

**State of Board of Health
Agenda
December 13, 2018 – 9:00 a.m.
Perimeter Center – Boardroom 2**

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|---|---|
| Call to Order and Welcome | Faye Prichard, Chair |
| Pledge of Allegiance | Linda Hines, RN |
| Introductions | Ms. Prichard |
| Review of Agenda | Joseph Hilbert, MPA Deputy Commissioner for Governmental and Regulatory Affairs |
| Approval of June 7, 2018 Minutes | Ms. Prichard |
| Commissioner’s Report | M. Norman Oliver, MD, MA State Health Commissioner |
| Regulatory Action Update | Mr. Hilbert |
| 2019 Board Meeting Schedule | Ms. Prichard |
| Break | |
| Proposed Amendments to Board of Health Bylaws | Mr. Hilbert |
| Public Comment Period | |
| <u>Board Action Item</u> | |
| Board of Health Annual Report – Virginia’s Plan for Well-Being | Laurie Forlano, DO Deputy Commissioner for Population Health |
| <u>Regulatory Action Items</u> | |
| Waterworks Regulations 12VAC5-590 (Proposed Amendments) | Dwayne Roadcap, Director Office of Drinking Water |
| Working Lunch Housing as a Social Determinant of Health | Demetria Lindsay, MD, Director Norfolk Health District |
| <u>Regulatory Action Items</u> | |
| Regulations for Disease Reporting and Control 12VAC5-90 (Fast Track Amendments) | Dr. Forlano |

Regulations for Recreational Water Advisories
12VAC5-135
(Fast Track Regulations)

Dr. Forlano

Regulations Governing Tourist Establishment
Swimming Pools and Other Public Pools
12VAC5-460
(Fast Track Amendments)

Allen Knapp, Director
Office of Environmental Health Services

Member Reports

Other Business

Adjourn



COMMONWEALTH of VIRGINIA

Department of Health

M. Norman Oliver, MD, MA
State Health Commissioner

P O Box 2448
RICHMOND, VA 23218

TTY 7-1-1 OR
1-800-828-1120

December 4, 2018

MEMORANDUM

TO: State Board of Health Members

FROM: Laurie Forlano, DO, MPH
Deputy Commissioner for Population Health

SUBJECT: Virginia's Plan for Well-Being/Board of Health Annual Report

Attached for your review is the draft version of Virginia's Plan for Well Being – Annual Report 2018. The report provides a status update for the 29 metrics across the Plan's four aims: Healthy, Connected Communities; Strong Start for Children; Preventive Actions; and System of Health Care.

The draft report is comprised of three sections, as follows:

- 1) a progress summary
 - this includes existing metrics, an inventory assessment of community-specific population health initiatives and agency-wide next steps
- 2) a metrics table
 - this includes 2020 goals for each metric, as well as 2016 baseline data and 2018 metric updates, as appropriate
- 3) a metadata listing for each of the 29 measures
 - in addition to the goal and current year status for each measure, this section includes a listing of all applicable data source(s), descriptions and limitations necessary for appropriate interpretation.

Upon your approval, the Virginia Department of Health will submit this report to the Governor and General Assembly, in compliance with the Board's annual reporting requirement pursuant to § 32.1-14 of the Code of Virginia.

2018 Annual Report on the Virginia's Plan for Well Being

Together with its partners, the Virginia Department of Health (VDH) aims to make Virginia the healthiest state in the nation. Using Virginia's Plan for Well Being (The Plan) as a guidance document, VDH monitors its shared progress for population health improvement as measured by multiple health indicators outlined in the 2018 Annual Progress Report. Using data to evaluate progress helps VDH to assess whether its strategies and systems are effective, and to make adjustments when needed.

As part of this continual improvement process, VDH is committed to the ongoing assessment and mitigation of health inequities that exist across the Commonwealth. The measures presented in the Annual Progress Report are at a state level; different communities may have different population health concerns. Health disparities and health inequities analyzed at lower geographic levels (e.g., county, health district, etc.), or within subpopulations, are more meaningful to guide action. This work is inculcated at the local level through community health assessment and community health improvement planning processes, which is driven by collective impact.

Progress on Metrics

The Plan outlines a path for improving the health and well-being of Virginians through four aims, 13 goals, and 29 measures. The table attached indicates the updated figure for each measure in The Plan, with the most current data available. The accompanying technical document provides more detail on values, data sources, and descriptions of each measure.

Of the 26 measures for which there is available data at the time of this report, 11 are showing marked improvement, although at different degrees. Of these, one measure (pregnancies per 1000 females ages 15-19 years old) has exceeded the goal that was originally set forth in The Plan. The remaining 15 measures persist as areas of focus, in that they have evidenced little to no change, or in some cases, have decreased further away from the intended goal. The measure regarding mental health and substance use hospitalization rate, marked with an asterisk, is one that is markedly worsening.

Improving Measures

- Ongoing collaborative community health planning process
- Pregnancies per 1,000 females ages 15-19 years
- Percent of third graders who pass the Standards of Learning Third Grade reading assessment
- HPV vaccine-girls
- HPV vaccines- boys
- Healthcare providers with a certified electronic health record
- Entities connected through the Health Information Exchange
- Hospitals meeting state goal for prevention of C Diff infections
- Avoidable deaths from heart disease, stroke, or HTN
- Adults using tobacco
- Infant mortality of black infants

Areas of Focus

- Percent of high school graduates enrolled in higher education within 16 months of graduation
- Percent of cost burdened households
- Percent of adults not participating in any physical activity
- Percent of adults overweight/obese
- Percent of adults receiving an annual influenza vaccine
- Percent of adults who receive colorectal cancer screening
- Percent of adults with a regular healthcare provider
- Percent of adults reporting 1+ days of poor health that kept them from doing usual activities
- Local health departments with an electronic health record
- Children not meeting the PALS-K Benchmark
- Percent of adults reporting at least one (1) adverse childhood experience
- Mental health/substance use hospitalization rate*

Further investigation into the drivers behind this lack of improvement in many areas is warranted. Many factors play into these measures and improvement will require a more holistic, cross-sector approach to observe positive change in these areas of focus.

Inventory of Local Community/Population Health Initiatives and Strategies

In 2018, VDH completed a project to inventory community-based collaborative activities and population health initiatives, plans, and coalitions that local health districts (LHDs) participate in or lead throughout the Commonwealth. VDH is identifying initiatives with common goals, objectives, and metrics. A comparison of the activities and projects in the inventory to metrics within The Plan will allow for alignment and intentionality of effort and shared results. Of the 492 efforts collected from LHDs, Aims 1 (70%) and 3 (67%) were more widely represented across the efforts than Aims 2 (36%) and 4 (32%). The majority of efforts seek to benefit these community sectors: health, parents and families, youth and children, education, human services, and government.

Next Steps:

Partnership for a Healthy Virginia

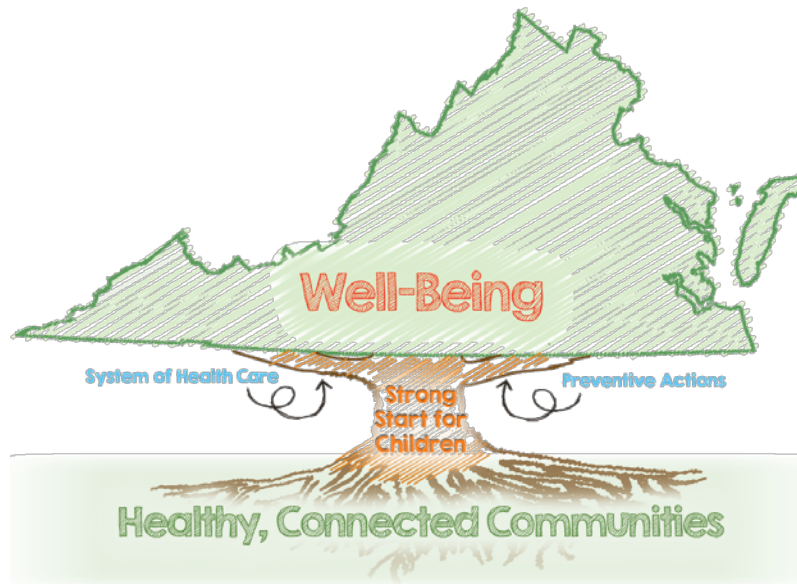
The Partnering for a Healthy Virginia Initiative is a new collaboration between the Virginia Department of Health and the Virginia Hospital and Healthcare Association. This partnership is aimed at improving Virginia's performance on population health metrics through building a broad-based, multi-sector coalition. The initiative is founded on the shared goal of making Virginia the healthiest state in the nation and is designed to build upon the existing strong partnership between these two organizations. The work will have a focus on coordinating the implementation of programs and services to improve population health across the Commonwealth with community health assessments serving as the primary driver of these efforts.

Virginia's not-for-profit hospitals complete community health needs assessments every three years as required by the Patient Protection and Affordable Care Act. Through this process, hospitals assess the health needs of the communities they serve and obtain data necessary to develop implementation strategies for priority areas. At the same time, other agencies, coalitions, and organizations also prepare local and statewide health improvement plans, which all address prioritized community health needs. Although these plans often overlap and share common goals, they can be better aligned and coordinated to achieve optimal performance on improving the population's health. The Partnership Advisory Committee, which already involves many of these local and state-level organizations, has convened twice, and the partnership is working to establish a shared agenda, performance metrics, and select potential demonstration projects.

State Health Assessment:

The next State Health Assessment is underway with an estimated completion date in December 2019. VDH staff are collecting and analyzing quantitative data as part of the Title V Needs Assessment. The State Health Assessment will build upon the Title V assessment (which has a focus on Maternal and Child Health populations) with other data sources to ensure a comprehensive assessment of health and well-being in Virginia. After the quantitative data is organized into population domain briefs, key populations of interest will be asked to consider the data and offer feedback and input into what they need to live healthy lives in Virginia. Stakeholders, including the Board of Health, will help review the data and consider the final development of the assessment recommendations and report.

The State Health Assessment will prioritize population health focal areas. In turn, VDH will lead the development of a new State Health Improvement Plan, using data to decide where to focus collective efforts and resources for the following five years. This improvement plan will include agreement on measures for monitoring and evaluation and will provide recommended strategies, systems level changes, and policy priorities to address needed areas of health improvement. Ownership of the identified strategies will fall on all collaborators involved in the process, as this work requires team effort. The state health assessment and improvement process will include a reinvigorated focus on health equity, and will address upstream drivers including the social determinants of health.



Virginia's Plan for Well-Being

2016-2020

Annual Report, 2018

Virginia Department of Health
109 Governor Street
Richmond, VA 23219
www.vdh.virginia.gov

Background

This information below serves as an annual report to *Virginia's Plan for Well-Being*, the Commonwealth of Virginia's state health improvement plan for 2016-2020. The plan has four aims:

1. Healthy, Connected Communities
2. Strong Start for Children
3. Preventive Actions
4. System of Health Care

Within this framework, the plan lays out 13 goals and 29 measures of success. This document describes the first year measures and status of indicators for review.

Vision: Well-Being for All Virginians

Well-Being

Measure Percent of adults in Virginia who report positive well-being; Baseline: 68% (2016).

2018 Update 66.8% (2017)

2020 Goal 70%

Data Source Virginia Behavioral Risk Factor Surveillance System. Virginia Department of Health.

Description The four-item Satisfaction with Life Scale (SWLS) asks respondents to indicate how much they agree with the four following statements on a scale from 1 (strongly agree) to 5 (strongly disagree): (1) "In most ways my life is close to ideal," (2) "The conditions of my life are excellent," (3) "I am satisfied with my life," and (4) "So far I have gotten the important things I want in life." Responses to the four SWLS questions are dichotomized into those indicating positive well-being (e.g., agree/strongly agree) and those indicating negative well-being (e.g., disagree/strongly disagree). For overall SWLS, adults responding agree or strongly agree to all four questions (score = 4), are considered positive. Data collection for the SWLS scale began in 2016 as part of Virginia's Behavioral Risk Factor Surveillance System.

The Behavioral Risk Factor Surveillance System is an ongoing, annual survey of adults who are randomly called via landline or cell phone. The survey is coordinated by the Centers for Disease Control and Prevention and conducted in all 50 states. The Virginia Department of Health conducts the survey in Virginia. Responses of don't know/not sure, refused, or missing are removed from the numerator and denominator in all estimates.

AIM 1 — Healthy, Connected Communities

Goal 1.1 **Virginia's Families Maintain Economic Stability**

1.1 A **High School Graduates Enrolled in Higher Education**

Measure Percent of Virginia high school graduates enrolled in an institute of higher education within 16 months after graduation; Baseline: 70.9% (2013).

2018 Update 72.0% (2015)

2020 Goal 75%

Data Source Virginia Postsecondary Enrollment Reports. Virginia Department of Education.

Description The percent of Virginia high school graduates who:

1. Graduated within five years of entering high school,
2. Earned a standard or advanced studies diploma, and
3. Were enrolled in an institute of higher education within 16 months of graduation.

This measure follows a cohort of students who entered ninth grade in the same year.

1.1 B [Cost-Burdened Households](#)

Measure Percent of cost-burdened households in Virginia (more than 30% of monthly income spent on housing costs); Baseline: 31.4% (2013).

2018 Update 29.9% (2016)

2020 Goal 29.0%

Data Source American Community Survey. U.S. Census Bureau.

Description This measure is calculated by dividing the number of Virginians that spent more than 30% of their monthly income on rent, mortgage, or housing without a mortgage by the number of occupied housing units in Virginia. The numerator is housing cost as a proportion of total income in a given year. The data are from the American Community Survey 1-Year Estimates. This is a point-in-time annual survey.

1.1 C [Consumer Opportunity Index Score](#)

Measure Consumer Opportunity Index score in Virginia; Baseline: 81.8 (2009-2013).

2018 Update 86.1 (2011-2015)

2020 Goal 83.7

Data Source The Virginia Department of Health created the Consumer Opportunity Index utilizing the following data sources: Affordability, Education, Townsend Profile from the U.S. Census American Consumer Survey and 5-Year Food Accessibility Index from the U.S. Department of Agriculture.

Description The Consumer Opportunity Index is an indicator of consumer access to resources that support long and healthy lives, with 100% representing perfect access and 0% representing no access. The metric is a multivariate index comprised of four indicators:

1. Affordability (housing and transportation cost as a percent of income),
2. Education (average years of schooling),
3. Food Accessibility (percent of population that is both low income and has low access to food), and
4. Townsend Material Deprivation Profile (unemployment, home ownership, overcrowded homes and homes without an automobile).

The Consumer Opportunity Index is one of four multivariate profiles that make up the Health Opportunity Index (HOI). The Virginia Department of Health convened stakeholders to identify 13 indicators to include in the HOI. From these indicators, four separate profiles were created using principal component analysis. Data for the indicators are taken from different sources using different methodologies, and are updated on differing schedules. Indicators in each

profile are combined using the geometric mean. Each indicator is given equal weight in the profile. The Consumer Opportunity Index indicators are established at the census-tract level. County-level profiles are determined for each indicator using a population-weighted average of each tract in the county. The state score represents the median county score.

1.1 D **Economic Opportunity Index Score**

Measure Economic Opportunity Index score in Virginia; Baseline: 70.7 (2009-2013).

2018 Update 75.0 (2011-2015)

2020 Goal 73.7

Data Source The Virginia Department of Health created the Economic Opportunity Index utilizing the following data sources: U.S. Census, American Economic Survey, and 5-Year Estimates.

Description The Economic Opportunity Index is an indicator of access to the economic resources that support long and healthy lives, with 100% representing perfect access and 0% representing no access. The metric is a multivariate profile comprised of three indicators:

1. Employment (jobs per worker weighted by distance to job),
2. Income Inequality (Gini Coefficient), and
3. Job Participation (percent of working age population in the labor force).

The Economic Opportunity Index is one of four multivariate profiles that make up the Health Opportunity Index (HOI). The Virginia Department of Health convened stakeholders to identify 13 indicators to include in the HOI. From these indicators, four separate profiles were created using principal component analysis. Indicators in each profile are combined using the geometric mean. Data for the indicators are taken from different sources using different methodologies, and are updated on differing schedules. Each indicator is given equal weight in the profile. The Economic Opportunity Index indicators are established at the census-tract level. County-level profiles are determined for each indicator using a population-weighted average of each tract in the county. The state score represents the median county score.

Goal 1.2 **Virginia’s Communities Collaborate to Improve the Population’s Health**

1.2 **Districts with Collaborative Community Health Improvement Processes**

Measure Percent of Virginia health planning districts that have established an on-going collaborative community health improvement process; Baseline: 43.0% (2015).

2018 Update 88.0% (2017)

2020 Goal 100%

Data Source Virginia Department of Health.

Description The measure is calculated by dividing the number of health districts in Virginia that report that a collaborative community health improvement process is established in their health planning district divided by 35 (total number of health planning districts).

AIM 2 — Strong Start for Children

Goal 2.1 Virginians Plan Their Pregnancies

2.1 Teen Pregnancy Rate

Measure Teen pregnancy rate per 1,000 females, ages 15 to 19 years, in Virginia; Baseline: 27.9 (2013).

2018 Update 20.9 (2016)

2020 Goal 25.1

Data Source Virginia Vital Records and Health Statistics Electronic Birth Certificates, Fetal Death Certificates, Induced Termination of Pregnancy Certificates. Virginia Department of Health.

Description This metric is created using live birth data from the electronic birth certificate as reported by birth facilities, Induced Termination of Pregnancy (ITOP) data as reported by ITOP facilities, fetal death data as reported by medical providers and the number of female teens (15-19 years of age) from the National Center for Health Statistics population estimates.

Goal 2.2 Virginia's Children Are Prepared to Succeed in Kindergarten

2.2 A Kindergartens Not Meeting Phonological Awareness Literacy (PALS-K) Benchmark

Measure Percent of children in Virginia who do not meet the PALS-K benchmarks in the fall of kindergarten and require literacy intervention; Baseline: 12.7% (2014-2015).

2018 Update 15.9% (2017-2018)

2020 Goal 12.2%

Data Source Phonological Awareness Literacy Screening – Kindergarten Results. Virginia Department of Education.

Description The Phonological Awareness Literacy Screening – Kindergarten (PALS-K) is conducted in the fall of each school year and identifies kindergarten students who are at risk for reading difficulties. The tool measures children's knowledge of several literacy fundamentals: phonological awareness, alphabet recognition, concept of word, knowledge of letter sounds, and spelling. The PALS-K is an assessment of literacy readiness and is not a comprehensive measure of school readiness. PALS-K is the state-provided screening tool for Virginia's Early Intervention Reading Initiative (EIRI) and is used by 99% of school divisions in the state on a voluntary basis.

2.2 B Third Graders Passing Reading Standards of Learning (SOL) Assessment

Measure Percent of third graders in Virginia who pass the Standards of Learning third grade reading assessment; Baseline: 69.0% (2014-2015).

2018 Update 74.6% (2016-2017)

2020 Goal 80.0%

Data Source Virginia Standards of Learning Results. Virginia Department of Education.

Description The Standards of Learning (SOL) for Virginia Public Schools establish minimum expectations for what students should know and be able to do at the end of each grade. All items on SOL tests

are reviewed by Virginia classroom teachers for accuracy and fairness, and teachers also assist the state Board of Education in setting proficiency standards for the tests.

Goal 2.3 **The Racial Disparity in Virginia’s Infant Mortality Rate is Eliminated**

2.3 **Infant Mortality Rate by Race**

Measure Black infant mortality rate in Virginia per 1,000 live births by race; Baseline: 12.2 (2013).

2018 Update 10.7 (2016)

2020 Goal 5.2

Data Source Virginia Vital Records and Health Statistics Electronic Birth Certificates and Electronic Death Certificates. Virginia Department of Health.

Description Virginia’s infant mortality rate is calculated by dividing the number of deaths of children under one year of age by the number of live births to mothers living in the state. The resulting number is multiplied by 1,000 to compute the rate.

AIM 3 — Preventive Actions

Goal 3.1 **Virginians Follow a Healthy Diet and Live Actively**

3.1 A **Adults Not Participating in Physical Activity**

Measure Percent of Virginia adults 18 years and older who do not participate in any physical activity during the past 30 days; Baseline: 23.5% (2014).

2018 Update 23.3% (2016)

2020 Goal 20.0%

Data Source Virginia Behavioral Risk Factor Surveillance System. Virginia Department of Health.

Description The percent of Virginia adults 18 years and older who reported that they did not participate in any physical activity other than their regular job during the past 30 days. The Behavioral Risk Factor Surveillance System (BRFSS) is an ongoing, annual survey of adults who are randomly called via landline or cell phone. The survey is coordinated by the Centers for Disease Control and Prevention (CDC) and conducted in all 50 states. The Virginia Department of Health conducts the survey in Virginia. The information is self-reported and not observed or measured. Responses of don’t know/not sure, refused, or missing were removed from the numerator and denominator in all estimates.

3.1 B **Adults Who Are Overweight or Obese**

Measure Percent of Virginia adults 18 years and older who are overweight or obese; Baseline: 64.7% (2014).

2018 Update 65.5% (2016)

2020 Goal 63.0%

Data Source Virginia Behavioral Risk Factor Surveillance System. Virginia Department of Health.

Description The percent of Virginia adults 18 years and older who reported a body mass index (BMI) greater than 25. The Behavioral Risk Factor Surveillance System (BRFSS) is an ongoing, annual survey of adults who are randomly called via landline or cell phone. The survey asks respondents what their height and weight are. BMI is then calculated based on reported height and weight. The survey is coordinated by the Centers for Disease Control and Prevention (CDC) and conducted in all 50 states. The Virginia Department of Health conducts the survey in Virginia. Responses of don't know/not sure, refused, or missing were removed from the numerator and denominator in all estimates.

3.1 C [Households That Are Food Insecure](#)

Measure Percent of Virginia households that are food insecure for some part of the year. Baseline: 11.9% (2013).

2018 Update 10.6% (2016)

2020 Goal 10.0%

Data Source *Map the Meal Gap* utilized the Current Population Survey, and American Community Survey from the U.S. Census Bureau.

Description Feeding America's *Map the Meal Gap* analyzes the relationship between food insecurity and indicators of food insecurity, and child food insecurity (poverty, unemployment, median income, etc.) at the state level.

Goal 3.2 [Virginia Prevents Nicotine Dependency](#)

3.2 [Adults Using Tobacco](#)

Measure Percent of Virginia adults aged 18 years and older who report using tobacco. Baseline: 21.9% (2014).

2018 Update 17.9% (2017)

2020 Goal 12.0%

Data Source Virginia Behavioral Risk Factor Surveillance System. Virginia Department of Health.

Description The percent of Virginia adults 18 years and older who report that they have smoked at least 100 cigarettes in their lifetime and currently smoke tobacco on at least some days, use chewing tobacco, use snuff and/or use snus. The Behavioral Risk Factor Surveillance System (BRFSS) is an ongoing, annual survey of adults who are randomly called via landline or cell phone. The survey is coordinated by the Centers for Disease Control and Prevention (CDC) and conducted in all 50 states. The Virginia Department of Health conducts the survey in Virginia. The information is self-reported and not observed or measured. Responses of don't know/not sure, refused, or missing were removed from the numerator and denominator in all estimates.

Goal 3.3 [Virginians Are Protected Against Vaccine-Preventable Diseases](#)

3.3 A [Adults Vaccinated Against Influenza](#)

Measure Percent of Virginia adults 18 years and older who received an annual influenza vaccine. Baseline: 48.2% (2014-2015).

2018 Update 47.9% (2016-2017)

2020 Goal 70%

Data Source Behavioral Risk Factor Surveillance System, and the National Immunization Survey. Centers for Disease Control and Prevention.

Description The percent of Virginians 18 years of age and older who received an annual influenza vaccine. The Centers for Disease Control and Prevention analyzed the National Immunization Survey-Flu and the Behavioral Risk Factor Surveillance System to estimate national and state level flu vaccination coverage. Influenza vaccination status is based on self-reported data and not validated with medical records.

3.3 B **Adolescents Vaccinated Against HPV**

Measure Percent of girls aged 13-17 in Virginia who receives three doses of HPV vaccine and percent of boys aged 13-17 in Virginia who receive three doses of HPV vaccine. Girls Baseline: 35.9% (2014), Boys Baseline: 22.5% (2014).

This measure has been updated for the 2018 Annual Report to reflect changes in CDC methodology. The above measure is no longer used. The updated measure is below:

Percent of girls ages 13-17/Percent of boys age 13-17 in Virginia who are “up to date” (UTD) in the HPV vaccine series. This can be met with two or three doses, depending on the age of initiation of the vaccine series. Girls UTD baseline (2016): 41.1%; Boys UTD Baseline (2016): 37.4%

2018 Update Girls (UTD): 68% (2016), Boys (UTD): 50.4% (2016)

2020 Goal Girls and Boys: 80.0%

Data Source National Immunization Survey-Teen. Centers for Disease Control and Prevention.

Description The percent of Virginia adolescents aged 13-17 (girls and boys reported separately) who received three doses of human papillomavirus (HPV) vaccine (two doses are recommended as of 2016). The National Immunization Survey-Teen (NIS-Teen) is an ongoing, annual survey of children, whose parents/guardians are randomly called via landline or cell phone. The survey is coordinated by the Centers for Disease Control and Prevention and conducted in all 50 states. Doses of vaccines administered are verified by providers through a mailed survey to the girls’ immunization providers.

Goal 3.4 Cancers Are Prevented or Diagnosed at the Earliest Stage Possible

3.4 **Adults Screened for Colorectal Cancer**

Measure Percent of Virginia adults aged 50 to 75 years who receive colorectal cancer screening. Baseline: 69.1% (2014).

2018 Update 70.3% (2016)

2020 Goal 85.0%

Data Source Virginia Behavioral Risk Factor Surveillance System. Virginia Department of Health.

Description The percent of Virginia adults, ages 50 to 75 years, who report receiving a colorectal cancer screening test based on the most recent guidelines (fecal occult blood test, proctoscopy, colonoscopy, or sigmoidoscopy). The Behavioral Risk Factor Surveillance System (BRFSS) is an ongoing, annual survey of adults who are randomly called via landline or cell phone. The survey

is coordinated by the Centers for Disease Control and Prevention (CDC) and conducted in all 50 states. The Virginia Department of Health conducts the survey in Virginia. The information is self-reported and not observed or measured. Responses of don't know/not sure, refused, or missing were removed from the numerator and denominator in all estimates. Data collected in even years: 2014, 2016, 2018, etc.

Goal 3.5 **Virginians Have Life-Long Wellness**

3.5 A **Disability-Free Life Expectancy**

Measure Average years of disability-free life expectancy for Virginians; Baseline: 66.1 (2013), 66.0 (2014).

2018 Update *measure calculation in process*

2020 Goal 67.3

Data Source U.S. Census Intercensal Population File Vintage 2014, Virginia Vital Records and Health Statistics Electronic Death Certificates, and the American Community Survey. Virginia Department of Health.

Description Disability-free life expectancy (DFLE) was calculated for Virginia census tracts by adding the estimates of the proportion of individuals with disabilities by tract and age group to the abridged life table estimates of mortality and population used for creating life expectancy (LE) estimates. The life table with the proportion of disabled individuals was the input for the analysis using the Chiang II methodology with Silcock's adjustment for calculation of LE and Sullivan's methods for DFLE. The disabled population proportion was defined for this study as answering yes to any one of the six disability questions (2009-2013 aggregate) in the American Community Survey. Significant consideration was given to disability chosen, small area analysis problems, and how to share the analysis for best impact. At the tract level, data censorship was considered when unusual population distributions were encountered. Minimum population size requirements were met to reduce large standard errors. DFLE estimates were added to a multiple linear regression model with social determinants of health as the explanatory variables.

3.5 B **Adults with Adverse Childhood Experiences**

Measure Percent of adults in Virginia who report at least one (1) adverse childhood experience; Baseline: 60.4% (2016).

2018 Update 61.2% (2017)

2020 Goal 45%

Data Source Virginia Behavioral Risk Factor Surveillance System. Virginia Department of Health.

Description Adverse childhood experiences (ACEs) include verbal, physical, or sexual abuse, as well as family dysfunction (e.g., an incarcerated, mentally ill, or substance-abusing family member; domestic violence; or absence of a parent because of divorce or separation). The ACE score is a measure of cumulative exposure to particular adverse childhood conditions. Exposure to any single ACE condition is counted as one point. If an adult experienced none of the conditions in childhood, the ACE score is zero. Points are totaled for a final ACE score. The Behavioral Risk Factor Surveillance System is an ongoing, annual survey of adults who are randomly called via landline or cell phone. The survey is coordinated by the Centers for Disease Control and Prevention

(CDC) and conducted in all 50 states. The Virginia Department of Health conducts the survey in Virginia. Responses of don't know/not sure, refused, or missing were removed from the numerator and denominator in all estimates.

AIM 4 — System of Health Care

Goal 4.1 **Virginia Has a Strong Primary Care System Linked to Behavioral Health Care, Oral Health Care, and Community Support Systems**

4.1 A **Adults with a Regular Health Care Provider**

Measure Percent of adults 18 years and older who have a regular health care provider; Baseline: 69.3% (2014).

2018 Update 71.7% (2016)

2020 Goal 85.0%

Data Source Virginia Behavioral Risk Factor Surveillance System. Virginia Department of Health.

Description The percent of Virginia adults who report that they have at least one personal healthcare provider for ongoing care. The Behavioral Risk Factor Surveillance System is an ongoing, annual survey of adults who are randomly called via landline or cell phone. The survey is coordinated by the Centers for Disease Control and Prevention and conducted in all 50 states. The Virginia Department of Health conducts the survey in Virginia. The information is self-reported and not observed or measured. Responses of don't know/not sure, refused, or missing were removed from the numerator and denominator in all estimates.

4.1 B **Avoidable Hospital Stays**

Measure Rate of avoidable hospital stays for ambulatory care sensitive conditions in Virginia per 100,000 persons; Baseline: 1,294 (2013).

2018 Update 1,151 (2014)

2020 Goal 1,100

Data Source Virginia Inpatient Hospitalization. Virginia Health Information.

Description The measure is the Agency for Healthcare Research and Quality's Prevention Quality Overall Composite (PQI #90) in Virginia. It includes hospitalizations that could have been prevented through high quality outpatient care, including uncontrolled diabetes, short-term diabetes complications, long-term diabetes complications (including amputated limbs), chronic obstructive pulmonary disease, high blood pressure, heart failure, chest pain, adult asthma, dehydration, pneumonia, and urinary tract infections. The number of hospital stays is provided for every 100,000 people who reside in that area.

4.1 C **Avoidable Cardiovascular Disease Deaths**

Measure Rate of avoidable deaths from heart disease, stroke, or hypertensive disease in Virginia per 100,000 persons; Baseline: 49.9 (2013).

2018 Update 42.4 (2016)

2020 Goal 40.0

Data Source Virginia Vital Records and Health Statistics Electronic Death Certificates. Virginia Department of Health.

Description Deaths included were those caused by cardiovascular disease, including chronic rheumatic heart disease (ICD 10 codes I05-I09), hypertension (ICD codes I10, I12, I15), ischemic heart disease (ICD 10 codes I20-I25), and cerebrovascular disease (ICD 10 codes I60-I69). An age-adjusted formula for population was used, truncating the years over 75, and then reformatting to the new million population for those age ranges.

4.1 D [Adult Mental Health and Substance Abuse Hospitalizations](#)

Measure Rate of adult mental health and substance abuse hospitalizations in Virginia per 100,000 adults; Baseline: 668.50 (2013).

2018 Update 803.4 (2016)

2020 Goal 635.1

Data Source Virginia Inpatient Hospitalization. Virginia Health Information.

Description Diagnosis codes to include for mental health and substance abuse hospitalizations were selected based on criteria developed by the Healthcare Cost and Utilization Project. The case definition used excluded discharges related to maternity stays and individuals under the age of 18. Population denominators were derived from midyear Census estimates provided by the National Center for Health Statistics.

4.1 E [Adults Whose Poor Health Kept Them from Usual Activities](#)

Measure Percent of adults 18 years and older in Virginia who reported having one or more days of poor health that kept them from doing their usual activities; Baseline: 19.5% (2014).

2018 Update 20.9% (2017)

2020 Goal 18.0%

Data Source Virginia Behavioral Risk Factor Surveillance System. Virginia Department of Health.

Description Percent of Virginia adults who reported having one or more days of poor health (physical health or mental health) and reported that poor health kept them from doing usual activities. The Behavioral Risk Factor Surveillance System (BRFSS) is an ongoing, annual survey of adults, who are randomly called via landline or cell phone. The survey is coordinated by the Centers for Disease Control and Prevention (CDC) and conducted in all 50 states. The Virginia Department of Health conducts the survey in Virginia. The information is self-reported and not observed or measured. Responses of don't know/not sure, refused, or missing were removed from the numerator and denominator in all estimates.

Goal 4.2 [Virginia's Health IT System Connects People, Services and Information to Support Optimal Health Outcomes](#)

4.2 A [Providers with Electronic Health Records](#)

Measure Percent of health care providers in Virginia who have implemented a certified electronic health record; Baseline: 70.6% (2014).

2018 Update 82.0% (2017)

| | |
|--------------------|---|
| 2020 Goal | 90.0% |
| Data Source | National Electronic Health Records Survey. Centers for Disease Control and Prevention. |
| Description | Data are from the National Electronic Health Records Survey (NEHRS). NEHRS, which is conducted by the National Center for Health Statistics and sponsored by the Office of the National Coordinator for Health Information Technology, is a nationally representative mixed mode survey of office-based physicians that collects information on physician and practice characteristics, including the adoption and use of EHR systems. Using a physician database, email addresses of sampled physicians were identified. Sampled physicians that did not have an email match were asked to complete the survey by mail or phone. Among those with email addresses, respondents were randomly assigned to one of four groups: an invitation to take the web survey through email, US mail, both, or no web survey option. Nonresponse to the web survey resulted in 3 mailings of the questionnaire followed by phone contacts. |

4.2 B [Entities Connected to Health Information Exchange](#)

| | |
|--------------------|--|
| Measure | Number of entities in Virginia connected through Connect Virginia HIE Inc., the electronic health information exchange, and the national e-Health Exchange; Baseline: 3,800 (2015). |
| 2018 Update | 6,289 (2017) |
| 2020 Goal | 7,600 |
| Data Source | Connect Virginia HIE, Inc. |
| Description | Connect Virginia HIE, Inc. is the statewide health information exchange (HIE) for the Commonwealth of Virginia. The HIE uses secure, electronic, internet-based technology to allow medical information to be exchanged by participating entities. Connect Virginia reports the number of entities in Virginia connected on a quarterly basis. |

4.2 C [Health Districts with Electronic Health Records](#)

| | |
|--------------------|---|
| Measure | Number of Virginia’s local public health districts that have electronic health records and connect to Connect Virginia, Virginia’s Health Information Exchange; Baseline: 0 (2015). |
| 2018 Update | 0 (2017) |
| 2020 Goal | 35 |
| Data Source | Virginia Department of Health. |
| Description | Count of Virginia’s local public health districts (total of 35) that have electronic health records and connect to Connect Virginia, Virginia’s Health Information Exchange. |

Goal 4.3 [Health Care-Associated Infections Are Prevented and Controlled in Virginia](#)

4.3 [Hospitals Meeting State Goal for Prevention of *C. difficile* Infections](#)

| | |
|--------------------|---|
| Measure | Percent of hospitals in Virginia meeting the state goal for prevention of hospital-onset <i>Clostridium difficile</i> infections; Baseline: 64.9% (2015). |
| 2018 Update | 82.1% (2017) |
| 2020 Goal | 100.0% |

Data Source National Healthcare Safety Network. Centers for Disease Control and Prevention.

Description The percent of Virginia hospitals that meet the state goal for prevention of hospital-onset *C. difficile* laboratory-identified events. The state goal is a standardized infection ratio ≤ 0.7 , which aligns with the goal of the Department of Health and Human Services National Healthcare-Associated Infections Action Plan.

| Virginia's Plan For Well-Being Measures* | | 2020 GOAL | 2016 Baseline | 2017 Update | 2018 Update |
|--|--|-----------|----------------------|----------------------|----------------------|
| Well-Being: Percent of Adults in Virginia Who Report Positive Well-Being | | 70% | -- | 68% (2016) | 66.80% (2017) |
| AIM 1 » Healthy, Connected Communities | Percent of High School Graduates Enrolled in an Institution of Higher Education Within 16 Months After Graduation | 75.0% | 70.9% (2013) | 72.0% (2014) | 72.0% (2015) |
| | Percent of Cost-Burdened Households (More Than 30% of Monthly Income Spent on Housing Costs) | 29.0% | 31.4% (2013) | 31.0% (2015) | 29.9% (2016) |
| | Consumer Opportunity Profile (Health Opportunity Index) | 83.7 | 81.8 (2013) | 86.1 (2015) | -- |
| | Economic Opportunity Profile (Health Opportunity Index) | 73.7 | 70.7 (2013) | 75 (2015) | -- |
| | Percent of Health Planning Districts That Have Established an On-going Collaborative Community Health Planning Process | 100.0% | 43.0% (2015) | 82.8% (2016) | 88.0% (2017) |
| AIM 2 » Strong Start for Children | Pregnancies Per 1,000 Females Ages 15 to 19 Years Old | 25.1 | 27.9 (2013) | 24.9 (2014) | 20.9 (2016) |
| | Percent of Children Who Do Not Meet the PALS-K Benchmarks in the Fall of Kindergarten and Require Literacy Interventions | 12.2% | 12.7% (2014-2015) | 13.8% (2015-2016) | 15.9% (2017-2018) |
| | Percent of Third Graders Who Pass the Standards of Learning Third Grade Reading Assessment | 80.0% | 69.0% (2014-2015) | 75.4% (2015-2016) | 74.6% (2016-2017) |
| | Black Infant Deaths Per 1,000 Black Live Births | 5.2 | 12.2 (2013) | 11.1 (2015) | 10.7 (2016) |

| Virginia's Plan For Well-Being Measures* | | 2020 GOAL | 2016 Baseline | 2017 Update | 2018 Update |
|--|--|-----------|----------------------|----------------------|----------------------|
| AIM 3 » Preventive Actions | Percent of Adults Who Did Not Participate In Any Physical Activity During the Past 30 Days | 20.0% | 23.5% (2014) | 25.1% (2015) | 23.3% (2016) |
| | Percent of Adults Who Are Overweight or Obese | 63.0% | 64.7% (2014) | 64.1% (2015) | 65.5% (2016) |
| | Percent of Households That Are Food Insecure For Some Part of the Year | 10.0% | 11.9% (2013) | 11.2% (2015) | 10.6% (2016) |
| | Percent of Adults Who Currently Use Tobacco | 12.0% | 21.9% (2014) | 16.5% (2016) | 17.9% (2017) |
| | Percent of Adults Who Receive an Annual Influenza Vaccine | 70.0% | 48.2% (2014-2015) | 46.0% (2015-2016) | 47.9% (2016-2017) |
| | Percent of Adolescent Girls (13-17 Years Old) Who Receive Two Doses of HPV Vaccine | 80.0% | -- | 41.1% (2016) | 68.0% (2017) |
| | Percent of Adolescent Boys (13-17 Years Old) Who Receive Two Doses of HPV Vaccine | 80.0% | -- | 37.4% (2016) | 50.4% (2017) |
| | Percent of Adults Ages 50-75 Years Old Who Receive Colorectal Cancer Screening | 85.0% | 69.1% (2014) | 70.3% (2016) | 70.3% (2016) |
| | Average Years of Disability-Free Life Expectancy | 67.3 | 66.1 (2013) | 66.0 (2014) | -- |
| | Percent of Adults Who Report at least One (1) Adverse Childhood Experience (ACEs) | 45.0% | -- | 60.4% (2016) | 61.2% (2017) |
| AIM 4 » System of Health Care | Percent of Adults Who Have a Regular Health-care Provider | 85.0% | 69.3% (2014) | 71.1% (2015) | 71.7% (2016) |
| | Avoidable Hospital Stays for Ambulatory Care Sensitive Conditions Per 100,000 Persons | 1,100 | 1,294 (2013) | 1,151 (2014) | -- |
| | Avoidable Deaths from Heart Disease, Stroke or Hypertensive Disease Per 100,000 Persons | 40.0 | 49.9 (2013) | 41.7 (2015) | 42.4 (2016) |
| | Mental Health and Substance Use Disorder Hospitalizations Per 100,000 Adults | 635.1 | 668.5 (2013) | 760.4 (2015) | 803.4 (2016) |
| | Percent of Adults Who Report Having One or More Days of Poor Health That Kept Them From Doing Their Usual Activities During the Past 30 Days | 18.0% | 19.5% (2014) | 19.0% (2015) | 20.9% (2017) |
| | Percent of Health-care Providers Who Have Implemented a Certified Electronic Health Record | 90.0% | 70.6% (2014) | 73.4% (2015) | 82.0% (2017) |
| | Number of Entities Connected Through Connect Virginia HIE Inc., and the Electronic Health Information Exchange, and the National e-Health Exchange | 7,600 | 3,800 (2015) | 4,832 (2016) | 6,289 (2017) |
| | Number of Local Health Districts That Have Electronic Health Records and Connect to Community Providers Through Connect Virginia | 35 | 0 (2015) | 0 (2016) | 0 (2017) |
| | Percent of Hospitals That Meet the State Goal for Prevention of Hospital-onset <i>Clostridium difficile</i> Infections | 100% | 64.9% (2015) | 65.4% (2016) | 82.1% (2017) |

*Virginia's Plan for Well-Being 2016–2020 and Technical Report can be found online at <http://virginiawellbeing.com> under Measures.



COMMONWEALTH of VIRGINIA

Department of Health

P O BOX 2448

RICHMOND, VA 23218

M. NORMAN OLIVER, MD, MA
STATE HEALTH COMMISSIONER

TTY 7-1-1 OR
1-800-828-1120

MEMORANDUM

DATE: October 11, 2018

TO: Virginia State Board of Health

FROM: Dwayne Roadcap, Director, Office of Drinking Water

SUBJECT: Proposed Stage for Amendments to the *Waterworks Regulations*

This regulatory action presents amendments to the *Waterworks Regulations*, which are necessary to ensure waterworks in the Commonwealth of Virginia protect the public health by supplying water that meets federal and state water quality standards. This stage follows the NOIRA, which was published in the October 30, 2017 issue of the *Virginia Register of Regulations*.

The *Waterworks Regulations* establish requirements and procedures for the issuance of permits, minimum standards for water quality (including requirements for waterworks owners to submit regular analytical results of sampling for biological, chemical, radiological, physical, and other tests), requirements for recordkeeping, reporting, public notice, and consumer confidence reports, requirements for inspections, and criteria for the siting, design, and construction of waterworks. The proposed regulatory action is the first comprehensive update of the *Waterworks Regulations* since 1993 and incorporates technologies and procedures that have come into use over the last 25 years.

The proposed amendments to Part I, General Framework for Waterworks Regulations, include:

- Adding 85 new defined terms and acronyms, revising 79 definitions, and deleting 49 definitions that are no longer used or relevant;
- Updating sections on the Waterworks Advisory Committee, variances, exemptions, and permit requirements;
- Adding details about business plans; and
- Making other modifications to ensure consistent use of defined terms and improve clarity and readability.

The proposed amendments to Part II, Operation Regulations for Waterworks, include:

- Reorganizing much of the content into new, smaller sections to improve clarity and readability, without changing the existing monitoring, treatment, reporting, and other requirements that are necessary for the state to retain primary enforcement responsibility for waterworks in Virginia;

- Adding an option to reduce the monitoring frequency for bacteriological contaminants at certain transient noncommunity waterworks
- Adding requirements for the owner of a waterworks to provide notification to the commissioner and consumers if the waterworks intends to start or stop fluoridation programs; and
- Updating sections on cross connection control, operator requirements, and evaluation for groundwater under the direct influence of surface water (GUDI).

The proposed amendments to Part III, Manual of Practice for Waterworks Design, include:

- Incorporating new treatment technologies and current industry standards for waterworks design, including automated control systems and alternate power requirements;
- Updating sections related to groundwater sources to reflect agency responsibilities and collect related requirements in one section instead of several; and
- Dividing several large sections into new, smaller sections to improve clarity and readability.

The Office of Drinking Water recommends that the Board of Health approve the regulatory action package. If approved, the Office of Drinking Water will submit the proposed amendments to the Registrar of Regulations for executive branch review. Following executive branch review and approval, the Registrar will publish the proposed amendments to the *Waterworks Regulations* in the *Virginia Register of Regulations* for a 60-day public comment period. At the conclusion of the public comment period, the Office of Drinking Water will review and respond to the public comments and prepare a final version of the proposed amendments to submit to the Board of Health for approval.

EXECUTIVE SUMMARY

This regulatory action presents amendments to the Waterworks Regulations, 12VAC5-590-10 *et seq.*, which ensure waterworks in the Commonwealth of Virginia protect public health by supplying water that meets federal and state water quality standards. The last comprehensive update of the Waterworks Regulations was in 1993. The proposed amendments address out-of-date regulations; incorporate new treatment, monitoring, and control technologies; bring requirements in current policies into the regulations; ensure design and operation requirements reflect current water consumption patterns; reorganize the regulations to improve readability and clarity; correct syntax and inconsistent use of terms; and ensure consistency with state law.

The proposed amendments involve almost every section of the regulations. However, they do not change any current water quality standards or any requirements related to compliance determination and treatment techniques. All of the monitoring and reporting requirements are also the same, with two exceptions: the option to reduce the monitoring frequency for bacteriological contaminants from quarterly to annually at qualified, well-operated transient noncommunity waterworks; and the requirement for a community waterworks to notify the State Health Commissioner and its consumers at least 90 days before it intends to start or discontinue a fluoridation program.

OVERVIEW OF THE REGULATIONS

The Waterworks Regulations establish requirements and procedures for permits, minimum standards for water quality (including requirements for waterworks owners to submit regular analytical results of sampling for biological, chemical, radiological, and physical contaminants, and other tests), requirements for recordkeeping, reporting, public notice, and consumer confidence reports, requirements for inspections, and criteria for the siting, design, and construction of waterworks.

The regulations currently consist of 4 parts and 16 appendices. Part I, the General Framework for Waterworks Regulations, contains definitions, general information, and procedures for requesting variances, exemptions, and permits. Part II, the Operation Regulations for Waterworks, contains requirements for monitoring, compliance determination, treatment techniques, operation, reporting, and cross connection control. Parts I and II include all of the federal requirements in the Safe Drinking Water Act and National Primary Drinking Water Regulations that VDH must implement in its regulations to maintain primary enforcement responsibility (*i.e.*, primacy). Part III, the Manual of Practice for Waterworks Design, contains requirements for water source development and the design and construction of treatment facilities, wells, storage facilities, distribution systems, and other processes and devices necessary to construct or modify a waterworks. Part IV, Exemptions for Noncommunity Waterworks to Specific Sections of the Manual of Practice (Part III), is applicable only to new construction at noncommunity waterworks.¹

¹ Noncommunity waterworks serve a population of 25 or more of the same people, who are not year-round residents, at least 60 days out of the year. An example of a noncommunity waterworks is a school that has its own water source.

The appendices contain background information used in developing the chemical, physical, and radiological limits of the drinking water standards, VDH field office locations, monthly operation report requirements, information about cross connection control plans, and information about determining the residual disinfection concentration and disinfectant contact time. The appendices also contain information about lead and copper sampling, best available treatment technologies, and consumer confidence reports and public notifications.

AMENDMENT PROCESS

VDH formed a regulatory advisory panel (RAP) in 2014 to conduct a detailed review of the Waterworks Regulations. The RAP had 28 members who represented waterworks, operators, county and local governments, consultants, and other state agencies. The University of Virginia Institute for Environmental Negotiation facilitated the RAP's five meetings between August and December 2014. VDH prepared draft amendments to the regulations based on the RAP's recommendations and then reviewed them with the Waterworks Advisory Committee (WAC).

The WAC, established pursuant to 12VAC5-590-40 5, generally meets every other month to consider issues affecting VDH and waterworks. Since 2014, the WAC has worked with VDH to review and provide stakeholder recommendations for amendments to the Waterworks Regulations. Several WAC members also served on the RAP. At its September 5, 2018 meeting, the WAC recommended the Board approve the proposed amendments to the Waterworks Regulations.

VDH published a Notice of Intended Regulatory Action (NOIRA) in the October 30, 2017 issue of the Virginia Register of Regulations. The NOIRA invited public comments on the regulatory action, including ideas, costs and benefits of the alternatives, and the potential impacts. VDH received three letters with comments, which are summarized in the Agency Background Document (TH-02).

OVERVIEW OF THE PROPOSED AMENDMENTS

The proposed amendments maintain the current structure of the regulations with Parts I, II, and III, and incorporate Part IV and relevant appendices into Parts II and III. Significant changes to each Part are described below.

Amendments to Part I, General Framework for Waterworks Regulations, include:

1. Updating the defined terms (Section 10) by adding 84 new defined terms and acronyms, revising 79 definitions, and deleting 49 definitions that are no longer used or relevant. The defined terms ensure consistency and a clear understanding of what words mean throughout the regulations. Many of the new terms were either used in the regulations but not defined before, or provide information about a new technology. "Microfiltration" and "membrane unit" are examples of the latter.

2. Adding Section 45, Waterworks Advisory Committee, to replace Subsection 5 of Section 40 since it was not closely related to the other subsections. It also updates the WAC membership and responsibilities to give more flexibility in nominating stakeholders.
3. Adding Section 55, Relationship of this chapter to the USBC, to clarify the jurisdiction of two state agencies, VDH and the Department of Housing and Community Development, which implements the USBC (Uniform Statewide Building Code). This section eliminates the need for a separate interagency agreement.
4. Revising the process and requirements to receive a permit to construct and operate a waterworks (Sections 200 through 330). Section 200 sets out a six-step process to obtain a construction permit and includes the submission of a business operation plan that demonstrates the waterworks technical, managerial, and financial capability. Section 290 specifies the requirements for a temporary operation permit.
5. Revising Section 320, Revocation of an operation permit, so that the conditions for revocation are consistent with those in § 32.1-174 of the Code of Virginia.
6. Making other modifications to ensure consistent use of defined terms and improve clarity and readability

Amendments to Part II, Operation Regulations for Waterworks, include:

1. Moving and consolidating all water quality standards, maximum contaminant levels, action levels, treatment techniques, and maximum disinfectant levels and goals to the first section of Part II (Section 340). This makes the drinking water standards easier to locate.
2. Reorganizing much of the content into new, smaller sections to improve clarity and readability, without changing the existing monitoring, treatment, reporting, or other requirements that are necessary for primacy. Section 370 is an example; the proposed amendments split Section 370 into Sections 370, 372, 373, 374, 376, 377, and 378. Each of the new sections covers monitoring requirements for one distinct group of contaminants.² Sections 410, Determination of Compliance, 420, Treatment technique requirement, and 530, Reporting, are comparable. None of the requirements for compliance determination, treatment techniques, or reporting changed. Instead, they are better organized.
3. Adding an option in Section 370 to reduce the monitoring frequency for bacteriological contaminants at qualified, well-operated transient noncommunity (TNC) waterworks. When VDH amended the Waterworks Regulations in 2016 to adopt the U.S. Environmental Protection Agency's (EPA) Revised Total Coliform Rule, the agency chose not to include the option for reduced monitoring. Based on stakeholder feedback,

² Rather than having a subsection of Section 370 for each distinct group of contaminants, the proposed amendment to Section 370 will only address bacteriological contaminants. Section 372 is for inorganic chemicals; Section 373 is for organic chemicals; Section 374 is for residual disinfectants, disinfection byproducts, and disinfection byproduct precursors, etc. Amendments to split up other sections are comparable.

VDH is including this alternative in this regulatory action. VDH and EPA believe there is little risk to public health because of the requirements to qualify for reduced monitoring: the TNC waterworks has to serve fewer than 1,000 people per day, use only groundwater, have a clean compliance history for a minimum of 12 consecutive months, be free of sanitary defects, have a protected water source, meet existing construction standards, and have an annual site visit or sanitary survey.

4. Repealing Section 460, Personnel, and adding Section 461, Classification of waterworks, operator requirements, and operator attendance, to make VDH's operator requirements consistent with the Department of Professional and Occupational Regulation's requirements for licensing operators. The revisions also include operator attendance requirements to ensure sufficient operators are present at waterworks for the treatment requirements and population served.
5. Adding a statement in Section 510 that the Board of Health recommends that all community waterworks in the Commonwealth deliver the optimum level of fluoride ion concentration, as determined by the U.S. Department of Health and Human Services. The same statement is included in Part III (Section 930). Sections 510 and 540 include requirements for the owner of a waterworks to provide at least 90 days notification to the commissioner and consumers (respectively) if the waterworks intends to start or stop a fluoridation program.
6. Revising Sections 580 through 630, affecting the cross connection control program, to provide flexibility to waterworks by allowing additional methods to comply with program requirements and to clarify and codify current requirements and practices. Waterworks that comply with current requirements and approved practices will see no additional impacts.

Amendments to Part III, Manual of Practice for Waterworks Design, include:

1. Revising Section 680 to remove the restriction on using point-of-use (POU) and point-of-entry (POE) devices for long-term compliance with primary maximum contaminant levels. This will provide additional flexibility to waterworks owners when the cost to install and operate centralized treatment exceeds the cost to install and maintain POU/POE treatment. Small noncommunity waterworks are most likely to use POU/POE devices.
2. Updating Section 840, Groundwater sources, to reflect agency responsibilities and collect related requirements in one section instead of several.
3. Dividing several large sections into new, smaller sections to improve clarity and readability. This is consistent with the changes in Part II and affects Sections 870, Mixing and sedimentation, 880, Filtration, 1000, Disinfection.

4. Adding Sections 882, Membrane filtration, 1004, Ozonation, and 1005, Ultraviolet light, to incorporate treatment technologies in the regulations that have come into use since the last significant amendments to Part III in 1993.
5. Revising Section 930, Fluoridation, to remove the reference to a permit and recommend that all community waterworks in the Commonwealth deliver the optimum level of fluoride ion concentration, as determined by the U.S. Department of Health and Human Services.

POTENTIAL AREAS OF CONTROVERSY

Reduced monitoring at qualified, well-operated TNCs: Section 370.

VDH incorporated the Revised Total Coliform Rule (a federal mandate) into the Waterworks Regulations in 2016. At that time, VDH did not include the option to reduce the monitoring frequency for bacteriological contaminants at certain TNCs from quarterly to annually. To reduce the possible burden of an owner collecting and submitting quarterly bacteriological samples at a qualified, well-operated TNC (with VDH conducting a sanitary survey every 3 years), the proposed amendments would also allow annual sampling with annual VDH site visits. EPA Region 3 determined that the proposed amendments to the Waterworks Regulations that are related to reduced monitoring at TNCs complies with the federal rule. For VDH, the change requires annual site visits to TNCs that qualify for reduced monitoring instead of going to the waterworks to conduct a sanitary survey every 3 years. VDH does not know how many TNCs will qualify for reduced monitoring or what impact increasing the frequency of site visits will have on staff resources.

Fluoridation: Sections 510, 540, and 930.

Fluoride in drinking water prevents tooth decay and reduces dental caries. However, some individuals and groups strongly oppose fluoridation. The proposed amendments to the Waterworks Regulations now clearly state that the Board of Health recommends that all community waterworks maintain an optimal level of fluoride in drinking water and require notice to the commissioner and consumers prior to any operational changes, which either initiate or permanently stop fluoridation. The proposed amendments will ensure waterworks notify the public about proposed changes in fluoridation before they take effect, but individuals and groups that oppose fluoridation may be resistant to any statement in the Waterworks Regulations that fluoridation is effective and recommended.

Cross connection control: Sections 580 through 630.

Community waterworks must reduce risks from cross connections and backflow, both of which can lead to contamination of drinking water. A number of waterworks owners requested changes to the Waterworks Regulations on these topics. Disagreement persists about specific requirements to track and monitor cross connection and backflow prevention devices. The

proposed changes reflect input from stakeholders and provide more clarity about requirements for cross connection control programs, with significant flexibility for waterworks to meet program requirements.

Surface water withdrawal: Section 830.

Section 830 does not reflect current VDH practices for evaluating a permit application that involves a surface water withdrawal. However, efforts to reach a consensus among stakeholders about how to revise this section were unsuccessful. Consequently, VDH does not propose any amendments to Section 830 at this time. VDH will continue to work with stakeholders outside of this regulatory action to reach consensus on this topic.



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Proposed Regulation Agency Background Document

| | |
|---|--|
| Agency name | Virginia Department of Health |
| Virginia Administrative Code (VAC) citation(s) | 12 VAC5-590 <i>et seq.</i> |
| Regulation title(s) | <i>Waterworks Regulations</i> |
| Action title | Amend and update the <i>Waterworks Regulations</i> |
| Date this document prepared | September 13, 2018 |

This information is required for executive branch review and the Virginia Registrar of Regulations, pursuant to the Virginia Administrative Process Act (APA), Executive Order 14 (as amended, July 16, 2018), the Regulations for Filing and Publishing Agency Regulations (1 VAC7-10), and the *Virginia Register Form, Style, and Procedure Manual for Publication of Virginia Regulations*.

Brief Summary

Please provide a brief summary (preferably no more than 2 or 3 paragraphs) of this regulatory change (i.e., new regulation, amendments to an existing regulation, or repeal of an existing regulation). Alert the reader to all substantive matters. If applicable, generally describe the existing regulation.

The *Waterworks Regulations* establish requirements and procedures for the issuance of permits, minimum standards for water quality (including requirements for waterworks owners to submit regular analytical results of sampling for biological, chemical, radiological, physical, and other tests), requirements for recordkeeping, reporting, public notice, and consumer confidence reports, requirements for inspections, and criteria for the siting, design, and construction of waterworks. The planned regulatory action is a comprehensive update of the *Waterworks Regulations*, including [Part I – General Framework for Waterworks Regulations](#), [Part II – Operation Regulations for Waterworks](#), and [Part III - Manual of Practice for Waterworks Design](#). [Part IV – Exceptions for Noncommunity Waterworks to Specific Sections of the Manual of Practice \(Part III\)](#) – will be incorporated into Part III, and the appendices will be incorporated into the body of the regulations or, where they are no longer relevant, deleted. Many of the changes simply refine and provide further clarity to existing regulations. Significant changes include amending out-of-date regulations, incorporating technologies and procedures that have come into use since the last major revision in 1993, and reorganizing sections to make them easier to understand and follow. The updates

to Part I will include deleting some of the definitions, revising the existing definitions, and adding some new ones. Other changes to Part I address permit requirements, the Waterworks Advisory Committee, business plans, variances, exemptions, and other administrative details. Significant updates to Part II will involve reorganizing much of the content into smaller sections to improve clarity and readability, but will not change the requirements in the regulations that are necessary for the state to retain primary enforcement responsibility for waterworks in Virginia. Other changes to Part II address cross connection control, operator requirements, evaluation for groundwater under the direct influence of surface water (GUDI), and requirements for waterworks to provide notification to the commissioner and consumers if they make changes to start or stop fluoridation programs. The changes to Part II also include adding the option to reduce the monitoring frequency for bacteriological contaminants at qualified, well-operated transient noncommunity waterworks. Updates to Part III address new technology and current industry standards for waterworks design, including automated control systems and alternate power requirements and reorganizing existing content into smaller sections to improve clarity and readability.

Acronyms and Definitions

Please define all acronyms used in the Agency Background Document. Also, please define any technical terms that are used in the document that are not also defined in the “Definition” section of the regulations.

“APA” means the Virginia Administrative Process Act.

“AWWA” means the American Water Works Association.

“BAT” means best available technology

“CCCP” means cross-connection control plan.

“CFR” means the Code of Federal Regulations.

“DEQ” means Department of Environmental Quality.

“DPOR” means Department of Professional and Occupational Regulation

“EPA” means United States Environmental Protection Agency.

“gpm” means gallons per minute.

“GUDI” means groundwater under the direct influence of surface water.

“MPA” means microscopic particulate analysis.

“NTNC” means nontransient noncommunity waterworks.

“PMCL” means primary maximum contaminant level.

“ODW” means the Virginia Department of Health Office of Drinking Water.

“O&M” means operation and maintenance.

“POE” means point of entry.

“POU” means point of use.

“RIS Style Manual” refers to the Virginia Register of Regulations *Form, Style and Procedure Manual for Publication of Virginia Regulations* (April 2014).

“RTCR” means the Revised Total Coliform Rule, 40 CFR 141, Subpart Y.

“SDWA” means Safe Drinking Water Act.

“TNC” means transient non-community waterworks.

“USBC” means Uniform Statewide Building Code.

“USC” means United States Code.

“VDH” means the Virginia Department of Health.

“VOSH” means the Virginia Occupational Safety and Health Program

“WAC” means waterworks advisory committee. The WAC advises VDH and the Health Commissioner.

Mandate and Impetus

Please identify the mandate for this regulatory change, and any other impetus that specifically prompted its initiation (e.g., new or modified mandate, petition for rulemaking, periodic review, board decision, etc.).

For purposes of executive branch review, "mandate" has the same meaning as defined in Executive Order 14 (as amended, July 16, 2018), "a directive from the General Assembly, the federal government, or a court that requires that a regulation be promulgated, amended, or repealed in whole or part."

This regulatory action under the standard rulemaking process is based in large part on the fulfillment of a 2014 agency initiative to comprehensively amend the *Waterworks Regulations*. This effort is intended to address the following changes since the last significant revision in 1993:

- Development of new treatment technologies;
- Development of new monitoring and control technologies;
- Water consumption patterns resulting from shifts in consumer use and water-saving plumbing features; and
- State laws that have been passed since the 1990s governing source water supply planning and withdrawal.

The regulatory action will also:

- Remove or revise outdated requirements;
- Reorganize the *Waterworks Regulations* to improve clarity and readability;
- Correct syntax and inconsistent terminology;
- Incorporate the appendices into the main body of the *Waterworks Regulations*; and
- Allow qualified, well-operated TNCs to monitor for total coliform bacteria on an annual basis instead of quarterly.

All federal mandates associated with previously promulgated EPA drinking water rules have already been incorporated into the *Waterworks Regulations*. With the exception of adding reduced monitoring for qualified, well-operated TNCs and reorganizing sections for clarity, none of the federal mandates are being changed or amended in this regulatory action.

Legal Basis

Please identify (1) the agency or other promulgating entity, and (2) the state and/or federal legal authority for the regulatory change, including the most relevant citations to the Code of Virginia or Acts of Assembly chapter number(s), if applicable. Your citation must include a specific provision, if any, authorizing the promulgating entity to regulate this specific subject or program, as well as a reference to the agency or promulgating entity's overall regulatory authority.

§ 32.1-169 of the *Code of Virginia* provides that the Board of Health (board) shall have general supervision and control over all water supplies and waterworks in the Commonwealth insofar as the bacteriological, chemical, radiological, and physical quality of waters furnished for human consumption may affect the public health and welfare and may require that all water supplies be pure water. In exercising such supervision and control, the board shall recognize the relationship between an owner's financial, technical, managerial, and operational capabilities and his capacity to comply with state and federal drinking water standards.

§ 32.1-170 of the *Code of Virginia* authorizes the board to promulgate regulations to govern waterworks, water supplies, and pure water to protect the public health and promote the public welfare. These regulations shall include criteria and procedures to accomplish these purposes.

§§ 32.1-167 through 32.1-168 and §§ 32.1-171 through 32.1-176 of the *Code of Virginia* provide additional details regarding the board's authorities and responsibilities for regulating waterworks in Virginia.

Purpose

Please explain the need for the regulatory change, including a description of: (1) the rationale or justification, (2) the specific reasons the regulatory change is essential to protect the health, safety or welfare of citizens, and (3) the goals of the regulatory change and the problems it's intended to solve.

The purpose of this action is to amend the *Waterworks Regulations* to update and clarify the requirements for waterworks. The amended *Waterworks Regulations* will provide the requirements necessary for waterworks to protect public health, safety and welfare by supplying safe drinking water to Virginians.

The Board of Health promulgated the *Waterworks Regulations* in 1991 and significantly amended them in 1993. Since 1993, sections of the *Waterworks Regulations*, primarily the definitions (12VAC5-590-10) and Part II, have been amended as needed to incorporate federal requirements in the *Safe Drinking Water Act* (42 USC § 300f *et seq.*) and National Primary Drinking Water Regulations (40 CFR Parts 141, 142, and 143). VDH completed the most recent amendment in November 2016 to incorporate the requirements in the Revised Total Coliform Rule (RTCR), 40 CFR 141.851 through 141.861, in the *Waterworks Regulations*. VDH made these amendments through “exempt” regulatory actions that were necessary for the state to retain primary enforcement responsibility for waterworks in Virginia. See § 2.2-4006 A 4 of the *Code of Virginia*. From 1993 to the present, the balance of the *Waterworks Regulations* have remained largely unchanged and, as a result, have become outdated and inefficient for the regulated community to use.

The VDH Office of Drinking Water, the WAC, and a Regulatory Advisory Panel consisting of waterworks stakeholders, collectively recommend that Parts I and III of the current *Waterworks Regulations* be updated in the areas of waterworks’ permitting, design, and construction, and Part II be amended to clarify operating requirements and improve overall readability. As part of the agency’s effort to clarify and improve the readability of the *Waterworks Regulations*, VDH also addressed consistent use of defined terms and technical terms across the entire document. The current regulatory action follows these recommendations and also incorporates the following: current water treatment technologies; current monitoring and control technologies; changes to water consumption patterns resulting from shifts in consumer use and water-saving plumbing fixtures; changes to source water quality and availability due to increased water demands; and new state laws and regulations governing source water supply planning and withdrawal.

Substance

Please briefly identify and explain the new substantive provisions, the substantive changes to existing sections, or both. A more detailed discussion is provided in the “Detail of Changes” section below.

The proposed amendments reorganize the way information is provided; add new sections to expand or clarify existing provisions or incorporate new provisions; delete sections in whole or in part to remove obsolete information and duplication; revise references and/or citations to be current; and correct sentence structure, grammar, spelling, and typographical errors. VDH reviewed and revised technical terms and word use to improve consistency throughout the *Waterworks Regulations*. No new federal mandates are included. Substantive changes include:

Part I – General Framework for Waterworks Regulations

1. Revise, add, or delete definitions.
2. Add units of measurement.
3. Add new section on the Waterworks Advisory Committee.
4. Add a new section on relationship to the Uniform Statewide Building Code (USBC).
5. Add a new section on administrative proceedings and update enforcement requirements to be more consistent with the APA and Title 32.1 of the *Code of Virginia*.

6. Clarify and streamline the permit process, including the requirements for obtaining a construction permit.
7. Add requirements and circumstances for issuance of a temporary operation permit.

Part II - Operation Regulations for Waterworks

8. Move and consolidate all water quality standards, maximum contaminant levels, action levels, treatment techniques, and maximum disinfectant levels and goals to first section of Part II.
9. Revise and clarify the procedure for determining surface water influence of groundwater sources.
10. Reorganize and move content of five large sections (370, 410, 420, 530, and 545) into several new, smaller sections.
11. Revise and clarify the classification of waterworks, operator requirements, and operator attendance.
12. Add new sections for abandoning and reactivating wells.
13. Move and revise operation report content requirements from Appendix G to section 570.
14. Revise and clarify cross-connection control program requirements.

Part III - Manual of Practice for Waterworks Design

15. Update design water demand and waterworks capacity requirements.
16. Revise and clarify metering, building design, layout, and laboratory design requirements.
17. Revise and clarify new source development requirements for groundwater sources, including springs.
18. Clarify well construction requirements and well classification.
19. Distinguish and clarify construction, testing, and capacity requirements for wells located in designated groundwater management areas (9VAC25-600).
20. Revise and clarify water treatment processes. Add new sections for membrane filtration, bag and cartridge filtration, pre-engineered package treatment units, powdered activated carbon, disinfection processes using chloramines, chlorine dioxide, ultraviolet light, and ozone.
21. Clarify design requirements for pump stations and equipment.
22. Distinguish atmospheric and pressure storage tank design requirements.
23. Reorganize and move content of four sections (870, 880, 1000, and 1080) into new, smaller sections.
24. Add new section on water loading stations.

Part IV- Exceptions for Noncommunity Waterworks

25. Move content to applicable sections in Part III and repeal this part.

Appendices

26. Appendix A. [Reserved] - Repeal.
27. Appendix B. Background Used in Developing the Chemical, Physical and Radiological Limits of the Drinking Water Standards - Extract relevant content and move to Part II. Repeal appendix.
28. Appendix C. Field Office Counties and Cities Served - Repeal. Content is available on VDH website.
29. Appendix D. [Reserved] - Repeal.
30. Appendix E. [Reserved] - Repeal.
31. Appendices F. and H. were previously repealed.
32. Appendix G. Monitoring and Reporting - Revise content and move to Part II. Repeal appendix.
33. Appendix I. Suggested Outline of Contents of a Cross Connection Control Program - Revise content and move to Part II. Repeal appendix.
34. Appendices J. and K. were previously repealed.
35. Appendix L. Determination of CT - Extract relevant content and move to Part II. Repeal appendix.
36. Appendix M. Lead and Copper - Repeal.
37. Appendix N. Inorganic Compounds and Organic Chemicals - Add reference in Part III to federal regulations for Best Available Treatment of inorganic and organic compounds. Repeal appendix.
38. Appendix O. Regulated Contaminants for Consumer Confidence Reports and Public Notification - Extract relevant content and move to Part II. Repeal appendix.
39. Appendix P. Best Available Technologies for Radionuclides - Add reference in Part III to federal regulations for Best Available Treatment of radionuclides. Repeal appendix.

Issues

Please identify the issues associated with the regulatory change, including: 1) the primary advantages and disadvantages to the public, such as individual private citizens or businesses, of implementing the new or amended provisions; 2) the primary advantages and disadvantages to the agency or the Commonwealth; and 3) other pertinent matters of interest to the regulated community, government officials, and the public. If there are no disadvantages to the public or the Commonwealth, include a specific statement to that effect.

VDH intends for the majority of the proposed changes to the *Waterworks Regulations* to update and clarify the existing requirements. In many cases, the changes will reflect current practices and technologies for treatment, monitoring, and reporting; changes that waterworks have already implemented, but, because it has been over 25 years since the last significant revision, have not been incorporated in the *Waterworks Regulations*. VDH has worked with stakeholder groups to make changes that are both protective of public health and reflect best practices for the regulated community. However, there are several specific areas, described below, upon which the stakeholders, VDH, and the citizens of the Commonwealth may not be in complete agreement. They include cross connection control, source water capacity evaluation, operator classification, point of use devices, reduced monitoring for bacteriological contaminants at certain TNCs, and the addition of fluoride to drinking water to reduce dental caries.

Community waterworks are required to take measures to reduce the possibility of cross connections and to prevent backflow, both of which can lead to contamination of drinking water. A number of waterworks owners requested changes to the *Waterworks Regulations* that reflect their current practices to track and monitor cross connection and backflow prevention devices, to educate consumers, and conditions that result in greater risk of contamination. The proposed changes reflect the input from stakeholders and have the advantage of being based largely on their input. However, the changes do not, and cannot, take into account all other stakeholders' concerns. VDH believes the changes provide more clarity about requirements for cross connection control programs, they provide a great deal of flexibility for waterworks to meet program requirements, and they are no less protective of public health than the current practices and requirements. While individual waterworks may have issues with the changes, VDH does not believe there are any disadvantages to the changes.

The determination of waterworks' source water capacity and how much can be withdrawn is a concern to stakeholders. Waterworks with wells located in a Virginia Groundwater Management Area may be subject to regulation by DEQ (based on the quantity of water that is withdrawn), and may be required to obtain a Groundwater Withdrawal Permit prior to construction. Waterworks with surface water sources may also be subject to regulation by DEQ, depending on the amount the waterworks withdraws and when the withdrawal commenced. Section 830 (12VC5-590-830) does not reflect VDH practices for evaluating a permit application that involves a surface water withdrawal. However, efforts to reach a consensus among stakeholders about how to revise this section were unsuccessful. Consequently, VDH does not propose any amendments to Section 830 at this time. VDH will continue to work with stakeholders outside of this regulatory action to reach consensus on this topic.

The operator classification and minimum attendance requirements may be an issue for a small subset of waterworks, particularly those with the Class 4, 5 and 6 designations, which are differentiated by the type of treatment provided and by the population served. This change establishes regulatory requirements that VDH has been implementing by policy. Placing the operator classification and attendance requirements in the *Waterworks Regulations* will give the regulated community a sense of security that the requirements will not be subject to change without going through the rulemaking process. The advantage to the regulatory change is that waterworks will be required to have properly trained and licensed operators, and the operators will have standards for training. For owners, the disadvantage will be the cost to train operators and, in some areas, the difficulty of finding sufficient trained, licensed operators. For the agency and the Commonwealth, having qualified operators in responsible charge of waterworks is critical to

ensuring waterworks can consistently and reliably provide drinking water that meets regulatory standards and is protective of public health.

VDH will allow point-of-use (POU) or point-of-entry (POE) devices for long-term compliance with PMCLs; except that POU devices are still prohibited for achieving compliance with microbial contaminant treatment technique requirements. This action will provide waterworks additional flexibility, allowing owners and operators the option to employ POU and POE devices to meet PMCLs.

VDH incorporated the Revised Total Coliform Rule (a federal mandate) into the *Waterworks Regulations* in 2016. At the time, VDH did not include the option in the rule to reduce the monitoring frequency for bacteriological contaminants at certain TNCs from quarterly to annual. To reduce (potentially) the burden of collecting and submitting quarterly bacteriological samples at qualified well-operated TNCs, VDH will add this option to the *Waterworks Regulations*. EPA Region 3 determined that the changes to the *Waterworks Regulations* that are related to reduced monitoring at TNCs are no less stringent than, and do not differ materially from, the federal rule. For VDH, the change requires the agency to increase its site visit frequency at those TNCs that qualify for reduced monitoring from every three years to every year. However, VDH believes the change will be a benefit for the TNCs that qualify because it will reduce their monitoring costs.

Although the benefits of adding fluoride to drinking water, which does not contain naturally occurring fluoride to prevent tooth decay and reduce dental caries, are widely accepted in the United States, some individuals and groups strongly oppose the practice. VDH is changing the *Waterworks Regulations* to clearly state that the Board of Health recommends that all community waterworks maintain an optimal level of fluoride in drinking water and to require notice to the commissioner and consumers prior to any operational changes which either initiate or permanently stop programs to provide community water fluoridation. The main advantage of the changes is that they align the recommended level of fluoridation with the U.S. Department of Health and Human Resources' guidelines and they ensure VDH and the public are notified about proposed changes in fluoridation before they take effect. Groups that oppose fluoridation may be resistant to any statement in the *Waterworks Regulations* that the practice is effective or recommended. VDH sees advantages to receiving notice about proposed changes in fluoridation programs and allowing the recommended level, currently 0.7 parts per million, to be established by the U.S. Department of Health and Human Resources.

Requirements More Restrictive than Federal

Please identify and describe any requirement of the regulatory change which is more restrictive than applicable federal requirements. Include a specific citation for each applicable federal requirement, and a rationale for the need for the more restrictive requirements. If there are no applicable federal requirements, or no requirements that exceed applicable federal requirements, include a specific statement to that effect.

There are two notable instances in which state authority has prescribed elements or details that are more restrictive than the federal mandate. These requirements, which are already in the *Waterworks Regulations* and have been modified to improve clarity, not to change either requirement, are:

Filtration avoidance for surface water sources.

Federal Mandate: Federal regulation (40 CFR 141.70 adopted in 1989) requires waterworks supplied by surface water sources (e.g., a river or lake) or GUDI sources, to provide filtration. However, the federal regulation allows a waterworks to avoid filtration (40 CFR 141.71) if it can demonstrate compliance with certain criteria and water quality standards. The EPA adoption of these exclusionary criteria was a concession to the largest U.S. cities, many of which do not practice filtration of their surface water sources.

Virginia Authority: In contrast, 12VAC5-590-395 A of the *Waterworks Regulations* requires all waterworks supplied by surface water or GUDI sources to provide *both* disinfection and filtration.

Rationale: VDH believes that EPA’s concessions potentially compromise public health because surface water sources are often contaminated with microbiological organisms that cause disease and gastrointestinal distress. VDH’s decision to require both disinfection and filtration reflects a long-standing policy (in force since the passage of Virginia’s Public Water Supplies law in 1916) that both filtration and disinfection are necessary to ensure the purity of drinking water obtained from surface water sources. Many other states have taken VDH’s approach by refusing to adopt the EPA criteria for avoiding filtration.

Microbial monitoring.

Federal Mandate: For groundwater systems, federal regulation (40 CFR 141.21 (a) (3) (i)) requires the noncommunity classified waterworks to monitor either monthly, *quarterly*, or *annually* for bacteriological contamination based on the population served. This classification includes the NTNC waterworks.

Virginia Authority: For groundwater systems, 12VAC5-590-370 A 2 of the *Waterworks Regulations* requires *monthly* monitoring for NTNC waterworks (e.g., rural schools or factories with their own water supply).

Rationale: VDH requires more frequent monitoring to protect the health of persons who regularly use water from a particular waterworks, such as schoolchildren and industrial workers. More frequent use increases a person’s exposure to any contaminants that may be present. Both state and federal regulations require monthly bacteriological monitoring at community waterworks, seasonal waterworks, TNC waterworks serving >1000 persons, and TNC waterworks using surface water or GUDI sources. TNC waterworks serving <1000 persons and using groundwater only may monitor annually provided they are well operated and meet certain criteria that are protective of public health.

Agencies, Localities, and Other Entities Particularly Affected

Please identify any other state agencies, localities, or other entities particularly affected by the regulatory change. “Particularly affected” are those that are likely to bear any identified disproportionate material impact which would not be experienced by other agencies, localities, or entities. “Locality” can refer to either local governments or the locations in the Commonwealth where the activities relevant to the regulation or regulatory change are most likely to occur. If no agency, locality, or entity is particularly affected, include a specific statement to that effect.

Other State Agencies Particularly Affected

The proposed changes to requirements for cross connection control codify current requirements implemented by policy; therefore, state agencies are already meeting these requirements and there are no state agencies “particularly affected”.

The Department of Professional and Occupational Regulation (DPOR), Board for Waterworks and Wastewater Works Operators and Onsite Sewage System Professionals, has established six (6) classes of operators. The proposed revisions will make the *Waterworks Regulations* consistent with the *Waterworks and Wastewater Works Operators Licensing Regulations* at 18VAC160-30 *et seq.* The number and qualifications of persons constituting the operating staff at a waterworks depend principally upon the capacity of the waterworks, the population served by the waterworks, and the complexity of the treatment process(es). Depending on the waterworks classification (as described in 12VAC5-590-461), applications for new and updated licenses may be required. This change will potentially affect DPOR by means of increased or changed applicant workload.

All waterworks using groundwater sources (wells and springs) are required to complete a GUDI evaluation at least once when a source is constructed and possibly in the future if water quality monitoring indicates a potential problem. State agencies such as the Department of Transportation, Department of Corrections and the Department of Conservation and Recreation that own and operate community and/or noncommunity waterworks that make use of groundwater sources and are required to complete a Level 3 assessment will be “particularly affected.”

Allowing POU or POE devices for long-term compliance with PMCLs will provide additional flexibility to waterworks owners. State agencies that own waterworks have the option to employ POU and POE devices to meet PMCLs. No state agencies are “particularly affected” since there is no increase in regulatory burden.

Allowing qualified well-operated TNCs to reduce the monitoring frequency for bacteriological contaminants from quarterly to annual will reduce the burden of collecting and submitting quarterly bacteriological samples. This change could reduce the burden for state agencies that own and operate TNCs that make use of groundwater sources. This includes, but is not limited to the Department of Transportation, Department of Corrections and the Department of Conservation and Recreation. No state agencies are “particularly affected” since there is no increase in regulatory burden.

Waterworks that practice community water fluoridation will have a clearly defined recommended optimum fluoride level, which will serve to build confidence in fluoridation. Waterworks that either begin or end community water fluoridation programs will be required to notify the commissioner and customers at least 90 days before beginning or ending a program. No state agencies are “particularly affected” because the state does not own or operate waterworks that do or could practice fluoridation.

Localities Particularly Affected

The proposed changes to requirements for cross connection control codify current requirements implemented by policy; therefore, localities are already meeting these requirements and there are no localities “particularly affected”.

All classified waterworks must have a licensed waterworks operator of equal classification or better than that of the waterworks. The attendance requirements at these waterworks by operators will vary depending particularly on the complexity of treatment. Depending on the waterworks classification (as described in 12VAC5-590-461), new and updated licensed operators may be required. This requirement has already been implemented by means of policy and the change to the regulations codifies an existing requirement. Therefore, classified waterworks have already implemented this requirement and, although certain localities (counties, cities, towns, authorities, political subdivisions, etc.) own and operate community and/or noncommunity waterworks that require a licensed waterworks operator, they are not “particularly affected.”

All waterworks using groundwater sources (wells and springs) are required to complete a GUDI evaluation at least once when a source is constructed and possibly in the future if water quality monitoring indicates a potential problem. Localities (counties, cities, town, authorities, political subdivisions, etc.) that own and operate community and/or noncommunity waterworks that make use of groundwater sources and are required to complete a Level 3 assessment will be “particularly affected.”

Allowing POU or POE devices for long-term compliance with PMCLs will provide additional flexibility to owners. This will allow localities that are owners of waterworks to employ POU and POE devices to meet PMCLs. No localities are “particularly affected” since there is no increase in regulatory burden.

Allowing qualified well-operated TNCs to reduce the monitoring frequency for bacteriological contaminants from quarterly to annual will reduce the burden of collecting and submitting bacteriological samples. This change could reduce the burden for localities that that own and operate TNCs that make use of groundwater sources. This could include TNCs at local parks and recreation areas. No localities are “particularly affected” since there is no increase in regulatory burden.

Waterworks that practice fluoridation will have a clearly defined recommended optimum fluoride level, which will serve to build confidence in fluoridation. Waterworks that either begin or end community water fluoridation programs will be required to notify the commissioner and customers prior to beginning or ending a program. Waterworks that practice community water fluoridation are typically medium and large size community waterworks, meaning waterworks that serve over 3,300 persons. Localities that may be “particularly affected” include community waterworks owners that practice fluoridation or begin fluoridation, including, counties, cities, towns, water authorities, and other owners.

Other Entities Particularly Affected

The proposed changes to requirements for cross connection control codify current requirements implemented by policy; therefore, the regulated community is already meeting these requirements and there are no other entities “particularly affected”.

The changes to licensed waterworks operator requirements have already been implemented by means of policy and the change to the regulations codifies an existing requirement. Therefore, classified waterworks and the regulated community have already implemented the requirements. Other entities are not “particularly affected.”

All waterworks using groundwater sources (wells and springs) are required to complete a GUDI evaluation at least once when a source is constructed and possibly in the future if water quality monitoring indicates a potential problem. Other entities such as restaurants, convenience stores, recreation areas, day cares, schools, and other businesses that own and operate community and or noncommunity waterworks that make use of groundwater sources and are required to complete a Level 3 assessment will be “particularly affected.”

Allowing POU or POE devices for long-term compliance with PMCLs will provide additional flexibility to owners. This will allow localities that are owners of waterworks to employ POU and POE devices to meet PMCLs. No other entities are “particularly affected” since there is no increase in regulatory burden.

Allowing qualified well-operated TNCs to reduce the monitoring frequency for bacteriological contaminants from quarterly to annual will reduce the burden of collecting and submitting bacteriological samples. This change could reduce the burden for other entities that own and operate TNCs and use groundwater sources. This could include day care facilities, restaurants, golf courses, and convenience stores. No other entities are “particularly affected” since there is no increase in regulatory burden.

Receiving water with a consistent, optimum level of fluoride will give customers a sense of confidence in the waterworks that practice community water fluoridation. The notice requirements will ensure those consumers are aware of actions to start or stop fluoridation programs, giving them an opportunity to provide feedback to the owner about the proposed change. Other entities that practice fluoridation or begin fluoridation, such as private companies that operate community waterworks, may be “particularly affected” if they propose to start or stop a fluoridation program.

Economic Impact

Pursuant to § 2.2-4007.04 of the Code of Virginia, please identify all specific economic impacts (costs and/or benefits), anticipated to result from the regulatory change. When describing a particular economic impact, specify which new requirement or change in requirement creates the anticipated economic impact. Please keep in mind that this is change versus the status quo.

Impact on State Agencies

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| <p><i>For your agency:</i> projected costs, savings, fees or revenues resulting from the regulatory change, including:</p> <ul style="list-style-type: none"> a) fund source / fund detail; b) delineation of one-time versus on-going expenditures; and c) whether any costs or revenue loss can be absorbed within existing resources | <p>There are negligible agency costs that will result from the implementation and enforcement of these regulatory changes.</p> <ul style="list-style-type: none"> a) Not applicable. b) Not applicable. c) Any costs associated with these program activities will be absorbed by current staff and under the existing program guidelines. |
| <p><i>For other state agencies:</i> projected costs, savings, fees or revenues resulting from the regulatory change, including a delineation of one-time versus on-going expenditures.</p> | <p>The proposed changes to requirements for cross connection control codify current requirements implemented by policy; therefore, affected state agencies are already meeting these requirements and there are no additional costs or savings.</p> <p>The waterworks classification and operator certification requirements codify requirements that VDH has implemented by policy. As a result, state agencies that own waterworks have already assumed these costs.</p> <p>Proposed changes to allow POU/POE devices would give state agencies the option to meet a PMCL without installing central treatment. This provides additional flexibility to meet PMCLs at a potentially lower cost. Based on a single POU installation at a small noncommunity waterworks, capital cost saving of \$21,800 per installation and O&M savings of \$600 per year could be achieved in comparison to a central treatment unit.</p> <p>Allowing qualified well-operated TNCs to reduce the monitoring frequency for bacteriological contaminants from quarterly to annual will reduce the burden of collecting and submitting bacteriological samples. State agencies that own and operate TNCs that qualify for this reduced monitoring could save approximately \$100 per year for each TNC.</p> <p>For the proposed changes to fluoridation requirements, there is no likely cost impact since this applies to community waterworks that practice fluoridation and state agencies do not own or operate community waterworks.</p> <p>The revised GUDI reevaluation protocol may require a waterworks owned by a state agency to complete a Step 3 evaluation. VDH estimates that no more than one Step 3 evaluation will be triggered per year for state owned waterworks. The cost for a Step 3 GUDI evaluation (as described in 12VAC5-590-430) is approximately \$7,480.</p> |

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| <p><i>For all agencies:</i> Benefits the regulatory change is designed to produce.</p> | <p>For cross connection control, the changes clarify requirements, provide flexibility for the regulated community and codify current practices.</p> <p>The waterworks classification and operator certification requirements codify existing policy. Having appropriately licensed operators at waterworks will help ensure they perform as designed to produce drinking water that meets water quality standards.</p> <p>The proposed changes to allow POU/POE devices provide state agencies additional flexibility to meet PMCLs at a potentially lower cost than central treatment.</p> <p>Allowing qualified well-operated TNCs to reduce the monitoring frequency for bacteriological contaminants will reduce the burden of collecting and submitting quarterly bacteriological samples.</p> <p>For the proposed changes to fluoridation requirements, VDH will receive advance notification of intended changes to fluoridation practices.</p> <p>The revised GUDI evaluation protocol will provide VDH and the regulated community additional confidence that the GUDI evaluation results and any required level of treatment are appropriate and protective of health.</p> |
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Impact on Localities

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| <p>Projected costs, savings, fees or revenues resulting from the regulatory change.</p> | <p>For cross connection control, the regulatory change clarifies requirements, provides flexibility for the regulated community and codifies current practices. Localities generally are already meeting these requirements and there are no additional costs or savings.</p> <p>The waterworks classification and operator certification requirements codify requirements that VDH has implemented by policy. As a result, localities that own waterworks have already assumed these costs.</p> <p>The proposed changes would allow localities to use POU/POE devices to meet PMCLs. The most likely waterworks to use POU and POEs will be very small NTNCs and TNCs, where the installation of centralized treatment is less cost-effective than the installation of the POU and POE devices. If selected, the estimated average first time installation costs to the waterworks:</p> |
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| | <p>POU = \$391; POE=\$644. Estimated annual O&M costs per installed unit range from \$20 - \$100. In comparison, centralized treatment for a small noncommunity waterworks would cost approximately \$22,500 based on 10 gpm treatment capacity. The O&M cost could be approximately \$700 per year. At most, VDH estimates 30 waterworks owned by localities would select POU/POE devices to meet a PMCL at some time in the future.</p> <p>Allowing qualified well-operated TNCs to reduce the monitoring frequency for bacteriological contaminants from quarterly to annual will reduce the burden of collecting and submitting bacteriological samples. Localities that own and operate TNCs that qualify for this reduced monitoring could save approximately \$100 per year for each TNC.</p> <p>For the proposed changes to fluoridation requirements, most localities with community waterworks would not trigger any additional costs, since very few waterworks either start or permanently stop fluoridation treatment. At most, VDH expects two or fewer waterworks per year to trigger the costs associated with public notification. The actual cost of public notification depends on the number of customers served and the method of public notification. Each community waterworks may be required to complete other public notifications and this requirement is insignificant.</p> <p>The revised GUDI reevaluation protocol may require a waterworks owned by locality to complete a Step 3 evaluation. VDH estimates that no more than ten Step 3 evaluations will be triggered per year for localities with waterworks. The cost for a Step 3 GUDI evaluation (as described in 12VAC5-590-430) is approximately \$7,480.</p> |
| <p>Benefits the regulatory change is designed to produce.</p> | <p>For cross connection control, the changes clarify requirements, provide flexibility for the regulated community and codify current practices.</p> <p>The waterworks classification and operator certification requirements codify existing policy. Having appropriately licensed operators at waterworks will help ensure they perform as designed to produce drinking water that meets water quality standards.</p> <p>The proposed changes to allow POU/POE devices provide localities additional flexibility to</p> |

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| | <p>meet PMCLs at a potentially lower cost than central treatment.</p> <p>Allowing qualified well-operated TNCs to reduce the monitoring frequency for bacteriological contaminants will reduce the burden of collecting and submitting quarterly bacteriological samples.</p> <p>For the proposed changes to fluoridation requirements, consumers and VDH will receive advance notification of intended changes to fluoridation practices.</p> <p>The revised GUDI evaluation protocol will provide VDH and the regulated community additional confidence that the GUDI evaluation results and any required level of treatment are appropriate and protective of health.</p> |
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Impact on Other Entities

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| <p>Description of the individuals, businesses, or other entities likely to be affected by the regulatory change. If no other entities will be affected, include a specific statement to that effect.</p> | <p>The changes to the cross connection control requirements are intended to clarify and codify current requirements and practices. These changes apply to all waterworks owners, but to the extent waterworks owners are in compliance with current requirements and approved practices, there are no additional impacts.</p> <p>The waterworks classification and operator certification requirements codify requirements that VDH has implemented by policy. As a result, other entities that own waterworks have already assumed these costs. These changes apply to all owners of classified waterworks.</p> <p>Use of POE and POU devices to comply with PMCLs will likely be implemented at NTNCs or TNCs as a less expensive alternative to installation of centralized treatment. This will affect a business that owns and operates a waterworks. Owners that could take advantage of this alternative include state and local governmental agencies, corporations, small businesses and nonprofit organizations.</p> <p>Allowing qualified well-operated TNCs to reduce the monitoring frequency for bacteriological contaminants from quarterly to annual will reduce the burden of collecting and submitting bacteriological samples. Other entities that own and operate TNCs that qualify for this reduced monitoring could save approximately \$100 per year for each TNC. Owners affected include state</p> |
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| | <p>and local governmental agencies, corporations, small businesses and nonprofit organizations.</p> <p>The proposed changes to fluoridation requirements affect owners of community waterworks. The only entities that may be affected (that have not already been addressed above) are private companies that operate community waterworks.</p> <p>The proposed changes to the GUDI evaluation procedure could impact owners of groundwater waterworks, including, not limited to water authorities, state agencies, county or local governments, corporations, small businesses, and nonprofit organizations.</p> |
| <p>Agency's best estimate of the number of such entities that will be affected. Please include an estimate of the number of small businesses affected. Small business means a business entity, including its affiliates, that:</p> <ul style="list-style-type: none"> a) is independently owned and operated and; b) employs fewer than 500 full-time employees or has gross annual sales of less than \$6 million. | <p>VDH records of waterworks owners do not provide the information necessary to definitively classify owners as a small business as defined herein. Nevertheless, the estimates are provided below. VDH interprets "affected" to mean that the change in the <i>Waterworks Regulations</i> would apply to the small business, and not a measure of the impact.</p> <p>Cross connection control: Approximately 2,000 small businesses.</p> <p>Operator Classification: approximately 800 small businesses.</p> <p>POE/POU: Up to approximately 30 small businesses</p> <p>RTCR: Up to approximately 1,100 small businesses</p> <p>Fluoridation: no small businesses.</p> <p>GUDI protocol: up to approximately 10 small businesses per year.</p> |
| <p>All projected costs for affected individuals, businesses, or other entities resulting from the regulatory change. Please be specific and include all costs including, but not limited to:</p> <ul style="list-style-type: none"> a) projected reporting, recordkeeping, and other administrative costs required for compliance by small businesses; b) specify any costs related to the development of real estate for commercial or residential purposes that are a consequence of the regulatory change; c) fees; d) purchases of equipment or services; and e) time required to comply with the requirements. | <p>Cross connection control: No additional costs</p> <p>Operator Classification: No additional costs</p> <p>POE/POU: Cost savings – no additional costs</p> <p>RTCR: Cost savings – no additional costs</p> <p>Fluoridation: Insignificant additional cost.</p> <p>GUDI protocol: VDH estimates up to 10 waterworks per year may trigger the Level 3 GUDI evaluation.</p> |

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| | <p>a) The cost for the Level 3 testing, if triggered, is approximately \$7,480. The total cost to a business could be approximately \$15,000.</p> <p>b) There are no specific costs related to development of real estate.</p> <p>c) There are no new fees.</p> <p>d) Any required equipment or services related to the testing is included in section a), above.</p> <p>e) The Level 3 testing could occur over a period of up to 12 months.</p> |
| <p>Benefits the regulatory change is designed to produce.</p> | <p>As a whole, VDH expects the regulatory changes will clarify requirements, codify existing requirements implemented by policy, provide options and flexibility to achieve compliance with water quality standards, improve readability, and provide enhanced public health protection.</p> |

Alternatives

Please describe any viable alternatives to the regulatory change that were considered, and the rationale used by the agency to select the least burdensome or intrusive alternative that meets the essential purpose of the regulatory change. Also, include discussion of less intrusive or less costly alternatives for small businesses, as defined in § 2.2-4007.1 of the Code of Virginia, of achieving the purpose of the regulatory change.

The no-action alternative to revising the *Waterworks Regulations* would allow waterworks permitting, operation, and design requirements to continue remaining unclear, conflicting, or unaddressed, and outdated practices would continue.

A partial revision of the *Waterworks Regulations*, to incorporate provisions that currently exist in policy or guidance, is one alternative. A partial revision would not address many of the shortcomings that the full reorganization and revision would provide, such as clarity, consistency, and better organization.

For the reasons previously stated, VDH is proposing to update or clarify all sections of the *Waterworks Regulations* where needed, and to re-organize the overall content in three parts.

Regulatory Flexibility Analysis

Pursuant to § 2.2-4007.1B of the Code of Virginia, please describe the agency’s analysis of alternative regulatory methods, consistent with health, safety, environmental, and economic welfare, that will accomplish the objectives of applicable law while minimizing the adverse impact on small business. Alternative regulatory methods include, at a minimum: 1) establishing less stringent compliance or reporting requirements; 2) establishing less stringent schedules or deadlines for compliance or reporting requirements; 3) consolidation or simplification of compliance or reporting requirements; 4) establishing performance standards for small businesses to replace design or operational standards required in the proposed regulation; and 5) the exemption of small businesses from all or any part of the requirements contained in the regulatory change.

The Commonwealth of Virginia, through VDH, has primary enforcement responsibility (or “primacy”) for the Safe Drinking Water Act (SDWA) granted by the EPA. Primacy is predicated on the requirement that the Commonwealth’s *Waterworks Regulations* will be no less stringent than the federal drinking water regulations (40 CFR Parts 141 and 142). Federal regulations that EPA promulgated pursuant to the SDWA have mandatory water quality standards and compliance requirements that include recordkeeping and reporting by the waterworks to the state. VDH has not pursued alternative regulatory methods to evaluate less stringent water quality standards, and/or reporting standards or schedules in order to maintain primacy. Although the SDWA and federal regulations contain provisions allowing variances and exemptions to the compliance and reporting requirements, which are included in the *Waterworks Regulations* at 12VAC5-590-140 and 12VAC5-590-150, VDH can only use these on a case-by-case basis and only for a limited period of time.

However, allowing certain well-operated TNCs to reduce the monitoring frequency for bacteriological contaminants from quarterly to annual will reduce the burden of collecting and submitting quarterly bacteriological samples. This option, which is part of EPA’s Reduced Total Coliform Rule, establishes less stringent compliance requirements and less stringent compliance schedules for qualified TNCs, many of which are owned by small businesses. In addition, allowing POU/POE devices to meet PMCLs provides owners of NTNCs and TNCs additional flexibility to use this technology to meet a PMCL. VDH expects this to be a lower-cost option than providing treatment at the waterworks’ treatment facility. Many owners of NTNCs and TNCs are small businesses.

Periodic Review and Small Business Impact Review Report of Findings

If you are using this form to report the result of a periodic review/small business impact review that is being conducted as part of this regulatory action, and was announced during the NOIRA stage, please indicate whether the regulatory change meets the criteria set out in Executive Order 14 (as amended, July 16, 2018), e.g., is necessary for the protection of public health, safety, and welfare; minimizes the economic impact on small businesses consistent with the stated objectives of applicable law; and is clearly written and easily understandable.

In addition, as required by § 2.2-4007.1 E and F of the Code of Virginia, include a discussion of the agency’s consideration of: (1) the continued need for the regulation; (2) the nature of complaints or comments received concerning the regulation from the public; (3) the complexity of the regulation; (4) the extent to which the regulation overlaps, duplicates, or conflicts with federal or state law or regulation; and (5) the length of time since the regulation has been evaluated or the degree to which technology, economic conditions, or other factors have changed in the area affected by the regulation.

These regulatory changes are necessary for the protection of public health, safety, and welfare. They include changes to the *Waterworks Regulations* to document requirements that have already been implemented by means of policy or codify current practices (operator classification, GUDI protocol, cross connection control). Other changes (POE/POU devices, reduced monitoring) increase regulatory flexibility for small businesses or generally do not have an impact on small businesses (fluoridation). Consequently, the changes will not impose any new regulatory requirements on existing small businesses that operate waterworks and may have a positive impact on the small business that provide products and services needed by waterworks.

The *Waterworks Regulations* are needed in order for the Commonwealth to retain primary enforcement authority for implementation of the SDWA and National Primary Drinking Water Regulations in Virginia and they must be no less stringent than the federal requirements. Loss of primacy would mean EPA would assume enforcement responsibility for water quality standards in Virginia and the state would lose

millions of federal dollars it currently receives for operating the public water system supervision program and drinking water state revolving loan fund program. As such, the *Waterworks Regulations* do not conflict, duplicate, or overlap with federal requirements.

VDH incorporated federal requirements into the *Waterworks Regulations* using “exempt” regulatory actions, but has not completed a comprehensive revision to the non-federal requirements since 1993. This revision addresses a range of items including development of new treatment technologies, development of new monitoring and control technologies, water consumption patterns resulting from shifts in consumer use and water-saving plumbing features, and state laws that the legislature has passed since the 1990s governing source water supply planning and withdrawal.

VDH has received comments from the regulated community about the need to update the *Waterworks Regulations* and has included stakeholders in the process of reviewing and developing amendments. VDH worked with a Regulatory Advisory Panel stakeholder group and the WAC to identify issues to be addressed during the update and develop consensus on the proposed changes.

Although the water quality standards in the *Waterworks Regulations* are complex, they are based on the federal regulations. As EPA continues to develop new standards for water quality and implement federal regulations, and industry standards continue to evolve, it will be necessary for VDH to review the *Waterworks Regulations* periodically to keep the requirements current.

To improve readability and understanding by the regulated community, VDH has reorganized nine sections of the *Regulations* into smaller, more readable sections.

Public Comment

Please summarize all comments received during the public comment period following the publication of the previous stage, and provide the agency response. Ensure to include all comments submitted: including those received on Town Hall, in a public hearing, or submitted directly to the agency or board. If no comment was received, enter a specific statement to that effect.

| Committer | Comment | Agency response |
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| Thomas G. Fauber, The Virginia Chapter of the ABPA (American Backflow Prevention Association) | <p>Letter dated 11/14/2017 to VDH expressing primary interest on protecting drinking water from contamination through cross connections on both sides of the service connection, with specific comments:</p> <ul style="list-style-type: none"> • Some guidance between the USBC and the proposed regulations have been removed by the Regulatory Advisory Panel. • The proposed changes would require many municipalities to walk back their programs thus providing less safety for our water systems. • The owner and responsible party for the distribution system should continue to have the | <p>To address these concerns, VDH, in concurrence with the WAC, assembled a workgroup with stakeholders familiar with the USBC and cross-connection/backflow prevention issues. The workgroup met on 4/13/2018 to consider Sections 55, and 585 through 630, which contain the requirements for using the USBC and cross-connection control programs. WAC members discussed the workgroup’s recommendations at subsequent meetings on 5/17/2018, 7/24/2018, and 9/5/2018 and incorporated them into the proposed regulations.</p> |

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| | <p>authority and the ability to decide whether a containment backflow prevention assembly is required.</p> <ul style="list-style-type: none"> The owner should always have the authority to decide whether a containment backflow assembly is required, or whether an isolation point-of-use device or assembly complying with the provisions of the USBC can substitute for containment. Recommendations were provided to Sections 12VAC5-590-580, 12VAC5-590-600, 12VAC5-590-610, 12VAC5-590-630. | |
| <p>Charles M. Murray, General Manager, Fairfax Water</p> | <p>Letter dated 11/28/2017 to VDH with specific comments:</p> <ul style="list-style-type: none"> Add regulations regarding ozone and other advanced oxidation treatment processes. Clarify requirements regarding backflow and cross-connection programs. Consider potential economic consequences of the proposed updates to surface water source and waterworks capacity. Nomination of Gregory Prelewicz to serve as the Fairfax Water’s stakeholder representative. | <ul style="list-style-type: none"> The ozone regulations are addressed in 12VAC5-590-1004. VDH and the WAC established a workgroup to consider issues with cross-connection control programs. The subgroup met and provided recommendations to the WAC that VDH incorporated into the amendments to the regulations. VDH and the WAC established a workgroup to discuss the issues about surface water withdrawals and safe yield as they affect past and future surface water availability and withdrawal permitting. The group met several times during 2018 but could not come to consensus on how to amend 12VAC5-590-830. Consequently, VDH does not propose any amendments to the section at this time. |
| <p>Andrea W. Wortzel, Troutman Sanders LLP for Mission H2O Virginia</p> | <p>Letter dated 11/29/2017 to VDH with comments:</p> <ul style="list-style-type: none"> Request to be part of the informal stakeholder interest in the management of Virginia’s water resources as it affects water supply and water availability, including the Eastern Virginia Groundwater Management Area. Proposed changes regarding the definition and use of the term “safe yield”. | <p>Mission H2O has similar issues regarding the “safe yield” and its impact on past and future surface water availability and withdrawal permitting. VDH included representatives from Mission H2O, Fairfax Water, Prince William County Service Authority, and others in the workgroup that considered regulatory language, a framework for evaluating surface water withdrawal capacity, and a way to balance differing requirements of law for DEQ and VDH, as they relate to 12VAC5-590-830. The group met several times during 2018 but could not come to consensus on how to amend 12VAC5-590-830.</p> |

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| | <ul style="list-style-type: none"> Nomination of Dean Dickey to serve as the Prince William County Service Authority's representative with Andrea Wortzel as alternate. | <p>Consequently, VDH does not propose any amendments to the section at this time.</p> |
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Public Participation

Please include a statement that in addition to any other comments on the regulatory change, the agency is seeking comments on the costs and benefits of the regulatory change and the impacts of the regulated community. Also, indicate whether a public hearing will be held to receive comments.

In addition to any other comments, the Virginia Department of Health is seeking comments on the costs and benefits of the proposal and the potential impacts of this regulatory proposal. The agency is seeking information on impacts on small businesses as defined in § 2.2-4007.1 of the *Code of Virginia*. Information may include: 1) projected reporting, recordkeeping and other administrative costs; 2) probable effect of the regulation on affected small businesses; and 3) description of less intrusive or costly alternative methods of achieving the purpose of the regulation.

Anyone wishing to submit written comments for the public comment file may do so through the Public Comment Forums feature of the Virginia Regulatory Town Hall web site at: <https://townhall.virginia.gov>. Written comments must include the name and address of the commenter. Comments may also be submitted by mail, email or fax to Nelson Daniel, 109 Governor Street, Room 629, Richmond, Virginia 23219, phone: 804-864-7210, fax: 804-864-7521, nelson.daniel@vdh.virginia.gov. In order to be considered, comments must be received by 11:59 pm on the last day of the public comment period.

A public hearing will be held following the publication of this stage, and notice of the hearing will be posted on the Virginia Regulatory Town Hall website (<https://townhall.virginia.gov>) and on the Commonwealth Calendar website (<https://commonwealthcalendar.virginia.gov/>). Both oral and written comments may be submitted at that time.

Detail of Changes

Please list all regulatory changes and the consequences of the changes. Explain the new requirements and what they mean rather than merely quoting the text of the regulation.

The following sections include amendments to replace “commissioner,” “district engineer,” “field office,” “ODW,” and “division” with “department” to ensure consistency in terminology: 10, 40, 110, 200, 210, 220, 240, 250, 270, 290, 300, 330, 350, 370, 372, 373, 374, 375, 376, 378, 379, 380, 382, 383, 384, 385, 392, 395, 401, 405, 415, 421, 430, 440, 490, 530, 540, 545, 550, 610, 830, 875, and 1180. However, in many sections, VDH did not amend or change the use of the word “commissioner” to validate that the context of its usage was more appropriate than “department.”

The following sections include amendments to replace “division” with “commissioner” to ensure the appropriate level of authority and because the “division” no longer exists within the Department of Health: 210, 220, 270, 290, 300, 840, 860, 910, 920, 930, and 990.

The following sections include amendments to replace “disinfectant residual” with “residual disinfectant” to ensure consistency in terminology: 10, 374, 376, 380, 395, 411, 440, 500, 550, and 1000.

The following sections include amendments to replace “in lieu” with “instead” to represent a more common meaning and be consistent with the RIS Style Manual: 290, 300, 374, 375, 376, 378, 405, 411, 500, 531, 545, and 680.

The following sections include amendments to replace “in order to” with “to” since the words “in order” are insignificant and do not affect the meaning of the sentence: 375, 392, 405, 540, 545, 570, 830, and 880.

The following sections include amendments to replace “owners” with “owner” because the singular term is more appropriate to the context of the regulations: 350, 370, 372, 373, 374, 375, 376, 378, 379, 380, 392, 401, 405, 421, 500, 530, 531, 540, 545, and 550.

The following sections include amendments to replace “prior to” with “before” to represent a more common meaning and to be consistent with the RIS Style Manual: 10, 40, 50, 210, 370, 375, 379, 395, 401, 405, 530, 540, 610, 840, 860, 940, and 1210.

The following sections include amendments to replace “water purveyor” or “purveyor” with “waterworks owner” or “owner” because the term “water purveyor” is being deleted from the definitions: 10, 600, and 610.

The following sections include amendments to replace “residual chlorine” with “chlorine residual” to ensure consistency in terminology: 10, 900, 960, and 1001.

The following sections include amendments to replace “surface water” with “surface water source” to differentiate between reference to the “source” versus the “type” and to ensure uniformity in terminology: 374, 376, 380, 401, 411, 531, 830, 883, and 1001.

The following sections include amendments to replace “taken” with “collected” to more appropriately represent the act of “sample collection” rather than “sample taken:” 375, 379, 380, 405, and 550.

The following sections include amendments to replace “water supply” with “source water” to differentiate among other usage of the term and to clarify its proper context: 140, 150, 220, 360, 375, 405, 830, 840, and 860.

| Current section number | New section number, if applicable | Current requirement | Change, intent, rationale, and likely impact of new requirements |
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| Article 1 | | Article 1 title is "Definitions" | Eliminate article number and title for simplicity. |
| 12VAC5-590-10 | N/A | Section title is "Definitions" Action level, Air gap separation, Auxiliary water system, Backflow, Backflow prevention device, Bag filters, Bank filtration, Best available technology, Commissioner, Compliance cycle, Compliance period, Consecutive waterworks, Consumer, Cross-connection, Disinfectant, Disinfection, Disinfection profile, Distribution main, Double gate-double check valve assembly, Dual sample set, Entry point, Exemption, Finished water, Free available chlorine, Groundwater, Groundwater system, Groundwater under the direct influence of surface water, Haloacetic acids (five), Halogen, Hypochlorite, Initial compliance period, Karst geology, Lake/reservoir, Lead free, Lead service line, Log inactivation, Maximum contaminant level, Maximum contaminant level goal, Maximum residual disinfectant level, Maximum total trihalomethane potential, Membrane filtration, Method detection limit, Most probable number, | <p>Eliminate article number and title for simplicity.</p> <p><u>Intent</u> – Change section title to "Definitions and units of measurement."</p> <p>The definitions for the terms listed in column three will be amended.</p> <p><u>Rationale</u> – The changes reflect current use of the terms, changes in technology, corrections of typographical errors, changes to ensure consistent use of terms throughout the regulations, changes in terminology, and/or using easier to understand definitions.</p> <p><u>Impact</u> – the regulations and the use of the terms throughout the regulations will be more straightforward and easier to understand.</p> |

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| | | <p>Nontransient noncommunity waterworks, One hundred year flood elevation, Operator, Optimal corrosion control treatment, Owner, Point of disinfectant application, Point-of-entry device, Point-of-use device, Pollution, Practical quantitation level, Prechlorination, Presedimentation, Process fluids, Pure water, Reduced pressure principle backflow prevention assembly, REM, Residual disinfectant concentration, Sanitary survey, Service connection, Sewer, Significant deficiency, Slow sand filtration, SUVA, Synthetic organic chemical, Too numerous to count, Total organic carbon, Total trihalomethanes, Transient noncommunity waterworks, Treatment technique, Used water, Variance, Virus, Volatile organic chemical, Water supply, Waterworks, and Wholesale waterworks.</p> | |
| <p>12VAC5-590-10</p> | <p>N/A</p> | <p>Annual daily water demand, Approved, Breakpoint chlorination, Chlorine, Chlorine gas, Chlorine solution (chlorine water), Chronically noncompliant waterworks, Coliform bacteria group, Comprehensive performance evaluation, CT,</p> | <p><u>Intent</u> – The definitions for the terms listed in column three will be deleted.</p> <p><u>Rationale</u> – Many of the terms are no longer used in the regulations and are not needed for historical purposes (e.g., “health regulations”). Other terms are used in only one section and are defined in that section. An example is “first draw sample” which is only used in 12VAC5-590-375 and is defined in</p> |

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| | | <p>Daily fluid intake, Dechlorination, Degree of hazard, Disinfectant contact time, District engineer, Domestic or other nondistribution system plumbing problem, Effective corrosion inhibitor residual, Equivalent residential connection, Exception First draw sample, GAC10, GAC20, Governmental entity, Health regulations, Interchangeable connection, Large waterworks, Liquid chlorine, Manmade beta particle and photon emitters, Maximum daily water demand, Medium waterworks, Office or ODW, Plant intake, Pollution hazard, Postchlorination, Raw water main, Responsible charge, Sanitary facilities, Secondary water source, Service line sample, Small waterworks, Standard sample, Terminal reservoir, Total effective storage volume, Transmission main, Two-stage lime softening, Water purveyor, Water supply main, Water well completion report, and Waterworks with a single service connection.</p> | <p>subsection B 2 b, Sample collection methods.</p> <p><u>Impact</u> – Improved understanding and application of the regulations by removing unnecessary content.</p> |
| <p>12VAC5- 590-10</p> | <p>N/A</p> | <p>None</p> | <p><u>Intent</u> – Add new definitions: Administrative process act, ANSI, ASME, ASTM, AWWA, Backflow elimination method, Backflow prevention assembly, Backpressure backflow, Backsiphonage,</p> |

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| | | | <p>Boil water advisory and boil water notice, BSSP, CAP, Case decision, CCCP, CCR, CDC, CFE, CFR, Clean compliance history, Comprehensive business plan, Confirmation sample, Consolidated, Containment, DBPPs, DBPs, DCLS, Department, DEQ, Distribution system, DOC, DPOR, Drawdown, EDR, EPA, GAC, GWMA, HPC, Isolation, Leakage, Log removal, Membrane module, Membrane technologies, Membrane unit, Microfiltration, MPA, Nanofiltration, ND, NSF, Operating staff, Optimum fluoride ion concentration, PAC, PCBs, PER, Permit, Permitted capacity, Person, pH, Physical disconnection, PMCL, Pressure vacuum breaker assembly, Primary disinfection, Process water, Project documents, QCRV, RAA, Regulations, Reverse osmosis, SDWA, Secondary disinfection, Site visit, SMCL, SOP, Source water, Supervisory control and data acquisition, TDS, TMF, Treatment, Ultrafiltration, Unconsolidated, USBC, UV, VOSH</p> |
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| | | | <p>Waiver, Water treatment plant, and Waterworks business operation plan.</p> <p>Add new subsection B, "Units of measurement".</p> <p><u>Rationale</u> – Definitions for terms, acronyms, and units of measure will enhance reader understanding and provide consistency throughout the regulations.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| Article 2 | | Article title is "General Information" | Eliminate article number and title for simplicity. |
| 12VAC5-590-20 | N/A | Section title is "Authority for regulations." | <p><u>Intent</u> – Repeal section.</p> <p><u>Rationale</u> – Section is unnecessary.</p> <p><u>Impact</u> – None.</p> |
| 12VAC5-590-30 | N/A | Section title is "Purpose of the regulations." | <p><u>Intent</u> – Repeal section.</p> <p><u>Rationale</u> – Section is unnecessary.</p> <p><u>Impact</u> – None.</p> |
| None | 12VAC5-590-35 | None | <p><u>Intent & Rationale</u> – Add new section with title "Delegation of authority." Commissioner can act on behalf of the Board of Health, with limitation.</p> <p><u>Impact</u> – none.</p> |
| 12VAC5-590-40 | N/A | <p>Section title is "Administration of regulations."</p> <ol style="list-style-type: none"> 1. Board of Health is responsible for promulgating, amending, and repealing regulations. 2. Commissioner is the executive officer of the Board of Health. 3. Division of Water Supply Engineering is designed the primary reviewing agent for administrating this chapter. 4. Central and field offices locations, 5. Waterworks Advisory Committee membership and role is defined, | <p><u>Intent</u> – Clarify and update to reflect organization changes.</p> <p>Change section title to "Administration of this chapter." Change subsection 1 to subsection A. Change subsection 2 to subsection B. Change to subsection 3 to subsection C; change "Division of Water Supply Engineering" to "department". Delete subsection 4 describing central and field offices. Delete subsection 5 and create new section 45 for the Waterworks Advisory Committee.</p> <p><u>Rationale</u> – Office of Drinking Water name and organization has changed and may change in future.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |

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| None | 12VAC5-590-45 | None | <p><u>Intent</u> – Create new section 45 titled "Waterworks Advisory Committee (WAC)." Provide clarification about committee membership, meetings, and the term of membership.</p> <p><u>Rationale</u> – Changes reflect current and future purpose of the WAC.</p> <p><u>Impact</u> – None, this is not a new requirement.</p> |
| 12VAC5-590-50 | N/A | <p>Section title is "Application of regulations to waterworks and water supplies in operation or planned prior to the effective date of the regulations."</p> <p>A. Waterworks must comply with Part II of this chapter.</p> <p>B. Compliance with Part III and IV is required for waterworks modification and construction.</p> <p>C. Compliance with Part III and IV is necessary for all repair to pipes, tanks, pumps and appurtenances part of a waterworks.</p> <p>D. VOC and unregulated contaminants regulations in accordance with times schedule presented.</p> <p>E. Lead and Copper regulations in accordance with time schedule presented.</p> | <p><u>Intent</u> – Change section title to "Application of regulations to waterworks in operation or planned before the effective date of the regulations." Remove "water supplies" from title. Water supplies may be misinterpreted. The regulation does not apply to the source of water before the point of intake at a waterworks.</p> <p>A. Delete reference to variance and exemption sections and simplify wording.</p> <p>B. Delete reference to Part IV (to be repealed). Clarify that existing facilities are not required to conform to Part III design requirements if they are not modified.</p> <p>C. Delete reference to Part IV (to be repealed.) Delete subsections D and E.</p> <p>Remove outdated regulations and timetables. Clarify that existing facilities are not required to upgrade to current design requirements unless modifications are proposed.</p> <p><u>Rationale</u> – Advancements in design cannot be imposed on existing facilities without excessive cost; and is not the intent of the regulations.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| None | 12VAC5-590-55 | None | <p><u>Intent</u> – Create new section titled "Relationship of this chapter to the USBC. Clarify the jurisdictions of two state government agencies.</p> |

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| | | | <p><u>Rationale</u> – Clearer regulations are preferable to the current interagency agreement between VDH and the Department of Housing and Community Development. This change will eliminate the need for the interagency agreement.</p> <p><u>Impact</u> – None.</p> |
| Article 3 | | Article title is “Procedures” | Eliminate article number and title for simplicity. |
| 12VAC5-590-60 | N/A | Section title is "Compliance with the Administrative Process Act (APA)." “All procedures outlined below...” | <p><u>Intent</u> – Repeal section.</p> <p><u>Rationale</u> – Section is unnecessary.</p> <p><u>Impact</u> – None.</p> |
| 12VAC5-590-70 | N/A | Section title is "Powers and procedures". The Board of Health reserves the right to authorize any procedure ... that is consistent with the provisions set forth herein and the ... Title 32.1 of the <i>Code of Virginia</i> . | <p><u>Intent</u> – Delete qualifying phrase “that is consistent with...” Clarify regulation and remove unnecessary text.</p> <p><u>Rationale</u> – Simple language conveys meaning directly.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| 12VAC5-590-80 | N/A | Section title is "Procedure." Regulations are established in accordance with the Administrative Process Act | <p><u>Intent</u> – Repeal section.</p> <p><u>Rationale</u> – Section is unnecessary</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| 12VAC5-590-90 | N/A | [Reserved] | <p><u>Intent</u> – Remove section.</p> <p><u>Rationale</u> – No content in section.</p> <p><u>Impact</u> – None.</p> |
| 12VAC5-590-100 | N/A | Section title is "Exception; emergency regulations." The Board of Health may promulgate regulations by complying with procedures in §32.1-13 of the <i>Code of Virginia</i> . | <p><u>Intent</u> – Add reference to APA procedures set forth in § 2.2-4011 of the <i>Code of Virginia</i> and clarify authority of the commissioner to act when the Board of Health is not in session.</p> <p><u>Rationale</u> – APA procedures must be followed. Clarifies the commissioner’s authority to act in an emergency situation.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| 12VAC5-590-110 | N/A | Section title is "Enforcement." 1. Notifying the alleged violator. | <u>Intent</u> – Renumber subsections and subdivisions. Add references to §§ 32.1-174 and 32.1-27 of the <i>Code</i> |

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| | | <p>2. Orders requiring owner to comply. 3. Enforcement of orders. 4. Voluntary compliance. 5. Hearing as a matter of right.</p> | <p><i>of Virginia</i>, where appropriate. Also, clarify regulation and remove unnecessary text and cross references.</p> <p>1 becomes subsection A, "Notice" to alleged violator. 2 becomes subsection B, "Orders" requiring owner to comply. 3 becomes subsection C, "Compliance with effective orders and this chapter". 4 becomes subsection D, "Special order", voluntary compliance information relocated to new subsection E, "Graduated enforcement actions". Remove 5. Hearing as a matter of right.</p> <p><u>Rationale</u> – Consistency needed with enforcement terminology and practices found in §§ 32.1-26, 32.1-27, and 32.1-174 of the <i>Code of Virginia</i>. Information in 5 is provided in new section 115.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| None | 12VAC5-590-115 | None | <p><u>Intent</u> – Create a new section titled "Administrative proceedings". Incorporate information from sections 160, 170, and 180 into this new section, consolidating information on topic.</p> <p><u>Rationale</u> – Related information presented together improves understanding.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| 12VAC5-590-120 | N/A | <p>Section title is "Emergency orders." Commissioner may issue emergency orders in case where there is imminent danger to public health from a waterworks. Emergency order may be communicated by the best practical notice and is effective immediately upon receipt. Violation of an Emergency Order. Emergency orders shall be effective for a period determined by the</p> | <p><u>Intent</u> – Add subsection letters A through E and organize text into subsections. Revise subsection B to be consistent with § 32.1-175 A of the <i>Code of Virginia</i>.</p> <p><u>Rationale</u> – Conform to RIS Style Manual.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |

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| | | commissioner. Emergency orders may be appealed in accordance of the APA. | |
| 12VAC5-590-125 | N/A | Section title is "Chronically noncompliant waterworks." A. Identification of chronically noncompliant waterworks (CNC). B. Bringing a CNC into compliance. C. Owner shall provide commissioner a copy of notice sent to each consumer within 5 calendar days of receiving the order. D. The commissioner shall send copy of order to chief administrative officer of the locality. E. Civil penalties statues. | <u>Intent</u> – Delete text in subsection A. Incorporate text from section B into new subsections A and B. Delete text in subsection C. Renumber subsection D to subsection C. Renumber subsection E to subsection D. Reference definition of chronically noncompliant contained in §32.1-167 of the <i>Code of Virginia</i> . Eliminate list of reasons for determination of chronically noncompliant, and refer to Code definition instead. <u>Rationale</u> – The Code language is more comprehensive than the existing regulations. <u>Impact</u> – Improved understanding and application of the regulations. |
| 12VAC5-590-130 | N/A | Section title is "Suspension." In case of disaster, the commissioner may suspend the application of the chapter until the disaster is abated. | <u>Intent</u> – Change section title to "Suspension of this chapter." Change "localities" to "waterworks" and clarify that enforcement may be suspended. Clarify that the commissioner may suspend enforcement of the regulations in the event of a man-made or natural disaster. <u>Rationale</u> –The existing phrase "application of the chapter" is unclear. <u>Impact</u> – Improved understanding and application of the regulations. |
| 12VAC5-590-140 | N/A | Section title is "Variances." Content is based on National Primary Drinking Water Regulations, 40 CFR 141.4, and section 1415 of the SDWA with no substantial changes. | <u>Intent</u> – Minor word changes. Change "application" to "request," "raw water" to "source water." Correct reference citations. Correct wording and references. Revise subsection F to specify due process rights. Set up text into subsections A through J. <u>Rationale</u> – Conform to RIS Style Manual. <u>Impact</u> – Improved understanding and application of the regulations. |
| 12VAC5-590-150 | N/A | Section title is "Exemptions." | <u>Intent</u> – Minor word changes. |

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| | | Content is based on National Primary Drinking Water Regulations, 40 CFR 141.4, and section 1416 of the SDWA with no substantial changes. | Change “application” to “request”. Correct reference citations. Correct wording and references in subsections D and H. Revise subsection D to specify due process rights. <u>Rationale</u> – Conform to RIS Style Manual. <u>Impact</u> – Improved understanding and application of the regulations. |
| 12VAC5-590-160 | N/A | Section title is "Type of hearings." 1. Informal hearing 2. Adjudicatory hearing 3. Regulatory hearing | <u>Intent</u> – Repeal section. Move and consolidate information to new section 115. Consolidate information on topic. <u>Rationale</u> – Related information presented together improves understanding. <u>Impact</u> – Improved understanding and application of the regulations. |
| 12VAC5-590-170 | N/A | Section title is "Request for hearing." | <u>Intent</u> – Repeal section. Move and consolidate information to new section 115. Consolidate information on topic. <u>Rationale</u> – Related information presented together improves understanding. <u>Impact</u> – Improved understanding and application of the regulations. |
| 12VAC5-590-180 | N/A | Section title is "Hearing as a matter of right." | <u>Intent</u> – Repeal section. Move and consolidate information to new section 115. Consolidate information on topic. <u>Rationale</u> – Related information presented together improves understanding. <u>Impact</u> – Improved understanding and application of the regulations. |
| 12VAC5-590-190 | N/A | Section title is "Permits." Written construction permit required from commissioner. Written operation permit required from commissioner. Conditions may be imposed on issuance of any permit. | <u>Intent</u> – Add subsection letters A through E to text: A. Written operation permit required for waterworks to operate. B. No construction changes without written construction |

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| | | | <p>permit or general permit for distribution mains.</p> <p>C. Construction permit not required for waterline extension projects meeting § 32.1-172 A of the <i>Code of Virginia</i>. Add exemption specified in the <i>Code</i> for ease of reference.</p> <p>D. Individual construction permits not required for distribution main projects when a general permit has been issued to a waterworks.</p> <p>E. Conditions may be imposed on issuance of any permit. Include reference to the general permit for distribution mains and the limited permit exemption.</p> <p><u>Rationale</u> – Clarify requirement for a permit and the types of permits. General permits are described later in the regulations (section 300) and need to be included here also.</p> <p><u>Impact</u> – Potential increase in general permits issued to waterworks instead of requiring standard construction permits, thereby reducing effort and costs to utilities and state government.</p> |
| <p>12VAC5-590-200</p> | <p>None</p> | <p>Section title is "Procedure for obtaining a construction permit." Construction permits are issued by the Commissioner. The section outlines the requirements for a construction permit: A. Submit an application to establish, construct, expand, modify and/or operate a waterworks; B. Participate in a preliminary engineering conference; C. Submit plan data and applicable information that may include: the engineer's report and preliminary plans with general information, extent of waterworks system, alternative plans, soil, groundwater conditions, and foundation problems, water consumption, fire flow requirements, sewerage system available,</p> | <p><u>Intent</u> – Revise with subsection letters A through G and re-organize text. Add requirements for business plans and records to demonstrate property rights where wells are located.</p> <p>A. Revise permit procedures, outlining 6 steps, including the waterworks business operation plan, required by § 32.1-772 B of the <i>Code of Virginia</i>.</p> <p>B. Delete preliminary conference requirements and replace with well site inspection (for groundwater sources only).</p> <p>C. Delete subsection C outlining content of engineer's report, and replace subsection D as the new subsection C "Plans for waterworks construction..." Remove requirement to provide boundaries of the municipality or area to be served, remove imprint of professional engineer's seal, remove legible</p> |

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| | | <p>source of water supply, proposed treatment processes, waste disposal, automatic equipment, project sites, financing, future extensions.</p> <p>D. Plans for waterworks improvements shall provide the following: a general layout and detailed plans.</p> <p>E. Submit complete, detailed, technical specifications for the proposed project.</p> <p>F. Submit a summary of complete design criteria.</p> | <p>prints suitable for microfilming with size not to exceed 30 inches by 42 inches. Add requirement to submit completed Form GW-2, and schematic drawings of well constructions. Change the requirement to locate all potential sources of pollution from 250 ft to 1000 ft of drilled wells.</p> <p>D. Replace subsection E with new subsection D “Specifications for waterworks construction...”</p> <p>E. Replace subsection F with new subsection E “Design criteria”. Remove design criteria requirement for reservoir surface area and area of watershed, and replace “yield of source of supply” with “water supply withdrawal capacity.”</p> <p>F. New subsection on requirement for copy of well lot plat plans and dedication document duly recorded with clerk of the circuit court. Clarify that well lot plat plans and dedication documents are required for community waterworks only;</p> <p>G. New subsection on non-community waterworks indicating that the commissioner may require a copy of a duly recorded plat plan of a well lot and a dedication document on a case-by-case basis.</p> <p>Consolidate and update procedures and submittal requirements in one location of the regulations. Refer to new standard well completion form.</p> <p><u>Rationale</u> – Business plan requirements added to state law since last revision to this section. Conference and report requirements listed are outdated and may inhibit communication. Use of one universal well completion form for both State agencies (VDH and DEQ) needed to obtain complete and accurate well construction data.</p> |
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| | | | <p>Impact – Potential reduction of time and expense to waterworks owners and VDH for small waterworks design and construction projects. Short-term increase in time spent by water well systems providers to transition to new form and provide business plan. This should be offset by owner’s assessment of and planning for the technical, managerial, and financial requirements to operate a waterworks successfully.</p> |
| <p>12VAC5-590-210</p> | <p>N/A</p> | <p>Section title is “Formal requirements for the submission of engineering data.” All drawings, specifications, and engineer’s reports submitted for approval shall be prepared by or under the supervision of a licensed professional engineer qualified to practice in Virginia. The front cover of each report shall bear the signed imprint of the seal of the licensed professional engineer and signed with original signature. If plans and specifications are found to be incomplete or inadequate, they will be returned to the submitting party with a letter outlining the necessary revisions.</p> | <p>Intent – Change section title to “Requirements for the submission of engineering data.” Add subsection letters A through D to the text.</p> <p>A. Preparation of drawings, specifications, and engineer’s reports submitted for approval under the supervision of a VA licensed professional engineer. Add reference to §54.1-408 of the <i>Code of Virginia</i> for land surveyors.</p> <p>B. Substitute requirements describing specific seal and signature specifications for engineering reports with "The quantity, format, and method of submission shall meet the evaluation needs of the commissioner and shall be consistent with the requirements in Chapter 42.1 of Title 59.1 of the <i>Code of Virginia</i>."</p> <p>C. Submittals to department at least 60 days prior to desired action by commissioner.</p> <p>D. Returning submittals for incompleteness or inadequacy, or when revisions are necessitated. Revise "letter" to "notified in writing". Delete recommendation to submit preliminary plans and engineer's report prior to preparation of final plans.</p> <p>Allow submission of electronic documents. Include professional engineer exemption as allowed by Code.</p> |

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| | | | <p><u>Rationale</u> – Allow more efficient submission and management of documents.</p> <p><u>Impact</u> – Negligible, as changes have already been implemented and cost savings to owners, consultants, and state agency have been realized.</p> |
| <p>12VAC5-590-220</p> | <p>N/A</p> | <p>Section title is "Compliance with Manual of Practice." A. Design guidelines are provided in the Manual of Practice but the commissioner may impose more stringent standards or requirements when required to meet critical areas, special conditions, special standards, or federal mandates. B. Designs must demonstrate that a system will adequately safeguard public health. C. Plans and specifications will be reviewed by the division. One set of approved plans and specifications will be stamped by the division and returned to the owner.</p> | <p><u>Intent</u> – Change section title to “Compliance with the Manual of Practice.”</p> <p>A. Reword to allow the “commissioner,” not the division, to impose more stringent standards or requirements than those contained in the Manual of Practice (Part III) when required to meet drinking water quality standards.</p> <p>B. State that design submissions must be in substantial compliance with the Manual of Practice or additional requirements established by the commissioner. Reword last sentence to state, "For each deviation, the commissioner may issue a design exception or require compliance with the criteria."</p> <p>C. Remove requirement for VDH to stamp and return one set of approved plans and specification to owner. Change division to “department” and specify that plans will be approved if they demonstrate substantial compliance with the Manual of Practice and any design criteria established by the commissioner.</p> <p>D. Create new subsections (D & E) for exceptions from Part III for transient noncommunity waterworks.</p> <p>Allow design exceptions to Part III when appropriate. Allow for exceptions granted by DPOR for transient noncommunity waterworks meeting specific conditions. Delete paper requirements.</p> |

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| | | | <p><u>Rationale</u> – Design flexibility and innovation are acceptable when conditions warrant. More efficient submission and management of documents will result. Division is no longer applicable.</p> <p><u>Impact</u> – Negligible, as changes have already been implemented and cost savings to owners, consultants, and state government have been realized.</p> |
| 12VAC5-590-230 | N/A | <p>Section title is "Issuance of the construction permit." Upon approval of the plans and specifications, the commissioner will issue a construction permit.</p> | <p><u>Intent</u> – Add subsection letters A through C to the text.</p> <ul style="list-style-type: none"> A. Commissioner issues construction permit following approval of plans and specifications. B. Construction permit shall be valid for period of 5 years. C. Construction permit may include conditions for securing equipment certifications and performance validations. <p>Clarify the time limits of the construction permit and allow conditions to be added to the construction permit.</p> <p><u>Rationale</u> – Construction must be started in order to provide reasonable assurance that design conditions have not changed. Documentation may be required for installed equipment to meet the performance or certification requirements of the design.</p> <p><u>Impact</u> – Reduces the potential for constructing waterworks incorrectly, thereby saving the owner's time and cost.</p> |
| 12VAC5-590-240 | N/A | <p>Section title is "Revisions of approved plans." Any deviations from approved plans and specifications must be approved. Revised plans and specifications shall be submitted in time to permit the review and approval before construction work is begun.</p> | <p><u>Intent</u> – Add subsection letters A and B to the text and replace "division" with "department" and other minor wording changes to improve grammar and accuracy of wording.</p> <p><u>Rationale</u> – Division is no longer applicable.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |

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| <p>12VAC5-590-250</p> | <p>N/A</p> | <p>Section title is "Statement required upon completion of construction." Upon completion of the construction or modification of the waterworks, the owner shall submit a statement signed by a licensed professional engineer stating that the construction work was completed in accordance with the approved plans and specifications.</p> | <p><u>Intent</u> – Add subsection letters A and B to the text. A. Clarify "statement of completion of construction". B. Add that project documents may require a performance verification report and operator training. <u>Rationale</u> – Improve receipt of deliverables from contractor after construction is completed. Contract documents may specify verification of performance and operator training for proprietary equipment in order to assure acceptable operation. <u>Impact</u> – Operation and performance of new process equipment may be improved.</p> |
| <p>12VAC5-590-260</p> | <p>N/A</p> | <p>Section title is "Issuance of the operation permit." Upon receipt of the 12VAC5-590-250 statement, the commissioner will issue an operating permit.</p> | <p><u>Intent</u> – Clarify procedures, requirements for a permit, and the content of a permit. Add subsection letters A through C. A. Issuing the operation permit following receipt of all required documentation, results, and inspection. B. An owner shall not operate a waterworks without first having obtained an operation permit except as provided in section 290. An owner shall not operate a substantially modified waterworks without first obtaining an amended operation permit. C. The commissioner shall establish the type, classification, permitted capacity of the waterworks, and specify these on the operation permit. Conditions may be included with the permit for operator, monitoring, and reporting requirements. <u>Rationale</u> – This is current procedure and the details are missing from the regulations. <u>Impact</u> – Waterworks will be permitted and operated by properly qualified operators.</p> |
| <p>12VAC5-590-270</p> | <p>N/A</p> | <p>Section title is "Inspection and correction." A. Within 30 days after placing a new or modified waterworks</p> | <p><u>Intent</u> – Clarify owner's responsibilities to notify and test prior to operating new facilities.</p> |

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| | | <p>into operation, the owner shall test the water. B. The commissioner has a right to inspect any waterworks and be present for any testing.</p> | <p>Change title to "Startup testing and inspections." A. Startup testing to be performed at new or modified waterworks following construction before being placed into operation. Replace "division" with "department." B. Remove "a member of the board or a member of the division." <u>Rationale</u> – Existing language is unclear. <u>Impact</u> – Improved understanding and application of the regulations.</p> |
| <p>12VAC5-590-280</p> | <p>N/A</p> | <p>Section title is "Procedure for obtaining a construction permit for well sources." The following procedures for well sources shall be used: 1. Submit Application. 2. Preliminary engineering conference. 3. Tentative well lot approval letter issued by VDH. 4. Submit engineer's report and preliminary plans. 5. Submit plans and specifications as per Section 200 D, E, and F, Section 210, and Section 840. 6. Compliance with Sections 220 through 270 required.</p> | <p><u>Intent</u> – Repeal section and move relevant content to subsections 200 B, C, and D. Combine well development procedures with permit procedures. <u>Rationale</u> – Source development is integral to the construction permit process and procedures need clarification. <u>Impact</u> – Improved understanding and application of the regulations.</p> |
| <p>12VAC5-590-290</p> | <p>N/A</p> | <p>Section title is "Procedure for issuance of special permits for new or nonconventional methods, processes, and equipment." A. Water treatment methods, processes or equipment which are not covered by the design criteria of Part III or IV, and which in principle or application are new or nonconventional, are subject to special permit application procedure in lieu of that set forth in Section 200. B. New or nonconventional developments shall have been thoroughly tested in a full-scale or representative pilot-plant installation before approval of a plant utilizing this process and equipment can be employed.</p> | <p><u>Intent</u> – Change title to "Issuance of a temporary operation permit." Replace "Special" and "Provisional" permits with "Temporary" permits and clarify requirements. Remove equipment requirements for surface water treatment. A. Change "special permit" to "temporary permit". B. Minor word changes. Remove testing requirement guideline for treating surface waters. For certain types of source water, continuous monitoring is required. C. Minor word changes on the submission of plans. D. Minor word changes on the issuance of a construction permit.</p> |

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| | | <p>Testing guidelines are provided.</p> <p>C. Detailed plans shall be submitted showing how, in case of disapproval, the plant or unit will be converted to, or replaced with, a proven process. Financial assurance is required.</p> <p>D. Commissioner will issue a construction permit if he is satisfied that the method, process, or equipment will efficiently produce water that will meet the operation standards of Part II, and that the method, process, or equipment may be converted to a conventional technique, if necessary.</p> <p>E. A provisional permit for a definite period of time will be issued for the operation of the new or nonconventional methods, processes, and equipment. Not more than one provisional permit will be granted during the evaluation period. Provisional permits requirements are listed.</p> <p>F. The commissioner will issue an operation permit upon lapse of the provisional permit if he finds that the waterworks meets the operation standards of Part II. If standards are not met, an order will be issued to require standards to be met.</p> | <p>E. Issuance of temporary operation permit. Change "provisional permit" to "temporary permit". Minor word changes.</p> <p>F. Delete existing requirements in subsection F and replace with "The commissioner may issue a temporary operation permit if the waterworks is not in compliance with the regulations and public health will not be jeopardized. The temporary permit may be issued for such period of time and subject to conditions as the commissioner may deem appropriate for the owner to achieve compliance with this chapter."</p> <p><u>Rationale</u> – Code of Virginia § 32.1-172 E provides for issuance of a temporary permit. Design requirements for treatment are in Part III of the Regulations.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| <p>12VAC5-590-300</p> | <p>N/A</p> | <p>Section title is "Procedure for obtaining a general permit for distribution mains."</p> <p>Instead of obtaining a permit for each distribution main project, an owner may elect to obtain a general permit for distribution mains.</p> <p>1. The owner shall develop, adopt, and have division approval of general specifications and plan details covering water main design and construction.</p> <p>2. The owner shall enter into a memorandum of understanding with the division. System-specific requirements are listed.</p> | <p><u>Intent</u> – Change title to "Issuance of a general permit for construction of distribution mains." Clarify meaning of a general permit, and the requirements and procedures for its issuance.</p> <p>Add subsection letter A and minor corrections.</p> <p>Add subsection letter B and minor corrections. Clarify that general specifications shall be at least as stringent as the requirements contained in this chapter. Add new subsection C. "Once the general specifications are approved and the MOU is agreed to by the commissioner, a general permit for distribution mains shall be issued with the MOU attached."</p> |

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| | | | <p>Add new subsection D. "The general permit allows for the construction of distribution mains. The duration for the general permit is five years."</p> <p><u>Rationale</u> – Clear requirements and procedures are needed to ensure that the owner is qualified to assume the responsibilities for design and construction of water distribution mains.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| 12VAC5-590-310 | N/A | <p>Section title is "Amendment or reissuance of permits." The commissioner may amend or reissue a permit.</p> | <p><u>Intent</u> – Change title to "Amendment or reissuance of operation permits." Substitute "water supply" for "source of supply" and "potable" for "pure". Use correct terms. Add subsection letters A and B to the text. A, Minor word changes to be consistent with § 32.1-173 of the <i>Code of Virginia</i>. Add new subsection B. "The commissioner may require submission of a business operation plan."</p> <p><u>Rationale</u> – Defined words need to be used consistently. Regulatory requirements need to be consistent with state law.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| 12VAC5-590-320 | N/A | <p>Section title is "Revocation or suspension of a permit." A. The commissioner may suspend or revoke a permit for listed reasons. B. When revoking or suspending permits, the commissioner shall send a written notice of intent to the owner stating the reasons for the proposed suspension or revocation and provide at least 30 days advance notice of the hearing. C. The owner has the right to a hearing.</p> | <p><u>Intent</u> – Change title to "Revocation of an operation permit." Delete "suspension" of a permit throughout this section. Clarify the procedure for revoking an operation permit. A. List of reasons when the commissioner may revoke an operation permit. The list is consistent with § 32.1-174 of the <i>Code of Virginia</i>. B. Add subsection title "Procedure for revocation of operation permit, and correct language to refer to new section 115 for administrative proceedings. Delete subsection C."</p> <p><u>Rationale</u> – Operation permits are not suspended, but may be revoked for specific reasons listed in § 32.1-</p> |

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| | | | <p>174 of the <i>Code of Virginia</i>, following procedures consistent with the APA.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| 12VAC5-590-330 | N/A | <p>Section title is "Monitoring, records, and reporting." The commissioner may require the owner to install, use, and maintain equipment for the control and testing of water flowing through the plant. Sampling and testing shall be by methods approved by the division. Test results shall be recorded, compiled, and reported to the field office in a format approved by the division.</p> | <p><u>Intent</u> – Stipulate the conditions when monitoring equipment in a treatment plant may be required by the state. Add subsection letter A and add list of reasons for requiring water treatment process monitoring equipment. Add subsection letter B and correct references to commissioner and department.</p> <p><u>Rationale</u> – The imposition of additional requirements by the state must be justified by explaining the basis for them, with the overall goal of protecting public health.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| Article 1 | | Article 1 title is "General." | Eliminate article number and title for simplicity. |
| 12VAC5-590-340 | N/A | <p>Section title is "General." All physical, chemical, bacteriological or radiological tests to determine compliance must be performed by DCLS or labs certified by DCLS.</p> | <p><u>Intent</u> – Change title to "Compliance standards." Move and consolidate all water quality standards, Maximum Contaminant Levels, Action Levels, Treatment Techniques, and Maximum Disinfectant Levels and Goals to first section. Number 1st paragraph subsection A. Additional sampling and testing may also be required by the commissioner.</p> <p>Move content about "Specific limits" of 390 B into new subsection 340 B. Add subsection C explaining how compliance is determined. Add subsection D addressing increasing residual disinfectant levels. Move section 440 Tables 2.2 - 2.5 and renumber as Tables 340.1 - 340.4. Create new Table 340.5 Microbial Contaminants, from EPA (see http://water.epa.gov/drink/contaminants/). Move section 440 Table 2.13 and renumber as Table 340.6.</p> |

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| | | | <p>Move section 440 Table 2.12 and renumber as Table 340.7.</p> <p><u>Rationale</u> – The drinking water standards need to be easily identified and located by the reader. Compliance tables are derived from National Primary Drinking Water Regulations at 40 CFR 143.3, 141.80, 141.23, 141.13, 141.61 - 141.66, 141.130, with no substantial changes.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| 12VAC5-590-350 | N/A | <p>Section title is "Sanitary surveys."</p> <p>A. Frequent assessments shall be made by owners.</p> <p>B. Commissioner may perform sanitary surveys.</p> <p>C. Eight components of the sanitary survey</p> <p>D. Significant deficiencies - notification and correction procedures.</p> | <p><u>Intent</u> – Change title to "Assessments and sanitary surveys." Clarify that the ODW conducts sanitary surveys and why.</p> <p>A. Change "supply source" to "supplies".</p> <p>B. Clarify that sanitary surveys are conducted by the department, who has right of entry with owners consent, and reasons for the survey.</p> <p>C. Minor technical corrections.</p> <p>D. Address significant deficiencies.</p> <p><u>Rationale</u> – Existing Regulations appear to suggest that sanitary surveys by the commissioner are optional. Content is based on National Primary Drinking Water Regulations 40 CFR 141.401, with no substantial changes.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| 12VAC5-590-360 | N/A | <p>Section title is "Responsibility; owner."</p> <p>A. General description of waterworks owner responsibilities.</p> <p>B. Delineates extent of waterworks to the customer's service connection.</p> | <p><u>Intent</u> – Change title to "Responsibilities of the owners." Distinguishes the authority of the waterworks owner and the property owner (consumer) with respect to water lines.</p> <p>A. Minor technical corrections.</p> <p>B. Clarifies that waterworks may not have ownership or responsibilities for service lines in some cases where local agreements prevail. Add new subsection C describing extent of property owner's control.</p> <p><u>Rationale</u> –The service connection may not always be located at the customer's property line; in some</p> |

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| | | | <p>locations the waterworks may agree to maintain the water service pipe from the water distribution main.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| Article 2 | | Article 2 title is “General Information.” | Eliminate article number and title for simplicity. |
| 12VAC5-590-370 | <p>Break section 370 into 7 smaller sections: 12VAC5-590-370 12VAC5-590-372 12VAC5-590-373 12VAC5-590-374 12VAC5-590-376 12VAC5-590-377 12VAC5-590-378</p> | <p>Section title is "Sampling frequency." Content includes detailed monitoring requirements (sampling and testing) for bacteriological, chemical, physical and radiological parameters. Content is based on National Primary Drinking Water Regulations 40 CFR 141.21, 141.23, 143.4, 141.24, 141.132, 141.621, 141.623, 141.625, 141.72, 141.73, 141.74, 141.173, 141.174, 141.550 - 141.564, 141.26, and 141.851 - 141.858, with no substantial changes.</p> | <p><u>Intent</u> – Rename section 370 "Monitoring requirements". Retain federal requirements unchanged, but break one large section into smaller ones, organized by water quality characteristic. In the revised section 370, move opening section paragraph to new subsection C to describe limits for consecutive waterworks monitoring. Add provisions in subsection A to allow qualified, well-operated TNCs to reduce the bacteriological monitoring frequency from quarterly to annually and provide requirements for reduced monitoring, increased monitoring, and returning to annual monitoring for these TNCs. Retain subsection B (1st paragraph) and rename “Chemical monitoring”. Enumerate text. Move subdivision B 1 to new section 372 “Inorganic chemicals monitoring.” Move subdivision B 2 to new section 373 “Organic chemicals monitoring.” Move subdivision B 3 to new section 374 “Residual disinfectant, DBPs, and DBPPs monitoring.” Delete subdivision B 4, Unregulated contaminants, and associated Tables 2.6 and 2.7. Contaminants listed are now regulated disinfection byproducts and are addressed elsewhere in the regulations. Move subdivision B 7 to new section 376 “Surface water or GUDI sources treatment monitoring” and renumber Table 2.5 to Table 376.1 "Grab Sample Monitoring Frequency". Move subsection C to new section 377 “Physical constituent monitoring.”</p> |

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| | | | <p>Move subsection D to new section 378 "Radiological monitoring." Add new subsection D to refer to other sections where new source monitoring requirements are given.</p> <p><u>Rationale</u> – Existing section is too large to navigate easily. "Sampling" is not accurate description of content. Allowing reduced monitoring at qualified, well-operated TNCs will lower the regulatory burden on these waterworks.</p> <p><u>Impact</u> – Improved understanding and application of the regulations. Less regulatory burden on certain TNCs.</p> |
| None | 12VAC5-590-372 | See 12VAC5-590-370 B 1 | <p><u>Intent</u> – Moved 12VAC5-590-370 B 1 to new section 372 "Inorganic chemicals monitoring."</p> <p>The monitoring requirements have not changed. Minor revisions to change "commissioner" to "department," "owners" to "the owner" and use defined acronyms.</p> <p><u>Rationale</u> – Existing section 370 is too large to navigate easily.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| None | 12VAC5-590-373 | See 12VAC5-590-370 B 2 | <p><u>Intent</u> – Moved 12VAC5-590-370 B 2 to new section 373 "Organic chemicals monitoring."</p> <p>The monitoring requirements have not changed. Minor revisions to change "commissioner" to "department," "owners" to "the owner" and use defined acronyms.</p> <p><u>Rationale</u> – Existing section 370 is too large to navigate easily.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| None | 12VAC5-590-374 | See 12VAC5-590-370 B 3 | <p><u>Intent</u> – Moved 12VAC5-590-370 B 3 to new section 374 "Residual disinfectant, DBPs, and DBPPs monitoring."</p> |

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| | | | <p>The monitoring requirements have not changed. Minor revisions to change “commissioner” to “department,” “owners” to “the owner” and use defined acronyms.</p> <p><u>Rationale</u> – Existing section 370 is too large to navigate easily.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| 12VAC5-590-375 | N/A | <p>Section title is "Lead and copper monitoring." Lead monitoring waiver - materials criteria: requires owner to demonstrate that all distribution system, service lines and service plumbing shall meet lead-free materials criteria pursuant to 42 USC § 300g-6(e). Content is based on National Primary Drinking Water Regulations 40 CFR 141.86, with no substantial changes.</p> | <p><u>Intent</u> – Correct references within section. Update lead content criteria to reflect Public Law 111-380, Reduction of Lead in Drinking Water Act. Added requirement that first-draw samples shall be collected without flushing the tap. (a) Modify lead monitoring waiver materials criteria: owners shall demonstrate that distribution system, service lines and plumbing connected to the waterworks, meets the lead material content criteria. (b) Solders and flux shall contain no more than 0.2% lead; and (c) The weighted average of wetted surface of pipes, pipe fittings, plumbing fittings, and plumbing fixtures shall contain no more than 0.25% lead. Minor revisions to change “commissioner” to “department,” “owners” to “the owner” and use defined acronyms.</p> <p><u>Rationale</u> – Existing citation is no longer applicable.</p> <p><u>Impact</u> – None. The new law went into effect on Jan 4, 2014 and has been implemented.</p> |
| None | 12VAC5-590-376 | See 12VAC5-590-370 B 7 | <p><u>Intent</u> – Moved 12VAC5-590-370 B 7 to new section 376 “Surface water or GUDI sources treatment monitoring” and renumbered Table 2.5 to Table 376.1 “Grab Sample Monitoring Frequency.”</p> <p>The monitoring requirements have not changed. Minor revisions to change “commissioner” to “department,” “owners” to “the owner” and use defined acronyms.</p> |

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| None | 12VAC5-590-377 | See 12VAC5-590-370 C | <p><u>Intent</u> – Moved 12VAC5-590-370 C to new section 377 “Physical constituent monitoring.”</p> <p>The monitoring requirements have not changed.</p> <p><u>Rationale</u> – Existing section 370 is too large to navigate easily.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| None | 12VAC5-590-378 | See 12VAC5-590-370 D | <p><u>Intent</u> – Moved 12VAC5-590-370 D to new section 378 “Radiological monitoring.”</p> <p>The monitoring requirements have not changed. Minor revisions to change “commissioner” to “department,” “owners” to “the owner” and use defined acronyms.</p> <p><u>Rationale</u> – Existing section 370 is too large to navigate easily.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| 12VAC5-590-379 | N/A | Section title is "Groundwater waterworks monitoring." Content is based on National Primary Drinking Water Regulations 40 CFR 141.402, with no substantial changes. | <p><u>Intent</u> – Change section title to “Groundwater system monitoring.” Consolidate all groundwater monitoring requirements into one section. Correct references within subsections A and B. Moved content of 12VAC5-590-425 A - D into new subsection 379 C.</p> <p><u>Rationale</u> – Specific requirements in subsection 425 may be overlooked as presently organized.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| 12VAC5-590-380 | N/A | Section title is "Bacteriological quality." Content includes determination of compliance with the PMCL and treatment technique requirements for microbial contaminants. Content is based on National Primary Drinking Water | <p><u>Intent</u> – Rename section 380 "Bacteriological compliance." Consolidate all bacteriological compliance requirements for groundwater monitoring into one section. Eliminate subdivisions A.1, A.3, A.4 and A.5 and convert A.2 to A. Revise subsection G to describe follow-up requirements for</p> |

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| | | Regulations 40 CFR 141.63, 141.21, and 141.402, with no substantial changes. | <p>groundwater source monitoring specified in sections 379, 430, and 840.</p> <p><u>Rationale</u> – Specific requirements in sections 379, 425, and 840 may be overlooked as presently organized.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| None | 12VAC5-590-382 | See 12VAC5-590-410 B | <p><u>Intent</u> – Moved 12VAC5-590-410 B to new section 382 “Inorganic chemicals compliance.” The methods to determine compliance have not changed.</p> <p><u>Rationale</u> – Group compliance determination sections together. Existing sections are too large to navigate, understand easily.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| None | 12VAC5-590-383 | See 12VAC5-590-410 C 1 | <p><u>Intent</u> – Moved 12VAC5-590-410 C 1 to new section 383 “Organic chemicals compliance.” The methods to determine compliance have not changed.</p> <p><u>Rationale</u> – Group compliance determination sections together. Existing sections are too large to navigate, understand easily.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| None | 12VAC5-590-384 | See 12VAC5-590-410 C 2 | <p><u>Intent</u> – Moved 12VAC5-590-410 C 2 to new section 384 “Residual disinfectant, DBPs, and DBPPs compliance.” The methods to determine compliance have not changed.</p> <p><u>Rationale</u> – Group compliance determination sections together. Existing sections are too large to navigate, understand easily.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| 12VAC5-590-385 | N/A | Lead and copper action level compliance Content based on National Primary Drinking Water Regulations 40 CFR 141.80. | <p><u>Intent</u> – Substitute defined acronym (AL) for “action level,” change “commissioner” to “department” and make minor wording changes to improve clarity.</p> |

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| None | 12VAC5-590-388 | See 12VAC5-590-400 and 12VAC5-590-410 D | <p><u>Intent</u> – Create new section 388 “Radiological compliance” (see below from 12VAC5-590-400). Move last sentence of subdivision 410 D to 388 C 2, and delete remaining text. The methods to determine compliance have not changed.</p> <p><u>Rationale</u> – Group compliance determination sections together. Existing sections are too large to navigate, understand easily.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| 12VAC5-590-390 | N/A | Section title is "Chemical and physical quality." A 1 through A 3. Action required for noncompliance with chemicals and turbidity. A 4. Action required for exceeding SMCL. B. General statement concerning contaminants and specific limits. | <p><u>Intent</u> – Rename section 390 "Physical constituent compliance." Identify specific physical constituents, how many samples are required and how compliance with SMCL is determined. The physical constituents listed in this section are color, odor, pH and total dissolved solids. Delete A 1 through A 3, and replace with confirmation sample and compliance determination requirements. Correct A 4 and renumber to A 3. Move subsection B to subdivision 340 B. Add new subsection B listing turbidity standards for groundwater sources that are not required to filter.</p> <p><u>Rationale</u> – Necessary, specific information is missing from the existing regulations.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| None | 12VAC5-590-391 | See 12VAC5-590-420, first paragraph. | <p><u>Intent</u> – Moved 1st paragraph of 12VAC5-590-420 to new section 391 “Treatment technique requirements,” and expand explanation.</p> <p><u>Rationale</u> – Group treatment technique sections together. Existing section (420) is too large to navigate, understand easily.</p> |

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| | | | <u>Impact</u> – Improved understanding and application of the regulations. |
| 12VAC5-590-392 | N/A | Section title is “Coliform treatment technique triggers and assessment requirements.” A. Treatment technique triggers and assessments. B. Completing Level 1 and Level 2 assessments. C. Requirement for corrective actions. D. Consultation between owner and department. E. Determining violations. Content is based on National Primary Drinking Water Regulations 40 CFR 141.859. | <u>Intent</u> – Ensure less ambiguous terminology and direction. Minor wording changes: Replace references to “a review” with “an evaluation”, and references to ODW or ODW field staff with “department”. <u>Rationale</u> – Improved understanding of the regulations. <u>Impact</u> – Increased public health protection. |
| None | 12VAC5-590-395 | See 12VAC5-590-420 | <u>Intent</u> – Moved 12VAC5-590-420 A to new section 395 “Surface water and GUDI sources, polymer, and recycle treatment techniques”, subdivision A. Moved 12VAC5-590-420 B 1 and B 2 to new subdivision 395 A 2. Content is essentially unchanged, except for new requirements for declared GUDI sources prior to installation of filtration treatment – added in subdivision 395 A 3, listing requirements for newly- declared GUDI sources during the interim period until filtration and disinfection treatment is installed and in operation. The requirements include: issuance of a continuous boil water notice, provide disinfection treatment to achieve a 4-log inactivation of viruses, and increase bacteriological sampling in the distribution system. Moved 12VAC5-590-420 G to new subdivision 395 B. Moved 12VAC5-590- 420 K to new subdivision 395 C. <u>Rationale</u> – Group treatment technique sections together. Existing section (420) is too large to navigate, understand easily. <u>Impact</u> – Improved understanding and application of the regulations. |
| 12VAC5-590-400 | 12VAC5-590-388 | Section title is "Radiological quality." Content is based on National Primary Drinking Water | <u>Intent</u> – Repeal section 400. Create new section 388 “Radiological compliance”. Move 400 A and B to new subsections |

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| | | Regulations 40 CFR 141.66, with no substantial changes. | <p>388 A, 388 B, and subdivision 388 C 1. Organize all radiological compliance requirements into one section before the treatment techniques sections.</p> <p><u>Rationale</u> – Specific requirements may be overlooked as presently written.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| None | 12VAC5-590-401 | See 12VAC5-590-420 B 3 a | <p><u>Intent</u> – Moved 12VAC5-590-420 B 3 a. to new section 401 “Enhanced filtration and disinfection for Cryptosporidium treatment techniques” and reorganized content.</p> <p><u>Rationale</u> – Group treatment technique sections together. Existing section (420) is too large to navigate, understand easily.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| 12VAC5-590-405 | | Section title is "Lead and copper treatment techniques." Content is based on National Primary Drinking Water Regulations 40 CFR 141.81 - 141.85, with no substantial changes. | <p><u>Intent, Rationale & Impact</u> – Minor technical corrections and wording changes only.</p> |
| 12VAC5-590-410 | Break section 410 into four smaller sections: 12VAC5-590-382 12VAC5-590-383 12VAC5-590-384 12VAC5-590-388 | Section title is “Determination of compliance.” Content includes compliance determination details for chemical and radiological parameters, turbidity, and disinfectant residuals, disinfection byproducts, and disinfection byproduct precursors. Content is based on National Primary Drinking Water Regulations 40 CFR 141.23, 141.11, 141.24, and 141.133, with no substantial changes. | <p><u>Intent</u> – Repeal section 410. Break large sections into smaller ones, organized by water quality characteristic. Content is essentially unchanged.</p> <p>Move subdivision 410 B to new section 382 “Inorganic chemicals compliance.”</p> <p>Move subdivision 410 C 1 to new section 383 “Organic chemicals compliance.”</p> <p>Move subdivision 410 C 2 to new section 384 “Residual disinfectant, DBPs, and DBPPs compliance.”</p> <p>Move last sentence of subdivision</p> <p>Create new section 388 “Radiological compliance” (see above from section 400). Move 410 D to 388 C 2, and delete remaining text.</p> <p><u>Rationale</u> – Existing sections too large to navigate easily.</p> |

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| None | 12VAC5-590-411 | See 12VAC5-590-420, subdivisions H, I, and J | <p><u>Intent</u> – Moved 12VAC5-590-420 H, I, and J to new section 411 “DBPPs, DBPs, and MRDLs treatment techniques.”</p> <p><u>Rationale</u> – Group treatment technique sections together. Existing section (420) is too large to navigate, understand easily.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| None | 12VAC5-590-415 | See 12VAC5-590-420, subdivision L | <p><u>Intent</u> – Moved 12VAC5-590-420 L to new section 415 “Uncovered finished water storage.”</p> <p><u>Rationale</u> – Group treatment technique sections together. Existing section (420) is too large to navigate, understand easily.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| 12VAC5-590-420 | Break section 420 into five smaller sections: 12VAC5-590-391 12VAC5-590-395 12VAC5-590-401 12VAC5-590-411 12VAC5-590-415 | <p>Section title is "Treatment technique requirement." Content includes treatment techniques for surface water or groundwater source under the direct influence of surface water. Requirements are described for disinfection, filtration, and enhanced filtration.</p> <p>Content is based on National Primary Drinking Water Regulations 40 CFR 141.71, 141.70 -141.73, 141.111, 141.76, 141.700- 141.703, 141.707, 141.708, 141.710, 141.711, 141.713, 141.715 - 141.720, 141.130, 141.135, 141.64, 141.65, 141.510, and 141.511, with no substantial changes.</p> | <p><u>Intent</u> – Repeal section 420. Break large sections into smaller ones. Content is essentially unchanged, except for new requirements for declared GUDI sources prior to installation of filtration treatment. Move 1st paragraph to new section 391 “Treatment technique requirements,” and expand explanation. Move subdivision 420 A to new section 395 “Surface water and GUDI sources, polymer, and recycle treatment techniques”, subdivision A. Move subdivision 420 B 1 and 420 B 2 to new subdivision 395 A 2. Move subdivision 420 B 3 a. to new section 401 “Enhanced filtration and disinfection for Cryptosporidium treatment techniques.” Move subdivision 420 B 3 b (1) to new subdivision 500 H. Move subdivision 420 B 3 b (2) to new subdivisions 500 D, E and F. Delete 'reserved' subdivisions 420 C, D, E, and F. Move subdivision 420 G to new subdivision 395 B. Move subdivisions 420 H, I, and J to new section 411 “DBPPs, DBPs,</p> |

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| | | | <p>and MRDLs treatment techniques." Move subdivision 420 K to new subdivision 395 C. Move subdivision 420 L to new section 415 "Uncovered finished water storage."</p> <p><u>Rationale</u> – Existing sections too large to navigate easily. Public health protection will be ensured when GUDI sources must remain in service prior to filter installation</p> <p><u>Impact</u> – Increased public health protection.</p> |
| 12VAC5-590-421 | N/A | <p>Section title is "Groundwater system treatment techniques." A. Sources that have confirmed E. coli contamination or a significant deficiency must take specific actions. B. Existing and new sources providing 4-log virus treatment of viruses must monitor. C. Monitoring requirements to demonstrate treatment effectiveness. D. Discontinuing compliance monitoring or treatment. Content is based on National Primary Drinking Water Regulations 40 CFR 141.403, with no substantial changes.</p> | <p><u>Intent</u> – Rename section "Groundwater source treatment techniques." Clearly distinguish monitoring requirements for groundwater sources that have confirmed 4-log virus treatment by the ODW. Delete the categories "existing" and "new".</p> <p><u>Rationale</u> – If a groundwater source is in operation, it is "existing"; the language is confusing.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| 12VAC5-590-425 | N/A | <p>Section title is "Raw water monitoring requirements for groundwater sources." Content is based on National Primary Drinking Water Regulations 40 CFR 141.402, with no substantial changes.</p> | <p><u>Intent</u> – Repeal section 425. Consolidate groundwater monitoring requirements into 12VAC5-590-379 and 380: move subsections A through D to 379 C. Move subsections E and F to section 380 G.</p> <p><u>Rationale</u> – Specific requirements may be overlooked as presently organized.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| 12VAC5-590-430 | N/A | <p>Section title is "Determination of surface water influence of groundwater sources." All groundwater sources utilized by waterworks such as wells, springs, and infiltration galleries, shall be evaluated by the division to determine surface water influence. The</p> | <p><u>Intent</u> – Allow microscopic particulate analysis (MPA) testing to determine the influence of surface water on groundwater, require interim actions if the waterworks is currently serving consumers with the GUDI source, allow owner to pursue corrective actions and mitigation plans when a source is declared to be GUDI, and</p> |

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| | | <p>source shall be evaluated in stepwise fashion. Step 1 source history. Step 2 source physiology and geology. Step 3 water quality.</p> | <p>require groundwater sources to be re-evaluated, as necessary. Add subsection letter A. All groundwater sources shall be evaluated to determine surface water influence using a three step process. Add subsection letter B. All groundwater sources shall be evaluated to the criteria in a stepwise fashion. Combined Steps 1 and 2 into Step 1 - source history, construction, and location. Change Step 2 to testing microbiological water quality using the conventional 20 Total Coliform and E. Coli samples collected on weekly frequency. Add new Step 3 allowing MPA testing along with physical parameter monitoring to determine surface water influence. Add new subsection C. If the GUDI determination process has reached Step 3, then disinfection treatment is required. Boil Water Advisory shall be required until the disinfection treatment is installed. Add new subsection D. If the source is declared to be GUDI, the owner may propose mitigation measures and/or a plan to correct deficiencies. The commissioner will then re-evaluate and make a GUDI determination. Add new subsection E. Commissioner may require groundwater sources to be re-evaluated for surface water influence.</p> <p><u>Rationale</u> – In 1992, EPA issued the Consensus Method (EPA 910-9-92-029, Oct. 1992) which relies on MPA testing as one level of evidence when surface water is influencing groundwater. Interim measures for potential GUDI wells are critical to protect public health because it can take several months to install treatment.</p> <p><u>Impact</u> – The current procedure for evaluating if a groundwater well is a GUDI source stops at Step 2. By adding an additional step, the owner will incur additional cost from the Step 3 testing but will acquire increased certainty that the well is a</p> |
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| | | | <p>GUDI source. The owner can always stop at Step 2 and forego Step 3 testing if it is clear that the water source is a GUDI source. Groundwater sources determined to be GUDI require significantly more treatment, monitoring, and reporting.</p> |
| 12VAC5-590-440 | N/A | <p>Section title is "Analytical methods." Analytical methods shall comply with National Primary Drinking Water Regulations 40 CFR Parts 141 and 143. Labs shall comply with DCLS regulations for certification of drinking water analyses. Tests for alkalinity, calcium, conductivity, disinfectant residual, orthophosphate, pH, silica, temperature and turbidity may be performed by any person acceptable to the commissioner.</p> | <p><u>Intent</u> – Confine subject matter to analytical methods; relocate other relevant content or delete irrelevant text. Add subsection letter A and include "40 CFR Part 136, if applicable." Insert subsection B to clarify laboratory certification requirements by DCLS and refer to 1VAC30-41. Add subsection letter C and include additional parameters: total organic carbon (TOC), dissolved organic carbon (DOC), specific ultraviolet absorption (SUVA) and UV254 (ultraviolet absorption at 254 nanometers); add requirement that all tests meet EPA-approved methods in 40 CFR Part 141. Move Tables 2.2, 2.3, 2.4, 2.5, 2.12, and 2.13 to section 340 and renumber them. Delete Tables 2.6 through 2.11.</p> <p><u>Rationale</u> – Current drinking water quality standards in tables should be located in separate section. Tables 2.6 through 2.11 are outdated.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| Article 3 | | <p>Article 3 title is "Operation of Waterworks."</p> | <p>Eliminate article number and title for simplicity.</p> |
| 12VAC5-590-450 | N/A | <p>Section title is "General." Waterworks operation comprises the constant operation and management of facilities and personnel.</p> | <p><u>Intent</u> – Change title to "Facility and personnel management." Minor word changes with clarification to include drinking water standards. Improve grammar.</p> <p><u>Rationale</u> – Existing text is awkward.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| 12VAC5-590-460 | 12VAC5-590-461 | <p>Section title is "Personnel." A. Waterworks operators in responsible charge must possess a valid waterworks</p> | <p><u>Intent</u> – Repeal section 460. Create new section 461 titled "Classification of waterworks, operator requirements, and</p> |

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| | | <p>operator license issued by the Board for Waterworks and Wastewater Works Operators and Onsite Sewage Professionals, Department of Professional and Occupational Regulations in accordance with 18VAC160-20-10 <i>et seq.</i> and Chapters 1, 2, 3 and 23 of Title 54.1 of the <i>Code of Virginia</i>.</p> <p>B. The number and class of operators in attendance are specified and personnel must conform with Table 2.9 - Minimum classification for waterworks operations additional operating personnel.</p> | <p>operator attendance.” Update operator requirements consistent with DPOR’s regulations, and clarify minimum operator attendance based on waterworks classification.</p> <p>A. Classification of Waterworks. Describe Class 1 through 6 waterworks, consistent with requirements in 18VAC160-20-10 (DPOR regulations).</p> <p>B. Operator requirements. Describe general requirements for licensed operators of classified and unclassified waterworks.</p> <p>C. Specify minimum operator attendance for each class of waterworks.</p> <p>D. Allow operator attendance alternatives; increased and reduced staffing attendance from those specified in subsection C based on specific-site conditions.</p> <p><u>Rationale</u> – Existing operator classification regulations are outdated. Currently operator attendance is inconsistent throughout the state; minimum attendance requirements are needed to assure proper performance of all waterworks.</p> <p><u>Impact</u> – Waterworks with membrane filtration will have increased operator requirements. For other waterworks, negligible, as changes have already been implemented and costs to owners, have already been realized.</p> |
| <p>12VAC5-590-470</p> | <p>N/A</p> | <p>Section title is “Waterworks appearance.”</p> <p>The general appearance and state of cleanliness of a waterworks can greatly influence the attitude of the public toward a utility and can actually promote public health. A community without confidence in its public water supply may resort to the use of water from questionable or polluted sources; therefore, the waterworks must be maintained in a clean and orderly condition to achieve this goal.</p> | <p><u>Intent</u> – Change title to “Waterworks condition”. The waterworks shall be maintained in a clean and orderly condition. Remove text on influence of public opinion and confidence.</p> <p><u>Rationale</u> – Language is subjective and unenforceable.</p> <p><u>Impact</u> – None.</p> |

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| None | 12VAC5-590-475 | See 12VAC5-590-840 B 14 | <p><u>Intent</u> – Create new section 475 titled “Removal of wells from service.” Clarify requirements for temporary inactivation and permanent abandonment of wells. Relocate requirements from 12VAC5-590-840 B 14 and update content as follows:</p> <p>A. Temporary inactivation. Require maintenance of well lot and routine inspections of wells that are taken out of service temporarily.</p> <p>B. Permanent abandonment. Add requirement for a certified water well systems provider to supervise well abandonment. Add requirement to submit documentation form to VDH. Add requirement to seal groundwater wells that are not in use by methods that will restore to the fullest extent possible the controlling geological conditions that existed before the well(s) were constructed.</p> <p><u>Rationale</u> – Maintenance of inactive wells is needed to assure acceptable performance when it is returned to service. Integrity of the groundwater resource is protected when a well is properly abandoned by qualified personnel.</p> <p><u>Impact</u> – Some waterworks may incur increased operating cost for quarterly inspection and documentation of wells that are temporarily inactivated.</p> |
| None | 12VAC5-590-476 | None | <p><u>Intent</u> – Create new section 476 titled “Reactivation of wells.” Add new requirements for bringing a well back into service. Establish minimum requirements for reactivating a well that has been taken out of service.</p> <p>A. Owner shall notify ODW of the intent to reactivate well.</p> <p>B. Well shall be pumped to waste for minimum of 5 well volumes and no less than 30 minutes.</p> <p>C. Water quality samples shall be collected.</p> |

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| | | | <p>D. Well yield and drawdown test may be required by the commissioner.</p> <p>E. A well may be activated for emergency use prior to receipt of satisfactory monitoring results, even if public health and safety are at risk, under special circumstances.</p> <p><u>Rationale</u> – Water quality of an unused well may deteriorate over time, therefore specific mitigation procedures are needed.</p> <p><u>Impact</u> – Some waterworks may incur a one-time cost for pumping and testing of inactivated wells prior to bringing them back in service.</p> |
| <p>12VAC5-590-480</p> | <p>N/A</p> | <p>Section title is “Analytical laboratory control.”</p> <p>A. Operational testing is required to present evidence that water has been properly prepared for each major key step in the treatment process, each key process is effective, and the finished product is clean, free from taste and odor, free from undesirable chemical characteristics, and is safe for human consumption.</p> <p>B. Laboratory analyses shall conform to the most current edition available of Standard Methods for the Examination of Water and Wastewater or analytical methods approved by the division.</p> <p>Ample laboratory space shall be provided for chemical and bacteriological testing.</p> | <p><u>Intent</u> – Change title to “Operational control testing and monitoring.” Consolidate requirements into one section, correct analytical method references, update minimum tests required for key treatment processes, and require proper calibration and maintenance.</p> <p>A. Add purpose of analyses is for ensuring compliance, other grammatical changes.</p> <p>B. Delete test method references and replace with EPA approved methods found in 40 CFR Parts 141 and 143. Add requirement to calibrate instruments.</p> <p>Add subsection C. Remove specific laboratory space requirements and replace with a reference to Section 760.</p> <p>Create new subsection D titled "Require waterworks on-site laboratory analyses." Move minimum on-site testing capabilities for selected types of treatment from subsection B and update content.</p> <p>Create new subsection E. “Process control instruments, monitors, gauges, and controllers ...shall be maintained fully operational and calibrated ...”</p> <p><u>Rationale</u> – Existing information is outdated. UV and ozone treatment are acceptable and minimum process control requirements need to be specified.</p> |

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| | | | <p><u>Impact</u> – Acceptable treatment operation will be assured by accurate and reliable test results and controls.</p> |
| 12VAC5-590-490 | N/A | <p>Section title is “Adequate treatment.”</p> <p>A. Adequate treatment is any one or any combination of the controlled processes of coagulation, sedimentation, absorption, filtration, disinfection, or other processes that produce water consistently meeting the requirements of the chapter.</p> <p>B. All waterworks shall provide adequate treatment and pure water.</p> | <p><u>Intent</u> – Change of "pure" water to "potable" water; change "division" to "department." Use correct terms where applicable and appropriate.</p> <p><u>Rationale</u> – Consistent terms and references should be used throughout Regulations.</p> <p><u>Impact</u> – None.</p> |
| 12VAC5-590-500 & Appendix L | N/A | <p>Section 500 title is "Disinfection by chlorination." Content includes</p> <p>A. Chlorine residual shall be maintained.</p> <p>B. Surface water plants must prechlorinate.</p> <p>C. GUDI sources shall be disinfected.</p> <p>D. Groundwater systems shall meet CT requirements for virus inactivation.</p> <p>E. Disinfection profile and benchmark requirements.</p> <p>Content is based on National Primary Drinking Water Regulations 40 CFR 141.72, with no substantial changes.</p> <p>Appendix L is entitled "Determination of CT." It includes:</p> <ul style="list-style-type: none"> • Disinfection criteria • Determination of compliance with Inactivation • Determination of Disinfection Contact Time • Disinfection Profile and Benchmark • CT values (Tables) for inactivation of Giardia and Virus for disinfectants. <p>Content is based on National Primary Drinking Water Regulations 40 CFR 141.74</p> | <p><u>Intent</u> – Change section title to "Disinfection criteria, determination of CT, disinfection profiles, and disinfection benchmarks for Giardia and virus inactivation." Eliminate requirement to chlorinate surface water prior to filtration. Consolidate microbial inactivation and disinfection profile requirements into one section. Move content to appropriate sections and correct references.</p> <p>A. Delete requirement deadlines that have expired.</p> <p>B. Delete existing subsection B. Move and expand subsection C requirements to new subsections 430 C and 430 D. Renumber subsection D to B.</p> <p>C. Disinfection criteria. Insert context of 1st paragraph from Appendix L. Move Table L-1 and rename as “Table 500.1.</p> <p>D. Developing the disinfection profile: Insert content from 500 E, 420 B 3 b (2) and Appendix L.</p> <p>E. Calculating the total inactivation ratio: Insert content from 420 H 3.</p> <p>F. Calculating the disinfection benchmark: Insert content from 420 B 3 b (2) and Appendix L</p> <p>G. Waterworks shall retain disinfection profile: Insert content from 500 E 1.</p> <p>H. Prior to making significant change: Insert content from 500 E 2 a and 420 B 3 b.</p> |

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| | | and 141.709, with no substantial changes. | <p>Copy Tables 1.1 through 1.6 in 40 CFR 141.74 as Tables 500.2 through 500.7 (CT Values for 3-Log Inactivation of Giardia lamblia by Free Chlorine.)</p> <p>Copy Table 3.1 in 40 CFR 141.74 as Table 500.12 (CT Values for Inactivation of Viruses by Chloramines.)</p> <p>Copy Table 2.1 from 40 CFR 141.74 as Tables 500.8 and 500.13 (CT Values for Inactivation of Giardia lamblia by Chlorine Dioxide and Ozone), respectively.</p> <p>Move content from Appendix L, Table L- 8 Baffling Classification, and renumber as Table 500.15.</p> <p><u>Rationale</u> – Pre-chlorination may cause disinfection byproducts and is no longer recommended. Disinfection profiles are developed using the microbial inactivation tables, so the information is best presented together. RIS Style Manual discourages use of Appendices.</p> <p><u>Impact</u> – Improved water quality provided to consumers. Improved understanding and application of the regulations.</p> |
| 12VAC5-590-505 | N/A | <p>Section title is “Emergency management plan for extended power outages.”</p> <p>A. Each community waterworks shall develop and maintain an emergency management plan for extended power outage.</p> <p>B. Each plan shall be kept current and readily accessible.</p> <p>C. Each community waterworks shall certify in writing that the plan is completed.</p> <p>D. List of items to include in the plan.</p> | <p><u>Intent</u> – Maintain content; minor corrections to use of terms.</p> <p><u>Rationale</u> – Improve clarity of text.</p> <p><u>Impact</u> – Improved readiness of waterworks towards continuous operation.</p> |
| 12VAC5-590-510 | N/A | <p>Section title is “Acceptable operating practices.”</p> <p>A. This section is not intended to be all inclusive.</p> <p>B. Waterworks designed for bacteria and turbidity removal shall not be operated without adequate chemical coagulation.</p> <p>C. Waterworks utilizing filtration in the treatment process shall</p> | <p><u>Intent</u> – Replace "treatment plant" with "waterworks" in subsection A. Delete subsections B through D. Clarify gravity flow filtration operation requirements and add membrane filtration integrity test requirements. Create new subsection B titled "Filter operation." Update content for gravity filter operation requiring</p> |

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| | | <p>not vary the rate of filtration through any single unit above its design capacity. D. Filtering units equipped with rewash facilities shall not be returned to service after backwashing until being thoroughly rewashd. E. All waterworks shall provide a minimum working pressure of 20 psi at all service connections.</p> | <p>chemical coagulation, constant hydraulic loading rate, and filter-to-waste operations. Add new requirement for microfiltration and ultrafiltration direct integrity test for pathogen removal credit. Re-number subsection E to C and clarify gauge pressure (psig) measurement. Add new subsections D and E on fluoridation practices.</p> <p><u>Rationale</u> – Requirements for pathogen removal credits for membranes must be consistent with federal Enhanced Surface Water Treatment Rules. The Board of Health recognizes the public health benefit of community water fluoridation and recommends that community water systems provide the optimum fluoride ion concentration in the water they provide to their consumers.</p> <p><u>Impact</u> – owners that add fluoride to drinking water are required to provide notice to the commissioner and consumer if they intend to permanently stop the fluoridation program. They are also required to provide notice if they intend to start a fluoridation program. The notice requirements mean owners cannot make a change during the 90-day notice period. Other changes are negligible because; requirements have already been implemented.</p> |
| None | 12VAC5-590-515 | None | <p><u>Intent</u> – Create new section 515 titled “Use of chemicals.” Adopt current industry standards for chemical used in water treatment. A. Chemicals shall be certified to ANSI/NSF standard 60. B. Chemicals shall bear the proper certification mark. C. Owner shall have documentation of their certification.</p> <p><u>Rationale</u> – ANSI/NSF Standard 60 is currently cited in Part III, section 860 and need to be moved here.</p> <p><u>Impact</u> – Negligible; requirements have already been implemented.</p> |

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| <p>12VAC5-590-520</p> | <p>N/A</p> | <p>Section title is “Waterworks expansion.” A. At such time as the water production of a community waterworks reaches 80% of the rated capacity of the waterworks for any consecutive three-month period, the owner shall cause plans and specifications to be developed for expansion of the waterworks to include a schedule for construction; however, if it can be shown by the owner that growth within the service area is limited and will not exceed the rated capacity of the waterworks or if unusual transient conditions caused production to reach the 80% level, preparation of plans and specifications for expansion will no longer be required.</p> | <p><u>Intent</u> – Change title to “Waterworks capacity.” Expand options for meeting water demands when waterworks are near their design capacity, consistent with Local and Regional Water Supply Planning regulation (9VAC25-780). Delete text in subsection A and replace with requirement for community waterworks that reach 80% of capacity to prepare and submit a written plan to address capacity needs within 30 days of notification by the department. Delete subsection B and replace with new text stipulating that the commissioner may require the owner to reevaluate a well source capacity when the well has demonstrated declining yield.</p> <p><u>Rationale</u> – Not all waterworks that reach 80% of rated capacity need to design for expansion. Other measures may be appropriate, such as reducing potable water demand through reduction of leakage or reclamation/reuse of water for nonpotable needs. Provide authority to require an owner to reevaluate a well yield when it has demonstrated declining yield.</p> <p><u>Impact</u> – Reduced demand on natural water supplies and potential capital, operation and maintenance cost savings to waterworks and their customers.</p> |
| <p>12VAC5-590-530</p> | <p>Break section 530 into three smaller sections: 12VAC5-590-530 12VAC5-590-531 12VAC5-590-532</p> | <p>Section title is “Reporting.” A. The results of required monitoring shall be reported by the owner (or authorized agent) to ODW by dates specified in this subsection. B. Report to the ODW. C. Reporting for Coliform TT violations. D. Seasonal waterworks start-up certification. E. Reporting for filtration and disinfection treatment. F. Reporting for lead and copper. G. Reporting for disinfection byproducts.</p> | <p><u>Intent</u> – Break up large section into smaller ones. A. Add that the results shall be reported in a format and method prescribed by the commissioner. B. Delete requirement for telephone and mail reporting and replace with method acceptable to the department. Convert subdivision B.1 to new subsection “C. Bacteriological examination reporting”. Convert subdivision B.2 to new subsection “D. Turbidity reporting”. Move subdivisions B.3 through B.5 into new subsection “E. PMCL exceedance”.</p> |

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| | | <p>H. Reporting for disinfectants. I. Reporting for disinfection byproduct precursors and enhanced coagulation or enhanced softening. J. Reporting of results to the district engineer. K. Recycle flow reporting requirements. L. Reporting for enhanced treatment for cryptosporidium. M. Reporting for groundwater waterworks. Content is based on National Primary Drinking Water Regulations 40 CFR 141.31, 141.21, 141.75, 141.175, 141.706, 141.721, 141.629, 141.134, 141.861, and 141.90, with no substantial changes.</p> | <p>Convert subdivision B.6 to new subsection F "Failure to comply with Sanitary Survey corrective actions". Convert subdivision B.7 to new subsection G. "Failure to comply with variance or exemption requirements". Convert subdivision B.8 to new subsection H. "Reporting a Tier 1 violation". Move subdivision B.9 into new section 531. "Reporting requirements for filtration treatment and disinfection treatment." Change subsection letter "C" to subsection "I". Change subsection letter "D" to "J". Move subsections E, G, H, and I to new section "531. Reporting requirements for filtration treatment and disinfection treatment." Move subsection F to new section 532 "Reporting requirements for lead and copper." Delete existing subsection J. Delete existing subsection K. (These have expired. On-going requirements are given in 12VAC5-590-550 B 16). Move subsection L to new section "531. Reporting requirements for filtration treatment and disinfection treatment." Change subsection letter "M" to "K". Delete subsection N.</p> <p><u>Rationale</u> – Too much information is provided in one section, which is too large and complex to navigate easily and comprehend requirements.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| None | 12VAC5-590-531 | See 12VAC5-590-530 B.9 and 12VAC5-590-530 E, G, H, I, & L | <p><u>Intent</u> – Moved 12VAC5-590-530 B.9 and E, G, H, I, and L to new section 531 titled "Reporting requirements for filtration treatment and disinfection treatment." The reporting requirements have not changed.</p> <p><u>Rationale</u> – Keep the relevancy of the information in one section, more</p> |

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| | | | <p>easily to navigate and comprehend requirements.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| None | 12VAC5-590-532 | See 12VAC5-590-530 F “Reporting requirements for lead and copper.” | <p><u>Intent</u> – Move subsection F to new section 532 titled “Reporting requirements for lead and copper.” The reporting requirements have not changed.</p> <p><u>Rationale</u> – Keep the relevancy of the information in one section, more easily to navigate and comprehend requirements.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| 12VAC5-590-540 | N/A | Section title is "Public notices." Content is based on National Primary Drinking Water Regulations 40 CFR 141.201-141.211, Part 141 Appendix A to Subpart Q, 141.403, 141.31, 141.33, with no substantial changes. | <p><u>Intent</u> – Improve readability and clarity. Add public notice requirements for consecutive waterworks to subsection A. Updated NSF International telephone number & web address. Include missing information & correct errors.</p> <p><u>Rationale</u> – Many waterworks purchase finished water and are required to notify customers under specific circumstances. Text must conform with RIS Style Manual.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| 12VAC5-590-545 & Appendix O | N/A | Section title is "Consumer confidence reports." Content is based on National Primary Drinking Water Regulations 40 CFR 141.151 - 141.155, Part 141 Appendix A to Subpart O, Part 141 Appendix B to Subpart Q, and 141.52, with no substantial changes. | <p><u>Intent</u> – Correct references. Update report content requirements in this section and eliminate Appendix O, placing it in new section 12VAC5-590-546.</p> <p><u>Rationale</u> – Group related sections together for easier navigation. Appendices will be eliminated in accordance with RIS Style Manual.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| None | 12VAC5-590-546 | See Appendix O, “Regulated Contaminants for Consumer Confidence Reports and Public Notification”. | <p><u>Intent</u> – Move content from Appendix O into new section 546 titled “Regulated contaminants for the consumer confidence reports and public notification” and renumber Table 546.1. Add information to indicate use of mandatory language for public</p> |

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| | | | <p>notification and consumer confidence reports.</p> <p><u>Rationale</u> – Improve accessibility of information.</p> <p><u>Impact</u> – Improved understanding.</p> |
| 12VAC5-590-550 | N/A | <p>Section title is “Recordkeeping.” Content is based on National Primary Drinking Water Regulations 40 CFR 141.33, 141.75, 141.91, 141.134, 141.155, 141.175, 141.405, 141.571, 141.629, 141.722, and 141.861 with no substantial changes.</p> | <p><u>Intent</u> – Insert new subsection A: All waterworks owners shall maintain waterworks records in accordance with the Records Retention and Disposition Schedule of the Library of Virginia, General Schedule No. 7 for public utility records of county and municipal governments. Reformat remaining section. Add specific retention requirements for: recycle flow, plant operational records, organization/staffing chart, record drawings and specifications, equipment manufacturer's manuals, lab test schedule, preventative maintenance schedule, and specific requirements for waterworks with groundwater sources. Consolidate list of recordkeeping requirements in one location.</p> <p><u>Rationale</u> – Reduce possibility of owner/operator overlooking or misplacing documents that demonstrate compliance with the regulations.</p> <p><u>Impact</u> – Improved documentation and compliance with operational regulations.</p> |
| 12VAC5-590-560 | N/A | <p>Section title is “Safety.” The waterworks' most important asset is a trained workforce. The protection of personnel through an active safety program is important. It is strongly recommended that every waterworks institute a safety program.</p> | <p><u>Intent</u> – Revise to require a safety program for the operation of the waterworks in accordance with VOSH requirements. Change recommendation to a requirement.</p> <p><u>Rationale</u> – Worker safety is necessary to assure reliable production of drinking water.</p> <p><u>Impact</u> – Waterworks will incur cost to develop and implement safety program, however, this should be offset by savings in employee absences, workmen's compensation, claims, etc.</p> |
| None | 12VAC5-590-565 | None | <p><u>Intent</u> – Create new section 565 titled “Source water protection.” Prevent source water quality</p> |

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| | | | <p>deterioration by encouraging waterworks to protect their water sources.</p> <p>A. Counties, cities, and towns that are waterworks owners may exercise their authority pursuant to §15.2-2109 of the <i>Code of Virginia</i> to protect their waterworks from pollution or injury.</p> <p>B. Any waterworks with a drinking water reservoir may establish a buffer around the intake to limit such uses as body contact recreation and boats powered by engines, pursuant to a plan acceptable to the waterworks and the department.</p> <p>C. Waterworks should develop source water protection plans for all their sources and report ongoing or completed protection initiatives to the department.</p> <p><u>Rationale</u> – A proactive approach to protecting source water quality will reduce incidents that could have a harmful impact on drinking water quality.</p> <p><u>Impact</u> - ODW provides technical and financial assistance to waterworks to assess and protect their sources; the potential cost to treat polluted source water may be reduced or eliminated.</p> |
| <p>12VAC5-590-570</p> | <p>N/A</p> | <p>Section title is “Operational report forms.” All waterworks required to report information to the department shall use approved forms.</p> | <p><u>Intent</u> – Rename section “Operational reporting requirements”. Delete opening sentence. Move and update Monthly Operation Report requirements for the type of water treatment from Appendix G to Tables 570.1 through 570.13. Create new subsection B – Reporting incidents within 24 hours. Specify minimum operation report content in Regulations and eliminate suggested content listed in Appendix G.</p> <p><u>Rationale</u> – Reporting consistency among waterworks with similar treatment facilities will be achieved with standardized content.</p> |

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| | | | <p>Appendices will be eliminated in accordance with RIS Style Manual.</p> <p><u>Impact</u> – Consistent monitoring and reporting of waterworks operations, leading to improved enforcement of the regulations and water quality provided to consumers.</p> |
| Article 4 | | Article 4 title is “Cross Connection Control and Backflow Prevention in Waterworks.” | Eliminate article number and title for simplicity. |
| 12VAC5-590-580 | N/A | <p>Section title is “General”</p> <p>Each owner is required to establish and enforce a program of cross connection control and backflow prevention for each waterworks. The program shall be approved by the division prior to issuance of the operation permit (See Appendix I).</p> | <p><u>Intent</u> – Change title to “General requirements for cross-connection control and backflow prevention.”</p> <p>Add subsection letters A – D.</p> <p>Consolidate general requirements and clarify what installations are prohibited.</p> <p>A. Add reference to 12VAC5-590-360. Delete reference to Appendix I (to be repealed).</p> <p>B. The owner shall not install or allow to be installed a water service connection to any premises, consumer’s water system, or auxiliary water system where cross connection is known to exist unless adequately safeguarded.</p> <p>C. Move text from 590 and summarize to this subsection.</p> <p>D. The owner shall maintain acceptable working pressure in the distribution system.</p> <p><u>Rationale</u> – Comply with RIS Style Manual.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| 12VAC5-590-590 | N/A | <p>Section title is “Cross connections.”</p> <p>A. The purveyor shall not install, maintain, or allow to be installed a water service connection to any premise where cross connections may exist unless it is abated or controlled.</p> <p>B. The purveyor shall not install, maintain, or allow to be installed any connection whereby water from an auxiliary water system may enter a waterworks unless the auxiliary</p> | <p><u>Intent</u> – Repeal section. Move content to section 580 B and summarize as noted above.</p> <p><u>Rationale</u> – Organization of content will improve understanding.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |

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| | | water system is approved by purveyor and the division. | |
| 12VAC5-590-600 | N/A | <p>Section title is "Responsibilities."</p> <p>A. General information</p> <p>B. Water Purveyor is required to establish and operate a cross-connection control program. Suggested elements are listed in Appendix I.</p> | <p><u>Intent</u> – Change title to "CCCP Responsibilities." Delete reference to Appendix I (to be repealed). Consolidate specific requirements in one section.</p> <p>A. Owner shall have a CCCP, with 1 designated individual to manage it.</p> <p>B. Owner shall establish procedures.</p> <p>C. Owner shall have tests conducted.</p> <p>D. In lieu of annual assessments, owner may have a public education program.</p> <p>E. Discontinuing service is required for specified conditions.</p> <p>F. Corrective action and report to department</p> <p>G. Owner is required to maintain an inventory and records of testing, repairs, and maintenance.</p> <p>H. Owner is required to maintain records of CCCP implementation.</p> <p><u>Rationale</u> – Organization of content will improve understanding. Comply with RIS Style Manual.</p> <p><u>Impact</u> – Increased flexibility for owners to have and implement the CCCP. Improved understanding and application of the regulations.</p> |
| 12VAC5-590-610 | N/A | <p>Section title is "Containment policy."</p> <p>A. Backflow prevention required at the service connection.</p> <p>B. If necessary, backflow prevention may be installed downstream of the service connection.</p> <p>C. Conditions requiring backflow prevention.</p> <p>D. Premises with booster pumps.</p> <p>E. List of facilities requiring backflow prevention.</p> | <p><u>Intent</u> – Change title to "Containment of backflow." Combine subsections A and B as subsection A. Update to include overlooked conditions and delete inappropriate ones; be consistent with USBC.</p> <p>A. Installation of approved assemblies, devices, and methods.</p> <p>B. New subsection. Allows POU isolation.</p> <p>C. Installation under special conditions.</p> <p>D. Low pressure cutoffs at pumps.</p> <p>E. Installation at specially identified facilities.</p> <p>F. Protection at temporary and emergency connections.</p> |

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| 12VAC5-590-620 | N/A | Section title is "Type of protection required." | <p><u>Intent</u> – Repeal section.</p> <p><u>Rationale</u> – Relevant content is contained in sections 610 and 630.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| 12VAC5-590-630 | N/A | <p>Section title is "Backflow prevention devices."</p> <p>A. Devices shall comply with USBC.</p> <p>B. Installation shall comply with USBC.</p> <p>Table 2.10 "Determination of degree of Hazard": High, Moderate and Low Hazard.</p> <p>C. Existing backflow prevention assemblies may be excluded.</p> | <p><u>Intent</u> – Change title to "Backflow prevention assemblies, devices, and backflow elimination methods for containment." Update requirements to agree with USBC.</p> <p>A. Compliance with USBC.</p> <p>B. Describe safeguards and relate to degree of hazard (high or low). Delete Table 2.10 & replace with Table 630.1 "Determination of Degree of Hazard" (High & Low Hazard only.)</p> <p>C. Do not install devices to operate or open during backflow prevention.</p> <p>D. Backflow device testers shall be certified.</p> <p><u>Rationale</u> – Eliminate conflicts between regulations and plumbing code.</p> <p><u>Impact</u> – Consistent standards improve public health protection.</p> |
| Article 1 | | Article title is "General" | Eliminate article number and title for simplicity. |
| 12VAC5-590-640 | N/A | <p>Section title is "General."</p> <p>The engineer shall confer with the division before proceeding with the detailed designs. The engineering report and preliminary plan shall include plant site selection. Operation and maintenance manuals are required for treatment facilities and pumping facilities.</p> | <p><u>Intent</u> – Change title to "General design considerations." Modify title to improve accuracy and accessibility of content. Add new subsections A-D. Eliminate redundant language. Require sound engineering basis for design.</p> <p>A. Clarify that community waterworks shall be designed for future water demand.</p> <p>B. Clarify design basis, including maximum daily and peak hour water demands, effective storage requirements for community and noncommunity waterworks.</p> <p>C. Clarify minimum residual pressure requirements for water demands including fire protection.</p> |

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| | | | <p>D. Include reference to NSF/ANSI Standard 61 for materials in contact with product water.</p> <p><u>Rationale</u> – Title needs to convey subject matter. Delete requirement for engineer conference, engineering report, and preliminary plan. These procedures are described in Part I, Section 200. Delete requirement for operation and maintenance manuals. Other options exist for obtaining the information and using it. Ensure consistency with industry best practices.</p> <p><u>Impact</u> – Administrative cost savings for the waterworks owner and others by providing improved information exchange. Assure reliability and performance of waterworks to produce safe drinking water.</p> |
| 12VAC5-590-650 | N/A | <p>Section title is “Objectives of a waterworks.”</p> <p>A. Objectives listed are the production of pure water; and the production of water appealing to the consumer.</p> <p>B. To reach the objectives of a waterworks, finished water quality shall conform to Part II of this chapter.</p> | <p><u>Intent</u> – Repeal section. Compliance with the water quality standards is stated in Part II and does not need to be repeated.</p> <p><u>Rationale</u> – Terms “Pure” and “appealing” do not assist in applying design requirements that follow.</p> <p><u>Impact</u> – None.</p> |
| 12VAC5-590-660 | N/A | <p>Section title is “Site location.”</p> <p>A. Location of wells and treatment plants above the 100-year flood elevation, or lower elevations considered if flood protection is shown.</p> <p>B. Waterworks shall be readily accessible in all seasons.</p> <p>C. Consideration should be given to transportation and electrical service.</p> | <p><u>Intent</u> – Insure adequate protection from potential contaminants due to surface runoff and identify other features that may be in close proximity. Clarify access requirements. Clarify that considerations apply to more than just the plant, and backup power source does not have to be external.</p> <p>A. Add requirement to grade site for adequate drainage, and add reference to section 840 E for other well location requirements.</p> <p>B. Change general statement to specify pumping and treatment facilities will be accessible, and access roads provided.</p> <p>C. Reword to require consideration of functional</p> |

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| | | | <p>aspects of the site, including transportation and electrical service.</p> <p><u>Rationale</u> – There are other important locational considerations besides flooding that may harm water quality. Not all types of facilities need to be accessible at all times to insure reliable and safe water service. Onsite power generation is acceptable as a secondary supply. Accessibility and reliable electrical service are needed at pump stations as well as treatment works.</p> <p><u>Impact</u> – Improve reliability of waterworks.</p> |
| 12VAC5-590-670 | N/A | <p>Section title is “Site size.”</p> <p>A. Refers to other sections for reserve area required around well and spring sites.</p> <p>B. Plant site shall be adequate for expansion and disposal of plant wastes.</p> <p>C. Refers to VA Code for disposal of treatment plant wastes.</p> | <p><u>Intent</u> – Improve accuracy and eliminate potential negative connotation of terminology.</p> <p>A. Change reference section numbers as appropriate.</p> <p>B. Change “disposal” to “handling” and change “wastes to “residuals”.</p> <p>C. Change “wastes” to “residuals.”</p> <p><u>Rationale</u> – Residuals are not always waste products that must be disposed of; beneficial uses exist.</p> <p><u>Impact</u> – None.</p> |
| 12VAC5-590-680 | N/A | <p>Section title is “Treatment process selection.”</p> <p>Considerations are listed:</p> <p>A. Source water quality and quantity.</p> <p>B. Source water quality changes.</p> <p>C. Water quality goals and public desire for better water.</p> <p>D. Removal of contaminants using BAT.</p> <p>E. Established treatment techniques must be used for PMCLs.</p> <p>F. POE or POU devices cannot be used for long-term compliance with PMCLs; only short-term, interim use as a condition of a variance or exemption issued by the commissioner.</p> | <p><u>Intent</u> – Change title to “Treatment process selection and BAT.” Clarify and consolidate content. Allow POU & POE devices for short-term use.</p> <p>A. Combine subsections A and B into one subsection.</p> <p>B. Add reference to BAT in federal regulations for Inorganic compounds (40 CFR 141.62) and Organic compounds (40 CFR 141.61).</p> <p>C. Delete general language and replace with references to BAT in federal regulations for Radionuclides (40 CFR 141-66).</p> <p>D. Add the option of approving alternate treatment technology.</p> <p>E. Include treatment techniques for Action Levels, and clarify that design shall employ these requirements.</p> |

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| | | | <p>F. Restrict the use of POU devices for treating microbiological contaminants.</p> <p>G. Add new subsection allowing the use of reverse osmosis and nanofiltration technology.</p> <p><u>Rationale</u> – Consolidation of text improves message. POU & POE devices have proven effective for short-term compliance with water quality standards, which is the objective.</p> <p><u>Impact</u> – Potential reduction is in capital and operation costs for use of POU and POE devices in place of centralized treatment; and allowing the use of membrane technology for certain treatment applications.</p> |
| Appendix N, Appendix P | N/A | <p>Best available treatment technology (BAT) is listed for inorganic compounds in Table I, and organic compounds in Table II, of Appendix N. BATs for radionuclides is listed in Tables I, II and III of Appendix P. Content is based on National Primary Drinking Water Regulations 40 CFR Part 142 Subpart G, with no substantial changes.</p> | <p><u>Intent</u> – Repeal Appendix N and Appendix P. Incorporate by reference the Best Available Treatment Technologies listed in the federal regulations in section 680. Consolidate treatment information and eliminate appendices in compliance with RIS Style Manual.</p> <p><u>Rationale</u> – Table formats are inconsistent with RIS, and information is available in the federal regulations.</p> <p><u>Impact</u> – Improved water quality provided to consumers.</p> |
| 12VAC5-590-690 | N/A | <p>Section title is “Capacity of waterworks.” Design capacity of a waterworks shall exceed the maximum daily water demand of the system; design on the basis of water consumption provided in table (subsection A).</p> <p>A. Annual daily water consumption rates (annual daily water demand): table.</p> <p>B. Minimum water storage of 200 gallons per equivalent residential connection at minimum pressure required.</p> <p>C. Minimum working pressure described; selection of fire flow described; formula</p> | <p><u>Intent</u> – Repeal section. Revise and relocate corrected content as follows: Delete first paragraph, and remove conflicting language. Eliminate outdated design values. Increase the capacity of the second well from 20% to 30% of water demand, for systems with only 2 wells. Eliminate maximum hour flow design formula, and the existing storage requirement.</p> <p>A. Delete subsection.</p> <p>B. Delete subsection. Revise storage requirement in new subsection 640 B 3.</p> <p>C. Delete subsection. Move minimum working pressure requirement and fire flow</p> |

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| | | <p>provided for estimating maximum hour domestic flow.</p> <p>D. Well source capacity of 0.5 gpm/equivalent residential connection required.</p> <p>E. Waterworks using only groundwater sources with 50+ residential connections are required to have at least 2 wells; 2nd well capacity must be at least 20% of waterworks capacity.</p> <p>F. Waterworks using only groundwater sources with fewer than 50 residential connections must have an auxiliary well pump or 48 hours of effective storage.</p> | <p>selection to new subsection 640 C.</p> <p>D. Delete subsection.</p> <p>E. Move subsection to new subsection 840 R, and increase minimum required capacity of 2nd well to 30%.</p> <p>F. Move subsection to new subsection 840 S, and clarify requirement for access to a replacement pump and related equipment.</p> <p><u>Rationale</u> – Tabulated water consumption rates are outdated and produce inaccurate estimates of water demands and design basis. Formula is outdated and produces inaccurate results. Existing language is unclear whether to design for the maximum daily water demand or for the annual daily water demand. Minimum acceptable storage and well capacity refer to concept of “equivalent residential connections” (ERC), which ignores effects of non-residential water demands and results in excess storage requirements for large waterworks. Failure of the primary well will require 2nd well to supply all water needs, so increased capacity of 2nd well is needed. Insure that the pump will be available and able to be put into operation when needed.</p> <p><u>Impact</u> – Improve design and reliability of waterworks.</p> |
| <p>12VAC5-590-700</p> | <p>N/A</p> | <p>Section title is “Metering total water production.”</p> <p>Waterworks that chlorinate and remove iron or manganese shall meter the water prior to treatment. Waterworks that soften by ion exchange shall meter water treated and delivered. Waterworks that remove turbidity shall meter prior and subsequent to treatment.</p> | <p><u>Intent</u> – Require all community waterworks to meter total water produced, instead of specific treatment facilities. Provide clarification on metering for noncommunity waterworks. Recommend the provision of metering of total water production. Expand metering requirement to all waterworks that provide treatment.</p> <p><u>Rationale</u> – Existing regulation excludes several treatment processes that use water, and makes no provision for new technologies in future.</p> |

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| | | | <u>Impact</u> – Metering will improve accountability of water use and will likely improve waterworks efficiency and reduce waste. |
| 12VAC5-590-710 | N/A | Section title is “Site layout.” Requires site grading, adequate drainage, walks, access roads, and driveways. Requires consideration of function. | <u>Intent</u> – Repeal section. Requirements are covered elsewhere. <u>Rationale</u> – No need for a separate section. <u>Impact</u> – None. |
| 12VAC5-590-720 | N/A | Section title is “Building layout.” Provide adequate lighting, ventilation, heat, drainage, dehumidification, and equipment accessibility. Consider operator safety, convenience, and separate rooms for storing chemicals. Provide sanitary facilities at all waterworks. | <u>Intent</u> – Change title to “Building design and construction.” Include reference to applicable building codes for building design and layout for purposes listed. Delete sections A-L, and add new sections A-F. Delete requirement for sanitary facilities. Modify title to improve accuracy and accessibility of content. Provide relevant references. <u>Rationale</u> – Title needs to convey subject matter. Design requirements are given in building codes and should not be included in this regulation. <u>Impact</u> – Waterworks design will be more consistent in compliance with applicable building codes and potential conflicts eliminated. |
| None | 12VAC5-590-725 | None | <u>Intent</u> – Add new section 725 titled “Automated monitoring and control systems.” Specify design requirements for (1) data security, (2) equipment protection, (3) data displaying and recording, & (4) manual operation and backup controls. Add requirement for automated monitors and controls. <u>Rationale</u> – Technology is widely used and continues to evolve; minimum requirements must be established to assure compliance with water quality standards, data quality and reporting. <u>Impact</u> – Improved reliability of waterworks operation. |
| 12VAC5-590-730 | N/A | Section title is “Standby power capability.” | <u>Intent</u> – Change title to “Alternate power sources.” Add reference to emergency management plan for |

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| | | Standby power may be required for treatment or pumping in order to maintain a minimum level of service during an emergency. | <p>extended power outages (section 505), to maintain a minimum level of service. Clarify requirements; improve accuracy, and accessibility of content.</p> <p><u>Rationale</u> – Allows more options to be considered for providing power during outages.</p> <p><u>Impact</u> – Potential reduction in capital costs and improved waterworks reliability.</p> |
| 12VAC5-590-740 | N/A | Section title is “Maintenance and servicing of equipment.” Provide adequate facilities for servicing & maintaining automatic equipment. | <p><u>Intent</u> – Repeal section and move content to section 720 A. Consolidate related text into one section.</p> <p><u>Rationale</u> – Design features should be addressed in one place to improve accessibility of content.</p> <p><u>Impact</u> – Improved facility design and operation.</p> |
| 12VAC5-590-750 | N/A | Section title is “Shop space and storage.” Include adequate facilities for shop space & storage. | <p><u>Intent</u> – Repeal section and move content to section 720 E. Consolidate related text into one section.</p> <p><u>Rationale</u> – Design features should be addressed in one place to improve accessibility of content.</p> <p><u>Impact</u> – Improved facility design and operation.</p> |
| 12VAC5-590-760 | N/A | Section title is “Laboratory.” A. Testing equipment must be adequate for purpose intended and recognized procedures shall be used. B. Lab floor and bench space is specified for plants treating for iron removal, manganese removal, softening by ion exchange, turbidity removal or softening by precipitation. C. Bacteriological testing must be in a separate lab room. | <p><u>Intent</u> – Change title to “Laboratory facilities.” Delete minimum floor and bench space requirements for treatment processes specified. Refer to DCLS regulations. Provide general design requirements only.</p> <p><u>Rationale</u> – Analytical laboratories are regulated by the DCLS and should not be included in this regulation.</p> <p><u>Impact</u> – Lab design will be more consistently in compliance with applicable DCLS certification requirements and potential conflicts eliminated.</p> |
| 12VAC5-590-770 | N/A | Section title is “Sample taps.” Water sample taps from each water source are required. Sample taps running to a lab | <p><u>Intent</u> – Change title to “Sampling and monitoring equipment.” Clarify sampling locations required for all</p> |

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| | | <p>sink are required for each unit treatment process. Taps shall be consistent with sampling needs. Petcock type taps are prohibited.</p> | <p>types of waterworks; address continuous monitoring.</p> <p>A. Clarify that taps are required to sample source water and water at entry point (to distribution system), and at each unit treatment process.</p> <p>B. Add subsection for continuous monitoring equipment requirements.</p> <p><u>Rationale</u> – Waterworks other than those using conventional filtration had not beennot addressed; continuous monitoring equipment is often used and had not been addressed.</p> <p><u>Impact</u> – Improved facility design and operation.</p> |
| 12VAC5-590-780 | N/A | <p>Section title is “Wall castings.” Consider providing extra wall castings in concrete for piping required if facility is expanded.</p> | <p><u>Intent</u> – Repeal section and move content to subsection 720 F. Consolidate related text into one section.</p> <p><u>Rationale</u> – Design features should be addressed in one place to improve accessibility of content.</p> <p><u>Impact</u> – Improved facility design.</p> |
| 12VAC5-590-790 | N/A | <p>Section title is “Water supply service.” Water used for treatment facilities shall be taken from a point after thorough chemical mixing.</p> | <p><u>Intent</u> – Change title to “Process water.” Clarify that water used in treatment processes or equipment must be taken from the finished water after all chemicals are added and mixed, and that backflow or backsiphonage will be prevented.</p> <p><u>Rationale</u> – Potentially contaminated water could be introduced into the treatment process, compromising the water quality produced.</p> <p><u>Impact</u> – Improved water quality provided to consumers.</p> |
| 12VAC5-590-800 | N/A | <p>Section title is “Disinfection.” Pipes, tanks, and equipment conveying or storing potable water must be disinfected prior to placing in service. Plans & specifications shall outline disinfection procedures. Forms of chlorine are described. Disinfection methods other than chlorination will be considered.</p> | <p><u>Intent</u> – Repeal section and move portion of text to subsection 1000 C. Consolidate related text into one section. Eliminate chlorine form and solution details and refer to AWWA standards.</p> <p><u>Rationale</u> – Disinfection should be addressed in one place to improve accessibility of content. Chemical</p> |

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| | | Required testing following disinfection and acceptance criteria is described. | <p>solution details are current in AWWA standards.</p> <p><u>Impact</u> – Improved water quality provided to consumers.</p> |
| 12VAC5-590-810 | N/A | Section title is “Paintings, coatings, sealers, or liners.” Paints, coatings, sealers, and liners in contact with raw, partially treated or potable water shall be approved prior to use. | <p><u>Intent</u> – Change title to “Components, materials, and products.” Delete specific approval requirement and refer to national standard.</p> <p><u>Rationale</u> – VDH does not approve specific materials used in water treatment individually; adherence to appropriate national standards is required.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| Article 2 | | Article title is “Source Development” | Eliminate article number and title for simplicity. |
| 12VAC5-590-820 | N/A | Section title is “General.” Source preference shall be given to water with minimal risk of contamination from wastewater. Engineer must prove that the proposed water source will comply with PMCLs for bacteriological, chemical, physical, and radiological qualities. | <p><u>Intent</u> – Change title to “New source water selection and sampling.” Change “wastewater” to “point and nonpoint pollution sources”. Refer to all water quality standards listed in section 340. Add correct reference section numbers.</p> <p><u>Rationale</u> – Title needs to convey subject matter; references need to be accurate and complete.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| 12VAC5-590-830 | N/A | Section title is “Surface water sources; quantity; quality; development structures.” A. General description of quantity requirements, including reasonable surplus and compensation for losses; definition of safe yield for simple and complex intakes. B. Owner required to conduct a sanitary survey of watershed. C. Intake structure design features listed. D. Detention reservoir defined as pretreatment structures. Development restrictions & | <p><u>Intent</u> – No changes</p> <p><u>Rationale</u> – Stakeholders could not agree on revisions to subsection A regarding how to determine safe yield, the capacity of surface water sources, or appropriate roles and authority of the executive branch agencies with responsibility for oversight of natural resources in Virginia.</p> <p><u>Impact</u> – VDH will continue to work with stakeholders outside this regulatory action to reach a consensus on this topic.</p> |

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| | | <p>construction requirements listed.</p> <p>E. Terminal reservoirs prohibited from body contact recreation or boats powered by gasoline.</p> | |
| <p>12VAC5-590-840</p> | <p>N/A</p> | <p>Section title is "Groundwater sources."</p> <p>A. Requirements for water quality testing, well lot, well location, class I and II construction</p> <p>B. General well development requirements, including water used, steel and plastic casing, packers, screens, pumping test, chemical conditioning, grouting, plumbness and alignment, temporary capping, bacteriological quality, water quality sampling, observation wells, well abandonment.</p> <p>C. Gravel packing, radial collectors, flowing artesian wells, springs.</p> | <p><u>Intent</u> – Update groundwater supply development requirements.</p> <p>A. Replace "public water supply wells" to "wells intended to serve a waterworks". Change "registered contractor" to "certified water well system provider" to be consistent with DPOR classifications.</p> <p>B. Add new subsection B describing well construction requirements for wells in Eastern Virginia or Eastern Shore Groundwater Management Areas.</p> <p>C. Add new subsection C. Eliminate description of bacteriological tests and refer to subsection K for water quality testing.</p> <p>D. Create new subsection D and revise minimum well lot requirements. Delete descriptions of plat plan and dedication document and refer to section 200.</p> <p>E. Create new subsection E. Add protection from animal feed lots, cemetery, and geothermal wells. Add minimum separation requirements for onsite storage of fuel.</p> <p>F. Create new subsection F for construction of Class I and II wells, completion of GW-2 form. Eliminate Class IIA and IIB well classifications.</p> <p>G. Change subsection B to subsection G and re-title to "Well construction materials and development." Update requirements for plastic well casing and delete maximum allowable depths table for PVC well casing. Delete water well completion report description. Delete requirements for chemical conditioning specifications. Update grouting requirements. Delete</p> |

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| | | | <p>plumbness and alignment testing. Modify temporary well abandonment to temporary capping requirements.</p> <p>H. Add new subsection H for well yield and drawdown tests. Add alternative test methods considerations, coordination with DEQ aquifer tests in groundwater management areas (GWMAs).</p> <p>I. Create new subsection I for well appurtenances including sanitary seal, vent, and pitless well units.</p> <p>J. Create new subsection J and add disinfection requirement after placement of well pump.</p> <p>K. Create new subsection K for water quality sampling and analysis, including bacteriological, chemical, physical, and radiological tests.</p> <p>L. Create new subsection L for observation wells and reword existing text to refer to DEQ construction requirements if located in GWMA, otherwise constructed in accordance with 12VAC5-630 (Private Well Regulations).</p> <p>M. Create new subsection M for sealing of select zones. [Delete permanent well abandonment subsection and create new section 475-Removal of wells from service and section 476-Reactivation of wells in Part II.]</p> <p>N. Create new subsection N for gravel packed wells. Add reference to construction requirements in subsection B for wells located in GWMAs.</p> <p>O. Create new subsection O for radial collector systems. Delete text on multiple aquifer wells.</p> <p>P. Create new subsection P for flowing artesian wells. Add requirements for pitless adapters.</p> <p>Q. Create new subsection Q for well capacity requirements of community waterworks. Capacity shall meet maximum daily demands. Define</p> |
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| | | | <p>sustainable yield for wells in consolidated rock formations.</p> <p>R. Create new subsection R for waterworks serving 50 or more residential connections. Require at least 2 wells; if only 2 provided then 2nd well rated for at least 30% of total design capacity.</p> <p>S. Create new subsection S for waterworks serving less than 50 residential connections. Require ready access to replacement equipment or 48 hours of finished water storage.</p> <p>T. Create new subsection T for springs.</p> <p><u>Rationale</u> – Update requirements to reflect current law and resolve conflicts with DEQ's regulations for Water Supply Planning, Groundwater Management Areas and Surface Water Withdrawals. These have been issued or amended since the last amendments to this section of the regulations.</p> <p><u>Impact</u> – Eliminate potential regulatory and jurisdictional conflicts when developing a groundwater source.</p> |
| Article 3 | | Article title is "Processes and Devices" | Eliminate article number and title for simplicity. |
| 12VAC5-590-850 | N/A | <p>Section title is "General." Design shall depend on source water quality and potable water standards. All surface waters shall be treated by conventional filtration and disinfection unless otherwise approved. Pre-sedimentation may be required. Operation and maintenance manuals are required.</p> | <p><u>Intent</u> – Change title to "Appropriate treatment". Refer to section 680 for treatment process selection and delete other regulation references. Delete required surface water treatment processes. Delete pre-sedimentation possibility. Refer to safety considerations in section 560. Delete requirement for O&M manuals. Delete requirement for conventional treatment of all surface water and refer to appropriate sections for treatment process selection.</p> <p><u>Rationale</u> – Alternatives to conventional treatment are available. O&M Manual requirements also deleted in section 640.</p> |

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| | | | <p><u>Impact</u> – Potential reduction in capital and operation costs to waterworks if alternative treatments are used.</p> |
| 12VAC5-590-860 | N/A | <p>Section title is “Chemical application.”</p> <p>A. Plans and specification requirements listed.</p> <p>B. Chemical shall be applied to maximize efficiency, consumer protection, operator safety, operation flexibility, prevent backflow, & provide for pH adjustment to the raw water.</p> <p>C. Feed equipment requirements listed, including: quantity, design, capacity, location, controls, solution tank features, material of construction, weighing scales, feed lines, & service water supply for dissolving chemicals.</p> <p>D. Chemicals.</p> <p>E. Housing.</p> <p>F. Operator safety.</p> | <p><u>Intent</u> – Clarify chemical feed design requirements and delete operation requirements.</p> <p>A. Minor wording changes.</p> <p>B. Minor wording changes to ensure consistent use of terms.</p> <p>C. Delete minimum of 2 feeders; require feed capacity with largest feeder out of service. Delete redundant backflow protection details. Clarify control features. Prohibit burial of chemical storage tanks.</p> <p>D. Delete chemical labeling details. Clarify chemical storage requirements based on dose. Include specific requirements for activated carbon because it is a combustible material.</p> <p>E. Delete floor slope requirement.</p> <p>F. Include reference to VOSH requirements. Add reference to chlorine section. Clarify operator protective equipment.</p> <p><u>Rationale</u> – Chemical labeling is specified in section 515. Chemical storage is based on average consumption to arrive at a reasonable supply onsite. Activated carbon is combustible and special safety precautions are required. Operations are covered in Part II of the regulations.</p> <p><u>Impact</u> – Excess chemical storage and consequent deterioration of chemical quality is reduced. Operator safety will be improved. Potential undetected leaks of buried chemicals will be avoided.</p> |
| None | 12VAC5-590-865 | See 12VAC5-590-870 A and B | <p><u>Intent</u> – Clarify requirements. New section 865 titled “Conventional filtration treatment.”</p> <p>Content moved from 870 A and 870 B:</p> <p>A. What comprises conventional filtration treatment.</p> <p>B. Designing for continuous operation.</p> <p>C. Added new presedimentation subsection.</p> |

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| | | | <p><u>Rationale</u> – Improve accessibility of information</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| 12VAC5-590-870 | Break section 870 into three smaller sections: 12VAC5-590-871 12VAC5-590-872 12VAC5-590-873 | Section title is “Mixing and sedimentation.” A. Surface water treatment process configuration B. Pretreatment for high turbidity or high coliform C. Flash (rapid) mixing design D. Flocculation mixing design E. Sedimentation design F. Combined softening - clarification units | <p><u>Intent</u> – Move content of existing subsections A – F to new sections noted and repeal section 870. Break large sections into smaller ones, organized by unit process. Content is essentially unchanged. Remove content from 870 A and 870 B and summarize to new section 865.</p> <p><u>Rationale</u> – Large body of information on distinct process design is more easily located with separate sections and titles. Combined softening-clarification units are not used in Virginia.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| None | 12VAC5-590-871 | See 12VAC5-590-870 C and D | <p><u>Intent</u> – Create new section 871 titled “Coagulation and flocculation.” Add in-line static mixers. Move content from subsection 870 C and 870 D and summarize requirements for rapid mixing and flocculation. Separate section for these treatment processes.</p> <p><u>Rationale</u> – Improve accessibility of information.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| None | 12VAC5-590-872 | See 12VAC5-590-870 E | <p><u>Intent</u> – Create new section 872 titled “Sedimentation,” and move content from subsection 870 E and summarize requirements for sedimentation. Allow consideration of sedimentation loading rates exceeding 0.5 gpm/ft² and reduced settling times. Separate section for this treatment process.</p> <p><u>Rationale</u> – Improve accessibility of information.</p> |

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| | | | <u>Impact</u> – Improved understanding and application of the regulations. |
| None | 12VAC5-590-873 | See 12VAC5-590-870 F | <p><u>Intent</u> – Create new section 873 titled “Solids contact treatment units,” and move content from 870 F and summarize requirements. Eliminate references to softening. Separate section for this treatment process.</p> <p><u>Rationale</u> – Improve accessibility of information.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| None | 12VAC5-590-874 | See 12VAC5-590-880 A | <p><u>Intent</u> – Create new section 874 titled “Gravity filtration,” and move content from 880 A and summarize requirements. Allow consideration of filter loading rates exceeding 4.0 gpm/ft². Include provision for air scour. Separate section for this treatment process.</p> <p><u>Rationale</u> – Improve accessibility of information.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| None | 12VAC5-590-875 | See 12VAC5-590-880 E | <p><u>Intent</u> – Create new section 875 titled “Direct filtration,” and move content from 880 E and summarize requirements. Separate section for this treatment process.</p> <p><u>Rationale</u> – Improve accessibility of information.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| 12VAC5-590-880 | Break section 880 into four smaller sections: 12VAC5-590-880 12VAC5-590-874 12VAC5-590-875 12VAC5-590-881 | Section title is “Filtration.” A. Rapid rate gravity filters B. High rate gravity filters C. Slow sand gravity filters D. Diatomaceous filters E. Direct filtration F. Rapid rate pressure filters | <p><u>Intent</u> – Change section 880 title to “Diatomaceous earth filtration” and retain content from subsection D only. Eliminate source restrictions for avoiding pretreatment. Retain pilot plant study but delete specific requirements. Break large sections into smaller ones, organized by water quality characteristic. Content is essentially unchanged.</p> <p><u>Rationale</u> – Existing sections too large to navigate easily. “Sampling” is not accurate description of content. Site-specific water quality should dictate study parameters.</p> |

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| | | | <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| None | 12VAC5-590-881 | See 12VAC5-590-880 C | <p><u>Intent</u> – Create new section 881 titled “Slow sand filtration,” and move content from 880 C and summarize requirements. Separate section for this treatment process.</p> <p><u>Rationale</u> – Improve accessibility of information.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| None | 12VAC5-590-882 | None | <p><u>Intent</u> – Create new section 882 titled “Membrane filtration.” Add application of membranes and disinfection removal credits. Refer to section 401.E.6. b. Add membrane design detail requirements, including configuration, materials, instrumentation, alarms, and sampling taps.</p> <p><u>Rationale</u> – Membranes may be successfully applied in water treatment. This treatment technology was not included in previous amendments to the regulations.</p> <p><u>Impact</u> – Potential reduction in capital and operation costs to waterworks if membrane treatment is used instead of conventional filtration.</p> |
| None | 12VAC5-590-883 | None | <p><u>Intent</u> – Create new section 883 titled “Bag and cartridge filtration”. Require pilot study. Add disinfection removal credits. Refer to section 401.E.6.a. Add filter design detail requirements, including instrumentation and alarms. Require O&M documents and operator training.</p> <p><u>Rationale</u> – Bag and cartridge filters may be successfully applied in water treatment.</p> <p><u>Impact</u> – Potential reduction in capital and operation costs to waterworks if bag and cartridge filtration is used instead of conventional filtration.</p> |

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| 12VAC5-590-890 | N/A | <p>Section title is "High rate treatment processes."</p> <p>A. General characteristics</p> <p>B. Instrumentation required</p> <p>C. Unit treatment process design requirements</p> | <p><u>Intent</u> – Repeal section and move applicable text to sections 874 "Gravity filtration" and 872 "Sedimentation". Improve accessibility of content.</p> <p><u>Rationale</u> – Information is more easily located with a separate section and title.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| None | 12VAC5-590-895 | None | <p><u>Intent</u> – Create new section 895 titled "Pre-engineered package treatment units." Include pre-designed & factory-built treatment equipment in the regulations.</p> <p><u>Rationale</u> – This equipment may be successfully applied in water treatment.</p> <p><u>Impact</u> – Potential reduction in capital and operation costs to waterworks if packaged treatment is used instead of conventional filtration.</p> |
| 12VAC5-590-900 | N/A | <p>Section title is "Softening."</p> <p>A. Lime, excess lime, excess lime soda process requirements.</p> <p>B. Cation exchange process.</p> | <p><u>Intent</u> – Change title to "Cation exchange softening." Delete subsection A. Delete section B catchline and reorganize text into new subsections A - P with minor revisions. Limit content to ion exchange softening process.</p> <p><u>Rationale</u> – Lime softening is not used in Virginia. Process is costly to operate and maintain, and is unlikely to be employed in future.</p> <p><u>Impact</u> – None.</p> |
| 12VAC5-590-910 | N/A | <p>Section title is "Aeration."</p> <p>A. Natural draft aeration.</p> <p>B. Forced or induced draft aeration.</p> <p>C. Pressure aeration.</p> <p>D. Other methods of aeration.</p> <p>E. Aerators that discharge through the atmosphere.</p> <p>F. Aerators used for oxidation or removal of dissolved gases.</p> <p>G. Ventilation in buildings.</p> <p>H. Bypass.</p> | <p><u>Intent</u> – Consolidate related text and clarify requirements. Expand and update this section. Delete subsections A through H, and reorganize content into new subsections A through E.</p> <p>A. General design requirements.</p> <p>B. Natural, forced or induced draft aeration.</p> <p>C. Pressure aeration.</p> <p>D. Packed Tower Aeration (Air Stripping).</p> <p>E. Other methods.</p> |

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| | | | <p><u>Rationale</u> – Terminology needs to be simplified and conform to current usage.</p> <p><u>Impact</u> – Improved understanding and application of the regulations, and attainment of water quality standards.</p> |
| 12VAC-590-920 | N/A | <p>Section title is “Iron and manganese control.”</p> <ul style="list-style-type: none"> A. Removal by oxidation, detention and filtration. B. Removal by lime soda process. C. Removal by continuous potassium permanganate regeneration. D. Removal by ion exchange. E. Sequestering. F. Sampling taps. G. Testing equipment. | <p><u>Intent</u> – Consolidate related text into new sections and clarify requirements. Consolidate and update subsections A, C, and D into one new subsection A. Eliminate subsection B on the lime soda process design. Update other design details into new subsections B through G.</p> <p><u>Rationale</u> – Lime softening is not used in Virginia. Process is costly to operate and maintain, and is unlikely to be employed in future.</p> <p><u>Impact</u> – None.</p> |
| 12VAC5-590-930 | N/A | <p>Section title is “Fluoridation.”</p> <ul style="list-style-type: none"> A. Plans, specifications. Operation and supervision required. B. Fluoride compounds. C. Fluoride compound storage. D. Chemical feed installations. E. Protective equipment. F. Dust control equipment. G. Measuring equipment. | <p><u>Intent</u> – Update fluoridation requirements.</p> <ul style="list-style-type: none"> A. The Board of Health recommends optimal fluoridation level to follow US Dept. of HHS guidelines B. Revise fluoride chemical names and include reference to standards. C. Add isolation of fluoride chemicals. D. Clarify chemical metering pump requirements, saturators. Allow fluoride feed to filtered water. E. No change to protective equipment. F. No change to dust control equipment. G. No change to fluoride ion measurement. <p><u>Rationale</u> – Agree with current federal recommendations, industry nomenclature, and best practices.</p> <p><u>Impact</u> – Negligible; the reduced dose and changes to point of application have already been instituted by most waterworks that fluoridate.</p> |
| 12VAC5-590-940 | N/A | <p>Section title is “Fluoride removal.”</p> | <p><u>Intent</u> – Improve grammar. Minor wording changes. Reorganize</p> |

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| | | | <p>subsections A and B into new subsections A through C.</p> <p><u>Rationale</u> – Rewording facilitates understanding.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| 12VAC5-590-950 | N/A | <p>Section title is “Stabilization.”</p> <ul style="list-style-type: none"> A. Carbon dioxide addition. B. Sulfuric acid. C. Removal of free CO₂. D. Deposition of calcium carbonate film. E. Polyphosphates. F. Split treatment. G. Residual chlorine may be used to prevent corrosion. H. Cathodic protection. I. Laboratory equipment. | <p><u>Intent</u> – Change title to “Corrosion control or stabilization” to improve accuracy and accessibility of content. Delete subsections A through C and E through G. Reorganize content into new subsections A through E, re-lettering subsection D to B, H to D, and I to E. Remove irrelevant text. Excess lime softening, split treatment, and chlorine residual are not satisfactory corrosion control methods in Virginia and are not used.</p> <p><u>Rationale</u> – Title needs to convey subject matter.</p> <p><u>Impact</u> – Improved water quality provided to consumers.</p> |
| 12VAC5-590-960 | N/A | <p>Section title is “Taste and odor control.”</p> <ul style="list-style-type: none"> A. Source treatment - T&O causes, copper sulfate addition to reservoirs, other chemicals B. Treatment methods - addition of chlorine, chlorine dioxide, potassium permanganate, aeration, powdered activated carbon. | <p><u>Intent</u> – Update and clarify acceptable methods for controlling typical taste and odors.</p> <p><u>Intent</u> – Update and clarify acceptable methods for controlling typical taste and odors. Revise source treatment in new subsection A and delete subsection B. Create new subsection B for aeration, C for chemical oxidation, and D for powdered activated carbon; E for GAC; move and update text. Delete text no longer relevant. Add subsection F for ozonation. Replace “raw water” with “source water.”</p> <p><u>Rationale</u> – Ozone is effective in controlling taste and odors. Effective chemical dosages are case-specific. Provides more options and flexibility for waterworks.</p> <p><u>Impact</u> – Improved effectiveness in treating taste and odor-causing compounds.</p> |

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| 12VAC5-590-970 | N/A | <p>Section title is "Removal of volatile synthetic organic chemicals (VOCs)."</p> <p>Refers to Appendix N for Best Available Technology; perform pilot studies unless 2 studies or prototype plants demonstrate feasibility.</p> <p>A. GAC. B. Packed tower aeration.</p> | <p><u>Intent</u> – Repeal section. Consolidate related text into one section.</p> <p><u>Rationale</u> – GAC is addressed in new section 985. Packed tower aeration is addressed in section 910.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| None | 12VAC5-590-975 | None | <p><u>Intent</u> – Create new section 975 titled "Removal of radionuclides." Establish acceptable design considerations for removal of radionuclides.</p> <p>A. Refer to BAT technologies list. B. Manganese greensand filtration. C. Waste handling. D. Occupational exposure. E. Control monitoring.</p> <p><u>Rationale</u> – Critical process design requirements are missing from the regulations.</p> <p><u>Impact</u> – Improved safety and effectiveness of treatment technology.</p> |
| 12VAC5-590-980 | N/A | Section title is "Microscreening." | <p><u>Intent</u> – Repeal section. Remove material no longer relevant</p> <p><u>Rationale</u> – Technology is not appropriate and is not used in potable water treatment in Virginia.</p> <p><u>Impact</u> – Improved water quality provided to consumers.</p> |
| None | 12VAC5-590-985 | See 12VAC5-590-970 | <p><u>Intent</u> – Create new section titled "GAC contactors." Incorporate applicable content from existing section 970. Clarify GAC treatment process design requirements.</p> <p><u>Rationale</u> – Information is more easily located in a separate section.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| 12VAC5-590-990 | N/A | Section title is "Waterworks waste." | <p><u>Intent</u> – Use correct nomenclature. Substitute "residuals" and "settled solids" for "sludges." Substitute "DEQ" for the "State Water Control Board" and specify that the owner will need to satisfy DEQ's waste disposal requirements.</p> |

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| | | | <p><u>Rationale</u> – Eliminate potential association with sewage or sanitary waste. DEQ regulates discharges to surface waters and disposal of waste.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| 12VAC5-590-1000 | Break section 1000 into two sections: 12VAC5-590-1000 12VAC5-590-1001 | Section title is “Disinfection.” A. Objective. B. Methods. C. Equipment. D. Engineering design. E. Respiratory protection. F. Application of chlorine. G. Evaluation of effectiveness. | <p><u>Intent</u> – Delete subsection B text and replace with new description of primary disinfection. Add new subsection C for disinfection of pipes, tanks and equipment prior to being placed in service, and refer to AWWA Standards. Relocate and update subsections C through G in new section 1001 titled “Chlorination” and relabel as subsections A through C. Distinguish objectives of primary disinfection and expand treatment options. Separate chlorination as one process type.</p> <p><u>Rationale</u> – Chlorine is no longer the sole disinfectant used; other processes are available that do not generate potentially harmful disinfection byproducts.</p> <p><u>Impact</u> – Improved water quality provided to consumers.</p> |
| None | 12VAC5-590-1001 | See 12VAC5-590-1000 C through G | <p><u>Intent</u> – Create new section 1001 titled “Chlorination,” with text relocated from section 1000. Include details on the chlorine treatment as a separate process. A. General design requirements. B. Gas chlorine feed systems. C. Calcium hypochlorite & sodium hypochlorite feed systems.</p> <p><u>Rationale</u> – May be successfully applied in potable water treatment.</p> <p><u>Impact</u> – Improved understanding and application of the regulations, with improved water quality provided to consumers.</p> |
| None | 12VAC5-590-1002 | None | <p><u>Intent</u> – Create new section 1002 titled “Chloramination.” A. Acceptability of chloramines. B. Controlling the process. C. pH adjustment. D. Lead leaching considered.</p> |

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| | | | <p>E. Public notification before initiating chloramination. Include details on the chloramine treatment as a separate process.</p> <p><u>Rationale</u> – May be successfully applied in potable water treatment.</p> <p><u>Impact</u> – Improved understanding and application of the regulations, with improved water quality provided to consumers.</p> |
| None | 12VAC5-590-1003 | None | <p><u>Intent</u> – Create new section 1003 titled “Chlorine dioxide addition.” Include details on the chlorine dioxide treatment as a separate process.</p> <p>A. Acceptability of chlorine dioxide. B. Onsite generation. C. Public notification before initiating use of chlorine dioxide.</p> <p><u>Rationale</u> – May be successfully applied in potable water treatment.</p> <p><u>Impact</u> – Improved understanding and application of the regulations, with improved water quality provided to consumers.</p> |
| None | 12VAC5-590-1004 | None | <p><u>Intent</u> – Create new section 1004 titled “Ozonation.” Include details on the ozone treatment process requirements.</p> <p>A. Acceptability of ozone. B. Ozone systems. C. PER on ozone. D. Treatability studies. E. Disinfection credit. F. Alarms & automatic shutdown.</p> <p><u>Rationale</u> – May be successfully applied in potable water treatment.</p> <p><u>Impact</u> – Improved water quality provided to consumers.</p> |
| None | 12VAC5-590-1005 | None | <p><u>Intent</u> – Create new section 1005 titled “Ultraviolet light (UV) disinfection.” Include details on the UV treatment process requirements.</p> <p>A-I. Reactor systems and design requirements.</p> |

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| | | | <p><u>Rationale</u> – May be successfully applied in potable water treatment.</p> <p><u>Impact</u> – Improved understanding and application of the regulations, with improved water quality provided to consumers.</p> |
| Article 4 | | Article title is “Pumping Facilities” | Eliminate article number and title for simplicity. |
| 12VAC5-590-1010 | N/A | Section title is “General.” Design facilities to maintain water quality. Avoid subsurface pits and pump rooms, inaccessible installations. | <p><u>Intent</u> – Change title to “Basic pumping facility design criteria”. Require all pumps to be accessible for servicing and repair. Require accessibility of pumps.</p> <p><u>Rationale</u> – Existing language does not ensure that facilities will be designed to allow for adequate maintenance.</p> <p><u>Impact</u> – Improved operation, maintenance, and service life of pump stations.</p> |
| 12VAC5-590-1020 | N/A | Section title is “Location.” | <p><u>Intent</u> – Minor rewording with 2 new subsections A and B.</p> <p><u>Rationale</u> – Improve clarity.</p> <p><u>Impact</u> – Improved compliance with the regulations and water quality provided to consumers.</p> |
| 12VAC5-590-1030 | N/A | Section title is “Groundwater facilities.” A. General well appurtenances. B. Drilled wells with motors mounted on the casing. C. Submersible pumps. D. Discharge piping. E. Well pump house construction. | <p><u>Intent</u> – Repeal section. Move relevant content to appropriate sections in the regulations: text on well appurtenances to section 840, well pump discharge piping to section 1065, and well enclosures to section 1040, as applicable.</p> <p><u>Rationale</u> – Eliminate redundancy and improve accessibility of content.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| 12VAC5-590-1040 | N/A | Section title is “Pump stations.” A. General requirements. B. Suction wells. C. Equipment servicing. D. Stairways and ladders. E. Heating. F. Ventilation. G. Dehumidification. H. Lighting. I. Pumps. J. Suction lift. | <p><u>Intent</u> – Consolidate pump station structure requirements in one section. Move, reorganize, and consolidate content from subsections A through H into one subsection. Relocate content from subsections I through K to section 1050. A. Enclosures; add reference to USBC.</p> |

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| | | K. Priming. | <p>B. Suction wells; insert relevant content from section 1040.</p> <p>C. Groundwater well enclosures and aprons; insert relevant content from section 1030.</p> <p>D. Spring enclosures; require vent.</p> <p><u>Rationale</u> – Improve accessibility of content.</p> <p><u>Impact</u> – Improved pump station design, operation and maintenance.</p> |
| 12VAC5-590-1050 | N/A | <p>Section title is “Booster pumps.”</p> <p>A. Booster pump requirements</p> <p>B. Inline booster pumps</p> | <p><u>Intent</u> – Change title to “Pumps and controls.” Add content from subsections 1040 I through K. Add content from subsections 1070 E through G. Delete existing subsection B “Inline booster pumps.” Consolidate content on pumps, controls, and power into single section.</p> <p><u>Rationale</u> – Improve accessibility of information.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| 12VAC5-590-1060 | N/A | <p>Section title is “Automatic and remote controlled stations.”</p> <p>Automatic signaling apparatus shall report to a facility manned 24 hours per day.</p> | <p><u>Intent</u> – Repeal section. These are not requirements.</p> <p><u>Rationale</u> – Design recommendations only.</p> <p><u>Impact</u> – None.</p> |
| 12VAC5-590-1070 | 12VAC5-590-1065 | <p>Section title is “Appurtenances.”</p> <p>A. Valves.</p> <p>B. Piping.</p> <p>C. Gauges and meters.</p> <p>D. Water seals.</p> <p>E. Controls.</p> <p>F. Power.</p> <p>G. Auxiliary power supply.</p> | <p><u>Intent</u> – Repeal section 1070. Create new section 1065 titled “Piping, valves, and meters”. Move content in subsections E through G to section 1050. Limit section content to appurtenances only. Relocate, reorganize, and consolidate text as follows:</p> <p>A. Piping.</p> <p>B. Valves.</p> <p>C. Gauges.</p> <p>D. Meters.</p> <p>E. Well discharge piping.</p> <p><u>Rationale</u> – Improve accessibility of information.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| Article 5 | | Article title is “Finished Water Storage Structures” | Eliminate article number and title for simplicity. |

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| <p>12VAC5-590-1080</p> | <p>Break section 1080 into 3 sections: 12VAC5-590-1080 12VAC5-590-1081 12VAC5-590-1082</p> | <p>Section title is "General." A. Location of facilities. B. Watertight roofs and covers. C. No drain connection to sewer. D. Overflow pipe. E. Access. F. Vents. G. Penetrations. H. Downspouts. I. Safety. J. Freeze protection. K. Catwalks. L. Surface grading and drainage. M. Cathodic protection and paint. N. Cleaning before disinfection. O. Disinfection & testing.</p> | <p><u>Intent</u> – Change title to "Basic finished water storage structure design criteria." Reorganize relevant content. A. Materials and design reference to AWWA standards. B. Safety and VOSH. C. Location of water storage structures. D. Pressure variation. Insert & consolidate content from subsection 1100 A. E. Level controls. Insert & consolidate content from subsections 1100 B & C. Create new section 1081 titled "Atmospheric tank storage". Create new section 1082 titled "Pressure tank storage".</p> <p><u>Rationale</u> – Information is more easily located in separate sections.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| <p>None</p> | <p>12VAC5-590-1081</p> | <p>See 12VAC5-590-1080 B through N</p> | <p><u>Intent</u> – Create new section 1081 titled "Atmospheric tank storage," relocate relevant text from subsections 1080 B through 1080 N as follows: A. Protection; B. Turnover of water. C. Drains. D. Overflows. E. Inlet and discharge pipes. F. Access. G. Vents. H. Penetrations. I. Freeze prevention. J. Catwalks. K. Grading and runoff. L. Cathodic protection and paints. M. Cleaning before disinfection. N. Disinfection, reference to AWWA standards.</p> <p><u>Rationale</u> – Information is more easily located in separate sections.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| <p>None</p> | <p>12VAC5-590-1082</p> | <p>See 12VAC5-590-1090 E</p> | <p><u>Intent</u> – Create new section 1082 titled "Pressure tank storage", reorganize relevant content, and insert content from subsection 1090 E. Modify to require tanks equal or</p> |

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| | | | <p>greater than 250 gal to have access manway and other appurtenances.</p> <p><u>Rationale</u> – Information is more easily located in separate sections.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| 12VAC5-590-1090 | N/A | <p>Section title is “Plant storage.”</p> <p>A. Washwater tanks. B. Clearwells. C. Finished water. D. Receiving basins 7 pump wet wells. E. Hydropneumatic (pressure) storage tanks</p> | <p><u>Intent</u> – Relocate subsection E “Hydropneumatic (pressure) tanks” to new section 1082 “Pressure tank storage.” Minor wording changes. Limit section content to finished water storage at treatment plants only.</p> <p><u>Rationale</u> – Hydropneumatic (pressure) tanks are not often located at surface water treatment plants; they are located at many well sites and sometimes in distribution systems.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| 12VAC5-590-1100 | N/A | <p>Section title is “Distribution storage.”</p> <p>A. Max variation between high and low level. B. Adequate controls. C. Pressure tanks.</p> | <p><u>Intent</u> – Repeal section. Relocate and consolidate subsections A through C into subsections 1080 D & 1080 E.</p> <p><u>Rationale</u> – Content relevant to section 1080.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| Article 6 | | <p>Article title is “Water Distribution Systems”</p> | <p>Eliminate article number and title for simplicity.</p> |
| 12VAC5-590-1110 | N/A | <p>Section title is “Materials.”</p> | <p><u>Intent</u> – Change title to “Distribution system materials.” Consolidate relevant text with minor wording changes: reference AWWA standards.</p> <p><u>Rationale</u> – Keep relevant content in place.</p> <p><u>Impact</u> – Improved understanding and application of the regulations.</p> |
| 12VAC5-590-1120 | N/A | <p>Section title is “Minimum pipe size.”</p> <p>A. 4-in. minimum pipe size. B. Pipe size for fire flows. C. The standard grading schedule of the Insurance Services Office and other</p> | <p><u>Intent</u> – Minor reorganization & update content; move subsection E into subsection B. Organize content appropriately and delete outdated references.</p> <p>A. Move subsection D to A 3. B. Move subsection E into subsection B.</p> |

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| | | <p>related organizations shall be followed in other cases.</p> <p>D. Justification by hydraulic analysis.</p> <p>E. Adequate flows and pressure.</p> | <p>C. Delete reference to "standard grading schedule of the Insurance Services Office and other related organizations."</p> <p><u>Rationale</u> – Minimum pipe size must be clearly defined to ensure adequate flow and pressure.</p> <p><u>Impact</u> – Improved water distribution to consumers.</p> |
| 12VAC5-590-1130 | N/A | <p>Section title is "System design."</p> <p>A. Minimizing dead-ends.</p> <p>B. Where dead-end lines occur, they shall be provided with a fire hydrant, flushing hydrant, or blowoff for flushing purposes.</p> <p>C. No flushing device connected to sewer.</p> | <p><u>Intent</u> – Change title to "Distribution system design". Require a "means of effective flushing" in place of specific "fire hydrant, flushing hydrant, or blowoff..." Allow alternate methods to flush water mains.</p> <p><u>Rationale</u> – Other options may exist or be available in the future to achieve the objective.</p> <p><u>Impact</u> – Potential cost savings to utilities while maintaining water quality provided to consumers.</p> |
| 12VAC5-590-1140 | N/A | <p>Section title is "Installation of water mains."</p> <p>A. Supports and restraints.</p> <p>B. Bedding.</p> <p>C. Trenching.</p> <p>D. The specifications for installation.</p> <p>E. Tracing wire for buried pipe.</p> | <p><u>Intent</u> – Change title to "Installation and testing of water mains." Incorporate industry standards for testing and allowable leakage.</p> <p>A. Add "and restraints" to text.</p> <p>B & C. No changes.</p> <p>D. Update to include AWWA standards on pressure testing and allowable leakage, as applicable.</p> <p>E. Minor wording changes.</p> <p><u>Rationale</u> – Acceptance criteria are not clearly defined in existing regulations.</p> <p><u>Impact</u> – Improved construction and reliability of distribution systems.</p> |
| 12VAC5-590-1150 | N/A | <p>Section title is "Separation of water mains and sewers."</p> <p>A. Factors to consider.</p> <p>B. Parallel installation.</p> <p>C. Crossing.</p> <p>D. Water pipes shall not pass through or come in contact with any part of a sewer manhole.</p> | <p><u>Intent</u> – Change title to "Separation of water mains and sanitary sewers." Remove requirements for AWWA approved water pipe and no leakage.</p> <p>A. Minor wording changes.</p> <p>B. Modify to require sanitary sewers to be constructed of AWWA distribution pipe, pressure tested in place in accordance with sections 1110 and 1140.</p> |

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| | | | <p>C. Minor wording changes. D. Delete sentence and require 10 feet horizontal separation distance or greater. E. Add new requirement for safe horizontal separation of water mains from other sources of contamination.</p> <p><u>Rationale</u> – Existing language is inconsistent with industry standards for water mains.</p> <p><u>Impact</u> – Improved construction and reliability of distribution systems.</p> |
| 12VAC5-590-1160 | N/A | <p>Section title is “Valve, air relief, meter, and blowoff chambers.” A. Air and sediment accumulations may be removed using fire hydrants, compressed air or pumping. B-C. Chambers & drainage. D. Valve inspection & servicing. E. Air relief & blowoff piping.</p> | <p><u>Intent</u> – Clarify means of removing sediments and air; require accessibility of valves and discharge piping from air relief and blow-off valves. A. Modify to require standard hydrants or blowoffs for removal of sediments; fire hydrants, blowoffs or air relief valves for removal of accumulated air. B-C. Minor wording changes; add information on backfill material as absorption pit. D. Add requirement for chambers or pits shall be designed for inspection and servicing of valves. E. Add requirements for air relief or blowoff piping.</p> <p><u>Rationale</u> – Removal methods are different for sediments (bottom of pipe) and air (top of pipe). Air relief valves require periodic inspection and service. Discharge water from air relief and blowoffs must be diverted away from the chamber to prevent potential submergence, valve malfunction, and contamination of potable water.</p> <p><u>Impact</u> – Improved design, construction, serviceability, and reliability of distribution systems.</p> |
| 12VAC5-590-1170 | N/A | <p>Section title is “Hydrants.” A. Hydrants that are not plugged must be drained to the ground or to dry wells. B. Hydrant drains shall not be connected to sewers.</p> | <p><u>Intent</u> – Clarify acceptable fire hydrant design and installation. A. Add further description of drain requirements. B. No changes. C. Delete "domestic flow" and add reference to section 1120.</p> |

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| | | C. Fire hydrants connected to water mains designed for fire flows and domestic flow. | <p><u>Rationale</u> – Hydrant drains must be properly constructed to achieve purpose; hydrants are provided for fire fighting and pipe flushing, not domestic use.</p> <p><u>Impact</u> – Reduced risk of contamination of drinking water.</p> |
| 12VAC5-590-1180 | N/A | Section title is “Surface water crossings.” A. Above water crossings. B. Under water crossings. | <p><u>Intent</u> – Clarify requirements for installation, testing, and repairs. A. Update on the preparation of project documents. B. Relabel subsection A as subsection B “Aerial water crossings”. C. Relabel subsection B as new subsection C. Modify text to require valves and taps for underwater crossings using rigid pipe only.</p> <p><u>Rationale</u> – Directional drilling method uses fusion-welded, flexible pipe, having low risk of pipe and joint failures.</p> <p><u>Impact</u> – Negligible; changes have already been implemented and cost savings to waterworks have been realized.</p> |
| 12VAC5-590-1190 | N/A | Section title is “Water services and plumbing.” | <p><u>Intent</u> – Repeal section. Content is addressed in preceding sections.</p> <p><u>Rationale</u> – The USBC has oversight.</p> <p><u>Impact</u> – None.</p> |
| 12VAC5-590-1200 | N/A | Section title is “Water pressure in systems.” | <p><u>Intent</u> – Repeal section. Content is addressed in preceding sections.</p> <p><u>Rationale</u> – The USBC has oversight.</p> <p><u>Impact</u> – None.</p> |
| 12VAC5-590-1210 | N/A | Section title is “Disinfection of water mains.” A. All mains must be disinfected before being put in service. B - E. Detailed procedure for flushing, disinfection methods, and testing of water mains. F. Procedures following repairs shall follow AWWA Standard C601. | <p><u>Intent</u> – Change title to “Disinfection and testing of water mains.” Remove outdated disinfection and testing procedures and refer to appropriate AWWA standard. A. Require water mains to be disinfected according to AWWA Standard C651, and delete subsections B through F. B. New subsection to require project documents to provide</p> |

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|-----------------|-----|--|---|
| | | | <p>details of procedures and disposal of water used.</p> <p><u>Rationale</u> – AWWA Standard C601 replaced by C651.</p> <p><u>Impact</u> – Negligible; current AWWA standard procedures are being implemented and accepted.</p> |
| 12VAC5-590-1220 | N/A | <p>Section title is “Cover.” All pipe shall be covered sufficiently to prevent freezing.</p> | <p><u>Intent</u> – Change title to “Pipe cover.” Clarify that all buried pipe shall be covered or encased sufficiently to prevent freezing and protect from damage by external forces. Include option of encasing pipe and include objective of damage protection.</p> <p><u>Rationale</u> – Sufficient earth cover may not be available in all instances; but there may be alternative solutions.</p> <p><u>Impact</u> – Improved design, construction, and performance of distribution systems.</p> |
| 12VAC5-590-1230 | N/A | <p>Section title is “Metering.” Each service connection shall be metered.</p> | <p><u>Intent</u> – Change title to “Service connection metering.” Clarify that service lines in community waterworks shall be metered. Require pipes connecting water mains to service connections to meet all applicable codes. Limit service meter requirement to community waterworks only; address installations where waterworks does not own or control the water line from the main to the service connection.</p> <p><u>Rationale</u> – Service meters are used for water accountability in community waterworks, but generally unnecessary in noncommunity waterworks because most have single service connections. The connecting pipe between the water main and the service may be owned or controlled by the waterworks, the locality, or a private entity.</p> <p><u>Impact</u> – Potential improvements in water accountability and reductions</p> |

| | | | |
|------|-----------------|------|--|
| | | | in water loss for community waterworks. |
| None | 12VAC5-590-1235 | None | <p>Intent – Create new section 1235 titled “Water loading stations.” Regulate water loading stations for hauling potable water.</p> <p>A. Design stations to prevent unauthorized use, tampering, and vandalism.</p> <p>B. Require backflow prevention on the fill connection.</p> <p>C. Prevent possible contamination from one user to the next.</p> <p>D. Require hoses to be approved for potable water.</p> <p>E. Require hoses to be protected from contamination.</p> <p>Rationale – Water hauling is a short-term solution to meet a potable water demand; minimum standards are needed to ensure that water is safe to consume.</p> <p>Impact – Reduced risk of contamination of hauled water.</p> |

| Current section number | New section number, if applicable | Current requirement | Change, intent, rationale, and likely impact of new requirements |
|---|-----------------------------------|---|---|
| Part IV Exceptions for Noncommunity Waterworks to Specific Sections of the Manual of Practice (Part III) – Repeal | | | |
| 12VAC5-590-1240 | N/A | Section title is “General.” | <p>Intent – Repeal section. Relocate specific requirements in Part III of the Regulations.</p> <p>Rationale – Text is unnecessary, as the entire Part IV is to be repealed.</p> <p>Impact – None.</p> |
| 12VAC5-590-1250 | N/A | <p>Section title is “Exceptions to Article 1 of Part III.”</p> <p>A. Minimum storage in conjunction with source, shall provide for peak hour demand.</p> <p>B. Minimum lab sink and workbench required.</p> | <p>Intent – Repeal section. Eliminate potential for overlooking content of this Part by moving specific exceptions into applicable sections of the Regulations.</p> <p>Rationale – Storage requirements are in 12VAC5-590-640 B, and laboratory requirements are in section 12VAC5-590-760 B.</p> |

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| | | | <u>Impact</u> – None. |
| 12VAC5-590-1260 | N/A | Section title is “Exceptions to Article 2 of Part III.” A. Minimum size well lot B. Minimum well source requirements and testing | <u>Intent</u> – Repeal section. Eliminate potential for overlooking content of this Part by moving specific exceptions into applicable sections of the Regulations. <u>Rationale</u> – Well lot requirements are in 12VAC5-590-840 D and well source requirements are in 12VAC5-590-840 H. <u>Impact</u> – None. |
| 12VAC5-590-1270 | N/A | Section title is “Exceptions to Article 5 of Part III.” Booster pumping duplicity and capacity. | <u>Intent</u> – Repeal section. Eliminate potential for overlooking content of this Part by moving specific exceptions into applicable sections of the Regulations. <u>Rationale</u> – Booster pump quantity and capacity requirements are in 12VAC5-590-1050 D 4 d. <u>Impact</u> – None. |
| 12VAC5-590-1280 | N/A | Section title is “Exceptions to Article 6 of Part III.” Water line plumbing inside a building shall comply with the Uniform Statewide Building Code (USBC). Water lines serving 2 or more buildings shall be adequately sized. | <u>Intent</u> – Repeal section. Eliminate unnecessary language. <u>Rationale</u> – Requirements of the USBC are not affected by these Regulations. Minimum capacity and pressure requirements must be maintained under all circumstances. <u>Impact</u> – None. |

DEPARTMENT OF HEALTH

CH 0590 Update and amend the Waterworks Regulations

Part I

General Framework for Waterworks Regulations

Article 1

Definitions

1 **12VAC5-590-10. Definitions and units of measurement.**

2 A. Definitions. As used in this chapter, the following words ~~and~~, terms, and abbreviations
3 shall have meanings respectively set forth unless the context clearly requires a different meaning:

4 "Action level" or "AL" means the concentration of lead or copper in water specified in 12VAC5-
5 590-385, which determines, in some cases, the treatment requirements contained in 12VAC5-
6 590-405 that an owner is required to complete.

7 "Administrative Process Act" or "APA" means Chapter 40 (§ 2.2-4000 et seq.) of Title 2.2 of
8 the Code of Virginia. The APA is the basic law conferring authority on agencies either to make
9 regulations or case decisions as well as to standardize court review thereof.

10 "Air gap separation" means the unobstructed vertical distance through the free atmosphere
11 between the lowest opening from any pipe or faucet supplying pure water to a tank, plumbing
12 fixture, or other device and the rim of the receptacle point of the potable water outlet and the flood
13 rim of the receiving vessel.

14 "~~Annual daily water demand~~" means the ~~average rate of daily water usage over at least the~~
15 ~~most recent three-year period.~~

16 "ANSI" means American National Standards Institute.

17 "Applied water" means water that is ready for filtration.

18 "ASME" means the American Society of Mechanical Engineers.

19 "ASTM" means the American Society for Testing and Materials.

20 ~~"Approved" means material, equipment, workmanship, process or method that has been~~
21 ~~accepted by the commissioner as suitable for the proposed use.~~

22 "Auxiliary water system" means any water supply or system on or available to the premises
23 of the consumer other than the waterworks. ~~These auxiliary waters may include water from a~~
24 ~~source such as wells, lakes, or streams; process fluids; or used water. They These may be~~
25 ~~polluted or contaminated ~~or~~, objectionable, or of questionable quality, and constitute an~~
26 ~~unapproved water source~~ supply or system over which the ~~water purveyor~~ waterworks owner
27 does not have control.

28 "AWWA" means the American Water Works Association.

29 "Backflow" means the undesirable reversal of flow of water or mixtures of water and other
30 liquids, mixtures gases, or other substances into ~~the distribution piping of a waterworks from any~~
31 ~~source or sources other than its intended source.~~

32 "Backflow elimination method" means the air gap separation or physical disconnection that
33 will eliminate the cross-connection.

34 "Backflow prevention assembly" means a mechanical unit, designed to stop the reversal of
35 flow that includes an inlet and outlet shutoff valve and test cocks to facilitate testing of the
36 assembly. Backflow prevention assemblies include the reduced pressure principle backflow
37 prevention (RPZ) assembly, the double gate-double check valve assembly, and the pressure
38 vacuum breaker assembly.

39 "Backflow prevention device" means ~~any approved device, method, or type of construction~~
40 ~~intended to prevent backflow into a waterworks.~~ a mechanical unit designed to stop the reversal
41 of flow that is not testable because it does not have inlet and outlet shutoff valves or test cocks.
42 Backflow prevention devices are not generally designed or constructed to withstand
43 backpressure. Backflow prevention devices generally include the atmospheric type vacuum
44 breakers and the dual check valve type devices.

45 "Backpressure backflow" means backflow caused by pressure in the downstream piping that
46 is superior to the supply pressure at the point of consideration.

47 "Backsiphonage" means backflow caused by a reduction in pressure that causes a partial
48 vacuum creating a siphon effect.

49 "Bag filters" means pressure-driven separation devices that remove particulate matter larger
50 than one micrometer using an engineered porous filtration media. They are typically constructed
51 of a ~~nonrigid~~ non-rigid, fabric filtration media housed in a pressure vessel in which the direction of
52 flow is from the inside of the bag to outside.

53 "Bank filtration" means a water treatment process that uses a well to recover surface water
54 that has naturally infiltrated into groundwater through a river bed ~~or bank(s)~~, bank or banks.
55 Infiltration is typically enhanced by the hydraulic gradient imposed by a nearby pumping water
56 supply or other ~~well(s)~~ well or wells.

57 "Best available technology" or "BAT" means the best practicable technology, treatment
58 techniques, or other means that the commissioner finds, after examination for efficacy under field
59 conditions and not solely under laboratory conditions ~~and in conformance with applicable EPA~~
60 ~~regulations,~~ that are available (taking cost into consideration).

61 "Board" means the State Board of Health.

62 "Boil water advisory" and "boil water notice" mean a statement that informs consumers that
63 their drinking water is, or may be, contaminated and that the water should be boiled before being
64 used for human consumption.

65 "BSSP" means a bacteriological sample siting plan.

66 ~~"Breakpoint chlorination" means the addition of chlorine to water until the chlorine demand~~
67 ~~has been satisfied and further additions result in a residual that is directly proportional to the~~
68 ~~amount added.~~

69 "CAP" means a corrective action plan.

70 "Cartridge filters" means pressure-driven separation devices that remove particulate matter
71 larger than one micrometer using an engineered porous filtration media. They are typically
72 constructed as rigid or semi-rigid, self-supporting filter elements housed in pressure vessels in
73 which flow is from the outside of the cartridge to the inside.

74 ~~"Chlorine" means dry chlorine.~~

75 "Case decision" means an agency determination as defined in § 2.2-4001 of the Code of
76 Virginia.

77 "CCCP" means a cross-connection control program.

78 "CCR" means consumer confidence report.

79 "CDC" means the Centers for Disease Control and Prevention.

80 "CFE" means the combined filter effluent.

81 "CFR" means the Code of Federal Regulations.

82 ~~"Chlorine gas" means dry chlorine in the gaseous state.~~

83 ~~"Chlorine solution (chlorine water)" means a solution of chlorine in water.~~

84 ~~"Chronically noncompliant waterworks" or "CNC" means a waterworks that is unable to~~
85 ~~provide pure water for any of the following reasons: (i) the waterworks' record of performance~~
86 ~~demonstrates that it can no longer be depended upon to furnish pure water to the persons served;~~
87 ~~(ii) the owner has inadequate technical, financial, or managerial capacity to furnish pure water to~~
88 ~~the people served; (iii) the owner has failed to comply with an order issued by the board or the~~
89 ~~commissioner; (iv) the owner has abandoned the waterworks and has discontinued supplying~~
90 ~~pure water to the persons served; or (v) the owner is subject to a forfeiture order pursuant to §~~
91 ~~32.1-174.1 of the Code of Virginia.~~

92 "Clean compliance history" means a record of no PMCL violations for microbiological
93 contaminants, no monitoring violations under 12VAC5-590-370, and no coliform treatment
94 technique trigger exceedances or treatment technique violations under 12VAC5-590-392.

95 "Coagulation" means a process using coagulant chemicals and mixing by which colloidal and
96 suspended materials are destabilized and agglomerated into floc.

97 ~~"Coliform bacteria group" means a group of bacteria predominantly inhabiting the intestines~~
98 ~~of man or animal but also occasionally found elsewhere. It includes all aerobic and facultative~~
99 ~~anaerobic, gram-negative, non-sporeforming bacilli that ferment lactose with production of gas.~~
100 ~~Also included are all bacteria that produce a dark, purplish-green colony with metallic sheen by~~
101 ~~the membrane filter technique used for coliform identification.~~

102 "Combined distribution system" means the interconnected distribution system consisting of
103 the distribution systems of wholesale waterworks and of the consecutive waterworks that receive
104 finished water.

105 "Commissioner" means the State Health Commissioner, who is the executive officer of the
106 board.

107 "Community waterworks" means a waterworks that serves at least 15 service connections
108 used by year-round residents or regularly serves at least 25 year-round residents.

109 "Compliance cycle" means the nine-year calendar year cycle during which a waterworks shall
110 monitor. Each compliance cycle consists of three three-year compliance periods. The first
111 calendar year cycle ~~begins~~ began January 1, 1993, and ~~ends~~ ended December 31, 2001; the
112 second ~~begins~~ January 1, 2002, and ~~ends~~ December 31, 2010; the third ~~begins~~ January 1, 2011,
113 and ~~ends~~ December 31, 2019 with subsequent compliance cycles continuing thereafter.

114 "Compliance period" means a three-year calendar year period within a compliance cycle.
115 Each compliance cycle ~~has~~ consists of three three-year compliance periods. ~~Within the first~~
116 ~~compliance cycle, the first compliance period runs from January 1, 1993, to December 31, 1995;~~
117 ~~the second from January 1, 1996, to December 31, 1998; the third from January 1, 1999, to~~
118 ~~December 31, 2001.~~ The first compliance period began January 1, 1993 and ended December
119 31, 1995, with subsequent compliance periods continuing thereafter.

120 "Comprehensive business plan" means a plan detailing the technical, managerial, and
121 financial (TMF) commitments that the owner will make in order to assure that the waterworks will
122 have the capability to provide water that complies with the regulations over the long term.

123 "~~Comprehensive performance evaluation~~" or "~~CPE~~" means a thorough review and analysis of
124 a ~~treatment plant's performance-based capabilities and associated administrative, operational~~
125 ~~and maintenance practices. It is conducted to identify factors that may be adversely impacting a~~
126 ~~plant's capability to achieve compliance and emphasizes approaches that can be implemented~~
127 ~~without significant capital improvements. For purposes of compliance with 12VAC5-590-530 E 1~~
128 ~~b (2), the comprehensive performance evaluation shall consist of at least the following~~
129 ~~components: assessment of plant performance, evaluation of major unit processes, identification~~
130 ~~and prioritization of performance limiting factors, assessment of the applicability of comprehensive~~
131 ~~technical assistance, and preparation of a CPE report.~~

132 "Confirmation sample" means another sample to be collected by the owner within a specified
133 time after the results of the initial sample are known to have exceeded a specified limit or standard,
134 in order to validate the initial result and to determine compliance.

135 "Confluent growth" means a continuous bacterial growth covering the entire filtration area of
136 a membrane filter, or a portion thereof, in which bacterial colonies are not discrete.

137 "Consecutive waterworks" means a waterworks that ~~has no water production or source facility~~
138 ~~of its own and that obtains all of its water from another permitted waterworks or receives some or~~
139 ~~all of its finished water from one or more wholesale waterworks.~~ Consecutive waterworks may
140 provide additional treatment to finished water. Delivery may be through a direct connection or
141 through the distribution system of one or more consecutive waterworks.

142 "Consolidated" means rock made from sedimentary, igneous, or metamorphic materials that
143 have been metamorphosed or cemented together forming strata or bodies of rock.

144 "Consumer" means any person ~~who drinks~~ receiving water for human consumption ~~water~~ from
145 a waterworks.

146 "Consumer's water system" means any water system located on the consumer's premises,
147 supplied by or in any manner connected to a waterworks.

148 "Containment" means the safeguard against backflow into a waterworks from a consumer's
149 water system by installing an appropriate backflow prevention assembly, backflow prevention
150 device, or backflow elimination method at the service connection.

151 "Contaminant" means any objectionable or hazardous physical, chemical, biological, or
152 radiological substance or matter in water.

153 "Conventional filtration treatment" means a series of processes including coagulation,
154 flocculation, sedimentation, and filtration resulting in substantial particulate removal.

155 "Corrosion inhibitor" means a substance capable of reducing the corrosivity of water toward
156 metal plumbing materials, especially lead and copper, by forming a protective film on the interior
157 surface of those materials.

158 ~~"Cross-connection"~~ "Cross-connection" means any ~~connection or structural arrangement,~~
159 ~~direct or indirect, to the waterworks whereby~~ actual or potential link, connection or physical
160 arrangement, direct or indirect, between used water, an auxiliary water system, or other source
161 of contamination to the waterworks through which backflow can occur.

162 ~~"CT" or "CT_{calc}"~~ means the product of ~~"residual disinfectant concentration" (C) in mg/L~~
163 ~~determined before or at the first customer~~ consumer, and the corresponding "disinfectant contact
164 time" (T) in minutes (i.e., "C" x "T").

165 ~~"Daily fluid intake" means the daily intake of water for drinking and culinary use and is defined~~
166 ~~as two liters.~~

167 ~~"Dechlorination" means the partial or complete reduction of residual chlorine in water by any~~
168 ~~chemical or physical process at a waterworks with a treatment facility.~~

169 ~~"Degree of hazard" means the level of health hazard, as derived from an evaluation of the~~
170 ~~potential risk to health and the adverse effect upon the waterworks.~~

171 "DBPPs" means disinfection byproduct precursors.

172 "DBPs" means disinfection byproducts.

173 "DCLS" means the Virginia Department of General Services, Division of Consolidated
174 Laboratory Services.

175 "Department" means the Virginia Department of Health.

176 "DEQ" means the Virginia Department of Environmental Quality.

177 "Diatomaceous earth filtration" means a process resulting in substantial particulate removal
178 in which (i) a precoat cake of diatomaceous earth filter media is deposited on a support membrane
179 (septum), and (ii) while the water is filtered by passing through the cake on the septum, additional
180 filter media known as body feed is continuously added to the feed water to maintain the
181 permeability of the filter cake.

182 "Direct filtration" means a series of processes including coagulation and filtration but excluding
183 sedimentation resulting in substantial particulate removal.

184 "Disinfectant" means any ~~oxidant (including chlorine)~~ that is chemical and physical agents,
185 including chlorine, chlorine dioxide, chloramines, ozone and UV light, added to water in any part
186 of the treatment or distribution process for the purpose of killing or ~~deactivating~~ inactivating
187 pathogenic organisms.

188 "~~Disinfectant contact time~~" ("~~T~~" in CT calculations) means the time in minutes that it takes for
189 water to move from the point of disinfectant application to the point where residual disinfectant
190 concentration ("~~C~~") is measured.

191 "Disinfection" means a process that inactivates or destroys pathogenic organisms in water by
192 ~~chemical oxidants or equivalent agents~~ use of a disinfectant.

193 "Disinfection profile" means a summary of Giardia lamblia or virus inactivation through the
194 water treatment plant.

195 "Distribution main" means a water ~~main~~ pipeline whose primary purpose is to ~~provide treated~~
196 convey drinking water to service connections.

197 "Distribution system" means a network of pipelines and appurtenances by which a waterworks
198 delivers drinking water to its consumers.

199 "~~District engineer~~" means the employee assigned by the Commonwealth of Virginia,
200 Department of Health, Office of Drinking Water to manage its regulatory activities in a

201 geographical area of the state consisting of a state planning district or subunit of a state planning
202 district.

203 "~~Domestic or other nondistribution system plumbing problem~~" means a coliform contamination
204 problem in a waterworks with more than one service connection that is limited to the specific
205 service connection from which the coliform positive sample was taken.

206 "DOC" means the dissolved organic carbon in a water sample.

207 "Double gate-double check valve assembly" means an ~~approved~~ assembly composed of two
208 single independently acting check valves including tightly closing shutoff valves located at each
209 end of the assembly and petcocks and test gauges for testing the watertightness of each check
210 valve.

211 "DPOR" means the Virginia Department of Professional and Occupational Regulation.

212 "Drawdown" means the difference, measured vertically, between the static water level in the
213 well and the water level during pumping.

214 "Dual sample set" means a set of two samples collected at the same time and same location,
215 with one sample analyzed for TTHM and the other sample analyzed for HAA5. ~~Dual sample sets~~
216 ~~are collected for the purposes of conducting an initial distribution system evaluation (IDSE) under~~
217 ~~12VAC5-590-370 B 3 e (2) and determining compliance with the TTHM and HAA5 MCLs under~~
218 ~~12VAC5-590-370 B 3 e (3).~~

219 "EDR" means electro dialysis reversal.

220 "~~Effective corrosion inhibitor residual~~" means, for the purpose of 12VAC5-590-405 A 1 only, a
221 concentration sufficient to form a passivating film on the interior walls of a pipe.

222 "Enhanced coagulation" means the addition of sufficient coagulant for improved removal of
223 disinfection byproduct precursors by conventional filtration treatment.

224 "Enhanced softening" means the improved removal of disinfection byproduct precursors by
225 precipitative softening.

226 "Entry point" means the place where water from the source after application of any treatment
227 is delivered to the distribution system. Where two or more sources are combined before
228 distribution, the entry point is the location that is representative of the blended water following all
229 treatment.

230 "EPA" means the United States Environmental Protection Agency.

231 ~~"Equivalent residential connection" means a volume of water used equal to a residential~~
232 ~~connection that is 400 gallons per day unless supportive data indicates otherwise.~~

233 ~~"Exception" means an approved deviation from a "shall" criteria contained in Part III (12VAC5-~~
234 ~~590-640 et seq.) of this chapter.~~

235 "Exemption" means allowing a waterworks that satisfies the criteria in 12VAC5-590-150 to
236 deviate from ~~a conditional waiver of a specific PMCL or treatment technique requirement that is~~
237 ~~granted to a specific~~ the waterworks for a limited period of time.

238 "Filter profile" means a graphical representation of individual filter performance, based on
239 continuous turbidity measurements or total particle counts versus time for an entire filter run, from
240 ~~startup~~ start-up to backwash inclusively, that includes an assessment of filter performance while
241 another filter is being backwashed.

242 "Filtration" means a process for removing particulate matter from water by passage through
243 porous media.

244 "Finished water" means water that is introduced into the distribution system of a waterworks
245 and is intended for distribution and consumption without further treatment, except as treatment
246 necessary to maintain water quality in the distribution system (~~e.g., booster disinfection, addition~~
247 ~~of corrosion control chemicals).~~ (e.g., booster disinfection).

248 ~~"First draw sample" means a one-liter sample of tap water, collected in accordance with~~
249 ~~12VAC5-590-375 B 2, that has been standing in plumbing pipes at least six hours and is collected~~
250 ~~without flushing the tap.~~

251 "Flocculation" means a process to enhance agglomeration or collection of smaller floc
252 particles into larger, more easily settleable particles through gentle stirring by hydraulic or
253 mechanical means.

254 "Flowing stream" means a course of running water flowing in a definite channel.

255 "Free available chlorine" means that portion of the total ~~residual~~ chlorine residual remaining
256 in water at the end of a specified contact period that will react chemically and biologically as
257 hypochlorous acid or hypochlorite ion.

258 ~~"GAC10" means granular activated carbon filter beds with an empty bed contact time of 10~~
259 ~~minutes based on average daily flow and a carbon reactivation frequency of every 180 days,~~
260 ~~except that the reactivation frequency for GAC10 used as a best available technology for~~
261 ~~compliance with 12VAC5-590-410 C 2 b (1) (b) shall be 120 days.~~

262 ~~"GAC20" means granular activated carbon filter beds with an empty bed contact time of 20~~
263 ~~minutes based on average daily flow and a carbon reactivation frequency of every 240 days.~~

264 "GAC" means granular activated carbon.

265 ~~"Governmental entity" means the Commonwealth, a town, city, county, service authority,~~
266 ~~sanitary district, or any other governmental body established under the Code of Virginia, including~~
267 ~~departments, divisions, boards, or commissions.~~

268 "Gross alpha particle activity" means the total radioactivity due to alpha particle emission as
269 inferred from measurements on a dry sample.

270 "Gross beta particle activity" means the total radioactivity due to beta particle emission as
271 inferred from measurements on a dry sample.

272 "Groundwater" means all water obtained from sources not classified as surface water ~~(or~~
273 ~~surface water sources).~~

274 "Groundwater system" means any waterworks that uses groundwater as its source of supply;
275 however, a waterworks that combines all its groundwater with surface water or with groundwater
276 under the direct influence of surface water ~~prior to~~ before treatment is not a groundwater system.
277 Groundwater systems include consecutive waterworks that receive ~~finished groundwater from a~~
278 ~~wholesale waterworks~~ potable water from another groundwater source.

279 "Groundwater under the direct influence of surface water" or "GUDI" means any water
280 beneath the surface of the ground with (i) significant occurrence of insects or other
281 macroorganisms, algae, or large-diameter pathogens such as Giardia lamblia, or
282 Cryptosporidium. ~~It also means~~ or (ii) significant and relatively rapid shifts in water characteristics
283 such as turbidity, temperature, conductivity, or pH that closely correlate to climatological or
284 surface water conditions. ~~The~~ GUDI source determinations shall be made by the department
285 ~~commissioner~~ in accordance with 12VAC5-590-430 ~~will determine direct influence of surface~~
286 ~~water.~~

287 "GWMA" means the groundwater management area designation by the State Water Control
288 Board.

289 "Haloacetic acids (five)" or "HAA5" means the sum of the concentrations ~~in milligrams per liter~~
290 of the haloacetic acid ~~compounds (monochloroacetic acid, dichloroacetic acid, trichloroacetic~~
291 ~~acid, monobromoacetic acid, and dibromoacetic acid), rounded to two significant figures after~~
292 ~~addition.~~ acids, expressed in milligrams per liter (mg/L) as rounded to two significant figures. For

293 the purpose of this chapter the HAA5 shall mean monochloroacetic acid, dichloroacetic acid,
294 trichloroacetic acid, monobromoacetic acid, and dibromoacetic acid.

295 "Halogen" means one of the chemical elements chlorine, bromine, fluorine, astatine, or iodine.

296 "Health hazard" means any condition, device, or practice in a waterworks or its operation that
297 creates, or may create, a danger to the health and well-being of the water consumer.

298 ~~"Health regulations" means regulations that include all primary maximum contaminant levels,~~
299 ~~treatment technique requirements, and all operational regulations, the violation of which would~~
300 ~~jeopardize the public health.~~

301 "HPC" means the heterotrophic plate count of a bacterial population.

302 "Human consumption" means drinking, food preparation, dishwashing, bathing, showering,
303 hand washing, teeth brushing, and maintaining oral hygiene.

304 ~~"Hypochlorite" means a solution of water and some form of chlorine, usually sodium~~
305 ~~hypochlorite~~ the ionic component from the disassociation of hypochlorous acid that performs the
306 function of disinfection. It is the available active ingredient in liquid hypochlorite disinfectants such
307 as sodium and calcium hypochlorite.

308 ~~"Initial compliance period" means for all regulated contaminants, the initial compliance period~~
309 ~~is the first full three-year compliance period beginning at least 18 months after promulgation with~~
310 ~~the exception of waterworks with 150 or more service connections for contaminants listed at Table~~
311 ~~2.3, VOC 19-21; Table 2.3, SOC 19-33; and antimony, beryllium, cyanide (as free cyanide), nickel,~~
312 ~~and thallium that shall begin January 1993~~ the compliance period in which chemical monitoring
313 begins.

314 ~~"Interchangeable connection" means an arrangement or device that will allow alternate but~~
315 ~~not simultaneous use of two sources of water.~~

316 "Isolation" means the safeguard against backflow into a waterworks from a consumer's water
317 system by installing an appropriate backflow prevention assembly or device or by installing a
318 backflow elimination method at the sources of potential contamination in the consumer's water
319 system. This is also called point-of-use isolation.

320 "Karst geology" means an area predominantly underlain by limestone, dolomite, or gypsum
321 and characterized by rapid underground drainage. ~~Such~~ These areas often feature sinkholes,
322 caverns, and sinking or disappearing creeks. ~~In Virginia, this generally includes all that area west~~
323 ~~of the Blue Ridge and, in Southwest Virginia, east of the Cumberland Plateau.~~

324 "Lake/reservoir" means a natural or ~~manmade~~ man-made basin or hollow on the Earth's
325 surface in which water collects or is stored that may or may not have a current or single direction
326 of flow.

327 ~~"Large waterworks" means, for the purposes of 12VAC5-590-375, 12VAC5-590-405,~~
328 ~~12VAC5-590-530 F, and 12VAC5-590-550 D only, a waterworks that serves more than 50,000~~
329 ~~persons.~~

330 "Lead free" means the following: (i) 1. When ~~when~~ used with respect to solders and flux, refers
331 to solders and flux containing not more than 0.2% lead; and (ii) 2. When ~~when~~ used with respect
332 to pipes, and pipe fittings, refers to pipes and pipe fittings containing not more than 8.0% lead;
333 pipe fittings, plumbing fittings, and plumbing fixtures, refers to the weighted average of wetted
334 surfaces of pipes, pipe fittings, plumbing fittings, and plumbing fixtures containing not more than
335 0.25% lead.

336 ~~3. When used with respect to plumbing fittings and fixtures intended by the plumbing~~
337 ~~manufacturer to dispense water for human ingestion, refers to fittings and fixtures that are~~
338 ~~in compliance with standards established in accordance with 42 USC § 300g-6(e).~~

339 "Lead service line" means a ~~service line~~ pipeline made of lead that connects the ~~water~~
340 distribution main to the building inlet and any lead pigtail, gooseneck, or other fitting that is
341 connected to ~~such lead line~~ the lead pipeline.

342 "Leakage" means the loss of potable water from the distribution system, up to the points of
343 service connections, through breaks or defects in piping and piping appurtenances.

344 "Legionella" means a genus of bacteria, some species of which have caused a type of
345 pneumonia called Legionnaires disease.

346 "Level 1 assessment" means an evaluation to identify the possible presence of sanitary
347 defects, defects in distribution system coliform monitoring practices, and, when possible, the likely
348 reason that the waterworks triggered the assessment.

349 "Level 2 assessment" means an evaluation to identify the possible presence of sanitary
350 defects, defects in distribution system coliform monitoring practices, and, when possible, the likely
351 reason that the waterworks triggered the assessment in a more comprehensive investigation than
352 a Level 1 assessment.

353 "~~Liquid chlorine~~" means ~~a liquefied, compressed chlorine gas as shipped in commerce~~.

354 "Locational running annual average" or "LRAA" means the average of sample analytical
355 results for samples taken at a particular monitoring location during the previous four calendar
356 quarters.

357 "Log inactivation (~~log removal~~)" means ~~that a 99% reduction is a 2-log inactivation; a 99.9%~~
358 ~~reduction is a 3-log inactivation; a 99.99% reduction is a 4-log inactivation~~ means the inactivation
359 of organisms expressed on a logarithmic scale. For example, a 99.9% inactivation is a 3-log
360 inactivation; whereas a 99.99% inactivation is a 4-log inactivation.

361 "Log removal" means the removal of organisms expressed on a logarithmic scale. For
362 example, a 99.9% is a 3-log removal; whereas a 99.99% removal is a 4-log removal.

363 ~~"Manmade beta particle and photon emitters" means all radionuclides emitting beta particles~~
364 ~~and/or photons listed in the most current edition of "Maximum Permissible Body Burdens and~~
365 ~~Maximum Permissible Concentration of Radionuclides in Air or Water for Occupational~~
366 ~~Exposure," National Bureau of Standards Handbook 69, except the daughter products of thorium-~~
367 ~~232, uranium-235 and uranium-238.~~

368 "Maximum contaminant level" or "MCL" means the maximum permissible level of a
369 contaminant in ~~pure~~ potable water that is delivered to any user consumer of a waterworks. MCLs
370 are set as close to the MCLGs as feasible using the ~~best available treatment technology~~ BAT.
371 MCLs may be either "primary" (PMCL), meaning based on health considerations, or "secondary"
372 (SMCL), meaning based on aesthetic considerations.

373 "Maximum contaminant level goal" or "MCLG" means the maximum level of a contaminant in
374 drinking water at which no known or anticipated adverse effect on the health of persons would
375 occur ~~and that allows an adequate margin of safety.~~ Applying an adequate margin of safety to the
376 MCLG allows the MCL to be set as the standard. Maximum contaminant level goals are
377 ~~nonenforceable~~ non-enforceable health goals.

378 ~~"Maximum daily water demand" means the rate of water usage during the day of maximum~~
379 ~~water use.~~

380 "Maximum residual disinfectant level" or "MRDL" means a level of a disinfectant added for
381 water treatment that may not be exceeded at the consumer's tap without an unacceptable
382 possibility of adverse health effects. ~~For chlorine and chloramines, a waterworks is in compliance~~
383 ~~with the MRDL when the running annual average of monthly averages of samples taken in the~~
384 ~~distribution system, computed quarterly, is less than or equal to the MRDL. For chlorine dioxide,~~
385 ~~a waterworks is in compliance with the MRDL when daily samples are taken at the entrance to~~
386 ~~the distribution system and no two consecutive daily samples exceed the MRDL. MRDLs are~~
387 ~~enforceable in the same manner as maximum contaminant levels. There is convincing evidence~~

388 ~~that addition of a disinfectant is necessary for control of waterborne microbial contaminants.~~
389 ~~Notwithstanding the MRDLs listed in Table 2.12, operators may increase residual disinfectant~~
390 ~~levels of chlorine or chloramines (but not chlorine dioxide) in the distribution system to a level and~~
391 ~~for a time necessary to protect public health to address specific microbiological contamination~~
392 ~~problems caused by circumstances such as distribution line breaks, storm runoff events, source~~
393 ~~water contamination, or cross connections.~~

394 "Maximum residual disinfectant level goal" or "MRDLG" means the maximum level of a
395 disinfectant added for water treatment at which no known or anticipated adverse effect on the
396 health of persons would occur, and that allows an adequate margin of safety. MRDLGs are
397 nonenforceable health goals and do not reflect the benefit of the addition of the chemical for
398 control of waterborne microbial contaminants.

399 "Maximum total trihalomethane potential" or "MTP" means the maximum concentration of total
400 trihalomethanes (TTHMs) produced in a given water containing a residual disinfectant ~~residual~~
401 after seven days at a temperature of 25°C or above.

402 ~~"Medium waterworks" means, for the purpose of 12VAC5-590-375 and 12VAC5-590-405~~
403 ~~only, a waterworks that serves greater than 3,300 and less than or equal to 50,000 persons.~~

404 "Membrane filtration" means a pressure or vacuum-driven separation process in which
405 particulate matter larger than one micrometer is rejected by an engineered barrier, primarily
406 through a size exclusion mechanism, and that has a measurable removal efficiency of a target
407 organism that can be verified through the application of a direct integrity test. ~~This definition~~
408 ~~includes the common membrane technologies of microfiltration, ultrafiltration, nanofiltration, and~~
409 ~~reverse osmosis~~ Included in this definition are the common membrane classifications of
410 microfiltration (MF), ultrafiltration (UF), nanofiltration (NF), and reverse osmosis (RO).

411 "Membrane module" means the smallest component of a membrane unit in which a specific
412 membrane surface area is housed in a device with a filtrate outlet.

413 "Membrane technologies" means those processes that use a permeable membrane to
414 remove ions, molecules, or particles from the process stream, such as MF, UF, NF, RO, and EDR.

415 "Membrane unit" means a group of membrane modules that share common valving that allows
416 the unit to be isolated from the rest of the system for the purpose of integrity testing or other
417 maintenance.

418 "Method detection limit" or "MDL" means the minimum concentration of a substance that can
419 be measured and reported with 99% confidence that the analyte concentration is greater than
420 zero and is determined from analysis of a sample in a given matrix containing the analyte.

421 "Microfiltration" or "MF" means a pressure-driven membrane technology that separates
422 particles, based on the pore-size rating of the membrane, from a feed stream by using a sieving
423 mechanism. Typically, MF can remove particles down to 0.1 micrometer in size.

424 "Most probable number" or "MPN" means ~~that~~ the density or number of organisms per unit
425 volume that, in accordance with statistical theory, would be more likely than any other number to
426 yield the observed test result or that would yield the observed test result with the greatest
427 frequency, expressed as density of organisms per 100 milliliters. Results are computed from the
428 number of positive findings of coliform-group organisms resulting from multiple-portion decimal-
429 dilution plantings most likely to be present in a water sample, and obtained from method-specific
430 statistical MPN tables.

431 "MPA" means the microscopic particulate analysis method approved by EPA for use in the
432 determination of whether a groundwater is under the influence of surface water.

433 "Nanofiltration" or "NF" means a pressure-driven membrane technology designed to remove
434 multivalent ions ("softening") and other constituents based on the pore size, which ranges from 1

435 – 10 nanometers. Nanofiltration membranes typically operate under a pressure range of 600 –
436 1100 psi.

437 "ND" means "nondetected" and is typically used by laboratories to express the absence of an
438 analyte in a test sample.

439 "Noncommunity waterworks" means a waterworks that is not a community waterworks, but
440 operates at least 60 days out of the year.

441 "Nonpotable water" means water not classified as pure water.

442 "Nontransient noncommunity waterworks" or "NTNC" means a waterworks that is not a
443 community waterworks and that regularly serves at least 25 of the same persons over six months
444 out of the year. When used in the context of an NTNC, "regularly serves" means four or more
445 hours per day, for four or more days per week, for 26 or more weeks per year.

446 "NSF" means the National Sanitation Foundation.

447 ~~"Office" or "ODW" means the Commonwealth of Virginia, Department of Health, Office of~~
448 ~~Drinking Water.~~

449 "One hundred year flood elevation level" or "100-year flood elevation" means the flood
450 ~~elevation that will, over a long period of time, be equaled or exceeded on the average once every~~
451 ~~100 years~~ that has a 1% probability of being equaled or exceeded in any given year.

452 "Operating staff" means individuals employed or appointed by an owner to work at a
453 waterworks. Included in this definition are operators, whether or not their license is appropriate
454 for the classification and category of the waterworks, and unlicensed individuals.

455 "Operator" means any individual with the requisite skills, employed or appointed by any owner,
456 and who is designated by ~~such the~~ owner to be the person ~~in responsible charge, such as having~~
457 full responsibility for the waterworks operations and any subordinate operating staff. The

458 individual may be a supervisor, a shift operator, or a substitute in charge, and whose duties
459 include testing or evaluation to control waterworks operations. Not included in this definition are
460 superintendents or directors of public works, city engineers, or other municipal or industrial
461 officials whose duties do not include the actual operation or direct supervision of waterworks.

462 "Optimal corrosion control treatment" means the corrosion control treatment that minimizes
463 the lead and copper concentrations at ~~users'~~ consumers' taps while ensuring that the treatment
464 does not cause the waterworks to violate any other section of this chapter.

465 "Optimum fluoride ion concentration" means that fluoride ion concentration recommended by
466 the U.S. Public Health Service for protection from dental caries.

467 "Owner" or "~~water purveyor~~" means an individual, group of individuals, partnership, firm,
468 association, institution, corporation, governmental entity, or the federal government that supplies
469 or proposes to supply water to any person within this ~~state~~ Commonwealth from or by means of
470 any waterworks (~~see Article 2 (§ 32.1-167 et seq.) of Chapter 6 of Title 32.1 of the Code of~~
471 ~~Virginia~~).

472 "PAC" means powdered activated carbon.

473 "PCBs" means polychlorinated biphenyls.

474 "PER" means a preliminary engineering report.

475 "Permit" means an authorization granted by the commissioner to construct or operate a
476 waterworks.

477 "Permitted capacity" means the limiting hydraulic capability of the waterworks, taking into
478 consideration the source water capacity, treatment facilities, finished water storage, delivery, and
479 distribution system.

480 "Person" means any individual, corporation, partnership, association, cooperative, limited
481 liability company, trust, joint venture, government, political subdivision, or any other legal or
482 commercial entity and any successor, representative, agent, or instrumentality thereof.

483 "pH" means the negative logarithm of the hydrogen ion concentration of an aqueous solution.

484 "Physical disconnection" means the removal or absence of pipes, fittings, or fixtures that
485 connect a waterworks directly or indirectly to any other water system.

486 "Picocurie" or "pCi" means that quantity of radioactive material producing 2.22 nuclear
487 transformations per minute.

488 ~~"Plant intake" means the works or structures at the head of a conduit through which water is~~
489 ~~diverted from a source (e.g., river or lake) into the treatment plant.~~

490 "PMCL" – see "Maximum contaminant level".

491 "Point of disinfectant application" means the point where the disinfectant is applied and water
492 downstream of that point is not subject to recontamination by surface ~~water~~-runoff.

493 "Point-of-entry ~~treatment~~ device" or "POE device" means a treatment device applied to the
494 water entering a house or building for the purpose of reducing contaminants in the water
495 distributed throughout the house or building.

496 "Point-of-use ~~treatment~~ device" or "POU device" means a treatment device applied to a single
497 tap for the purpose of reducing contaminants in the water at that one tap.

498 "Pollution" means the presence of any foreign substance (chemical, physical, radiological, or
499 biological) in water that tends to degrade its quality so as to constitute an unnecessary risk to
500 human health or impair the usefulness of the water.

501 ~~"Pollution hazard" means a condition through which an aesthetically objectionable or~~
502 ~~degrading material may enter the waterworks or a consumer's water system.~~

503 ~~"Postchlorination" means the application of chlorine to water subsequent to treatment.~~

504 "Potable water" – see "Pure water."

505 "Practical quantitation level" or "PQL" means the lowest level ~~achievable by good laboratories~~
506 ~~within specified limits during routine laboratory operating conditions~~ that can be reliably measured
507 within specified limits of precision and accuracy during routine laboratory conditions.

508 "Prechlorination" means the application of chlorine to water ~~prior to~~ before filtration.

509 "Presedimentation" means a preliminary treatment process used to remove gravel, sand, and
510 other particulate material from the source water through settling before the water enters the
511 primary clarification and filtration processes in a water treatment plant.

512 "Pressure vacuum breaker assembly" means an assembly designed to prevent
513 backsiphonage and used for high-hazard or low-hazard situations, composed of an independently
514 operating, spring-loaded check valve; an independently operating, spring-loaded air-inlet valve;
515 and tightly closing shutoff valves located at each end of the assembly; and fitted with properly
516 located test cocks.

517 "Primary disinfection" means disinfection to achieve a desired level of inactivation of targeted
518 pathogenic organisms in water by chemical or physical agents as an integral part of the treatment
519 process.

520 "Process fluids" means any fluid or solution that may be chemically, biologically, or otherwise
521 contaminated or polluted that would constitute a health, ~~pollutional~~ environmental, or system
522 hazard if introduced into the waterworks. This includes, but is not limited to: (i) polluted or
523 contaminated water; (ii) used waters; (iii) cooling waters; (iv) contaminated natural waters taken
524 from wells, lakes/reservoirs, streams, or irrigation systems; (v) chemicals in solution or
525 suspension; or (vi) oils, gases, acids, alkalis, and other liquid and gaseous fluid used in industrial
526 or other processes.

- 527 ~~1. Polluted or contaminated water;~~
- 528 ~~2. Process waters;~~
- 529 ~~3. Used waters, originating from the waterworks that may have deteriorated in sanitary~~
- 530 ~~quality;~~
- 531 ~~43. Cooling waters;~~
- 532 ~~54. Contaminated natural waters taken from wells, lakes, lakes/reservoirs, streams, or~~
- 533 ~~irrigation systems;~~
- 534 ~~65. Chemicals in solution or suspension; and or~~
- 535 ~~76. Oils, gases, acids, alkalis, and other liquid and gaseous fluid used in industrial or other~~
- 536 ~~processes, or for firefighting purposes.~~

537 "Process water" means water used for dissolving dry chemicals; diluting liquid chemicals; and

538 operating chemical feeders, treatment facilities, or equipment.

539 "Project documents" means the engineer's report, design criteria, preliminary and final plans,

540 specifications, and procurement documents for the construction of new waterworks or

541 modifications to existing waterworks.

542 "Pure water" means water fit for human consumption that is (i) sanitary and normally free of

543 minerals, organic substances, and toxic agents in excess of reasonable amounts and (ii)

544 adequate in quantity and quality for the minimum health requirements of the persons served (~~see~~

545 ~~Article 2 (§ 32.1-167 et seq.) of Chapter 6 of Title 32.1 of the Code of Virginia).~~

546 ~~"Raw water main" means a water main that conveys untreated water from a source to a~~

547 ~~treatment facility.~~

548 "QCRV" means the quality control release value used in challenge tests of microfiltration (MF)

549 and ultrafiltration (UF) membrane filters.

550 "RAA" means running annual average.

551 "Reduced pressure principle backflow prevention ~~device~~assembly" or "RPZ ~~device~~assembly"
552 means a ~~device containing a minimum of two independently acting check valves together with an~~
553 ~~automatically operated pressure differential relief valve located between the two check valves~~ an
554 assembly designed to prevent backsiphonage or backpressure backflow used for high or low
555 hazard situations, composed of two independently operating spring-loaded check valves together
556 with an independent, hydraulically operating pressure differential relief valve located between the
557 two check valves. During normal flow and at the cessation of normal flow, the pressure between
558 these two checks shall be less than the supply pressure. ~~In case of leakage of either check valve,~~
559 ~~the differential relief valve, by discharging to the atmosphere, shall operate to maintain the~~
560 ~~pressure between the check valves at less than the supply pressure.~~ The unit assembly shall
561 include tightly closing shutoff valves located at each end of the ~~device~~ RPZ assembly, and each
562 device shall be fitted with properly located test cocks. ~~These devices shall be of the approved~~
563 ~~type.~~

564 "Regulations" means the Waterworks Regulations (12VAC5-590).

565 "REM" means the unit of dose equivalent from ionizing radiation to the total body or any
566 internal organ or organ system. A millirem (~~MREM~~) mrem is 1/1000 of a REM.

567 "Repeat compliance period" means any subsequent compliance period after the initial
568 compliance period.

569 "Residual disinfectant concentration" (~~"C" in CT Calculations~~) means the concentration of
570 disinfectant measured in mg/L in a representative sample of water.

571 "~~Responsible charge~~" means ~~designation by the owner of any individual to have duty and~~
572 ~~authority to operate or modify the operation of waterworks processes.~~

573 "Reverse osmosis" or "RO" means a membrane technology designed to remove salts, low-
574 molecular weight solutes, and all other constituents up to 0.0001 micron in size by applying a
575 pressure in excess of osmotic pressure to force water through a semi-permeable membrane from
576 a region of high solution concentration to a region of lower solution concentration.

577 ~~"Sanitary facilities" means piping and fixtures, such as sinks, lavatories, showers, and toilets,~~
578 ~~supplied with potable water and drained by wastewater piping.~~

579 "Sanitary defect" means a defect that could provide a pathway of entry for microbial
580 contamination into the distribution system or that is indicative of a failure or imminent failure in a
581 protective barrier that is already in place.

582 "Sanitary survey" means an evaluation conducted by ~~ODW~~ the department of a waterworks'
583 water supply, facilities, equipment, operation, maintenance, monitoring records, and overall
584 management ~~of a waterworks~~ to ensure the provision of ~~pure~~ potable water.

585 "SDWA" means the Safe Drinking Water Act and its amendments.

586 "Seasonal waterworks" means a noncommunity waterworks that is not operated as a
587 waterworks on a year-round basis, and starts up and shuts down at the beginning and end of
588 each operating season.

589 ~~"Secondary water source" means any approved water source, other than a waterworks'~~
590 ~~primary source, connected to or available to that waterworks for emergency or other nonregular~~
591 ~~use.~~

592 "Secondary disinfection" means disinfection by chemical oxidants or equivalent agents
593 applied at the entry point or in the distribution system to provide a residual disinfectant in water to
594 maintain water quality and safeguard against chance contamination from permeation, leaching,
595 intrusion, regrowth, or biofilms.

596 "Sedimentation" means a process for removal of solids before filtration by gravity or
597 separation.

598 "Service connection" means the point of delivery of finished water ~~to a customer's building~~
599 ~~service line as follows:~~ from a waterworks to a consumer's water system, fire protection system,
600 irrigation system, and to all other points where finished water is delivered through the distribution
601 system to a consumer. Service connections may be permanent, temporary, or emergency.

602 1. ~~If a meter is installed, the service connection is the downstream side of the meter;~~

603 2. ~~If a meter is not installed, the service connection is the point of connection to the~~
604 ~~waterworks;~~

605 3. ~~When the water purveyor is also the building owner, the service connection is the entry~~
606 ~~point to the building.~~

607 "~~Service line sample~~" means ~~a one-liter sample of water, collected in accordance with~~
608 ~~12VAC5-590-375 B 2 c, that has been standing for at least six hours in a service line.~~

609 "Sewer" means any pipe or conduit used to convey sanitary sewage, stormwater, or industrial
610 waste streams. Combined sewers convey both stormwater and sanitary sewage.

611 "Significant deficiency" means any defect in a waterworks' design, operation, maintenance, or
612 administration, as well as the failure or malfunction of any waterworks component, that may
613 cause, or has the potential to cause, an unacceptable risk to health or could affect the reliable
614 delivery of ~~pure~~ potable water to consumers.

615 "Single-family structure" means, for the purpose of 12VAC5-590-375 B only, a building
616 constructed as a single-family residence that is currently used as either a residence or a place of
617 business.

618 "Site visit" means a tour of a waterworks by department staff or other authorized persons for
619 purposes including assessing and documenting its physical condition, operations, and
620 compliance activities.

621 "Slow sand filtration" means a process involving passage of raw source water through a bed
622 of sand at low velocity (generally less than 0.4 m/h) resulting in substantial particulate removal by
623 physical and biological mechanisms.

624 "Small waterworks" means, for the purpose of 12VAC5-590-375, 12VAC5-590-405, 12VAC5-
625 590-530 F and 12VAC5-590-550 D only, a waterworks that serves 3,300 persons or fewer.

626 ~~"Standard sample" means that portion of finished drinking water that is examined for the~~
627 ~~presence of coliform bacteria.~~

628 "SMCL"– see "Maximum contaminant level".

629 "SOP" means standard operating procedure.

630 "Source water" means water as it is pumped or otherwise withdrawn from a well, spring,
631 stream, lake/reservoir, or any body of surface water (natural or impounded), and before any
632 treatment.

633 "Supervisory control and data acquisition" or "SCADA" means a computer-controlled system
634 used by a waterworks to monitor its operations. Typical design features may be specific to
635 individual waterworks and include alarm, response, control, and data acquisition.

636 "Surface water" means all water open to the atmosphere and subject to surface runoff.

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

641 ~~"Synthetic organic chemicals" or "SOC" means one of the family families of organic manmade~~
642 ~~compounds generally utilized for agriculture or industrial purposes.~~

643 "Synthetic organic chemical" or "SOC" means a man-made organic compound, generally
644 utilized for agriculture or industrial purposes. Table 340.2 lists SOCs regulated as contaminants.

645 "System hazard" means a condition posing an actual, or threat of, damage to the physical
646 properties of the waterworks or a consumer's water system.

647 "TDS" means total dissolved solids.

648 "Terminal reservoir" means an impoundment providing end storage of water prior to treatment.

649 "TMF" means the technical, managerial, and financial capabilities to operate and maintain a
650 waterworks.

651 "Too numerous to count" or "TNTC" means that the total number of bacterial colonies exceeds
652 200 on a 47-mm diameter membrane filter used for coliform detection.

653 ~~"Total effective storage volume" means the volume available to store water in distribution~~
654 ~~reservoirs measured as the difference between the reservoir's overflow elevation and the~~
655 ~~minimum storage elevation. The minimum storage elevation is that elevation of water in the~~
656 ~~reservoir that can provide a minimum pressure of 20 psi at a flow as determined in 12VAC5-590-~~
657 ~~690 C to the highest elevation served within that reservoir's service area under systemwide~~
658 ~~maximum daily water demand.~~

659 "Total organic carbon" or "TOC" means total organic carbon in milligrams per liter (mg/l) ~~mg/L~~
660 measured using heat, oxygen, ultraviolet irradiation, chemical oxidants, or combinations of these
661 oxidants that convert organic carbon to carbon dioxide, rounded to two significant figures.

662 "Total trihalomethanes" or "TTHM" means the sum of the concentrations of the
663 trihalomethanes (THMs) expressed in milligrams per liter (mg/L) and rounded to two significant

664 figures. For the purpose of ~~these regulations, the TTHMs~~ this chapter, TTHM shall mean
665 trichloromethane (chloroform), dibromochloromethane, bromodichloromethane, and
666 tribromomethane (bromoform).

667 "Transient noncommunity waterworks" or "TNC" means a noncommunity waterworks that is
668 not a nontransient noncommunity waterworks (NTNC). A TNC serves at least 25 persons daily
669 for at least 60 days out of the year.

670 "~~Transmission main~~" means ~~a water main whose primary purpose is to move significant~~
671 ~~quantities of treated water among service areas.~~

672 "Treatment" means any process that changes the chemical, physical, radiological, or
673 bacteriological quality of water.

674 "Treatment technique ~~requirement~~" or "TT" means ~~a requirement that specifies for a~~
675 ~~contaminant a specific treatment technique(s)~~ technology or process demonstrated to the
676 satisfaction of the ~~division~~ department to lead to a reduction in the level of ~~such a specific~~
677 contaminant sufficient to comply with ~~these regulations~~ this chapter.

678 "Triggered source water monitoring" means monitoring required of any groundwater system
679 as a result of a total coliform-positive sample in the distribution system.

680 "Trihalomethane" or "THM" means one of the family of organic compounds, named as
681 derivatives of methane, wherein three of the four hydrogen atoms in methane are each substituted
682 by a halogen atom in the molecular structure.

683 "~~Two-stage lime softening~~" means ~~a process in which chemical addition and hardness~~
684 ~~precipitation occur in each of two distinct unit clarification processes in series prior to filtration.~~

685 "Ultrafiltration" or "UF" means a membrane technology designed to remove particles up to
686 0.01 micron in size.

687 "Unconsolidated" means loose sediment that has not been compacted, cemented, lithified, or
688 metamorphosed into rock; sediment may be derived from a sedimentary-type, igneous-type,
689 metamorphic-type rock, which includes clay, silt, sand, gravel, and mixtures of these particle
690 types.

691 "Uncovered finished water storage facility" means a tank, reservoir, or other facility used to
692 store water that will undergo no further treatment to reduce microbial pathogens (except residual
693 disinfection) and is directly open to the atmosphere.

694 "Unregulated contaminant" or "UC" means a contaminant for which a monitoring requirement
695 has been established, but for which no MCL or treatment technique requirement has been
696 established.

697 "USBC" means the Uniform Statewide Building Code, 13VAC5-63.

698 "Used water" means any water supplied by a ~~water purveyor from the~~ waterworks to a
699 consumer's water system after it has passed through the service connection and is no longer
700 under the control of the owner.

701 "UV" means ultraviolet.

702 "Variance" means allowing a waterworks that satisfies the criteria in 12VAC5-590-140 to
703 provide drinking water that does not fully comply with the regulations. ~~a conditional waiver of a~~
704 ~~specific regulation that is granted to a specific waterworks.~~ A PMCL variance is a variance to a
705 primary maximum contaminant level, or a treatment technique requirement. An operational
706 variance is a variance to an operational regulation or a ~~secondary maximum contaminant level~~
707 SMCL. ~~Variances for monitoring, reporting and public notification requirements will not be granted.~~

708 "Virus" means a ~~microbe~~ virus of fecal origin that is infectious to humans by waterborne
709 transmission, and must be preemptively inactivated through disinfection before human
710 consumption.

711 ~~"Volatile synthetic organic chemical" or "VOC" means one of the family families of manmade~~
712 ~~organic compounds generally characterized by low molecular weight and rapid vaporization at~~
713 ~~relatively low temperatures or pressures.~~

714 "Volatile organic chemical" or "VOC" means an organic compound generally characterized by
715 its low molecular weight and its tendency to vaporize rapidly at relatively low temperatures and
716 pressures. Table 340.2 lists VOCs regulated as contaminants.

717 "VOSH" means the Virginia Occupational Safety and Health program.

718 "Waiver" means permission from the department to deviate from the monitoring and reporting
719 requirements in the regulations for a specific contaminant.

720 "Waterborne disease outbreak" means the significant occurrence of acute infectious illness,
721 epidemiologically associated with the ingestion of water from a waterworks that is deficient in
722 treatment, as determined by the commissioner or the State Epidemiologist.

723 "Water purveyor" (same as owner).

724 "Water supply" means the source of water ~~that shall have been taken into a waterworks from~~
725 ~~all including~~ wells, streams, springs, lakes, and other bodies of surface waters (natural or
726 impounded), and the tributaries thereto, and all impounded groundwater, ~~but the~~. The term "water
727 supply" shall not include any waters above the point of intake of ~~such the~~ waterworks (see Article
728 2 (§ 32.1-167 et seq.) of Chapter 6 of Title 32.1 of the Code of Virginia).

729 ~~"Water supply main" or "main" means any water supply pipeline that is part of a waterworks~~
730 ~~distribution system.~~

731 "Water treatment plant" means that portion of a waterworks intended specifically for water
732 treatment; it may include, among other operations, coagulation, sedimentation, filtration, and
733 disinfection.

734 ~~"Water Well Completion Report" means a report form published by the State Water Control~~
735 ~~Board entitled "Water Well Completion Report," which requests specific information pertaining to~~
736 ~~the ownership, driller, location, geological formations penetrated, water quantity and quality~~
737 ~~encountered as well as construction of water wells. The form is to be completed by the well driller.~~

738 "Waterworks" means a system that serves piped water for human consumption to at least 15
739 service connections or 25 or more individuals for at least 60 days out of the year. "Waterworks"
740 includes all structures, equipment, and appurtenances used in the storage, collection, purification,
741 treatment, and distribution of ~~pure~~ potable water except the piping and fixtures inside the building
742 where such water is delivered (~~see Article 2 (§ 32.1-167 et seq.) of Chapter 6 of Title 32.1 of the~~
743 ~~Code of Virginia~~).

744 "Waterworks business operation plan" – see "Comprehensive business plan."

745 ~~"Waterworks with a single service connection" means a waterworks that supplies drinking~~
746 ~~water to consumers via a single service line.~~

747 "Wholesale waterworks" means a waterworks that treats source water as necessary to
748 produce ~~finished~~ potable water and then delivers some or all of that ~~finished~~ potable water to
749 another waterworks. Delivery may be through a direct connection or through the distribution
750 system of one or more consecutive waterworks.

751 B. Units of measurement.

752 °C – degrees Celsius

753 CU – color units

754 ft² – square feet of area

755 ft/min – feet per minute

756 ft/sec – feet per second

- 757 gpd – gallons per day
- 758 gpd/ft² – gallons per day per square foot
- 759 gpm – gallons per minute
- 760 gpm/ft – gallons per minute per foot
- 761 gpm/ft² – gallons per minute per square foot
- 762 in – inches
- 763 lb – pounds
- 764 lb/day – pounds per day
- 765 lb/ft² – pounds per square foot
- 766 MFL – million fibers per liter
- 767 MGD – million gallons per day
- 768 mg/L – milligrams per liter
- 769 min – minutes
- 770 mJ/cm² – millijoules per square centimeter
- 771 mrem – millirem
- 772 nm – nanometer (10⁻⁹ meter)
- 773 NTU – nephelometric turbidity units
- 774 pCi – picocuries
- 775 pCi/L – picocuries per liter
- 776 ppb - parts per billion, or micrograms per liter (µg/L)
- 777 ppm – parts per million, or milligrams per liter (mg/L)

778 ppq – parts per quadrillion, or pictograms per liter (pg/L)
779 ppt – parts per trillion, or nanograms per liter (ng/L)
780 psi – pounds per square inch
781 psig – pounds per square inch gauge
782 scfm/ft² – standard cubic feet per minute per square foot
783 µm – micrometers (10⁻⁶ meter or microns)
784 µg/L – micrograms per liter
785 µS/cm – microSiemens per centimeter
786 W/m² – Watts per square meter

787 **Article 2**
788 **General Information**

789 **~~12VAC5-590-20. Authority for regulations. (Repealed.)~~**

790 ~~Article 2 (§ 32.1-5 et seq.) of Chapter 1 of Title 32.1 of the Code of Virginia provides that the~~
791 ~~State Board of Health has the duty to protect the public health and to ensure that all water supplies~~
792 ~~destined for public consumption be pure water. In order to discharge that duty, the board is~~
793 ~~empowered to supervise and regulate all waterworks and water supplies within the state (see~~
794 ~~Article 2 of Chapter 1 of Title 32.1 of the Code of Virginia).~~

795 **~~12VAC5-590-30. Purpose of regulations. (Repealed.)~~**

796 ~~These regulations have been promulgated by the board to: 1. Ensure that all water supplies~~
797 ~~destined for public consumption be pure water; 2. Guide the commissioner in his determination~~

798 of whether a permit for a public water supply or waterworks should be issued; and 3. Assist the
799 owner or his authorized engineer in the preparation of an application, plans, specifications, reports
800 and other data.

801 **12VAC5-590-35. Delegation of authority.**

802 The commissioner, or the commissioner's designee, may perform any act of the board
803 provided under this chapter, except as limited by § 32.1-20 of the Code of Virginia.

804 **12VAC5-590-40. Administration of regulations this chapter.**

805 These regulations are administered by the following parties:

806 1. ~~State Board of Health, which has responsibility~~ A. The board is responsible for
807 promulgating, amending, and repealing regulations ~~which~~ to ensure a supply of ~~pure~~ potable
808 water.

809 2. ~~State Health Commissioner, who is the executive officer~~ B. The commissioner is vested
810 with all the authority of the State Board of Health ~~with the authority of the board when it is not in~~
811 session, ~~and~~ subject to such rules and regulations as may be prescribed by the board.

812 3. ~~Division of Water Supply Engineering, which~~ C. The department is designated as the
813 primary ~~reviewing~~ agent of the board for the purpose of administering this chapter. It examines
814 ~~and passes upon~~ the technical aspects of all applications and plans for waterworks projects ~~prior~~
815 ~~to the~~ before drafting of a permit for final approval by the ~~State Health Commissioner~~
816 commissioner. It also has primary responsibility for monitoring waterworks operations to ensure
817 that water supplied to ~~the public is pure~~ consumers is potable water.

818 4. ~~Central and field offices, which are maintained by the division, the central office is~~
819 ~~located in Richmond, Virginia. The Office of Water Programs maintains six field offices~~
820 ~~which are responsible for activities of the division within their service areas. Applications~~

821 ~~for waterworks permits should be submitted to the appropriate field office. The addresses~~
822 ~~of the field offices and a description of the areas that they serve are listed in Appendix C.~~
823 ~~5. Waterworks Advisory Committee, which shall be appointed by the commissioner, shall~~
824 ~~consist of thirteen appointed members and three ex officio members specified below. The~~
825 ~~commissioner shall appoint to the Waterworks Advisory Committee one individual each~~
826 ~~from the following: a member of the Virginia Section American Water Works Association;~~
827 ~~a member of the Virginia Society of Professional Engineers; a member of the Virginia~~
828 ~~Water Well Association, Inc.; a member of the Consulting Engineers Council; a water~~
829 ~~treatment plant operator having a valid license of the highest classification in waterworks~~
830 ~~issued by the State Board for Waterworks and Wastewater Works Operators; a faculty~~
831 ~~member of a state university or college whose principal field of teaching is Environmental~~
832 ~~Engineering; a community waterworks owner; a nontransient noncommunity (NTNC)~~
833 ~~representative; a representative from Virginia Rural Water Association; a representative~~
834 ~~from Virginia Water Projects, Inc.; a representative from the Virginia Municipal League; a~~
835 ~~representative from the Virginia Association of Counties; and a citizen representative. Ex~~
836 ~~officio members shall consist of the Director, Office of Water Programs, who shall act as~~
837 ~~chairman; Director, Division of Water Supply Engineering; and Director, Division of~~
838 ~~Consolidated Laboratory Services or their designees.~~

839 ~~Appointed members shall serve at the discretion of the commissioner with staggered terms~~
840 ~~being of three years in duration. The Waterworks Advisory Committee shall make~~
841 ~~recommendations to the commissioner regarding waterworks and water supply policies,~~
842 ~~procedures and programs of the division.~~

843 **12VAC5-590-45. Waterworks Advisory Committee (WAC).**

844 A. A WAC shall be formed by the commissioner to provide peer review of the regulatory,
845 policy, and legislative aspects of the department's authorities. Committee members shall consist

846 of industry professionals employed outside the department with longstanding expertise or vested
847 interest in waterworks operations and represent a diverse group of stakeholders. Members shall
848 be experts in the fields of water treatment technologies, public health, water quality, economics,
849 environmental science, public utilities, community development, or industry regulations. A
850 minimum of nine persons shall be appointed to the committee by the commissioner.

851 B. The WAC will convene at least quarterly.

852 C. WAC meetings will be considered public meetings. Notice of scheduled meetings will be
853 posted on the Virginia Regulatory Town Hall at least seven working days before the date of the
854 meeting. Meeting minutes will be posted to the Virginia Regulatory Town Hall within 10 working
855 days after the meeting.

856 D. Each member of the WAC shall hold office for a term of three years, except that:

857 1. With approval by the commissioner, members are eligible for reappointment to
858 consecutive terms.

859 2. Each member of the WAC serves at the pleasure of the commissioner.

860 E. The commissioner shall appoint the chair of the WAC.

861 F. The WAC shall have a department staff member serve as secretary.

862 **12VAC5-590-50. Application of regulations to waterworks and water supplies in operation**
863 **or planned prior to before the effective date of the regulations.**

864 ~~Waterworks and water supplies which were in operation prior to the effective date of the~~
865 ~~regulations may continue operation if they comply with the operational regulations set forth in Part~~
866 ~~II. Operation permits, which will be in addition to all permits previously received, will be issued to~~
867 ~~such waterworks as soon as practicable after the effective date of these regulations.~~

868 A. ~~Waterworks and water supplies unable to comply with Part II of this chapter may be issued~~
869 ~~the appropriate variances and/or exemptions in conjunction with the operation permit to allow~~
870 ~~continued operation during the period of adjustment. Any variances and/or exemptions will be~~
871 ~~issued in accordance with the procedures contained in Article 3 of Part I of this chapter. The owner~~
872 ~~shall comply with Part II of this chapter unless a variance or exemption is issued by the~~
873 ~~commissioner.~~

874 B. Compliance with design criteria set forth in ~~Parts~~ Part III and IV of this chapter is necessary
875 ~~for waterworks modification~~ limited to modifications to existing waterworks and for all construction
876 of new waterworks commenced after the effective date of these revised regulations ~~this chapter.~~
877 Portions of waterworks not being modified are not required to comply with the design criteria of
878 Part III. Waterworks construction or modification is deemed to be commenced for purposes of this
879 section upon receipt of final plans and specifications by the field office issuance of the construction
880 permit.

881 C. Compliance with the requirements set forth in ~~Parts~~ Part III and IV of this chapter for
882 materials, construction methods, disinfection, etc., is necessary for all repairs to pipes, tanks,
883 pumps, and appurtenances ~~which~~ that are part of a waterworks.

884 D. ~~Volatile Synthetic Organic Chemicals (VOCs) and Unregulated Contaminants (UCs)~~
885 ~~Regulations are effective immediately for those community and NTNC waterworks which serve~~
886 ~~more than 10,000 persons. The VOC and UC regulations are effective immediately for community~~
887 ~~and NTNC waterworks serving 3,300 to 10,000 persons. The VOC and UC regulations become~~
888 ~~effective on January 1, 1991, for community and NTNC waterworks serving less than 3,300~~
889 ~~persons. (See Table 2.7.)~~

890 E. ~~The Lead and Copper Regulations establish a treatment technique that includes~~
891 ~~requirements for corrosion control treatment, water supply (source water) treatment, lead service~~
892 ~~line replacement, and public education. These requirements are triggered, in some cases, by lead~~

893 and copper action levels measured in samples collected at consumers' taps. Unless otherwise
894 indicated, each of the provisions of 12VAC5-590-375, 12VAC5-590-405, 12VAC5-590-530 F and
895 12VAC5-590-550 D applies to community waterworks and nontransient noncommunity
896 waterworks. The requirements set forth in 12VAC5-590-375, 12VAC5-590-530 D and 12VAC5-
897 590-550 D shall take effect on July 7, 1991.

898 **12VAC5-590-55. Relationship of this chapter to the USBC.**

899 A. This chapter governs waterworks' facilities from any source water to all service
900 connections.

901 B. In accordance with § 36-98 of the Code of Virginia and the USBC, the USBC governs the
902 construction of buildings and structures, including plumbing systems and backflow prevention
903 methods. The USBC also governs the water service piping from the service connection to a
904 building or structure.

905 C. Notwithstanding subsections A and B of this section, this chapter shall govern:

906 1. Water treatment, storage, pumping facilities, and water piping that are part of a
907 waterworks and housed in any building or structure; and

908 2. Backflow prevention assemblies or elimination methods, or both, installed for
909 containment and located downstream from the service connection, including where
910 located in any building or structure.

911 Article 3

912 Procedures

913 **12VAC5-590-60. Compliance with the Administrative Process Act. (Repealed.)**

914 The provisions of the Administrative Process Act (Chapter 1.1:1 of Title 9) and Title 32.1 of
915 the Code of Virginia govern this chapter. All procedures outlined below are in addition to, or in
916 compliance with, the requirements of that Act.

917 **12VAC5-590-70. Powers and procedures.**

918 The board reserves the right to ~~authorize~~ utilize any lawful procedure for the enforcement of
919 this chapter that is consistent with the provisions set forth herein and the provisions of Title 32.1
920 of the Code of Virginia.

921 **12VAC5-590-80. Procedure. (Repealed.)**

922 Regulations for the operations, construction, or modification of a waterworks or water supply
923 are established, amended, or repealed only in accordance with the Administrative Process Act.

924 **12VAC5-590-100. Exception; emergency regulations.**

925 If the establishment of a regulation is necessary for the preservation of public health, safety,
926 or welfare to meet any emergency, not provided for by this chapter, the board or commissioner,
927 acting on behalf of the board when it is not in session, may immediately promulgate and adopt
928 the necessary regulation by complying with the procedures set forth in either §§ 2.2-4011 or 32.1-
929 13 of the Code of Virginia.

930 **12VAC5-590-110. Enforcement.**

931 All waterworks must be operated in compliance with the requirements as set forth in this
932 chapter as follows:

933 1. A. Notice. Whenever the ~~commissioner, his appointed representative, or the division~~
934 department has reason to believe that a violation of Title 32.1 ~~or of the Code of Virginia or of any~~
935 section of this chapter ~~has~~ may have occurred or ~~is~~ may be occurring, the ~~division~~ department
936 shall ~~so~~ notify the alleged violator. ~~Such~~ The notice shall (i) be in writing; (ii) shall cite the statute,
937 regulation or regulations that are allegedly being ~~violated,~~ violated; and shall (iii) state the facts
938 ~~which~~ that form the basis for believing that the violation ~~has~~ may have occurred or ~~is~~ may be
939 occurring; and (iv) include information on the process for obtaining a final decision or fact finding
940 from the department on whether or not a violation has occurred. ~~A notice of violation~~ This
941 notification is not an official finding, case decision, or adjudication, but may be accompanied by
942 include a request that certain to the owner to respond timely and to take specific corrective action
943 be taken by a stated deadline.

944 2. B. Orders. Pursuant to § 32.1-26 of the Code of Virginia, the ~~commissioner~~ board may issue
945 orders to require any owner to comply with the provisions of ~~Title 32.1 of the Code of Virginia or~~
946 ~~this chapter~~ any law administered by it, the commissioner, or the department, any regulations
947 promulgated by the board, including any section of this chapter, or any case decision of the board
948 or commissioner. ~~The order shall be signed by the commissioner and~~ commissioner, acting on
949 behalf of the board when it is not in session, will sign the order and it may require:

- 950 a. 1. The immediate cessation or correction of the violation;
- 951 b. 2. The acquisition or use of additional equipment, supplies, or personnel to ensure that
952 the violation does not recur;
- 953 c. 3. The submission of a plan to prevent future violations;
- 954 d. 4. The submission of an application for a variance or exemption;
- 955 e. 5. Any other corrective action deemed necessary for proper compliance with ~~the~~ this
956 chapter; or

957 ~~f. Division review~~ 6. Evaluation and approval, if appropriate, of the required submissions,
958 if appropriate.

959 ~~3.~~ C. Compliance with effective orders and this chapter. The commissioner may act as the
960 agent of the board to enforce all effective orders and this chapter. Should any owner fail to comply
961 with any effective order or this chapter, the commissioner may:

962 ~~a.~~ 1. Institute a an administrative proceeding to revoke the owner's permit in accordance
963 with 12VAC5-590-320 and § 32.1-174 of the Code of Virginia, or other appropriate
964 administrative remedies;

965 ~~b.~~ Apply to an appropriate court for an injunction or other legal process to prevent or stop
966 any practice in violation of the order;

967 ~~c.~~ 2. Request attorney for the Commonwealth criminal prosecution by a Commonwealth's
968 Attorney with the appropriate jurisdiction in accordance with § 32.1-27 of the Code of
969 Virginia to bring a criminal action;

970 ~~d.~~ 3. Request civil action by the Attorney General to bring an action for impose a civil
971 penalty, injunction seek injunctive relief, or other appropriate remedy legal remedies
972 pursuant to §§ 32.1-27 and 32.1-176 of the Code of Virginia; or

973 ~~e.~~ 4. Do any combination of the above subdivision C 1, C 2, or C 3 of this section.

974 ~~4.~~ D. Special Order. Pursuant to § 32.1-175.01 of the Code of Virginia, the commissioner may,
975 after an informal fact-finding proceeding held in accordance with § 2.2-4019 of the Code of
976 Virginia, issue a special order that may include a civil penalty against an owner who violates the
977 Public Water Supply Law, §§ 32.1-167 through 32.1-176 of the Code of Virginia, this chapter, or
978 any order of the board.

979 E. Graduated enforcement actions. Nothing in this section shall prevent the commissioner ~~or~~
980 ~~the division from taking action prior to issuing an order or department~~ from making efforts to obtain

981 voluntary compliance through conference, warning, or other appropriate means before issuance
982 of an order, instituting an administrative proceeding, or requesting an action by a
983 Commonwealth's Attorney or the Attorney General.

984 5. Hearing as a matter of right (see 12VAC5-590-180).

985

986 **12VAC5-590-115. Administrative proceedings.**

987 A. Types of administrative proceedings. Administrative proceedings before the board, the
988 commissioner, or the commissioner's designee, shall include the following forms depending upon
989 the nature of the controversy and the interests of the named party involved.

990 1. An informal fact-finding proceeding is an informal conference between the department
991 staff and the named party held in accordance with § 2.2-4019 of the Code of Virginia.

992 2. A formal hearing is an adjudicatory proceeding before the commissioner or a designated
993 hearing officer held in accordance with § 2.2-4020 of the Code of Virginia.

994 B. Request for administrative proceeding. The named party may request an administrative
995 proceeding by sending a request, in writing, to the department.

996 C. Administrative proceeding as a matter of right. The named party whose rights, duties, or
997 privileges have been or may be affected by any action or inaction of the board, commissioner, or
998 department in the administration of this chapter, shall have a right to both an informal fact-finding
999 proceeding and a formal hearing; however, the commissioner reserves the right to require
1000 participation in an informal fact-finding proceeding before granting the request for a formal
1001 hearing.

1002 **12VAC5-590-120. Emergency ~~Orders~~ orders.**

1003 A. The commissioner may, pursuant to § 32.1-175 of the Code of Virginia, issue emergency
1004 orders in any case where there is an imminent danger to the public health resulting from the
1005 operation of any waterworks or the source of a water supply.

1006 B. An emergency order may be communicated by the best practical notice under all the
1007 circumstances and is effective immediately upon receipt. The commissioner may order the
1008 immediate cessation of the operation of any waterworks or the use of any water supply or the
1009 correction of any condition causing the production or distribution of any water constituting an
1010 imminent danger to the public health and welfare. ~~The order may state any requirements~~
1011 ~~necessary to remove the danger to the public health, including the immediate cessation of the~~
1012 ~~operation of the waterworks or the use of any water supply.~~

1013 C. Violation of an emergency order is subject to civil enforcement and is punishable as a
1014 criminal misdemeanor.

1015 D. Emergency orders shall be effective for a period determined by the commissioner.

1016 E. Emergency orders may be appealed in accordance with the provisions of the Administrative
1017 Process Act APA.

1018 **12VAC5-590-125. Chronically noncompliant waterworks.**

1019 ~~A. The commissioner may identify a waterworks as chronically noncompliant (CNC) whenever~~
1020 ~~he determines that:~~

1021 ~~1. The waterworks has a documented performance record that demonstrates the~~
1022 ~~waterworks is not a dependable supplier of potable water;~~

1023 ~~2. The owner has shown inadequate technical, financial, or managerial capabilities to~~
1024 ~~provide potable water;~~

- 1025 ~~3. The owner has failed to comply with an order issued by the commissioner;~~
1026 ~~4. The owner has abandoned the waterworks and has discontinued providing potable~~
1027 ~~water to the consumers; or~~
1028 ~~5. The owner is subject to a forfeiture order pursuant to § 32.1-174.1 of the Code of~~
1029 ~~Virginia.~~

1030 ~~B. Once~~ If the commissioner determines that a waterworks is ~~CNC~~ a chronically noncompliant
1031 waterworks, as defined in § 32.1-167 of the Code of Virginia, he then the commissioner shall
1032 issue an order to the owner containing a schedule to bring the waterworks into compliance with
1033 this chapter and require the submission of a comprehensive waterworks business operation plan
1034 business plan pursuant to § 32.1-172 B of the Code of Virginia. If capital improvements are
1035 necessary to bring the waterworks into compliance, and the owner does not possess sufficient
1036 assets to make the necessary improvements, the order shall require the owner to make annual,
1037 good faith applications for loans, grants, or both, to appropriate financial institutions to secure
1038 funding for such improvements, until such the improvements are complete and operational. The
1039 owner shall provide a copy of the order to each consumer ~~with a copy of the compliance schedule~~
1040 within 10 calendar days of issuance of the order.

1041 B. Within 15 calendar days of issuance of the commissioner's order, the owner shall certify in
1042 writing that a copy of the order was distributed to each consumer within the 10-day period
1043 specified in subsection A of this section.

1044 ~~C. The owner shall provide the commissioner a copy of the notice order was distributed and~~
1045 ~~a signed certification of the distribution completion date within five calendar days of completing~~
1046 ~~the notification required in subsection B of this section.~~

1047 ~~D. C.~~ The commissioner shall send a copy of the order to the chief administrative officer of
1048 the locality in which the waterworks is located for appropriate action under § 15.2-2146 of the
1049 Code of Virginia.

1050 E. ~~D.~~ In addition to the provisions of § 32.1-27 of the Code of Virginia, any owner who violates
1051 this chapter, an order of the board, or a statute governing public water supplies shall be subject
1052 to those civil penalties provided in ~~§§ 32.1-167 through 32.1-176~~ Article 2 (§ 32.1-167 et seq.) of
1053 Chapter 6 of Title 32.1 of the Code of Virginia.

1054 **12VAC5-590-130. Suspension of this chapter.**

1055 If, in the case of a ~~manmade~~ man-made or natural disaster, the commissioner ~~finds~~
1056 determines that certain regulations cannot be complied with ~~and that the public health is better~~
1057 ~~served by access to semiregulated or nonregulated water supplies than by the closing of those~~
1058 ~~affected supplies he may suspend,~~ then the application enforcement of the chapter those
1059 regulations may be suspended for specific affected localities designated waterworks and institute
1060 a provisional regulatory scheme instituted until ~~the disaster is abated~~ the conditions that brought
1061 about the suspension have abated.

1062 **12VAC5-590-140. Variances.**

1063 A. The commissioner may grant a variance to a ~~primary maximum contaminant level (PMCL),~~
1064 a PMCL, SMCL, treatment technique requirement, or an operational regulation, ~~or a secondary~~
1065 ~~maximum contaminant level (SMCL)~~ by following the appropriate procedures set forth in this
1066 ~~section.~~ section:

1067 1. Requirements for a variance. A ~~PMCL~~ variance may be granted to a waterworks from
1068 any requirement ~~respecting~~ with respect to a PMCL or SMCL upon a finding that:

1069 a. Alternative ~~sources of water~~ supplies are not reasonably available to the
1070 waterworks;

1071 b. The characteristics of the ~~raw water sources which are~~ source water that is
1072 reasonably available to the waterworks ~~prevent~~prevents the waterworks from meeting
1073 the PMCL or SMCL requirements, and on condition that the waterworks installs the
1074 ~~best available technology~~ BAT, treatment techniques, or other means, which the
1075 commissioner finds are generally available (taking costs into consideration); and

1076 c. The granting of a variance will not result in an unreasonable risk to the health of
1077 persons served by the waterworks.

1078 2. The commissioner may grant a one or more treatment technique ~~variance~~ variances to
1079 a waterworks from any requirement of a specified treatment technique upon a finding that
1080 the waterworks applying for the variance has demonstrated that ~~such~~ the treatment
1081 technique is not necessary to protect the health of persons because of the nature of the
1082 ~~raw water source of such~~ source water at the waterworks.

1083 3. The commissioner may grant a variance to a waterworks from an operational regulation
1084 ~~or a SMCL~~ if a thorough investigation reveals that the hardship imposed outweighs the
1085 benefits that may be received by the public and that the granting of ~~such~~ the variance does
1086 not subject the public to unreasonable health risks. ~~An operational variance may not be~~
1087 ~~issued from monitoring, reporting, or public notification requirements.~~

1088 4. An operational variance may not be issued from monitoring, reporting, or public
1089 notification requirements.

1090 B. ~~Application~~Request for a variance. Any owner may apply in writing for a variance. The
1091 ~~application should~~ request shall be sent to the ~~appropriate field office~~ department for evaluation.

1092 All ~~applications~~ requests for a variance shall include the following:

1093 1. A citation of the regulation from which a variance is requested;

1094 2. The nature and duration of the variance requested;

- 1095 3. Relevant analytical results of water quality sampling of the waterworks, including results
1096 of relevant tests conducted pursuant to the requirements of this chapter;
- 1097 4. A statement of the hardship to the owner and the anticipated impacts to the public health
1098 and welfare if a variance were granted;
- 1099 5. Suggested conditions that might be imposed on the granting of a variance that would
1100 limit its detrimental impact on public health and welfare;
- 1101 6. Other information, if any, believed by the ~~applicant~~ owner to be pertinent to the
1102 ~~application request~~; and
- 1103 7. ~~Such~~ Any other information as may be required by the commissioner to make the
1104 determination.

1105 ~~8C.~~ For any ~~application request~~ made for a PMCL variance, the ~~applicant~~ owner shall also
1106 include;

1107 a~~1~~. Explanation in full and evidence of the ~~best available treatment technology~~ BAT and
1108 ~~techniques~~;

1109 b~~2~~. Economic and legal factors relevant to the owner's ability to comply;

1110 c~~3~~. Analytical results of ~~raw water~~ source water quality relevant to the variance request;

1111 d~~4~~. A proposed compliance schedule including the date each step toward compliance will
1112 be achieved. ~~Such~~ The schedule shall include as a minimum the following dates:

1113 (1)~~a~~. Date by which arrangement for an alternative ~~raw water source~~ source water or
1114 improvement of an existing ~~raw water source~~ source water will be completed;

1115 (2)~~b~~. Date of initiation of the connection of the alternative ~~raw water source~~ source
1116 water or improvement of the existing ~~raw water source~~ source water; and

1117 (3)~~c~~. Date by which final compliance is to be achieved.

1118 e5. A plan for the provision of potable safe drinking water in the case of an excessive
1119 rise in the contaminant level for which the variance is requested; ~~and~~

1120 ~~f6. A plan for interim control measures during the effective period of the variance;~~ and

1121 g7. A plan for notifying the consumers at least once every three months, or more
1122 frequently if determined by the commissioner, that the waterworks is operating under
1123 the condition or conditions of a variance.

1124 9D. For any ~~application request~~ made for a treatment technique variance, the ~~applicant~~owner
1125 must also include a statement that monitoring and other reasonable requirements prescribed by
1126 the commissioner as a condition to the variance will be performed.

1127 ~~E.~~ Consideration of a variance ~~application request~~.

1128 1. The commissioner shall act on any variance ~~application request~~ submitted pursuant to
1129 subsection B of this section within 90 days of receipt of the ~~application~~ submittal.

1130 2. The commissioner will consider comments received during the comment period and
1131 testimony in the record of a public hearing held before making a determination.

1132 ~~2.3.~~ In the commissioner's consideration of whether the waterworks is unable to comply
1133 with a contaminant level required by this chapter (~~PMCL variance~~) because of the nature
1134 of the ~~raw water source~~ source water, the commissioner shall consider such factors as the
1135 following:

1136 a. The availability and effectiveness of ~~treatment methods~~BAT for which the variance
1137 is requested; and

1138 b. Cost and other economic considerations such as implementing treatment, improving
1139 the quality of the source water, or using an alternate source.

1140 34. In the commissioner's consideration of whether a waterworks should be granted a
1141 variance to a required treatment technique because ~~such~~ the treatment is unnecessary to
1142 protect the public health (~~treatment technique variance~~), the commissioner shall consider
1143 such factors as the following:

1144 a. Quality of the source water ~~source~~ including water quality data and pertinent sources
1145 of pollution; and

1146 b. Source protection measures employed by the waterworks.

1147 45. In the commissioner's consideration of whether a waterworks should be granted a
1148 variance to a required operational procedure ~~or SMCL~~ (~~operational variance~~), the
1149 commissioner shall consider such factors as the following:

1150 a. The effect that such a variance would have on the adequate operation of the
1151 waterworks, including operator safety (in accordance with ~~Virginia Occupational Safety~~
1152 ~~and Health~~ VOSH laws and regulations);

1153 b. The cost and other economic considerations imposed by this requirement; and

1154 c. The effect that such a variance would have on the protection of the public health.

1155 ~~DE~~. Disposition of a variance application request.

1156 1. The commissioner may reject any ~~application~~ request for a variance by sending a
1157 rejection notice to the applicant. The rejection notice shall be in writing and shall state the
1158 reasons for the rejection. A rejection notice constitutes a case decision. ~~The applicant has~~
1159 ~~the right to petition for a hearing within 60 days of the date of the rejection to challenge~~
1160 ~~the rejection pursuant to 12VAC5-590-160 and 12VAC5-590-180. If the commissioner~~
1161 proposes to deny the variance, the owner shall be provided with an opportunity for an
1162 informal fact-finding proceeding as provided in § 2.2-4019 of the Code of Virginia.

1163 2. If the commissioner grants the variance, the applicant shall be notified in writing of this
1164 decision. ~~Such~~ The notice shall identify the variance, the waterworks covered, and shall
1165 specify the period of time for which the variance will be effective.

1166 a. For a PMCL variance as specified in subdivision A 1 of this section, ~~such~~ the notice
1167 shall provide that the variance will be terminated when the waterworks comes into
1168 compliance with the applicable regulation and may be terminated upon a finding by
1169 the commissioner that the waterworks has failed to comply with any requirements of a
1170 final schedule issued pursuant to subdivision ~~D~~ E 3 of this section.

1171 b. For a treatment technique variance as specified in subdivision A 2 of this section,
1172 ~~such~~ the notice shall provide that the variance may be terminated at any time upon a
1173 finding by the commissioner that the nature of the ~~raw water~~ source water supply is
1174 such that the specified treatment technique for which the variance was granted is
1175 necessary to protect the public health or upon a finding that the waterworks has failed
1176 to comply with monitoring and other requirements prescribed by the commissioner as
1177 a condition or conditions to the granting of the variance.

1178 c. For an operational variance as specified in subdivision A 3 of this section, ~~such~~ the
1179 notice shall provide that the variance will be terminated when the waterworks comes
1180 into compliance with the applicable regulation and may be terminated upon a finding
1181 by the commissioner that the waterworks has failed to comply with any requirements
1182 or schedules issued in conjunction with the variance. The effective date of the
1183 operational variance shall be the date of its issuance. A public hearing is not required
1184 before the issuance of an operational variance.

1185 3. Schedules pursuant to PMCL and treatment technique variances:

1186 a. The proposed schedule for compliance shall specify dates by which steps towards
1187 compliance are to be taken, including where applicable:

1188 (1) Date by which arrangement for ~~an~~ the alternative ~~water~~ source water or
1189 improvement of the existing ~~raw-water~~ source water will be completed. ;

1190 (2) Date of connection to the alternative ~~raw-water~~ source water or improvement of the
1191 existing ~~raw-water~~ source water.; and

1192 (3) Date by which final compliance is to be achieved.

1193 b. If the waterworks has no access to an alternative ~~raw-water~~ source water and can effect
1194 or anticipate no adequate improvement of the existing ~~raw-water~~ source water, then the
1195 proposed schedule may specify an indefinite time period for compliance until a new and
1196 effective treatment technology is developed, at which time a new compliance schedule
1197 shall be prescribed by the commissioner.

1198 c. The schedule for implementation of interim control measures during the period of
1199 variance shall specify interim treatment techniques, methods, and equipment and dates
1200 by which steps toward meeting the interim control measures are to be met.

1201 d. The schedule shall be prescribed by the commissioner at the time the variance is
1202 granted.

1203 e. For a PMCL variance specified in subdivision A 1 of this section, the commissioner shall
1204 propose a schedule for:

1205 (1)- Compliance (including increments of progress) by the waterworks with each
1206 contaminant level requirement covered by the variance; and

1207 (2)- Implementation by the waterworks of such control measures as the commissioner
1208 may require for each contaminant level covered by the variance.

1209 EG. Public hearings on PMCL and treatment technique variances and their schedules.

1210 1. Notice of a public hearing shall be provided before a variance and schedule proposed
1211 by the commissioner pursuant to subsection ~~D~~ E of this section may take effect. A notice
1212 given pursuant to the preceding sentence may cover the granting of more than one
1213 variance and a public hearing held pursuant to such notice shall include each of the
1214 variances covered by the notice.

1215 2. Notice of a public hearing on ~~an application~~ a request for a variance and its schedule
1216 shall be advertised in at least one major newspaper of general circulation in the region in
1217 which the waterworks is located. The notice shall include a summary of the proposed
1218 variance and its schedule and shall contain the time, date, and place of the public hearing.
1219 If the schedule exceeds five years from the date of the variance, then the rationale for the
1220 extended compliance schedule shall be discussed in the notice.

1221 FH. Issuance of variance.

1222 1. Within 30 days after the public hearing, the commissioner shall, taking into
1223 consideration information obtained during such hearing, revise the proposed variance as
1224 necessary and prescribe the final schedule for compliance and interim measures for the
1225 waterworks granted a variance. If the schedule for compliance exceeds five years from
1226 the date of issuance of the variance, then the commissioner shall document the rationale
1227 for the extended compliance schedule.

1228 2. Such schedule shall establish the timetable by which the waterworks shall comply with
1229 each contaminant level and treatment technique requirement prescribed by this chapter.
1230 Such schedule shall also consider if the waterworks is to become part of a regional
1231 waterworks. Such schedule shall provide the shortest practicable time schedule under the
1232 circumstances.

1233 G. Posting of variances. All variances granted to any waterworks are nontransferable. Each
1234 variance must be attached to the permit of the waterworks to which it is granted. Each variance
1235 is a condition to that permit and is revoked when the permit is revoked.

1236 H. No variances shall be granted to 12VAC5-590-380, ~~12VAC5-590-400, or 12VAC5-590-~~
1237 ~~420, 12VAC5-590-388, 12VAC5-590-395, or 12VAC5-590-411.~~

1238 **12VAC5-590-150. Exemptions.**

1239 A. The commissioner may grant an exemption to any ~~primary maximum contaminant level~~
1240 ~~(PMCL)~~ PMCL or treatment technique requirement by following the procedures set forth in this
1241 ~~subsection~~ section. An exemption may be granted to a waterworks ~~from any requirement with~~
1242 ~~respect to a PMCL or treatment technique requirement~~ upon a finding that:

1243 1. The waterworks must be unable to implement measures to develop an alternative
1244 supply of source of water supply;

1245 2. The waterworks cannot reasonably make management or restructuring changes that
1246 will result in compliance or improve the quality of the drinking water;

1247 3. Due to compelling factors (which may include economic factors), the waterworks is
1248 unable to comply with such contaminant level or treatment technique requirement;

1249 4. The granting of the exemption will not result in an unreasonable risk to the health of
1250 persons served by the waterworks;

1251 5. The waterworks was in operation on the effective date of such contaminant level or
1252 treatment technique requirement; and

1253 6. The waterworks has not been granted a variance.

1254 B. ~~Application for exemption. A waterworks~~ The owner may request an exemption for a
1255 waterworks by submitting a written ~~application~~ request to the ~~appropriate field office~~ department
1256 for evaluation. All ~~applications~~ requests for an exemption shall include the following information:

- 1257 1. A citation to the regulation from which the exemption is requested;
- 1258 2. Nature and duration of the exemption requested;
- 1259 3. Relevant analytical results of water quality sampling of the waterworks, including results
1260 of relevant tests conducted pursuant to the requirements of this chapter;
- 1261 4. Explanation of the compelling factors such as time or economic factors ~~which~~ that
1262 prevent such waterworks from achieving compliance;
- 1263 5. Other information believed by the ~~applicant~~ owner to be pertinent to the ~~application~~
1264 request;
- 1265 6. A proposed compliance schedule, including the date when each step toward
1266 compliance will be achieved; and
- 1267 7. Such other information as may be required by the commissioner to make the
1268 determination.

1269 C. Consideration of an exemption ~~application~~ request.

1270 1. The commissioner shall act on any exemption ~~application~~ request submitted pursuant
1271 to subsection B of this section within 90 days of receipt of the ~~application~~ request.

1272 2. In the commissioner's consideration of whether the waterworks is unable to comply due
1273 to compelling factors, the commissioner shall consider such factors as the following:

- 1274 a. Construction, installation, or modification of treatment equipment or systems;
- 1275 b. The time needed to put into operation a new water treatment ~~facility~~ plant to replace
1276 an existing ~~waterworks~~ water treatment plant ~~which~~ that is not in compliance;

- 1277 c. The economic feasibility of compliance;
- 1278 d. The availability of Drinking Water State Revolving Fund (a department program to
1279 assist waterworks in achieving the public health protection objectives of the SDWA)
1280 assistance or any other federal or state program that is reasonably likely to be
1281 available within the period of the exemption;
- 1282 e. The consideration of rate increases, accounting changes, the appointment of a
1283 licensed operator under the state operator's licensure program, or contractual
1284 agreements for joint operation with one or more waterworks;
- 1285 f. The activities consistent with Virginia's capacity development strategy to help the
1286 waterworks acquire and maintain technical, financial, and managerial capacity to come
1287 into compliance;
- 1288 g. The ownership changes, physical consolidation with another waterworks, or other
1289 feasible and appropriate means of consolidation that would result in compliance; and
- 1290 h. The availability of an alternative source of drinking water, including the feasibility of
1291 partnerships with neighboring waterworks, as identified by the waterworks or by the
1292 commissioner consistent with the capacity development strategy.

1293 D. Disposition of an exemption ~~application~~ request.

- 1294 1. The commissioner may reject any ~~application~~ request for an exemption by sending a
1295 rejection notice to the ~~applicant~~ owner. The rejection notice shall be in writing and shall
1296 state the reasons for the rejection. A rejection notice constitutes a case decision. ~~The~~
1297 ~~applicant has the right to petition for a hearing within 60 days of the date of the rejection~~
1298 ~~to challenge the rejection pursuant to 12VAC5-590-160 and 12VAC5-590-180. If the~~
1299 commissioner proposes to deny the exemption, then the owner shall be provided with an

1300 opportunity for an informal fact-finding proceeding as provided in § 2.2-4019 of the Code
1301 of Virginia.

1302 2. If the commissioner grants the exemption, then the applicantowner shall be notified in
1303 writing of this decision. ~~Such~~The notice shall identify the exemption and the waterworks
1304 covered and shall specify the termination date of the exemption. ~~Such notice shall provide~~
1305 ~~that the exemption~~ Exemptions shall be terminated when the waterworks comes into
1306 compliance with the applicable regulation and may be terminated upon a finding by the
1307 commissioner that the waterworks has failed to comply with any requirements of a final
1308 schedule issued pursuant to subsection F of this section.

1309 3. The commissioner shall propose a schedule for:

1310 a. Compliance (including increments of progress) by the waterworks with each
1311 contaminant level and treatment technique requirement covered by the exemption;
1312 and

1313 b. Implementation by the waterworks of such control measures as the commissioner
1314 may require for each contaminant level and treatment technique requirement covered
1315 by the exemption.

1316 4. The schedule shall be prescribed by the commissioner at the time the exemption is
1317 granted.

1318 5. For a waterworks that serves a population of not more than 3,300 persons and that
1319 needs financial assistance for the necessary improvements under the initial compliance
1320 schedule, an exemption granted by the commissioner may be for one or more additional
1321 two-year periods, but not to exceed a total of six additional years, only if the commissioner
1322 establishes that the waterworks is taking all practicable steps to meet the requirements of

1323 the exemption and the established compliance period. The commissioner will document
1324 the findings in granting an extension under this subdivision.

1325 E. Public hearings on exemptions and their schedules.

1326 1. Notice of a public hearing shall be provided before an exemption and schedule
1327 proposed by the commissioner pursuant to subsection D of this section may take effect.

1328 A Such notice ~~given pursuant to the preceding sentence~~ may cover the granting of more
1329 than one exemption, and a public hearing held pursuant to ~~such~~ the notice shall include
1330 each of the exemptions covered by the notice.

1331 2. Notice of a public hearing on ~~an application~~ a request for an exemption and its schedule
1332 shall be advertised in at least one major newspaper of general circulation in the region in
1333 which the waterworks is located.

1334 3. The notice shall include a summary of the proposed exemption and its schedule and
1335 shall contain the time, date, and place of the public hearing.

1336 F. Issuance of exemption.

1337 1. Within 30 days after the public hearing, the commissioner shall, taking into
1338 consideration information obtained during such hearing, revise the proposed exemption
1339 as necessary and prescribe the final compliance schedule ~~for compliance~~ and interim
1340 measures before issuing the exemption to ~~for the waterworks granted an exemption.~~

1341 2. ~~Such~~ The schedule shall establish the timetable by which the waterworks shall comply
1342 with each contaminant level and treatment technique requirement prescribed by this
1343 ~~chapter~~ section. If the schedule for compliance exceeds five years from the date of
1344 issuance of the exemption, then the commissioner shall document the rationale for the
1345 extended compliance period. Such schedule shall also consider if the waterworks is to
1346 become part of a regional waterworks.

1347 G. Posting of exemptions. All exemptions granted to any waterworks are nontransferable.
1348 Each exemption must be attached to the operation permit of the waterworks to which it is granted.
1349 Each exemption is a condition to that permit and is revoked when the permit is revoked.

1350 H. No exemption shall be granted to 12VAC5-590-380, 12VAC5-590-400, ~~or 12VAC5-590-~~
1351 ~~420-B-1-b,~~ 12VAC5-590-388, or 12VAC5-590-395.

1352 **12VAC5-590-160. ~~Types of hearings. (Repealed.)~~**

1353 ~~Hearings before the board, the commissioner, or their designees shall include any of the~~
1354 ~~following forms depending upon the nature of the controversy and the interests of the parties~~
1355 ~~involved.~~

1356 ~~1. An informal hearing is a meeting with the district engineer and field director and held in~~
1357 ~~accordance with § 9-6.14:11 of the Code of Virginia. The field director may consider all~~
1358 ~~evidence presented at the meeting which is relevant to the issue in controversy.~~
1359 ~~Presentation of evidence, however, is entirely voluntary. The field office has no subpoena~~
1360 ~~power. No verbatim record will be taken at the informal hearing, but the field director may~~
1361 ~~make preliminary findings of fact, and may submit a copy of those preliminary findings,~~
1362 ~~with recommendations, to the commissioner and or division director for review. A copy of~~
1363 ~~the findings shall be mailed to the appellant.~~

1364 ~~2. The adjudicatory hearing is a formal, public, adjudicatory proceeding before the~~
1365 ~~commissioner or a designated hearing officer held in conformance with § 9-6.14:12.~~
1366 ~~Pursuant to the hearings process:~~

1367 ~~a. A Notice which states the time, place, and issues involved in the prospective hearing~~
1368 ~~shall be sent to parties requesting the hearing by certified mail at least 15 calendar~~
1369 ~~days before the hearing is to take place;~~

1370 ~~b. A record of the hearing will be made by a court reporter or other approved means.~~
1371 ~~A copy of the transcript of the hearing, if transcribed, will be provided within a~~
1372 ~~reasonable time to any person upon written request and payment of the cost. If the~~
1373 ~~record is not transcribed, then the cost of preparation of the transcript will be borne by~~
1374 ~~the party requesting the transcript;~~

1375 ~~c. All interested parties may attend the hearing and present evidence, expert or~~
1376 ~~otherwise, that is material and relevant to the issues in controversy. The admissibility~~
1377 ~~of evidence shall be in accordance with the Administrative Process Act. All parties may~~
1378 ~~be represented by counsel;~~

1379 ~~d. The commissioner or hearing officer, pursuant to § 9-9.14:13 of the Code of Virginia,~~
1380 ~~may issue subpoenas for the attendance of witnesses and the production of books,~~
1381 ~~papers, maps, and records. The failure of a witness without legal excuse to appear or~~
1382 ~~to testify or to produce documents may be reported by the commissioner to the~~
1383 ~~appropriate circuit court; and~~

1384 ~~e. The commissioner may designate a hearing officer or subordinate to conduct the~~
1385 ~~hearing, as provided in § 9-6.14:12 of the Code of Virginia, and to make written~~
1386 ~~recommended findings of fact and conclusions of law to be submitted for review and~~
1387 ~~final decision by the commissioner. The final decision of the commissioner shall be~~
1388 ~~reduced to writing and will contain the explicit findings of fact upon which his decision~~
1389 ~~is based. Copies of the decision shall be delivered to the owner affected by it. Notice~~
1390 ~~of a decision will be served upon the parties and become a part of the record. Service~~
1391 ~~may be by personal service or certified mail, return receipt requested.~~

1392 ~~3. A regulatory hearing is a public meeting of the board which is held for the purpose of~~
1393 ~~adopting, amending, or repealing rules and regulations. A regulatory hearing requires that:~~

1394 a. A notice shall be published, in at least one newspaper of general circulation in the
1395 commonwealth, not less than 60 days prior to the day on which the regulatory hearing
1396 is to be held. Such notice shall state the time, place, and nature of the hearing and the
1397 express terms or an informative survey of the rules that are to be adopted, amended,
1398 or repealed;

1399 b. All interested persons may be present at the hearing and may present comments,
1400 arguments, objections, and evidence which concern the proposed rules; and

1401 c. The board may adopt, repeal, or amend any rule or regulation which was included
1402 in the general notice published prior to the meeting. Rules and regulations may be
1403 adopted in the form in which they were described in the notice, or as amended at the
1404 hearing, provided the amendments do not alter the main purpose of the rule or
1405 regulation.

1406 **12VAC5-590-170. Request for hearing. (Repealed.)**

1407 Any person may request a hearing by sending a request, in writing, to the appropriate field
1408 office or the central office.

1409 **12VAC5-590-180. Hearing as a matter of right. (Repealed.)**

1410 Any person whose rights, duties or privileges have been or may be affected by any action or
1411 inaction of the board, its agents, or deputies in the administration of this chapter, shall have a right
1412 to both an informal and an adjudicatory hearing; however, the commissioner reserves the right to
1413 require participation in an informal hearing before granting the request for a full adjudicatory
1414 hearing.

1415 **12VAC5-590-190. Permits.**

1416 A. No owner or other person shall cause or allow any waterworks to be operated in the
1417 Commonwealth without a written operation permit issued by the commissioner.

1418 B. No owner or other person shall cause or allow the construction or change in the manner of
1419 transmission, storage, purification, treatment, or distribution of water (including the extension of
1420 water pipes for the distribution of water) at any waterworks ~~or water supply~~ in the Commonwealth
1421 without a written construction permit, or a general permit for distribution mains, from the
1422 commissioner. ~~Furthermore, no owner or other person shall cause or permit any waterworks or~~
1423 ~~water supply to be operated without a written operation permit issued by the commissioner which~~
1424 ~~authorizes the operation of the waterworks or water supply. Conditions may be imposed on the~~
1425 ~~issuance of any permit, and no waterworks or water supply may be constructed, modified, or~~
1426 ~~operated in violation of these conditions.~~

1427 C. Construction permits may not be required for the extension of water distribution piping
1428 having a diameter of eight inches or less and serving less than 15 connections (see § 32.1-172 A
1429 of the Code of Virginia).

1430 D. Individual construction permits for distribution mains are not required for waterworks that
1431 obtain a general permit (see 12VAC5-590-300).

1432 E. Conditions may be imposed on the issuance of any permit, and no waterworks may be
1433 constructed, modified, or operated in violation of these conditions.

1434 **12VAC5-590-200. Procedure for obtaining a construction permit.**

1435 A. Construction permits are issued by the ~~Commissioner~~ commissioner, but all requests for a
1436 construction permit are directed initially to the ~~Field Office~~ department. The procedure for
1437 obtaining ~~the~~ a construction permit includes the following steps:

1438 (i) ~~the submission of an application, (ii) a preliminary engineering conference, (iii) the~~
1439 ~~submission of an engineer's report (optional at the discretion of the Field Director), and,~~
1440 (iv) ~~the submission of plans, specifications, design criteria and other data in the number~~
1441 ~~requested by the Division.~~

1442 A. An application for a permit shall be submitted by the owner or authorized agent requesting
1443 permission to establish, construct, expand, modify, and/or operate a waterworks or water supply.
1444 The application shall clearly indicate whether the affected water supply is a community,
1445 nontransient noncommunity, or noncommunity waterworks.

1446 B. A preliminary conference with the Division's appropriate District Engineer will be held. The
1447 applicant's engineer shall be prepared to set forth the water supply problems and the proposed
1448 solution in such a manner as to support his conclusions and recommendations.

1449 1. Owners shall notify the department of all proposed construction projects, except
1450 distribution main projects that are permitted under the provisions of a general permit for
1451 distribution mains (see 12VAC5-590-300), or when the project is for the extension of water
1452 distribution piping having a diameter of eight inches or less and serving less than 15
1453 connections (see § 32.1-172 A of the Code of Virginia).

1454 2.The submission of a Waterworks Permit Application to the department on a form
1455 approved by the department.

1456 3. Based on the application received, the department shall notify the owner if a preliminary
1457 engineering conference is required. A preliminary engineering conference shall be
1458 required for projects proposed using alternative delivery methods authorized under § 2.2-
1459 4380 of the Code of Virginia. The preliminary engineering conference shall define the
1460 scope of the project, project phasing, milestones, and deliverables. An evaluation
1461 procedure shall be agreed upon and the conference shall be documented.

1462 4. The submission of preliminary engineering or intermediate design reports, if required
1463 by the department. The need for, and scope of, the reports shall be established during
1464 the preliminary engineering conference.

1465 5. The submission of a waterworks business operation plan that demonstrates the
1466 waterworks' TMF capability. The waterworks business operation plan consists of four
1467 primary components:

1468 a. Waterworks information which includes ownership data, a waterworks' facility
1469 description, operator requirements, staffing needs, and staff training.

1470 b. Management information which identifies critical business practices necessary for
1471 effective management and operation of the waterworks. Management information
1472 includes the requirements essential for managing and operating the waterworks and
1473 defines the processes, methods, and tasks necessary for complying with the
1474 regulations.

1475 c. Financial information which projects whether the waterworks' revenues and cash
1476 flow will be sufficient for meeting the cost of operation and maintenance for at least
1477 five full years from the initiation of operations. Financial information also demonstrates
1478 the owner's ability to direct the waterworks' finances to support technical and
1479 managerial capacities and includes a self-assessment consisting of several financial
1480 metrics: operating cash reserve, debt service coverage, emergency reserve, and
1481 revenue sufficiency.

1482 d. Sustainability improvements which are identified throughout the waterworks
1483 business operation plan to address TMF aspects of the waterworks' business
1484 processes that need improvement.

1485 6. The submission of plans, specifications, final design criteria, and other supporting
1486 design data. This submission may include manufacturers' equipment data sheets,
1487 drawings, and specifications, when the specific materials or equipment to be used in the
1488 project have been preselected by the owner with the engineer's concurrence.

1489 B. Well site inspection. When, upon inspection by the department, one or more well locations
1490 are found suitable for well sites, tentative approval in writing shall be furnished to the owner
1491 authorizing the drilling of the well or wells, the exact location where each well is to be drilled, and
1492 the well construction requirements. This tentative approval will become void after a 12-month
1493 period.

1494 C. ~~The engineer's report and preliminary plans for waterworks shall present the following~~
1495 ~~information where applicable:~~

1496 ~~1. General information – The report shall include:~~

1497 ~~a. A description of any existing waterworks and sewerage facilities.~~

1498 ~~b. Identification of the municipality or area served.~~

1499 ~~c. The name and mailing address of the owner.~~

1500 ~~2. Extent of waterworks system – The report shall include:~~

1501 ~~a. A description of the nature and extent of the area to be served.;~~

1502 ~~b. Provisions for extending the waterworks system to include additional areas.~~

1503 ~~c. An appraisal of the future requirements for service, including existing and potential~~
1504 ~~industrial, commercial, institutional and other water supply needs.~~

1505 ~~3. Alternate plans – Where two or more solutions exist for providing public water supply~~
1506 ~~facilities, each of which is feasible and practicable, the report shall discuss the alternate~~
1507 ~~plans and give reasons for selecting the one recommended, including financial~~
1508 ~~considerations.~~

1509 ~~4. Soil, groundwater conditions, and foundation problems – The report shall include:~~

1510 ~~a. A description of the character of the soil through which water mains are to be laid.~~

1511 ~~b. A description of foundation conditions prevailing at sites of proposed structures.~~

1512 c. A description of the approximate elevation of ground water in relation to subsurface
1513 structures.

1514 ~~5. Water consumption – The report shall include:~~

1515 a. A description of the population trends as indicated by available records, and the
1516 estimated population which will be served by the proposed water supply system or
1517 expanded system.

1518 b. Present and estimated future water consumption values used as the basis of design.

1519 c. Present and estimated future yield of the sources of supply.

1520 ~~6. Fire flow requirements; – if fire flows are to be provided, the quantity of fire flow which
1521 will be made available by the proposed or enlarged system shall be given.~~

1522 ~~7. Sewerage system available; – Describe the existing system and sewage treatment
1523 works, with special reference to its relationship to the existing or proposed waterworks
1524 which may affect the operation of the water supply system, or which may affect the quality
1525 of the water supply.~~

1526 ~~8. Source of water supply: – Describe the proposed source or sources of water supply to
1527 be developed and the reasons for their selection by supplying the following data:~~

1528 a. Surface water sources

1529 (1) Hydrological data, stream flow, and weather records;

1530 (2) Safe yield, including all factors that may affect it;

1531 (3) Maximum flood flow, together with approval for safety features of spillway and dam
1532 from appropriate reviewing authority;

1533 ~~(4) Summarized quality of raw water with special references to fluctuation in quality,~~
1534 ~~changing meteorological conditions, sources of contamination, measures to protect~~
1535 ~~the watershed, etc.~~

1536 ~~b. Groundwater sources~~

1537 ~~(1) Sites considered,~~

1538 ~~(2) Advantages of site selected,~~

1539 ~~(3) Elevation with respect to surroundings and 100-year flood,~~

1540 ~~(4) Probable character of geological formations through which source is to be~~
1541 ~~developed,~~

1542 ~~(5) Unusual geological conditions affecting site,~~

1543 ~~(6) Summary of source exploration, test well depth and method of construction,~~
1544 ~~placement of liners or screens; pumping test, hours, capacity; water level and specified~~
1545 ~~yield, water quality,~~

1546 ~~(7) Possible sources of contamination.~~

1547 ~~9. Proposed treatment processes – Summarize and establish the adequacy of proposed~~
1548 ~~processes for the treatment of the specified water under consideration (pilot studies may~~
1549 ~~be required).~~

1550 ~~10. Waste disposal – Discuss the various wastes from the water treatment plant, their~~
1551 ~~volume, proposed treatment and points for discharge.~~

1552 ~~11. Automatic equipment – Provide supporting data justifying automatic equipment,~~
1553 ~~including servicing.~~

1554 ~~12. Project sites – The report shall include:~~

1555 ~~a. A discussion on various sites considered and advantages of the recommended one;:~~

1556 b. A description of the proximity of residences, industries, and other establishments,
1557 c. The location of potential sources of pollution that may influence the quality of the
1558 supply or interfere with the effective operation of the waterworks system, such as
1559 sewage absorption systems, septic tanks, privies, cesspools, sink holes, sanitary
1560 landfills, petroleum storage tanks, etc.

1561 13. Financing – The report shall state:

1562 a. The estimated cost of integral parts of the system,
1563 b. The detailed estimated annual cost of operation,
1564 c. The proposed method of financing, both capital charges and operating expenses.

1565 14. Future extensions – Summarize planning for future needs and service.

1566 D. C. Plans for waterworks improvements construction shall provide the following information,
1567 where applicable:

1568 1. A general layout ~~which~~ that includes:

1569 a. Suitable title, to include name of waterworks;₁
1570 b. Name of owner of waterworks;₁
1571 c. Area or institution to be served;₁
1572 d. Scale, in feet;₁
1573 e. North Point;₁
1574 f. Datum used;₁
1575 g. ~~Boundaries of the municipality or area to be served,~~
1576 h. g. Date, address, and name of designing owner's engineer;₁
1577 i. Imprint of professional engineer's seal (see 12VAC5-590-220),

1578 j. ~~Legible prints suitable for microfilming, with size not to exceed 30 inches by 42~~
1579 ~~inches;~~

1580 k. ~~h.~~ Location and size of existing water mains, distribution system; and

1581 ~~l.~~ i. Location and nature of existing waterworks structures and appurtenances affecting
1582 the proposed ~~improvements~~ construction noted on one sheet.

1583 2. Detailed plans ~~which~~ that include where applicable:

1584 a. Stream crossings, providing profiles with elevations of the stream bed and the
1585 normal and ~~extreme high and low water levels,~~ water level;

1586 b. Profiles having a horizontal scale of not more than 100 feet to the inch and a vertical
1587 scale of not more than 10 feet to the inch, with both scales clearly indicated;:

1588 c. Location and size of ~~the~~ property to be used for ~~the~~ groundwater development with
1589 respect to known references such as street intersections or section lines;:

1590 d. Topography and arrangement of present or planned wells or structures, with contour
1591 intervals not greater than two feet;:

1592 e. Elevation of highest known flood ~~level,~~ floor of structure, upper terminal of protective
1593 casing, and outside surrounding grade, using United States Coast and Geodetic
1594 Survey, United States Geological Survey, or equivalent elevations where applicable
1595 as a reference;:

1596 f. ~~Schematic drawing~~ A completed Uniform Water Well Completion Report, Form GW-
1597 2, and schematic drawings of well construction, showing diameter and depth of
1598 ~~drillholes~~ drill holes, casing and liner diameters and depths, grouting depths,
1599 elevations and designation of geological formation, water levels, and other details to
1600 describe the proposed well completely;:

- 1601 g. ~~Location~~ If not previously submitted in the PER: location of all potential sources of
 1602 pollution within ~~250~~ 1000 feet ~~(or further, depending upon aquifer type and recharge~~
 1603 ~~area)~~ of drilled wells, 100 feet of treated water storage facilities, five miles upstream
 1604 from surface water intakes, and the entire drainage area of springs;
- 1605 h. Size, length, identity, and location ~~of~~ of sewers, drains, ~~water mains~~ distribution
 1606 system, and water treatment plant structures;
- 1607 i. Schematic flow diagrams and hydraulic profiles showing the flow through various
 1608 water treatment plant units;
- 1609 j. Piping in sufficient detail to show flow through the water treatment plant, including
 1610 waste lines;
- 1611 k. Location of all chemical feeding equipment and points of chemical application;
- 1612 l. All appurtenances, specific structures, equipment, water treatment plant waste
 1613 disposal units, and point of discharge having any relationship to the plans for ~~water~~
 1614 ~~mains and/or~~ distribution system or waterworks structures;
- 1615 m. Location of sanitary or other facilities such as lavatories, showers, toilets, and
 1616 lockers;
- 1617 n. Location, dimensions, and elevations of all proposed water treatment plant
 1618 facilities; and
- 1619 o. Adequate description of all features not otherwise covered by the specifications.

1620 ~~E.~~ D. Specifications for waterworks construction improvements shall provide the following
 1621 information, where applicable: Complete, detailed, technical specifications shall be supplied for
 1622 the proposed project which include where applicable:

- 1623 1. A program for keeping existing waterworks facilities in operation during construction of
 1624 additional facilities so as to minimize interruption of service;_i
- 1625 2. Laboratory facilities and equipment, as well as sampling taps and their locations;_i
- 1626 3. Number and design of treatment process components;_i
- 1627 4. Materials or proprietary equipment for sanitary or other facilities including any necessary
 1628 backflow or backsiphonage backflow protection;_i
- 1629 5. Workmanship;_i and
- 1630 6. Other equipment.

1631 ~~F.~~ E. Design criteria. A summary of complete design criteria shall be submitted for the
 1632 proposed project, containing but not limited to the following information, where applicable:

- 1633 1. ~~Yield of source of supply,~~ Source water capacity;
- 1634 2. ~~Reservoir surface area,~~
- 1635 3. ~~Area of watershed,~~
- 1636 4. ~~2.~~ Estimated water consumption, including average day, maximum day, and peak hour
 1637 flows;
- 1638 5. ~~3.~~ Number and type of proposed services;_i
- 1639 6. ~~4.~~ Fire-fighting requirements;_i
- 1640 7. ~~5.~~ Basin capacities;_i
- 1641 8. ~~6.~~ Retention times;_i
- 1642 9. ~~7.~~ Unit loadings;_i
- 1643 10. ~~8.~~ Filter area and proposed filtration rate;_i
- 1644 11. ~~9.~~ Backwash rate;_i and

1645 ~~42.10.~~ Feeder capacities and ranges.

1646 F. For community waterworks, a copy of the duly recorded (i) plat plan of the well lot or
1647 subdivision plan showing the well lot; and (ii) dedication document stating that the well lot shall
1648 be used only for waterworks appurtenances as long as the lot is utilized as part of a waterworks.

1649 G. For noncommunity waterworks, the commissioner may, on a case-by-case basis, require
1650 a copy of a duly recorded plat plan of a well lot and a dedication document stating that the well
1651 lot shall be used only for waterworks appurtenances as long as the lot is utilized as part of a
1652 waterworks. In imposing such a requirement, the commissioner shall take into consideration
1653 public health protection and the waterworks' operations, treatment processes, and
1654 appurtenances.

1655 **12VAC5-590-210. ~~Formal requirements~~ Requirements for the submission of engineering**
1656 **data.**

1657 A. In accordance with Article 1 (~~§ 54.1-400 et seq.~~) of Chapter 4 of Title 54.1 the provisions
1658 of Chapter 4 (§ 54.1-400 et seq.) of Title 54.1 of the Code of Virginia, all drawings, specifications,
1659 and engineer's reports submitted for approval shall be prepared by or under the supervision of a
1660 licensed professional engineer legally qualified to practice in Virginia, unless submitted under §
1661 54.1-408 of the Code of Virginia for practice of land surveying in subdivisions.

1662 B. ~~The front cover of each set of drawings, of each copy of the engineer's report, and of each~~
1663 ~~copy of the specifications submitted for review shall bear the signed imprint of the seal of the~~
1664 ~~licensed professional engineer who prepared or supervised the preparation and be signed with~~
1665 ~~an original signature. In addition, each drawing submitted shall bear an imprint or a legible~~
1666 ~~facsimile of such seal. The quantity, format, and method of submission shall meet the~~
1667 ~~reviewevaluation needs of the department and shall be consistent with the requirements in~~
1668 Chapter 42.1 (§ 59.1-479 et seq.) of Title 59.1 of the Code of Virginia.

1669 C. All reports, plans, and specifications shall be submitted to the ~~field office~~ department at
1670 least 60 days ~~prior to~~ before the date upon which action by the department or division
1671 commissioner is desired.

1672 D. If the procedures for obtaining a construction permit in 12VAC5-590-200 are not complied
1673 with, or if plans and specifications are found to be incomplete or inadequate for ~~detailed review~~
1674 evaluation, then the plans and specifications will be returned to the submitting party. If revisions
1675 to the plans or specifications or both are necessitated, ~~a letter will be sent to the~~ owner and
1676 engineer who prepared them ~~outlining the~~ will be notified in writing of the necessary revisions.
1677 Revised plans or specifications or both constitute a resubmittal; ~~however, the division will make~~
1678 every resubmission. Every effort will be made to complete the ~~review of such~~ evaluation of these
1679 revisions promptly. Preliminary plans and the engineer's report should be submitted for review
1680 prior to preparation of final plans.

1681 **12VAC5-590-220. Compliance with the Manual of Practice.**

1682 A. The design guidelines set forth in ~~the Manual of Practice (Part III)~~ Part III of the regulations,
1683 the "Manual of Practice," specify general criteria for the design and construction of waterworks.
1684 The ~~division~~ commissioner may impose standards or requirements ~~which~~ that are more stringent
1685 than those contained in the Manual of Practice when required ~~for critical areas or special~~
1686 ~~conditions~~ to meet drinking water quality standards. Any ~~such~~ special standards or requirements
1687 with a federal mandate shall take precedence over the criteria in the manual and will be items
1688 ~~which~~ that warrant careful consideration at the preliminary engineering conference, referenced in
1689 12VAC5-590-200-B.

1690 B. Designs submitted for waterworks must demonstrate that the ~~system~~ waterworks will
1691 adequately safeguard public health. Submissions ~~which~~ that are in substantial compliance with
1692 the Manual of Practice and any ~~of~~ additional requirements of the ~~department~~ commissioner, as
1693 ~~noted above,~~ in subdivision A of this section will be approved. Justification for a design may be

1694 required for those portions of the submitted design ~~which that~~ differ from the criteria ~~of the division,~~
1695 set forth in the Manual of Practice and any established by the commissioner, or accepted
1696 engineering practices. Deviations from "shall" mandatory criteria contained in the Manual of
1697 Practice which the design engineer, in his judgment, believes to be substantial in nature shall be
1698 identified and justified. For each deviation, The division the commissioner may require changes
1699 in designs which are not in substantial compliance with the manual and which are not adequately
1700 justified by the engineer owner issue a design exception or require compliance with the criteria.

1701 C. Final, complete, and detailed plans and specifications submitted in accordance with the
1702 provisions of 12VAC5-590-200 and 12VAC5-590-210 will be ~~reviewed~~ evaluated by the ~~division~~
1703 department as soon as practicable upon receipt. ~~Such plans~~ Plans and specifications will be
1704 approved if they demonstrate substantial compliance with the design criteria set forth in the
1705 Manual of Practice and any established by the commissioner and if the waterworks, as
1706 constructed or modified, will be able to function in compliance with ~~the operating regulations set~~
1707 forth in Part II of this chapter. One set of the approved plans and specifications will be stamped
1708 by the division and returned to the owner.

1709 D. Compliance with the Manual of Practice for transient noncommunity waterworks is allowed
1710 the following exceptions as long as the conditions in subsection E of this section are satisfied:

1711 1. The design of a transient noncommunity waterworks is not required to satisfy the
1712 professional engineer licensure requirement of 12VAC5-590-210 under the following
1713 conditions:

1714 a. The waterworks shall serve no more than 100 persons per day.

1715 b. The waterworks shall consist only of one supply of source water, pressure tank no
1716 greater than 250 gallon capacity, and single service connection.

1717 c. The single service connection shall be a building or structure of less than 5,000
1718 square feet total floor space. The determination of square footage shall be calculated
1719 using the outside perimeter of the building or structure.

1720 2. Although the owner of a transient noncommunity waterworks is required to use a water
1721 well systems provider certified by the DPOR for drilling wells, the remainder of the
1722 waterworks facility construction at a transient noncommunity waterworks may be
1723 performed by a master plumber or a certified water well systems provider, as defined in §
1724 54.1-1129.1 of the Code of Virginia.

1725 E. The conditions for exceptions to the Manual of Practice for transient noncommunity
1726 waterworks specified in subsection D of this section are as follows:

1727 1. The owner shall submit a signed and dated statement attached to the permit application,
1728 certifying that subsection D of this section will be satisfied.

1729 2. The owner shall submit information related to the design, construction, and materials
1730 used as required by the department.

1731 _____

1732 **12VAC5-590-230. Issuance of the construction permit.**

1733 A. Upon approval of the plans and specifications, the commissioner will issue a permit to the
1734 owner to construct or modify his ~~the~~ waterworks or ~~water supply~~ in accordance with the approved
1735 plans and specifications.

1736 B. The construction permit shall be valid for a period of five years. If construction has not
1737 begun within five years but were to proceed in the future, then the owner shall reapply for a new
1738 construction permit.

1739 C. The construction permit may include conditions for securing equipment certifications and
1740 performance validations.

1741 **12VAC5-590-240. Revisions of approved plans.**

1742 A. Any deviations from the approved plans and specifications affecting capacity, hydraulic
1743 conditions, operating units, the functioning of water treatment processes, or the quality of water
1744 to be delivered must be approved by the ~~division~~ department before any ~~such changes~~ of these
1745 deviations are ~~made~~ implemented.

1746 B. Revised plans and specifications shall be submitted in time to ~~permit~~ allow the ~~review~~
1747 evaluation and approval of ~~such~~ these plans or specifications before any construction work ~~which~~
1748 that will be affected by ~~such~~ these changes ~~is begun~~ may begin.

1749 **12VAC5-590-250. Statement required upon completion of construction.**

1750 A. Upon completion of the construction or modification of the waterworks, the owner shall
1751 submit to the ~~field office~~ department a statement signed by a licensed professional engineer
1752 stating that the construction work was completed in accordance with the approved plans and
1753 specifications, revised only in accordance with the provisions of 12VAC5-590-240. This statement
1754 is called a statement of completion of construction and shall be based upon inspections of the
1755 waterworks during and after construction or modifications, ~~that~~ These inspections are to be
1756 adequate to insure the truth of the statement of completion of construction.

1757 B. The project documents may require a performance validation report to confirm the design,
1758 performance criteria, and appropriate emergency procedures for specific processes and
1759 equipment. The project documents may also require operator training. If these requirements are
1760 included in the project documents, then the statement of completion of construction shall also
1761 include the performance validation report and a certification of successful operator training, as
1762 applicable.

1763 **12VAC5-590-260. Issuance of the operation permit.**

1764 A. Upon receipt of the 12VAC5-590-250 statement of completion of construction, receipt of all
1765 required certifications and test results, inspection by the department to ensure that the project has
1766 been satisfactorily completed in accordance with the approved design documents, and verification
1767 that bacteriological test results comply with the requirements set forth in Part II of these
1768 regulations, as appropriate, the commissioner will issue an operating operation permit. However,
1769 the commissioner may delay the granting of the permit pending inspection by the field office to
1770 insure that the work has been satisfactorily completed.

1771 B. The owner shall not operate a waterworks without first having obtained an operation permit
1772 except as provided in 12VAC5-590-290.

1773 C. The commissioner shall establish the type (community waterworks, NTNC, or TNC),
1774 classification, and permitted capacity of the waterworks, and specify these on the operation
1775 permit. Conditions may be included with the permit for operator, monitoring, and reporting
1776 requirements.

1777 **12VAC5-590-270. ~~Inspection and correction.~~ Start-up testing and inspections.**

1778 A. Within 30 days after Before placing a new or modified waterworks or water supply into
1779 operation following construction, the owner shall test the water produced at the entry point to the
1780 distribution system in a manner acceptable to the division department. The field office will be
1781 notified owner shall notify the department of the time and place of the tests. Results The owner
1782 shall send the results of the tests will be sent to the field office department.

1783 B. The commissioner, a member of the board, or a member of the division has a right to
1784 inspect any waterworks or water supply and to be present for any testing in accordance with Title
1785 32.1 of the Code of Virginia.

1786 ~~12VAC5-590-280. Procedure for obtaining a construction permit for well sources.~~

1787 ~~(Repealed.)~~

1788 ~~Since the quantity and quality of water from proposed wells cannot be anticipated, the~~
1789 ~~following procedure shall be used:~~

1790 ~~1. Submittal of application--see 12VAC5-590-200 A.~~

1791 ~~2. Preliminary engineering conference--see 12VAC5-590-200 B.~~

1792 ~~3. When, upon inspection by the division's engineer, one or more well lots are found~~
1793 ~~suitable for well sites, then tentative approval in writing will be furnished to the owner~~
1794 ~~authorizing him to proceed with the drilling of the well or wells and this letter will specify~~
1795 ~~the exact location on the lot where each well is to be drilled. Also, the letter will specify~~
1796 ~~that the well shall be Class I or Class II, meeting the specifications set forth in Part III~~
1797 ~~Article 2, Source Development. This tentative approval will become void after a 12-month~~
1798 ~~period and the site must be reinspected before construction when so voided.~~

1799 ~~4. Submittal of engineer's report and preliminary plans--see 12VAC5-590-200 C.~~

1800 ~~5. Submittal of plans, specifications, and other data--see subsections D, E, and F of~~
1801 ~~12VAC5-590-200; 12VAC5-590-210 and 12VAC5-590-840. One of the following must~~
1802 ~~also be submitted:~~

1803 ~~a. A copy of the plat plan showing that it has been duly recorded and signed by the~~
1804 ~~clerk of the court, giving the deed book and page number and date of recording, will~~
1805 ~~be required before a construction permit can be issued, or~~

1806 ~~b. If the well lot is identified on a recorded plan of the subdivision as a well lot, then~~
1807 ~~this is acceptable, if recorded as required by this subsection.~~

1808 In addition, a dedication document duly recorded with the clerk of the circuit court must
1809 be furnished stating that the well lot shall be used only for waterworks appurtenances
1810 as long as this lot is utilized as part of a waterworks.

1811 **12VAC5-590-290. Procedure for issuance of special permits for new or nonconventional**
1812 **methods, processes, and equipment Issuance of a temporary operation permit.**

1813 A. Water treatment methods, processes, and equipment ~~which~~ that are not covered by the
1814 design criteria of Part III ~~or Part IV~~ of this chapter, and which in principle or application are new
1815 or nonconventional, are subject to a ~~special~~ temporary permit application procedure ~~in lieu~~ instead
1816 of that set forth in 12VAC5-590-200. A ~~special~~ temporary permit may be issued only after detailed
1817 ~~review~~ evaluation of all engineering data and after a period of extensive monitoring of the water
1818 treatment plant performance.

1819 B. ~~The policy of the board is to encourage~~The department encourages the development of
1820 any new or nonconventional methods, processes, and equipment, which, by virtue of treatability
1821 studies, appear to have application for ~~the purification of raw water~~ treatment. However, these
1822 new or nonconventional developments shall have been thoroughly tested in a ~~full-scale~~ full-scale
1823 or representative ~~pilot plant~~ pilot-plant installation before ~~approval of a plant utilizing this process~~
1824 these methods, processes, and equipment can be employed are approved and an operation
1825 permit issued. ~~The result of this testing must~~ results shall be submitted to the ~~field office~~
1826 department. The testing required on new or nonconventional developments ~~will~~ shall generally
1827 follow these guidelines:

1828 1. All procedures used in validating the process shall be conducted under the supervision
1829 of (i) a licensed professional engineer experienced in the field of environmental
1830 engineering, (ii) the owner's engineering staff, or (iii) a testing firm acceptable to the
1831 ~~division~~ commissioner;

- 1832 2. Samples shall be collected and analyzed in a manner ~~which would~~ that shall
1833 demonstrate water treatment plant effectiveness and efficiency under adverse conditions
1834 and over extended periods of time in the area of the proposed installation;
- 1835 3. The data shall be from the continuous operation of a ~~full-scale~~ full-scale or pilot plant
1836 treating the type of water to be handled;
- 1837 4. Automatic indicating, recording, and totalizing ~~flow measuring~~ equipment shall be
1838 provided, and the total flow shall be measured and recorded daily;
- 1839 ~~5. At installations treating surface waters, employing coagulation, flocculation,~~
1840 ~~sedimentation, filtration, and disinfection, automatic indicating and recording equipment~~
1841 ~~shall be provided for continuously monitoring the turbidity of the raw water, settled water,~~
1842 ~~and each filter effluent, as well as pH monitoring of the treated water (flash mix effluent);~~
- 1843 ~~6.~~ 5. If the ~~raw water source~~ source water receives upstream discharges of treated
1844 industrial wastes or ~~sewage effluents~~ treated wastewater, then automatic indicating and
1845 recording equipment shall be provided for continuously monitoring the pH of ~~raw~~ the
1846 source and finished water, and in addition to the chlorine residual of the finished water;
- 1847 ~~7.~~ 6. The minimum sampling and analysis program will be established by the ~~division~~
1848 commissioner in accordance with the process under investigation; and,
- 1849 ~~8.~~ 7. All analyses shall be made in accordance with the most current edition of Standard
1850 Methods for the Examination of Water and Wastewater, published by the American Public
1851 Health Association, the American Water Works Association, and the Water Pollution
1852 Control Federation or analytical methods approved in advance by the division utilize
1853 methods that are consistent with 12VAC5-590-440.

1854 C. Detailed plans shall be submitted where possible showing how, in case of nonacceptance,
1855 the water treatment plant or ~~unit~~ water treatment methods, processes, and equipment will be

1856 converted to, or replaced with, a proven process. Also, financial resources must be assured to
1857 make the conversion; ~~(for example: e.g., funds placed in escrow or a bond posted)~~posted.

1858 D. After ~~review~~ evaluation of the plans and testing data, the commissioner will issue a
1859 construction permit if ~~he is satisfied~~ the performance data verifies that the method, process, or
1860 equipment ~~will~~ may efficiently produce water ~~that will meet~~ in accordance with the design
1861 specifications and the operation standards of Part II of this chapter, and that the method, process,
1862 or equipment may be converted to a conventional technique, if necessary.

1863 E. Upon completion of construction or modification, a ~~provisional~~ temporary permit for a
1864 definite period of time will be issued for the operation of the new or nonconventional methods,
1865 processes, and equipment. Not more than one ~~provisional~~ temporary permit will be granted for a
1866 similar installation during the evaluation period. The ~~provisional~~ temporary operation permit shall
1867 require that:

1868 1. The evaluation period shall be a minimum of 12 months and no longer than 18 months;
1869 and

1870 2. The holder of a ~~provisional~~ temporary operation permit ~~must~~ shall submit reports on
1871 operation during the evaluation period as required by the ~~division~~ commissioner. The
1872 reports shall be prepared by (i) a licensed professional engineer experienced in the field
1873 of environmental engineering, (ii) the owner's operating or engineering staff, or (iii) a
1874 testing firm ~~acceptable to the division~~ organization.

1875 F. ~~The commissioner will issue an operation permit upon lapse of the provisional permit, if, on~~
1876 ~~the basis of testing during that period, he finds that the new or nonconventional method, process,~~
1877 ~~or equipment efficiently meets the operation standards of Part II. If the standards are not met,~~
1878 ~~then the commissioner will issue an order which will require the alteration of the waterworks or~~
1879 ~~water supply in a manner that will enable those standards to be met.~~

1880 F. The commissioner may issue a temporary operation permit if the waterworks is not in
1881 compliance with the regulations and public health will not be jeopardized. The temporary permit
1882 may be issued for such a period of time and subject to such conditions as the commissioner may
1883 deem appropriate for the owner to achieve compliance with this chapter.

1884 1. The commissioner may require, as a condition to a temporary operation permit, the
1885 submission of a waterworks business operation plan by new waterworks and existing waterworks
1886 that have demonstrated limited TMF capability or significant noncompliance with the regulations.

1887 2. The waterworks business operation plan shall satisfy the requirements of 12VAC5-590-200

1888 A 5.

1889

1890 **12VAC5-590-300. Procedure for obtaining issuance of a general permit for construction of**
1891 **distribution mains.**

1892 A. In lieu ~~of~~ Instead of obtaining a permit for each distribution main project, an owner may elect
1893 to obtain a general permit for the construction of distribution mains. These general permits are
1894 issued by the commissioner, but all requests for a general permit are directed initially to the ~~field~~
1895 office ~~department~~.

1896 B. The following ~~procedure for obtaining the~~ requirements shall be satisfied for the issuance
1897 of a general permit ~~shall be used~~:

1898 1. The owner shall develop, adopt, and have ~~division~~ the commissioner's approval of
1899 general specifications and plan details covering ~~water~~ distribution main design and
1900 construction. The general specifications shall be at least as stringent as the requirements
1901 contained in this chapter.

1902 2. The owner shall enter into a ~~memorandum of understanding~~ Memorandum of
1903 Understanding (MOU) with the ~~division which outlines the following~~ commissioner. The

1904 commissioner will outline the system-specific waterworks-specific requirements, and the
1905 owner's method of compliance with such requirements: the requirements.

1906 The waterworks-specific requirements include, but are not limited to the following:

1907 a. The maximum size of pipe to be covered by the general permit;

1908 b. The means for modifying the ~~division~~ department's approved general specifications
1909 and plan details;

1910 c. The maintenance of engineering capabilities satisfactory to the ~~division~~
1911 commissioner, either on-staff or through contractual arrangements;

1912 d. The preparation of engineering plans and specifications for individual projects;

1913 e. The maintenance of up-to-date distribution system maps and other appropriate
1914 records; and

1915 f. The submission by the owner to the ~~division~~ department of appropriate reports,
1916 including an annual report and summary, concerning all projects constructed under

1917 the terms of the ~~general permit~~ MOU and information concerning changes to the
1918 distribution system.

1919 C. Once the general specifications are approved and the MOU is agreed to by the
1920 commissioner, a general permit for distribution mains shall be issued with the MOU attached.

1921 D. The general permit allows for the construction of distribution mains. The duration for the
1922 general permit is five years.

1923 **12VAC5-590-310. Amendment or reissuance of operation permits.**

1924 A. The commissioner may amend or reissue a an operation permit where (i) there is a change
1925 in the manner of storage, ~~the~~ treatment, or in the ~~source~~ of supply of the source water at the
1926 permitted location; (ii) the existing permit is no longer valid; or (iii) for any other cause incident to

1927 the protection of the public health; or (iv) for the supplying of pure potable water; A provided
1928 notice may be required to be is given to the owner, and, if one is required, a hearing held in
1929 accordance with the provisions of ~~subdivisions 1 and 2 of 12VAC5-590-160~~ 12VAC5-590-115.

1930 B. The commissioner may require submission of a waterworks business operation plan as a
1931 condition to amend or reissue an operation permit. The waterworks business operation plan shall
1932 satisfy the requirements of 12VAC5-590- 200 A 5.

1933

1934 **12VAC5-590-320. Revocation ~~or suspension~~ of a an operation permit.**

1935 A. The commissioner may ~~suspend or~~ revoke a an operation permit in accordance with
1936 ~~Administrative Process Act~~ the APA. Reasons for revocation of ~~permits~~ are as follows include:

- 1937 1. The waterworks can no longer be depended upon to furnish potable water;
1938 2. The capacity of the waterworks is inadequate for the purpose of furnishing potable
1939 water;
1940 3. The owner has failed to abide by an order issued by the commissioner;
1941 4. The owner has abandoned the waterworks and discontinued supplying potable water;
1942 or
1943 5. The owner has failed to pay the waterworks operation fee required by § 32.1-171.1 of
1944 the Code of Virginia.

1945 ~~Failure to comply with the conditions of the operation permit; or~~

1946 ~~2. Violation of Title 32.1 of the Code of Virginia or of any of this chapter from which no~~
1947 ~~variance or exemption has been granted;;~~

1948 ~~3. Change in ownership;~~

1949 ~~4. Abandonment of the waterworks and discontinuing the supplying of pure water; and~~

1950 ~~5. Any of the grounds specified in § 32.1-174 of the Code of Virginia.~~

1951 B. Procedure for revocation of operation permit. When revoking ~~or suspending permits an~~
1952 operation permit in accordance with ~~the above subsection A of this section,~~ the commissioner
1953 shall:

1954 1. Send a written notice of intent to ~~suspend or~~ revoke by certified mail to the last known
1955 address of the ~~waterworks~~ owner. The notice shall state the reasons for the proposed
1956 ~~suspension or~~ revocation of the operation permit, the authority under which the
1957 commissioner proposes to act, and ~~shall give the time and place of the hearing; and offer~~
1958 the opportunity for an administrative proceeding in accordance with 12VAC5-590-115.

1959 2. Provide at least 30 days advance notice of the ~~hearing~~ administrative proceeding.

1960 C. ~~An owner who is given notice of intent to revoke or suspend his permit has a right to a~~
1961 ~~hearing as specified in 12VAC5-590-160 and 12VAC5-590-180.~~

1962 **12VAC5-590-330. Monitoring, records, and reporting.**

1963 A. The commissioner or ~~the division~~ department may require the owner ~~or operator of any~~
1964 ~~waterworks or water supply~~ to install, use, and maintain monitoring equipment for the control and
1965 testing of water flowing through the water treatment plant to:

1966 1. Identify and determine the cause of operational problems;

1967 2. Determine the necessary corrective actions for these problems;

1968 3. Ensure compliance with Part II of this chapter, and

1969 4. Prepare the finished water for entry into the distribution system.

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Part II

Operation Regulations for Waterworks

Article 4

General Drinking Water Compliance Standards, Testing, Surveys, and Responsibilities

12VAC5-590-340. General Compliance standards.

A. All physical, chemical, bacteriological, or radiological analyses for the purpose of demonstrating compliance with ~~primary and secondary maximum contaminant levels action levels~~ or contaminants that do not have PMCLs but for which compliance samples must be analyzed by certified laboratories the requirements of this chapter shall be performed by the Commonwealth of Virginia, ~~Department of General Services, Division of Consolidated Laboratory Services (DCLS)~~ DCLS or in ~~by~~ laboratories certified by the ~~Division of Consolidated Laboratory Services DCLS~~ for such purposes unless listed in 12VAC5-590-440 C. The owner is responsible for the collection and submission of all samples. The department may require sampling and testing that exceeds the minimal requirements specified in this chapter. A sample is deemed to have been collected only ~~if and~~ when its results are made known to the ~~Office of Drinking Water~~ODWdepartment.

B. Specific limits. No attempt has been made to prescribe specific limits for every contaminant that might occur in a water supply or a waterworks. Although the need exists for continued attention to the entry of chemical, physical, bacteriological, and radiological substances into drinking water, the limits are confined to substances recognized as being detrimental to the health or well-being of the consumer or cause significant degradation of the usefulness of the water. Limits for innumerable substances would require an impossible burden of analytical examination. The specific limits included in this chapter are listed in Tables 340.1 through 340.7.

C. Compliance is determined:

- 1994 1. Based on sample results or calculated averages, where appropriate, rounded to the
1995 same number of significant figures as the PMCL, SMCL, AL, or MRDL of the contaminant
1996 in question, or
- 1997 2. By the application of the specific treatment technique for particular contaminants (see
1998 12VAC5-590-391).

TABLE 340.1.
Inorganic Chemicals.

| <u>SUBSTANCE</u> | <u>PMCL (mg/L)</u> |
|---|---|
| <u>Antimony</u> | <u>0.006</u> |
| <u>Arsenic</u> | <u>0.010^a</u> |
| <u>Asbestos</u> | <u>7 million fibers/liter (longer than 10 µm)</u> |
| <u>Barium</u> | <u>2</u> |
| <u>Beryllium</u> | <u>0.004</u> |
| <u>Cadmium</u> | <u>0.005</u> |
| <u>Chromium</u> | <u>0.1</u> |
| <u>Cyanide (as free Cyanide)</u> | <u>0.2</u> |
| <u>Fluoride</u> | <u>4.0^b</u> |
| <u>Mercury</u> | <u>0.002</u> |
| <u>Nickel</u> | <u>No limits designated</u> |
| <u>Nitrate (as N)</u> | <u>10^c</u> |
| <u>Nitrite (as N)</u> | <u>1.0^c</u> |
| <u>Total Nitrate and Nitrite (as N)</u> | <u>10^c</u> |

| | |
|-----------------------|---|
| <u>Selenium</u> | <u>0.05</u> |
| <u>Thallium</u> | <u>0.002</u> |
| <u>SUBSTANCE</u> | <u>SECONDARY MAXIMUM CONTAMINANT LEVEL (mg/L)</u> |
| <u>Aluminum</u> | <u>0.05-0.2^d</u> |
| <u>Chloride</u> | <u>250^c</u> |
| <u>Copper</u> | <u>1.0</u> |
| <u>Corrosivity</u> | <u>Noncorrosive</u> |
| <u>Fluoride</u> | <u>2.0</u> |
| <u>Foaming agents</u> | <u>0.5^e</u> |
| <u>Iron</u> | <u>0.3</u> |
| <u>Manganese</u> | <u>0.05</u> |
| <u>Silver</u> | <u>0.1</u> |
| <u>Sulfate</u> | <u>250^c</u> |
| <u>Zinc</u> | <u>5</u> |
| <u>SUBSTANCE</u> | <u>ACTION LEVEL (mg/L)</u> |
| <u>Lead</u> | <u>0.015</u> |
| <u>Copper</u> | <u>1.3</u> |

^a Arsenic sampling results shall be reported to the nearest 0.001 mg/L.
^b The fluoride PMCL applies only to community waterworks.
^c Significant figures are noted as shown. For values with trailing zeros, significant figures are noted as shown. The limits for nitrate and nitrate-nitrite have two significant figures. The limits for chloride and sulfate have three significant figures.
^d Varying water quality and treatment situations necessitates a flexible range for the aluminum SMCL. The owner is encouraged to maintain an aluminum

concentration as low as possible. If the aluminum concentration in the finished water causes discoloration, then the owner is urged to contact the department.

^e Concentrations reported in terms of Methylene Blue Active Substances.

TABLE 340.2.
Organic Chemicals.

| <u>SUBSTANCE</u> | <u>PMCL (mg/L)</u> |
|--|--------------------|
| <u>VOC</u> | |
| <u>Benzene</u> | <u>0.005</u> |
| <u>Carbon tetrachloride</u> | <u>0.005</u> |
| <u>Chlorobenzene (also called Monochlorobenzene)</u> | <u>0.1</u> |
| <u>o-Dichlorobenzene</u> | <u>0.6</u> |
| <u>p-Dichlorobenzene</u> | <u>0.075</u> |
| <u>1,2-Dichloroethane (also called Ethylene dichloride)</u> | <u>0.005</u> |
| <u>1,1-Dichloroethylene (also called Dichloroethene)</u> | <u>0.007</u> |
| <u>cis-1,2-Dichloroethylene</u> | <u>0.07</u> |
| <u>Trans-1,2-Dichloroethylene</u> | <u>0.1</u> |
| <u>Dichloromethane (also called Methylene chloride)</u> | <u>0.005</u> |
| <u>1,2-Dichloropropane</u> | <u>0.005</u> |
| <u>Ethylbenzene</u> | <u>0.7</u> |
| <u>Styrene</u> | <u>0.1</u> |
| <u>Tetrachloroethylene (PCE) (also called Perchloroethylene)</u> | <u>0.005</u> |
| <u>Toluene</u> | <u>1</u> |

| | |
|---|-----------------------|
| <u>1,2,4-Trichlorobenzene</u> | <u>0.07</u> |
| <u>1,1,1-Trichloroethane</u> | <u>0.2</u> |
| <u>1,1,2-Trichloroethane</u> | <u>0.005</u> |
| <u>Trichloroethylene (TCE)</u> | <u>0.005</u> |
| <u>Vinyl Chloride</u> | <u>0.002</u> |
| <u>Xylene (total)</u> | <u>10^a</u> |
| <u>SOC</u> | |
| <u>Acrylamide</u> | <u>TT^b</u> |
| <u>Alachlor (also called Lasso)</u> | <u>0.002</u> |
| <u>Atrazine</u> | <u>0.003</u> |
| <u>Benzo(a)pyrene</u> | <u>0.0002</u> |
| <u>Carbofuran</u> | <u>0.04</u> |
| <u>Chlordane</u> | <u>0.002</u> |
| <u>Dalapon</u> | <u>0.2</u> |
| <u>Di(2-ethylhexyl)adipate (also called Bis(2-ethylhexyl)adipate)</u> | <u>0.4</u> |
| <u>Di(2-ethylhexyl)phthalate (also called Bis(2-ethylhexyl)phthalate)</u> | <u>0.006</u> |
| <u>1,2-Dibromo-3-chloropropane (DBCP)</u> | <u>0.0002</u> |
| <u>2,4-Dichlorophenoxyacetic Acid (2,4-D)</u> | <u>0.07</u> |
| <u>Dinoseb</u> | <u>0.007</u> |
| <u>Diquat</u> | <u>0.02</u> |

| | |
|--|----------------------------|
| <u>Endothall</u> | <u>0.1</u> |
| <u>Endrin</u> | <u>0.002</u> |
| <u>Epichlorohydrin</u> | <u>TT^b</u> |
| <u>Ethylene dibromide (EDB) (also called 1,2-Dibromoethane)</u> | <u>0.00005</u> |
| <u>Glyphosate</u> | <u>0.7</u> |
| <u>Heptachlor</u> | <u>0.0004</u> |
| <u>Heptachlor epoxide</u> | <u>0.0002</u> |
| <u>Hexachlorobenzene</u> | <u>0.001</u> |
| <u>Hexachlorocyclopentadiene</u> | <u>0.05</u> |
| <u>Lindane (also called gamma-HCH and gamma BHC)</u> | <u>0.0002</u> |
| <u>Methoxychlor</u> | <u>0.04</u> |
| <u>Oxamyl (Vydate)</u> | <u>0.2</u> |
| <u>Pentachlorophenol(PCP)</u> | <u>0.001</u> |
| <u>Picloram</u> | <u>0.5</u> |
| <u>Polychlorinated biphenyls (PCBs)</u> | <u>0.0005</u> |
| <u>Simazine</u> | <u>0.004</u> |
| <u>2,3,7,8-TCDD (Dioxin)</u> | <u>3 X 10⁻⁸</u> |
| <u>Toxaphene</u> | <u>0.003</u> |
| <u>2,4,5-Trichlorophenoxypropionic Acid (2,4,5-TP or Silvex)</u> | <u>0.05</u> |

^a The limit for xylene has two significant figures.

^b Each waterworks must certify annually to the department that when acrylamide and epichlorohydrin are used to treat water, the combination (or product) of dose

and monomer level does not exceed the levels specified as follows: (i) acrylamide = 0.05% dosed at 1 mg/L (or equivalent) and (ii) epichlorohydrin = 0.01% dosed at 20 mg/L (or equivalent). The certification shall be in writing, using third-party certification approved by the department or the manufacturer's certification.

TABLE 340.3.
Physical Quality

| <u>PARAMETER</u> | <u>STANDARD</u> | <u>CONCENTRATION</u> |
|--|----------------------------|---|
| <u>Color</u> | <u>SMCL</u> | <u>15 Color Units (CU)</u> |
| <u>Odor</u> | <u>SMCL</u> | <u>3 Threshold odor numbers</u> |
| <u>pH</u> | <u>SMCL</u> | <u>6.5-8.5</u> |
| <u>Total dissolved solids (TDS)</u> | <u>SMCL</u> | <u>500 mg/L^a</u> |
| <u>Turbidity</u> | <u>Treatment Technique</u> | <u>See 12VAC5-590-395 A 2 b^b</u> |
| <p>^a <u>TDS has three significant figures.</u></p> <p>^b <u>Operational goal: Surface water treatment plants with gravity flow granular media filters are capable of producing filtered water with a turbidity consistently less than 0.10 NTU. Therefore, for water treatment plants, the operational goal for filter effluent turbidity for each filter, before any post-filtration chemical addition, is 0.10 NTU.</u></p> | | |

TABLE 340.4.
Radiological Quality.

| <u>PARAMETER</u> | <u>PMCL</u> |
|--|--------------------------------|
| <u>Combined radium-226 and radium-228.</u> | <u>5 pCi/L</u> |
| <u>Gross alpha particle activity (excluding Radon and Uranium)</u> | <u>15 pCi/L</u> |
| <u>Beta particle and photon radioactivity.</u> | <u>4 mrem/yr^{a,b}</u> |
| <u>Uranium</u> | <u>30 µg/L^c</u> |

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

^b Except for the radionuclides listed in Schedule I, the concentration of man-made radionuclides causing 4 mrem total body or organ dose equivalents shall be calculated on the basis of a 2 liter per day drinking water intake using the 168-hour data listed in "Maximum Permissible Body Burdens and Maximum Permissible Concentrations of Radionuclides in Air and in Water for Occupational Exposure," NBS Handbook 69 issued June 5, 1959 and 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.

^c The limit for uranium has two significant figures.

Schedule 1

Average annual concentrations assumed to produce a total body organ dose of 4 mrem/year.

| <u>RADIONUCLIDE</u> | <u>CRITICAL ORGAN</u> | <u>pCi/L</u> |
|---------------------|-----------------------|---------------------------|
| <u>Tritium</u> | <u>Total Body</u> | <u>20,000^d</u> |
| <u>Strontium-90</u> | <u>Bone Marrow</u> | <u>8</u> |

^d The limit for tritium has five significant figures.

TABLE 340.5.
Microbial Contaminants.

| <u>CONTAMINANT</u> | <u>PMCL or TI</u> |
|------------------------|--|
| <u>Cryptosporidium</u> | <u>II</u> <u>Minimum 99% (2-log) removal plus additional log removal or inactivation based upon bin classification in 12VAC5-590-401 D.</u> |
| <u>Giardia lamblia</u> | <u>II</u> <u>99.9% (3-log) removal or inactivation.</u> |
| <u>Viruses</u> | <u>II</u> <u>99.99% (4-log) removal or inactivation</u> |
| <u>Legionella</u> | <u>II</u> |

| | |
|--|--|
| | <u>No limit, but if Giardia lamblia and viruses are removed or inactivated, according to the treatment techniques in 12VAC5-590-395, Legionella will also be controlled.</u> |
| <u>Heterotrophic plate count (HPC)</u> | <u>TT</u> <u>No more than 500 bacterial colonies per milliliter. (HPC is not a contaminant, it is an analytic method used to measure a variety of bacteria found in water.)</u> |
| <u>Escherichia coli (E. coli)</u> | <u>PMCL</u> <u>(1) Any E. coli-positive repeat sample following a total coliform-positive routine sample.</u> <u>(2) Total coliform-positive repeat sample following an E. coli-positive routine sample.</u> <u>(3) Failure to collect all require repeat samples following an E. coli-positive routine sample.</u> <u>(4) Failure to test for E. coli when any repeat sample tests positive for total coliform.</u> |

TABLE 340.6.
Disinfection Byproducts.

| <u>PARAMETER</u> | <u>PMCL (mg/L)</u> |
|--|--------------------------|
| <u>TTHM</u> ■ <u>Bromodichloromethane</u> ■ <u>Bromoform</u> ■ <u>Chloroform</u> ■ <u>Dibromochloromethane</u> | <u>0.080^a</u> |
| <u>HAA5</u> ■ <u>Bromoacetic acid</u> ■ <u>Dibromoacetic acid</u> ■ <u>Dichloroacetic acid</u> ■ <u>Monochloroacetic acid</u> ■ <u>Trichloroacetic acid</u> | <u>0.060^a</u> |
| <u>Bromate</u> | <u>0.010^a</u> |
| <u>Chlorite</u> | <u>1.0^a</u> |
| <u>^a The limits for TTHM, HAA5, and bromate have three significant figures. The limit for chlorite has two significant figures.</u> | |

TABLE 340.7.

Maximum Residual Disinfectant Level Goals (MRDLG) and Maximum Residual Disinfectant Levels (MRDL) for Disinfectants.

| <u>RESIDUAL DISINFECTANT</u> | <u>MRDL (mg/L)</u> |
|---|--|
| <u>Chlorine</u> | <u>4.0 (as Cl₂)^a</u> |
| <u>Chloramines</u> | <u>4.0 (as Cl₂)^a</u> |
| <u>Chlorine Dioxide</u> | <u>0.8 (as ClO₂)</u> |
| <u>^aChlorine and chloramines have two significant figures.</u> | |

1999 D. Notwithstanding the MRDLs in Table 340.7, an owner may increase the residual
 2000 disinfectant level of chlorine or chloramines (but not chlorine dioxide) in the distribution system to
 2001 a level and for a time necessary to protect public health. This may include specific microbiological
 2002 contamination problems caused by circumstances such as, but not limited to, distribution line
 2003 breaks, storm runoff events, water supply contamination events, or cross-connection events.

2004 **12VAC5-590-350. Sanitary surveys Assessments and sanitary surveys.**

2005 A. Frequent assessments shall be made by the owner of the water supply ~~source~~ and
 2006 waterworks to locate and identify health hazards to the waterworks. The manner and frequency
 2007 of making these assessments, and the rate at which discovered health hazards are to be
 2008 removed, shall be the responsibility of the owner. Every effort shall be made by the owner, to the
 2009 extent of his jurisdiction, to prevent the degradation of the quality of water ~~supply sources~~ supplies.

2010 B. ~~The commissioner may perform sanitary surveys.~~ The department is required to perform
 2011 sanitary surveys and site visits to assess the condition of a waterworks and its source water.
 2012 Pursuant to § 32.1-25 of the Code of Virginia, the department personnel have the right, with the
 2013 owner's consent, of entry onto the waterworks property and the facilities to inspect, investigate,
 2014 evaluate, conduct tests, and collect samples for testing for the purposes of determining
 2015 compliance with the provisions of any law, regulation, or order administered by the board or

2016 commissioner or any conditions in a permit, license, or certificate issued by the board or
2017 commissioner. ~~Owners~~ The owner shall provide any existing information requested by the
2018 department that will enable ~~the commissioner~~ the department personnel to conduct the sanitary
2019 survey or site visit.

2020 C. A sanitary survey includes, but is not limited to, an ~~onsite~~ evaluation of all of the following
2021 eight components:

2022 1. Source;

2023 2. Treatment;

2024 3. Distribution system;

2025 4. Finished water storage;

2026 5. Pumps, pumping facilities, and controls;

2027 6. Monitoring, reporting, data verification, and a special monitoring evaluation during each
2028 sanitary survey to determine whether the waterworks monitoring is appropriate or needs
2029 modification;

2030 7. Waterworks system management and operation; and,

2031 8. Number and classification of ~~licensed operator(s)~~ operator or operators ~~required in~~
2032 ~~12VAC5-590-460. Licensed operators~~ Operators shall also comply with all applicable
2033 regulations promulgated by the Virginia Board for Waterworks and Wastewater Works
2034 Operators and Onsite Sewage System Professionals and ~~, Department of Professional~~
2035 ~~and Occupational Regulation~~ DPOR.

2036 D. Significant deficiencies discovered as a result of a sanitary survey shall be addressed in
2037 accordance with the following:

2038 1. The ~~commissioner~~ department shall issue written notification describing the significant
2039 deficiency to the owner.

2040 2. Within 30 days of the ~~significant deficiency~~ significant-deficiency notification, the owner
2041 shall consult with the ~~commissioner~~ department regarding the appropriate corrective
2042 action with a schedule for implementing the corrective action. ~~Any~~ A waterworks with one
2043 or more significant deficiencies must have a ~~Corrective Action Plan (CAP)~~ CAP as
2044 described in 12VAC5-590-421 A.

2045 3. Within 45 days of the ~~significant deficiency~~ significant-deficiency notification, the owner
2046 shall submit to the department a CAP with a schedule for meeting the requirements of
2047 12VAC5-590-421 A.

2048 **12VAC5-590-360. Responsibility; Responsibilities of the owner.**

2049 A. ~~The water utility owner or owner of the property served, to the extent of their respective~~
2050 ~~jurisdictions, shall provide and maintain conditions through~~ throughout the entirety of the ~~water~~
2051 ~~supply system~~ waterworks in a manner ~~which~~ that will assure a high degree of capability and
2052 reliability to ~~effect compliance with these standards~~ comply with Part II of this chapter. This
2053 requirement shall pertain to the ~~source of supply~~ source water, transmission, treatment,
2054 ~~transmission~~, storage, and distribution system facilities and the operation thereof. ~~In addition, this~~
2055 ~~requirement shall include specific and continuing assessment of the capability, effectiveness, and~~
2056 ~~reliability of the treatment process in relation to potential contaminants in the source of supply.~~
2057 ~~Finally, this requirement shall include the identification and evaluation of~~ The owner shall identify
2058 and evaluate all factors having with the potential for impairing the quality of the water as delivered
2059 ~~to customers and appropriate preventive and control~~ the consumers. Preventative control
2060 measures identified in Part II of this chapter shall be promptly implemented to protect public
2061 health.

2062 B. ~~For the purpose of application of this chapter, responsibility for the conditions in the water~~
2063 ~~supply system shall be considered to be held by:~~

2064 1. ~~The owner from the source of supply to the customer's service connection; and~~

2065 2. ~~The owner of the property served and the municipal, county, or other authority having~~

2066 ~~legal jurisdiction from the customer's service connection to the free-flowing outlet. For the~~

2067 ~~purpose of achieving compliance with this chapter, the owner shall exercise control of the~~

2068 ~~waterworks from the source water to the service connection. This requirement does not~~

2069 ~~imply ownership of, or maintenance for, any portion of the service line where local~~

2070 ~~agreements and conditions dictate otherwise.~~

2071 C. ~~The property owner shall exercise control of all buildings, structures, and equipment up to~~

2072 ~~the point of the service connection to the waterworks. This requirement does not limit or modify~~

2073 ~~ownership of, or maintenance for, the service line, that may be specified by local agreements and~~

2074 ~~conditions.~~

2075 Article 2

2076 General Information

2077 **12VAC5-590-370. Sampling frequency Monitoring requirements.**

2078 ~~The commissioner may exempt consecutive waterworks that obtain potable water from~~

2079 ~~another water system for distribution from all monitoring requirements in this section except for~~

2080 ~~bacteriological (subsection A of this section); disinfectant residuals, disinfection byproducts, and~~

2081 ~~disinfection byproduct precursors (subdivision B 3 of this section); and lead and copper (12VAC5-~~

2082 ~~590-375). The required sampling frequencies are as follows:~~

2083 A. Bacteriological monitoring.

2084 1. The owner shall collect total coliform samples at specific sites and according to a

2085 schedule that is representative of water quality throughout the distribution system, which

2086 shall be documented in a written ~~bacteriological sample siting plan (BSSP)~~ BSSP. The
2087 BSSP shall be established or approved by the ~~commissioner~~ department after
2088 investigation of the source water, method of treatment and storage, and ~~protection of the~~
2089 ~~water concerned~~ the final delivery of the drinking water through the distribution system.
2090 The BSSP shall include, but is not limited to, the following:

2091 a. Specific routine, repeat, and triggered source water monitoring sites, identified by
2092 address or location.

2093 b. Distribution map showing the location where specific sampling sites will be selected
2094 with all monitoring sites identified.

2095 c. A minimum of three routine sample sites identified for each required routine sample
2096 for waterworks serving 3,300 or fewer people.

2097 d. Sample collection schedule with the number of routine samples required per
2098 monitoring period in accordance with Table ~~2-4370.1~~ 2-4370.1 and subdivision A 4 of this
2099 section.

2100 e. Repeat sample sites for each routine sample site that shall include the original
2101 routine location, at least one tap within five service connections upstream, and at least
2102 one tap within five service connections downstream with the following exceptions:

2103 (1) Alternative repeat sample sites may be allowed when a routine site is one
2104 connection away from or at the end of a ~~water supply~~ distribution system main or as
2105 approved by the ~~commissioner~~ department;

2106 (2) ~~Groundwater waterworks~~ A groundwater system serving 1,000 or fewer people
2107 may propose repeat sample sites, such as entry point to the distribution system, that
2108 differentiate potential source water and distribution system contamination;

2109 (3) ~~Groundwater waterworks~~ A groundwater system serving 1,000 or fewer people with
2110 a single well source and no treatment may propose that one repeat sample be
2111 collected at the triggered source water monitoring site, provided that representative
2112 sampling of the distribution system is still achieved.

2113 f. A repeat sampling site shall not be eliminated from future collections solely based
2114 on a history of questionable water quality unless the sampling point is unacceptable
2115 as determined by the ~~commissioner~~ department.

2116 g. A seasonal waterworks may collect special samples in accordance with an approved
2117 start-up procedure pursuant to subdivision A ~~4~~ 12 a of this section.

2118 2. The minimum number of bacteriological samples for total coliform evaluation to be
2119 collected and analyzed monthly from the distribution system of a community waterworks
2120 ~~or nontransient noncommunity waterworks~~ a NTNC shall be in accordance with Table 2-4-
2121 370.1. ~~Owners of all~~ The owner of a (i) ~~transient noncommunity waterworks~~ TNC that use
2122 uses a surface water source or a groundwater source under the direct influence of surface
2123 water ~~and or~~ (ii) a large transient noncommunity waterworks TNC (serving 1,000 or more
2124 persons per day) ~~waterworks~~ shall collect and submit samples monthly for analysis in
2125 accordance with Table 2-4-370.1. ~~Owners of~~ For all other ~~transient noncommunity~~
2126 ~~waterworks~~ TNCs, the owner shall collect and submit samples for analysis each calendar
2127 quarter in accordance with Table 2-4- 370.1. The minimum number of samples must be
2128 collected and submitted even if the waterworks has exceeded the E. coli PMCL or the total
2129 coliform treatment technique triggers.

2130 3. The samples shall be ~~taken~~ collected at ~~reasonably~~ evenly spaced time intervals as
2131 practical throughout the month, except that a waterworks that ~~use~~ uses only groundwater
2132 and serving 4,900 or fewer people may collect all the required samples on a single day if
2133 the samples are ~~taken~~ collected from different sites.

2134 4. If the results of a sanitary survey or other factors determine that some other frequency
 2135 is more appropriate than that stated in subdivisions A 2 and A 3 and A 4 of this section,
 2136 then a modified BSSP may be required. The altered frequency shall be confirmed or
 2137 changed on the basis of subsequent sanitary surveys or as otherwise determined by the
 2138 ~~commissioner~~ department.

2139 5. ~~An~~ The owner may conduct more compliance monitoring than is required by this section
 2140 to investigate potential problems in the distribution system and to assist in uncovering
 2141 problems. ~~An~~ The owner may ~~take~~ collect more than the minimum number of required
 2142 routine samples. If the samples are ~~taken~~ collected in accordance with the existing BSSP
 2143 and are representative of water quality throughout the distribution system, then all of the
 2144 results shall be included in determining whether a coliform treatment technique has been
 2145 triggered.

2146 6. ~~An~~ The owner may propose repeat monitoring locations believed to be representative
 2147 of a pathway for contamination of the distribution system. ~~An~~ The owner may elect to
 2148 specify either alternative fixed locations or criteria for selecting repeat sampling sites on a
 2149 situational basis in a ~~standard operating procedure (SOP)~~ SOP in its BSSP. The owner
 2150 shall design the SOP to focus on the collection of repeat samples at locations that best
 2151 verify and determine the extent of potential contamination of the distribution system ~~area~~
 2152 based on specific situations. The ~~commissioner~~ department shall require modifications to
 2153 the SOP or require alternative monitoring locations as needed.

2154

| TABLE 2.4370.1. Bacteriological Monitoring. | |
|--|---|
| POPULATION SERVED PER DAY | MINIMUM NUMBER OF SAMPLES ^a (See subdivision A 2 of this section) |
| 25 - 1,000 ^b | 1 |

| | | |
|--|-----------------------|-----|
| | 1,001 - 2,500 | 2 |
| | 2,501 - 3,300 | 3 |
| | 3,301 - 4,100 | 4 |
| | 4,101 - 4,900 | 5 |
| | 4,901 - 5,800 | 6 |
| | 5,801 - 6,700 | 7 |
| | 6,701 - 7,600 | 8 |
| | 7,601 - 8,500 | 9 |
| | 8,501 - 12,900 | 10 |
| | 12,901 - 17,200 | 15 |
| | 17,201 - 21,500 | 20 |
| | 21,501 - 25,000 | 25 |
| | 25,001 - 33,000 | 30 |
| | 33,001 - 41,000 | 40 |
| | 41,001 - 50,000 | 50 |
| | 50,001 - 59,000 | 60 |
| | 59,001 - 70,000 | 70 |
| | 70,001 - 83,000 | 80 |
| | 83,001 - 96,000 | 90 |
| | 96,001 - 130,000 | 100 |
| | 130,001 - 220,000 | 120 |
| | 220,001 - 320,000 | 150 |
| | 320,001 - 450,000 | 180 |
| | 450,001 - 600,000 | 210 |
| | 600,001 - 780,000 | 240 |
| | 780,001 - 970,000 | 270 |
| | 970,001 - 1,230,000 | 300 |
| | 1,230,001 - 1,520,000 | 330 |
| | 1,520,001 - 1,850,000 | 360 |
| | 1,850,001 - 2,270,000 | 390 |
| | 2,270,001 - 3,020,000 | 420 |
| | 3,020,001 - 3,960,000 | 450 |
| | 3,960,001 or more | 480 |

^a Monthly monitoring is required for the following waterworks: (i) community, (ii) nontransient noncommunity, (iii) all noncommunity waterworks that use either a surface water source or a GUDI source or both, (iv) all seasonal waterworks, and (v) large noncommunity (> 1,000 people per day). Quarterly monitoring is required for noncommunity waterworks not specifically identified in the monthly requirements. Annual monitoring may be allowed at a TNC that meets the criteria specified in subdivision A 8 of this section.

^b Includes a waterworks that have at least 15 service connections, but serve fewer than 25 persons.

2155 7. All bacteriological analyses shall be performed in accordance with 12VAC5-590-440 by
2156 the ~~Division of Consolidated Laboratory Services (DCLS)~~ DCLS or by a laboratory certified
2157 by the DCLS for drinking water samples.

2158 8. Annual monitoring. The department may reduce the bacteriological monitoring
2159 frequency at a well-operated TNC from a quarterly sample to one annual sample and the
2160 waterworks may remain at the annual monitoring frequency provided that all of the
2161 following conditions are continuously met:

2162 a. The waterworks serves 1,000 or fewer people per day.

2163 b. The waterworks uses groundwater only and is not under the influence of surface
2164 water.

2165 c. The waterworks has a clean compliance history for a minimum of 12 consecutive
2166 months.

2167 d. The most recent sanitary survey shows that the waterworks is free of sanitary
2168 defects or has corrected all identified sanitary defects.

2169 e. The waterworks has a protected water source.

2170 f. The waterworks meets existing approved construction standards.
2171 g. The department has conducted an annual site visit within the last 12 months, and
2172 all identified sanitary defects have been corrected. For the purposes of this section,
2173 an annual site visit is equivalent to a voluntary Level 2 assessment that meets the
2174 criteria in 12VAC5-590-392 C. A sanitary survey may meet the requirement for an
2175 annual site visit in the year in which the sanitary survey is completed if all identified
2176 sanitary defects have been corrected.

2177 8.9. Increased monitoring.

2178 a. A transient noncommunity waterworks TNC on quarterly or annual monitoring shall
2179 begin monthly monitoring in the month following an event if any of the following were
2180 to occur occurs: (i) the waterworks triggers a Level 2 assessment or two Level 1
2181 assessments under the provisions of 12VAC5-590-392 in a rolling 12-month period,
2182 (ii) the waterworks has an E. coli PMCL violation, (iii) the waterworks has a coliform
2183 treatment technique violation, (iv) the owner has two monitoring violations under
2184 12VAC5-590-370 A 2, or (v) the owner has one monitoring violation under 12VAC5-
2185 590-370 A 2 and one Level 1 assessment under 12VAC5-590-392 in a rolling 12-
2186 month period. Owners—The owner shall continue monthly monitoring until the
2187 requirements in subdivisions A 9 a A 10 a and A 9 b A 10 b of this section are met. A
2188 waterworks on monthly monitoring for other reasons is not considered to be on
2189 increased monitoring for the purpose of this subdivision.

2190 b. A TNC on annual monitoring that experiences one monitoring violation of section
2191 12VAC5-590-370 must begin quarterly monitoring in the quarter following the event.
2192 The owner shall continue quarterly monitoring until the conditions in subdivision A 11
2193 of this section are continuously met and the department reduces the monitoring
2194 frequency.

2195 9-10. Returning to quarterly routine monitoring. The ~~commissioner~~ department may return
2196 the monitoring frequency of a ~~transient noncommunity waterworks~~ TNC subject to
2197 subdivision A 9 a of this section and using groundwater not under the influence of surface
2198 water to quarterly monitoring if:

2199 a. The ~~commissioner~~ department has completed a sanitary survey or a site visit within
2200 the last 12 months, and the ~~transient noncommunity waterworks~~ TNC is free of sanitary
2201 defects and has a protected water source; and

2202 b. The ~~owner~~ waterworks has maintained a clean compliance history, ~~defined as a~~
2203 record of no PMCL violations for microbiological contaminants, no monitoring
2204 violations under 12VAC5-590-370, and no coliform treatment technique trigger
2205 exceedances or treatment technique violations under 12VAC5-590-392, for a
2206 minimum of 12 consecutive months following the event.

2207 11. Returning to annual routine monitoring. The department may reduce the
2208 monitoring frequency of a TNC subject to subdivision A 9 of this section and using
2209 groundwater not under the influence of surface water to annual monitoring if:

2210 a. An annual site visit or sanitary survey is conducted by the department and all
2211 identified sanitary defects are corrected. The waterworks may substitute a voluntary
2212 Level 2 assessment for the annual site visit.

2213 b. The waterworks has a protected water source and maintained a clean compliance
2214 history for a minimum of 12 consecutive months following the event.

2215 c. The waterworks has in place or has adopted one or more of the following additional
2216 barriers to contamination: (i) an approved cross-connection control program, (ii)
2217 a licensed operator, (iii) continuous disinfection and maintenance of a residual in the
2218 distribution system in accordance with criteria specified by the department, (iv)

2219 demonstration of maintenance of at least a 4-log removal or inactivation of viruses in
2220 accordance with 12VAC5-590-379 A, or (v) other equivalent enhancements approved
2221 by the department.

2222 40. 12. Seasonal waterworks monitoring.

2223 a. All ~~A~~ A seasonal waterworks shall demonstrate completion of an approved start-up
2224 procedure that may include start-up sampling ~~prior to~~ before serving water.

2225 b. A seasonal waterworks shall monitor every month that it is in operation.

2226 c. The ~~commissioner~~ department may waive any seasonal waterworks from some or
2227 all of the requirements for seasonal waterworks if the entire distribution system
2228 remains pressurized during the entire period that the waterworks is not operating.

2229 d. Failure to complete an approved start-up procedure ~~prior to~~ before serving water is
2230 a treatment technique violation and requires the owner to provide public notification
2231 under Tier 2 conditions in ~~12VAC5-590-540~~ 12VAC5-590-540 A 2.

2232 e. Failure to submit certification of completion to the ~~commissioner~~ department after
2233 the owner completes an approved start-up procedure is a reporting violation and
2234 requires the owner to provide public notification under Tier 3 conditions in ~~12VAC5-~~
2235 ~~590-540~~ 12VAC5-590-540 A 3.

2236 41. ~~13.~~ 13. Additional routine monitoring in the month following a total coliform-positive sample.

2237 a. ~~Owners~~ The owner collecting samples on a quarterly or annual frequency shall
2238 collect at least three additional routine samples during the month following one or more
2239 total coliform-positive samples, with or without a Level 1 treatment trigger. The owner
2240 shall use the results of additional routine samples in coliform treatment technique
2241 trigger calculations under 12VAC5-590-392 B.

2242 b. The requirements specified in subdivision ~~A 11 a~~ A 13 a of this section may be
2243 waived by the ~~commissioner~~ department if:

2244 (1) The ~~commissioner~~ department conducts a site visit before the end of the next
2245 month in which the waterworks provides water and has determined whether additional
2246 monitoring or corrective action is needed;

2247 (2) The ~~commissioner~~ department has determined why the sample was total coliform
2248 positive and has established that the owner corrected the problem or will correct the
2249 problem before the end of the next month in which the waterworks serves water. In
2250 this case, the decision and the rationale for the decision shall be documented and
2251 approved in writing by the ~~commissioner~~ department. The ~~commissioner~~ department
2252 shall make this document available to EPA and the public. The documentation shall
2253 describe the specific cause of the total coliform-positive sample and what action the
2254 owner has taken or will take to correct this problem; or

2255 (3) The ~~commissioner~~ department determines that the owner has corrected the
2256 contamination problem before collecting the set of repeat samples required in
2257 12VAC5-590-380 D 3, and all repeat samples are total coliform negative. The
2258 ~~commissioner~~ department may waive the requirement for additional routine monitoring
2259 the next month.

2260 c. The requirements specified in subdivision ~~A 11 a~~ A 13 a of this section may not be
2261 waived by the ~~commissioner~~ department solely on the grounds that all repeat samples
2262 are total coliform negative.

2263 ~~42:14.~~ Failure to collect every required routine or additional routine sample in a compliance
2264 period is a monitoring violation and requires the owner to provide public notification under
2265 Tier 3 conditions in ~~12VAC5-590-540~~ 12VAC5-590-540 A 3.

2266 ~~13.15.~~ Failure to submit monitoring results after the owner properly conducts monitoring
2267 is a reporting violation and requires the owner to provide public notification under Tier 3
2268 conditions in ~~12VAC5-590-540~~ 12VAC5-590-540 A 3.

2269 B. Chemical monitoring. The location of sampling points, the chemicals measured, the
2270 frequency, and the timing of sampling within each compliance period shall be established or
2271 approved by the ~~commissioner~~ department at the time of issuance of a waterworks operation
2272 permit, but may be modified as waterworks' conditions and regulations change.

2273 1. The ~~commissioner~~ department may increase required monitoring where necessary to
2274 detect variations within the waterworks and to provide quality control for any treatment
2275 processes that are employed.

2276 2. Analysis of field composite samples shall not be allowed.

2277 3. Samples for contaminants that may exhibit seasonal variations shall be collected during
2278 the period of the year when contamination is most likely to occur.

2279 4. Failure to comply with the sampling schedules in this section shall require public
2280 notification pursuant to ~~12VAC5-590-540~~ 12VAC5-590-540 A 3.

2281 C. The department may allow a consecutive waterworks that obtain potable water from
2282 another waterworks to limit monitoring to bacteriological, residual disinfectant, DBPs, and lead
2283 and copper.

2284 D. Monitoring requirements for a waterworks developing new sources of source water are
2285 provided in 12VAC5-590-820, 12VAC5-590-830, and 12VAC5-590-840.

2286 E. The department may require an owner to collect additional samples to provide quality
2287 control for any treatment processes that are employed.

2288 F. Surface water sampling requirements specified in 12VAC5-590-372 through 12VAC5-590-
2289 378 apply to GUDI sources.

2290 ~~Any other dates contained in this chapter notwithstanding, all waterworks shall comply with~~
2291 ~~all applicable PMCLs listed in Tables 2.2 and 2.3.~~

2292 ~~Design criteria for new or modified waterworks or owners developing new sources of supply~~
2293 ~~are found in 12VAC5-590-820, 12VAC5-590-830 and 12VAC5-590-840.~~

2294 ~~1. Inorganic chemical. Community and nontransient noncommunity waterworks owners~~
2295 ~~shall conduct monitoring to determine compliance with the MCLs in Table 2.2 in~~
2296 ~~accordance with this section. All other noncommunity waterworks owners shall conduct~~
2297 ~~monitoring to determine compliance with the nitrate and nitrite PMCLs in Table 2.2 (as~~
2298 ~~appropriate) in accordance with this section. Monitoring shall be conducted as follows:~~

2299 ~~a. The owner of any groundwater source waterworks with 150 or more service~~
2300 ~~connections shall take a minimum of one sample at each entry point to the distribution~~
2301 ~~system which is representative of each source, after treatment, unless a change in~~
2302 ~~condition makes another sampling point more representative of each source or~~
2303 ~~treatment plant (hereafter called a sampling point) starting in the compliance period~~
2304 ~~beginning January 1, 1993. The owner of any groundwater source waterworks with~~
2305 ~~fewer than 150 service connections shall take a minimum of one sample at each~~
2306 ~~sampling point for asbestos, barium, cadmium, chromium, fluoride, mercury, nitrate,~~
2307 ~~nitrite, and selenium in the compliance period beginning January 1, 1993, for antimony,~~
2308 ~~beryllium, cyanide (as free cyanide), nickel, and thallium in the compliance period~~
2309 ~~beginning January 1, 1996, and for arsenic (for community and nontransient~~
2310 ~~noncommunity waterworks) in compliance with subdivision B 1 d (6) (b) of this section.~~

2311 ~~b. The owner of any waterworks which uses a surface water source in whole or in part~~
2312 ~~with 150 or more service connections shall take a minimum of one sample at each~~
2313 ~~entry point to the distribution system after any application of treatment or in the~~
2314 ~~distribution system at a point which is representative of each source, after treatment,~~
2315 ~~unless a change in conditions makes another sampling point more representative of~~
2316 ~~each source or treatment plant (hereafter called a sampling point) beginning January~~
2317 ~~1, 1993. The owner of any waterworks which use a surface water source in whole or~~
2318 ~~in part with fewer than 150 service connections shall take a minimum of one sample~~
2319 ~~at each sampling point for asbestos, barium, cadmium, chromium, fluoride, mercury,~~
2320 ~~nitrate, nitrite, and selenium beginning January 1, 1993, for antimony, beryllium,~~
2321 ~~cyanide (as free cyanide), nickel, and thallium beginning January 1, 1996, and for~~
2322 ~~arsenic (for community and nontransient noncommunity waterworks) in compliance~~
2323 ~~with subdivision B 1 d (6) (a) of this section.~~

2324 ~~c. If a waterworks draws water from more than one source and the sources are~~
2325 ~~combined before distribution, the owner shall sample at an entry point to the~~
2326 ~~distribution system during periods of normal operating conditions (i.e., when water is~~
2327 ~~representative of all sources being used).~~

2328 ~~d. The frequency of monitoring for asbestos shall be in accordance with subdivision B~~
2329 ~~1 d (1) of this section; the frequency of monitoring for barium, cadmium, chromium,~~
2330 ~~fluoride, mercury, and selenium shall be in accordance with subdivision B 1 d (2) of~~
2331 ~~this section; the frequency of monitoring for antimony, beryllium, cyanide (as free~~
2332 ~~cyanide), nickel, and thallium shall be in accordance with subdivision B 1 d (3) of this~~
2333 ~~section; the frequency of monitoring for nitrate shall be in accordance with subdivision~~
2334 ~~B 1 d (4) of this section; the frequency of monitoring for nitrite shall be in accordance~~

2335 with subdivision B 1 d (5) of this section; and the frequency of monitoring for arsenic
2336 shall be in accordance with subdivision B 1 d (6) of this section.

2337 (1) The frequency of monitoring conducted to determine compliance with the PMCL
2338 for asbestos specified in Table 2.2 shall be conducted as follows:

2339 (a) The owner of each community and nontransient noncommunity waterworks is
2340 required to monitor for asbestos during the first three-year compliance period of each
2341 nine-year compliance cycle beginning in the compliance period starting January 1,
2342 1993.

2343 (b) If the owner believes the waterworks is not vulnerable to either asbestos
2344 contamination in its source water or due to corrosion of asbestos-cement pipe, or both,
2345 the owner may apply to the commissioner for a waiver of the monitoring requirement
2346 in subdivision B 1 d (1) (a) of this section. If the commissioner grants the waiver, the
2347 owner is not required to monitor.

2348 (c) The commissioner may grant a waiver based on a consideration of the following
2349 factors:

2350 (i) Potential asbestos contamination of the water source; and
2351 (ii) The use of asbestos-cement pipe for finished water distribution and the corrosive
2352 nature of the water.

2353 (d) A waiver remains in effect until the completion of the three-year compliance period.
2354 The owner of a waterworks not receiving a waiver shall monitor in accordance with the
2355 provisions of subdivision B 1 d (1) (a) of this section.

2356 (e) The owner of a waterworks vulnerable to asbestos contamination due solely to
2357 corrosion of asbestos-cement pipe shall take one sample at a tap served by asbestos-

2358 ~~cement pipe and under conditions where asbestos contamination is most likely to~~
2359 ~~occur.~~

2360 ~~(f) The owner of a waterworks vulnerable to asbestos contamination due solely to~~
2361 ~~source water shall monitor sampling points in accordance with subdivision B 1 of this~~
2362 ~~section.~~

2363 ~~(g) The owner of a waterworks vulnerable to asbestos contamination due both to its~~
2364 ~~source water supply and corrosion of asbestos cement pipe shall take one sample at~~
2365 ~~a tap served by asbestos cement pipe and under conditions where asbestos~~
2366 ~~contamination is most likely to occur.~~

2367 ~~(h) The owner of a waterworks which exceeds the PMCL as determined in 12VAC5-~~
2368 ~~590-410 B 1 shall monitor quarterly beginning in the next quarter after the exceedance~~
2369 ~~occurred.~~

2370 ~~(i) The commissioner may decrease the quarterly monitoring requirement to the~~
2371 ~~frequency specified in subdivision B 1 d (1) (a) of this section provided the~~
2372 ~~commissioner has determined that the waterworks is reliably and consistently below~~
2373 ~~the PMCL. In no case can the commissioner make this determination unless the owner~~
2374 ~~of a groundwater source waterworks takes a minimum of two quarterly samples or the~~
2375 ~~owner of a waterworks which uses a surface water source in whole or in part takes a~~
2376 ~~minimum of four quarterly samples.~~

2377 ~~(j) If monitoring data collected after January 1, 1990, are generally consistent with the~~
2378 ~~requirements of subdivision B 1 d (1) of this section, then the commissioner may allow~~
2379 ~~an owner to use that data to satisfy the monitoring requirement for the initial~~
2380 ~~compliance period beginning January 1, 1993.~~

2381 ~~(2) The frequency of monitoring conducted to determine compliance with the MCLs in~~
2382 ~~Table 2.2 for barium, cadmium, chromium, fluoride, mercury, and selenium shall be as~~
2383 ~~follows:~~

2384 ~~(a) The owner of a groundwater source waterworks shall take one sample at each~~
2385 ~~sampling point during each compliance period beginning in the compliance period~~
2386 ~~starting January 1, 1993.~~

2387 ~~(b) The owner of a waterworks which uses a surface water source in whole or in part~~
2388 ~~shall take one sample annually at each sampling point beginning January 1, 1993.~~

2389 ~~(c) An owner may apply to the commissioner for a waiver from the monitoring~~
2390 ~~frequencies specified in subdivision B 1 d (2) (a) or (b) of this section.~~

2391 ~~(d) A condition of the waiver shall require that the owner shall take a minimum of one~~
2392 ~~sample while the waiver is effective. The term during which the waiver is effective shall~~
2393 ~~not exceed one compliance cycle (i.e., nine years).~~

2394 ~~(e) The commissioner may grant a waiver provided the owner of a waterworks that~~
2395 ~~uses a surface water source in whole or in part has monitored annually for at least~~
2396 ~~three years and groundwater waterworks have conducted a minimum of three rounds~~
2397 ~~of monitoring. (At least one sample shall have been taken since January 1, 1990.) The~~
2398 ~~owner of any waterworks which uses a surface water source in whole or in part or a~~
2399 ~~groundwater source waterworks shall demonstrate that all previous analytical results~~
2400 ~~were less than the PMCL. Waterworks that use a new water source are not eligible for~~
2401 ~~a waiver until three rounds of monitoring from the new source have been completed.~~

2402 ~~(f) In determining the appropriate reduced monitoring frequency, the commissioner~~
2403 ~~shall consider:~~

2404 ~~(i) Reported concentrations from all previous monitoring;~~

2405 ~~(ii) The degree of variation in reported concentrations; and~~

2406 ~~(iii) Other factors that may affect contaminant concentrations such as changes in~~

2407 ~~groundwater pumping rates, changes in the waterworks configuration, changes in the~~

2408 ~~waterworks operating procedures, or changes in stream flows or characteristics.~~

2409 ~~(g) A decision by the commissioner to grant a waiver shall be made in writing and shall~~

2410 ~~set forth the basis for the determination. The request for a waiver may be initiated by~~

2411 ~~the commissioner or upon an application by the owner. The owner shall specify the~~

2412 ~~basis for the request. The commissioner shall review and, where appropriate, revise~~

2413 ~~the determination of the appropriate monitoring frequency when the owner submits~~

2414 ~~new monitoring data or when other data relevant to the waterworks appropriate~~

2415 ~~monitoring frequency become available.~~

2416 ~~(h) Owners of waterworks that exceed the PMCLs as calculated in 12VAC5-590-410~~

2417 ~~shall monitor quarterly beginning in the next quarter after the exceedance occurred.~~

2418 ~~(i) The commissioner may decrease the quarterly monitoring requirement to the~~

2419 ~~frequencies specified in subdivision B 1 d (2) (a), (b) or (c) of this section provided a~~

2420 ~~determination has been made that the waterworks is reliably and consistently below~~

2421 ~~the PMCL. In no case can the commissioner make this determination unless the owner~~

2422 ~~of a groundwater source waterworks takes a minimum of two quarterly samples or the~~

2423 ~~owner of a waterworks which uses a surface water source in whole or in part takes a~~

2424 ~~minimum of four quarterly samples.~~

2425 ~~(3) The frequency of monitoring conducted to determine compliance with the PMCLs~~

2426 ~~in Table 2.2 for antimony, beryllium, cyanide (as free cyanide), nickel, and thallium~~

2427 ~~shall be as follows:~~

2428 ~~(a) The owner of a groundwater source waterworks with 150 or more service~~
2429 ~~connections shall take one sample at each sampling point during each compliance~~
2430 ~~period beginning in the compliance period starting January 1, 1993. The owner of a~~
2431 ~~groundwater source waterworks with fewer than 150 service connections shall take~~
2432 ~~one sample at each sampling point during each compliance period beginning in the~~
2433 ~~compliance period starting January 1, 1996.~~

2434 ~~(b) The owner of a waterworks that uses a surface water source in whole or in part~~
2435 ~~with 150 or more service connections shall take one sample annually at each sampling~~
2436 ~~point beginning January 1, 1993. The owner of a waterworks that uses a surface water~~
2437 ~~source in whole or in part with fewer than 150 service connections shall take one~~
2438 ~~sample annually at each sampling point beginning January 1, 1996.~~

2439 ~~(c) An owner may apply to the commissioner for a waiver from the monitoring~~
2440 ~~frequencies specified in subdivision B 1 d (3) (a) or (b) of this section.~~

2441 ~~(d) A condition of the waiver shall require that the owner take a minimum of one sample~~
2442 ~~while the waiver is effective. The term during which the waiver is effective shall not~~
2443 ~~exceed one compliance cycle (i.e., nine years).~~

2444 ~~(e) The commissioner may grant a waiver provided the owner of a waterworks that~~
2445 ~~uses a surface water source in whole or in part has monitored annually for at least~~
2446 ~~three years and groundwater waterworks have conducted a minimum of three rounds~~
2447 ~~of monitoring. (At least one sample shall have been taken since January 1, 1990.) The~~
2448 ~~owner of any waterworks which uses a surface water source in whole or in part or a~~
2449 ~~groundwater source waterworks shall demonstrate that all previous analytical results~~
2450 ~~were less than the PMGL. Waterworks that use a new water source are not eligible for~~
2451 ~~a waiver until three rounds of monitoring from the new source have been completed.~~

2452 ~~(f) In determining the appropriate reduced monitoring frequency, the commissioner~~
2453 ~~shall consider:~~

2454 ~~(i) Reported concentrations from all previous monitoring;~~
2455 ~~(ii) The degree of variation in reported concentrations; and~~

2456 ~~(iii) Other factors which may affect contaminant concentrations such as changes in~~
2457 ~~groundwater pumping rates, changes in the waterworks configuration, changes in the~~
2458 ~~waterworks operating procedures, or changes in stream flows or characteristics.~~

2459 ~~(g) A decision by the commissioner to grant a waiver shall be made in writing and shall~~
2460 ~~set forth the basis for the determination. The request for a waiver may be initiated by~~
2461 ~~the commissioner or upon an application by the owner. The owner shall specify the~~
2462 ~~basis for the request. The commissioner shall review and, where appropriate, revise~~
2463 ~~the determination of the appropriate monitoring frequency when the owner submits~~
2464 ~~new monitoring data or when other data relevant to the waterworks appropriate~~
2465 ~~monitoring frequency become available.~~

2466 ~~(h) Owners of waterworks that exceed the PMCLs as calculated in 12VAC5-590-410~~
2467 ~~shall monitor quarterly beginning in the next quarter after the exceedance occurred.~~

2468 ~~(i) The commissioner may decrease the quarterly monitoring requirement to the~~
2469 ~~frequencies specified in subdivision B 1 d (3) (a), (b) or (c) of this section provided a~~
2470 ~~determination has been made that the waterworks is reliably and consistently below~~
2471 ~~the PMCL. In no case shall the commissioner make this determination unless the~~
2472 ~~owner of a groundwater source waterworks takes a minimum of two quarterly samples~~
2473 ~~or the owner of a waterworks which uses a surface water source in whole or in part~~
2474 ~~takes a minimum of four quarterly samples.~~

2475 ~~(4) All community, nontransient noncommunity and noncommunity waterworks owners~~
2476 ~~shall monitor to determine compliance with the PMCL for nitrate in Table 2.2.~~

2477 ~~(a) Owners of community and nontransient noncommunity waterworks that use a~~
2478 ~~groundwater source shall monitor annually beginning January 1, 1993.~~

2479 ~~(b) Owners of community and nontransient noncommunity waterworks that use a~~
2480 ~~surface water source in whole or in part shall monitor quarterly beginning January 1,~~
2481 ~~1993.~~

2482 ~~(c) For owners of community and nontransient noncommunity waterworks that use~~
2483 ~~groundwater, the repeat monitoring frequency shall be quarterly for at least one year~~
2484 ~~following any one sample in which the concentration is greater than 50% of the PMCL.~~
2485 ~~The commissioner may allow the owner of a waterworks, that uses groundwater, to~~
2486 ~~reduce the sampling frequency to annually after four consecutive quarterly samples~~
2487 ~~are reliably and consistently less than the PMCL.~~

2488 ~~(d) For community and nontransient noncommunity waterworks, the commissioner~~
2489 ~~may allow the owner of a waterworks that uses a surface water source in whole or in~~
2490 ~~part, to reduce the sampling frequency to annually if all analytical results from four~~
2491 ~~consecutive quarters are less than 50% of the PMCL. Such waterworks shall return to~~
2492 ~~quarterly monitoring if any one sample is greater than or equal to 50% of the PMCL.~~

2493 ~~(e) The owners of all other noncommunity waterworks shall monitor annually beginning~~
2494 ~~January 1, 1993.~~

2495 ~~(f) After the initial round of quarterly sampling is completed, the owner of each~~
2496 ~~community and nontransient noncommunity waterworks that is monitoring annually~~
2497 ~~shall take subsequent samples during the quarter(s) which previously resulted in the~~
2498 ~~highest analytical result.~~

2499 ~~(5) All owners shall monitor to determine compliance with the PMCL for nitrite in Table~~
2500 ~~2.2.~~

2501 ~~(a) All owners shall take one sample at each sampling point in the compliance period~~
2502 ~~beginning January 1, 1993.~~

2503 ~~(b) After the initial sample, the owner of any waterworks where an analytical result for~~
2504 ~~nitrite is less than 50% of the PMCL shall monitor at the frequency specified by the~~
2505 ~~commissioner.~~

2506 ~~(c) The repeat monitoring frequency for any owner shall be quarterly for at least one~~
2507 ~~year following any one sample in which the concentration is greater than 50% of the~~
2508 ~~PMCL. The commissioner may allow an owner to reduce the sampling frequency to~~
2509 ~~annually after determining the analysis results are reliably and consistently less than~~
2510 ~~the PMCL.~~

2511 ~~(d) Owners of waterworks which are monitoring annually shall take each subsequent~~
2512 ~~sample during the quarter(s) which previously resulted in the highest analytical result.~~

2513 ~~(6) The frequency of monitoring conducted to determine compliance with the PMCLs~~
2514 ~~in Table 2.2 for arsenic shall be as follows:~~

2515 ~~(a) The owner of each community and nontransient noncommunity waterworks that~~
2516 ~~uses a surface water source in whole or in part shall take one sample annually at each~~
2517 ~~sampling point beginning January 23, 2006.~~

2518 ~~(b) The owner of each community and nontransient noncommunity groundwater~~
2519 ~~source waterworks shall take one sample at each entry point during each compliance~~
2520 ~~period starting January 23, 2006.~~

2521 ~~(c) Owners of waterworks that exceed the PMCL, as calculated in 12VAC5-590-410,~~
2522 ~~shall monitor quarterly beginning in the next quarter after the exceedance has~~
2523 ~~occurred.~~

2524 ~~(d) The commissioner may decrease the quarterly monitoring requirement to the~~
2525 ~~frequencies specified in subdivision B 1 d (6) (a) or (b) of this section provided a~~
2526 ~~determination has been made that the waterworks is reliably and consistently below~~
2527 ~~the PMCL. In no case can the commissioner make this determination unless the owner~~
2528 ~~of a groundwater source waterworks takes a minimum of two quarterly samples or the~~
2529 ~~owner of a waterworks that uses a surface water source in whole or in part takes a~~
2530 ~~minimum of four quarterly samples.~~

2531 ~~(e) No waivers shall be granted by the commissioner for arsenic.~~

2532 ~~2. Organic chemicals. Owners of all community and nontransient noncommunity~~
2533 ~~waterworks shall sample for organic chemicals in accordance with their water source.~~
2534 ~~Where two or more sources are combined before distribution, the owner shall sample at~~
2535 ~~the entry point for the combined sources during periods of normal operating conditions.~~

2536 ~~a. Owners of waterworks that use groundwater shall take a minimum of one sample at~~
2537 ~~each entry point to the distribution system which is representative of each source, after~~
2538 ~~treatment (hereafter called a sampling point).~~

2539 ~~b. Owners of waterworks that use a surface water source in whole or in part shall take~~
2540 ~~a minimum of one sample at points in the distribution system that are representative~~
2541 ~~of each source or at each entry point to the distribution system, after treatment~~
2542 ~~(hereafter called a sampling point).~~

2543 ~~c. The owner of each community and nontransient noncommunity waterworks shall~~
2544 ~~take four consecutive quarterly samples for each contaminant listed in Table 2.3-VOC~~

2545 ~~2 through 21 and SOC during each compliance period, beginning in the compliance~~
2546 ~~period starting January 1, 1993.~~

2547 ~~d. Reduced monitoring.~~

2548 ~~(1) VOC.~~

2549 ~~(a) If the initial monitoring for contaminants listed in Table 2.3-VOC 1 through 8 and~~
2550 ~~the monitoring for the contaminants listed in Table 2.3-VOC 9 through 21 as allowed~~
2551 ~~in subdivision B 2 d (1) (c) of this section has been completed by December 31, 1992,~~
2552 ~~and the waterworks did not detect any contaminant listed in Table 2.3-VOC 1 through~~
2553 ~~21, then the owner of each groundwater waterworks and waterworks that use a surface~~
2554 ~~water source in whole or in part shall take one sample annually beginning January 1,~~
2555 ~~1993.~~

2556 ~~(b) After a minimum of three years of annual sampling, the commissioner may allow~~
2557 ~~the owner of a groundwater waterworks with no previous detection of any contaminant~~
2558 ~~listed in Table 2.3-VOC 2 through 21 to take one sample during each compliance~~
2559 ~~period.~~

2560 ~~(c) The commissioner may allow the use of monitoring data collected after January 1,~~
2561 ~~1988, for purposes of initial monitoring compliance. If the data are generally consistent~~
2562 ~~with the other requirements in this section, the commissioner may use these data (i.e.,~~
2563 ~~a single sample rather than four quarterly samples) to satisfy the initial monitoring~~
2564 ~~requirement of subdivision B 2 c of this section. Owners of waterworks that use~~
2565 ~~grandfathered samples and did not detect any contaminants listed in Table 2.3-VOC,~~
2566 ~~2 through 21, shall begin monitoring annually in accordance with subdivision B 2 d (1)~~
2567 ~~(a) of this section beginning January 1, 1993.~~

2568 ~~(2) SOC.~~

2569 ~~(a) Owners of waterworks serving more than 3,300 persons that do not detect a~~
2570 ~~contaminant listed in Table 2.3-SOC in the initial compliance period, may reduce the~~
2571 ~~sampling frequency to a minimum of two quarterly samples in one year during each~~
2572 ~~repeat compliance period.~~

2573 ~~(b) Owners of waterworks serving less than or equal to 3,300 persons that do not~~
2574 ~~detect a contaminant listed in Table 2.3-SOC in the initial compliance period may~~
2575 ~~reduce the sampling frequency to a minimum of one sample during each repeat~~
2576 ~~compliance period.~~

2577 ~~e. Waiver application.~~

2578 ~~(1) For VOCs. The owner of any community and nontransient noncommunity~~
2579 ~~groundwater waterworks which does not detect a contaminant listed in Table 2.3-VOC~~
2580 ~~may apply to the commissioner for a waiver from the requirements of subdivisions B-2~~
2581 ~~d (1) (a) and (b) of this section after completing the initial monitoring. A waiver shall be~~
2582 ~~effective for no more than six years (two compliance periods). The commissioner may~~
2583 ~~also issue waivers to small systems for the initial round of monitoring for 1,2,4-~~
2584 ~~trichlorobenzene.~~

2585 ~~(2) For SOCs. The owner of any community and nontransient noncommunity~~
2586 ~~waterworks may apply to the commissioner for a waiver from the requirement of~~
2587 ~~subdivisions B-2 c and d (2) of this section. The owner shall reapply for a waiver for~~
2588 ~~each compliance period.~~

2589 ~~f. The commissioner may grant a waiver after evaluating the following factors:~~
2590 ~~Knowledge of previous use (including transport, storage, or disposal) of the~~
2591 ~~contaminant within the watershed or zone of influence of the source. If a determination~~
2592 ~~by the commissioner reveals no previous use of the contaminant within the watershed~~

2593 or zone of influence, a waiver may be granted. If previous use of the contaminant is
2594 unknown or it has been used previously, then the following factors shall be used to
2595 determine whether a waiver is granted.

2596 (1) Previous analytical results.

2597 (2) The proximity of the waterworks to a potential point or nonpoint source of
2598 contamination. Point sources include spills and leaks of chemicals at or near a
2599 waterworks or at manufacturing, distribution, or storage facilities, or from hazardous
2600 and municipal waste landfills and other waste handling or treatment facilities. Nonpoint
2601 sources for SOCs include the use of pesticides to control insect and weed pests on
2602 agricultural areas, forest lands, home and gardens, and other land application uses.

2603 (3) The environmental persistence and transport of the contaminants listed in Table
2604 2.3 VOC and SOC.

2605 (4) How well the water source is protected against contamination, such as whether it
2606 is a waterworks that uses a surface water source in whole or in part or whether it is a
2607 groundwater source waterworks. Groundwater source waterworks shall consider
2608 factors such as depth of the well, the type of soil, wellhead protection, and well
2609 structure integrity. Owners of waterworks that use surface water in whole or in part
2610 shall consider watershed protection.

2611 (5) Special factors.

2612 (a) For VOCs. The number of persons served by the waterworks and the proximity of
2613 a smaller waterworks to a larger waterworks.

2614 (b) For SOCs. Elevated nitrate levels at the waterworks supply source.

2615 (c) For SOCs. Use of PCBs in equipment used in the production, storage, or
2616 distribution of water (i.e., PCBs used in pumps, transformers, etc.).

2617 g. Condition for waivers.

2618 ~~(1) As a condition of the VOC waiver the owner of a groundwater waterworks shall~~
2619 ~~take one sample at each sampling point during the time the waiver is effective (i.e.,~~
2620 ~~one sample during two compliance periods or six years) and update its vulnerability~~
2621 ~~assessment considering the factors listed in subdivision B 2 f of this section. Based on~~
2622 ~~this vulnerability assessment the commissioner shall reconfirm that the waterworks is~~
2623 ~~nonvulnerable. If the commissioner does not make this reconfirmation within three~~
2624 ~~years of the initial determination, then the waiver is invalidated and the owner is~~
2625 ~~required to sample annually as specified in subdivision B 2 d (1) (a) of this section.~~

2626 ~~(2) The owner of any community and nontransient noncommunity waterworks that use~~
2627 ~~surface water in whole or in part which does not detect a contaminant listed in Table~~
2628 ~~2.3 VOC may apply to the commissioner for a waiver from the requirements of~~
2629 ~~subdivision B 2 d (1) (a) of this section after completing the initial monitoring.~~
2630 ~~Waterworks meeting these criteria shall be determined by the commissioner to be~~
2631 ~~nonvulnerable based on a vulnerability assessment during each compliance period.~~
2632 ~~Each owner receiving a waiver shall sample at the frequency specified by the~~
2633 ~~commissioner (if any).~~

2634 ~~(3) There are no conditions to SOC waivers.~~

2635 h. ~~If a contaminant listed in Table 2.3 VOC 2 through 21 or SOC 1 through 33 is~~
2636 ~~detected then (NOTE: Detection occurs when a contaminant level exceeds the current~~
2637 ~~detection limit as defined by EPA.):~~

2638 ~~(1) Each owner shall monitor quarterly at each sampling point which resulted in a~~
2639 ~~detection.~~

2640 ~~(2) The commissioner may decrease the quarterly monitoring requirement specified in~~
2641 ~~subdivision B 2 h (1) of this section provided it has determined that the waterworks is~~
2642 ~~reliably and consistently below the PMCL. In no case shall the commissioner make~~
2643 ~~this determination unless the owner of a groundwater waterworks takes a minimum of~~
2644 ~~two quarterly samples and the owner of a waterworks that use surface water in whole~~
2645 ~~or in part takes a minimum of four quarterly samples.~~

2646 ~~(3) If the commissioner determines that the waterworks is reliably and consistently~~
2647 ~~below the PMCL, the commissioner may allow the waterworks to monitor annually.~~
2648 ~~Owners of waterworks that monitor annually shall monitor during the quarter(s) that~~
2649 ~~previously yielded the highest analytical result.~~

2650 ~~(4) Owners of waterworks that have three consecutive annual samples with no~~
2651 ~~detection of a contaminant may apply to the commissioner for a waiver for VOC as~~
2652 ~~specified in subdivision B 2 e (1) or to SOC as specified in subdivision B 2 e (2) of this~~
2653 ~~section.~~

2654 ~~(5) Subsequent monitoring due to contaminant detection.~~

2655 ~~(a) Owners of groundwater waterworks that have detected one or more of the following~~
2656 ~~two carbon organic compounds: trichloroethylene, tetrachloroethylene, 1,2-~~
2657 ~~dichloroethane, 1,1,1-trichloroethane, cis-1,2-dichloroethylene, trans-1,2-~~
2658 ~~dichloroethylene, or 1,1-dichloroethylene shall monitor quarterly for vinyl chloride. A~~
2659 ~~vinyl chloride sample shall be taken at each sampling point at which one or more of~~
2660 ~~the two carbon organic compounds were detected. If the results of the first analysis~~
2661 ~~do not detect vinyl chloride, the commissioner may reduce the quarterly monitoring~~
2662 ~~frequency of vinyl chloride monitoring to one sample during each compliance period.~~
2663 ~~Owners of waterworks that use surface water in whole or in part are required to monitor~~
2664 ~~for vinyl chloride as specified by the commissioner.~~

2665 ~~(b) If monitoring results in detection of one or more of certain related contaminants~~
2666 ~~(heptachlor and heptachlor epoxide), then subsequent monitoring shall analyze for all~~
2667 ~~related contaminants.~~

2668 ~~i. Owners of waterworks that violate the requirements of Table 2.3 for VOCs or SOCs,~~
2669 ~~as determined by 12VAC5-590-410 C, shall monitor quarterly. After a minimum of four~~
2670 ~~consecutive quarterly samples that show the waterworks is in compliance as specified~~
2671 ~~in 12VAC5-590-410 C and the commissioner determines that the waterworks is~~
2672 ~~reliably and consistently below the PMCL, the owner may monitor at the frequency~~
2673 ~~and time specified in subdivision B 2 h (3) of this section.~~

2674 ~~3. Disinfectant residuals, disinfection byproducts and disinfection byproduct precursors.~~

2675 ~~a. Unless otherwise noted, owners of all waterworks that use a chemical disinfectant~~
2676 ~~shall comply with the requirements of this section as follows:~~

2677 ~~(1) Owners of community or nontransient noncommunity waterworks that use surface~~
2678 ~~water or groundwater under the direct influence of surface water and serving 10,000~~
2679 ~~or more persons shall comply with this section beginning January 1, 2002.~~

2680 ~~(2) Owners of community or nontransient noncommunity waterworks that use surface~~
2681 ~~water or groundwater under the direct influence of surface water serving fewer than~~
2682 ~~10,000 persons and waterworks using only groundwater not under the direct influence~~
2683 ~~of surface water shall comply with this section beginning January 1, 2004.~~

2684 ~~(3) Owners of transient noncommunity waterworks that use surface water or~~
2685 ~~groundwater under the direct influence of surface water and serving 10,000 or more~~
2686 ~~persons and using chlorine dioxide as a disinfectant or oxidant shall comply with any~~
2687 ~~requirements for chlorine dioxide in this section beginning January 1, 2002.~~

2688 ~~(4) Owners of transient noncommunity waterworks that use surface water or~~
2689 ~~groundwater under the direct influence of surface water serving fewer than 10,000~~
2690 ~~persons and using chlorine dioxide as a disinfectant or oxidant and waterworks using~~
2691 ~~only groundwater not under the direct influence of surface water and using chlorine~~
2692 ~~dioxide as a disinfectant or oxidant shall comply with any requirements for chlorine~~
2693 ~~dioxide in this section beginning January 1, 2004.~~

2694 ~~b. Owners shall take all samples during normal operating conditions.~~

2695 ~~(1) Analysis under this section for disinfection byproducts (TTHM, HAA5, chlorite and~~
2696 ~~bromate) shall be conducted by a laboratory that has received certification by EPA or~~
2697 ~~the state except as noted in subdivision B 3 b (2) of this section.~~

2698 ~~(2) Measurement under this section of daily chlorite samples at the entry point to the~~
2699 ~~distribution system, disinfection residuals (free chlorine, combined chlorine, total~~
2700 ~~chlorine and chlorine dioxide), alkalinity, bromide, TOC, SUVA (DOC and UV₂₅₄), pH~~
2701 ~~and magnesium shall be made by a party approved by the commissioner.~~

2702 ~~(3) DPD colorimetric test kits may be used to measure residual disinfectant~~
2703 ~~concentrations for chlorine, chloramines and chlorine dioxide.~~

2704 ~~c. Failure to monitor in accordance with the monitoring plan required under subdivision~~
2705 ~~B 3 j of this section is a monitoring violation. Failure to monitor shall be treated as a~~
2706 ~~violation for the entire period covered by the annual average where compliance is~~
2707 ~~based on a running annual average of monthly or quarterly samples or averages and~~
2708 ~~the owner's failure to monitor makes it impossible to determine compliance with~~
2709 ~~PMCLs or MRDLs.~~

~~2710 d. Owners may use only data collected under the provisions of this section or the US
2711 EPA Information Collection Rule, 40 CFR Part 141 Subpart M, Information Collection
2712 Requirements (ICR) for Public Water Systems, to qualify for reduced monitoring.~~

~~2713 e. TTHM/HAA5 monitoring. Owners of community or nontransient noncommunity
2714 waterworks shall monitor TTHM and HAA5 at the frequency indicated below, unless
2715 otherwise indicated:~~

~~2716 (1) Running annual average monitoring requirements.~~

~~2717 (a) Routine monitoring requirements:~~

~~2718 (i) Owners of waterworks using surface water or groundwater under the direct
2719 influence of surface water and serving at least 10,000 persons shall collect four water
2720 samples per quarter per treatment plant. At least 25% of all samples collected each
2721 quarter shall be at locations representing maximum residence time in the distribution
2722 system. The remaining samples shall be taken at locations representative of at least
2723 average residence time in the distribution system and representative of the entire
2724 distribution system. When setting the sample locations the waterworks shall take into
2725 account number of persons served, different sources of water, and different treatment
2726 methods.~~

~~2727 (ii) Owners of waterworks using surface water or groundwater under the direct
2728 influence of surface water and serving from 500 to 9,999 persons shall collect one
2729 sample per quarter per treatment plant. The sample location shall represent maximum
2730 residence time in the distribution system.~~

~~2731 (iii) Owners of waterworks using surface water or groundwater under the direct
2732 influence of surface water and serving fewer than 500 persons shall collect one sample
2733 per year per treatment plant during the month of warmest water temperature. The~~

2734 sample location shall represent maximum residence time in the distribution system. If
2735 the sample (or average of annual samples, if more than one sample is taken) exceeds
2736 PMCL in Table 2.13, the owner shall increase monitoring to one sample per treatment
2737 plant per quarter, taken at a point reflecting the maximum residence time in the
2738 distribution system, until waterworks meets reduced monitoring criteria.

2739 (iv) Owners of waterworks using only groundwater not under direct influence of surface
2740 water using chemical disinfectant and serving at least 10,000 persons shall collect one
2741 sample per quarter per treatment plant. The sample location shall represent maximum
2742 residence time in the distribution system.

2743 (v) Owners of waterworks using only groundwater not under direct influence of surface
2744 water using chemical disinfectant and serving fewer than 10,000 persons shall collect
2745 one sample per year per treatment plant during the month of warmest water
2746 temperature. The sample location shall represent maximum residence time in the
2747 distribution system. If the sample (or average of annual samples, if more than one
2748 sample is taken) exceeds PMCL in Table 2.13, the owner shall increase monitoring to
2749 one sample per treatment plant per quarter, taken at a point reflecting the maximum
2750 residence time in the distribution system, until the waterworks meets the criteria for
2751 reduced monitoring found in subdivision B 3 e (1) (d) of this section.

2752 (vi) If an owner elects to sample more frequently than the minimum required, at least
2753 25% of all samples collected each quarter (including those taken in excess of the
2754 required frequency) shall be taken at locations that represent the maximum residence
2755 time of the water in the distribution system. The remaining samples shall be taken at
2756 locations representative of at least average residence time in the distribution system.

2757 (vii) With prior approval of the commissioner, owners of waterworks that utilize multiple
2758 wells from a common aquifer may consider these multiple sources as one treatment

2759 ~~plant for determining the minimum number of samples to be collected for TTHM and~~
2760 ~~HAA5 analysis.~~

2761 ~~(b) After one year of routine monitoring an owner may reduce monitoring, except as~~
2762 ~~otherwise provided, as follows:~~

2763 ~~(i) Owners of waterworks using surface water or groundwater under the direct~~
2764 ~~influence of surface water and serving at least 10,000 persons that has a source water~~
2765 ~~annual average TOC level, before any treatment, of equal to or less than 4.0 mg/L and~~
2766 ~~a TTHM annual average equal to or less than 0.040 mg/L and HAA5 annual average~~
2767 ~~equal to or less than 0.030 mg/L may reduce its monitoring to one sample per~~
2768 ~~treatment plant per quarter at a distribution system location reflecting maximum~~
2769 ~~residence time.~~

2770 ~~(ii) Owners of waterworks using surface water or groundwater under the direct~~
2771 ~~influence of surface water serving from 500 to 9,999 persons that has a source water~~
2772 ~~annual average TOC level, before any treatment, equal to or less than 4.0 mg/L and a~~
2773 ~~TTHM annual average equal to or less than 0.040 mg/L and HAA5 annual average~~
2774 ~~equal to or less than 0.030 mg/L may reduce its monitoring to one sample per~~
2775 ~~treatment plant per year at a distribution system location reflecting maximum~~
2776 ~~residence time during the month of warmest water temperature.~~

2777 ~~(iii) Owners of waterworks using only groundwater not under the direct influence of~~
2778 ~~surface water, using chemical disinfectant and serving at least 10,000 persons that~~
2779 ~~has a TTHM annual average of equal to or less than 0.040 mg/L and HAA5 annual~~
2780 ~~average of equal to or less than 0.030 mg/L may reduce its monitoring to one sample~~
2781 ~~per treatment plant per year at a distribution system location reflecting maximum~~
2782 ~~residence time during the month of warmest water temperature.~~

2783 ~~(iv) Owners of waterworks using only groundwater not under the direct influence of~~
2784 ~~surface water, using chemical disinfectant and serving fewer than 10,000 persons that~~
2785 ~~has a TTHM annual average equal to or less than 0.040 mg/L and HAA5 annual~~
2786 ~~average equal to or less than 0.030 mg/L for two consecutive years or TTHM annual~~
2787 ~~average equal to or less than 0.020 mg/L and HAA5 annual average of equal to or~~
2788 ~~less than 0.015 mg/L for one year may reduce its monitoring to one sample per~~
2789 ~~treatment plant per three-year monitoring cycle at a distribution system location~~
2790 ~~reflecting maximum residence time during the month of warmest water temperature,~~
2791 ~~with the three-year cycle beginning on January 1 following the quarter in which the~~
2792 ~~system qualifies for reduced monitoring.~~

2793 ~~(v) Owners of waterworks using surface water or groundwater under the direct~~
2794 ~~influence of surface water serving fewer than 500 persons may not reduce its~~
2795 ~~monitoring to less than one sample per treatment plant per year.~~

2796 ~~(vi) In order to qualify for reduced monitoring for TTHM and HAA5 under subdivision~~
2797 ~~B 3 e (1) (b) (i) through (iv) of this section, owners of waterworks using surface water~~
2798 ~~or groundwater under the direct influence of surface water not monitoring under the~~
2799 ~~provisions of subdivision B 3 (i) shall take monthly TOC samples every 30 days at a~~
2800 ~~location prior to any treatment, beginning April 1, 2008. In addition to meeting other~~
2801 ~~criteria for reduced monitoring in subdivision B 3 e (1) (b) (i) through (iv) of this section,~~
2802 ~~the source water TOC running annual average shall be less than or equal to 4.0 mg/L~~
2803 ~~(based on the most recent four quarters of monitoring) on a continuing basis at each~~
2804 ~~treatment plant to reduce or remain on reduced monitoring for TTHM and HAA5. Once~~
2805 ~~qualified for reduced monitoring for TTHM and HAA5 under subdivision B 3 e (1) (b)~~
2806 ~~(i) through (iv) of this section, a system may reduce source water TOC monitoring to~~
2807 ~~quarterly TOC samples taken every 90 days at a location prior to any treatment.~~

2808 ~~(c) Owners of waterworks on a reduced monitoring schedule may remain on that~~
2809 ~~reduced schedule as long as the average of all samples taken in the year (for~~
2810 ~~waterworks that must monitor quarterly) or the result of the sample (for waterworks~~
2811 ~~that must monitor no more frequently than annually) is no more than 0.060 mg/L and~~
2812 ~~0.045 mg/L for TTHMs and HAA5, respectively. Owners of waterworks that do not~~
2813 ~~meet these levels shall resume monitoring at the frequency identified in subdivision B~~
2814 ~~3 e (1) (a) of this section in the quarter immediately following the monitoring period in~~
2815 ~~which the waterworks exceeds 0.060 mg/L or 0.045 mg/L for TTHMs and HAA5,~~
2816 ~~respectively. For waterworks using only groundwater not under the direct influence of~~
2817 ~~surface water and serving fewer than 10,000 persons, if either the TTHMs annual~~
2818 ~~average is greater than 0.080 mg/L or the HAA5 annual average is greater than 0.060~~
2819 ~~mg/L, the owner shall go to increased monitoring identified in subdivision B 3 e (1) (a)~~
2820 ~~of this section in the quarter immediately following the monitoring period in which the~~
2821 ~~waterworks exceeds 0.080 mg/L or 0.060 mg/L for TTHM or HAA5 respectively.~~

2822 ~~(d) Owners of waterworks on increased monitoring may return to routine monitoring if,~~
2823 ~~after at least one year of monitoring, their TTHM annual average is equal to or less~~
2824 ~~than 0.060 mg/L and their HAA5 annual average is equal to or less than 0.045 mg/L.~~

2825 ~~(e) The commissioner may return a waterworks to routine monitoring at the~~
2826 ~~commissioner's discretion.~~

2827 ~~(2) Initial distribution system evaluations (IDSE).~~

2828 ~~(a) This subdivision establishes monitoring and other requirements for identifying~~
2829 ~~locational running annual average (LRAA) compliance monitoring locations for~~
2830 ~~determining compliance with maximum contaminant levels for total trihalomethanes~~
2831 ~~(TTHM) and haloacetic acids (five) (HAA5). Owners shall use an IDSE to determine~~
2832 ~~locations with representative high TTHM and HAA5 concentrations throughout the~~

2833 ~~distribution system. IDSEs are used in conjunction with, but separate from running~~
 2834 ~~annual average compliance monitoring locations, subdivision B 3 e (1) (a) of this~~
 2835 ~~section, to identify and select locational running annual average compliance~~
 2836 ~~monitoring locations, subdivision B 3 e (3) of this section.~~

2837 ~~(b) This subdivision applies to the following waterworks:~~

2838 ~~(i) Community waterworks that use a primary or residual disinfectant other than~~
 2839 ~~ultraviolet light or delivers water that has been treated with a primary or residual~~
 2840 ~~disinfectant other than ultraviolet light; or,~~

2841 ~~(ii) Nontransient noncommunity waterworks that serve at least 10,000 people and use~~
 2842 ~~a primary or residual disinfectant other than ultraviolet light or delivers water that has~~
 2843 ~~been treated with a primary or residual disinfectant other than ultraviolet light.~~

2844 ~~(c) Owners shall comply with the following schedule:~~

| Waterworks Population | Owners shall submit a standard monitoring plan or system specific study plan ¹ or 40/30 certification ² to the commissioner by or receive very small system waiver from the commissioner. | Owners shall complete standard monitoring or system specific study by | Owners shall submit IDSE report to the commissioner by ³ |
|--|---|---|---|
| Waterworks that are not part of a combined distribution system and waterworks that serve the largest population in the combined distribution system | | | |
| Equal to or greater than 100,000 | October 1, 2006 | September 30, 2008 | January 1, 2009 |
| 50,000-99,999 | April 1, 2007 | March 31, 2009 | July 1, 2009 |
| 10,000-49,999 | October 1, 2007 | September 30, 2009 | January 1, 2010 |
| Less than 10,000 (CWS Only) | April 1, 2008 | March 31, 2010 | July 1, 2010 |
| Other waterworks that are part of a combined distribution system | | | |

| | | | |
|--|---|---|---|
| Wholesale waterworks or consecutive waterworks | -at the same time as the waterworks with the earliest compliance date in the combined distribution system | -at the same time as the waterworks with the earliest compliance date in the combined distribution system | -at the same time as the waterworks with the earliest compliance date in the combined distribution system |
|--|---|---|---|

¹If, within 12 months after the date identified in this column, the commissioner does not approve the plan or notify the owner that the review has been completed; the owner may consider the submitted plan as approved. The owner shall implement the plan and shall complete standard monitoring or a system specific study no later than the date identified in the third column.

²The owner shall submit the 40/30 certification under subdivision B 3 e (2) (d) (v) of this section by the date indicated.

³If, within three months after the date identified in this column (nine months after the date identified in this column if the owner is required to comply with the schedule for waterworks populations 10,000 to 49,999), the commissioner does not approve the IDSE report or notify the owner that the review has not been completed, the owner may consider the submitted report as approved and the owner shall implement the recommended monitoring in accordance with subdivision B 3 e (3) of this section as required.

2845 For the purpose of this schedule, the commissioner has determined that the combined
2846 distribution system does not include consecutive waterworks that receive water from
2847 a wholesale waterworks only on an emergency basis or receive less than 10% of their
2848 total water consumption from a wholesale waterworks. The commissioner has also
2849 determined that the combined distribution system does not include wholesale
2850 waterworks that deliver water to a consecutive waterworks only on an emergency
2851 basis or delivers less than 10% of the total water used by a consecutive waterworks.
2852 (d) Owners shall conduct standard monitoring that meets the requirements in
2853 subdivision B 3 e (2) (d) (iii) of this section, or a system specific study that meets the
2854 requirements in subdivision B 3 e (2) (d) (iv) of this section, or certify to the
2855 commissioner that the waterworks meets 40/30 certification criteria under subdivision
2856 B 3 e (2) (d) (v) of this section, or qualify for a very small system waiver under
2857 subdivision B 3 e (2) (d) (vi) of this section.

2858 ~~(i) Owners shall have taken the full complement of routine TTHM and HAA5~~
2859 ~~compliance samples required of a waterworks based on population and source water~~
2860 ~~under subdivision B 3 e (1) of this section (or the owner shall have taken the full~~
2861 ~~complement of reduced TTHM and HAA5 compliance samples required of an owner~~
2862 ~~based population and source water under subdivision B 3 e (1) of this section if the~~
2863 ~~waterworks meet reduced monitoring criteria under subdivision B 3 e (1)) of this~~
2864 ~~section during the period specified in subdivision B 3 e (2) (d) (v) ((a)) of this section~~
2865 ~~to meet the 40/30 certification criteria in subdivision B 3 e (2) (d) (v) of this section.~~
2866 ~~Owners shall have taken TTHM and HAA5 samples under subdivision B 3 e (1) of this~~
2867 ~~section to be eligible for the very small system waiver in subdivision B 3 e (2) (d) (vi)~~
2868 ~~of this section.~~

2869 ~~(ii) If the owner has not taken the required samples, the owner shall conduct standard~~
2870 ~~monitoring that meets the requirements in subdivision B 3 e (2) (d) (iii) of this section,~~
2871 ~~or a system specific study that meets the requirements in subdivision B 3 e (2) (d) (iv)~~
2872 ~~of this section.~~

2873 ~~(iii) Standard monitoring.~~

2874 ~~((a)) The standard monitoring plan shall comply with the following paragraphs ((i))~~
2875 ~~through ((iv)). Owners shall prepare and submit the standard monitoring plan to the~~
2876 ~~commissioner according to the schedule in subdivision B 3 e (2) (c) of this section.~~

2877 ~~((i)) The standard monitoring plan shall include a schematic of the waterworks~~
2878 ~~distribution system (including distribution system entry points and their sources, and~~
2879 ~~storage facilities), with notes indicating locations and dates of all projected standard~~
2880 ~~monitoring, and all projected compliance monitoring in accordance with subdivision B~~
2881 ~~3 e (1) of this section.~~

2882 ~~((ii)) The standard monitoring plan shall include justification of standard monitoring~~
 2883 ~~location selection and a summary of data relied on to justify standard monitoring~~
 2884 ~~location selection.~~

2885 ~~((iii)) The standard monitoring plan shall specify the population served and waterworks~~
 2886 ~~type (surface water, groundwater under the direct influence of surface water or~~
 2887 ~~groundwater).~~

2888 ~~((iv)) Owners shall retain a complete copy of the submitted standard monitoring plan,~~
 2889 ~~including any modification required by the commissioner of the standard monitoring~~
 2890 ~~plan, for as long as the owner is required to retain the IDSE report under subdivision~~
 2891 ~~B 3 e (2) (d) (iii) ((c)) ((iv)) of this section.~~

2892 ~~((b)) Owners shall monitor as indicated in the following table. Owners shall collect dual~~
 2893 ~~sample sets at each monitoring location. One sample in the dual sample set shall be~~
 2894 ~~analyzed for TTHM. The other sample in the dual sample set shall be analyzed for~~
 2895 ~~HAA5. Owners shall conduct one monitoring period during the peak historical month~~
 2896 ~~for TTHM levels or HAA5 levels or the month of warmest water temperature. Owners~~
 2897 ~~shall review available compliance, study, or operational data to determine the peak~~
 2898 ~~historical month for TTHM or HAA5 levels or warmest water temperature.~~

| Source Water Type | Population Size Category | Monitoring Periods and Frequency of Sampling | Distribution System Monitoring Locations ¹ | | | | |
|-------------------------------|--------------------------------------|---|---|-------------------|------------------------|---------------------|---------------------|
| | | | Total per monitoring period | Near Entry Points | Average Residence Time | High TTHM Locations | High HAA5 Locations |
| Surface water or ground-water | Less than 500 consecutive waterworks | one (during peak historical month) ² | 2 | 4 | - | 4 | - |

| | | | | | | | |
|--|---|---|----|---|----|----|----|
| under the direct influence of surface water. | Less than 500 nonconsecutive waterworks | | 2 | - | - | 4 | 4 |
| | 500-3,300 consecutive waterworks | four (every 90 days) | 2 | 4 | - | 4 | - |
| | 500-3,300 nonconsecutive waterworks | | 2 | - | - | 4 | 4 |
| | 3,301-9,999 | | 4 | - | 4 | 2 | 4 |
| | 10,000-49,999 | six (every 60 days) | 8 | 4 | 2 | 3 | 2 |
| | 50,000-249,999 | | 16 | 3 | 4 | 5 | 4 |
| | 250,000-999,999 | | 24 | 4 | 6 | 8 | 6 |
| | 1,000,000-4,999,999 | | 32 | 6 | 8 | 10 | 8 |
| | Equal to or greater than 5,000,000 | | 40 | 8 | 10 | 12 | 10 |
| Ground-water | Less than 500 consecutive waterworks | one (during peak historical month) ² | 2 | 4 | - | 4 | - |
| | Less than 500 nonconsecutive waterworks | | 2 | - | - | 4 | 4 |
| | 500-9,999 | four (every 90 days) | 2 | - | - | 4 | 4 |
| | 10,000-99,999 | | 6 | 4 | 4 | 2 | 2 |
| | 100,000-499,999 | | 8 | 4 | 4 | 3 | 3 |
| | Equal to or greater than 500,000 | | 12 | 2 | 2 | 4 | 4 |

¹A dual sample set (i.e., a TTHM and an HAA5 sample) shall be taken at each monitoring location during each monitoring period.

²The peak historical month is the month with the highest TTHM or HAA5 levels or the warmest water temperature.

2899 ~~((i)) Owners shall take samples at locations other than the existing monitoring locations~~
2900 ~~used in subdivision B 3 e (1) of this section. Monitoring locations shall be distributed~~
2901 ~~throughout the distribution system.~~

2902 ~~((ii)) If the number of entry points to the distribution system is fewer than the specified~~
2903 ~~number of entry point monitoring locations, excess entry point samples shall be~~
2904 ~~replaced equally at high TTHM and HAA5 locations. If there is an odd extra location~~
2905 ~~number, the owner shall take a sample at a high TTHM location. If the number of entry~~
2906 ~~points to the distribution system is more than the specified number of entry point~~
2907 ~~monitoring locations, owners shall take samples at entry points to the distribution~~
2908 ~~system having the highest annual water flows.~~

2909 ~~((iii)) The monitoring under subdivision B 3 e (2) (d) (iii) ((b)) of this section may not be~~
2910 ~~reduced.~~

2911 ~~((c)) The IDSE report shall include the elements required in the following paragraphs.~~
2912 ~~Owners shall submit the IDSE report to the commissioner according to the schedule~~
2913 ~~in subdivision B 3 e (2) (c) of this section.~~

2914 ~~((i)) The IDSE report shall include all TTHM and HAA5 analytical results from~~
2915 ~~compliance monitoring required under subdivision B 3 e (1) of this section and all~~
2916 ~~standard monitoring conducted during the period of the IDSE as individual analytical~~
2917 ~~results and LRAAs presented in a tabular or spreadsheet format acceptable to the~~
2918 ~~commissioner. If changed from the standard monitoring plan submitted under~~
2919 ~~subdivision B 3 e (2) (d) (iii) ((a)) of this section, the report shall also include a~~

2920 ~~schematic of the distribution system, the population served, and system type (surface~~
2921 ~~water, groundwater under the direct influence of surface water or groundwater).~~

2922 ~~((iii)) The IDSE report shall include an explanation of any deviations from the approved~~
2923 ~~standard monitoring plan.~~

2924 ~~((iii)) Owners shall recommend and justify the compliance monitoring locations to be~~
2925 ~~used in accordance with subdivision B 3 e (3) of this section and timing based on the~~
2926 ~~protocol in subdivision B 3 e (2) (e) of this section.~~

2927 ~~((iv)) Owners shall retain a complete copy of the IDSE report submitted under this~~
2928 ~~section for 10 years after the date the report was submitted to the commissioner. If the~~
2929 ~~commissioner modifies the LRAA monitoring requirements recommended in the IDSE~~
2930 ~~report or if the commissioner approves alternative monitoring locations, the owner~~
2931 ~~shall keep a copy of the commissioner's notification on file for 10 years after the date~~
2932 ~~of the commissioner's notification. The owner shall make the IDSE report and any~~
2933 ~~commissioner's notification available for review by the commissioner or the public.~~

2934 ~~(iv) System specific studies.~~

2935 ~~((a)) The system specific study plan shall be based on either existing monitoring results~~
2936 ~~as required under subdivision B 3 e (2) (d) (iv) ((a)) or modeling as required under~~
2937 ~~subdivision B 3 e (2) (d) (iv) ((a)) of this section. Owners shall prepare and submit the~~
2938 ~~waterworks specific study plan to the commissioner according to the schedule in~~
2939 ~~subdivision B 3 e (2) (c) of this section.~~

2940 ~~((i)) Existing monitoring results. Owners may comply by submitting monitoring results~~
2941 ~~collected before the waterworks is required to begin monitoring under subdivision B 3~~
2942 ~~e (2) (c) of this section. The monitoring results and analysis shall meet the criteria in~~
2943 ~~subdivisions ((1)) and ((2)) as follows:~~

2944 ~~((1)) Minimum requirements.~~

2945 ~~((A)) TTHM and HAA5 results shall be based on samples collected and analyzed in~~
2946 ~~accordance with 12VAC5-590-440. Samples shall be collected no earlier than five~~
2947 ~~years prior to the study plan submission date.~~

2948 ~~((B)) The monitoring locations and frequency shall meet the conditions identified in the~~
2949 ~~following table. Each location shall be sampled once during the peak historical month~~
2950 ~~for TTHM levels or HAA5 levels or the month of warmest water temperature for every~~
2951 ~~12 months of data submitted for that location. Monitoring results shall include all~~
2952 ~~compliance monitoring results in accordance with subdivision B 3 e (1) of this section~~
2953 ~~plus additional monitoring results as necessary to meet minimum sample~~
2954 ~~requirements.~~

| System Type | Population Size Category | Number of Monitoring Locations | Number of Samples | |
|--|------------------------------------|--------------------------------|-------------------|------|
| | | | TTHM | HAA5 |
| Surface water or groundwater under the direct influence of surface water | Less than 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 |
| | Equal to or greater than 5,000,000 | 60 | 360 | 360 |
| Groundwater | Less than 500 | 3 | 3 | 3 |
| | 500-9,999 | 3 | 9 | 9 |
| | 10,000-99,999 | 12 | 48 | 48 |
| | 100,000-499,999 | 18 | 72 | 72 |
| | Equal to or greater than 500,000 | 24 | 96 | 96 |

2955 ~~((2)) Reporting monitoring results. Owners shall report the following information:~~

2956 ~~((A)) Owners shall report previously collected monitoring results and certify that the~~
2957 ~~reported monitoring results include all compliance and non-compliance results~~
2958 ~~generated during the time period beginning with the first reported result and ending~~
2959 ~~with the most recent results collected in accordance with subdivision B 3 e (1) of this~~
2960 ~~section.~~

2961 ~~((B)) Owners shall certify that the samples were representative of the entire distribution~~
2962 ~~system and that treatment, and distribution system have not changed significantly~~
2963 ~~since the samples were collected.~~

2964 ~~((C)) The study monitoring plan shall include a schematic of the distribution system~~
2965 ~~(including distribution system entry points and their sources, and storage facilities),~~
2966 ~~with notes indicating the locations and dates of all completed or planned system~~
2967 ~~specific study monitoring.~~

2968 ~~((D)) The system specific study plan shall specify the population served and system~~
2969 ~~type (surface water, groundwater under the direct influence of surface water or~~
2970 ~~groundwater).~~

2971 ~~((E)) Owners shall retain a complete copy of the system specific study plan submitted,~~
2972 ~~including any modification requested by the commissioner of the system specific study~~
2973 ~~plan, for as long as the owner is required to retain the IDSE report under subdivision~~
2974 ~~B 3 e (2) (d) (iv) ((b)) ((vii)) of this section.~~

2975 ~~((F)) If previously collected data that fully meets the number of samples required under~~
2976 ~~subdivision B 3 e (2) (d) (iv) ((a)) ((i)) ((1)) ((b)) of this section and the commissioner~~
2977 ~~rejects some of the data, the owner shall either conduct additional monitoring to~~
2978 ~~replace rejected data on a schedule the commissioner approves or conduct standard~~
2979 ~~monitoring under subdivision B 3 e (2) (d) (iii) of this section.~~

2980 ~~((ii)) Modeling. Owners may comply through analysis of an extended period simulation~~
 2981 ~~hydraulic model. The extended period simulation hydraulic model and analysis shall~~
 2982 ~~meet the following criteria:~~

2983 ~~((1)) Minimum requirements.~~

2984 ~~((A)) The model shall simulate 24-hour variation in demand and show a consistently~~
 2985 ~~repeating 24-hour pattern of residence time.~~

2986 ~~((B)) The model shall represent the criteria listed in the following table:~~

| | |
|---|---|
| - | 75% of pipe volume; |
| - | 50% of pipe length; |
| - | All pressure zones; |
| - | All 12-inch diameter and larger pipes; |
| - | 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; |
| - | All 6-inch and larger pipes that connect remote areas of a distribution system to the main portion of the system; |
| - | All storage facilities with standard operations represented in the model; and |
| - | All active pump stations with controls represented in the model; and |
| - | All active control valves. |

2987 ~~((C)) The model shall be calibrated, or have calibration plans, for the current~~
 2988 ~~configuration of the distribution system during the period of high TTHM formation~~
 2989 ~~potential. All storage facilities shall be evaluated as part of the calibration process. All~~
 2990 ~~required calibration shall be completed no later than 12 months after plan submission.~~

2991 ~~((2)) Reporting modeling. The system specific study plan shall include the following~~
 2992 ~~information:~~

2993 ~~((A)) Tabular or spreadsheet data demonstrating that the model meets requirements~~
 2994 ~~in subdivision B 3 e (2) (d) (iv) ((a)) ((ii)) ((1)) ((b)) of this section.~~

2995 ~~((B)) A description of all calibration activities undertaken, and if calibration is complete,~~
2996 ~~a graph of predicted tank levels versus measured tank levels for the storage facility~~
2997 ~~with the highest residence time in each pressure zone, and a time series graph of the~~
2998 ~~residence time at the longest residence time storage facility in the distribution system~~
2999 ~~showing the predictions for the entire simulation period (i.e., from time zero until the~~
3000 ~~time it takes to for the model to reach a consistently repeating pattern of residence~~
3001 ~~time).~~

3002 ~~((C)) Model output showing preliminary 24-hour average residence time predictions~~
3003 ~~throughout the distribution system.~~

3004 ~~((D)) Timing and number of samples representative of the distribution system planned~~
3005 ~~for at least one monitoring period of TTHM and HAA5 dual sample monitoring at a~~
3006 ~~number of locations no less than would be required for the system under standard~~
3007 ~~monitoring in subdivision B 3 e (2) (d) (iii) of this section during the historical month of~~
3008 ~~high TTHM. These samples shall be taken at locations other than existing compliance~~
3009 ~~monitoring locations listed in subdivision B 3 e (1) of this section.~~

3010 ~~((E)) Description of how all requirements will be completed no later than 12 months~~
3011 ~~after owner submits the system specific study plan.~~

3012 ~~((F)) Schematic of the distribution system (including distribution system entry points~~
3013 ~~and their sources, and storage facilities), with notes indicating the locations and dates~~
3014 ~~of all completed system specific study monitoring (if calibration is complete) and all~~
3015 ~~compliance monitoring listed in subdivision B 3 e (1) of this section.~~

3016 ~~((G)) Population served and system type (surface water, groundwater under the direct~~
3017 ~~influence of surface water or groundwater).~~

3018 ~~((H)) Owners shall retain a complete copy of the system specific study plan submitted,~~
3019 ~~including any modification recommended by the commissioner to the waterworks~~
3020 ~~specific study plan, for as long as the owner is required to retain the IDSE report under~~
3021 ~~subdivision B 3 e (2) (d) (iv) ((b)) ((vii)) of this section.~~

3022 ~~((3)) If an owner submits a model that does not fully meet the requirements under~~
3023 ~~paragraph (iv) ((a)) ((ii)) of this section, the owners shall correct the deficiencies and~~
3024 ~~respond to commissioner's inquiries concerning the model. If the owner fails to correct~~
3025 ~~deficiencies or respond to inquiries to the commissioner's satisfaction, the owner shall~~
3026 ~~conduct standard monitoring under subdivision B 3 e (2) (d) (iii) of this section.~~

3027 ~~((b)) The IDSE report shall include the elements required in the following paragraphs.~~
3028 ~~Owners shall submit the IDSE report according to the schedule in subdivision B 3 e~~
3029 ~~(2) (c) of this section.~~

3030 ~~((i)) The IDSE report shall include all TTHM and HAA5 analytical results from~~
3031 ~~compliance monitoring in subdivision B 3 e (1) of this section and all system specific~~
3032 ~~study monitoring conducted during the period of the system specific study presented~~
3033 ~~in a tabular or spreadsheet format acceptable to the commissioner. If changed from~~
3034 ~~the system specific study plan submitted under subdivision B 3 e (2) (d) (iv) ((a)) of~~
3035 ~~this section, the IDSE report shall also include a schematic of the distribution system,~~
3036 ~~the population served; and system type (surface water, groundwater under the direct~~
3037 ~~influence of surface water or groundwater).~~

3038 ~~((ii)) Owners of waterworks using the modeling provision under subdivision B 3 e (2)~~
3039 ~~(d) (iv) ((a)) ((ii)) of this section shall include final information for the elements~~
3040 ~~described in subdivision B 3 e (2) (d) (iv) ((a)) ((ii)) ((2)) of this section, and a 24-hour~~
3041 ~~time series graph of residence time for each LRAA compliance monitoring location~~
3042 ~~selected.~~

3043 ~~((iii)) The owner shall recommend and justify LRAA compliance monitoring locations~~
3044 ~~and timing based on the protocol in subdivision B 3 e (2) (e) of this section.~~

3045 ~~((iv)) The IDSE report shall include an explanation of any deviations from the~~
3046 ~~waterworks approved system specific study plan.~~

3047 ~~((v)) The IDSE report shall include the basis (analytical and modeling results) and~~
3048 ~~justification the owner used to select the recommended LRAA monitoring locations.~~

3049 ~~((vi)) The owner may submit the IDSE report in lieu of the system specific study plan~~
3050 ~~on the schedule identified in subdivision B 3 e (2) (e) of this section for submission of~~
3051 ~~the system specific study plan if the owner believes the necessary information has~~
3052 ~~been obtained by the time that the waterworks specific study plan is due. If the owner~~
3053 ~~elects this approach, the IDSE report shall also include all information required under~~
3054 ~~subdivision B 3 e (2) (d) (iv) ((a)) of this section.~~

3055 ~~((vii)) The owner shall retain a complete copy of the IDSE report submitted under this~~
3056 ~~subdivision for 10 years after the date submitted. If the commissioner modifies the~~
3057 ~~LRAA monitoring requirements that the owner recommended in the IDSE report or if~~
3058 ~~the commissioner approves alternative monitoring locations, the owner shall keep a~~
3059 ~~copy of the commissioner's notification on file for 10 years after the date of the~~
3060 ~~commissioner's notification. The owner shall make the IDSE report and any notification~~
3061 ~~from the commissioner available for review by the commissioner or the public.~~

3062 ~~(v) 40/30 certifications.~~

3063 ~~((a)) Eligibility. Waterworks are eligible for 40/30 certification if the waterworks had no~~
3064 ~~TTHM or HAA5 monitoring violations under subdivision B 3 e (1) of this section and~~
3065 ~~no individual sample exceeded 0.040 mg/L for TTHM or 0.030 mg/L for HAA5 during~~

3066 an eight consecutive calendar quarter period beginning no earlier than the date
 3067 specified in the following table.

| | |
|--|---|
| If the waterworks 40/30 Certification Is Due | Then the waterworks eligibility for 40/30 certification is based on eight consecutive calendar quarters of compliance monitoring under subdivision B 3 e (1) results beginning no earlier than ⁴ |
| October 1, 2006 | January 2004 |
| April 1, 2007 | January 2004 |
| October 1, 2007 | January 2005 |
| April 1, 2008 | January 2005 |

⁴Unless the waterworks is on reduced monitoring under subdivision B 3 e (1) of this section and was not required to monitor during the specified period. If the owner did not monitor during the specified period, the owner shall base eligibility on compliance samples taken during the 12 months preceding the specified period.

3068 ~~((b)) Requirements for 40/30 certification:~~

3069 ~~((i)) Certify to the commissioner that every individual compliance sample taken under~~

3070 ~~subdivision B 3 e (1) of this section during the periods specified in subdivision B 3 e~~

3071 ~~(2) (d) (v) ((a)) of this section were less than or equal to 0.040 mg/L for TTHM and less~~

3072 ~~than or equal to 0.030 mg/L for HAA5, and that the waterworks has not had any TTHM~~

3073 ~~or HAA5 monitoring violations during the period specified in subdivision ((a)).~~

3074 ~~((iii)) The commissioner may require the owner to submit compliance monitoring~~

3075 ~~results, distribution system schematics, and/or recommended LRAA compliance~~

3076 ~~monitoring locations in addition to the certification. If an owner fails to submit the~~

3077 ~~requested information, the commissioner may require standard monitoring under~~

3078 ~~subdivision B 3 e (2) (d) (iii) of this section or a system specific study under subdivision~~

3079 ~~B 3 e (2) (d) (iv) of this section.~~

3080 ~~((iii)) The commissioner may still require standard monitoring under subdivision B 3 e~~

3081 ~~(2) (d) (iii) or a system specific study under subdivision B 3 e (2) (d) (iv) of this section~~

3082 even if the waterworks meet the criteria in subdivision B 3 e (2) (d) (v) ((a)) of this
3083 section.

3084 ((iv)) The owner shall retain a complete copy of the certification submitted under this
3085 subdivision for 10 years after the date that the owner submitted the certification. The
3086 owner shall make the certification, all data upon which the certification is based, and
3087 any notification from the commissioner available for review by the commissioner or the
3088 public.

3089 (vi) Very small system waivers.

3090 ((a)) If the waterworks serves fewer than 500 people and has taken TTHM and HAA5
3091 samples under subdivision B 3 e (1) of this section, the owner is not required to comply
3092 with this subdivision unless the commissioner notifies the owner to conduct standard
3093 monitoring under subdivision B 3 e (2) (d) (iii) or a system specific study under
3094 subdivision B 3 e (2) (d) (iv) of this section.

3095 ((b)) If the owner has not taken TTHM and HAA5 samples under subdivision B 3 e (1)
3096 of this section or if the commissioner notifies the owner to comply with this subdivision,
3097 the owner shall conduct standard monitoring under subdivision B 3 e (2) (d) (iii) of this
3098 section or a system specific study under subdivision B 3 e (2) (d) (iv) of this section.

3099 (e) LRAA compliance monitoring location recommendations.

3100 (i) The IDSE report shall include recommendations and justification for where and
3101 during what month(s) TTHM and HAA5 monitoring in accordance with subdivision B 3
3102 e (3) of this section should be conducted. These recommendations shall be based on
3103 the criteria in the paragraphs in this section.

3104 (ii) Owners shall select the number of monitoring locations specified in the following
3105 table. These recommended locations will be used as LRAA routine compliance

3106 monitoring locations, unless the commissioner requires different or additional
 3107 locations. The locations should be distributed throughout the distribution system to the
 3108 extent possible.

| Source Water Type | Population Size Category | Monitoring Frequency ⁴ | Distribution System Monitoring Location | | | |
|--|------------------------------------|-----------------------------------|--|------------------------|------------------------|--|
| | | | Total per monitoring period ² | Highest TTHM Locations | Highest HAA5 Locations | Existing Compliance Locations in accordance with subdivision B 3 e (1) |
| Surface water or groundwater under the direct influence of surface water | Less than 500 | per year | 2 | 4 | 4 | - |
| | 500-3,300 | per quarter | 2 | 4 | 4 | - |
| | 3,301-9,999 | per quarter | 2 | 4 | 4 | - |
| | 10,000-49,999 | per quarter | 4 | 2 | 4 | 4 |
| | 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 |
| | Equal to or greater than 5,000,000 | per quarter | 20 | 8 | 7 | 5 |
| Groundwater | Less than 500 | per year | 2 | 4 | 4 | - |
| | 500-9,999 | per year | 2 | 4 | 4 | - |
| | 10,000-99,999 | per quarter | 4 | 2 | 4 | 4 |
| | 100,000-499,999 | per quarter | 6 | 3 | 2 | 4 |

| | | | | | | |
|--|----------------------------------|-------------|---|---|---|---|
| | Equal to or greater than 500,000 | per quarter | 8 | 3 | 3 | 2 |
|--|----------------------------------|-------------|---|---|---|---|

¹All owners shall monitor during month of highest DBP concentrations.

²Owners of waterworks on quarterly monitoring (except for surface water source or GUDI source waterworks serving 500-3,300) shall take dual sample sets every 90 days at each monitoring location. Groundwater source waterworks serving 500-9,999 (on annual monitoring) shall take dual sample sets annually at each monitoring location. Waterworks serving fewer than 500 and surface water source or GUDI source waterworks serving 500-3,300 shall take individual TTHM and HAA5 samples (instead of a dual sample set) at the locations with the highest TTHM and HAA5 concentrations, respectively. Waterworks serving fewer than 500 shall sample annually and surface water source or GUDI source systems serving 500-3,300 shall sample every 90 days. Only one location with a dual sample set per monitoring period is needed if highest TTHM and HAA5 concentrations occur at the same location (and month, if monitoring annually).

- 3109 ~~(iii) Owners shall recommend LRAA compliance monitoring locations based on~~
- 3110 ~~standard monitoring results, system specific study results, and compliance monitoring~~
- 3111 ~~results under subdivision B 3 e (1) of this section. Owners shall follow the protocol in~~
- 3112 ~~subdivision B 3 e (2) (e) (iii) ((a)) through ((h)) of this section. If required to monitor at~~
- 3113 ~~more than eight locations, the owner shall repeat the protocol as necessary. If an~~
- 3114 ~~owner does not have existing compliance monitoring results under subdivision B 3 e~~
- 3115 ~~(1) of this section or if the owner does not have enough existing compliance monitoring~~
- 3116 ~~results under subdivision B 3 e (1) of this section, the owner shall repeat the protocol,~~
- 3117 ~~skipping the provisions of subdivision B 3 e (2) (e) (iii) ((c)) and ((g)) of this section as~~
- 3118 ~~necessary, until the owner has identified the required total number of monitoring~~
- 3119 ~~locations.~~
- 3120 ~~((a)) Location with the highest TTHM LRAA not previously selected as a LRAA~~
- 3121 ~~monitoring location.~~
- 3122 ~~((b)) Location with the highest HAA5 LRAA not previously selected as a LRAA~~
- 3123 ~~monitoring location.~~

3124 ~~((c)) Existing average residence time compliance monitoring location under~~
3125 ~~subdivision B 3 e (1) of this section (maximum residence time compliance monitoring~~
3126 ~~location for ground water systems) with the highest HAA5 LRAA not previously~~
3127 ~~selected as a LRAA monitoring location.~~

3128 ~~((d)) Location with the highest TTHM LRAA not previously selected as a LRAA~~
3129 ~~monitoring location.~~

3130 ~~((e)) Location with the highest TTHM LRAA not previously selected as a LRAA~~
3131 ~~monitoring location.~~

3132 ~~((f)) Location with the highest HAA5 LRAA not previously selected as a LRAA~~
3133 ~~monitoring location.~~

3134 ~~((g)) Existing average residence time compliance monitoring location under~~
3135 ~~subdivision B 3 e (1) of this section (maximum residence time compliance monitoring~~
3136 ~~location for ground water systems) with the highest TTHM LRAA not previously~~
3137 ~~selected as a LRAA monitoring location.~~

3138 ~~((h)) Location with the highest HAA5 LRAA not previously selected as a LRAA~~
3139 ~~monitoring location.~~

3140 ~~(iv) An owner may recommend locations other than those specified in subdivision B 3~~
3141 ~~e (2) (e) (iii) of this section if the owner includes a rationale for selecting other locations.~~
3142 ~~If the commissioner approves the alternate locations, the owners shall monitor at these~~
3143 ~~locations to determine compliance under subdivision B 3 e (3) of this section.~~

3144 ~~(v) The recommended schedule shall include LRAA monitoring during the peak~~
3145 ~~historical month for TTHM and HAA5 concentration, unless the commissioner~~
3146 ~~approves another month. Once the owner has identified the peak historical month, and~~
3147 ~~if the owner is required to conduct routine monitoring at least quarterly, the owner shall~~

3148 ~~schedule LRAA compliance monitoring at a regular frequency of every 90 days or~~
3149 ~~fewer.~~

3150 ~~(f) The owner shall use only the analytical methods specified in 12VAC5-590-440, or~~
3151 ~~otherwise approved by EPA for monitoring, to demonstrate compliance.~~

3152 ~~(g) IDSE results will not be used for the purpose of determining compliance with MCLs~~
3153 ~~in Table 2.13.~~

3154 ~~(3) Locational running annual average monitoring requirements.~~

3155 ~~(a) This subdivision establishes monitoring and other requirements for achieving~~
3156 ~~compliance with maximum contaminant levels based on locational running annual~~
3157 ~~averages (LRAA) for total trihalomethanes (TTHM) and haloacetic acids (five) (HAA5),~~
3158 ~~and for achieving compliance with maximum residual disinfectant residuals for chlorine~~
3159 ~~and chloramines for certain consecutive waterworks.~~

3160 ~~(b) This subdivision applies to community waterworks or nontransient noncommunity~~
3161 ~~waterworks that uses a primary or residual disinfectant other than ultraviolet light or~~
3162 ~~delivers water that has been treated with a primary or residual disinfectant other than~~
3163 ~~ultraviolet light.~~

3164 ~~(c) Owner shall comply on the schedule in the following table based on the type of~~
3165 ~~waterworks:~~

| Type of Waterworks | Waterworks shall comply with Locational Running Average monitoring by: ⁴ |
|--|---|
| Waterworks that are not part of a combined distribution system and waterworks that serve the largest population in the combined distribution system | |
| Waterworks serving equal to or greater than 100,000 | April 1, 2012 |

| | |
|--|---|
| Waterworks serving 50,000-99,999 | October 1, 2012 |
| Waterworks serving 10,000-49,999 | October 1, 2013 |
| Waterworks serving less than 10,000 | October 1, 2013 if no Cryptosporidium monitoring is required under 12VAC5-590-420 B 3 a (1) (c) or October 1, 2014 if Cryptosporidium monitoring is required under 12VAC5-590-420 B 3 a (1) (c) |
| Other waterworks that are part of a combined distribution system | |
| Consecutive waterworks or wholesale waterworks | at the same time as the waterworks with the earliest compliance date in the combined distribution system |

⁴The commissioner may grant up to an additional 24 months for compliance with MCLs and operational evaluation levels if the waterworks require capital improvements to comply with an MCL.

- 3166 (i) Waterworks monitoring frequency is specified in subdivision B 3 e (3) (d) (ii) of this
3167 section.
- 3168 ((a)) Owners of waterworks required to conduct quarterly monitoring shall begin
3169 monitoring in the first full calendar quarter that includes the compliance date in the
3170 table in subdivision B 3 e (3) (c) of this section.
- 3171 ((b)) Owners of waterworks required to conduct monitoring at a frequency that is less
3172 than quarterly shall begin monitoring in the calendar month recommended in the IDSE
3173 report prepared under subdivision B 3 e (2) (d) (iii) or subdivision B 3 e (2) (d) (iv) of
3174 this section or the calendar month identified in the LRAA monitoring plan developed
3175 under subdivision B 3 e (3) (e) of this section no later than 12 months after the
3176 compliance date in the table in subdivision B 3 e (3) (c) of this section.
- 3177 (ii) Owners of waterworks required to conduct quarterly monitoring shall make
3178 compliance calculations at the end of the fourth calendar quarter that follows the
3179 compliance date and at the end of each subsequent quarter (or earlier if the LRAA

3180 ~~calculated based on fewer than four quarters of data would cause the MCL to be~~
3181 ~~exceeded regardless of the monitoring results of subsequent quarters). Owners of~~
3182 ~~waterworks required to conduct monitoring at a frequency that is less than quarterly~~
3183 ~~shall make compliance calculations beginning with the first compliance sample taken~~
3184 ~~after the compliance date.~~

3185 ~~(iii) For the purpose of the schedule in subdivision B 3 e (3) (c) of this section, the~~
3186 ~~commissioner has determine that the combined distribution system does not include~~
3187 ~~consecutive waterworks that receive water from a wholesale waterworks only on an~~
3188 ~~emergency basis or receive less than 10% of their total water consumption from a~~
3189 ~~wholesale waterworks. The commissioner has also determine that the combined~~
3190 ~~distribution system does not include wholesale waterworks which deliver water to a~~
3191 ~~consecutive waterworks only on an emergency basis or deliver less than 10% of the~~
3192 ~~total water used by a consecutive waterworks.~~

3193 ~~(d) Routine monitoring.~~

3194 ~~(i) Owners submitting an IDSE report shall begin monitoring at the locations and~~
3195 ~~months the owner recommended in the IDSE report submitted under subdivision B 3~~
3196 ~~e (2) (e) of this section following the schedule in subdivision B 3 e (3) (c) of this section,~~
3197 ~~unless the commissioner requires other locations or additional locations after review.~~
3198 ~~If the owner submitted a 40/30 certification under subdivision B 3 e (2) (d) (v) of this~~
3199 ~~section or the waterworks qualified for a very small system waiver under subdivision~~
3200 ~~B 3 e (2) (d) (vi) of this section or the waterworks is a nontransient noncommunity~~
3201 ~~waterworks serving less than 10,000, the owner shall monitor at the location(s) and~~
3202 ~~dates identified in the monitoring plan in subdivision B 3 j of this section, updated as~~
3203 ~~required by subdivision B 3 e (3) (e) of this section.~~

3204 (ii) Owners shall monitor at no fewer than the number of locations identified in the
 3205 following table:

| Source Water Type | Population Size Category | Monitoring Frequency ¹ | Distribution System Monitoring Location Total per Monitoring Period ² |
|--|------------------------------------|-----------------------------------|--|
| Surface water or groundwater under the direct influence of surface water | Less than 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 |
| | Equal to or greater than 5,000,000 | per quarter | 20 |
| Groundwater | Less than 500 | per year | 2 |
| | 500-9,999 | per year | 2 |
| | 10,000-99,999 | per quarter | 4 |
| | 100,000-499,999 | per quarter | 6 |
| | Equal to or greater than 500,000 | per quarter | 8 |

¹All owners shall monitor during month of highest DBP concentrations.

²Owners of waterworks on quarterly monitoring (except for surface water source or GUDI source waterworks serving 500-3,300) shall take dual sample sets every 90 days at each monitoring location. Groundwater source waterworks serving 500-9,999 (on annual monitoring) shall take dual sample sets annually at each monitoring location. Waterworks serving fewer than 500 and surface water source or GUDI source waterworks serving 500-3,300 shall take individual TTHM and HAA5 samples (instead of a dual sample set) at the locations with the highest TTHM and HAA5 concentrations, respectively. Waterworks serving fewer than 500 shall sample annually and surface water source or GUDI source systems serving 500-3,300 shall sample every 90 days. Only one location with a dual sample set per monitoring period is needed if highest TTHM and HAA5 concentrations occur at the same location (and month, if monitoring annually).

3206 (iii) Owners of waterworks not using disinfection that begin using a disinfectant other
 3207 than UV light after the dates in subdivision B 3 e (2) of this section for complying with
 3208 the IDSE requirements shall consult with the commissioner to identify compliance

3209 ~~monitoring locations. Owners shall then develop a monitoring plan under subdivision~~
3210 ~~B 3 e (3) (e) of this section that includes those monitoring locations.~~

3211 ~~(iv) Owners shall use an approved method listed in 12VAC5-590-440 for TTHM and~~
3212 ~~HAA5 analyses. Analyses shall be conducted by laboratories that have received~~
3213 ~~certification by EPA or DGLS as specified in 12VAC5-590-440.~~

3214 ~~(e) Monitoring plan.~~

3215 ~~(i) Owners shall develop and implement a monitoring plan to be kept on file for review~~
3216 ~~by the commissioner and the public. The monitoring plan shall be completed no later~~
3217 ~~than the date the owner conducts the initial monitoring and contain:~~

3218 ~~((a)) Monitoring locations;~~

3219 ~~((b)) Monitoring dates; and~~

3220 ~~((c)) Compliance calculation procedures.~~

3221 ~~(ii) If the owner was not required to submit an IDSE report under either subdivision B~~
3222 ~~3 e (2) (d) (iii) or subdivision B 3 e (2) (d) (iv) of this section, and the waterworks did~~
3223 ~~not have sufficient monitoring locations under subdivision B 3 e (1) of this section to~~
3224 ~~identify the required number of LRAA compliance monitoring locations indicated in~~
3225 ~~subdivision B 3 e (2) (e) (ii) of this section, the owner shall identify additional locations~~
3226 ~~by alternating selection of locations representing high TTHM levels and high HAA5~~
3227 ~~levels until the required number of compliance monitoring locations have been~~
3228 ~~identified. The owner shall also provide the rationale for identifying the locations as~~
3229 ~~having high levels of TTHM or HAA5. If the waterworks has more monitoring locations~~
3230 ~~under subdivision B 3 e (1) of this section than required for LRAA compliance~~
3231 ~~monitoring in subdivision B 3 e (2) (e) (ii) of this section, the owner shall identify which~~
3232 ~~locations the waterworks will use for LRAA compliance monitoring by alternating~~

3233 ~~selection of locations representing high TTHM levels and high HAA5 levels until the~~
3234 ~~required number of LRAA compliance monitoring locations have been identified.~~

3235 ~~(iii) Owners of waterworks using surface water or groundwater under the direct~~
3236 ~~influence of surface water serving more than 3,300 people shall submit a copy of the~~
3237 ~~monitoring plan to the commissioner prior to the date the waterworks conducts the~~
3238 ~~initial monitoring, unless the IDSE report submitted under subdivision B 3 e (2) of this~~
3239 ~~section contains all the information required by this section.~~

3240 ~~(iv) Owners may revise the monitoring plan to reflect changes in treatment, distribution~~
3241 ~~system operations and layout (including new service areas), or other factors that may~~
3242 ~~affect TTHM or HAA5 formation, or for reasons approved by the commissioner, after~~
3243 ~~consultation with the commissioner regarding the need for changes and the~~
3244 ~~appropriateness of the changes. If the owner changes monitoring locations, the owner~~
3245 ~~shall replace existing compliance monitoring locations with the lowest LRAA with new~~
3246 ~~locations that reflect the current distribution system locations with expected high TTHM~~
3247 ~~or HAA5 levels. The commissioner may also require modifications in the monitoring~~
3248 ~~plan. Owners of waterworks using surface water or groundwater under the direct~~
3249 ~~influence of surface water serving more than 3,300 people shall submit a copy of the~~
3250 ~~modified monitoring plan to the commissioner prior to the date the owner is required~~
3251 ~~to comply with the revised monitoring plan.~~

3252 ~~(f) Reduced monitoring~~

3253 ~~(i) Owners may reduce monitoring to the level specified in the following table any time~~
3254 ~~the LRAA is less than or equal to 0.040 mg/L for TTHM and less than or equal to 0.030~~
3255 ~~mg/L for HAA5 at all monitoring locations. Owners may only use data collected under~~
3256 ~~the provisions of this subdivision or subdivision B 3 e (1) of this section to qualify for~~
3257 ~~reduced monitoring. In addition, the source water annual average TOC level, before~~

3258 any treatment, shall be less than or equal to 4.0 mg/L at each treatment plant treating
 3259 surface water or ground water under the direct influence of surface water, based on
 3260 monitoring conducted under either subdivision B 3 e (1) (b) (vi) or B 3 i of this section.

| Source Water Type | Population Size Category | Monitoring Frequency ¹ | Distribution System Monitoring Location per Monitoring Period |
|---|------------------------------------|-----------------------------------|---|
| Surface water or ground water under the direct influence of surface water | Less than 500 | - | 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; 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 |
| | Equal to or greater than 5,000,000 | per quarter | 10 dual sample sets – at the locations with the five highest TTHM and five highest HAA5 LRAAs |

| Source Water Type | Population Size Category | Monitoring Frequency [†] | Distribution System Monitoring Location per Monitoring Period |
|-------------------|----------------------------------|-----------------------------------|---|
| Groundwater | Less than 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; 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; 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 |
| | Equal to or greater than 500,000 | per quarter | 4 dual sample sets at the locations with the two highest TTHM and two highest HAA5 LRAAs |

[†]Owners of waterworks on quarterly monitoring shall take dual sample sets every 90 days.

3261 (ii) owners may remain on reduced monitoring as long as the TTHM LRAA is less than
3262 or equal to 0.040 mg/L and the HAA5 LRAA is less than or equal to 0.030 mg/L at
3263 each monitoring location (for waterworks with quarterly reduced monitoring) or each
3264 TTHM sample is less than or equal to 0.060 mg/L and each HAA5 sample is less than
3265 or equal to 0.045 mg/L (for waterworks with annual or less frequent monitoring). In
3266 addition, the source water annual average TOC level, before any treatment, shall be

3267 ~~less than or equal to 4.0 mg/L at each treatment plant treating surface water or ground~~
3268 ~~water under the direct influence of surface water, based on monitoring conducted~~
3269 ~~under either subdivision B 3 e (1) (b) (vi) or B 3 i of this section.~~

3270 ~~(iii) If the LRAA based on quarterly monitoring at any monitoring location exceeds~~
3271 ~~either 0.040 mg/L for TTHM or 0.030 mg/L for HAA5 or if the annual (or less frequent)~~
3272 ~~sample at any location exceeds either 0.060 mg/L for TTHM or 0.045 mg/L for HAA5,~~
3273 ~~or if the source water annual average TOC level, before any treatment, is greater than~~
3274 ~~4.0 mg/L at any treatment plant treating surface water or ground water under the direct~~
3275 ~~influence of surface water, the owner shall resume routine monitoring under~~
3276 ~~subdivision B 3 e (3) (d) of this section or begin increased monitoring if subdivision B~~
3277 ~~3 e (3) (g) of this section applies.~~

3278 ~~(iv) The commissioner may return the waterworks to routine monitoring at the~~
3279 ~~commissioner's discretion.~~

3280 ~~(v) A waterworks may remain on reduced monitoring after the dates identified in~~
3281 ~~subdivision B 3 e (3) (c) of this section for compliance with this section only if the~~
3282 ~~waterworks qualifies for a 40/30 certification under subdivision B 3 e (2) (d) (v) of this~~
3283 ~~section or has received a very small system waiver under subdivision B 3 e (2) (d) (vi)~~
3284 ~~of this section, plus the waterworks meets the reduced monitoring criteria in~~
3285 ~~subdivision B 3 e (3) (f) of this section, and the owner did not change or add monitoring~~
3286 ~~locations from those used for compliance monitoring under subdivision B 3 e (1) of this~~
3287 ~~section. If the monitoring locations under this subdivision differ from the monitoring~~
3288 ~~locations under subdivision B 3 e (1) of this section, the owner may not remain on~~
3289 ~~reduced monitoring after the dates identified in subdivision B 3 e (3) (c) of this section~~
3290 ~~for compliance with this subdivision.~~

3291 ~~(vi) Owners shall use an approved method listed in 12VAC5-590-440 for TTHM and~~
3292 ~~HAA5 analyses. Analyses shall be conducted by laboratories that have received~~
3293 ~~certification by EPA or DCLS as specified in 12VAC5-590-440.~~

3294 ~~(g) Increased Monitoring~~

3295 ~~(i) Owners of waterworks required to monitor at a particular location annually or less~~
3296 ~~frequently than annually under subdivision B 3 e (3) (d) or subdivision B 3 e (3) (f) of~~
3297 ~~this section, shall increase monitoring to dual sample sets once per quarter (taken~~
3298 ~~every 90 days) at all locations if a TTHM sample is greater than 0.080 mg/L or a HAA5~~
3299 ~~sample is greater than 0.060 mg/L at any location.~~

3300 ~~(ii) A waterworks is in violation of the MCL when the LRAA exceeds the MCLs in Table~~
3301 ~~2.13, calculated based on four consecutive quarters of monitoring (or the LRAA~~
3302 ~~calculated based on fewer than four quarters of data if the MCL would be exceeded~~
3303 ~~regardless of the monitoring results of subsequent quarters). Waterworks are in~~
3304 ~~violation of the monitoring requirements for each quarter that a monitoring result would~~
3305 ~~be used in calculating an LRAA if the owner fails to monitor.~~

3306 ~~(iii) Owners may return to routine monitoring once the waterworks has conducted~~
3307 ~~increased monitoring for at least four consecutive quarters and the LRAA for every~~
3308 ~~monitoring location is less than or equal to 0.060 mg/L for TTHM and less than or equal~~
3309 ~~to 0.045 mg/L for HAA5.~~

3310 ~~(iv) Owners of waterworks on increased monitoring under subdivision e (1) in this~~
3311 ~~section shall remain on increased monitoring until the waterworks qualify for a return~~
3312 ~~to routine monitoring under subdivision B 3 e (3) (g) (iii) of this section. The owner shall~~
3313 ~~conduct increased monitoring under subdivision B 3 e (3) (g) of this section at the~~
3314 ~~monitoring locations in the monitoring plan developed under subdivision B 3 e (3) (e)~~

3315 of this section beginning at the date identified in subdivision B 3 e (3) (c) of this section
3316 for compliance with this subdivision and remain on increased monitoring until the
3317 waterworks qualifies for a return to routine monitoring under subdivision B 3 e (3) (g)
3318 (iii) of this section.

3319 (v) Owners shall use an approved method listed in 12VAC5-590-440 for TTHM and
3320 HAA5 analyses. Analyses shall be conducted by laboratories that have received
3321 certification by EPA or DCLS as specified in 12VAC5-590-440.

3322 f. Chlorite. Owners of community and nontransient noncommunity waterworks using
3323 chlorine dioxide, for disinfection or oxidation, shall conduct monitoring for chlorite.

3324 (1) Routine monitoring.

3325 (a) Daily monitoring. Owners shall take daily samples at the entrance to the distribution
3326 system. For any daily sample that exceeds the chlorite PMCL in Table 2.13, the owner
3327 shall take additional samples in the distribution system the following day at the
3328 locations required by subdivision B 3 f (1) (c) of this section, in addition to the sample
3329 required at the entrance to the distribution system.

3330 (b) Monthly monitoring. Owners shall take a three-sample set each month in the
3331 distribution system. The owner shall take one sample at each of the following locations:
3332 near the first customer, at a location representative of average residence time, and at
3333 a location reflecting maximum residence time in the distribution system. Any additional
3334 routine sampling shall be conducted in the same manner (as three-sample sets, at the
3335 specified locations). The owner may use the results of additional monitoring conducted
3336 under subdivision B 3 f (1) (c) of this section to meet the requirement for monitoring in
3337 this paragraph.

3338 ~~(c) Additional monitoring requirements. On each day following a routine sample~~
3339 ~~monitoring result that exceeds the chlorite PMCL in Table 2.13 at the entrance to the~~
3340 ~~distribution system, the owner is required to take three chlorite distribution system~~
3341 ~~samples at the following locations: as close to the first customer as possible, in a~~
3342 ~~location representative of average residence time, and as close to the end of the~~
3343 ~~distribution system as possible (reflecting maximum residence time in the distribution~~
3344 ~~system).~~

3345 ~~(2) Reduced monitoring.~~

3346 ~~(a) Chlorite monitoring at the entrance to the distribution system required by~~
3347 ~~subdivision B 3 f (1) (a) of this section may not be reduced.~~

3348 ~~(b) Chlorite monitoring in the distribution system required by subdivision B 3 f (1) (b)~~
3349 ~~of this section may be reduced to one three-sample set per quarter after one year of~~
3350 ~~monitoring where no individual chlorite sample taken in the distribution system under~~
3351 ~~subdivision B 3 f (1) (b) of this section has exceeded the chlorite PMCL in Table 2.13~~
3352 ~~and the owner has not been required to conduct monitoring under subdivision B 3 f (1)~~
3353 ~~(c) of this section. The owner may remain on the reduced monitoring schedule until~~
3354 ~~either any of the three individual chlorite samples taken quarterly in the distribution~~
3355 ~~system under subdivision B 3 f (1) (b) of this section exceeds the chlorite PMCL or the~~
3356 ~~owner is required to conduct monitoring under subdivision B 3 f (1) (c) of this section,~~
3357 ~~at which time the owner shall revert to routine monitoring.~~

3358 ~~g. Bromate.~~

3359 ~~(1) The owner of a community or nontransient noncommunity waterworks treatment~~
3360 ~~plant using ozone, for disinfection or oxidation, shall take one sample per month and~~

3361 analyze it for bromate. The owner shall take samples monthly at the entrance to the
3362 distribution system while the ozonation system is operating under normal conditions.

3363 ~~(2) Reduced monitoring.~~

3364 ~~(a) Until March 31, 2009, owners of waterworks required to analyze for bromate may~~
3365 ~~reduce monitoring from monthly to quarterly, if the waterworks average source water~~
3366 ~~bromide concentration is less than 0.05 mg/L based on representative monthly~~
3367 ~~bromide measurements for one year. The owner may remain on reduced bromate~~
3368 ~~monitoring until the running annual average source water bromide concentration,~~
3369 ~~computed quarterly, is equal to or greater than 0.05 mg/L based on representative~~
3370 ~~monthly measurements. If the running annual average source water bromide~~
3371 ~~concentration is equal to or greater than 0.05 mg/L, the owner shall resume routine~~
3372 ~~monitoring required by subdivision B 3 g (1) of this section in the following month.~~

3373 ~~(b) Beginning April 1, 2009, owners may no longer use the provisions of subdivision B~~
3374 ~~3 g (2) (a) of this section to qualify for reduced monitoring. An owner required to~~
3375 ~~analyze for bromate may reduce monitoring from monthly to quarterly, if the~~
3376 ~~waterworks running annual average bromate concentration is equal to or less than~~
3377 ~~0.0025 mg/L based on monthly bromate measurements under subdivision B 3 g (1) of~~
3378 ~~this section for the most recent four quarters, with samples analyzed in accordance~~
3379 ~~with 12VAC5-590-440. If a waterworks has qualified for reduced bromate monitoring~~
3380 ~~under subdivision B 3 g (2) (a) of this section, the owner may remain on reduced~~
3381 ~~monitoring as long as the running annual average of quarterly bromate samples is~~
3382 ~~equal to or less than 0.0025 mg/L based on samples analyzed in accordance with~~
3383 ~~12VAC5-590-440. If the running annual average bromate concentration is greater than~~
3384 ~~0.0025 mg/L, the owner shall resume routine monitoring required by subdivision B 3 g~~
3385 ~~(1) of this section.~~

3386 ~~(3) Bromide. Owners of waterworks required to analyze for bromate may reduce~~
3387 ~~bromate monitoring from monthly to once per quarter, if the owner demonstrates that~~
3388 ~~the average source water bromide concentration is less than 0.05 mg/L based upon~~
3389 ~~representative monthly measurements for one year. The owner shall continue bromide~~
3390 ~~monitoring to remain on reduced bromate monitoring.~~

3391 ~~h. Monitoring requirements for disinfectant residuals.~~

3392 ~~(1) Chlorine and chloramines.~~

3393 ~~(a) Owners of waterworks that use chlorine or chloramines shall measure the residual~~
3394 ~~disinfectant level in the distribution system at the same point in the distribution system~~
3395 ~~and at the same time as total coliforms are sampled, as specified in subsection A.~~
3396 ~~Owners of waterworks that use surface water or groundwater under the direct~~
3397 ~~influence of surface water may use the results of residual disinfectant concentration~~
3398 ~~sampling found in subdivision B 7 c (1) of this section in lieu of taking separate~~
3399 ~~samples.~~

3400 ~~(b) Residual disinfectant level monitoring may not be reduced.~~

3401 ~~(2) Chlorine dioxide.~~

3402 ~~(a) Owners of waterworks that use chlorine dioxide for disinfection or oxidation shall~~
3403 ~~take daily samples at the entrance to the distribution system. For any daily sample that~~
3404 ~~exceeds the MRDL in Table 2.12, the owner shall take samples in the distribution~~
3405 ~~system the following day at the locations required by subdivision B 3 h (2) (b) of this~~
3406 ~~section, in addition to the sample required at the entrance to the distribution system.~~

3407 ~~(b) On each day following a routine sample monitoring result that exceeds the MRDL~~
3408 ~~in Table 2.12, the owner is required to take three chlorine dioxide distribution system~~
3409 ~~samples. If chlorine dioxide or chloramines are used to maintain a disinfectant residual~~

3410 in the distribution system, or if chlorine is used to maintain a disinfectant residual in
3411 the distribution system and there are no disinfection addition points after the entrance
3412 to the distribution system (i.e., no booster chlorination), the owner shall take three
3413 samples as close to the first customer as possible, at intervals of at least six hours. If
3414 chlorine is used to maintain a disinfectant residual in the distribution system and there
3415 are one or more disinfection addition points after the entrance to the distribution
3416 system (i.e., booster chlorination), the owner shall take one sample at each of the
3417 following locations: as close to the first customer as possible, in a location
3418 representative of average residence time, and as close to the end of the distribution
3419 system as possible (reflecting maximum residence time in the distribution system).

3420 (c) Chlorine dioxide monitoring may not be reduced.

3421 i. Monitoring requirements for disinfection byproduct precursors (DBPP).

3422 (1) Owners of community or nontransient noncommunity waterworks using surface
3423 water or groundwater under the direct influence of surface water and using
3424 conventional filtration treatment (as defined in 12VAC5-590-10) shall monitor each
3425 treatment plant for TOC no later than the point of combined filter effluent turbidity
3426 monitoring and representative of the treated water. All owners required to monitor
3427 under subdivision (B 3 i (1)) shall also monitor for TOC in the source water prior to any
3428 treatment at the same time as monitoring for TOC in the treated water. These samples
3429 (source water and treated water) are referred to as paired samples. At the same time
3430 as the source water sample is taken, all owners shall monitor for alkalinity in the source
3431 water prior to any treatment. Owners shall take one paired sample and one source
3432 water alkalinity sample per month per plant at a time representative of normal
3433 operating conditions and influent water quality.

3434 ~~(2) Owners of community or nontransient noncommunity waterworks that use surface~~
3435 ~~water or groundwater under the direct influence of surface water with an average~~
3436 ~~treated water TOC of less than 2.0 mg/L for two consecutive years, or less than 1.0~~
3437 ~~mg/L for one year, may reduce monitoring for both TOC and alkalinity to one paired~~
3438 ~~sample and one source water alkalinity sample per plant per quarter. The owners shall~~
3439 ~~revert to routine monitoring in the month following the quarter when the annual average~~
3440 ~~treated water TOC equal to or greater than 2.0 mg/L.~~

3441 ~~j. The owner of each waterworks required to monitor under subdivision B 3 of this~~
3442 ~~section shall develop and implement a monitoring plan. The owner shall maintain the~~
3443 ~~plan and make it available for inspection by the commissioner and the general public~~
3444 ~~no later than 30 days following the applicable compliance dates in subdivision B 3 a of~~
3445 ~~this section. The owners of all community or nontransient noncommunity waterworks~~
3446 ~~that use surface water or groundwater under the direct influence of surface water~~
3447 ~~servicing more than 3,300 people shall submit a copy of the monitoring plan to the~~
3448 ~~commissioner no later than the date of the first report required under 12VAC5-590-~~
3449 ~~530 A. The commissioner may also require the plan to be submitted by any other~~
3450 ~~owner. After review, the commissioner may require changes in any plan elements. The~~
3451 ~~plan shall include at least the following elements:~~

3452 ~~(1) Specific locations and schedules for collecting samples for any parameters~~
3453 ~~included in subdivision B 3 of this section.~~

3454 ~~(2) How the owner will calculate compliance with PMCLs, MRDLs, and treatment~~
3455 ~~techniques.~~

3456 ~~(3) The sampling plan for a consecutive waterworks shall reflect the entire consecutive~~
3457 ~~distribution system.~~

3458 4. ~~Unregulated contaminants (UCs). Owners of all community and nontransient~~
3459 ~~noncommunity waterworks shall sample for the contaminants listed in Table 2.6 and Table~~
3460 ~~2.7 as follows:~~

3461 a. ~~Table 2.6—Group A~~

3462 ~~(1) Owners of waterworks that use a surface water source in whole or in part shall~~
3463 ~~sample at the entry points to the distribution system which is representative of each~~
3464 ~~source, after treatment (hereafter called a sampling point). The minimum number of~~
3465 ~~samples is one year of consecutive quarterly samples per sampling point beginning in~~
3466 ~~accordance with Table 2.8.~~

3467 ~~(2) Owners of waterworks that use groundwater shall sample at points of entry to the~~
3468 ~~distribution system which is representative of each source (hereafter called a sampling~~
3469 ~~point). The minimum number of samples is one sample per sampling point beginning~~
3470 ~~in accordance with Table 2.8.~~

3471 ~~(3) The commissioner may require a confirmation sample for positive or negative~~
3472 ~~results.~~

3473 ~~(4) Owners of waterworks serving less than 150 connections may inform the~~
3474 ~~commissioner, in writing, that their waterworks is available for sampling instead of~~
3475 ~~performing the required sampling.~~

3476 ~~(5) All waterworks required to sample under this section shall repeat the sampling at~~
3477 ~~least every five years.~~

3478 b. ~~Table 2.6—Group B and Table 2.7~~

3479 ~~(1) The owner of each community and nontransient noncommunity waterworks shall~~
3480 ~~take four consecutive quarterly samples at the entry points to the distribution system~~
3481 ~~which is representative of each source (hereafter called a sampling point) for each~~

3482 ~~contaminant listed in Table 2.6 Group B and report the results to the commissioner.~~
3483 ~~Monitoring shall be completed by December 31, 1995.~~

3484 ~~(2) The owner of each community and nontransient noncommunity waterworks shall~~
3485 ~~take one sample at each sampling point for each contaminant listed in Table 2.7 and~~
3486 ~~report the results to the commissioner. Monitoring shall be completed by December~~
3487 ~~31, 1995.~~

3488 ~~(3) The owner of each community and nontransient noncommunity waterworks may~~
3489 ~~apply to the commissioner for a waiver from the monitoring requirements of~~
3490 ~~subdivisions B 4 b (1) and (2) of this section for the contaminants listed in Table 2.6~~
3491 ~~Group B and Table 2.7.~~

3492 ~~(4) The commissioner may grant a waiver for the requirement of subdivision B 4 b (1)~~
3493 ~~of this section based on the criteria specified in subdivision B 2 f of this section. The~~
3494 ~~commissioner may grant a waiver from the requirement of subdivision B 4 b (2) of this~~
3495 ~~section if previous analytical results indicate contamination would not occur, provided~~
3496 ~~this data was collected after January 1, 1990.~~

3497 ~~(5) If the waterworks utilizes more than one source and the sources are combined~~
3498 ~~before distribution, the owner shall sample at an entry point to the distribution system~~
3499 ~~during periods of normal operating conditions (i.e., when water is representative of all~~
3500 ~~sources being used).~~

3501 ~~(6) The commissioner may require a confirmation sample for positive or negative~~
3502 ~~results.~~

3503 ~~(7) Instead of performing the monitoring required by this section, the owner of a~~
3504 ~~community waterworks or nontransient noncommunity waterworks serving fewer than~~
3505 ~~150 service connections may send a letter to the commissioner stating that the~~

3506 ~~waterworks is available for sampling. This letter shall be sent to the commissioner by~~
3507 ~~January 1, 1994. The owner shall not send such samples to the commissioner unless~~
3508 ~~requested to do so by the commissioner.~~

3509 ~~(8) All waterworks required to sample under this subdivision shall repeat the sampling~~
3510 ~~at least every five years.~~

3511 ~~5. Reserved.~~

3512 ~~6. Reserved.~~

3513 ~~7. Monitoring filtration and disinfection.~~

3514 ~~a. The owner of a waterworks that uses a surface water source or a groundwater~~
3515 ~~source under the direct influence of surface water and provides filtration treatment~~
3516 ~~shall monitor in accordance with this section beginning June 29, 1993, or when~~
3517 ~~filtration is installed, whichever is later.~~

3518 ~~b. Turbidity measurements as required by 12VAC5-590-370 C shall be performed on~~
3519 ~~representative samples of the filtered water every four hours (or more frequently) that~~
3520 ~~the waterworks serves water to the public. An owner may substitute continuous~~
3521 ~~turbidity monitoring for grab sample monitoring if it validates the continuous~~
3522 ~~measurement for accuracy on a regular basis using a protocol approved by the~~
3523 ~~commissioner. For any waterworks using slow sand filtration or filtration treatment~~
3524 ~~other than conventional treatment, direct filtration, or diatomaceous earth filtration, the~~
3525 ~~office may reduce the sampling frequency to once per day if it determines that less~~
3526 ~~frequent monitoring is sufficient to indicate effective filtration performance. For~~
3527 ~~waterworks serving 500 or fewer persons, the commissioner may reduce the turbidity~~
3528 ~~sampling frequency to once per day, regardless of the type of filtration treatment used,~~

3529 if the commissioner determines that less frequent monitoring is sufficient to indicate
3530 effective filtration performance.

3531 ~~(1) In addition to the above, as of January 1, 2001, waterworks serving at least 10,000~~
3532 ~~people and as of January 1, 2005, waterworks serving less than 10,000 people~~
3533 ~~supplied by surface water or groundwater under the direct influence of surface water~~
3534 ~~using conventional filtration treatment or direct filtration shall conduct continuous~~
3535 ~~monitoring of turbidity for each individual filter, using an approved method in 12VAC5-~~
3536 ~~590-440. The turbidimeter shall be calibrated using the procedure specified by the~~
3537 ~~manufacturer. The owner shall record the results of individual filter turbidity monitoring~~
3538 ~~every 15 minutes.~~

3539 ~~(2) If there is a failure in the continuous turbidity monitoring equipment, the owner shall~~
3540 ~~conduct grab sampling every four hours in lieu of continuous monitoring but for no~~
3541 ~~more than five working days (for waterworks serving at least 10,000 people) or 14 days~~
3542 ~~(for waterworks serving less than 10,000 people) following the failure of the equipment.~~

3543 ~~(3) If a waterworks serving less than 10,000 people consists of two or fewer filters,~~
3544 ~~continuous monitoring of the combined filter effluent may be used in lieu of individual~~
3545 ~~filter monitoring.~~

3546 ~~c. The residual disinfectant concentration of the water entering the distribution system~~
3547 ~~shall be monitored continuously, and the lowest value shall be recorded each day,~~
3548 ~~except that if there is a failure in the continuous monitoring equipment, grab sampling~~
3549 ~~every four hours may be conducted in lieu of continuous monitoring, but for no more~~
3550 ~~than five working days following the failure of the equipment, and owners of~~
3551 ~~waterworks serving 3,300 or fewer persons may take grab samples in lieu of~~
3552 ~~continuous monitoring on an ongoing basis at the frequencies each day prescribed~~
3553 ~~below:~~

Table 2.5
Grab Sample Monitoring Frequency

| Waterworks Size By Population | Samples/Day [†] |
|-------------------------------|--------------------------|
| 500 or less | 1 |
| 501 to 1,000 | 2 |
| 1,000 to 2,500 | 3 |
| 2,501 to 3,300 | 4 |

[†]The day's samples cannot be taken at the same time. The sampling intervals are subject to commissioner's review and approval. If at any time the residual disinfectant concentration falls below 0.2 mg/L in a waterworks using grab sampling in lieu of continuous monitoring, the waterworks owner shall take a grab sample every four hours until the residual disinfectant concentration is equal to or greater than 0.2 mg/L.

- 3554 ~~(1) The residual disinfectant concentration shall be measured at least at the same~~
3555 ~~points in the distribution system and at the same time as total coliforms are sampled,~~
3556 ~~as specified in subsection A of this section, except that the district engineer may allow~~
3557 ~~an owner which uses both a surface water source or a groundwater source under~~
3558 ~~direct influence of surface water, and a groundwater source to take disinfectant~~
3559 ~~residual samples at points other than the total coliform sampling points if the division~~
3560 ~~determines that such points are more representative of treated (disinfected) water~~
3561 ~~quality within the distribution system. Heterotrophic bacteria, measured as~~
3562 ~~heterotrophic plate count (HPC) as specified in 12VAC5-590-420 B may be measured~~
3563 ~~in lieu of residual disinfectant concentration.~~
- 3564 ~~(2) If the commissioner determines, based on site-specific considerations, that a~~
3565 ~~waterworks has no means for having a sample transported and analyzed for HPC by~~
3566 ~~a certified laboratory under the requisite time and temperature conditions and that the~~
3567 ~~waterworks is providing adequate disinfection in the distribution system, the~~
3568 ~~requirements of subdivision B 7 b (1) of this section do not apply to that waterworks.~~

3569 ~~d. The following information on the samples taken in the distribution system in~~
3570 ~~conjunction with total coliform monitoring pursuant to 12VAC5-590-420 B shall be~~
3571 ~~reported monthly to the district engineer by the owner:~~

3572 ~~(1) Number of instances where the residual disinfectant concentration is measured;~~

3573 ~~(2) Number of instances where the residual disinfectant concentration is not measured~~
3574 ~~but HPC is measured;~~

3575 ~~(3) Number of instances where the residual disinfectant concentration is measured but~~
3576 ~~not detected and no HPC is measured;~~

3577 ~~(4) Number of instances where no residual disinfectant concentration is detected and~~
3578 ~~where the HPC is greater than 500/mL;~~

3579 ~~(5) Number of instances where the residual disinfectant concentration is not measured~~
3580 ~~and HPC is greater than 500/mL.~~

3581 ~~(6) For the current and previous month the waterworks serves water to the public, the~~
3582 ~~value of "V" in percent in the following formula:~~

3583
$$V = (c + d + e) / (a + b) \times 100$$

3584 where

3585 a = the value in subdivision B 7 d (1) of this section,

3586 b = the value in subdivision B 7 d (2) of this section,

3587 c = the value in subdivision B 7 d (3) of this section,

3588 d = the value in subdivision B 7 d (4) of this section,

3589 e = the value in subdivision B 7 d (5) of this section,

3590 ~~(7) If the commissioner determines, based on site-specific considerations, that an~~
3591 ~~owner has no means for having a sample transported and analyzed for HPC by a~~
3592 ~~certified laboratory within the requisite time and temperature conditions and that the~~
3593 ~~waterworks is providing adequate disinfection in the distribution system, the~~
3594 ~~requirements of subdivision B 7 c (1) of this section do not apply.~~

3595 ~~e. An owner need not report the data listed in 12VAC5-590-530 E 2 a if all data listed~~
3596 ~~in 12VAC5-590-530 E 2 a through E 2 c remain on file at the waterworks and the~~
3597 ~~district engineer determines that the owner has submitted all the information required~~
3598 ~~by 12VAC5-590-530 E 2 a through c for at least 12 months.~~

3599 ~~8. Operational. Owners may be required by the commissioner to collect additional samples~~
3600 ~~to provide quality control for any treatment processes that are employed.~~

3601 ~~C. Physical. All samples for turbidity analysis shall be taken at a representative entry point or~~
3602 ~~points to the water distribution system unless otherwise specified. Turbidity samples shall be~~
3603 ~~analyzed in accordance with 12VAC5-590-480 B 1 a, at least once per day at all waterworks that~~
3604 ~~use surface water sources or groundwater sources under the direct influence of surface water.~~

3605 ~~D. Radiological. The location of sampling points, the radionuclides measured in community~~
3606 ~~waterworks, the frequency, and the timing of sampling within each compliance period shall be~~
3607 ~~established or approved by the commissioner. The commissioner may increase required~~
3608 ~~monitoring where necessary to detect variations within the waterworks. Failure to comply with the~~
3609 ~~sampling schedules in this section will require public notification pursuant to 12VAC5-590-540.~~

3610 ~~Community waterworks owners shall conduct monitoring to determine compliance with the~~
3611 ~~PMGLs in Table 2.5 and 12VAC5-590-400 in accordance with this section.~~

3612 ~~1. Monitoring and compliance requirements for gross alpha particle activity, radium-226,~~
3613 ~~radium-228, and uranium.~~

3614 a. ~~Community waterworks owners shall conduct initial monitoring to determine~~
3615 ~~compliance with 12VAC5-590-400 B 2, B 3, and B 4 by December 31, 2007. For the~~
3616 ~~purposes of monitoring for gross alpha particle activity, radium-226, radium-228,~~
3617 ~~uranium, and beta particle and photon radioactivity in drinking water, "detection limit"~~
3618 ~~is defined as in Appendix B of this chapter.~~

3619 ~~(1) Applicability and sampling location for existing community waterworks or sources.~~
3620 ~~The owners of all existing community waterworks using ground water, surface water~~
3621 ~~or waterworks using both ground and surface water shall sample at every entry point~~
3622 ~~to the distribution system that is representative of all sources being used under normal~~
3623 ~~operating conditions. The community waterworks owner shall take each sample at the~~
3624 ~~same entry point unless conditions make another sampling point more representative~~
3625 ~~of each source.~~

3626 ~~(2) Applicability and sampling location for new community waterworks or sources. All~~
3627 ~~new community waterworks or community waterworks that use a new source of water~~
3628 ~~shall begin to conduct initial monitoring for the new source within the first quarter after~~
3629 ~~initiating use of the source. Community waterworks owners shall conduct more~~
3630 ~~frequent monitoring when directed by the commissioner in the event of possible~~
3631 ~~contamination or when changes in the distribution system or treatment processes~~
3632 ~~occur which may increase the concentration of radioactivity in finished water.~~

3633 b. Initial monitoring: ~~Community waterworks owners shall conduct initial monitoring for~~
3634 ~~gross alpha particle activity, radium-226, radium-228, and uranium as follows:~~

3635 ~~(1) Community waterworks without acceptable historical data, as defined below, shall~~
3636 ~~collect four consecutive quarterly samples at all entry points before December 31,~~
3637 ~~2007.~~

3638 ~~(2) Grandfathering of data: The commissioner may allow historical monitoring data~~
3639 ~~collected at an entry point to satisfy the initial monitoring requirements for that entry~~
3640 ~~point, for the following situations:~~

3641 ~~(a) To satisfy initial monitoring requirements, a community waterworks owner having~~
3642 ~~only one entry point to the distribution system may use the monitoring data from the~~
3643 ~~last compliance monitoring period that began between June 2000 and December 8,~~
3644 ~~2003.~~

3645 ~~(b) To satisfy initial monitoring requirements, a community waterworks owner with~~
3646 ~~multiple entry points and having appropriate historical monitoring data for each entry~~
3647 ~~point to the distribution system may use the monitoring data from the last compliance~~
3648 ~~monitoring period that began between June 2000 and December 8, 2003.~~

3649 ~~(3) For gross alpha particle activity, uranium, radium-226, and radium-228 monitoring,~~
3650 ~~the commissioner may waive the final two quarters of initial monitoring for an entry~~
3651 ~~point if the results of the samples from the previous two quarters are below the method~~
3652 ~~detection limit specified in Appendix B.~~

3653 ~~(4) If the average of the initial monitoring results for an entry point is above the PMCL,~~
3654 ~~the community waterworks owner shall collect and analyze quarterly samples at that~~
3655 ~~entry point until the owner has results from four consecutive quarters that are at or~~
3656 ~~below the PMCL, unless the community waterworks owner enters into another~~
3657 ~~schedule as part of a formal compliance agreement with the commissioner.~~

3658 ~~c. Reduced monitoring: The commissioner may allow community waterworks owners~~
3659 ~~to reduce the future frequency of monitoring from once every three years to once every~~
3660 ~~six or nine years at each entry point, based on the following criteria:~~

3661 ~~(1) If the average of the initial monitoring results for each contaminant (i.e., gross alpha~~
3662 ~~particle activity, uranium, radium-226, or radium-228) is below the method detection~~
3663 ~~limit specified in Appendix B, the community waterworks owner shall collect and~~
3664 ~~analyze for that contaminant using at least one sample at that entry point every nine~~
3665 ~~years.~~

3666 ~~(2) For gross alpha particle activity and uranium, if the average of the initial monitoring~~
3667 ~~results for each contaminant is at or above the method detection limit specified in~~
3668 ~~Appendix B but at or below 1/2 of the PMCL, the community waterworks owner shall~~
3669 ~~collect and analyze for that contaminant using at least one sample at that entry point~~
3670 ~~every six years. For combined radium-226 and radium-228, the analytical results shall~~
3671 ~~be combined. If the average of the combined initial monitoring results for radium-226~~
3672 ~~and radium-228 is at or above the method detection limit specified in Appendix B but~~
3673 ~~at or below 1/2 the PMCL, the community waterworks owner shall collect and analyze~~
3674 ~~for that contaminant using at least one sample at that entry point every six years.~~

3675 ~~(3) For gross alpha particle activity and uranium, if the average of the initial monitoring~~
3676 ~~results for each contaminant is above 1/2 the PMCL but at or below the PMCL, the~~
3677 ~~community waterworks owner shall collect and analyze at least one sample at that~~
3678 ~~entry point every three years. For combined radium-226 and radium-228, the analytical~~
3679 ~~results shall be combined. If the average of the combined initial monitoring results for~~
3680 ~~radium-226 and radium-228 is above 1/2 the PMCL but at or below the MPCL, the~~
3681 ~~community waterworks owner shall collect and analyze at least one sample at that~~
3682 ~~entry point every three years.~~

3683 ~~(4) Community waterworks owners shall use the samples collected during the reduced~~
3684 ~~monitoring period to determine the monitoring frequency for subsequent monitoring~~
3685 ~~periods (e.g., if a community waterworks' entry point is on a nine-year monitoring~~

3686 period, and the sample result is above 1/2 the PMCL, then the next monitoring period
3687 for that entry point is three years).

3688 (5) If a community waterworks owner has a monitoring result that exceeds the PMCL
3689 while on reduced monitoring, the community waterworks owner shall collect and
3690 analyze quarterly samples at that entry point until the community waterworks owner
3691 has results from four consecutive quarters that are below the PMCL, unless the
3692 community waterworks enters into another schedule as part of a formal compliance
3693 agreement with the commissioner.

3694 d. Compositing: To fulfill quarterly monitoring requirements for gross alpha particle
3695 activity, radium-226, radium-228, or uranium, a community waterworks owner may
3696 composite up to four consecutive quarterly samples from a single entry point if analysis
3697 is done within a year of the first sample. The commissioner will treat analytical results
3698 from the composited sample as the average analytical result to determine compliance
3699 with the PMCLs and the future monitoring frequency. If the analytical result from the
3700 composited sample is greater than 1/2 the PMCL, the commissioner may direct the
3701 community waterworks owner to take additional quarterly samples before allowing the
3702 community waterworks owner to sample under a reduced monitoring schedule.

3703 e. A gross alpha particle activity measurement may be substituted for the required
3704 radium-226 measurement provided that the measured gross alpha particle activity
3705 does not exceed 5 pCi/L. A gross alpha particle activity measurement may be
3706 substituted for the required uranium measurement provided that the measured gross
3707 alpha particle activity does not exceed 15 pCi/L.

3708 The gross alpha measurement shall have a confidence interval of 95% (1.65 , where
3709 is the standard deviation of the net counting rate of the sample) for radium-226 and
3710 uranium. When a community waterworks owner uses a gross alpha particle activity

3711 ~~measurement in lieu of a radium-226 and/or uranium measurement, the gross alpha~~
3712 ~~particle activity analytical result will be used to determine the future monitoring~~
3713 ~~frequency for radium-226 and/or uranium. If the gross alpha particle activity result is~~
3714 ~~less than the detection limit as specified in Appendix B, 1/2 the detection limit will be~~
3715 ~~used to determine compliance and the future monitoring frequency.~~

3716 ~~2. Monitoring and compliance requirements for beta particle and photon radioactivity. To~~
3717 ~~determine compliance with the maximum contaminant levels in 12VAC5-590-400 B 5 for~~
3718 ~~beta particle and photon radioactivity, a community waterworks owner shall monitor at a~~
3719 ~~frequency as follows:~~

3720 ~~a. Community waterworks owners (using surface or groundwater) designated by the~~
3721 ~~commissioner as vulnerable shall sample for beta particle and photon radioactivity.~~
3722 ~~Community waterworks owners shall collect quarterly samples for beta emitters and~~
3723 ~~annual samples for tritium and strontium-90 at each entry point to the distribution~~
3724 ~~system, beginning within one quarter after being notified by the commissioner.~~
3725 ~~Community waterworks already designated by the commissioner shall continue to~~
3726 ~~sample until the commissioner reviews and either reaffirms or removes the~~
3727 ~~designation.~~

3728 ~~(1) If the gross beta particle activity minus the naturally occurring potassium-40 beta~~
3729 ~~particle activity at an entry point has a running annual average (computed quarterly)~~
3730 ~~less than or equal to 50 pCi/L (screening level), the commissioner may reduce the~~
3731 ~~frequency of monitoring at that entry point to once every three years. Community~~
3732 ~~waterworks owners shall collect all samples required in subdivision 2 a of this~~
3733 ~~subsection during the reduced monitoring period.~~

3734 ~~(2) For community waterworks in the vicinity of a nuclear facility, the commissioner~~
3735 ~~may allow the community waterworks owners to utilize environmental surveillance~~

3736 data collected by the nuclear facility in lieu of monitoring at the community waterworks'
3737 entry point(s), where the commissioner determines if such data is applicable to a
3738 particular community waterworks. In the event that there is a release from a nuclear
3739 facility, community waterworks owners which are using surveillance data shall begin
3740 monitoring at the community waterworks' entry point(s) in accordance with subdivision
3741 2-a of this subsection.

3742 b. Community waterworks owners (using surface or groundwater) designated by the
3743 commissioner as utilizing waters contaminated by effluents from nuclear facilities shall
3744 sample for beta particle and photon radioactivity. Community waterworks owners shall
3745 collect quarterly samples for beta emitters and iodine-131 and annual samples for
3746 tritium and strontium-90 at each entry point to the distribution system, beginning within
3747 one quarter after being notified by the commissioner. Owners of community
3748 waterworks already designated by the commissioner as using waters contaminated by
3749 effluents from nuclear facilities shall continue to sample until the commissioner reviews
3750 and either reaffirms or removes the designation.

3751 (1) Quarterly monitoring for gross beta particle activity shall be based on the analysis
3752 of monthly samples or the analysis of a composite of three monthly samples. The
3753 former is recommended.

3754 (2) For iodine-131, a composite of five consecutive daily samples shall be analyzed
3755 once each quarter. As directed by the commission, more frequent monitoring shall be
3756 conducted when iodine-131 is identified in the finished water.

3757 (3) Annual monitoring for strontium-90 and tritium shall be conducted by means of the
3758 analysis of a composite of four consecutive quarterly samples or analysis of four
3759 quarterly samples. The latter procedure is recommended.

3760 ~~(4) If the gross beta particle activity minus the naturally occurring potassium-40 beta~~
3761 ~~particle activity at a sampling point has a running annual average (computed quarterly)~~
3762 ~~less than or equal to 15 pCi/L (screening level), the commissioner may reduce the~~
3763 ~~frequency of monitoring at that sampling point to every three years. Community~~
3764 ~~waterworks owners shall collect all samples required in subdivision 2 b of this~~
3765 ~~subsection during the reduced monitoring period.~~

3766 ~~(5) For community waterworks in the vicinity of a nuclear facility, the commissioner~~
3767 ~~may allow the community waterworks owner to utilize environmental surveillance data~~
3768 ~~collected by the nuclear facility in lieu of the monitoring at the community waterworks'~~
3769 ~~entry point(s), where the commissioner determines such data is applicable to a~~
3770 ~~particular waterworks. In the event that there is a release from a nuclear facility,~~
3771 ~~community waterworks owners which are using surveillance data shall begin~~
3772 ~~monitoring at the community waterworks' entry point(s) in accordance with subdivision~~
3773 ~~2 b of this subsection.~~

3774 ~~c. Owners of community waterworks designated by the commissioner to monitor for~~
3775 ~~beta particle and photon radioactivity cannot apply to the commissioner for a waiver~~
3776 ~~from the monitoring frequencies specified in subdivision 2 a or 2 b of this subsection.~~

3777 ~~d. Community waterworks owners may analyze for naturally occurring potassium-40~~
3778 ~~beta particle activity from the same or equivalent sample used for the gross beta~~
3779 ~~particle activity analysis. Community waterworks owners are allowed to subtract the~~
3780 ~~potassium-40 beta particle activity value from the total gross beta particle activity value~~
3781 ~~to determine if the screening level is exceeded. The potassium-40 beta particle activity~~
3782 ~~shall be calculated by multiplying elemental potassium concentrations (in mg/L) by a~~
3783 ~~factor of 0.82.~~

3784 e. ~~If the gross beta particle activity minus the naturally occurring potassium-40 beta~~
3785 ~~particle activity exceeds the appropriate screening level, an analysis of the sample~~
3786 ~~shall be performed to identify the major radioactive constituents present in the sample~~
3787 ~~and the appropriate doses shall be calculated and summed to determine compliance~~
3788 ~~with 12VAC5-590-400 B 5 a, using the formula in 12VAC590-400 B 5 b. Doses shall~~
3789 ~~also be calculated and combined for measured levels of tritium and strontium to~~
3790 ~~determine compliance.~~

3791 f. ~~Community waterworks owners shall monitor monthly at the entry point(s) which~~
3792 ~~exceed the maximum contaminant level in 12VAC5-590-400 B 5 beginning the month~~
3793 ~~after the exceedance occurs. Community waterworks owners shall continue monthly~~
3794 ~~monitoring until the community waterworks has established, by a rolling average of~~
3795 ~~three monthly samples, that the PMCL is being met. Community waterworks owners~~
3796 ~~who establish that the PMCL is being met shall return to quarterly monitoring until they~~
3797 ~~meet the requirements set forth in subdivision 2 a (1) or 2 b (4) of this subsection.~~

3798 ~~3. General monitoring and compliance requirements for radionuclides.~~

3799 a. ~~The commissioner may require more frequent monitoring than specified in~~
3800 ~~subdivisions 1 and 2 of this subsection, or may require confirmation samples at his~~
3801 ~~discretion. The results of the initial and confirmation samples shall be averaged for use~~
3802 ~~in compliance determinations.~~

3803 b. ~~Each community waterworks owner shall monitor at the time designated by the~~
3804 ~~commissioner during each compliance period.~~

3805 c. ~~Compliance: Compliance with 12VAC5-590-400 B 2 through B 5 will be determined~~
3806 ~~based on the analytical results(s) obtained at each entry point. If one entry point is in~~
3807 ~~violation of a PMCL, the community waterworks is in violation of the PMCL.~~

3808 ~~(1) For community waterworks monitoring more than once per year, compliance with~~
3809 ~~the PMCL is determined by a running annual average at each entry point. If the~~
3810 ~~average of any entry point is greater than the PMCL, then the community waterworks~~
3811 ~~is out of compliance with the PMCL.~~

3812 ~~(2) For community waterworks monitoring more than once per year, if any sample~~
3813 ~~result will cause the running average to exceed the PMCL at any entry point, the~~
3814 ~~community waterworks is out of compliance with the PMCL immediately.~~

3815 ~~(3) Community waterworks owners shall include all samples taken and analyzed under~~
3816 ~~the provisions of this section in determining compliance, even if that number is greater~~
3817 ~~than the minimum required.~~

3818 ~~(4) If a community waterworks owner does not collect all required samples when~~
3819 ~~compliance is based on a running annual average of quarterly samples, compliance~~
3820 ~~will be based on the running average of the samples collected.~~

3821 ~~(5) If a sample result is less than the method detection limit as specified in Appendix~~
3822 ~~B, zero will be used to calculate the annual average, unless a gross alpha particle~~
3823 ~~activity is being used in lieu of radium-226 and/or uranium. If the gross alpha particle~~
3824 ~~activity result is less than the method detection limit as specified in Appendix B, 1/2~~
3825 ~~the method detection limit will be used to calculate the annual average.~~

3826 ~~d. The commissioner has the discretion to delete results of obvious sampling or~~
3827 ~~analytic errors.~~

3828 ~~e. If the PMCL for radioactivity set forth in 12VAC5-590-400 B 2 through B 5 is~~
3829 ~~exceeded, the owner of a community waterworks shall give notice to the commissioner~~
3830 ~~pursuant to 12VAC5-590-530 and to the public as required by 12VAC5-590-540.~~

3831 **12VAC5-590-372. Inorganic chemicals monitoring.**

3832 A. The owner of a community waterworks or a NTNC shall conduct monitoring to determine
3833 compliance with the PMCLs and SMCLs listed in Table 340.1 in accordance with this section. The
3834 owner of a TNC shall conduct monitoring to determine compliance with the nitrate, nitrite, and
3835 nitrate-nitrite PMCLs listed in Table 340.1 in accordance with this section.

3836 B. If a waterworks draws water from more than one source and the sources are combined
3837 before distribution, then the owner shall sample at an entry point to the distribution system during
3838 periods of normal operating conditions (i.e., when water is representative of all sources being
3839 used).

3840 C. When the results of sampling for antimony, arsenic, asbestos, barium, beryllium, cadmium,
3841 cyanide (as free cyanide), chromium, fluoride, mercury, nickel, selenium, or thallium exceed the
3842 applicable PMCL, the owner shall collect a confirmation sample, at the same sampling site, within
3843 two weeks of notification of the analytical results of the first sample.

3844 D. Monitoring frequency.

3845 1. Asbestos. The commissioner has granted a statewide waiver for asbestos. If the
3846 statewide waiver is removed or if site-specific waterworks conditions warrant monitoring
3847 for asbestos, then monitoring to determine compliance with the PMCL for asbestos
3848 specified in Table 340.1 shall be conducted as follows:

3849 a. The owner of a community waterworks or a NTNC shall monitor for asbestos during
3850 the first three-year compliance period of each nine-year compliance cycle.

3851 b. If the statewide waiver is removed, and the owner believes the waterworks is not
3852 vulnerable to asbestos contamination from either its source water or due to corrosion
3853 of its asbestos-cement pipe, then the owner may apply to the commissioner for a
3854 monitoring waiver for asbestos. If the commissioner grants the monitoring waiver, then
3855 the owner is not required to monitor.

3856 c. The commissioner may grant a waiver based on a consideration of the following
3857 factors:

3858 (1) Potential asbestos contamination of the source water; and

3859 (2) The use of asbestos-cement pipe for finished water distribution and the corrosive
3860 nature of the water.

3861 d. A waiver remains in effect until the completion of the compliance period (i.e., three
3862 years).

3863 e. The owner of a waterworks vulnerable to asbestos contamination due solely to
3864 corrosion of its asbestos-cement pipe shall collect one sample at a tap served by the
3865 asbestos-cement pipe and under conditions where asbestos contamination is most
3866 likely to occur.

3867 f. The owner of a waterworks vulnerable to asbestos contamination due to its source
3868 water shall monitor at the entry points.

3869 g. The owner of a waterworks vulnerable to asbestos contamination due both to its
3870 source water and corrosion of its asbestos-cement pipe shall collect one sample at a
3871 tap served by the asbestos-cement pipe and under conditions where asbestos
3872 contamination is most likely to occur.

3873 h. The owner of a waterworks that exceeds the PMCL as determined in 12VAC5-590-
3874 382 A shall monitor quarterly beginning in the next quarter after the exceedance
3875 occurred.

3876 i. The department may decrease the quarterly monitoring requirement to the frequency
3877 specified in subdivision D 1 a of this section provided the department has determined
3878 that the waterworks is reliably and consistently below the PMCL. In no case shall the
3879 department make this determination unless the owner of a groundwater system

3880 collects a minimum of two quarterly samples or the owner of a waterworks that uses a
3881 surface water source, in whole or in part, collects a minimum of four quarterly samples.

3882 2. Antimony, arsenic, barium, beryllium, cadmium, chromium, cyanide (as free cyanide),
3883 fluoride, mercury, nickel, selenium, and thallium. Monitoring to determine compliance with
3884 the PMCL for these contaminants specified in Table 340.1 shall be conducted as follows:

3885 a. The owner shall collect one sample at each groundwater source entry point during
3886 each compliance period.

3887 b. The owner shall collect one sample annually at each surface water source entry
3888 point, in whole or in part.

3889 c. The owner may apply to the department for a waiver from the monitoring frequencies
3890 specified in subdivisions D 2 a and D 2 b of this section.

3891 (1) A condition of the waiver shall require that the owner collect a minimum of one
3892 sample while the waiver is effective. The waiver remains in effect for one compliance
3893 cycle (i.e., nine years).

3894 (2) The department may grant a waiver provided the owner has monitored surface
3895 water source entry points, in whole or in part, annually for at least three years and has
3896 conducted a minimum of three rounds of monitoring at groundwater source entry
3897 points. At least one sample shall have been collected since January 1, 1990. The
3898 owner shall demonstrate that all previous analytical results were less than the PMCL.
3899 A waterworks that uses a new groundwater or surface water source is not eligible for
3900 a waiver until three rounds of monitoring from the new source have been completed.

3901 (3) In determining the appropriate reduced monitoring frequency, the department shall
3902 consider:

3903 (a) Reported concentrations from all previous monitoring;

3904 (b) The degree of variation in reported concentrations; and

3905 (c) Other factors that may affect contaminant concentrations such as changes in

3906 groundwater pumping rates, changes in the waterworks configuration, changes in the

3907 waterworks operating procedures, or changes in stream flows or characteristics.

3908 (4) A decision by the department to grant a waiver shall be made in writing and shall

3909 set forth the basis for the determination. The request for a waiver may be initiated by

3910 the department or upon an application by the owner. The owner shall specify the basis

3911 for the request. The department shall evaluate and, where appropriate, revise the

3912 determination of the appropriate monitoring frequency when the owner submits new

3913 monitoring data or when other data relevant to the appropriate monitoring frequency

3914 become available.

3915 (5) No arsenic waivers shall be granted by the department.

3916 d. The owner of a waterworks that exceed the PMCLs as calculated in 12VAC5-590-

3917 382 shall monitor quarterly beginning in the next quarter after the exceedance

3918 occurred. The department may decrease the quarterly monitoring requirement to the

3919 frequencies specified in subdivision D 2 a, D 2 b, or D 2 c of this section provided a

3920 determination has been made that the analytical results are reliably and consistently

3921 below the PMCL. In no case may the department make this determination unless the

3922 owner collects a minimum of two quarterly samples from each groundwater source

3923 entry point and a minimum of four quarterly samples from each surface water source

3924 entry point, in whole or in part.

3925 3. Nitrate and combined nitrate-nitrite as nitrogen. Monitoring to determine compliance

3926 with the PMCL for nitrate and combined nitrate-nitrite as nitrogen specified in Table 340.1

3927 shall be conducted as follows:

3928 a. The owner shall collect one sample annually at each groundwater source entry
3929 point.

3930 b. The owner shall collect one sample quarterly at each surface water source entry
3931 point, in whole or in part.

3932 c. For groundwater source entry points at community and NTNCs, the repeat
3933 monitoring frequency shall be quarterly for at least one year following any one sample
3934 in which the concentration is greater than 50% of the PMCL. After four consecutive
3935 quarters of monitoring, the department may allow the owner to reduce the sampling
3936 frequency to annually after determining the results are reliably and consistently less
3937 than the PMCL.

3938 d. For surface water source entry points, in whole or in part, the department may allow
3939 the owner to reduce the sampling frequency to annually if all analytical results from
3940 four consecutive quarters are less than 50% of the PMCL. The waterworks shall return
3941 to quarterly monitoring if the concentration found in any one sample is greater than or
3942 equal to 50% of the PMCL.

3943 e. After any round of quarterly sampling is completed as required by subdivisions D 3
3944 c and D 3 d of this section, the owner who is monitoring annually shall collect
3945 subsequent samples during the quarter that previously resulted in the highest
3946 analytical result.

3947 f. No monitoring waivers shall be issued for nitrate or combined nitrate-nitrite as
3948 nitrogen.

3949 4. Nitrite. Monitoring to determine compliance with the PMCL for nitrite specified in Table
3950 340.1 shall be conducted as follows:

3951 a. The owner shall collect one sample at each entry point during the initial compliance
3952 period.

3953 b. After the initial sample, the owner of a waterworks where an analytical result for
3954 nitrite is less than 50% of the PMCL shall monitor at the frequency specified by the
3955 department.

3956 c. The repeat monitoring frequency for an owner shall be quarterly for at least one year
3957 following any one sample in which the concentration is greater than 50% of the PMCL.
3958 The department may allow an owner to reduce the sampling frequency to annually
3959 after determining the analysis results are reliably and consistently less than the PMCL.

3960 d. The owner who is monitoring annually shall collect each subsequent sample during
3961 the quarter that previously resulted in the highest analytical result.

3962 e. No monitoring waivers shall be issued for nitrite.

3963 5. Aluminum, chloride, copper, corrosivity, fluoride, foaming agents (surfactants), iron,
3964 manganese, silver, sulfate, and zinc. Monitoring to determine compliance with the SMCL
3965 for these contaminants specified in Table 340.1 shall be conducted as follows:

3966 a. The owner shall collect one sample at each groundwater source entry point during
3967 each compliance period.

3968 b. The owner shall collect one sample annually at each surface water source entry
3969 point, in whole or in part.

3970 **12VAC5-590-373. Organic chemicals monitoring.**

3971 A. The owner of a community waterworks or a NTNC shall conduct monitoring to determine
3972 compliance with PMCLs listed in Table 340.2 in accordance with this section. Where two or more

3973 sources are combined before distribution, the owner shall sample at the entry point for the
3974 combined sources during periods of normal operation conditions.

3975 1. The owner of a waterworks that uses groundwater shall collect a minimum of one
3976 sample at each entry point.

3977 2. The owner of a waterworks that uses surface water, in whole or in part, shall collect a
3978 minimum of one sample at each entry point.

3979 B. During the initial compliance period and each subsequent compliance period, the owner
3980 shall monitor during four consecutive calendar quarters for each contaminant listed in Table
3981 340.2. A minimum of one sample at each entry point shall be collected during each calendar
3982 quarter.

3983 C. Reduced monitoring.

3984 1. VOCs.

3985 a. The requirement for four quarterly samples during the initial monitoring period as
3986 specified in subsection B of this section may not be reduced.

3987 b. The department may decrease the requirement for quarterly monitoring during
3988 subsequent compliance periods provided it has been determined that the analytical
3989 results are reliably and consistently below the PMCL.

3990 (1) In no case shall the department make this determination unless the owner collects
3991 a minimum of two quarterly samples at each groundwater source entry point, or

3992 (2) The owner collects a minimum of four quarterly samples at each surface water
3993 source entry point, in whole or in part.

3994 c. If the department determines that the waterworks is reliably and consistently below
3995 the PMCL, then the department may allow the owner to monitor annually. The owner

3996 who monitors annually shall monitor during the quarter that previously yielded the
3997 highest analytical result.

3998 d. For a groundwater system only. After a minimum of three years of annual sampling,
3999 the department may allow the owner with no previous detection of any VOCs listed in
4000 Table 340.2 to collect one sample during each compliance period.

4001 e. The owner of a groundwater system that has three consecutive annual samples with
4002 no detection of a contaminant may apply to the department for a waiver.

4003 2. SOCs.

4004 a. The owner of a waterworks serving more than 3,300 persons that do not detect any
4005 SOCs listed in Table 340.2 in the initial compliance period may reduce the sampling
4006 frequency to a minimum of two quarterly samples in one year during each repeat
4007 compliance period.

4008 b. The owner of a waterworks serving less than or equal to 3,300 persons that does
4009 not detect any SOCs listed in Table 340.2 in the initial compliance period may reduce
4010 the sampling frequency to a minimum of one sample during each repeat compliance
4011 period.

4012 c. The department may decrease the requirement for quarterly monitoring during
4013 subsequent monitoring periods as specified in subsection B of this section provided
4014 the analytical results of the four quarterly samples required during the initial monitoring
4015 are reliably and consistently below the PMCL.

4016 d. The department may reduce the increased monitoring required by subdivision D 1
4017 of this section provided the department has determined that the analytical results are
4018 reliably and consistently below the PMCL. In no case shall the department make this
4019 latter determination unless:

4020 (1) The owner collects a minimum of two quarterly samples at each groundwater
4021 source entry point.

4022 (2) The owner collects a minimum of four quarterly samples at each surface water
4023 source entry point, in whole or in part.

4024 e. If the department determines that the analytical results are reliably and consistently
4025 below the PMCL, the department may allow the owner to monitor annually. The owner
4026 who monitors annually shall monitor during the quarter that previously yielded the
4027 highest analytical result.

4028 f. The owner of a waterworks that has three consecutive annual samples with no
4029 detection of a contaminant may apply to the department for a waiver for SOC
4030 monitoring by submitting a waiver application as specified in subdivisions E 1 b and
4031 E 2 b of this section. The waiver remains in effect for one compliance period (i.e., three
4032 years).

4033 3. Return to compliance. The owner of a waterworks that exceeds the PMCLs listed in
4034 Table 340.2 for VOCs or SOCs, as determined by 12VAC5-590-383, shall monitor
4035 quarterly. After a minimum of four consecutive quarterly samples that show the
4036 waterworks is in compliance as specified in 12VAC5-590-383 and the department
4037 determines that the analytical results are reliably and consistently below the PMCL, the
4038 owner may monitor at the frequency and time specified in subdivisions C 1 c and C 2 e of
4039 this section.

4040 D. Increased monitoring.

4041 1. If the owner of a waterworks that is on reduced monitoring detects a contaminant listed
4042 in Table 340.2 (see 12VAC5-590-383 A regarding confirmation samples), then the owner

4043 shall monitor quarterly at each sampling point where the contaminant was detected

4044 unless:

4045 a. That contaminant was previously detected and the department determined it was

4046 reliably and consistently below the PMCL according to subdivisions C 1 b and C 2 d

4047 of this section;

4048 b. Historical sampling data do not indicate a meaningful increase in the contaminant

4049 concentration; and

4050 c. The contaminant concentration does not exceed the PMCL.

4051 2. Vinyl chloride.

4052 a. The owner of a groundwater system that has detected one or more of the following

4053 two-carbon organic compounds: trichloroethylene, tetrachloroethylene, 1,2-

4054 dichloroethane, 1,1,1-trichloroethane, cis-1,2-dichloroethylene, trans-1,2-

4055 dichloroethylene, or 1,1-dichloroethylene shall monitor quarterly for vinyl chloride. A

4056 vinyl chloride sample shall be collected at each sampling point at which one or more

4057 of the two-carbon organic compounds were detected. If the results of the first analysis

4058 do not detect vinyl chloride, then the department may reduce the quarterly monitoring

4059 frequency of vinyl chloride monitoring to one sample during each compliance period.

4060 b. The owner who is required to monitor for vinyl chloride as specified by the

4061 department at each surface water source entry point, in whole or in part.

4062 3. If monitoring detects one or more of certain related contaminants (heptachlor and

4063 heptachlor epoxide), then subsequent monitoring shall analyze for all related

4064 contaminants.

4065 4. For entry points sampled and analyzed for contaminants listed in Table 340.2, the

4066 following detection limits apply:

- 4067 a. A VOC is detected at a level equal to or greater than 0.0005 mg/L; and
4068 b. A SOC is detected at a level equal to or greater than defined by EPA under 40 CFR
4069 141.24 (h) (18) or by the department.

4070 E. Monitoring waivers.

4071 1. Groundwater source entry points.

4072 a. The owner of a waterworks that does not detect a VOC contaminant listed in Table
4073 340.2 may apply to the department for a waiver from the subsequent compliance
4074 period requirements of subsection B, and subdivisions C 1 c and C 1 d of this section
4075 after completing the initial monitoring. A waiver shall be effective for no more two
4076 compliance periods (i.e., six years).

4077 b. The owner of a waterworks may apply to the department for a SOC monitoring
4078 waiver from the requirement of subsection B and subdivision C 2 of this section. The
4079 owner must reapply for a waiver for each subsequent compliance period (i.e., three
4080 years).

4081 2. Surface water source entry points, in whole or in part.

4082 a. No VOC monitoring waivers shall be issued.

4083 b. The owner of a waterworks that does not detect a SOC contaminant listed in Table
4084 340.2 may apply to the commissioner for a SOC monitoring waiver from the
4085 requirement of subsection B and subdivision C 2 of this section. The owner must
4086 reapply for a waiver for each subsequent compliance period (i.e., three years).

4087 3. Monitoring waiver applications. The owner shall submit a monitoring waiver application
4088 for evaluation on a form approved by the department. The commissioner may grant a

4089 waiver after an evaluation of the use, transport, storage, or disposal of any organic
4090 contaminant within the watershed or zone of influence of the source.

4091 a. If an evaluation by the department reveals no previous use of the contaminants
4092 within the watershed or zone of influence, then a waiver may be granted.

4093 b. If an evaluation by the department reveals either previous use of the contaminants
4094 or that use is unknown, then the following factors shall be used to determine whether
4095 a waiver is granted:

4096 (1) Previous analytical results.

4097 (2) The proximity of the source water to land use activities that are potential point or
4098 nonpoint sources of organic contamination and to potential conduits to groundwater.

4099 Point sources include spills and leaks of chemicals at or near a waterworks or at
4100 manufacturing, distribution, or storage facilities, or from hazardous or municipal waste
4101 landfills and other waste handling or treatment facilities. Nonpoint sources for SOCs
4102 include the use of pesticides to control insects and weed pests on agricultural areas,
4103 forest lands, home and gardens, and other land application uses.

4104 (3) The environmental persistence and transport of the contaminants listed in Table
4105 340.2.

4106 (4) The implementation of wellhead protection measures by the owner.

4107 (5) For groundwater well sources: well construction, well depth, soil type, geological
4108 conditions, and well structure integrity.

4109 (6) Special factors.

4110 (a) For VOCs. The number of persons served by the waterworks and the proximity of
4111 a smaller waterworks to a larger waterworks.

4112 (b) For SOCs. Elevated nitrate levels at the waterworks' source water.

4113 (c) For SOCs. Use of PCBs in equipment used in the production, storage, or
4114 distribution of water (i.e., PCBs used in pumps, transformers, etc.).

4115 c. An entry point at which treatment has been installed to remove VOCs or SOCs is
4116 not eligible for a monitoring waiver for the VOCs or SOCs for which treatment has
4117 been installed.

4118 d. All waterworks are granted a waiver from monitoring dioxin, endoathal, and
4119 glyphosate unless the department determines that there is a source of these
4120 contaminants which poses a threat to the source water.

4121 4. Condition for waivers.

4122 a. Groundwater source entry points.

4123 (1) As a condition of the VOC waiver, the owner shall collect one sample at each entry
4124 point during the time the waiver is effective (i.e., one sample during two compliance
4125 periods or six years). Based on this data, the department may reconfirm that the
4126 source is nonsusceptible. If the department does not make this reconfirmation within
4127 three years of the initial determination, then the waiver is invalidated and the owner is
4128 required to sample annually.

4129 (2) There are no conditions to SOC waivers.

4130 b. Surface water source entry points, in whole or in part. There are no conditions to
4131 VOC and SOC waivers for waterworks in regard to these entry points.

4132

4133 **12VAC5-590-374. Residual disinfectant, DBPs, and DBPPs monitoring.**

4134 A. Unless otherwise noted, an owner of a waterworks that uses a chemical disinfectant shall
4135 comply with the requirements of this section as follows:

4136 1. The owner of a community waterworks or a NTNC shall comply with this section.

4137 2. The owner of a TNC that uses any combination of a surface water source, a GUDI
4138 source, or a groundwater source and uses chlorine dioxide as a disinfectant or oxidant
4139 shall comply with all the requirements for chlorine dioxide in this section.

4140 B. The owner shall collect all samples during normal operating conditions.

4141 1. Analysis under this section for DBPs (TTHM, HAA5, chlorite, and bromate) shall be
4142 conducted by a laboratory that has received certification by the DCLS except as noted in
4143 subdivisions B 2 and B 3 of this section.

4144 2. Measurement under this section of daily chlorite samples at the entry point to the
4145 distribution system, residual disinfectant (free chlorine, combined chlorine, total chlorine,
4146 and chlorine dioxide), alkalinity, TOC, SUVA (DOC and UV₂₅₄), pH, and magnesium shall
4147 be made by a party approved by the department.

4148 3. Residual disinfectant concentrations for free chlorine, combined chlorine, total chlorine,
4149 and chlorine dioxide shall be made using equipment deemed satisfactory by the
4150 department.

4151 C. Monitoring plan. The owner required to monitor under this section shall develop and
4152 implement a monitoring plan. The owner shall maintain the plan and make it available for
4153 inspection by the department and the general public. The owner of a community waterworks or a
4154 NTNC that uses either a surface water source or a GUDI source or both and serving more than
4155 3,300 people shall submit a copy of the monitoring plan to the department no later than the date
4156 of the first report required under 12VAC5-590-531 A. The department may also require the plan

4157 to be submitted by any other owner. After evaluation, the department may require changes in any
4158 of the plan elements. The plan shall include at least the following:

4159 1. Specific locations and schedules with monitoring dates for collecting samples for any
4160 parameters included in this section.

4161 2. How the owner will calculate compliance with PMCLs, MRDLs, and treatment
4162 techniques.

4163 3. The sampling plan for a consecutive waterworks shall reflect the entire consecutive
4164 distribution system.

4165 D. Failure to monitor in accordance with the monitoring plan required under subsection C of
4166 this section is a monitoring violation. Failure to monitor shall be treated as a violation for the entire
4167 period covered by the annual average where compliance is based on a RAA of monthly or
4168 quarterly samples or averages, and the owner's failure to monitor makes it impossible to
4169 determine compliance with PMCLs or MRDLs.

4170 E. The owner may use only data collected under the provisions of this section to qualify for
4171 reduced monitoring.

4172 F. TTHM and HAA5 monitoring. The owner of a community waterworks or a NTNC shall
4173 conduct the LRAA monitoring for TTHM and HAA5 at the frequency given below, unless otherwise
4174 indicated.

4175 1. This subdivision establishes monitoring and other requirements for achieving
4176 compliance with PMCLs based on the LRAA for TTHM and HAA5, and for achieving
4177 compliance with MRDLs for chlorine and chloramines for certain consecutive waterworks.

4178 2. This subdivision applies to a community waterworks or a NTNC that uses a primary or
4179 secondary disinfectant other than UV light or delivers water that has been treated with a
4180 primary or secondary disinfectant other than UV light.

4181 3. Routine monitoring.

4182 a. If the waterworks is a NTNC serving less than 10,000 people, then the owner shall
 4183 monitor at the location or locations and dates identified in the monitoring plan in
 4184 subsection C of this section, updated as required by subdivision F 3 e of this section.

4185 b. The owner shall monitor at no fewer than the number of locations identified in Table
 4186 374.1:

TABLE 374.1.
Monitoring Frequency by Source Water Type for TTHM and HAA5.

| <u>SOURCE WATER TYPE</u> | <u>POPULATION SIZE CATEGORY</u> | <u>MONITORING FREQUENCY^{4a}</u> | <u>DISTRIBUTION SYSTEM MONITORING LOCATION TOTAL PER MONITORING PERIOD^b</u> |
|-------------------------------------|---|--|--|
| <u>Surface water or GUDI Source</u> | <u>Less than 500</u> | <u>per year</u> | <u>2</u> |
| | <u>500 - 3,300</u> | <u>per quarter</u> | <u>2</u> |
| | <u>3,301 - 9,999</u> | <u>per quarter</u> | <u>2</u> |
| | <u>10,000 - 49,999</u> | <u>per quarter</u> | <u>4</u> |
| | <u>50,000 - 249,999</u> | <u>per quarter</u> | <u>8</u> |
| | <u>250,000 - 999,999</u> | <u>per quarter</u> | <u>12</u> |
| | <u>1,000,000 - 4,999,999</u> | <u>per quarter</u> | <u>16</u> |
| | <u>Equal to or greater than 5,000,000</u> | <u>per quarter</u> | <u>20</u> |
| <u>Groundwater</u> | <u>Less than 500</u> | <u>per year</u> | <u>2</u> |
| | <u>500 - 9,999</u> | <u>per year</u> | <u>2</u> |
| | <u>10,000 - 99,999</u> | <u>per quarter</u> | <u>4</u> |
| | <u>100,000 - 499,999</u> | <u>per quarter</u> | <u>6</u> |
| | <u>Equal to or greater than 500,000</u> | <u>per quarter</u> | <u>8</u> |

4187 ^a The owner shall monitor during the month of highest DBP concentrations.

4188 ^b The owner of a waterworks on quarterly monitoring (except those using either a surface water
 4189 source or a GUDI source or both and serving 500 - 3,300 people) shall collect dual sample
 4190 sets every 90 days at each monitoring location. A groundwater system serving 500 - 9,999
 4191 people shall collect dual sample sets annually at each monitoring location. A waterworks
 4192 serving fewer than 500 people and a waterworks using either a surface water source or a

4193 GUDI source or both and serving 500 - 3,300 people shall collect individual TTHM and HAA5
4194 samples (instead of a dual sample set) at the locations with the highest TTHM and HAA5
4195 concentrations, respectively. A waterworks serving fewer than 500 people shall sample
4196 annually, and a waterworks using either a surface water source or a GUDI source or both
4197 and serving 500 - 3,300 people shall sample every 90 days. For a waterworks serving fewer
4198 than 500 people, only one location with a dual sample set per monitoring period is needed if
4199 the highest TTHM and HAA5 concentrations occur at the same location (and month, if
4200 monitoring annually).

4201
4202 c. The owner of a waterworks not using disinfection and then begin using a disinfectant
4203 other than UV light shall consult with the department to identify compliance monitoring
4204 locations. The owner shall then develop a monitoring plan under subdivision F 3 e of
4205 this section to include those monitoring locations.

4206 d. The owner shall use an approved method listed in 12VAC5-590-440 for TTHM and
4207 HAA5 analyses. Analyses shall be conducted by laboratories that have received
4208 certification by EPA or DCLS as specified in 12VAC5-590-440.

4209 e. The owner may revise the monitoring plan to reflect changes in treatment, distribution
4210 system operations and layout (including new service areas), or other factors that may
4211 affect TTHM or HAA5 formation, or for reasons approved by the department, after
4212 consultation with the department regarding the need for changes and the appropriateness
4213 of the changes. If the owner changes monitoring locations, then the owner shall replace
4214 existing compliance monitoring locations with the lowest LRAA with new locations that
4215 reflect the current distribution system locations with expected high TTHM or HAA5 levels.
4216 The department may also require modifications in the monitoring plan. The owner of a
4217 waterworks using either a surface water source or a GUDI source or both and serving
4218 more than 3,300 people shall submit a copy of the modified monitoring plan to the
4219 department before the date the owner is required to comply with the revised monitoring
4220 plan.

4221 4. Reduced monitoring.

4222 a. The owner may reduce monitoring to the level specified in Table 374.2 any time the
 4223 LRAA is less than or equal to 0.040 mg/L for TTHM and less than or equal to 0.030
 4224 mg/L for HAA5 at all monitoring locations. The owner may only use data collected
 4225 under the provisions of this section to qualify for reduced monitoring. In addition, the
 4226 source water annual average TOC level, before any treatment, shall be less than or
 4227 equal to 4.0 mg/L at each water treatment plant treating either a surface water source
 4228 or a GUDI source or both, based on monitoring conducted under subsection J of this
 4229 section.
 4230

TABLE 374.2.
Reduced Monitoring for TTHM and HAA5.

| <u>SOURCE WATER TYPE</u> | <u>POPULATION SIZE CATEGORY</u> | <u>MONITORING FREQUENCY^a</u> | <u>DISTRIBUTION SYSTEM MONITORING LOCATION PER MONITORING PERIOD</u> |
|-------------------------------------|---------------------------------|---|--|
| <u>Surface water or GUDI Source</u> | <u>Less than 500</u> | | <u>Monitoring may not be reduced.</u> |
| | <u>500 - 3,300</u> | <u>per year</u> | <u>One TTHM and one 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; one dual sample set per year if the highest TTHM and HAA5 measurements occurred at the same location and quarter.</u> |
| | <u>3,301 - 9,999</u> | <u>per year</u> | <u>Two 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.</u> |
| | <u>10,000 - 49,999</u> | <u>per quarter</u> | <u>Two dual sample sets: at the locations with the highest</u> |

TABLE 374.2.
Reduced Monitoring for TTHM and HAA5.

| <u>SOURCE WATER TYPE</u> | <u>POPULATION SIZE CATEGORY</u> | <u>MONITORING FREQUENCY^a</u> | <u>DISTRIBUTION SYSTEM MONITORING LOCATION PER MONITORING PERIOD</u> |
|--------------------------|---|---|--|
| | | | <u>TTHM and highest HAA5 LRAAs.</u> |
| | <u>50,000 - 249,999</u> | <u>per quarter</u> | <u>Four dual sample sets: at the locations with the two highest TTHM and two highest HAA5 LRAAs.</u> |
| | <u>250,000 - 999,999</u> | <u>per quarter</u> | <u>Six dual sample sets: at the locations with the three highest TTHM and three highest HAA5 LRAAs.</u> |
| | <u>1,000,000 - 4,999,999</u> | <u>per quarter</u> | <u>Eight dual sample sets: at the locations with the four highest TTHM and four highest HAA5 LRAAs.</u> |
| | <u>Equal to or greater than 5,000,000</u> | <u>per quarter</u> | <u>Ten dual sample sets: at the locations with the five highest TTHM and five highest HAA5 LRAAs.</u> |
| <u>Groundwater</u> | <u>Less than 500</u> | <u>every third year</u> | <u>One TTHM and one 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; one dual sample set per year if the highest TTHM and HAA5 measurements occurred at the same location and quarter.</u> |
| | <u>500 - 9,999</u> | <u>per year</u> | <u>One TTHM and one 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; one dual sample set per year if the highest TTHM and HAA5 measurements</u> |

TABLE 374.2.
Reduced Monitoring for TTHM and HAA5.

| <u>SOURCE WATER TYPE</u> | <u>POPULATION SIZE CATEGORY</u> | <u>MONITORING FREQUENCY^a</u> | <u>DISTRIBUTION SYSTEM MONITORING LOCATION PER MONITORING PERIOD</u> |
|---|---|---|--|
| | | | <u>occurred at the same location and quarter.</u> |
| | <u>10,000 - 99,999</u> | <u>per year</u> | <u>Two 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.</u> |
| | <u>100,000 - 499,999</u> | <u>per quarter</u> | <u>Two dual sample sets: at the locations with the highest TTHM and highest HAA5 LRAAs.</u> |
| | <u>Equal to or greater than 500,000</u> | <u>per quarter</u> | <u>Four dual sample sets: at the locations with the two highest TTHM and two highest HAA5 LRAAs.</u> |
| <u>^a The owner of a waterworks on quarterly monitoring shall collect dual sample sets every 90 days.</u> | | | |

4231

4232

b. The owner may remain on reduced monitoring as long as the TTHM LRAA is less

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than or equal to 0.040 mg/L and the HAA5 LRAA is less than or equal to 0.030 mg/L

4234

at each monitoring location (for waterworks with quarterly reduced monitoring). In

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addition, the source water annual average TOC level, before any treatment, shall be

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less than or equal to 4.0 mg/L at each water treatment plant treating either a surface

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water source or a GUDI source or both, based on monitoring conducted under

4238

subsection J of this section.

4239

c. If the LRAA based on quarterly monitoring at any monitoring location exceeds either

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0.040 mg/L for TTHM or 0.030 mg/L for HAA5 or if the annual (or less frequent) sample

4241

at any location exceeds either 0.060 mg/L for TTHM or 0.045 mg/L for HAA5, or if the

4242 source water annual average TOC level, before any treatment, is greater than 4.0
4243 mg/L at any water treatment plant treating either a surface water source or a GUDI
4244 source or both, then the owner shall resume routine monitoring under subdivision F 3
4245 of this section or begin increased monitoring if subdivision F 5 of this section applies.

4246 d. A waterworks may return to routine monitoring at the department's discretion.

4247 5. Increased monitoring.

4248 a. The owner of a waterworks required to monitor at a particular location annually or
4249 less frequently than annually under subdivision F 3 or F 4 of this section, shall increase
4250 monitoring to dual sample sets once per quarter (collected every 90 days) at all
4251 locations if a TTHM sample is greater than 0.080 mg/L or a HAA5 sample is greater
4252 than 0.060 mg/L at any location.

4253 b. The owner may return to routine monitoring once the waterworks has conducted
4254 increased monitoring for at least four consecutive quarters and the LRAA for every
4255 monitoring location is less than or equal to 0.060 mg/L for TTHM and less than or equal
4256 to 0.045 mg/L for HAA5.

4257 G. Chlorite. The owner of a community waterworks or a NTNC using chlorine dioxide, for
4258 disinfection or oxidation, shall conduct monitoring for chlorite.

4259 1. Routine monitoring.

4260 a. The owner shall collect daily samples at the entry point to the distribution system.
4261 For any daily sample that exceeds the chlorite PMCL listed in Table 340.6, the owner
4262 shall collect additional samples in the distribution system the following day at the
4263 locations required by subdivision G 1 c of this section, in addition to the sample
4264 required at the entrance to the distribution system.

4265 b. The owner shall collect a three-sample set each month in the distribution system.
4266 The owner shall collect one sample at each of the following locations: near the first
4267 customer, at a location representative of average residence time, and at a location
4268 reflecting maximum residence time in the distribution system. Any additional routine
4269 sampling shall be conducted in the same manner (as three-sample sets, at the
4270 specified locations). The owner may use the results of additional monitoring conducted
4271 under subdivision G 1 c of this section to meet the requirement for monitoring in this
4272 paragraph.

4273 c. On each day following a routine sample monitoring result that exceeds the chlorite
4274 PMCL listed in Table 340.6 at the entrance to the distribution system, the owner is
4275 required to collect three chlorite distribution system samples at the following locations:
4276 as close to the first customer as possible, in a location representative of average
4277 residence time, and as close to the end of the distribution system as possible
4278 (reflecting maximum residence time in the distribution system).

4279 2. Reduced monitoring.

4280 a. Chlorite monitoring at the entrance to the distribution system required by subdivision
4281 G 1 a of this subsection may not be reduced.

4282 b. Chlorite monitoring in the distribution system required by subdivision G 1 b of this
4283 section may be reduced to one three-sample set per quarter after one year of
4284 monitoring where no individual chlorite sample collected in the distribution system
4285 under subdivision G 1 b of this section has exceeded the chlorite PMCL listed in Table
4286 340.6 and the owner has not been required to conduct monitoring under subdivision
4287 G 1 c of this section. The owner may remain on the reduced monitoring schedule until
4288 either any of the three individual chlorite samples collected quarterly in the distribution
4289 system under subdivision G 1 b of this section exceeds the chlorite PMCL or the owner

4290 is required to conduct monitoring under subdivision G 1 c of this section, at which time
4291 the owner shall revert to routine monitoring.

4292 H. Bromate.

4293 1. The owner of a community waterworks or a NTNC water treatment plant using ozone,
4294 for disinfection or oxidation, shall collect one sample per month and analyze it for bromate.
4295 The owner shall collect samples monthly at the entrance to the distribution system while
4296 the ozonation system is operating under normal conditions.

4297 2. The owner required to analyze for bromate may reduce monitoring from monthly to
4298 quarterly if the waterworks RAA bromate concentration is less than or equal to 0.0025
4299 mg/L based on monthly bromate measurements under subdivision H 1 of this section for
4300 the most recent four quarters. If a waterworks has qualified for reduced bromate
4301 monitoring under this subdivision, then the owner may remain on reduced monitoring as
4302 long as the RAA of quarterly bromate samples is equal to or less than 0.0025 mg/L. If the
4303 RAA bromate concentration is greater than 0.0025 mg/L, then the owner shall resume
4304 routine monitoring required by subdivision H 1 of this section.

4305 I. Monitoring requirements for the residual disinfectant.

4306 1. Chlorine and chloramines.

4307 a. The owner of a waterworks that uses chlorine or chloramines shall measure the
4308 residual disinfectant level in the distribution system at the same point in the distribution
4309 system and at the same time as total coliform bacteria are sampled, as specified in
4310 12VAC5-590-370 A and 12VAC5-590-380 D. The owner of a waterworks using either
4311 a surface water source or a GUDI source or both may use the results of the residual
4312 disinfectant concentration sampling found in 12VAC5-590-376 D instead of collecting
4313 separate samples.

4314 b. Residual disinfectant level monitoring may not be reduced.

4315 2. Chlorine dioxide.

4316 a. The owner of a waterworks that uses chlorine dioxide for disinfection or oxidation
4317 shall collect daily samples at the entrance to the distribution system. For any daily
4318 sample that exceeds the MRDL listed in Table 340.7, the owner shall collect samples
4319 in the distribution system the following day at the locations required by subdivision I 2
4320 b of this section, in addition to the sample required at the entrance to the distribution
4321 system.

4322 b. On each day following a routine sample monitoring result that exceeds the MRDL
4323 listed in Table 340.7, the owner is required to collect three chlorine dioxide distribution
4324 system samples. If chlorine dioxide or chloramines are used to maintain a residual
4325 disinfectant in the distribution system, or if chlorine is used to maintain a residual
4326 disinfectant in the distribution system and there is no rechlorination after the entry
4327 point, then the owner shall collect three samples as close to the first customer as
4328 possible, at intervals of at least six hours. If chlorine is used to maintain a residual
4329 disinfectant in the distribution system and there are one or more rechlorination points
4330 after the entry point, then the owner shall collect one sample at each of the following
4331 locations: as close to the first customer as possible, in a location representative of
4332 average residence time, and as close to the end of the distribution system as possible
4333 (reflecting maximum residence time in the distribution system).

4334 c. Chlorine dioxide monitoring may not be reduced.

4335 3. Ozone. Ozone residual levels shall be monitored continuously and recorded. A portable
4336 ozone meter is recommended as a backup.

4337 4. Additional monitoring and reporting requirements are specified in 12VAC5-590-500 to
4338 demonstrate log inactivation or removal of Giardia lamblia, virus, and Cryptosporidium.

4339 J. Monitoring requirements for DBPPs.

4340 1. The owner of a community waterworks or a NTNC using either a surface water source
4341 or a GUDI source or both and using conventional filtration treatment, as defined in
4342 12VAC5-590-10, shall monitor each water treatment plant for TOC no later than the point
4343 of CFE turbidity monitoring and representative of the treated water. The owner shall also
4344 monitor for TOC in the source water before any treatment at the same time as monitoring
4345 for TOC in the treated water. These samples (source water and treated water) are referred
4346 to as paired samples. At the same time as the source water sample is collected, the owner
4347 shall monitor for alkalinity in the source water before any treatment. The owner shall collect
4348 one paired sample and one source water alkalinity sample per month per water treatment
4349 plant at a time representative of normal operating conditions and influent water quality.

4350 2. The owner of a community waterworks or a NTNC that uses either a surface water
4351 source or a GUDI source or both with an average treated water TOC of less than 2.0 mg/L
4352 for two consecutive years, or less than 1.0 mg/L for one year, may reduce monitoring for
4353 both TOC and alkalinity to one paired sample and one source water alkalinity sample per
4354 water treatment plant per quarter. The owner shall revert to routine monitoring in the month
4355 following the quarter when the annual average treated water TOC is equal to or greater
4356 than 2.0 mg/L.

4357 _____
4358 **12VAC5-590-375. Lead and copper monitoring.**

4359 A. The ~~owners~~ owner of all a community waterworks and or a ~~nontransient noncommunity~~
4360 ~~waterworks~~ NTNC shall monitor for lead and copper in tap water (subsection B of this section),

4361 water quality (corrosion) parameters in the distribution system and at entry points (subsection C
4362 of this section), and lead and copper in water supplies (subsection D of this section).

4363 B. Monitoring requirements for lead and copper in tap water.

4364 1. Sample site location.

4365 a. By the ~~commissioner-determined~~ date determined by the department for
4366 commencement of monitoring under subdivision B 4 a of this section, ~~each~~ the owner
4367 shall complete a materials evaluation of the distribution system ~~in-order~~ to identify a
4368 pool of targeted sampling sites that meets the requirements of this subdivision, and
4369 that is sufficiently large to ensure that the owner can collect the number of lead and
4370 copper tap samples required in subdivision B 3 of this section. All sites from which ~~first~~
4371 ~~draw~~ first-draw samples are collected shall be selected from this pool of targeted
4372 sampling sites. Sampling sites may not include faucets that have ~~point-of-use~~ POU
4373 devices or ~~point-of-entry~~ POE ~~treatment~~ devices designed to remove inorganic
4374 contaminants.

4375 b. When the distribution system evaluation required in subdivision B 1 a of this section
4376 is insufficient to locate the requisite number of lead and copper sampling sites that
4377 meet the targeting criteria of this section, the owner shall review the sources of
4378 information listed below ~~in-order~~ to identify a sufficient number of sampling sites. In
4379 addition, the owner shall seek to collect such information where possible in the course
4380 of its normal operations (e.g., checking service line materials when reading water
4381 meters or performing maintenance activities):

4382 (1) All plumbing codes, permits, and records in the files of the building department or
4383 departments that indicate the plumbing materials that are installed within publicly and
4384 privately owned structures connected to the distribution system;

4385 (2) All inspections and records of the distribution system that indicate the material
4386 composition of the service connections that connect a structure to the distribution
4387 system; and

4388 (3) All existing water quality information, which includes the results of all prior analyses
4389 of the waterworks or individual structures connected to the waterworks, indicating
4390 locations that may be particularly susceptible to high lead or copper concentrations.

4391 c. The sampling sites selected for a community waterworks' sampling pool (~~tier 1~~
4392 ~~sampling sites~~) (Tier 1 sampling sites) shall consist of single family structures that:

4393 (1) Contain copper pipes with lead solder installed between January 1983 and April
4394 1986 or contain lead pipes; or

4395 (2) Are served by a lead service line.

4396 NOTE: When multiple-family residences comprise at least 20% of the structures
4397 served by a waterworks, the owner may include these types of structures in the
4398 sampling pool.

4399 d. The owner of ~~any a~~ community waterworks with insufficient ~~tier~~ Tier 1 sampling sites
4400 shall complete the sampling pool with ~~tier~~ Tier 2 sampling sites consisting of buildings,
4401 including multiple-family residences that:

4402 (1) Contain copper pipes with lead solder installed between January 1983 and April
4403 1986 or contain lead pipes; or

4404 (2) Are served by a lead service line.

4405 e. The owner of ~~any a~~ community waterworks with insufficient ~~tier~~ Tier 1 and ~~tier~~ Tier
4406 2 sampling sites shall complete the sampling pool with ~~tier~~ Tier 3 sampling sites,
4407 consisting of single family structures that contain copper pipes with lead solder

4408 installed before 1983. The owner of a community waterworks with insufficient ~~tier~~ Tier
4409 1, ~~tier~~ Tier 2, and ~~tier~~ Tier 3 sampling sites shall complete the sampling pool with
4410 representative sites throughout the distribution system. For the purpose of this
4411 subdivision, a representative site is a site in which the plumbing materials used at that
4412 site would be commonly found at other sites served by the waterworks.

4413 f. The sampling sites selected for a ~~nontransient noncommunity waterworks~~ NTNC
4414 ~~(tier 1 sampling sites)~~ (Tier 1 sampling sites) shall consist of buildings that:

4415 (1) Contain copper pipes with lead solder installed between January 1983 and April
4416 1986 or contain lead pipes; or

4417 (2) Are served by a lead service line.

4418 g. The owner of a ~~nontransient noncommunity waterworks~~ NTNC with insufficient ~~tier~~
4419 Tier 1 sites that meet the targeting criteria in subdivision B 1 f of this section shall
4420 complete the sampling pool with sampling sites that contain copper pipes with lead
4421 solder installed before 1983. If additional sites are needed to complete the sampling
4422 pool, the owner of a ~~nontransient noncommunity waterworks~~ NTNC shall use
4423 representative sites throughout the distribution system. For the purpose of this
4424 subdivision, a representative site is a site in which the plumbing materials used at that
4425 site would be commonly found at other sites served by the waterworks.

4426 h. The owner of ~~any~~ a waterworks whose distribution system contains lead service
4427 lines shall draw 50% of the samples the owner collects during each monitoring period
4428 from sites that contain lead pipes, or copper pipes with lead solder, and 50% of the
4429 samples the owner collects from sites served by a lead service line. ~~Any~~ The owner
4430 who cannot identify a sufficient number of sampling sites served by a lead service line

4431 shall collect ~~first-draw~~ first-draw tap samples from all of the sites identified as being
4432 served by ~~such~~ these lines.

4433 2. Sample collection methods.

4434 a. All tap samples for lead and copper, with the exception of lead service line samples
4435 collected under 12VAC5-590-405 C 4 and samples collected under subdivision B 2 e
4436 of this section, shall be ~~first-draw~~ first-draw samples.

4437 b. Each first-draw tap sample for lead and copper shall be one liter in volume, ~~and~~
4438 have stood motionless in the plumbing system of each sampling site for at least six
4439 hours, and have been collected without flushing the tap. ~~First-draw~~ First-draw samples
4440 from residential housing shall be collected from the cold-water kitchen tap or from a
4441 bathroom sink tap. First-draw samples from a nonresidential building shall be one liter
4442 in volume and shall be collected at an interior tap from which water is typically drawn
4443 for consumption. Non-first-draw samples collected ~~in lieu of~~ instead of first-draw
4444 samples pursuant to subdivision B 2 e of this section shall be one liter in volume and
4445 shall be collected at an interior tap from which water is typically drawn for consumption.
4446 ~~First-draw~~ First-draw samples may be collected by the owner or the owner may allow
4447 residents to collect ~~first-draw~~ first-draw samples after instructing the residents of the
4448 sampling procedures specified in this subdivision. To avoid problems of residents
4449 handling nitric acid, acidification of ~~first-draw~~ first-draw samples may be done up to 14
4450 days after the sample is collected. After acidification to resolubilize the metals, the
4451 sample must stand in the original container for the time specified in the approved EPA
4452 method before the sample can be analyzed. If an owner allows residents to perform
4453 sampling, then the owner may not challenge, based on alleged errors in sample
4454 collection, the accuracy of sampling results.

4455 c. Each lead service line sample collected pursuant to 12VAC5-590-405 C 4 for the
4456 purpose of avoiding replacement shall be one liter in volume and have stood
4457 motionless in the lead service line for at least six hours. Lead service line samples
4458 shall be collected in one of the following three ways:

4459 (1) At the tap after flushing the volume of water between the tap and the lead service
4460 line. The volume of water shall be calculated based on the interior diameter and length
4461 of the pipe between the tap and the lead service line;

4462 (2) Tapping directly into the lead service line; or

4463 (3) If the sampling site is a building constructed as a ~~single-family~~ single family
4464 residence, then allowing the water to run until there is a significant change in
4465 temperature that would be indicative of water that has been standing in the lead
4466 service line.

4467 d. ~~A~~ The owner shall collect each ~~first-draw~~ first-draw tap sample from the same
4468 sampling site from which the owner collected a previous sample. If, for any reason,
4469 the owner cannot gain entry to a sampling site ~~in order~~ to collect a follow-up tap
4470 sample, then the owner may collect the follow-up tap sample from another sampling
4471 site in the sampling pool as long as the new site meets the same targeting criteria and
4472 is within reasonable proximity of the original site.

4473 e. The owner of a ~~nontransient noncommunity waterworks~~ NTNC, or a community
4474 waterworks that meets the criteria of 12VAC5-590-405 D 2 e (2) that does not have
4475 enough taps that can supply first-draw samples, as defined in subdivision B 2 b of this
4476 section, may apply to the ~~district engineer~~ department in writing to substitute non-first-
4477 draw samples. If approved by the ~~commissioner~~ department, such then an owners
4478 owner shall collect as many first-draw samples from appropriate taps as possible and

4479 identify sampling times and locations that would likely result in the longest standing
4480 time for the remaining sites.

4481 3. Number of samples.

4482 a. ~~Owners~~ The owner shall collect at least one sample during each monitoring period
4483 specified in subdivision B 4 of this section from the number of sites listed in the first
4484 column (standard monitoring) of ~~the table in subdivision B 3 c of this section~~ Table
4485 375.1. The owner of a waterworks conducting reduced monitoring under subdivision
4486 B 4 d of this section shall collect at least one sample from the number of sites specified
4487 in the second column (reduced monitoring) of ~~the table in subdivision B 3 c of this~~
4488 ~~section~~ Table 375.1 during each monitoring period specified in subdivision B 4 d of
4489 this section. ~~Such reduced~~ Reduced monitoring sites shall be representative of the
4490 sites required for standard monitoring. The ~~commissioner~~ department may specify
4491 sampling locations when an owner is conducting reduced monitoring.

4492 b. The owner of a waterworks that has fewer than five drinking water taps that are
4493 normally used for human consumption meeting the sample site criteria of subdivision
4494 B 1 of this section to reach the required number of sample sites listed in ~~the table in~~
4495 ~~subdivision B 3 c of this section~~ Table 375.1, shall collect at least one sample from
4496 each tap and then shall collect additional samples from those taps on different days
4497 during the monitoring period to meet the required number of sites. Alternatively, the
4498 ~~commissioner~~ department may allow ~~these~~ the owners owner to collect a number of
4499 samples less than the number of sites specified in ~~the table in subdivision B 3 c of this~~
4500 ~~section~~ Table 375.1, provided that 100% of all taps that are normally used for human
4501 consumption are sampled. The ~~commissioner~~ department ~~must~~ shall approve this
4502 reduction of the minimum number of samples in writing based on a request from the

4503 owner or onsite verification by the ~~district engineer~~ designated department
 4504 representative.

4505 e. ~~The lead and copper tap sample table is as follows:~~

4506
 4507 =
 4507 TABLE 375.1.
 4508 Tap Samples for Lead and Copper.

| System Size <u>WATERWORKS SIZE</u> (Number of People Served) | Number of Sites <u>NUMBER OF SITES</u> (Standard Monitoring) | Number of Sites <u>NUMBER OF SITES</u> (Reduced Monitoring) |
|---|---|--|
| greater <u>Greater</u> than 100,000 | 100 | 50 |
| 10,001 - 100,000 | 60 | 30 |
| 3,301 - 10,000 | 40 | 20 |
| 501 - 3,300 | 20 | 10 |
| 101 - 500 | 10 | 5 |
| less <u>Less</u> than or equal to 100 | 5 | 5 |

4509 4. Timing of monitoring.

4510 a. Initial tap sampling. The first six-month monitoring period for small (serving less than
 4511 3,300 population), ~~medium-size~~ medium (serving 3,301 to 50,000 population), and
 4512 large waterworks (serving greater than 50,000 population) shall be established by the
 4513 ~~commissioner~~ department.

4514 (1) ~~Owners~~ The owner of all a large waterworks shall monitor during two consecutive
 4515 six-month periods.

4516 (2) ~~Owners~~ The owner of all a small and or a ~~medium-size~~ medium waterworks shall
 4517 monitor during each six-month monitoring period until the waterworks exceeds the
 4518 lead or copper ~~action level~~ AL and is therefore required to implement the corrosion
 4519 control treatment requirements under 12VAC5-590-405 A 2, in which case the owner
 4520 shall continue monitoring in accordance with subdivision B 4 b of this section, or the
 4521 waterworks meets the lead and copper ~~action levels~~ ALs during two consecutive six-

4522 month monitoring periods, in which case the owner may reduce monitoring in
4523 accordance with subdivision B 4 d of this section.

4524 b. Monitoring after installation of corrosion control and ~~water supply (source water)~~
4525 source water treatment.

4526 (1) The owner of ~~any~~ a large waterworks that installs optimal corrosion control
4527 treatment pursuant to 12VAC5-590-405 A 2 d (4) shall monitor during two consecutive
4528 six-month monitoring periods by the date specified in 12VAC5-590-405 A 2 d (5).

4529 (2) The owner of ~~any~~ a small or ~~a medium-size~~ medium waterworks that installs optimal
4530 corrosion control treatment pursuant to 12VAC5-590-405 A 2 e (5) shall monitor during
4531 two consecutive six-month monitoring periods by the date specified in ~~12VAC5-590-~~
4532 ~~405 A 2 d (6)~~ 12VAC5-590-405 A 2 e (6).

4533 (3) The owner of ~~any~~ a waterworks that installs source water treatment pursuant to
4534 12VAC5-590-405 B 1 c shall monitor during two consecutive six-month monitoring
4535 periods by the date specified in 12VAC5-590-405 B 1 d.

4536 c. Monitoring after the ~~commissioner~~ department specifies water quality parameter
4537 values for optimal corrosion control. After the ~~commissioner~~ department specifies the
4538 values for water quality control parameters under 12VAC5-590-405 A 1 f, the owner
4539 shall monitor during each subsequent six-month monitoring period, with the first
4540 monitoring period to begin on the date the ~~commissioner~~ department specifies the
4541 optimal values.

4542 d. Reduced monitoring.

4543 (1) The owner of a small or ~~a medium-size~~ medium waterworks that meets the lead
4544 and copper ~~action levels~~ ALs during each of two consecutive six-month monitoring
4545 periods may reduce the number of samples in accordance with subdivision B 3 of this

4546 section, and reduce the frequency of sampling to once per year. The owner of a small
4547 or a medium water system waterworks collecting fewer than five samples, as specified
4548 in subdivision B 3 b of this section, that meets the lead and copper ~~action levels~~ ALs
4549 during each of two consecutive six-month monitoring periods may reduce the
4550 frequency of sampling to once per year. In no case may the owner reduce the number
4551 of samples required below the minimum of one sample per available tap. This
4552 sampling shall begin during the calendar year immediately following the end of the
4553 second consecutive six-month monitoring period.

4554 (2) The owner of ~~any~~ a waterworks that meets the lead ~~action level~~ AL and maintains
4555 the range of values for the water quality control parameters reflecting optimal corrosion
4556 control treatment specified by the ~~commissioner~~ department under 12VAC5-590-405
4557 A 1 f during each of two consecutive six-month monitoring periods may reduce the
4558 frequency of monitoring to once per year and to reduce the number of lead and copper
4559 samples in accordance with subdivision B 3 of this section if the owner receives written
4560 approval from the ~~commissioner~~ department. This sampling shall begin during the
4561 calendar year immediately following the end of the second consecutive six-month
4562 monitoring period. The ~~commissioner~~ department ~~must review~~ shall evaluate
4563 monitoring, treatment, and other relevant information submitted by the owner in
4564 accordance with ~~12VAC5-590-530 F~~ 12VAC5-590-532 and ~~must~~ shall notify the owner
4565 in writing when a determination is made that the owner is eligible to commence
4566 reduced monitoring pursuant to this subdivision. The ~~commissioner~~ department ~~must~~
4567 ~~review~~ shall evaluate, and where appropriate, revise ~~his~~ the determination when the
4568 owner submits new monitoring or treatment data, or when other data relevant to the
4569 number and frequency of tap sampling becomes available.

4570 (3) The owner of a small or ~~a medium-size~~ medium waterworks that meets the lead
4571 and copper ~~action levels~~ ALs during three consecutive years of monitoring may reduce
4572 the frequency of monitoring for lead and copper from annually to once every three
4573 years. The owner of ~~any~~ a waterworks that meets the lead ~~action-level~~ AL and
4574 maintains the range of values for the water quality control parameters reflecting
4575 optimal corrosion control treatment specified by the ~~commissioner~~ department under
4576 12VAC5-590-405 A 1 f during three consecutive years of monitoring may reduce the
4577 frequency of monitoring from annually to once every three years if the owner receives
4578 written approval from the ~~commissioner~~ department. Samples collected once every
4579 three years shall be collected no later than every third calendar year. The
4580 ~~commissioner~~ department ~~must review~~ shall evaluate monitoring, treatment, and other
4581 relevant information submitted by the owner in accordance with ~~12VAC5-590-530 F~~
4582 12VAC5-590-532 and ~~must~~ shall notify the owner in writing when a determination is
4583 made that the owner is eligible to commence reduced monitoring pursuant to this
4584 subdivision. The ~~commissioner~~ department ~~must review~~ shall evaluate, and where
4585 appropriate, revise ~~his~~ the determination when the owner submits new monitoring or
4586 treatment data, or when other data relevant to the number and frequency of tap
4587 sampling becomes available.

4588 (4) The owner of a waterworks that reduces the number and frequency of sampling
4589 shall collect these samples from representative sites included in the pool of targeted
4590 sampling sites identified in subdivision B 1 of this section. ~~Owners~~ The owner sampling
4591 annually or less frequently shall conduct the lead and copper tap sampling during the
4592 months of June, July, August, or September. For a ~~nontransient noncommunity~~
4593 ~~waterworks~~ NTNC that does not operate during the months of June through
4594 September, the ~~commissioner~~ department shall designate an alternate monitoring

4595 period that represents a time of normal operation for the waterworks. This sampling
4596 shall begin in the calendar year immediately following the end of the second
4597 consecutive six-month monitoring period ~~of~~ for the ~~owners~~ owner initiating annual
4598 monitoring, and during the three-year period following the end of the third consecutive
4599 calendar year of annual monitoring for the ~~owners~~ owner initiating triennial monitoring.

4600 (5) The owner of ~~any a~~ a waterworks that demonstrates for two consecutive six-month
4601 monitoring periods that the tap water lead level computed under 12VAC5-590-385 C
4602 is less than or equal to 0.005 mg/L and the tap water copper level computed under
4603 12VAC5-590-385 C is less than or equal to 0.65 mg/L may reduce the number of
4604 samples in accordance with subdivision B 3 of this section and reduce the frequency
4605 of sampling to once every three calendar years.

4606 (6) The owner of a small or ~~medium-size~~ a medium waterworks subject to reduced
4607 monitoring that exceeds the lead or copper ~~action level~~ AL shall resume sampling in
4608 accordance with subdivision B 4 c of this section and collect the number of samples
4609 specified for standard monitoring under subdivision B 3 of this section. ~~Such~~ The
4610 owner shall also conduct water quality parameter monitoring in accordance with
4611 ~~subdivision C 2, 3, or 4~~ subdivisions C 2 through C 4 of this section (as appropriate)
4612 during the monitoring period in which the ~~action level~~ AL is exceeded. The owner of
4613 ~~any such a~~ a waterworks may resume annual monitoring for lead and copper at the tap
4614 at the reduced number of sites specified in subdivision B 3 of this section after it has
4615 completed two subsequent consecutive six-month rounds of monitoring that meet the
4616 criteria of subdivision B 4 d (1) of this section or may resume triennial monitoring for
4617 lead and copper at the reduced number of sites after it demonstrates through
4618 subsequent rounds of monitoring that it meets the criteria of either subdivision B 4 d
4619 (3) or B 4 d (5) of this section.

4620 (7) The owner of any a waterworks subject to the reduced monitoring frequency that
4621 fails to meet the lead action-level AL during any four-month monitoring period or that
4622 fails to operate at or above the minimum value or within the range of values for the
4623 water quality parameters specified by the ~~commissioner~~ department under 12VAC5-
4624 590-405 A 1 f for more than nine days in any six-month period specified in subdivision
4625 C 4 of this section shall conduct tap water sampling for lead and copper at the
4626 frequency specified in subdivision B 4 c of this section, collect the number of samples
4627 specified for standard monitoring under subdivision B 3 of this section, and resume
4628 monitoring for water quality parameters within the distribution system in accordance
4629 with subdivision C 4 of this section. This standard tap water sampling shall begin no
4630 later than the six-month period beginning January 1 of the calendar year following the
4631 lead action-level AL exceedance or water quality parameter excursion. The owner of
4632 such a waterworks may resume reduced monitoring for lead and copper at the tap and
4633 for water quality parameters within the distribution system under the following
4634 conditions:

4635 (a) The owner may resume annual monitoring for lead and copper at the tap at the
4636 reduced number of sites specified in subdivision B 3 of this section after completion of
4637 two subsequent six-month rounds of monitoring that meet the criteria of subdivision B
4638 4 d 2(2) of this section and the owner has received written approval from the
4639 ~~commissioner~~ department that it is appropriate to resume reduced monitoring on an
4640 annual frequency. This sampling shall begin during the calendar year immediately
4641 following the end of the second consecutive six-month monitoring period.

4642 (b) The owner may resume triennial monitoring for lead and copper at the tap at the
4643 reduced number of sites after demonstration through subsequent rounds of monitoring
4644 that it meets the criteria of either subdivision B 4 d (3) or B 4 d (5) of this section and

4645 the owner has received written approval from the ~~commissioner~~ department that it is
4646 appropriate to resume triennial monitoring.

4647 (c) The owner may reduce the number of water quality parameter tap water samples
4648 required in accordance with subdivision C 5 a of this section and the frequency with
4649 which it collects ~~such~~ these samples in accordance with subdivision C 5 b of this
4650 section. The owner of such a waterworks may not resume triennial monitoring for water
4651 quality parameters at the tap until it demonstrates, in accordance with the
4652 requirements of subdivision C 5 b of this section, that it has requalified for triennial
4653 monitoring.

4654 (8) The owner of ~~any~~ a waterworks subject to a reduced monitoring frequency under
4655 subdivision B 4 d of this section shall notify the ~~district engineer~~ department in writing
4656 in accordance with 12VAC5-590-530 ~~F 1 e~~ and 12VAC5-590-532 of any upcoming
4657 long-term change in the treatment or addition of a new ~~water~~ source water as
4658 described in this section. The ~~commissioner~~ department ~~must review~~ shall evaluate
4659 and approve the addition of a new ~~water~~ source water or long-term change in the water
4660 treatment before it is implemented by the owner. The ~~commissioner~~ department may
4661 require the owner to resume sampling in accordance with subdivision B 4 c of this
4662 section and collect the number of samples specified for standard monitoring under
4663 subdivision B 3 of this section or take other appropriate steps such as increased water
4664 quality parameter monitoring or re-evaluation of its corrosion control treatment given
4665 the potentially different water quality considerations.

4666 5. Additional monitoring by owner. The results of ~~any~~ monitoring conducted in addition to
4667 the minimum requirements of this section shall be considered by the owner and the
4668 ~~commissioner~~ department in making ~~any~~ determinations (i.e., calculating the 90th
4669 percentile lead or copper level) under 12VAC5-590-385 C.

4670 6. Invalidation of lead or copper tap water samples. A sample invalidated under this
4671 subdivision does not count toward determining lead or copper 90th percentile levels under
4672 12VAC5-590-385 C or toward meeting the minimum monitoring requirements of
4673 subdivision B 3 of this section.

4674 a. The ~~commissioner~~ department may invalidate a lead or copper tap water sample if
4675 at least one of the following conditions is met:

4676 (1) The laboratory establishes that improper sample analysis caused erroneous
4677 results.

4678 (2) The ~~commissioner~~ department determines that the sample was ~~taken~~ collected
4679 from a site that did not meet the site selection criteria of this section.

4680 (3) The sample container was damaged in transit.

4681 (4) There is substantial reason to believe that the sample was subject to tampering.

4682 b. The owner shall report the results of all samples to the ~~district engineer~~ department
4683 and all supporting documentation for samples the owner believes should be
4684 invalidated.

4685 c. To invalidate a sample under subdivision B 6 a of this section, the decision and the
4686 rationale for the decision shall be documented in writing. The ~~commissioner~~
4687 department may not invalidate a sample solely on the grounds that a follow-up sample
4688 result is higher or lower than that of the original sample.

4689 d. The owner shall collect a replacement ~~samples~~ sample for ~~any a samples~~ sample
4690 invalidated under this section if, after the invalidation of one or more samples, the
4691 owner has too few samples to meet the minimum requirements of subdivision B 3 of
4692 this section. ~~Any such~~ A replacement ~~samples~~ sample shall be ~~taken~~ collected as soon
4693 as possible, but no later than 20 days after the date the commissioner invalidates the

4694 sample or by the end of the applicable monitoring period, whichever occurs later.
4695 Replacement samples ~~taken~~ collected after the end of the applicable monitoring period
4696 shall not also be used to meet the monitoring requirements of a subsequent monitoring
4697 period. The replacement samples shall be ~~taken~~ collected at the same locations as
4698 the invalidated samples or, if that is not possible, at locations other than those already
4699 used for sampling during the monitoring period.

4700 7. Monitoring waivers for small waterworks. The owner of ~~any~~ a small waterworks that
4701 meets the criteria of this subdivision may apply to the ~~commissioner~~ department to reduce
4702 the frequency of monitoring for lead and copper to once every nine years (i.e., a full waiver)
4703 if the owner meets all of the materials criteria specified in subdivision B 7 a of this section
4704 and all of the monitoring criteria specified in subdivision B 7 b of this section. The owner
4705 of ~~any~~ a small waterworks that meets the criteria in subdivisions B 7 a and B 7 b of this
4706 section only for lead, or only for copper, may apply to the ~~commissioner~~ department for a
4707 waiver to reduce the frequency of tap water monitoring to once every nine years for that
4708 contaminant only (i.e., a partial waiver).

4709 a. Materials criteria. The owner shall demonstrate that the distribution system ~~and~~
4710 ~~service lines and all drinking water supply plumbing~~ service lines and plumbing
4711 connected to the waterworks, including plumbing conveying drinking water within all
4712 residences and buildings connected to the waterworks, are free of lead-containing
4713 materials or copper-containing materials, as those terms are defined in this
4714 subdivision, as follows:

4715 (1) Lead. To qualify for a full waiver, or a waiver of the tap water monitoring
4716 requirements for lead (i.e., a lead waiver), the owner shall provide certification and
4717 supporting documentation to the ~~commissioner~~ department that the waterworks is free
4718 of all lead-containing materials, as follows:

4719 (a) It contains no plastic pipes that contain lead plasticizers, or plastic service lines
4720 that contain lead plasticizers; and

4721 ~~(b) It is free of lead service lines, lead pipes, lead soldered pipe joints, and leaded~~
4722 ~~brass or bronze alloy fittings and fixtures, unless such fittings and fixtures meet the~~
4723 ~~specifications of any standard established pursuant to 42 USC § 300g-6(e) (SDWA §~~
4724 ~~1417(e)).~~

4725 (b) Solders and flux contain no more than 0.2% lead; and

4726 (c) The weighted average of wetted surface of pipes, pipe fittings, plumbing fittings,
4727 and plumbing fixtures contain no more than 0.25% lead.

4728 (2) Copper. To qualify for a full waiver, or a waiver of the tap water monitoring
4729 requirements for copper (i.e., a copper waiver), the owner shall provide certification
4730 and supporting documentation to the ~~commissioner~~ department that the waterworks
4731 contains no copper pipes or copper service lines.

4732 b. Monitoring criteria for waiver issuance. The owner shall have completed at least one
4733 six-month round of standard tap water monitoring for lead and copper at sites
4734 approved by the ~~commissioner~~ department and from the number of sites required by
4735 subdivision B 3 of this section and demonstrate that the 90th percentile levels for any
4736 and all rounds of monitoring conducted since the owner became free of all lead-
4737 containing or copper-containing materials, as appropriate, meet the following criteria:

4738 (1) Lead levels. To qualify for a full waiver, or a lead waiver, the owner shall
4739 demonstrate that the 90th percentile lead level does not exceed 0.005 mg/L.

4740 (2) Copper levels. To qualify for a full waiver, or a copper waiver, the owner shall
4741 demonstrate that the 90th percentile copper level does not exceed 0.65 mg/L.

4742 c. ~~Commissioner~~ Department approval of waiver application. The ~~commissioner~~
4743 department shall notify the owner of the waiver determination, in writing, setting forth
4744 the basis of ~~his~~ the decision and any condition of the waiver. As a condition of the
4745 waiver, the ~~commissioner~~ department may require the owner to perform specific
4746 activities (e.g., limited monitoring, periodic outreach to customers to remind them to
4747 avoid installation of materials that might void the waiver) to avoid the risk of lead or
4748 copper concentration of concern in tap water. The owner of a small waterworks shall
4749 continue monitoring for lead and copper at the tap as required by subdivisions B 4 a
4750 through B 4 d of this section, as appropriate, until it receives written notification from
4751 the ~~commissioner~~ department that the waiver has been approved.

4752 d. Monitoring frequency for owners with waivers.

4753 (1) ~~An~~ The owner with a full waiver shall conduct tap water monitoring for lead and
4754 copper in accordance with subdivision B 4 d (4) of this section at the reduced number
4755 of sampling sites identified in subdivision B 3 of this section at least once every nine
4756 years and provide the materials certification specified in subdivision B 7 a of this
4757 section for both lead and copper to the ~~commissioner~~ department along with the
4758 monitoring results. Samples collected every nine years shall be collected no later than
4759 every ninth calendar year.

4760 (2) ~~An~~ The owner with a partial waiver shall conduct tap water monitoring for the
4761 waived contaminant in accordance with subdivision B 4 d (4) of this section at the
4762 reduced number of sampling sites specified in subdivision B 3 of this section at least
4763 once every nine years and provide the materials certification specified in subdivision
4764 B 7 a of this section pertaining to the waived contaminant along with the monitoring
4765 results. ~~Such an~~ The owner also shall continue to monitor for the nonwaived

4766 contaminant in accordance with requirements of subdivisions B 4 a through B 4 d of
4767 this section, as appropriate.

4768 (3) ~~Any~~ The owner with a full or partial waiver shall notify the ~~district engineer~~
4769 ~~department~~ in writing in accordance with ~~12VAC5-590-530 F 1 e~~ 12VAC5-590-532 B
4770 3 of any upcoming long-term change in the treatment or addition of a new source
4771 water, as described in that section. The ~~commissioner must review~~ department shall
4772 evaluate and approve the addition of a new source water or a long-term change in
4773 water treatment before it is implemented by the owner. The ~~commissioner~~ department
4774 has the authority to require the owner to add or modify waiver conditions (e.g., require
4775 recertification that the waterworks is free of lead-containing or copper-containing
4776 materials; require additional round or rounds of monitoring), if it deems ~~such~~ these
4777 modifications are necessary to address treatment or source water changes at the
4778 waterworks.

4779 (4) If an owner with a full or partial waiver becomes aware that it is no longer free of
4780 lead-containing or copper-containing materials, as appropriate, (e.g., as a result of
4781 new construction or repairs), then the owner shall notify the ~~district engineer~~
4782 department in writing no later than 60 days after becoming aware of ~~such a~~ the change.

4783 e. Continued eligibility. If the owner continues to satisfy the requirements of subdivision
4784 B 7 d of this section, then the waiver will be renewed automatically, unless any of the
4785 conditions listed in subdivisions B 7 e (1), B 7 e (2), or B 7 e (3) of this section occurs.
4786 ~~An~~ The owner whose waiver has been revoked may reapply for a waiver ~~at such time~~
4787 ~~as~~ when ~~it~~ he again meets the appropriate materials and monitoring criteria of
4788 subdivisions B 7 a and B 7 b of this section.

4789 (1) A waterworks with a full waiver or a lead waiver no longer satisfies the materials
4790 criteria of subdivision B 7 a (1) of this section or has a 90th percentile lead level greater
4791 than 0.005 mg/L.

4792 (2) A waterworks with a full waiver or a copper waiver no longer satisfies the materials
4793 criteria of subdivision B 7 a (2) of this section or has a 90th percentile copper level
4794 greater than 0.65 mg/L.

4795 (3) The ~~commissioner~~ department notifies the owner, in writing, that the waiver has
4796 been revoked, setting forth the basis of the decision.

4797 f. Requirements following waiver revocation. A waterworks whose full or partial waiver
4798 has been revoked by the ~~commissioner~~ department is subject to the corrosion control
4799 treatment and lead and copper tap water monitoring requirements, as follows:

4800 (1) If the waterworks exceeds the lead or copper ~~action level~~ AL, then the owner shall
4801 implement corrosion control treatment in accordance with the deadlines specified in
4802 12VAC5-590-405 A 2 e and any other applicable requirements of this section.

4803 (2) If the waterworks meets both the lead and the copper ~~action level~~ AL, then the
4804 owner shall monitor for lead and copper at the tap no less frequently than once every
4805 three years using the reduced number of sample sites specified in subdivision B 3 of
4806 this section.

4807 g. Pre-existing waivers. Waivers for small waterworks approved by the ~~commissioner~~
4808 in writing ~~prior to~~ before April 11, 2000, shall remain in effect under the following
4809 conditions:

4810 (1) If the waterworks has demonstrated that it is both free of lead-containing and
4811 copper-containing materials, as required by subdivision B 7 a of this section and that
4812 its 90th percentile lead levels and 90th percentile copper levels meet the criteria of

4813 subdivision B 7 b of this section, then the waiver remains in effect so long as the owner
4814 continues to meet the waiver eligibility criteria of subdivision B 7 e of this section. The
4815 first round of tap water monitoring conducted pursuant to subdivision B 7 d of this
4816 section shall be completed no later than nine years after the last time the owner has
4817 monitored for lead and copper at the tap.

4818 (2) If the waterworks has met the materials criteria of subdivision B 7 a of this section
4819 but has not met the monitoring criteria of subdivision B 7 b of this section, then the
4820 owner shall conduct one six-month round of standard tap water monitoring for lead
4821 and copper at sites approved by the ~~commissioner~~ department demonstrating that it
4822 meets the criteria of subdivision B 7 b of this section. Thereafter, the waiver shall
4823 remain in effect as long as the owner meets the continued eligibility criteria of
4824 subdivision B 7 e of this section. The first round of tap water monitoring conducted
4825 pursuant to subdivision B 7 d of this section shall be completed no later than nine years
4826 after the round of monitoring conducted pursuant to subdivision B 7 b of this section.

4827 C. Monitoring requirements for water quality parameters. The owners of all large waterworks
4828 and all small and ~~medium-size~~ medium waterworks that exceed the lead or copper ~~action level~~
4829 AL shall monitor for water quality parameters in addition to lead and copper in accordance with
4830 this section.

4831 1. General requirements.

4832 a. Sample collection methods.

4833 (1) Tap samples shall be representative of water quality throughout the distribution
4834 system taking into account the number of persons served, the different sources of
4835 water, the different treatment methods employed by the waterworks, and seasonal
4836 variability. Tap sampling under this section is not required to be conducted at taps

4837 targeted for lead and copper sampling under subdivision B 1 of this section. ~~Owners~~
 4838 The owner may find it convenient to conduct tap sampling for water quality parameters
 4839 at sites approved for coliform sampling.

4840 (2) Samples collected at the entry point or points to the distribution system shall be
 4841 from locations representative of each source water after treatment. If a waterworks
 4842 draws water from more than one source water and the ~~sources~~ source waters are
 4843 combined before distribution, then the owner shall sample at an entry point to the
 4844 distribution system during periods of normal operating conditions (i.e., when water is
 4845 representative of all ~~sources~~ source waters being used).

4846 b. Number of samples.

4847 (1) ~~Owners~~ The owner shall collect two tap samples from the standard monitoring
 4848 number of sites given in Table 375.2 for applicable water quality parameters during
 4849 each monitoring period specified under ~~subdivision~~ subdivisions C 2 through C 5 of
 4850 this section ~~from the following number of sites.~~

4851 TABLE 375.2.
 4852 Water Quality Monitoring for Lead and Copper.

| System Size <u>WATERWORKS</u> <u>SIZE</u> (Number of People Served) | <u>NUMBER OF SITES FOR WATER QUALITY</u> <u>PARAMETERS</u> | |
|--|--|-------------------------------------|
| | Number of Sites for Water Quality Parameters <u>STANDARD</u> <u>MONITORING</u> | <u>REDUCED</u> <u>MONITORING</u> |
| greater <u>Greater</u> than 100,000 | 25 | <u>10</u> |
| 10,001 - 100,000 | 10 | <u>7</u> |
| 3,301 - 10,000 | 3 | <u>3</u> |
| 501 - 3,300 | 2 | <u>2</u> |
| 101 - 500 | 1 | <u>1</u> |
| less <u>Less</u> than or equal to 100 | 1 | <u>1</u> |

4853

4854 (2) Except as provided in subdivision C 3 c of this section, ~~owners~~ the owner shall
4855 collect two samples for each applicable water quality parameter at each entry point to
4856 the distribution system during each monitoring period specified in subdivision C 2 of
4857 this section. During each monitoring period specified in ~~subdivision~~ subdivisions C 3
4858 through C 5 of this section, ~~owners~~ the owner shall collect one sample for each
4859 applicable water quality parameter at each entry point to the distribution system.

4860 2. Initial sampling. The ~~owners~~ owner of all a large waterworks shall measure the
4861 applicable water quality parameters as specified below at taps and at each entry point to
4862 the distribution system during each six-month monitoring period specified in subdivision B
4863 4 a of this section. The ~~owners~~ owner of all a small and or ~~medium-size~~ medium
4864 waterworks shall measure the applicable water quality parameters at the locations
4865 specified below during each six-month monitoring period specified in subdivision B 4 a of
4866 this section during which the waterworks exceeds the lead or copper ~~action level~~ AL.

4867 a. At taps:

4868 (1) pH;

4869 (2) Alkalinity;

4870 (3) Orthophosphate, when an inhibitor containing a phosphate compound is used;

4871 (4) Silica, when an inhibitor containing a silicate compound is used;

4872 (5) Calcium;

4873 (6) Conductivity; and

4874 (7) Water temperature.

4875 b. At each entry point to the distribution system: all of the applicable parameters listed
4876 in subdivision C 2 a of this section.

4877 3. Monitoring after installation of corrosion control. The owner of ~~any~~ a large waterworks
4878 ~~which~~ that installs optimal corrosion control treatment pursuant to 12VAC5-590-405 A 2 d
4879 (4) shall measure the water quality parameters at the locations and frequencies specified
4880 below during each six-month monitoring period specified in subdivision B 4 b (1) of this
4881 section. The owner of ~~any~~ a small or ~~medium-size~~ a medium waterworks that installs
4882 optimal corrosion control treatment shall conduct ~~such~~ monitoring during each six-month
4883 monitoring period specified in subdivision B 4 b (2) of this section in which the waterworks
4884 exceeds the lead or copper ~~action level~~ AL.

4885 a. At taps, two samples for:

4886 (1) pH;

4887 (2) Alkalinity;

4888 (3) Orthophosphate, when an inhibitor containing a phosphate compound is used;

4889 (4) Silica, when an inhibitor containing a silicate compound is used; and

4890 (5) Calcium, when calcium carbonate stabilization is used as part of corrosion control.

4891 b. Except as provided in subdivision C 3 c of this section, at each entry point to the
4892 distribution system, at least one sample no less frequently than every two weeks (~~bi-~~
4893 ~~weekly~~) (biweekly) for:

4894 (1) pH;

4895 (2) When alkalinity is adjusted as part of optimal corrosion control, a reading of the
4896 dosage rate of the chemical used to adjust ~~alkalinity, and~~ the alkalinity and the
4897 alkalinity concentration; and

4898 (3) When a corrosion inhibitor is used as part of optimal corrosion control, a reading of
4899 the dosage rate of the inhibitor used, and the concentration of orthophosphate or silica
4900 (whichever is applicable).

4901 c. The owner of any a groundwater waterworks system may limit entry point sampling
4902 described in subdivision C 3 b of this section to those entry points that are
4903 representative of water quality and treatment conditions throughout the waterworks. If
4904 water from untreated ~~ground-water~~ groundwater sources mixes with water from treated
4905 ~~ground-water~~ groundwater sources, then the owner shall monitor for water quality
4906 parameters both at representative entry points receiving treatment and representative
4907 entry points receiving no treatment. ~~Prior to~~ Before the start of any monitoring under
4908 this subdivision, the owner shall provide to the ~~commissioner~~ department written
4909 information identifying the selected entry points and documentation, including
4910 information on seasonal variability, sufficient to demonstrate that the sites are
4911 representative of water quality and treatment conditions throughout the waterworks.

4912 4. Monitoring after the ~~commissioner~~ department specifies water quality parameter values
4913 for optimal corrosion control. After the ~~commissioner~~ department specifies the values for
4914 applicable water quality control parameters reflecting optimal corrosion control treatment
4915 under 12VAC5-590-405 A 1 f, the ~~owners~~ owner of all a large waterworks shall measure
4916 the applicable water quality parameters in accordance with subdivision C 3 of this section
4917 and determine compliance with the requirements of 12VAC5-590-405 A 1 g every six
4918 months with the first six-month period to begin on either January 1 or July 1, whichever
4919 comes first, after the ~~commissioner~~ department specifies the optimal values under
4920 12VAC5-590-405 A 1 f. The owner of any a small or medium-size a medium waterworks
4921 shall conduct ~~such~~ monitoring during each six-month monitoring period specified in this
4922 subdivision in which the waterworks exceeds the lead or copper ~~action-level~~ AL. For the

4923 owner of ~~any such~~ a small and ~~or medium-size~~ a medium waterworks that is subject to a
 4924 reduced monitoring frequency pursuant to subdivision B 4 d of this section at the time of
 4925 the ~~action-level~~ AL exceedance, the start of the applicable six-month period under this
 4926 subdivision shall coincide with the start of the applicable monitoring period under
 4927 subdivision B 4 d of this section. Compliance with the ~~commissioner-designated~~
 4928 department-designated optimal water quality parameter values shall be determined as
 4929 specified under 12VAC5-590-405 A 1 g.

4930 5. Reduced monitoring.

4931 a. The owner of ~~any~~ a waterworks that maintains the range of values for the water
 4932 quality parameters reflecting optimal corrosion control treatment during each of two
 4933 consecutive six-month monitoring periods under subdivision C 4 of this section shall
 4934 continue monitoring at the entry point or points to the distribution system as specified
 4935 in subdivision C 3 b of this section. The owner of ~~such~~ the waterworks may collect two
 4936 tap samples for applicable water quality parameters from the ~~following~~ reduced
 4937 number of sites during each six-month monitoring period shown in Table 375.2.

4938

| Size of Water System (Number of People Served) | Reduced Number of WQP Monitoring Sites |
|--|--|
| greater than 100,000 | 10 |
| 10,001 to 100,000 | 7 |
| 3,301 to 10,000 | 3 |
| 501 to 3,300 | 2 |
| 101 to 500 | 4 |
| less than or equal to 100 | 4 |

4939

4940 b. The owner of ~~any~~ a waterworks that maintains the range of values for the water
 4941 quality parameters reflecting optimal corrosion control treatment specified by the

4942 ~~commissioner~~ department under 12VAC5-590-405 A 1 f during three consecutive
4943 years of monitoring may reduce the frequency with which the owner collects the
4944 number of tap samples for applicable water quality parameters specified in subdivision
4945 C 5 of this section from every six months to annually. This sampling begins during the
4946 calendar year immediately following the end of the monitoring period in which the third
4947 consecutive year of six-month monitoring occurs. The owner of ~~any~~ a waterworks that
4948 maintains the range of values for the water quality parameters reflecting optimal
4949 corrosion control treatment specified by the ~~commissioner~~ department under 12VAC5-
4950 590-405 A 1 f during three consecutive years of annual monitoring under this
4951 subdivision may reduce the frequency with which it collects the number of tap samples
4952 for applicable water quality parameters specified in subdivision C 5 a of this section
4953 from annually to every three years. This sampling begins during the calendar year
4954 immediately following the end of the monitoring period in which the third consecutive
4955 year of six-month monitoring occurs.

4956 c. The owner of a waterworks may reduce the frequency with which tap samples are
4957 collected for applicable water quality parameters specified in subdivision C 5 a of this
4958 section to every three years if the owner demonstrates during two consecutive
4959 monitoring periods that the tap water lead level at the 90th percentile is less than or
4960 equal to the PQL for lead (0.005 mg/L), that the tap water copper level at the 90th
4961 percentile is less than or equal to 0.65 mg/L for copper, and that the owner also has
4962 maintained the range of values for water quality parameters reflecting optimal
4963 corrosion control treatment specified by the ~~commissioner~~ department under 12VAC5-
4964 590-405 A 1 f. Monitoring conducted every three years shall be done no later than
4965 every third calendar year.

4966 d. The owner of a waterworks that conducts sampling annually shall collect these
4967 samples evenly throughout the year so as to reflect seasonal variability.

4968 e. The owner of ~~any a~~ a waterworks subject to the reduced monitoring frequency that
4969 fails to operate at or above the minimum value or within the range of values for the
4970 water quality parameters specified by the ~~commissioner~~ department under 12VAC5-
4971 590-405 A 1 f for more than nine days in any six-month period specified in 12VAC5-
4972 590-405 A 1 g shall resume distribution system tap water sampling in accordance with
4973 the number and frequency requirements in subdivision C 4 of this section. ~~Such an~~
4974 The owner may resume annual monitoring for water quality parameters at the tap at
4975 the reduced number of sites specified in subdivision C 5 of this section after completion
4976 of two subsequent consecutive six-month rounds of monitoring that meet the criteria
4977 of that subdivision or may resume triennial monitoring for water quality parameters at
4978 the tap at the reduced number of sites after demonstration through subsequent rounds
4979 of monitoring that the criteria of either subdivision C 5 b or C 5 c of this section has
4980 been met.

4981 6. Additional monitoring by owners. The results of any monitoring conducted in addition to
4982 the minimum requirements of this section shall be considered by the owner and the
4983 ~~commissioner~~ department in making any determinations under this section or 12VAC5-
4984 590-405 A 1.

4985 D. Monitoring requirements for lead and copper in water supplies (source water).

4986 1. Sample location, collection methods, and number of samples.

4987 a. The owner of a waterworks that fails to meet the lead or copper ~~action level~~ AL on
4988 the basis of tap samples collected in accordance with subsection A of this section shall
4989 collect lead and copper ~~water supply~~ source water samples in accordance with the

4990 following requirements regarding sample location, number of samples, and collection
4991 methods:

4992 (1) The owner of a waterworks served by groundwater sources shall ~~take~~collect a
4993 minimum of one sample at every entry point to the distribution system ~~that is~~
4994 ~~representative of each well after treatment (hereafter called a sampling point)~~. The
4995 owner shall ~~take~~collect one sample at the same sampling point unless conditions
4996 make another sampling point more representative of each source water or water
4997 treatment plant.

4998 (2) The owner of a waterworks served by surface water sources shall ~~take~~collect a
4999 minimum of one sample at every entry point to the distribution system ~~after any~~
5000 ~~application of treatment or in the distribution system at a point that is representative of~~
5001 ~~each source after treatment (hereafter called a sampling point)~~. The owner shall ~~take~~
5002 collect each sample at the same sampling point unless conditions make another
5003 sampling point more representative of each source water or water treatment plant.
5004 Note that for the purpose of this subdivision, a waterworks served by a surface water
5005 source includes waterworks served by a combination of surface water and ~~ground~~
5006 groundwater sources.

5007 (3) If a waterworks draws water from more than one source waters and the ~~sources~~
5008 source waters are combined before distribution, then the owner shall collect samples
5009 at an entry point to the distribution system during periods of normal operating
5010 conditions (i.e., when water is representative of all ~~sources~~ source waters being used).

5011 (4) The ~~commissioner~~ department may reduce the total number of samples that must
5012 be analyzed by allowing the use of compositing. Compositing of samples shall be done
5013 by certified laboratory personnel. Composite samples from a maximum of five samples
5014 are allowed, provided that if the lead concentration in the composite sample is greater

5015 than or equal to 0.001 mg/L or the copper concentration is greater than or equal to
5016 0.160 mg/L, then either a follow-up sample shall be collected and analyzed within 14
5017 days at each sampling point included in the composite or if duplicates ~~of~~ or sufficient
5018 quantities from the original samples from each sampling point used in the composite
5019 are available, then the owner may use these instead of resampling.

5020 b. Where the results of sampling indicate an exceedance of maximum permissible
5021 ~~water supply~~ source water levels established under 12VAC5-590-405 B 4, the
5022 ~~commissioner~~ department may require that one additional sample be collected as
5023 soon as possible after the initial sample was ~~taken~~ collected (but not to exceed two
5024 weeks) at the same sampling point. If a ~~commissioner required~~ confirmation sample
5025 required by the department is ~~taken~~ collected for lead or copper, then the results of
5026 the initial and confirmation sample shall be averaged in determining compliance with
5027 the ~~commissioner-specified~~ department-specified maximum permissible levels. Any A
5028 sample value below the ~~method detection limit~~ MDL shall be considered to be zero.
5029 Any A value above the ~~method detection limit~~ MDL but below the PQL shall either be
5030 considered as the measured value or be considered one-half the PQL. The PQL for
5031 lead is equal to 0.005 mg/L, and the PQL for copper is equal to 0.050 mg/L.

5032 2. Monitoring frequency after a waterworks exceeds ~~a tap action level~~ AL. The owner of
5033 ~~any a~~ a waterworks ~~which that~~ that exceeds the lead or copper ~~action level~~ AL at the tap shall
5034 collect one ~~water supply~~ source water sample from each entry point to the distribution
5035 system no later than six months after the end of the monitoring period during which the
5036 lead or copper ~~action level~~ AL was exceeded. For monitoring periods that are annual or
5037 less frequent, the end of the monitoring period is September 30 of the calendar year in
5038 which the sampling occurs, or if the ~~commissioner~~ department has established an
5039 alternate monitoring period, the last day of that period.

5040 3. Monitoring frequency after installation of ~~water supply~~ source water treatment. The
5041 owner of ~~any a~~ waterworks that installs ~~water supply~~ source water treatment pursuant to
5042 12VAC5-590-405 B 1 c shall collect an additional source water ~~supply~~ sample from each
5043 entry point to the distribution system during two consecutive six-month monitoring periods
5044 by the deadline specified in 12VAC5-590-405 B 1 d.

5045 4. Monitoring frequency after the ~~commissioner~~ department specifies maximum
5046 permissible ~~water supply~~ source water lead and copper levels or determines that ~~water~~
5047 ~~supply~~ source water treatment is not needed.

5048 a. ~~An~~ The owner shall monitor at the frequency specified below in cases where the
5049 ~~commissioner~~ department specifies maximum permissible ~~water supply~~ source water
5050 lead and copper levels under 12VAC5-590-405 B 1 e or determines that the owner is
5051 not required to install ~~water supply~~ source water treatment under 12VAC5-590-405 B
5052 2 b.

5053 (1) The owner of a waterworks using only groundwater shall collect samples once
5054 during the three-year compliance period in effect when the applicable ~~commissioner~~
5055 department determination under subdivision D 4 a of this section is made. ~~Owners of~~
5056 ~~such these waterworks~~ The owner shall collect samples once during each subsequent
5057 compliance period. Triennial samples shall be collected every third calendar year.

5058 (2) The owner of a waterworks using surface water ~~(or a combination of surface and~~
5059 ~~groundwater)~~ (or a combination of surface water and groundwater sources) shall
5060 collect samples once during each year, the first annual monitoring period to begin
5061 during the year in which the applicable ~~commissioner~~ department determination is
5062 made under subdivision D 4 a of this section.

5063 b. ~~An~~ The owner is not required to conduct ~~water supply~~ source water sampling for
5064 lead or copper if the waterworks meets the ~~action level~~ AL for the specific contaminant
5065 in tap water samples during the entire ~~water supply~~ source water sampling period
5066 applicable to the waterworks under subdivision D 4 a (1) or D 4 a (2) of this section.

5067 5. Reduced monitoring frequency.

5068 a. The owner of a waterworks using only groundwater may reduce the monitoring
5069 frequency for lead and copper in ~~water supplies~~ source waters to once during each
5070 nine-year compliance cycle provided that the samples are collected no later than every
5071 ninth calendar year and if the owner meets one of the following criteria:

5072 (1) The owner demonstrates that the finished ~~drinking~~ water entering the distribution
5073 system has been maintained below the maximum permissible lead and copper
5074 concentrations specified by the ~~commissioner~~ department under 12VAC5-590-405 B
5075 1 e during at least three consecutive compliance periods under subdivision D 4 a of
5076 this section; or

5077 (2) The ~~commissioner~~ department has determined that ~~water supply~~ source water
5078 treatment is not needed and the owner demonstrates that, during the last three
5079 consecutive compliance periods in which sampling was conducted under subdivision
5080 D 4 a of this section, the concentration of lead in the ~~water supply~~ source water was
5081 less than or equal to 0.005 mg/L and the concentration of copper in the ~~water supply~~
5082 source water was less than or equal to 0.65 mg/L.

5083 b. The owner of a waterworks using surface water (~~or a combination of surface and~~
5084 ~~ground waters~~) (or a combination of surface water and groundwater sources) may
5085 reduce the monitoring frequency for lead and copper in ~~water supplies~~ source waters
5086 to once during each nine-year compliance cycle provided that the samples are

5087 collected no later than every ninth calendar year and if the owner meets one of the
5088 following criteria:

5089 (1) The owner demonstrates that finished ~~drinking~~ water entering the distribution
5090 system has been maintained below the maximum permissible lead and copper
5091 concentrations specified by the ~~commissioner~~ department under 12VAC5-590-405 B
5092 1 e for at least three consecutive years; or

5093 (2) The ~~commissioner~~ department has determined that ~~water supply~~ source water
5094 treatment is not needed and the owner demonstrates that, during the last three
5095 consecutive years, the concentration of lead in the ~~water supply~~ source water was less
5096 than or equal to 0.005 mg/L and the concentration of copper in the ~~water supply~~ source
5097 water was less than or equal to 0.65 mg/L.

5098 c. ~~Owners~~ The owner of a waterworks that uses a new ~~water supply~~ source water is
5099 not eligible for reduced monitoring for lead or copper until concentrations in samples
5100 collected from the new ~~supply~~ source water during three consecutive monitoring
5101 periods are below the maximum permissible lead and copper concentrations specified
5102 in 12VAC5-590-405 B 1 e.

5103 **12VAC5-590-376. Surface water and GUDI sources treatment monitoring.**

5104 A. The owner of a waterworks that uses either a surface water source or a GUDI source or
5105 both and provides filtration treatment shall monitor in accordance with this section.

5106 B. Turbidity measurements shall be performed on representative samples of the filtered water
5107 every four hours (or more frequently) that the waterworks serves water to the public. The owner
5108 may substitute continuous turbidity monitoring for grab sample monitoring if he validates the
5109 continuous measurement for accuracy on a regular basis using a protocol approved by the
5110 department. For a waterworks using slow sand filtration or filtration treatment other than

5111 conventional treatment, direct filtration, or diatomaceous earth filtration, the department may
5112 reduce the sampling frequency to once per day if the department determines that less frequent
5113 monitoring is sufficient to indicate effective filtration performance. For a waterworks serving 500
5114 or fewer persons, the department may reduce the turbidity sampling frequency to once per day,
5115 regardless of the type of filtration treatment used, if the department determines that less frequent
5116 monitoring is sufficient to indicate effective filtration performance.

5117 1. The owner of a waterworks supplied by either a surface water source or a GUDI source
5118 or both using conventional filtration treatment or direct filtration shall conduct continuous
5119 monitoring of turbidity for each individual filter. The turbidimeter shall be calibrated using
5120 the procedure specified by the turbidimeter manufacturer. The owner shall record the
5121 results of individual filter turbidity monitoring a minimum of every 15 minutes.

5122 2. If there is a failure in the continuous turbidity monitoring equipment, then the owner shall
5123 conduct grab sampling every four hours instead of continuous monitoring but for no more
5124 than five working days (for a waterworks serving 10,000 or more persons) or 14 days (for
5125 a waterworks serving less than 10,000 persons) following the failure of the equipment.

5126 3. If a waterworks serving less than 10,000 persons consists of two or fewer filters,
5127 continuous monitoring of the CFE may be used instead of individual filter monitoring.

5128 C. The residual disinfectant concentration of the water entering the distribution system shall
5129 be monitored continuously, and the lowest and highest values shall be recorded each day. If there
5130 is a failure in the continuous monitoring equipment, then grab sampling every four hours shall be
5131 conducted instead of continuous monitoring, but for no more than five working days following the
5132 failure of the equipment. The owner of a waterworks serving 3,300 or fewer persons may collect
5133 grab samples instead of continuous monitoring on an ongoing basis at the frequencies prescribed
5134 in Table 376.1.

- 5135 1. The day's samples cannot be collected at the same time.
- 5136 2. The sampling intervals are subject to department's evaluation and approval.
- 5137 3. If at any time the residual disinfectant concentration falls below 0.2 mg/L in a waterworks
- 5138 using grab sampling instead of continuous monitoring, then the owner shall collect a grab sample
- 5139 every four hours until the residual disinfectant concentration is equal to or greater than 0.2 mg/L.

Table 376.1.
Grab Sample Monitoring Frequency

| <u>WATERWORKS SIZE BY POPULATION</u> | <u>SAMPLES/DAY</u> |
|--------------------------------------|--------------------|
| <u>500 or less</u> | <u>1</u> |
| <u>501 - 1,000</u> | <u>2</u> |
| <u>1,000 - 2,500</u> | <u>3</u> |
| <u>2,501 - 3,300</u> | <u>4</u> |

5140

5141 D. The residual disinfectant concentration shall be measured at least at the same points in

5142 the distribution system and at the same time as total coliform bacteria are sampled, as specified

5143 in 12VAC5-590-370 A and 12VAC5-590-380 D, except that the department may allow the owner

5144 of a waterworks that uses a groundwater source along with either a surface water source or a

5145 GUDI source or both to collect residual disinfectant samples at points other than the total coliform

5146 sampling points if the department determines that these points are more representative of treated

5147 (disinfected) water quality within the distribution system. Heterotrophic bacteria, measured as

5148 HPC as specified in 12VAC5-590-395 A 2 a (3), may be measured instead of residual disinfectant

5149 concentration.

5150 E. The following information on the samples collected in the distribution system in conjunction

5151 with total coliform monitoring pursuant to 12VAC5-590-395 A 2 shall be reported monthly to the

5152 department by the owner:

- 5153 1. Number of instances where the residual disinfectant concentration is measured;

5154 2. Number of instances where the residual disinfectant concentration is not measured but
5155 HPC is measured;

5156 3. Number of instances where the residual disinfectant concentration is measured but not
5157 detected and no HPC is measured;

5158 4. Number of instances where no residual disinfectant concentration is detected and
5159 where the HPC is greater than 500/mL;

5160 5. Number of instances where the residual disinfectant concentration is not measured and
5161 HPC is greater than 500/mL; and

5162 6. For the current and previous month the waterworks serves water to the public, the value
5163 of "V," in percent, in the following formula:

5164
$$V = [(c + d + e) / (a + b)] \times 100$$

5165 where

5166 a = the value in subdivision E 1 of this section;

5167 b = the value in subdivision E 2 of this section;

5168 c = the value in subdivision E 3 of this section;

5169 d = the value in subdivision E 4 of this section;

5170 e = the value in subdivision E 5 of this section.

5171 **12VAC5-590-377. Physical constituent monitoring.**

5172 A. Color, odor, pH, and total dissolved solids. Monitoring to determine compliance with the
5173 SMCLs for these constituents specified in Table 340.3 shall be conducted as follows:

5174 1. The owner shall collect one sample at each groundwater source entry point during each
5175 compliance period.

5176 2. The owner shall collect one sample annually at each surface water source entry point,
5177 in whole or in part.

5178 B. Onsite daily turbidity measurements may be required to be performed on representative
5179 samples collected at each entry point for groundwater sources not required to filter, to determine
5180 compliance set forth in 12VAC5-590-379 B. The turbidity monitoring requirements for a
5181 waterworks required to filter are specified in 12VAC5-590-376 B.

5182 **12VAC5-590-378. Radiological monitoring.**

5183 A. The location of sampling points, the radionuclides measured in community waterworks, the
5184 frequency, and the timing of sampling within each compliance period shall be established or
5185 approved by the department. The department may increase required monitoring where necessary
5186 to detect variations within the waterworks. Failure to comply with the sampling schedules in this
5187 section will require public notification pursuant to 12VAC5-590-540 A 3.

5188 B. The owner of a community waterworks shall conduct monitoring to determine compliance
5189 with the PMCLs listed in Table 340.4 and 12VAC5-590-388 in accordance with this section.

5190 1. Monitoring requirements for gross alpha particle activity, radium-226, radium-228, and
5191 uranium.

5192 a. The owner shall conduct initial monitoring to determine compliance with the PMCLs
5193 listed in Table 340.4 for gross alpha particle activity, radium-226, radium-228, and
5194 uranium. For the purposes of monitoring for gross alpha particle activity, radium-226,
5195 radium-228, uranium, and beta particle and photon radioactivity in drinking water,
5196 "detection limit" is defined as specified in Table 378.1.

5197 (1) Applicability and sampling location for an existing community waterworks or its
5198 sources. The owner using groundwater, surface water, or both groundwater and
5199 surface water shall sample at every entry point to the distribution system that is

5200 representative of all sources being used under normal operating conditions. The owner
5201 shall collect each sample at the same entry point unless conditions make another
5202 sampling point more representative of each source.

5203 (2) Applicability and sampling location for a new community waterworks or its sources.
5204 A new community waterworks or a community waterworks that uses a new source
5205 water shall begin to conduct initial monitoring for the new source water within the first
5206 quarter after initiating use. The owner shall conduct more frequent monitoring when
5207 directed by the department in the event of possible contamination or when changes in
5208 the distribution system or treatment processes occur that may increase the
5209 concentration of radioactivity in the finished water.

5210 b. Initial monitoring: The owner shall conduct initial monitoring for gross alpha particle
5211 activity, radium-226, radium-228, and uranium as follows:

5212 (1) The owner shall collect four consecutive quarterly samples at all entry points.

5213 (2) For gross alpha particle activity, uranium, radium-226, and radium-228 monitoring,
5214 the department may waive the final two quarters of initial monitoring for an entry point
5215 if the results of the samples from the previous two quarters are below the detection
5216 limit as defined by and as specified in Table 378.1.

5217 (3) If the average of the initial monitoring results for an entry point is above the PMCL,
5218 then the owner shall collect and analyze quarterly samples at that entry point until the
5219 owner has results from four consecutive quarters that are at or below the PMCL,
5220 unless the owner enters into another schedule as part of a formal compliance
5221 agreement with the department.

5222 c. Reduced monitoring: The department may allow the owner to reduce the future
5223 frequency of monitoring from once every three years to once every six or nine years
5224 at each entry point, based on the following criteria:

5225 (1) If the average of the initial monitoring results for each contaminant (i.e., gross alpha
5226 particle activity, uranium, radium-226, or radium-228) is below the detection limit as
5227 specified in Table 378.1, then the owner shall collect and analyze for that contaminant
5228 using at least one sample at that entry point every nine years.

5229 (2) For gross alpha particle activity, combined radium, and uranium, if the average of
5230 the initial monitoring results for each contaminant is at or above the detection limit as
5231 specified in Table 378.1, but at or below 1/2 of the PMCL, then the owner shall collect
5232 and analyze for that contaminant using at least one sample at that entry point every
5233 six years.

5234 (3) For gross alpha particle activity, combined radium, and uranium, if the average of
5235 the initial monitoring results for each contaminant is above 1/2 the PMCL but at or
5236 below the PMCL, then the owner shall collect and analyze at least one sample at that
5237 entry point every three years.

5238 (4) The owner shall use the samples collected during the reduced monitoring period
5239 to determine the monitoring frequency for subsequent monitoring periods (e.g., if a
5240 waterworks' entry point is on a nine-year monitoring period, and the sample result is
5241 above 1/2 the PMCL, then the next monitoring period for that entry point is three
5242 years).

5243 (5) If the owner has a monitoring result that exceeds the PMCL while on reduced
5244 monitoring, then he shall collect and analyze quarterly samples at that entry point until
5245 the results from four consecutive quarters are below the PMCL, unless the waterworks

5246 enters into another schedule as part of a formal compliance agreement with the
5247 department.

5248 d. Compositing: To fulfill quarterly monitoring requirements for gross alpha particle
5249 activity, radium-226, radium-228, or uranium, the owner may composite up to four
5250 consecutive quarterly samples from a single entry point if analysis is done within a
5251 year of the first sample. The department will treat analytical results from the
5252 composited sample as the average analytical result to determine compliance with the
5253 PMCLs and the future monitoring frequency. If the analytical result from the
5254 composited sample is greater than 1/2 the PMCL, then the department may direct the
5255 owner to collect additional quarterly samples before allowing the owner to sample
5256 under a reduced monitoring schedule.

5257 e. A gross alpha particle activity measurement may be substituted for the required
5258 radium-226 measurement provided that the measured gross alpha particle activity
5259 does not exceed 5 pCi/L. A gross alpha particle activity measurement may be
5260 substituted for the required uranium measurement provided that the measured gross
5261 alpha particle activity does not exceed 15 pCi/L. The gross alpha measurement shall
5262 have a confidence interval of 95% (1.65 σ , where σ is the standard deviation of the net
5263 counting rate of the sample) for radium-226 and uranium. When an owner uses a gross
5264 alpha particle activity measurement instead of a radium-226 or uranium measurement,
5265 the gross alpha particle activity analytical result will be used to determine the future
5266 monitoring frequency for radium-226 or uranium. If the gross alpha particle activity
5267 result is less than the detection limit as specified in Table 378.1, then 1/2 the detection
5268 limit will be used to determine compliance and the future monitoring frequency.

5269 2. Monitoring requirements for beta particle and photon radioactivity. To determine
5270 compliance with the PMCL in Table 340.4 for beta particle and photon radioactivity, an
5271 owner shall monitor at a frequency as follows:

5272 a. The owner (~~using surface or groundwater~~) (using surface water or groundwater
5273 sources) designated by the department as vulnerable shall sample for beta particle
5274 and photon radioactivity. The owner shall collect quarterly samples for beta emitters
5275 and annual samples for tritium and strontium-90 at each entry point to the distribution
5276 system, beginning within one quarter after being notified by the department. A
5277 waterworks already designated by the department shall continue to sample until the
5278 department evaluates and either reaffirms or removes the designation.

5279 (1) If the gross beta particle activity minus the naturally occurring potassium-40 beta
5280 particle activity at an entry point has a RAA (computed quarterly) less than or equal to
5281 50 pCi/L (screening level), then the department may reduce the frequency of
5282 monitoring at that entry point to once every three years. The owner shall collect all
5283 samples required in subdivision B 2 a of this section during the reduced monitoring
5284 period.

5285 (2) For a waterworks in the vicinity of a nuclear facility, the department may allow the
5286 owner to utilize environmental surveillance data collected by the nuclear facility instead
5287 of monitoring at the waterworks' entry point or points, where the department
5288 determines the data is applicable to a particular waterworks. In the event that there is
5289 a release from a nuclear facility, the owner who is using surveillance data shall begin
5290 monitoring at the waterworks' entry point or points in accordance with subdivision B 2
5291 a of this section.

5292 b. The owner (using either a surface water or a groundwater source or both)
5293 designated by the department as utilizing waters contaminated by effluents from

5294 nuclear facilities shall sample for beta particle and photon radioactivity. The owner
5295 shall collect quarterly samples for beta emitters and iodine-131 and annual samples
5296 for tritium and strontium-90 at each entry point to the distribution system, beginning
5297 within one quarter after being notified by the department. The owner of a waterworks
5298 already designated by the department as using waters contaminated by effluents from
5299 nuclear facilities shall continue to sample until the department evaluates and either
5300 reaffirms or removes the designation.

5301 (1) Quarterly monitoring for gross beta particle activity shall be based on the analysis
5302 of monthly samples or the analysis of a composite of three monthly samples. The
5303 former procedure is recommended.

5304 (2) For iodine-131, a composite of five consecutive daily samples shall be analyzed
5305 once each quarter. As directed by the department, more frequent monitoring shall be
5306 conducted when iodine-131 is identified in the finished water.

5307 (3) Annual monitoring for strontium-90 and tritium shall be conducted by means of the
5308 analysis of a composite of four consecutive quarterly samples or analysis of four
5309 quarterly samples. The latter procedure is recommended.

5310 (4) If the gross beta particle activity minus the naturally occurring potassium-40 beta
5311 particle activity at a sampling point has a RAA (computed quarterly) less than or equal
5312 to 15 pCi/L (screening level), then the department may reduce the frequency of
5313 monitoring at that sampling point to every three years. The owner shall collect all
5314 samples required in subdivision B 2 b of this section during the reduced monitoring
5315 period.

5316 (5) For a waterworks in the vicinity of a nuclear facility, the department may allow the
5317 owner to utilize environmental surveillance data collected by the nuclear facility instead

5318 of the monitoring at the waterworks' entry point or points, where the department
5319 determines the data is applicable to a particular waterworks. In the event that there is
5320 a release from a nuclear facility, the owner who is using surveillance data shall begin
5321 monitoring at the waterworks' entry point or points in accordance with subdivision B 2
5322 b of this section.

5323 c. The owner of a waterworks designated by the department to monitor for beta particle
5324 and photon radioactivity cannot apply to the department for a waiver from the
5325 monitoring frequencies specified in subdivision B 2 a or B 2 b of this section.

5326 d. The owner may analyze for naturally occurring potassium-40 beta particle activity
5327 from the same or equivalent sample used for the gross beta particle activity analysis.
5328 The owner is allowed to subtract the potassium-40 beta particle activity value from the
5329 total gross beta particle activity value to determine if the screening level is exceeded.
5330 The potassium-40 beta particle activity shall be calculated by multiplying elemental
5331 potassium concentrations (in mg/L) by a factor of 0.82.

5332 e. If the gross beta particle activity minus the naturally occurring potassium-40 beta
5333 particle activity exceeds the appropriate screening level, then an analysis of the
5334 sample shall be performed to identify the major radioactive constituents present in the
5335 sample and the appropriate doses shall be calculated and summed to determine
5336 compliance with the PMCL for beta particles and photon radioactivity. Doses shall also
5337 be calculated and combined for measured levels of tritium and strontium to determine
5338 compliance.

5339 f. The owner shall monitor monthly at the entry point or points that exceed the PMCLs
5340 listed in Table 340.4 beginning the month after the exceedance occurs. The owner
5341 shall continue monthly monitoring until the waterworks has established, by a rolling
5342 average of three monthly samples, that the PMCL is being met. The owner who

5343 establishes that the PMCL is being met shall return to quarterly monitoring until the
5344 requirements set forth in subdivision B 2 a (1) or B 2 b (4) of this section are met.

5345 3. General monitoring requirements for radionuclides.

5346 a. The department may require more frequent monitoring than specified in
5347 subdivisions B 1 and B 2 of this section, or may require confirmation samples at the
5348 department's discretion. The results of the initial and confirmation samples shall be
5349 averaged for use in compliance determinations.

5350 b. The owner shall monitor at the time designated by the department during each
5351 compliance period.

5352 c. The department has the discretion to delete results of obvious sampling or analytic
5353 errors.

5354 d. Table 378.1 provides the minimum detection limits for radiological analyses.

TABLE 378.1.
Minimum Detection Limits for Radiological Analyses

| <u>CONTAMINANT</u> | <u>DETECTION LIMIT</u> <u>(pCi/L unless otherwise noted)</u> |
|---------------------|---|
| <u>Gross alpha</u> | <u>3</u> |
| <u>Gross beta</u> | <u>4</u> |
| <u>Cesium-134</u> | <u>10</u> |
| <u>Iodine-131</u> | <u>1</u> |
| <u>Radium-226</u> | <u>1</u> |
| <u>Radium 228</u> | <u>1</u> |
| <u>Strontium-89</u> | <u>10</u> |
| <u>Strontium-90</u> | <u>2</u> |
| <u>Tritium</u> | <u>1,000</u> |
| <u>Uranium</u> | <u>1 (µg/L)</u> |

5355 **12VAC5-590-379. Groundwater waterworks system monitoring.**

5356 A. General monitoring requirements.

5357 1. ~~Owners~~ The owner of a groundwater ~~waterworks~~ system, including consecutive and
5358 wholesale waterworks, shall conduct monitoring in accordance with this section, except
5359 that requirements do not apply to waterworks that combine all of their groundwater
5360 sources with surface water sources or with ~~groundwater under the direct influence of~~
5361 ~~surface water~~ GUDI sources ~~prior to~~ before treatment in accordance with ~~12VAC5-590-~~
5362 ~~420~~ 12VAC5-590-395.

5363 2. Source water monitoring ~~for owners of~~ by the owner of a groundwater ~~waterworks~~
5364 system that ~~do~~ does not provide 4-log treatment of viruses for their groundwater sources
5365 before or at the first customer ~~are~~ is described in subsection B of this section.

5366 3. ~~Owners of~~ The owner of a groundwater ~~waterworks~~ system that ~~provide~~ provides at
5367 least 4-log treatment of viruses before or at the first customer ~~are~~ is required to conduct
5368 compliance monitoring in accordance with 12VAC5-590-421 C.

5369 4. ~~Owners~~ The owner of a groundwater ~~waterworks~~ system that ~~have~~ has confirmed fecal
5370 E. coli contamination, as determined by source water monitoring conducted under
5371 subsection B of this section or have been notified of a significant deficiency as described
5372 in 12VAC5-590-350 D₁, shall implement one or more of the corrective actions outlined in
5373 12VAC5-590-421 A 1, as prescribed by the ~~commissioner~~ department.

5374 5. ~~Owners~~ The owner of a groundwater ~~waterworks~~ system that ~~do~~ does not provide 4-log
5375 treatment of viruses before or at the first customer₁, and ~~are~~ is not performing compliance
5376 monitoring₁, shall provide a triggered source water monitoring ~~plans~~ plan to the
5377 ~~commissioner~~ department.

5378 6. Any source water sample collected in accordance with this section shall be analyzed
5379 for E. coli using one of the analytical methods in 40 CFR 141.402(c).

5380 B. Groundwater source microbial monitoring.

5381 1. Triggered source water monitoring.

5382 a. General requirements. ~~Groundwater waterworks owners~~ The groundwater system

5383 owner shall conduct triggered source water monitoring if both the conditions identified

5384 in subdivisions B 1 a (1) and B 1 a (2) of this section exist.

5385 (1) The groundwater ~~waterworks~~ system owner does not provide at least 4-log

5386 treatment of viruses before or at the first customer for each groundwater source; and

5387 (2) The groundwater ~~waterworks~~ system owner is notified that a sample collected

5388 under 12VAC5-590-370 A is total ~~coliform-positive~~ coliform positive and the sample is

5389 not invalidated under 12VAC5-590-380 E.

5390 b. Sampling requirements. ~~Groundwater waterworks owners~~ The groundwater system

5391 owner shall collect, within 24 hours of notification of the total coliform-positive sample,

5392 one ~~groundwater~~ source water sample from each groundwater source in use at the

5393 time the total coliform-positive sample was collected under 12VAC5-590-370 A, except

5394 as provided in this subdivision ~~B-4 b~~.

5395 (1) The ~~commissioner~~ department may extend the 24-hour time limit on a case-by-

5396 case basis if the owner cannot collect the ~~groundwater~~ source water sample within 24

5397 hours due to circumstances beyond his control. In the case of an extension, the

5398 ~~commissioner~~ department shall specify how much time the owner has to collect the

5399 sample.

5400 (2) If approved by the ~~commissioner~~ department, the ~~owners~~ owner of a waterworks

5401 with more than one groundwater source may meet the requirements of this subdivision

5402 ~~B-4~~ by sampling a representative groundwater source or sources. ~~Owners~~ The owner

5403 shall submit, for the ~~commissioner's~~ department's approval, a triggered source water

5404 monitoring plan that identifies one or more groundwater sources that are

5405 representative of each monitoring site in the waterworks' bacteriological sample siting
5406 report or that identifies groundwater sources that are ~~hydro-geologically~~
5407 hydrogeologically similar and clearly identifies which sources will be sampled.

5408 (3) A groundwater system serving 1,000 people or fewer may use a triggered source
5409 water sample collected from a groundwater source to meet both the requirements of
5410 12VAC5-590-380 and to satisfy the monitoring requirements of this subdivision ~~B-1~~ for
5411 a groundwater source.

5412 c. Additional requirements.

5413 (1) If an E. coli-positive triggered source water sample collected under this subdivision
5414 ~~B-1~~ is not invalidated under subdivision B 2 of this section, then the groundwater
5415 ~~waterworks~~ system owner shall provide public notification and collect five additional
5416 source water samples from the same source within 24 hours of being notified of the E.
5417 coli-positive sample.

5418 (a) If the E. coli-positive triggered source water sample is also used as a repeat
5419 sample, then an E. coli PMCL violation is incurred under 12VAC5-590-380 B 1 a.

5420 (b) If a waterworks ~~takes~~ collects more than one repeat sample at the monitoring
5421 location required for triggered source water monitoring, then the number of additional
5422 source water samples required under subdivision B 1 c (1) of this section may be
5423 reduced by the number of repeat samples ~~taken~~ collected at that location that were
5424 not E. coli positive.

5425 (2) If any of the five additional samples are E. coli positive, the groundwater system
5426 owner shall comply with the treatment technique requirements of 12VAC5-590-421.

5427 d. Consecutive and wholesale waterworks.

5428 (1) A consecutive groundwater ~~waterworks~~ system owner ~~that who~~ has a total coliform-
5429 positive sample collected in accordance with 12VAC5-590-370 A shall notify the
5430 wholesale waterworks owner and the ~~district engineer~~ department within 24 hours of
5431 being notified of the total coliform-positive sample.

5432 (2) A The wholesale groundwater ~~waterworks~~ system owner shall comply with the
5433 following:

5434 (a) A The wholesale groundwater ~~waterworks~~ system owner ~~that who~~ receives notice
5435 from a consecutive waterworks it serves that a sample collected in accordance with
5436 12VAC5-590-370 A is total ~~coliform-positive~~ coliform positive shall, within 24 hours of
5437 being notified, collect a sample from its groundwater ~~source(s)~~ source or sources as
5438 described in subdivision B 1 of this section.

5439 (b) If the sample collected under this subdivision ~~B-4~~ is E. coli-positive, then the
5440 wholesale groundwater system owner shall within 24 hours notify all consecutive
5441 waterworks served by that groundwater source of the E. coli coli-positive source water
5442 ~~positive~~ sample as described in 12VAC5-590-540 and shall meet the requirements of
5443 subdivision B 1 c of this section.

5444 e. Exception to the triggered source water monitoring requirements. A groundwater
5445 system owner is not required to comply with the source water monitoring requirements
5446 of this subdivision ~~B-4~~ if the ~~commissioner~~ department determines, and documents in
5447 writing, that:

5448 (1) The total coliform-positive sample collected in accordance with 12VAC5-590-370
5449 A is invalidated under 12VAC5-590-380 E.

5450 (2) The total coliform-positive sample collected in accordance with 12VAC5-590-370
5451 A is caused by a distribution system deficiency (sanitary defect).

5452 (3) The total coliform-positive sample collected in accordance with 12VAC5-590-370
5453 A was caused by distribution system conditions that will cause total coliform-positive
5454 samples.

5455 2. Invalidation of an E. coli-positive groundwater source sample.

5456 a. A The groundwater ~~waterworks~~ system owner may obtain the ~~commissioner's~~
5457 department's invalidation of an E. coli-positive groundwater source sample collected
5458 under subdivision B 1 of this section only under the conditions specified in subdivisions
5459 B 2 a (1) and B 2 a (2) of this section:

5460 (1) The groundwater ~~waterworks~~ system owner provides the ~~commissioner~~
5461 department with written notice from the laboratory that improper sample analysis
5462 occurred; or

5463 (2) The ~~commissioner~~ department determines and documents in writing that there is
5464 substantial evidence that the E. coli-positive groundwater source sample is not related
5465 to source water quality.

5466 b. If the ~~commissioner~~ department invalidates an E. ~~coli-positive~~ coli-positive
5467 groundwater source sample, then the groundwater system owner shall collect another
5468 source water sample under subdivision B 1 of this section within 24 hours of being
5469 notified by the ~~commissioner~~ department of the invalidation decision and have it
5470 analyzed for E. coli.

5471 3. Sampling location. All groundwater source samples required under subdivision B 1 of
5472 this section shall be collected at a location ~~prior to~~ before any treatment of the groundwater
5473 source unless otherwise approved by the ~~commissioner~~ department.

5474 4. Public notification. The owner of a groundwater ~~waterworks~~ system with a source water
5475 sample collected under this subsection that is E. coli positive and that is not invalidated

5476 under subdivision B 2 of this section, including consecutive waterworks served by the
5477 groundwater source, shall conduct public notification as required in 12VAC5-590-540 A 1.
5478 5. Monitoring violations. Failure to meet the monitoring requirements of subdivision B 1 of
5479 this section is a violation and requires the groundwater ~~waterworks~~ system owner to
5480 provide public notification as required in 12VAC5-590-540 A 3.

5481 C. Monitoring requirements for source water.

5482 1. The owner of a groundwater source utilizing chlorine disinfection or any other treatment
5483 or chemical addition that may alter or affect the bacteriological quality of the source water
5484 shall collect source water samples for bacteriological analysis in accordance with this
5485 section.

5486 2. All bacteriological samples under this section shall be collected from the source water
5487 before any treatment or chemical addition.

5488 a. The owner shall provide a suitable source water sample tap at each groundwater
5489 source.

5490 b. If conditions indicate that it is not possible to install a source water sample tap, then
5491 an alternate sample location acceptable to the department may be utilized for this
5492 monitoring.

5493 3. All samples shall be analyzed by a test method that will yield a Most Probable Number
5494 (MPN) result for both total coliforms and E. coli.

5495 4. Number of samples.

5496 a. The number of routine source water samples to be collected and the frequency of
5497 sampling shall be determined by the department. The department will notify the owner
5498 of the source water sampling requirements.

5499 b. As a minimum, the owner shall collect source water samples in accordance with
 5500 Table 379.1.

TABLE 379.1.
Monitoring Requirements for Source Water Samples.

| <u>SOURCE TYPE</u> | <u>MINIMUM ROUTINE SOURCE WATER MONITORING FREQUENCY</u> | <u>PARAMETERS</u> |
|--|--|---|
| <u>Well located in non-karst geology</u> | <u>One sample per year</u> | <u>Total coliforms MPN and E coli MPN</u> |
| <u>Well located in karst geology</u> | <u>One sample per calendar quarter</u> | <u>Total coliforms MPN and E coli MPN</u> |
| <u>Spring</u> | <u>One sample per month</u> | <u>Total coliforms MPN and E coli MPN</u> |

5501 c. When a single sample result from a groundwater source that requires a routine
 5502 source water monitoring frequency of less than monthly indicates total coliforms in
 5503 excess of 50 colonies/100 mL or the presence of E. coli, the owner shall collect one
 5504 confirmation sample within seven calendar days after notification of the results.

5505 d. The department may require that additional source water samples be collected and
 5506 will establish the specific number of samples and the monitoring frequency.

5507 **12VAC5-590-380. Bacteriological quality compliance.**

5508 A. Analytical methodology.

5509 ~~1. The standard sample volume for the coliform test shall consist of 100 milliliters,~~
 5510 ~~regardless of the analytical method used.~~

5511 ~~2. Owners~~ The owner need needs only to determine the presence or absence of total
 5512 coliforms and E. coli; ~~a determination of total coliform density is not required~~ for routine
 5513 bacteriological monitoring at entry points or distribution system locations.

5514 3. ~~The time from sample collection to initiation of test medium incubation shall not exceed~~
5515 ~~30 hours.~~

5516 4. ~~Owners are encouraged but not required to hold samples below 10°C during transit.~~

5517 5. ~~If water having residual chlorine (measured as free, combined, or total chlorine) is to be~~
5518 ~~analyzed, sufficient sodium thiosulfate ($\text{Na}_2\text{S}_2\text{O}_3$) shall be added to the sample bottle before~~
5519 ~~sterilization to neutralize any residual chlorine in the water sample.~~

5520 B. PMCLs for microbial contaminants.

5521 1. A waterworks is in compliance with the PMCL for E. coli unless any of the conditions
5522 identified in this subdivision occur. A violation may pose an acute risk to public health and
5523 is a Tier 1 condition requiring public notification as described in 12VAC5-590-540 A 1
5524 when:

5525 a. A repeat sample following a total coliform-positive routine sample is E. coli positive;

5526 b. A repeat sample following an E. coli-positive routine sample is total coliform positive;

5527 c. The owner fails to ~~take~~ collect all required repeat samples following an E. coli-
5528 positive routine sample; or

5529 d. The owner fails to test for E. coli when any repeat sample tests positive for total
5530 coliform.

5531 2. Compliance shall be determined with the PMCL for E. coli for each monitoring period
5532 for which monitoring for total coliforms is required.

5533 C. ~~The best available technology~~ BAT, treatment techniques, or other means available for
5534 achieving compliance with the PMCL for E. coli shall be:

5535 1. Protection of wells from contamination by coliforms by appropriate placement, and
5536 construction, and maintenance of the wells;

5537 2. Maintenance of a detectable residual disinfectant residual throughout the distribution
5538 system;

5539 3. Proper maintenance of the distribution system including appropriate pipe replacement
5540 and repair procedures, water main flushing programs, proper operation and maintenance
5541 of storage tanks and reservoirs, continual maintenance of positive water pressure in all
5542 parts of the distribution system, and an approved ~~cross-connection~~ cross-connection
5543 control program;

5544 4. Filtration and disinfection of either a surface water source or surface-influenced
5545 ~~groundwater~~ a GUDI source or both; and

5546 5. Disinfection of groundwater using strong oxidants such as chlorine, chlorine dioxide, or
5547 ozone.

5548 D. A total coliform-positive result is indicative of a breakdown in the protective barriers and
5549 shall be cause for repeat monitoring and special follow-up action to locate and eliminate the cause
5550 of contamination.

5551 1. For each routine sample found to be total coliform positive, the ~~waterworks~~ owner shall
5552 collect a set of three repeat samples within 24 hours of being notified of the positive result.
5553 The ~~commissioner~~ department may extend the 24-hour limit on a case-by-case basis. For
5554 groundwater ~~waterworks~~ systems, the requirements of 12VAC5-590-379 shall also apply,
5555 and all repeat samples must be analyzed for E. coli using one of the analytical methods in
5556 40 CFR 141.402(c).

5557 a. The owner shall collect at least one repeat sample from the sampling tap where the
5558 original total coliform-positive sample was ~~taken~~ collected, and at least one repeat
5559 sample at a tap within five service connections upstream and at least one repeat
5560 sample at a tap within five service connections downstream of the original sampling

5561 site. If a total coliform-positive sample is at the end of the distribution system or one
5562 service connection away from the end of the distribution system, the owner must still
5563 ~~take~~ collect all required repeat samples.

5564 b. The owner shall collect an additional set of repeat samples if one or more repeat
5565 samples in the current set of repeat samples is total coliform positive. The owner shall
5566 collect the additional set of repeat samples within 24 hours of being notified of the
5567 positive results, unless the ~~commissioner~~ department extends the limit as provided in
5568 this section. The owner shall continue to collect additional sets of repeat samples until
5569 either total coliforms are not detected in one complete set of repeat samples or the
5570 owner determines that a coliform treatment technique trigger specified in 12VAC5-
5571 590-392 B has been exceeded as a result of a repeat sample being total coliform
5572 positive and notifies the ~~appropriate ODW field office~~ department. If a trigger identified
5573 in 12VAC5-590-392 B is exceeded as a result of a routine sample being total coliform
5574 positive, ~~then an~~ the owner is required to conduct only one round of repeat monitoring
5575 for each total coliform-positive routine sample.

5576 c. If the owner collects a routine sample before learning the results of the previous
5577 routine sample, and the sample is ~~taken~~ collected within five service connections of
5578 the initial routine sample, then the owner may count the subsequent sample as a
5579 repeat sample when the initial sample results are found to be total coliform positive.

5580 d. If one or more repeat samples ~~taken~~ collected at the monitoring location required
5581 for triggered source water monitoring are E. coli positive, then the ~~waterworks~~ owner
5582 has exceeded the E. coli PMCL and must comply with the groundwater system
5583 treatment technique requirements specified in 12VAC5-590-421.

5584 e. If all repeat samples ~~taken~~ collected at the monitoring location required for triggered
5585 source water monitoring are E. coli negative, and a repeat sample ~~taken~~ collected at

5586 a monitoring location other than the one required for triggered source water monitoring
5587 is E. coli positive, then the ~~waterworks~~ owner has exceeded the E. coli PMCL.
5588 However, the owner is not required to collect five additional source water samples from
5589 the same source within 24 hours of learning the E. coli-positive result.

5590 f. The ~~waterworks~~ owner shall collect all repeat samples on the same day, except the
5591 ~~commissioner~~ department may allow the owner of a waterworks with a single service
5592 connection to collect the required set of repeat samples over a three-day period or to
5593 collect a larger volume repeat sample in one or more sample containers of any size
5594 as long as the total volume collected is at least 300 ml.

5595 g. If a repeat sample ~~taken~~ collected at the monitoring location required for triggered
5596 source water monitoring is E. coli positive, then the ~~waterworks~~ owner has exceeded
5597 the E. coli PMCL and must collect five additional source water samples from the same
5598 source within 24 hours of learning the E. coli-positive result.

5599 2. Results of all routine and repeat samples not invalidated by the ~~commissioner~~
5600 department shall be used to determine compliance with the PMCL for E. coli and whether
5601 a treatment technique trigger specified in 12VAC5-590-392 B has been exceeded.

5602 3. ~~Special-purpose~~ Special-purpose samples, such as those ~~taken~~ collected to determine
5603 whether disinfection practices are sufficient following pipe placement, replacement, or
5604 repair, and samples ~~taken~~ collected before start-up of a seasonal waterworks, shall not be
5605 used to determine compliance. Repeat samples are not considered ~~special-purpose~~
5606 special-purpose samples.

5607 E. A total coliform-positive sample invalidated under this paragraph does not count towards
5608 meeting the minimum monitoring requirements of this section. To invalidate a total coliform-
5609 positive sample under this subsection, the written decision and rationale shall be ~~reviewed~~

5610 ~~evaluated~~, approved, and signed by the ~~commissioner~~ department. The ~~commissioner~~
5611 department shall make this document available to EPA and the public. The written documentation
5612 shall state the specific cause of the total coliform-positive sample and what action the owner has
5613 taken, or will take, to correct this problem. The ~~commissioner~~ department shall not invalidate a
5614 total coliform-positive sample solely on the grounds that all repeat samples are total coliform
5615 negative.

5616 1. The ~~commissioner~~ department may invalidate a total ~~coliform-positive~~ coliform-positive
5617 sample if any of the following conditions are met:

5618 a. The laboratory establishes that improper sample analysis caused the total coliform-
5619 positive result;

5620 b. The ~~commissioner~~ department, on the basis of the results of repeat samples
5621 collected as required by subdivision D 1 of this section, determines that the total
5622 coliform-positive sample resulted from a domestic or other ~~nondistribution~~ non-
5623 distribution system plumbing problem. The ~~commissioner~~ department cannot
5624 invalidate a sample on the basis of repeat sample results unless all repeat ~~sample(s)~~
5625 samples collected at the same tap as the original total coliform-positive sample are
5626 also total coliform positive, and all repeat samples collected at a location other than
5627 the original tap are total coliform negative (~~e.g., the commissioner cannot invalidate a~~
5628 ~~total coliform-positive sample on the basis of repeat samples if all the repeat samples~~
5629 ~~are total coliform negative, or if the waterworks has only one service connection~~) (e.g.,
5630 the department cannot invalidate a total coliform-positive sample on the basis of repeat
5631 samples if all the repeat samples are total coliform negative, or if the waterworks has
5632 only one service connection); or

5633 c. The ~~commissioner~~ department has substantial grounds to believe that a total
5634 coliform-positive result is due to a circumstance or condition that does not reflect water

5635 quality in the distribution system. In this case, the ~~waterworks~~ owner shall still collect
5636 all repeat samples required under subdivision D 1 of this section, and use them to
5637 determine whether a coliform treatment technique trigger in 12VAC5-590-392 B has
5638 been exceeded.

5639 2. A laboratory must invalidate a sample because of sampling interference (i.e., turbid
5640 culture in absence of (i) gas production, or (ii) acid reaction; exhibition of confluent growth;
5641 or production of colonies too numerous to count). The ~~waterworks owners~~ owner shall
5642 collect a replacement sample from the same location within 24 hours, and have it analyzed
5643 for the presence of total coliforms. The ~~waterworks~~ owner must continue to resample
5644 within 24 hours and have the samples analyzed until ~~they obtain~~ a valid result is obtained.
5645 The ~~commissioner~~ department may waive the 24-hour time limit on a case-by-case basis.

5646 F. Escherichia coli (E. coli).

5647 1. If ~~any a~~ a routine, or repeat, sample or replacement sample is total coliform positive, then
5648 the ~~waterworks~~ owner shall analyze ~~that~~ the total coliform-positive culture medium to
5649 determine if E. coli are present. If E. coli are present, then the ~~waterworks~~ owner shall
5650 notify the ~~appropriate ODW field office~~ department by the end of the day when the
5651 ~~waterworks~~ owner is notified of the test result, unless the ~~ODW's field office~~ department is
5652 closed, in which case the ~~appropriate ODW field office~~ department must be notified before
5653 the end of the next business day.

5654 2. The ~~commissioner~~ department has the discretion to allow a ~~waterworks~~ an owner, on a
5655 case-by-case basis, to forgo E. coli testing on a total coliform-positive sample if the owner
5656 assumes that the total coliform-positive sample is E. coli positive. Accordingly, the owner
5657 must notify the ~~appropriate ODW field office~~ department as specified in subdivision F1 of
5658 this subsection and the provisions of subdivision B 1 of this section apply.

5659 G. Groundwater sources.

5660 1. Groundwater sources shall be disinfected in accordance with ~~12VAC5-590-1000~~ when
5661 ~~the total coliform geometric mean of 20 or more raw water samples measured by a method~~
5662 ~~yielding a multiple-portion decimal dilution (MPN) result is greater than three.~~ 12VAC5-
5663 590-421 A 1 d when the results of the source water monitoring samples specified in
5664 12VAC5-590-430 B 2 or 12VAC5-590-840 K 1 a indicate a total coliform concentration
5665 (geometric mean) of the 20 samples to be greater than 3 colonies/100 mL but less than
5666 100 colonies/100mL. The value 1.0 shall be used to represent a ~~negative~~ zero coliform
5667 result in the calculation of the geometric mean.

5668 2. Groundwater sources ~~containing a total coliform geometric mean of 100 or more~~
5669 ~~organisms per 100 milliliters or with more than 10% of these samples exceeding 100~~
5670 ~~organisms per 100 milliliters constitutes unacceptable contamination for disinfection~~
5671 ~~treatment only.~~ source monitoring results conducted in accordance with 12VAC5-590-430
5672 B 2 or 12VAC5-590-840 K 1 a that indicate a total coliform concentration equal to or
5673 greater than 100 colonies/100 ml constitutes contamination that is not treatable by single-
5674 barrier disinfection treatment alone.

5675 3. Groundwater sources shall be disinfected in accordance the requirements of ~~12VAC5-~~
5676 ~~590-1000~~ 12VAC5-590-421 A 1 d when the source water quality contributes to the
5677 waterworks' failure to meet the bacteriological PMCL specified in subsection B of this
5678 section.

5679 4. ~~Groundwater sources shall be disinfected in accordance with 12VAC5-590-421 A 1 d~~
5680 ~~when the results of source development samples specified in 12VAC5-590-840 B 11~~
5681 ~~indicate the presence of E. coli in two or more samples.~~

5682 ~~5. Groundwater sources shall be disinfected in accordance with 12VAC5-590-421 A 1 d~~
5683 ~~when the results of raw water monitoring conducted in accordance with 12VAC5-590-425~~
5684 ~~indicate the presence of E. coli in two or more samples during any running six-month~~
5685 ~~period.~~

5686 4. If the results of the source water monitoring required by 12VAC5-590-379 C or 12VAC5-
5687 590-430 B 2 indicate the presence of E. coli in two or more samples collected during any
5688 running six-month period, then the owner shall:

5689 a. Issue a Tier 1 public notice in accordance with 12VAC5-590-540 A 1.

5690 b. Provide disinfection treatment to achieve a 4-log virus inactivation and removal as
5691 specified in 12VAC5-590-421 A 1 d.

5692 c. Conduct compliance monitoring as specified in 12VAC5-590-421 B and 12VAC5-
5693 590-421 C.

5694 5. If the results of the source water monitoring required in 12VAC5-590-379 C indicate
5695 total coliform concentration in excess of 50 colonies/100 mL in three or more samples
5696 collected during any running six-month period or the presence of E. coli in two or more
5697 samples collected during any running six-month period, then the source water shall be re-
5698 evaluated for GUDI determination in accordance with 12VAC5-590-430.

5699 6. The department may require that any groundwater source be disinfected in accordance
5700 with the requirements of 12VAC5-590-421 A 1 d.

5701 ~~H. Groundwater systems conducting source water monitoring as described in 12VAC5-590-~~
5702 ~~379 shall determine the presence or absence of E. coli. All samples shall be analyzed in~~
5703 ~~accordance with 12VAC5-590-440 by the Division of Consolidated Laboratory Services (DCLS)~~
5704 ~~DCLS or by a laboratory certified by DCLS for drinking water samples analyses.~~

5705 _____

5706 **12VAC5-590-382. Inorganic chemicals compliance.**

5707 A. When the results of sampling for antimony, arsenic, asbestos, barium, beryllium, cadmium,
5708 cyanide (as free cyanide), chromium, fluoride, mercury, nickel, selenium, or thallium exceed the
5709 applicable PMCL, the owner shall collect a confirmation sample, at the same sampling point,
5710 within two weeks of notification of the analytical results of the first sample. The fluoride PMCL
5711 applies only to community waterworks.

5712 1. The results of the initial and confirmation samples shall be averaged to determine
5713 compliance with subsection A of this section. The department has the discretion to delete
5714 results of obvious sampling errors.

5715 2. Compliance with the PMCLs for antimony, arsenic, asbestos, barium, beryllium,
5716 cadmium, cyanide (as free cyanide), chromium, fluoride, mercury, nickel, selenium, and
5717 thallium listed in Table 340.1 shall be determined based on the analytical results obtained
5718 at each sampling point.

5719 a. For the owner who is conducting monitoring more frequently than annually,
5720 compliance with the PMCL for antimony, arsenic, asbestos, barium, beryllium,
5721 cadmium, cyanide (as free cyanide), chromium, fluoride, mercury, nickel, selenium, or
5722 thallium is determined by a RAA at each sampling point. If the average at any sampling
5723 point is greater than the PMCL, then the waterworks is out of compliance. If any single
5724 sample would cause the annual average to be exceeded, then the waterworks is out
5725 of compliance immediately. A sample result below the MDL shall be calculated as zero
5726 for the purpose of determining the annual average. If the owner fails to collect the
5727 required number of samples, compliance (average concentration) shall be based on
5728 the total number of samples collected.

5729 b. For the owner who is monitoring annually, or less frequently, the waterworks is out
5730 of compliance with the PMCL for antimony, arsenic, asbestos, barium, beryllium,
5731 cadmium, cyanide (as free cyanide), chromium, fluoride, mercury, nickel, selenium, or
5732 thallium if the average of the original sample and a confirmation sample of a
5733 contaminant at any sampling point is greater than the PMCL. The owner monitoring
5734 annually or less frequently whose sample results exceeds the PMCL shall begin
5735 quarterly sampling. The owner shall not be considered in violation of the PMCL until
5736 one year of quarterly sampling has been completed and the RAA is exceeded.
5737 However, if the confirmation sample is not collected, the owner is in violation of the
5738 PMCL for antimony, arsenic, asbestos, barium, beryllium, cadmium, cyanide (as free
5739 cyanide), chromium, fluoride, mercury, nickel, selenium, or thallium. If the owner fails
5740 to collect the required number of samples, then compliance (average concentration)
5741 shall be based on the total number of samples collected.

5742 B. Compliance with the PMCLs for nitrate and nitrite shall be determined based on the
5743 analytical results obtained at each sampling point. The waterworks is not out of compliance with
5744 the PMCL if the concentrations of these contaminants are equal to or below the PMCLs. Where
5745 nitrate or nitrite sample results exceed the PMCL, the owner shall collect a confirmation sample,
5746 from the same sampling point that exceeded the PMCL within 24 hours of the owner's receipt of
5747 the analytical results of the first sample. The results of the initial and confirmation sample shall be
5748 averaged to determine compliance. The owner unable to comply with the 24-hour sampling
5749 requirement shall immediately notify the consumers in the area served by the waterworks in
5750 accordance with 12VAC5-590-540 A 1. The owner exercising this option shall collect and analyze
5751 a confirmation sample within two weeks of notification of the analytical results of the first sample.
5752 The department may require more frequent monitoring. The department has the discretion to
5753 delete results of obvious sampling errors.

5754 1. Nitrate nitrogen (NO₃-N) levels not exceeding 20 mg/L may be allowed in a
5755 noncommunity waterworks if the owner:

5756 a. Demonstrates to the satisfaction of the department that this water will not be
5757 available to children under six months of age;

5758 b. Provides continuous posting of the fact that NO₃-N levels exceed 10 mg/L and the
5759 potential health effects of exposure;

5760 c. Notifies health officials annually of NO₃-N levels that exceed 10 mg/L; and

5761 d. The department shall determine that no adverse health effects will result.

5762 2. Nitrite in water poses a significant health hazard. Water with nitrite-nitrogen
5763 concentrations over 1 mg/L should not be used for infant feedings.

5764 C. Compliance with the SMCLs for aluminum, chloride, copper, corrosivity, fluoride, foaming
5765 agents, iron, manganese, silver, sulfate, or zinc shall be determined based on the analytical
5766 results obtained at each sampling point. When the result of a sample exceeds the applicable
5767 SMCL, the owner shall collect a confirmation sample, at the same sampling point, within two
5768 weeks of notification of the analytical results of the first sample. The results of the initial and
5769 confirmation samples shall be averaged to determine compliance. If the average concentration
5770 level of any of these constituents exceeds the SMCL, then the department shall determine
5771 whether treatment for the constituents can be accomplished or more suitable source waters are,
5772 or can be made, available. This determination shall be made as quickly as possible. If either of
5773 these alternatives is feasible, then corrective action shall be promptly implemented by the owner
5774 if deemed necessary by the department. Exceeding the fluoride SMCL requires annual public
5775 notice in accordance with 12VAC5-590-540 G.

5776 _____

5777 **12VAC5-590-383. Organic chemicals compliance.**

5778 A. When the results of sampling indicate positive results for contaminants listed in Table
5779 340.2, the owner shall collect a confirmation sample, at the same sampling point, within two weeks
5780 of notification of the analytical results of the first sample.

5781 B. The results of the initial and confirmation samples shall be averaged to determine the
5782 waterworks' compliance in accordance with subsection C of this section. The department has the
5783 discretion to delete results of obvious sampling errors.

5784 C. Compliance with Table 340.2 shall be determined based on the analytical results obtained
5785 at each sampling point. A sample result below the detection limit shall be calculated as zero for
5786 the purposes of determining the annual average. If the owner fails to collect the required number
5787 of samples, then compliance (average concentration) shall be based on the total number of
5788 samples collected.

5789 1. For the owner who is conducting monitoring more frequently than annually, compliance
5790 is determined by a RAA of all samples collected at each sampling point. If the annual
5791 average of any sampling point is greater than the PMCL, then the waterworks is out of
5792 compliance. If the initial sample or a subsequent sample would cause the annual average
5793 to be exceeded, then the waterworks is out of compliance immediately. A sample result
5794 below the detection limit shall be calculated as zero for purposes of determining the annual
5795 average.

5796 2. If the owner is conducting monitoring annually, or less frequently, then the owner is not
5797 in violation if the average of the initial and confirmation samples is greater than the PMCL
5798 for that contaminant; however, the owner shall begin quarterly sampling. The owner will
5799 not be considered in violation of the PMCL until one year of quarterly sampling has been
5800 completed and the RAA is exceeded. If any sample will cause the RAA to exceed the

5801 PMCL at any sampling point, then the waterworks is immediately out of compliance with
5802 the PMCL.

5803 **12VAC5-590-384. Residual disinfectant, DBPs, and DBPPs compliance.**

5804 A. General requirements.

5805 1. Where compliance is based on a RAA of monthly or quarterly samples or averages and
5806 the owner fails to monitor for TTHM, HAA5, or bromate, this failure to monitor shall be
5807 treated as a monitoring violation for the entire period covered by the annual average.

5808 Where compliance is based on a RAA of monthly or quarterly samples or averages and
5809 the owner's failure to monitor makes it impossible to determine compliance with MRDLs
5810 for chlorine and chloramines, this failure to monitor shall be treated as a monitoring
5811 violation for the entire period covered by the annual average.

5812 2. All samples collected and analyzed under the provisions of this section shall be included
5813 in determining compliance, even if that number is greater than the minimum required.

5814 3. The owner is in violation of the PMCL when the LRAA exceeds the PMCLs listed in
5815 Table 340.6 calculated based on four consecutive quarters of monitoring, or the LRAA
5816 calculated based on fewer than four quarters of data if the PMCL would be exceeded
5817 regardless of the monitoring results of subsequent quarters. The owner is in violation of
5818 the monitoring requirements for each quarter that a monitoring result would be used in
5819 calculating the LRAA if the owner fails to monitor.

5820 B. Disinfection byproducts.

5821 1. TTHM and HAA5.

5822 a. The owner of a waterworks required to monitor quarterly shall calculate the LRAAs
5823 for TTHM and HAA5 using monitoring results collected under 12VAC5-590-374 F and
5824 determine that each LRAA does not exceed the PMCL in order to comply with the

5825 PMCLs listed in Table 340.6. If the owner fails to complete four consecutive quarters
5826 of monitoring, then the owner shall calculate compliance with the PMCL based on the
5827 average of the available data from the most recent four quarters. If the owner collects
5828 more than one sample per quarter at a monitoring location, then the owner shall
5829 average all samples collected in the quarter at that location to determine a quarterly
5830 average to be used in the LRAA calculation.

5831 b. The owner of a waterworks required to monitor annually or less frequently shall
5832 determine that each sample collected is less than the PMCL in order to determine
5833 compliance with the PMCLs listed in Table 340.6. If any sample result exceeds the
5834 PMCL, then the owner shall comply with the requirements of 12VAC5-590-374 F 5. If
5835 no sample result exceeds the PMCL, then the sample result for each monitoring
5836 location is considered the LRAA for that monitoring location.

5837 c. The owner is in violation of the monitoring requirements for each quarter that a
5838 monitoring result would be used in calculating an LRAA if the owner fails to monitor.

5839 d. A waterworks has exceeded the operational evaluation level at any monitoring
5840 location where the sum of the two previous quarters' TTHM results plus twice the
5841 current quarter's TTHM result, divided by four to determine an average, exceeds 0.080
5842 mg/L, or where the sum of the two previous quarters' HAA5 results plus twice the
5843 current quarter's HAA5 result, divided by four to determine an average, exceeds 0.060
5844 mg/L.

5845 (1) The owner of a waterworks that exceeds the operational evaluation level shall
5846 conduct an operational evaluation and submit a written report of the evaluation to the
5847 department on a form approved by the department no later than 90 days after being
5848 notified of the analytical result that caused the waterworks to exceed the operational
5849 evaluation level. The written report shall be made available to the public upon request.

5850 (2) The operational evaluation report shall include an examination of the waterworks
5851 treatment and distribution operational practices, including source water conditions,
5852 storage tank operations, excess storage capacity, distribution system flushing,
5853 changes in source water or source water quality, and treatment changes or problems
5854 that may contribute to TTHM and HAA5 formation and what steps could be considered
5855 to minimize future exceedances.

5856 (3) The owner may request and the department may allow the owner to limit the scope
5857 of the evaluation if the owner is able to identify the cause of the operational evaluation
5858 level exceedance. The request to limit the scope of the evaluation does not extend the
5859 schedule in subdivision B 1 d (1) of this section for submitting the written report. The
5860 department shall approve this limited scope of evaluation in writing and the owner shall
5861 keep that approval with the completed report.

5862 2. Bromate. Compliance shall be based on a running annual arithmetic average, computed
5863 quarterly, of monthly samples collected by the owner as prescribed by 12VAC5-590-374
5864 H. For months in which the owner collects more than one sample, compliance is based on
5865 the average of all samples collected during the month. If the average result of the samples
5866 covering any consecutive four-quarter period exceeds the PMCL listed in Table 340.6,
5867 then the owner is in violation of the PMCL and shall notify the public pursuant to 12VAC5-
5868 590-540 A 2, in addition to reporting to the department pursuant to 12VAC5-590-530 and
5869 12VAC5-590-531. If the owner fails to complete 12 consecutive months of monitoring,
5870 then compliance with the PMCL for the last four-quarter compliance period shall be based
5871 on the average of the available data.

5872 3. Chlorite. Compliance shall be based on an arithmetic average of each three-sample set
5873 collected in the distribution system as prescribed by 12VAC5-590-374 G. If the arithmetic
5874 average of any three-sample set exceeds the PMCL listed in Table 340.6, then the owner

5875 is in violation of the PMCL and shall notify the public pursuant to 12VAC5-590-540 A 2, in
5876 addition to reporting to the department pursuant to 12VAC5-590-530 and 12VAC5-590-
5877 531.

5878 C. Residual disinfectant.

5879 1. Chlorine and chloramines.

5880 a. Compliance shall be based on a running annual arithmetic average, computed
5881 quarterly, of monthly averages of all samples collected by the owner under 12VAC5-
5882 590-374 I 1 a. If the average covering any consecutive four-quarter period exceeds
5883 the MRDL listed in Table 340.7, then the owner is in violation of the MRDL and shall
5884 notify the public pursuant to 12VAC5-590-540 A 2, in addition to reporting to the
5885 department pursuant to 12VAC5-590-530 and 12VAC5-590-531.

5886 b. In cases where the owner switches between the use of chlorine and chloramines
5887 for residual disinfection during the year, compliance shall be determined by including
5888 together all monitoring results of both chlorine and chloramines in calculating
5889 compliance. Reports submitted pursuant to 12VAC5-590-530 and 12VAC5-590-531
5890 shall clearly indicate which residual disinfectant was analyzed for each sample.

5891 c. Notwithstanding the MRDLs listed in Table 340.7, operators may increase the
5892 residual disinfectant levels of chlorine or chloramines in the distribution system to a
5893 level and for a time necessary to protect public health to address specific
5894 microbiological contamination problems caused by circumstances such as water main
5895 breaks in the distribution system, storm runoff events, source water contamination, or
5896 cross-connections.

5897 2. Chlorine dioxide.

5898 a. Acute violations. Compliance shall be based on consecutive daily samples collected
5899 by the owner under 12VAC5-590-374 I 2 a. If any daily sample collected at the
5900 entrance to the distribution system exceeds the MRDL listed in Table 340.7, and on
5901 the following day one or more of the three samples collected in the distribution system
5902 exceed the MRDL, then the owner is in violation of the MRDL and shall take immediate
5903 corrective action to lower the level of chlorine dioxide below the MRDL and shall notify
5904 the public pursuant to the procedures for Tier 1 conditions in 12VAC5-590-540 A 1 in
5905 addition to reporting to the department pursuant to 12VAC5-590-530 and 12VAC5-
5906 590-531. Failure to collect samples in the distribution system the day following an
5907 exceedance of the chlorine dioxide MRDL at the entrance to the distribution system
5908 shall also be considered an MRDL violation and the owner shall notify the public of the
5909 violation in accordance with the provisions for Tier 1 conditions in 12VAC5-590-540 A
5910 1 in addition to reporting to the department pursuant to 12VAC5-590-530 and 12VAC5-
5911 590-531.

5912 b. Non-acute violations. Compliance shall be based on consecutive daily samples
5913 collected by the owner under 12VAC5-590-374 I 2 a. If any two consecutive daily
5914 samples collected at the entrance to the distribution system exceed the MRDL listed
5915 in Table 340.7 and all distribution system samples collected are below the MRDL, then
5916 the owner is in violation of the MRDL and shall take corrective action to lower the level
5917 of chlorine dioxide below the MRDL at the point of sampling and shall notify the public
5918 pursuant to the procedures for Tier 2 conditions in 12VAC5-590-540 A 2 in addition to
5919 reporting to the department pursuant to 12VAC5-590-530 and 12VAC5-590-531.
5920 Failure to monitor at the entrance to the distribution system the day following an
5921 exceedance of the chlorine dioxide MRDL at the entrance to the distribution system is
5922 also an MRDL violation and the owner shall notify the public of the violation in

5923 accordance with the provisions for Tier 2 conditions in 12VAC5-590-540 A 2 in addition
5924 to reporting to the department pursuant to 12VAC5-590-530 and 12VAC5-590-531.

5925 D. Disinfection byproduct precursors (DBPPs).

5926 1. Compliance shall be determined as specified by 12VAC5-590-411 A 3.

5927 2. For the owner required to meet Step 1 TOC removals, if the value calculated under
5928 12VAC5-590-411 A 3 a (4) is less than 1.00, then the owner is in violation of the treatment
5929 technique requirements and shall notify the public pursuant to 12VAC5-590-540 A 2 in
5930 addition to reporting to the department pursuant to 12VAC5-590-530 and 12VAC5-590-
5931 531.

5932 **12VAC5-590-385. Lead and copper ~~action level~~ AL compliance.**

5933 A. The lead ~~action level~~ AL is exceeded if the concentration of lead in more than 10% of tap
5934 water samples collected during any monitoring period conducted in accordance with 12VAC5-
5935 590-375 B is greater than 0.015 mg/L (i.e., if the 90th percentile lead level is greater than 0.015
5936 mg/L).

5937 B. The copper ~~action level~~ AL is exceeded if the concentration of copper in more than 10% of
5938 tap water samples collected during any monitoring period conducted in accordance with 12VAC5-
5939 590-375 B is greater than 1.3 mg/L (i.e., if the 90th percentile copper level is greater than 1.3
5940 mg/L).

5941 C. The 90th percentile lead and copper levels shall be computed as follows:

5942 1. The results of all lead or copper samples taken during a monitoring period shall be
5943 placed in ascending order from the sample with the lowest concentration to the sample
5944 with the highest concentration. Each sampling result shall be assigned a number,
5945 ascending by single integers beginning with the number 1 for the sample with the lowest

5946 contaminant level. The number assigned to the sample with the highest contaminant level
5947 shall be equal to the total number of samples taken.

5948 2. The number of samples taken during the monitoring period shall be multiplied by 0.9.

5949 3. The contaminant concentration in the numbered sample yielded by the calculation in
5950 subdivision C 2 of this section is the 90th percentile contaminant level.

5951 4. For a waterworks serving fewer than 100 people, and the owner collects ~~that collect~~ five
5952 samples per monitoring period, the 90th percentile is computed by taking the average of
5953 the highest and second highest concentrations.

5954 5. For an the owner that who has been allowed by the ~~commissioner~~ department to collect
5955 fewer than five samples in accordance with 12VAC5-590-375 B 3, the sample result with
5956 the highest concentration is considered the 90th percentile value.

5957 **12VAC5-590-388. Radiological compliance.**

5958 A. MCLGs for radionuclides are listed in Table 546.1 of 12VAC5-590-546 B.

5959 B. PMCLs for radionuclides are applicable to community waterworks only and are listed in
5960 Table 340.4. Compliance with PMCLs will be determined based on the analytical results obtained
5961 at each entry point. If the sample result at one entry point exceeds the PMCL, then the owner is
5962 in violation of the PMCL.

5963 1. For the owner who is monitoring more than once per year, compliance with the PMCL
5964 is determined by a RAA of the analytical results at each entry point. If the average result
5965 at any entry point is greater than the PMCL, then the waterworks is out of compliance with
5966 the PMCL.

5967 2. For the owner who is monitoring more than once per year, if any sample result will
5968 cause the RAA to exceed the PMCL at any entry point, then the waterworks is out of
5969 compliance with the PMCL immediately.

5970 3. All samples collected and analyzed under the provisions 12VAC5-590-378 shall be
5971 included in determining compliance, even if that number is greater than the minimum
5972 required.

5973 4. If the owner does not collect all required samples when compliance is based on a RAA
5974 result of quarterly samples, then compliance will be based on the RAA result of the
5975 samples collected.

5976 5. If a sample result is less than the detection limit as specified in Table 378.1, then zero
5977 will be used to calculate the RAA, unless a gross alpha particle activity result is being used
5978 instead of radium-226 or uranium. If the gross alpha particle activity result is less than the
5979 detection limit as specified in Table 378.1, then one-half the detection limit will be used to
5980 calculate the RAA.

5981 C. Radiological (gross alpha, combined radium-226 and radium-228, uranium, and man-made
5982 radioactivity).

5983 1. Compliance with the radiological PMCLs shall be based on the RAA results. PMCLs
5984 are indicated in Table 340.4. Sampling for radiological analysis shall be in compliance with
5985 12VAC5-590-378.

5986 2. Compliance shall be determined by rounding off results to the same number of
5987 significant figures as the PMCL for the radionuclide in question.

5988 D. If a PMCL for radioactivity listed in Table 340.4 is exceeded, then the owner shall give
5989 notice to the department pursuant to 12VAC5-590-530 and to the public as required by 12VAC5-
5990 590-540 A 2.

5991 ~~12VAC5-590-390. Chemical and physical quality~~ Physical constituent compliance.

5992 A. ~~Necessary action for noncompliance.~~

5993 1. ~~Inorganic chemicals. See 12VAC5-590-530 B and 12VAC5-590-540.~~

5994 2. ~~Organic chemicals. See 12VAC5-590-530 B and 12VAC5-590-540.~~

5995 3. ~~Turbidity. See 12VAC5-590-530 B and 12VAC5-590-540.~~

5996 A. Color, odor, pH, and total dissolved solids.

5997 1. When the sampling results for color, odor, pH, or total dissolved solids exceed the
5998 applicable SMCL, the owner shall collect a confirmation sample, at the same sampling
5999 site, within two weeks of notification of the analytical results of the first sample.

6000 2. The results of the initial and confirmation samples shall be averaged to determine
6001 compliance with 12VAC5-590-340 C. The department has the discretion to void results of
6002 obvious sampling errors.

6003 4.3. If the average concentration level of any contaminant of a substance of color, odor,
6004 pH, or total dissolved solids is greater than the Secondary Maximum Contaminant Level
6005 SMCL listed in Table 340.3, then the division will department shall determine whether
6006 treatment to remove the substance that contaminant can be accomplished or more
6007 suitable supplies of source water are, or can be made, available. This determination will
6008 be made as quickly as possible. If either of these alternatives is possible, corrective action
6009 shall be promptly taken by the owner if deemed necessary by the division.

6010 B. ~~Specific limits. No attempt has been made to prescribe specific limits for every contaminant~~
6011 ~~that might enter a water supply or waterworks. Although the need exists for continued attention~~
6012 ~~to the entry of chemical and physical substances into water, the limits are confined to substances~~
6013 ~~recognized as being detrimental to the health or well-being of the consumer. Limits for~~

6014 innumerable substances would require an impossible burden of analytical examination. The
6015 specific limits included in these regulations are listed in Tables 2.2, 2.3, and 2.4. Turbidity in
6016 groundwater sources not required to filter shall not:

6017 1. Interfere with disinfection throughout the distribution system;

6018 2. Cause taste and odors upon disinfection; or

6019 3. Cause consumers to question the safety of their drinking water.

6020 **12VAC5-590-391. Treatment technique requirements.**

6021 A. When it is not technically or economically feasible to monitor for a particular PMCL or a
6022 contaminant, one or more specific treatment techniques that lead to a reduction in the
6023 concentration level of that contaminant shall be required. The application of that treatment
6024 technique reduces the contaminant in question to a concentration level that achieves compliance
6025 with this chapter.

6026 B. Failure to continuously maintain the treatment technique is a violation of this chapter and
6027 public notification in accordance with 12VAC5-590-540 A 2 is required.

6028 **12VAC5-590-392. Coliform treatment technique triggers and assessment requirements.**

6029 A. Assessments shall be conducted in accordance with subsections C, ~~D~~, and through E of
6030 this section after exceeding treatment technique triggers.

6031 B. Treatment technique triggers.

6032 1. Level 1 treatment technique triggers:

6033 a. For ~~owners~~ the owner required to collect 40 or more samples per month, the number
6034 of total coliform-positive samples exceeds 5.0% of the number of samples collected
6035 for the month.

- 6036 b. For ~~owners~~ the owner required to collect fewer than 40 samples per month, when
6037 there are two or more total coliform-positive samples in the same month.
- 6038 c. The owner fails to collect every required repeat sample after any single total
6039 coliform-positive sample.
- 6040 2. Level 2 treatment technique triggers:
- 6041 a. An E. coli PMCL violation, as specified in 12VAC5-590-380 B 2.
- 6042 b. A second Level 1 trigger occurs within a rolling 12-month period, unless the
6043 ~~commissioner~~ department has determined a likely reason for the first Level 1 treatment
6044 technique trigger and that the owner has corrected the problem.
- 6045 C. Assessment requirements.
- 6046 1. Level 1 and 2 assessments shall be conducted ~~in order~~ to identify the possible presence
6047 of sanitary defects and defects in the distribution system coliform monitoring practices.
6048 The owner shall be responsible for conducting Level 1 assessments. Level 2 assessments
6049 shall be conducted by the ~~commissioner~~ department.
- 6050 2. When conducting Level 1 and Level 2 assessments, the assessor shall include:
- 6051 a. ~~A review~~ An evaluation and identification of inadequacies in sample sites, sampling
6052 protocol, and sample processing;
- 6053 b. ~~A review~~ An evaluation of atypical events that could affect distributed water quality
6054 or indicate that distributed water quality was impaired;
- 6055 c. Evaluation of changes in distribution system maintenance and operation that could
6056 affect distributed water quality, including water storage;
- 6057 d. Evaluation of source and treatment considerations that impact distributed water
6058 quality; and

- 6059 e. Evaluation of existing water quality monitoring data.
- 6060 3. Level 1 assessment.
- 6061 a. The owner shall complete the assessment and document the assessment on ~~the~~
6062 ~~Waterworks Level 1 Assessment form~~ a form approved by the department. The owner
6063 shall submit the assessment form, as soon as practical, but within 30 days after the
6064 owner learns that a trigger in subdivision B 1 of this section has been exceeded.
- 6065 b. If the ~~commissioner~~ department ~~reviews~~ evaluates the completed Level 1
6066 assessment and determines that the assessment is not sufficient, including any
6067 proposed timetable for any corrective actions, then the ~~commissioner~~ department shall
6068 consult with the owner. If the ~~commissioner~~ department requires revisions after the
6069 consultation, then the owner shall submit a revised assessment form to the ~~appropriate~~
6070 ~~ODW field office~~ department on an agreed upon schedule not to exceed 30 days from
6071 the date of consultation.
- 6072 c. Upon completion and submission of the assessment form by the owner, the
6073 ~~commissioner~~ department shall determine if the owner has identified a likely cause for
6074 the Level 1 trigger and, if so, confirm that the owner has corrected the problem or has
6075 included a schedule acceptable to the ~~commissioner~~ department for correcting the
6076 problem.
- 6077 4. Level 2 assessment.
- 6078 a. ~~ODW~~ The department will complete the assessment and document the assessment
6079 ~~on the Waterworks Level 2 Assessment form~~ on a form approved by the department.
6080 ~~ODW staff~~ The department will consult with the owner during the assessment and
6081 complete the assessment within 30 days upon learning a that the waterworks has
6082 exceeded any of the ~~trigger~~ triggers in subdivision B 2 of this section.

6083 b. The ~~commissioner~~ department will send to the owner the completed assessment
6084 form, which will describe any detected sanitary defects, corrective actions completed
6085 or needed and, if needed, a timetable to complete the corrective actions. The owner
6086 will return the form within seven days with signature that indicates concurrence with
6087 the listed actions needed and timetable to complete the corrective actions. If the owner
6088 does not concur with either an action or timetable to complete a corrective action, then
6089 the owner shall notify the ~~commissioner~~ department, complete consultation with the
6090 ~~commissioner~~ department, and develop a revised corrective action schedule. The
6091 owner shall submit the revised schedule to the ~~commissioner~~ department for ~~review~~
6092 evaluation and approval within 30 days of the date of the consultation.

6093 D. Corrective actions.

6094 1. The owner shall correct sanitary defects found through either the Level 1 or the Level 2
6095 assessment conducted under subsection C of this section.

6096 2. The owner shall complete the corrective action or corrective actions in compliance with
6097 the timetable approved by the ~~commissioner~~ department in consultation with the owner.
6098 The owner shall notify the ~~appropriate ODW field office~~ department no later than seven
6099 days after each scheduled corrective action is completed.

6100 E. Consultation.

6101 1. At any time during the assessment or corrective action phase, either the owner or the
6102 ~~commissioner~~ department may request a consultation with the other party to determine
6103 the appropriate actions to be taken.

6104 2. The owner may consult with the ~~commissioner~~ department on all relevant information
6105 that may impact the ability to comply with subsection D of this section.

6106 F. Violations. Failure to conduct the required assessment or corrective actions in accordance
6107 with subsections C and D of this section, after exceeding a treatment technique trigger specified
6108 in subsection B of this section, is a treatment technique violation. The owner shall provide public
6109 notification as required under Tier 2 conditions specified in ~~12VAC5-590-540~~12VAC5-590-540 A
6110 2.

6111 **12VAC5-590-395. Surface water and GUDI sources, polymer, and recycle treatment**
6112 **techniques.**

6113 A. Surface water and GUDI source treatment techniques.

6114 1. The filtration and disinfection provisions of this section are required treatment
6115 techniques for a waterworks supplied by either a surface water source or a GUDI source
6116 or both. These treatment technique requirements are in place of a PMCL for the following
6117 contaminants: Giardia lamblia, viruses, heterotrophic bacteria, Cryptosporidium,
6118 Legionella, and turbidity. A waterworks that uses either a surface water source or a GUDI
6119 source or both shall provide treatment of that source water that complies with these
6120 treatment technique requirements. See 12VAC5-590-401 for filtration log removal credits
6121 and required log inactivation for Cryptosporidium. See 12VAC5-590-500 for log removal
6122 credits and required log inactivation for Giardia lamblia and viruses. These treatment
6123 technique requirements consist of installing and properly operating water treatment
6124 processes that reliably achieve:

6125 a. At least 99.9% (3-log) removal or inactivation of Giardia lamblia between a point
6126 where the source water is not subject to recontamination by surface water runoff and
6127 a point downstream before or at the first customer;

6128 b. At least 99.99% (4-log) removal or inactivation of viruses between a point where the
6129 source water is not subject to recontamination by surface water runoff and a point
6130 downstream before or at the first customer; and

6131 c. At least 99% (2-log) removal of Cryptosporidium between a point where the source
6132 water is not subject to recontamination by surface water runoff and a point downstream
6133 before or at the first customer.

6134 2. A waterworks that uses either a surface water source or a GUDI source or both is
6135 considered to be in compliance with the requirements of subdivision A 1 of this section if
6136 it meets the following disinfection and filtration requirements:

6137 a. Disinfection requirements.

6138 (1) The disinfection treatment shall be sufficient to ensure that the total treatment
6139 processes of that waterworks achieve at least 99.9% (3-log) inactivation or removal of
6140 Giardia lamblia and at least 99.99% (4-log) inactivation or removal of viruses. If any
6141 physical process can achieve at least a 3-log removal of Giardia lamblia but cannot
6142 adequately remove pathogens, then the disinfection treatment shall provide a second
6143 treatment barrier for Giardia lamblia, Legionella, heterotrophic bacteria, and viruses.
6144 The disinfection treatment shall be sufficient to assure at least a 0.5 log inactivation of
6145 Giardia lamblia.

6146 (2) The residual disinfectant concentration in the water entering the distribution system
6147 shall not be less than 0.2 mg/L for more than four hours.

6148 (3) The residual disinfectant concentration in the distribution system, measured as
6149 total chlorine, free chlorine, combined chlorine, or chlorine dioxide, shall not be
6150 undetectable in more than 5% of the samples each month, for any two consecutive
6151 months that the waterworks serves water to the public. If the department determines

6152 that a waterworks is experiencing excessive coliform occurrences in its distribution
6153 system, then the department may require the owner to maintain minimum chlorine
6154 residual levels of 0.2 mg/L or monochloramine levels of 0.5 mg/L throughout the
6155 distribution system. Water in the distribution system with a heterotrophic bacteria
6156 concentration less than or equal to 500/mL, measured as HPC, is deemed to have a
6157 detectable residual disinfectant for the purposes of determining compliance with this
6158 requirement. Thus, the value "V," in percent, in the following formula shall not exceed
6159 5% in one month, for any two consecutive months.

$$V = \left[\frac{(c + d + e)}{(a + b)} \right] * 100$$

6160

6161 where

6162 a = number of instances where the residual disinfectant concentration is measured;

6163 b = number of instances where the residual disinfectant concentration is not measured
6164 but HPC is measured;

6165 c = number of instances where the residual disinfectant concentration is measured but
6166 not detected and no HPC is measured;

6167 d = number of instances where no residual disinfectant concentration is detected and
6168 where the HPC is greater than 500/mL; and

6169 e = number of instances where the residual disinfectant concentration is not measured
6170 and HPC is greater than 500/mL.

6171 (4) The department may determine that the HPC compliance requirements of
6172 subdivision A 2 a (3) of this section do not apply based on site-specific considerations
6173 or if an owner has no means for having a sample transported and analyzed for HPC

6174 by a certified laboratory under the requisite time and temperature conditions and the
6175 waterworks is providing adequate disinfection in the distribution system.

6176 b. Filtration requirements. A waterworks that uses either a surface water source or a
6177 GUDI source or both shall provide filtration treatment by using one of the following
6178 methods:

6179 (1) Conventional filtration.

6180 (a) Achieve a filtered water turbidity of less than or equal to 0.3 NTU in at least 95% of
6181 the measurements taken each month. Samples shall be representative of the
6182 waterworks' filtered water.

6183 (b) The turbidity level of representative samples of a waterworks' filtered water shall at
6184 no time exceed one NTU, measured as specified in 12VAC5-590-440.

6185 (c) A waterworks that uses lime softening may acidify representative samples before
6186 analysis using a protocol approved by the department.

6187 (d) Water treatment plants utilizing conventional or direct filtration with gravity flow
6188 granular media filters are capable of producing filtered water with turbidity consistently
6189 less than 0.10 NTU. Therefore, for these types of water treatment plants, the
6190 operational goal for filter effluent turbidity for each filter, before any post-filtration
6191 chemical addition, shall be 0.10 NTU.

6192 (2) Diatomaceous earth filtration.

6193 (a) The turbidity level of representative samples of a waterworks' filtered water shall
6194 be less than or equal to one NTU in at least 95% of the measurements taken each
6195 month.

6196 (b) The turbidity level of representative samples of a waterworks' filtered water shall at
6197 no time exceed five NTU.

6198 (3) Slow sand filtration.

6199 (a) The turbidity level of representative samples of a waterworks' filtered water shall
6200 be less than or equal to one NTU in at least 95% of the measurements taken each
6201 month, except that if the department determines there is no significant interference
6202 with disinfection at a higher turbidity level, then the department may substitute this
6203 higher turbidity limit for that waterworks.

6204 (b) The turbidity level of representative samples of a waterworks' filtered water shall at
6205 no time exceed five NTU.

6206 (4) Membrane filters, bag filters, and cartridge filters.

6207 (a) The turbidity level of representative samples of a waterworks' filtered water shall
6208 be less than or equal to 0.3 NTU in at least 95% of the measurements taken each
6209 month, except that if the department determines there is no significant interference
6210 with disinfection at a higher turbidity level, then the department may substitute this
6211 higher turbidity limit for that waterworks.

6212 (b) Water treatment plants utilizing membrane filtration are capable of producing
6213 filtered water with turbidity consistently less than 0.05 NTU. Therefore, for these types
6214 of water treatment plants, the operational goal for filter effluent turbidity for each filter,
6215 before any post-filtration chemical addition, is 0.05 NTU.

6216 (c) The turbidity level of representative samples of a waterworks' filtered water shall at
6217 no time exceed one NTU.

6218 (5) The owner may use a filtration technology not listed in this section if the owner
6219 demonstrates to the satisfaction of the department by full-scale, pilot-plant, or

6220 challenge studies, or by other approved means that the alternative filtration
6221 technology, in combination with disinfection, will meet the requirements of this section.

6222 3. Once the department has determined that a waterworks utilizes either a surface water
6223 source or a GUDI source or both (see 12VAC5-590-430), then filtration and disinfection
6224 treatments are required. The owner shall install and have in operation treatment units that
6225 meet the requirements described in subdivisions A 1 and A 2 of this section no later than
6226 18 months following the department's determination. During the interim period, and until
6227 filtration and disinfection treatments are installed and in operation, the owner shall
6228 discontinue use of either the surface water source or GUDI source or both unless the
6229 source must remain in service because discontinuing the source is not a viable option, at
6230 which point the owner shall:

6231 a. Issue a continuous boil water notice through the public notification procedure in
6232 12VAC5-590-540 A 1 until the required filtration and disinfection treatments are
6233 installed and are in operation;

6234 b. Provide disinfection treatment to achieve a 4-log inactivation of virus during the
6235 interim period before the filtration treatment is installed. Monitoring equipment shall be
6236 installed that will ensure compliance with this requirement; and

6237 c. Increase bacteriological sampling frequency in the distribution system. For the
6238 owner required to collect routine distribution system bacteriological samples at a
6239 monthly frequency, the owner shall collect twice the number of samples required for
6240 that population each month. For the owner required to collect routine bacteriological
6241 samples at a quarterly frequency, the owner shall increase the sampling frequency to
6242 monthly.

6243 B. Polymer treatment techniques.

6244 1. The owner shall certify annually in writing to the department (using third-party or
6245 manufacturer's certification) that, when polymers containing acrylamide or epichlorohydrin
6246 are used by the waterworks, the combination (or product) of dose and monomer level does
6247 not exceed the following specified levels:

6248 a. Acrylamide = 0.05% dosed at one ppm (or equivalent) of polymer.

6249 b. Epichlorohydrin = 0.01% dosed at 20 ppm (or equivalent) of polymer.

6250 2. Certifications may rely on the manufacturers or third parties, as approved by the
6251 department.

6252 C. Recycle treatment techniques.

6253 1. If spent filter backwash water, thickener supernatant, or liquids from dewatering
6254 processes are recycled, in a waterworks supplied by either a surface water source or a
6255 GUDI source or both that employ conventional filtration or direct filtration treatment, then
6256 the waterworks is subject to the treatment technique requirement described in subsection
6257 A.

6258 2. Under this requirement, recycle flows shall be returned through all the processes of the
6259 treatment system, or an alternative location approved by the department.

6260 **12VAC5-590-400. Radiological quality. (Repealed)**

6261 ~~The effects of human radiation exposure are viewed as harmful, and any unnecessary~~
6262 ~~exposure to ionizing radiation should be avoided.~~

6263 ~~A. Maximum contaminant level goals for radionuclides are listed in subsection A of Table 2.5~~
6264 ~~of 12VAC5-590-440.~~

6265 ~~B. Maximum contaminant levels for radionuclides are applicable to community waterworks~~
6266 ~~only and are listed in this section and subsection B of Table 2.5.~~

- 6267 1. (Reserved.)
- 6268 2. PMCL for combined radium-226 and radium-228. The primary maximum contaminant
6269 level for combined radium-226 and radium-228 is 5 pCi/L. The combined radium-226 and
6270 radium-228 value is determined by the addition of the results of the analysis for radium-
6271 226 and the analysis for radium-228.
- 6272 3. PMCL for gross alpha particle activity (excluding radon and uranium). The primary
6273 maximum contaminant level for gross alpha particle activity (including radium-226 but
6274 excluding radon and uranium) is 15 pCi/L.
- 6275 4. PMCL for uranium. The primary maximum contaminant level for uranium is 30 µg/l.
- 6276 5. PMCL for beta particle and photon radioactivity.
- 6277 a. The average annual concentration of beta particle and photon radioactivity from
6278 man-made radionuclides in drinking water must not produce an annual dose
6279 equivalent to the total body or any internal organ greater than 4 millirem/year
6280 (mrem/year).
- 6281 b. Except for the radionuclides listed in schedule 1 of Table 2.5, the concentration of
6282 man-made radionuclides causing 4 mrem total body or organ dose equivalents must
6283 be calculated on the basis of 2 liter per day drinking water intake using the 168-hour
6284 data list in "Maximum Permissible Body Burdens and Maximum Permissible
6285 Concentrations of Radionuclides in Air and in Water for Occupational Exposure," NBX
6286 (National Bureau of Standards) Handbook 69 as amended August 1963, U.S.
6287 Department of Commerce. A copy of this document may be reviewed at the Virginia
6288 Department of Health Office of Drinking Water office in Richmond, Virginia. If two or
6289 more radionuclides are present, the sum of their annual dose equivalent to the total
6290 body or to any organ shall not exceed 4 mrem/year.

6291 ~~6. Compliance dates. Compliance dates for combined radium-226 and radium-228, gross~~
6292 ~~alpha particle activity, gross beta particle and photon radioactivity, and uranium:~~
6293 ~~community waterworks owners must comply with the PMCLs listed in subdivisions 2, 3, 4,~~
6294 ~~and 5 of this subsection beginning December 8, 2003, and compliance shall be~~
6295 ~~determined in accordance with the requirements of 12VAC5-590-370 D. Compliance with~~
6296 ~~reporting requirements for the radionuclides under 12VAC5-590-545 and 12VAC5-590-~~
6297 ~~540 is required on December 8, 2003.~~

6298 **12VAC5-590-401. Enhanced filtration and disinfection for Cryptosporidium treatment**
6299 **techniques.**

6300 A. A waterworks using either a surface water source or a GUDI source or both shall comply
6301 with the requirements of this section based on their population or if the waterworks is a wholesaler,
6302 based on the population of the largest waterworks in the combined distribution system.

6303 B. The owner shall conduct an initial and a second round of source water monitoring for each
6304 water treatment plant that treats either a surface water source or a GUDI source or both. This
6305 monitoring may include sampling for Cryptosporidium, E. coli, and turbidity to determine what
6306 level, if any, of additional Cryptosporidium treatment is required.

6307 1. Initial round of source water monitoring. The owner shall conduct the following
6308 monitoring on the schedule in subdivision B 3 of this section unless the monitoring
6309 avoidance criteria in subdivision B 4 of this section are met.

6310 a. The owner of a waterworks serving at least 10,000 people shall sample the source
6311 water for Cryptosporidium, E. coli, and turbidity at least monthly for 24 months.

6312 b. The owner of a waterworks serving fewer than 10,000 people:

6313 (1) Shall sample the source water for E. coli at least once every two weeks for 12
6314 months, or

6315 (2) May avoid E. coli monitoring if the owner notifies the department that he will monitor
6316 for Cryptosporidium as described in subdivision B 1 c of this section. The owner shall
6317 notify the department no later than three months before the date at which he is
6318 otherwise required to start E. coli monitoring.

6319 c. The owner of a waterworks serving fewer than 10,000 people shall sample the
6320 source water for Cryptosporidium at least twice per month for 12 months or at least
6321 monthly for 24 months if he meets one of the following, based on monitoring conducted
6322 under subdivision B 1 b of this section:

6323 (1) For a waterworks using source water from a lake/reservoir, the annual mean E. coli
6324 concentration is greater than 10 E. coli/100 mL.

6325 (2) For a waterworks using source water from flowing stream, the annual mean E. coli
6326 concentration is greater than 50 E. coli/100 mL.

6327 (3) The waterworks does not conduct E. coli monitoring as described in subdivision B
6328 1 b of this section.

6329 (4) The waterworks using a GUDI source shall comply with the requirements of
6330 subdivision B 1 c of this section based on the E. coli level that applies to the nearest
6331 surface water body. If no surface water body is nearby, the waterworks shall comply
6332 based on the requirements that apply to a waterworks using source water from a
6333 lake/reservoir.

6334 d. For the waterworks serving fewer than 10,000 people, the department may approve
6335 monitoring for an indicator other than E. coli under subdivision B 1 b (1) of this section.
6336 The department also may approve an alternative to the E. coli concentration in
6337 subdivision B 1 c (1), B 1 c (2), or B 1 c (4) of this section to trigger Cryptosporidium
6338 monitoring. This approval by the department shall be provided to the owner in writing

6339 and shall include the basis for the department's determination that the alternative
 6340 indicator or trigger level will provide a more accurate identification of whether a
 6341 waterworks will exceed the Bin 1 Cryptosporidium level in subdivision B 1 a of this
 6342 section.

6343 e. The waterworks may sample more frequently than required under this section if the
 6344 sampling frequency is evenly spaced throughout the monitoring period.

6345 2. Second round of source water monitoring: The owner shall conduct a second round of
 6346 source water monitoring that meets the requirements for monitoring parameters,
 6347 frequency, and duration described in subdivision B 1 of this section, unless the monitoring
 6348 exemption criteria in subdivision B 4 of this section are met. The owner shall conduct this
 6349 monitoring on the schedule in subdivision B 3 of this section.

6350 3. Monitoring schedule. The owner shall begin the monitoring required in subdivisions B 1
 6351 and B 2 of this section no later than the month beginning with the date listed in Table
 6352 401.1:

TABLE 401.1.
Source Water Monitoring Starting Dates.

| <u>OWNERS OF WATERWORKS THAT SERVE...</u> | <u>SHALL BEGIN THE FIRST ROUND OF SOURCE WATER MONITORING NO LATER THAN THE MONTH BEGINNING...</u> | <u>AND SHALL BEGIN THE SECOND ROUND OF SOURCE WATER MONITORING NO LATER THAN THE MONTH BEGINNING...</u> |
|--|--|---|
| <u>At least 100,000 people</u> | <u>October 1, 2006</u> | <u>April 1, 2015</u> |
| <u>From 50,000 - 99,999 people</u> | <u>April 1, 2007</u> | <u>October 1, 2015</u> |
| <u>From 10,000 - 49,999 people</u> | <u>April 1, 2008</u> | <u>October 1, 2016</u> |
| <u>Fewer than 10,000 and monitor for E. coli</u> | <u>October 1, 2008</u> | <u>October 1, 2017</u> |

| | | |
|---|---------------|---------------|
| Fewer than 10,000 and monitor for Cryptosporidium ^a | April 1, 2010 | April 1, 2019 |
| ^a Applies to a waterworks that meet the conditions of subdivision B 1 c of this section. | | |

6353 4. Monitoring avoidance.

6354 a. The owner is not required to conduct source water monitoring if the waterworks will
6355 provide a total of at least 5.5-log of treatment for Cryptosporidium, equivalent to
6356 meeting the treatment requirements of Bin 4 in subdivision D 2 of this section.

6357 b. If the owner chooses to provide the level of treatment in subdivision B 4 a of this
6358 section, rather than start source water monitoring, then the owner shall notify the
6359 department in writing no later than the date the owner is otherwise required to submit
6360 a sampling schedule for monitoring under subdivision B 5 of this section. Alternatively,
6361 the owner may choose to stop sampling at any point after initiating monitoring if the
6362 owner notifies the department in writing that he will provide this level of treatment. The
6363 owner shall install and operate technologies to provide this level of treatment by the
6364 applicable treatment compliance date in subdivision D 3 of this section.

6365 5. Sampling schedules.

6366 a. The owner of a waterworks required to conduct source water monitoring in
6367 accordance with subsection B of this section shall submit a sampling schedule that
6368 specifies the calendar dates when the owner shall collect each required sample.

6369 (1) The owner shall submit a sampling schedule to the department no later than three
6370 months before the applicable date listed in subdivision B 3 of this section for each
6371 round of required monitoring.

6372 (2) If the department does not respond to the owner regarding the sampling schedule,
6373 then the owner shall sample at the reported schedule.

6374 b. The owner shall collect samples within two days before or two days after the dates
6375 indicated in the sampling schedule (i.e., within a five-day period around the schedule
6376 date) unless one of the conditions of this subdivision apply:

6377 (1) If an extreme condition or situation exists that may pose danger to the sample
6378 collector, or that cannot be avoided and causes the owner to be unable to sample in
6379 the scheduled five-day period, then the owner shall sample as close to the scheduled
6380 date as is feasible unless the department approves an alternative sampling date. The
6381 owner shall submit an explanation for the delayed sampling date to the department
6382 concurrent with the shipment of the sample to the laboratory.

6383 (2) If the owner is unable to report a valid analytical result for a scheduled sampling
6384 date due to equipment failure, loss of or damage to the sample, failure to comply with
6385 the analytical method requirements, including the quality control requirements of
6386 12VAC5-590-440, or the failure of an approved laboratory to analyze the sample, then
6387 the owner shall collect a replacement sample. The owner shall collect the replacement
6388 sample not later than 21 days after receiving information that an analytical result
6389 cannot be reported for the scheduled date unless the owner demonstrates that
6390 collecting a replacement sample within this time frame is not feasible or the department
6391 approves an alternative resampling date. The owner shall submit an explanation for
6392 the delayed sampling date to the department concurrent with the shipment of the
6393 sample to the laboratory.

6394 c. The owner of a waterworks that fails to meet the criteria of subdivision B 5 b of this
6395 section for any source water sample required under subsection B of this section shall
6396 revise the sampling schedule to add dates for collecting all missed samples. The
6397 owner shall submit the revised schedule to the department for approval before the
6398 owner begins collecting the missed samples.

6399 6. Sampling locations.

6400 a. The owner of a waterworks required to conduct source water monitoring under
6401 subsection B of this section shall collect samples for each water treatment plant that
6402 treats either a surface water source or a GUDI source or both. Where multiple water
6403 treatment plants draw source water from the same influent, such as the same pipe or
6404 intake, the department may approve one set of monitoring results to be used to satisfy
6405 the requirements of subsection B of this section for all water treatment plants.

6406 b. The owner shall collect source water samples before chemical treatment, such as
6407 coagulants, oxidants, and disinfectants. However, the department may approve the
6408 collection of a source water sample after chemical treatment. To grant this approval,
6409 the department shall determine that collecting a sample before chemical treatment is
6410 not feasible for the owner and that the chemical treatment is unlikely to have a
6411 significant adverse effect on the analysis of the sample.

6412 c. The owner of a waterworks that recycle filter backwash water shall collect source
6413 water samples before the point of filter backwash water addition.

6414 d. Bank filtration.

6415 (1) The owner that receives Cryptosporidium treatment credit for bank filtration under
6416 12VAC5-590-395 A 2 b (1) shall collect source water samples from the surface water
6417 before bank filtration.

6418 (2) The owner that uses bank filtration as pretreatment to a water treatment plant shall
6419 collect source water samples from the well (i.e., after bank filtration). The use of bank
6420 filtration during monitoring shall be consistent with routine operational practice. The
6421 owner collecting samples after a bank filtration process may not receive treatment
6422 credit for the bank filtration under subdivision E 4 c of this section.

6423 e. Multiple sources. The owner of a waterworks that uses multiple source waters,
6424 including multiple surface water sources and blended surface water and groundwater
6425 sources, shall collect samples as specified in subdivision B 6 e (1) or B 6 e (2) of this
6426 section. The use of multiple source waters during monitoring shall be consistent with
6427 routine operational practice.

6428 (1) If a sampling tap is available where the source waters are combined before
6429 treatment, then the owner shall collect samples from the tap.

6430 (2) If a sampling tap is not available where the source waters are combined before
6431 treatment, then the owner shall collect samples at each source near the intake on the
6432 same day and shall follow either subdivision B 6 e (2) (a) or B 6 e (2) (b) of this section
6433 for sample analysis.

6434 (a) The owner may composite samples from each source into one sample before
6435 analysis. The volume of sample from each source shall be weighted according to the
6436 proportion of the source water in the total water treatment plant flow at the time the
6437 sample is collected.

6438 (b) The owner may choose to have samples analyzed from each source separately
6439 and calculate a weighted average of the analysis results for each sampling date. The
6440 weighted average shall be calculated by multiplying the analysis result for each source
6441 water by the fraction the source water contributed to the total water treatment plant
6442 flow at the time the sample was collected and then summing these values.

6443 f. Additional requirements. The owner shall submit a description of the sampling
6444 location or locations to the department at the same time as the sampling schedule
6445 required in subdivision B 3 of this section. This description shall address the position
6446 of the sampling location in relation to the waterworks' source water or source waters

6447 and treatment processes, including pretreatment, points of chemical treatment, and
6448 filter backwash recycle. If the department does not respond to an owner regarding
6449 sampling location or locations, then the owner shall sample at the reported location or
6450 locations.

6451 7. Analytical methods. All analytical methods shall be conducted in accordance with
6452 12VAC5-590-440.

6453 8. Approved laboratories.

6454 a. Cryptosporidium. The owner shall have Cryptosporidium samples analyzed by a
6455 laboratory that has received reciprocal certification approved under DCLS' Laboratory
6456 Certification Program for Analysis of Cryptosporidium in Water.

6457 b. E. coli. A laboratory certified by DCLS for total coliform analysis under 12VAC5-590-
6458 440 is approved for E. coli analysis when the laboratory uses the same technique for
6459 E. coli that the laboratory uses under 12VAC5-590-440. Laboratories shall use
6460 methods for enumeration of E. coli in source water approved in 12VAC5-590-440.

6461 c. Turbidity. Measurements of turbidity shall be made by a party approved by the
6462 department.

6463 9. Reporting of the source water results shall be in accordance with 12VAC5-590-531.

6464 10. The owner of a waterworks treating either a surface water source or a GUDI source,
6465 or both, that operates for only part of the year shall conduct source water monitoring in
6466 accordance with this section, but with the following modifications:

6467 a. The owner shall sample the source water only during the months that the
6468 waterworks operates unless the department specifies another monitoring period based
6469 on waterworks operating practices.

6470 b. The owner of a waterworks that operates less than six months per year and that
6471 monitor for Cryptosporidium shall collect at least six Cryptosporidium samples per year
6472 during each of two years of monitoring. Samples shall be evenly spaced throughout
6473 the period the waterworks operates.

6474 11. New sources.

6475 a. The owner of a waterworks that begins using either a new surface water source or
6476 a GUDI source or both is required to begin monitoring under subdivision B 3 of this
6477 section and shall monitor the new source on a schedule approved by the department.
6478 Source water monitoring shall meet the requirements of this section. The owner shall
6479 also meet the bin classification and Cryptosporidium treatment requirements of
6480 subdivisions D 1 and D 2 of this section, for the new source on a schedule approved
6481 by the department.

6482 b. The requirements of this section apply to a waterworks using either a surface water
6483 source or a GUDI source or both that begin operation after the monitoring start date
6484 applicable to the size of the waterworks under subdivision B 3 of this section.

6485 c. The owner shall begin a second round of source water monitoring no later than six
6486 years following the initial bin classification under subdivision D 1 of this section.

6487 12. Failure to collect any source water sample required under this section in accordance
6488 with the sampling schedule, sampling location, analytical method, approved laboratory,
6489 and reporting requirements of subdivisions B 5 through B 9 of this section is a monitoring
6490 violation.

6491 13. Grandparenting monitoring data. The owner may use grandparenting monitoring data
6492 collected before the applicable monitoring start date in subdivision B 3 of this section to
6493 meet the initial source water monitoring requirements in subdivision B 1 of this section.

6494 Grandparented data may be substituted for an equivalent number of months at the end of
6495 the monitoring period. All data submitted under this subdivision shall meet the
6496 requirements in subdivisions B 13 a through B 13 h of this section and be approved by the
6497 department:

6498 a. The owner may grandparent Cryptosporidium samples to meet the requirements of
6499 this section when the owner does not have corresponding E. coli and turbidity samples.
6500 The owner who grandparents Cryptosporidium samples without E. coli and turbidity
6501 samples is not required to collect E. coli and turbidity samples when the owner
6502 completes the requirements for Cryptosporidium monitoring under this section.

6503 b. The analysis of E. coli samples shall meet the analytical method and approved
6504 laboratory requirements of subdivisions B 7 and B 8 of this section.

6505 c. The analysis of Cryptosporidium samples shall meet the requirements of subdivision
6506 B 8 of this section.

6507 d. The sampling location shall meet the conditions in subdivision B 6 of this section.

6508 e. Cryptosporidium sample collection intervals may vary for the conditions specified in
6509 subdivisions B 5 b (1) and B 5 b (2) of this section, if the owner provides documentation
6510 of the condition when reporting monitoring results.

6511 (1) The department may approve grandparenting of previously collected data where
6512 there are time gaps in the sampling frequency if the owner conducts additional
6513 monitoring the department specifies to ensure that the data used to comply with the
6514 initial source water monitoring requirements of subsection B of this section are
6515 seasonally representative and unbiased.

6516 (2) The owner may grandparent previously collected data where the sampling
6517 frequency within each month varied. If the Cryptosporidium sampling frequency varied,

6518 then the owner shall follow the monthly averaging procedure in subdivision D 1 a (5)
6519 of this section, when calculating the bin classification for a filtered waterworks.

6520 f. The owner who requests to grandparent previously collected monitoring results shall
6521 report the following information by the applicable dates listed in the following
6522 subdivisions. The owner shall report this information to the department.

6523 (1) The owner shall report the intent to submit previously collected monitoring results
6524 for grandparenting. This report shall specify the number of previously collected results
6525 the owner shall submit, the dates of the first and last sample, and whether an owner
6526 shall conduct additional source water monitoring to meet the requirements in
6527 subsection B of this section. The owner shall report this information no later than the
6528 date the sampling schedule listed in subdivision B 3 of this section is required.

6529 (2) The owner shall report previously collected monitoring results for grandparenting
6530 no later than two months after the applicable date listed in subdivision B 3 of this
6531 section.

6532 (a) For each sample result, the owner shall report the applicable data elements in
6533 12VAC5-590-531 A 5.

6534 (b) The owner shall certify that the reported monitoring results include all results the
6535 waterworks generated during the time period beginning with the first reported result
6536 and ending with the final reported result. This applies to samples that were collected
6537 from the sampling location specified for source water monitoring under subdivision B
6538 1 of this section, not spiked, and analyzed using the laboratory's routine process for
6539 the analytical methods listed in this section.

6540 (c) The owner shall certify that the samples were representative of a waterworks'
6541 source waters and the source waters have not changed. The owner shall report a

6542 description of the sampling location or locations, which shall address the position of
6543 the sampling location in relation to the waterworks' source water or source waters and
6544 treatment processes, including points of chemical addition and filter backwash recycle.

6545 (d) For Cryptosporidium samples, the laboratory or laboratories that analyzed the
6546 samples shall provide a letter certifying that the quality control criteria specified in the
6547 methods listed in subdivision B 8 of this section were met for each sample batch
6548 associated with the reported results. Alternatively, the laboratory may provide bench
6549 sheets and sample examination report forms for each field, matrix spike, initial
6550 precision and recovery (IPR), ongoing precision and recovery (OPR), and method
6551 blank sample associated with the reported results.

6552 g. If the department determines that a previously collected data set submitted for
6553 grandparenting was generated during source water conditions that were not normal
6554 for the waterworks, such as a drought, the department may disapprove the data.
6555 Alternatively, the department may approve the previously collected data if the owner
6556 reports additional source water monitoring data, as determined by the department, to
6557 ensure that the data set used under subdivision D 1 of this section represents average
6558 source water conditions for the waterworks.

6559 h. If the owner submits previously collected data that fully meets the number of
6560 samples required for initial source water monitoring under subdivision B 1 of this
6561 section and some of the data are rejected due to not meeting the requirements of this
6562 section, then the owner shall conduct additional monitoring to replace rejected data on
6563 a schedule approved by the department. The owner is not required to begin this
6564 additional monitoring until two months after notification that data have been rejected
6565 and additional monitoring is necessary.

6566 C. The owner of a waterworks that plans to make a significant change to the disinfection
6567 practice shall develop disinfection profiles and calculate disinfection benchmarks, as described in
6568 12VAC5-590-500.

6569 1. The owner shall notify the department before changing the disinfection practice and
6570 shall include in this notice the following information:

6571 a. A completed disinfection profile and disinfection benchmark for Giardia lamblia and
6572 viruses;

6573 b. A description of the proposed change in disinfection practice; and

6574 c. An analysis of how the proposed change will affect the current level of disinfection.

6575 2. Significant changes to the disinfection practice are defined as follows:

6576 a. Changes to the point of disinfection;

6577 b. Changes to the disinfectant or disinfectants used in the water treatment plant;

6578 c. Changes to the disinfection process; or

6579 d. Any other modification identified by the department as a significant change to
6580 disinfection practice.

6581 D. The owner shall determine the Cryptosporidium treatment bin classification as described
6582 in subdivision D 1 of this section and provide additional treatment for Cryptosporidium, if required,
6583 as described in subdivision D 2 of this section. The owner shall implement Cryptosporidium
6584 treatment according to the schedule in subdivision D 3 of this section.

6585 1. Bin classification for waterworks.

6586 a. Following completion of the initial round of source water monitoring required under
6587 subdivision B 1 of this section, the owner shall calculate an initial Cryptosporidium bin
6588 concentration for each water treatment plant for which monitoring was required.

6589 Calculation of the bin concentration shall use the Cryptosporidium results reported
6590 under subdivision B 1 of this section and shall follow these procedures:

6591 (1) For the owner who collects a total of at least 48 samples, the bin concentration is
6592 equal to the arithmetic mean of all sample concentrations.

6593 (2) For the owner who collects a total of at least 24 samples, but not more than 47
6594 samples, the bin concentration is equal to the highest arithmetic mean of all sample
6595 concentrations in any 12 consecutive months during which Cryptosporidium samples
6596 were collected.

6597 (3) For the owner of a waterworks that serves fewer than 10,000 people and monitor
6598 for Cryptosporidium for only one year (i.e., collect 24 samples in 12 months), the bin
6599 concentration is equal to the arithmetic mean of all sample concentrations.

6600 (4) For water treatment plants that operate only part of the year and that monitor fewer
6601 than 12 months per year under subdivision B 1 of this section, the bin concentration is
6602 equal to the highest arithmetic mean of all sample concentrations during any year of
6603 Cryptosporidium monitoring.

6604 (5) If the monthly Cryptosporidium sampling frequency varies, then the owner shall
6605 first calculate a monthly average for each month of monitoring. The owner shall then
6606 use these monthly average concentrations, rather than individual sample
6607 concentrations, in the applicable calculation for bin classification in subdivisions D 1 a
6608 (1) through D 1 a (4) of this section.

6609 b. The owner shall determine the initial bin classification from Table 401.2 using the
6610 Cryptosporidium bin concentration calculated under subdivision D 1 a of this section:
6611

TABLE 401.2.

Bin Classification for Filtered Waterworks.

| <u>FOR OWNERS OF WATERWORKS THAT ARE:</u> | <u>WITH A CRYPTOSPORIDIUM BIN CONCENTRATION OF^a ...</u> | <u>THE BIN CLASSIFICATION IS...</u> |
|--|---|-------------------------------------|
| <u>...required to monitor for Cryptosporidium under subdivision B 1 of this section</u> | <u>Cryptosporidium less than 0.075 oocysts/L</u> | <u>Bin 1</u> |
| | <u>Cryptosporidium equal to or greater than 0.075 oocysts/L but less than 1.0 oocysts/L</u> | <u>Bin 2</u> |
| | <u>Cryptosporidium equal to or greater than 1.0 oocysts/L but less than 3.0 oocysts/L</u> | <u>Bin 3</u> |
| | <u>Cryptosporidium equal to or greater than 3.0 oocysts/L</u> | <u>Bin 4</u> |
| <u>...serving fewer than 10,000 people and NOT required to monitor for Cryptosporidium under subdivision B 1 c of this section</u> | <u>Not Applicable</u> | <u>Bin 1</u> |
| ^{4a} <u>^aBased on calculations in subdivision D 1 a or D 1 c of this section, as applicable.</u> | | |

6612 c. Following completion of the second round of source water monitoring required under
 6613 subdivision B 2 of this section, the owner shall recalculate the Cryptosporidium bin
 6614 concentration using the Cryptosporidium results reported under subdivision B 2 of this
 6615 section and following the procedures in subdivisions D 1 a (1) through D 1 a (4) of this
 6616 section. The owner shall then redetermine the bin classification using this bin
 6617 concentration and Table 401.3.

6618 d. Reporting of bin classifications.

6619 (1) The owner shall report the initial bin classification under subdivision D 1 b of this
 6620 section to the department for approval no later than six months after the waterworks
 6621 is required to complete the initial source water monitoring based on the schedule in
 6622 subdivision B 3 of this section.

6623 (2) The owner shall report the bin classification under subdivision D 1 c of this section
 6624 to the department for approval no later than six months after the owner is required to
 6625 complete the second round of source water monitoring based on the schedule in
 6626 subdivision D 1 a (3) of this section.

6627 (3) The bin classification report to the department shall include a summary of source
 6628 water monitoring data and the calculation procedure used to determine bin
 6629 classification.

6630 e. Failure to comply with the conditions of subdivision D 1 d of this section is a violation
 6631 of the treatment technique requirement.

6632 2. Waterworks additional Cryptosporidium treatment requirements.

6633 a. A waterworks shall provide the level of additional treatment for Cryptosporidium
 6634 specified in this subdivision based on the bin classification as determined under
 6635 subdivision D 1 of this section and according to the schedule in subdivision D 3 b of
 6636 this section.

6637

TABLE 401.3.
Cryptosporidium Treatment Requirements.

| <u>IF THE WATERWORKS BIN CLASSIFICATION IS...</u> | <u>AND THE WATERWORKS USES THE FOLLOWING FILTRATION TREATMENT IN FULL COMPLIANCE WITH 12VAC5-590-395 A 1 AND 12VAC5-590-395 A 2, THEN THE ADDITIONAL CRYPTOSPORIDIUM TREATMENT REQUIREMENTS ARE...</u> | | | |
|---|--|--------------------------------|---|--|
| | <u>Conventional filtration treatment (including softening)</u> | <u>Direct filtration</u> | <u>Slow sand or diatomaceous earth filtration</u> | <u>Alternative filtration technologies</u> |
| <u>Bin 1</u> | <u>No additional treatment</u> | <u>No additional treatment</u> | <u>No additional treatment</u> | <u>No additional treatment</u> |

| | | | | |
|---|--------------------------|--------------------------|--------------------------|----------|
| <u>Bin 2</u> | <u>1-log treatment</u> | <u>1.5-log treatment</u> | <u>1-log treatment</u> | <u>a</u> |
| <u>Bin 3</u> | <u>2-log treatment</u> | <u>2.5-log treatment</u> | <u>2-log treatment</u> | <u>b</u> |
| <u>Bin 4</u> | <u>2.5-log treatment</u> | <u>3-log treatment</u> | <u>2.5-log treatment</u> | <u>c</u> |
| <u>^a As determined by the department such that the total Cryptosporidium removal and inactivation is at least 4.0-log.</u> <u>^b As determined by the department such that the total Cryptosporidium removal and inactivation is at least 5.0-log.</u> <u>^c As determined by the department such that the total Cryptosporidium removal and inactivation is at least 5.5-log.</u> | | | | |

- 6638 b. Additional treatment.
- 6639 (1) The owner shall use one or more of the treatment and management options listed
- 6640 in subsection E of this section, termed the microbial toolbox, to comply with the
- 6641 additional Cryptosporidium treatment required in subdivision D 2 a of this section.
- 6642 (2) A waterworks classified in Bin 3 and Bin 4 shall achieve at least 1-log of the
- 6643 additional Cryptosporidium treatment required under subdivision D 2 a of this section
- 6644 using either one or a combination of the following: (i) bag filters, (ii) bank filtration, (iii)
- 6645 cartridge filters, (iv) chlorine dioxide, (v) membranes, (vi) ozone, or (vii) UV, as
- 6646 described in subdivisions E 3 through E 7 of this section.
- 6647 c. Failure by a waterworks in any month to achieve treatment credit by meeting criteria
- 6648 in subdivisions E 3 through E 7 of this section for microbial toolbox options that is at
- 6649 least equal to the level of treatment required in subdivision D 2 a of this section is a
- 6650 violation of the treatment technique requirement.
- 6651 d. If the department determines during a sanitary survey or an equivalent source water
- 6652 assessment that after an owner completed the monitoring conducted under
- 6653 subdivision B 1 or B 2 of this section, significant changes occurred in the waterworks'
- 6654 watershed that could lead to increased contamination of the source water by

6655 Cryptosporidium, then the owner shall take actions specified by the department to
6656 address the contamination. These actions may include additional source water
6657 monitoring or implementing microbial toolbox options listed in subdivision E 2 of this
6658 section.

6659 3. Schedule for compliance with Cryptosporidium treatment requirements.

6660 a. Following the initial bin classification in accordance with subdivision D 1 b of this
6661 section, the owner shall provide the level of treatment for Cryptosporidium required
6662 under subdivision D 2 of this section according to the schedule in subdivision D 3 b of
6663 this section.

6664 b. If the bin classification for a filtered waterworks changes following the second round
6665 of source water monitoring, as determined under subdivision D 1 c of this section, then
6666 the owner shall provide the level of treatment for Cryptosporidium required under
6667 subdivision D 2 of this section on a schedule approved by the department.

6668 E. The owner of a waterworks required to provide additional treatment for Cryptosporidium
6669 shall implement microbial toolbox options that are designed and operated as described in
6670 subdivisions E 1 through E 7 of this section.

6671 1. The owner receives the treatment credits listed in Table 401.4 by meeting the conditions
6672 for microbial toolbox options described in subdivisions E 3 through E 7 of this section. The
6673 owner shall apply these treatment credits to meet the treatment requirements in
6674 subdivision D 2 of this section.

6675 2. Microbial Toolbox Summary Table: Options, Treatment Credits and Criteria

TABLE 401.4.

Microbial Toolbox Summary: Options, Treatment Credits and Criteria.

| <u>TOOLBOX OPTION</u> | <u>CRYPTOSPORIDIUM TREATMENT CREDIT WITH DESIGN AND IMPLEMENTATION CRITERIA</u> |
|-----------------------|---|
|-----------------------|---|

| <u>Source Protection and Management Toolbox Options</u> | |
|---|---|
| <u>Alternative source/ intake management</u> | <u>No prescribed credit. The owner may conduct simultaneous monitoring for treatment bin classification at alternative intake locations or under alternative intake management strategies. Specific criteria are in subdivision E 3 b of this section.</u> |
| <u>Prefiltration Toolbox Options</u> | |
| <u>Presedimentation basin with coagulation</u> | <u>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 performance criteria approved by the department. To be eligible, basins shall be operated continuously with coagulant addition and all water treatment plant flow shall pass through basins. Specific criteria are in subdivision E 4 a of this section.</u> |
| <u>Two-stage lime softening</u> | <u>0.5-log credit for two-stage softening where chemical addition and hardness precipitation occur in both stages. All water treatment plant flow shall pass through both stages. Single-stage softening is credited as equivalent to conventional treatment. Specific criteria are in subdivision E 4 b of this section.</u> |
| <u>Bank filtration</u> | <u>0.5-log credit for 25-foot setback; 1.0-log credit for 50-foot setback; aquifer shall be unconsolidated sand containing at least 10% fines; average turbidity in wells shall be less than 1 NTU. A waterworks using wells followed by filtration when conducting source water monitoring shall sample the well to determine bin classification and are not eligible for additional credit. Specific criteria are in subdivision E 4 c of this section.</u> |
| <u>Treatment Performance Toolbox Options</u> | |
| <u>Combined filter performance</u> | <u>0.5-log credit for CFE turbidity less than or equal to 0.15 NTU in at least 95% of measurements each month. Specific criteria are in subdivision E 5 a of this section.</u> |
| <u>Individual filter performance</u> | <u>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% 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 subdivision E 5 b of this section.</u> |
| <u>Additional Filtration Toolbox Options</u> | |
| <u>Bag or cartridge filters (individual filters)</u> | <u>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 subdivision E 6 a of this section.</u> |
| <u>Bag or cartridge filters (in series)</u> | <u>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 subdivision E 6 a of this section.</u> |
| <u>Membrane filtration</u> | <u>Log credit equivalent to removal efficiency demonstrated in challenge test for device if supported by direct integrity</u> |

| | |
|-------------------------------------|--|
| | <u>testing. Specific criteria are in subdivision E 6 b of this section.</u> |
| <u>Second stage filtration</u> | <u>0.5-log credit for second separate granular media filtration stage if treatment train includes coagulation before first filter. Specific criteria are in subdivision E 6 c of this section.</u> |
| <u>Slow sand filters</u> | <u>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 subdivision E 6 d of this section.</u> |
| <u>Inactivation Toolbox Options</u> | |
| <u>Chlorine dioxide</u> | <u>Log credit based on measured CT in relation to Table 401.5. Specific criteria in subdivision E 7 b of this section.</u> |
| <u>Ozone</u> | <u>Log credit based on measured CT in relation to Table 401.6. Specific criteria in subdivision E 7 b of this section.</u> |
| <u>UV</u> | <u>Log credit based on validated UV dose in relation to Table 401.7; reactor validation testing required to establish UV dose and associated operating conditions. Specific criteria in subdivision E 7 c of this section.</u> |

6676 3. Source toolbox components.

6677 a. Reserved.

6678 b. Alternative source.

6679 (1) The owner may conduct source water monitoring that reflects a different intake
6680 location (either in the same source or for an alternate source) or a different procedure
6681 for the timing or level of withdrawal from the source (alternative source water
6682 monitoring). If the department approves, then the owner may determine the bin
6683 classification under subdivision D 1 of this section based on the alternative source
6684 water monitoring results.

6685 (2) If the owner conducts alternative source water monitoring under subdivision E 3 b
6686 (1) of this section, then the owner shall also monitor the current water treatment plant
6687 intake concurrently as described in subsection B of this section. "Plant intake" means
6688 the works or structures at the head of a conduit through which source water is diverted
6689 (e.g., river or lake) into the water treatment plant.

6690 (3) Alternative source water monitoring under subdivision E 3 b (1) of this section shall
6691 meet the requirements for source water monitoring to determine bin classification, as
6692 described in subdivisions B 1 through B 13 of this section. The owner shall report the
6693 alternative source water monitoring results to the department, along with supporting
6694 information documenting the operating conditions under which the samples were
6695 collected.

6696 (4) If the owner determines the bin classification under subdivision D 1 of this section
6697 using alternative source water monitoring results that reflect a different intake location
6698 or a different procedure for managing the timing or level of withdrawal from the source,
6699 then the owner shall relocate the intake or permanently adopt the withdrawal
6700 procedure, as applicable, no later than the applicable treatment compliance date in
6701 subdivision D 3 of this section.

6702 4. Prefiltration treatment toolbox components.

6703 a. Presedimentation. The owner receives 0.5-log Cryptosporidium treatment credit for
6704 a presedimentation basin during any month the process meets the following criteria:

6705 (1) The presedimentation basin shall be in continuous operation and shall treat the
6706 entire water treatment plant flow at a waterworks using either a surface water source
6707 or a GUDI source or both.

6708 (2) A coagulant shall be continuously added to the presedimentation basin.

6709 (3) The presedimentation basin shall achieve the performance criteria in either of the
6710 following:

6711 (a) Demonstrates at least 0.5-log mean reduction of influent turbidity. This reduction
6712 shall be determined using daily turbidity measurements in the presedimentation

6713 process influent and effluent and shall be calculated as follows: log10 (monthly mean
6714 of daily influent turbidity) - log10 (monthly mean of daily effluent turbidity).

6715 (b) Complies with the performance criteria approved by the department that
6716 demonstrate at least 0.5-log mean removal of micron-sized particulate material
6717 through the presedimentation process.

6718 b. Two-stage lime softening. The owner receives an additional 0.5-log
6719 Cryptosporidium treatment credit for a two-stage lime softening plant if chemical
6720 addition and hardness precipitation occur in two separate and sequential softening
6721 stages before filtration. Both softening stages shall treat the entire plant flow taken
6722 from either a surface water source or a GUDI source or both.

6723 c. Bank filtration. The owner receives Cryptosporidium treatment credit for bank
6724 filtration that serves as pretreatment to a water filtration plant by meeting the criteria
6725 in this subdivision. The owner using bank filtration upon beginning source water
6726 monitoring under subdivision B 1 of this section shall collect samples as described in
6727 subdivision B 6 d of this section and is not eligible for this credit.

6728 (1) Wells with a groundwater flow path of at least 25 feet receive 0.5-log treatment
6729 credit; and wells with a groundwater flow path of at least 50 feet receive 1.0-log
6730 treatment credit. The groundwater flow path shall be determined as specified in
6731 subdivision E 4 c (4) of this section.

6732 (2) Only wells in granular aquifers are eligible for treatment credit. Granular aquifers
6733 are those comprised of sand, clay, silt, rock fragments, pebbles or larger particles, and
6734 minor cement. The owner shall characterize the aquifer at the well site to determine
6735 aquifer properties. The owner shall extract a core from the aquifer and demonstrate

6736 that in at least 90% of the core length, grains less than 1.0 mm in diameter constitute
6737 at least 10% of the core material.

6738 (3) Only horizontal and vertical wells are eligible for treatment credit.

6739 (4) For vertical wells, the groundwater flow path is the measured distance from the
6740 edge of the surface water body under high flow conditions (determined by the 100-
6741 year flood elevation boundary or by the floodway, as defined in Federal Emergency
6742 Management Agency flood hazard maps) to the well screen. For horizontal wells, the
6743 groundwater flow path is the measured distance from the bed of the river under normal
6744 flow conditions to the closest horizontal well lateral screen.

6745 (5) The owner shall monitor each wellhead for turbidity at least once every four hours
6746 while the bank filtration process is in operation. If monthly average turbidity levels,
6747 based on daily maximum values in the well, exceed 1 NTU, the owner shall report this
6748 result to the department and conduct an assessment within 30 days to determine the
6749 cause of the high turbidity levels in the well. If the department determines that microbial
6750 removal has been compromised, the department may revoke treatment credit until the
6751 owner implements corrective actions approved by the department to remediate the
6752 problem.

6753 (6) Springs and infiltration galleries are not eligible for treatment credit under this
6754 section.

6755 (7) Bank filtration demonstration of performance. The department may approve
6756 Cryptosporidium treatment credit for bank filtration based on a demonstration-of-
6757 performance study that meets the criteria in this subdivision. This treatment credit may
6758 be greater than 1.0-log and may be awarded to bank filtration that does not meet the
6759 criteria in subdivisions E 4 c (1) through E 4 c (5) of this section.

6760 (a) The study shall follow a protocol approved by the department and shall involve the
6761 collection of data on the removal of Cryptosporidium or a surrogate for
6762 Cryptosporidium and related hydrogeologic and water quality parameters during the
6763 full range of operating conditions.

6764 (b) The study shall include sampling both from the production well or wells and from
6765 monitoring wells that are screened and located along the shortest flow path between
6766 the surface water source and the production well or wells.

6767 5. Treatment performance toolbox components.

6768 a. Combined filter performance. The owner using conventional filtration treatment or
6769 direct filtration treatment receives an additional 0.5-log Cryptosporidium treatment
6770 credit during any month the waterworks meets the criteria in this subdivision.
6771 Combined filter effluent (CFE) turbidity shall be less than or equal to 0.15 NTU in at
6772 least 95% of the measurements. Turbidity shall be measured as described in 12VAC5-
6773 590-376 B.

6774 b. Individual filter performance. The owner using conventional filtration treatment or
6775 direct filtration treatment receives 0.5-log Cryptosporidium treatment credit, which can
6776 be in addition to the 0.5-log credit under subdivision E 5 a of this section, during any
6777 month the waterworks meets the criteria in this subdivision. Compliance with these
6778 criteria shall be based on individual filter turbidity monitoring as described in 12VAC5-
6779 590-376 B.

6780 (1) The filtered water turbidity for each individual filter shall be less than or equal to
6781 0.15 NTU in at least 95% of the measurements recorded each month.

6782 (2) No individual filter may have a measured turbidity greater than 0.3 NTU in two
6783 consecutive measurements collected 15 minutes apart.

6784 (3) The owner who has received treatment credit for individual filter performance and
6785 fails to meet the requirements of subdivision E 5 b (1) or E 5 b (2) of this section during
6786 any month does not receive a treatment technique violation under subdivision D 2 c of
6787 this section if the department determines the following:

6788 (a) The failure was due to unusual and short-term circumstances that could not
6789 reasonably be prevented through optimizing water treatment plant design, operation,
6790 and maintenance.

6791 (b) The waterworks has experienced no more than two failures in any calendar year.

6792 6. Additional filtration toolbox components.

6793 a. Bag and cartridge filters. The owner receives Cryptosporidium treatment credit of
6794 up to 2.0-log for individual bag or cartridge filters and up to 2.5-log for bag or cartridge
6795 filters operated in series by meeting the criteria in subdivisions E 6 a (1) through E 6 a
6796 (10) of this section. To be eligible for this credit, the owner shall report the results of
6797 challenge testing that meets the requirements of subdivisions E 6 a (2) through E 6 a
6798 (9) of this section to the department. The filters shall treat the entire water treatment
6799 plant flow taken from either a surface water source or a GUDI source or both.

6800 (1) The Cryptosporidium treatment credit awarded to bag or cartridge filters shall be
6801 based on the removal efficiency demonstrated during challenge testing that is
6802 conducted according to the criteria in subdivisions E 6 a (2) through E 6 a (9) of this
6803 section. A factor of safety equal to 1-log for individual bag or cartridge filters and 0.5-
6804 log for bag or cartridge filters in series shall be applied to challenge testing results to
6805 determine removal credit. The owner may use the results from challenge testing
6806 conducted before January 5, 2006, if the prior testing was consistent with the criteria
6807 specified in subdivisions E 6 a (2) through E 6 a (9) of this section.

6808 (2) Challenge testing shall be performed on full-scale bag or cartridge filters, and the
6809 associated filter housing or pressure vessel, that are identical in material and
6810 construction to the filters and housings the waterworks will use for removal of
6811 Cryptosporidium. Bag or cartridge filters shall be challenge tested in the same
6812 configuration that the waterworks will use, either as individual filters or as a series
6813 configuration of filters.

6814 (3) Challenge testing shall be conducted using Cryptosporidium or a surrogate that is
6815 removed no more efficiently than Cryptosporidium. The microorganism or surrogate
6816 used during challenge testing is referred to as the challenge particulate. The
6817 concentration of the challenge particulate shall be determined using a method capable
6818 of discreetly quantifying the specific microorganism or surrogate used in the test; gross
6819 measurements such as turbidity shall not be used.

6820 (4) The maximum feed water concentration that can be used during a challenge test
6821 shall be based on the detection limit of the challenge particulate in the filtrate (i.e.,
6822 filtrate detection limit) and shall be calculated using the following equation:

6823 Maximum Feed Concentration = $1 \times 10^4 \times$ (Filtrate Detection Limit)

6824 (5) Challenge testing shall be conducted at the maximum design flow rate for the filter
6825 as specified by the manufacturer.

6826 (6) Each filter evaluated shall be tested for a duration sufficient to reach 100% of the
6827 terminal pressure drop that establishes the maximum pressure drop under which the
6828 filter may be used to comply with the requirements of subdivision E 6 of this section.

6829 (7) Removal efficiency of a filter shall be determined from the results of the challenge
6830 test and expressed in terms of log removal values using the following equation:

6831 $LRV = LOG_{10}(C_f) - LOG_{10}(C_p)$.

6832 where LRV = log removal value demonstrated during challenge testing; C_f = the feed
6833 concentration measured during the challenge test; and C_p = the filtrate concentration
6834 measured during the challenge test. In applying this equation, the same units shall be
6835 used for the feed and filtrate concentrations. If the challenge particulate is not detected
6836 in the filtrate, then the term C_p shall be set equal to the detection limit.

6837 (8) Each filter tested shall be challenged with the challenge particulate during three
6838 periods over the filtration cycle: within two hours of start-up of a new filter; when the
6839 pressure drop is between 45% and 55% of the terminal pressure drop; and at the end
6840 of the cycle after the pressure drop has reached 100% of the terminal pressure drop.
6841 An LRV shall be calculated for each of these challenge periods for each filter tested.
6842 The LRV for the filter (LRV filter) shall be assigned the value of the minimum LRV
6843 observed during the three challenge periods for that filter.

6844 (9) If fewer than 20 filters are tested, then the overall removal efficiency for the filter
6845 product line shall be set equal to the lowest LRV filter among the filters tested. If 20 or
6846 more filters are tested, then the overall removal efficiency for the filter product line shall
6847 be set equal to the 10th percentile of the set of LRV filter values for the various filters
6848 tested. The percentile is defined by $(i/(n+1))$, where i is the rank of n individual data
6849 points ordered lowest to highest. If necessary, the 10th percentile may be calculated
6850 using linear interpolation.

6851 (10) If a previously tested filter is modified in a manner that could change the removal
6852 efficiency of the filter product line, then challenge testing to demonstrate the removal
6853 efficiency of the modified filter shall be conducted and submitted to the department.

6854 b. Membrane filtration.

6855 (1) The owner receives Cryptosporidium treatment credit for membrane filtration that
6856 meets the criteria of this subdivision. Membrane cartridge filters that meet the definition
6857 of membrane filtration in 12VAC5-590-10 are eligible for this credit. The level of
6858 treatment credit the owner receives is equal to the lower of the values determined as
6859 follows:

6860 (a) The removal efficiency demonstrated during challenge testing conducted under the
6861 conditions in subdivision E 6 b (2) of this section.

6862 (b) The maximum removal efficiency that can be verified through direct integrity testing
6863 used with the membrane filtration process under the conditions in subdivision E 6 b
6864 (3) of this section.

6865 (2) Challenge Testing. The membrane used by the waterworks shall undergo
6866 challenge testing to evaluate removal efficiency, and the owner shall report the results
6867 of the challenge testing to the department. Challenge testing shall be conducted
6868 according to the criteria in subdivisions E 6 b (2) (a) through E 6 b (2) (g) of this section.
6869 The owner may use data from challenge testing conducted before January 5, 2006, if
6870 the prior testing was consistent with the criteria:

6871 (a) Challenge testing shall be conducted on either a full-scale membrane module,
6872 identical in material and construction to the membrane modules used in the
6873 waterworks' treatment facility, or a smaller-scale membrane module, identical in
6874 material and similar in construction to the full-scale module. A module is defined as
6875 the smallest component of a membrane unit in which a specific membrane surface
6876 area is housed in a device with a filtrate outlet structure.

6877 (b) Challenge testing shall be conducted using Cryptosporidium or a surrogate that is
6878 removed no more efficiently than Cryptosporidium. The organism or surrogate used

6879 during challenge testing is referred to as the challenge particulate. The concentration
6880 of the challenge particulate, in both the feed and filtrate water, shall be determined
6881 using a method capable of discretely quantifying the specific challenge particulate
6882 used in the test; gross measurements such as turbidity shall not be used.

6883 (c) The maximum feed water concentration that can be used during a challenge test
6884 is based on the detection limit of the challenge particulate in the filtrate and shall be
6885 determined according to the following equation:

6886 Maximum Feed Concentration = $3.16 \times 10^6 \times (\text{Filtrate Detection Limit})$

6887 (d) Challenge testing shall be conducted under representative hydraulic conditions at
6888 the maximum design flux and maximum design process recovery specified by the
6889 manufacturer for the membrane module. Flux is defined as the throughput of a
6890 pressure-driven membrane process expressed as flow per unit of membrane area.
6891 Recovery is defined as the volumetric percent of feed water that is converted to filtrate
6892 over the course of an operating cycle uninterrupted by events such as chemical
6893 cleaning or a solids removal process (i.e., backwashing).

6894 (e) Removal efficiency of a membrane module shall be calculated from the challenge
6895 test results and expressed as a log removal value according to the following equation:

6896 $LRV = \text{LOG}_{10}(C_f) - \text{LOG}_{10}(C_p)$,

6897 where LRV = log removal value demonstrated during the challenge test; C_f = the feed
6898 concentration measured during the challenge test; and C_p = the filtrate concentration
6899 measured during the challenge test. Equivalent units shall be used for the feed and
6900 filtrate concentrations. If the challenge particulate is not detected in the filtrate, then
6901 the term C_p is set equal to the detection limit for the purpose of calculating the LRV.

6902 An LRV shall be calculated for each membrane module evaluated during the challenge
6903 test.

6904 (f) The removal efficiency of a membrane filtration process demonstrated during
6905 challenge testing shall be expressed as a log removal value (LRV_{C-Test}). If fewer than
6906 20 modules are tested, then LRV_{C-Test} is equal to the lowest of the representative LRVs
6907 among the modules tested. If 20 or more modules are tested, then LRV_{C-Test} is equal
6908 to the 10th percentile of the representative LRVs among the modules tested. The
6909 percentile is defined by $(i/(n+1))$, where i is the rank of n individual data points ordered
6910 lowest to highest. If necessary, the 10th percentile may be calculated using linear
6911 interpolation.

6912 (g) The challenge test shall establish a QCRV for a nondestructive performance test
6913 that demonstrates the Cryptosporidium removal capability of the membrane filtration
6914 module. This performance test shall be applied to each production membrane module
6915 used by the waterworks that was not directly challenge tested to verify
6916 Cryptosporidium removal capability. Production modules that do not meet the
6917 established QCRV are not eligible for the treatment credit demonstrated during the
6918 challenge test.

6919 (h) If a previously tested membrane is modified in a manner that could change the
6920 removal efficiency of the membrane or the applicability of the nondestructive
6921 performance test and associated QCRV, then additional challenge testing to
6922 demonstrate the removal efficiency of, and determine a new QCRV for, the modified
6923 membrane shall be conducted and submitted to the department.

6924 (3) Direct integrity testing. The owner shall conduct direct integrity testing in a manner
6925 that demonstrates a removal efficiency equal to or greater than the removal credit
6926 awarded to the membrane filtration process and meets the requirements described in

6927 subdivisions E 6 b (3) (a) through E 6 b (3) (f) of this section. A direct integrity test is
6928 defined as a physical test applied to a membrane unit to identify and isolate integrity
6929 breaches (i.e., one or more leaks that could result in contamination of the filtrate).

6930 (a) The direct integrity test shall be independently applied to each membrane unit in
6931 service. A membrane unit is defined as a group of membrane modules that share
6932 common valving that allows the unit to be isolated from the rest of the waterworks for
6933 the purpose of integrity testing or other maintenance.

6934 (b) The direct integrity method shall have a resolution of three micrometers or less,
6935 where resolution is defined as the size of the smallest integrity breach that contributes
6936 to a response from the direct integrity test.

6937 (c) The direct integrity test shall have a sensitivity sufficient to verify the log treatment
6938 credit awarded to the membrane filtration process by the department, where sensitivity
6939 is defined as the maximum log removal value that can be reliably verified by a direct
6940 integrity test. Sensitivity shall be determined using the approach in either of the
6941 following as applicable to the type of direct integrity test the waterworks uses:

6942 (i) For direct integrity tests that use an applied pressure or vacuum, the direct integrity
6943 test sensitivity shall be calculated according to the following equation:

6944
$$\text{LRV}_{\text{DIT}} = \text{LOG}_{10}(\text{Q}_p / (\text{VCF} \times \text{Q}_{\text{breach}}))$$

6945 where LRV_{DIT} = the sensitivity of the direct integrity test;

6946 Q_p = total design filtrate flow from the membrane unit;

6947 Q_{breach} = flow of water from an integrity breach associated with the smallest integrity
6948 test response that can be reliably measured; and

6949 VCF = volumetric concentration factor. The volumetric concentration factor is the ratio
6950 of the suspended solids concentration on the high-pressure side of the membrane
6951 relative to that in the feed water.

6952 (ii) For direct integrity tests that use a particulate or molecular marker, the direct
6953 integrity test sensitivity shall be calculated according to the following equation:

6954 $LRV_{DIT} = LOG_{10}(C_f) - LOG_{10}(C_p),$

6955 where LRV_{DIT} = the sensitivity of the direct integrity test;

6956 C_f = the typical feed concentration of the marker used in the test; and

6957 C_p = the filtrate concentration of the marker from an integral membrane unit.

6958 (d) The owner shall establish a control limit within the sensitivity limits of the direct
6959 integrity test that is indicative of an integral membrane unit capable of meeting the
6960 removal credit awarded by the department.

6961 (e) If the result of a direct integrity test exceeds the control limit established under
6962 subdivision E 6 b (3) (d) of this section, then the owner shall remove the membrane
6963 unit from service. The owner shall conduct a direct integrity test to verify any repairs,
6964 and may return the membrane unit to service only if the direct integrity test is within
6965 the established control limit.

6966 (f) The owner shall conduct direct integrity testing on each membrane unit at a
6967 frequency of not less than once each day that the membrane unit is in operation. The
6968 department may approve less frequent testing, based on demonstrated process
6969 reliability, the use of multiple barriers effective for Cryptosporidium, or reliable process
6970 safeguards.

6971 (4) Indirect integrity monitoring. The owner shall conduct continuous indirect integrity
6972 monitoring on each membrane unit according to the criteria in subdivisions E 6 b (4)
6973 (a) through E 6 b (4) (e). Indirect integrity monitoring is defined as monitoring some
6974 aspect of filtrate water quality that is indicative of the removal of particulate matter.
6975 The owner who implements continuous direct integrity testing of membrane units in
6976 accordance with the criteria in subdivisions E 6 b (3) (a) through E 6 b (3) (f) of this
6977 section is not subject to the requirements for continuous indirect integrity monitoring.
6978 The owner shall submit a monthly report to the department summarizing all continuous
6979 indirect integrity monitoring results triggering direct integrity testing and the corrective
6980 action that was taken in each case.

6981 (a) Unless the department approves an alternative parameter, continuous indirect
6982 integrity monitoring shall include continuous filtrate turbidity monitoring.

6983 (b) Continuous monitoring shall be conducted at a frequency of no less than once
6984 every 15 minutes.

6985 (c) Continuous monitoring shall be separately conducted on each membrane unit.

6986 (d) If indirect integrity monitoring includes turbidity and if the filtrate turbidity readings
6987 are above 0.15 NTU for a period greater than 15 minutes (i.e., two consecutive 15-
6988 minute readings above 0.15 NTU), direct integrity testing shall immediately be
6989 performed on the associated membrane unit as specified in subdivisions E 6 b (3) (a)
6990 through E 6 b (3) (f) of this section.

6991 (e) If indirect integrity monitoring includes an alternative parameter approved by the
6992 department and if the alternative parameter exceeds a control limit approved by the
6993 department for a period greater than 15 minutes, then direct integrity testing shall

6994 immediately be performed on the associated membrane units as specified in
6995 subdivisions E 6 b (3) (a) through E 6 b (3) (f) of this section.

6996 c. Second stage filtration. The owner receives 0.5-log Cryptosporidium treatment
6997 credit for a separate second stage of filtration that consists of sand, dual media, GAC,
6998 or other fine grain media following granular media filtration if approved by the
6999 department. To be eligible for this credit, the first stage of filtration shall be preceded
7000 by a coagulation step and both filtration stages shall treat the entire water treatment
7001 treatment plant flow taken from either a surface water source or a GUDI source or
7002 both. A cap, such as GAC, on a single stage of filtration is not eligible for this credit.
7003 The department shall approve the treatment credit based on an assessment of the
7004 design characteristics of the filtration process.

7005 d. Slow sand filtration (as secondary filter). The owner is eligible to receive 2.5-log
7006 Cryptosporidium treatment credit for a slow sand filtration process that follows a
7007 separate stage of filtration if both filtration stages treat the entire water treatment plant
7008 flow taken from either a surface water source or a GUDI source or both and no residual
7009 disinfectant is present in the influent water to the slow sand filtration process. The
7010 department shall approve the treatment credit based on an assessment of the design
7011 characteristics of the filtration process. This subdivision does not apply to treatment
7012 credit awarded to slow sand filtration used as a primary filtration process.

7013 7. Inactivation toolbox components.

7014 a. Calculation of CT values.

7015 (1) CT is the product of the disinfectant contact time (T, in minutes) and disinfectant
7016 concentration (C, in milligrams per liter). The owner of a waterworks with treatment
7017 credit for chlorine dioxide or ozone under subdivision E 7 b of this section shall

7018 calculate CT at least once each day, with both C and T measured during peak hourly
7019 flow in accordance with the procedure listed in 12VAC5-590-500.

7020 (2) A waterworks with several disinfection segments in sequence may calculate CT for
7021 each segment, where a disinfection segment is defined as a treatment unit process
7022 with a measurable residual disinfectant level and a liquid volume. Under this approach,
7023 the owner shall add the Cryptosporidium CT values in each segment to determine the
7024 total CT for the treatment plant.

7025 b. CT values for chlorine dioxide and ozone.

7026 (1) The owner receives the Cryptosporidium treatment credit listed in Table 401.5 by
7027 meeting the corresponding chlorine dioxide CT value for the applicable water
7028 temperature, as described in subdivision E 7 a of this section.

7029

TABLE 401.5.
CT Values (mg-min/L) for Cryptosporidium Inactivation by Chlorine Dioxide^a

| | <u>WATER TEMPERATURE, °C</u> | | | | | |
|-------------------|------------------------------|-------------|-------------|-------------|-------------|-------------|
| <u>LOG CREDIT</u> | <u>≤0.5</u> | <u>1</u> | <u>2</u> | <u>3</u> | <u>5</u> | <u>7</u> |
| <u>0.25</u> | <u>159</u> | <u>153</u> | <u>140</u> | <u>128</u> | <u>107</u> | <u>90</u> |
| <u>0.5</u> | <u>319</u> | <u>305</u> | <u>279</u> | <u>256</u> | <u>214</u> | <u>180</u> |
| <u>1.0</u> | <u>637</u> | <u>610</u> | <u>558</u> | <u>511</u> | <u>429</u> | <u>360</u> |
| <u>1.5</u> | <u>956</u> | <u>915</u> | <u>838</u> | <u>767</u> | <u>643</u> | <u>539</u> |
| <u>2.0</u> | <u>1275</u> | <u>1220</u> | <u>1117</u> | <u>1023</u> | <u>858</u> | <u>719</u> |
| <u>2.5</u> | <u>1594</u> | <u>1525</u> | <u>1396</u> | <u>1278</u> | <u>1072</u> | <u>899</u> |
| <u>3.0</u> | <u>1912</u> | <u>1830</u> | <u>1675</u> | <u>1534</u> | <u>1286</u> | <u>1079</u> |
| | <u>WATER TEMPERATURE, °C</u> | | | | | |
| <u>LOG CREDIT</u> | <u>10</u> | <u>15</u> | <u>20</u> | <u>25</u> | <u>30</u> | |
| <u>0.25</u> | <u>69</u> | <u>45</u> | <u>29</u> | <u>19</u> | <u>12</u> | |
| <u>0.5</u> | <u>138</u> | <u>89</u> | <u>58</u> | <u>38</u> | <u>24</u> | |
| <u>1.0</u> | <u>277</u> | <u>179</u> | <u>116</u> | <u>75</u> | <u>49</u> | |
| <u>1.5</u> | <u>415</u> | <u>268</u> | <u>174</u> | <u>113</u> | <u>73</u> | |

| | | | | | | |
|------------|------------|------------|------------|------------|------------|--|
| <u>2.0</u> | <u>553</u> | <u>357</u> | <u>232</u> | <u>150</u> | <u>98</u> | |
| <u>2.5</u> | <u>691</u> | <u>447</u> | <u>289</u> | <u>188</u> | <u>122</u> | |
| <u>3.0</u> | <u>830</u> | <u>536</u> | <u>347</u> | <u>226</u> | <u>147</u> | |

7030 ^aThe owner may use this equation to determine log credit between the indicated values:

7031 Log credit = (0.001506x(1.09116)^{Temp})x CT.

7032 (2) The owner receives the Cryptosporidium treatment credit listed in Table 401.6 by

7033 meeting the corresponding ozone CT values for the applicable water temperature, as

7034 described in subdivision E 7 a of this section.

TABLE 401.6.
CT Values (mg-min/L) for Cryptosporidium Inactivation by Ozone^a.

| <u>LOG CREDIT</u> | <u>WATER TEMPERATURE, °C</u> | | | | | | | | | | |
|-------------------|------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|
| | <u>≤0.5</u> | <u>1</u> | <u>2</u> | <u>3</u> | <u>5</u> | <u>7</u> | <u>10</u> | <u>15</u> | <u>20</u> | <u>25</u> | <u>30</u> |
| <u>0.25</u> | <u>6.0</u> | <u>5.8</u> | <u>5.2</u> | <u>4.8</u> | <u>4.0</u> | <u>3.3</u> | <u>2.5</u> | <u>1.6</u> | <u>1.0</u> | <u>0.6</u> | <u>0.39</u> |
| <u>0.5</u> | <u>12</u> | <u>12</u> | <u>10</u> | <u>9.5</u> | <u>7.9</u> | <u>6.5</u> | <u>4.9</u> | <u>3.1</u> | <u>2.0</u> | <u>1.2</u> | <u>0.78</u> |
| <u>1.0</u> | <u>24</u> | <u>23</u> | <u>21</u> | <u>19</u> | <u>16</u> | <u>13</u> | <u>9.9</u> | <u>6.2</u> | <u>3.9</u> | <u>2.5</u> | <u>1.6</u> |
| <u>1.5</u> | <u>36</u> | <u>35</u> | <u>31</u> | <u>29</u> | <u>24</u> | <u>20</u> | <u>15</u> | <u>9.3</u> | <u>5.9</u> | <u>3.7</u> | <u>2.4</u> |
| <u>2.0</u> | <u>48</u> | <u>46</u> | <u>42</u> | <u>38</u> | <u>32</u> | <u>26</u> | <u>20</u> | <u>12</u> | <u>7.8</u> | <u>4.9</u> | <u>3.1</u> |
| <u>2.5</u> | <u>60</u> | <u>58</u> | <u>52</u> | <u>48</u> | <u>40</u> | <u>33</u> | <u>25</u> | <u>16</u> | <u>9.8</u> | <u>6.2</u> | <u>3.9</u> |
| <u>3.0</u> | <u>72</u> | <u>69</u> | <u>63</u> | <u>57</u> | <u>47</u> | <u>39</u> | <u>30</u> | <u>19</u> | <u>12</u> | <u>7.4</u> | <u>4.7</u> |

^aThe owner may use this equation to determine log credit between the indicated values:

Log credit = (0.0397x(1.09757)^{Temp})x CT.

7035 c. UV light. The owner receives Cryptosporidium, Giardia lamblia, and virus treatment

7036 credits for UV light reactors by achieving the corresponding UV dose values shown in

7037 subdivision E 7 c (1) of this section. The owner shall validate and monitor UV reactors

7038 as described in subdivisions E 7 c (2) and E 7 c (3) of this section to demonstrate that

7039 they are achieving a particular UV dose value for treatment credit.

7040 (1) UV dose table. The treatment credits listed in Table 401.7 are for UV light at a

7041 wavelength of 254 nm as produced by a low-pressure mercury vapor lamp. To receive

7042 treatment credit for other lamp types, the owner shall demonstrate an equivalent

7043 germicidal dose through reactor validation testing, as described in subdivision E 7 c

7044 (2) of this section. The UV dose values listed in Table 401.7 are applicable only to
7045 post-filter applications of UV in filtered waterworks.

7046

TABLE 401.7.

UV Doses for Cryptosporidium, Giardia lamblia and Virus Inactivation Credit.

| <u>LOG CREDIT</u> | <u>CRYPTOSPORIDIUM UV DOSE (mJ/cm²)</u> | <u>GIARDIA LAMBLIA UV DOSE (mJ/cm²)</u> | <u>VIRUS UV DOSE (mJ/cm²)</u> |
|-------------------|--|--|--|
| <u>0.5</u> | <u>1.6</u> | <u>1.5</u> | <u>39</u> |
| <u>1.0</u> | <u>2.5</u> | <u>2.1</u> | <u>58</u> |
| <u>1.5</u> | <u>3.9</u> | <u>3.0</u> | <u>79</u> |
| <u>2.0</u> | <u>5.8</u> | <u>5.2</u> | <u>100</u> |
| <u>2.5</u> | <u>8.5</u> | <u>7.7</u> | <u>121</u> |
| <u>3.0</u> | <u>12</u> | <u>11</u> | <u>143</u> |
| <u>3.5</u> | <u>15</u> | <u>15</u> | <u>163</u> |
| <u>4.0</u> | <u>22</u> | <u>22</u> | <u>186</u> |

7047 (2) Reactor validation testing. The owner shall use UV reactors that have undergone
7048 validation testing to determine the operating conditions under which the reactor
7049 delivers the UV dose required in subdivision E 7 c (1) of this section (i.e., validated
7050 operating conditions). These operating conditions shall include flow rate, UV intensity
7051 as measured by a UV sensor, and UV lamp status.

7052 (a) When determining validated operating conditions, the owner shall account for the
7053 following factors: (i) UV absorbance of the water; (ii) lamp fouling and aging; (iii)
7054 measurement uncertainty of online sensors; (iv) UV dose distributions arising from the
7055 velocity profiles through the reactor; (v) failure of UV lamps or other critical waterworks
7056 components; and (vi) inlet and outlet piping or channel configurations of the UV
7057 reactor.

7058 (b) Validation testing shall include the following: full-scale testing of a reactor that
7059 conforms uniformly to the UV reactors used by the waterworks and inactivation of a

7060 test microorganism whose dose-response characteristics have been quantified with a
7061 low-pressure mercury vapor lamp.

7062 (c) UV reactor validation testing shall be in accordance with EPA's recommended
7063 validation protocol for UV reactors, as described in EPA's "Ultraviolet Disinfection
7064 Guidance Manual for the Final Long Term 2 Enhanced Surface Water Treatment
7065 Rule," November 2006, EPA Office of Water. Alternative protocols may be considered
7066 for approval by the department on a case-by-case basis.

7067 (d) Validation testing, whether onsite or offsite, shall be performed by a third party
7068 independent of the UV reactor manufacturer and the owner, to ensure that validation
7069 testing and data analysis are conducted in a technically sound manner without bias.

7070 (e) To receive credit for lamp types other than low-pressure types, the owner shall
7071 demonstrate an equivalent germicidal dose through reactor validation testing.

7072 (f) A validation report shall be submitted and approved by the department to receive
7073 disinfection credit.

7074 (3) UV reactor monitoring.

7075 (a) The owner shall monitor the UV reactors to determine if the reactors are operating
7076 within validated conditions, as determined under subdivision E 7 c (2) of this section.
7077 This monitoring shall include UV intensity as measured by a UV sensor, flow rate, lamp
7078 status, and other parameters the department designates based on UV reactor
7079 operation. The owner shall verify the calibration of UV sensors and shall recalibrate
7080 sensors in accordance with a protocol approved by the department.

7081 (b) To receive treatment credit for UV light, the owner shall treat at least 95% of the
7082 water delivered to the public during each month by the UV reactors operating within
7083 validated conditions for the required UV dose, as described in subdivisions E 7 c (1)

7084 and E 7 c (2) of this section. The owner shall demonstrate compliance with this
7085 condition by the monitoring required under subdivision E 7 c (3) (a) of this section.

7086 F. The owner shall comply with the applicable recordkeeping and reporting requirements
7087 described in 12VAC5-590-530, 12VAC5-590-531, 12VAC5-590-550, and 12VAC5-590-570.

7088 **12VAC5-590-405. Lead and copper treatment techniques.**

7089 A. Lead and copper corrosion control techniques.

7090 1. Corrosion control treatment requirements. The ~~owners~~ owner of all a community
7091 waterworks and or a nontransient noncommunity waterworks NTNC shall install and
7092 operate optimum corrosion control treatment by completing the corrosion control treatment
7093 requirements described below which are applicable to ~~such~~ these ~~owners~~ waterworks
7094 under subdivision A 2 of this section.

7095 a. Owner's proposal regarding corrosion control treatment. Based upon the results of
7096 lead and copper tap monitoring and water quality parameter monitoring, the ~~owners~~
7097 owner of a small ~~and or~~ medium waterworks exceeding the lead or copper ~~action level~~
7098 AL shall propose installation of one or more of the corrosion control treatments listed
7099 in subdivision A 1 c (1) of this section that the owner believes constitutes optimal
7100 corrosion control for that waterworks. The ~~commissioner~~ department may require the
7101 owner to conduct additional water quality parameter monitoring in accordance with
7102 12VAC5-590-375 C 2 to assist the ~~commissioner~~ department in ~~reviewing~~ evaluating
7103 the proposal.

7104 b. Applicability of studies of corrosion control treatment (applicable to small and
7105 medium waterworks). The ~~commissioner~~ department may require the owner of ~~any a~~
7106 small or medium waterworks that exceeds the lead or copper ~~action level~~ AL to perform

7107 corrosion control studies under subdivision A 1 c of this section to identify optimal
7108 corrosion control treatment for the waterworks.

7109 c. Corrosion control studies.

7110 (1) The owner of any a waterworks required by the ~~commissioner~~ department to
7111 perform corrosion control studies shall evaluate the effectiveness of each of the
7112 following treatments, and, if appropriate, combinations of the following treatments to
7113 identify the optimal corrosion control treatment for that waterworks:

7114 (a) Alkalinity and pH adjustment;

7115 (b) Calcium hardness adjustment; and

7116 (c) The addition of a ~~phosphate~~ phosphate-based or ~~silicate-based~~ silicate-based
7117 corrosion inhibitor at a concentration sufficient to maintain an effective corrosion
7118 inhibitor residual concentration in all test tap samples, such that a passivating film is
7119 formed on the interior walls of the pipe.

7120 (2) The owner shall evaluate each of the corrosion control treatments using either pipe
7121 rig/loop tests, metal coupon tests, partial-system tests, or analyses based on
7122 documented analogous treatments with other waterworks of similar size, water
7123 chemistry, and distribution system configuration.

7124 (3) The owner shall measure the following water quality parameters in any tests
7125 conducted under subdivision A 1 c of this section before and after evaluating the
7126 corrosion control treatments listed ~~above~~ in subdivision A 1 c (1) of this section:

7127 (a) Lead;

7128 (b) Copper;

7129 (c) pH;

7130 (d) Alkalinity;

7131 (e) Calcium;

7132 (f) Conductivity;

7133 (g) Orthophosphate (when an inhibitor containing a phosphate compound is used);

7134 (h) Silicate (when an inhibitor containing a silicate compound is used); and

7135 (i) Water temperature.

7136 (4) The owner shall identify all chemical or physical constraints that limit or prohibit the

7137 use of a particular corrosion control treatment and document such constraints with at

7138 least one of the following:

7139 (a) Data and documentation showing that a particular corrosion control treatment has

7140 adversely affected other water treatment processes when used by another waterworks

7141 with comparable water quality characteristics; or

7142 (b) Data and documentation demonstrating that the owner has previously attempted

7143 to evaluate a particular corrosion control treatment and has found that the treatment

7144 is ineffective or adversely affects other water quality treatment processes.

7145 (5) The owner shall evaluate the effect of the chemicals used for corrosion control

7146 treatment on other water quality treatment processes.

7147 (6) On the basis of an analysis of the data generated during each evaluation, the owner

7148 shall propose in writing to the ~~district engineer~~ department in writing, that the treatment

7149 option ~~that~~ resulting from the corrosion control studies ~~indicate~~ constitutes optimal

7150 corrosion control treatment for that waterworks. The owner shall provide a rationale

7151 for ~~its~~ the recommendation along with all supporting documentation specified in

7152 subdivisions A 1 c (1) through A 1 c (5) of this section.

7153 d. Approval of optimal corrosion control treatment.

7154 (1) Based upon consideration of available information including, where applicable,
7155 studies performed under subdivision A 1 c of this section and ~~an~~ the owner's proposed
7156 treatment alternative, the ~~commissioner~~ department shall either approve the corrosion
7157 control treatment option recommended by the owner, or designate alternative
7158 corrosion control treatment or treatments from among those listed in subdivision A 1 c
7159 (1) of this section. When approving optimal treatment, the ~~commissioner~~ department
7160 shall consider the effects that additional corrosion control treatment will have on water
7161 quality parameters and on other water quality treatment processes.

7162 (2) The ~~commissioner~~ department shall notify the owner of ~~his~~ the determination on
7163 optimal corrosion control treatment in writing and explain the basis for this
7164 determination. If the ~~commissioner~~ department requests additional information to aid
7165 ~~a review~~ an evaluation, then the owner shall provide the information.

7166 e. Installation of optimal corrosion control. ~~Each~~ The owner shall properly install and
7167 operate throughout the waterworks the optimal corrosion control treatment approved
7168 by the ~~commissioner~~ department under subdivision A 1 d of this section. ~~Also see~~
7169 12VAC5-590-190. A construction permit is required before installation of any
7170 treatment, in accordance with 12VAC5-590-200.

7171 f. ~~Commissioner's review~~ The commissioner's department's evaluation of treatment
7172 and specification of the optimal water quality control parameters shall consist of the
7173 following:-

7174 (1) The ~~commissioner~~ department shall evaluate the results of all lead and copper tap
7175 samples and water quality parameter samples submitted by the owner and determine
7176 whether the owner has properly installed and operated the optimal corrosion control

7177 treatment approved by the ~~commissioner~~ department under subdivision A 1 d of this
7178 section. Upon ~~reviewing~~ evaluating the results of tap water and water quality
7179 parameter monitoring by the owner, both before and after the owner installs optimal
7180 corrosion control treatment, the ~~commissioner~~ department shall designate:

7181 (a) A minimum value or a range of values for pH measured at each entry point to the
7182 distribution system;

7183 (b) A minimum pH value, measured in all tap samples. ~~Such~~ The value shall be equal
7184 to or greater than 7.0, unless the ~~commissioner~~ department determines that meeting
7185 a pH level of 7.0 is not technologically feasible or is not necessary for the owner to
7186 optimize corrosion control;

7187 (c) If a corrosion inhibitor is used, then a minimum concentration or a range of
7188 concentrations for the inhibitor, measured at each entry point to the distribution system
7189 and in all tap samples, that the ~~commissioner~~ department determines is necessary to
7190 form a passivating film on the interior walls of the pipes of the distribution system;

7191 (d) If alkalinity is adjusted as part of the optimal corrosion control treatment, then a
7192 minimum concentration or a range of concentrations for alkalinity, measured at each
7193 entry point to the distribution system and in all tap samples; or

7194 (e) If calcium carbonate stabilization is used as part of the corrosion control, then a
7195 minimum concentration or a range of concentrations for calcium, measured in all tap
7196 samples.

7197 (2) The values for the applicable water quality control parameters listed ~~above~~ in
7198 subdivision A 1 c (3) of this section shall be those that the ~~commissioner~~ department
7199 determines to reflect optimal corrosion control treatment for the waterworks. The
7200 ~~commissioner~~ department may designate values for additional water quality control

7201 parameters determined by the ~~commissioner~~ department to reflect optimal corrosion
7202 control for the waterworks. The ~~commissioner~~ department shall notify the owner in
7203 writing of these determinations and explain the basis for ~~his~~ the decisions.

7204 g. Continued operation and monitoring. The ~~owners~~ owner of ~~all~~ a waterworks
7205 optimizing corrosion control shall continue to operate and maintain optimal corrosion
7206 control treatment, including maintaining water quality parameters at or above minimum
7207 values or within ranges designated by the ~~commissioner~~ department under subdivision
7208 A 1 f of this section as verified by all samples collected under 12VAC5-590-375 C 4
7209 through 12VAC5-590-375 C 6. Compliance with the requirements of this subdivision
7210 shall be determined every six months, as specified under 12VAC5-590-375 C 4. The
7211 ~~owner of a~~ waterworks is out of compliance with the requirements of this subdivision
7212 for a six-month period if excursions occur for any ~~commissioner-specified~~ department-
7213 specified parameter on more than nine days during the period. An excursion occurs
7214 whenever the daily value for one or more of the water quality parameters measured at
7215 a sampling location is below the minimum value or outside the range designated by
7216 the ~~commissioner~~ department. ~~Daily values shall be calculated as follows.~~ The
7217 ~~commissioner~~ department has discretion to delete results of obvious sampling errors
7218 from this calculation. Daily values shall be calculated as follows:

7219 (1) On days when more than one measurement for the water quality parameter is
7220 collected at the sampling location, the daily value shall be the average of all results
7221 collected during the day regardless of whether they are collected through continuous
7222 monitoring, grab sampling, or a combination of both.

7223 (2) On days when only one measurement for the water quality parameter is collected
7224 at the sampling location, the daily value shall be the result of that measurement.

7225 (3) On days when no measurement is collected for the water quality parameter at the
7226 sampling location, the daily value shall be the daily value calculated on the most recent
7227 day on which the water quality parameter was measured at the sample site.

7228 h. Modification of the ~~commissioner's~~ department's treatment decisions. Upon ~~his own~~
7229 the department's initiative or in response to a request by an owner or other interested
7230 party, the ~~commissioner~~ department may modify ~~his~~ the determination of the optimal
7231 corrosion control treatment under subdivision A 1 d of this section or optimal water
7232 quality control parameters under subdivision A 1 f of this section. A request for
7233 modification by an owner or other interested party shall be in writing, explain why the
7234 modification is appropriate, and provide supporting documentation. The ~~commissioner~~
7235 department may modify the determination where it is concluded that ~~such~~ the change
7236 is necessary to ensure that the waterworks continues to optimize corrosion control
7237 treatment. A revised determination shall be made in writing, set forth the new treatment
7238 requirements, explain the basis for the ~~commissioner's~~ department's decision, and
7239 provide an implementation schedule for completing the treatment modifications.

7240 2. Corrosion control treatment steps.

7241 a. ~~Owners~~ The owner shall complete the applicable corrosion control treatment
7242 requirements described in subdivision A 1 of this section by the deadlines established
7243 in this subdivision.

7244 (1) The owner of a large waterworks (serving > 50,000 persons) shall complete the
7245 corrosion control treatment steps specified in subdivision A 2 d of this section, unless
7246 the owner is deemed to have optimized corrosion control under subdivision A 2 b (2)
7247 or ~~subdivision A 2 b (3)~~ of this section.

7248 (2) The owner of a small waterworks (serving ≤ 3300 persons) ~~and or~~ or a medium
7249 waterworks (serving $>3,300$ and $\leq 50,000$ persons) shall complete the corrosion
7250 control treatment steps specified in subdivision A 2 e of this section, unless the owner
7251 is deemed to have optimized corrosion control under subdivisions A 2 b (1) through A
7252 2 b (3) of this section.

7253 b. ~~An~~ The owner is deemed to have optimized corrosion control and is not required to
7254 complete the applicable corrosion control treatment steps identified in this subdivision
7255 if the waterworks satisfies one of the criteria specified in subdivisions A 2 b (1) through
7256 A 2 b (3) of this section. ~~Any such~~ The owner deemed to have optimized corrosion
7257 control under this subdivision, and ~~which~~ who has treatment in place, shall continue to
7258 operate and maintain optimal corrosion control treatment and meet any requirements
7259 that the ~~commissioner~~ department determines appropriate to ensure optimal corrosion
7260 control treatment is maintained.

7261 (1) The owner of a small or medium waterworks is deemed to have optimized corrosion
7262 control if the waterworks meets the lead and copper ~~action levels~~ ALs during each of
7263 two consecutive six-month monitoring periods conducted in accordance with 12VAC5-
7264 590-375.

7265 (2) ~~Any~~ The owner may be deemed by the ~~commissioner~~ department to have
7266 optimized corrosion control treatment if the owner demonstrates to the satisfaction of
7267 the ~~commissioner~~ department that the owner has conducted activities equivalent to
7268 the corrosion control steps applicable to ~~such~~ the waterworks under this section. If the
7269 ~~commissioner~~ department makes this determination, then the owner shall be provided
7270 with a written notice explaining the basis for the decision and the notice shall specify
7271 the water quality control parameters representing optimal corrosion control in
7272 accordance with subdivision A 1 f of this section. ~~Waterworks owners~~ The owner

7273 deemed to have optimized corrosion control under this subdivision shall operate in
7274 compliance with the ~~commissioner designated~~ department-designated optimal water
7275 quality control parameters in accordance with subdivision A 1 g and continue to
7276 conduct lead and copper tap and water quality parameter sampling in accordance with
7277 12VAC5-590-375 B 4 c and 12VAC5-590-375 C 4, respectively. The owner shall
7278 provide the ~~commissioner~~ department with the following information ~~in order~~ to support
7279 a determination under this subdivision:

7280 (a) The results of all test samples collected for each of the water quality parameters in
7281 subdivision A 1 c (3) of this section;

7282 (b) A report explaining the test methods used by the owner to evaluate the corrosion
7283 control treatments listed in subdivision A 1 c (1) of this section, the results of all tests
7284 conducted, and the basis for the owner's selection of optimal corrosion control
7285 treatment;

7286 (c) A report explaining how corrosion control has been installed and how it is being
7287 maintained to insure minimal lead and copper concentrations at consumers' taps; and

7288 (d) The results of tap water samples collected in accordance with 12VAC5-590-375 B
7289 at least once every six months for one year after corrosion control treatment has been
7290 installed.

7291 (3) ~~Any~~ A waterworks is deemed to have optimized corrosion control if the owner
7292 submits results of tap water monitoring conducted in accordance with 12VAC5-590-
7293 375 B and source water monitoring conducted in accordance with 12VAC5-590-375
7294 D, and which that demonstrates demonstrate for two consecutive six-month monitoring
7295 periods that the difference between the 90th percentile tap water lead level, computed

7296 under 12VAC5-590-385 C, and the highest source water lead concentration is less
7297 than the PQL for lead (0.005 mg/L).

7298 (a) ~~Any~~ The owner ~~that~~ who submits monitoring results indicating that the highest
7299 source water lead level is below the ~~method-detection-limit~~ MDL may also be deemed
7300 to have optimized corrosion control under this subdivision if the 90th percentile tap
7301 water lead level is less than or equal to the PQL for lead (0.005 mg/L) for two
7302 consecutive six-month monitoring periods.

7303 (b) ~~Any~~ The owner deemed to have optimized corrosion control under this subdivision
7304 shall continue monitoring for lead and copper at the tap no less frequently than once
7305 every three calendar years using the reduced number of sites specified in 12VAC5-
7306 590-375 B 3 and collecting the samples at times and locations specified in 12VAC5-
7307 590-375 B 4 d (4).

7308 (c) ~~Any~~ The owner deemed to have optimized corrosion control pursuant to this
7309 subdivision shall notify the ~~district engineer~~ department in writing pursuant to ~~12VAC5-~~
7310 ~~590-530 F 1 e~~ 12VAC5-590-532 B 3 of any upcoming long-term change in treatment
7311 or addition of a new ~~water~~ source water as described in that subdivision. The
7312 ~~commissioner~~ department ~~must review~~ shall evaluate and approve the addition of a
7313 new source ~~water source~~ or long-term change in water treatment before it is
7314 implemented by the owner. The ~~commissioner~~ department may require the owner of
7315 ~~any such a~~ waterworks to conduct additional monitoring or to take other actions the
7316 ~~commissioner~~ department deems appropriate to ensure that minimum levels of
7317 corrosion control are being maintained in the distribution system.

7318 (d) ~~A~~ The owner is not deemed to have optimized corrosion control under this
7319 subdivision, and shall implement corrosion control treatment specified in subdivision
7320 A 2 b (3) (e) of this section, unless the copper ~~action level~~ AL is met.

7321 (e) The owner of a waterworks triggered into corrosion control because the waterworks
7322 no longer is deemed to have optimized corrosion control under this subsection shall
7323 implement corrosion control treatment in accordance with the deadlines in subdivision
7324 A 2 e of this section. The owner of ~~any such a~~ large waterworks shall adhere to the
7325 schedule specified in subdivision A 2 e of this section for ~~medium-size~~ a medium
7326 ~~systems~~ waterworks, with the time period for completing each step being triggered by
7327 the date the owner is no longer deemed to have optimized corrosion control treatment
7328 under this subsection.

7329 c. The owner of ~~any a~~ small or medium waterworks that is required to complete the
7330 corrosion control steps due to the exceedance of the lead or copper ~~action-level~~ AL
7331 may cease completing the treatment steps whenever the waterworks meets both
7332 ~~action-levels~~ ALs during each of two consecutive six-month monitoring periods
7333 conducted pursuant to 12VAC5-590-375 B 4 a and submits the results to the ~~district~~
7334 ~~engineer-department~~. If ~~any such a~~ waterworks thereafter exceeds the lead or copper
7335 ~~action-level~~ AL during any monitoring period, the owner shall recommence completion
7336 of the applicable treatment steps, beginning with the first treatment step ~~which~~ that
7337 was not previously completed in its entirety. The ~~commissioner~~ department may
7338 require the owner to repeat treatment steps previously completed where the
7339 ~~commissioner~~ department determines that this is necessary to properly implement the
7340 treatment requirements of this section. The ~~commissioner~~ department shall notify the
7341 owner in writing of ~~such a~~ the determination and explain the basis for ~~his~~ the decision.
7342 The requirement for the owner of ~~any a~~ small or medium waterworks to implement
7343 corrosion control treatment steps in accordance with subdivision A 2 e of this section
7344 (including waterworks deemed to have optimized corrosion control under subdivision

7345 A 2 b (1) of this section) is triggered whenever ~~any~~ a small or medium waterworks
7346 exceeds the lead or copper ~~action level~~ AL.

7347 d. Treatment steps and deadlines for large waterworks. Except as provided in
7348 subdivisions A 2 b (2) and A 2 b (3) of this section, ~~owners~~ the owner of a large
7349 waterworks shall complete the following corrosion control treatment steps (described
7350 in the referenced portions of subdivision A 1 of this section, 12VAC5-590-375 B and
7351 12VAC5-590-375 C).

7352 (1) Step 1: The owner shall conduct initial monitoring (12VAC5-590-375 B 4 a and
7353 12VAC5-590-375 C 2) during two consecutive six-month monitoring periods by a date
7354 specified by the ~~commissioner~~ department .

7355 (2) Step 2: The owner shall complete corrosion control studies (subdivision A 1 c of
7356 this section) and submit the study and recommendations to the ~~commissioner~~
7357 department no later than 18 months after the date that initial monitoring is completed
7358 as specified in Step 1.

7359 (3) Step 3: The ~~commissioner~~ department shall approve optimal corrosion control
7360 treatment (subdivision A 1 d) no later than 12 months following receipt of the corrosion
7361 control study required in Step 2.

7362 (4) Step 4: The owner shall install optimal corrosion control treatment (subdivision A 1
7363 e) no later than 24 months following the ~~commissioner's~~ department's approval of
7364 optimal corrosion control treatment specified in Step 3 (~~See 12VAC5-590-200~~).

7365 (5) Step 5: The owner shall complete follow-up sampling (12VAC5-590-375 B 4 b and
7366 12VAC5-590-375 C 3) no later than 12 months following the installation of optimal
7367 corrosion control treatment specified in Step 4.

7368 (6) Step 6: The ~~commissioner~~ department shall ~~review~~ evaluate the installation of
7369 treatment and designate optimal water quality control parameters (subdivision A 1 f)
7370 no later than six months following completion of follow-up sampling specified in Step
7371 5.

7372 (7) Step 7: The owner shall operate the waterworks in compliance with the
7373 ~~commissioner-specified~~ department-specified optimal water quality control
7374 parameters (subdivision A 1 g) and continue to conduct tap sampling (12VAC5-590-
7375 375 B 4 c and 12VAC5-590-375 C 4).

7376 e. Treatment steps and deadlines for small and medium waterworks. Except as
7377 provided in subdivision A 2 b of this section, ~~owners~~ the owner of a small ~~and~~ or
7378 medium waterworks shall complete the following corrosion control treatment steps
7379 (described in the referenced portions of subdivision A 1, 12VAC5-590-375 B 1, and
7380 12VAC5-590-375 C) ;

7381 (1) Step 1: The owner shall conduct initial tap sampling (12VAC5-590-375 B 4 a and
7382 12VAC5-590-375 C 2) until the waterworks either exceeds the lead or copper ~~action~~
7383 ~~level~~ AL or becomes eligible for reduced monitoring under 12VAC5-590-375 B 4 d.
7384 The owner of a waterworks exceeding the lead or copper ~~action level~~ AL shall propose
7385 optimal corrosion control treatment (subdivision A 1 a of this section) within six months
7386 after the end of the monitoring period during which it exceeds one of the ~~action levels~~
7387 ALs.

7388 (2) Step 2: Within 12 months after the end of the monitoring period during which a
7389 waterworks exceeds the lead or copper ~~action level~~ AL, the ~~commissioner~~ department
7390 may require the owner to perform corrosion control studies (subdivision A 1 b of this
7391 section). If the ~~commissioner~~ department does not require the owner to perform ~~such~~

7392 ~~these~~ studies, the ~~commissioner~~ department shall specify optimal corrosion control
7393 treatment (subdivision A 1 d of this section) within the following timeframes:

7394 (a) For a medium waterworks, within 18 months after the end of the monitoring period
7395 during which ~~such~~ the waterworks exceeds the lead or copper action-level AL.

7396 (b) For a small waterworks, within 24 months after the end of the monitoring period
7397 during which ~~such~~ the waterworks exceeds the lead or copper action-level AL.

7398 (3) Step 3: If the ~~commissioner~~ department requires ~~an~~ the owner to perform corrosion
7399 control studies under Step 2, then the owner shall complete the studies (subdivision A
7400 1 c of this section) and submit the study and recommendations to the ~~commissioner~~
7401 department within 18 months after the ~~commissioner~~ department requires that ~~such~~
7402 the studies be conducted.

7403 (4) Step 4: If the ~~waterworks~~ owner has performed corrosion control studies under
7404 Step 2, then the ~~commissioner~~ department shall designate optimal corrosion control
7405 treatment (subdivision A 1 d of this section) within six months after completion of Step
7406 3.

7407 (5) Step 5: The owner shall install optimal corrosion control treatment (subdivision A 1
7408 e of this section) within 24 months after the ~~commissioner~~ department designates such
7409 treatment. A construction permit is required before installation of any treatment, in
7410 accordance with ~~See~~ 12VAC5-590-200.

7411 (6) Step 6: The owner shall complete follow-up sampling (12VAC5-590-375 B 4 b and
7412 12VAC5-590-375 C 3) within 36 months after the ~~commissioner~~ department
7413 designates optimal corrosion control treatment.

7414 (7) Step 7: The ~~commissioner~~ department shall ~~review~~ evaluate the owner's installation
7415 of treatment and designate optimal water quality control parameters (subdivision A 1 f
7416 of this section) within six months after completion of Step 6.

7417 (8) Step 8: The owner shall operate the waterworks in compliance with the
7418 ~~commissioner-designated~~ department-designated optimal water quality control
7419 parameters (subdivision A 1 g of this section) and continue to conduct tap sampling
7420 (12VAC5-590-375 B 4 c and 12VAC5-590-375 C 4).

7421 B. ~~Water supply (source water)~~ Source water treatment technique requirements for lead and
7422 copper. The owner of ~~any a~~ a waterworks exceeding the lead or copper ~~action-level~~ AL shall
7423 complete the applicable ~~water supply~~ source water monitoring and treatment requirements
7424 (described in the referenced portions of subdivision B 2 of this section, and in 12VAC5-590-375
7425 B and 12VAC5-590-375 D) by the following deadlines-;

7426 1. Deadlines for completing source water ~~supply~~-treatment steps.

7427 a. Step 1: The owner of a waterworks exceeding the lead or copper ~~action-level~~ AL
7428 shall complete lead and copper source water ~~supply~~ monitoring (12VAC5-590-375 D
7429 2) and ~~make~~ submit a treatment proposal to the ~~district-engineer~~ department
7430 (subdivision B 2 a of this section) no later than 180 days after the end of the monitoring
7431 period during which the lead or copper ~~action-level~~ AL was exceeded.

7432 b. Step 2: The ~~commissioner~~ department shall make a determination regarding the
7433 need for source water ~~supply~~ treatment (subdivision B 2 b of this section) within six
7434 months after submission of monitoring results under Step 1.

7435 c. Step 3: If the ~~commissioner~~ department requires installation of source water ~~supply~~
7436 treatment, then the owner shall install the treatment (subdivision B 3 of this section)
7437 within 24 months after completion of Step 2.

7438 d. Step 4: The owner shall complete follow-up tap water monitoring (12VAC5-590-375
7439 B 4 b) and source water supply lead and copper monitoring (12VAC5-590-375 D 3)
7440 within 36 months after completion of Step 2.

7441 e. Step 5: The ~~commissioner~~ department shall ~~review~~evaluate the owner's installation
7442 and operation of the source water supply treatment and specify maximum permissible
7443 source water supply lead and copper levels (subdivision B 4 of this section) within six
7444 months after completion of Step 4.

7445 f. Step 6: The owner shall operate the waterworks in compliance with the
7446 ~~commissioner-specified~~ department-specified maximum permissible source water
7447 lead and copper ~~water supply~~ levels (subdivision B 4 of this section) and continue
7448 source water supply monitoring (12VAC5-590-375 D 4).

7449 2. Description of source water supply treatment requirements.

7450 a. Waterworks treatment recommendation. The owner of ~~any a~~ a waterworks ~~which that~~
7451 exceeds the lead or copper ~~action level~~ AL shall propose in writing to the ~~district~~
7452 ~~engineer~~ department, the installation and operation of one of the source water supply
7453 treatments listed in subdivision B 2 b of this section. ~~An~~ The owner may propose that
7454 no treatment be installed based upon a demonstration that source water supply
7455 treatment is not necessary to minimize lead and copper levels at ~~users'~~ consumers'
7456 taps.

7457 b. ~~Commissioner's~~ Department's determination regarding source water supply
7458 treatment. The ~~commissioner~~ department shall complete an evaluation of the results
7459 of all source water supply samples submitted by the owner to determine whether
7460 source water supply treatment is necessary to minimize lead or copper levels in water
7461 delivered to ~~users'~~ consumers' taps. If the ~~commissioner~~ department determines that

7462 treatment is needed, ~~then the commissioner~~ department shall either require installation
7463 and operation of the source water supply treatment recommended by the owner or
7464 require the installation and operation of another source water supply treatment from
7465 among the following: (i) ion exchange, (ii) ~~reverse osmosis RO~~, (iii) lime softening, or
7466 (iv) coagulation/filtration. If the ~~commissioner~~ department requests additional
7467 information to aid in the ~~review~~ evaluation, ~~then~~ the owner shall provide the information
7468 by the date specified by the ~~commissioner~~ department in the request. The
7469 ~~commissioner~~ department shall notify the owner in writing of the determination and set
7470 forth the basis for the decision.

7471 3. Installation of source water supply treatment. ~~Each~~ The owner shall properly install and
7472 operate the source water supply treatment designated by the ~~commissioner~~ department
7473 under subdivision B 2 b of this section.

7474 4. ~~Commissioner's review~~ The department's evaluation of source water supply treatment
7475 and specification of maximum permissible source water supply lead and copper levels.
7476 The ~~commissioner~~ department shall ~~review~~ evaluate the source water supply samples
7477 ~~taken~~ collected by the owner both before and after the owner installs source water supply
7478 treatment, and determine whether the owner has properly installed and operated the
7479 source water supply treatment designated by the ~~commissioner~~ department. Based upon
7480 the ~~review~~ evaluation, the ~~commissioner~~ department shall designate the maximum
7481 permissible lead and copper concentrations for finished water entering the distribution
7482 system. ~~Such~~ The levels shall reflect the contaminant removal capability of the treatment
7483 properly operated and maintained. The ~~commissioner~~ department shall notify the owner
7484 in writing and explain the basis for the decision.

7485 5. Continued operation and maintenance. ~~Each~~ The waterworks shall be operated to
7486 maintain lead and copper levels below the maximum permissible concentrations

7487 designated by the ~~commissioner~~ department at each sampling point monitored in
7488 accordance with 12VAC5-590-375 D. The waterworks is out of compliance with this
7489 subdivision if the level of lead or copper at any sampling point is greater than the maximum
7490 permissible concentration designated by the ~~commissioner~~ department.

7491 6. Modification of the ~~commissioner's~~ department's treatment decisions. Upon ~~his own~~ the
7492 department's initiative or in response to a request by an owner or other interested party,
7493 the ~~commissioner~~ department may modify ~~his~~ the determination of the source water supply
7494 treatment under subdivision B 2 b of this section, or may modify the maximum permissible
7495 lead and copper concentrations for finished water entering the distribution system under
7496 subdivision B 4 of this section. A request for modification by an owner or other interested
7497 party shall be in writing, explain why the modification is appropriate, and provide
7498 supporting documentation. The ~~commissioner~~ department may modify the determination
7499 where ~~he concludes~~ the conclusion is made that ~~such~~ the change is necessary to ensure
7500 that the waterworks continues to minimize lead and copper concentrations in ~~water~~
7501 supplies source waters. A revised determination shall be made in writing, set forth the new
7502 treatment requirements, explain the basis for the ~~commissioner's~~ department's decision,
7503 and provide an implementation schedule for completing the treatment modifications.

7504 C. Lead service line replacement treatment technique requirements:

7505 1. ~~Owners~~ The owner of a waterworks that ~~fail~~ fails to meet the lead action level AL in tap
7506 samples ~~taken~~ collected pursuant to 12VAC5-590-375 B 4 b, after installing corrosion
7507 control or source water supply treatment (whichever sampling occurs later), shall replace
7508 lead service lines in accordance with the requirements of this section. If a ~~waterworks~~ the
7509 owner is in violation of subdivision A 2 of this section or subsection B of this section for
7510 failure to install source water supply or corrosion control treatment, then the ~~commissioner~~
7511 department may require the owner to commence lead service line replacement under this

7512 section after the date by which the owner was required to conduct monitoring under
7513 12VAC5-590-375 B 4 b has passed.

7514 2. ~~An~~The owner shall replace annually at least 7.0% of the initial number of lead service
7515 lines in its distribution system. The initial number of lead service lines is the number of
7516 lead lines in place at the time the replacement program begins. The owner shall identify
7517 the initial number of lead service lines in its distribution system based upon a materials
7518 evaluation, including the evaluation required under 12VAC5-590-375 B 1. The first year of
7519 lead service line replacement shall begin on the first day following the end of the
7520 monitoring period in which the lead action level AL was exceeded under subdivision C 1
7521 of this ~~subsection~~ section. If monitoring is required annually or less frequently, then the
7522 end of the monitoring period is September 30 of the calendar year in which the sampling
7523 occurs. If the ~~commissioner~~ department has established an alternate monitoring period,
7524 then the end of the monitoring period will be the last day of that period.

7525 3. The owner of ~~any a~~ a waterworks resuming a lead service line replacement program after
7526 the cessation of the lead service line replacement program as allowed by subdivision C 7
7527 of this section shall update the inventory of lead service lines to include those sites that
7528 were previously determined not to require replacement through the sampling provision
7529 under subdivision C 4 of this section. The owner shall then divide the updated number of
7530 remaining lead service lines by the number of remaining years in the program to determine
7531 the number of lines that must be replaced per year (7.0% lead service line replacement is
7532 based on a 15-year replacement program; so, for example, ~~owners~~ the owner resuming
7533 lead service line replacement after previously conducting two years of replacement would
7534 divide the updated inventory by 13). For ~~these owners that~~ the owner who has ~~have~~
7535 completed a 15-year lead service line replacement program, the ~~commissioner~~
7536 department will determine a schedule for replacing or retesting lines that were previously

7537 tested out under the replacement program when the waterworks re-exceeds the lead
7538 action-level AL.

7539 4. ~~An~~ The owner is not required to replace an individual lead service line if the lead
7540 concentration in all service line samples from that line, ~~taken~~-collected pursuant to
7541 12VAC5-590-375 B 2 c, is less than or equal to 0.015 mg/L.

7542 5. ~~An~~ The owner shall replace that portion of the lead service line that is owned by the
7543 waterworks. In cases where the ~~waterworks~~ owner does not own the entire lead service
7544 line, the ~~waterworks~~ owner shall notify the building owner, or the building owner's
7545 authorized agent, that the ~~waterworks~~ owner will replace that portion of the service line
7546 that is owned by the waterworks and shall offer to replace the building owner's portion of
7547 the line. The ~~waterworks~~ owner is not required to bear the cost of replacing the building
7548 owner's portion of the service line, nor is the ~~waterworks~~ owner required to replace the
7549 building owner's portion where the ~~waterworks~~ owner chooses not to pay the cost of
7550 replacing the building owner's portion of the line, or where replacing the building owner's
7551 portion would be precluded by state, local, or common law. ~~A waterworks~~ The owner ~~that~~
7552 who does not replace the entire length of the service line also shall complete the following
7553 tasks-;

7554 a. At least 45 days ~~prior to~~ before commencing with the partial replacement of a lead
7555 service line, the ~~waterworks~~ owner shall provide notice to the resident or residents of
7556 all buildings served by the line explaining that they may experience a temporary
7557 increase of lead levels in ~~their~~ the drinking water, along with guidance on measures
7558 consumers can take to minimize their exposure to lead. The ~~commissioner~~ department
7559 may allow the ~~waterworks~~ owner to provide notice under the previous sentence less
7560 than 45 days ~~prior to~~ before commencing partial lead service line replacement where
7561 ~~such~~ the replacement is in conjunction with emergency repairs. In addition, the

7562 ~~waterworks~~ owner shall inform the resident or residents served by the lead service line
7563 that the ~~waterworks~~ owner will, at the ~~waterworks~~ owner's expense, collect a sample
7564 from each ~~partially-replaced~~ partially replaced lead service line that is representative
7565 of the water in the service line for analysis of lead content, as prescribed in 12VAC5-
7566 590-375 B 2 c, within 72 hours after the completion of the partial replacement of the
7567 lead service line. The ~~waterworks~~ owner shall collect the sample and report the results
7568 of the analysis to the building owner and resident or residents served by the service
7569 line within three business days of receiving the results. Mailed notices post-marked
7570 within three business days of receiving the results shall be considered on time.

7571 b. The ~~waterworks~~ owner shall provide the information required by subdivision C 5 a
7572 of this section to the residents of individual dwellings by mail or by other methods
7573 approved by the ~~commissioner~~ department. In instances where ~~multi-family~~ multifamily
7574 dwellings are served by the service line, the ~~waterworks~~ owner shall have the option
7575 to post the information at a conspicuous location.

7576 6. The ~~commissioner~~ department shall require ~~an~~ the owner to replace lead service lines
7577 on a shorter schedule than that required by this subsection, taking into account the number
7578 of lead service lines in the waterworks, where ~~such~~ a shorter replacement schedule is
7579 feasible. The ~~commissioner~~ department shall make this determination in writing and notify
7580 the owner of the findings within six months after the waterworks is triggered into lead
7581 service line replacement based on monitoring referenced in subdivision C 1 of this section.

7582 7. ~~Any~~ The owner may cease replacing lead service lines whenever ~~first-draw~~ first-draw
7583 tap samples collected pursuant to 12VAC5-590-375 B 2 b meet the lead ~~action-level~~ AL
7584 during each of two consecutive six-month monitoring periods and the owner submits the
7585 results to the ~~district engineer~~ department. If the ~~first-draw~~ first-draw tap samples collected
7586 in ~~any such~~ a waterworks thereafter ~~exceeds~~ exceed the lead ~~action-level~~ AL, then the

7587 owner shall recommence replacing lead service lines, pursuant to subdivision C 3 of this
7588 section.

7589 8. To demonstrate compliance with subdivisions C 1 through C 5 of this section, an owner
7590 shall report to the ~~district engineer~~ department the information specified in ~~42VAC5-590-~~
7591 ~~530 F 5~~ 12VAC5-590-532.

7592 D. Lead public education requirements. The ~~waterworks~~ owner shall deliver a consumer
7593 notice of lead tap water monitoring results to all persons served by the ~~water system~~ waterworks
7594 at sites that are tested in accordance with subdivision D 4 of this section. The owner of a
7595 waterworks that exceeds the lead ~~action level~~ AL based on tap water samples collected in
7596 accordance with 12VAC5-590-375 B shall deliver the public education materials contained in
7597 ~~subdivisions~~ subdivision D 1 of this section in accordance with the requirements in subdivision D
7598 2 of this section. The owner of a waterworks that exceeds the lead ~~action level~~ AL shall sample
7599 the tap water of any customer who requests it in accordance with subdivision D 3 of this section.

7600 1. Content of written materials. The owner shall include the following text in all of the
7601 printed materials distributed through the lead public education program-;

7602 a. Community waterworks and ~~nontransient noncommunity waterworks~~ NTNCs.
7603 ~~Owners~~ The owner of a community waterworks or a ~~nontransient noncommunity~~
7604 ~~waterworks~~ NTNC shall include the following elements in printed materials (e.g.,
7605 brochures and pamphlets) in the same order as listed below. In addition, the language
7606 specified in subdivisions D 1 a (1) through D 1 a (2) and in subdivision D 1 a (6) of this
7607 section shall be included in materials, exactly as written, except for the text in brackets
7608 for which the ~~waterworks~~ owner shall include system-specific information. Any
7609 additional information presented by the owner shall be consistent with the information
7610 below and be in plain language that can be understood by the general public. The

7611 ~~commissioner~~ department may require the ~~waterworks~~ owner to obtain approval of the
7612 content of written material ~~prior to~~ before delivery.

7613 (1) IMPORTANT INFORMATION ABOUT LEAD IN YOUR DRINKING WATER.

7614 ~~[INSERT NAME OF WATERWORKS]~~ (Insert name of waterworks) found elevated
7615 levels of lead in drinking water in some homes/buildings. Lead can cause serious
7616 health problems, especially for pregnant women and young children. Please read this
7617 information closely to see what you can do to reduce lead in your drinking water.

7618 (2) Health effects of lead. Lead can cause serious health problems if too much enters
7619 your body from drinking water or other sources. It can cause damage to the brain and
7620 kidneys, and can interfere with the production of red blood cells that carry oxygen to
7621 all parts of your body. The greatest risk of lead exposure is to infants, young children,
7622 and pregnant women. Scientists have linked the effects of lead on the brain with
7623 lowered IQ in children. Adults with kidney problems and high blood pressure can be
7624 affected by low levels of lead more than healthy adults. Lead is stored in the bones,
7625 and it can be released later in life. During pregnancy, the child receives lead from the
7626 mother's bones, which may affect brain development.

7627 (3) Sources of lead.

7628 (a) Explain what lead is.

7629 (b) Explain possible sources of lead in drinking water and how lead enters drinking
7630 water. Include information on home/building materials and services lines that may
7631 contain lead.

7632 (c) Discuss other important sources of lead exposure in addition to drinking water (e.g.,
7633 paint).

7634 (4) Discuss the steps the consumer can take to reduce their exposure to lead in
7635 drinking water.

7636 (a) Encourage running the water to flush out the lead.

7637 (b) Explain concerns with using hot water from the tap and specifically caution against
7638 the use of hot water for preparing baby formula.

7639 (c) Explain that boiling water does not reduce lead levels.

7640 (d) Discuss other options consumers can take to reduce exposure to lead in drinking
7641 water, such as alternative sources or treatment of water.

7642 (e) Suggest that parents have their child's blood tested for lead.

7643 (5) Explain why there are elevated levels of lead in the waterworks' drinking water (if
7644 known) and what the ~~waterworks~~ owner is doing to reduce the lead levels in
7645 homes/buildings.

7646 (6) For more information call us at [~~INSERT WATERWORKS OWNER'S CONTACT~~
7647 ~~PHONE NUMBER~~], or [~~IF APPLICABLE~~](Insert owner's contact phone number), or if
7648 applicable, visit our website at [~~INSERT WATERWORKS' WEBSITE HERE~~](Insert
7649 waterworks' website URL here). For more information on reducing lead exposure
7650 around your home/building and the health effects of lead, visit EPA's website at
7651 <http://www.epa.gov/lead> or contact your health care provider.

7652 b. In addition to including the elements specified in subdivision D 1 a of this section,
7653 the ~~owners~~ owner of a community waterworks shall:

7654 (1) Tell consumers how to get their water tested.

7655 (2) Discuss lead in plumbing components and the difference between low lead and
7656 lead free. "Lead free" means:-(i) when used with respect to solders and flux refers to

7657 solders and flux containing not more than 0.2% lead, and (ii) when used with respect
7658 to pipes, and pipe fittings, plumbing fittings, and plumbing fixtures refers to the
7659 weighted average of wetted surfaces of pipes, and pipe fittings, plumbing fittings, and
7660 plumbing fixtures containing not more than 0.25% lead.

7661

7662 2. Delivery of public education materials.

7663 a. The owner of ~~any~~ a waterworks serving a large proportion of non-English speaking
7664 consumers, as determined by the ~~commissioner~~ department, shall include in all public
7665 education materials information in the appropriate ~~language(s)~~ language or languages
7666 regarding the importance of the notice or contain a telephone number or address
7667 where persons served may contact the ~~water system~~ waterworks to obtain a translated
7668 copy of the public education materials or to request assistance in the appropriate
7669 language.

7670 b. The owner of a community waterworks that exceeds the lead ~~action level~~ AL on the
7671 basis of tap water samples collected in accordance with 12VAC5-590-375 B, and that
7672 is not already conducting public education tasks, shall conduct the public education
7673 tasks under this subdivision within 60 days after the end of the monitoring period in
7674 which the exceedance occurred. For a waterworks that ~~are~~ is required to conduct
7675 monitoring annually or less frequently, the end of the monitoring period is September
7676 30 of the calendar year in which the sampling occurs, or, if the ~~commissioner~~
7677 department has established an alternate monitoring period, the last day of that period.

7678 These public education tasks include:

7679 (1) Deliver printed materials meeting the content requirements of subdivision D 1 of
7680 this section to all bill paying customers.

7681 (2) Contact customers who are most at risk by delivering education materials that meet
7682 the content requirements of subdivision D 1 of this section to the local health
7683 department even if they are not located within the ~~water system's~~ waterworks' service
7684 area, along with an informational notice that encourages distribution to all the
7685 organization's potentially affected customers or community ~~water system's users~~
7686 waterworks' consumers. The ~~waterworks~~ owner shall contact the local health
7687 department directly by phone or in person. The local health department may provide
7688 a specific list of additional community based organizations serving target populations,
7689 which may include organizations outside the service area of the ~~water system~~
7690 waterworks. If ~~such~~ these lists are provided, then the ~~waterworks~~ owner shall deliver
7691 education materials that meet the content requirements of subdivision D 1 of this
7692 section to all organizations on the provided lists.

7693 (3) Contact customers who are most at risk by delivering materials that meet the
7694 content requirements of subdivision D 1 of this section to the following organizations
7695 that are located within the ~~water system's~~ waterworks' service area, along with an
7696 informational notice that encourages distribution to all the organization's potentially
7697 affected customers or community ~~water system's~~ waterworks' users: (i) public and
7698 private schools or school boards; (ii) Women, Infants and Children (WIC) and Head
7699 Start programs; (iii) public and private hospitals and medical clinics; (iv) pediatricians;
7700 (v) family planning clinics; and (vi) local welfare agencies.

7701 (4) Make a good faith effort to locate the following organizations within the service area
7702 and deliver materials that meet the content requirements of subdivision D 1 of this
7703 section to them, along with an informational notice that encourages distribution to all
7704 potentially affected customers or ~~users~~ consumers. The good faith effort to contact at-
7705 risk customers may include requesting a specific contact list of these organizations

7706 from the local health department, even if the agencies are not located within the ~~water~~
7707 system's waterworks' service area: (i) licensed childcare centers; (ii) public and private
7708 preschools; and (iii) obstetricians-gynecologists and midwives.

7709 (5) No less often than quarterly, provide information on or in each water bill as long as
7710 the waterworks exceeds the ~~action level~~ AL for lead. The message on the water bill
7711 shall include the following statement exactly as written except for the text in brackets
7712 for which the owner shall include system-specific information: ~~[INSERT NAME OF~~
7713 ~~WATERWORKS]~~ (Insert name of waterworks) found high levels of lead in drinking
7714 water in some homes. Lead can cause serious health problems. For more information
7715 please call ~~[INSERT NAME OF WATERWORKS]~~ or visit ~~[IF APPLICABLE INSERT~~
7716 ~~WATERWORKS' WEBSITE]~~ (Insert name of waterworks) or (if applicable) visit our
7717 website at (Insert waterworks' website URL here). The message or delivery
7718 mechanism can be modified in consultation with the ~~commissioner~~ department;
7719 specifically, the ~~commissioner~~ department may allow a separate mailing of public
7720 education materials to customers if the ~~waterworks~~ owner cannot place the information
7721 on water bills.

7722 (6) Post materials meeting the content requirements of subdivision D 1 of this section
7723 on the waterworks' website if the waterworks serves a population greater than 100,000
7724 persons.

7725 (7) Submit a press release to newspapers, television, and radio stations.

7726 (8) In addition to the delivery requirements contained in subdivisions D 2 b (1) through
7727 D 2 b (7) of this section, the ~~owners of~~ owner of a waterworks exceeding the lead
7728 ~~action level~~ AL shall implement at least three activities from one or more of the
7729 following categories: (i) public service announcements; (ii) paid advertisements; (iii)
7730 public area informational displays; (iv) e-mails to customers; (v) public meetings; (vi)

7731 household deliveries; (vii) targeted individual customer contact; (viii) direct material
7732 distribution to all ~~multi-family~~ multifamily homes and institutions; and (ix) other methods
7733 approved by the ~~commissioner~~ department. The educational content and selection of
7734 these activities shall be determined in consultation with the ~~district-engineer~~
7735 department.

7736 (9) As long as a community ~~water-system~~ waterworks exceeds the lead ~~action-level~~
7737 AL, the ~~waterworks~~ owner shall repeat the following public education activities:

7738 (a) The owner of a community ~~water-system~~ waterworks ~~owner~~ shall repeat the tasks
7739 contained in subdivisions D 2 b (1) through D 2 b (3), and D 2 b (8) of this section
7740 every 12 months.

7741 (b) The owner of a community ~~water-system~~ waterworks ~~owner~~ shall repeat tasks
7742 contained in subdivision D 2 b (5) of this section with each billing cycle.

7743 (c) The owner of a community ~~water-system~~ waterworks serving a population greater
7744 than 100,000 shall post and retain the material on a publicly accessible website
7745 pursuant to subdivision D 2 b (6) of this section.

7746 (d) The owner of a community ~~water-system~~ waterworks ~~owner~~ shall repeat the task
7747 in subdivision D 2 b (7) of this section twice every 12 months on a schedule agreed
7748 upon with the ~~commissioner~~ department.

7749 (10) The ~~commissioner~~ department may allow the public education activities described
7750 in subdivision D 2 b of this section to extend beyond the 60-day requirement if needed
7751 for implementation purposes on a case-by-case basis; however, this extension must
7752 be approved in writing by the ~~commissioner~~ department in advance of the 60-day
7753 deadline.

7754 c. The owner of a ~~nontransient noncommunity waterworks~~ NTNC that exceeds the
7755 lead ~~action level~~ AL on the basis of tap water samples collected in accordance with
7756 12VAC5-590-375 B, and that is not already conducting public education tasks, shall
7757 conduct the public education tasks under this subdivision within 60 days after the end
7758 of the monitoring period in which the exceedance occurred. For a waterworks that ~~are~~
7759 is required to conduct monitoring annually or less frequently, the end of the monitoring
7760 period is September 30 of the calendar year in which the sampling occurs, or, if the
7761 ~~commissioner~~ department has established an alternate monitoring period, the last day
7762 of that period. These public education tasks include:

7763 (1) Post informational posters containing all of the public education elements
7764 contained in subdivision D 1 of this section in a public place or common area in each
7765 of the buildings served by the waterworks; and

7766 (2) Distribute informational pamphlets or brochures on lead in drinking water
7767 containing all of the public education elements in subdivision D 1 of this section to
7768 each person served by the ~~nontransient noncommunity waterworks~~ NTNC. The
7769 ~~commissioner~~ department may allow the owner to utilize electronic transmission ~~in lieu~~
7770 instead of or combined with printed materials as long as it achieves at least the same
7771 coverage.

7772 (3) The owner of a ~~nontransient noncommunity waterworks~~ NTNC shall repeat the
7773 tasks contained in subdivisions D 2 c (1) through D 2 c (2) of this section at least once
7774 during each calendar year in which the waterworks exceeds the lead ~~action level~~ AL.

7775 (4) The ~~commissioner~~ department may allow the public education activities described
7776 in subdivision D 2 c of this section to extend beyond the 60-day requirement if needed
7777 for implementation purposes on a case-by-case basis; however, this extension must

7778 be approved in writing by the ~~commissioner~~ department in advance of the 60-day
7779 deadline.

7780 d. ~~A~~ The owner may discontinue delivery of public education materials if the
7781 waterworks has met the lead ~~action-level~~ AL during the most recent six-month
7782 monitoring period conducted pursuant to 12VAC5-590-375 B. The owner shall
7783 recommence public education in accordance with this subsection if the waterworks
7784 subsequently exceeds the lead ~~action-level~~ AL during any monitoring period.

7785 e. The owner of a community waterworks may apply to the ~~district~~
7786 ~~engineer~~department, in writing, (unless the ~~commissioner~~ department has waived the
7787 requirement for prior approval) to use only the text specified in subdivision D 1 a of
7788 this section ~~in lieu~~ instead of the text in subdivisions D 1 a through D 1 b of this section
7789 and to perform the tasks listed in subdivisions D 2 c (1) through D 2 c (2) of this section
7790 ~~in lieu~~ instead of the tasks in subdivisions D 2 b (1) through D 2 b (9) of this section if:

7791 (1) The waterworks serves a facility, such as a prison or a hospital, where the
7792 population served is not capable of or is prevented from making improvements to
7793 plumbing or installing POU treatment devices; and

7794 (2) The owner provides water as part of the cost of services provided and does not
7795 separately charge for water consumption.

7796 f. The owner of a community waterworks serving 3,300 or fewer people may limit
7797 certain aspects ~~their~~ of the public education programs as follows:

7798 (1) With respect to the requirements of subdivision D 2 b (8) of this section, the owner
7799 of a waterworks serving 3,300 or fewer people shall implement at least one of the
7800 activities listed in that subdivision.

7801 (2) With respect to the requirements of subdivision D 2 b (2) of this section, the owner
7802 of a waterworks serving 3,300 or fewer people may limit the distribution of the public
7803 education materials required under that subdivision to facilities and organizations
7804 served by the waterworks that are most likely to be visited regularly by pregnant
7805 women and children.

7806 (3) With respect to the requirements of subdivision D 2 b (7) of this section, the
7807 ~~commissioner~~department may waive this requirement for ~~systems~~ waterworks serving
7808 3,300 or fewer persons as long as the owner distributes notices to every household
7809 served by the waterworks.

7810 3. Supplemental monitoring and notification of results. The owner of a waterworks that
7811 fails to meet the lead ~~action level~~ AL on the basis of tap samples collected in accordance
7812 with 12VAC5-590-375 B shall offer to sample the tap water of any customer who requests
7813 it. The owner is not required to pay for collecting or analyzing the sample, nor is the owner
7814 required to collect and analyze the sample itself.

7815 4. Notification of results. The ~~owners of all~~ owner of a community waterworks ~~and or a~~
7816 ~~nontransient noncommunity waterworks~~ NTNC shall provide a notice of the individual tap
7817 results from lead tap water monitoring carried out under the requirements of 12VAC5-590-
7818 375 B to the persons served by the waterworks at the specific sampling site from which
7819 the sample was ~~taken~~ collected (e.g., the occupants of the residence or buildings where
7820 the tap was tested).

7821 a. Timing of notification. ~~An~~The owner shall provide this consumer notice as soon as
7822 practical, but no later than 30 days after the owner learns of the tap monitoring results.

7823 b. Content. The consumer notice shall include the results of lead tap water monitoring
7824 for the tap that was tested, an explanation of the health effects of lead, list steps

7825 consumers can take to reduce exposure to lead in drinking water, and contact
7826 information for the waterworks. The notice shall also provide the ~~maximum~~
7827 ~~contaminant level goal~~ MCLG and the ~~action level~~ AL for lead and the definitions for
7828 these two terms from 12VAC5-590-10.

7829 c. Delivery. The consumer notice shall be provided to persons served at the tap that
7830 was tested, either by mail or by another method approved by the ~~commissioner~~
7831 department. For example, the owner of a ~~nontransient noncommunity waterworks~~
7832 NTNC may post the results on a bulletin board in the facility to allow ~~users~~ consumers
7833 to review the information. The owner shall provide the notice to customers at sample
7834 taps tested, including consumers who do not receive water bills.

7835 **12VAC5-590-410. ~~Determination of compliance.~~ (Repealed.)**

7836 ~~For the purposes of determining compliance with a PMCL or action level, the following criteria~~
7837 ~~shall be used:~~

7838 ~~A. Bacteriological results. Compliance with the PMCL for coliform bacteria shall be determined~~
7839 ~~as specified in 12VAC5-590-380 B. Repeat samples shall be used as a basis for determining~~
7840 ~~compliance with these regulations.~~

7841 ~~B. Inorganic chemicals.~~

7842 ~~1. Antimony, arsenic, asbestos, barium, beryllium, cadmium, cyanide (as free cyanide),~~
7843 ~~chromium, fluoride, mercury, nickel, selenium, and thallium. Where the results of sampling~~
7844 ~~for antimony, arsenic, asbestos, barium, beryllium, cadmium, cyanide (as free cyanide),~~
7845 ~~chromium, fluoride, mercury, nickel, selenium, or thallium exceed the PMCL, the owner~~
7846 ~~shall take a confirmation sample, at the same sampling point, within two weeks of~~
7847 ~~notification of the analytical results of the first sample.~~

7848 ~~a. The results of the initial and confirmation samples shall be averaged to determine~~
7849 ~~compliance with subdivision B 1 c of this subsection. The commissioner has the~~
7850 ~~discretion to delete results of obvious sampling errors.~~

7851 ~~b. The commissioner may require more frequent monitoring.~~

7852 ~~c. Compliance with antimony, arsenic, asbestos, barium, beryllium, cadmium, cyanide~~
7853 ~~(as free cyanide), chromium, fluoride, mercury, nickel, selenium, and thallium in Table~~
7854 ~~2.2 of 12VAC5-590-440 shall be determined based on the analytical result(s) obtained~~
7855 ~~at each sampling point.~~

7856 ~~(1) Owners that are conducting monitoring more frequently than annually, compliance~~
7857 ~~with the PMCL for antimony, arsenic, asbestos, barium, beryllium, cadmium, cyanide~~
7858 ~~(as free cyanide), chromium, fluoride, mercury, nickel, selenium, and thallium is~~
7859 ~~determined by a running annual average at each sampling point. If the average at any~~
7860 ~~sampling point is greater than the PMCL, then the waterworks is out of compliance. If~~
7861 ~~any one sample would cause the annual average to be exceeded, then the waterworks~~
7862 ~~is out of compliance immediately. Any sample below the method detection limit shall~~
7863 ~~be calculated at zero for the purpose of determining the annual average. If an owner~~
7864 ~~fails to collect the required number of samples, compliance (average concentration)~~
7865 ~~shall be based on the total number of samples collected.~~

7866 ~~(2) Owners that are monitoring annually, or less frequently, the waterworks is not out~~
7867 ~~of compliance with the PMCL for antimony, arsenic, asbestos, barium, beryllium,~~
7868 ~~cadmium, cyanide (as free cyanide), chromium, fluoride, mercury, nickel, selenium,~~
7869 ~~and thallium if the average of the original sample and a confirmation sample of a~~
7870 ~~contaminant at any sampling point is greater than the PMCL. Owners of waterworks~~
7871 ~~monitoring annually or less frequently whose sample result exceeds the PMCL shall~~
7872 ~~begin quarterly sampling. The waterworks shall not be considered in violation of the~~

7873 ~~PMCL until it has completed one year of quarterly sampling. However, if the~~
7874 ~~confirmation sample is not collected, the waterworks is in violation of the PMCL for~~
7875 ~~antimony, arsenic, asbestos, barium, beryllium, cadmium, cyanide (as free cyanide),~~
7876 ~~chromium, fluoride, mercury, nickel, selenium, or thallium. If an owner fails to collect~~
7877 ~~the required number of samples, compliance (average concentration) shall be based~~
7878 ~~on the total number of samples collected.~~

7879 ~~2. Nitrate and nitrite. Compliance with the PMCL is determined based on one sample from~~
7880 ~~each sampling point if the levels of these contaminants are below the PMCLs. Where~~
7881 ~~nitrate or nitrite sample results exceed the PMCL, the owner shall take a confirmation~~
7882 ~~sample from the same sampling point that exceeded the PMCL within 24 hours of the~~
7883 ~~owner's receipt of the analytical results of the first sample. The results of the initial and~~
7884 ~~confirmation sample shall be averaged to determine compliance with this subdivision.~~
7885 ~~Owners unable to comply with the 24-hour sampling requirement shall immediately notify~~
7886 ~~the consumers in the area served by the waterworks in accordance with 12VAC5-590-~~
7887 ~~540. Owners exercising this option shall take and analyze a confirmation sample within~~
7888 ~~two weeks of notification of the analytical results of the first sample. The commissioner~~
7889 ~~may require more frequent monitoring. The commissioner has the discretion to delete~~
7890 ~~results of obvious sampling errors.~~

7891 ~~C. Organic chemicals.~~

7892 ~~1. VOCs and SOCs. A confirmation sample shall be required for positive results for~~
7893 ~~contaminants listed in Table 2.3. The commissioner has the discretion to delete results of~~
7894 ~~obvious sampling errors from this calculation.~~

7895 ~~a. The results of the initial and confirmation sample shall be averaged to determine~~
7896 ~~the waterworks' compliance in accordance with subdivision C 1 b of this subsection.~~

7897 ~~b. Compliance with Table 2.3 shall be determined based on the analytical results~~
7898 ~~obtained at each sampling point. Any samples below the detection limit shall be~~
7899 ~~calculated as zero for the purposes of determining the annual average. (Note: Refer~~
7900 ~~to detection definition at 12VAC5-590-370 B 2 h.) If an owner fails to collect the~~
7901 ~~required number of samples, compliance (average concentration) will be based on the~~
7902 ~~total number of samples collected.~~

7903 ~~(1) Owners that are conducting monitoring more frequently than annually, compliance~~
7904 ~~is determined by a running annual average of all samples taken at each sampling~~
7905 ~~point. If the annual average of any sampling point is greater than the PMCL, then the~~
7906 ~~waterworks is out of compliance. If the initial sample or a subsequent sample would~~
7907 ~~cause the annual average to be exceeded, then the waterworks is out of compliance~~
7908 ~~immediately. Any samples below the detection limit shall be calculated as zero for~~
7909 ~~purposes of determining the annual average. (Note: Refer to detection definition at~~
7910 ~~12VAC5-590-370 B 2 h.)~~

7911 ~~(2) If monitoring is conducted annually, or less frequently, the waterworks is not in~~
7912 ~~violation if the average of the initial and confirmation sample is greater than the PMCL~~
7913 ~~for that contaminant; however, the owner shall begin quarterly sampling. The~~
7914 ~~waterworks will not be considered in violation of the PMCL until the owner has~~
7915 ~~completed one year of quarterly sampling. If any sample will cause the running annual~~
7916 ~~average to exceed the PMCL at any sampling point, the waterworks is immediately~~
7917 ~~out of compliance with the PMCL.~~

7918 ~~2. Disinfectant residuals, disinfection byproducts and disinfection byproduct precursors.~~
7919 ~~Compliance with 12VAC5-590-370 B 3 a through B 3 k is as follows:~~

7920 ~~a. General requirements.~~

7921 ~~(1) Where compliance is based on a running annual average of monthly or quarterly~~
7922 ~~samples or averages and the owner fails to monitor for TTHM, HAA5, or bromate, this~~
7923 ~~failure to monitor will be treated as a monitoring violation for the entire period covered~~
7924 ~~by the annual average. Where compliance is based on a running annual average of~~
7925 ~~monthly or quarterly samples or averages and the owner's failure to monitor makes it~~
7926 ~~impossible to determine compliance with MRDLs for chlorine and chloramines, this~~
7927 ~~failure to monitor shall be treated as a monitoring violation for the entire period covered~~
7928 ~~by the annual average.~~

7929 ~~(2) All samples taken and analyzed under subdivision C 2 of this section shall be~~
7930 ~~included in determining compliance, even if that number is greater than the minimum~~
7931 ~~required.~~

7932 ~~(3) If during the first year of monitoring under 12VAC5-590-370 B 3 b, any individual~~
7933 ~~quarter's average will cause the running annual average of that waterworks to exceed~~
7934 ~~the PMCL in Table 2.12 and Table 2.13, the waterworks is out of compliance at the~~
7935 ~~end of that quarter.~~

7936 ~~b. Disinfection byproducts.~~

7937 ~~(1) TTHMs and HAA5.~~

7938 ~~(a) Running Annual Average. All waterworks using surface water or groundwater~~
7939 ~~under the direct influence of surface water serving 10,000 or more persons shall~~
7940 ~~comply with this section beginning January 1, 2002. All waterworks using surface~~
7941 ~~water or groundwater under the direct influence of surface water serving less than~~
7942 ~~10,000 persons and all waterworks using groundwater not under the direct influence~~
7943 ~~of surface water shall comply with this section beginning January 1, 2004. All~~

7944 ~~waterworks shall comply with this section until the dates listed in 12VAC5-590-370 B~~
7945 ~~e (3) (c).~~

7946 ~~(i) For waterworks monitoring quarterly, compliance with PMCLs in Table 2.13 shall be~~
7947 ~~based on a running annual arithmetic average, computed quarterly, of quarterly~~
7948 ~~arithmetic averages of all samples collected by the owner as prescribed by 12VAC5-~~
7949 ~~590-370 B 3 e (1).~~

7950 ~~(ii) For waterworks monitoring less frequently than quarterly, the owner demonstrates~~
7951 ~~PMCL compliance if the average of samples taken that year under the provisions of~~
7952 ~~12VAC5-590-370 B 3 e (1) does not exceed the PMCLs in Table 2.13. If the average~~
7953 ~~of these samples exceeds the PMCL, the owner shall increase monitoring to once per~~
7954 ~~quarter per treatment plant and such a waterworks is not in violation of the PMCL until~~
7955 ~~it has completed one year of quarterly monitoring, unless the result of fewer than four~~
7956 ~~quarter of monitoring will cause the running annual average to exceed the PMCL, in~~
7957 ~~which case the waterworks is in violation at the end of that quarter. Owners of~~
7958 ~~waterworks required to increase monitoring frequency to quarterly monitoring shall~~
7959 ~~calculate compliance by including the sample that triggered the increase monitoring~~
7960 ~~plus the following three quarter of monitoring.~~

7961 ~~(iii) If the running annual arithmetic average of quarterly averages covering any~~
7962 ~~consecutive four-quarter period exceeds the PMCL in Table 2.12 and Table 2.13, the~~
7963 ~~waterworks is in violation of the PMCL and the owner shall notify the public pursuant~~
7964 ~~to 12VAC5-590-540 in addition to reporting to the commissioner pursuant to 12VAC5-~~
7965 ~~590-530.~~

7966 ~~(iv) If an owner fails to complete four consecutive quarters of monitoring, compliance~~
7967 ~~with the PMCL in Table 2.13 for the last four-quarter compliance period shall be based~~
7968 ~~on an average of the available data.~~

7969 ~~(b) Locational Running Annual Average (LRAA). All waterworks shall comply with this~~
7970 ~~section beginning on the dates listed in 12VAC5-590-370 B e (3) (c).~~

7971 ~~(i) Owners of waterworks required to monitor quarterly shall calculate LRAAs for TTHM~~
7972 ~~and HAA5 using monitoring results collected under 12VAC5-590-370 B 3 e (3) and~~
7973 ~~determine that each LRAA does not exceed the PMCL in order to comply with PMCLs~~
7974 ~~in Table 2.13. If the owner fails to complete four consecutive quarters of monitoring,~~
7975 ~~the owner shall calculate compliance with the PMCL based on the average of the~~
7976 ~~available data from the most recent four quarters. If the owner takes more than one~~
7977 ~~sample per quarter at a monitoring location, the owner shall average all samples taken~~
7978 ~~in the quarter at that location to determine a quarterly average to be used in the LRAA~~
7979 ~~calculation.~~

7980 ~~(ii) Owners of waterworks required to monitor yearly or less frequently shall determine~~
7981 ~~that each sample taken is less than the PMCL in order to determine compliance with~~
7982 ~~PMCLs in Table 2.13. If any sample exceeds the PMCL, the owner shall comply with~~
7983 ~~the requirements of 12VAC5-590-370 B 3 e (3) (g). If no sample exceeds the PMCL,~~
7984 ~~the sample result for each monitoring location is considered the LRAA for that~~
7985 ~~monitoring location.~~

7986 ~~(iii) Waterworks are in violation of the monitoring requirements for each quarter that a~~
7987 ~~monitoring result would be used in calculating an LRAA if the owner fails to monitor.~~

7988 ~~(iv) Waterworks have exceeded the operational evaluation level at any monitoring~~
7989 ~~location where the sum of the two previous quarters' TTHM results plus twice the~~
7990 ~~current quarter's TTHM result, divided by four to determine an average, exceeds 0.080~~
7991 ~~mg/L, or where the sum of the two previous quarters' HAA5 results plus twice the~~
7992 ~~current quarter's HAA5 result, divided by four to determine an average, exceeds 0.060~~
7993 ~~mg/L.~~

7994 ~~((a)) Owners of waterworks that exceed the operational evaluation level shall conduct~~
7995 ~~an operational evaluation and submit a written report of the evaluation to the~~
7996 ~~commissioner no later than 90 days after being notified of the analytical result that~~
7997 ~~causes the waterworks to exceed the operational evaluation level. The written report~~
7998 ~~shall be made available to the public upon request.~~

7999 ~~((b)) The operational evaluation report shall include an examination of waterworks~~
8000 ~~treatment and distribution operational practices, including storage tank operations,~~
8001 ~~excess storage capacity, distribution system flushing, changes in sources or source~~
8002 ~~water quality, and treatment changes or problems that may contribute to TTHM and~~
8003 ~~HAA5 formation and what steps could be considered to minimize future exceedances.~~

8004 ~~((c)) The owner may request and the commissioner may allow waterworks to limit the~~
8005 ~~scope of the evaluation if the owner is able to identify the cause of the operational~~
8006 ~~evaluation level exceedance. The request to limit the scope of the evaluation does not~~
8007 ~~extend the schedule in paragraph ((a)) of this section for submitting the written report.~~
8008 ~~The commissioner shall approve this limited scope of evaluation in writing and the~~
8009 ~~owner shall keep that approval with the completed report.~~

8010 ~~(2) Bromate. Compliance shall be based on a running annual arithmetic average,~~
8011 ~~computed quarterly, of monthly samples (or, for months in which the waterworks takes~~
8012 ~~more than one sample, the average of all samples taken during the month) collected~~
8013 ~~by the owner as prescribed by 12VAC5-590-370 B 3 g. If the average of samples~~
8014 ~~covering any consecutive four quarter period exceeds the PMCL in Table 2.13, the~~
8015 ~~waterworks is in violation of the PMCL and the owner shall notify the public pursuant~~
8016 ~~to 12VAC5-590-540, in addition to reporting to the commissioner pursuant to 12VAC5-~~
8017 ~~590-530. If an owner fails to complete 12 consecutive months' monitoring, compliance~~

8018 with the PMCL for the last four-quarter compliance period shall be based on an
8019 average of the available data.

8020 (3) Chlorite. Compliance shall be based on an arithmetic average of each three sample
8021 set taken in the distribution system as prescribed by 12VAC5-590-370 B 3 f (1) (a), (b)
8022 and (c). If the arithmetic average of any three sample set exceeds the PMCL in Table
8023 2.13, the waterworks is in violation of the PMCL and the owner shall notify the public
8024 pursuant to 12VAC5-590-540, in addition to reporting to the commissioner pursuant to
8025 12VAC5-590-530.

8026 c. Disinfectant residuals.

8027 (1) Chlorine and chloramines.

8028 (a) Compliance shall be based on a running annual arithmetic average, computed
8029 quarterly, of monthly averages of all samples collected by the waterworks under
8030 12VAC5-590-370 B 3 h (1) (a). If the average covering any consecutive four-quarter
8031 period exceeds the MRDL in Table 2.12, the waterworks is in violation of the MRDL
8032 and the owner shall notify the public pursuant to 12VAC5-590-540, in addition to
8033 reporting to the commissioner pursuant to 12VAC5-590-530.

8034 (b) In cases where waterworks switch between the use of chlorine and chloramines
8035 for residual disinfection during the year, compliance shall be determined by including
8036 together all monitoring results of both chlorine and chloramines in calculating
8037 compliance. Reports submitted pursuant to 12VAC5-590-530 shall clearly indicate
8038 which residual disinfectant was analyzed for each sample.

8039 (2) Chlorine dioxide.

8040 (a) Acute violations. Compliance shall be based on consecutive daily samples
8041 collected by the owner under 12VAC5-590-370 B 3 h (2) (a). If any daily sample taken

8042 at the entrance to the distribution system exceeds the MRDL in Table 2.12, and on the
8043 following day one (or more) of the three samples taken in the distribution system
8044 exceed the MRDL, the waterworks is in violation of the MRDL and the owner shall take
8045 immediate corrective action to lower the level of chlorine dioxide below the MRDL and
8046 the owner shall notify the public pursuant to the procedures for Tier 1 conditions in
8047 12VAC5-590-540 in addition to reporting to the commissioner in pursuant to 12VAC5-
8048 590-530. Failure to take samples in the distribution system the day following an
8049 exceedance of the chlorine dioxide MRDL at the entrance to the distribution system
8050 will also be considered an MRDL violation and the owner shall notify the public of the
8051 violation in accordance with the provisions for Tier 1 conditions in 12VAC5-590-540 in
8052 addition to reporting to the commissioner in pursuant to 12VAC5-590-530.

8053 (b) Nonacute violations. Compliance shall be based on consecutive daily samples
8054 collected by the owner under 12VAC5-590-370 B 3 h (2) (a). If any two consecutive
8055 daily samples taken at the entrance to the distribution system exceed the MRDL in
8056 Table 2.12 and all distribution system samples taken are below the MRDL, the
8057 waterworks is in violation of the MRDL and the owner shall take corrective action to
8058 lower the level of chlorine dioxide below the MRDL at the point of sampling and shall
8059 notify the public pursuant to the procedures for Tier 2 conditions in 12VAC5-590-540
8060 in addition to reporting to the commissioner in pursuant to 12VAC5-590-530. Failure
8061 to monitor at the entrance to the distribution system the day following an exceedance
8062 of the chlorine dioxide MRDL at the entrance to the distribution system is also an
8063 MRDL violation and the owner shall notify the public of the violation in accordance with
8064 the provisions for Tier 2 conditions in 12VAC5-590-540 in addition to reporting to the
8065 commissioner in pursuant to 12VAC5-590-530.

~~8066 d. Disinfection byproduct precursors (DBPP). Compliance shall be determined as
8067 specified by 12VAC5-590-420 H 3. Owners may begin monitoring to determine
8068 whether Step 1 TOC removals can be met 12 months prior to the compliance date for
8069 the waterworks. This monitoring is not required and failure to monitor during this period
8070 is not a violation. However, any owner that does not monitor during this period, and
8071 then determines in the first 12 months after the compliance date that it is not able to
8072 meet the Step 1 requirements in 12VAC5-590-420 H 2 b and shall therefore apply for
8073 alternate minimum TOC removal (Step 2) requirements, is not eligible for retroactive
8074 approval of alternate minimum TOC removal (Step 2) requirements as allowed
8075 pursuant to 12VAC5-590-420 H 2 c and is in violation. Owners may apply for alternate
8076 minimum TOC removal (Step 2) requirements any time after the compliance date. For
8077 waterworks required to meet Step 1 TOC removals, if the value calculated under
8078 12VAC5-590-420 H 3 a (4) is less than 1.00, the waterworks is in violation of the
8079 treatment technique requirements and the owner shall notify the public pursuant to
8080 12VAC5-590-540 in addition to reporting to the commissioner pursuant to 12VAC5-
8081 90-530.~~

~~8082 D. Radiological results (gross alpha, combined radium-226 and radium-228, uranium and
8083 man-made radioactivity). Compliance with the radiological PMCLs shall be in accordance with
8084 12VAC5-590-370 D 3 c. PMCLs are indicated in subsection B of Table 2.5. Sampling for
8085 radiological analysis shall be in compliance with 12VAC5-590-370 D 1 and D 2. Furthermore,
8086 compliance shall be determined by rounding off results to the same number of significant figures
8087 as the PMCL for the substance in question.~~

~~8088 E. Reserved.~~

~~8089 F. Turbidity. The requirements in this subsection apply to filtered waterworks until June 29,
8090 1993. The requirements in this section apply to unfiltered waterworks with surface water sources~~

8091 or groundwater sources under the direct influence of surface water that are required to install
8092 filtration equipment until June 29, 1993, or until filtration is installed, whichever is later. When a
8093 sample exceeds the PMCL for turbidity a confirmation sample shall be collected for analysis as
8094 soon as possible. In cases where a turbidimeter is required at the waterworks, the preferable
8095 resampling time is within one hour of the initial sampling. The repeat sample shall be the sample
8096 used for the purpose of calculating the monthly average. Compliance for public notification
8097 purposes shall be based on the monthly averages of the daily samples. However, public
8098 notification is also required if the average of samples taken on two consecutive days exceeds five
8099 NTU.

8100 G. All analyses for PMCL and action level compliance determinations shall be consistent with
8101 current Environmental Protection Agency Regulations found at 40 CFR Part 141.

8102 **12VAC5-590-411. DBPPs, DBPs, and MRDL treatment techniques.**

8103 **A. Treatment technique for control of DBPPs.**

8104 **1. Applicability.**

8105 **a. The owner of a community waterworks or a NTNC shall comply with treatment**
8106 **techniques for the control of DBPPs.**

8107 **b. A waterworks that uses either a surface water source or a GUDI source or both**
8108 **using conventional filtration treatment shall operate with enhanced coagulation or**
8109 **enhanced softening to achieve the TOC percentage removal levels specified in**
8110 **subdivision A 2 of this section unless the waterworks meets at least one of the**
8111 **alternative compliance criteria listed in subdivision A 1 c or A 1 d of this section.**

8112 **c. Alternative compliance criteria for enhanced coagulation and enhanced softening**
8113 **waterworks. A waterworks that uses either a surface water source or a GUDI source**
8114 **or both provided with conventional filtration treatment may use the alternative**

8115 compliance criteria in subdivisions A 1 c (1) through A 1 c (6) of this section to comply
8116 with this section instead of complying with subdivision A 2 of this section. The owner
8117 shall comply with monitoring requirements in 12VAC5-590-374 I.

8118 (1) The waterworks' source water TOC level is less than 2.0 mg/L, calculated quarterly
8119 as a RAA.

8120 (2) The waterworks' treated water TOC level is less than 2.0 mg/L, calculated quarterly
8121 as a RAA.

8122 (3) The waterworks' source water TOC level is less than 4.0 mg/L, calculated quarterly
8123 as a RAA; the source water alkalinity is greater than 60 mg/L (as CaCO₃), calculated
8124 quarterly as a RAA; and no TTHM and HAA5 LRAAs are greater than 0.040 mg/L and
8125 0.030 mg/L, respectively.

8126 (4) No TTHM and HAA5 LRAAs are greater than 0.040 mg/L and 0.030 mg/L,
8127 respectively, and the waterworks uses only chlorine for primary disinfection and
8128 maintains a residual in the distribution system.

8129 (5) The waterworks' source water SUVA, before any treatment and measured monthly,
8130 is less than or equal to 2.0 liters per milligram-meter (L/mg-m), calculated quarterly as
8131 a RAA.

8132 (6) The waterworks' finished water SUVA, measured monthly, is less than or equal to
8133 2.0 L/mg-m, calculated quarterly as a RAA.

8134 d. Additional alternative compliance criteria for softening waterworks. A waterworks
8135 practicing enhanced softening that cannot achieve the TOC removals required by
8136 subdivision A 2 b of this section may use the alternative compliance criteria in
8137 subdivisions A 1 c (1) and A 1 c (2) instead complying with subdivision A 2 of this

8138 section. A waterworks shall comply with monitoring requirements in 12VAC5-590-374

8139 I.

8140 (1) Softening that results in lowering the treated water alkalinity to less than 60 mg/L

8141 (as CaCO3), measured monthly and calculated quarterly as a RAA.

8142 (2) Softening that results in removing at least 10 mg/L of magnesium hardness (as

8143 CaCO3), measured monthly and calculated quarterly as a RAA.

8144 2. Enhanced coagulation and enhanced softening performance requirements.

8145 a. A waterworks shall achieve the percentage reduction of TOC specified in

8146 subdivision A 2 b of this section between the source water and the CFE, unless the

8147 department approves an owner's request for alternate minimum TOC removal (Step

8148 2) requirements under subdivision A 2 c of this section.

8149 Required Step 1 TOC reductions, indicated in Table 411.1, are based upon specified

8150 source water parameters. A waterworks practicing softening is required to meet the

8151 Step 1 TOC reductions in the far-right column (Source water alkalinity greater than

8152 120 mg/L) for the specified source water TOC.

8153 b. Step 1 Required removal of TOC by "Enhanced Coagulation and Enhanced

8154 Precipitative Softening Guidance Manual," May 1999, EPA Office of Water.

8155

TABLE 411.1.
Required Percentage Removals of TOC^{a,b}.

| <u>SOURCE WATER TOC, mg/L</u> | <u>SOURCE WATER ALKALINITY, mg/L as CaCO₃</u> | | |
|-------------------------------|--|---------------------|----------------------------|
| | <u>0 - 60</u> | <u>>60 - 120</u> | <u>>120^c</u> |
| <u>>2.0 - 4.0</u> | <u>35.0%</u> | <u>25.0%</u> | <u>15.0%</u> |
| <u>>4.0 - 8.0</u> | <u>45.0%</u> | <u>35.0%</u> | <u>25.0%</u> |
| <u>>8.0</u> | <u>50.0%</u> | <u>40.0%</u> | <u>30.0%</u> |

^aA waterworks meeting at least one of the conditions in subdivisions A 1 c (1) through A 1 c (6) of this section is not required to operate with enhanced coagulation.

^bA waterworks utilizing softening and meeting one of the alternative compliance criteria in subdivision A 1 d of this section is not required to operate with enhanced softening.

^cA waterworks practicing softening shall meet the TOC removal requirements in this column.

8156 c. A waterworks that uses either a surface water source or a GUDI source or both with
8157 conventional treatment that cannot achieve the Step 1 TOC removals required by
8158 subdivision A 2 b due to water quality parameters or operational constraints shall apply
8159 to the department, within three months of failure to achieve the TOC removals required
8160 by subdivision A 2 b of this section, for approval of alternative minimum TOC (Step 2)
8161 removal requirements submitted by the owner. If the department approves the
8162 alternative minimum TOC removal (Step 2) requirements, then the department may
8163 make those requirements retroactive for the purposes of determining compliance. Until
8164 the department approves the alternate minimum TOC removal (Step 2) requirements,
8165 the waterworks shall meet the Step 1 TOC removals contained in subdivision A 2 b of
8166 this section.

8167 d. Alternate minimum TOC removal (Step 2) requirements. Applications, made to the
8168 department by the owner of a waterworks using enhanced coagulation, for approval of
8169 alternative minimum TOC removal (Step 2) requirements under subdivision A 2 c of
8170 this section shall include, at a minimum, results of bench-scale or pilot-scale testing
8171 conducted under subdivision A 2 d (1) of this section. The submitted bench-scale or
8172 pilot-scale testing shall be used to determine the alternate enhanced coagulation level.

8173 (1) Alternate enhanced coagulation level is defined as coagulation at a coagulant dose
8174 and pH as determined by the method described in subdivisions A 2 d (1) through A 2
8175 d (5) of this section so that an incremental addition of 10 mg/L of alum (or equivalent

8176 amount of ferric salt) results in a TOC removal of equal to or less than 0.3 mg/L. The
8177 percentage removal of TOC at this point on the "TOC removal versus coagulant dose"
8178 curve is then defined as the minimum TOC removal required for the waterworks. Once
8179 approved by the department, this minimum requirement supersedes the minimum
8180 TOC removal requirements listed in Table 411.1. This requirement shall be effective
8181 until the department approves a new value based on the results of a new bench-scale
8182 and pilot-scale test. Failure to achieve the alternative minimum TOC removal levels
8183 set by the department is a violation of this section.

8184 (2) Bench-scale or pilot-scale testing of enhanced coagulation shall be conducted by
8185 using representative water samples and adding 10 mg/L increments of alum (or
8186 equivalent amounts of ferric salt) until the pH is reduced to a level less than or equal
8187 to the enhanced coagulation Step 2 target pH shown in Table 411.2.

8188

TABLE 411.2.
Enhanced Coagulation.

| <u>ALKALINITY (mg/L as CaCO₃)</u> | <u>TARGET pH</u> |
|--|------------------|
| <u>0 - 60</u> | <u>5.5</u> |
| <u>>60 - 120</u> | <u>6.3</u> |
| <u>>120 - 240</u> | <u>7.0</u> |
| <u>>240</u> | <u>7.5</u> |

8189 (3) For source waters with alkalinities of less than 60 mg/L for which addition of small
8190 amounts of alum or equivalent addition of iron coagulant drives the pH below 5.5
8191 before significant TOC removal occurs, the waterworks shall add necessary chemicals
8192 to maintain the pH between 5.3 and 5.7 in samples until the TOC removal of 0.3 mg/L
8193 per 10 mg/L alum added (or equivalent addition of iron coagulant) is reached.

8194 (4) The waterworks may operate at any coagulant dose or pH necessary (consistent
8195 with other sections of this chapter) to achieve the minimum TOC percentage removal
8196 approved under subdivision A 2 c of this section.

8197 (5) If the TOC removal is consistently less than 0.3 mg/L of TOC per 10 mg/L of
8198 incremental alum dose at all dosages of alum (or equivalent addition of iron coagulant),
8199 then the water is deemed to contain TOC not amenable to enhanced coagulation. The
8200 owner may then apply to the department for a waiver of enhanced coagulation
8201 requirements.

8202 3. Compliance calculations.

8203 a. A waterworks that uses either a surface water source or a GUDI source or both
8204 other than those identified in subdivision A 1 b or A 1 c of this section shall comply
8205 with requirements contained in subdivision A 2 b or A 2 c of this section. The owner
8206 shall calculate compliance quarterly, beginning after the waterworks has collected 12
8207 months of data, by determining an annual average using the following method:

8208 (1) Determine actual monthly TOC percentage removal, equal to:

8209 $[1 - (\text{treated water TOC} / \text{source water TOC})] \times 100.$

8210 (2) Determine the required monthly TOC percentage removal (from either Table 411.1
8211 or from subdivision A 2 c of this section).

8212 (3) Divide the value in subdivision A 3 a (1) of this section by the value in subdivision
8213 A 3 a (2) of this section.

8214 (4) Add together the results of subdivision A 3 a (3) of this section for the last 12 months
8215 and divide by 12.

8216 (5) If the value calculated in subdivision A 3 a (4) of this section is less than 1.00, then
8217 the waterworks is not in compliance with the TOC percentage removal requirements.

8218 b. The owner may use the provisions in subdivisions A 3 b (1) through A 3 b (5) of this
8219 section instead of the calculations in subdivisions A 3 a (1) through A 3 a (5) of this
8220 section to determine compliance with TOC percentage removal requirements.

8221 (1) In any month that the waterworks' treated or source water TOC level is less than
8222 2.0 mg/L, the waterworks may assign a monthly value of 1.0 (instead of the value
8223 calculated in subdivision A 3 a (3) of this section) when calculating compliance under
8224 the provisions of subdivision A 3 a of this section.

8225 (2) In any month that the waterworks practicing softening removes at least 10 mg/L of
8226 magnesium hardness (as CaCO₃), the waterworks may assign a monthly value of 1.0
8227 (instead of the value calculated in subdivision A 3 a (3) of this section) when calculating
8228 compliance under the provisions of subdivision A 3 a of this section.

8229 (3) In any month that the waterworks' source water SUVA before any treatment is
8230 equal to or less than 2.0 L/mg-m, the waterworks may assign a monthly value of 1.0
8231 (instead of the value calculated in subdivision A 3 a (3) of this section) when calculating
8232 compliance under the provisions of subdivision A 3 a of this section.

8233 (4) In any month that the waterworks' finished water SUVA is equal to or less than 2.0
8234 L/mg-m, the waterworks may assign a monthly value of 1.0 (instead of the value
8235 calculated in subdivision A 3 a (3) of this section) when calculating compliance under
8236 the provisions of subdivision A 3 a of this section.

8237 (5) In any month that the waterworks practicing enhanced softening lowers the
8238 alkalinity below 60 mg/L (as CaCO₃), the waterworks may assign a monthly value of

8239 1.0 (instead of the value calculated in subdivision A 3 a (3) of this section) when
8240 calculating compliance under the provisions of subdivision A 3 a of this section.

8241 c. A waterworks that uses either a surface water source or a GUDI source or both and
8242 using conventional treatment may also comply with the requirements of this section by
8243 meeting the criteria in subdivision A 1 b or A 1 c of this section.

8244 4. Enhanced coagulation or enhanced softening is the treatment technique required to
8245 control the level of DBP precursors in water treatment and distribution system for a
8246 waterworks using either a surface water source or a GUDI source or both and using
8247 conventional treatment.

8248 B. The BAT, treatment techniques, or other means available for achieving compliance with
8249 the PMCLs for DBPs shown in Table 340.6 are listed below:

8250 1. The BAT, treatment techniques, or other means available for achieving compliance with
8251 the PMCLs for bromate and chlorite:

| <u>DISINFECTION BYPRODUCT</u> | <u>BEST AVAILABLE TECHNOLOGY</u> |
|-------------------------------|---|
| <u>Bromate</u> | <u>Control of ozone treatment process to reduce production of bromate.</u> |
| <u>Chlorite</u> | <u>Control of treatment processes to reduce disinfectant demand and control of disinfection treatment processes to reduce disinfectant levels</u> |

8252 2. The BAT, treatment techniques, or other means available for achieving compliance with
8253 the RAA PMCLs for TTHM and HAA5:

| <u>DISINFECTION BYPRODUCT</u> | <u>BEST AVAILABLE TECHNOLOGY</u> |
|-------------------------------|--|
| <u>TTHM and HAA5</u> | <u>Enhanced coagulation or enhanced softening or GAC10, with chlorine as the primary and residual disinfectant</u> |

8254 3. The BAT, treatment techniques, or other means available for achieving compliance with
 8255 the LRAA PMCLs for TTHM and HAA5 for a waterworks that disinfects its source water:

| <u>DISINFECTION BYPRODUCT</u> | <u>BEST AVAILABLE TECHNOLOGY</u> |
|-------------------------------|--|
| <u>TTHM and HAA5</u> | <u>Enhanced coagulation or enhanced softening, plus GAC10; or NF with a molecular weight cutoff less than or equal to 1000 Daltons; or GAC20</u> |

8256 4. The BAT, treatment techniques, or other means available for achieving compliance with
 8257 the LRAA MCLs for TTHM and HAA5 for a a consecutive waterworks and applies only to
 8258 the disinfected water that a consecutive waterworks buys or otherwise receives:

| <u>DISINFECTION BYPRODUCT</u> | <u>BEST AVAILABLE TECHNOLOGY</u> |
|-------------------------------|--|
| <u>TTHM and HAA5</u> | <u>A waterworks serving equal to or greater than 10,000 people: Improved distribution system and storage tank management to reduce residence time, plus the use of chloramines for residual disinfectant maintenance</u> <u>A waterworks serving less than 10,000 people: Improved distribution system and storage tank management to reduce residence time</u> |

8259 **12VAC5-590-415. Uncovered finished water storage.**

8260 A. A waterworks with uncovered finished water storage facilities shall comply with the
 8261 requirements to cover the facility as described in this section.

8262 B. The owner shall immediately notify the department of the use of each uncovered finished
 8263 water storage facility.

8264 C. All uncovered finished water storage facilities shall be covered, in compliance with a
 8265 schedule approved by the department.

8266 D. Failure to comply with the requirements of this section is a violation of the treatment
 8267 technique requirement.

8268 **12VAC5-590-420. Treatment technique requirement. (Repealed).**

8269 This section establishes treatment technique requirements in lieu of maximum contaminant
8270 levels for specified contaminants. Failure to meet any requirement of this section after the
8271 applicable date specified is a treatment technique violation.

8272 A. The filtration and disinfection provisions of this section are required treatment techniques
8273 for any waterworks supplied by a surface water source and waterworks supplied by a groundwater
8274 source under the direct influence of surface water. This section establishes treatment technique
8275 requirements in lieu of PMCL's for the following contaminants: Giardia lamblia, viruses,
8276 heterotrophic bacteria (HPC), Legionella, Cryptosporidium and turbidity. Each waterworks with a
8277 surface water source or a groundwater source under the direct influence of surface water shall
8278 provide treatment of that source water that complies with these treatment technique requirements.
8279 The treatment technique requirements consist of installing and properly operating water treatment
8280 processes which reliably achieve:

8281 1. At least 99.9% (3-log) removal and/or inactivation of Giardia lamblia cysts between a
8282 point where the raw water is not subject to recontamination by surface water runoff and a
8283 point downstream before or at the first customer; and

8284 2. At least 99.99% (4-log) removal and/or inactivation of viruses between a point where
8285 the raw water is not subject to recontamination by surface water runoff and a point
8286 downstream before or at the first customer; and

8287 3. At least 99% (2-log) removal of Cryptosporidium between a point where the raw water
8288 is not subject to recontamination by surface water runoff and a point downstream before
8289 or at the first customer.

8290 B. A waterworks using a surface water source or a groundwater source under the direct
8291 influence of surface water is considered to be in compliance with the requirements of subsection

8292 ~~A of this section if it meets the following disinfection filtration and enhanced filtration and~~
8293 ~~disinfection for Cryptosporidium requirements:~~

8294 ~~1. Disinfection. Waterworks with a surface water source or a groundwater source under~~
8295 ~~the direct influence of surface water shall provide disinfection treatment in accordance~~
8296 ~~with this section.~~

8297 ~~a. The disinfection treatment shall be sufficient to ensure that the total treatment~~
8298 ~~processes of that waterworks achieve at least 99.9% (3-log) inactivation and/or~~
8299 ~~removal of Giardia lamblia cysts and at least 99.99% (4-log) inactivation and/or~~
8300 ~~removal of viruses.~~

8301 ~~b. The residual disinfectant concentration in the water entering the distribution system~~
8302 ~~cannot be less than 0.2 mg/L for more than four hours.~~

8303 ~~c. The residual disinfectant concentration in the distribution system, measured as total~~
8304 ~~chlorine, combined chlorine, or chlorine dioxide cannot be undetectable in more than~~
8305 ~~5.0% of the samples each month, for any two consecutive months that the waterworks~~
8306 ~~serves water to the public. Water in the distribution system with a heterotrophic~~
8307 ~~bacteria concentration less than or equal to 500/mL, measured as heterotrophic plate~~
8308 ~~count (HPC) is deemed to have a detectable disinfectant residual for purposes of~~
8309 ~~determining compliance with this requirement. Thus, the value "V" in percent in the~~
8310 ~~following formula cannot exceed 5.0% in one month, for any two consecutive months.~~

8311
$$V = (c + d + e) / (a + b) \times 100$$

8312 ~~a = number of instances where the residual disinfectant concentration is measured;~~

8313 ~~b = number of instances where the residual disinfectant concentration is not~~
8314 ~~measured but HPC is measured;~~

8315 ~~c = number of instances where the residual disinfectant concentration is measured but~~
8316 ~~not detected and no HPC is measured;~~

8317 ~~d = number of instances where no residual disinfectant concentration is detected and~~
8318 ~~where the HPC is greater than 500/mL; and~~

8319 ~~e = number of instances where the residual disinfectant concentration is not measured~~
8320 ~~and HPC is greater than 500/mL.~~

8321 ~~d. The commissioner may determine, based on site-specific considerations, that an~~
8322 ~~owner has no means for having a sample transported and analyzed for HPC by a~~
8323 ~~certified laboratory under the requisite time and temperature conditions and the~~
8324 ~~waterworks is providing adequate disinfection in the distribution system, that the~~
8325 ~~requirements of subdivision B 1 c of this section does not apply.~~

8326 ~~2. Filtration. (Also see 12VAC5-590-880.) All waterworks that use a surface water source~~
8327 ~~or a groundwater source under the direct influence of surface water shall provide filtration~~
8328 ~~treatment by using one of the following methods:~~

8329 ~~a. Conventional filtration or direct filtration.~~

8330 ~~(1) Achieve a filtered water turbidity of less than or equal to 0.3 NTU in at least 95% of~~
8331 ~~the measurements taken each month. Samples shall be representative of the~~
8332 ~~waterworks' filtered water.~~

8333 ~~(2) The turbidity level of representative samples of a system's filtered water shall at no~~
8334 ~~time exceed 1 NTU, measured as specified in 12VAC5-590-440.~~

8335 ~~(3) A system that uses lime softening may acidify representative samples prior to~~
8336 ~~analysis using a protocol approved by the commissioner.~~

8337 ~~b. Slow sand filtration.~~

8338 ~~(1) The turbidity level of representative samples of a waterworks' filtered water shall~~
8339 ~~be less than or equal to one NTU in at least 95% of the measurements taken each~~
8340 ~~month, except that if the commissioner determines there is no significant interference~~
8341 ~~with disinfection at a higher turbidity level, the commissioner may substitute this higher~~
8342 ~~turbidity limit for that waterworks.~~

8343 ~~(2) The turbidity level of representative samples of a waterworks' filtered water shall at~~
8344 ~~no time exceed five NTU.~~

8345 ~~c. Diatomaceous earth filtration.~~

8346 ~~(1) The turbidity level of representative samples of a waterworks' filtered water shall~~
8347 ~~be less than or equal to one NTU in at least 95% of the measurements taken each~~
8348 ~~month.~~

8349 ~~(2) The turbidity level of representative samples of a waterworks' filtered water shall at~~
8350 ~~no time exceed five NTU.~~

8351 ~~d. Other filtration technologies. An owner may use a filtration technology not listed in~~
8352 ~~subdivisions 2 a through c of this subsection if the owner demonstrates to the~~
8353 ~~commissioner (by pilot plant studies or other means) that the alternative filtration~~
8354 ~~technology, in combination with disinfection treatment, achieves 99.9% removal (3-~~
8355 ~~log) and/or inactivation of Giardia lamblia cysts, 99.99% removal (4-log) and/or~~
8356 ~~inactivation of viruses, and 99% removal (2-log) of Cryptosporidium oocysts. For an~~
8357 ~~owner that makes this demonstration, a turbidity limit of representative samples of a~~
8358 ~~waterworks' filtered water, not to exceed 0.3 NTU, shall be established by the~~

8359 commissioner, which the waterworks must meet at least 95% of the time. In addition,
8360 the commissioner shall establish a maximum turbidity limit of representative samples
8361 of a waterworks' filtered water, not to exceed 1 NTU that the waterworks must not
8362 exceed at any time. These turbidity limits shall consistently achieve the removal rates
8363 and/or inactivation rates stated in this subdivision.

8364 e. Each waterworks using a surface water source or groundwater source under the
8365 direct influence of surface water shall be operated by licensed operators of the
8366 appropriate classification as per the Virginia Board for Waterworks and Wastewater
8367 Works Operators Regulations (18VAC155-20).

8368 f. If the commissioner has determined that a waterworks has a surface water source
8369 or a groundwater source under the direct influence of surface water, filtration is
8370 required. The waterworks shall provide disinfection during the interim before filtration
8371 is installed as follows:

8372 (1) The residual disinfectant concentration in the distribution system shall not be less
8373 than 2.0 mg/L for more than four hours.

8374 (2) The owner shall issue continuing boil water notices through the public notification
8375 procedure in 12VAC5-590-540 until such time as the required filtration equipment is
8376 installed.

8377 (3) As an alternative to subdivisions B f 2 (1) and (2) of this section, the owner may
8378 demonstrate that the source can meet the appropriate C-T values shown in Appendix
8379 L and be considered to satisfy the requirements for 99.9% removal of Giardia cysts
8380 and virus, respectively. In addition, the waterworks owner shall comply with the
8381 following:

8382 ~~(a) Justify that other alternative sources of supply meeting these regulations are not~~
8383 ~~immediately available.~~

8384 ~~(b) Analysis of the source is performed quarterly for the contaminants listed in Tables~~
8385 ~~2.2, 2.3, and 2.4. The primary maximum contaminant levels shall not be exceeded.~~

8386 ~~(c) Daily turbidity monitoring and maintenance of the turbidity level not to exceed five~~
8387 ~~NTU.~~

8388 ~~(d) MPN analysis of the raw water based on the minimum sample frequency chart~~
8389 ~~below:~~

| Population Served | Coliform Samples/Week |
|-------------------|-----------------------|
| ≤500 | 1 |
| 501 – 3,300 | 2 |
| 3,301 – 10,000 | 3 |
| 10,001 – 25,000 | 4 |
| >25,000 | 5 |

~~Note: Shall be taken on separate days.~~

8390 ~~(e) Bacteriological sampling of the distribution system at a frequency of twice that~~
8391 ~~required by Table 2.1.~~

8392 ~~3. Enhanced filtration and disinfection for Cryptosporidium – All waterworks using a~~
8393 ~~surface water source or a groundwater source under the direct influence of surface water~~
8394 ~~shall comply with the following requirements based on their population or if the waterworks~~
8395 ~~is a wholesaler, based on the population of the largest waterworks in the combined~~
8396 ~~distribution system:~~

8397 ~~a. Owners shall conduct an initial and a second round of source water monitoring for~~
8398 ~~each plant that treats a surface water or groundwater under the direct influence of~~
8399 ~~surface water source. This monitoring may include sampling for Cryptosporidium, E.~~

8400 coli, and turbidity to determine what level, if any, of additional Cryptosporidium
8401 treatment is required.

8402 (1) Initial round of source water monitoring. Owners shall conduct the following
8403 monitoring on the schedule in subdivision B 3 a (3) of this section unless they meet
8404 the monitoring avoidance criteria in subdivision B 3 a (4) of this section.

8405 (a) Owners of waterworks serving at least 10,000 people shall sample their source
8406 water for Cryptosporidium, E. coli, and turbidity at least monthly for 24 months.

8407 (b) Owners of waterworks serving fewer than 10,000 people:

8408 (i) shall sample their source water for E. coli at least once every two weeks for 12
8409 months, or

8410 (ii) may avoid E. coli monitoring if the waterworks notifies the commissioner that it will
8411 monitor for Cryptosporidium as described in paragraph (c) of this section. The owner
8412 shall notify the commissioner no later than three months prior to the date the
8413 waterworks is otherwise required to start E. coli monitoring.

8414 (c) Owners of waterworks serving fewer than 10,000 people shall sample their source
8415 water for Cryptosporidium at least twice per month for 12 months or at least monthly
8416 for 24 months if they meet one of the following, based on monitoring conducted under
8417 subdivision B 3 a (1) (b) of this section:

8418 (i) For waterworks using lake/reservoir sources, the annual mean E. coli concentration
8419 is greater than 10 E. coli/100 mL.

8420 (ii) For waterworks using flowing stream sources, the annual mean E. coli
8421 concentration is greater than 50 E. coli/100 mL.

8422 ~~(iii) The waterworks does not conduct E. coli monitoring as described in paragraph (1)~~
8423 ~~(b) of this section.~~

8424 ~~(iv) Waterworks using ground water under the direct influence of surface water shall~~
8425 ~~comply with the requirements of subdivision B 3 a (1) (c) of this section based on the~~
8426 ~~E. coli level that applies to the nearest surface water body. If no surface water body is~~
8427 ~~nearby, the waterworks shall comply based on the requirements that apply to~~
8428 ~~waterworks using lake/reservoir sources.~~

8429 ~~(d) For waterworks serving fewer than 10,000 people, the commissioner may approve~~
8430 ~~monitoring for an indicator other than E. coli under subdivision B 3 a (1) (b) (i) of this~~
8431 ~~section. The commissioner also may approve an alternative to the E. coli concentration~~
8432 ~~in subdivision B 3 a (1) (c) (i), (ii) or (iv) of this section to trigger Cryptosporidium~~
8433 ~~monitoring. This approval by the commissioner shall be provided to the waterworks in~~
8434 ~~writing and shall include the basis for the commissioner's determination that the~~
8435 ~~alternative indicator and/or trigger level will provide a more accurate identification of~~
8436 ~~whether a waterworks will exceed the Bin 1 Cryptosporidium level in subdivision B 3 c~~
8437 ~~(1) (a) of this section.~~

8438 ~~(e) Waterworks may sample more frequently than required under this section if the~~
8439 ~~sampling frequency is evenly spaced throughout the monitoring period.~~

8440 ~~(2) Second round of source water monitoring: Owners shall conduct a second round~~
8441 ~~of source water monitoring that meets the requirements for monitoring parameters,~~
8442 ~~frequency, and duration described in subdivision B 3 a (1) of this section, unless they~~
8443 ~~meet the monitoring exemption criteria in subdivision B 3 a (4) of this section. Owners~~
8444 ~~shall conduct this monitoring on the schedule in subdivision B 3 a (3) of this section.~~

8445 ~~(3) Monitoring schedule. Owners shall begin the monitoring required in subdivisions B~~
 8446 ~~3 a (1) and (2) of this section no later than the month beginning with the date listed in~~
 8447 ~~the following table:~~

Source Water Monitoring Starting Dates Table

| Owners of waterworks that serve... | Shall begin the first round of source water monitoring no later than the month beginning... | And shall begin the second round of source water monitoring no later than the month beginning... |
|--|---|--|
| At least 100,000 people | October 1, 2006 | April 1, 2015 |
| From 50,000 to 99,999 people | April 1, 2007 | October 1, 2015 |
| From 10,000 to 49,999 people | April 1, 2008 | October 1, 2016 |
| Fewer than 10,000 and monitor for E. coli | October 1, 2008 | October 1, 2017 |
| Fewer than 10,000 and monitor for Cryptosporidium ⁴ | April 1, 2010 | April 1, 2019 |

⁴Applies to waterworks that meet the conditions of subdivision B 3 a (1) (c) of this section.

8448 ~~(4) Monitoring avoidance.~~

8449 ~~(a) Owners are not required to conduct source water monitoring under subdivision C~~
 8450 ~~3 a of this section if the waterworks will provide a total of at least 5.5-log of treatment~~
 8451 ~~for Cryptosporidium, equivalent to meeting the treatment requirements of Bin 4 in~~
 8452 ~~subdivision B 3 c (2) of this section.~~

8453 ~~(b) If an owner chooses to provide the level of treatment in subdivision B 3 a (4) (a) of~~
 8454 ~~this section, rather than start source water monitoring, the owners shall notify the~~
 8455 ~~commissioner in writing no later than the date the owner is otherwise required to~~
 8456 ~~submit a sampling schedule for monitoring under subdivision B 3 a (5) of this section.~~
 8457 ~~Alternatively, an owner may choose to stop sampling at any point after the owner has~~
 8458 ~~initiated monitoring if the owner notifies the commissioner in writing that it will provide~~

8459 ~~this level of treatment. Owners shall install and operate technologies to provide this~~
8460 ~~level of treatment by the applicable treatment compliance date in subdivision B 3 c (3).~~

8461 ~~(5) Sampling schedules.~~

8462 ~~(a) Owners of waterworks required to conduct source water monitoring in accordance~~
8463 ~~with subdivision B 3 a shall submit a sampling schedule that specifies the calendar~~
8464 ~~dates when the owner shall collect each required sample.~~

8465 ~~(i) Owners shall submit sampling schedules to the commissioner no later than three~~
8466 ~~months prior to the applicable date listed in subdivision B 3 a (3) for each round of~~
8467 ~~required monitoring.~~

8468 ~~(ii) If the commissioner does not respond to an owner regarding the sampling~~
8469 ~~schedule, the owner shall sample at the reported schedule.~~

8470 ~~(b) Owners shall collect samples within two days before or two days after the dates~~
8471 ~~indicated in their sampling schedule (i.e., within a five-day period around the schedule~~
8472 ~~date) unless one of the conditions of the following paragraphs apply.~~

8473 ~~(i) If an extreme condition or situation exists that may pose danger to the sample~~
8474 ~~collector, or that cannot be avoided and causes the owner to be unable to sample in~~
8475 ~~the scheduled five-day period, the owner shall sample as close to the scheduled date~~
8476 ~~as is feasible unless the commissioner approves an alternative sampling date. The~~
8477 ~~owner shall submit an explanation for the delayed sampling date to the commissioner~~
8478 ~~concurrent with the shipment of the sample to the laboratory.~~

8479 ~~(ii) If an owner is unable to report a valid analytical result for a scheduled sampling~~
8480 ~~date due to equipment failure, loss of or damage to the sample, failure to comply with~~
8481 ~~the analytical method requirements, including the quality control requirements of~~
8482 ~~12VAC5-590-440, or the failure of an approved laboratory to analyze the sample, then~~

8483 the owner shall collect a replacement sample. The owner shall collect the replacement
8484 sample not later than 21 days after receiving information that an analytical result
8485 cannot be reported for the scheduled date unless the owner demonstrates that
8486 collecting a replacement sample within this time frame is not feasible or the
8487 commissioner approves an alternative resampling date. The owner shall submit an
8488 explanation for the delayed sampling date to the commissioner concurrent with the
8489 shipment of the sample to the laboratory.

8490 (c) Owners of waterworks that fail to meet the criteria of subdivision B 3 a (5) (b) of
8491 this section for any source water sample required under subdivision B 3 a shall revise
8492 their sampling schedules to add dates for collecting all missed samples. Owners shall
8493 submit the revised schedule to the commissioner for approval prior to when the owner
8494 begins collecting the missed samples.

8495 (6) Sampling locations.

8496 (a) Owners of waterworks required to conduct source water monitoring under
8497 subdivision B 3 a shall collect samples for each plant that treats a surface water or
8498 groundwater under the direct influence of surface water source. Where multiple plants
8499 draw water from the same influent, such as the same pipe or intake, the commissioner
8500 may approve one set of monitoring results to be used to satisfy the requirements
8501 subdivision B 3 a for all plants.

8502 (b) Owners shall collect source water samples prior to chemical treatment, such as
8503 coagulants, oxidants and disinfectants. However, the commissioner may approve the
8504 collection of a source water sample after chemical treatment. To grant this approval,
8505 the commissioner shall determine that collecting a sample prior to chemical treatment
8506 is not feasible for the waterworks and that the chemical treatment is unlikely to have a
8507 significant adverse effect on the analysis of the sample.

8508 ~~(c) Owners of waterworks that recycle filter backwash water shall collect source water~~
8509 ~~samples prior to the point of filter backwash water addition.~~

8510 ~~(d) Bank filtration.~~

8511 ~~(i) Waterworks that receive Cryptosporidium treatment credit for bank filtration under~~
8512 ~~12VAC5-590-420 B 2 d, shall collect source water samples in the surface water prior~~
8513 ~~to bank filtration.~~

8514 ~~(ii) Waterworks that use bank filtration as pretreatment to a filtration plant shall collect~~
8515 ~~source water samples from the well (i.e., after bank filtration). Use of bank filtration~~
8516 ~~during monitoring shall be consistent with routine operational practice. Waterworks~~
8517 ~~collecting samples after a bank filtration process may not receive treatment credit for~~
8518 ~~the bank filtration under subdivision B 3 d (4) (c) of this section.~~

8519 ~~(e) Multiple sources. Owners of waterworks with plants that use multiple water~~
8520 ~~sources, including multiple surface water sources and blended surface water and~~
8521 ~~ground water sources shall collect samples as specified in subdivision B 3 a (6) (e) (i)~~
8522 ~~or (ii) of this section. The use of multiple sources during monitoring shall be consistent~~
8523 ~~with routine operational practice.~~

8524 ~~(i) If a sampling tap is available where the sources are combined prior to treatment,~~
8525 ~~waterworks shall collect samples from the tap.~~

8526 ~~(ii) If a sampling tap where the sources are combined prior to treatment is not available,~~
8527 ~~owners shall collect samples at each source near the intake on the same day and shall~~
8528 ~~follow either subdivision B 3 a (6) (e) (ii) ((a)) or ((b)) of this section for sample analysis.~~

8529 ~~((a)) Owners may composite samples from each source into one sample prior to~~
8530 ~~analysis. The volume of sample from each source shall be weighted according to the~~
8531 ~~proportion of the source in the total plant flow at the time the sample is collected.~~

8532 ~~((b)) Owners may analyze samples from each source separately and calculate a~~
8533 ~~weighted average of the analysis results for each sampling date. The weighted~~
8534 ~~average shall be calculated by multiplying the analysis result for each source by the~~
8535 ~~fraction the source contributed to total plant flow at the time the sample was collected~~
8536 ~~and then summing these values.~~

8537 ~~(f) Additional Requirements. Owners shall submit a description of their sampling~~
8538 ~~location(s) to the commissioner at the same time as the sampling schedule required~~
8539 ~~in subdivision B-3-a (3) of this section. This description shall address the position of~~
8540 ~~the sampling location in relation to the waterworks water source(s) and treatment~~
8541 ~~processes, including pretreatment, points of chemical treatment, and filter backwash~~
8542 ~~recycle. If the commissioner does not respond to an owner regarding sampling~~
8543 ~~location(s), the owner shall sample at the reported location(s).~~

8544 ~~(7) Analytical methods. All analytical methods shall be conducted in accordance with~~
8545 ~~12VAC5-590-440.~~

8546 ~~(8) Approved laboratories.~~

8547 ~~(a) Cryptosporidium. Owners shall have Cryptosporidium samples analyzed by a~~
8548 ~~laboratory that is approved under EPA's Laboratory Quality Assurance Evaluation~~
8549 ~~Program for Analysis of Cryptosporidium in Water or a laboratory that has been~~
8550 ~~certified for Cryptosporidium analysis by an equivalent state laboratory certification~~
8551 ~~program.~~

8552 ~~(b) E. coli. Any laboratory certified by the state for total coliform or fecal coliform~~
8553 ~~analysis under 12VAC5-590-440 is approved for E. coli analysis when the laboratory~~
8554 ~~uses the same technique for E. coli that the laboratory uses under 12VAC5-590-440.~~

8555 ~~Laboratories shall use methods for enumeration of E. coli in source water approved in~~
8556 ~~12VAC5-590-440.~~

8557 ~~(c) Turbidity. Measurements of turbidity shall be made by a party approved by the~~
8558 ~~commissioner.~~

8559 ~~(9) Reporting of the source water results shall be in accordance with 12VAC5-590-~~
8560 ~~530.~~

8561 ~~(10) Plants operating only part of the year. Owners of waterworks treating surface~~
8562 ~~water or groundwater under the direct influence of surface water that operates for only~~
8563 ~~part of the year shall conduct source water monitoring in accordance with this section,~~
8564 ~~but with the following modifications:~~

8565 ~~(a) Owners shall sample their source water only during the months that the plant~~
8566 ~~operates unless the commissioner specifies another monitoring period based on plant~~
8567 ~~operating practices.~~

8568 ~~(b) Owners of waterworks with plants that operate less than six months per year and~~
8569 ~~that monitor for Cryptosporidium shall collect at least six Cryptosporidium samples per~~
8570 ~~year during each of two years of monitoring. Samples shall be evenly spaced~~
8571 ~~throughout the period the plant operates.~~

8572 ~~(11) New sources;~~

8573 ~~(a) Owners of waterworks that begin using a new source of surface water or~~
8574 ~~groundwater under the direct influence of surface water after the waterworks is~~
8575 ~~required to begin monitoring under subdivision B 3 a (3) of this section shall monitor~~
8576 ~~the new source on a schedule the commissioner approves. Source water monitoring~~
8577 ~~shall meet the requirements of this section. The owner shall also meet the bin~~

8578 classification and Cryptosporidium treatment requirements of subdivision B 3 c (1) and
8579 (2) of this section, for the new source on a schedule the commissioner approves.

8580 (b) The requirements of this section apply to waterworks using surface water or
8581 groundwater under the direct influence of surface water that begin operation after the
8582 monitoring start date applicable to the waterworks size under subdivision B 3 a (3) of
8583 this section.

8584 (c) The owner shall begin a second round of source water monitoring no later than six
8585 years following initial bin classification under in subdivision B 3 c (1) of this section.

8586 (12) Failure to collect any source water sample required under this section in
8587 accordance with the sampling schedule, sampling location, analytical method,
8588 approved laboratory, and reporting requirements of subdivision B 3 a (5), (6), (7), (8),
8589 or (9) of this section is a monitoring violation.

8590 (13) Grandfathering monitoring data. Owners may use (grandfather) monitoring data
8591 collected prior to the applicable monitoring start date in subdivision B 3 a (3) of this
8592 section to meet the initial source water monitoring requirements in subdivision B 3 a
8593 (1) of this section. Grandfathered data may substitute for an equivalent number of
8594 months at the end of the monitoring period. All data submitted under this paragraph
8595 shall meet the requirements in (13) (a) through (h) listed below and be approved by
8596 the commissioner:

8597 (a) An owner may grandfather Cryptosporidium samples to meet the requirements of
8598 this section when the owner does not have corresponding E. coli and turbidity samples.
8599 A waterworks that grandfathers Cryptosporidium samples without E. coli and turbidity
8600 samples is not required to collect E. coli and turbidity samples when the system
8601 completes the requirements for Cryptosporidium monitoring under this section.

8602 ~~(b) E. coli sample analysis. The analysis of E. coli samples shall meet the analytical~~
8603 ~~method and approved laboratory requirements of subdivision B 3 a (7) and (8) of this~~
8604 ~~section.~~

8605 ~~(c) Cryptosporidium sample analysis. The analysis of Cryptosporidium samples shall~~
8606 ~~meet the requirements of subdivision B 3 a (8) of this section.~~

8607 ~~(d) Sampling location. The sampling location shall meet the conditions in subdivision~~
8608 ~~B 3 a (6) of this section.~~

8609 ~~(e) Sampling frequency. Cryptosporidium samples were collected no less frequently~~
8610 ~~than each calendar month on a regular schedule, beginning no earlier than January~~
8611 ~~1999. Sample collection intervals may vary for the conditions specified in subdivision~~
8612 ~~B 3 a (5) (b) (i) and (ii) of this section, if the owner provides documentation of the~~
8613 ~~condition when reporting monitoring results.~~

8614 ~~(i) The commissioner may approve grandfathering of previously collected data where~~
8615 ~~there are time gaps in the sampling frequency if the owner conducts additional~~
8616 ~~monitoring the commissioner specifies to ensure that the data used to comply with the~~
8617 ~~initial source water monitoring requirements of subdivision B 3 a of this section are~~
8618 ~~seasonally representative and unbiased.~~

8619 ~~(ii) Owners may grandfather previously collected data where the sampling frequency~~
8620 ~~within each month varied. If the Cryptosporidium sampling frequency varied, owners~~
8621 ~~shall follow the monthly averaging procedure in subdivision B 3 c (1) (a) (v) of this~~
8622 ~~section, when calculating the bin classification for filtered systems.~~

8623 ~~(f) Reporting monitoring results for grandfathering. Owners that request to grandfather~~
8624 ~~previously collected monitoring results shall report the following information by the~~

8625 applicable dates listed in the following paragraphs. Owners shall report this information
8626 to the commissioner.

8627 (i) Owners shall report that they intend to submit previously collected monitoring results
8628 for grandfathering. This report shall specify the number of previously collected results
8629 the owner shall submit, the dates of the first and last sample, and whether an owner
8630 shall conduct additional source water monitoring to meet the requirements in
8631 subdivision B 3 a of this section. Owners shall report this information no later than the
8632 date the sampling schedule listed in subdivision B 3 a (3) of this section is required.

8633 (ii) Owners shall report previously collected monitoring results for grandfathering,
8634 along with the associated documentation listed in paragraphs ((a)) through ((d)) listed
8635 below, no later than two months after the applicable date listed in subdivision B 3 a (3)
8636 of this section.

8637 ((a)) For each sample result, owners shall report the applicable data elements in
8638 12VAC5-590-530 E 1 c.

8639 ((b)) Owners shall certify that the reported monitoring results include all results the
8640 waterworks generated during the time period beginning with the first reported result
8641 and ending with the final reported result. This applies to samples that were collected
8642 from the sampling location specified for source water monitoring under subdivision B
8643 3 a (13) (f) of this section, not spiked, and analyzed using the laboratory's routine
8644 process for the analytical methods listed in this section.

8645 ((c)) Owners shall certify that the samples were representative of a plant's source
8646 water(s) and the source water(s) have not changed. Owners shall report a description
8647 of the sampling location(s), which shall address the position of the sampling location

8648 in relation to the waterworks' water source(s) and treatment processes, including
8649 points of chemical addition and filter backwash recycle.

8650 ~~((d)) For Cryptosporidium samples, the laboratory or laboratories that analyzed the~~
8651 ~~samples shall provide a letter certifying that the quality control criteria specified in the~~
8652 ~~methods listed in subdivision B 3 a (8) of this section were met for each sample batch~~
8653 ~~associated with the reported results. Alternatively, the laboratory may provide bench~~
8654 ~~sheets and sample examination report forms for each field, matrix spike, IPR, OPR,~~
8655 ~~and method blank sample associated with the reported results.~~

8656 ~~(g) If the commissioner determines that a previously collected data set submitted for~~
8657 ~~grandfathering was generated during source water conditions that were not normal for~~
8658 ~~the waterworks, such as a drought, the commissioner may disapprove the data.~~
8659 ~~Alternatively, the commissioner may approve the previously collected data if the owner~~
8660 ~~reports additional source water monitoring data, as determined by the commissioner,~~
8661 ~~to ensure that the data set used under subdivision B 3 c (1) of this section represents~~
8662 ~~average source water conditions for the waterworks.~~

8663 ~~(h) If an owner submits previously collected data that fully meets the number of~~
8664 ~~samples required for initial source water monitoring under subdivision B 3 a (1) of this~~
8665 ~~section and some of the data are rejected due to not meeting the requirements of this~~
8666 ~~section, the owner shall conduct additional monitoring to replace rejected data on a~~
8667 ~~schedule the commissioner approves. Owners are not required to begin this additional~~
8668 ~~monitoring until two months after notification that data have been rejected and~~
8669 ~~additional monitoring is necessary.~~

8670 ~~b. Owners of waterworks that plan to make a significant change to their disinfection~~
8671 ~~practice shall develop disinfection profiles and calculate disinfection benchmarks, as~~
8672 ~~described in subdivision B 3 a (1) and (2) below.~~

8673 ~~(1) Requirements when making a significant change in disinfection practice.~~

8674 ~~(a) Following the completion of initial source water monitoring under subdivision B 3 a~~

8675 ~~(1) of this section, owners of waterworks that plan to make a significant change to its~~

8676 ~~disinfection practice, as defined in subdivision B 3 b (1) (b) of this section, shall develop~~

8677 ~~disinfection profiles and calculate disinfection benchmarks for Giardia lamblia and~~

8678 ~~viruses as described in subdivision B 3 b (2) of this section. Prior to changing the~~

8679 ~~disinfection practice, the owner shall notify the commissioner and shall include in this~~

8680 ~~notice the information in subdivision B 3 b (1) a) (i) through (iii) of this section.~~

8681 ~~(i) A completed disinfection profile and disinfection benchmark for Giardia lamblia and~~

8682 ~~viruses as described in subdivision B 3 b (2) of this section.~~

8683 ~~(ii) A description of the proposed change in disinfection practice.~~

8684 ~~(iii) An analysis of how the proposed change will affect the current level of disinfection.~~

8685 ~~(b) Significant changes to disinfection practice are defined as follows:~~

8686 ~~(i) Changes to the point of disinfection;~~

8687 ~~(ii) Changes to the disinfectant(s) used in the treatment plant;~~

8688 ~~(iii) Changes to the disinfection process; or~~

8689 ~~(iv) Any other modification identified by the commissioner as a significant change to~~

8690 ~~disinfection practice.~~

8691 ~~(2) Developing the disinfection profile and benchmark.~~

8692 ~~(a) Owners of waterworks required to develop disinfection profiles in accordance with~~

8693 ~~subdivision B 3 b (1) of this section shall follow the requirements of this section.~~

8694 ~~Owners shall monitor at least weekly for a period of 12 consecutive months to~~

8695 ~~determine the total log inactivation for Giardia lamblia and viruses. If owners monitor~~

8696 ~~more frequently, the monitoring frequency shall be evenly spaced. Owners of~~
8697 ~~waterworks that operate for fewer than 12 months per year shall monitor weekly during~~
8698 ~~the period of operation. Owners shall determine log inactivation for Giardia lamblia~~
8699 ~~through the entire plant, based on CT99.9 values in Appendix L. Owners shall~~
8700 ~~determine log inactivation for viruses through the entire treatment plant based on a~~
8701 ~~protocol approved by the commissioner.~~

8702 ~~(b) Owners of waterworks with a single point of disinfectant application prior to the~~
8703 ~~entrance to the distribution system shall conduct the monitoring in subdivision B 3 b~~
8704 ~~(2) (b) (i) through (iv) of this section. Owners of waterworks with more than one point~~
8705 ~~of disinfectant application shall conduct the monitoring in subdivision B 3 b (2) (b) (i)~~
8706 ~~through (iv) of this section for each disinfection segment. Owners shall monitor the~~
8707 ~~parameters necessary to determine the total inactivation ratio, using analytical~~
8708 ~~methods in Appendix L.~~

8709 ~~(i) For waterworks using a disinfectant other than UV, the temperature of the~~
8710 ~~disinfected water shall be measured at each residual disinfectant concentration~~
8711 ~~sampling point during peak hourly flow or at an alternative location approved by the~~
8712 ~~commissioner.~~

8713 ~~(ii) For waterworks using chlorine, the pH of the disinfected water shall be measured~~
8714 ~~at each chlorine residual disinfectant concentration sampling point during peak hourly~~
8715 ~~flow or at an alternative location approved by the commissioner.~~

8716 ~~(iii) The disinfectant contact time(s) (t) shall be determined during peak hourly flow.~~

8717 ~~(iv) The residual disinfectant concentration(s) (C) of the water before or at the first~~
8718 ~~customer and prior to each additional point of disinfectant application shall be~~
8719 ~~measured during peak hourly flow.~~

8720 ~~(c) In lieu of conducting new monitoring under subdivision B 3 b (2) (b) of this section,~~
8721 ~~owners may elect to meet the requirements of subdivision B 3 b (2) (c) (i) or (ii) of this~~
8722 ~~section.~~

8723 ~~(i) Owners of waterworks that have at least one year of existing data that are~~
8724 ~~substantially equivalent to data collected under the provisions of subdivision B 3 b (2)~~
8725 ~~(b) of this section may use these data to develop disinfection profiles as specified in~~
8726 ~~this section if the owner has neither made a significant change to its treatment practice~~
8727 ~~nor changed sources since the data were collected. Owners may develop disinfection~~
8728 ~~profiles using up to three years of existing data.~~

8729 ~~(ii) Owners may use disinfection profile(s) developed under 12VAC5-590-500 E 2 in~~
8730 ~~lieu of developing a new profile if the owner has neither made a significant change to~~
8731 ~~its treatment practice nor changed sources since the profile was developed. Owners~~
8732 ~~that have not developed a virus profile under 12VAC5-590-500 E 2 shall develop a~~
8733 ~~virus profile using the same monitoring data on which the Giardia lamblia profile is~~
8734 ~~based.~~

8735 ~~(d) Owners of waterworks shall calculate the total inactivation ratio for Giardia lamblia~~
8736 ~~as specified in subdivision B 3 b (2) (d) (i) through (iii) of this section.~~

8737 ~~(i) Owners of waterworks using only one point of disinfectant application may~~
8738 ~~determine the total inactivation ratio for the disinfection segment based on either of~~
8739 ~~the methods in subdivision B 3 b (2) (d) (i) ((a)) or ((b)) of this section.~~

8740 ~~((a)) Determine one inactivation ratio ($CT_{calc}/CT_{99.9}$) before or at the first customer~~
8741 ~~during peak hourly flow.~~

8742 ~~((b)) Determine successive $CT_{calc}/CT_{99.9}$ values, representing sequential~~
8743 ~~inactivation ratios, between the point of disinfectant application and a point before or~~

8744 at the first customer during peak hourly flow. The owner shall calculate the total
8745 inactivation ratio by determining $(CT_{calc}/CT_{99.9})$ for each sequence and then adding
8746 the $(CT_{calc}/CT_{99.9})$ values together to determine $(\sum (CT_{calc}/CT_{99.9}))$.

8747 (ii) Owners of waterworks using more than one point of disinfectant application before
8748 the first customer shall determine the CT value of each disinfection segment
8749 immediately prior to the next point of disinfectant application, or for the final segment,
8750 before or at the first customer, during peak hourly flow. The $(CT_{calc}/CT_{99.9})$ value of
8751 each segment and $(\sum (CT_{calc}/CT_{99.9}))$ shall be calculated using the method in
8752 paragraph (i) ((b)) of this section.

8753 (iii) The owner shall determine the total logs of inactivation by multiplying the value
8754 calculated in subdivision B 3 b (2) (d) (i) or (ii) of this section by 3.0.

8755 (iv) Owners shall calculate the log of inactivation for viruses using a protocol approved
8756 by the commissioner.

8757 (e) Owners shall use the procedures specified in (i) and (ii) listed below to calculate a
8758 disinfection benchmark.

8759 (i) For each year of profiling data collected and calculated under subdivision B 3 b (2)
8760 (a) through (d) of this section, owners shall determine the lowest mean monthly level
8761 of both *Giardia lamblia* and virus inactivation. Owners shall determine the mean
8762 *Giardia lamblia* and virus inactivation for each calendar month for each year of profiling
8763 data by dividing the sum of daily or weekly *Giardia lamblia* and virus log inactivation
8764 by the number of values calculated for that month.

8765 (ii) The disinfection benchmark is the lowest monthly mean value (for waterworks with
8766 one year of profiling data) or the mean of the lowest monthly mean values (for

8767 ~~waterworks with more than one year of profiling data) of Giardia lamblia and virus log~~
8768 ~~inactivation in each year of profiling data.~~

8769 ~~c. Owners shall determine their Cryptosporidium treatment bin classification as~~
8770 ~~described in subdivision B 3 c (1) and provide additional treatment for~~
8771 ~~Cryptosporidium, if required, as described in subdivision B 3 c (2). Owners shall~~
8772 ~~implement Cryptosporidium treatment according to the schedule in subdivision B 3 c~~
8773 ~~(3).~~

8774 ~~(1) Bin classification for waterworks.~~

8775 ~~(a) Following completion of the initial round of source water monitoring required under~~
8776 ~~subdivision B 3 a (1), owners shall calculate an initial Cryptosporidium bin~~
8777 ~~concentration for each plant for which monitoring was required. Calculation of the bin~~
8778 ~~concentration shall use the Cryptosporidium results reported under subdivision B 3 a~~
8779 ~~(1) and shall follow these procedures:~~

8780 ~~(i) For waterworks that collect a total of at least 48 samples, the bin concentration is~~
8781 ~~equal to the arithmetic mean of all sample concentrations.~~

8782 ~~(ii) For waterworks that collect a total of at least 24 samples, but not more than 47~~
8783 ~~samples, the bin concentration is equal to the highest arithmetic mean of all sample~~
8784 ~~concentrations in any 12 consecutive months during which Cryptosporidium samples~~
8785 ~~were collected.~~

8786 ~~(iii) For waterworks that serve fewer than 10,000 people and monitor for~~
8787 ~~Cryptosporidium for only one year (i.e., collect 24 samples in 12 months), the bin~~
8788 ~~concentration is equal to the arithmetic mean of all sample concentrations.~~

8789 ~~(iv) For waterworks with plants operating only part of the year that monitor fewer than~~
8790 ~~12 months per year under subdivision B 3 a (1), the bin concentration is equal to the~~

8791 highest arithmetic mean of all sample concentrations during any year of
 8792 Cryptosporidium monitoring.

8793 (v) If the monthly Cryptosporidium sampling frequency varies, owners shall first
 8794 calculate a monthly average for each month of monitoring. Owners shall then use
 8795 these monthly average concentrations, rather than individual sample concentrations,
 8796 in the applicable calculation for bin classification in subdivision B 3 c (1) (a) (i) through
 8797 (iv) of this section.

8798 (b) Owners shall determine their initial bin classification from the following table and
 8799 using the Cryptosporidium bin concentration calculated under subdivision B 3 c (1) (a)
 8800 of this section:

Bin Classification Table for Filtered Systems

| For owners of waterworks that are: | with a Cryptosporidium bin concentration of ¹ ... | The bin classification is... |
|--|--|------------------------------|
| ...required to monitor for Cryptosporidium under subdivision B 3 a (1) | Cryptosporidium less than 0.075 oocysts/L | Bin 1 |
| | Cryptosporidium equal to or greater than 0.075 oocysts/L but less than 1.0 oocysts/L | Bin 2 |
| | Cryptosporidium equal to or greater than 1.0 oocysts/L but less than 3.0 oocysts/L | Bin 3 |
| | Cryptosporidium equal to or greater than 3.0 oocysts/L | Bin 4 |
| ...serving fewer than 10,000 people and NOT required to monitor for Cryptosporidium under B 3 a (1)(c) | NA | Bin 1 |

¹Based on calculations in subdivision B 3 c (1) (a) or (c) of this section, as applicable

8801 (c) Following completion of the second round of source water monitoring required
 8802 under subdivision B 3 a (2), owners shall recalculate their Cryptosporidium bin
 8803 concentration using the Cryptosporidium results reported under subdivision B 3 a (2)
 8804 and following the procedures in subdivision B 3 c (1) (a)(i) through (iv) of this section.

8805 ~~Owners shall then redetermine their bin classification using this bin concentration and~~
8806 ~~the table in subdivision B 3 c (1) (b) of this section.~~

8807 ~~(d) Reporting of bin classifications~~

8808 ~~(i) Owners shall report their initial bin classification under subdivision B 3 c (1) (b) of~~
8809 ~~this section to the commissioner for approval no later than six months after the~~
8810 ~~waterworks is required to complete initial source water monitoring based on the~~
8811 ~~schedule in subdivision B 3 a (3).~~

8812 ~~(ii) Owners shall report their bin classification under subdivision B 3 c (1) (c) of this~~
8813 ~~section to the commissioner for approval no later than six months after the owner is~~
8814 ~~required to complete the second round of source water monitoring based on the~~
8815 ~~schedule in subdivision B 3 c (1) 3 a (3) of this section.~~

8816 ~~(iii) The bin classification report to the commissioner shall include a summary of source~~
8817 ~~water monitoring data and the calculation procedure used to determine bin~~
8818 ~~classification.~~

8819 ~~(e) Failure to comply with the conditions of subdivision B 3 c (1) (d) of this section is a~~
8820 ~~violation of the treatment technique requirement.~~

8821 ~~(2) Waterworks additional Cryptosporidium treatment requirements.~~

8822 ~~(a) Waterworks shall provide the level of additional treatment for Cryptosporidium~~
8823 ~~specified in this paragraph based on their bin classification as determined under~~
8824 ~~subdivision B 3 c (1) of this section and according to the schedule in subdivision B 3 c~~
8825 ~~(3) (b) of this section.~~

| | |
|--|--|
| If the waterworks bin classification is... | And the waterworks uses the following filtration treatment in full compliance with 12VAC5-590-420 A and B, then the additional Cryptosporidium treatment requirements are... |
|--|--|

| - | Conventional filtration treatment (including softening) | Direct filtration | Slow sand or diatomaceous earth filtration | Alternative filtration technologies |
|-------|---|-------------------------|--|-------------------------------------|
| Bin 1 | No additional treatment | No additional treatment | No additional treatment | No additional treatment |
| Bin 2 | 1-log treatment | 1.5-log treatment | 1-log treatment | (1) |
| Bin 3 | 2-log treatment | 2.5-log treatment | 2-log treatment | (2) |
| Bin 4 | 2.5-log treatment | 3-log treatment | 2.5-log treatment | (3) |

¹As determined by the commissioner such that the total Cryptosporidium removal and inactivation is at least 4.0-log

²As determined by the commissioner such that the total Cryptosporidium removal and inactivation is at least 5.0-log

³As determined by the commissioner such that the total Cryptosporidium removal and inactivation is at least 5.5-log

- 8826 (b) Additional treatment
- 8827 (i) Owners shall use one or more of the treatment and management options listed in
- 8828 subdivision B 3 d, termed the microbial toolbox, to comply with the additional
- 8829 Cryptosporidium treatment required in subdivision B 3 c (2) (a) of this section.
- 8830 (ii) Waterworks classified in Bin 3 and Bin 4 shall achieve at least 1-log of the additional
- 8831 Cryptosporidium treatment required under subdivision B 3 c (2) (a) of this section using
- 8832 either one or a combination of the following: bag filters, bank filtration, cartridge filters,
- 8833 chlorine dioxide, membranes, ozone, or UV, as described in subdivision B 3 d (3)
- 8834 through (7) of this section.
- 8835 (c) Failure by a waterworks in any month to achieve treatment credit by meeting criteria
- 8836 in subdivision B 3 d (3) through (7) of this section for microbial toolbox options that is
- 8837 at least equal to the level of treatment required in subdivision B 3 c (2) (a) of this
- 8838 section is a violation of the treatment technique requirement.

8839 ~~(d) If the commissioner determines during a sanitary survey or an equivalent source~~
 8840 ~~water assessment that after a waterworks completed the monitoring conducted under~~
 8841 ~~subdivision B 3 a (1) or (2) of this section, significant changes occurred in the~~
 8842 ~~waterworks' watershed that could lead to increased contamination of the source water~~
 8843 ~~by Cryptosporidium, the owner shall take actions specified by the commissioner to~~
 8844 ~~address the contamination. These actions may include additional source water~~
 8845 ~~monitoring and/or implementing microbial toolbox options listed in subdivision B 3 d~~
 8846 ~~(2) of this section.~~

8847 ~~(3) Schedule for compliance with Cryptosporidium treatment requirements.~~

8848 ~~(a) Following initial bin classification in accordance with subdivision B 3 c (1) (b) of this~~
 8849 ~~section, waterworks shall provide the level of treatment for Cryptosporidium required~~
 8850 ~~under subdivision B 3 c (2) of this section according to the schedule in subdivision B~~
 8851 ~~3 c (3) (b) of this section.~~

8852 ~~(b) Cryptosporidium treatment compliance dates.~~

Cryptosporidium Treatment Compliance Dates Table

| Waterworks that serve.... | Shall comply with Cryptosporidium treatment requirements no later than ⁴ ... |
|------------------------------|---|
| At least 100,000 people | April 1, 2012 |
| From 50,000 to 99,999 people | October 1, 2012 |
| From 10,000 to 49,999 people | October 1, 2013 |
| Fewer than 10,000 people | October 1, 2014 |

⁴The commissioner may allow up to an additional two years for complying with the treatment requirement for waterworks making capital improvements.

8853 ~~(c) If the bin classification for a filtered system changes following the second round of~~
 8854 ~~source water monitoring, as determined under subdivision B 3 c (1) (c) of this section,~~

8855 the waterworks shall provide the level of treatment for Cryptosporidium required under
 8856 subdivision B 3 c (2) of this section on a schedule the commissioner approves.

8857 d. Owners of waterworks required to provide additional treatment for Cryptosporidium
 8858 shall implement microbial toolbox options that are designed and operated as described
 8859 in subdivision B 3 d (1) through (7) of this section.

8860 (1) Waterworks receive the treatment credits listed in the table in subdivision B 3 d (2)
 8861 of this section by meeting the conditions for microbial toolbox options described in
 8862 subdivision B 3 d (3) through (7) of this section. Waterworks apply these treatment
 8863 credits to meet the treatment requirements in subdivision B 3 c (2) of this section.

8864 (2) Microbial Toolbox Summary Table: Options, Treatment Credits and Criteria

8865 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 | |
| Alternative source/ intake management | No prescribed credit. Owners may conduct simultaneous monitoring for treatment bin classification at alternative intake locations or under alternative intake management strategies. Specific criteria are in subdivision B 3 d (3) (b). |
| Pre Filtration Toolbox Options | |
| 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 performance criteria approved by the commissioner. To be eligible, basins shall be operated continuously with |

| | |
|---------------------------------------|---|
| | <p>coagulant addition and all plant flow shall pass through basins. Specific criteria are in subdivision B 3 d (4) (a)</p> |
| Two-stage lime softening | <p>0.5-log credit for two-stage softening where chemical addition and hardness precipitation occur in both stages. All plant flow shall pass through both stages. Single-stage softening is credited as equivalent to conventional treatment. Specific criteria are in subdivision B 3 d (4) (b).</p> |
| Bank filtration | <p>0.5-log credit for 25-foot setback; 1.0-log credit for 50-foot setback; aquifer shall be unconsolidated sand containing at least 10% fines; average turbidity in wells shall be less than 1 NTU. Waterworks using wells followed by filtration when conducting source water monitoring shall sample the well to determine bin classification and are not eligible for additional credit. Specific criteria are in subdivision B 3 d (4) (c).</p> |
| Treatment Performance Toolbox Options | |
| Combined filter performance | <p>0.5-log credit for combined filter effluent turbidity less than or equal to 0.15 NTU in at least 95% of measurements each month. Specific criteria are in subdivision B 3 d (5) (a).</p> |
| Individual filter performance | <p>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% 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 subdivision B 3 d (5) (b).</p> |

| Additional Filtration Toolbox Options | |
|---|---|
| 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 subdivision B 3 d (6) (a). |
| 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 subdivision B 3 d (6) (a). |
| Membrane filtration | Log credit equivalent to removal efficiency demonstrated in challenge test for device if supported by direct integrity testing. Specific criteria are in subdivision B 3 d (6) (b). |
| 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 subdivision B 3 d (6) (c). |
| 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 subdivision B 3 d (6) (d). |
| Inactivation Toolbox Options | |
| Chlorine dioxide | Log credit based on measured CT in relation to CT table. Specific criteria in subdivision B 3 d (7) (b). |
| Ozone | Log credit based on measured CT in relation to CT table. Specific criteria in subdivision B 3 d (7) (b). |
| 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 subdivision B
3-d (7) (d).

- 8866 ~~(3) Source toolbox components.~~
- 8867 ~~(a) Reserved~~
- 8868 ~~(b) Alternative source.~~
- 8869 ~~(i) An owner may conduct source water monitoring that reflects a different intake~~
8870 ~~location (either in the same source or for an alternate source) or a different procedure~~
8871 ~~for the timing or level of withdrawal from the source (alternative source monitoring). If~~
8872 ~~the commissioner approves, an owner may determine the bin classification under~~
8873 ~~subdivision B 3 c (1) of this section based on the alternative source monitoring results.~~
- 8874 ~~(ii) If an owner conducts alternative source monitoring under subdivision B 3 d (3) (b)~~
8875 ~~(i) of this section, the owner shall also monitor their current plant intake concurrently~~
8876 ~~as described in subdivision B 3 a of this section.~~
- 8877 ~~(iii) Alternative source monitoring under subdivision B 3 d (3) (b) (i) of this section shall~~
8878 ~~meet the requirements for source monitoring to determine bin classification, as~~
8879 ~~described in subdivision B 3 a (1) through (13) of this section. Owners shall report the~~
8880 ~~alternative source monitoring results to the commissioner, along with supporting~~
8881 ~~information documenting the operating conditions under which the samples were~~
8882 ~~collected.~~
- 8883 ~~(iv) If an owner determines the bin classification under subdivision B 3 c (1) of this~~
8884 ~~section using alternative source monitoring results that reflect a different intake~~
8885 ~~location or a different procedure for managing the timing or level of withdrawal from~~
8886 ~~the source, the owner shall relocate the intake or permanently adopt the withdrawal~~

8887 procedure, as applicable, no later than the applicable treatment compliance date in
8888 subdivision B 3 c (3) of this section.

8889 ~~(4) Pre-filtration treatment toolbox components.~~

8890 ~~(a) Presedimentation. Waterworks receive 0.5-log Cryptosporidium treatment credit~~
8891 ~~for a presedimentation basin during any month the process meets the following criteria:~~

8892 ~~(i) The presedimentation basin shall be in continuous operation and shall treat the~~
8893 ~~entire plant flow taken from a surface water or groundwater under the direct influence~~
8894 ~~of surface water source.~~

8895 ~~(ii) The waterworks shall continuously add a coagulant to the presedimentation basin.~~

8896 ~~(iii) The presedimentation basin shall achieve the performance criteria in either of the~~
8897 ~~following.~~

8898 ~~((a)) Demonstrates at least 0.5-log mean reduction of influent turbidity. This reduction~~
8899 ~~shall be determined using daily turbidity measurements in the presedimentation~~
8900 ~~process influent and effluent and shall be calculated as follows: $\log_{10}(\text{monthly mean}$~~
8901 ~~of daily influent turbidity) - $\log_{10}(\text{monthly mean of daily effluent turbidity})$.~~

8902 ~~((b)) Complies with performance criteria approved by the commissioner that~~
8903 ~~demonstrate at least 0.5-log mean removal of micron-sized particulate material~~
8904 ~~through the presedimentation process.~~

8905 ~~(b) Two-stage lime softening. Waterworks receive an additional 0.5-log~~
8906 ~~Cryptosporidium treatment credit for a two-stage lime softening plant if chemical~~
8907 ~~addition and hardness precipitation occur in two separate and sequential softening~~
8908 ~~stages prior to filtration. Both softening stages shall treat the entire plant flow taken~~
8909 ~~from a surface water or groundwater under the direct influence of surface water~~
8910 ~~source.~~

8911 ~~(c) Bank filtration. Waterworks receive Cryptosporidium treatment credit for bank~~
8912 ~~filtration that serves as pretreatment to a filtration plant by meeting the criteria in this~~
8913 ~~paragraph. Waterworks using bank filtration when they begin source water monitoring~~
8914 ~~under subdivision B 3 a (1) of this section shall collect samples as described in~~
8915 ~~subdivision B 3 a (6) (d) of this section and are not eligible for this credit.~~

8916 ~~(i) Wells with a ground water flow path of at least 25 feet receive 0.5-log treatment~~
8917 ~~credit; wells with a ground water flow path of at least 50 feet receive 1.0-log treatment~~
8918 ~~credit. The ground water flow path shall be determined as specified in subdivision B 3~~
8919 ~~d (c) (iv) of this section.~~

8920 ~~(ii) Only wells in granular aquifers are eligible for treatment credit. Granular aquifers~~
8921 ~~are those comprised of sand, clay, silt, rock fragments, pebbles or larger particles, and~~
8922 ~~minor cement. A waterworks shall characterize the aquifer at the well site to determine~~
8923 ~~aquifer properties. Owners shall extract a core from the aquifer and demonstrate that~~
8924 ~~in at least 90% of the core length, grains less than 1.0 mm in diameter constitute at~~
8925 ~~least 10% of the core material.~~

8926 ~~(iii) Only horizontal and vertical wells are eligible for treatment credit.~~

8927 ~~(iv) For vertical wells, the ground water flow path is the measured distance from the~~
8928 ~~edge of the surface water body under high flow conditions (determined by the 100-~~
8929 ~~year floodplain elevation boundary or by the floodway, as defined in Federal~~
8930 ~~Emergency Management Agency flood hazard maps) to the well screen. For horizontal~~
8931 ~~wells, the ground water flow path is the measured distance from the bed of the river~~
8932 ~~under normal flow conditions to the closest horizontal well lateral screen.~~

8933 ~~(v) Owners shall monitor each wellhead for turbidity at least once every four hours~~
8934 ~~while the bank filtration process is in operation. If monthly average turbidity levels,~~

8935 based on daily maximum values in the well, exceed 1 NTU, the owner shall report this
8936 result to the commissioner and conduct an assessment within 30 days to determine
8937 the cause of the high turbidity levels in the well. If the commissioner determines that
8938 microbial removal has been compromised, the commissioner may revoke treatment
8939 credit until the owner implements corrective actions approved by the commissioner to
8940 remediate the problem.

8941 (vi) Springs and infiltration galleries are not eligible for treatment credit under this
8942 section.

8943 (vii) Bank filtration demonstration of performance. The commissioner may approve
8944 Cryptosporidium treatment credit for bank filtration based on a demonstration of
8945 performance study that meets the criteria in this paragraph. This treatment credit may
8946 be greater than 1.0 log and may be awarded to bank filtration that does not meet the
8947 criteria in subdivision B 3 d (4) (c) (i) through (v) of this section.

8948 ((a)) The study shall follow a protocol approved by the commissioner and shall involve
8949 the collection of data on the removal of Cryptosporidium or a surrogate for
8950 Cryptosporidium and related hydrogeologic and water quality parameters during the
8951 full range of operating conditions.

8952 ((b)) The study shall include sampling both from the production well(s) and from
8953 monitoring wells that are screened and located along the shortest flow path between
8954 the surface water source and the production well(s).

8955 (5) Treatment performance toolbox components.

8956 (a) Combined filter performance. Waterworks using conventional filtration treatment or
8957 direct filtration treatment receive an additional 0.5 log Cryptosporidium treatment
8958 credit during any month the waterworks meets the criteria in this paragraph. Combined

8959 filter effluent (CFE) turbidity shall be less than or equal to 0.15 NTU in at least 95% of
8960 the measurements. Turbidity shall be measured as described in 12VAC5-590-370 B 7
8961 b and 12VAC5-590-370 E.

8962 (b) Individual filter performance. Waterworks using conventional filtration treatment or
8963 direct filtration treatment receive 0.5-log Cryptosporidium treatment credit, which can
8964 be in addition to the 0.5-log credit under subdivision B 3 d (5) (a) of this section, during
8965 any month the waterworks meets the criteria in this paragraph. Compliance with these
8966 criteria shall be based on individual filter turbidity monitoring as described in 12VAC5-
8967 590-370 B 7 b (1).

8968 (i) The filtered water turbidity for each individual filter shall be less than or equal to 0.15
8969 NTU in at least 95% of the measurements recorded each month.

8970 (ii) No individual filter may have a measured turbidity greater than 0.3 NTU in two
8971 consecutive measurements taken 15 minutes apart.

8972 (iii) Any waterworks that has received treatment credit for individual filter performance
8973 and fails to meet the requirements of subdivision B 3 d (5) (b) (i) or (ii) of this section
8974 during any month does not receive a treatment technique violation under subdivision
8975 B 3 c (2) (c) if the commissioner determines the following:

8976 ((a)) The failure was due to unusual and short-term circumstances that could not
8977 reasonably be prevented through optimizing treatment plant design, operation, and
8978 maintenance.

8979 ((b)) The waterworks has experienced no more than two such failures in any calendar
8980 year.

8981 (6) Additional filtration toolbox components.

8982 ~~(a) Bag and cartridge filters. Waterworks receive Cryptosporidium treatment credit of~~
8983 ~~up to 2.0-log for individual bag or cartridge filters and up to 2.5-log for bag or cartridge~~
8984 ~~filters operated in series by meeting the criteria in subdivision B 3 d (6) (a) (i) through~~
8985 ~~(x) of this section. To be eligible for this credit, owners shall report the results of~~
8986 ~~challenge testing that meets the requirements of subdivision B 3 d (6) (a)(ii) through~~
8987 ~~(ix) of this section to the commissioner. The filters shall treat the entire plant flow taken~~
8988 ~~from a surface water or groundwater under the direct influence of surface water~~
8989 ~~source.~~

8990 ~~(i) The Cryptosporidium treatment credit awarded to bag or cartridge filters shall be~~
8991 ~~based on the removal efficiency demonstrated during challenge testing that is~~
8992 ~~conducted according to the criteria in subdivision B 3 d (6) (a) (ii) through (ix) of this~~
8993 ~~section. A factor of safety equal to 1-log for individual bag or cartridge filters and 0.5-~~
8994 ~~log for bag or cartridge filters in series shall be applied to challenge testing results to~~
8995 ~~determine removal credit. Owners may use results from challenge testing conducted~~
8996 ~~prior to January 5, 2006, if the prior testing was consistent with the criteria specified in~~
8997 ~~subdivision B 3 d (6) (a) (ii) through (ix) of this section.~~

8998 ~~(ii) Challenge testing shall be performed on full-scale bag or cartridge filters, and the~~
8999 ~~associated filter housing or pressure vessel, that are identical in material and~~
9000 ~~construction to the filters and housings the waterworks will use for removal of~~
9001 ~~Cryptosporidium. Bag or cartridge filters shall be challenge tested in the same~~
9002 ~~configuration that the waterworks will use, either as individual filters or as a series~~
9003 ~~configuration of filters.~~

9004 ~~(iii) Challenge testing shall be conducted using Cryptosporidium or a surrogate that is~~
9005 ~~removed no more efficiently than Cryptosporidium. The microorganism or surrogate~~
9006 ~~used during challenge testing is referred to as the challenge particulate. The~~

9007 concentration of the challenge particulate shall be determined using a method capable
9008 of discreetly quantifying the specific microorganism or surrogate used in the test; gross
9009 measurements such as turbidity shall not be used.

9010 (iv) The maximum feed water concentration that can be used during a challenge test
9011 shall be based on the detection limit of the challenge particulate in the filtrate (i.e.,
9012 filtrate detection limit) and shall be calculated using the following equation:

9013
$$\text{Maximum Feed Concentration} = 1 \times 10^4 \times (\text{Filtrate Detection Limit})$$

9014 (v) Challenge testing shall be conducted at the maximum design flow rate for the filter
9015 as specified by the manufacturer.

9016 (vi) Each filter evaluated shall be tested for a duration sufficient to reach 100% of the
9017 terminal pressure drop, which establishes the maximum pressure drop under which
9018 the filter may be used to comply with the requirements of subdivision B 3 d (6) (a) of
9019 this section.

9020 (vii) Removal efficiency of a filter shall be determined from the results of the challenge
9021 test and expressed in terms of log removal values using the following equation:

9022
$$\text{LRV} = \text{LOG}_{10}(C_f) - \text{LOG}_{10}(C_p)$$

9023 where LRV = log removal value demonstrated during challenge testing; C_f = the feed
9024 concentration measured during the challenge test; and C_p = the filtrate concentration
9025 measured during the challenge test. In applying this equation, the same units shall be
9026 used for the feed and filtrate concentrations. If the challenge particulate is not detected
9027 in the filtrate, then the term C_p shall be set equal to the detection limit.

9028 (viii) Each filter tested shall be challenged with the challenge particulate during three
9029 periods over the filtration cycle: within two hours of start-up of a new filter; when the
9030 pressure drop is between 45 and 55% of the terminal pressure drop; and at the end of

9031 ~~the cycle after the pressure drop has reached 100% of the terminal pressure drop. An~~
9032 ~~LRV shall be calculated for each of these challenge periods for each filter tested. The~~
9033 ~~LRV for the filter (LRV_{filter}) shall be assigned the value of the minimum LRV observed~~
9034 ~~during the three challenge periods for that filter.~~

9035 ~~(ix) If fewer than 20 filters are tested, the overall removal efficiency for the filter product~~
9036 ~~line shall be set equal to the lowest LRV filter among the filters tested. If 20 or more~~
9037 ~~filters are tested, the overall removal efficiency for the filter product line shall be set~~
9038 ~~equal to the 10th percentile of the set of LRV_{filter} values for the various filters tested.~~
9039 ~~The percentile is defined by $(i/(n+1))$ where i is the rank of n individual data points~~
9040 ~~ordered lowest to highest. If necessary, the 10th percentile may be calculated using~~
9041 ~~linear interpolation.~~

9042 ~~(x) If a previously tested filter is modified in a manner that could change the removal~~
9043 ~~efficiency of the filter product line, challenge testing to demonstrate the removal~~
9044 ~~efficiency of the modified filter shall be conducted and submitted to the commissioner.~~

9045 ~~(b) Membrane filtration.~~

9046 ~~(i) Waterworks receive Cryptosporidium treatment credit for membrane filtration that~~
9047 ~~meets the criteria of this paragraph. Membrane cartridge filters that meet the definition~~
9048 ~~of membrane filtration in 12VAC5-590-10 are eligible for this credit. The level of~~
9049 ~~treatment credit a waterworks receives is equal to the lower of the values determined~~
9050 ~~as follows:~~

9051 ~~((a)) The removal efficiency demonstrated during challenge testing conducted under~~
9052 ~~the conditions in subdivision B 3 d (6) (b) (ii) of this section.~~

9053 ~~((b)) The maximum removal efficiency that can be verified through direct integrity~~
9054 ~~testing used with the membrane filtration process under the conditions in subdivision~~
9055 ~~B 3 d (6) (b) (iii) of this section.~~

9056 ~~(ii) Challenge Testing. The membrane used by the waterworks shall undergo~~
9057 ~~challenge testing to evaluate removal efficiency, and the owner shall report the results~~
9058 ~~of challenge testing to the commissioner. Challenge testing shall be conducted~~
9059 ~~according to the criteria in paragraphs ((a)) through ((g)) of this section as follows~~
9060 ~~(owners may use data from challenge testing conducted prior to January 5, 2006, if~~
9061 ~~the prior testing was consistent with the criteria):~~

9062 ~~((a)) Challenge testing shall be conducted on either a full-scale membrane module,~~
9063 ~~identical in material and construction to the membrane modules used in the~~
9064 ~~waterworks' treatment facility, or a smaller-scale membrane module, identical in~~
9065 ~~material and similar in construction to the full-scale module. A module is defined as~~
9066 ~~the smallest component of a membrane unit in which a specific membrane surface~~
9067 ~~area is housed in a device with a filtrate outlet structure.~~

9068 ~~((b)) Challenge testing shall be conducted using Cryptosporidium oocysts or a~~
9069 ~~surrogate that is removed no more efficiently than Cryptosporidium oocysts. The~~
9070 ~~organism or surrogate used during challenge testing is referred to as the challenge~~
9071 ~~particulate. The concentration of the challenge particulate, in both the feed and filtrate~~
9072 ~~water, shall be determined using a method capable of discretely quantifying the~~
9073 ~~specific challenge particulate used in the test; gross measurements such as turbidity~~
9074 ~~shall not be used.~~

9075 ~~((c)) The maximum feed water concentration that can be used during a challenge test~~
9076 ~~is based on the detection limit of the challenge particulate in the filtrate and shall be~~
9077 ~~determined according to the following equation:~~

9078 Maximum Feed Concentration = $3.16 \times 10^6 \times$ (Filtrate Detection Limit)

9079 ~~((d)) Challenge testing shall be conducted under representative hydraulic conditions~~
9080 ~~at the maximum design flux and maximum design process recovery specified by the~~
9081 ~~manufacturer for the membrane module. Flux is defined as the throughput of a~~
9082 ~~pressure driven membrane process expressed as flow per unit of membrane area.~~
9083 ~~Recovery is defined as the volumetric percent of feed water that is converted to filtrate~~
9084 ~~over the course of an operating cycle uninterrupted by events such as chemical~~
9085 ~~cleaning or a solids removal process (i.e., backwashing).~~

9086 ~~((e)) Removal efficiency of a membrane module shall be calculated from the challenge~~
9087 ~~test results and expressed as a log removal value according to the following equation:~~

9088
$$\text{LRV} = \text{LOG}_{10}(C_f) - \text{LOG}_{10}(C_p)$$

9089 ~~where LRV = log removal value demonstrated during the challenge test; C_f = the feed~~
9090 ~~concentration measured during the challenge test; and C_p = the filtrate concentration~~
9091 ~~measured during the challenge test. Equivalent units shall be used for the feed and~~
9092 ~~filtrate concentrations. If the challenge particulate is not detected in the filtrate, the~~
9093 ~~term C_p is set equal to the detection limit for the purpose of calculating the LRV. An~~
9094 ~~LRV shall be calculated for each membrane module evaluated during the challenge~~
9095 ~~test.~~

9096 ~~((f)) The removal efficiency of a membrane filtration process demonstrated during~~
9097 ~~challenge testing shall be expressed as a log removal value ($\text{LRV}_{\text{C-Test}}$). If fewer than~~
9098 ~~20 modules are tested, then $\text{LRV}_{\text{C-Test}}$ is equal to the lowest of the representative LRVs~~
9099 ~~among the modules tested. If 20 or more modules are tested, then $\text{LRV}_{\text{C-Test}}$ is equal~~
9100 ~~to the 10th percentile of the representative LRVs among the modules tested. The~~
9101 ~~percentile is defined by $(i/(n+1))$ where i is the rank of n individual data points ordered~~

9102 lowest to highest. If necessary, the 10th percentile may be calculated using linear
9103 interpolation.

9104 ~~((g)) The challenge test shall establish a quality control release value (QCRV) for a~~
9105 ~~nondestructive performance test that demonstrates the Cryptosporidium removal~~
9106 ~~capability of the membrane filtration module. This performance test shall be applied to~~
9107 ~~each production membrane module used by the waterworks that was not directly~~
9108 ~~challenge tested in order to verify Cryptosporidium removal capability. Production~~
9109 ~~modules that do not meet the established QCRV are not eligible for the treatment credit~~
9110 ~~demonstrated during the challenge test.~~

9111 ~~((h)) If a previously tested membrane is modified in a manner that could change the~~
9112 ~~removal efficiency of the membrane or the applicability of the non-destructive~~
9113 ~~performance test and associated QCRV, additional challenge testing to demonstrate~~
9114 ~~the removal efficiency of, and determine a new QCRV for, the modified membrane~~
9115 ~~shall be conducted and submitted to the commissioner.~~

9116 ~~(iii) Direct integrity testing. Owners shall conduct direct integrity testing in a manner~~
9117 ~~that demonstrates a removal efficiency equal to or greater than the removal credit~~
9118 ~~awarded to the membrane filtration process and meets the requirements described in~~
9119 ~~subdivision B 3 d 6 (b) (iii) ((a)) through ((f)) of this section. A direct integrity test is~~
9120 ~~defined as a physical test applied to a membrane unit in order to identify and isolate~~
9121 ~~integrity breaches (i.e., one or more leaks that could result in contamination of the~~
9122 ~~filtrate).~~

9123 ~~((a)) The direct integrity test shall be independently applied to each membrane unit in~~
9124 ~~service. A membrane unit is defined as a group of membrane modules that share~~
9125 ~~common valving that allows the unit to be isolated from the rest of the system for the~~
9126 ~~purpose of integrity testing or other maintenance.~~

9127 ~~((b)) The direct integrity method shall have a resolution of three micrometers or less,~~
9128 ~~where resolution is defined as the size of the smallest integrity breach that contributes~~
9129 ~~to a response from the direct integrity test.~~

9130 ~~((c)) The direct integrity test shall have a sensitivity sufficient to verify the log treatment~~
9131 ~~credit awarded to the membrane filtration process by the commissioner, where~~
9132 ~~sensitivity is defined as the maximum log removal value that can be reliably verified~~
9133 ~~by a direct integrity test. Sensitivity shall be determined using the approach in either~~
9134 ~~of the following as applicable to the type of direct integrity test the waterworks uses:~~

9135 ~~((i)) For direct integrity tests that use an applied pressure or vacuum, the direct integrity~~
9136 ~~test sensitivity shall be calculated according to the following equation:~~

9137
$$\text{LRV}_{\text{DIT}} = \text{LOG}_{10}(Q_p / (\text{VCF} \times Q_{\text{breach}}))$$

9138 ~~where LRV_{DIT} = the sensitivity of the direct integrity test;~~

9139 ~~Q_p = total design filtrate flow from the membrane unit;~~

9140 ~~Q_{breach} = flow of water from an integrity breach associated with the smallest integrity~~
9141 ~~test response that can be reliably measured, and~~

9142 ~~VCF = volumetric concentration factor. The volumetric concentration factor is the ratio~~
9143 ~~of the suspended solids concentration on the high pressure side of the membrane~~
9144 ~~relative to that in the feed water.~~

9145 ~~((ii)) For direct integrity tests that use a particulate or molecular marker, the direct~~
9146 ~~integrity test sensitivity shall be calculated according to the following equation:~~

9147
$$\text{LRV}_{\text{DIT}} = \text{LOG}_{10}(C_f) - \text{LOG}_{10}(C_p)$$

9148 ~~where LRV_{DIT} = the sensitivity of the direct integrity test;~~

9149 ~~C_f = the typical feed concentration of the marker used in the test; and~~

9150 C_p = the filtrate concentration of the marker from an integral membrane unit.

9151 ~~((d)) Owners shall establish a control limit within the sensitivity limits of the direct~~
9152 ~~integrity test that is indicative of an integral membrane unit capable of meeting the~~
9153 ~~removal credit awarded by the commissioner.~~

9154 ~~((e)) If the result of a direct integrity test exceeds the control limit established under~~
9155 ~~subdivision B 3 d (6) (b) (iii) ((d)) of this section, the owners shall remove the~~
9156 ~~membrane unit from service. Owners shall conduct a direct integrity test to verify any~~
9157 ~~repairs, and may return the membrane unit to service only if the direct integrity test is~~
9158 ~~within the established control limit.~~

9159 ~~((f)) Owners shall conduct direct integrity testing on each membrane unit at a~~
9160 ~~frequency of not less than once each day that the membrane unit is in operation. The~~
9161 ~~commissioner may approve less frequent testing, based on demonstrated process~~
9162 ~~reliability, the use of multiple barriers effective for Cryptosporidium, or reliable process~~
9163 ~~safeguards.~~

9164 ~~(iv) Indirect integrity monitoring. Owners shall conduct continuous indirect integrity~~
9165 ~~monitoring on each membrane unit according to the criteria in ((a)) through ((e)).~~
9166 ~~Indirect integrity monitoring is defined as monitoring some aspect of filtrate water~~
9167 ~~quality that is indicative of the removal of particulate matter. A waterworks that~~
9168 ~~implements continuous direct integrity testing of membrane units in accordance with~~
9169 ~~the criteria in B 3 d (6) (b) (iv) (iii) ((a)) through ((f)) of this section is not subject to the~~
9170 ~~requirements for continuous indirect integrity monitoring. Owners shall submit a~~
9171 ~~monthly report to the commissioner summarizing all continuous indirect integrity~~
9172 ~~monitoring results triggering direct integrity testing and the corrective action that was~~
9173 ~~taken in each case.~~

9174 ~~((a)) Unless the commissioner approves an alternative parameter, continuous indirect~~
9175 ~~integrity monitoring shall include continuous filtrate turbidity monitoring.~~

9176 ~~((b)) Continuous monitoring shall be conducted at a frequency of no less than once~~
9177 ~~every 15 minutes.~~

9178 ~~((c)) Continuous monitoring shall be separately conducted on each membrane unit.~~

9179 ~~((d)) If indirect integrity monitoring includes turbidity and if the filtrate turbidity readings~~
9180 ~~are above 0.15 NTU for a period greater than 15 minutes (i.e., two consecutive 15-~~
9181 ~~minute readings above 0.15 NTU), direct integrity testing shall immediately be~~
9182 ~~performed on the associated membrane unit as specified in subdivision B 3 d (6) (b)~~
9183 ~~(iii) ((a)) through ((f)) of this section.~~

9184 ~~((e)) If indirect integrity monitoring includes an alternative parameter approved by the~~
9185 ~~commissioner and if the alternative parameter exceeds a control limit approved by the~~
9186 ~~commissioner for a period greater than 15 minutes, direct integrity testing shall~~
9187 ~~immediately be performed on the associated membrane units as specified in~~
9188 ~~subdivision B 3 d (6) (b) (iii) ((a)) through ((f)) of this section.~~

9189 ~~(c) Second stage filtration. Waterworks receive 0.5-log Cryptosporidium treatment~~
9190 ~~credit for a separate second stage of filtration that consists of sand, dual media, GAC,~~
9191 ~~or other fine grain media following granular media filtration if the commissioner~~
9192 ~~approves. To be eligible for this credit, the first stage of filtration shall be preceded by~~
9193 ~~a coagulation step and both filtration stages shall treat the entire plant flow taken from~~
9194 ~~a surface water or groundwater under the direct influence of surface water source. A~~
9195 ~~cap, such as GAC, on a single stage of filtration is not eligible for this credit. The~~
9196 ~~commissioner shall approve the treatment credit based on an assessment of the~~
9197 ~~design characteristics of the filtration process.~~

9198 ~~(d) Slow sand filtration (as secondary filter). Waterworks are eligible to receive 2.5-log~~
9199 ~~Cryptosporidium treatment credit for a slow sand filtration process that follows a~~
9200 ~~separate stage of filtration if both filtration stages treat entire plant flow taken from a~~
9201 ~~surface water or ground water under the direct influence of surface water source and~~
9202 ~~no disinfectant residual is present in the influent water to the slow sand filtration~~
9203 ~~process. The commissioner shall approve the treatment credit based on an~~
9204 ~~assessment of the design characteristics of the filtration process. This paragraph does~~
9205 ~~not apply to treatment credit awarded to slow sand filtration used as a primary filtration~~
9206 ~~process.~~

9207 ~~(7) Inactivation toolbox components.~~

9208 ~~(a) Calculation of CT values~~

9209 ~~(i) CT is the product of the disinfectant contact time (T, in minutes) and disinfectant~~
9210 ~~concentration (C, in milligrams per liter). Owners of waterworks with treatment credit~~
9211 ~~for chlorine dioxide or ozone under subdivision B 3 d (7) (b) of this section shall~~
9212 ~~calculate CT at least once each day, with both C and T measured during peak hourly~~
9213 ~~flow in accordance with the procedure listed in Appendix L.~~

9214 ~~(ii) Waterworks with several disinfection segments in sequence may calculate CT for~~
9215 ~~each segment, where a disinfection segment is defined as a treatment unit process~~
9216 ~~with a measurable disinfectant residual level and a liquid volume. Under this approach,~~
9217 ~~owners shall add the Cryptosporidium CT values in each segment to determine the~~
9218 ~~total CT for the treatment plant.~~

9219 ~~(b) CT values for chlorine dioxide and ozone.~~

9220 (i) Waterworks receive the Cryptosporidium treatment credit listed in the following table
 9221 by meeting the corresponding chlorine dioxide CT value for the applicable water
 9222 temperature, as described in subdivision B 3 d (7) (a) of this section.

CT Values (mg-min/L) for Cryptosporidium Inactivation by Chlorine Dioxide¹

| Log credit | Water Temperature, °C | | | | | | | | | | |
|------------|---------------------------|------|------|------|------|------|-----|-----|-----|-----|-----|
| | Less than or equal to 0.5 | 1 | 2 | 3 | 5 | 7 | 10 | 15 | 20 | 25 | 30 |
| 0.25 | 159 | 153 | 140 | 128 | 107 | 90 | 69 | 45 | 29 | 19 | 12 |
| 0.5 | 319 | 305 | 279 | 256 | 214 | 180 | 138 | 89 | 58 | 38 | 24 |
| 1.0 | 637 | 610 | 558 | 511 | 429 | 360 | 277 | 179 | 116 | 75 | 49 |
| 1.5 | 956 | 915 | 838 | 767 | 643 | 539 | 415 | 268 | 174 | 113 | 73 |
| 2.0 | 1275 | 1220 | 1117 | 1023 | 858 | 719 | 553 | 357 | 232 | 150 | 98 |
| 2.5 | 1594 | 1525 | 1396 | 1278 | 1072 | 899 | 694 | 447 | 289 | 188 | 122 |
| 3.0 | 1912 | 1830 | 1675 | 1534 | 1286 | 1079 | 830 | 536 | 347 | 226 | 147 |

¹Waterworks may use this equation to determine log credit between the indicated values:

$$\text{Log credit} = (0.001506 \times (1.09116)^{\text{Temp}}) \times \text{CT}$$

9223 (ii) Waterworks receive the Cryptosporidium treatment credit listed in the following
 9224 table by meeting the corresponding ozone CT values for the applicable water
 9225 temperature, as described in subdivision B 3 d (7) (a) of this section.

CT Values (mg-min/L) for Cryptosporidium Inactivation by Ozone¹

| Log credit | Water Temperature, °C | | | | | | | | | | |
|------------|---------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| | Less than or equal to 0.5 | 1 | 2 | 3 | 5 | 7 | 10 | 15 | 20 | 25 | 30 |
| 0.25 | 6.0 | 5.8 | 5.2 | 4.8 | 4.0 | 3.3 | 2.5 | 1.6 | 1.0 | 0.6 | 0.39 |
| 0.5 | 12 | 12 | 10 | 9.5 | 7.9 | 6.5 | 4.9 | 3.1 | 2.0 | 1.2 | 0.78 |
| 1.0 | 24 | 23 | 21 | 19 | 16 | 13 | 9.9 | 6.2 | 3.9 | 2.5 | 1.6 |

| | | | | | | | | | | | |
|-----|----|----|----|----|----|----|----|-----|-----|-----|-----|
| 1.5 | 36 | 35 | 31 | 29 | 24 | 20 | 15 | 9.3 | 5.9 | 3.7 | 2.4 |
| 2.0 | 48 | 46 | 42 | 38 | 32 | 26 | 20 | 12 | 7.8 | 4.9 | 3.1 |
| 2.5 | 60 | 58 | 52 | 48 | 40 | 33 | 25 | 16 | 9.8 | 6.2 | 3.9 |
| 3.0 | 72 | 69 | 63 | 57 | 47 | 39 | 30 | 19 | 12 | 7.4 | 4.7 |

⁴Waterworks may use this equation to determine log credit between the indicated values:

$$\text{Log credit} = (0.0397 \times (1.09757)^{\text{Temp}}) \times \text{CT}$$

- 9226 ~~(c) Ultraviolet light. Waterworks receive Cryptosporidium, Giardia lamblia, and virus~~
9227 ~~treatment credits for ultraviolet (UV) light reactors by achieving the corresponding UV~~
9228 ~~dose values shown in subdivision B 3 d (7) (c) (i) of this section. Waterworks shall~~
9229 ~~validate and monitor UV reactors as described in subdivision B 3 d (7) (c) (ii) and (iii)~~
9230 ~~of this section to demonstrate that they are achieving a particular UV dose value for~~
9231 ~~treatment credit.~~
- 9232 ~~(i) UV dose table. The treatment credits listed in this table are for UV light at a~~
9233 ~~wavelength of 254 nm as produced by a low pressure mercury vapor lamp. To receive~~
9234 ~~treatment credit for other lamp types, waterworks shall demonstrate an equivalent~~
9235 ~~germicidal dose through reactor validation testing, as described in subdivision B 3 d~~
9236 ~~(7) (c) (ii) of this section. The UV dose values in this table are applicable only to post-~~
9237 ~~filter applications of UV in filtered systems.~~

UV dose table for Cryptosporidium, Giardia lamblia, and virus inactivation credit

| Log credit | Cryptosporidium UV dose (mJ/cm ²) | Giardia lamblia UV dose (mJ/cm ²) | Virus UV dose (mJ/cm ²) |
|------------|---|---|-------------------------------------|
| 0.5 | 1.6 | 1.5 | 39 |
| 1.0 | 2.5 | 2.1 | 58 |
| 1.5 | 3.9 | 3.0 | 79 |
| 2.0 | 5.8 | 5.2 | 100 |
| 2.5 | 8.5 | 7.7 | 121 |
| 3.0 | 12 | 11 | 143 |
| 3.5 | 15 | 15 | 163 |

| | | | |
|-----|----|----|-----|
| 4.0 | 22 | 22 | 186 |
|-----|----|----|-----|

9238 ~~(ii) Reactor validation testing. Waterworks shall use UV reactors that have undergone~~
9239 ~~validation testing to determine the operating conditions under which the reactor~~
9240 ~~delivers the UV dose required in subdivision B 3 d (7) (c) (i) of this section (i.e.,~~
9241 ~~validated operating conditions). These operating conditions shall include flow rate, UV~~
9242 ~~intensity as measured by a UV sensor, and UV lamp status.~~

9243 ~~((a)) When determining validated operating conditions, owners shall account for the~~
9244 ~~following factors: UV absorbance of the water; lamp fouling and aging; measurement~~
9245 ~~uncertainty of online sensors; UV dose distributions arising from the velocity profiles~~
9246 ~~through the reactor; failure of UV lamps or other critical waterworks components; and~~
9247 ~~inlet and outlet piping or channel configurations of the UV reactor.~~

9248 ~~((b)) Validation testing shall include the following: full scale testing of a reactor that~~
9249 ~~conforms uniformly to the UV reactors used by the waterworks and inactivation of a~~
9250 ~~test microorganism whose dose response characteristics have been quantified with a~~
9251 ~~low pressure mercury vapor lamp.~~

9252 ~~(iii) Reactor monitoring.~~

9253 ~~((a)) Owners shall monitor their UV reactors to determine if the reactors are operating~~
9254 ~~within validated conditions, as determined under subdivision B 3 d (7) (c) (ii) of this~~
9255 ~~section. This monitoring shall include UV intensity as measured by a UV sensor, flow~~
9256 ~~rate, lamp status, and other parameters the commissioner designates based on UV~~
9257 ~~reactor operation. Owners shall verify the calibration of UV sensors and shall~~
9258 ~~recalibrate sensors in accordance with a protocol the commissioner approves.~~

9259 ~~((b)) To receive treatment credit for UV light, waterworks shall treat at least 95% of the~~
9260 ~~water delivered to the public during each month by UV reactors operating within~~

9261 ~~validated conditions for the required UV dose, as described in subdivision B 3 d (7) (c)~~
9262 ~~(i) and (ii) of this section. Owners shall demonstrate compliance with this condition by~~
9263 ~~the monitoring required under subdivision B 3 d (7) (c) (iii)((a)) of this section.~~

9264 ~~e. Owners shall comply with the applicable recordkeeping and reporting requirements~~
9265 ~~described in 12VAC5-590-530 and 12VAC5-590-550.~~

9266 ~~C. Reserved.~~

9267 ~~D. Reserved.~~

9268 ~~E. Reserved.~~

9269 ~~F. Reserved.~~

9270 ~~G. Beginning January 1, 1993, each owner shall certify annually in writing to the commissioner~~
9271 ~~(using third party or manufacturer's certification) that, when polymers containing acrylamide or~~
9272 ~~epichlorohydrin are used by the waterworks in drinking water systems, the combination (or~~
9273 ~~product) of dose and monomer level does not exceed the following specified levels: Acrylamide~~
9274 ~~= 0.05% dosed at 1 ppm (or equivalent) of polymer. Epichlorohydrin = 0.01% dosed at 20 ppm~~
9275 ~~(or equivalent) of polymer. Certifications may rely on manufacturers or third parties, as approved~~
9276 ~~by the commissioner.~~

9277 ~~H. Treatment technique for control of disinfection byproduct (DBPP) precursors.~~

9278 ~~1. Applicability.~~

9279 ~~a. Waterworks that use surface water or groundwater under the direct influence of~~
9280 ~~surface water using conventional filtration treatment shall operate with enhanced~~
9281 ~~coagulation or enhanced softening to achieve the TOC percent removal levels~~
9282 ~~specified in subdivision H 2 of this section unless the waterworks meets at least one~~
9283 ~~of the alternative compliance criteria listed in subdivision H 1 b or c of this section.~~

9284 ~~b. Alternative compliance criteria for enhanced coagulation and enhanced softening~~
9285 ~~waterworks. Owners of waterworks that use surface water or groundwater under the~~
9286 ~~direct influence of surface water provided with conventional filtration treatment may~~
9287 ~~use the alternative compliance criteria in subdivisions H 1 b (1) through (6) of this~~
9288 ~~section to comply with this section in lieu of complying with subdivision H 2 of this~~
9289 ~~section. Owners shall still comply with monitoring requirements in 12VAC5-590-370 B~~
9290 ~~3 i.~~

9291 ~~(1) The waterworks' source water TOC level, measured according to 12VAC5-590-~~
9292 ~~440, is less than 2.0 mg/L, calculated quarterly as a running annual average.~~

9293 ~~(2) The waterworks' treated water TOC level, measured according to 12VAC5-590-~~
9294 ~~440, is less than 2.0 mg/L, calculated quarterly as a running annual average.~~

9295 ~~(3) The waterworks' source water TOC level, measured according to 12VAC5-590-~~
9296 ~~440, is less than 4.0 mg/L, calculated quarterly as a running annual average; the~~
9297 ~~source water alkalinity, measured according to 12VAC5-590-440, is greater than 60~~
9298 ~~mg/L (as CaCO₃), calculated quarterly as a running annual average; and either the~~
9299 ~~TTHM and HAA5 running annual averages are no greater than 0.040 mg/L and 0.030~~
9300 ~~mg/L, respectively; or prior to the effective date for compliance in 12VAC590-370 B 3~~
9301 ~~a, the owner has made a clear and irrevocable financial commitment not later than the~~
9302 ~~effective date for compliance in 12VAC590-370 B 3 a to use of technologies that will~~
9303 ~~limit the levels of TTHMs and HAA5 to no more than 0.040 mg/L and 0.030 mg/L,~~
9304 ~~respectively. Owners shall submit evidence of a clear and irrevocable financial~~
9305 ~~commitment, in addition to a schedule containing milestones and periodic progress~~
9306 ~~reports for installation and operation of appropriate technologies, to the commissioner~~
9307 ~~for approval not later than the effective date for compliance in 12VAC590-370 B 3 a.~~
9308 ~~These technologies shall be installed and operating not later than June 30, 2005.~~

9309 Failure to install and operate these technologies by the date in the approved schedule
9310 will constitute a violation of these regulations.

9311 ~~(4) The TTHM and HAA5 running annual averages are no greater than 0.040 mg/L~~
9312 ~~and 0.030 mg/L, respectively, and the waterworks uses only chlorine for primary~~
9313 ~~disinfection and maintenance of a residual in the distribution system.~~

9314 ~~(5) The waterworks' source water SUVA, prior to any treatment and measured monthly~~
9315 ~~according to 12VAC5-590-440, is less than or equal to 2.0 L/mg-m, calculated~~
9316 ~~quarterly as a running annual average.~~

9317 ~~(6) The waterworks' finished water SUVA, measured monthly according to 12VAC5-~~
9318 ~~590-440, is less than or equal to 2.0 L/mg-m, calculated quarterly as a running annual~~
9319 ~~average.~~

9320 ~~c. Additional alternative compliance criteria for softening waterworks. Waterworks~~
9321 ~~practicing enhanced softening that cannot achieve the TOC removals required by~~
9322 ~~subdivision H 2 b of this section may use the alternative compliance criteria in~~
9323 ~~subdivisions H 1 c (1) and (2) of this section in lieu of complying with subdivision H 2~~
9324 ~~of this section. Owners shall still comply with monitoring requirements in 12VAC5-590-~~
9325 ~~370-B-3 i.~~

9326 ~~(1) Softening that results in lowering the treated water alkalinity to less than 60 mg/L~~
9327 ~~(as CaCO₃), measured monthly according to 12VAC5-590-440 and calculated~~
9328 ~~quarterly as a running annual average.~~

9329 ~~(2) Softening that results in removing at least 10 mg/L of magnesium hardness (as~~
9330 ~~CaCO₃), measured monthly according to 12VAC5-590-440 and calculated quarterly~~
9331 ~~as a running annual average.~~

9332 ~~2. Enhanced coagulation and enhanced softening performance requirements.~~

9333 a. ~~Waterworks shall achieve the percent reduction of TOC specified in subdivision H~~
 9334 ~~2 b of this section between the source water and the combined filter effluent, unless~~
 9335 ~~the commissioner approves a waterworks' request for alternate minimum TOC~~
 9336 ~~removal (Step 2) requirements under subdivision H 2 c of this section.~~

9337 b. ~~Required Step 1 TOC reductions, indicated in the following table, are based upon~~
 9338 ~~specified source water parameters measured in accordance with 12VAC5-590-440.~~
 9339 ~~Waterworks practicing softening are required to meet the Step 1 TOC reductions in~~
 9340 ~~the far-right column (Source water alkalinity greater than 120 mg/L) for the specified~~
 9341 ~~source water TOC:~~

9342 ~~Step 1 Required Removal of TOC by Enhanced Coagulation and Enhanced Softening~~
 9343 ~~for Community or Nontransient Noncommunity Waterworks That Use Surface Water~~
 9344 ~~or Groundwater Under the Direct Influence of Surface Water Using Conventional~~
 9345 ~~Treatment^{1,2}~~

| Source-water TOC mg/L | Source-water alkalinity, mg/L as CaCO ₃ | | |
|-----------------------|--|---------------------|-------------------------------|
| | 0-60 | greater than 60-120 | greater than 120 ³ |
| greater than 2.0-4.0 | 35.0% | 25.0% | 15.0% |
| greater than 4.0-8.0 | 45.0% | 35.0% | 25.0% |
| greater than 8.0 | 50.0% | 40.0% | 30.0% |

¹~~Waterworks meeting at least one of the conditions in subdivisions H 1 b (1) through (6) of this section are not required to operate with enhanced coagulation.~~

²~~Softening waterworks meeting one of the alternative compliance criteria in subdivision H 1 c of this section are not required to operate with enhanced softening.~~

³~~Waterworks practicing softening shall meet the TOC removal requirements in this column.~~

9346 c. ~~Waterworks that use surface water or groundwater under the direct influence of~~
 9347 ~~surface water with conventional treatment systems that cannot achieve the Step 1~~
 9348 ~~TOC removals required by subdivision H 2 b of this section due to water quality~~
 9349 ~~parameters or operational constraints shall apply to the commissioner, within three~~
 9350 ~~months of failure to achieve the TOC removals required by subdivision H 2 b of this~~

9351 ~~section, for approval of alternative minimum TOC (Step 2) removal requirements~~
9352 ~~submitted by the waterworks. If the commissioner approves the alternative minimum~~
9353 ~~TOC removal (Step 2) requirements, the commissioner may make those requirements~~
9354 ~~retroactive for the purposes of determining compliance. Until the commissioner~~
9355 ~~approves the alternate minimum TOC removal (Step 2) requirements, the owner shall~~
9356 ~~meet the Step 1 TOC removals contained in subdivision H 2 b of this section.~~

9357 ~~d. Alternate minimum TOC removal (Step 2) requirements. Applications, made to the~~
9358 ~~commissioner by waterworks using enhanced coagulation, for approval of alternative~~
9359 ~~minimum TOC removal (Step 2) requirements under subdivision H 2 c of this section~~
9360 ~~shall include, at a minimum, results of bench or pilot-scale testing conducted under~~
9361 ~~subdivision H 2 d (1) of this section. The submitted bench or pilot-scale testing shall~~
9362 ~~be used to determine the alternate enhanced coagulation level.~~

9363 ~~(1) Alternate enhanced coagulation level is defined as coagulation at a coagulant dose~~
9364 ~~and pH as determined by the method described in subdivisions H 2 d (1) through (5)~~
9365 ~~of this section such that an incremental addition of 10 mg/L of alum (or equivalent~~
9366 ~~amount of ferric salt) results in a TOC removal of equal to or less than 0.3 mg/L. The~~
9367 ~~percent removal of TOC at this point on the "TOC removal versus coagulant dose"~~
9368 ~~curve is then defined as the minimum TOC removal required for the waterworks. Once~~
9369 ~~approved by the commissioner, this minimum requirement supersedes the minimum~~
9370 ~~TOC removal required by the table in subdivision H 2 b of this section. This~~
9371 ~~requirement will be effective until such time as the commissioner approves a new value~~
9372 ~~based on the results of a new bench and pilot-scale test. Failure to achieve the~~
9373 ~~alternative minimum TOC removal levels set by the commissioner is a violation of~~
9374 ~~these regulations.~~

9375 ~~(2) Bench or pilot-scale testing of enhanced coagulation shall be conducted by using~~
 9376 ~~representative water samples and adding 10 mg/L increments of alum (or equivalent~~
 9377 ~~amounts of ferric salt) until the pH is reduced to a level less than or equal to the~~
 9378 ~~enhanced coagulation Step 2 target pH shown in the following table:~~

~~Enhanced Coagulation Step 2 Target pH~~

| Alkalinity (mg/L as CaCO₃) | Target pH |
|--|----------------------|
| 0-60 | 5.5 |
| greater than 60-120 | 6.3 |
| greater than 120-240 | 7.0 |
| greater than 240 | 7.5 |

9379 ~~(3) For waters with alkalinities of less than 60 mg/L for which addition of small amounts~~
 9380 ~~of alum or equivalent addition of iron coagulant drives the pH below 5.5 before~~
 9381 ~~significant TOC removal occurs, the owner shall add necessary chemicals to maintain~~
 9382 ~~the pH between 5.3 and 5.7 in samples until the TOC removal of 0.3 mg/L per 10 mg/L~~
 9383 ~~alum added (or equivalent addition of iron coagulant) is reached.~~

9384 ~~(4) The owner may operate at any coagulant dose or pH necessary (consistent with~~
 9385 ~~other sections of these regulations) to achieve the minimum TOC percent removal~~
 9386 ~~approved under subdivision H 2 c of this section.~~

9387 ~~(5) If the TOC removal is consistently less than 0.3 mg/L of TOC per 10 mg/L of~~
 9388 ~~incremental alum dose at all dosages of alum (or equivalent addition of iron coagulant),~~
 9389 ~~the water is deemed to contain TOC not amenable to enhanced coagulation. The~~
 9390 ~~waterworks may then apply to the commissioner for a waiver of enhanced coagulation~~
 9391 ~~requirements.~~

9392 ~~3. Compliance calculations.~~

9393 ~~a. Owners of waterworks that use surface water or groundwater under the direct~~
 9394 ~~influence of surface water other than those identified in subdivision H 1 b or H 1 c of~~

9395 ~~this section shall comply with requirements contained in subdivision H 2 b or H 2 c of~~
9396 ~~this section. Owners shall calculate compliance quarterly, beginning after the~~
9397 ~~waterworks has collected 12 months of data, by determining an annual average using~~
9398 ~~the following method:~~

9399 ~~(1) Determine actual monthly TOC percent removal, equal to:~~

9400 ~~—(1-(treated water TOC/source water TOC))X100~~

9401 ~~(2) Determine the required monthly TOC percent removal (from either the table in~~
9402 ~~subdivision H 2 b of this section or from subdivision H 2 c of this section).~~

9403 ~~(3) Divide the value in subdivision H 3 a (1) of this section by the value in subdivision~~
9404 ~~H 3 a (2) of this section.~~

9405 ~~(4) Add together the results of subdivision H 3 a (3) of this section for the last 12~~
9406 ~~months and divide by 12.~~

9407 ~~(5) If the value calculated in subdivision H 3 a (4) of this section is less than 1.00, the~~
9408 ~~waterworks is not in compliance with the TOC percent removal requirements.~~

9409 ~~b. Owners may use the provisions in subdivisions H 3 b (1) through (5) of this section~~
9410 ~~in lieu of the calculations in subdivisions H 3 a (1) through (5) of this section to~~
9411 ~~determine compliance with TOC percent removal requirements.~~

9412 ~~(1) In any month that the waterworks' treated or source water TOC level, measured~~
9413 ~~according to 12VAC5-590-440, is less than 2.0 mg/L, the owner may assign a monthly~~
9414 ~~value of 1.0 (in lieu of the value calculated in subdivision H 3 a (3) of this section) when~~
9415 ~~calculating compliance under the provisions of subdivision H 3 a of this section.~~

9416 ~~(2) In any month that a waterworks practicing softening removes at least 10 mg/L of~~
9417 ~~magnesium hardness (as CaCO₃), the waterworks may assign a monthly value of 1.0~~

9418 ~~(in lieu of the value calculated in subdivision H 3 a (3) of this section) when calculating~~
9419 ~~compliance under the provisions of subdivision H 3 a of this section.~~

9420 ~~(3) In any month that the waterworks' source water SUVA, prior to any treatment and~~
9421 ~~measured according to 12VAC5-590-440, is equal to or less than 2.0 L/mg-m, the~~
9422 ~~owner may assign a monthly value of 1.0 (in lieu of the value calculated in subdivision~~
9423 ~~H 3 a (3) of this section) when calculating compliance under the provisions of~~
9424 ~~subdivision H 3 a of this section.~~

9425 ~~(4) In any month that the waterworks' finished water SUVA, measured according to~~
9426 ~~12VAC5-590-440, is equal to or less than 2.0 L/mg-m, the owner may assign a monthly~~
9427 ~~value of 1.0 (in lieu of the value calculated in subdivision H 3 a (3) of this section) when~~
9428 ~~calculating compliance under the provisions of subdivision H 3 a of this section.~~

9429 ~~(5) In any month that a waterworks practicing enhanced softening lowers alkalinity~~
9430 ~~below 60 mg/L (as CaCO₃), the owner may assign a monthly value of 1.0 (in lieu of~~
9431 ~~the value calculated in subdivision H 3 a (3) of this section) when calculating~~
9432 ~~compliance under the provisions of subdivision H 3 a of this section.~~

9433 ~~c. Waterworks that use surface water or groundwater under the direct influence of~~
9434 ~~surface water and using conventional treatment may also comply with the~~
9435 ~~requirements of this section by meeting the criteria in subdivision H 1 b or c of this~~
9436 ~~section.~~

9437 ~~4. Enhanced coagulation or enhanced softening is the treatment technique required to~~
9438 ~~control the level of DBP precursors in drinking water treatment and distribution systems~~
9439 ~~for waterworks using surface water or groundwater under the direct influence of surface~~
9440 ~~water and using conventional treatment.~~

9441 ~~I. The best technology, treatment techniques, or other means available for achieving~~
 9442 ~~compliance with the maximum contaminant levels for disinfection byproducts show in Table 2.13~~
 9443 ~~are listed below:~~

9444 ~~1. The best technology, treatment techniques, or other means available for achieving~~
 9445 ~~compliance with the maximum contaminant levels for bromate and chlorite:~~

| Disinfection byproduct | Best available technology |
|------------------------|--|
| 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 |

9446 ~~2. The best technology, treatment techniques, or other means available for achieving~~
 9447 ~~compliance with the running annual average maximum contaminant levels for TTHM and~~
 9448 ~~HAA5:~~

| Disinfection byproduct | Best available technology |
|---|---|
| Total trihalomethanes (TTHM) and Haloacetic acids (five) (HAA5) | Enhanced coagulation or enhanced softening or GAC10, with chlorine as the primary and residual disinfectant |

9449 ~~3. The best technology, treatment techniques, or other means available for achieving~~
 9450 ~~compliance with the locational running annual average maximum contaminant levels for~~
 9451 ~~TTHM and HAA5 for all systems that disinfect their source water:~~

| Disinfection byproduct | Best available technology |
|---|---|
| Total trihalomethanes (TTHM) and Haloacetic acids (five) (HAA5) | Enhanced coagulation or enhanced softening, plus GAC10; or nanofiltration with a molecular weight cutoff less than or equal to 1000 Daltons; or GAC20 |

9452 ~~4. The best technology, treatment techniques, or other means available for achieving~~
 9453 ~~compliance with the locational running annual average maximum contaminant levels for~~
 9454 ~~TTHM and HAA5 for consecutive waterworks and applies only to the disinfected water~~
 9455 ~~that consecutive waterworks buy or otherwise receive:~~

| Disinfection byproduct | Best available technology |
|------------------------|---------------------------|
|------------------------|---------------------------|

| | |
|--|---|
| <p>Total trihalomethanes (TTHM) and Haloacetic acids (five) (HAA5)</p> | <p>Waterworks serving equal to or greater than 10,000: Improved distribution system and storage tank management to reduce residence time, plus the use of chloramines for disinfectant residual maintenance</p> <p>Waterworks serving less than 10,000: Improved distribution system and storage tank management to reduce residence time</p> |
|--|---|

9456 ~~J. The best technology, treatment techniques, or other means available for achieving~~
9457 ~~compliance with the maximum residual disinfectant levels identified in Table 2.12 is the control of~~
9458 ~~treatment processes to reduce disinfectant demand and control of disinfection treatment~~
9459 ~~processes to reduce disinfectant levels.~~

9460 ~~K. If spent filter backwash water, thickener supernatant, or liquids from dewatering processes~~
9461 ~~are recycled, in any waterworks supplied by a surface water source and waterworks supplied by~~
9462 ~~a groundwater source under the direct influence of surface water that employ conventional~~
9463 ~~filtration or direct filtration treatment, then they are subject to the recycle treatment technique~~
9464 ~~requirement. Under this requirement recycle flows shall be returned through all the processes of~~
9465 ~~the treatment system, or an alternative location approved by the state, by June 8, 2004.~~

9466 ~~L. Waterworks with uncovered finished water storage facilities shall comply with the~~
9467 ~~requirements to cover the facility or treat the discharge from the facility as described in this~~
9468 ~~paragraph.~~

9469 ~~1. Waterworks using uncovered finished water storage facilities shall comply with the~~
9470 ~~conditions of this section.~~

9471 ~~2. Owners shall notify the commissioner of the use of each uncovered finished water~~
9472 ~~storage facility no later than April 1, 2008.~~

9473 ~~3. Owners shall meet the conditions of subdivision L 3 a or b of this section for each~~
9474 ~~uncovered finished water storage facility or be in compliance with a State approved~~
9475 ~~schedule to meet these conditions no later than April 1, 2009.~~

- 9476 a. ~~All uncovered finished water storage facilities shall be covered.~~
- 9477 b. ~~Waterworks shall treat the discharge from the uncovered finished water storage~~
- 9478 ~~facility to the distribution system to achieve inactivation and/or removal of at least 4-~~
- 9479 ~~log virus, 3-log Giardia lamblia, and 2-log Cryptosporidium using a protocol approved~~
- 9480 ~~by the commissioner.~~

9481 4. ~~Failure to comply with the requirements of this section is a violation of the treatment~~

9482 ~~technique requirement.~~

9483 **12VAC5-590-421. Groundwater system treatment techniques.**

9484 A. Owners The owner of a groundwater systems system that (i) ~~have~~ has a confirmed E. coli

9485 contamination as described in 12VAC5-590-379 B or (ii) ~~have~~ has been notified in writing of a

9486 significant deficiency as described in 12VAC5-590-350 D shall meet the requirements of this

9487 section. Failure to meet any requirement of this section after the applicable time period specified

9488 is a treatment technique violation.

9489 1. Owners The owner of ~~groundwater systems meeting either one of the conditions in~~

9490 ~~clause (i) or (ii) above~~ shall implement one or more of the following corrective actions:

- 9491 a. Correct all significant deficiencies;
- 9492 b. Provide an alternate source of water;
- 9493 c. Eliminate the source of contamination; or
- 9494 d. Provide treatment of the groundwater source that reliably achieves at least 4-log
- 9495 treatment of viruses before or at the first ~~consumer~~ customer.

9496 2. Unless the ~~ODW~~ department directs the ~~groundwater system~~ owner to implement a

9497 specific corrective action, the ~~groundwater system~~ owner shall consult with the ~~ODW~~

9498 department regarding the appropriate corrective action within 30 days of receiving written

9499 notification from the ~~commissioner~~ department or the laboratory. This consultation may
9500 take the form of a telephone conversation, ~~electronic mail~~ e-mail, meeting, or other
9501 mechanism agreed to by the ~~ODW~~ department.

9502 3. Within 45 days of receiving this notification, the ~~groundwater system~~ owner shall submit
9503 a written Corrective Action Plan (CAP) to the ~~commissioner~~ department that satisfactorily
9504 addresses the deficiency. The CAP shall include a schedule for completing individual
9505 actions, and it shall include one or more of the corrective actions in subdivision A 1 of this
9506 section. Approval of the CAP by the ~~commissioner~~ department constitutes an approved
9507 CAP.

9508 4. Within 120 days of receiving written notification from the ~~commissioner~~ department or
9509 the laboratory, the ~~groundwater system~~ owner shall either:

9510 a. Have a completed corrective ~~action~~ actions in accordance with the ~~commissioner-~~
9511 ~~approved~~ department-approved CAP including ~~commissioner-specified~~ department-
9512 specified interim measures; or

9513 b. Be in compliance with a ~~commissioner-approved~~ department-approved CAP and
9514 ~~schedule subject to the conditions specified in subdivisions 4 b 1 and 2 of this~~
9515 ~~subsection.~~

9516 (1) Any subsequent modifications to a ~~commissioner-approved~~ department-approved
9517 CAP and schedule shall also be approved by the ~~commissioner~~ department.

9518 (2) If the ~~commissioner~~ department specifies interim measures for protection of the
9519 public health pending the ~~commissioner's~~ department's approval of the CAP and
9520 schedule or pending completion of the CAP, then the ~~groundwater system~~ owner shall
9521 comply with these interim measures as well as with any schedule specified by the
9522 ~~commissioner~~ department.

9523 5. When a significant deficiency is identified at a waterworks that uses both a
9524 groundwater and a surface water or a GUDI source, the owner shall comply with this
9525 section unless the ~~commissioner~~ department has determined that the significant
9526 deficiency is in a portion of the distribution system that is served solely by the surface
9527 water or a the GUDI source.

9528 B. ~~Owners~~ The owner of a groundwater ~~systems~~ system that ~~provide~~ provides at least 4-log
9529 treatment of viruses before or at the first customer shall conduct compliance monitoring to
9530 demonstrate treatment effectiveness, in accordance with subsection C of this section. The owner
9531 shall also conduct source water monitoring in accordance with 12VAC5-590-379 C.

9532 ~~1. Existing groundwater sources. A groundwater system that is not required to meet the~~
9533 ~~source water monitoring requirements of 12VAC5-590-379 for any groundwater source(s)~~
9534 ~~because the owner has been notified by the ODW that the groundwater system provides~~
9535 ~~at least 4-log treatment of viruses before or at the first customer for any groundwater~~
9536 ~~source(s) shall comply with the following:~~

9537 ~~a. The groundwater system owner shall have written approval from the ODW that the~~
9538 ~~groundwater system provides at least 4-log treatment of viruses before or at the first~~
9539 ~~customer served by the groundwater source.~~

9540 ~~b. The groundwater system owner shall conduct compliance monitoring as required by~~
9541 ~~subsection C of this section within 30 days of placing the source in service.~~

9542 ~~2. New groundwater sources. A groundwater system owner that places a new groundwater~~
9543 ~~source into service shall meet the requirements of subdivisions 1 a and b of this subsection and~~
9544 ~~conduct raw water monitoring in accordance with 12VAC5-590-425. The groundwater system~~
9545 ~~owner shall provide engineering, operational, or other information as required by the ODW~~
9546 ~~department to complete a determination of virus treatment effectiveness.~~

9547 C. The owner of a groundwater system ~~subject to the requirements of subsection B of this~~
9548 ~~section~~ that provides at least 4-log treatment of viruses shall monitor the effectiveness and
9549 reliability of treatment for that groundwater source before or at the first customer as follows:

9550 1. Chemical disinfection.

9551 a. The owner ~~of a groundwater system that~~ who serves greater than 3,300 people shall
9552 continuously monitor and record the residual disinfectant concentration using
9553 analytical methods specified in ~~40 CFR 141.74 (a)(2)~~ 12VAC5-590-440 at a location
9554 approved by the ~~ODW~~ department and shall record the lowest residual disinfectant
9555 concentration each day that water from the groundwater source is served to the public.
9556 The ~~groundwater system~~ owner shall maintain at least the ~~ODW-determined~~
9557 department-determined residual disinfectant concentration every day the groundwater
9558 system serves water from the groundwater source to the public. If there is a failure in
9559 the continuous monitoring equipment, the ~~groundwater system~~ owner shall conduct
9560 grab sampling every four hours until the continuous monitoring equipment is returned
9561 to service. The system shall resume continuous residual disinfectant monitoring within
9562 14 days.

9563 b. The owner ~~of a groundwater system that~~ who serves 3,300 or fewer people shall
9564 monitor the residual disinfectant concentration using analytical methods specified in
9565 ~~40 CFR 141.74 (a)(2)~~ 12VAC5-590-440 at a location approved by the ~~ODW~~
9566 department and record the residual disinfection concentration each day that water
9567 from the groundwater source is served to the public. The ~~groundwater system~~ owner
9568 shall maintain the ~~ODW-determined~~ department-determined residual disinfectant
9569 concentration every day the groundwater system serves water from the groundwater
9570 source to the public. The ~~groundwater system~~ owner shall ~~take~~ collect a daily grab
9571 sample during the hour of peak flow or at another time specified by the ~~ODW~~

9572 department. If any daily grab sample measurement falls below the ~~ODW-determined~~
9573 department-determined residual disinfectant concentration, the ~~groundwater system~~
9574 source waterworks owner shall ~~take~~ collect follow-up samples every four hours until
9575 the residual disinfectant concentration is restored to the ~~ODW-determined~~ department-
9576 determined level. ~~A groundwater system that~~ The owner who serves 3,300 or fewer
9577 people may monitor continuously to meet the requirements of this subsection.

9578 c. When the disinfection treatment is required based on confirmed *E. coli*
9579 contamination in the source water, the requirements in this section apply. When the
9580 disinfection treatment is required for any other reason or provided voluntarily by the
9581 owner, the department will determine the frequency of residual disinfectant monitoring.

9582 ed. Failure to maintain the ~~ODW-specified~~ department-specified minimum residual
9583 disinfectant concentration for a period of more than four hours is a violation of the
9584 treatment technique requirement.

9585 2. ~~A groundwater system owner that~~ The owner who uses an a ~~ODW-approved~~
9586 department-approved alternative treatment to meet the requirements of this section by
9587 providing at least 4-log treatment of viruses before or at the first customer shall:

9588 a. Monitor the alternative treatment in accordance with all ~~ODW-specified~~ department-
9589 specified monitoring requirements; and

9590 b. Operate the alternative treatment in accordance with all ~~ODW-specified~~ department-
9591 specified compliance requirements necessary to achieve at least 4-log treatment of
9592 viruses.

9593 3. Failure to meet the monitoring requirements of subsection C of this section is a violation
9594 and requires the ~~groundwater system~~ owner to provide public notification as required in
9595 12VAC5-590-540 A 3.

- 9596 D. Discontinuing compliance monitoring or treatment.
- 9597 1. ~~A groundwater system~~ The owner may discontinue compliance monitoring if the ~~ODW~~
9598 department determines and documents in writing that compliance monitoring is no longer
9599 necessary for that groundwater source. ~~Owners of groundwater systems that have~~ The
9600 owner who has ~~ODW department~~ approval to discontinue compliance monitoring shall be
9601 subject to the triggered source water monitoring requirements of 12VAC5-590-379 B 1.
- 9602 2. ~~A groundwater system owner~~ The owner who is discontinuing compliance monitoring is
9603 still subject to the requirements of 12VAC5-590-380 G.
- 9604 3. ~~Owners of waterworks with groundwater sources that have~~ The owner who has been
9605 required by the ~~commissioner~~ department to provide at least 4-log treatment of viruses
9606 shall not discontinue treatment or monitoring.

9607 **12VAC5-590-425. ~~Raw water monitoring requirements for groundwater sources.~~**
9608 **(Repealed.)**

9609 ~~A. The owner of any groundwater source utilizing chlorine disinfection or any other treatment~~
9610 ~~or chemical addition that may alter or affect the bacteriological quality of the raw water shall collect~~
9611 ~~source samples for bacteriological analysis in accordance with this section.~~

9612 ~~B. All bacteriological samples under this section shall be collected from the raw water prior to~~
9613 ~~any treatment or chemical addition.~~

9614 ~~1. The owner shall provide a suitable raw water sample tap at each groundwater source.~~

9615 ~~2. If conditions are such that it is not possible to install a raw water sample tap, an alternate~~
9616 ~~sample location acceptable to the commissioner may be utilized for this monitoring.~~

9617 C. All samples shall be analyzed in accordance with 12VAC5-590-440 by the DCLS or by a
 9618 laboratory certified by DCLS for drinking water samples and by a test method that will yield a Most
 9619 Probable Number (MPN) result for both total coliforms and E. coli.

9620 D. Number of samples.

9621 1. The number of routine raw water samples to be collected and the frequency of sampling
 9622 shall be determined by the district engineer. The district engineer will notify the waterworks
 9623 owner of the raw water sampling requirements.

9624 2. As a minimum, the owner shall collect raw water samples in accordance with the
 9625 following table:

| Source Type | Minimum Routine Raw Water Monitoring Frequency | Parameters |
|-----------------------------------|--|------------------------------------|
| Well located in non-karst geology | One sample per year | Total coliforms MPN and E coli MPN |
| Well located in karst geology | One sample per calendar quarter | Total coliforms MPN and E coli MPN |
| Spring | One sample per month | Total coliforms MPN and E coli MPN |

9626 3. When a single sample result from any groundwater source that requires a routine raw
 9627 water monitoring frequency of less than monthly indicates total coliforms in excess of 50
 9628 colonies per 100 mL or the presence of E. coli, the owner shall collect one confirmation
 9629 sample within 10 calendar days of notification of the results. The district engineer may
 9630 require that additional samples be collected and will establish the specific number of
 9631 samples and the monitoring frequency.

9632 E. If the results of the raw water monitoring required by this section indicate total coliforms in
 9633 excess of 50 colonies per 100 ml in two or more samples collected during any running six-month
 9634 period or the presence of E. coli in two or more samples collected during any running six-month
 9635 period, the waterworks owner shall provide all necessary information required in 12VAC5-590-

9636 ~~430 to the district engineer and the commissioner will make a GUDI determination for the~~
9637 ~~groundwater source.~~

9638 ~~F. If the results of the raw water monitoring required by this section indicate the presence of~~
9639 ~~E. coli in two or more samples collected during any running six-month period, the waterworks~~
9640 ~~owner shall:~~

9641 ~~1. Issue a Tier 1 public notice in accordance with 12VAC5-590-540 A 1.~~

9642 ~~2. Provide disinfection treatment to achieve a 4-log virus inactivation as specified in~~
9643 ~~12VAC5-590-421 A 1 d.~~

9644 ~~3. Conduct compliance monitoring as specified in 12VAC5-590-421 C 1.~~

9645 **12VAC5-590-430. Determination of surface water influence of groundwater sources.**

9646 ~~A. All waterworks' A groundwater sources source utilized by a waterworks, such as including~~
9647 ~~wells, springs, and infiltration galleries, shall be evaluated by the division department and a~~
9648 ~~determination of surface water influence shall be made by the department to determine surface~~
9649 ~~water influence. The waterworks owner shall provide to the division department all necessary~~
9650 ~~information to make this determination in accordance with the following three-step procedure~~
9651 ~~described in subsection B of this section.~~

9652 ~~B. The groundwater source shall be evaluated and subjected to all the criteria in a stepwise~~
9653 ~~fashion. Once the department has made a determination with regard to surface water influence,~~
9654 ~~has been made it is not necessary to continue to the next step:~~

9655 ~~1. Step one- 1. Evaluation of source history, construction, and location.~~

9656 ~~a. The source is not surface influenced if the division has previously determined that~~
9657 ~~disinfection treatment is not required (see 12VAC5-590-380 G).~~

9658 ~~b. a.~~ The source is surface influenced under the direct influence of surface water if it
9659 has been directly associated with a biological waterborne disease outbreak. ~~such a~~
9660 Giardiasis, or if it has been directly associated with chemical contamination from the
9661 surface.

9662 ~~c.~~ For all sources consisting of a spring, infiltration gallery, wells located in Karstian
9663 geology, or not classified as either 12VAC5-590-430 A 1 or 2 the determination shall
9664 proceed to step two.

9665 b. The source is under the direct influence of surface water if there are any
9666 demonstrated or known direct connections between the source to surface water via
9667 surface water bodies, sinkholes, troughs, drainage ways, or other geologic features.

9668 c. The source is under the direct influence of surface water if a sanitary survey reveals,
9669 or there is other evidence to indicate, that surface water is directly entering the source.

9670 d. If the department has not determined that the source is influenced by surface water
9671 based upon the criteria in subdivisions B 1 a through B 1 c of this section, then the
9672 source evaluation proceeds to Step 2.

9673 2. ~~Step two-~~ 2. source physiology and geology Microbiological water quality.

9674 a. The owner shall collect a series of bacteriological samples directly from the source
9675 before any treatment. The specific number of samples to be collected, the sampling
9676 frequency, and the duration of sampling shall be determined by the department.

9677 (1) At a minimum, a series of 20 samples collected on a weekly frequency is required.
9678 Sample collection may be adjusted within the week to collect samples immediately
9679 following rainfall events, whenever possible.

9680 (2) All bacteriological analyses shall be performed in accordance with 12VAC5-590-
9681 440 by the DCLS or by a laboratory certified by the DCLS for drinking water samples

9682 and by a test method that will yield both total coliform concentration and E. coli
9683 concentration.

9684 (3) The department may utilize bacteriological results from source water samples
9685 collected in accordance with 12VAC5-590-379 C if the sample results cover at least a
9686 20-week period that includes multiple significant rainfall events for this Step 2
9687 evaluation.

9688 b. The total coliform concentration sample results shall be evaluated as follows:

9689 (1) If the results of the total coliform concentration samples indicate three or more
9690 samples with total coliform greater than 100 colonies/100 ml, then the source
9691 evaluation proceeds to Step 3.

9692 (2) If the results of the total coliform concentration samples indicate a geometric mean
9693 equal to or greater than 100 colonies/100 ml, then the requirements of 12VAC5-590-
9694 380 G 2 will apply.

9695 c. The E. coli concentration samples shall be evaluated as follows:

9696 (1) If the results of the E. coli concentration samples indicate greater than or equal to
9697 five E. coli per 100 ml in three or more samples, then the source evaluation proceeds
9698 to Step 3.

9699 (2) If the results of the E. coli concentration samples indicate the presence of E. coli in
9700 five or more samples, then the source evaluation proceeds to Step 3.

9701 ~~a. The source is not surface influenced if it consists of a properly constructed Class I~~
9702 ~~or Class II well in non-Karstian geologic provinces of the state, with no history of~~
9703 ~~turbidity fluctuations, and that have been determined by the division to be adequately~~
9704 ~~treated by disinfection alone (12VAC5-590-380 G).~~

9705 b. The source is surface influenced if a sanitary survey reveals that surface water may
9706 directly enter the source either through structural defects or through nearby surface
9707 water bodies, sinkholes, troughs, drainage ways, or other suspect geological features.

9708 c. The determination for sources consisting of a spring, infiltration gallery, wells located
9709 in Karstian geology or otherwise not classified under 12VAC5-590-430 B 1 or 2 shall
9710 proceed to step three.

9711 3. Step three - 3. water quality Additional water quality monitoring.

9712 a. The source is not surface influenced if the total coliform concentrations of the raw
9713 water as measured by the multiple-portion decimal dilution (MPN) method is less than
9714 100 organisms/100 mL based on a geometric mean of 20 or more samples over a
9715 period of six months with no more than 10% of these samples exceeding 100
9716 organisms/100 mL; and having no record or confirmed fecal coliform contamination.

9717 a. The owner shall prepare and submit a written source water monitoring plan to the
9718 department for approval detailing additional water quality samples to be collected
9719 directly from the source before any treatment, and if applicable from a nearby surface
9720 water source. The monitoring plan shall include the following:

9721 (1) The specific parameters to be monitored.

9722 (2) The monitoring frequency for each parameter.

9723 (3) The duration of monitoring.

9724 b. The source is surface influenced if:

9725 (1) The source turbidity, temperature, pH, or conductivity fluctuate following climatic
9726 events or fluctuate relative to nearby surface bodies of water, or

9727 ~~(2) The source exhibits the presence of diatoms, rotifers, coccidia, plant debris, insect~~
9728 ~~parts, or Giardia cysts as identified by particulate analysis.~~

9729 b. The source water monitoring plan shall include Microscopic Particulate Analysis
9730 (MPA).

9731 (1) A minimum of four source water MPA tests is required, two to be conducted during
9732 a wet period and two to be conducted during a dry period. All MPA tests shall be
9733 collected at least 60 days apart.

9734 (2) All MPA tests shall be performed by a laboratory approved by the department and
9735 shall include both Giardia lamblia and Cryptosporidium.

9736 (3) All MPA testing and reporting of results shall be in accordance with the EPA
9737 "Consensus Method for Determining Groundwaters Under the Direct Influence of
9738 Surface Water Using Microscopic Particulate Analysis (MPA)," dated October 1992,
9739 Environmental Services Division.

9740 c. The source water monitoring plan shall include monitoring of the physical
9741 parameters such as temperature, pH, turbidity, conductivity, and other parameters.

9742 (1) If a surface water source is located near the groundwater source being evaluated,
9743 then monitoring of the nearby surface water source is required, using the same
9744 physical parameters and frequency as the groundwater source.

9745 (2) Records of rainfall and other climatological events shall be maintained and reported
9746 with the physical parameter results.

9747 d. The owner shall provide the department with all of the monitoring results required
9748 in the approved monitoring plan. Results of all MPA tests shall be reported within 10
9749 days of receipt by the owner. If any MPA result indicates the presence of Giardia
9750 lamblia or Cryptosporidium, then the owner shall notify the department within 24 hours

9751 of receipt. The results of the physical parameter monitoring shall be provided along
9752 with applicable rainfall or climatological data to the department in a summary report.

9753 e. The additional water quality monitoring results shall be evaluated as follows:

9754 (1) The source is under the direct influence of surface water if any single MPA test
9755 result indicates a score of equal to or greater than 20.

9756 (2) The source is under the direct influence of surface water if any two MPA test results
9757 indicate a score of equal to or greater than 15.

9758 (3) The source is under the direct influence of surface water if the results of physical
9759 parameter monitoring indicate a correlation between fluctuations in the groundwater
9760 source in direct response to a rainfall or other climatological event.

9761 (4) The source is under the direct influence of surface water if the results of physical
9762 parameter monitoring indicate a direct correlation between the groundwater source
9763 being evaluated and the physical parameters of a nearby surface water source.

9764 (5) The source is a groundwater source and is not under the direct influence of surface
9765 water if (i) all MPA test results indicate a score of equal to or less than 9, and (ii) there
9766 are no fluctuations in source water monitored physical parameters in direct response
9767 to a rainfall or other climatological event, and (iii) there is no direct correlation in the
9768 monitored physical parameters between the groundwater source being evaluated and
9769 a nearby surface water source.

9770 f. If the department has not determined that the source is under the direct influence of
9771 surface water based upon the criteria in subdivisions B 3 e (1) through B 3 e (4) of this
9772 section, and if at least one of the MPA test results indicate a score of greater than 9
9773 but less than 15, then the department shall evaluate all available water quality

9774 monitoring data, source construction, location, geology, and any other relevant factors,

9775 and to determine that either:

9776 (1) The source is a groundwater source and is not under the direct influence of surface

9777 water; or

9778 (2) The source is at risk and requires continued source water monitoring as prescribed

9779 by the department.

9780 C. If the source is subject to the requirements of subdivision B 3 of this section, then the owner

9781 shall perform the following interim measures until the department has made a final GUDI

9782 determination:

9783 1. Provide disinfection treatment to achieve a 4-log inactivation of virus in accordance with

9784 12VAC5-590-421 A 1 d;

9785 2. Conduct compliance monitoring in accordance with 12VAC5-590-421 C 1;

9786 3. If the disinfection treatment required in subdivision C 1 of this section has to be installed,

9787 then the owner shall issue a public notice in accordance with 12VAC5-590-540 A 1

9788 advising consumers to boil the water before using it for human consumption. The boil

9789 water notice shall remain in effect until the disinfection treatment is installed and in

9790 operation.

9791 4. The department may require that the owner perform additional interim measures if

9792 deemed necessary to protect public health.

9793 D. If the total coliform concentration criteria in subdivision B 2 b of this section or the E. coli

9794 concentration criteria in subdivision B 2 c of this section are exceeded or if the department has

9795 declared the source to be GUDI, then the owner may propose either mitigation measures or a

9796 plan to correct deficiencies, or both.

9797 1. Any proposed mitigation measures or corrective actions must be detailed in a report
9798 submitted to the department for approval. The report shall be prepared by a professional
9799 engineer licensed in Virginia, a professional geologist licensed in Virginia, or other
9800 licensed professional approved by the department. The report shall include:

9801 a. A description of the proposed mitigation or corrective action activities such as the repair
9802 of structural defects, elimination of sources of contamination in proximity to the source,
9803 implementation of source water protection measures, or other mitigation or corrective
9804 action activities.

9805 b. Specific milestones and milestone completion dates.

9806 c. A follow-up source water monitoring plan to be implemented upon completion of the
9807 mitigation measures or of the corrective actions.

9808 2. If the source must remain in operation during the period of time that the mitigation or
9809 corrective action activities are implemented and evaluated, then the department may
9810 require that the owner implement the interim measures described in 12VAC5-590-395 A
9811 3 or subdivisions C 1 through C 4 of this section.

9812 3. A final summary report, detailing either the mitigation measures or the corrective actions
9813 or both that are completed, the results of the follow-up monitoring, conclusions,
9814 recommendations and all other supporting data, shall be submitted to the department for
9815 approval.

9816 a. The final summary report shall be prepared by a professional engineer licensed in
9817 Virginia, a professional geologist licensed in Virginia, or other licensed professional
9818 approved by the department.

9819 b. Upon evaluation of the final report and supporting data, the department will make a
9820 GUDI determination.

9821 E. For any source previously determined to be a groundwater source and not under the direct
9822 influence of surface water, the department may:

9823 1. Require that the source be re-evaluated in accordance with procedures contained in
9824 this section, or

9825 2. Waive any additional re-evaluation under this section.

9826 **12VAC5-590-440. Analytical methods.**

9827 A. All drinking water analyses for compliance with PMCLs and SMCLs or ALs purposes shall
9828 have been performed by analytical methods that are consistent with current U.S.
9829 Environmental Protection Agency EPA regulations found at 40 CFR Part 141 and 40 CFR Part
9830 143 as well as 40 CFR Part 136, if applicable. Standards for laboratories Laboratories seeking
9831 certification to perform drinking water analyses shall comply with all are found in the Regulations
9832 for the Certification of Laboratories Analyzing Drinking Water (1VAC30-41) and other applicable
9833 regulations promulgated by the Department of General Services, Division of Consolidated
9834 Laboratory Services and DCLS.

9835 B. For the purposes of determining compliance, the department will only accept results from
9836 samples that have been handled, processed, and documented in accordance with the
9837 Regulations for the Certification of Laboratories Analyzing Drinking Water (1VAC30-41).

9838 C. Testing for alkalinity, calcium, conductivity, residual disinfectant residual, orthophosphate,
9839 pH, silica, temperature, and turbidity, TOC, DOC, SUVA, and UV254 for compliance purposes
9840 may be performed by any person or party acceptable to the commissioner department, in
9841 accordance with methods specified in 40 CFR Part 141.

Table 2.2 — Inorganic Chemicals.

| Substance | Primary Maximum Contaminant Level (mg/L) |
|-----------|--|
| Antimony | 0.006 |

| | |
|----------------------------------|--|
| Arsenic (As) | 0.010*** |
| Asbestos | 7 Million Fibers/Liter (longer than 10 um) |
| Barium (Ba) | 2 |
| Beryllium | 0.004 |
| Cadmium (Cd) | 0.005 |
| Chromium (Cr) | 0.1 |
| Cyanide (as free Cyanide) | 0.2 |
| Fluoride (F) | 4.0 # |
| Mercury (Hg) | 0.002 |
| Nickel | No Limits Designated |
| Nitrate (as N) | 10** |
| Nitrite (as N) | 1 |
| Total Nitrate and Nitrite (as N) | 10 |
| Selenium (Se) | 0.05 |
| Thallium | 0.002 |
| Substance | Secondary Maximum Contaminant Level (mg/L) |
| Chloride (Cl) | 250.0 |
| Copper (Cu) | 1.0 |
| Corrosivity | Noncorrosive, See Appendix B |
| Fluoride | 2.0 |
| Foaming Agents | 0.5* |
| Iron (Fe) | 0.3 |
| Manganese (Mn) | 0.05 |
| Sodium (Na) | No Limits Designated |
| Sulfate (SO ₄) | 250.0 |
| Zinc (Zn) | 5.0 |
| Substance | Action Level (mg/L) |
| Lead (Pb) | 0.015 |
| Copper (Cu) | 1.3 |

Note. For artificially fluoridated waterworks the minimum concentration of fluoride should be 0.8 mg/L and the maximum should be 1.0 mg/L. The optimum control limit is 0.9 mg/L. (See Appendix B)

*Note. Concentration reported in terms of Methylene Blue Active Substances.

**Note. See Appendix B for Exception Regarding Noncommunity Waterworks.

***Note. The PMCL for arsenic is 0.010 mg/L for community and nontransient noncommunity waterworks effective January 23, 2006. Arsenic sampling results shall be reported to the nearest 0.001 mg/L.

9842

Table 2.3 — Organic Chemicals.

| Substance | Primary Maximum Contaminant Levels (mg/L) |
|--------------------------------|---|
| VOG | |
| 1. Vinyl Chloride | 0.002 |
| 2. Benzene | 0.005 |
| 3. Carbon Tetrachloride | 0.005 |
| 4. 1,2-Dichloroethane | 0.005 |
| 5. Trichloroethylene (TCE) | 0.005 |
| 6. 1,1-Dichloroethylene | 0.007 |
| 7. 1,1,1-Trichloroethane | 0.2 |
| 8. para-Dichlorobenzene | 0.075 |
| 9. cis-1,2-Dichloroethylene | 0.07 |
| 10. 1,2-Dichloropropane | 0.005 |
| 11. Ethylbenzene | 0.7 |
| 12. Monochlorobenzene | 0.1 |
| 13. o-Dichlorobenzene | 0.6 |
| 14. Styrene | 0.1 |
| 15. Tetrachloroethylene | 0.005 |
| 16. Toluene | 1 |
| 17. trans-1,2-Dichloroethylene | 0.1 |
| 18. Xylene (total) | 10 |
| 19. Dichloromethane | 0.005 |
| 20. 1,2,4-Trichlorobenzene | 0.07 |
| 21. 1,1,2-Trichloroethane | 0.05 |
| SOC | |
| 1. Alachlor | 0.002 |
| 2. Atrazine | 0.003 |
| 3. Carbofuran | 0.04 |
| 4. Chlordane | 0.002 |

| | |
|---|--------------------|
| 5. Heptachlor | 0.0004 |
| 6. Heptachlor epoxide | 0.0002 |
| 7. Polychlorinated biphenyls (PCBs) | 0.0005 |
| 8. Dibromochloropropane (DBCP) | 0.0002 |
| 9. Ethylene dibromide (EDB) | 0.00005 |
| 10. Lindane | 0.0002 |
| 11. Methoxychlor | 0.04 |
| 12. Toxaphene | 0.003 |
| 13. 4-Dichlorophenoxyacetic Acid (2,4-D) | 0.07 |
| 14. 2,4,5-Trichlorophenoxypropionic Acid (2,4,5-TP or Silvex) | 0.05 |
| 15. Reserved | - |
| 16. Reserved | - |
| 17. Reserved | - |
| 18. Pentachlorophenol | 0.001 |
| 19. Benzo(a)pyrene | 0.0002 |
| 20. Dalapon | 0.2 |
| 21. Di(2-ethylhexy)adipate | 0.4 |
| 22. Di(2-ethylhexy)phthalate | 0.006 |
| 23. Dinoseb | 0.007 |
| 24. Diquat | 0.02 |
| 25. Endothall | 0.1 |
| 26. Endrin | 0.002 |
| 27. Glyphosate | 0.7 |
| 28. Hexachlorobenzene | 0.001 |
| 29. Hexachlorocyclopentadiene | 0.05 |
| 30. Oxamyl (Vydate) | 0.2 |
| 31. Picloram | 0.5 |
| 32. Simazine | 0.004 |
| 33. 2,3,7,8-TCDD (Dioxin) | 3×10^{-8} |

9843

Table 2.4 — Physical Quality.

| Parameter | Maximum Contaminant Level | Concentration |
|-----------|---------------------------|----------------|
| Color | Secondary | 15 Color Units |

| | | |
|--|-----------|--------------------------|
| Odor | Secondary | 3-Threshold odor numbers |
| pH | Secondary | 6.5-8.5 |
| Total Dissolved | Secondary | 500 mg/L Solids (TDS) |
| Turbidity | Primary | *1 Turbidity Unit |
| * See Appendix B for operational requirements. | | |

9844

Table 2.5— Radiological Quality.

| A. Maximum Contaminant Level Goals for Radionuclides | | |
|---|-----------------------------------|-----------|
| Substance | MCLG | |
| 1. Combined radium-226 and radium-228 | Zero | |
| 2. Gross alpha particle activity (excluding Radon and uranium) | Zero | |
| 3. Beta particle and photon radioactivity | Zero | |
| 4. Uranium | Zero | |
| B. Primary Maximum Contaminant Levels for Radionuclides | | |
| Substance | Primary Maximum Contaminant Level | |
| 1. Combined radium-226 and radium-228 | 5 pCi/L | |
| 2. Gross Alpha Activity (excluding Radon and Uranium) | 15 pCi/L | |
| 3. Uranium | 30 µg/L | |
| Primary Maximum Contaminant Levels for Beta Particle and Photon Radioactivity from Man-Made Radionuclides | | |
| 1. The average annual concentration of Beta particle and Photon radioactivity from man-made radionuclides in drinking water shall not produce an annual dose equivalent to the total body or any internal organ greater than 4 millirem/year. | | |
| 2. Except for the radionuclides listed in Schedule I, the concentration of man-made radionuclides causing 4 MREM total body or organ dose equivalents shall be calculated on the basis of a 2 liter per day drinking water intake using the 168-hour data listed in "Maximum Permissible Body Burdens and Maximum Permissible Concentrations of Radionuclides in Air and Water for Occupational Exposure," MBS 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 exceed 4 millirem/year. | | |
| Schedule 1 | | |
| Average annual concentrations assumed to produce a total body organ dose of 4 mrem/year. | | |
| Radionuclide | Critical Organ | pCi/liter |

| | | |
|------------------|-------------|--------|
| Tritium | Total Body | 20,000 |
| Strontium-90 | Bone Marrow | 8 |
| * See Appendix B | - | - |

9845

Table 2.6 — Unregulated Contaminant Organics to be Monitored.

| Group A | |
|-------------------------------|-------------------------------|
| 1. Chloroform | 12. Chloromethane |
| 2. Bromodichloromethane | 13. Bromoethane |
| 3. Chlorodibromomethane | 14. 1,2,3-Trichloropropane |
| 4. Bromoform | 15. 1,1,1,2-Tetrachloroethane |
| 5. Chlorobenzene | 16. Chloroethane |
| 6. m-Dichlorobenzene | 17. 2,2-Dichloropropane |
| 7. Dibromomethane | 18. o-Chlorotoluene |
| 8. 1,1-Dichloropropene | 19. p-Chlorotoluene |
| 9. 1,1-Dichloroethane | 20. Bromobenzene |
| 10. 1,1,2,2-Tetrachloroethane | 21. 1,3-Dichloropropene |
| 11. 1,3-Dichloropropane | - |
| Group B | |
| 1. Aldrin | 8. Metoachlor |
| 2. Butachlor | 9. Metribuzin |
| 3. Carbaryl | 10. Propachlor |
| 4. Dicamba | 11. Aldicarb |
| 5. Dieldrin | 12. Aldicarb sulfone |
| 6. Methomyl | 13. Aldicarb sulfoxide |
| 7. 3-Hyposycarbofuran | - |

9846

Table 2.7 — Reserved

9847

Table 2.8 — Organic Chemical Monitoring Implementation Schedule.

| Number of Persons Served | Monitoring to Begin During the Quarter that Begins |
|--------------------------|--|
| Over 10,000 | January 1, 1988 |
| 3,300 to 10,000 | January 1, 1989 |
| less than 3,300 | January 1, 1991 |

9848

Table 2.9 — PMCL Effective Dates.

| | |
|--|------------------|
| Table 2.3, Organics Chemicals, VOC 1 through 8 (Phase I) | January 9, 1989 |
| Total Trihalomethanes and Fluoride | July 1, 1991 |
| Table 2.3, Organics Chemicals, VOC 9 through 18 and SOC 1 through 14 (Phase II VOCs and SOCs) | July 30, 1992 |
| Asbestos, Cadmium, Chromium, Mercury, Nitrate, Nitrite, Total Nitrate+Nitrite, Selenium (Phase II IOCs) | July 30, 1992 |
| Table 2.3, Organics Chemicals, SOC 15 through 18 and Table 2.2, Inorganic Chemicals, Barium (Phase II SOCs and IOCs) | January 1, 1993 |
| Table 2.3, Organics Chemicals, VOC 19 through 21, SOC 19 through 33 and Table 2.2, Inorganic Chemicals; antimony, beryllium, cyanide (as free cyanide), nickel, and thallium | January 17, 1994 |
| Uranium | December 8, 2003 |
| E. coli | April 1, 2016 |

9849

Table 2.10 — Maximum Contaminant Level Goals for Microbiological Contaminants.

| Contaminant | MCLG |
|----------------------------|------|
| Giardia lamblia | Zero |
| Viruses | Zero |
| Legionella | Zero |
| Cryptosporidium | Zero |
| Escherichia coli (E. coli) | Zero |

9850

Table 2.11 — Maximum Contaminant Level Goals for Disinfection Byproducts.

| Disinfection byproduct | MCLG (mg/L) |
|------------------------|-------------|
| Bromate | Zero |
| Bromodichloromethane | Zero |
| Bromoform | Zero |
| Chlorite | 0.8 |
| Chloroform | 0.07 |
| Dibromochloromethane | 0.06 |
| Dichloroacetic acid | Zero |
| Monochloroacetic acid | 0.07 |

| | |
|----------------------|------|
| Trichloroacetic acid | 0.02 |
|----------------------|------|

9851

Table 2.12 — Maximum Residual Disinfectant Level Goals (MRDLG) and Maximum Residual Disinfectant Levels (MRDL) for Disinfectants

| Disinfectant residual | MRDLG (mg/L) | MRDL (mg/L) |
|-----------------------|----------------------------|----------------------------|
| Chlorine | 4 (as Cl ₂) | 4.0 (as Cl ₂) |
| Chloramines | 4 (as Cl ₂) | 4.0 (as Cl ₂) |
| Chlorine dioxide | 0.8 (as ClO ₂) | 0.8 (as ClO ₂) |

9852

Notwithstanding the MRDLs in Table 2.12, owners may increase residual disinfectant levels

9853

in the distribution system of chlorine or chloramines (but not chlorine dioxide) to a level and for a

9854

time necessary to protect public health, to address specific microbiological contamination

9855

problems caused by circumstances such as, but not limited to, distribution line breaks, storm run-

9856

off events, source water contamination events, or cross-connection events.

Table 2.13 — Primary Maximum Contaminant Levels (PMCL) for Disinfection Byproducts

| Disinfection byproduct | PMCL (mg/L) |
|--------------------------------|-------------|
| Total trihalomethanes (TTHM) | 0.080 |
| Haloacetic Acids (five) (HAA5) | 0.060 |
| Bromate | 0.010 |
| Chlorite | 1.0 |

9857

9858

Article 3

9859

Operation of Waterworks

9860

12VAC5-590-450. General. Facility and personnel management.

9861

Waterworks operation comprises the constant ~~operation~~ oversight and management of the

9862

facilities and personnel. Consideration ~~must~~ shall be given to such factors as the ~~competent~~

9863

competency of personnel; ~~standards of water quality;~~ including drinking water standards; water

9864

treatment plant maintenance and cleanliness; analytical laboratory control; and the operation

9865

and maintenance of ~~plant equipment, plant records and safety~~ the facilities, including water

9866 treatment plant equipment and distribution system equipment and piping. As the degree of
9867 complexity of water treatment the waterworks increases, so does the expertise and skill required
9868 to produce a high quality water also increases of the operating staff.

9869 **12VAC5-590-460. Personnel. (Repealed.)**

9870 The operation of waterworks, both small and large, must rest in the hands of qualified persons.
9871 The number of such employees in a waterworks system depends principally upon the size, the
9872 quality of the raw water, and the type of treatment processes used.

9873 A. ~~Waterworks operators designated by the waterworks owner to be in responsible charge~~
9874 ~~must possess a valid waterworks operator license issued by the Board for Waterworks and~~
9875 ~~Wastewater Works Operators and Onsite Sewage Professionals, Department of Professional and~~
9876 ~~Occupational Regulation, in accordance with that board's regulations (18VAC160-20-10 et seq.)~~
9877 ~~and Chapters 1, 2, 3, and 23 of Title 54.1 of the Code of Virginia. The license must be of a~~
9878 ~~classification equal to or higher than that of the waterworks. Additional operating personnel at the~~
9879 ~~waterworks must also be licensed as specified below.~~

9880 B. ~~The number and class of operators in attendance and additional operating personnel are a~~
9881 ~~minimum to meet the requirements of protection of the public health of the consumer and safety~~
9882 ~~of the operating personnel. The classification of operators and additional operating personnel in~~
9883 ~~attendance must conform with Table 2.9.~~

9884 1. ~~The owner shall designate one or more properly licensed operators to be in responsible~~
9885 ~~charge of the waterworks at all times. When no designated operator is on duty or in~~
9886 ~~communication with the operating personnel in attendance at the waterworks, a substitute~~
9887 ~~operator shall be designated by the owner. The substitute operator shall possess a valid~~
9888 ~~operator license of a classification equal to or greater than that of the waterworks.~~

9889 ~~2. All waterworks having design capacity of 2.0 mgd or higher and employing filtration~~
 9890 ~~must have a minimum of two operating personnel on duty whenever the plant is in~~
 9891 ~~operation. All other waterworks employing filtration must have a minimum of one operating~~
 9892 ~~person on duty whenever the plant is in operation.~~

9893 ~~3. Waterworks designed for softening only and utilizing chemical precipitation:~~

9894 ~~a. Waterworks having a design capacity of 2.0 mgd or higher must have a minimum of~~
 9895 ~~two operating personnel in attendance at all times the plant is in operation; and~~

9896 ~~b. All other waterworks must have a minimum of one operator operating person in~~
 9897 ~~attendance at all times the treatment plant is in operation.~~

9898 ~~4. Waterworks utilizing iron and manganese removal by precipitation and having a design~~
 9899 ~~capacity of 0.5 mgd or higher must have a minimum of one operating person on duty at~~
 9900 ~~all times the treatment plant is in operation.~~

9901 ~~5. Waterworks providing treatment or no treatment and serving 400 or more persons and~~
 9902 ~~not previously covered will require daily attendance at each treatment facility by an~~
 9903 ~~operating person for sufficient time to insure proper operation of the facility and protection~~
 9904 ~~of the public health, as determined by the division.~~

TABLE 2.9
 MINIMUM CLASSIFICATION FOR WATERWORKS OPERATIONS
 ADDITIONAL OPERATING PERSONNEL

| PLANT CLASSIFICATION | PLANT CAPACITY (MGC) | EQUIVALENT POPULATION SERVED | TREATMENT | OPERATOR IN RESPONSIBLE CHARGE (CLASS) | SHIFT SUPERVISOR (CLASS) | OTHERS |
|----------------------|----------------------|------------------------------|--|--|--------------------------|-----------------------|
| CLASS I | 15.0 or more | 150,000 | Conventional filtration or filter rate more than 2 gpm/ft ² | I | I | II, III, IV Trainees* |

| | | | | | | |
|--------------|---|------------------------------------|---|-----|-----|---------------------------|
| CLASS I | 5.0 but less than 15.0 | 50,000 but less than 150,000 | Conventio nal filtration filter rate more than 2-gpm/ft ² | I | II | II,III,IV Traine e* |
| CLASS II | Less than 5.0 | Less than 50,000 | Filtering rater greater than 2 gpm/ft ² | II | II | III, IV Traine e* |
| CLASS II | 0.5 but less than 5.0 | 5,000 but less than 50,000 | Conventio nal filtration | II | III | III, IV Traine e* |
| CLASS III | Less than 0.5 | Less than 5,000 | Conventio nal filtration | III | III | IV or Traine e* |
| CLASS III | 5,000 or more | - | Approved treatment other than convention al filtration and fluoridatio n | III | IV | IV or Traine e* |
| CLASS III | Sufficient persons or connecti ons to be classified as a Public Water supply | - | Not under higher classificati ons but using fluoridatio n | III | IV | Traine e* |
| CLASS IV | Less than 5,000 | - | Approved treatment other than convention al filtration and fluoridatio n or no treatment serving 400 or | IV | IV | Traine e* |

| | | | | | | |
|--|--|--|-----------------|--|--|--|
| | | | more persons | | | |
|--|--|--|-----------------|--|--|--|

* Trainees should meet basic prerequisites for operators with the exception of experience and have potential for licensing wherever listed in these guidelines. Owner must provide a qualified substitute operator when only one operator is normally employed. The substitute must have the same class license as the operator.

9905 12VAC5-590-461. Classification of waterworks, operator requirements, and operator
9906 attendance.

9907 A. Classification of waterworks. All community and NTNC waterworks, including consecutive
9908 waterworks, fitting the classification protocol in this subsection shall be designated as classified
9909 waterworks. The commissioner retains the discretion to assign the classification of the waterworks
9910 or treatment facility either higher or lower. Those community and NTNC waterworks failing to fall
9911 within one of the classifications listed below shall be designated an unclassified waterworks
9912 unless specified otherwise by the commissioner. Normally, a TNC waterworks shall not be
9913 classified and shall not be required to have an operator, unless the commissioner determines that
9914 it is necessary to ensure satisfactory operation of the installed treatment. If a waterworks consists
9915 of multiple treatment facilities, then these facilities may be individually classified for the purpose
9916 of determining the operator requirements.

9917 1. Class 1 shall mean:

9918 a. A waterworks or a water treatment plant serving 50,000 or more persons, or having
9919 a water treatment plant capacity of 5.0 MGD or more and employing conventional
9920 filtration or chemical coagulation in combination with membrane filtration; or

9921 b. The waterworks is designated by the commissioner to be a Class 1 waterworks.

9922 2. Class 2 shall mean:

9923 a. A waterworks or a water treatment plant serving 5,000 or more persons but fewer
9924 than 50,000 persons or having a water treatment plant capacity of 0.5 MGD or more
9925 but less than 5.0 MGD, whichever range applies, and employing rapid rate

9926 conventional filtration (see 12VAC5-590-874), or chemical coagulation in combination
9927 with membrane filtration; or

9928 b. A waterworks or a water treatment plant serving fewer than 50,000 persons or
9929 having a water treatment plant capacity of less than 5.0 MGD and employing high rate
9930 conventional filtration (see 12VAC5-590-874); or

9931 c. The waterworks is designated by the commissioner to be a Class 2 waterworks.

9932 3. Class 3 shall mean:

9933 a. A waterworks or a water treatment plant serving fewer than 5,000 persons or having
9934 a water treatment plant capacity less than 0.5 MGD, whichever is greater, and
9935 employing conventional filtration or chemical coagulation in combination with
9936 membrane filtration; or

9937 b. A waterworks or a water treatment plant serving 5,000 or more persons or having a
9938 water treatment plant capacity of 0.5 MGD or more, whichever is greater, and
9939 employing one or more of the following: disinfection other than with hypochlorination;
9940 caustic soda feed; iron and manganese removal; ion exchange; slow sand filtration;
9941 aeration; rechlorination other than with hypochlorination; activated carbon contactors;
9942 membrane or other filtration technologies without chemical coagulation; and
9943 fluoridation with a saturator or acid feed; or

9944 c. A waterworks or a water treatment plant employing fluoridation with other than a
9945 saturator not considered a Class 1 or Class 2 waterworks; or

9946 d. The waterworks is designated by the commissioner to be a Class 3 waterworks.

9947 4. Class 4 shall mean:

9948 a. A waterworks or a water treatment plant serving fewer than 5,000 persons or having
9949 a water treatment plant capacity of less than 0.5 MGD, and employing one or more of
9950 the following: disinfection other than with hypochlorination; caustic soda feed; iron and
9951 manganese removal; ion exchange; slow sand filtration; aeration; rechlorination other
9952 than with hypochlorination; activated carbon contactors; membrane or other filtration
9953 technologies without chemical coagulation; and fluoridation with a saturator; or
9954 b. The waterworks is designated by the commissioner to be a Class 4 waterworks.

9955 5. Class 5 shall mean:

9956 a. Waterworks serving 400 or more persons that:
9957 (1) Provides no treatment; or
9958 (2) Employs one or more of the following treatment processes:
9959 (a) Hypochlorination for disinfection; or
9960 (b) Corrosion control with calcite or magnesium oxide contactors or solution feed
9961 except with caustic soda; or
9962 (c) Sequestration by solution feed.
9963 b. The waterworks is designated by the commissioner to be a Class 5 waterworks.

9964 6. Class 6 shall mean:

9965 a. A waterworks serving fewer than 400 persons that:
9966 (1) Provides no treatment; or
9967 (2) Employs one or more of the following treatment processes:
9968 (a) Hypochlorination for disinfection; or

9969 (b) Corrosion control with calcite or magnesium oxide contactors or solution feed
9970 except with caustic soda; or

9971 (c) Sequestration by solution feed.

9972 b. The waterworks is designated by the commissioner to be a Class 6 waterworks.

9973 B. Operator requirements. The operation of all waterworks must rest in the hands of qualified
9974 staff. The number and qualifications of persons constituting the operating staff at a waterworks
9975 depend principally upon the capacity of the waterworks, the number of persons served by the
9976 waterworks, and the complexity of the treatment process or processes. If a classified waterworks
9977 or water treatment plant is without a required operator, then the owner shall notify the department
9978 as soon as practical but no later than 24 hours of such an occurrence.

9979 1. The operator attendance requirements specified in subsection C of this section are a
9980 minimum to protect the health of the consumer and safety of the operating staff. The
9981 department may increase the required operating attendance when appropriate to protect
9982 human health.

9983 2. A classified waterworks shall be operated by an operator having a valid license issued
9984 by the Commonwealth of Virginia (18VAC160-30-90) with a classification equal to or
9985 higher than the classification of the waterworks or water treatment plant being operated.
9986 (See definition of operator in 12VAC5-590-10).

9987 3. Operators are not required at unclassified waterworks.

9988 C. Minimum operator attendance at classified waterworks. For the purpose of this section and
9989 12VAC5-590-570, all classified waterworks or individual water treatment plants shall maintain the
9990 minimum operator attendance as follows.

- 9991 1. Class 1. The waterworks shall have a minimum of two operating staff in attendance
9992 whenever the water treatment plant is in operation; at least one of the operating staff must
9993 be an operator.
- 9994 2. Class 2. The waterworks shall have a minimum of one operator in attendance whenever
9995 the water treatment plant is in operation.
- 9996 3. Class 3. The waterworks employing conventional filtration or chemical coagulation in
9997 combination with membrane filtration shall have a minimum of one operator in attendance
9998 whenever the water treatment plant is in operation. All other treatment facilities may have
9999 operator attendance similar to a Class 4 waterworks.
- 10000 4. Class 4. The waterworks shall be attended by an operator at least three days per week,
10001 except that water treatment plants employing membrane filters treating surface water
10002 sources or GUDI sources shall be attended by an operator daily. The attendance shall be
10003 for sufficient time to perform the necessary operations, monitoring, and maintenance.
- 10004 5. Class 5 and Class 6.
- 10005 a. Where no treatment is provided, the waterworks shall be attended by an operator
10006 at least twice a month.
- 10007 b. When treatment is provided, the waterworks shall be attended by an operator at
10008 least once per week.
- 10009 c. The attendance shall be for sufficient time to perform the necessary operations,
10010 monitoring, and maintenance.
- 10011 D. Operator attendance alternatives.
- 10012 1. Increased staffing attendance may be required by the commissioner on a case-by-case
10013 basis to protect public health.

10014 2. Reduced operator attendance for Class 3 through Class 6 waterworks may be
10015 considered by the commissioner on a case-by-case basis.

10016 3. When requiring increased operator attendance, or considering reduced operator
10017 attendance, the commissioner will consider the following criteria, which includes:

10018 a. Operational history;

10019 b. Type of treatment;

10020 c. Facility capacity and hours of operation;

10021 d. Population served;

10022 e. Type and reliability of remote monitoring controls, alarms, and communications;

10023 f. Reliable staff communications; and

10024 g. Emergency response plans and procedures.

10025 _____

10026 **12VAC5-590-470. Waterworks appearance condition.**

10027 ~~The general appearance and state of cleanliness of a waterworks can greatly influence the~~
10028 ~~attitude of the public toward a utility and can actually promote public health. A community without~~
10029 ~~confidence in its public water supply with often resort to the use of water from questionable or~~
10030 ~~polluted sources; therefore, the The waterworks must shall be maintained in a clean and orderly~~
10031 ~~condition to achieve this goal.~~

10032 **12VAC5-590-475. Removal of wells from service.**

10033 A. Temporary inactivation.

10034 1. A water well temporarily inactivated shall be sealed with a watertight cap or wellhead
10035 seal.

- 10036 2. The well shall be maintained so that it will not be a source or channel for contamination
10037 during temporary inactivation.
- 10038 3. The wellhead shall be visually inspected and observations documented to verify
10039 adequate sanitary integrity on a quarterly basis.
- 10040 4. The well lot shall be maintained.
- 10041 B. Permanent abandonment.
- 10042 1. Well abandonment shall be supervised by a certified water well systems provider.
- 10043 2. All well abandonments shall be documented on a Uniform Water Well Completion
10044 Report, Form GW-2, and submitted to the department within 30 days of completing the
10045 physical abandonment.
- 10046 3. Groundwater wells that are abandoned shall be sealed by methods that will restore to
10047 the fullest extent possible the controlling geological conditions that existed before the wells
10048 were constructed.
- 10049 4. Casing and screen materials may be salvaged.
- 10050 5. The well shall be checked from land surface to the entire depth of the well before it is
10051 sealed to ascertain freedom from obstructions that may interfere with sealing operations.
10052 Effort shall be made to remove or clear any obstacles that may prohibit sealing by grouting
10053 the complete well depth.
- 10054 6. The well shall be thoroughly chlorinated before sealing.
- 10055 7. Bored wells and uncased wells shall be backfilled with clean fill to the water level. A
10056 two-foot-thick bentonite grout plug shall be placed immediately above the water level.
10057 Clean fill shall be placed on top of the bentonite grout plug and brought up to at least five
10058 feet from the ground surface. The top five feet of the well casing, if present, shall be

10059 removed from the bore hole. If an open annular space is present around the well casing,
10060 then the annular space shall be filled with bentonite grout to the maximum depth possible,
10061 but less than or equal to 20 feet. A one-foot-thick cement or bentonite grout plug that
10062 completely fills the bore void space shall be placed a minimum of five feet from the ground
10063 surface. As an alternative, bored wells and uncased wells may be completely filled with
10064 concrete, sand-cement, bentonite-cement, or neat cement grout, to within a minimum of
10065 five feet from the ground surface by introduction through a pipe initially extending to the
10066 bottom of the well. The pipe shall be raised, but remain submerged in grout or concrete,
10067 as the well is filled. The remaining space shall be filled with clean fill that is mounded a
10068 minimum of one foot above the surrounding ground surface.

10069 8. Non-bored wells constructed in unconsolidated formations shall be completely filled with
10070 concrete, sand-cement, bentonite-cement, or neat cement grout to within a minimum of
10071 five feet from the ground surface by introduction through a pipe initially extending to the
10072 bottom of the well. The pipe shall be raised, but remain submerged in grout or concrete,
10073 as the well is filled. The remaining space shall be filled with clean fill that is mounded a
10074 minimum of one foot above the surrounding ground surface.

10075 9. Wells constructed in consolidated rock formations or which penetrate zones of
10076 consolidated rock may be filled with sand or gravel opposite the zones of consolidated
10077 rock. The top of the sand or gravel fill shall be at least five feet below the top of the
10078 consolidated rock and at least 20 feet below land surface. The remainder of the well shall
10079 be filled with concrete, sand-cement, bentonite-cement, or neat cement grout to within a
10080 minimum of five feet from the ground surface by introduction through a pipe initially
10081 extending to the bottom of the well. The pipe shall be raised, but remain submerged in
10082 grout or concrete, as the well is filled. The remaining space shall be filled with clean fill
10083 that is mounded a minimum of one foot above the surrounding ground surface.

10084 10. The location of the well shall be permanently documented for future reference.

10085 **12VAC5-590-476. Reactivation of wells.**

10086 A. The owner shall notify the department of the intent to reactivate a well.

10087 B. Before bringing the well into service, it shall be pumped to waste (purged) for a minimum
10088 of five well volumes, but no less than 30 minutes. The purged well water shall be discharged in a
10089 manner so that it will not return to the well, directly or indirectly, during the pumping period.

10090 C. After the well is pumped, water quality samples shall be collected. If the well has been
10091 inactive for less than one year, then two samples shall be collected at least 30 minutes apart and
10092 tested for the presence of E. coli. If the well has been inactive for one or more years, then it shall
10093 be tested for total coliform density (MPN), nitrate, and if determined by the department, inorganics,
10094 VOCs, SOCs, and radionuclides. Satisfactory test results shall be obtained before placing the well
10095 in service.

10096 D. A well yield and drawdown test may be required by the department before bringing the well
10097 into service. The test shall be performed in accordance with 12VAC5-590-840 H, as applicable.

10098 E. A well may be activated for emergency use before receipt of satisfactory monitoring results,
10099 even if public health and safety are unknowns and may be at risk, as determined by the
10100 department. However, in these circumstances, a special water advisory shall be approved by the
10101 department and issued by the waterworks at the same time the well is activated.

10102 **12VAC5-590-480. ~~Analytical laboratory control~~Operational control testing and monitoring.**

10103 A. ~~Analyses~~ Water analyses and tests performed at waterworks are ~~made~~ conducted for four
10104 main purposes: (i) to ensure compliance; (ii) to control water treatment plant operation; (iii) to
10105 record water treatment plant performance; and (iv) to improve plant performance, and to
10106 undertake fundamental research of value to the plant and to the profession in general provide

10107 information for improving water treatment plant performance. Tests designed to control operation
10108 should shall present evidence that:

10109 1. ~~The water has been properly prepared for each major key step in the treatment~~
10110 ~~process;~~2. Each key process, such as mixing, coagulation, sedimentation, filtration,
10111 softening, iron and manganese removal, disinfection, and taste and odor control ~~has~~
10112 ~~proceeded according to plan~~ is effective; and

10113 32. The finished product is clean, is free from objectionable taste ~~or~~ and odor, is free from
10114 undesirable chemical characteristics, and is safe for human consumption.

10115 B. ~~Laboratory analyses shall conform with the most current edition available of Standard~~
10116 ~~Methods for the Examination of Water and Wastewater published by the American Public Health~~
10117 ~~Association, the American Water Works Association, and the Water Pollution Control Federation,~~
10118 ~~or analytical methods approved by the division.~~ Testing for regulatory compliance purposes shall
10119 use an EPA-approved analytical method found in 40 CFR Parts 141 and 143. Instruments used
10120 for operational control purposes must be calibrated in accordance with manufacturers'
10121 instructions. Calibrations shall be documented in a manner acceptable to the department.

10122 C. Ample laboratory space shall be provided for all required laboratory analyses as specified
10123 in 12VAC5-590-760.

10124 1. ~~Chemical. The analyses listed below are the minimum required. Additional testing may~~
10125 ~~be required by the division.~~

10126 a. ~~Waterworks utilizing treatment for turbidity removal shall provide equipment for the~~
10127 ~~analysis of pH, alkalinity, hardness, turbidity, water temperature and coagulation~~
10128 ~~dosage. An electric pH meter must be provided; however, a color comparator may be~~
10129 ~~used as a back-up unit. Turbidities must be determined by the use of a nephelometer.~~
10130 ~~Minimum equipment for coagulation control shall be a multiple jar stirring machine.~~

10131 ~~b. Waterworks providing softening only and utilizing chemical precipitation shall~~
10132 ~~provide equipment for analysis of pH utilizing an electric pH meter, alkalinity, hardness,~~
10133 ~~water temperature, and chemical dosage for precipitation utilizing a multiple jar stirring~~
10134 ~~machine.~~

10135 ~~c. Waterworks providing iron and manganese removal by chemical precipitation shall~~
10136 ~~provide equipment for analysis of pH, alkalinity, iron, manganese, and water~~
10137 ~~temperature.~~

10138 ~~d. Waterworks providing fluoridation shall provide equipment for analysis of the~~
10139 ~~fluoride ion concentration and water temperature.~~

10140 ~~e. Waterworks providing chlorination or rechlorination shall provide equipment for the~~
10141 ~~analysis of chlorine residual and temperature.~~

10142 ~~f. Waterworks providing iron and manganese removal by ion exchange and or~~
10143 ~~softening by ion exchange shall provide equipment for the analysis of iron and~~
10144 ~~manganese, or hardness.~~

10145 ~~2. Bacteriological. Only results of bacteriological analyses performed by the Division of~~
10146 ~~Consolidated Laboratory Services, or by laboratories and laboratory personnel certified by~~
10147 ~~the Division of Consolidated Laboratory Services will be acceptable.~~

10148 ~~a. The number and frequency of bacteriological sampling shall comply with Article 1 of~~
10149 ~~Part II. Additional analyses may be necessary when deemed so by the division.~~

10150 ~~b. Waterworks having a rated capacity of 3.0 mgd or more or serving an equivalent of~~
10151 ~~30,000 persons or more shall provide laboratory space and equipment for routine~~
10152 ~~bacteriological analysis.~~

10153 ~~c. Bacteriological sampling in accordance with Article 1 of Part II is required by all~~
10154 ~~waterworks.~~

10155 D. Required waterworks onsite laboratory analyses. The analyses listed in this subsection are
10156 the minimum required. Additional testing may be required by the department.

10157 1. The owner of a waterworks employing chemical coagulation or lime softening in
10158 combination with any filtration treatment for turbidity removal or TOC reduction shall
10159 provide equipment for the analysis of pH, alkalinity, hardness, turbidity, water temperature,
10160 and coagulant dosage. A calibrated electric pH meter must be provided; however, a color
10161 comparator may be used as a backup unit. Turbidities must be determined by the use of
10162 a calibrated turbidimeter. ~~Minimum equipment for coagulation control shall be a multiple~~
10163 ~~jar stirring machine.~~

10164 2. The owner of a waterworks employing membrane filtration without chemical coagulation
10165 or lime softening shall provide equipment for the analysis of turbidity and temperature.
10166 Turbidities shall be determined by the use of a calibrated turbidimeter.

10167 3. The owner of a waterworks employing softening only and utilizing chemical precipitation
10168 shall provide equipment for the analysis of pH utilizing a calibrated electric pH meter,
10169 alkalinity, hardness, water temperature, and chemical dosage for precipitation utilizing a
10170 multiple jar stirring machine.

10171 4. The owner of a waterworks employing iron and manganese removal by chemical
10172 precipitation shall provide equipment for the analysis of pH, alkalinity, iron, manganese,
10173 and water temperature.

10174 5. The owner of a waterworks employing fluoridation shall provide equipment for the
10175 analysis of the fluoride ion concentration and water temperature.

10176 6. The owner of a waterworks employing chlorination, rechlorination, chloramination, or
10177 rechloramination shall provide equipment for the analysis of the appropriate chlorine
10178 residual measurement and temperature.

10179 7. The owner of a waterworks employing iron and manganese removal by ion exchange
10180 or softening by ion exchange shall provide equipment for the analysis of iron and
10181 manganese.

10182 E. Process control instruments, monitors, gauges, and controllers, including reading,
10183 recording, and alarm features, required in Part III, Manual of Practice, shall be maintained fully
10184 operational and calibrated in accordance with the manufacturers' instructions.

10185 1. The owner of a waterworks employing UV for inactivation credit shall perform UV sensor
10186 calibration checks. Calibrations and instrument checks shall be documented in a manner
10187 acceptable to the department. All UV sensors shall be calibrated with a reference UV
10188 sensor at least monthly. It is also recommended that off-line/standby sensors be calibrated
10189 at the same time. At least one reference sensor for calibration of online sensors shall be
10190 provided. The reference UV sensor shall be calibrated at least yearly at a qualified facility,
10191 usually the manufacturer. Ultraviolet transmittance (UVT) analyzer calibration is required
10192 when used as a control instrument. The UVT analyzer shall be calibrated at least weekly
10193 by comparing online measurements to a benchtop spectrophotometer that is calibrated in
10194 accordance with manufacturer's instructions. Instead of an online UVT analyzer, a
10195 benchtop spectrophotometer may be utilized to determine UV transmittance at least every
10196 four hours.

10197 **12VAC5-590-490. Adequate treatment.**

10198 A. Adequate treatment is any one or any combination of the controlled processes of
10199 coagulation, sedimentation, absorption, filtration, disinfection, or other processes that produce a
10200 water consistently meeting the requirements of this chapter. The concept of adequate treatment
10201 also includes processes that are appropriate to (i) the source of supply water; (ii) waterworks that
10202 are of adequate capacity to meet maximum demands without creating health hazards, and that
10203 are located, designed, and constructed to eliminate or prevent ~~cross-connections~~ cross-

10204 connections; and (iii) the conscientious operation by well-trained and competent personnel whose
10205 qualifications are commensurate with the responsibilities of the position and acceptable to the
10206 division department.

10207 B. All A waterworks shall provide adequate treatment and when required and in accordance
10208 with 12VAC5-590-680 to ensure the production of pure potable water.

10209 **12VAC5-590-500. Disinfection by chlorination criteria, determination of CT, disinfection**
10210 **profiles, and disinfection benchmarks for Giardia and virus inactivation.**

10211 A. All A ~~water supplies derived from~~ waterworks utilizing surface water sources or GUDI
10212 sources, in whole or in part, shall be disinfected in accordance with subsection C of this section
10213 and 12VAC5-590-1000 until June 29, 1993. It is recommended that a chlorine residual be
10214 maintained. Beginning June 29, 1993, every owner of a waterworks shall comply with the
10215 disinfection requirements of 12VAC5-590-420.

10216 B. ~~Owners of waterworks utilizing surface waters as a water supply shall practice~~
10217 ~~prechlorination. The requirement for prechlorination may be waived by the commissioner when~~
10218 ~~warranted.~~

10219 C. ~~Owners of waterworks utilizing groundwater as a water supply that has been determined~~
10220 ~~by the commissioner to be under the direct influence of surface water, as provided in 12VAC5-~~
10221 ~~590-430, will be required to disinfect. If the commissioner determines that the groundwater supply~~
10222 ~~is surface influenced, the owner shall provide disinfection during the interim before filtration is~~
10223 ~~installed in accordance with 12VAC5-590-420 B-2 f. If filtration is installed prior to June 29, 1993,~~
10224 ~~the owner shall comply with the disinfection requirements of 12VAC5-590-1000 until June 29,~~
10225 ~~1993. By June 29, 1993, all owners of waterworks using a groundwater source determined to be~~
10226 ~~under the direct influence of surface water shall comply with the disinfection requirements of~~
10227 ~~12VAC5-590-420.~~

10228 ~~D. The owner~~ Owners of a groundwater systems system subject to the requirements of
10229 12VAC5-590-421 A 1 d shall provide a primary disinfection treatment by means of one of the
10230 following:

10231 1. A residual disinfectant residual concentration (C) and contact time (T) to achieve a 4-log
10232 removal or inactivation of viruses. CT shall be calculated in accordance with ~~Appendix L~~
10233 subsections C and D of this section, which contains contain information on calculation methods
10234 and contact tank baffling factors.

10235 2. UV treatment to achieve a 4-log removal or inactivation of viruses. Log inactivation shall
10236 be determined in accordance with 12VAC5-590-401 E 7 c. A secondary disinfection residual in
10237 the distribution system may be required by the department.

10238 ~~E. Disinfection profile data and disinfection benchmark data.~~

10239 1. ~~The owner of any waterworks that has disinfection profile data shall retain this data in~~
10240 ~~graphic form, as a spreadsheet, or in some other format acceptable to the commissioner~~
10241 ~~for review as part of sanitary surveys conducted by the commissioner. Appendix L lists the~~
10242 ~~procedure for developing a disinfection profile.~~

10243 2. ~~Disinfection benchmarking.~~

10244 a. ~~The owner of any waterworks that has developed a disinfection profile and that~~
10245 ~~decides to make a significant change to its disinfection practice shall consult with the~~
10246 ~~commissioner prior to making such change. Significant changes to disinfection~~
10247 ~~practice are:~~

10248 (1) ~~Changes to the point of disinfection;~~

10249 (2) ~~Changes to the disinfectants used in the treatment plant;~~

10250 (3) ~~Changes to the disinfection process; and~~

10251 ~~(4) Any other modification identified by the commissioner.~~

10252 b. ~~The owner of any waterworks that is modifying its disinfection practice shall~~
10253 ~~calculate its disinfection benchmark using the following procedure:~~

10254 ~~(1) For each year of profiling data collected, the owner shall determine the lowest~~
10255 ~~average monthly Giardia lamblia inactivation in each year of profiling data. The owner~~
10256 ~~shall determine the average Giardia lamblia inactivation for each calendar month for~~
10257 ~~each year of profiling data by dividing the sum of daily (or weekly) Giardia lamblia~~
10258 ~~inactivation by the number of values calculated for that month.~~

10259 ~~(2) The disinfection benchmark is the lowest monthly average value (for waterworks~~
10260 ~~with one year of profiling data) or average of lowest monthly average values (for~~
10261 ~~waterworks with more than one year of profiling data) of the monthly logs of Giardia~~
10262 ~~lamblia inactivation in each year of profiling data.~~

10263 ~~(3) The owner of a waterworks that uses either chloramines or ozone for primary~~
10264 ~~disinfection shall also calculate the disinfection benchmark for viruses using a method~~
10265 ~~approved by the commissioner.~~

10266 c. ~~The owner shall submit the following information to the commissioner as part of the~~
10267 ~~waterworks' consultation process.~~

10268 ~~(1) A description of the proposed change;~~

10269 ~~(2) The disinfection profile for Giardia lamblia (and, if necessary, viruses) and~~
10270 ~~benchmark listed in subdivision E 2 b of this section;~~

10271 ~~(3) An analysis of how the proposed change will affect the current levels of disinfection;~~
10272 ~~and~~

10273 ~~(4) Any additional information to justify the change.~~

10274 C. Disinfection criteria.

10275 1. An owner of a waterworks utilizing surface water sources in whole or in part, or GUDI
 10276 sources, shall provide a minimum 3-log (99.9%) removal of Giardia cysts and a 4-log
 10277 (99.99%) removal of viruses, respectively.

10278 2. Additional inactivation levels that must be achieved by disinfection shall be in
 10279 accordance with Table 500.1 for waterworks employing the filtration processes listed.

10280

TABLE 500.1.
Maximum Log Removal Credits for Various Filtration Technologies and the Resulting
Minimum Required Logs of Inactivation by Disinfection

| <u>FILTRATION PROCESS^a</u> | <u>MAXIMUM LOG REMOVAL CREDITS FOR FILTRATION</u> | | <u>ADDITIONAL LOG INACTIVATION REQUIRED BY DISINFECTION</u> | |
|--|---|----------------|---|----------------|
| | <u>Giardia lamblia</u> | <u>Viruses</u> | <u>Giardia lamblia</u> | <u>Viruses</u> |
| <u>Conventional</u> | <u>2.5</u> | <u>2.0</u> | <u>0.5</u> | <u>2.0</u> |
| <u>Direct</u> | <u>2.0</u> | <u>1.0</u> | <u>1.0</u> | <u>3.0</u> |
| <u>Pre-engineered package</u> | <u>2.5</u> | <u>Zero</u> | <u>0.5</u> | <u>4.0</u> |
| <u>Diatomaceous Earth</u> | <u>2.0</u> | <u>1.0</u> | <u>1.0</u> | <u>3.0</u> |
| <u>Slow Sand</u> | <u>2.0</u> | <u>2.0</u> | <u>1.0</u> | <u>2.0</u> |
| <u>Membrane (MF or UF)</u> | <u>3.0</u> | <u>Zero</u> | <u>0.5</u> | <u>4.0</u> |
| <u>Bag or Cartridge</u> | <u>2.0</u> | <u>Zero</u> | <u>1.0</u> | <u>4.0</u> |
| <u>^a Refer to Part III of this chapter for further description of the filtration processes.</u> | | | | |

10281 D. A disinfection profile shall be developed in accordance with the procedures in subdivisions
 10282 D 1 through D 3.

10283 1. The owner shall monitor at least weekly for a period of 12 consecutive months to
 10284 determine the total log inactivation for Giardia lamblia and viruses. If an owner monitors
 10285 more frequently, then the monitoring frequency shall be evenly spaced. An owner of a

10286 waterworks that operates for fewer than 12 months per year shall monitor weekly during
10287 the period of operation.

10288 2. The owner of a waterworks with a single point of disinfectant application before the
10289 entrance to the distribution system, or with more than one point of disinfectant application,
10290 shall conduct the monitoring in subdivisions D 2 a through D 2 e of this section.

10291 a. For a waterworks using a disinfectant other than UV, the temperature of the
10292 disinfected water shall be measured at each residual disinfectant concentration
10293 sampling point during peak hourly flow or at an alternative location approved by the
10294 department.

10295 b. For a waterworks using chlorine, the pH of the disinfected water shall be measured
10296 at each chlorine residual disinfectant concentration sampling point during peak hourly
10297 flow or at an alternative location approved by the department.

10298 c. The residual disinfectant concentration (C) of the water before or at the first
10299 customer, and before each additional point of disinfectant application, shall be
10300 measured at peak hourly flow.

10301 d. The disinfectant contact times (T) of the water before or at the first customer, and
10302 before each additional point of disinfectant application, shall be determined during
10303 peak hourly flow. The disinfectant contact time to be used for calculating CT is T_{10} ,
10304 which is the detention time at which 90 % of the water passing through a unit is retained
10305 within that unit. T_{10} shall be determined either by calculations that involve the
10306 theoretical hydraulic detention time and baffling factors that account for the degree of
10307 short-circuiting that might be expected through any given unit, or by tracer studies.
10308 The baffling factors listed in Table 500.15 shall be used in determining contact time if
10309 tracer studies are not performed.

10310 e. Inactivation credits for ozone contactors will be based on only the chambers that
10311 have a measured ozone residual. A minimum of two dedicated online monitors per
10312 ozone contactor shall be installed at locations suited to the CT calculation method
10313 used. Ozone residual levels shall be monitored continuously and recorded. Methods
10314 for computing log inactivation of Giardia lamblia and virus shall be approved by the
10315 department. Tracer studies shall be required to verify T₁₀ values before receiving
10316 inactivation credit.

10317 3. Instead of conducting new monitoring under subdivision D 2 of this section, an owner
10318 may elect to meet the requirements of subdivision D 3 a or D 3 b of this section.

10319 a. The owner who has at least one year of existing data that are substantially
10320 equivalent to data collected under the provisions of subdivision D 3 of this section shall
10321 use these data to develop disinfection profiles if the owner has neither made a
10322 significant change to the treatment practice nor changed sources since the data were
10323 collected. The owner may develop a disinfection profile using up to three years of
10324 existing data.

10325 b. The owner may use a disinfection profile developed previously in accordance with
10326 the procedures in subdivisions D 1 through D 3 of this section, if the owner has neither
10327 made a change to the treatment practice nor changed sources since the profile was
10328 developed. An owner who has not developed a virus profile shall develop a virus
10329 disinfection profile using the same monitoring data on which the Giardia lamblia profile
10330 is based.

10331 E. The owner shall calculate the total inactivation ratio for Giardia lamblia and viruses as
10332 specified in subdivisions E 1 through E 4 of this subsection, based on CT_{99.9} (3-log) values using
10333 the appropriate values in Tables 500.2 through 500.14. Note that the 3-log values in the tables
10334 for Giardia lamblia also indicate that a 4-log virus inactivation can be achieved. pH and

10335 temperature values between the indicated values in Tables 500.2 through 500.14 shall be
10336 determined by linear interpolation, or the CT value at the lower temperature and at the higher pH
10337 shall be used. All parameters necessary to determine the total inactivation ratio shall be monitored
10338 during peak hourly flow.

10339 1. The owner using only one point of disinfectant application shall determine the total
10340 inactivation ratio for the disinfection segment based on either of the following methods:

10341 a. Determine one inactivation ratio ($CT_{calc}/CT_{99.9}$) before or at the first customer during
10342 peak hourly flow.

10343 b. Determine successive $CT_{calc}/CT_{99.9}$ values, representing sequential inactivation
10344 ratios, between the point of disinfectant application and a point before or at the first
10345 customer during peak hourly flow. The owner shall calculate the total inactivation ratio
10346 by determining ($CT_{calc}/CT_{99.9}$) for each sequence and then adding the ($CT_{calc}/CT_{99.9}$)
10347 values together to determine total inactivation ($\Sigma (CT_{calc}/CT_{99.9})$).

10348 2. The owner using more than one point of disinfectant application before the first customer
10349 shall determine the CT value of each disinfection segment immediately before the next
10350 point of disinfectant application, or for the final segment before or at the first customer,
10351 during peak hourly flow. The ($CT_{calc}/CT_{99.9}$) value of each segment and ($\Sigma (CT_{calc}/CT_{99.9})$)
10352 shall be calculated using the method in subdivision E 1 a or E 1 b of this subsection.

10353 3. The owner shall determine the total logs of inactivation of Giardia lamblia by multiplying
10354 the value calculated in subdivision E 1 a or E 1 b of this subsection by 3.0.

10355 4. The owner shall determine the total logs of inactivation of viruses by multiplying the
10356 value calculated in subdivision E 1 a or E 1 b of this subsection by 4.0.

10357 F. A disinfection benchmark shall be calculated following the procedures in subdivisions F 1
10358 through F 3 of this subsection.

10359 1. For each year of profiling data collected and calculated, an owner shall determine the
10360 lowest mean monthly level of both Giardia lamblia and virus inactivation. The owner shall
10361 determine the mean Giardia lamblia and virus inactivation for each calendar month for
10362 each year of profiling data by dividing the sum of daily or weekly Giardia lamblia and virus
10363 log inactivation by the number of values calculated for that month.

10364 2. The disinfection benchmark is the lowest monthly mean value (for waterworks with one
10365 year of profiling data) or the mean of the lowest monthly mean values (for waterworks with
10366 more than one year of profiling data) of Giardia lamblia and virus log inactivation in each
10367 year of profiling data.

10368 3. The owner of a waterworks using chloramines, ozone, or chlorine dioxide for primary
10369 disinfection shall calculate the disinfection benchmark for viruses from the data collected,
10370 in the same manner used to calculate the Giardia lamblia disinfection benchmark.

10371 G. The owner shall retain the disinfection profile in graphic form, as a spreadsheet, or in some
10372 other format acceptable to the department for evaluation as part of sanitary surveys conducted
10373 by the department.

10374 H. Before making a significant change to the waterworks disinfection practice, the owner shall
10375 review the disinfection benchmark and consult with the department.

10376 1. Significant changes to disinfection practice are (i) changes to the point of disinfectant
10377 application; (ii) changes to the disinfectants used in the treatment plant; (iii) changes to
10378 the disinfection process; and (iv) any other modification identified by the department.

10379 2. The owner shall submit the following information to the department as part of the
10380 consultation process: (i) a description of the proposed change; (ii) the disinfection profile
10381 and benchmarks established for Giardia lamblia and, if necessary, viruses; (iii) an analysis

10382 of how the proposed change will affect the current levels of disinfection; and (iv) any
 10383 additional information to justify the change.

TABLE 500.2.
CT Values for 3-Log Inactivation of Giardia lamblia by Free Chlorine at Less than 0.5°C .

10384

| <u>FREE RESIDUAL (mg/L)</u> | <u>pH</u> | | | | | | |
|-------------------------------------|-------------|------------|------------|------------|------------|------------|-------------|
| | <u>≤6.0</u> | <u>6.5</u> | <u>7.0</u> | <u>7.5</u> | <u>8.0</u> | <u>8.5</u> | <u>≤9.0</u> |
| <u>≤0.4</u> | <u>137</u> | <u>163</u> | <u>195</u> | <u>237</u> | <u>277</u> | <u>329</u> | <u>390</u> |
| <u>0.6</u> | <u>141</u> | <u>168</u> | <u>200</u> | <u>239</u> | <u>286</u> | <u>342</u> | <u>407</u> |
| <u>0.8</u> | <u>145</u> | <u>172</u> | <u>205</u> | <u>246</u> | <u>295</u> | <u>354</u> | <u>422</u> |
| <u>1.0</u> | <u>148</u> | <u>176</u> | <u>210</u> | <u>253</u> | <u>304</u> | <u>365</u> | <u>437</u> |
| <u>1.2</u> | <u>152</u> | <u>180</u> | <u>215</u> | <u>259</u> | <u>313</u> | <u>376</u> | <u>451</u> |
| <u>1.4</u> | <u>155</u> | <u>184</u> | <u>221</u> | <u>266</u> | <u>321</u> | <u>387</u> | <u>464</u> |
| <u>1.6</u> | <u>157</u> | <u>189</u> | <u>226</u> | <u>273</u> | <u>329</u> | <u>397</u> | <u>477</u> |
| <u>1.8</u> | <u>162</u> | <u>193</u> | <u>231</u> | <u>279</u> | <u>338</u> | <u>407</u> | <u>489</u> |
| <u>2.0</u> | <u>165</u> | <u>197</u> | <u>236</u> | <u>286</u> | <u>346</u> | <u>417</u> | <u>500</u> |
| <u>2.2</u> | <u>169</u> | <u>201</u> | <u>242</u> | <u>297</u> | <u>353</u> | <u>426</u> | <u>511</u> |
| <u>2.4</u> | <u>172</u> | <u>205</u> | <u>247</u> | <u>298</u> | <u>361</u> | <u>435</u> | <u>522</u> |
| <u>2.6</u> | <u>175</u> | <u>209</u> | <u>252</u> | <u>304</u> | <u>368</u> | <u>444</u> | <u>533</u> |
| <u>2.8</u> | <u>178</u> | <u>213</u> | <u>257</u> | <u>310</u> | <u>375</u> | <u>452</u> | <u>543</u> |
| <u>3.0</u> | <u>181</u> | <u>217</u> | <u>261</u> | <u>316</u> | <u>382</u> | <u>460</u> | <u>552</u> |

10385

TABLE 500.3.
CT Values for 3-Log Inactivation of Giardia lamblia by Free Chlorine at 5°C.

10386

| <u>FREE RESIDUAL (mg/L)</u> | <u>pH</u> | | | | | | |
|-------------------------------------|-------------|------------|------------|------------|------------|------------|-------------|
| | <u>≤6.0</u> | <u>6.5</u> | <u>7.0</u> | <u>7.5</u> | <u>8.0</u> | <u>8.5</u> | <u>≤9.0</u> |
| <u>≤0.4</u> | <u>97</u> | <u>117</u> | <u>139</u> | <u>166</u> | <u>198</u> | <u>236</u> | <u>279</u> |
| <u>0.6</u> | <u>100</u> | <u>120</u> | <u>143</u> | <u>171</u> | <u>204</u> | <u>244</u> | <u>291</u> |
| <u>0.8</u> | <u>103</u> | <u>122</u> | <u>146</u> | <u>175</u> | <u>210</u> | <u>252</u> | <u>301</u> |
| <u>1.0</u> | <u>105</u> | <u>125</u> | <u>149</u> | <u>179</u> | <u>216</u> | <u>260</u> | <u>312</u> |

| | | | | | | | |
|------------|------------|------------|------------|------------|------------|------------|------------|
| <u>1.2</u> | <u>107</u> | <u>127</u> | <u>152</u> | <u>183</u> | <u>221</u> | <u>267</u> | <u>320</u> |
| <u>1.4</u> | <u>109</u> | <u>130</u> | <u>155</u> | <u>187</u> | <u>227</u> | <u>274</u> | <u>329</u> |
| <u>1.6</u> | <u>111</u> | <u>132</u> | <u>158</u> | <u>192</u> | <u>232</u> | <u>281</u> | <u>337</u> |
| <u>1.8</u> | <u>114</u> | <u>135</u> | <u>162</u> | <u>196</u> | <u>238</u> | <u>287</u> | <u>345</u> |
| <u>2.0</u> | <u>116</u> | <u>138</u> | <u>165</u> | <u>200</u> | <u>243</u> | <u>294</u> | <u>353</u> |
| <u>2.2</u> | <u>118</u> | <u>140</u> | <u>169</u> | <u>204</u> | <u>248</u> | <u>300</u> | <u>361</u> |
| <u>2.4</u> | <u>120</u> | <u>143</u> | <u>172</u> | <u>209</u> | <u>253</u> | <u>306</u> | <u>368</u> |
| <u>2.6</u> | <u>122</u> | <u>146</u> | <u>175</u> | <u>213</u> | <u>258</u> | <u>312</u> | <u>375</u> |
| <u>2.8</u> | <u>124</u> | <u>148</u> | <u>178</u> | <u>217</u> | <u>263</u> | <u>318</u> | <u>382</u> |
| <u>3.0</u> | <u>126</u> | <u>151</u> | <u>182</u> | <u>221</u> | <u>268</u> | <u>324</u> | <u>389</u> |

10387

TABLE 500.4.
CT Values for 3-Log Inactivation of Giardia lamblia by Free Chlorine at 10°C.

10388

| <u>FREE RESIDUAL (mg/L)</u> | <u>pH</u> | | | | | | |
|-----------------------------|-------------|------------|------------|------------|------------|------------|-------------|
| | <u>≤6.0</u> | <u>6.5</u> | <u>7.0</u> | <u>7.5</u> | <u>8.0</u> | <u>8.5</u> | <u>≤9.0</u> |
| <u>≤0.4</u> | <u>73</u> | <u>88</u> | <u>104</u> | <u>125</u> | <u>149</u> | <u>177</u> | <u>209</u> |
| <u>0.6</u> | <u>75</u> | <u>90</u> | <u>107</u> | <u>128</u> | <u>153</u> | <u>183</u> | <u>218</u> |
| <u>0.8</u> | <u>78</u> | <u>92</u> | <u>110</u> | <u>131</u> | <u>158</u> | <u>189</u> | <u>226</u> |
| <u>1.0</u> | <u>79</u> | <u>94</u> | <u>112</u> | <u>134</u> | <u>162</u> | <u>195</u> | <u>234</u> |
| <u>1.2</u> | <u>80</u> | <u>95</u> | <u>114</u> | <u>137</u> | <u>166</u> | <u>200</u> | <u>240</u> |
| <u>1.4</u> | <u>82</u> | <u>98</u> | <u>116</u> | <u>140</u> | <u>170</u> | <u>206</u> | <u>247</u> |
| <u>1.6</u> | <u>83</u> | <u>99</u> | <u>119</u> | <u>144</u> | <u>174</u> | <u>211</u> | <u>253</u> |
| <u>1.8</u> | <u>86</u> | <u>101</u> | <u>122</u> | <u>147</u> | <u>179</u> | <u>215</u> | <u>259</u> |
| <u>2.0</u> | <u>87</u> | <u>104</u> | <u>124</u> | <u>150</u> | <u>182</u> | <u>221</u> | <u>265</u> |
| <u>2.2</u> | <u>89</u> | <u>105</u> | <u>127</u> | <u>153</u> | <u>186</u> | <u>225</u> | <u>271</u> |
| <u>2.4</u> | <u>90</u> | <u>107</u> | <u>129</u> | <u>157</u> | <u>190</u> | <u>230</u> | <u>276</u> |
| <u>2.6</u> | <u>92</u> | <u>110</u> | <u>131</u> | <u>160</u> | <u>194</u> | <u>234</u> | <u>281</u> |
| <u>2.8</u> | <u>93</u> | <u>111</u> | <u>134</u> | <u>163</u> | <u>197</u> | <u>239</u> | <u>287</u> |
| <u>3.0</u> | <u>95</u> | <u>113</u> | <u>137</u> | <u>166</u> | <u>201</u> | <u>243</u> | <u>292</u> |

10389

TABLE 500.5.
CT Values for 3-Log Inactivation of Giardia lamblia by Free Chlorine at 15°C.

10390

| 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 |

10391

TABLE 500.6.
CT Values for 3-Log Inactivation of Giardia lamblia by Free Chlorine at 20°C.

10392

| 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 |

| | | | | | | | |
|------------|-----------|-----------|-----------|-----------|------------|------------|------------|
| <u>1.6</u> | <u>42</u> | <u>50</u> | <u>59</u> | <u>72</u> | <u>87</u> | <u>105</u> | <u>126</u> |
| <u>1.8</u> | <u>43</u> | <u>51</u> | <u>61</u> | <u>74</u> | <u>89</u> | <u>108</u> | <u>129</u> |
| <u>2.0</u> | <u>44</u> | <u>52</u> | <u>62</u> | <u>75</u> | <u>91</u> | <u>110</u> | <u>132</u> |
| <u>2.2</u> | <u>44</u> | <u>53</u> | <u>63</u> | <u>77</u> | <u>93</u> | <u>113</u> | <u>135</u> |
| <u>2.4</u> | <u>45</u> | <u>54</u> | <u>65</u> | <u>78</u> | <u>95</u> | <u>115</u> | <u>138</u> |
| <u>2.6</u> | <u>46</u> | <u>55</u> | <u>66</u> | <u>80</u> | <u>97</u> | <u>117</u> | <u>141</u> |
| <u>2.8</u> | <u>47</u> | <u>56</u> | <u>67</u> | <u>81</u> | <u>99</u> | <u>119</u> | <u>143</u> |
| <u>3.0</u> | <u>47</u> | <u>57</u> | <u>68</u> | <u>83</u> | <u>101</u> | <u>122</u> | <u>146</u> |

10393

TABLE 500.7.
CT Values for 3-Log Inactivation of Giardia lamblia by Free Chlorine at 25°C and Higher.

10394

| <u>FREE RESIDUAL (mg/L)</u> | <u>pH</u> | | | | | | |
|-----------------------------|-------------|------------|------------|------------|------------|------------|-------------|
| | <u>≤6.0</u> | <u>6.5</u> | <u>7.0</u> | <u>7.5</u> | <u>8.0</u> | <u>8.5</u> | <u>≤9.0</u> |
| <u>≤0.4</u> | <u>24</u> | <u>29</u> | <u>35</u> | <u>42</u> | <u>50</u> | <u>59</u> | <u>70</u> |
| <u>0.6</u> | <u>25</u> | <u>30</u> | <u>36</u> | <u>43</u> | <u>51</u> | <u>61</u> | <u>73</u> |
| <u>0.8</u> | <u>26</u> | <u>31</u> | <u>37</u> | <u>44</u> | <u>53</u> | <u>63</u> | <u>75</u> |
| <u>1.0</u> | <u>26</u> | <u>31</u> | <u>37</u> | <u>45</u> | <u>54</u> | <u>65</u> | <u>78</u> |
| <u>1.2</u> | <u>27</u> | <u>32</u> | <u>38</u> | <u>46</u> | <u>55</u> | <u>67</u> | <u>80</u> |
| <u>1.4</u> | <u>27</u> | <u>33</u> | <u>39</u> | <u>47</u> | <u>57</u> | <u>69</u> | <u>82</u> |
| <u>1.6</u> | <u>28</u> | <u>33</u> | <u>40</u> | <u>48</u> | <u>58</u> | <u>70</u> | <u>84</u> |
| <u>1.8</u> | <u>29</u> | <u>34</u> | <u>41</u> | <u>49</u> | <u>60</u> | <u>72</u> | <u>86</u> |
| <u>2.0</u> | <u>29</u> | <u>35</u> | <u>41</u> | <u>50</u> | <u>61</u> | <u>74</u> | <u>88</u> |
| <u>2.2</u> | <u>30</u> | <u>35</u> | <u>42</u> | <u>51</u> | <u>62</u> | <u>75</u> | <u>90</u> |
| <u>2.4</u> | <u>30</u> | <u>36</u> | <u>43</u> | <u>52</u> | <u>63</u> | <u>77</u> | <u>92</u> |
| <u>2.6</u> | <u>31</u> | <u>37</u> | <u>44</u> | <u>53</u> | <u>65</u> | <u>78</u> | <u>94</u> |
| <u>2.8</u> | <u>31</u> | <u>37</u> | <u>45</u> | <u>54</u> | <u>66</u> | <u>80</u> | <u>96</u> |
| <u>3.0</u> | <u>32</u> | <u>38</u> | <u>46</u> | <u>55</u> | <u>67</u> | <u>81</u> | <u>97</u> |

10395

TABLE 500.8.
CT Values for Inactivation of Viruses by Free Chlorine, pH 6.0-9.0.

| | |
|--|-------------------------------|
| | <u>WATER TEMPERATURE (°C)</u> |
|--|-------------------------------|

| <u>LOG INACTIVATION CREDIT</u> | <u>0.5</u> | <u>1</u> | <u>2</u> | <u>3</u> | <u>4</u> | <u>5</u> | <u>6</u> | <u>7</u> | <u>8</u> |
|--------------------------------|-------------------------------|-------------|-------------|------------|------------|------------|------------|------------|------------|
| <u>2</u> | <u>6.0</u> | <u>5.8</u> | <u>5.3</u> | <u>4.9</u> | <u>4.4</u> | <u>4.0</u> | <u>3.8</u> | <u>3.6</u> | <u>3.4</u> |
| <u>3</u> | <u>9.0</u> | <u>8.7</u> | <u>8.0</u> | <u>7.3</u> | <u>6.7</u> | <u>6.0</u> | <u>5.6</u> | <u>5.2</u> | <u>4.8</u> |
| <u>4</u> | <u>12.0</u> | <u>11.6</u> | <u>10.7</u> | <u>9.8</u> | <u>8.9</u> | <u>8.0</u> | <u>7.6</u> | <u>7.2</u> | <u>6.8</u> |
| <u>LOG INACTIVATION CREDIT</u> | <u>WATER TEMPERATURE (°C)</u> | | | | | | | | |
| | <u>9</u> | <u>10</u> | <u>11</u> | <u>12</u> | <u>13</u> | <u>14</u> | <u>15</u> | <u>16</u> | <u>17</u> |
| <u>2</u> | <u>3.2</u> | <u>3.0</u> | <u>2.8</u> | <u>2.6</u> | <u>2.4</u> | <u>2.2</u> | <u>2.0</u> | <u>1.8</u> | <u>1.6</u> |
| <u>3</u> | <u>4.4</u> | <u>4.0</u> | <u>3.8</u> | <u>3.6</u> | <u>3.4</u> | <u>3.2</u> | <u>3.0</u> | <u>2.8</u> | <u>2.6</u> |
| <u>4</u> | <u>6.4</u> | <u>6.0</u> | <u>5.6</u> | <u>5.2</u> | <u>4.8</u> | <u>4.4</u> | <u>4.0</u> | <u>3.8</u> | <u>3.6</u> |
| <u>LOG INACTIVATION CREDIT</u> | <u>WATER TEMPERATURE (°C)</u> | | | | | | | | |
| | <u>18</u> | <u>19</u> | <u>20</u> | <u>21</u> | <u>22</u> | <u>23</u> | <u>24</u> | <u>25</u> | - |
| <u>2</u> | <u>1.4</u> | <u>1.2</u> | <u>1.0</u> | <u>1.0</u> | <u>1.0</u> | <u>1.0</u> | <u>1.0</u> | <u>1.0</u> | - |
| <u>3</u> | <u>2.4</u> | <u>2.2</u> | <u>2.0</u> | <u>1.8</u> | <u>1.6</u> | <u>1.4</u> | <u>1.2</u> | <u>1.0</u> | - |
| <u>4</u> | <u>3.4</u> | <u>3.2</u> | <u>3.0</u> | <u>2.8</u> | <u>2.6</u> | <u>2.4</u> | <u>2.2</u> | <u>2.0</u> | - |

10396

TABLE 500.9.

CT Values for Inactivation of Giardia lamblia by Chlorine Dioxide, pH 6.0-9.0.

| <u>LOG INACTIVATION CREDIT</u> | <u>WATER TEMPERATURE (°C)</u> | | | | | | | | |
|--------------------------------|-------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| | <u>1</u> | <u>2</u> | <u>3</u> | <u>4</u> | <u>5</u> | <u>6</u> | <u>7</u> | <u>8</u> | <u>9</u> |
| <u>0.5</u> | <u>10.0</u> | <u>8.6</u> | <u>7.2</u> | <u>5.7</u> | <u>4.3</u> | <u>4.2</u> | <u>4.2</u> | <u>4.1</u> | <u>4.1</u> |
| <u>1</u> | <u>21.0</u> | <u>17.9</u> | <u>14.9</u> | <u>11.8</u> | <u>8.7</u> | <u>8.5</u> | <u>8.3</u> | <u>8.1</u> | <u>7.9</u> |
| <u>1.5</u> | <u>32.0</u> | <u>27.3</u> | <u>22.5</u> | <u>17.8</u> | <u>13.0</u> | <u>12.8</u> | <u>12.6</u> | <u>12.4</u> | <u>12.2</u> |
| <u>2</u> | <u>42.0</u> | <u>35.8</u> | <u>29.5</u> | <u>23.3</u> | <u>17.0</u> | <u>16.6</u> | <u>16.2</u> | <u>15.8</u> | <u>15.4</u> |
| <u>2.5</u> | <u>52.0</u> | <u>44.5</u> | <u>37.0</u> | <u>29.5</u> | <u>22.0</u> | <u>21.4</u> | <u>20.8</u> | <u>20.2</u> | <u>19.6</u> |
| <u>3</u> | <u>63.0</u> | <u>53.8</u> | <u>44.5</u> | <u>35.3</u> | <u>26.0</u> | <u>25.4</u> | <u>24.8</u> | <u>24.2</u> | <u>23.6</u> |
| <u>LOG INACTIVATION CREDIT</u> | <u>WATER TEMPERATURE (°C)</u> | | | | | | | | |
| | <u>10</u> | <u>11</u> | <u>12</u> | <u>13</u> | <u>14</u> | <u>15</u> | <u>16</u> | <u>17</u> | <u>18</u> |
| <u>0.5</u> | <u>4.0</u> | <u>3.8</u> | <u>3.7</u> | <u>3.5</u> | <u>3.4</u> | <u>3.2</u> | <u>3.1</u> | <u>2.9</u> | <u>2.8</u> |
| <u>1</u> | <u>7.7</u> | <u>7.4</u> | <u>7.1</u> | <u>6.9</u> | <u>6.6</u> | <u>6.3</u> | <u>6.0</u> | <u>5.8</u> | <u>5.5</u> |
| <u>1.5</u> | <u>12.0</u> | <u>11.6</u> | <u>11.2</u> | <u>10.8</u> | <u>10.4</u> | <u>10.0</u> | <u>9.5</u> | <u>9.0</u> | <u>8.5</u> |
| <u>2</u> | <u>15.0</u> | <u>14.6</u> | <u>14.2</u> | <u>13.8</u> | <u>13.4</u> | <u>13.0</u> | <u>12.4</u> | <u>11.8</u> | <u>11.2</u> |

| | | | | | | | | | |
|--|-------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|------------|------------|
| <u>2.5</u> | <u>19.0</u> | <u>3.8</u> | <u>3.7</u> | <u>3.5</u> | <u>3.4</u> | <u>3.2</u> | <u>3.1</u> | <u>2.9</u> | <u>2.8</u> |
| <u>3</u> | <u>23.0</u> | <u>7.4</u> | <u>7.1</u> | <u>6.9</u> | <u>6.6</u> | <u>6.3</u> | <u>6.0</u> | <u>5.8</u> | <u>5.5</u> |
| <u>LOG INACTIVATION CREDIT</u> | <u>WATER TEMPERATURE (°C)</u> | | | | | | | | |
| | <u>19</u> | <u>20</u> | <u>21</u> | <u>22</u> | <u>23</u> | <u>24</u> | <u>25</u> | - | - |
| <u>0.5</u> | <u>2.6</u> | <u>2.5</u> | <u>2.4</u> | <u>2.3</u> | <u>2.2</u> | <u>2.1</u> | <u>2.0</u> | - | - |
| <u>1</u> | <u>5.3</u> | <u>5.0</u> | <u>4.7</u> | <u>4.5</u> | <u>4.2</u> | <u>4.0</u> | <u>3.7</u> | - | - |
| <u>1.5</u> | <u>8.0</u> | <u>7.5</u> | <u>7.1</u> | <u>6.7</u> | <u>6.3</u> | <u>5.9</u> | <u>5.5</u> | - | - |
| <u>2</u> | <u>10.6</u> | <u>10.0</u> | <u>9.5</u> | <u>8.9</u> | <u>8.4</u> | <u>7.8</u> | <u>7.3</u> | - | - |
| <u>2.5</u> | <u>2.6</u> | <u>2.5</u> | <u>12.2</u> | <u>11.4</u> | <u>10.6</u> | <u>9.8</u> | <u>9.0</u> | - | - |
| <u>3</u> | <u>5.3</u> | <u>5.0</u> | <u>14.2</u> | <u>13.4</u> | <u>12.6</u> | <u>11.8</u> | <u>11.0</u> | - | - |

10397

TABLE 500.10.

CT Values for Inactivation of Virus by Chlorine Dioxide, pH 6.0-9.0.

| | | | | | | | | | |
|--|-------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| <u>LOG INACTIVATION CREDIT</u> | <u>WATER TEMPERATURE (°C)</u> | | | | | | | | |
| | <u>1</u> | <u>2</u> | <u>3</u> | <u>4</u> | <u>5</u> | <u>6</u> | <u>7</u> | <u>8</u> | <u>9</u> |
| <u>2</u> | <u>8.4</u> | <u>7.7</u> | <u>7.0</u> | <u>6.3</u> | <u>5.6</u> | <u>5.3</u> | <u>5.0</u> | <u>4.8</u> | <u>4.5</u> |
| <u>3</u> | <u>25.6</u> | <u>23.5</u> | <u>21.4</u> | <u>19.2</u> | <u>17.1</u> | <u>16.2</u> | <u>15.4</u> | <u>14.5</u> | <u>13.7</u> |
| <u>4</u> | <u>50.1</u> | <u>45.9</u> | <u>41.8</u> | <u>37.6</u> | <u>33.4</u> | <u>31.7</u> | <u>30.1</u> | <u>28.4</u> | <u>26.8</u> |
| <u>LOG INACTIVATION CREDIT</u> | <u>WATER TEMPERATURE (°C)</u> | | | | | | | | |
| | <u>10</u> | <u>11</u> | <u>12</u> | <u>13</u> | <u>14</u> | <u>15</u> | <u>16</u> | <u>17</u> | <u>18</u> |
| <u>2</u> | <u>4.2</u> | <u>3.9</u> | <u>3.6</u> | <u>3.4</u> | <u>3.1</u> | <u>2.8</u> | <u>2.7</u> | <u>2.5</u> | <u>2.4</u> |
| <u>3</u> | <u>12.8</u> | <u>12.0</u> | <u>11.1</u> | <u>10.3</u> | <u>9.4</u> | <u>8.6</u> | <u>8.2</u> | <u>7.7</u> | <u>7.3</u> |
| <u>4</u> | <u>25.1</u> | <u>23.4</u> | <u>21.7</u> | <u>20.1</u> | <u>18.4</u> | <u>16.7</u> | <u>15.9</u> | <u>15.0</u> | <u>14.2</u> |
| <u>LOG INACTIVATION CREDIT</u> | <u>WATER TEMPERATURE (°C)</u> | | | | | | | | |
| | <u>19</u> | <u>20</u> | <u>21</u> | <u>22</u> | <u>23</u> | <u>24</u> | <u>25</u> | - | |
| <u>2</u> | <u>2.2</u> | <u>2.1</u> | <u>2.0</u> | <u>1.8</u> | <u>1.7</u> | <u>1.5</u> | <u>1.4</u> | - | |
| <u>3</u> | <u>6.8</u> | <u>6.4</u> | <u>6.0</u> | <u>5.6</u> | <u>5.1</u> | <u>4.7</u> | <u>4.3</u> | - | |
| <u>4</u> | <u>13.3</u> | <u>12.5</u> | <u>11.7</u> | <u>10.9</u> | <u>10.0</u> | <u>9.2</u> | <u>8.4</u> | - | |

10398

TABLE 500.11.

CT Values for Inactivation of Giardia lamblia by Chloramines, pH 6.0-9.0.

| <u>LOG INACTIVATIO N CREDIT</u> | <u>WATER TEMPERATURE (°C)</u> | | | | | | | | |
|---|-------------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| | <u>1</u> | <u>2</u> | <u>3</u> | <u>4</u> | <u>5</u> | <u>6</u> | <u>7</u> | <u>8</u> | <u>9</u> |
| <u>0.5</u> | <u>635</u> | <u>568</u> | <u>500</u> | <u>433</u> | <u>365</u> | <u>354</u> | <u>343</u> | <u>332</u> | <u>321</u> |
| <u>1</u> | <u>1,27</u> <u>0</u> | <u>1,13</u> <u>6</u> | <u>1,00</u> <u>3</u> | <u>869</u> | <u>735</u> | <u>711</u> | <u>687</u> | <u>663</u> | <u>639</u> |
| <u>1.5</u> | <u>1,90</u> <u>0</u> | <u>1,70</u> <u>0</u> | <u>1,50</u> <u>0</u> | <u>1,30</u> <u>0</u> | <u>1,10</u> <u>0</u> | <u>1,06</u> <u>6</u> | <u>1,03</u> <u>2</u> | <u>998</u> | <u>964</u> |
| <u>2</u> | <u>2,53</u> <u>5</u> | <u>2,26</u> <u>9</u> | <u>2,00</u> <u>3</u> | <u>1,73</u> <u>6</u> | <u>1,47</u> <u>0</u> | <u>1,42</u> <u>2</u> | <u>1,37</u> <u>4</u> | <u>1,32</u> <u>6</u> | <u>1,27</u> <u>8</u> |
| <u>2.5</u> | <u>3,17</u> <u>0</u> | <u>2,83</u> <u>5</u> | <u>2,50</u> <u>0</u> | <u>2,16</u> <u>5</u> | <u>1,83</u> <u>0</u> | <u>1,77</u> <u>2</u> | <u>1,71</u> <u>4</u> | <u>1,65</u> <u>6</u> | <u>1,59</u> <u>8</u> |
| <u>3</u> | <u>3,80</u> <u>0</u> | <u>3,40</u> <u>0</u> | <u>3,00</u> <u>0</u> | <u>2,60</u> <u>0</u> | <u>2,20</u> <u>0</u> | <u>2,13</u> <u>0</u> | <u>2,06</u> <u>0</u> | <u>1,99</u> <u>0</u> | <u>1,92</u> <u>0</u> |
| <u>LOG INACTIVATIO N CREDIT</u> | <u>WATER TEMPERATURE (°C)</u> | | | | | | | | |
| | <u>10</u> | <u>11</u> | <u>12</u> | <u>13</u> | <u>14</u> | <u>15</u> | <u>16</u> | <u>17</u> | <u>18</u> |
| <u>0.5</u> | <u>310</u> | <u>298</u> | <u>286</u> | <u>274</u> | <u>262</u> | <u>250</u> | <u>237</u> | <u>224</u> | <u>211</u> |
| <u>1</u> | <u>615</u> | <u>592</u> | <u>569</u> | <u>546</u> | <u>523</u> | <u>500</u> | <u>474</u> | <u>448</u> | <u>422</u> |
| <u>1.5</u> | <u>930</u> | <u>894</u> | <u>858</u> | <u>822</u> | <u>786</u> | <u>750</u> | <u>710</u> | <u>670</u> | <u>630</u> |
| <u>2</u> | <u>1,23</u> <u>0</u> | <u>1,18</u> <u>4</u> | <u>1,13</u> <u>8</u> | <u>1,09</u> <u>2</u> | <u>1,04</u> <u>6</u> | <u>1,00</u> <u>0</u> | <u>947</u> | <u>894</u> | <u>841</u> |
| <u>2.5</u> | <u>1,54</u> <u>0</u> | <u>1,48</u> <u>2</u> | <u>1,42</u> <u>4</u> | <u>1,36</u> <u>6</u> | <u>1,30</u> <u>8</u> | <u>1,25</u> <u>0</u> | <u>1,18</u> <u>3</u> | <u>1,11</u> <u>6</u> | <u>1,04</u> <u>9</u> |
| <u>3</u> | <u>1,85</u> <u>0</u> | <u>1,78</u> <u>0</u> | <u>1,71</u> <u>0</u> | <u>1,64</u> <u>0</u> | <u>1,57</u> <u>0</u> | <u>1,50</u> <u>0</u> | <u>1,42</u> <u>0</u> | <u>1,34</u> <u>0</u> | <u>1,26</u> <u>0</u> |
| <u>LOG INACTIVATIO N CREDIT</u> | <u>WATER TEMPERATURE (°C)</u> | | | | | | | | |
| | <u>19</u> | <u>20</u> | <u>21</u> | <u>22</u> | <u>23</u> | <u>24</u> | <u>25</u> | | |
| <u>0.5</u> | <u>198</u> | <u>185</u> | <u>173</u> | <u>161</u> | <u>149</u> | <u>137</u> | <u>125</u> | | |
| <u>1</u> | <u>396</u> | <u>370</u> | <u>346</u> | <u>322</u> | <u>298</u> | <u>274</u> | <u>250</u> | | |
| <u>1.5</u> | <u>590</u> | <u>550</u> | <u>515</u> | <u>480</u> | <u>445</u> | <u>410</u> | <u>375</u> | | |
| <u>2</u> | <u>788</u> | <u>735</u> | <u>688</u> | <u>641</u> | <u>594</u> | <u>547</u> | <u>500</u> | | |
| <u>2.5</u> | <u>982</u> | <u>915</u> | <u>857</u> | <u>799</u> | <u>741</u> | <u>683</u> | <u>625</u> | | |
| <u>3</u> | <u>1,18</u> <u>0</u> | <u>1,10</u> <u>0</u> | <u>1,03</u> <u>0</u> | <u>960</u> | <u>890</u> | <u>820</u> | <u>750</u> | | |

10399

TABLE 500.12.

CT Values for Inactivation of Virus by Chloramines, pH 6.0-9.0.

| <u>LOG INACTIVATIO N CREDIT</u> | <u>WATER TEMPERATURE (°C)</u> | | | | | | | | |
|---|-------------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| | <u>1</u> | <u>2</u> | <u>3</u> | <u>4</u> | <u>5</u> | <u>6</u> | <u>7</u> | <u>8</u> | <u>9</u> |
| <u>2</u> | <u>1,24</u> <u>3</u> | <u>1,14</u> <u>7</u> | <u>1,05</u> <u>0</u> | <u>954</u> | <u>857</u> | <u>814</u> | <u>771</u> | <u>729</u> | <u>686</u> |
| <u>3</u> | <u>2,06</u> <u>3</u> | <u>1,90</u> <u>3</u> | <u>1,74</u> <u>3</u> | <u>1,58</u> <u>3</u> | <u>1,42</u> <u>3</u> | <u>1,35</u> <u>2</u> | <u>1,28</u> <u>1</u> | <u>1,20</u> <u>9</u> | <u>1,13</u> <u>8</u> |
| <u>4</u> | <u>2,88</u> <u>3</u> | <u>2,65</u> <u>9</u> | <u>2,43</u> <u>6</u> | <u>2,21</u> <u>2</u> | <u>1,98</u> <u>8</u> | <u>1,88</u> <u>9</u> | <u>1,78</u> <u>9</u> | <u>1,69</u> <u>0</u> | <u>1,59</u> <u>0</u> |
| <u>LOG INACTIVATIO N CREDIT</u> | <u>WATER TEMPERATURE (°C)</u> | | | | | | | | |
| | <u>10</u> | <u>11</u> | <u>12</u> | <u>13</u> | <u>14</u> | <u>15</u> | <u>16</u> | <u>17</u> | <u>18</u> |
| <u>2</u> | <u>643</u> | <u>600</u> | <u>557</u> | <u>514</u> | <u>471</u> | <u>428</u> | <u>407</u> | <u>385</u> | <u>364</u> |
| <u>3</u> | <u>1,06</u> <u>7</u> | <u>996</u> | <u>925</u> | <u>854</u> | <u>783</u> | <u>712</u> | <u>676</u> | <u>641</u> | <u>605</u> |
| <u>4</u> | <u>1,49</u> <u>1</u> | <u>1392</u> | <u>1292</u> | <u>1193</u> | <u>1,09</u> <u>3</u> | <u>994</u> | <u>944</u> | <u>895</u> | <u>845</u> |
| <u>LOG INACTIVATIO N CREDIT</u> | <u>WATER TEMPERATURE (°C)</u> | | | | | | | | |
| | <u>19</u> | <u>20</u> | <u>21</u> | <u>22</u> | <u>23</u> | <u>24</u> | <u>25</u> | - | - |
| <u>2</u> | <u>342</u> | <u>321</u> | <u>300</u> | <u>278</u> | <u>257</u> | <u>235</u> | <u>214</u> | - | - |
| <u>3</u> | <u>570</u> | <u>534</u> | <u>498</u> | <u>463</u> | <u>427</u> | <u>392</u> | <u>356</u> | - | - |
| <u>4</u> | <u>796</u> | <u>746</u> | <u>696</u> | <u>646</u> | <u>597</u> | <u>547</u> | <u>497</u> | - | - |

10400

TABLE 500.13.

CT Values for Inactivation of Giardia lamblia by Ozone.

| <u>LOG INACTIVATION CREDIT</u> | <u>WATER TEMPERATURE (°C)</u> | | | | | | | | |
|--|-------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| | <u>1</u> | <u>2</u> | <u>3</u> | <u>4</u> | <u>5</u> | <u>6</u> | <u>7</u> | <u>8</u> | <u>9</u> |
| <u>0.5</u> | <u>0.48</u> | <u>0.44</u> | <u>0.40</u> | <u>0.36</u> | <u>0.32</u> | <u>0.30</u> | <u>0.28</u> | <u>0.27</u> | <u>0.25</u> |
| <u>1</u> | <u>0.97</u> | <u>0.89</u> | <u>0.80</u> | <u>0.72</u> | <u>0.63</u> | <u>0.60</u> | <u>0.57</u> | <u>0.54</u> | <u>0.51</u> |
| <u>1.5</u> | <u>1.50</u> | <u>1.36</u> | <u>1.23</u> | <u>1.09</u> | <u>0.95</u> | <u>0.90</u> | <u>0.86</u> | <u>0.81</u> | <u>0.77</u> |
| <u>2</u> | <u>1.90</u> | <u>1.75</u> | <u>1.60</u> | <u>1.45</u> | <u>1.30</u> | <u>1.23</u> | <u>1.16</u> | <u>1.09</u> | <u>1.02</u> |
| <u>2.5</u> | <u>2.40</u> | <u>2.20</u> | <u>2.00</u> | <u>1.80</u> | <u>1.60</u> | <u>1.52</u> | <u>1.44</u> | <u>1.36</u> | <u>1.28</u> |
| <u>3</u> | <u>2.90</u> | <u>2.65</u> | <u>2.40</u> | <u>2.15</u> | <u>1.90</u> | <u>1.81</u> | <u>1.71</u> | <u>1.62</u> | <u>1.52</u> |
| | <u>WATER TEMPERATURE (°C)</u> | | | | | | | | |

| <u>LOG INACTIVATION CREDIT</u> | <u>10</u> | <u>11</u> | <u>12</u> | <u>13</u> | <u>14</u> | <u>15</u> | <u>16</u> | <u>17</u> | <u>18</u> |
|--|-------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| | <u>0.5</u> | <u>0.23</u> | <u>0.22</u> | <u>0.20</u> | <u>0.19</u> | <u>0.17</u> | <u>0.16</u> | <u>0.15</u> | <u>0.14</u> |
| <u>1</u> | <u>0.48</u> | <u>0.45</u> | <u>0.42</u> | <u>0.38</u> | <u>0.35</u> | <u>0.32</u> | <u>0.30</u> | <u>0.29</u> | <u>0.27</u> |
| <u>1.5</u> | <u>0.72</u> | <u>0.67</u> | <u>0.62</u> | <u>0.58</u> | <u>0.53</u> | <u>0.48</u> | <u>0.46</u> | <u>0.43</u> | <u>0.41</u> |
| <u>2</u> | <u>0.95</u> | <u>0.89</u> | <u>0.82</u> | <u>0.76</u> | <u>0.69</u> | <u>0.63</u> | <u>0.60</u> | <u>0.57</u> | <u>0.54</u> |
| <u>2.5</u> | <u>1.20</u> | <u>1.12</u> | <u>1.04</u> | <u>0.95</u> | <u>0.87</u> | <u>0.79</u> | <u>0.75</u> | <u>0.71</u> | <u>0.68</u> |
| <u>3</u> | <u>1.43</u> | <u>1.33</u> | <u>1.24</u> | <u>1.14</u> | <u>1.05</u> | <u>0.95</u> | <u>0.90</u> | <u>0.86</u> | <u>0.81</u> |
| <u>LOG INACTIVATION CREDIT</u> | <u>WATER TEMPERATURE (°C)</u> | | | | | | | | |
| | <u>19</u> | <u>20</u> | <u>21</u> | <u>22</u> | <u>23</u> | <u>24</u> | <u>25</u> | - | - |
| <u>0.5</u> | <u>0.13</u> | <u>0.12</u> | <u>0.11</u> | <u>0.10</u> | <u>0.10</u> | <u>0.09</u> | <u>0.08</u> | - | - |
| <u>1</u> | <u>0.26</u> | <u>0.24</u> | <u>0.22</u> | <u>0.21</u> | <u>0.19</u> | <u>0.18</u> | <u>0.16</u> | - | - |
| <u>1.5</u> | <u>0.38</u> | <u>0.36</u> | <u>0.34</u> | <u>0.31</u> | <u>0.29</u> | <u>0.26</u> | <u>0.24</u> | - | - |
| <u>2</u> | <u>0.51</u> | <u>0.48</u> | <u>0.45</u> | <u>0.42</u> | <u>0.38</u> | <u>0.35</u> | <u>0.32</u> | - | - |
| <u>2.5</u> | <u>0.64</u> | <u>0.60</u> | <u>0.56</u> | <u>0.52</u> | <u>0.48</u> | <u>0.44</u> | <u>0.40</u> | - | - |
| <u>3</u> | <u>0.13</u> | <u>0.12</u> | <u>0.11</u> | <u>0.10</u> | <u>0.10</u> | <u>0.09</u> | <u>0.08</u> | | |

10401

TABLE 500.14.
CT Values for Inactivation of Virus by Ozone.

| <u>LOG INACTIVATION CREDIT</u> | <u>WATER TEMPERATURE (°C)</u> | | | | | | | | |
|--|-------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| | <u>1</u> | <u>2</u> | <u>3</u> | <u>4</u> | <u>5</u> | <u>6</u> | <u>7</u> | <u>8</u> | <u>9</u> |
| <u>2</u> | <u>0.90</u> | <u>0.83</u> | <u>0.75</u> | <u>0.68</u> | <u>0.60</u> | <u>0.58</u> | <u>0.56</u> | <u>0.54</u> | <u>0.52</u> |
| <u>3</u> | <u>1.40</u> | <u>1.28</u> | <u>1.15</u> | <u>1.03</u> | <u>0.90</u> | <u>0.88</u> | <u>0.86</u> | <u>0.84</u> | <u>0.82</u> |
| <u>4</u> | <u>1.80</u> | <u>1.65</u> | <u>1.50</u> | <u>1.35</u> | <u>1.20</u> | <u>1.16</u> | <u>1.12</u> | <u>1.08</u> | <u>1.04</u> |
| <u>LOG INACTIVATION CREDIT</u> | <u>WATER TEMPERATURE (°C)</u> | | | | | | | | |
| | <u>10</u> | <u>11</u> | <u>12</u> | <u>13</u> | <u>14</u> | <u>15</u> | <u>16</u> | <u>17</u> | <u>18</u> |
| <u>2</u> | <u>0.50</u> | <u>0.46</u> | <u>0.42</u> | <u>0.38</u> | <u>0.34</u> | <u>0.30</u> | <u>0.29</u> | <u>0.28</u> | <u>0.27</u> |
| <u>3</u> | <u>0.80</u> | <u>0.74</u> | <u>0.68</u> | <u>0.62</u> | <u>0.56</u> | <u>0.50</u> | <u>0.48</u> | <u>0.46</u> | <u>0.44</u> |
| <u>4</u> | <u>1.00</u> | <u>0.92</u> | <u>0.84</u> | <u>0.76</u> | <u>0.68</u> | <u>0.60</u> | <u>0.58</u> | <u>0.56</u> | <u>0.54</u> |
| <u>LOG INACTIVATION CREDIT</u> | <u>WATER TEMPERATURE (°C)</u> | | | | | | | | |
| | <u>19</u> | <u>20</u> | <u>21</u> | <u>22</u> | <u>23</u> | <u>24</u> | <u>25</u> | - | - |
| <u>2</u> | <u>0.26</u> | <u>0.25</u> | <u>0.23</u> | <u>0.21</u> | <u>0.19</u> | <u>0.17</u> | <u>0.15</u> | - | - |

| | | | | | | | | | |
|----------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|---|---|
| <u>3</u> | <u>0.42</u> | <u>0.40</u> | <u>0.37</u> | <u>0.34</u> | <u>0.31</u> | <u>0.28</u> | <u>0.25</u> | - | - |
| <u>4</u> | <u>0.52</u> | <u>0.50</u> | <u>0.46</u> | <u>0.42</u> | <u>0.38</u> | <u>0.34</u> | <u>0.30</u> | - | - |

10402

TABLE 500.15.
Baffling Classifications.

| <u>BAFFLING CONDITION</u> | <u>T₁₀/T</u> | <u>BAFFLING DESCRIPTION</u> |
|--|-------------------------|--|
| <u>Unbaffled (mixed flow)</u> | <u>0.1</u> | <u>None, agitated basin, very low length-to-width ratio, high inlet and outlet flow velocities</u> |
| <u>Poor</u> | <u>0.3</u> | <u>Single or multiple unbaffled inlets and outlets, no intra-basin baffles</u> |
| <u>Average</u> | <u>0.5</u> | <u>Baffled inlet or outlet with some intra-basin baffles</u> |
| <u>Superior</u> | <u>0.7</u> | <u>Perforated inlet baffle, serpentine or perforated intra-basin baffles, outlet weir or perforated launders</u> |
| ^a At perfect plug flow conditions, T ₁₀ is equal to T. | | |

10403

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10407 **12VAC5-590-505. Emergency management plan for extended power outages.**

10408 A. ~~Each~~ The owner of a community waterworks (including consecutive waterworks) shall
 10409 develop and maintain an emergency management plan for extended power outages.

10410 B. ~~Each~~ The plan shall be kept current and shall be kept ~~retained~~ at a location that is readily
 10411 accessible to the owner in the event of an extended power outage.

10412 C. ~~Each~~ The owner of a community waterworks shall certify in writing to the ~~appropriate field~~
 10413 ~~office of the Office of Drinking Water in the Department of Health~~ department that the waterworks
 10414 plan has been completed ~~such plan~~.

10415 D. ~~Each~~ The plan shall address the following where applicable:

- 10416 1. Identification of the criteria (events, duration of power outage, etc.) that will initiate
10417 activation of the plan.
- 10418 2. How the ~~community waterworks~~ owner will respond to an extended power outage for
10419 lasting a minimum of five days.
- 10420 3. Procedures for obtaining and distributing potable water in the event that the primary
10421 ~~source(s) becomes~~ source or sources become unavailable.
- 10422 4. Notification procedures and example notices to the public and media (local radio
10423 stations, television stations, local newspapers, etc.) including conservation notices and
10424 boil water advisories.
- 10425 5. Emergency disinfection procedures for the distribution ~~system(s)~~system and storage
10426 ~~tank(s)~~ tank or tanks.
- 10427 6. The ~~telephone number of~~ point of contact for the appropriate ~~ODW~~ field office of the
10428 ~~Office of Drinking Water in the Virginia Department of Health~~department.
- 10429 7. The ~~names and telephone numbers of~~ points of contact for the waterworks personnel
10430 who should be notified.
- 10431 8. The ~~name and telephone number of~~ point of contact for the Local Emergency
10432 Coordinator designated by the Virginia Department of Emergency Management.
- 10433 9. The ~~names and telephone numbers of~~ points of contact for the electric power, natural
10434 gas, and propane distributors, or other energy supplier to the waterworks.
- 10435 **12VAC5-590-510. Acceptable operating practices.**
- 10436 A. This section is not intended to be all inclusive but reflects the concern for the public health
10437 significance of certain practices related to ~~treatment plant~~ waterworks operation.

10438 ~~B. Waterworks designed for bacteria and turbidity removal shall not be operated without~~
10439 ~~adequate chemical coagulation as determined by the division.~~

10440 B. Filter operation.

10441 1. Gravity flow granular media filters designed for pathogen and turbidity removal shall not
10442 be operated without adequate chemical coagulation as determined by the department.

10443 2. A waterworks utilizing gravity flow granular media filtration shall not vary the rate of
10444 filtration through any single filter above its design capacity unless approved by the
10445 department.

10446 3. Gravity flow granular media filters equipped with filter-to-waste facilities shall not be
10447 returned to service after backwashing until a thorough rinsing period has occurred so that
10448 the filter-to-waste water has a turbidity less than or equal to 0.3 NTU.

10449 4. All MF and UF technologies employed for pathogen removal shall demonstrate removal
10450 efficiency equal to the removal (log inactivation) credit given in Table 500.1 in 12VAC5-
10451 590-500 C 2. A direct integrity test acceptable to the department shall be conducted and
10452 include the following:

10453 a. The direct integrity test capability shall be provided for each filter unit, and

10454 b. The direct integrity test shall be conducted at least daily for each day the filtration
10455 unit is in operation.

10456 ~~C. Waterworks utilizing filtration in the treatment process shall not vary the rate of filtration~~
10457 ~~through any single filtering unit above its design capacity unless approved by the division.~~

10458 ~~D. Filtering units equipped with rewash facilities shall not be returned to service after~~
10459 ~~backwashing until being thoroughly rewash.~~

10460 ~~E. C.~~ All waterworks shall provide a minimum working pressure of 20 psi-gauge (psig) at all
10461 service connections.

10462 D. The board recommends that all community waterworks in the Commonwealth deliver the
10463 optimum fluoride ion concentration, as determined by the U.S. Department of Health and Human
10464 Services.

10465 E. A waterworks owner shall provide the commissioner at least 90 days prior written notice
10466 of the intent to initiate or discontinue a program to provide the optimum fluoride ion concentration.

10467

10468

10469 12VAC5-590-515. Use of chemicals.

10470 A. All chemicals used in water treatment shall be compliant with NSF/ANSI Standard 60-2017.

10471 These chemicals shall include, but are not limited to the following:

10472 1. Corrosion and scale inhibitors;

10473 2. Coagulants and flocculants;

10474 3. Disinfectants and oxidants;

10475 4. pH adjustment chemicals;

10476 5. Regenerating agents; and

10477 6. Membrane cleaning compounds.

10478 B. Chemical containers shall bear the proper certification mark and identification consistent
10479 with the Safety Data Sheet for the chemical used.

10480 C. The owner shall maintain documentation verifying that all chemicals meet NSF/ANSI
10481 Standard 60-2017 certification requirements.

10482 **12VAC5-590-520. Waterworks expansion capacity.**

10483 ~~A. At such time as the water production of a community waterworks reaches 80% of the rated~~
10484 ~~capacity of the waterworks for any consecutive three-month period, the owner shall cause plans~~
10485 ~~and specifications to be developed for expansion of the waterworks to include a schedule for~~
10486 ~~construction; however, if it can be shown by the owner that growth within the service area is limited~~
10487 ~~and will not exceed the rated capacity of the waterworks or if unusual transient conditions caused~~
10488 ~~production to reach the 80% level, preparation of plans and specifications for expansion will no~~
10489 ~~longer be required.~~

10490 A. When the water production of a community waterworks reaches 80% of the permitted
10491 capacity for any consecutive three-month period, the owner shall prepare and submit a written
10492 plan within 30 days of notification by the department to address capacity needs. This plan shall
10493 be evaluated by the department and corrective actions shall be approved by the commissioner.

10494 ~~B. All waterworks shall provide metering of total water production.~~

10495 B. The commissioner may require the owner to reevaluate the source water capacity of a well
10496 by conducting a yield and drawdown test in accordance with 12VAC5-590-840 H when the well
10497 has demonstrated declining yield.

10498 **12VAC5-590-530. Reporting.**

10499 A. The results of any all required monitoring activity shall be reported by the owner (or their
10500 authorized agent) to the ~~ODW~~department no later than (i) the 10th day of the month following the
10501 month during which the test results were received, or (ii) the 10th day following the end of the
10502 monitoring period, whichever is shorter, unless stipulated otherwise by the ~~commissioner~~
10503 department. The results of any required monitoring activity shall be reported by the owner (or their
10504 authorized agent) in a format and method prescribed by the ~~commissioner~~ department. For
10505 routine compliance samples analyzed for contaminants listed in Tables 340.1 through 340.7, the

10506 owner shall request that the certified analytical laboratory performing the analyses provide the
10507 data electronically to the department as per the requirements of this section.

10508 B. It shall be the duty and responsibility of an owner to report to the ~~ODW department~~ in the
10509 most expeditious manner (usually by telephone) under the following circumstances. If it is done
10510 by telephone a confirming report shall be mailed for circumstances identified in subsections C
10511 through J of this section. The owner shall contact the department for the acceptable notification
10512 method. The official laboratory data report shall be sent to the department as soon as practical.

10513 4. ~~C.~~ Bacteriological examination reporting.

10514 a. 1. When a bacteriological examination shows that samples are required (see 12VAC5-
10515 590-380 D), the owner shall collect the repeat samples within 24 hours of being notified of
10516 the positive result and shall report the repeat sample results to the ~~appropriate ODW field~~
10517 ~~office department.~~

10518 b. 2. Microbial contamination, as evidenced by one or more routine distribution system
10519 water samples indicating the presence of E. coli or waterborne pathogens, shall be
10520 reported by the owner to the ~~appropriate ODW field office department~~ by the end of the
10521 day when the owner was notified of the test result, unless ~~ODW's field office~~ the
10522 department is closed, in which case ~~ODW~~ the department shall be notified before the end
10523 of the next business day.

10524 c. 3. An E. coli PMCL violation shall be reported by the owner to the ~~appropriate ODW~~
10525 ~~field office department~~ by the end of the day when the owner was notified of the test result,
10526 unless the ~~ODW field office department~~ is closed, in which case ~~ODW~~ the department
10527 shall be notified before the end of the next business day.

10528 d. 4. ~~Any~~ The owner who has failed to comply with the monitoring requirements of
10529 12VAC5-590-370 shall report the monitoring violation to the ~~appropriate ODW field office~~

10530 department in writing within 10 days after the owner discovers the violation and shall notify
10531 the public in accordance with 12VAC5-590-540 A 3.

10532 ~~2. When the daily average of turbidity testing exceeds 5.0 NTU a report shall be made~~
10533 ~~within 48 hours~~

10534 D. Turbidity reporting. For a waterworks required to filter for pathogen and turbidity removal,
10535 a report shall be made within 24 hours to the department if the filtered water turbidity
10536 measurement exceeds the following concentrations based on the filtration treatment type:

10537 1. Conventional filtration -- one NTU.

10538 2. Diatomaceous earth filtration -- five NTU.

10539 3. Slow sand filtration -- five NTU.

10540 4. Membrane, bag and cartridge filtration -- one NTU.

10541 E. PMCL exceedance.

10542 ~~3. 1.~~ 1. When a PMCL of an inorganic or organic chemical is exceeded for a single sample
10543 the owner shall report ~~same~~ the exceedance within seven days. If ~~any one a~~ a sample result
10544 would cause the compliance average to be exceeded, then the owner shall report ~~same~~
10545 in the sample result, in context with the compliance average, to the department within 48
10546 hours.

10547 ~~4. 2.~~ 2. When the average value of the samples collected pursuant to ~~12VAC5-590-410~~
10548 12VAC5-590-382 and 12VAC5-590-383 exceeds the PMCL of ~~any an organic inorganic~~
10549 ~~or inorganic~~ organic chemical, the owner shall report ~~same~~ the exceedance to the
10550 department within 48 hours.

10551 ~~5.~~ 3. When the ~~maximum contaminant level~~ PMCL for ~~a radionuclides~~ radionuclide has
10552 been exceeded as determined by Table ~~2.5~~ 340.4, the results shall be reported to the
10553 department within 48 hours.

10554 ~~6.~~ F. The owner shall report to the ~~district engineer~~ department within 48 hours of the failure
10555 to comply with the monitoring and sanitary survey requirements of this chapter.

10556 ~~7.~~ G. The owner shall report to the ~~district engineer~~ department within 48 hours of the failure
10557 to comply with the requirements of ~~any~~ the schedule prescribed pursuant to a variance or
10558 exemption.

10559 ~~8.~~ H. The owner shall report a Tier 1 violation or situation, as described in 12VAC5-590-540
10560 A 1, to the ~~district engineer~~ department as soon as practical, but no later than 24 hours after the
10561 owner learns of the Tier 1 violation or situation. At the same time the report is made, the owner
10562 shall consult with the ~~field office~~ department to determine the need for any additional actions to
10563 address the violation or situation.

10564 ~~9.~~ The owner shall report a violation of treatment technique requirement resulting from a
10565 single exceedance of the maximum allowable turbidity limit, as described in 12VAC5-590-
10566 420 B 2 a (2), B 2 a (3), B 2 b (2), B 2 c (2), and B 2 d, to the district engineer as soon as
10567 practical, but no later than 24 hours after the owner learns of the violation. At the same
10568 time the report is made, the owner shall consult with the field office to determine the need
10569 for any additional actions to address the violation or situation.

10570 ~~C.~~ I. Reporting requirements for coliform treatment technique violations.

10571 1. ~~Any~~ The owner who has violated the treatment technique required in 12VAC5-590-392
10572 B shall report the violation to the ~~appropriate ODW field office~~ department no later than
10573 the end of the next business day after learning of the violation and shall notify the public
10574 in accordance with 12VAC5-590-540 A 2.

10575 2. ~~Any~~ The owner who is required to conduct an assessment under 12VAC5-590-392 C
10576 shall submit the assessment report within 30 days to the ~~appropriate ODW field office~~
10577 department.

10578 3. The owner shall notify the ~~appropriate ODW field office~~ department in writing after each
10579 scheduled corrective action is completed for corrections that were not completed by the
10580 time of submission of the assessment form under the requirements of 12VAC5-590-392
10581 C.

10582 ~~D. J.~~ J. The owner of a seasonal waterworks shall submit the certification of completion of the
10583 approved start-up procedure on a form approved by ~~to~~ the ~~commissioner~~ department ~~prior to~~
10584 before serving water.

10585 ~~E. Reporting requirements for filtration treatment and disinfection treatment.~~

10586 1. ~~The owner of a waterworks that provides filtration treatment shall report monthly to the~~
10587 ~~commissioner the following specified information beginning June 29, 1993, or when~~
10588 ~~filtration is installed, whichever is later.~~

10589 ~~a. Turbidity measurements as required by 12VAC5-590-370 B 7 a shall be reported~~
10590 ~~within 10 days after the end of each month the waterworks serves water to the public.~~
10591 ~~Information that shall be reported includes:~~

10592 ~~(1) The total number of filtered water turbidity measurements taken during the month.~~

10593 ~~(2) The number and percentage of filtered water turbidity measurements taken during~~
10594 ~~the month which are less than or equal to the turbidity limits specified in 12VAC5-590-~~
10595 ~~420 B 2 for the filtration technology being used.~~

10596 ~~(3) The date and value of any turbidity measurements taken during the month which~~
10597 ~~exceed 5.0 NTU.~~

~~10598 b. The owner of a waterworks using surface water or groundwater under the direct
10599 influence of surface water that provides conventional filtration treatment or direct
10600 filtration shall report monthly to the commissioner the information specified in
10601 subdivisions E 1 a (1) and (2) of this section. Also, the owner of a waterworks that
10602 provides filtration approved under 12VAC5-590-420 B 2 d shall report monthly to the
10603 commissioner the information specified in subdivision E 1 a (1) of this section.~~

~~10604 (1) Turbidity measurements as required by 12VAC5-590-420 B 2 a (3) shall be
10605 reported within 10 days after the end of each month the system serves water to the
10606 public. Information that shall be reported includes:~~

~~10607 (a) The total number of filtered water turbidity measurements taken during the month.~~

~~10608 (b) The number and percentage of filtered water turbidity measurements taken during
10609 the month that are less than or equal to the turbidity limits specified in 12VAC5-590-
10610 420 B 2 a (3) or 12VAC5-590-420 B 2 d.~~

~~10611 (c) The date and value of any turbidity measurements taken during the month that
10612 exceed 1.0 NTU for systems using conventional filtration treatment or direct filtration,
10613 or that exceed the maximum level set by the commissioner under 12VAC590-420 B 2
10614 d.~~

~~10615 (2) The owner shall maintain the results of individual filter monitoring taken under
10616 12VAC5-590-370 B 7 b (1) for at least three years. The owner shall report that he has
10617 conducted individual filter turbidity monitoring under 12VAC5-590-370 B 7 b (1) within
10618 10 days after the end of each month the waterworks serves water to the public. Owners
10619 shall report individual filter turbidity measurement results taken under 12VAC5-590-
10620 370 B 7 b (1) within 10 days after the end of each month the waterworks serves water
10621 to the public only if measurements demonstrate one or more of the conditions in~~

10622 subdivisions E 1 b (2) (a) or (b) of this section. The owners of waterworks that use lime
10623 softening may apply to the commissioner for alternative exceedance levels for the
10624 levels specified in subdivisions E 1 b (2) (a) or (b) of this section if they can
10625 demonstrate that higher turbidity levels in individual filters are due to lime carryover
10626 only and not due to degraded filter performance.

10627 (a) For waterworks serving 10,000 or more people:

10628 (i) For any individual filter that has a measured turbidity level of greater than 1.0 NTU
10629 in two consecutive measurements taken 15 minutes apart, the owner shall report the
10630 filter number, the turbidity measurement, and the date, or dates, on which the
10631 exceedance occurred. In addition, the owner shall either produce a filter profile for the
10632 filter within seven days of the exceedance (if the owner is not able to identify an
10633 obvious reason for the abnormal filter performance) and report that the profile has
10634 been produced or report the obvious reason for the exceedance.

10635 (ii) For any individual filter that has a measured turbidity level of greater than 0.5 NTU
10636 in two consecutive measurements taken 15 minutes apart at the end of the first four
10637 hours of continuous filter operation after the filter has been backwashed or otherwise
10638 taken offline, the owner shall report the filter number, the turbidity, and the date, or
10639 dates, on which the exceedance occurred. In addition, the owner shall either produce
10640 a filter profile for the filter within seven days of the exceedance (if the owner is not able
10641 to identify an obvious reason for the abnormal filter performance) and report that the
10642 profile has been produced or report the obvious reason for the exceedance.

10643 (iii) For any individual filter that has a measured turbidity level of greater than 1.0 NTU
10644 in two consecutive measurements taken 15 minutes apart at any time in each of three
10645 consecutive months, the owner shall report the filter number, the turbidity
10646 measurement, and the date, or dates, on which the exceedance occurred. In addition,

10647 ~~the owner shall conduct a self-assessment of the filter within 14 days of the~~
10648 ~~exceedance and report that the self-assessment was conducted. The self-assessment~~
10649 ~~shall consist of at least the following components: assessment of filter performance;~~
10650 ~~development of a filter profile; identification and prioritization of factors limiting filter~~
10651 ~~performance; assessment of the applicability of corrections; and preparation of a filter~~
10652 ~~self-assessment report.~~

10653 ~~(iv) For any individual filter that has a measured turbidity level of greater than 2.0 NTU~~
10654 ~~in two consecutive measurements taken 15 minutes apart at any time in each of two~~
10655 ~~consecutive months, the owner shall report the filter number, the turbidity~~
10656 ~~measurement, and the date, or dates, on which the exceedance occurred. In addition,~~
10657 ~~the owner shall arrange for the conduct of a comprehensive performance evaluation~~
10658 ~~by the commissioner or a third party approved by the commissioner no later than 30~~
10659 ~~days following the exceedance and have the evaluation completed and submitted to~~
10660 ~~the commissioner no later than 90 days following the exceedance.~~

10661 ~~(b) For waterworks serving less than 10,000 people:~~

10662 ~~(i) For any individual filter (or the turbidity of combined filter effluent for systems with~~
10663 ~~two filters that monitor combined filter effluent in lieu of individual filters) that has a~~
10664 ~~measured turbidity level of greater than 1.0 NTU in two consecutive measurements~~
10665 ~~taken 15 minutes apart, the owner shall report the filter number(s), the turbidity~~
10666 ~~measurement(s), and the date, or dates, on which the exceedance occurred and the~~
10667 ~~cause (if known) for the exceedance(s).~~

10668 ~~(ii) For any individual filter (or the turbidity of combined filter effluent for systems with~~
10669 ~~two filters that monitor combined filter effluent in lieu of individual filters) that has a~~
10670 ~~measured turbidity level of greater than 1.0 NTU in two consecutive measurements~~
10671 ~~taken 15 minutes apart at any time in each of three consecutive months, the owner~~

10672 shall conduct a self-assessment of the filter(s) within 14 days of the day the filter
10673 exceeded 1.0 NTU unless a comprehensive performance evaluation as specified in
10674 clause (iii) of this subdivision was required. Owners of waterworks with two filters that
10675 monitor the combined filter effluent in lieu of individual filters shall conduct a self
10676 assessment on both filters. The self-assessment shall be reported to the commissioner
10677 and consist of at least the following components: date self-assessment was triggered;
10678 date the self-assessment was completed; assessment of filter performance;
10679 development of a filter profile; identification and prioritization of factors limiting filter
10680 performance; assessment of the applicability of corrections; and preparation of a filter
10681 self-assessment report. The self assessment shall be submitted within 10 days after
10682 the end of the month or 14 days after the self assessment was triggered only if it was
10683 triggered during the last four days of the month.

10684 (iii) For any individual filter (or the turbidity of combined filter effluent for systems with
10685 two filters that monitor combined filter effluent in lieu of individual filters) that has a
10686 measured turbidity level of greater than 2.0 NTU in two consecutive measurements
10687 taken 15 minutes apart at any time in each of two consecutive months, the owner shall
10688 arrange for a comprehensive performance evaluation by the commissioner or a third
10689 party approved by the commissioner no later than 60 days following the day the filter
10690 exceeded 2.0 NTU in two consecutive months. The owner shall report within 10 days
10691 after the end of the month that a comprehensive performance evaluation is required
10692 and the date that it was triggered. If a comprehensive performance evaluation has
10693 been completed by the commissioner or a third party approved by the commissioner
10694 within the 12 prior months or the owner and the commissioner are jointly participating
10695 in an ongoing Comprehensive Technical Assistance project at the waterworks, a new
10696 comprehensive performance evaluation is not required. If conducted, a

10697 comprehensive performance evaluation shall be completed and submitted to the
10698 commissioner no later than 120 days following the day the filter exceeded 2.0 NTU in
10699 two consecutive measurements for the second straight month.

10700 c. Reporting source water monitoring results.

10701 (1) Owners shall report results from the source water monitoring required in 12VAC5-
10702 590-420 B 3 a no later than 10 days after the end of the first month following the month
10703 when the sample is collected.

10704 (2) Owners shall report the applicable information in subdivisions (a) and (b) as follows
10705 for the source water monitoring required in 12VAC5-590-420 B 3 a.

10706 (a) Owners shall report the following data elements for each Cryptosporidium analysis:

| |
|--|
| Data element |
| PWS ID |
| Facility ID |
| Sample collection date |
| Sample type (field or matrix spike) |
| Sample volume filtered (L), to nearest ¼ L |
| Was 100% of filtered volume examined |
| Number of oocysts counted |

10707 (i) For matrix spike samples, the owner shall also report the sample volume spiked
10708 and estimated number of oocysts spiked. These data are not required for field
10709 samples.

10710 (ii) For samples in which less than 10 L is filtered or less than 100% of the sample
10711 volume is examined, the owner shall also report the number of filters used and the
10712 packed pellet volume.

10713 ~~(iii) For samples in which less than 100% of sample volume is examined, the owner~~
 10714 ~~shall also report the volume of resuspended concentrate and volume of this~~
 10715 ~~resuspension processed through immunomagnetic separation.~~

10716 (b) Owners shall 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, GUDI) |
| 7. E. coli/100 mL |
| 8. Turbidity ^a |

^a~~Owners of waterworks serving fewer than 10,000 people that are not required to monitor for turbidity under in 12VAC5-590-420 B 3 a are not required to report turbidity with their E. coli results.~~

10717 ~~2. Disinfection information specified below shall be reported to the district engineer within~~
 10718 ~~10 days after the end of each month the waterworks serves water to the public. Information~~
 10719 ~~that shall be reported includes:~~

10720 ~~a. For each day, the lowest measurement of residual disinfectant concentration in mg/L~~
 10721 ~~in water entering the distribution system.~~

10722 ~~b. The date and duration of each period when the residual disinfectant concentration~~
 10723 ~~in water entering the distribution system fell below 0.2 mg/L and when the district~~
 10724 ~~engineer was notified of the occurrence.~~

10725 ~~c. The following information on the samples taken in the distribution system in~~
 10726 ~~conjunction with total coliform monitoring pursuant to 12VAC5-590-420 B.~~

- 10727 ~~(1) Number of instances where the residual disinfectant concentration is measured;~~
- 10728 ~~(2) Number of instances where the residual disinfectant concentration is not measured~~
- 10729 ~~but HPC is measured;~~
- 10730 ~~(3) Number of instances where the residual disinfectant concentration is measured but~~
- 10731 ~~not detected and no HPC is measured;~~
- 10732 ~~(4) Number of instances where no residual disinfectant concentration is detected and~~
- 10733 ~~where HPC is greater than 500/mL;~~
- 10734 ~~(5) Number of instances where the residual disinfectant concentration is not measured~~
- 10735 ~~and HPC is greater than 500/mL;~~
- 10736 ~~(6) For the current and previous month the system serves water to the public, the value~~
- 10737 ~~of "V" in percent in the following formula:~~
- $$V = \frac{c + d + e}{a + b} \times 100$$
- 10738 ~~a = the value in subdivision E 2 c (1) of this section~~
- 10739 ~~b = the value in subdivision E 2 c (2) of this section~~
- 10740 ~~c = the value in subdivision E 2 c (3) of this section~~
- 10741 ~~d = the value in subdivision E 2 c (4) of this section~~
- 10742 ~~e = the value in subdivision E 2 c (5) of this section~~
- 10743 ~~(7) If the division determines, based on site specific considerations, that a waterworks~~
- 10744 ~~owner has no means for having a sample transported and analyzed for HPC by a~~
- 10745 ~~certified laboratory within the requisite time and temperature conditions and that the~~
- 10746 ~~waterworks is providing adequate disinfection in the distribution system, the~~
- 10747 ~~requirements of subdivision E 2 c (1) through (6) of this section do not apply.~~

10748 ~~d. An owner need not report the data listed in subdivision E 2 a of this section if all~~
10749 ~~data listed in subdivisions E 2 a through c of this section remain on file at the~~
10750 ~~waterworks and the commissioner determines that the owner has submitted all of the~~
10751 ~~information required by subdivisions E 2 a through c of this section for the last 12~~
10752 ~~months.~~

10753 ~~3. If at any time the chlorine residual falls below 0.2 mg/L in the water entering the~~
10754 ~~distribution system, the owner shall notify the district engineer as soon as possible, but no~~
10755 ~~later than by the end of the next business day. The owner also shall notify the district~~
10756 ~~engineer by the end of the next business day whether or not the residual was restored to~~
10757 ~~at least 0.2 mg/L within four hours.~~

10758 ~~F. Reporting requirements for lead and copper. All owners shall report all of the following~~
10759 ~~information to the district engineer in accordance with this subsection.~~

10760 ~~1. Reporting requirements for tap water monitoring for lead and copper and for water~~
10761 ~~quality parameter monitoring.~~

10762 ~~a. Except as provided in subdivision F 1 a (7) of this section, an owner shall report the~~
10763 ~~information specified below for all tap water samples specified in 12VAC5-590-375 B~~
10764 ~~and for all water quality parameter samples specified in 12VAC5-590-375 C within the~~
10765 ~~first 10 days following the end of each applicable monitoring period specified in~~
10766 ~~12VAC5-590-375 B and 12VAC5-590-375 C (i.e., every six months, annually, every~~
10767 ~~three years, or every nine years). For monitoring periods with a duration less than six~~
10768 ~~months, the end of the monitoring period is the last date samples can be collected~~
10769 ~~during the period as specified in 12VAC5-590-375 B and C.~~

10770 ~~(1) The results of all tap samples for lead and copper including location or a location~~
10771 ~~site code and the criteria under 12VAC5-590-375 B 1 c through 12VAC5-590-375 B 1~~

10772 ~~f or 12VAC5-590-375 C under which the site was selected for the waterworks'~~
10773 ~~sampling pool.~~

10774 ~~(2) Documentation for each tap water lead or copper sample for which the owner~~
10775 ~~requests invalidation pursuant to 12VAC5-590-375 B 6.~~

10776 ~~(3) The 90th percentile lead and copper concentrations measured from among all lead~~
10777 ~~and copper tap water samples collected during each monitoring period (calculated in~~
10778 ~~accordance with 12VAC5-590-385 C) unless the district engineer calculates the 90th~~
10779 ~~percentile lead and copper levels under subdivision F 8 of this section.~~

10780 ~~(4) With the exception of initial tap sampling conducted pursuant to 12VAC5-590-375~~
10781 ~~B 4 a, the owner shall designate any site that was not sampled during previous~~
10782 ~~monitoring periods, and include an explanation of why sampling sites have changed.~~

10783 ~~(5) The results of all tap samples for pH, and where applicable, alkalinity, calcium,~~
10784 ~~conductivity, temperature, and orthophosphate or silica collected under 12VAC5-590-~~
10785 ~~375 C 2 through 12VAC5-590-375 C 5.~~

10786 ~~(6) The results of all samples collected at the entry point(s) to the distribution system~~
10787 ~~for applicable water quality parameters under 12VAC5-590-375 C 2 through 12VAC5-~~
10788 ~~590-375 C 5.~~

10789 ~~(7) The owner shall report the results of all water quality parameter samples collected~~
10790 ~~under 12VAC5-590-375 C 3 through 12VAC5-590-375 C 6 during each six month~~
10791 ~~monitoring period specified in 12VAC5-590-375 C 4 within the first ten days following~~
10792 ~~the end of the monitoring period unless the commissioner has specified a more~~
10793 ~~frequent reporting requirement.~~

~~10794 b. The owner of a nontransient noncommunity waterworks, or a community
10795 waterworks meeting the criteria of 12VAC5-590-405 D 2 e, that does not have enough
10796 taps that can provide first draw samples, must either:~~

~~10797 (1) Provide written documentation to the commissioner identifying standing times and
10798 locations for enough non-first draw samples to make up the sampling pool under
10799 12VAC5-590-375 B 2 e by the start of the first applicable monitoring period under
10800 12VAC5-590-375 B 4, unless the commissioner has waived prior approval of non-first-
10801 draw sample sites selected by the owner pursuant to 12VAC5-590-375 B 2 e; or~~

~~10802 (2) If the commissioner has waived prior approval of non-first draw sample sites
10803 selected by the owner, identify, in writing, each site that did not meet the six hour
10804 minimum standing time and the length of standing time for that particular substitute
10805 sample collected pursuant to 12VAC5-590-375 B 2 e and include this information with
10806 the lead and copper sample results required to be submitted pursuant to subdivision
10807 F 1 a (1) of this section.~~

~~10808 c. At a time specified by the commissioner, or if no specific time is designated by the
10809 commissioner, then as early as possible prior to the addition of a new source or any
10810 long-term change in water treatment, an owner deemed to have optimized corrosion
10811 control under 12VAC5-590-405 A 2 b (3); an owner subject to reduced monitoring
10812 pursuant to 12VAC5-590-375 B 4 d; or an owner subject to a monitoring waiver
10813 pursuant to 12VAC5-590-375 B 7, shall submit written documentation to the district
10814 engineer describing the change or addition. The district engineer must review and the
10815 commissioner must approve the addition of a new source or a long-term change in
10816 treatment before it is implemented by the owner. Examples of long-term treatment
10817 changes include the addition of a new treatment process or modification of an existing
10818 treatment process. Examples of modification include switching secondary~~

10819 ~~disinfectants, switching coagulants (e.g., alum to ferric chloride), switching corrosion~~
10820 ~~inhibitor products (e.g., orthophosphate to blended phosphate). Long-term changes~~
10821 ~~can include dose changes to existing chemicals if the waterworks is planning long-~~
10822 ~~term changes to its finished water pH or residual inhibitor concentration. Long-term~~
10823 ~~treatment changes would not include chemical dose fluctuations associated with daily~~
10824 ~~raw water quality changes.~~

10825 ~~d. The owner of any small waterworks applying for a monitoring waiver under 12VAC5-~~
10826 ~~590-375 B 7 or subject to a waiver granted pursuant to 12VAC5-590-375 B 7 c, shall~~
10827 ~~provide the following information to the commissioner in writing by the specified~~
10828 ~~deadline:~~

10829 ~~(1) By the start of the first applicable monitoring period in 12VAC5-590-375 B 4, the~~
10830 ~~owner of any small waterworks applying for a monitoring waiver shall provide the~~
10831 ~~documentation required to demonstrate that it meets the waiver criteria of 12VAC5-~~
10832 ~~590-375 B 7 a and 12VAC5-590-375 B 7 b.~~

10833 ~~(2) No later than nine years after the monitoring previously conducted pursuant to~~
10834 ~~12VAC5-590-375 B 7 b or 12VAC5-590-375 B 7 d (1), the owner of each small~~
10835 ~~waterworks desiring to maintain its monitoring waiver shall provide the information~~
10836 ~~required by 12VAC5-590-375 B 7 d (1) and 12VAC5-590-375 B 7 d (2).~~

10837 ~~(3) No later than 60 days after becoming aware that it is no longer free of lead-~~
10838 ~~containing or copper-containing material, the owner of each small waterworks with a~~
10839 ~~monitoring waiver shall provide written notification to the district engineer, setting forth~~
10840 ~~the circumstances resulting in the lead-containing or copper-containing materials~~
10841 ~~being introduced into the waterworks and what corrective action, if any, the owner~~
10842 ~~plans to take to remove these materials.~~

10843 e. ~~The owner of each groundwater source waterworks that limits water quality~~
10844 ~~parameter monitoring to a subset of entry points under 12VAC5-590-375 C 3 c shall~~
10845 ~~provide, by the commencement of such monitoring, written correspondence to the~~
10846 ~~district engineer that identifies the selected entry points and includes information~~
10847 ~~sufficient to demonstrate that the sites are representative of water quality and~~
10848 ~~treatment conditions throughout the waterworks.~~

10849 2. ~~Water supply (source water) monitoring reporting requirements.~~

10850 a. ~~An owner shall report the sampling results for all source water samples collected in~~
10851 ~~accordance with 12VAC5-590-375 D within the first 10 days following the end of each~~
10852 ~~source water monitoring period (i.e., annually, per compliance period, per compliance~~
10853 ~~cycle) specified in 12VAC5-590-375 D.~~

10854 b. ~~With the exception of the first round of source water sampling conducted pursuant~~
10855 ~~to 12VAC5-590-375 D 2, the owner shall specify any site which was not sampled~~
10856 ~~during previous monitoring periods, and include an explanation of why the sampling~~
10857 ~~point has changed.~~

10858 3. ~~Corrosion control treatment reporting requirements. By the applicable dates under~~
10859 ~~12VAC5-590-405 A 2 a, owners shall report the following information:~~

10860 a. ~~For owners demonstrating that they have already optimized corrosion control,~~
10861 ~~information required in 12VAC5-590-405 A 2 b (2) or 12VAC5-590-405 A 2 b (3).~~

10862 b. ~~For owners required to optimize corrosion control, the owner's recommendation~~
10863 ~~regarding optimal corrosion control treatment under 12VAC5-590-405 A 1 a.~~

10864 c. ~~For owners required to evaluate the effectiveness of corrosion control treatments~~
10865 ~~under 12VAC5-590-405 A 1 c, the information required by that subdivision.~~

10866 ~~d. For owners required to install optimal corrosion control designated by the~~
10867 ~~commissioner under 12VAC5-590-405 A 1 d, a letter certifying that the owner has~~
10868 ~~completed installing that treatment.~~

10869 ~~4. Water supply source water treatment reporting requirements. By the applicable dates~~
10870 ~~in 12VAC5-590-405 B, owners shall provide the following information to the district~~
10871 ~~engineer:~~

10872 ~~a. If required under 12VAC5-590-405 B 2 a, the owner's recommendation regarding~~
10873 ~~source water treatment;~~

10874 ~~b. For owners required to install source water treatment under 12VAC5-590-405 B 2~~
10875 ~~b, a letter certifying that the owner has completed installing the treatment designated~~
10876 ~~by the commissioner within 24 months after the commissioner designated the~~
10877 ~~treatment.~~

10878 ~~5. Lead service line replacement reporting requirements. Owners shall report the following~~
10879 ~~information to the district engineer to demonstrate compliance with the requirements of~~
10880 ~~12VAC5-590-405 C:~~

10881 ~~a. No later than 12 months after the end of a monitoring period in which a waterworks~~
10882 ~~exceeds the lead action level in sampling referred to in 12VAC5-590-405 C 1, the~~
10883 ~~owner shall submit written documentation to the district engineer of the materials~~
10884 ~~evaluation conducted as required in 12VAC5-590-375 B 1, to identify the initial number~~
10885 ~~of lead service lines in the distribution system at the time the waterworks exceeds the~~
10886 ~~lead action level, and provide the owner's schedule for annually replacing at least 7.0%~~
10887 ~~of the initial number of lead service lines in its distribution system.~~

10888 ~~b. No later than 12 months after the end of a monitoring period in which a waterworks~~
10889 ~~exceeds the lead action level in sampling referred to in 12VAC5-590-405 C 1, and~~

10890 every 12 months thereafter, the owner shall demonstrate to the district engineer in
10891 writing that the owner has either:

10892 (1) Replaced in the previous 12 months at least 7.0% of the initial lead service lines
10893 (or a greater number of lines specified by the commissioner under 12VAC5-590-405
10894 C-6) in the distribution system, or

10895 (2) Conducted sampling that demonstrates that the lead concentration in all service
10896 line samples from an individual line(s), taken pursuant to 12VAC5-590-375 B-2 c, is
10897 less than or equal to 0.015 mg/L. In such cases, the total number of lines replaced
10898 and/or which meet the criteria in 12VAC5-590-405 C-4 shall equal at least 7.0% of the
10899 initial number of lead lines identified under subdivision F-5 a of this section (or the
10900 percentage specified by the commissioner under 12VAC5-590-405 C-6).

10901 c. The annual letter submitted to the district engineer under subdivision F-5 b of this
10902 section shall contain the following information:

10903 (1) The number of lead service lines scheduled to be replaced during the previous year
10904 of the waterworks' replacement schedule;

10905 (2) The number and location of each lead service line replaced during the previous
10906 year of the waterworks' replacement schedule;

10907 (3) If measured, the water lead concentration and location of each lead service line
10908 sampled, the sampling method, and the date of sampling.

10909 d. The owner of any waterworks that collects lead service line samples following partial
10910 lead service line replacement required by 12VAC5-590-405 C shall report the results
10911 to the district engineer within the first ten days of the month following the month in
10912 which the owner receives the laboratory results, or as specified by the commissioner.
10913 Owners shall also report any additional information as specified by the commissioner,

10914 and in a time and manner prescribed by the commissioner, to verify that all partial lead
10915 service line replacement activities have taken place.

10916 ~~6. Public education program reporting requirements. Owners shall report the following~~
10917 ~~information to the district engineer to demonstrate compliance with the requirements of~~
10918 ~~12VAC5-590-405 D.~~

10919 a. ~~The owner of any waterworks that is subject to the public education requirements~~
10920 ~~in 12VAC5-590-405 D shall, within 10 days after the end of each period in which the~~
10921 ~~owner is required to perform public education tasks in accordance with 12VAC5-590-~~
10922 ~~405 D 2, send written notice to the district engineer that contains:~~

10923 ~~(1) A demonstration that the owner has delivered the public education materials that~~
10924 ~~meet the content requirements of 12VAC5-590-405 D 1 and the delivery requirements~~
10925 ~~of 12VAC5-590-405 D 2, and~~

10926 ~~(2) A list of all the newspapers, radio stations, television stations, and facilities and~~
10927 ~~organizations to which the owner delivered public education materials during the~~
10928 ~~period in which the owner was required to perform public education tasks.~~

10929 b. ~~Unless required by the commissioner, an owner who previously has submitted the~~
10930 ~~information required by subdivision F 6 a (2) of this section need not resubmit the~~
10931 ~~information required by subdivision F 6 a (2) of this section, as long as there has been~~
10932 ~~no changes in the distribution list and the owner certifies that the public education~~
10933 ~~materials were distributed to the same list submitted previously.~~

10934 c. ~~No later than three months following the end of the monitoring period, the owner~~
10935 ~~shall mail a sample copy of the consumer notification of tap results to the district~~
10936 ~~engineer along with a certification that the notification has been distributed in a manner~~
10937 ~~consistent with the requirements of 12VAC5-590-405 D 4.~~

10938 ~~7. Reporting of additional monitoring data. The owner of any waterworks which collects~~
10939 ~~sampling data in addition to that required by 12VAC5-590-375 shall report the results to~~
10940 ~~the district engineer within the first 10 days following the end of the applicable monitoring~~
10941 ~~period under 12VAC5-590-375 B, 12VAC5-590-375 C, and 12VAC5-590-375 D during~~
10942 ~~which the samples are collected.~~

10943 ~~8. Reporting of the 90th percentile lead and copper concentrations where the district~~
10944 ~~engineer calculates a waterworks' 90th percentile concentrations. An owner is not required~~
10945 ~~to report the 90th percentile lead and copper concentrations measured from among all~~
10946 ~~lead and copper tap samples collected during each monitoring period, as required by~~
10947 ~~subdivision F 1 a (4) of this section if:~~

10948 ~~a. The commissioner has previously notified the owner that the district engineer will~~
10949 ~~calculate the waterworks' 90th percentile lead and copper concentrations, based on~~
10950 ~~the lead and copper tap results submitted pursuant to subdivision F 8 b (1) of this~~
10951 ~~section, and has specified a date before the end of the applicable monitoring period~~
10952 ~~by which the owner shall provide the results of the lead and copper tap water samples;~~

10953 ~~b. The owner has provided the following information to the district engineer by the date~~
10954 ~~specified in subdivision F 8 a of this section:~~

10955 ~~(1) The results of all tap samples for lead and copper including the location of each~~
10956 ~~site and the criteria under 12VAC5-590-375 B 1 c through 12VAC5-590-375 B 1 f or~~
10957 ~~12VAC5-590-375 B 1 g under which the site was selected for the waterworks sampling~~
10958 ~~pool, pursuant to subdivision F 1 a (1) of this section;~~

10959 ~~(2) An identification of sampling sites utilized during the current monitoring period that~~
10960 ~~were not sampled during the previous monitoring periods, and an explanation why~~
10961 ~~sampling sites have changed; and~~

10962 ~~(3) The district engineer has provided the results of the 90th percentile lead and copper~~
10963 ~~calculations, in writing, to the owner before the end of the monitoring period.~~

10964 ~~G. Reporting requirements for disinfection byproducts. Owners shall report the following~~
10965 ~~information in accordance with subsection A of this section. (The district engineer may choose to~~
10966 ~~perform calculations and determine whether the PMCL was violated, in lieu of having the owner~~
10967 ~~report that information):~~

10968 ~~1. Running Annual Average Reporting:~~

10969 ~~a. The owner of a waterworks monitoring for TTHM and HAA5 under the requirements~~
10970 ~~of 12VAC5-590-370 B 3 e (1) on a quarterly or more frequent basis shall report:~~

10971 ~~(1) The number of samples taken during the last quarter.~~

10972 ~~(2) The location, date, and result of each sample taken during the last quarter.~~

10973 ~~(3) The arithmetic average of all samples taken in the last quarter.~~

10974 ~~(4) The annual arithmetic average of the quarterly arithmetic averages of this section~~
10975 ~~for the last four quarters.~~

10976 ~~(5) Whether, based on 12VAC5-590-410 C 2 b (1) (a), the PMCL was violated.~~

10977 ~~b. The owner of a waterworks monitoring for TTHMs and HAA5 under the requirements~~
10978 ~~of 12VAC5-590-370 B 3 e (1) less frequently than quarterly (but at least annually) shall~~
10979 ~~report:~~

10980 ~~(1) The number of samples taken during the last year.~~

10981 ~~(2) The location, date, and result of each sample taken during the last monitoring~~
10982 ~~period.~~

10983 ~~(3) The arithmetic average of all samples taken over the last year.~~

10984 ~~(4) Whether, based on 12VAC5-590-410 C 2 b (1) (a) the PMCL was violated.~~

- 10985 ~~c. The owner of a waterworks monitoring for TTHMs and HAA5 under the requirements~~
10986 ~~of 12VAC5-590-370 B 3 e (1) less frequently than annually shall report:~~
- 10987 ~~(1) The location, date, and result of the last sample taken.~~
- 10988 ~~(2) Whether, based on 12VAC5-590-410 C 2 b (1) (a), the PMCL was violated.~~
- 10989 ~~2. Locational Running Annual Average (LRAA) Reporting:~~
- 10990 ~~a. Owners shall report the following information for each monitoring location to the~~
10991 ~~commissioner:~~
- 10992 ~~(1) Number of samples taken during the last quarter.~~
- 10993 ~~(2) Date and results of each sample taken during the last quarter.~~
- 10994 ~~(3) Arithmetic average of quarterly results for the last four quarters for each LRAA,~~
10995 ~~beginning at the end of the fourth calendar quarter that follows the compliance date~~
10996 ~~and at the end of each subsequent quarter. If the LRAA calculated based on fewer~~
10997 ~~than four quarters of data would cause the PMCL to be exceeded regardless of the~~
10998 ~~monitoring results of subsequent quarters, the owner shall report this information to~~
10999 ~~the commissioner as part of the first report due following the compliance date or~~
11000 ~~anytime thereafter that this determination is made. If the owner is required to conduct~~
11001 ~~monitoring at a frequency that is less than quarterly, the owner shall make compliance~~
11002 ~~calculations beginning with the first compliance sample taken after the compliance~~
11003 ~~date, unless the owner is required to conduct increased monitoring under 12VAC5-~~
11004 ~~590-370 B 3 e (3) (g).~~
- 11005 ~~(4) Whether, based on Table 2.13, the PMCL was violated at any monitoring location.~~

- 11006 ~~(5) Any operational evaluation levels, under 12VAC5-590-410 C 2 b (1) (b) (iv), that~~
11007 ~~were exceeded during the quarter and, if so, the location and date, and the calculated~~
11008 ~~TTHM and HAA5 levels.~~
- 11009 ~~b. Owners of waterworks using surface water or GUDI seeking to qualify for or remain~~
11010 ~~on reduced TTHM/HAA5 monitoring shall report the following source water TOC~~
11011 ~~information for each treatment plant that treats surface water or ground water under~~
11012 ~~the direct influence of surface water to the commissioner within 10 days of the end of~~
11013 ~~any quarter in which monitoring is required:~~
- 11014 ~~(1) The number of source water TOC samples taken each month during last quarter.~~
- 11015 ~~(2) The date and result of each sample taken during last quarter.~~
- 11016 ~~(3) The quarterly average of monthly samples taken during last quarter or the result of~~
11017 ~~the quarterly sample.~~
- 11018 ~~(4) The running annual average (RAA) of quarterly averages from the past four~~
11019 ~~quarters.~~
- 11020 ~~(5) Whether the RAA exceeded 4.0 mg/L.~~
- 11021 ~~3. The owner of a waterworks monitoring for chlorite under the requirements of 12VAC5-~~
11022 ~~590-370 B 3 f shall report:~~
- 11023 ~~a. The number of entry point samples taken each month for the last three months.~~
- 11024 ~~b. The location, date, and result of each sample (both entry point and distribution~~
11025 ~~system) taken during the last quarter.~~
- 11026 ~~c. For each month in the reporting period, the arithmetic average of all samples taken~~
11027 ~~in each three sample set taken in the distribution system.~~

- 11028 d. Whether, based on ~~12VAC5-590-410 C 2 b~~, the PMCL was violated, in which month
11029 and how many times it was violated each month.
- 11030 4. The owner of a waterworks monitoring for bromate under the requirements of ~~12VAC5-~~
11031 ~~590-370 B 3 g~~ shall report:
- 11032 a. ~~The number of samples taken during the last quarter.~~
- 11033 b. ~~The location, date, and result of each sample taken during the last quarter.~~
- 11034 c. ~~The arithmetic average of the monthly arithmetic averages of all samples taken in~~
11035 ~~the last year.~~
- 11036 d. ~~Whether, based on 12VAC5-590-410 C 2 b, the PMCL was violated.~~
- 11037 H. ~~Reporting requirements for disinfectants. Owners shall report the information specified~~
11038 ~~below in accordance with subsection A of this section. (The district engineer may choose to~~
11039 ~~perform calculations and determine whether the MRDL was violated, in lieu of having the owner~~
11040 ~~report that information):~~
- 11041 1. ~~The owner of a waterworks monitoring for chlorine or chloramines under the~~
11042 ~~requirements of 12VAC5-590-370 B 3 h~~ shall report:
- 11043 a. ~~The number of samples taken during each month of the last quarter.~~
- 11044 b. ~~The monthly arithmetic average of all samples taken in each month for the last 12~~
11045 ~~months.~~
- 11046 c. ~~The arithmetic average of all monthly averages for the last 12 months.~~
- 11047 d. ~~Whether, based on 12VAC5-590-410 C 2 c, the MRDL was violated.~~
- 11048 2. The owner of a waterworks monitoring for chlorine dioxide under the requirements of
11049 12VAC5-590-370 B 3 h shall report:
- 11050 a. ~~The dates, results, and locations of samples taken during the last quarter.~~

11051 ~~b. Whether, based on 12VAC5-590-410 C 2 c, the MRDL was violated.~~

11052 ~~c. Whether the MRDL was exceeded in any two consecutive daily samples and~~

11053 ~~whether the resulting violation was acute or nonacute.~~

11054 ~~I. Reporting requirements for disinfection byproduct precursors and enhanced coagulation or~~

11055 ~~enhanced softening. Owners shall report the following information in accordance with subsection~~

11056 ~~A of this section. (The district engineer may choose to perform calculations and determine~~

11057 ~~whether the treatment technique was met, in lieu of having the owner report that information):~~

11058 ~~1. The owner of a waterworks monitoring monthly or quarterly for TOC under the~~

11059 ~~requirements of 12VAC5-590-370 B 3 i and required to meet the enhanced coagulation or~~

11060 ~~enhanced softening requirements in 12VAC5-590-420 H 2 b or c shall report:~~

11061 ~~a. The number of paired (source water and treated water) samples taken during the~~

11062 ~~last quarter.~~

11063 ~~b. The location, date, and results of each paired sample and associated alkalinity taken~~

11064 ~~during the last quarter.~~

11065 ~~c. For each month in the reporting period that paired samples were taken, the~~

11066 ~~arithmetic average of the percent reduction of TOC for each paired sample and the~~

11067 ~~required TOC percent removal.~~

11068 ~~d. Calculations for determining compliance with the TOC percent removal~~

11069 ~~requirements, as provided in 12VAC5-590-420 H 3 a.~~

11070 ~~e. Whether the system is in compliance with the enhanced coagulation or enhanced~~

11071 ~~softening percent removal requirements in 12VAC5-590-420 H 2 a for the last four~~

11072 ~~quarters.~~

11073 2. ~~The owner of a waterworks monitoring monthly or quarterly for TOC under the~~
11074 ~~requirements of 12VAC5-590-370 B 3 i and meeting one or more of the alternative~~
11075 ~~compliance criteria in 12VAC5-590-420 H 1 b or c shall report:~~

11076 a. ~~The alternative compliance criterion that the system is using.~~

11077 b. ~~The number of paired samples taken during the last quarter.~~

11078 c. ~~The location, date, and result of each paired sample and associated alkalinity taken~~
11079 ~~during the last quarter.~~

11080 d. ~~The running annual arithmetic average based on monthly averages (or quarterly~~
11081 ~~samples) of source water TOC for systems meeting a criterion in 12VAC5-590-420 H~~
11082 ~~1 b (1) or (3) or of treated water TOC for systems meeting the criterion in 12VAC5-~~
11083 ~~590-420 H 1 b (2).~~

11084 e. ~~The running annual arithmetic average based on monthly averages (or quarterly~~
11085 ~~samples) of source water SUVA for systems meeting the criterion in 12VAC5-590-420~~
11086 ~~H 1 b (5) or of treated water SUVA for systems meeting the criterion in 12VAC5-590-~~
11087 ~~420 H 1 b (6).~~

11088 f. ~~The running annual average of source water alkalinity for systems meeting the~~
11089 ~~criterion in 12VAC5-590-420 H 1 b (3) and of treated water alkalinity for systems~~
11090 ~~meeting the criterion in 12VAC5-590-420 H 1 c (1).~~

11091 g. ~~The running annual average for both TTHM and HAA5 for systems meeting the~~
11092 ~~criterion in 12VAC5-590-420 H 1 b (3) or (4).~~

11093 h. ~~The running annual average of the amount of magnesium hardness removal (as~~
11094 ~~CaCO₃, in mg/L) for systems meeting the criterion in 12VAC5-590-420 H 1 c (2).~~

11095 ~~i. Whether the system is in compliance with the particular alternative compliance~~
11096 ~~criterion in 12VAC5-590-420 H 1 b or c.~~

11097 ~~J. Reporting of analytical results to the district engineer will not be required in instances where~~
11098 ~~the state laboratory performs the analysis and reports same to the district engineer.~~

11099 ~~K. Recycle flow reporting requirements. The owner of any waterworks supplied by a surface~~
11100 ~~water source and waterworks supplied by a groundwater source under the direct influence of~~
11101 ~~surface water that employs conventional filtration or direct filtration treatment shall notify the~~
11102 ~~commissioner in writing by December 8, 2003, if the system recycles spent filter backwash water,~~
11103 ~~thickener supernatant, or liquids from dewatering processes. This notification shall include, as a~~
11104 ~~minimum:~~

11105 ~~1. A plant schematic showing the origin of all flows that are recycled, including but not~~
11106 ~~limited to spent filter backwash water, thickener supernatant, and liquids from dewatering~~
11107 ~~processes. The schematic shall also specify the hydraulic conveyance used to transport~~
11108 ~~all recycle flows and the location where recycle flows are reintroduced back into the~~
11109 ~~treatment plant.~~

11110 ~~2. Typical recycle flow in gallons per minute (gpm), the highest observed plant flow~~
11111 ~~experienced in the previous year (gpm), design flow for the treatment plant (gpm), and~~
11112 ~~state-approved operating capacity for the plant.~~

11113 ~~L. Reporting of requirements for enhanced treatment for cryptosporidium.~~

11114 ~~1. Owners shall report sampling schedules under 12VAC5-590-420 B 3 a (5) and source~~
11115 ~~water monitoring results under subsection E 1 c of this section unless they notify the~~
11116 ~~commissioner that they will not conduct source water monitoring due to meeting the~~
11117 ~~criteria of 12VAC5-590-420 B 3 a (4).~~

- 11118 ~~2. Owners shall report the use of uncovered finished water storage facilities to the~~
 11119 ~~commissioner as described in 12VAC5-590-420 L.~~
- 11120 ~~3. Owners of waterworks that provide filtration shall report their Cryptosporidium bin~~
 11121 ~~classification as described in 12VAC-590-420 B 3 c.~~
- 11122 ~~4. Owners shall report disinfection profiles and benchmarks to the commissioner as~~
 11123 ~~described in 12VAC5-590-420 B 3 b (1) through (2) prior to making a significant change~~
 11124 ~~in disinfection practice.~~
- 11125 ~~5. Owners shall report to the commissioner in accordance with the following table for any~~
 11126 ~~microbial toolbox options used to comply with treatment requirements under 12VAC5-590-~~
 11127 ~~420 B 3 c (2). Alternatively, the commissioner may approve a waterworks to certify~~
 11128 ~~operation within required parameters for treatment credit rather than reporting monthly~~
 11129 ~~operational data for toolbox options.~~

11130 **Microbial Toolbox Reporting Requirements**

| Toolbox option | Owners shall submit the following information | On the following schedule |
|--------------------------------------|---|--|
| Alternative source/intake management | Verification that waterworks has relocated the intake or adopted the intake withdrawal procedure reflected in monitoring results | No later than the applicable treatment compliance date in 12VAC5-590-420 B 3 c (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 performance criteria approved by the commissioner | Monthly reporting within 10 days following the month in which the monitoring was conducted, beginning on the applicable treatment compliance date in 12VAC5-590-420 B 3 c (3). |
| Two-stage lime softening | Monthly verification of the following: (i) Chemical addition and hardness precipitation occurred | Monthly reporting within 10 days following the month in which the |

| | | |
|-------------------------------|---|---|
| | <p>in two separate and sequential softening stages prior to filtration</p> <p>(ii) Both stages treated 100% of the plant flow</p> | <p>monitoring was conducted, beginning on the applicable treatment compliance date in 12VAC5-590-420 B 3 c (3).</p> |
| Bank filtration | <p>Initial demonstration of the following:</p> <p>(i) Unconsolidated, predominantly sandy aquifer</p> <p>(ii) Setback distance of at least 25 ft. (0.5-log credit) or 50 ft. (1.0-log credit)</p> | <p>No later than the applicable treatment compliance date in 12VAC5-590-420 B 3 c (3).</p> |
| | <p>If monthly average of daily max turbidity is greater than 1.0 NTU then system shall report result and submit an assessment of the cause</p> | <p>Report within 30 days following the month in which the monitoring was conducted, beginning on the applicable treatment compliance date in 12VAC5-590-420 B 3 c (3).</p> |
| Combined filter performance | <p>Monthly verification of combined filter effluent (CFE) turbidity levels less than or equal to 0.15 NTU in at least 95% of the four-hour CFE measurements taken each month</p> | <p>Monthly reporting within 10 days following the month in which the monitoring was conducted, beginning on the applicable treatment compliance date in 12VAC5-590-420 B 3 c (3).</p> |
| Individual filter performance | <p>Monthly verification of the following:</p> <p>(i) Individual filter effluent (IFE) turbidity levels less than or equal to 0.15 NTU in at least 95% of samples each month in each filter</p> <p>(ii) No individual filter greater than 0.3 NTU in two consecutive readings 15 minutes apart</p> | <p>Monthly reporting within 10 days following the month in which the monitoring was conducted, beginning on the applicable treatment compliance date in 12VAC5-590-420 B 3 c (3).</p> |
| Demonstration of performance | <p>Results from testing following a protocol approved by the commissioner</p> | <p>No later than the applicable treatment compliance date in 12VAC5-590-420 B 3 c (3).</p> |
| | <p>(ii) As required by the commissioner, monthly verification of operation within conditions of commissioner approval</p> | <p>Within 10 days following the month in which monitoring was</p> |

| | | |
|-----------------------------------|---|---|
| | for demonstration of performance credit | conducted, beginning on the applicable treatment compliance date in 12VAC5-590-420 B 3 c (3). |
| Bag filters and cartridge filters | Demonstration that the following criteria are met: (i) Process meets the definition of bag or cartridge filtration (ii) Removal efficiency established through challenge testing that meets criteria in 12VAC5-590-420 B 3 d (6) (a) | No later than the applicable treatment compliance date in 12VAC5-590-420 B 3 c (3). |
| | Monthly verification that 100% of plant flow was filtered | Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in 12VAC5-590-420 B 3 c (3). |
| Membrane filtration | Results of verification testing demonstrating the following: (i) Removal efficiency established through challenge testing that meets criteria in subsection J of this section (ii) Integrity test method and parameters, including resolution, sensitivity, test frequency, control limits, and associated baseline | No later than the applicable treatment compliance date in 12VAC5-590-420 B 3 c (3). |
| | Monthly report summarizing the following: (i) All direct integrity tests above the control limit (ii) If applicable, any turbidity or alternative indirect integrity monitoring approved by the commissioner results triggering direct integrity testing and the corrective action that was taken | Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in 12VAC5-590-420 B 3 c (3). |
| Second stage filtration | Monthly verification that 100% of flow was filtered through both stages and that first stage was preceded by a coagulation step | Within 10 days following the month in which monitoring was conducted, beginning on |

| | | |
|--|--|--|
| | | the applicable treatment compliance date in 12VAC5-590-420 B 3 c (3). |
| Slow sand filtration (as secondary filter) | Monthly verification that both a slow sand filter and a preceding separate stage of filtration treated 100% of flow from surface water or groundwater under the direct influence of surface water sources | Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in 12VAC5-590-420 B 3 c (3). |
| Chlorine dioxide | Summary of CT values for each day as described in 12VAC5-590-420 B 3 d (7)(b)(i) | Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in 12VAC5-590-420 B 3 c (3). |
| Ozone | Summary of CT values for each day as described in 12VAC5-590-420 B 3 d (7)(b)(ii) | Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in 12VAC5-590-420 B 3 c (3). |
| UV | Validation test results demonstrating operating conditions that achieve required UV dose | No later than the applicable treatment compliance date in 12VAC5-590-420 B 3 c (3). |
| | 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 12VAC5-590-420 B 3 d (7) (c) | Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in 12VAC5-590-420 B 3 c (3). |

11131 MK. Reporting requirements for groundwater systems. Owners of groundwater systems. The

11132 owner shall report the following information in accordance with subsection A of this section.:

11133 1. ~~Owners of groundwater systems~~ The owner conducting compliance monitoring as
11134 required by 12VAC5-590-421 C shall notify the ~~ODW department~~ as soon as possible
11135 practical any time whenever the groundwater system fails to meet the ~~ODW department-~~
11136 specified specified minimum residual disinfectant concentration for more than four hours,
11137 but no later than the next business day.

11138 2. ~~Owners of groundwater systems that are~~ The owner required to conduct corrective
11139 action as described in 12VAC5-590-421 A shall notify the ~~ODW department~~ within 30 days
11140 of completion of corrective action.

11141 3. ~~Owners of groundwater systems~~ The owner subject to the source water monitoring
11142 requirements of 12VAC5-590-379 that do not conduct this monitoring under the provision
11143 of 12VAC5-590-380 E, shall provide documentation to the ~~ODW department~~ within 30
11144 days of the collection that the sample met the criteria defined in 12VAC5-590-380 E.

11145 ~~N. Information to be included on the operation monthly report shall be determined by the~~
11146 ~~commissioner for each waterworks on an individual basis. Appendix G contains suggested~~
11147 ~~monthly operation report requirements.~~

11148 **12VAC5-590-531. Reporting requirements for filtration treatment and disinfection**
11149 **treatment.**

11150 A. The owner of a waterworks using either a surface water source or a GUDI source or both
11151 shall report monthly to the department the following specified information.

11152 1. Turbidity measurements as required by 12VAC5-590-376 B shall be reported within 10
11153 days after the end of each month the waterworks serves water to the public. Information
11154 that shall be reported includes:

11155 a. The total number of filtered water turbidity measurements collected during the
11156 month.

11157 b. The number and percentage of filtered water turbidity measurements collected
11158 during the month that are less than or equal to the turbidity limits specified in 12VAC5-
11159 590-395 A 2 b for the filtration technology being used.

11160 c. The owner of a waterworks that uses lime softening may apply to the department
11161 for alternative exceedance levels for the levels specified in subdivision A 1 b of this
11162 section if he can demonstrate that higher turbidity levels in individual filters are due to
11163 lime carryover only and not due to degraded filter performance.

11164 2. The owner of a waterworks with combined distribution systems serving at least 10,000
11165 persons using either a surface water source or a GUDI source or both that provides
11166 conventional filtration treatment or direct filtration shall report monthly to the department
11167 the information specified in subdivisions A 2 a and A 2 b of this section. Also, the owner
11168 of a waterworks that provides filtration approved under 12VAC5-590-395 A 2 b shall report
11169 monthly to the department the information specified in subdivisions A 2 a and A 2 b of
11170 this section.

11171 a. Turbidity measurements collected to meet 12VAC5-590-395 A 2 b shall be reported
11172 within 10 days after the end of each month the waterworks serves water to the public.

11173 Information that shall be reported includes:

11174 (1) The total number of filtered water turbidity measurements collected during the
11175 month.

11176 (2) The number and percentage of filtered water turbidity measurements collected
11177 during the month that are less than or equal to the turbidity limits specified in 12VAC5-
11178 590-395 A 2 b.

11179 (3) The date and value of any turbidity measurements collected during the month that
11180 exceed 1 NTU for waterworks using conventional filtration treatment or direct filtration,

11181 or that exceed the maximum level set by the department under 12VAC5-590-395 A 2
11182 b.

11183 b. The owner shall maintain the results of individual filter monitoring collected under
11184 12VAC5-590-376 B for at least three years. The owner shall report the completion of
11185 individual filter turbidity monitoring under 12VAC5-590-376 B within 10 days after the
11186 end of each month the waterworks serves water to the public. The owner shall report
11187 individual filter turbidity measurement results collected under 12VAC5-590-376 B
11188 within 10 days after the end of each month the waterworks serves water to the public
11189 only if measurements demonstrate one or more of the conditions in 12VAC5-590-395
11190 A 2 b. The owner of a waterworks that uses lime softening may apply to the department
11191 for alternative exceedance levels for the levels specified in 12VAC5-590-395 A 2 b if
11192 he can demonstrate that higher turbidity levels in individual filters are due to lime
11193 carryover only and not due to degraded filter performance.

11194 3. For a waterworks with combined distribution systems serving 10,000 or more persons:

11195 a. For an individual filter that has a measured turbidity level of greater than 1.0 NTU in
11196 two consecutive measurements collected 15 minutes apart, the owner shall report the
11197 filter number, the turbidity measurement, and the date, or dates, on which the
11198 exceedance occurred. In addition, the owner shall either produce a filter profile for the
11199 filter within seven days of the exceedance (if the owner is not able to identify an
11200 obvious reason for the abnormal filter performance) and report that the profile has
11201 been produced or report the obvious reason for the exceedance.

11202 b. For an individual filter that has a measured turbidity level of greater than 0.5 NTU in
11203 two consecutive measurements collected 15 minutes apart at the end of the first four
11204 hours of continuous filter operation after the filter has been backwashed or otherwise
11205 taken offline, the owner shall report the filter number, the turbidity, and the date, or

11206 dates, on which the exceedance occurred. In addition, the owner shall either produce
11207 a filter profile for the filter within seven days of the exceedance (if the owner is not able
11208 to identify an obvious reason for the abnormal filter performance) and report that the
11209 profile has been produced or report the obvious reason for the exceedance.

11210 c. For an individual filter that has a measured turbidity level of greater than 1.0 NTU in
11211 two consecutive measurements collected 15 minutes apart at any time in each of three
11212 consecutive months, the owner shall report the filter number, the turbidity
11213 measurement, and the date, or dates, on which the exceedance occurred. In addition,
11214 the waterworks shall conduct a self-assessment of the filter within 14 days of the
11215 exceedance and report that the self-assessment was conducted. The self-assessment
11216 shall consist of at least the following components: assessment of filter performance;
11217 development of a filter profile; identification and prioritization of factors limiting filter
11218 performance; assessment of the applicability of corrections; and preparation of a filter
11219 self-assessment report.

11220 d. For an individual filter that has a measured turbidity level of greater than 2.0 NTU in
11221 two consecutive measurements collected 15 minutes apart at any time in each of two
11222 consecutive months, the owner shall report the filter number, the turbidity
11223 measurement, and the date, or dates, on which the exceedance occurred. In addition,
11224 the owner shall arrange for the conduct of a comprehensive performance evaluation
11225 (CPE) by the department or a third party approved by the department no later than 30
11226 days following the exceedance and have the evaluation completed and submitted to
11227 the department no later than 90 days following the exceedance. A CPE means a
11228 thorough evaluation and analysis of a water treatment plant's performance-based
11229 capabilities and associated administrative, operational, and maintenance practices. A
11230 CPE is conducted to identify factors that may be adversely impacting a water treatment

11231 plant's capability to achieve compliance, and emphasizes approaches that can be
11232 implemented without significant capital improvements.

11233 4. For a waterworks with combined distribution systems serving less than 10,000 persons:

11234 a. For an individual filter (or the turbidity of CFE for waterworks with two filters that
11235 monitor CFE instead of individual filters) that has a measured turbidity level of greater
11236 than 1.0 NTU in two consecutive measurements collected 15 minutes apart, the owner
11237 shall report the filter number or numbers, the turbidity measurements, and the date, or
11238 dates, on which the exceedance occurred and the cause (if known) for the
11239 exceedances.

11240 b. For an individual filter (or the turbidity of CFE for a waterworks with two filters that
11241 monitor CFE instead of individual filters) that has a measured turbidity level of greater
11242 than 1.0 NTU in two consecutive measurements collected 15 minutes apart at any
11243 time in each of three consecutive months, the owner shall conduct a self-assessment
11244 of the filter or filters within 14 days of the day the filter exceeded 1.0 NTU unless a
11245 CPE as specified in subdivision A 4 c of this section was required. A waterworks with
11246 two filters that monitor the CFE instead of individual filters shall conduct a self-
11247 assessment on both filters. The self-assessment shall be reported to the department
11248 and consist of at least the following components: (i) date the self-assessment was
11249 triggered; (ii) date the self-assessment was completed; (iii) an assessment of filter
11250 performance; (iv) development of a filter profile; (v) identification and prioritization of
11251 factors limiting filter performance; (vi) assessment of the applicability of corrections;
11252 and (vii) preparation of a filter self-assessment report. The self-assessment shall be
11253 submitted within 10 days after the end of the month or 14 days after the self-
11254 assessment was triggered only if it was triggered during the last four days of the month.

11255 c. For an individual filter (or the turbidity of CFE for a waterworks with two filters that
11256 monitor CFE instead of individual filters) that has a measured turbidity level of greater
11257 than 2.0 NTU in two consecutive measurements collected 15 minutes apart at any
11258 time in each of two consecutive months, the owner shall arrange for a CPE, as defined
11259 in subdivision A 3 d of this section, by the department or a third party approved by the
11260 department no later than 60 days following the day the filter exceeded 2.0 NTU in two
11261 consecutive months. The owner shall report within 10 days after the end of the month
11262 that a CPE is required and the date that it was triggered. If a CPE has been completed
11263 by the department or a third party approved by the department within the 12 prior
11264 months or the owner and the department are jointly participating in an ongoing
11265 comprehensive technical assistance project at the waterworks, then a new CPE is not
11266 required. If conducted, a CPE shall be completed and submitted to the department no
11267 later than 120 days following the day the filter exceeded 2.0 NTU in two consecutive
11268 measurements for the second straight month.

11269 5. Reporting Cryptosporidium monitoring results.

11270 a. The owner shall report results from the source water monitoring required in 12VAC5-
11271 590-401 B no later than 10 days after the end of the first month following the month
11272 when the sample is collected.

11273 b. The owner shall report the following data elements for each Cryptosporidium
11274 analysis:

11275 (1) Public water system (PWS) ID No.;

11276 (2) Facility ID;

11277 (3) Sample collection date;

11278 (4) Sample type (field or matrix spike);

- 11279 (5) Sample volume filtered (L), to nearest 1/4 L;
- 11280 (6) Was 100% of filtered volume examined; and
- 11281 (7) Number of oocysts counted.
- 11282 c. Quality control for Cryptosporidium analysis
- 11283 (1) For matrix spike samples, the owner shall also report the sample volume spiked
- 11284 and the estimated number of oocysts spiked. These data are not required for field
- 11285 samples.
- 11286 (2) For samples in which less than 10 L is filtered or less than 100% of the sample
- 11287 volume is examined, the owner shall also report the number of filters used and the
- 11288 packed pellet volume.
- 11289 (3) For samples in which less than 100% of the sample volume is examined, the owner
- 11290 shall also report the volume of re-suspended concentrate and volume of this re-
- 11291 suspension processed through immunomagnetic separation.
- 11292 d. The owner shall report the following data elements for each E. coli analysis:
- 11293 (1) PWS ID No.;
- 11294 (2) Facility ID;
- 11295 (3) Sample collection date;
- 11296 (4) Analytical method number;
- 11297 (5) Method type;
- 11298 (6) Source water type (flowing stream, lake or reservoir, GUDI source);
- 11299 (7) E. coli/100 mL; and
- 11300 (8) Turbidity

11301 e. The owner of a waterworks serving fewer than 10,000 persons and not required to
 11302 monitor for turbidity under 12VAC5-590-401 B is not required to report turbidity with
 11303 their E. coli results.

11304 B. Reporting of requirements for enhanced treatment for Cryptosporidium.

11305 1. The owner shall report sampling schedules under 12VAC5-590-401 B and source water
 11306 monitoring results under 12VAC5-590-531 A 5, unless the owner notifies the department
 11307 that he will not conduct source water monitoring due to meeting the criteria of 12VAC5-
 11308 590-401 B 4.

11309 2. The owner shall report the use of uncovered finished water storage facilities to the
 11310 department as described in 12VAC5-590-415.

11311 3. The owner of a waterworks that provide filtration shall report their Cryptosporidium bin
 11312 classification as described in 12VAC5-590-401 D.

11313 4. The owner shall report disinfection profiles and benchmarks to the department as
 11314 described in 12VAC5-590-401 C 1 and VAC5-590-401 C 2 before making a significant
 11315 change in disinfection practice.

11316 5. The owner shall report to the department in accordance with Table 531.1 for any
 11317 microbial toolbox options used to comply with treatment requirements under 12VAC5-590-
 11318 401 D 2. Alternatively, the department may approve a waterworks to certify operation
 11319 within required parameters for treatment credit rather than reporting monthly operational
 11320 data for toolbox options.

11321

| <u>TABLE 531.1.</u> <u>Microbial Toolbox Reporting Requirements.</u> | | |
|---|---|---|
| <u>TOOLBOX</u> <u>OPTION</u> | <u>OWNERS SHALL SUBMIT THE</u> <u>FOLLOWING INFORMATION:</u> | <u>ON THE FOLLOWING</u> <u>SCHEDULE:</u> |

| | | |
|---|---|---|
| <u>Alternative source/intake management</u> | <u>Verification that the waterworks has relocated the intake or adopted the intake withdrawal procedure reflected in monitoring results.</u> | <u>No later than the applicable treatment compliance date in 12VAC5-590-401 D 3.</u> |
| <u>Presedimentation</u> | <u>Monthly verification of the following:</u> <u>(i) Continuous basin operation;</u> <u>(ii) Treatment of 100% of the flow;</u> <u>(iii) Continuous addition of a coagulant; and,</u> <u>(iv) At least 0.5-log mean reduction of influent turbidity or compliance with alternative performance criteria approved by the department.</u> | <u>Monthly reporting within 10 days following the month in which the monitoring was conducted, beginning on the applicable treatment compliance date in 12VAC5-590-401 D 3.</u> |
| <u>Two-stage lime softening</u> | <u>Monthly verification of the following:</u> <u>(i) Chemical addition and hardness precipitation occurred in two separate and sequential softening stages before filtration; and,</u> <u>(ii) Both stages treated 100% of the water treatment plant flow.</u> | <u>Monthly reporting within 10 days following the month in which the monitoring was conducted, beginning on the applicable treatment compliance date in 12VAC5-590-401 D 3.</u> |
| <u>Bank filtration</u> | <u>Initial demonstration of the following:</u> <u>(i) Unconsolidated, predominantly sandy aquifer; and,</u> <u>(ii) Setback distance of at least 25 ft. (0.5-log credit) or 50 ft. (1.0-log credit).</u> | <u>No later than the applicable treatment compliance date in 12VAC5-590-401 D 3.</u> |
| | <u>If monthly average of daily maximum turbidity is greater than 1 NTU then the waterworks shall report the result and submit an assessment of the cause.</u> | <u>Report within 30 days following the month in which the monitoring was conducted, beginning on the applicable treatment compliance date in 12VAC5-590-401 D 3.</u> |
| <u>Combined filter performance</u> | <u>Monthly verification of CFE turbidity levels less than or equal to 0.15 NTU in at least 95% of the four-hour CFE measurements collected each month.</u> | <u>Monthly reporting within 10 days following the month in which the monitoring was conducted, beginning on the applicable treatment compliance date in 12VAC5-590-401 D 3.</u> |
| <u>Individual filter performance</u> | <u>Monthly verification of the following:</u> <u>(i) Individual filter effluent turbidity levels less than or equal to 0.15</u> | <u>Monthly reporting within 10 days following the month in which the monitoring was conducted, beginning on the applicable treatment</u> |

| | | |
|--|--|--|
| | <p><u>NTU in at least 95% of samples each month in each filter; and,</u></p> <p><u>(ii) No individual filter greater than 0.3 NTU in two consecutive readings 15 minutes apart.</u></p> | <p><u>compliance date in 12VAC5-590-401 D 3.</u></p> |
| <u>Demonstration of performance</u> | <p><u>Results from testing following a protocol approved by the department.</u></p> | <p><u>No later than the applicable treatment compliance date in 12VAC5-590-401 D 3.</u></p> |
| | <p><u>As required by the department, monthly verification of operation within conditions of the department's approval for demonstration of performance credit.</u></p> | <p><u>Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in 12VAC5-590-401 D 3.</u></p> |
| <u>Bag filters and cartridge filters</u> | <p><u>Demonstration that the following criteria are met:</u></p> <p><u>(i) Process meets the definition of bag or cartridge filtration; and,</u></p> <p><u>(ii) Removal efficiency established through challenge testing that meets criteria in 12VAC5-590-401 E 6 a.</u></p> | <p><u>No later than the applicable treatment compliance date in 12VAC5-590-401 D 3.</u></p> |
| | <p><u>Monthly verification that 100% of the water treatment plant flow was filtered.</u></p> | <p><u>Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in 12VAC5-590-401 D 3.</u></p> |
| <u>Membrane filtration</u> | <p><u>Results of verification testing demonstrating the following:</u></p> <p><u>(i) Removal efficiency established through challenge testing that meets criteria in subdivision B 5 of this section; and</u></p> <p><u>(ii) Integrity test method and parameters, including resolution, sensitivity, test frequency, control limits, and associated baseline.</u></p> | <p><u>No later than the applicable treatment compliance date in 12VAC5-590-401 D 3.</u></p> |
| | <p><u>Monthly report summarizing the following:</u></p> <p><u>(i) All direct integrity tests above the control limit; and,</u></p> <p><u>(ii) If applicable, any turbidity or alternative indirect integrity monitoring approved by the department that results in triggering</u></p> | <p><u>Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in 12VAC5-590-401 D 3.</u></p> |

| | | |
|---|--|---|
| | <u>direct integrity testing and the corrective action that was taken.</u> | |
| <u>Second stage filtration</u> | <u>Monthly verification that 100% of flow was filtered through both stages and that first stage was preceded by a coagulation step.</u> | <u>Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in 12VAC5-590-401 D 3.</u> |
| <u>Slow sand filtration (as secondary filter)</u> | <u>Monthly verification that both a slow sand filter and a preceding separate stage of filtration treated 100% of flow from surface water or GUDI.</u> | <u>Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in 12VAC5-590-401 D 3.</u> |
| <u>Chlorine dioxide</u> | <u>Summary of CT values for each day as described in 12VAC5-590-401 E 7 b (1).</u> | <u>Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in 12VAC5-590-401 D 3.</u> |
| <u>Ozone</u> | <u>Summary of CT values for each day as described in 12VAC5-590-401 E 7 b (2).</u> | <u>Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in 12VAC5-590-401 D 3.</u> |
| <u>UV</u> | <u>Validation test results demonstrating operating conditions that achieve required UV dose.</u> | <u>No later than the applicable treatment compliance date in 12VAC5-590-401 D 3.</u> |
| | <u>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 12VAC5-590-401 E 7 c (1).</u> | <u>Within 10 days following the month in which monitoring was conducted, beginning on the applicable treatment compliance date in 12VAC5-590-401 D 3.</u> |

11322

11323 C. Disinfection information specified below shall be reported to the department within 10 days

11324 after the end of each month the waterworks serves water to the public. Information that shall be

11325 reported includes:

11326 1. For each day, the lowest measurement of residual disinfectant concentration in mg/L in

11327 water entering the distribution system.

11328 2. The date and duration of each period when the residual disinfectant concentration in
11329 water entering the distribution system fell below 0.2 mg/L and when the department was
11330 notified of the occurrence.

11331 3. The following information on the samples collected in the distribution system in
11332 conjunction with total coliform monitoring pursuant to 12VAC5-590-395 A 2.

11333 a. Number of instances where the residual disinfectant concentration is measured;

11334 b. Number of instances where the residual disinfectant concentration is not measured
11335 but HPC is measured;

11336 c. Number of instances where the residual disinfectant concentration is measured but
11337 not detected and no HPC is measured;

11338 d. Number of instances where no residual disinfectant concentration is detected and
11339 where HPC is greater than 500/mL;

11340 e. Number of instances where the residual disinfectant concentration is not measured
11341 and HPC is greater than 500/mL; and

11342 f. For the current and previous month the waterworks serves water to the public, the
11343 value of "V," in percent, in the following formula:

11344

$$V = \left[\frac{(c + d + e)}{(a + b)} \right] * 100$$

11345

11346 a = the value in subdivision C 3 a of this section

11347 b = the value in subdivision C 3 b of this section

11348 c = the value in subdivision C 3 c of this section

11349 d = the value in subdivision C 3 d of this section

11350 e = the value in subdivision C 3 e of this section

11351
11352 g. The department may determine that, based on site-specific considerations, if an
11353 owner has no means for having a sample transported and analyzed for HPC by a
11354 certified laboratory under the requisite time and temperature conditions and the
11355 waterworks is providing adequate disinfection in the distribution system, the HPC
11356 compliance requirements of subdivisions C 3 a through C 3 f of this section do not
11357 apply.

11358 4. The owner need not report the data listed in subdivision C1 of this section if all data
11359 listed in subdivisions C 1 through C 3 of this section remain on file at the waterworks and
11360 the department determines that the owner has submitted all of the information required by
11361 subdivisions C 1 through C 3 of this section for the last 12 months.

11362 5. A waterworks using disinfection oxidants other than free chlorine after filtration shall
11363 continue to record disinfection profile measurements and incorporate log inactivation
11364 computations into their Monthly Operation Reports, as described in 12VAC5-590-570.

11365 D. Reporting requirements for DBPs. The owner shall report the following information to the
11366 department in accordance with 12VAC5-590-530. The department may choose to perform
11367 calculations and determine whether the PMCL was violated, instead of having the owner report
11368 that information.

11369 1. Locational Running Annual Average (LRAA) Reporting:

11370 a. The owner shall report the following information for each monitoring location to the
11371 department:

11372 (1) Number of samples collected during the last quarter.

11373 (2) Date and results of each sample collected during the last quarter.

11374 (3) Arithmetic average of quarterly results for the last four quarters for each LRAA,
11375 beginning at the end of the fourth calendar quarter that follows the compliance date
11376 and at the end of each subsequent quarter. If the LRAA calculated based on fewer
11377 than four quarters of data would cause the PMCL to be exceeded regardless of the
11378 monitoring results of subsequent quarters, the owner shall report this information to
11379 the department as part of the first report due following the compliance date or anytime
11380 thereafter that this determination is made. If the owner is required to conduct
11381 monitoring at a frequency that is less than quarterly, then the owner shall make
11382 compliance calculations beginning with the first compliance sample collected after the
11383 compliance date, unless the owner is required to conduct increased monitoring under
11384 12VAC5-590-374 F 5.

11385 (4) Whether, based on 12VAC5-590-384 B 1, the PMCL was violated at any monitoring
11386 location.

11387 (5) Any operational evaluation levels, under 12VAC5-590-384 B 1 d, that were
11388 exceeded during the quarter and, if so, the location and date, and the calculated TTHM
11389 and HAA5 levels.

11390 b. The owner of a waterworks using either a surface water source or a GUDI source
11391 or both seeking to qualify for or remain on reduced TTHM and HAA5 monitoring shall
11392 report the following source water TOC information for each water treatment plant that
11393 treats surface water or ground water under the direct influence of surface water to the
11394 department within 10 days of the end of any quarter in which monitoring is required:

11395 (1) The number of source water TOC samples collected each month during last
11396 quarter.

- 11397 (2) The date and result of each sample collected during last quarter.
- 11398 (3) The quarterly average of monthly samples collected during last quarter or the result
- 11399 of the quarterly sample.
- 11400 (4) The RAA of quarterly averages from the past four quarters.
- 11401 (5) Whether the RAA exceeded 4.0 mg/L.
- 11402 2. The owner of a waterworks monitoring for chlorite under the requirements of 12VAC5-
- 11403 590-374 G shall report:
- 11404 a. The number of entry point samples collected each month for the last three months.
- 11405 b. The location, date, and result of each sample (both entry point and distribution
- 11406 system) collected during the last quarter.
- 11407 c. For each month in the reporting period, the arithmetic average of all samples
- 11408 collected in each three sample set collected in the distribution system.
- 11409 d. Whether, based on 12VAC5-590-384 B 3, the PMCL was violated, in which month
- 11410 and how many times it was violated each month.
- 11411 3. The owner of a waterworks monitoring for bromate under the requirements of 12VAC5-
- 11412 590-374 H shall report:
- 11413 a. The number of samples collected during the last quarter.
- 11414 b. The location, date, and result of each sample collected during the last quarter.
- 11415 c. The arithmetic average of the monthly arithmetic averages of all samples collected
- 11416 in the last year.
- 11417 d. Whether, based on 12VAC5-590-384 B 2, the PMCL was violated.

11418 E. Reporting requirements for disinfectants. The owner shall report the information specified
11419 below to the department in accordance with 12VAC5-590-530 within 10 days after the end of each
11420 monitoring period in which samples were collected. (The department may choose to perform
11421 calculations and determine whether the MRDL was violated, instead of having the owner report
11422 that information):

11423 1. The owner of a waterworks monitoring for chlorine or chloramines under the
11424 requirements of 12VAC5-590-374 I 1 shall report:

11425 a. The number of samples collected during each month of the last quarter.

11426 b. The monthly arithmetic average of all samples collected in each month for the last
11427 12 months.

11428 c. The arithmetic average of all monthly averages for the last 12 months.

11429 d. Whether, based on 12VAC5-590-384 C 1, the MRDL was violated.

11430 2. The owner of a waterworks monitoring for chlorine dioxide under the requirements of
11431 12VAC5-590-374 I 2 shall report:

11432 a. The dates, results, and locations of samples collected during the last quarter.

11433 b. Whether, based on 12VAC5-590-384 C 2, the MRDL was violated.

11434 c. Whether the MRDL was exceeded in any two consecutive daily samples and
11435 whether the resulting violation was acute or nonacute.

11436 F. Reporting requirements for DBPPs and enhanced coagulation or enhanced softening. The
11437 owner shall report the following information to the department within 10 days after the end of each
11438 monitoring period in which the samples were collected in accordance with subsection A of this
11439 section. (The department may choose to perform calculations and determine whether the
11440 treatment technique was met, instead of having the owner report that information):

- 11441 1. The owner of a waterworks monitoring monthly or quarterly for TOC under the
11442 requirements of 12VAC5-590-374 J and required to meet the enhanced coagulation or
11443 enhanced softening requirements in 12VAC5-590-411 A 2 shall report:
- 11444 a. The number of paired (source water and treated water) samples collected during
11445 the last quarter.
- 11446 b. The location, date, and results of each paired sample and associated alkalinity
11447 collected during the last quarter.
- 11448 c. For each month in the reporting period that paired samples were collected, the
11449 arithmetic average of the percent reduction of TOC for each paired sample and the
11450 required TOC percent removal.
- 11451 d. Calculations for determining compliance with the TOC percentage removal
11452 requirements, as provided in 12VAC5-590-411 A 3.
- 11453 e. Whether the waterworks is in compliance with the enhanced coagulation or
11454 enhanced softening percent removal requirements in 12VAC5-590-411 A 2 for the last
11455 four quarters.
- 11456 2. The owner of a waterworks monitoring monthly or quarterly for TOC under the
11457 requirements of 12VAC5-590-374 J and meeting one or more of the alternative
11458 compliance criteria in 12VAC5-590-411 A 1 b or 12VAC5-590-411 A 1 c shall report:
- 11459 a. The alternative compliance criterion that the waterworks is using.
- 11460 b. The number of paired samples collected during the last quarter.
- 11461 c. The location, date, and result of each paired sample and associated alkalinity
11462 collected during the last quarter.

11463 d. The running annual arithmetic average based on monthly averages (or quarterly
11464 samples) of source water TOC for a waterworks meeting a criterion in 12VAC5-590-
11465 411 A 1 c (1) or 12VAC5-590-411 A 1 c (3) or of treated water TOC for waterworks
11466 meeting the criterion in 12VAC5-590-411 A 1 c (2).

11467 e. The running annual arithmetic average based on monthly averages (or quarterly
11468 samples) of source water SUVA for a waterworks meeting the criterion in 12VAC5-
11469 590-411 A 1 c (5) or of treated water SUVA for a waterworks meeting the criterion in
11470 12VAC5-590-411 A 1 c (6).

11471 f. The RAA of source water alkalinity for a waterworks meeting the criterion in 12VAC5-
11472 590-411 A 1 c (3) and of treated water alkalinity for a waterworks meeting the criterion
11473 in 12VAC5-590-411 A 1 c (1).

11474 g. The RAA for both TTHM and HAA5 for a waterworks meeting the criterion in
11475 12VAC5-590-411 A 1 c (3) or 12VAC5-590-411 A 1 c (4).

11476 h. The RAA of the amount of magnesium hardness removal (as CaCO₃, in mg/L) for a
11477 waterworks meeting the criterion in 12VAC5-590-411 A 1 c (2).

11478 i. Whether the waterworks is in compliance with the particular alternative compliance
11479 criterion in 12VAC5-590-411 A 1 b or 12VAC5-590-411 A 1 c.

11480 G. Additional reporting requirements. The owner shall report the following incidents within 24
11481 hours to the department:

11482 1. A waterborne disease outbreak that is potentially attributable to that waterworks.

11483 2. Chlorine residual of below 0.2 mg/L in the water entering the distribution system. The
11484 owner also shall notify the department by the end of the next business day whether or not
11485 the residual was restored to at least 0.2 mg/L within four hours.

11486 12VAC5-590-532. Reporting requirements for lead and copper.

11487 A. The owner shall report all of the following information to the department in accordance with
11488 this subsection.

11489 B. Reporting requirements for tap water monitoring for lead and copper and for water quality
11490 parameter monitoring.

11491 1. Except as provided in subdivision B 1 g of this section, an owner shall report the
11492 information specified below for all tap water samples specified in 12VAC5-590-375 B and
11493 for all water quality parameter samples specified in 12VAC5-590-375 C within the first 10
11494 days following the end of each applicable monitoring period specified in 12VAC5-590-375
11495 B and 12VAC5-590-375 C (i.e., every six months, annually, every three years, or every
11496 nine years). For monitoring periods with a duration less than six months, the end of the
11497 monitoring period is the last date samples can be collected during the period as specified
11498 in 12VAC5-590-375 B and 12VAC5-590-375 C.

11499 a. The results of all tap samples for lead and copper including location or a location
11500 site code and the criteria under 12VAC5-590-375 B 1 c through 12VAC5-590-375 B 1
11501 f or 12VAC5-590-375 C under which the site was selected for the waterworks'
11502 sampling pool.

11503 b. Documentation for each tap water lead or copper sample for which the owner
11504 requests invalidation pursuant to 12VAC5-590-375 B 6.

11505 c. The 90th percentile lead and copper concentrations measured from among all lead
11506 and copper tap water samples collected during each monitoring period (calculated in
11507 accordance with 12VAC5-590-385 C) unless the department calculates the 90th
11508 percentile lead and copper levels under subsection I of this section.

11509 d. With the exception of initial tap sampling conducted pursuant to 12VAC5-590-375
11510 B 4 a, the owner shall designate any site that was not sampled during previous
11511 monitoring periods, and include an explanation of why sampling sites have changed.

11512 e. The results of all tap samples for pH, and where applicable, alkalinity, calcium,
11513 conductivity, temperature, and orthophosphate or silica collected under 12VAC5-590-
11514 375 C 2 through 12VAC5-590-375 C 5.

11515 f. The results of all samples collected at the entry point or points to the distribution
11516 system for applicable water quality parameters under 12VAC5-590-375 C 2 through
11517 12VAC5-590-375 C 5.

11518 g. The owner shall report the results of all water quality parameter samples collected
11519 under 12VAC5-590-375 C 3 through 12VAC5-590-375 C 6 during each six month
11520 monitoring period specified in 12VAC5-590-375 C 4 within the first 10 days following
11521 the end of the monitoring period unless the department has specified a more frequent
11522 reporting requirement.

11523 2. The owner of a NTNC, or a community waterworks meeting the criteria of 12VAC5-590-
11524 405 D 2 e, that does not have enough taps that can provide first-draw samples, must
11525 either:

11526 a. Provide written documentation to the department identifying standing times and
11527 locations for enough non-first-draw samples to make up the sampling pool under
11528 12VAC5-590-375 B 2 e by the start of the first applicable monitoring period under
11529 12VAC5-590-375 B 4, unless the department has waived prior approval of non-first-
11530 draw sample sites selected by the owner pursuant to 12VAC5-590-375 B 2 e; or

11531 b. If the department has waived prior approval of non-first-draw sample sites selected
11532 by the owner, then the owner shall identify, in writing, each site that did not meet the

11533 six-hour minimum standing time and the length of standing time for that particular
11534 substitute sample collected pursuant to 12VAC5-590-375 B 2 e and include this
11535 information with the lead and copper sample results required to be submitted pursuant
11536 to subsection B of this section.

11537 3. At a time specified by the department, or if no specific time is designated by the
11538 department, then as early as practical before the addition of a new source or any long-
11539 term change in water treatment, an owner (i) deemed to have optimized corrosion control
11540 under 12VAC5-590-405 A 2 b (3), (ii) subject to reduced monitoring pursuant to 12VAC5-
11541 590-375 B 4 d, or (iii) subject to a monitoring waiver pursuant to 12VAC5-590-375 B 7,
11542 shall submit written documentation to the department describing the change or addition.
11543 The department must approve the addition of a new source or a long-term change in
11544 treatment before it is implemented by the owner. Examples of long-term treatment
11545 changes include the addition of a new treatment process or modification of an existing
11546 treatment process. Examples of modification include switching secondary disinfectants,
11547 switching coagulants (e.g., alum to ferric chloride), switching corrosion inhibitor products
11548 (e.g., orthophosphate to blended phosphate). Long-term changes can include dose
11549 changes to existing chemicals if the waterworks is planning long-term changes to its
11550 finished water pH or residual inhibitor concentration. Long-term treatment changes would
11551 not include chemical dose fluctuations associated with daily source water quality changes.

11552 4. The owner of a small waterworks applying for a monitoring waiver under 12VAC5-590-
11553 375 B 7 or subject to a waiver granted pursuant to 12VAC5-590-375 B 7 c, shall provide
11554 the following information to the department in writing by the specified deadline:

11555 a. By the start of the first applicable monitoring period in 12VAC5-590-375 B 4, the
11556 owner of a small waterworks applying for a monitoring waiver shall provide the

11557 documentation required to demonstrate that the waiver criteria of 12VAC5-590-375 B
11558 7 a and 12VAC5-590-375 B 7 b have been met.

11559 b. No later than nine years after the monitoring previously conducted pursuant to
11560 12VAC5-590-375 B 7 b or 12VAC5-590-375 B 7 d (1), the owner of a small waterworks
11561 desiring to maintain its monitoring waiver shall provide the information required by
11562 12VAC5-590-375 B 7 d (1) and 12VAC5-590-375 B 7 d (2).

11563 c. No later than 60 days after becoming aware that it is no longer free of lead-
11564 containing or copper-containing material, the owner of a small waterworks with a
11565 monitoring waiver shall provide written notification to the department, setting forth the
11566 circumstances resulting in the lead-containing or copper-containing materials being
11567 introduced into the waterworks and what corrective action, if any, the owner plans to
11568 take to remove these materials.

11569 5. The owner of a groundwater system that limits water quality parameter monitoring to a
11570 subset of entry points under 12VAC5-590-375 C 3 c shall provide, by the commencement
11571 of the monitoring, written correspondence to the department that identifies the selected
11572 entry points and includes information sufficient to demonstrate that the sites are
11573 representative of water quality and treatment conditions throughout the waterworks.

11574 C. Source water monitoring reporting requirements.

11575 1. The owner shall report the sampling results for all source water samples collected in
11576 accordance with 12VAC5-590-375 D within the first 10 days following the end of each
11577 source water monitoring period (i.e., annually, per compliance period, per compliance
11578 cycle) specified in 12VAC5-590-375 D.

11579 2. With the exception of the first round of source water sampling conducted pursuant to
11580 12VAC5-590-375 D 2, the owner shall specify any site that was not sampled during

11581 previous monitoring periods, and include an explanation of why the sampling point has
11582 changed.

11583 D. Corrosion control treatment reporting requirements. By the applicable dates under
11584 12VAC5-590-405 A 2 a, an owner shall report the following information:

11585 1. For the owner demonstrating that he has already optimized corrosion control,
11586 information required in 12VAC5-590-405 A 2 b (2) or 12VAC5-590-405 A 2 b (3).

11587 2. For the owner required to optimize corrosion control, the owner's recommendation
11588 regarding optimal corrosion control treatment under 12VAC5-590-405 A 1 a.

11589 3. For the owner required to evaluate the effectiveness of corrosion control treatments,
11590 the information required under 12VAC5-590-405 A 1 c.

11591 4. For the owner required to install optimal corrosion control designated by the department
11592 under 12VAC5-590-405 A 1 d, a letter certifying that the owner has completed installing
11593 that treatment.

11594 E. Source water treatment reporting requirements. By the applicable dates in 12VAC5-590-
11595 405 B, an owner shall provide the following information to the department:

11596 1. If required under 12VAC5-590-405 B 2 a, the owner's recommendation regarding
11597 source water treatment; or

11598 2. For an owner required to install source water treatment under 12VAC5-590-405 B 2 b,
11599 a letter certifying that the owner has completed installing the treatment designated by the
11600 department within 24 months after the department designated the treatment.

11601 F. Lead service line replacement reporting requirements. The owner shall report the following
11602 information to the department to demonstrate compliance with the requirements of 12VAC5-590-
11603 405 C:

11604 1. No later than 12 months after the end of a monitoring period in which a waterworks
11605 exceeds the lead AL in sampling referred to in 12VAC5-590-405 C 1, the owner shall
11606 submit written documentation to the department of the materials evaluation conducted as
11607 required in 12VAC5-590-375 B 1, to identify the initial number of lead service lines in the
11608 distribution system at the time the waterworks exceeds the lead AL, and provide the
11609 owner's schedule for annually replacing at least 7.0% of the initial number of lead service
11610 lines in its distribution system.

11611 2. No later than 12 months after the end of a monitoring period in which a waterworks
11612 exceeds the lead AL in sampling referred to in 12VAC5-590-405 C 1, and every 12 months
11613 thereafter, the owner shall demonstrate to the department in writing that the owner has
11614 either:

11615 a. Replaced in the previous 12 months at least 7.0% of the initial lead service lines (or
11616 a greater number of lines specified by the department under 12VAC5-590-405 C 6) in
11617 the distribution system; or

11618 b. Conducted sampling that demonstrates that the lead concentration in all service line
11619 samples from an individual line or lines, collected pursuant to 12VAC5-590-375 B 2 c,
11620 is less than or equal to 0.015 mg/L. In these cases, the total number of lines replaced
11621 that meet the criteria in 12VAC5-590-405 C 4 shall equal at least 7.0% of the initial
11622 number of lead service lines identified under subdivision F 1 of this section (or the
11623 percentage specified by the department under 12VAC5-590-405 C 6).

11624 3. The annual letter submitted to the department under subdivision F 2 of this section shall
11625 contain the following information:

11626 a. The number of lead service lines scheduled to be replaced during the previous year
11627 of the waterworks' replacement schedule;

11628 b. The number and location of each lead service line replaced during the previous year
11629 of the waterworks' replacement schedule; and

11630 c. If measured, the water lead concentration and location of each lead service line
11631 sampled, the sampling method, and the date of sampling.

11632 4. The owner of a waterworks that collects lead service line samples following partial lead
11633 service line replacement required by 12VAC5-590-405 C shall report the results to the
11634 department within the first 10 days of the month following the month in which the owner
11635 receives the laboratory results, or as specified by the department. The owner shall also
11636 report any additional information as specified by the department, and in a time and manner
11637 prescribed by the department, to verify that all partial lead service line replacement
11638 activities have taken place.

11639 G. Public education program reporting requirements. The owner shall report the following
11640 information to the department to demonstrate compliance with the requirements of 12VAC5-590-
11641 405 D.

11642 1. The owner of a waterworks that is subject to the public education requirements in
11643 12VAC5-590-405 D shall, within 10 days after the end of each period in which the owner
11644 is required to perform public education tasks in accordance with 12VAC5-590-405 D 2,
11645 send written notice to the department that contains:

11646 a. A demonstration that the owner has delivered the public education materials that
11647 meet the content requirements of 12VAC5-590-405 D 1 and the delivery requirements
11648 of 12VAC5-590-405 D 2; and

11649 b. A list of all the newspapers, radio stations, television stations, and facilities and
11650 organizations to which the owner delivered public education materials during the
11651 period in which the owner was required to perform public education tasks.

11652 2. Unless required by the department, an owner who previously has submitted the
11653 information required by subdivision G 1 b of this section need not resubmit the information
11654 required by subdivision G 1 b of this section, as long as there has been no changes in the
11655 distribution list and the owner certifies that the public education materials were distributed
11656 to the same list submitted previously.

11657 3. No later than three months following the end of the monitoring period, the owner shall
11658 mail a sample copy of the consumer notification of tap results to the department along with
11659 a certification that the notification has been distributed in a manner consistent with the
11660 requirements of 12VAC5-590-405 D 4.

11661 H. Reporting of additional monitoring data. The owner of a waterworks that collects sampling
11662 data in addition to that required by 12VAC5-590-375 shall report the results to the department
11663 within the first 10 days following the end of the applicable monitoring period under 12VAC5-590-
11664 375 B, 12VAC5-590-375 C, and 12VAC5-590-375 D during which the samples are collected.

11665 I. Reporting of the 90th percentile lead and copper concentrations where the department
11666 calculates a waterworks' 90th percentile concentrations. The owner is not required to report the
11667 90th percentile lead and copper concentrations measured from among all lead and copper tap
11668 samples collected during each monitoring period, as required by subdivision B 1 d of this section
11669 if:

11670 1. The department has previously notified the owner that the department will calculate the
11671 waterworks' 90th percentile lead and copper concentrations, based on the lead and copper
11672 tap results submitted pursuant to subdivision I 2 a of this section, and has specified a date
11673 before the end of the applicable monitoring period by which the owner shall provide the
11674 results of the lead and copper tap water samples;

11675 2. The owner has provided the following information to the department by the date
11676 specified in subdivision I 1 of this section:

11677 a. The results of all tap samples for lead and copper including the location of each site
11678 and the criteria under 12VAC5-590-375 B 1 c through 12VAC5-590-375 B 1 f or
11679 12VAC5-590-375 B 1 g under which the site was selected for the waterworks sampling
11680 pool, pursuant to subdivision B 1 a of this section;

11681 b. An identification of sampling sites utilized during the current monitoring period that
11682 were not sampled during the previous monitoring periods, and an explanation why
11683 sampling sites have changed; and

11684 c. The department has provided the results of the 90th percentile lead and copper
11685 calculations, in writing, to the owner before the end of the monitoring period.

11686 _____
11687 **12VAC5-590-540. Public notices.**

11688 A. All ~~The owners~~ owner shall give public notice to (i) persons served by the waterworks and
11689 (ii) the owner of any consecutive waterworks to which it sells or otherwise provides water under
11690 the following circumstances.

- 11691 1. Tier 1.
- 11692 a. When E. coli are present in the distribution system, or when the waterworks fails to
11693 test for E. coli when any repeat sample tests positive for total coliform;
- 11694 b. Violation of the PMCL for E. coli;
- 11695 c. Violation of the PMCL for nitrate, nitrite, or total nitrate and nitrite;
- 11696 d. Failure to ~~take~~ collect a confirmation sample within 24 hours of the waterworks
11697 receipt of the first sample showing an exceedance of the nitrate or nitrite PMCL;

- 11698 e. Exceedance of the nitrate PMCL by a noncommunity waterworks, where permitted
11699 to exceed the PMCL by the ~~commissioner~~ department;
- 11700 f. Violation of the MRDL for chlorine dioxide when one or more samples ~~taken~~ collected
11701 in the distribution system the day following an exceedance of the MRDL at the entry
11702 point ~~of~~ to the distribution system exceed the MRDL;
- 11703 g. Failure to monitor chlorine dioxide residuals in the distribution system the day
11704 following an exceedance of the chlorine dioxide MRDL at the entrance to the
11705 distribution system;
- 11706 h. Violation of the treatment technique requirements for filtration and disinfection
11707 resulting from a single exceedance of the maximum allowable turbidity limit, where the
11708 ~~commissioner~~ department determines after consultation that a Tier 1 notice is
11709 required;
- 11710 i. Failure to consult with the ~~commissioner~~ department within 24 hours after the owner
11711 learns of the violation of the treatment technique requirements for filtration and
11712 disinfection resulting from a single exceedance of the maximum allowable turbidity
11713 limit;
- 11714 j. Occurrence of a waterborne disease outbreak or other waterborne emergency (such
11715 as a failure or significant interruption in key water treatment processes, a natural
11716 disaster that disrupts the water supply or distribution system, or a chemical spill or
11717 unexpected loading of possible pathogens into the source water that significantly
11718 increases the potential for drinking water contamination);
- 11719 k. Detection of E. coli in groundwater source samples; or

11720 I. Other violations or situations with significant potential to have serious adverse effects
11721 on human health as a result of short-term exposure, as determined by the
11722 ~~commissioner~~ department on a case-by-case basis.

11723 2. Tier 2.

11724 a. All violations of the PMCL, MRDL, and treatment technique requirements, except
11725 where a Tier 1 public notice is required or where the ~~commissioner~~ department
11726 determines that a Tier 1 notice is required instead per subdivision A 1 I of this
11727 ~~subsection~~ section;

11728 b. Violations of the monitoring and testing procedure requirements, where the
11729 ~~commissioner~~ department determines that a Tier 2 rather than a Tier 3 public notice is
11730 required instead, taking into account potential health impacts and persistence of the
11731 violation;

11732 c. Failure to comply with the terms and conditions of any variance or exemption in
11733 place; or

11734 d. Failure to take corrective action or failure to maintain at least ~~four-log~~ 4-log treatment
11735 of viruses (using inactivation, removal, or an approved combination of ~~four-log~~ 4-log
11736 virus inactivation and removal) before or at the first customer under the treatment
11737 technique requirements for waterworks with groundwater sources.

11738 3. Tier 3.

11739 a. Monitoring violations, except where a Tier 1 public notice is required per
11740 subdivisions A 1 d and A 1 g of this ~~subsection~~ section, or where the ~~commissioner~~
11741 department determines that a Tier 2 public notice is required instead per subdivision
11742 A 2 b of this ~~subsection~~ section;

11743 b. Failure to comply with a testing procedure, except where a Tier 1 notice is required
11744 per subdivision A 1 b of this ~~subsection~~section or where the ~~commissioner~~ department
11745 determines that a Tier 2 notice is required instead per subdivision A 2 b of this
11746 ~~subsection~~section;

11747 c. Operation under a variance or an exemption to a PMCL or treatment technique
11748 requirement;

11749 d. Availability of ~~unregulated contaminant~~ UC monitoring results; or

11750 e. Exceedance of the fluoride ~~secondary maximum contaminant level (SMCL)~~; and
11751 SMCL.

11752 ~~f. Reporting and recordkeeping violations specified in 12VAC5-590-530 B, C, and D,~~
11753 ~~and 12VAC5-590-550 L.~~

11754 4. The department may require public notice for violations or other situations not listed in
11755 this section, or may require a higher tier of public notice for specific violations and
11756 situations listed in this section.

11757 a. The content and extent of distribution of these public notices shall be determined by
11758 the department.

11759 b. The owner shall provide the public notice certification required in 12VAC5-590-540
11760 N subsection N of this section.

11761 c. At least 90 days before initiating or discontinuing a program to provide the optimum
11762 fluoride ion concentration, a waterworks owner shall deliver written notice to the
11763 waterworks' consumers. Notice to consumers shall be consistent with 12VAC5-590-
11764 540 C 2 d.

11765 B. If a waterworks has a violation, failure, exceedance, or situation in a portion of the
11766 distribution system that is physically or hydraulically isolated from other parts of the distribution
11767 system, the ~~commissioner~~ department may allow the owner to limit distribution of the public notice
11768 to only those persons served by that portion of the waterworks ~~which~~ that is out of compliance.
11769 The decision granting limited distribution of the public notice shall be issued in writing.

11770 C. Public notice distribution requirements.

11771 1. For Tier 1 violations, exceedances, or situations, the owner shall:

11772 a. Provide a public notice as soon as practical but no later than 24 hours after the
11773 owner learns of the violation, exceedance, or situation;

11774 b. Initiate consultation with the ~~commissioner~~ department as soon as practical, but no
11775 later than 24 hours after the owner learns of the violation, exceedance, or situation,
11776 to determine additional public notice requirements;

11777 c. Comply with any additional public notice requirements, including any repeat notices
11778 or direction on the duration of the posted notices, that are established as a result of
11779 the consultation with the ~~commissioner~~ department. ~~Such~~ These requirements may
11780 include the timing, form, manner, frequency, and content of repeat notices (if any) and
11781 other actions designed to reach all persons served; and

11782 d. Provide the public notice in a form and manner reasonably calculated to reach all
11783 persons served. The form and manner shall fit the specific situation, and shall be
11784 designed to reach residential, transient, and ~~non-transient~~ nontransient users of the
11785 waterworks. ~~In order to~~ To reach all persons served, owners shall use, at a minimum,
11786 one or more of the following forms of delivery:

11787 (1) Appropriate broadcast media (such as radio and television);

11788 (2) Posting of the public notice in conspicuous locations throughout the area served
11789 by the waterworks;

11790 (3) Hand delivery of the public notice to persons served by the ~~water system~~
11791 waterworks; or

11792 (4) Another delivery method approved in writing by the ~~commissioner~~ department.

11793 2. For Tier 2 violations, exceedances, or situations, the owner shall:

11794 a. Provide the public notice as soon as practical, but no later than 30 days after the
11795 owner learns of the violation, exceedance, or situation. The ~~commissioner~~ department
11796 may allow, on a case-by-case determination, additional time for the initial notice of up
11797 to three months from the date the owner learns of the violation, exceedance, or
11798 situation; however, the ~~commissioner~~ department shall not grant an extension to the
11799 30-day deadline for any unresolved violation, exceedance, or situation.

11800 b. Repeat the public notice every three months as long as the violation, exceedance,
11801 or situation persists, unless the ~~commissioner~~ department determines that appropriate
11802 circumstances warrant a different repeat notice frequency. In no circumstance shall
11803 the repeat notice be given less frequently than once per year. Repeat notice frequency
11804 less than every three months shall not be allowed for (i) a violation as specified in
11805 12VAC5-590-380 B and 12VAC5-590-392 F; (ii) a treatment technique violation for
11806 filtration and disinfection; and (iii) other ongoing violations, exceedances, or situations.

11807 c. Consult with the ~~commissioner~~ department as soon as practical but no later than 24
11808 hours after the owner learns of a violation of the treatment technique requirements for
11809 filtration and disinfection resulting from a single exceedance of the maximum allowable
11810 turbidity limit to determine whether a Tier 1 public notice is required to protect public
11811 health. If consultation does not take place within the 24-hour period, then the owner

11812 shall distribute a Tier 1 public notice of the violation within the next 24 hours (i.e., no
11813 later than 48 hours after the owner learns of the violation).

11814 d. Provide the initial public notice and any repeat notices in a form and manner that is
11815 reasonably calculated to reach persons served in the required time period.

11816 (1) For a community waterworks, the owner shall:

11817 (a) Mail or otherwise directly deliver the public notice to each customer receiving a bill
11818 and to other service connections to which water is delivered by the waterworks; and

11819 (b) Use any other distribution method reasonably calculated to reach other persons
11820 regularly served by the waterworks, if they would not normally be reached by the notice
11821 required in subdivision C 2 d (1) (a) of this ~~subsection~~ section. ~~Such~~ These persons
11822 may include those who do not pay water bills or do not have service connection
11823 addresses (e.g., house renters, apartment dwellers, university students, nursing home
11824 patients, prison inmates, etc.). Other methods may include: (i) Publication ~~publication~~
11825 in a local newspaper; (ii) delivery of multiple copies for distribution by customers that
11826 provide their drinking water to others (e.g., apartment building owners or large private
11827 employers); (iii) posting in public places served by the ~~system~~ waterworks or on the
11828 Internet; or (iv) delivery to community organizations.

11829 (2) For a noncommunity waterworks, the owner shall:

11830 (a) Post the public notice in conspicuous locations throughout the distribution system
11831 frequented by persons served by the waterworks, or by mail or direct delivery to each
11832 customer and service connection (where known); and

11833 (b) Use any other method reasonably calculated to reach other persons served by the
11834 system if they would not normally be reached by the notice required in subdivision C
11835 2 d (2) (a) of this ~~subsection~~ section. ~~Such~~ These persons may include those served

11836 who may not see a posted notice because the posted notice is not in a location they
11837 routinely pass by. Other methods may include (i) publication in a local newspaper or
11838 newsletter distributed to customers; (ii) use of e-mail to notify employees or students;
11839 or (iii) delivery of multiple copies in central locations (e.g., community centers).

11840 e. Maintain a posted public notice in place for as long as the violation, exceedance, or
11841 situation persists, but in no case for less than seven days, even if the violation,
11842 exceedance, or situation is resolved.

11843 3. For Tier 3 violations, exceedances, or situations the owner shall:

11844 a. Provide the public notice not later than one year after the owner learns of the
11845 violation, exceedance, or situation or begins operating under a variance or exemption.

11846 b. Repeat the public notice annually for as long as the violation, exceedance, variance,
11847 exemption, or other situation persists.

11848 c. Maintain a posted public notice in place for as long as the violation, exceedance,
11849 variance, exemption, or other situation persists, but in no case less than seven days
11850 even if the violation, exceedance, or situation is resolved.

11851 d. Instead of individual Tier 3 public notices, the owner may use an annual report
11852 detailing all violations, exceedances, and situations that occurred during the previous
11853 ~~twelve~~ 12 months, as long as the timing requirements of subdivision C 3 a of this
11854 ~~subsection~~ section are met. For a community waterworks, the ~~Consumer Confidence~~
11855 ~~Report (CCR)~~ CCR may be used as a vehicle for the initial Tier 3 public notice and all
11856 required repeat notices, provided that:

11857 (1) The CCR is provided to persons served by the waterworks no later than 12 months
11858 after the owner learns of the violation, exceedance, or other situation.

11859 (2) The Tier 3 public notice contained in the CCR meets the content requirements in
11860 subsection ~~E~~ D of this section.

11861 (3) The CCR is distributed in a manner meeting the delivery requirements in subdivision
11862 ~~D-3-e~~ C 3 e (1) of this section.

11863 e. For a community waterworks, the owner shall:

11864 (1) Mail or otherwise directly deliver the public notice to each customer receiving a bill
11865 and to other service connections to which water is delivered by the waterworks; and

11866 (2) Use any other method reasonably calculated to reach other persons regularly
11867 served by the ~~system~~ waterworks, if they would not normally be reached by the notice
11868 required in subdivision C 3 e (1) of this ~~subsection~~ section. ~~Such~~ These persons may
11869 include those who do not pay water bills or do not have service connection addresses
11870 (e.g., house renters, apartment dwellers, university students, nursing home patients,
11871 prison inmates, etc.). Other methods may include (i) publication in a local newspaper,
11872 (ii) delivery of multiple copies for distribution by customers that provide their drinking
11873 water to others (e.g., apartment building owners or large private employers),
11874 (iii) posting in public places or on the Internet, or (iv) delivery to community
11875 organizations.

11876 f. For a noncommunity waterworks the owner shall:

11877 (1) Post the public notice in conspicuous locations throughout the distribution system
11878 frequented by persons served by the waterworks, or by mail or direct delivery to each
11879 customer and service connection (where known); and

11880 (2) Use any other method reasonably calculated to reach other persons served by the
11881 system, if they would not normally be reached by the notice required in subdivision 3
11882 f (1) of this subsection. ~~Such~~ These persons may include those who may not see a

11883 posted notice because the notice is not in a location they routinely pass by. Other
11884 methods may include: ~~Publication~~ (i) publication in a local newspaper or newsletter
11885 distributed to customers; (ii) use of ~~E-mail~~ e-mail to notify employees or students; or,
11886 (iii) delivery of multiple copies in central locations (e.g., community centers).

11887 D. Public notice contents.

11888 1. Each public notice for PMCL, MRDL, and TT violations and other situations requiring a
11889 public notice shall include the following elements:

11890 a. A description of the violation, exceedance, or situation, including the ~~contaminant(s)~~
11891 contaminant or contaminants of concern, and (as applicable) the contaminant ~~level(s)~~
11892 level or levels;

11893 b. When the violation, exceedance, or situation occurred;

11894 c. Any potential adverse health effects from the violation, exceedance, or situation,
11895 including the standard language under subdivision 5 a or 5 b of this subsection,
11896 whichever is applicable;

11897 d. The population at risk, including subpopulations particularly vulnerable if exposed
11898 to the contaminant in their drinking water;

11899 e. Whether alternative water supplies should be used;

11900 f. What actions consumers should take, including when they should seek medical help,
11901 if known;

11902 g. What the owner is doing to correct the violation, exceedance, or situation;

11903 h. When the owner expects the waterworks to return to compliance or resolve the
11904 situation;

- 11905 i. The name, business address, and phone number of the owner, operator, or designee
11906 as a source of additional information concerning the notice; and
- 11907 j. A statement to encourage the notice recipient to distribute the public notice to other
11908 persons served, using the standard language under subdivision 5 c of this subsection,
11909 where applicable.
- 11910 2. Each public notice for a waterworks that has been granted a variance or exemption
11911 shall include the following elements:
- 11912 a. An explanation of the reasons for the variance or exemption;
- 11913 b. The date on which the variance or exemption was issued;
- 11914 c. A brief status report on the steps the owner is taking to install treatment, find
11915 alternative sources of source water, or otherwise comply with the terms and schedules
11916 of the variance or exemption; and
- 11917 d. A notice of any opportunity for public input in the ~~review~~evaluation of the variance
11918 or exemption.
- 11919 3. Each public notice for a waterworks that violates the conditions of a variance or an
11920 exemption shall contain the ~~ten~~ 10 elements listed in subdivision D 1 of this ~~subsection~~
11921 section.
- 11922 4. Each public notice shall:
- 11923 a. Be displayed in a conspicuous way when printed or posted;
- 11924 b. Not contain overly technical language or very small print;
- 11925 c. Not be formatted in a way that defeats the purpose of the notice;
- 11926 d. Not contain language ~~which~~that nullifies the purpose of the notice;

11927 e. Contain information in the appropriate ~~language(s)~~ language or languages, for
11928 waterworks serving a large proportion of ~~non-English-speaking~~ non-English-speaking
11929 consumers, regarding the importance of the notice or contain a telephone number or
11930 address where persons served may contact the owner to obtain a translated copy of
11931 the notice or to request assistance in the appropriate language.

11932 5. The public notice shall include the following standard language:

11933 a. For PMCL or MRDL violations, treatment technique violations, and violations of the
11934 condition of a variance or an exemption~~standard exemption~~, use standard health
11935 effects language as specified in ~~Appendix O-12VAC5-590-546~~ corresponding to each
11936 PMCL, MRDL, and treatment technique violation and for each violation of a condition
11937 of a variance or an exemption. For violation of the treatment technique requirement,
11938 the public notice shall also include one or both of the following statements, as
11939 appropriate:

11940 (1) We failed to conduct the required assessment.

11941 (2) We failed to correct all sanitary defects that were identified during the assessment.

11942 b. For monitoring and testing procedure violations including failure to monitor for total
11943 coliform bacteria or E. coli ~~prior to~~ before serving water from a seasonal ~~waterworks--~~
11944 ~~standard~~ waterworks, use standard language as specified below, including the
11945 language necessary to fill in the blanks:

11946 We are required to monitor your drinking water for specific contaminants on a regular
11947 basis. Results of regular monitoring are an indicator of whether or not your drinking
11948 water meets health standards. During (compliance period), we (did not monitor or test
11949 or did not complete all monitoring or testing) for ~~(contaminant(s))~~, (contaminant or

11950 contaminants) and therefore cannot be sure of the quality of your drinking water during
11951 that time.

11952 c. For all public ~~notices--standard~~ notices, use standard language (where applicable),
11953 as specified below:

11954 Please share this information with all the other people who drink this water, especially
11955 those who may not have received this notice directly (~~for example, people in~~
11956 ~~apartments, nursing homes, schools, and businesses~~) (e.g., people in apartments,
11957 nursing homes, schools, and businesses). You can do this by posting this notice in a
11958 public place or distributing copies by hand or mail.

11959 d. For total coliform bacteria treatment technique violations the public notice shall
11960 include the following statement: We found coliforms indicating the need to look for
11961 potential problems in our waterworks. When this occurs, we are required to conduct
11962 assessments to identify problems and correct any problems that are found. The public
11963 notice shall also include the following statements, as appropriate:

11964 (1) We failed to conduct the required assessment.

11965 (2) We failed to correct all sanitary defects that were identified during the assessment.

11966 e. For E. coli treatment technique violations the public notice shall include the following
11967 statement: We violated the standard for E. coli, indicating the need to look for potential
11968 problems in our waterworks. When this occurs, we are required to conduct a detailed
11969 assessment to identify problems and to correct any problems that are found. The
11970 public notice shall also include the following statements, as appropriate:

11971 (1) We failed to conduct the required assessment.

11972 (2) We failed to correct all sanitary defects that were identified during the assessment.

- 11973 E. Public notice to new billing units or customers.
- 11974 1. For a community waterworks, the owner shall give a copy of the most recent public
- 11975 notice for any continuing violation, exceedance, variance, or exemption, or other ongoing
- 11976 situations situation requiring a public notice to all new billing units or new customers ~~prior~~
- 11977 ~~to~~ before or at the time service begins.
- 11978 2. For a noncommunity waterworks, the owner shall continuously post the public notice in
- 11979 conspicuous locations ~~in order~~ to inform new consumers of any continuing violation,
- 11980 exceedance, variance, or exemption, or other situation requiring a public notice for as long
- 11981 as the violation, exceedance, variance, exemption, or other situation persists.
- 11982 F. Special notice of the availability of ~~unregulated contaminant~~ UC monitoring results.
- 11983 1. The owner of a community waterworks or ~~non-transient~~, a NTNC noncommunity
- 11984 ~~waterworks~~ shall notify persons served by the ~~system~~ waterworks of the availability of the
- 11985 results of ~~such~~ the sampling no later than 12 months after the monitoring results are
- 11986 known.
- 11987 2. The special notice shall meet the requirements ~~for~~ of a Tier 3 public notice and shall
- 11988 identify a person and telephone number to contact for information on the monitoring
- 11989 results.
- 11990 G. Special notice for exceedance of the SMCL for fluoride.
- 11991 1. ~~A Community~~ community waterworks that exceed the SMCL of 2 mg/L, but do not
- 11992 exceed the PMCL of 4 mg/L for fluoride, shall provide public notice to persons served as
- 11993 soon as practical but no later than 12 months from the day the owner learns of the
- 11994 exceedance.
- 11995 2. A copy of the notice shall be sent to all new billing units and new customers at the time
- 11996 service begins and to the ~~district engineer~~ department.

- 11997 3. The owner shall repeat the notice at least annually for as long as the SMCL is exceeded.
- 11998 4. If the public notice is posted, then the notice shall remain in place for as long as the
- 11999 SMCL is exceeded, but in no case less than seven days even if the exceedance is
- 12000 eliminated.
- 12001 5. On a case-by-case basis, the ~~commissioner~~ department may require an initial notice
- 12002 sooner than 12 months and repeat notices more frequently than annually.
- 12003 6. The form and manner of the public notice (including repeat notices) shall meet the
- 12004 requirements ~~for~~ of a Tier 3 public notice.
- 12005 7. The public notice shall contain the following language, including the language
- 12006 necessary to fill in the blanks:
- 12007 This is an alert about your drinking water and a cosmetic dental problem that might affect
- 12008 children under nine years of age. At low levels, fluoride can help prevent cavities, but
- 12009 children drinking water containing more than 2 milligrams per liter (mg/L) of fluoride may
- 12010 develop cosmetic discoloration of their permanent teeth (dental fluorosis). The drinking
- 12011 water provided by your community waterworks (name) has a fluoride concentration of
- 12012 (insert value) mg/L. Dental fluorosis, in its moderate or severe forms, may result in a brown
- 12013 staining and/or pitting of the permanent teeth. This problem occurs only in developing
- 12014 teeth, before they erupt from the gums. Children under nine should be provided with
- 12015 alternative sources of drinking water or water that has been treated to remove the excess
- 12016 fluoride to avoid the possibility of staining and pitting of their permanent teeth. You may
- 12017 also want to contact your dentist about proper use by young children of fluoride-containing
- 12018 products by young children. Older children and adults may safely drink the water. Drinking
- 12019 water containing more than 4 mg/L of fluoride (the U.S. Environmental Protection Agency's
- 12020 drinking water standard) can increase your risk of developing bone disease. Your drinking

12021 water does not contain more than 4 mg/L of fluoride, but we are required to notify you
12022 when we discover that the fluoride levels in your drinking water exceed 2 mg/L because
12023 of this cosmetic dental problem. For more information, please call (name of water system
12024 contact) of (name of community waterworks) at (phone number). Some home water
12025 treatment units are also available to remove fluoride from drinking water. To learn more
12026 about available home water treatment units, you may call NSF International at ~~1-877-NSF-~~
12027 ~~HELP~~ 1-877-867-3435 or email info@nsf.org.

12028 H. Special notice for nitrate exceedances above PMCL by a noncommunity waterworks.

12029 1. The owner of a noncommunity waterworks granted permission by the ~~commissioner~~
12030 department to exceed the nitrate PMCL shall provide public notice to persons served
12031 meeting the requirements ~~for~~ of a Tier 1 notice.

12032 2. The public notice shall be posted continuously and shall indicate the fact that nitrate
12033 levels exceed 10 mg/L and the potential health effects of exposure, meeting the
12034 requirements ~~for~~ of Tier 1 public notice delivery and content.

12035 I. Special notice for repeated failure to conduct sampling of the source water for
12036 Cryptosporidium.

12037 1. ~~An~~ The owner who is required to sample source water shall provide public notice to
12038 persons served when he has failed to collect any three months of required samples. The
12039 form and manner of the public notice shall satisfy the requirements of a Tier 2 notice, and
12040 the notice shall be repeated in accordance with the requirements of a Tier 2 notice.

12041 2. The notice shall contain the following language, including the language to fill in the
12042 blanks:

12043 We are required to monitor the source of your drinking water for Cryptosporidium. Results
12044 of the monitoring are to be used to determine whether water treatment at the [blank – fill

12045 in treatment plant name] is sufficient to adequately remove Cryptosporidium from your
12046 drinking water. We are required to complete this monitoring and make this determination
12047 by [blank – fill in required bin determination date]. We "did not monitor" or "did not complete
12048 all monitoring or testing" on schedule and, therefore, we may not be able to determine by
12049 the required date what treatment modifications, if any, shall be made to ensure adequate
12050 Cryptosporidium removal. Missing this deadline may, in turn, jeopardize our ability to have
12051 the required treatment modifications, if any, completed by the deadline required, [blank –
12052 fill in date].

12053 For more information, please call [blank – fill in name of waterworks contact] of [blank –
12054 fill in name of waterworks] at [blank – fill in phone number].

12055 3. The notice shall contain a description of what the owner is doing to correct the violation
12056 and when the owner expects the waterworks to return to compliance or resolve the
12057 situation.

12058 J. Special notice for failure to determine bin classification or mean Cryptosporidium level.

12059 1. ~~A~~ The owner who is required to determine a bin classification or to determine mean
12060 Cryptosporidium level shall provide public notice to persons served when the
12061 determination has not been made as required. The form and manner of the public notice
12062 shall satisfy the requirements of a Tier 2 notice, and the notice shall be repeated in
12063 accordance with the requirements of a Tier 2 notice. However, a public notice is not
12064 required if the owner is complying with a schedule to address the violation approved by
12065 the ~~ODW~~ department.

12066 2. The notice shall contain the following language, including the language to fill in the
12067 blanks:

12068 We are required to monitor the source of your drinking water for Cryptosporidium in order
12069 to determine by [blank – fill in date] whether water treatment at the [blank – fill in treatment
12070 plant name] is sufficient to adequately remove Cryptosporidium from you drinking water.
12071 We have not made this determination by the required date. Our failure to do this may
12072 jeopardize our ability to have the required treatment modifications, if any, completed by
12073 the required deadline of [blank – fill in date]. For more information, please call [blank – fill
12074 in name of waterworks contact] of [blank – fill in name of waterworks] at [blank – fill in
12075 telephone number].

12076 3. The notice shall contain a description of what the owner is doing to correct the violation
12077 and when the owner expects the waterworks to return to compliance or resolve the
12078 situation.

12079 K. Special notice for significant deficiencies by a noncommunity groundwater systems system.

12080 1. ~~Any~~ An owner of a noncommunity groundwater system who has not corrected a
12081 significant deficiency within one year of being notified by the ~~ODW~~ department shall
12082 provide public notice to the consumers.

12083 2. The form and manner of the public notice shall satisfy the requirements of a Tier 2
12084 notice.

12085 3. The owner shall continue to notify the public annually until the requirements of 12VAC5-
12086 590-421 have been satisfied. The notice shall include:

12087 a. The nature of the significant deficiency and the date it was identified by the ~~ODW~~
12088 department; and

12089 b. The ~~ODW~~ department approved plan and schedule for correcting the significant
12090 deficiency including interim measures, progress to date, and which of the interim
12091 measures have been completed.

12092 4. For a noncommunity groundwater systems system with a large proportion of ~~non-~~
12093 ~~English-speaking~~ non-English-speaking consumers, the notice shall contain information in
12094 the appropriate language or languages regarding the importance of the notice or contain
12095 a telephone number or address where the consumers may contact the owner to obtain a
12096 translated copy of the notice or assistance with the appropriate language.

12097 5. If directed by the ~~ODW~~ department, the owner of a noncommunity groundwater system
12098 with significant deficiencies that have been corrected shall inform the consumers of the
12099 significant deficiencies, how the deficiencies were corrected, and the date or dates of
12100 correction.

12101 L. The ~~district engineer~~ department may give notice to the public required by this section on
12102 behalf of the owner as long as the notice if the district engineer complies with the requirements
12103 of this section. However, the owner remains legally responsible for ensuring that the requirements
12104 of this section are met.

12105 M. The department may require an owner to provide public notice for significant changes in
12106 water quality.

12107 N. Within 10 days of completion of each initial and repeat public notice, the owner shall provide
12108 the ~~district engineer~~ department with the following:

- 12109 1. A certification that he has fully complied with the public notice requirements; and
- 12110 2. A representative copy of each type of notice that was distributed, published, posted,
12111 and made available to the persons served by the waterworks and to the media.

12112 NO. The owner shall maintain copies of each public notice and certification for at least three
12113 years after issuance.

12114 _____

12115 **12VAC5-590-545. Consumer confidence reports.**

12116 A. Purpose and applicability.

12117 1. ~~Each~~ The owner of a community waterworks ~~owner~~ shall deliver to his customers an
12118 annual report that contains information on the quality of the water delivered by the
12119 waterworks and characterizes the risks, if any, from exposure to contaminants detected in
12120 the drinking water.

12121 2. For the purpose of this section, customers are defined as billing units or service
12122 connections to which water is delivered by a community waterworks.

12123 3. For the purpose of this section, a contaminant is detected when the laboratory reports
12124 the contaminant level as a measured level and not as ~~non-detected (ND)~~ ND or less than
12125 (<) a certain level. The owner shall utilize a laboratory that complies with ~~12VAC5-590-~~
12126 ~~340, and the laboratory's analytical and reporting procedures shall have been in~~
12127 ~~accordance with 12VAC5-590-440; laboratory certification requirements of the~~
12128 ~~Commonwealth of Virginia, Department of General Services, Division of Consolidated~~
12129 ~~Laboratory Services; and consistent with current U. S. Environmental Protection Agency~~
12130 ~~regulations found at 40 CFR Part 141~~ 12VAC5-590-440.

12131 B. Effective dates.

12132 1. ~~Each~~ The owner of an existing community waterworks ~~owner~~ shall deliver his report by
12133 July 1 annually.

12134 2. The owner of a new community waterworks shall deliver his first report by July 1 of the
12135 year after its first full calendar year in operation and annually thereafter.

12136 3. The owner of a community waterworks that sells water to a consecutive waterworks
12137 shall deliver the applicable information necessary to comply with the requirements
12138 contained in this section to the consecutive waterworks by April 1 annually, or on a date

12139 mutually agreed upon by the seller and the purchaser and specifically included in a
12140 contract between the parties.

12141 C. Content.

12142 1. ~~Each~~ The owner of a community waterworks ~~owner~~ shall provide his customers an
12143 annual report that contains the information on the source of the water delivered as follows:

12144 a. ~~Each~~ The report shall identify the source or sources of the water delivered by the
12145 community waterworks by providing information on:

12146 (1) The type of the source water (e.g., surface water, ground water); and

12147 (2) The commonly used name, if any, and location of the body or bodies of the source
12148 water.

12149 b. Where a source water assessment has been completed, the report shall:

12150 (1) Notify consumers of the availability of the assessment;

12151 (2) Describe the means to obtain the assessment; and

12152 (3) Include a brief summary of the waterworks' susceptibility to potential sources of
12153 contamination.

12154 c. The owner ~~should~~ is encouraged to highlight in the report significant sources of
12155 contamination in the source water area if ~~such~~ the information is readily available.

12156 2. For the purpose of compliance with this section, ~~each~~ the report shall include the
12157 following definitions:

12158 a. "Maximum contaminant level goal" or "MCLG" means the level of a contaminant in
12159 drinking water below which there is no known or expected risk to health. MCLGs allow
12160 for a margin of safety.

12161 b. "Maximum contaminant level" or "MCL" means the highest level of a contaminant
12162 that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using
12163 the best available treatment technology.

12164 c. A The report for a community waterworks operating under a variance or an
12165 exemption issued by the ~~commissioner~~ department under 12VAC5-590-140 and
12166 12VAC5-590-150 shall include the following definition: "Variances and exemptions"
12167 means state or EPA permission not to meet an MCL or a treatment technique under
12168 certain conditions.

12169 d. A The report that contains data on contaminants that EPA regulates using any of
12170 the following terms shall include the applicable definitions:

12171 (1) "Treatment technique" means a required process intended to reduce the level of a
12172 contaminant in drinking water.

12173 (2) "Action level" means the concentration of a contaminant that, if exceeded, triggers
12174 treatment or other requirements that an owner shall follow.

12175 (3) "Maximum residual disinfectant level goal" or "MRDLG" means the level of a
12176 drinking water disinfectant below which there is no known or expected risk to health.
12177 MRDLGs do not reflect the benefits of the use of disinfectants to control microbial
12178 contaminants.

12179 (4) "Maximum residual disinfectant level" or "MRDL" means the highest level of a
12180 disinfectant allowed in drinking water. There is convincing evidence that addition of a
12181 disinfectant is necessary for the control of microbial contaminants.

12182 (5) "Level 1 assessment" means a study of the waterworks to identify potential
12183 problems and determine, if possible, why total coliform bacteria have been found in
12184 our waterworks.

12185 (6) "Level 2 assessment" means a very detailed study of the waterworks to identify
12186 potential problems and determine, if possible, why an E. coli PMCL violation has
12187 occurred and why total coliform bacteria have been found in our waterworks on
12188 multiple occasions.

12189 3. Information on detected contaminants.

12190 a. This section specifies the requirements for information to be included in ~~each~~ the
12191 report for ~~the following contaminants:~~

12192 ~~(1) Contaminants subject to a PMCL, action level, maximum residual disinfectant level~~
12193 ~~MRDL, or treatment technique as specified in 12VAC5-590-370;~~

12194 ~~(2) Unregulated contaminants subject to monitoring as specified in 12VAC5-590-370;~~
12195 and

12196 ~~(3) Disinfection byproducts or microbial contaminants,, except as provided under~~
12197 ~~subdivision 5 a of this subsection, and which are detected in the finished water~~
12198 ~~contaminants subject to a PMCL, action level AL, MRDL, or treatment technique as~~
12199 ~~specified in 12VAC5-590-340.~~

12200 b. The data relating to these contaminants shall be displayed in one table or in several
12201 adjacent tables. Any additional monitoring results that a an owner of a community
12202 waterworks ~~owner~~ chooses to include in the report shall be displayed separately.

12203 c. The data shall be derived from data collected to comply with EPA and state
12204 monitoring and analytical requirements during the calendar year preceding the year
12205 the report is due, except that where an owner is allowed to monitor for contaminants
12206 specified in subdivision C 3 a (1) and 3 a (3) of this ~~subsection~~ section less often than
12207 once a year, the table or tables shall include the date and results of the most recent
12208 sampling, and the report shall include a brief statement indicating that the data

12209 presented in the report are from the most recent testing done in accordance with the
12210 regulations. No data older than five years need be included.

12211 d. For detected contaminants subject to a PMCL, ~~action level~~ AL, MRDL, or treatment
12212 technique as ~~specified in 12VAC5-590-370 and listed in Tables 2.1, 2.2 (Primary~~
12213 ~~Maximum Contaminant Levels only), 2.3, 2.4 (Primary Maximum Contaminant Levels~~
12214 ~~only), and 2.5~~ listed in Tables 340.1 through 340.7, the table or tables shall contain:

12215 (1) The PMCL for that contaminant expressed as a number equal to or greater than
12216 1.0 as provided in ~~Appendix O, with an exception for beta/photon emitters. When the~~
12217 ~~detected level of beta/photon emitters has been reported in the units of pCi/L and does~~
12218 ~~not exceed 50 pCi/L, the report may list the PMCL as 50 pCi/L. In this case, the owner~~
12219 ~~shall include in the report the following footnote: The PMCL for beta particles is 4~~
12220 ~~mrem/year. EPA considers 50 pCi/L to be the level of concern for beta particles~~
12221 12VAC5-590-546;

12222 (2) The MCLG for that contaminant expressed in the same units as the PMCL as
12223 provided in ~~Appendix O~~ 12VAC5-590-546;

12224 (3) If there is no PMCL for a detected contaminant, then the table shall indicate that
12225 there is a treatment technique, or specify the ~~action level~~ AL, applicable to that
12226 contaminant, and the report shall include the definitions for either treatment technique
12227 ~~and/or~~ or ~~action level~~ AL or both, as appropriate, specified in subdivision C 3 d of this
12228 ~~subsection~~ section;

12229 (4) For contaminants subject to a PMCL, except turbidity and E. coli, the highest
12230 contaminant level used to determine compliance and the range of detected levels is
12231 as follows:

12232 (a) When compliance with the PMCL is determined annually or less frequently, the
12233 highest detected level at any sampling point and the range of detected levels
12234 expressed in the same units as the PMCL.

12235 (b) When compliance with the PMCL is determined by calculating a ~~running annual~~
12236 ~~average~~ RAA of all samples ~~taken~~ collected at a sampling point, the highest average
12237 of any of the sampling points and the range of all sampling points expressed in the
12238 same units as the PMCL. For the PMCLs for TTHM and HAA5, the owner shall include
12239 the highest ~~locational running annual average~~ LRAA and the range of individual
12240 sample results for all sampling points expressed in the same units as the PMCL. If
12241 more than one location exceeds the TTHM or HAA5 PMCL, then the owner shall
12242 include the ~~locational running annual averages~~ LRAAs for all locations that exceed the
12243 PMCL.

12244 (c) When compliance with the PMCL is determined on a ~~systemwide~~ system-wide basis
12245 by calculating a ~~running annual average~~ RAA of all samples at all sampling points, the
12246 average and range of detection expressed in the same units as the PMCL. The range
12247 of detection for TTHM and HAA5 shall include the individual sample results ~~for the~~
12248 ~~IDSE conducted under 12VAC5-590-370 B 3 e (2) for the calendar year that the IDSE~~
12249 ~~samples were taken~~ for the purpose of establishing the monitoring locations for EPA's
12250 "Stage 2 Disinfectants and Disinfection Byproducts Rule" initial distribution system
12251 evaluation.

12252 (5) For turbidity, the highest single measurement and the lowest monthly percentage
12253 of combined filter samples meeting the turbidity limits specified in ~~42VAC5-590-~~
12254 ~~420~~ 12VAC5-590-395 A 2 b for the filtration technology being used. The report should
12255 include an explanation of the reasons for measuring turbidity;

12256 (6) For lead and copper, the 90th percentile value of the most recent round of sampling
12257 and the number of sampling sites exceeding the ~~action level~~ AL;

12258 (7) For E. coli, the total number of positive samples;

12259 (8) The likely source or sources of the detected contaminants. Specific information
12260 regarding contaminants may be available in sanitary surveys and source water
12261 assessments, and should be used when available to the owner. If the owner lacks
12262 specific information on the likely source, then the report shall include one or more of
12263 the typical sources for that contaminant listed in ~~Appendix O~~ 12VAC5-590-546 that are
12264 most applicable to the system.

12265 e. If the owner of a community waterworks ~~owner~~ distributes water to his customers
12266 from multiple hydraulically independent distribution systems that are fed by different
12267 ~~raw water sources~~ source waters, then:

12268 (1) The table shall contain a separate column for each service area and the report
12269 shall identify each separate distribution system; or

12270 (2) The owner shall produce a separate report tailored to include data for each service
12271 area.

12272 f. The table or tables shall clearly identify any data indicating violations of PMCLs,
12273 MRDLs, or treatment techniques and the report shall contain a clear and readily
12274 understandable explanation of the violation including:

12275 (1) The length of the violation;

12276 (2) The potential adverse health effects using the relevant language of ~~Appendix~~
12277 12VAC5-590-546; and

12278 (3) Actions taken by the ~~waterworks~~ owner to address the violation.

12279 ~~g. For detected unregulated contaminants subject to monitoring as specified in~~
12280 ~~12VAC5-590-370 and listed in Tables 2.6 and 2.7, for which monitoring is required,~~
12281 ~~the table or tables shall contain the average and range at which the contaminant was~~
12282 ~~detected. The report may include a brief explanation of the reasons for monitoring for~~
12283 ~~unregulated contaminants.~~

12284 4. Information on Cryptosporidium, radon, and other contaminants:

12285 a. If the owner has performed any monitoring for Cryptosporidium, which indicates that
12286 Cryptosporidium may be present in the source water or the finished water, then the
12287 report shall include:

12288 (1) A summary of the results of the monitoring; and

12289 (2) An explanation of the significance of the results.

12290 b. If the owner has performed any monitoring for radon, which indicates that radon
12291 may be present in the finished water, then the report shall include:

12292 (1) The results of the monitoring; and

12293 (2) An explanation of the significance of the results.

12294 c. If the owner has performed additional monitoring that indicates the presence of other
12295 contaminants in the finished water, then the report should include any results that may
12296 indicate a health concern, as determined by the commissioner. Detections above a
12297 proposed MCL or health advisory level may indicate possible health concerns. For
12298 ~~such~~ these contaminants, the report should include:

12299 (1) The results of the monitoring; and

12300 (2) An explanation of the significance of the results noting the existence of a health
12301 advisory or a proposed regulation.

12302 5. Compliance with other regulations.

12303 a. In addition to the requirements of subdivision C 3 f of this ~~subsection~~ section, the

12304 report shall note any violation that occurred during the year covered by the report of a

12305 requirement listed below:

12306 (1) a. Monitoring and reporting of compliance data;

12307 (2) b. Filtration and disinfection prescribed by ~~12VAC5-590-420~~ 12VAC5-590-395. For

12308 an owners owner who ~~have~~ has failed to install adequate filtration or disinfection

12309 equipment or processes, or ~~have~~ has had a failure of such equipment or processes

12310 ~~which~~ that constitutes a violation, the report shall include the following language as part

12311 of the explanation of potential adverse health effects: Inadequately treated water may

12312 contain disease-causing organisms. These organisms include bacteria, viruses, and

12313 parasites, which can cause symptoms such as nausea, cramps, diarrhea, and

12314 associated headaches;

12315 (3) c. Lead and copper control requirements prescribed by ~~12VAC5-590-370~~ 12VAC5-

12316 590-375. For an owners owner who ~~fail~~ fails to take one or more of the prescribed

12317 actions, the report shall include the applicable language of ~~Appendix O~~ 12VAC5-590-

12318 546 for lead, copper, or both;

12319 (4) d. Treatment techniques for ~~Acrylamide~~ acrylamide and ~~Epichlorohydrin~~

12320 epichlorohydrin prescribed by ~~12VAC5-590-420 G~~ 12VAC5-590-395 B. For an owner

12321 ~~owners~~ who ~~violate~~ violates the requirements of that section, the report shall include

12322 the relevant language from ~~Appendix O~~; 12VAC5-590-546;

12323 (5) e. Recordkeeping of compliance data;

12324 (6) f. Special monitoring requirements for ~~unregulated contaminants~~ prescribed by

12325 ~~12VAC5-590-370 B 4~~ and for sodium; and

12326 ~~(7) g.~~ Violation of the terms of a variance, an exemption, or an administrative or judicial
12327 order.

12328 ~~b. The report shall contain:~~

12329 ~~(1) A clear and readily understandable explanation of the violation;~~

12330 ~~(2) Any potential adverse health effects; and~~

12331 ~~(3) The steps the owner has taken to correct the violation.~~

12332 ~~c. For community groundwater systems, the following shall be included:~~

12333 ~~(1) A significant deficiency that is uncorrected at the time of the report, or;~~

12334 ~~(2) An E. coli-positive groundwater source sample that is not invalidated at the time of~~
12335 ~~the report.~~

12336 ~~d. The owner of a community groundwater system shall report annually the information~~
12337 ~~in subdivision 5 c of this subsection until the ODW determines that the significant~~
12338 ~~deficiency or the E. coli-positive source water sample has been satisfactorily~~
12339 ~~addressed. The report shall include the following information:~~

12340 ~~(1) The nature of the significant deficiency or the source of the E. coli contamination~~
12341 ~~and the date the significant deficiency was identified by the ODW or the date or dates~~
12342 ~~of the E. coli-positive source samples.~~

12343 ~~(2) If the E. coli contamination has been addressed in accordance with 12VAC5-590-~~
12344 ~~421 and the date of such action.~~

12345 ~~(3) The ODW approved plan and schedule for correcting the significant deficiency or~~
12346 ~~E. coli contamination including interim measures, progress to date, and which interim~~
12347 ~~measures have been completed.~~

12348 ~~(4) In communities with a large portion of non-English speaking consumers, the notice~~
12349 ~~shall contain information in the appropriate language or languages regarding the~~
12350 ~~importance of the notice or contain a telephone number or address where the~~
12351 ~~consumers may contact the owner to obtain a translated copy of the notice or~~
12352 ~~assistance with the appropriate language.~~

12353 ~~(5) For E. coli contamination, the potential health effects language shall be included.~~
12354 ~~e. If directed by the ODW, the owner of a community groundwater system with~~
12355 ~~significant deficiencies that have been corrected at the time of the report shall inform~~
12356 ~~his consumers of the significant deficiencies, how the deficiencies were corrected, and~~
12357 ~~the date or dates of correction under subdivisions 5 d (1) through (4) of this subsection.~~

12358 6. Variances and exemptions. If a ~~system~~ waterworks is operating under the terms of a
12359 variance or an exemption issued by the commissioner under 12VAC5-590-140 and
12360 12VAC5-590-150, then the report shall contain:

- 12361 a. An explanation of the reasons for the variance or exemption;
- 12362 b. The date on which the variance or exemption was issued;
- 12363 c. A brief status report on the steps the owner is taking to install treatment, find
12364 alternative sources of source water, or otherwise comply with the terms and schedules
12365 of the variance or exemption; and
- 12366 d. A notice of any opportunity for public input in the ~~review~~ evaluation or renewal of the
12367 variance or exemption.

12368 7. Additional information.

12369 a. The report shall contain a brief explanation regarding contaminants, which may
12370 reasonably be expected to be found in drinking water including bottled water. This

12371 explanation shall include the exact language of subdivisions 7 a (1), 7 a (2), and 7 a
12372 (3) of this subsection or the owner shall use his own comparable language following
12373 approval by the ~~commissioner~~ department. The report also shall include the exact
12374 language of subdivision 7 a (4) of this subsection.

12375 (1) The sources of drinking water (both tap water and bottled water) include rivers,
12376 lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface
12377 of the land or through the ground, it dissolves naturally occurring minerals and, in some
12378 cases, radioactive material, and can pick up substances resulting from the presence
12379 of animals or from human activity.

12380 (2) Contaminants that may be present in source water include: (i) microbial
12381 contaminants, such as viruses and bacteria, which may come from sewage treatment
12382 plants, septic systems, agricultural livestock operations, and wildlife; (ii) inorganic
12383 contaminants, such as salts and metals, which can be naturally occurring or result
12384 from urban stormwater runoff, industrial or domestic wastewater discharges, oil and
12385 gas production, mining, or farming; (iii) pesticides and herbicides, which may come
12386 from a variety of sources such as agriculture, urban stormwater runoff, and residential
12387 uses; (iv) organic chemical contaminants, including ~~synthetic and volatile organic~~
12388 ~~chemicals~~ SOCs and VOCs, which are byproducts of industrial processes and
12389 petroleum production, and can also come from gas stations, urban stormwater runoff,
12390 and septic systems; and (v) radioactive contaminants, which can be naturally occurring
12391 or be the result of oil and gas production and mining activities.

12392 (3) ~~In order to~~ To ensure that tap water is safe to drink, EPA prescribes regulations
12393 that limit the amount of certain contaminants in the water provided by ~~public water~~
12394 ~~systems~~ waterworks. The U.S. Food and Drug Administration ~~FDA~~ (FDA) regulations

12395 establish limits for contaminants in bottled water which must provide the same
12396 protection for public health.

12397 (4) Drinking water, including bottled water, may reasonably be expected to contain at
12398 least small amounts of some contaminants. The presence of contaminants does not
12399 necessarily indicate that water poses a health risk. More information about
12400 contaminants and potential health effects can be obtained by calling the ~~Environmental~~
12401 ~~Protection Agency's~~ EPA's Safe Drinking Water Hotline (800-426-4791).

12402 b. The report shall include the telephone number of the owner, operator, or designee
12403 of the community waterworks as a source of additional information concerning the
12404 report.

12405 c. In communities with a large proportion of ~~non-English-speaking~~ non-English-
12406 speaking residents, as determined by the ~~commissioner~~ department, the report shall
12407 contain information in the appropriate language or languages regarding the
12408 importance of the report or contain a telephone number or address where ~~such~~ the
12409 residents may contact the ~~system~~ waterworks to obtain a translated copy of the report
12410 or assistance in the appropriate language.

12411 d. The report shall include the following information about opportunities for public
12412 participation in decisions that may affect the quality of the drinking water. The
12413 ~~waterworks~~ owner should consider including the following additional relevant
12414 information:

12415 (1) The time and place of regularly scheduled board meetings of the governing body
12416 ~~which~~ that has authority over the waterworks; and

12417 (2) If regularly scheduled board meetings are not held, then the name and telephone
12418 number of a waterworks representative who has operational or managerial authority
12419 over the waterworks.

12420 e. The owner may include ~~such~~ additional information as he deems necessary for
12421 public education consistent with, and not detracting from, the purpose of the report.

12422 f. For a community groundwater system:

12423 (1) Where there is a significant deficiency that is uncorrected at the time of the report
12424 or an E. coli-positive source water sample that is not invalidated in accordance with
12425 12VAC5-590-380 at the time of the report, the owner shall report the following:

12426 (a) The nature of the significant deficiency or the source water, if known, of the E. coli
12427 contamination;

12428 (b) The date the significant deficiency was identified by the department or the date or
12429 dates of the E. coli-positive source water samples;

12430 (c) If the E. coli contamination has been addressed in accordance with 12VAC5-590-
12431 421 and the date of the action;

12432 (d) The department-approved plan and schedule, including interim measures,
12433 progress to date, and which interim measures have been completed, for correcting the
12434 significant deficiency or E. coli contamination; and

12435 (e) The potential health effects language in 12VAC5-590-546 for an E. coli-positive
12436 source water sample that is not invalidated in accordance with 12VAC5-590-380.

12437 (2) If directed by the department, where there are significant deficiencies that have
12438 been corrected at the time of the report, then the owner shall report the significant
12439 deficiencies, how the deficiencies were corrected, and the date or dates of correction.

12440 D. Additional health information.

12441 1. All reports shall prominently display the following language: Some people may be more
12442 vulnerable to contaminants in drinking water than the general population. Immuno-
12443 compromised persons such as persons with cancer who are undergoing chemotherapy,
12444 persons who have undergone organ transplants, people with HIV/AIDS or other immune
12445 system disorders, some elderly, and infants can be particularly at risk from infections.
12446 These people should seek advice about drinking water from their health care providers.
12447 ~~EPA/CDC~~ EPA/Center for Disease Control (CDC) guidelines on appropriate means to
12448 lessen the risk of infection by Cryptosporidium and other microbial contaminants are
12449 available from the Safe Drinking Water Hotline (800-426-4791).

12450 2. ~~Any waterworks~~ The owner who detects arsenic at levels above 0.005 mg/L, but equal
12451 to or below the PMCL of 0.010 mg/L, shall include in his report the following informational
12452 statement about arsenic: While your drinking water meets EPA's standard for arsenic, it
12453 does contain low levels of arsenic. EPA's standard balances the current understanding of
12454 arsenic's possible health effects against the cost of removing arsenic from drinking water.
12455 EPA continues to research the health effects of low levels of arsenic, which is a mineral
12456 known to cause cancer in humans at high concentrations and is linked to other health
12457 effects such as skin damage and circulatory problems.

12458 ~~In lieu~~ Instead of the statement required in this subdivision, the ~~waterworks~~ owner may
12459 include his own educational statement after receiving approval from the ~~commissioner~~
12460 department.

12461 3. ~~A waterworks owner who detects arsenic levels above 0.010 mg/L shall include the~~
12462 ~~health effects language contained in Appendix O.~~

12463 4. ~~An~~ The owner who detects nitrate at levels above 5 mg/L, but below the PMCL, shall
12464 include in his report the following informational statement about the impacts of nitrate on
12465 children: Nitrate in drinking water at levels above 10 ppm is a health risk for infants of less
12466 than six months of age. High nitrate levels in drinking water can cause blue baby
12467 syndrome. Nitrate levels may rise quickly for short periods of time because of rainfall or
12468 agricultural activity. If you are caring for an infant, then you should ask advice from your
12469 health care provider.

12470 ~~In lieu~~ Instead of the statement required in this subdivision, the ~~waterworks~~ owner may
12471 include his own educational statement after receiving approval from the ~~commissioner~~
12472 department.

12473 ~~54.~~ All reports shall prominently display the following language: If present, elevated levels
12474 of lead can cause serious health problems, especially for pregnant women and young
12475 children. Lead in drinking water is primarily from materials and components associated
12476 with service lines and home plumbing. (Name of Utility) is responsible for providing high
12477 quality drinking water, but cannot control the variety of materials used in plumbing
12478 components. When your water has been sitting for several hours, you can minimize the
12479 potential for lead exposure by flushing your tap for 30 seconds to two minutes before using
12480 water for drinking or cooking. If you are concerned about lead in your water, then you may
12481 wish to have your water tested. Information on lead in drinking water, testing methods,
12482 and steps you can take to minimize exposure is available from the Safe Drinking Water
12483 Hotline (800-426-4791).

12484 ~~In lieu~~ Instead of the statement required in this subdivision, the owner may include his own
12485 educational statement after receiving approval from the ~~commissioner~~ department.

12486 6. ~~Community waterworks owners who detect TTHM above 0.080 mg/L, but below the~~
12487 ~~PMCL, as an annual average shall include health effects language prescribed by~~
12488 ~~paragraph 82 of Appendix O.~~

12489 E. The owner of a Community community waterworks owners required to complete a Level 1
12490 or a Level 2 assessment that is not due to an E. coli PMCL violation shall include in the report the
12491 text specified in subdivisions E 1, ~~E 2,~~ and through E 3 of this section as appropriate, filling in the
12492 blanks accordingly, and shall include in the report the text specified in subdivision E 4 of this
12493 section, if appropriate.

12494 1. Coliforms are bacteria that are naturally present in the environment and are used as an
12495 indicator that other, potentially harmful, waterborne pathogens may be present or that a
12496 potential pathway exists through which contamination may enter the drinking water
12497 distribution system. We found coliforms indicating the need to look for potential problems
12498 in water treatment or distribution. When this occurs, we are required to conduct
12499 assessments to identify problems and to correct any problems that are found.

12500 2. During the past year, we were required to conduct (insert the number of Level 1
12501 assessments) Level 1 assessments. (insert the number of Level 1 assessments) Level 1
12502 assessments were completed. In addition, we were required to ~~take~~ collect (insert the
12503 number of corrective actions) corrective actions and we completed (insert the number of
12504 corrective actions) of these actions.

12505 3. During the past year (insert the number of Level 2 assessments) Level 2 assessments
12506 were required to be completed for our waterworks. (insert the number of Level 2
12507 assessments) Level 2 assessments were completed. In addition, we were required to ~~take~~
12508 collect (insert the number of corrective actions) corrective actions and we completed
12509 (insert the number of corrective actions) of these actions.

12510 4. ~~Any~~ An owner who failed to complete all of the required assessments or correct all
12511 identified sanitary defects shall also include one or both of the following statements, as
12512 appropriate:

12513 a. During the past year, we failed to conduct all of the required assessments.

12514 b. During the past year, we failed to correct all identified sanitary defects that were
12515 found during the assessments.

12516 F. The owner of a Community community waterworks ~~owners~~ required to conduct Level 2
12517 assessments due to an E. coli PMCL violation shall include in the report the text specified in
12518 subdivisions F 1 and F 2 of this section, filling in the blanks accordingly, and shall include in the
12519 report the text specified in subdivision F 3 of this section, if appropriate.

12520 1. E. coli are bacteria whose presence indicates that the water may be contaminated with
12521 human or animal wastes. Human pathogens in these wastes can cause short-term effects,
12522 such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a
12523 greater health risk for infants, young children, the elderly, and people with severely
12524 compromised immune systems. We found E. coli, indicating the need to look for potential
12525 problems in water treatment or distribution. When this occurs, we are required to conduct
12526 assessments to identify problems and to correct any problems that are found.

12527 2. We were required to complete a Level 2 assessment because we found E. coli in our
12528 waterworks. In addition, we were required to ~~take~~ collect (insert number of corrective
12529 actions) corrective actions and we completed (insert number of corrective actions) of these
12530 actions.

12531 3. Any owner who has failed to complete the required assessment or correct all identified
12532 sanitary defects shall also include one or both of the following statements, as appropriate:

12533 a. We failed to conduct the required assessment.

12534 b. We failed to correct all sanitary defects that were identified during the assessment
12535 that we conducted.

12536 4. If ~~a waterworks detects~~ E. coli is detected in a waterworks and ~~has violated~~ the E. coli
12537 PMCL is violated, in addition to completing the table as specified in subdivision C 3 d of
12538 this section, the owner shall include one or more of the following statements to describe
12539 any noncompliance, as applicable:

12540 a. We had an E. coli-positive repeat sample following a total coliform-positive routine
12541 sample.

12542 b. We had a total coliform-positive repeat sample following an E. coli-positive routine
12543 sample.

12544 c. We failed to ~~take~~ collect all the required repeat samples following an E. coli-positive
12545 routine sample.

12546 d. We failed to test for E. coli when any repeat sample tested positive for total coliform.

12547 5. If ~~a waterworks detects~~ E. coli is detected in a waterworks and ~~has not violated~~ the E.
12548 coli PMCL is not violated, in addition to completing the table as specified in subdivision C
12549 3 d of this section, the owner may include a statement that explains that although ~~they~~
12550 ~~have detected~~ E. coli was detected, ~~they are~~ he is not in violation of the E. coli PMCL.

12551 G. Report delivery and recordkeeping.

12552 1. ~~Each~~ The owner of a community waterworks ~~owner~~ shall mail or otherwise directly
12553 deliver one copy of the report to each customer, except as follows:

12554 a. ~~Owners~~ The owner of community waterworks serving fewer than 10,000 persons
12555 shall have the option to either mail (or otherwise directly deliver) a copy of the report
12556 to each customer or publish the report in a local newspaper or newspapers of general

12557 circulation serving the area in which the waterworks is located by July 1 of each year;
12558 and

12559 b. If the owner chooses to publish the report, then the owner shall inform customers,
12560 either in the newspaper in which the report is to be published or by other means
12561 approved by the ~~commissioner~~ department, that a copy of the report will not be mailed
12562 to them and that a copy of the report will be made available to the public upon request.

12563 2. The owner of a Community community waterworks ~~owners~~ shall make a good faith
12564 effort to deliver the report to the consumers who are served by the waterworks but are not
12565 ~~bill-paying~~ bill-paying customers, such as renters or workers. This good faith effort shall
12566 include at least one, and preferably two or more, of the following methods appropriate to
12567 the particular waterworks:

- 12568 a. Posting the reports on the Internet;
- 12569 b. Mailing to postal patrons in metropolitan areas;
- 12570 c. Advertising the availability of the report in the news media;
- 12571 d. Publication in a local newspaper;
- 12572 e. Posting in public places such as libraries, community centers, and public buildings;
- 12573 f. Delivery of multiple copies for distribution by single-biller customers such as
12574 apartment buildings or large private employers;
- 12575 g. Delivery to community organizations; or
- 12576 h. Other methods as approved by the ~~commissioner~~ department.

12577 3. No later than July 1 of each year, the owner of a community waterworks ~~owners~~ shall
12578 deliver a copy of the report to the ~~district engineer~~ department, followed within three
12579 months by a certification that the report has been distributed to customers and that the

12580 information in the report is correct and consistent with the compliance monitoring data
 12581 previously submitted to the ~~commissioner~~ department.

12582 4. No later than July 1 of each year, the owner of a community waterworks ~~owners~~ shall
 12583 deliver the report to any other agency or clearinghouse specified by the ~~commissioner~~
 12584 department.

12585 5. The owner of a ~~Community~~ community waterworks ~~owners~~ shall make the report
 12586 available to the public upon request.

12587 6. The owner of ~~each~~ a community waterworks serving 100,000 or more persons shall
 12588 post the current year's report to a publicly accessible site on the Internet.

12589 7. The owner of a ~~Community~~ community waterworks ~~owners~~ shall retain copies of the
 12590 report for no less than three years.

12591 _____
 12592 _____

12593 **12VAC5-590-546. Regulated contaminants for the consumer confidence reports and public**
 12594 **notification.**

12595 A. Public notices and CCRs shall contain the appropriate mandatory language and information
 12596 listed, as required by 12VAC5-590-540 and 12VAC5-590-545.

12597 B. Information on regulated contaminants is presented in Table 546.1.

TABLE 546.1.
Content Requirements of Consumer Confidence Reports and Public Notices.

| <u>CONTAMINANT</u> <u>(UNITS)</u> | <u>TRADITI</u> <u>ONAL</u> <u>PMCL IN</u> <u>mg/l</u> | <u>TO</u> <u>CONV</u> <u>ERT</u> <u>FOR</u> <u>CCR,</u> <u>MULTI</u> <u>PLY</u> <u>BY</u> | <u>PMCL</u> <u>IN CCR</u> <u>UNITS</u> | <u>MCLG</u> | <u>MAJOR</u> <u>SOURCES</u> <u>IN</u> <u>DRINKING</u> <u>WATER</u> | <u>HEALTH</u> <u>EFFECTS</u> <u>LANGUAGE</u> |
|--------------------------------------|--|--|--|-------------|--|--|
| <u>Microbiological Contaminants</u> | | | | | | |

| | | | | |
|------------------------------------|---|----------|---|---|
| (1) <u>Total Coliform Bacteria</u> | TT | n/a | <u>Naturally present in the environment</u> | <u>Coliforms are bacteria that are naturally present in the environment and are used as an indicator that other, potentially-harmful, waterborne pathogens may be present or that a potential pathway exists through which contamination may enter the waterworks.</u> |
| (2) <u>E. coli</u> | <u>PMCL: In compliance unless (i) the waterworks has an E. coli-positive repeat sample following a total coliform-positive routine sample; (ii) the waterworks has a total coliform-positive repeat sample following an E. coli-positive routine sample; (iii) the waterworks owner fails to collect all required repeat samples following an E. coli positive routine sample; or (iv) the waterworks owner fails to test for E. coli when any repeat</u> | <u>0</u> | <u>Human and animal fecal waste</u> | <u>E. coli are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Human pathogens in these wastes can cause short-term effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a greater health risk for infants, young children, the elderly, and people with severely-compromised immune systems.</u> |

| | | | | | | |
|---|--|--|-----------|----------------------|-------------------------------------|---|
| | <u>sample tests positive for total coliform.</u> | | | | | |
| - <u>(3) E. coli</u> | <u>TT</u> | | | <u>n/a</u> | <u>Human and animal fecal waste</u> | <u>E. coli are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Human pathogens in these wastes can cause short-term health effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a greater health risk for infants, young children, the elderly, and people with severely compromised immune system.</u> |
| <u>(4) Source water fecal indicator (E. coli)</u> | <u>TT</u> | | <u>TT</u> | <u>0 for E. coli</u> | | <u>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</u> |

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| | | | | | | <u>diarrhea, cramps,</u> <u>nausea, headaches,</u> <u>or other symptoms.</u> <u>They may pose a</u> <u>special health risk</u> <u>for infants, young</u> <u>children, some of</u> <u>the</u> <u>elderly, and people</u> <u>with severely</u> <u>compromised</u> <u>immune system.</u> |
| <u>(5) Groundwater</u> <u>rule TT violations</u> <u>other than source</u> <u>water fecal</u> <u>indicator E. coli</u> <u>above^a</u> | <u>TT</u> | | | <u>TT</u> | | <u>Inadequately</u> <u>treated or</u> <u>inadequately</u> <u>protected water</u> <u>may contain</u> <u>disease-causing</u> <u>organisms. These</u> <u>organisms can</u> <u>cause symptoms</u> <u>such as diarrhea,</u> <u>nausea, cramps,</u> <u>and associated</u> <u>headaches.</u> |
| <u>(6)Turbidity</u> | <u>TT</u> | | <u>TT</u> | <u>n/a</u> | <u>Soil runoff</u> | <u>Turbidity has no</u> <u>health effects.</u> <u>However, turbidity</u> <u>can interfere with</u> <u>disinfection and</u> <u>provide a medium</u> <u>for microbial</u> <u>growth. Turbidity</u> <u>may indicate the</u> <u>presence of</u> <u>disease-causing</u> <u>organisms. These</u> |

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| | | | | | | organisms include <u>bacteria, viruses, and parasites that can cause symptoms such as nausea, cramps, diarrhea and associated headaches.</u> |
| <u>(7) Giardia lamblia, viruses, Hetrotropic plate count, Legionella, Cryptosporidium^a</u> | <u>TT^c</u> | | <u>n/a</u> | <u>0</u> | <u>n/a</u> | <u>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.</u> |
| <u>Radioactive Contaminants</u> | | | | | | |
| <u>(8) Beta/photon emitters (mrem/yr)</u> | <u>4 mrem/yr</u> | | <u>4</u> | <u>0</u> | <u>Decay of natural and man-made deposits</u> | <u>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 PMCL over many years may have an increased risk of getting cancer.</u> |
| <u>(9) Alpha emitters (pCi/L)</u> | <u>15 pCi/L</u> | | <u>15</u> | <u>0</u> | <u>Erosion of natural deposits</u> | <u>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 PMCL over</u> |

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| | | | | | | many years may have an increased risk of getting cancer. |
| <u>(10) Combined radium (pCi/L)</u> | <u>5 pCi/L</u> | | <u>5</u> | <u>0</u> | <u>Erosion of natural deposits</u> | <u>Some people who drink water containing radium-226 or radium-228 in excess of the PMCL over many years may have an increased risk of getting cancer.</u> |
| <u>(11) Uranium (ppb)</u> | <u>30 µg/L</u> | | <u>30</u> | <u>0</u> | <u>Erosion of natural deposits</u> | <u>Some people who drink water containing uranium in excess of the PMCL over many years may have an increased risk of getting cancer and kidney toxicity.</u> |
| <u>Inorganic Contaminants</u> | | | | | | |
| <u>(12) Antimony (ppb)</u> | <u>0.006</u> | <u>1000</u> | <u>6</u> | <u>6</u> | <u>Discharge from petroleum refineries; fire retardants; ceramics; electronics; solder</u> | <u>Some people who drink water containing antimony well in excess of the PMCL over many years could experience increases in blood cholesterol and decreases in blood sugar.</u> |
| <u>(13) Arsenic (ppb)</u> | <u>0.010</u> | <u>1000</u> | <u>10.</u> | <u>0</u> | <u>Erosion of natural deposits; Runoff from orchards; Runoff from glass and electronics production wastes</u> | <u>Some people who drink water containing arsenic in excess of the PMCL over many years could experience skin damage or problems with their circulatory system, and may have an increased risk of getting cancer.</u> |

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| <u>(14) Asbestos (MFL)</u> | <u>7 MFL</u> | | <u>7</u> | <u>7</u> | <u>Decay of asbestos cement water mains;</u> <u>Erosion of natural deposits</u> | <u>Some people who drink water containing asbestos in excess of the PMCL over many years may have an increased risk of developing benign intestinal polyps.</u> |
| <u>(15) Barium (ppm)</u> | <u>2</u> | | <u>2</u> | <u>2</u> | <u>Discharge of drilling wastes;</u> <u>Discharge from metal refineries;</u> <u>Erosion of natural deposits</u> | <u>Some people who drink water containing barium in excess of the PMCL over many years could experience an increase in their blood pressure.</u> |
| <u>(16) Beryllium (ppb)</u> | <u>0.004</u> | <u>1000</u> | <u>4</u> | <u>4</u> | <u>Discharge from metal refineries and coal-burning factories;</u> <u>Discharge from electrical, aerospace, and defense industries</u> | <u>Some people who drink water containing beryllium well in excess of the PMCL over many years could develop intestinal lesions.</u> |
| <u>(17) Cadmium (ppb)</u> | <u>0.005</u> | <u>1000</u> | <u>5</u> | <u>5</u> | <u>Corrosion of galvanized pipes;</u> <u>Erosion of natural deposits;</u> <u>Discharge from metal refineries;</u> <u>Run-off from waste batteries and paints</u> | <u>Some people who drink water containing cadmium in excess of the PMCL over many years could experience kidney damage.</u> |
| <u>(18) Chromium (ppb)</u> | <u>0.1</u> | <u>1000</u> | <u>100</u> | <u>100</u> | <u>Discharge from steel</u> | <u>Some people who drink water</u> |

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| | | | | | <u>and pulp mills;</u> <u>Erosion of natural deposits</u> | <u>containing chromium well in excess of the PMCL over many years could experience allergic dermatitis.</u> |
| <u>(19) Copper (ppm)</u> | <u>AL=1.3</u> | | <u>AL=1.3</u> | <u>1.3</u> | <u>Corrosion of household plumbing systems;</u> <u>Erosion of natural deposits</u> | <u>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.</u> |
| <u>(20) Cyanide (ppb)</u> | <u>0.2</u> | <u>1000</u> | <u>200</u> | <u>200</u> | <u>Discharge from steel/metal factories;</u> <u>Discharge from plastic and fertilizer factories</u> | <u>Some people who drink water containing cyanide well in excess of the PMCL over many years could experience nerve damage or problems with their thyroid.</u> |
| <u>(21) Fluoride (ppm)</u> | <u>4</u> | | <u>4</u> | <u>4</u> | <u>Erosion of natural deposits;</u> <u>Water additive which promotes strong</u> | <u>Some people who drink water containing fluoride in excess of the PMCL over many years could get bone disease, including pain and</u> |

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| | | | | | <u>teeth; Discharge from fertilizer and aluminum factories</u> | <u>tenderness of the bones. Fluoride in drinking water at half the PMCL 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.</u> |
| <u>(22) Lead (ppb)</u> | <u>AL=0.015</u> | <u>1000</u> | <u>AL=15</u> | <u>0</u> | <u>Corrosion of household plumbing systems; Erosion of natural deposits</u> | <u>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.</u> |
| <u>(23) Mercury [inorganic] (ppb)</u> | <u>0.002</u> | <u>1000</u> | <u>2</u> | <u>2</u> | <u>Erosion of natural deposits; Discharge from refineries and factories; Runoff from landfills;</u> | <u>Some people who drink water containing inorganic mercury well in excess of the PMCL over many years could experience kidney damage.</u> |

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| | | | | | <u>Runoff from cropland</u> | |
| <u>(24) Nitrate (ppm)</u> | <u>10</u> | | <u>10</u> | <u>10</u> | <u>Runoff from fertilizer use;</u> <u>Leaching from septic tanks, sewage;</u> <u>Erosion of natural deposits</u> | <u>Infants below the age of six months who drink water containing nitrate in excess of the PMCL could become seriously ill and, if untreated, may die.</u> <u>Symptoms include shortness of breath and blue baby syndrome.</u> |
| <u>(25) Nitrite (ppm)</u> | <u>1</u> | | <u>1</u> | <u>1</u> | <u>Runoff from fertilizer use;</u> <u>Leaching from septic tanks, sewage;</u> <u>Erosion of natural deposits</u> | <u>Infants below the age of six months who drink water containing nitrite in excess of the PMCL could become seriously ill and, if untreated, may die.</u> <u>Symptoms include shortness of breath and blue baby syndrome.</u> |
| <u>(26) Total Nitrate and Nitrite</u> | <u>10</u> | | <u>n/a</u> | <u>10</u> | <u>n/a</u> | <u>Infants below the age of six months who drink water containing nitrate and nitrite in excess of the PMCL could become seriously ill and, if untreated, may die.</u> <u>Symptoms include shortness of breath and blue baby syndrome.</u> |
| <u>(27) Selenium (ppb)</u> | <u>0.05</u> | <u>1000</u> | <u>50</u> | <u>50</u> | <u>Discharge from petroleum and metal refineries;</u> <u>Erosion of</u> | <u>Selenium is an essential nutrient.</u> <u>However, some people who drink water containing selenium in excess</u> |

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| | | | | | | <u>natural deposits; Discharge from mines</u> | <u>of the PMCL over many years could experience hair or fingernail losses, numbness in fingers or toes, or problems with their circulation.</u> |
| <u>(28) Thallium (ppb)</u> | <u>0.002</u> | <u>1000</u> | <u>2</u> | <u>0.5</u> | | <u>Leaching from ore-processing sites; Discharge from electronics, glass, and drug factories</u> | <u>Some people who drink water containing thallium in excess of the PMCL over many years could experience hair loss, changes in their blood, or problems with their kidneys, intestines, or liver.</u> |
| <u>Synthetic Organic Chemicals including Pesticides and Herbicides</u> | | | | | | | |
| <u>(29) 2,4-D (ppb)</u> | <u>0.07</u> | <u>1000</u> | <u>70</u> | <u>70</u> | | <u>Runoff from herbicides used on row crops</u> | <u>Some people who drink water containing the weed killer 2,4-D well in excess of the PMCL over many years could experience problems with their kidneys, liver, or adrenal glands.</u> |
| <u>(30) 2,4,5-TP [Silvex] (ppb)</u> | <u>0.05</u> | <u>1000</u> | <u>50</u> | <u>50</u> | | <u>Residue of banned herbicide</u> | <u>Some people who drink water containing silvex in excess of the PMCL over many years could experience liver problems.</u> |
| <u>(31) Acrylamide</u> | <u>II</u> | | <u>II</u> | <u>0</u> | | <u>Added to water during sewage/wastewater treatment</u> | <u>Some people who drink water containing high levels of acrylamide over a long period of time could have problems with their</u> |

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| | | | | | | nervous system or blood, and may have an increased risk of getting cancer. |
| <u>(32) Alachlor (ppb)</u> | <u>0.002</u> | <u>1000</u> | <u>2</u> | <u>0</u> | <u>Runoff from herbicide used on row crops</u> | <u>Some people who drink water containing alachlor in excess of the PMCL 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.</u> |
| <u>(33) Atrazine (ppb)</u> | <u>0.003</u> | <u>1000</u> | <u>3</u> | <u>3</u> | <u>Runoff from herbicide used on row crops</u> | <u>Some people who drink water containing the atrazine well in excess of the PMCL over many years could experience problems with their cardiovascular system or reproductive difficulties.</u> |
| <u>(34) Benzo(a)pyrene[P AH]</u> | <u>0.0002</u> | <u>1,000,000</u> | <u>200</u> | <u>0</u> | <u>Leaching from linings of water storage tanks and distribution lines</u> | <u>Some people who drink water containing benzo(a)pyrene in excess of the PMCL over many years could experience reproductive difficulties and may have an increased risk of getting cancer.</u> |
| <u>(35) Carbofuran (ppb)</u> | <u>0.04</u> | <u>1000</u> | <u>40</u> | <u>40</u> | <u>Leaching of soil fumigant used on</u> | <u>Some people who drink water containing carbofuran in</u> |

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| | | | | | <u>rice and alfalfa</u> | <u>excess of the PMCL over many years could experience problems with their blood, or nervous or reproductive systems.</u> |
| <u>(36) Chlordane (ppb)</u> | <u>0.002</u> | <u>1000</u> | <u>2</u> | <u>0</u> | <u>Residue of banned termiticide</u> | <u>Some people who drink water containing chlordane in excess of the PMCL over many years could experience problems with their liver or nervous system, and may have an increased risk of getting cancer.</u> |
| <u>(37) Dalapon (ppb)</u> | <u>0.2</u> | <u>1000</u> | <u>200</u> | <u>20</u> <u>0</u> | <u>Runoff from herbicide used on rights of way</u> | <u>Some people who drink water containing dalapon well in excess of the PMCL over many years could experience minor kidney changes.</u> |
| <u>(38) Di(2-ethylhexyl) adipate (ppb)</u> | <u>0.4</u> | <u>1000</u> | <u>400</u> | <u>40</u> <u>0</u> | <u>Discharge from chemical factories</u> | <u>Some people who drink water containing di(2-ethylhexyl)adipate well in excess of the PMCL over many years could experience toxic effects, such as weight loss, liver enlargement or possible reproductive difficulties.</u> |
| <u>(39) Di(2-ethylhexyl)phthalate (ppb)</u> | <u>0.006</u> | <u>1000</u> | <u>6</u> | <u>0</u> | <u>Discharge from rubber and</u> | <u>Some people who drink water containing di(2-ethylhexyl)phthalate in excess of the</u> |

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| | | | | | <u>chemical factories</u> | <u>PMCL over many years may have problems with their liver, or experience reproductive difficulties, and may have an increased risk of getting cancer.</u> |
| <u>(40) Dibromochloropropane (DBCP) (ppt)</u> | <u>0.0002</u> | <u>1,000,000</u> | <u>200</u> | <u>0</u> | <u>Runoff/leaching from soil fumigant used on soybeans, cotton, pineapples, and orchards</u> | <u>Some people who drink water containing DBCP well in excess of the PMCL over many years could experience reproductive problems and may have an increased risk of getting cancer.</u> |
| <u>(41) Dinoseb (ppb)</u> | <u>0.007</u> | <u>1000</u> | <u>7</u> | <u>7</u> | <u>Runoff from herbicide used on soybeans and vegetables</u> | <u>Some people who drink water containing dinoseb well in excess of the PMCL over many years could experience reproductive difficulties.</u> |
| <u>(42) Diquat (ppb)</u> | <u>0.02</u> | <u>1000</u> | <u>20</u> | <u>20</u> | <u>Runoff from herbicide use</u> | <u>Some people who drink water containing diquat in excess of the PMCL over many years could get cataracts.</u> |
| <u>(43) Dioxin [2,3,7,8-TCDD] (ppq)</u> | <u>0.00000003</u> | <u>1,000,000,000</u> | <u>30</u> | <u>0</u> | <u>Emissions from waste incineration and other combustion; Discharge from</u> | <u>Some people who drink water containing dioxin in excess of the PMCL over many years could experience reproductive difficulties and may have an increased</u> |

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| | | | | | <u>chemical factories</u> | <u>risk of getting cancer.</u> |
| <u>(44) Endothall (ppb)</u> | <u>0.1</u> | <u>1000</u> | <u>100</u> | <u>10</u> <u>0</u> | <u>Runoff from herbicide use</u> | <u>Some people who drink water containing endothall in excess of the PMCL over many years could experience problems with their stomach or intestines.</u> |
| <u>(45) Endrin (ppb)</u> | <u>0.002</u> | <u>1000</u> | <u>2</u> | <u>2</u> | <u>Runoff of banned insecticide</u> | <u>Some people who drink water containing endrin in excess of the PMCL over many years could experience liver problems.</u> |
| <u>(46) Epichlorohydrin</u> | <u>TT</u> | | <u>TT</u> | <u>0</u> | <u>Discharge from industrial chemical factories; An impurity of some water treatment chemicals</u> | <u>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.</u> |
| <u>(47) Ethylene dibromide (ppt)</u> | <u>0.00005</u> | <u>1,000,000</u> | <u>50</u> | <u>0</u> | <u>Discharge from petroleum refineries</u> | <u>Some people who drink water containing ethylene dibromide in excess of the PMCL over many years could experience problems with their liver, stomach, reproductive system, or kidneys, and may have an increased risk of getting cancer.</u> |

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| <u>(48) Glyphosate (ppb)</u> | <u>0.7</u> | <u>1000</u> | <u>700</u> | <u>70</u> <u>0</u> | <u>Runoff from herbicide use</u> | <u>Some people who drink water containing glyphosate in excess of the PMCL over many years could experience problems with their kidneys or reproductive difficulties.</u> |
| <u>(49) Heptachlor (ppt)</u> | <u>0.0004</u> | <u>1,000,000</u> | <u>400</u> | <u>0</u> | <u>Residue of banned pesticide</u> | <u>Some people who drink water containing heptachlor in excess of the PMCL over many years could experience liver damage and may have an increased risk of getting cancer.</u> |
| <u>(50) Heptachlor epoxide (ppt)</u> | <u>0.0002</u> | <u>1,000,000</u> | <u>200</u> | <u>0</u> | <u>Breakdown of heptachlor</u> | <u>Some people who drink water containing heptachlor epoxide in excess of the PMCL over many years could experience liver damage, and may have an increased risk of getting cancer.</u> |
| <u>(51) Hexachlorobenzene (ppb)</u> | <u>0.001</u> | <u>1000</u> | <u>1</u> | <u>0</u> | <u>Discharge from metal refineries and agricultural chemical factories</u> | <u>Some people who drink water containing hexachlorobenzene in excess of the PMCL over many years could experience problems with their liver or kidneys or adverse reproductive effects, and may</u> |

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| | | | | | | have an increased risk of getting cancer. |
| (52) <u>Hexachlorocyclopentadiene (ppb)</u> | <u>0.05</u> | <u>1000</u> | <u>50</u> | <u>50</u> | <u>Discharge from chemical factories</u> | <u>Some people who drink water containing hexachlorocyclopentadiene well in excess of the PMCL over many years could experience problems with their stomach or kidneys.</u> |
| (53) <u>Lindane (ppt)</u> | <u>0.0002</u> | <u>1,000,000</u> | <u>200</u> | <u>200</u> | <u>Runoff/leaching from insecticide used on cattle, lumber, gardens</u> | <u>Some people who drink water containing lindane in excess of the PMCL over many years could experience problems with their kidneys or liver.</u> |
| (54) <u>Methoxychlor (ppb)</u> | <u>0.04</u> | <u>1000</u> | <u>40</u> | <u>40</u> | <u>Runoff/leaching from insecticide used on fruits, vegetables, alfalfa, livestock</u> | <u>Some people who drink water containing methoxychlor in excess of the PMCL over many years could experience reproductive difficulties.</u> |
| (55) <u>Oxamyl [Vydate] (ppb)</u> | <u>0.2</u> | <u>1000</u> | <u>200</u> | <u>200</u> | <u>Runoff/leaching from insecticide used on apples, potatoes and tomatoes</u> | <u>Some people who drink water containing oxamyl in excess of the PMCL over many years could experience slight nervous system effects.</u> |
| (56) <u>PCBs [Polychlorinated biphenyls] (ppt)</u> | <u>0.0005</u> | <u>1,000,000</u> | <u>500</u> | <u>0</u> | <u>Runoff from landfills; Discharge</u> | <u>Some people who drink water containing PCBs in excess of the PMCL over many</u> |

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| | | | | | <u>of waste chemicals</u> | <u>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.</u> |
| <u>(57) Pentachlorophenol (ppb)</u> | <u>0.001</u> | <u>1000</u> | <u>1</u> | <u>0</u> | <u>Discharge from wood preserving factories</u> | <u>Some people who drink water containing pentachlorophenol in excess of the PMCL over many years could experience problems with their liver or kidneys, and may have an increased risk of getting cancer.</u> |
| <u>(58) Picloram (ppb)</u> | <u>0.5</u> | <u>1000</u> | <u>500</u> | <u>50</u> <u>0</u> | <u>Herbicide runoff</u> | <u>Some people who drink water containing picloram in excess of the PMCL over many years could experience problems with their liver.</u> |
| <u>(59) Simazine (ppb)</u> | <u>0.004</u> | <u>1000</u> | <u>4</u> | <u>4</u> | <u>Herbicide runoff</u> | <u>Some people who drink water containing simazine in excess of the PMCL over many years could experience problems with their blood.</u> |
| <u>(60) Toxaphene (ppb)</u> | <u>0.003</u> | <u>1000</u> | <u>3</u> | <u>0</u> | <u>Runoff/leaching from insecticide used on</u> | <u>Some people who drink water containing toxaphene in excess of the</u> |

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| | | | | | <u>cotton and cattle</u> | <u>PMCL over many years could experience problems with their thyroid, kidneys, or liver and may have an increased risk of getting cancer.</u> |
| <u>Volatile Organic Chemicals</u> | | | | | | |
| <u>(61) Benzene (ppb)</u> | <u>0.005</u> | <u>1000</u> | <u>5</u> | <u>0</u> | <u>Discharge from factories; Leaching from gas storage tanks and landfills</u> | <u>Some people who drink water containing benzene in excess of the PMCL over many years could experience anemia or a decrease in blood platelets, and may have an increased risk of getting cancer.</u> |
| <u>(62) Carbon tetrachloride (ppb)</u> | <u>0.005</u> | <u>1000</u> | <u>5</u> | <u>0</u> | <u>Discharge from chemical plants and other industrial activities</u> | <u>Some people who drink water containing carbon tetrachloride in excess of the PMCL over many years could experience problems with their liver and may have an increased risk of getting cancer.</u> |
| <u>(63) Chlorobenzene (ppb)</u> | <u>0.1</u> | <u>1000</u> | <u>100</u> | <u>100</u> | <u>Discharge from chemical and agricultural chemical factories</u> | <u>Some people who drink water containing chlorobenzene in excess of the PMCL over many years could experience problems with their liver or kidneys.</u> |
| <u>(64) o-Dichlorobenzene (ppb)</u> | <u>0.6</u> | <u>1000</u> | <u>600</u> | <u>600</u> | <u>Discharge from industrial chemical factories</u> | <u>Some people who drink water containing o-dichlorobenzene well in excess of</u> |

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| | | | | | | the PMCL over many years could experience problems with their liver, kidneys, or spleen, or changes in their blood. |
| <u>(65) p-Dichlorobenzene (ppb)</u> | <u>0.075</u> | <u>1000</u> | <u>75</u> | <u>75</u> | <u>Discharge from industrial chemical factories</u> | <u>Some people who drink water containing p-dichlorobenzene in excess of the PMCL over many years could experience anemia, damage to their liver, kidneys, or circulatory systems.</u> |
| <u>(66) 1,2-Dichloroethane (ppb)</u> | <u>0.005</u> | <u>1000</u> | <u>5</u> | <u>0</u> | <u>Discharge from industrial chemical factories</u> | <u>Some people who drink water containing 1,2-dichloroethane in excess of the PMCL over many years may have an increased risk of getting cancer.</u> |
| <u>(67) 1,1-Dichloroethylene (ppb)</u> | <u>0.007</u> | <u>1000</u> | <u>7</u> | <u>7</u> | <u>Discharge from industrial chemical factories</u> | <u>Some people who drink water containing 1,1-dichloroethylene in excess of the PMCL over many years could experience problems with their liver.</u> |
| <u>(68) cis-1,2-Dichloroethylene (ppb)</u> | <u>0.07</u> | <u>1000</u> | <u>70</u> | <u>70</u> | <u>Discharge from industrial chemical factories</u> | <u>Some people who drink water containing cis-1,2-dichloroethylene in excess of the PMCL over many years could experience problems with their liver.</u> |

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| <u>(69) trans-1,2-Dichloroethylene (ppb)</u> | <u>0.1</u> | <u>1000</u> | <u>100</u> | <u>100</u> | <u>Discharge from industrial chemical factories</u> | <u>Some people who drink water containing trans-1,2-dichloroethylene well in excess of the PMCL over many years could experience problems with their liver.</u> |
| <u>(70) Dichloromethane (ppb)</u> | <u>0.005</u> | <u>1000</u> | <u>5</u> | <u>0</u> | <u>Discharge from pharmaceutical and chemical factories</u> | <u>Some people who drink water containing dichloromethane in excess of the PMCL over many years could have liver problems and may have an increased risk of getting cancer.</u> |
| <u>(71) 1,2-Dichloropropane (ppb)</u> | <u>0.005</u> | <u>1000</u> | <u>5</u> | <u>0</u> | <u>Discharge from industrial chemical factories</u> | <u>Some people who drink water containing 1,2-dichloropropane in excess of the PMCL over many years may have an increased risk of getting cancer.</u> |
| <u>(72) Ethylbenzene (ppb)</u> | <u>0.7</u> | <u>1000</u> | <u>700</u> | <u>700</u> | <u>Discharge from petroleum refineries</u> | <u>Some people who drink water containing ethylbenzene well in excess of the PMCL over many years could experience problems with their liver or kidneys.</u> |
| <u>(73) Styrene (ppb)</u> | <u>0.1</u> | <u>1000</u> | <u>100</u> | <u>100</u> | <u>Discharge from rubber and plastic factories; Leaching</u> | <u>Some people who drink water containing styrene well in excess of the PMCL over many years could experience</u> |

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| | | | | | <u>from landfills</u> | <u>problems with their liver, kidneys, or circulatory system.</u> |
| <u>(74) Tetrachloroethylene (ppb)</u> | <u>0.005</u> | <u>1000</u> | <u>5</u> | <u>0</u> | <u>Discharge from factories and dry cleaners</u> | <u>Some people who drink water containing tetrachloroethylene in excess of the PMCL over many years could have problems with their liver, and may have an increased risk of getting cancer.</u> |
| <u>(75) 1,2,4-Trichlorobenzene (ppb)</u> | <u>0.07</u> | <u>1000</u> | <u>70</u> | <u>70</u> | <u>Discharge from textile-finishing factories</u> | <u>Some people who drink water containing 1,2,4-trichlorobenzene well in excess of the PMCL over many years could experience changes in their adrenal glands.</u> |
| <u>(76) 1,1,1,-Trichloroethane (ppb)</u> | <u>0.2</u> | <u>1000</u> | <u>200</u> | <u>200</u> | <u>Discharge from metal degreasing sites and other factories</u> | <u>Some people who drink water containing 1,1,1-trichloroethane in excess of the PMCL over many years could experience problems with their liver, nervous system, or circulatory system.</u> |
| <u>(77) 1,1,2-Trichloroethane (ppb)</u> | <u>0.005</u> | <u>1000</u> | <u>5</u> | <u>3</u> | <u>Discharge from industrial chemical factories</u> | <u>Some people who drink water containing 1,1,2-trichloroethane well in excess of the PMCL over many years could have problems with their liver, kidneys, or immune systems.</u> |

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| <u>(78) Trichloroethylene (ppb)</u> | <u>0.005</u> | <u>1000</u> | <u>5</u> | <u>0</u> | <u>Discharge from metal degreasing sites and other factories</u> | <u>Some people who drink water containing trichloroethylene in excess of the PMCL over many years could experience problems with their liver and may have an increased risk of getting cancer.</u> |
| <u>(79) Toluene (ppm)</u> | <u>1</u> | | <u>1</u> | <u>1</u> | <u>Discharge from petroleum factories</u> | <u>Some people who drink water containing toluene well in excess of the PMCL over many years could have problems with their nervous system, kidneys, or liver.</u> |
| <u>(80) Vinyl Chloride (ppb)</u> | <u>0.002</u> | <u>1000</u> | <u>2</u> | <u>0</u> | <u>Leaching from PVC piping; Discharge from plastic factories</u> | <u>Some people who drink water containing vinyl chloride in excess of the PMCL over many years may have an increased risk of getting cancer.</u> |
| <u>(81) Xylenes (ppm)</u> | <u>10</u> | | <u>10</u> | <u>10</u> | <u>Discharge from petroleum factories; Discharge from chemical factories</u> | <u>Some people who drink water containing xylenes in excess of the PMCL over many years could experience damage to their nervous system.</u> |
| <u>Disinfection Byproducts, Precursors, and Residuals</u> | | | | | | |

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| <u>(82) TTHM [total trihalomethanes] (ppb)</u> | <u>0.080</u> | <u>1000</u> | <u>80</u> | <u>n/a</u> | <u>Byproduct of drinking water disinfection</u> | <u>Some people who drink water containing trihalomethanes (THMs) in excess of the PMCL over many years could experience problems with their liver, kidneys, or central nervous systems, and may have an increased risk of getting cancer.</u> |
| <u>(83) Haloacetic acids (HAA) (ppb)</u> | <u>0.060</u> | <u>1000</u> | <u>60</u> | <u>n/a</u> | <u>Byproduct of drinking water disinfection</u> | <u>Some people who drink water containing haloacetic acids in excess of the PMCL over many years may have an increased risk of getting cancer.</u> |
| <u>(84) Bromate (ppb)</u> | <u>0.010</u> | <u>1000</u> | <u>10</u> | <u>0</u> | <u>Byproduct of drinking water disinfection</u> | <u>Some people who drink water containing bromate in excess of the PMCL over many years may have an increased risk of getting cancer.</u> |
| <u>(85) Chloramines (ppm)</u> | <u>MRDL =4.0</u> | | <u>MRDL= 4.0</u> | <u>MRDLG =4</u> | <u>Water additive used to control microbes</u> | <u>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</u> |

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| | | | | | | <u>discomfort or anemia.</u> |
| <u>(86) Chlorine (ppm)</u> | <u>MRDL</u> <u>=4.0</u> | | <u>MRDL=</u> <u>4.0</u> | <u>MRDLG</u> <u>=4</u> | <u>Water</u> <u>additive</u> <u>used to</u> <u>control</u> <u>microbes</u> | <u>Some people who</u> <u>use water</u> <u>containing chlorine</u> <u>well in excess of</u> <u>the MRDL could</u> <u>experience</u> <u>irritating effects to</u> <u>their eyes and</u> <u>nose. Some</u> <u>people who drink</u> <u>water containing</u> <u>chlorine well in</u> <u>excess of the</u> <u>MRDL could</u> <u>experience</u> <u>stomach</u> <u>discomfort.</u> |
| <u>(87) Chlorine dioxide</u> <u>(ppb)^b</u> | <u>MRDL</u> <u>=0.8</u> | <u>1000</u> | <u>MRDL=</u> <u>800</u> | <u>MRDLG</u> <u>=800</u> | <u>Water</u> <u>additive</u> <u>used to</u> <u>control</u> <u>microbes</u> | <u>Some infants and</u> <u>young children</u> <u>who drink water</u> <u>containing chlorine</u> <u>dioxide in excess</u> <u>of the MRDL could</u> <u>experience</u> <u>nervous system</u> <u>effects. Similar</u> <u>effects may occur</u> <u>in fetuses of</u> <u>pregnant women</u> <u>who drink water</u> <u>containing chlorine</u> <u>dioxide in excess</u> <u>of the MRDL.</u> <u>Some people may</u> <u>experience</u> <u>anemia.</u> |
| <u>(88) Chlorine dioxide,</u> <u>where any two</u> <u>consecutive daily</u> <u>samples collected at</u> <u>the entrance to the</u> <u>distribution system are</u> <u>above the MRDL.^a</u> | <u>MRDL</u> <u>=0.8</u> | | | <u>MRDLG</u> <u>=0.8</u> | | <u>The chlorine</u> <u>dioxide violations</u> <u>reported today are</u> <u>the result of</u> <u>exceedances at</u> <u>the treatment</u> <u>facility only, not</u> <u>within the</u> <u>distribution system</u> <u>which delivers</u> <u>water to</u> |

| | | | | | | |
|---|----------------------------|--|------------|-----------------------------|---|---|
| | | | | | | <u>consumers.</u> <u>Continued</u> <u>compliance with</u> <u>chlorine dioxide</u> <u>levels within the</u> <u>distribution system</u> <u>minimizes the</u> <u>potential risk of</u> <u>these violations to</u> <u>consumers.</u> |
| <u>(89) Chlorine dioxide,</u> <u>where one or more</u> <u>distribution system</u> <u>samples are above the</u> <u>MRDL.^a</u> | <u>MRDL</u> <u>=0.8</u> | | | <u>MRDLG</u> <u>=0.8</u> | | <u>The chlorine</u> <u>dioxide violations</u> <u>reported today</u> <u>include</u> <u>exceedances of</u> <u>the EPA standard</u> <u>within the</u> <u>distribution system</u> <u>which delivers</u> <u>water to</u> <u>consumers.</u> <u>Violations of the</u> <u>chlorine dioxide</u> <u>standard within the</u> <u>distribution system</u> <u>may harm human</u> <u>health based on</u> <u>short-term</u> <u>exposures. Certain</u> <u>groups, including</u> <u>fetuses, infants,</u> <u>and young</u> <u>children, may be</u> <u>especially</u> <u>susceptible to</u> <u>nervous system</u> <u>effects from</u> <u>excessive chlorine</u> <u>dioxide exposure.</u> |
| <u>(90) Chlorite (ppm)</u> | <u>1.0</u> | | <u>1.0</u> | <u>0.8</u> | <u>By-product</u> <u>of drinking</u> <u>water</u> <u>disinfectio</u> <u>n</u> | <u>Some infants and</u> <u>young children</u> <u>who drink water</u> <u>containing chlorite</u> <u>in excess of the</u> <u>PMCL could</u> <u>experience</u> <u>nervous system</u> <u>effects. Similar</u> <u>effects may occur</u> <u>in fetuses of</u> |

| | | | | | | |
|--|-----------|--|-----------|------------|---|---|
| | | | | | | <u>pregnant women who drink water containing chlorite in excess of the PMCL. Some people may experience anemia.</u> |
| <u>(91) Total organic carbon (ppm)</u> | <u>II</u> | | <u>II</u> | <u>n/a</u> | <u>Naturally present in the environment</u> | <u>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 byproducts in excess of the PMCL may lead to adverse health effects, liver or kidney problems, or nervous systems effects, and may lead to an increased risk of getting cancer.</u> |

12598 ^aThis information is for public notification purposes only.

12599 ^bThis information is for the CCR purposes only.

12600 ^cViolations of the treatment technique requirements for filtration and disinfection that involve

12601 turbidity exceedances may use the health effects language for turbidity instead.

12602 **12VAC5-590-550. Recordkeeping.**

12603 A. The owner shall maintain all of the waterworks records in accordance with the Records

12604 Retention and Disposition Schedule of the Library of Virginia, General Schedule No. 7 for public

12605 utility records of county and municipal governments.

12606 ~~B. All The owners owner~~ shall retain at ~~their~~ the waterworks or at a convenient location near
12607 ~~their~~ the waterworks the following records for ~~the minimum~~ not less than the time periods
12608 specified:

12609 ~~A. Records of microbiological~~ 1. Microbiological analyses and turbidity analyses, including
12610 records of any repeat samples ~~taken~~ collected and meeting the criteria for an extension of
12611 the 24-hour period for collecting repeat samples as required under 12VAC5-590-380 --
12612 Five years.

12613 ~~B2. Chemical Analyses~~ analyses -- 10 years.

12614 3. The following information shall be provided for subdivisions B 1 and B 2 of this section:

12615 a. Date, place, and time of sampling as well as the name of the person who collected
12616 the sample;

12617 b. Identification of sample (e.g., routine, repeat, confirmation sample, source water,
12618 other);

12619 c. Date of analysis;

12620 d. Laboratory and/or person responsible for performing analysis;

12621 e. Analytical method/technique used; and

12622 f. Results of the analysis.

12623 ~~C4. Individual filter monitoring required under 12VAC5-590-530 E 1 b (2) --~~ 12VAC5-590-
12624 531 A 2 b -- Three years.

12625 ~~D5. Results of Disinfection Profile~~ disinfection profile including raw data and analysis --
12626 Indefinitely.

12627 ~~E6. Disinfection Benchmarking~~ benchmarking including raw data and analysis --
12628 Indefinitely.

12629 F. ~~The following information shall be provided for subsections A and B of this section:~~

12630 1. ~~Date, place, and time of sampling as well as the name of the person who collected the~~

12631 ~~sample;~~

12632 2. ~~Identification of sample (e.g., routine, check sample, raw water, other);~~

12633 3. ~~Date of analysis;~~

12634 4. ~~Laboratory and/or person responsible for performing analysis;~~

12635 5. ~~Analytical method/technique used; and~~

12636 6. ~~Results of the analysis.~~

12637 ~~G7.~~ Original records of all sampling data and analyses, reports, surveys, letters,

12638 evaluations, schedules, ~~commissioner~~ department determinations, and any other

12639 information required by 12VAC5-590-405 A 1 and 2, B, C, and D; and 12VAC5-590-375

12640 B, C, and D 12VAC5-590-405 A 2, 12VAC5-590-405 B, 12VAC5-590-405 C, and 12VAC5-

12641 590-405 D, pertaining to lead and copper. Each waterworks owner shall retain the records

12642 required by this section for no fewer than ~~12~~ -- 12 years.

12643 ~~H8. Owners shall keep results~~ Results from the initial round of source water monitoring

12644 under ~~12VAC5-590-420 B 3 a (1)~~ 12VAC5-590-401 B 1 and the second round of source

12645 water monitoring under ~~12VAC5-590-420 B 3 a (2)~~ 12VAC5-590-401 B 2 until three years

12646 after bin classification under ~~12VAC5-590-420 B 3 c (1)~~ 12VAC5-590-401 D 1 for the

12647 particular round of monitoring.

12648 ~~I. Owners shall keep any~~ 9. Any notification to the ~~commissioner~~ department that they will

12649 not conduct source water monitoring will not be conducted due to meeting the criteria of

12650 ~~12VAC5-590-420 B 3 a (4)~~ for three 12VAC5-590-401 B 4 -- Three years.

12651 ~~J~~10. ~~Owners shall keep the results~~ Results of treatment monitoring associated with
12652 microbial toolbox options under ~~12VAC5-590-420 B 3 d (3) through (7)~~ 12VAC5-590-401
12653 E 3 through 12VAC5-590-401 E 7 and with uncovered finished water reservoirs under
12654 ~~12VAC5-590-420 L~~ 12VAC5-590-415, as applicable, for ~~three~~ Three years.

12655 ~~K~~11. Action taken to correct violations of ~~these regulations -- three~~ this chapter - Three
12656 years after last action with respect to violation involved.

12657 ~~L~~12. ~~Owners~~ The owner shall retain completed assessment forms for all Level 1 and Level
12658 2 assessments conducted in accordance with 12VAC5-590-392 C, regardless of who
12659 conducts the assessment, and documentation of corrective actions completed as a result
12660 of those assessments, or other available summary documentation of the sanitary defects
12661 and correction actions taken under 12VAC5-590-392 D for a period not less than five years
12662 after completion of the assessment or corrective action, whichever is later.

12663 ~~M~~13. Copies of reports, summaries, or communications relating to any sanitary surveys
12664 performed -- 10 years following inspection.

12665 ~~N~~14. Variance or exemptions granted (and records related thereto) -- ~~five~~ Five years
12666 following expiration of the variance or exemption.

12667 ~~O~~15. ~~Cross connection~~ Cross-connection control program records -- 10 years.

12668 ~~P~~16. ~~The owner of a~~ Owners of waterworks that ~~recycle~~ recycles flow, as stipulated in
12669 ~~12VAC5-590-420 K~~ 12VAC5-590-395 C, shall collect and retain on file the recycle flow
12670 information for review and evaluation by the ~~district engineer beginning June 8, 2004~~
12671 department. This information shall be retained for a minimum of 10 years. Information shall
12672 include, as a minimum:

12673 4a. Copy of the recycle notification submitted to the ~~district engineer under 12VAC5-~~
12674 ~~590-530 K~~ department.

- 12675 2b. List of all recycle flows and the frequency with which they are returned.
- 12676 3c. Average and maximum backwash flow rate through the filters and the average and
- 12677 maximum duration of the filter backwash process, in minutes.
- 12678 4d. Typical filter run length and a written summary of how the filter run length is
- 12679 determined.
- 12680 5e. The type of treatment provided for the recycle flow.
- 12681 6f. Data on the physical dimensions of the equalization and/or treatment units, typical
- 12682 and maximum hydraulic loading rates, type of treatment chemicals used, average
- 12683 dose, frequency of use, and frequency at which solids are removed, if applicable.
- 12684 Q17. Copies of monitoring plans developed pursuant to these regulations shall be kept for
- 12685 the same period of time as the records of analyses taken under the plan are required to
- 12686 be kept under subsection A or B of this section, except as specified elsewhere in this
- 12687 chapter.
- 12688 R18. ~~All owners~~ The owner shall retain the following additional records:
- 12689 4a. ~~Plant operational records.~~ -- 5 years after the end of the calendar year;
- 12690 2b. ~~Water well completion reports.~~ Current organizational/staffing chart;
- 12691 3c. Record (As-built) engineering plans and specifications of facilities. -- Retain for the
- 12692 life of the facility;
- 12693 d. Equipment manuals for items in use -- Retain for the life of the equipment or facility;
- 12694 4e. Shop drawings of major equipment. in use -- Retain for the life of the equipment;
- 12695 f. Current list or chart of required laboratory tests with test frequencies and sampling
- 12696 locations;
- 12697 g. Current preventive maintenance schedule;

- 12698 ~~5h.~~ Records of ~~equipment repair or replacement~~ of equipment in use -- Retain for the
- 12699 life of the equipment;
- 12700 6j. Updated map of water distribution system; and
- 12701 7j. All accident reports. --Three years
- 12702 ~~5c.~~ Additional recordkeeping requirements for groundwater systems The owner of a
- 12703 waterworks with groundwater sources shall maintain the following records:
- 12704 1. ~~Records of corrective~~ Corrective actions – --10 years.
- 12705 2. ~~Records of public~~ Public notification as required by 12VAC5-590-540 -- Three years.
- 12706 3. ~~Records of invalidation~~ Invalidation of groundwater source samples – -- Five years.
- 12707 4. For consecutive waterworks, ~~records of~~ notification to the wholesale waterworks of
- 12708 coliform-positive samples – -- Five years.
- 12709 5. For a waterworks required to conduct compliance monitoring:
- 12710 a. ~~Records of the ODW Department-specified minimum~~ residual disinfectant ~~residual~~
- 12711 – --10 years.
- 12712 b. ~~Records of the lowest~~ Lowest daily residual disinfectant concentration – -- Five
- 12713 years.
- 12714 c. ~~Records of the dates~~ Dates and duration of any failure to maintain the ~~ODW~~
- 12715 department-specified minimum residual disinfectant concentration for a period of more
- 12716 than four hours – -- Five years.
- 12717 d. ~~Records of any ODW Department-specified~~ compliance parameters for alternative
- 12718 treatment and records of the date and duration of any failure to meet the alternative
- 12719 treatment operating requirements for more than four hours – --Five years.

12720 **12VAC5-590-560. Safety.**

12721 ~~Since its trained personnel is the waterworks' most important asset, an important phase of~~
12722 ~~waterworks operation is the protection of personnel through an active safety program; therefore,~~
12723 ~~it is strongly recommended that every waterworks institute a safety program. The owner of a~~
12724 ~~waterworks shall institute a safety program to inform personnel of the known hazards, preventive~~
12725 ~~measures, and emergency procedures pertaining to the operation of the waterworks in~~
12726 ~~accordance with VOSH laws and regulations.~~

12727 **12VAC5-590-565. Source Water Protection.**

12728 A. A waterworks owned by a county, city, or town may exercise the authority pursuant to §
12729 15.2-2109 of the Code of Virginia to protect the waterworks from pollution or injury.

12730 B. The owner of a waterworks with a drinking water reservoir may establish a buffer around
12731 the intake to limit such uses as body contact recreation and boats powered by engines, pursuant
12732 to a plan acceptable to the department.

12733 C. The owner of a waterworks should develop a source water protection plan for all the
12734 sources and report ongoing or completed protection initiatives to the department.

12735 _____
12736 **12VAC5-590-570. Operational ~~report forms.~~ reporting requirements.**

12737 ~~All waterworks required to report information to the department shall use the forms approved~~
12738 ~~by the division.~~

12739 A. Monthly operational reports.

12740 1. A classified waterworks is required to report monthly information to the department no
12741 later than the 10th of the month following the month during which the monitoring period
12742 occurred.

12743 2. A classified waterworks using conventional filtration shall report using the monthly
12744 operating report (MOR) form approved by the department. All other classified waterworks
12745 shall report the required information specified in Tables 570.1 through 570.13, based on
12746 the treatment processes employed. Monitoring data shall be collected for each day the
12747 operating staff attend to the operation of the facilities.

12748 3. To determine if a waterworks using UV reactor systems is operating within validated
12749 conditions designed in accordance with 12VAC5-590-1005, the following parameters shall
12750 be monitored and reported: (i) on/off status for each reactor; (ii) flow rate through reactor
12751 train; (iii) UV intensity as measured by a UV sensor; (iv) lamp status; (v) lamp age; and
12752 UV transmittance. The operational set points shall be reported if set point control is used.
12753 The calculated UV dose shall be reported if other than a set point control is used.

12754 4. An unclassified waterworks is required to report quarterly the following information
12755 specified in Table 570.1, where applicable, to the department no later than the 10th of the
12756 month following the calendar quarter during which the monitoring period occurred.

12757 5. An unclassified waterworks that is using any of the treatment processes described in
12758 Tables 570.2 through 570.13 is required to report no later than the 10th of the month
12759 following the calendar month during which the monitoring occurred. The report shall
12760 contain the required information specified in Tables 570.1 through 570.13 based on the
12761 treatment processes employed. The monitoring data shall be collected at a minimum
12762 frequency as established by the department.

12763 6. The department may vary the reporting requirements on a case-by-case basis.

12764

Table 570.1.
Baseline Data -- All Waterworks.

| |
|-----------------------------------|
| <u>Public Water System ID No.</u> |
|-----------------------------------|

| |
|---|
| <u>System Name</u> |
| <u>Reporting month and year (reporting quarter and year^a)</u> |
| <u>Location (county)</u> |
| <u>Number of connections, monthly average (maximum for reporting period^a)</u> |
| <u>Population served, monthly average (quarterly average and maximum day^a)</u> |
| <u>Total source water withdrawn, gpd</u> |
| <u>Total source water treated, gpd</u> |
| <u>Total finished water produced, gal/month (for each entry point) and/or Total water purchased, gal/month (at each consecutive connection)</u> |
| <u>Operator Name (printed and signature)</u> |
| <u>Operator Classification (Class 1 to Class 6)</u> |
| <u>Operator DPOR Certification No.</u> |
| <u>Name and contact information of the emergency contact person (text, voice phone number)</u> |
| ^a <u>Required for an unclassified waterworks.</u> |

12765

Table 570.2.
Chlorine Disinfection.

| |
|---|
| <u>Chlorine compound used (chlorine gas, calcium hypochlorite or sodium hypochlorite)</u> |
| <u>Amount of chlorine compound used at each application point, lb/day</u> |
| <u>Residual disinfectant concentration (measured as total chlorine, free chlorine, combined chlorine, or chlorine dioxide) at entry point, mg/L</u> |
| <u>Chlorite concentration (if chlorine dioxide is used), daily measurement at entry point, mg/L</u> |

12766

Table 570.3.
Chlorine Residual in the Distribution System.

| |
|--|
| <u>Chlorine compound used (chlorine gas, calcium hypochlorite or sodium hypochlorite)</u> |
| <u>Residual disinfectant concentration, measured as total chlorine, free chlorine, combined chlorine, or chlorine dioxide, mg/L</u> <u>(Collected with each total coliform bacteria sample, in accordance with approved sampling plan).</u> |

12767

Table 570.4.
Rechlorination in Distribution System.

| |
|--|
| <u>Chlorine compound used (chlorine gas, calcium hypochlorite or sodium hypochlorite)</u> |
| <u>Amount of chlorine compound used at each application point, lb/day</u> |
| <u>Free chlorine residual concentration before rechlorination, mg/L</u> |
| <u>Free chlorine residual concentration after rechlorination, mg/L</u> |
| <u>Free chlorine residual, mg/L (measured and reported with each total coliform bacteria sample, in accordance with approved sampling plan.)</u> |

12768

Table 570.5.
Iron and Manganese Treatment by Oxidation, Detention and Filtration.

| |
|---|
| <u>Source water iron and manganese concentrations, mg/L (each source)</u> |
| <u>Oxidant amount used, lb/day</u> |
| <u>Finished water iron and manganese concentrations, mg/L (each filter)</u> |
| <u>Finished water pH (each filter)</u> |
| <u>Filter hours between backwash (each filter)</u> |

12769

Table 570.6.
Iron and Manganese Treatment by Ion Exchange.

| |
|--|
| <u>Ion exchange material (type, manufacturer, and product name)</u> |
| <u>Source water iron and manganese concentrations, mg/L (each source)</u> |
| <u>Finished water iron and manganese concentrations, mg/L (each unit softener)</u> |
| <u>Finished water pH (each unit softener)</u> |
| <u>Head Loss, psi (each unit softener)</u> |
| <u>Regeneration date and method (each unit softener)</u> |
| <u>Backwash date and duration of washing (each unit softener)</u> |
| <u>Backwash rate, gpm (each unit softener)</u> |

12770

Table 570.7.
Sequestration of Iron and Manganese.

| |
|---|
| <u>Chemical used (manufacturer and product name)</u> |
| <u>Quantity used, lb/day (average)</u> |
| <u>Source water iron and manganese concentrations, mg/L (each source)</u> |

| |
|--|
| <u>Finished water (entry point) iron and manganese concentrations, mg/L</u> |
| <u>Finished water (entry point) treatment chemical concentration, mg/L</u> |
| <u>Treatment chemical residual concentration, mg/L</u> <u>(Value at distal end of distribution system. Report at same frequency as free chlorine residual testing.)</u> |

12771

Table 570.8.
pH Adjustment or Corrosion Control by Chemical Addition.

| |
|--|
| <u>Chemical used (manufacturer and product name)</u> |
| <u>Quantity used, lb/day (average)</u> |
| <u>Source water pH</u> |
| <u>Finished water (entry point) pH</u> |
| <u>Finished water (entry point) treatment chemical concentration, mg/L</u> <u>(if required water quality parameter for compliance with lead and copper)</u> |

Table 570.9.
Cation Exchange Softening.

| |
|---|
| <u>Cation exchange material (type, manufacturer, and product name)</u> |
| <u>Regeneration date and method (each unit)</u> |
| <u>Backwashing date and duration of washing (each unit)</u> |
| <u>Softener influent hardness, mg/L as CaCO₃ (each source)</u> |
| <u>Softener effluent hardness, mg/L as CaCO₃ (each unit)</u> |
| <u>Stabilization chemical type, weight, daily dosage</u> |
| <u>Finished water (entry point) pH</u> |
| <u>Finished water (entry point) alkalinity, mg/L</u> |
| <u>Finished water (entry point) hardness, as CaCO₃</u> |

12772

Table 570.10.
Fluoridation.

| |
|--|
| <u>Chemical used (manufacturer and product name)</u> |
| <u>Fluoride used, lb/day</u> |
| <u>Fluoride dosage, mg/L (daily)</u> |

Water treated, MGD

Finished water (entry point) fluoride concentration, mg/L (maximum, minimum, and average)

12773

Table 570.11.
Microfiltration or Ultrafiltration.

| |
|---|
| <u>Hours unit in operation</u> |
| <u>Source water flow, gpd</u> |
| <u>Filtrate volume, gpd</u> |
| <u>Recirculated during suspension mode (volume or % of feed flow, per day)</u> |
| <u>Waste volume, gpd</u> |
| <u>Maximum stabilized flux, gpd/ft²</u> |
| <u>Source water turbidity, NTU bench test (daily)</u> |
| <u>Source water turbidity, NTU in line (collected at same time as bench test)</u> |
| <u>Source water turbidity, NTU in-line (maximum daily)</u> |
| <u>Source water alkalinity, mg/L as CaCO₃ (daily)</u> |
| <u>Source water hardness, mg/L as CaCO₃ (daily)</u> |
| <u>Source water temperature, °C (daily)</u> |
| <u>Source water pH (daily)</u> |
| <u>Filtered water turbidity, NTU bench test (daily)</u> |
| <u>Filtered water turbidity, NTU in line (collected at same time as bench test)</u> |
| <u>Filtered water turbidity, NTU in-line (maximum daily)</u> |

| |
|---|
| <u>Pressure loss across pre-filter, psi (daily)</u> <u>(if pre-filters are automatically cleaned, reporting is not required)</u> |
| <u>Number of membrane modules in use (daily)</u> |
| <u>Direct integrity test start time (daily)</u> |
| <u>Direct integrity test starting pressure, psi (each membrane unit, daily)</u> |
| <u>Direct integrity test final pressure, psi (daily)</u> |
| <u>Direct integrity test duration, minutes (daily)</u> |
| <u>Direct integrity test pressure decay rate, psi/minute (daily)</u> |
| <u>Direct integrity test Log Removal Value (daily)</u> |
| <u>Trans-membrane pressure, psi (daily)</u> |
| <u>Trans-membrane pressure before clean-in-place, psi</u> |
| <u>Trans-membrane pressure after clean-in-place, psi</u> |
| <u>Cleaning solution used (manufacturer and product name)</u> |
| <u>pH of rinse water after clean-in-place</u> |
| <u>Calibrations completed (itemized instruments with dates completed)</u> |
| <u>Module repairs/replacements (itemized with dates repairs/replacements)</u> |
| <u>Entry point log inactivation of Giardia by disinfection (daily)</u> |

12774

Table 570.12.
Reverse Osmosis.

| |
|---|
| <u>Hours unit in operation</u> |
| <u>Pre-filter inlet pressure, psi (daily)</u> |

| |
|--|
| <u>Pre-filter outlet pressure, psi (daily)</u> |
| <u>RO Inlet pressure, psi (daily)</u> |
| <u>RO outlet pressure, psi (daily)</u> |
| <u>Total permeate flow, gpd</u> |
| <u>Concentrate flow (bypass), gpd</u> |
| <u>Finished water flow, gpd</u> |
| <u>Total finished water (entry point) flow, gpd</u> |
| <u>Pre RO TDS, mg/L (daily)</u> |
| <u>Post RO TDS, mg/L (daily)</u> |
| <u>Pre RO turbidity, NTU (daily)</u> |
| <u>Post RO turbidity, NTU</u> |
| <u>Pre RO conductivity, μS/cm (daily)</u> |
| <u>Post RO conductivity, μS/cm (daily)</u> |
| <u>Finished water conductivity, μS/cm (daily)</u> |
| <u>Source water pH (daily)</u> |
| <u>Permeate pH (daily)</u> |
| <u>Finished water (entry point) pH (daily)</u> |
| <u>Module repairs/replacements (itemized with dates of repairs/replacements)</u> |

12775

Table 570.13.
UV Disinfection.

| |
|--|
| <u>Total run time, hours (per unit)</u> |
| <u>Lamp status for each reactor train</u> |
| <u>Lamp age for each reactor train</u> |
| <u>Total production, MGD or gpd</u> |
| <u>Flow Rates, minimum, maximum and average, MGD or gpd for each reactor train</u> |

To receive disinfection credit, the following shall also be reported:

| |
|---|
| <u>Number of off-specification events</u> |
| <u>Total off-specification volume, gal</u> |
| <u>Percent off-specification volume,</u> |
| <u>UV Intensity setpoint, W/m² (if using intensity setpoint approach, daily)</u> |
| <u>UV Intensity for each reactor, minimum, W/m² (if using intensity setpoint approach, daily)</u> |
| <u>UV Intensity sensor calibration date(s) for each reactor</u> |
| <u>Required dose, mJ/cm² (if using calculated dose approach)</u> |
| <u>UV Transmittance (UVT) for each reactor, daily percentage (if using calculated dose approach)</u> |
| <u>Calculated dose for each reactor, daily minimum, mJ/cm² (if using calculated dose approach)</u> |
| <u>Validated dose for each reactor, daily minimum, mJ/cm² (if using calculated dose approach)</u> |
| <u>UVT analyzer calibration date(s) (if using calculated dose approach)</u> |
| <u>UV intensity sensor correction factor</u> |

- 12776 B. The owner shall report the following incidents within 24 hours to the department:
- 12777 1. Water pressure below the 20 psi minimum required in the distribution system, including
- 12778 zero or negative pressure. Examples of these events include treatment plant or pump

- 12779 station shutdowns due to equipment failure, power outages, emptying of storage tanks,
12780 and draining of the distribution system during fire flow events.
- 12781 2. Flooding of clearwells.
- 12782 3. Flooding of groundwater wells.
- 12783 4. Any other situation that occurs with the waterworks that presents or may present an
12784 imminent and substantial threat to public health.

12785

12786

Article 4

12787

~~Cross-Connection Control and Backflow Prevention in Waterworks~~

12788 **12VAC5-590-580. General requirements for cross-connection control and backflow**
12789 **prevention.**

12790 ~~A. The purpose of this article is to require as a condition for the issuance and continued use~~
12791 ~~of the operation permit for the waterworks that each owner of a waterworks~~ Every owner shall
12792 ~~establish and enforce a program of cross-connection control and backflow prevention for each~~
12793 ~~waterworks~~ cross-connection control program (CCCP) in accordance with 12VAC5-590-360. The
12794 goal of the CCCP is to prevent the intrusion of contamination into the distribution system via cross-
12795 connections and backflow. The cross-connection control and backflow prevention program shall
12796 ~~be approved by the division prior to issuance of the operation permit (see Appendix I).~~

12797 B. The owner shall not install or allow to be installed a service connection to any premises
12798 where cross-connections to a waterworks or a consumer's water system exist, unless the cross-
12799 connections are adequately safeguarded to the satisfaction of the owner and the department.

12800 C. The owner shall not install, maintain, or allow to be installed any connection whereby water
12801 from an auxiliary water system may enter a waterworks or consumer's water system, unless the

12802 auxiliary water system, the method of connection, and use of such system shall have been
12803 approved by the owner and the department.

12804 D. The owner, in accordance with 12VAC5-590-510 C, shall maintain acceptable working
12805 pressures in the distribution system to reduce the potential for backflow to occur.

12806 _____

12807 **12VAC5-590-590. ~~Cross connections.~~ (Repealed.)**

12808 ~~A. The purveyor shall not install, maintain, or allow to be installed a water service connection~~
12809 ~~to any premises where cross connections to a waterworks or a consumer's water system may~~
12810 ~~exist unless such cross connections are abated or controlled to the satisfaction of the water~~
12811 ~~purveyor or the division.~~

12812 ~~B. The purveyor shall not install, maintain, or allow to be installed any connection whereby~~
12813 ~~water from an auxiliary water system may enter a waterworks or consumer's water system unless~~
12814 ~~the auxiliary water system and the method of connection and use of such system shall have been~~
12815 ~~approved by the water purveyor and by the division.~~

12816 **12VAC5-590-600. ~~Responsibilities~~ CCCP responsibilities.**

12817 ~~A. General. Effective cross connection control requires the cooperation of the water purveyor,~~
12818 ~~the building official, the consumer, the Virginia Department of Health, and the backflow prevention~~
12819 ~~device tester.~~

12820 ~~B. Water purveyor.~~

12821 ~~1. The purveyor shall establish or cause to be established and operate a cross connection~~
12822 ~~control and backflow prevention program. The owner shall establish and operate a CCCP~~
12823 ~~consistent with the extent of the distribution system and the type of consumer served. This~~
12824 ~~program plan shall include at least one designated individual ~~who shall be responsible for the~~~~
12825 ~~inspection of the waterworks for cross connection and backflow prevention control assigned by~~

12826 the owner. Requirements for this position shall include training and experience in cross-
12827 connection control programs. This program shall be carried out in accordance with the Uniform
12828 Statewide Building Code and shall be a continuing program.

12829 2. ~~Suggested elements of this program are contained in Appendix I. The purveyor has full~~
12830 ~~responsibility for water quality and for the construction, maintenance, and operation of the~~
12831 ~~waterworks beginning at the water source and ending at the service connection.~~

12832 3. ~~The purveyor shall have thorough inspections and operational tests made at least~~
12833 ~~annually of backflow prevention devices which are required and installed at the service~~
12834 ~~connection.~~

12835 B. The owner shall establish appropriate policies to complete assessments of consumers'
12836 water systems, and shall determine both the degree of hazard and the appropriateness of existing
12837 safeguards.

12838 C. The owner shall establish procedures for completing operational tests, or other evaluation
12839 procedures as appropriate, at least annually, and after installation, relocation, or repairs, for
12840 testable backflow prevention assemblies, devices, and methods that provide containment.

12841 D. Instead of annual operational tests (12VAC5-590-600 C) and the related records and
12842 inventory of backflow prevention assemblies, backflow elimination methods, and backflow
12843 prevention devices (12VAC5-590-600 G), the owner may provide a public education program to
12844 residential and commercial consumers whose premise plumbing is not complex and where there
12845 are no known or suspected high hazards as identified in Table 630.1. For all other residential
12846 consumers, the department may approve a public education program provided by the owner as
12847 part of the CCCP.

12848 1. The public education program shall be designed to prompt consumer self-assessments,
12849 increase the awareness of cross-connections, and inform the consumer of the public
12850 health hazards of backflow.

12851 2. The public education program shall describe, at a minimum:

12852 a. Causes of backflow;

12853 b. Hazards and health effects of cross-connections and backflow;

12854 c. Resources available to identify actual or potential cross-connections;

12855 d. Safeguards to use to eliminate or reduce the hazards at the point of use; and

12856 e. Sources for additional information.

12857 ~~4. In the event of backflow of pollution or contamination into the waterworks, the purveyor~~
12858 ~~shall promptly take or cause corrective action, to confine and eliminate the pollution or~~
12859 ~~contamination. The purveyor shall immediately notify the division when backflow occurs.~~

12860 E. The owner shall discontinue or refuse water service to the consumer, to ensure that the
12861 waterworks is adequately protected from cross-connections and backflow, if any of the following
12862 conditions occur:

12863 1. A required backflow prevention assembly or backflow elimination method is not
12864 installed, tested, and maintained in accordance with the applicable sections of this
12865 chapter;

12866 2. A required backflow prevention assembly or backflow elimination method is inoperable
12867 or has been removed or bypassed; or

12868 3. An unprotected or inadequately protected cross-connection is known to exist on the
12869 premises and the owner has determined that there is inadequate backflow prevention at
12870 the service connection.

12871 F. In the event of backflow of contaminants into the waterworks, the owner shall promptly take
12872 or cause corrective action to confine and eliminate the contamination. The owner shall report the
12873 event to the department within one business day, in the most expeditious manner. The owner
12874 shall submit a written report by the 10th day of the month following the month during which
12875 backflow occurred addressing the incident, its causes and effects, and safeguards required or
12876 other action taken.

12877 G. The owner shall maintain an inventory and records of testing, repairs, and maintenance of
12878 all backflow prevention assemblies, backflow elimination methods, and backflow prevention
12879 devices required and installed under 12VAC5-590-610.

12880 H. The owner shall maintain records related to the CCCP implementation, and any other
12881 records required by the department in accordance with 12VAC5-590-550.

12882 ~~5. The purveyor shall take positive action to ensure that the waterworks is adequately~~
12883 ~~protected at all times. If a cross connection exists or backflow occurs into a consumer's~~
12884 ~~water system or if the pressure in the waterworks is lowered below 10 psi gauge, the~~
12885 ~~purveyor may discontinue the water service to the consumer and water service shall not~~
12886 ~~be restored until the deficiencies have been corrected or eliminated to the satisfaction of~~
12887 ~~the purveyor.~~

12888 _____
12889 _____

12890 **12VAC5-590-610. Containment policy of backflow.**

12891 A. ~~An approved backflow prevention device~~ Backflow prevention assemblies or
12892 backflow elimination methods shall be installed (i) at each the service connection ~~to a~~
12893 ~~consumer's water system where, in the judgment of the water purveyor or the division, a health,~~
12894 ~~pollution, or system hazard to the waterworks exists. B. When, as a matter of practicality, the~~

12895 ~~backflow prevention device cannot be installed at the service connection, the device may be or~~
12896 ~~(ii) located downstream of the service connection but prior to~~ before any unprotected takeoffs.

12897 B. Where the consumer's water system is not intricate or complex and where actual or
12898 potential cross-connection hazards can be eliminated or reduced, point-of-use isolation protection
12899 by application of appropriate backflow prevention assemblies, backflow prevention devices, or
12900 backflow elimination methods complying with the USBC may be used instead of containment.

12901 C. A backflow prevention device assembly or backflow elimination method shall be installed
12902 ~~at each service connection to a consumer's water system serving premises where the following~~
12903 ~~conditions exist:~~

12904 1. ~~Premises on which any~~ A substance is handled in such a manner as to create an actual
12905 ~~or potential hazard to a waterworks (this shall include premises having sources or systems~~
12906 ~~containing process fluids or waters originating from a waterworks which are no longer~~
12907 ~~under the control of the water purveyor); (this shall include premises having sources or~~
12908 ~~systems containing process fluids or waters originating from a waterworks which are no~~
12909 ~~longer under the control of the owner);~~

12910 2. ~~Premises having~~ There exists internal ~~cross-connections~~ cross-connections that, in the
12911 judgment of the ~~water purveyor~~ owner or the ~~division~~ department, may not be easily
12912 correctable or have intricate or complex plumbing arrangements ~~which~~ that make it
12913 impracticable to determine whether or not ~~cross-connections~~ cross-connections exist;

12914 3. ~~Premises where, because of~~ There are security requirements or other prohibitions or
12915 restrictions; ~~it is impossible or impractical to make a complete cross-connection survey~~
12916 ~~that prevent the assessment of all potential cross-connections that may impair the quality~~
12917 ~~of the water delivered;~~

12918 4. ~~Premises having~~ There is a repeated history of ~~cross-connections~~ cross-connections
12919 being established or reestablished;

12920 5. ~~Premises having fire protection systems utilizing combinations of sprinklers, fire loops,~~
12921 ~~storage tanks, pumps, antifreeze protection, or auxiliary water sources including siamese~~
12922 ~~connections (fire loops and sprinkler systems with openings not subject to flooding, and~~
12923 ~~containing no antifreeze or other chemicals, no separate fire protection storage, or~~
12924 ~~auxiliary sources, will not normally require backflow prevention); and~~

12925 5. There are fire protection systems, lawn sprinkler systems, or irrigation systems. ~~6. Other~~
12926 ~~premises specified by the division or the purveyor when cause can be shown that a~~
12927 ~~potential cross-connection hazard not enumerated above exists~~

12928 6. Cause can be shown by the department or owner that a potential cross-connection
12929 hazard exists.

12930 D. ~~Premises.~~ The owner shall ensure that premises having booster pumps or fire pumps
12931 connected to the waterworks shall be equipped with ~~a low pressure regulating or cutoff device to~~
12932 ~~shut off the booster pump when the pressure in the waterworks drops to a minimum of 10 psi~~
12933 gauge control devices to prevent a reduction of pump suction line pressure to less than 20 psig.

12934 E. ~~An approved.~~ A backflow prevention device assembly or backflow elimination method shall
12935 be installed at ~~each service connection to a consumer's water system serving, but not necessarily~~
12936 ~~limited to,~~ the following types of facilities, including:

12937 1. Hospitals, mortuaries, clinics, veterinary establishments, nursing homes, and medical
12938 buildings;

12939 2. Laboratories;

12940 3. Piers, docks, and waterfront facilities;

- 12941 4. Sewage treatment plants, sewage pumping stations, or storm water pumping stations;
- 12942 5. Food and beverage processing plants;
- 12943 6. Chemical plants, dyeing plants, and pharmaceutical plants;
- 12944 7. Metal plating industries;
- 12945 8. Petroleum or ~~natural gas~~ natural-gas processing or storage plants;
- 12946 9. Radioactive materials processing plants or nuclear reactors;
- 12947 10. Car washes and laundries;
- 12948 ~~11. Lawn sprinkler systems, and irrigation systems;~~
- 12949 ~~12. Fire service systems;~~
- 12950 11. Buildings with commercial, industrial, or institutional occupants served through a
- 12951 master meter;
- 12952 12. Water loading facilities;
- 12953 13. Slaughter houses and poultry processing plants;
- 12954 14. Farms where the water is used for other than household purposes;
- 12955 15. Commercial greenhouses and nurseries;
- 12956 16. Health clubs with swimming pools, therapeutic baths, hot tubs, or saunas;
- 12957 17. Paper and ~~paper products~~ paper-product plants and printing plants;
- 12958 18. Pesticide or exterminating companies and their vehicles with storage or mixing tanks;
- 12959 19. Facilities that blend, store, package, transport, or treat chemicals, and their related
- 12960 vehicles;
- 12961 ~~4920~~. Schools or colleges with laboratory facilities;

12962 ~~2021. Highrise buildings (four or more stories)~~ Multistorey office and commercial buildings
12963 or both with four or more stories, including residential buildings classified by the USBC as
12964 commercial; and

12965 ~~21. Multiuse commercial, office, or warehouse facilities; and~~

12966 ~~22. Others specified by the purveyor~~ owner or the ~~division~~ department when reasonable
12967 cause can be shown for a potential backflow or ~~cross-connection~~ cross-connection hazard.

12968 F. All temporary or emergency service connections shall be protected where reasonable
12969 cause can be shown for a potential backflow or cross-connection hazard. Backflow prevention
12970 assemblies or backflow elimination methods used shall be appropriately certified or approved to
12971 match the requirements of this section.

12972 _____

12973 **~~12VAC5-590-620. Type of protection required. (Repealed.)~~**

12974 ~~The type of protection required shall depend on the degree of hazard which exists or may~~
12975 ~~exist and on the method of potential backflow. Backflow occurs either by back pressure or by back~~
12976 ~~siphonage.~~

12977 ~~The degree of hazard, either high, moderate, or low, is based on the nature of the~~
12978 ~~contaminant; the potential of the health hazard; the probability of the backflow occurrence; and~~
12979 ~~the effect on waterworks structures, equipment, and appurtenances used in the storage,~~
12980 ~~collection, purification, treatment, and distribution of pure water.~~

12981 ~~Table 2.10 shall be used as a guide to determine the degree of hazard for any situation.~~

12982 ~~A. Air gaps give the highest degree of protection and shall be used whenever practical to do~~
12983 ~~so in high hazard situations subject to back pressure.~~

12984 B. An air gap separation and a reduced pressure principle backflow prevention device will
12985 protect against back pressure when operating properly. Vacuum breakers will not protect against
12986 back pressure, but will protect against back-siphonage when operating properly.

12987 C. Backflow prevention devices consisting of dual independent check valves with or without
12988 an intermediate atmospheric vent shall only be used in low hazard situations.

12989 D. Barometric loops are not acceptable.

12990 E. An interchangeable connection or change-over device has limitations which prevent its use
12991 where back pressure is present or may occur, the auxiliary supply is not an approved source, or
12992 the waterworks line pressure is less than 20 psi. Since this type connection is one of the easiest
12993 to bypass, the use of this type device will be approved only as a temporary and continuously
12994 supervised arrangement. In most instances, an approved device or method must be included and
12995 approved by the purveyor and division.

12996 **12VAC5-590-630. Backflow prevention assemblies, devices, and backflow elimination**
12997 **methods for containment.**

12998 A. Any backflow prevention assembly or device or backflow elimination method shall be of the
12999 approved type and shall comply with the Uniform Statewide Building Code USBC.

13000 B. Any backflow prevention device shall be installed in a manner approved by the water
13001 purveyor and in accordance with the Uniform Statewide Building Code.

13002 **B. General Safeguards**

13003 1. The backflow prevention assembly or device or backflow elimination method used shall
13004 depend on the degree of hazard that exists or may exist. The safeguard shall ensure
13005 maintenance of the distribution system water quality and its usefulness.

13006 2. The degree of hazard, either high or low, is based on (i) the nature of the contaminant;
 13007 (ii) the potential of the health hazard; (iii) the potential method of backflow (either by
 13008 backpressure or by backsiphonage); and (iv) the potential effect on waterworks structures,
 13009 equipment, and appurtenances used in the storage, collection, purification, treatment, and
 13010 distribution of potable water. Table 630.1 shall be used as a guide to determine the degree
 13011 of hazard for any situation.

Table 630.1.
Determination of Degree of Hazard.

| <u>Cross connections that meet or may meet the following conditions shall be rated at the corresponding degree of hazard.</u> | |
|--|---|
| <u>High Hazard</u> | <u>Low Hazard</u> |
| <u>The contaminant would be toxic, poisonous, noxious, unhealthy, or of unknown quality.</u> | <u>The contaminant would only degrade the quality of the water aesthetically or impair the usefulness of the water.</u> |
| <u>A health hazard would exist.</u> | <u>A health hazard would not exist.</u> |
| <u>The contaminant would disrupt the service of piped water for human consumption.</u> | <u>The contaminant would not disrupt service of piped water for human consumption.</u> |
| <u>Backflow would be by either backpressure or backsiphonage.</u> | <u>Backflow would occur by backsiphonage.</u> |
| <u>Examples: sewage, used water, nonpotable water, auxiliary water systems, and mixtures of water and other liquids, gases, or other toxic or hazardous chemicals.</u> | <u>Examples: food residuals, nontoxic chemicals, and nonhazardous chemicals.</u> |

13012 3. The USBC and the manufacturer's specifications shall be used to determine the
 13013 appropriateness of the backflow prevention assembly or device application for
 13014 containment.

13015 ~~C. Existing backflow prevention devices approved by the purveyor and the division prior to the~~
 13016 ~~effective date of this chapter shall, except for inspection, testing, and maintenance requirements,~~
 13017 ~~be excluded from the requirements of 12VAC5-590-600 A and B if the water purveyor and the~~
 13018 ~~division are assured that the devices will protect the waterworks.~~

13019 C. Backflow prevention devices or assemblies with openings, outlets, or vents that are
 13020 designed to operate or open during backflow prevention shall not be installed:

13021 1. In areas subject to flooding or in pits;

13022 2. In areas with atmospheric conditions that represent a contamination threat to the potable
 13023 water supply; and

13024 3. In such a manner as to be able to be bypassed.

13025 D. Starting January 1, 2022, persons testing and repairing backflow prevention assemblies
 13026 and devices shall be certified by a Commonwealth of Virginia tradesman certification program
 13027 (identified by DPOR as backflow prevention device workers). Until January 1, 2022, persons
 13028 testing and repairing backflow prevention assemblies and devices shall be qualified to perform
 13029 such work as demonstrated by possessing a certification or license from a local or state agency
 13030 having legal authority or shall possess a certificate of completion of applicable vocational training
 13031 acceptable to the owner.

| TABLE 2.10. DETERMINATION OF DEGREE OF HAZARD | |
|---|--|
| Premises with one or more of the following conditions shall be rated at the corresponding degree of hazard. | |
| High Hazard | The contaminant would be toxic, poisonous, noxious or unhealthy. |
| - | A health hazard would exist. |
| - | A high probability exists of a backflow occurrence either by back pressure or by back siphonage. |
| - | The contaminant would disrupt the service of piped water for human consumption. |
| - | Examples - sewage, used water, nonpotable water, auxiliary water systems, toxic or hazardous chemicals, etc. |
| Moderate Hazard | The contaminant would only degrade the quality of the water aesthetically or impair the usefulness of the water. |
| - | A health hazard would not exist. |
| - | A moderate probability exists of a backflow occurrence either by back pressure or by back siphonage. |

| | |
|------------|---|
| - | The contaminant would not seriously disrupt service of piped water for human consumption. |
| - | Examples— food stuff, nontoxic chemicals, nonhazardous chemicals, etc. |
| Low Hazard | The contaminant would only degrade the quality of the water aesthetically. |
| - | A health hazard would not exist. |
| - | A low probability exists of the occurrence of backflow primarily by back siphonage. |
| - | The contaminant would not disrupt service of piped water. |
| - | Examples— food stuff, nontoxic chemicals, nonhazardous, chemicals, etc. |

13032

Part III

13033

Manual of Practice for Waterworks Design

13034

Article 1

13035

General

13036 **12VAC5-590-640. General design considerations.**

13037 A. Waterworks shall conform with to the Public Water Supply Law, Article 2 of Chapter 6 of

13038 Title 32.1 of the Code of Virginia. The engineer shall confer with the division before proceeding

13039 with the detailed designs. The engineering report and preliminary plan shall include plant site

13040 selection. Ordinarily, Community waterworks shall be designed to provide for the estimated

13041 population water demand 10 to 30 years hence under predicted growth conditions. All waterworks

13042 shall be designed so that they can readily be increased in capacity except where circumstances

13043 preclude the probability of expansion. Expansion by modular steps should be considered.

13044 Operation and maintenance manuals are required for treatment facilities and pumping facilities.

13045 B. Waterworks design shall be based on sound engineering practice substantiated in the

13046 engineer's design and approved by the commissioner. Historical data or typical usage figures of

13047 waterworks with similar service area characteristics, and appropriate peaking factors, shall be

13048 used to support the design. USBC and design standards may be referenced for noncommunity
13049 waterworks, as appropriate.

13050 1. Community waterworks shall be designed to meet or exceed the estimated maximum
13051 daily water demand of the service area at the design year. The design shall account for
13052 diurnal demand patterns, and special demands placed on the waterworks such as
13053 firefighting, industrial use, and wholesale customers.

13054 2. Noncommunity waterworks shall be designed to meet or exceed the peak hour demand
13055 of the proposed services. Either Pump pump capacity and/or or storage capacity or both
13056 may be utilized to meet the peak hour demand.

13057 3. Effective storage.

13058 a. Community waterworks shall provide sufficient finished water effective storage to
13059 enable the waterworks to meet the estimated maximum daily water demand at the
13060 design year. Compliance with this requirement is normally determined by the use of a
13061 hydraulic model. In the absence of a hydraulic model, effective storage shall be a
13062 minimum of one-half of estimated maximum daily water demand of the waterworks at
13063 the design year.

13064 b. There is no minimum finished water effective storage requirement for noncommunity
13065 waterworks.

13066 c. Effective storage of atmospheric storage tanks shall be the volume available to store
13067 finished water in atmospheric reservoirs or tanks, measured as the difference between
13068 the overflow elevation, or the normal maximum operating level, and the minimum
13069 storage elevation. For atmospheric tanks that use a portion of their volume to generate
13070 distribution system pressure, the minimum storage elevation is that elevation of water

13071 in the tank that can provide a minimum pressure of 20 psig throughout that tank's
13072 service area under distribution system-wide maximum daily water demand.

13073 d. Effective storage of pressure storage tanks shall be one-third of the nominal
13074 pressure vessel storage capacity.

13075 C. Waterworks shall be designed to provide a minimum residual pressure of 20 psig at all
13076 service connections. Design shall be based on the most restrictive conditions, defaulting to the
13077 greater of peak hour demand or maximum daily water demand plus applicable fire flows. Fire flow
13078 design values shall be identified by the engineer after coordination among the owner, local and
13079 state building officials, and fire officials. Distribution system hydraulic modeling may be used to
13080 demonstrate compliance with this requirement.

13081 D. Materials used in the construction of waterworks that are in contact with the product water
13082 shall comply with NSF/ANSI Standard 61–2017 or an approved equivalent.

13083 **12VAC5-590-650. Objectives of a waterworks. (Repealed.)**

13084 ~~A. The objectives of a waterworks are:~~

13085 ~~1. The production of pure water; and~~

13086 ~~2. The production of water appealing to the consumer.~~

13087 ~~B. To reach the objectives of a waterworks, finished water quality shall conform with Article 1~~
13088 ~~of Part II of this chapter.~~

13089 **12VAC5-590-660. Site location.**

13090 A. Wells and water treatment plants shall be located above the projected 400-year 100-year
13091 flood-plain elevation. A lower elevations may be considered if it can be adequately shown that
13092 the wells or treatment plants can be protected from flooding. Site grading and adequate drainage

13093 shall be provided. Springs subject to flooding shall not be approved. See 12VAC5-590-840 E for

13094 additional well location requirements.

13095 B. The waterworks pumping and treatment facilities shall be readily accessible in all seasons.

13096 Access roads shall be provided.

13097 C. ~~Consideration should be given to~~ Functional aspects of the site shall be considered in

13098 design, including the convenience of transportation facilities to the plant site and also to the

13099 availability of electric power from more than one source of outside power.

13100 **12VAC5-590-670. Site size.**

13101 A. The area reserved around a well or spring site shall conform with ~~12VAC5-590-820,~~

13102 ~~12VAC5-590-830, and to~~ 12VAC5-590-840 D and 12VAC5-590-840 E.

13103 B. The treatment plant site shall be of ample size to accommodate expansion, and ample

13104 space shall be provided at the treatment site for adequate ~~disposal~~ handling of treatment plant

13105 wastes residuals.

13106 C. The disposal of water treatment plant ~~wastes~~ residuals shall conform to the State Water

13107 Control Law, Chapter 3.1 of Title 62.1 of the Code of Virginia.

13108 **12VAC5-590-680. Treatment process selection and BAT.**

13109 A. The following shall be considered when selecting treatment processes ~~to achieve treatment~~

13110 goals: (i) The the quality and variability of the source water, and (ii) Possible possible future

13111 changes in the quality and quantity of the source water.

13112 ~~A. The quality and variability of the source water.~~

13113 ~~B. Possible future changes in the quality of the source.~~

13114 ~~C. Water quality goals, including the growing desire of the public for better water.~~

13115 ~~D. When removal of contaminants for which BAT has been specified is necessary,~~
13116 ~~processes classified as BAT shall be employed.~~

13117 ~~E. When treatment technique requirements have been established in lieu of MCLs,~~
13118 ~~processes specified by such requirements shall be employed.~~

13119 ~~F. POE or POU devices shall not be utilized for long-term compliance with PMCLs. Such~~
13120 ~~devices may be considered for short term, interim use, as a condition of a variance or~~
13121 ~~exemption issued by the commissioner.~~

13122 B. The design shall employ best available technologies (BAT) for achieving compliance with
13123 the PMCLs for organic chemicals listed in 40 CFR 141.61, and BAT for achieving compliance with
13124 the PMCLs for inorganic chemicals listed in 40 CFR 141.62.

13125 C. The design shall employ BAT for achieving compliance with the PMCLs for radionuclides
13126 listed in 40 CFR 141.66, including radium-226, radium-228, uranium, gross alpha particle activity,
13127 beta particle and photon radioactivity. The design shall consider the system size and use
13128 limitations for specific technologies listed in 40 CFR 141.66.

13129 D. Alternative technologies may be employed when approved by the commissioner.

13130 E. When treatment technique requirements have been established in lieu instead of PMCLs
13131 or Action Levels, the design shall employ processes specified by these requirements.

13132 F. POU devices shall not be used to achieve compliance with the treatment technique for
13133 microbial contaminants. POE or POU devices may be considered for short-term interim use,
13134 when approved as a condition of a variance or exemption issued by the commissioner.

13135 G. For softening, TDS removal, organics removal, and other treatment purposes, the use of
13136 RO and NF shall be in accordance with ANSI/AWWA Standard B114-16, or as allowed by the
13137 commissioner on a case-by-case basis.

13138 _____

13139 12VAC5-590-690. Capacity of waterworks. (Repealed.)

13140 The design capacity of the waterworks shall exceed the maximum daily water demand of the
13141 system. Waterworks shall normally be designed on the following basis of water consumption. If
13142 deviations are made, they shall be based on sound engineering knowledge substantiated in the
13143 designer's report and approved by the division.

13144 A. Daily water consumption rates (annual daily water demand):

| | |
|---|-------------|
| Dwellings, per person | 100 gpd |
| High schools with showers, per person | 16 gpd |
| Elementary schools without showers, per person | 10 gpd |
| Boarding schools, per person | 75 gpd |
| Motels at 65 gallons per person, minimum per room | 130 gpd |
| Trailer courts at three persons per trailer, per trailer | 300 gpd |
| Restaurants, per seat | 50 gpd |
| Interstate or through highway restaurants, per seat | 180 gpd |
| Interstate rest areas, per person | 5 gpd |
| Service stations, per vehicle served | 10 gpd |
| Factories, per person, per eight-hour shift | 15-35 gpd |
| Shopping centers, per 1,000 sq.ft. of ultimate floor space | 200-300 gpd |
| Hospitals, per bed | 300 gpd |
| Nursing homes, per bed | 200 gpd |
| Home for the aged, per bed | 100 gpd |
| Doctor's office in medical center | 500 gpd |
| Laundromats, 9 to 12# machines, per machine | 500 gpd |
| Community colleges per student and faculty member | 15 gpd |
| Swimming pools, per swimmer | 10 gpd |
| Theaters, drive-in type, per car | 5 gpd |
| Theaters, auditorium type, per seat | 5 gpd |
| Picnic areas, per person | 5 gpd |
| Camps, resort, day and night with limited plumbing, per camp site | 50 gpd |
| Picnic areas, per person | 5 gpd |
| Luxury Camps with flush toilets, per camp site | 100 gpd |

13145 ~~B. Minimum acceptable effective finished water storage for human consumption shall not be~~
13146 ~~less than 200 gallons per equivalent residential connection at minimum pressure.~~

13147 ~~C. All waterworks shall provide at least a minimum working (under flow) pressure of 20 psi at~~
13148 ~~the service connection based on the greater of maximum hour or maximum day plus applicable~~
13149 ~~fire flows. Applicable fire flows shall be selected by coordination between the water supply owner,~~
13150 ~~design consultant, local officials and local fire marshal. When the number of residential units is~~
13151 ~~less than 1,000, the formula $Q=11.4N^{0.544}$, is acceptable for estimating maximum hour domestic~~
13152 ~~demand flow, where Q=total gallons per minute and N=total number of residential units. The~~
13153 ~~division can require a higher design pressure if indicated by site conditions.~~

13154 ~~D. A waterworks utilizing wells as the sole source of supply shall provide source capacity of a~~
13155 ~~minimum of 0.5 gallons per minute per equivalent residential connection.~~

13156 ~~E. Waterworks serving 50 or more residential connections with wells as the source of supply~~
13157 ~~shall provide at least two water sources that do not hydraulically interfere with another source of~~
13158 ~~public water supply. Consideration shall be given to requiring each source to be of a minimum~~
13159 ~~yield so its reliability is realistic. The secondary well should be rated at 20% of the waterworks~~
13160 ~~capacity as a minimum.~~

13161 ~~F. Waterworks serving less than 50 residential connections with wells as the source of supply~~
13162 ~~shall provide or have access to an auxiliary pump stored or stocked locally or they shall provide~~
13163 ~~48 hours of total effective storage volume based on water usage.~~

13164 **12VAC5-590-700. Metering total water production.**

13165 ~~A. Waterworks providing chlorination only shall meter the water prior to treatment. The design~~
13166 ~~of all community and nontransient noncommunity waterworks that shall provide treatment or~~
13167 ~~produce greater than 300,000 gallons per month shall provide metering of total water production.~~
13168 ~~If the waterworks treatment process or processes result in a waste flow, the design shall provide~~

13169 ~~metering of total source water withdrawn and finished water produced. The design of all transient~~
13170 ~~noncommunity waterworks that produce greater than 300,000 gallons per month shall provide~~
13171 ~~metering of total water production.~~

13172 B. ~~Waterworks providing iron or manganese removal, or both, shall meter the water prior to~~
13173 ~~treatment. The design of all NTNCs that provide treatment or have a design capacity of greater~~
13174 ~~than 300,000 gallons per month shall provide Metering metering of total water production. at~~
13175 ~~waterworks that do not meet the conditions found in subsection A of this section is encouraged.~~

13176 C. ~~Waterworks providing softening by ion exchange, shall meter all water treated and total~~
13177 ~~water delivered to the distribution system. D. Waterworks providing turbidity removal or softening~~
13178 ~~by precipitation, or both, shall meter the water prior to and subsequent to treatment. The design~~
13179 ~~of all TNCs that provide treatment or have a design capacity of greater than 300,000 gallons per~~
13180 ~~month shall provide metering of total water production.~~

13181 D. ~~If the waterworks treatment process or processes result in a waste flow, including filter~~
13182 ~~backwash, ion exchange regenerate, or residual solids, then the design shall provide metering of~~
13183 ~~total source water withdrawn and finished water produced.~~

13184 E. ~~All waterworks shall provide metering of total water production. Metering of total water~~
13185 ~~production at waterworks that do not meet the conditions found in subsections A through D of this~~
13186 ~~section should be provided is encouraged.~~

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13189 **12VAC5-590-710. Site layout. (Repealed.)**

13190 A. ~~Functional aspects of site layout shall be considered.~~

13191 B. ~~Site grading shall be provided.~~

13192 C. ~~Adequate site drainage shall be provided.~~

- 13193 ~~D. Walks shall be provided.~~
- 13194 ~~E. Access roads shall be provided.~~
- 13195 ~~F. Driveways shall be provided.~~
- 13196 **12VAC5-590-720. Building layout design and construction.**
- 13197 ~~A. Adequate ventilation shall be provided.~~
- 13198 ~~B. Adequate lighting shall be provided.~~
- 13199 ~~C. Adequate heating shall be provided.~~
- 13200 ~~D. Adequate drainage shall be provided.~~
- 13201 ~~E. Adequate dehumidification equipment shall be provided.~~
- 13202 ~~F. Accessibility of equipment for operation, servicing, and removal shall be provided.~~
- 13203 ~~G. Flexibility of operation shall be provided.~~
- 13204 ~~H. Safety precautions shall be considered. Reference the applicable health and safety~~
- 13205 ~~standards of the Virginia Department of Labor and Industry for the appropriate requirements.~~
- 13206 ~~I. Convenience of operation shall be considered.~~
- 13207 ~~J. Separate rooms for chemical storage and feed equipment to reduce dust problems shall be~~
- 13208 ~~considered.~~
- 13209 ~~K. Sanitary facilities shall be provided at all waterworks installations requiring an operator in~~
- 13210 ~~attendance at all times during operation.~~
- 13211 ~~L. A. In accordance with the USBC, Chapter 6 (§ 36.97 et seq.) of Title 36 of the Code of~~
- 13212 ~~Virginia, and the Statewide Fire Prevention Code (§ 27.94 et seq.) of Title 27 of the Code of~~
- 13213 ~~Virginia, all waterworks building design and construction shall include necessary features that will~~
- 13214 ~~assure a functional and safe environment, including but not limited to: adequate ventilation,~~

13215 lighting, heating, drainage, dehumidification, and accessibility to equipment for operation and
13216 maintenance.

13217 B. Consistent with subdivision A of this section, the waterworks building design and layout
13218 shall incorporate safety provisions to protect waterworks operators and other personnel, in
13219 accordance with Article 1 (§ 40.1-22) of Chapter 3 of Title 40.1 of the Code of Virginia. These
13220 provisions must comply with federal occupational safety and health standards and regulations
13221 promulgated under Title 29, Section 651 et seq. of the U.S. Code, and shall include: separation
13222 of incompatible chemicals, confined space entry, handrails and guards, ladders, lighting, warning
13223 signs, smoke detectors, chlorine leak detectors, protective equipment, safety showers, eye
13224 washes, and fire extinguishers.

13225 C. Positive identification of the contents of a piping system shall be by lettered legend giving
13226 the name of the contents. Arrows ~~should~~ shall be used to indicate the direction of flow. Legends
13227 shall be applied close to valves, adjacent to changes in direction and branches, where pipes pass
13228 through walls and floors, and at frequent intervals on straight pipe runs. The lettering shall be of
13229 such color, size, and location so as to be clearly visible and readable.

13230 ~~M. No conduit or basin containing filtered water shall have a common division wall with another~~
13231 ~~conduit or basin~~ D. Common division walls between basins or conduits containing nonpotable
13232 water and potable water are prohibited. Vertical double division walls, where separated sufficiently
13233 to permit ready access for inspection, are permissible where the division walls are monolithic in
13234 construction and are properly keyed into their footings or are cast monolithically with their footings.

13235 E. Shop space and storage requirements shall be provided.

13236 F. Wherever pipes pass through walls of concrete structures, extra wall castings to facilitate
13237 expansion and future uses shall be provided.

13238 **12VAC5-590-725. Automated monitoring and control systems.**

13239 The design of computers, including Supervisory Control and Data Acquisition (SCADA)
13240 systems, if used to monitor and control water treatment and distribution system facilities, shall
13241 meet the following general requirements:

13242 1. Data security.

13243 a. Automated systems used to display and record data or control functions that are
13244 connected to the internet shall be secure.

13245 b. Backup power supply shall be provided to allow orderly shutdown of the computer
13246 system and prevent corruption of data. The protection shall also power associated
13247 communications equipment.

13248 c. Adequate hardware shall be in place to allow a high degree of SCADA and computer
13249 system reliability and data security.

13250 d. Adequate hardware and associated facilities shall be provided for data archiving.

13251 2. Equipment protection. SCADA and computer systems shall have adequate protection
13252 from voltage surges and spikes on the power supply, external data links, and
13253 environmental conditions.

13254 3. Data displaying and recording.

13255 a. SCADA and computer systems used to meet the continuous recording requirements
13256 of this chapter shall record an observation on a minimum frequency of once per 15
13257 minutes, unless a greater recording frequency is required.

13258 b. SCADA and computer systems used to meet the indicating and recording
13259 requirements of this chapter shall provide displays that show a minimum 24-hour trend

13260 of results for each parameter. The display panel or panels shall be located in an area
13261 where it can be routinely viewed by the waterworks operators.

13262 c. SCADA and computer systems used to meet the indicating and recording
13263 requirements of this chapter shall monitor the values and provide alerts for the operator
13264 by visual display and audible alarms. Alarm conditions shall be recorded into an alarm
13265 log.

13266 4. Waterworks pumps, chemical feeders, and other essential electrical equipment
13267 controlled through a SCADA or an automated control system shall have the capability for
13268 independent manual operation. Where a high degree of reliability is required, a backup
13269 control system shall be provided.

13270 **12VAC5-590-730. ~~Standby power capability~~ Alternate power sources.**

13271 ~~Standby power capability may be required by the division so that water may be treated or~~
13272 ~~pumped, or both, to the distribution system in order to maintain a minimum level of service during~~
13273 ~~an emergency.~~

13274 A. An emergency management plan for extended power outages shall be developed for each
13275 community waterworks as specified in 12VAC5-590-505.

13276 B. Alternative power sources at all waterworks shall be considered in the design, in order to
13277 maintain a minimum level of service during an electrical power outage.

13278 **12VAC5-590-740. ~~Maintenance and servicing of equipment.~~ (Repealed.)**

13279 ~~Adequate facilities must be provided for the maintenance and servicing of automatic~~
13280 ~~equipment.~~

13281 ~~12VAC5-590-750. Shop space and storage. (Repealed.)~~

13282 Adequate facilities should be included for shop space and storage consistent with the
13283 designed facilities.

13284 ~~12VAC5-590-760. Laboratory facilities.~~

13285 Laboratory equipment and facilities shall be compatible with the raw water source, intended
13286 design of the water treatment plant, and the complexity of the water treatment involved.

13287 A. Testing equipment provided shall be adequate for the purpose intended and recognized
13288 procedures must be utilized. The design of laboratory facilities shall be compatible with the
13289 equipment provided, the water supply, and the design and complexity of the water treatment.

13290 B. ~~Sufficient~~ The design of community waterworks and NTNCs shall provide for adequate floor
13291 and bench space, adequate ventilation, adequate light, storage room, laboratory sink, and
13292 auxiliary facilities shall be provided. Office space is not included in the following specified
13293 laboratory sizes: adequate separation of incompatible activities, adequate environmental controls,
13294 and auxiliary facilities sufficient to carry out reliable testing.

13295 1. ~~Waterworks providing iron or manganese removal, or softening by ion exchange should~~
13296 ~~provide a laboratory with a minimum of 64 square feet of floor area and 20 square feet of~~
13297 ~~bench area.~~

13298 2. ~~Waterworks providing turbidity removal or softening by precipitation, or both, should~~
13299 ~~provide a laboratory with a minimum of 200 square feet of floor area and 65 square feet~~
13300 ~~of bench area.~~

13301 3. ~~Waterworks providing turbidity removal or softening by precipitation, or both, and in-~~
13302 ~~plant bacteriological analysis should provide a laboratory with a minimum of 300 square~~
13303 ~~feet of floor area and 100 square feet of bench area.~~

13304 C. ~~When a bacteriological laboratory is required a separate room of adequate space shall be~~
13305 ~~provided.~~ Certified analytical laboratory facilities analyzing drinking water shall comply with
13306 1VAC30-41.

13307 **12VAC5-590-770. Sample taps Sampling and monitoring equipment.**

13308 A. Sample taps shall be provided so that water samples can be obtained from each water
13309 source water and each entry point to the distribution system. At waterworks providing treatment,
13310 sample taps shall be provided ~~from each unit operation of treatment, with the taps being located~~
13311 ~~at the master control sink in the laboratory. Taps shall be consistent with sampling needs and~~
13312 ~~shall not be of the petcock type~~ at the entrance and exit of each unit treatment process and at the
13313 entry point to the distribution system.

13314 1. For surface water treatment plants, a master control sink shall monitor source water,
13315 chemically treated water, settled water, combined filter water, and at the entry point to the
13316 distribution system.

13317 2. All sample taps shall discharge in the downward direction and be provided with a
13318 suitable air gap to prevent cross-connection.

13319 B. Continuous monitoring instrumentation shall have electronic sensors that continuously read
13320 the parameter and shall display results in real time. Continuous recording equipment shall be
13321 provided with the monitoring instrument to store in memory or print one data point at least every
13322 15 minutes. Each result shall be a single result at that time: if signal averaging is applied, the
13323 averaging period shall not exceed 30 seconds. The recording equipment shall be capable of
13324 producing a paper copy (or equivalent electronic file) showing daily trends, including maximum,
13325 minimum, and average values.

13326 **12VAC5-590-780. ~~Wall castings. (Repealed.)~~**

13327 ~~Consideration shall be given to providing extra wall castings built into the structure to facilitate~~
13328 ~~expansion and future uses wherever pipes pass through walls of concrete structures.~~

13329 **12VAC5-590-790. ~~Water supply service~~ Process water.**

13330 ~~The water supply service for treatment facilities shall be taken from a point after there has~~
13331 ~~been thorough mixing of all chemicals added to the water. Process water shall be taken from the~~
13332 ~~finished water. An approved backflow prevention assembly or device shall be installed on the~~
13333 ~~process water supply pipe before connection to the treatment process or equipment.~~

13334 **12VAC5-590-800. ~~Disinfection. (Repealed.)~~**

13335 ~~All pipes, tanks, and equipment which can convey or store potable water shall be disinfected~~
13336 ~~prior to being placed in service. Plans and specifications shall outline the procedures and include~~
13337 ~~the disinfectant dosage, contact time, and method of testing the results of the procedure.~~

13338 ~~1. Forms of chlorine for disinfection.~~

13339 ~~a. Liquid chlorine. The use of liquid chlorine shall be acceptable only when suitable~~
13340 ~~equipment is available and only under the direction of a person trained to handle liquid~~
13341 ~~chlorine. Emergency handling equipment shall be provided.~~

13342 ~~It will normally require 4.2 lbs. of liquid chlorine (supplied under pressure in steel~~
13343 ~~containers) to produce a concentration of 50 mg/L of available chlorine in 10,000~~
13344 ~~gallons of water.~~

13345 ~~b. Calcium hypochlorite. Granular and tablet forms are available (both with 65%~~
13346 ~~available chlorine). It will normally require 6.5 lbs. of calcium hypochlorite to produce~~
13347 ~~a concentration of 50 mg/L of available chlorine in 10,000 gallons of water.~~

13348 c. ~~Sodium hypochlorite. This is supplied in strengths of 5.25% to 16% available~~
13349 ~~chlorine. The required amount of sodium hypochlorite to produce a 50 mg/L~~
13350 ~~concentration of available chlorine in 10,000 gallons of water can be calculated from~~
13351 ~~the following formula:~~

$$\frac{50}{\% \text{ available chlorine}}$$

13352 2. ~~Methods of disinfection other than chlorination may be considered by the division on a~~
13353 ~~case-by-case basis.~~

13354 3. ~~Testing of water following disinfection:~~

13355 a. ~~All chlorine residual determinations shall be made using only those methods~~
13356 ~~approved by the division; and~~

13357 b. ~~Two water samples for bacteriological analysis must be collected at least 24 hours~~
13358 ~~apart and analyzed by a certified laboratory. The results of these samples must~~
13359 ~~indicate no coliform contamination before the pipe, tanks, or equipment can be utilized~~
13360 ~~as part of the waterworks. If contamination is indicated, then the disinfection procedure~~
13361 ~~must be repeated.~~

13362 **12VAC5-590-810. ~~Paints, coatings, sealers, or liners~~ Components, materials, and products.**

13363 ~~Paints, coatings, sealers or liners which contact raw, partially treated, or potable water and~~
13364 ~~are used in pipes, tanks, or equipment which can convey or store these waters shall be approved~~
13365 ~~by the division before application. All components, materials, and products that will be in contact~~
13366 ~~with source water, partially treated water, finished water, or water treatment chemicals shall~~
13367 ~~comply with NSF/ANSI Standard 61-2017.~~

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Article 2

Source Development

12VAC5-590-820. General New source water selection and sampling.

A. Preference shall be given to the best available sources of supply ~~which~~ that present minimal risks of contamination from ~~wastewater~~ point and nonpoint pollution sources ~~which~~ that contain a minimum of impurities that may be hazardous to health, and that give the greatest potential of ensuring a sufficient quantity of potable water.

B. In all cases, sources shall be selected and maintained on a basis ~~which~~ that will assure that the water is continuously amenable to available treatment processes. In selecting the source of water to be developed, the ~~designing engineer must~~ owner shall prove to the satisfaction of the commissioner that the water ~~which is to be delivered to the consumers shall comply with all applicable PMCLs of the board with respect to bacteriological, physical, chemical and radiological qualities~~ to be delivered to the consumers will comply with 12VAC5-590-340.

C. All water samples for bacteriological, chemical, physical, and radiological analyses ~~must~~ shall be submitted to the Commonwealth of Virginia, Department of General Services, Division of Consolidated Laboratory Services DCLS or to a testing laboratory certified by the Division of Consolidated Laboratory Services DCLS. All bacteriological analyses ~~must be performed at laboratories in accordance with analysis~~ 12VAC5-590-370 A and 12VAC5-590-480 B-2 Analytical methods shall be in accordance with 12VAC5-590-440.

12VAC5-590-830. Surface water sources; quantity; quality; development structures.

A. A surface water source includes all tributary streams and drainage basins, natural lakes, and artificial reservoirs or impoundments above the point of water supply intake.

1. The quantity of water at the source shall:
 - a. Be adequate to supply the water demand of the service area;

13392 b. Provide a reasonable surplus for anticipated growth; and
13393 c. Be adequate to compensate for all losses, including evaporation, seepage, flow-by
13394 requirements, etc.

13395 2. The safe yield of the source shall be determined as follows:

13396 a. Simple intake (free-flowing stream). The safe yield is defined as the minimum
13397 withdrawal rate available during a day and recurring every 30 years (30 year - one day
13398 low flow). To generate the report for this, data is to be used to illustrate the worst
13399 drought of record in Virginia since 1930. If actual gauge records are not available for
13400 this, gauges are to be correlated from similar watersheds and numbers are to be
13401 synthesized; and

13402 b. Complex intake (impoundments in conjunction with streams). The safe yield is
13403 defined as the minimum withdrawal rate available to withstand the worst drought of
13404 record in Virginia since 1930. If actual gauge records are not available, correlation is
13405 to be made with a similar watershed and numbers synthesized in-order to develop the
13406 report.

13407 Note: Local governments may request this aid from the State Water Control Board
13408 (SWCB) by contacting either the Health Department's Office of Water Programs or the
13409 SWCB's headquarters office in Richmond.

13410 B. The owner shall conduct, or have conducted, a sanitary survey and a study of the factors,
13411 both natural and man-made, which will affect the quality of the water at the source. The results of
13412 the sanitary survey shall be submitted to the division. Such survey and study shall include, but
13413 shall not be limited to:

13414 1. Obtaining samples over a sufficient period of time to assess the bacteriological,
13415 physical, chemical, and radiological characteristics of the water;

- 13416 2. Determining future uses and effects of impoundments or reservoirs;
- 13417 3. Determining the degree of control over the watershed that may be exercised by the
- 13418 owner; and
- 13419 4. Assessing degree of hazard to the source by possible spillage of materials that may be
- 13420 toxic, harmful, or detrimental to treatment processes.

13421 C. Intake structures shall provide for:

- 13422 1. Withdrawal of water from at least three levels in impoundments or reservoirs.
- 13423 Withdrawal of water from more than one level may be required in run-of-the-stream intakes
- 13424 if the quality varies with depth;
- 13425 2. Separate facilities for release of less desirable water held in storage;
- 13426 3. Screens on intake ports with provisions for adequate cleaning;
- 13427 4. Prevention of flooding of access walkways and control valves of intakes on multiple
- 13428 purpose reservoirs; and
- 13429 5. Velocity of flow through inlet structure such that frazil ice will be held to a minimum.

13430 D. A detention reservoir is a structure into which water is stored for pretreatment to improve

13431 water quality prior to other treatment. Where a detention reservoir is required, the development

13432 shall assure that:

- 13433 1. Water quality is protected by controlling runoff into reservoir;
- 13434 2. Dikes are structurally sound and protected against wind action and erosion;
- 13435 3. Point of influent flow is separated from the point of withdrawal; and
- 13436 4. Sufficient detention time is provided in the reservoir as recommended by the designer
- 13437 and approved by the division.

13438 E. In order to protect the public health and guarantee a supply of pure water, terminal
13439 reservoirs shall not be utilized for body contact recreation and boats powered by gasoline engines.
13440 Large terminal reservoirs may be used for body contact recreation and boats powered by gasoline
13441 engines provided a buffer zone acceptable to the division and water purveyor is furnished. Site
13442 preparation shall include but not be limited to the removal of brush and trees to the high water
13443 elevation, and protection from floods during construction.

13444 **12VAC5-590-840. Groundwater sources.**

13445 A. A groundwater source includes all water obtained from drilled wells and springs. Wells and
13446 springs ~~should~~ shall be protected from contamination during construction. All ~~public water supply~~
13447 wells intended to serve a waterworks shall be constructed by ~~registered Virginia contractors a~~
13448 certified water well system provider. All wells shall be constructed in a manner to protect
13449 groundwater resources by preventing contaminated water or water having undesirable physical,
13450 chemical, or radiological characteristics from entering ~~potable water~~ aquifers.

13451 B. All wells located within the Eastern Virginia or the Eastern Shore Groundwater
13452 Management Areas (GWMA) shall be constructed in a manner to protect groundwater resources
13453 by preventing blending or cross contamination of the aquifers.

13454 1. Wells shall not be constructed with screens in multiple aquifers.

13455 2. Geophysical logging and formation sampling shall be required for all wells during
13456 construction, in addition to submitting a Uniform Water Well Completion Report, Form GW-

13457 2.

13458 3. Observation and production wells shall be constructed with gravel packs and grout in a
13459 manner that prevents movement between aquifers. Gravel pack shall be terminated close
13460 to the top of the well screens and shall not extend above the top of the screened aquifer.

13461 The remainder of the annular space shall be filled with grout material.

13462 4. Pump intake setting shall be documented and the pump intake shall not be set below
13463 the top of a confined aquifer or the bottom of an unconfined aquifer that supplies water to
13464 the well.

13465 C. All groundwater sources must be analyzed for chemical, physical, radiological, and
13466 bacteriological quality in order to determine treatment requirements as described in 12VAC5-590-
13467 840 K. Groundwater containing total coliform concentrations of less than 100 and more than three
13468 organisms per 100 milliliters based on the geometric mean of 20 or more samples shall be
13469 disinfected. Groundwater containing total coliform concentrations of 100 or more organisms per
13470 100 milliliters based on the geometric mean of 20 or more samples constitutes unacceptable
13471 contamination for disinfection only. Groundwater with widely fluctuating or increasing
13472 bacteriological results may be determined by the division to be unsuitable for disinfection
13473 treatment alone.

13474 The class of well to be constructed shall be determined by the division. All well lot, well
13475 location, and well construction requirements contained in this section may be varied by the
13476 division as specific geologic and site conditions dictate.

13477 1. Minimum well lot D. Wells intended for use as a community waterworks shall be located
13478 on a well lot meeting the following minimum requirements:

13479 a. 1. The well lot shall provide a distance of at least 50 feet from the well to all property
13480 lines of the well lot. Larger well lots may be required under certain conditions. Fencing of
13481 the well lot may be required under certain conditions;

13482 2. The owner shall consider the need for a larger well lot for future expansion, the need to
13483 provide security measures such as lot fencing, and the need to establish additional well
13484 lots for future use;

13485 b. ~~3.~~ If the well lot does not adjoin a public road, ~~then~~ an ~~all-weather~~ access road shall be
13486 provided and an access easement recorded as part of the well lot;

13487 c. ~~4.~~ The well lot shall be graded to divert surface runoff away from the well and to prevent
13488 ponding on the well lot; and

13489 d. ~~5.~~ The well lot or lots ~~must~~ and access to the lot or lots shall be located by a survey,
13490 and a final plat plan and dedication document prepared and recorded as described in
13491 12VAC5-590-200. ~~The final plat plan must agree with the preliminary plat plan with respect~~
13492 ~~to size and boundaries of the lot or lots selected for well or wells. One of the following~~
13493 ~~must be submitted:~~

13494 ~~(1) A copy of the plat plan showing that it has been duly recorded and signed by the~~
13495 ~~clerk of the circuit court for the jurisdiction where the well is located and giving the~~
13496 ~~deed book and page number and date of recording will be required before a~~
13497 ~~construction permit can be issued or~~

13498 ~~(2) If the well lot is identified on a recorded plan of the subdivision as a well lot, then~~
13499 ~~this is acceptable, if recorded as indicated in subdivision A 1 d (1) above; and~~

13500 e. ~~In addition, a dedication document duly recorded with the clerk of the circuit court~~
13501 ~~must be furnished stating that the well lot shall be used only for waterworks~~
13502 ~~appurtenances as long as this lot is utilized as part of a waterworks.~~

13503 2. E. Minimum well location requirements:

13504 a. 1. The horizontal distance from the well to any septic tank, ~~purification field~~ sanitary
13505 drainfield, pit privy, cesspool, barnyard, ~~hog~~ animal feed lot, cemetery, geothermal well or
13506 source of similar contamination, ~~as well as~~ and all surface runoff from ~~such~~ actual or
13507 potential sources of contamination, shall be at least 50 feet; ;

13508 ~~b. 2.~~ The horizontal distances from the well to any pipe carrying sewage or pipe in which
13509 sewage can back up shall be at least 50 feet; ~~and,~~

13510 ~~c. The horizontal distance from the well to any petroleum or chemical storage tank or~~
13511 ~~pipe line or similar source of contamination shall be at least 50 feet, except that where~~
13512 ~~plastic type well casing is used, the separation distance shall be at least 100 feet. This~~
13513 ~~100-foot separation may be obtained by an enlarged well lot, easements, deed~~
13514 ~~restrictions, or other equivalent legal means.~~

13515 3. A minimum separation distance of 50 feet shall be maintained between a fuel storage
13516 tank and a well; however, a lesser distance may be allowed if the fuel is propane or natural
13517 gas, or if it is liquid fuel meeting the following requirements:

13518 a. Liquid fuel tanks shall be located above grade.

13519 b. Liquid fuel tanks shall be double-walled with an inner wall leak-detection alarm, or
13520 single-walled with a full-capacity containment system constructed of compatible
13521 material.

13522 c. The liquid fuel line shall be located above grade, or enclosed in a protective casing
13523 if below grade, and the liquid fuel tank shall be provided with a paved and curbed
13524 parking pad at the tank filling location.

13525 4. The commissioner shall require a spill response plan if the fuel is stored within 50 ft of
13526 the well.

13527 F. The class of well to be constructed shall be determined by the commissioner. A Uniform
13528 Water Well Completion Report, Form GW-2, shall be completed and submitted to the department
13529 with the project documents, in accordance with procedures in 12VAC5-590-200.

13530 31. Minimum construction requirements for Class I wells:

13531 a. The well shall be drilled and cased to a depth sufficient to exclude undesirable
13532 groundwater, but in no case shall ~~the casing~~ this depth be less than 100 feet in depth;
13533 below finished grade.

13534 b. The diameter of the drill hole ~~to the depth required above~~ shall be at least three
13535 inches greater than the outside diameter of the couplings of the casing to be used;
13536 and.

13537 c. For wells constructed in consolidated formations, the lower end of the casing shall
13538 terminate in solid rock or other impervious formation when practical to do so.

13539 ~~e. d.~~ The annular space around the casing shall be grouted to a depth of at least 100
13540 feet in a manner satisfactory to the ~~division~~ commissioner. When the outer casing
13541 cannot be removed, the annular spacing between the drill hole and the outer casing
13542 shall also be sealed in a manner approved by the ~~division~~ commissioner.

13543 42. Minimum construction requirements for Class II wells. This classification includes two
13544 types of construction, either of which is acceptable:

13545 a. ~~Type A wells in which the annular space around the casing is grouted a minimum~~
13546 ~~of 20 feet from the surface:~~

13547 (1) ~~The well shall be drilled and cased to a depth of at least 100 feet; and~~

13548 (2) ~~The cased drill hole shall pass through at least the first 50 feet of unconsolidated~~
13549 ~~formation such as caving sand, gravel or other material that will collapse against the~~
13550 ~~casing;~~

13551 b. ~~Type B wells in which the annular space around the casing is grouted:~~

13552 (4) a. The well shall be drilled and cased to a depth sufficient to exclude undesirable
13553 groundwater, but in no case shall ~~the casing be less than 50 feet in length;~~ this depth
13554 be less than 50 feet below finished grade.

13555 (2) b. The diameter of the drill hole ~~to the depth required above~~ shall be at least three
13556 inches greater than the outside diameter of the couplings of the casing to be used;_

13557 (3) ~~The~~ c. For wells constructed in consolidated formations, the lower end of the
13558 enlarged portion of the drill hole should terminate in solid rock or other impervious
13559 formation when practical to do so; ~~and.~~

13560 (4) d. The annular space around the casing shall be grouted to a depth of at least 50
13561 feet in a manner satisfactory to the ~~division~~ commissioner. When the outer casing
13562 cannot be removed, the annular spacing between the drill hole and the outer casing
13563 shall be sealed in a manner approved by the ~~division~~ commissioner.

13564 ~~B. General well development requirements~~ G. Well construction materials and development:

13565 1. Water used in well construction shall be from a ~~satisfactory~~ potable water source or
13566 from the well under construction.

13567 2. Casing and liner pipe;_

13568 ~~a. Shall be metallic pipe meeting ASTM, ANSI, AWWA or API~~ Steel casing and liner
13569 pipe shall meet ASTM, NSF/ANSI, or AWWA specifications and standards applicable
13570 to wells. Dimensions shall conform to the following table: Steel pipe dimensions shall
13571 conform to Table 840.1.

13572 TABLE 840.1.

13573 Steel Well Casing Pipe

| |
|-------------|
| STEEL PIPES |
|-------------|

| SIZE (inches) | DIAMETER (inches) | | THICKNESS (inches) | WEIGHT PER FOOT (pounds) | |
|------------------|-------------------|----------|-----------------------|-----------------------------|-------------------------------------|
| | External | Internal | | Plain Ends | With Threads and Couplings |
| 4 id | 4.5 | 4.026 | 0.237 | 10.79 | 11.0 : |
| 6 id | 6.625 | 6.065 | 0.280 | 18.97 | 19.18 : |
| 8 | 8.625 | 7.981 | 0.322 | 28.55 | 29.35 : |
| 10 | 10.750 | 10.020 | 0.365 | 40.48 | 41.85 |
| 12 | 12.750 | 12.000 | 0.375 | 49.56 | 51.15 |
| 14 od | 14.000 | 13.250 | 0.375 | 54.57 | 57.00 |
| 16 | 16.000 | 15.250 | 0.375 | 62.58 | 65.30 |
| 18 | 18.000 | 17.250 | 0.375 | 70.59 | 73.00 |
| 20 | 20.000 | 19.250 | 0.375 | 78.60 | 81.00 : |
| 22 | 22.000 | 21.000 | 0.500 | 114.81 | |
| 24 | 24.000 | 23.000 | 0.500 | 125.49 | |
| 26 | 26.000 | 25.000 | 0.500 | 136.17 | |
| 28 | 28.000 | 27.000 | 0.500 | 146.85 | |
| 30 | 30.000 | 29.000 | 0.500 | 157.53 | |
| 32 | 32.000 | 31.000 | 0.500 | 168.21 | |
| 34 | 34.000 | 33.000 | 0.500 | 178.89 | |
| 36 | 36.000 | 35.000 | 0.500 | 189.57 | |

13574 b. Plastic pipes may be approved following investigation by the division. The casing
13575 shall be PVC type 1120 (cell identification 12454), NSF approved for well casings
13576 meeting appropriate ASTM, ANSI, AWWA or API specifications and used to depths in
13577 conformance with the information contained in the following tables: Plastic well casing
13578 shall be PVC meeting ASTM F480-14, NSF/ANSI Standard 61-2017, or AWWA
13579 Standard A100-15. Depths shall not exceed the published resistance to hydraulic
13580 collapse pressure of the PVC casing, taking into account the installation techniques
13581 and grouting methods. Well casing wall thickness shall be sufficient to withstand
13582 anticipated formation and hydrostatic pressures and mechanical forces imposed

13583 during installation, well development, and use. PVC well casing shall meet the
 13584 requirements of ASTM, NSF/ANSI, and AWWA, as applicable.

| Maximum Allowable Depths of Installation of Polyvinyl Chloride (PVC) Thermoplastic Water Well Casing | | | | | | | | | |
|---|------------------------------|-------|-------|-------|------|-----|------|------|------|
| Type 1120 (12454) | | | | | | | | | |
| Schedule Number | Nominal Diameter of PVC 1120 | | | | | | | | |
| | 2 | 2.5 | 3 | 3.5 | 4 | 5 | 6 | 8 | 10 |
| 40- | 560' | 740' | 485' | 265' | 291' | 19- | 143' | 99' | 74' |
| 80- | 1750' | 2040' | 1380' | 1085' | 912' | 64- | 395' | 400' | 340' |

13585 -

| | |
|----------|---------------------------|
| SDR No. | All Diameters of PVC 1120 |
| SDR 41 | 25 |
| SDR 32.5 | 50' |
| SDR 26 | 108' |
| SDR 21 | 212' |
| SDR 17 | 413 |
| SDR 13.5 | 868' |

13586 c. ~~Heavy weight~~ Heavyweight casing pipe may be required under certain geologic and
 13587 hydrostatic conditions: ~~and~~.

13588 d. Where corrosive conditions exist, materials such as coated casings, stainless steel,
 13589 bronze, or plastic may be used as casings or linings subject to approval by the ~~division~~
 13590 commissioner, and meeting the requirements of NSF/ANSI Standard 61-2017.

13591 3. Packers or other well construction materials shall be of a material that will not impart
 13592 taste, odors, toxic substances, or bacterial contamination to the water in the well. No lead
 13593 is to be used in packers, flux, piping, etc.

13594 4. Screens, where required, shall:

- 13595 a. Be constructed of material ~~which~~ that will not be damaged by chemical action of
13596 groundwater or future cleaning operations;
- 13597 b. Have size of openings to be based on sieve analysis of the formation to be screened,
13598 and ~~should~~ shall be adequate to pass flows at a velocity of 0.1 ~~feet per second~~ ft/sec
13599 or less; and
- 13600 c. Be installed so that exposure above the pumping level will not occur.
- 13601 ~~5. A water well completion report shall:~~
- 13602 a. ~~Be submitted to the division, the State Water Control Board and the owner; and~~
- 13603 b. ~~Provide all data requested on the most recent well completion form.~~
- 13604 ~~6. The yield and drawdown test data over a 48-hour minimum period shall be provided;~~
13605 ~~however, in those areas where geologic conditions warrant, the required test period may~~
13606 ~~be varied by the division.~~
- 13607 ~~7. Chemical conditioning shall be included in specifications as to method, equipment,~~
13608 ~~chemicals, testing for residual chemicals, disposal of waste, and inhibitors used.~~
- 13609 ~~8.~~ 5. Grouting requirements.
- 13610 a. Neat cement grout ~~is normally required and shall consist of cement (API Spec. 10,~~
13611 ~~Class G cement or Class B similar to ASTM C150 TYPE II)~~ shall consist of Portland
13612 cement and water with not more than six gallons of water per 94-pound sack of
13613 cement, and shall be in place within 48 hours of well construction. A maximum of 6.0%,
13614 by weight, bentonite and 2.0%, by weight, calcium chloride, may be added. NOTE:
13615 ~~When exceptional conditions require the use of a less fluid grout to bridge voids, a~~
13616 ~~mixture of cement (ASTM C150 TYPE II), sand and water in the proportion of not more~~
13617 ~~than two parts by weight of sand to one part of cement with not more than six gallons~~

13618 ~~of clean water per 94 pound sack of cement may be used if approved by the division;~~
13619 Other grout mixes may be approved by the commissioner where special conditions
13620 warrant.

13621 b. Application.

13622 (1) Grout shall be installed by means of continuous pressure grouting from the bottom
13623 of the annular opening upward in one continuous operation until the annular opening
13624 is filled.

13625 (2) Sufficient annular opening shall be provided to permit a minimum of ~~4-1/2~~ 1-1/2
13626 inches of grout around the protective casing, including couplings, if used.

13627 (3) ~~Prior to Before grouting, bentonite, Aquagel, or similar approved materials may be~~
13628 ~~added to the annular opening, in the manner indicated for grouting; and wells, suitable~~
13629 ~~fill material such as bentonite, low-strength cement/sand mix, or similar materials that~~
13630 ~~have been approved by the commissioner shall be added to the annular opening below~~
13631 ~~the grout zone to seal and stabilize these areas. Instead of this requirement, the casing~~
13632 ~~may be grouted for its entire depth.~~

13633 c. ~~Protective casing~~ Casing shall be provided with sufficient centralizers attached to
13634 the casing to ~~permit~~ allow unobstructed flow and uniform thickness of the grout.

13635 d. Where plastic well casing is used, the heat of hydration of cement mixtures and the
13636 hydraulic collapse pressure of the casing shall be taken into consideration when
13637 choosing grout composition and placement in accordance with the DEQ guidelines.

13638 ~~9. Plumbness and alignment:~~

13639 ~~a. Every well shall be tested for plumbness and alignment;~~

13640 ~~b. The test method shall be clearly stated in specifications; and~~

13641 ~~c. Excessive kinks and bends shall not be acceptable.~~

13642 ~~40. 6. To prevent tampering and contamination of the source water, unused wells shall be~~
13643 ~~capped and locked. Watertight welded metal plates, set screw caps, or screw-on caps are~~
13644 ~~acceptable for temporarily capping a well until the pumping equipment is installed.~~

13645 H. A well yield and drawdown test shall be performed in accordance with requirements of this
13646 subsection. The commissioner may require additional pumping wells, observation wells, or longer
13647 duration tests where site conditions warrant.

13648 1. The yield and drawdown test duration shall be a minimum of 48 hours. Data to be
13649 collected during the yield and drawdown test shall be recorded on the Well Yield and
13650 Recovery Report form provided by the department. When the source water requirements
13651 for a noncommunity waterworks are determined to be three gpm or less over normal hours
13652 of operation, the 48-hour minimum drawdown test may be reduced to no less than 12
13653 hours. Any reduction shall be approved by the commissioner before conducting the test.

13654 2. Discharge from the pumping well shall be conveyed away from the test site to avoid
13655 recharge.

13656 3. Where multiple wells are intended to be used, the location and geology of each well in
13657 the vicinity shall be evaluated. The commissioner shall require that:

13658 a. The yield and drawdown test be performed simultaneously on the multiple wells, or
13659 b. During the yield and drawdown test of the pumping well, the water levels of the
13660 neighboring wells shall be monitored. If the water level of the neighboring wells
13661 declines in response to the pumping well, then additional evaluation shall be required
13662 by a Professional Engineer or a Professional Geologist with experience in groundwater
13663 source evaluations.

13664 4. The commissioner may consider alternative testing methods and analyses as proposed
13665 by Professional Engineers or Professional Geologists with experience in groundwater
13666 source evaluations. Where geological conditions exist that prohibit an accurate
13667 determination of well yield using methods prescribed in this subsection, additional testing
13668 procedures shall be required on an individual basis and approved by the commissioner.

13669 5. When an aquifer test is required by the DEQ for a well located in a GWMA, the yield
13670 and drawdown test may be incorporated into the aquifer test plan protocol, if approved by
13671 the commissioner before conducting the test.

13672 I. Well appurtenances.

13673 1. A sanitary seal shall be provided on the top of the well casing, or a watertight well cap
13674 shall be provided when a pitless adapter is installed.

13675 2. The well casing shall extend at least 12 inches above the concrete floor or apron.

13676 3. Where aprons are used, they shall be centered on the well and measure at least 6 ft by
13677 6 ft by 6 inches thick.

13678 4. Provisions shall be made for venting the well casing to the atmosphere. Where vertical
13679 turbine pumps are used, vents into the side of the casing may be necessary to provide
13680 adequate venting.

13681 5. Each well casing shall be provided with equipment and appurtenances for measuring
13682 the water level elevation in the well. Corrosion-resistant materials shall be used. Where
13683 necessary, the appurtenances shall be attached firmly to the drop pipe or pump column
13684 and in a manner as to prevent entrance of foreign materials.

13685 6. All pitless well units, adapters, and watertight caps shall be listed by the Water Systems
13686 Council as certified products, or as approved by the commissioner.

13687 J. Every new, modified, or reconditioned groundwater well or spring shall be disinfected after
13688 placement of the final pumping equipment. Wells shall be disinfected in accordance with AWWA
13689 Standard C654-13.

13690 K. Water quality tests.

13691 Water quality sampling and analysis shall be conducted for every new, modified, or
13692 reconditioned well or spring to determine what treatment, if any, is required. All samples
13693 shall be analyzed by DCLS or a testing laboratory certified by DCLS. Water quality
13694 analytical methods shall conform to requirements contained in 12VAC5-590-440.

13695 ~~44-1. Bacteriological quality:~~

13696 ~~a. Every new, modified, or reconditioned groundwater source shall be disinfected after~~
13697 ~~placement of the final pumping equipment; and~~

13698 ~~b. A series of nine consecutive negative samples for bacteriological examination or a~~
13699 ~~series of 20 or more samples for most probable number (MPN) examination is~~
13700 ~~required.~~

13701 a. Bacteriological samples for new or deepened wells shall consist of a series of 20
13702 samples collected at a minimum of 30-minute intervals during the last 10 hours of the
13703 yield and drawdown test. These samples shall be analyzed for both total coliform
13704 density and E. coli density. See 12VAC5-590-380 G for groundwater disinfection
13705 treatment requirements, and 12VAC5-590-430 for surface water influence
13706 determinations.

13707 b. Bacteriological samples for modified or reconditioned wells shall consist of two
13708 samples collected at least 30 minutes apart, at a minimum, while the pump is in
13709 continuous operation. These samples shall be analyzed for both total coliform density

13710 and E. coli density. More samples may be required by the commissioner, depending
13711 on the work performed.

13712 ~~12. Samples for chemical, physical and radiological analyses shall be submitted on every~~
13713 ~~new, modified, or reconditioned well. The sample must be collected near the end of the~~
13714 ~~pumping test and after the well water has cleared.~~

13715 2. Samples for new wells shall be collected for chemical, physical, and radiological
13716 contaminants listed in Tables 340.1 through 340.4. SOC tests may be waived by the
13717 commissioner if supported by the source water assessment of vulnerability to
13718 contamination. Chemical sampling analysis for a TNC may be limited to nitrate and nitrite
13719 only. Samples shall be collected at the end of the yield and drawdown test and after the
13720 well water has shown no further change in the clarity of the water. Chemical, physical, and
13721 radiological constituent testing for modified or reconditioned wells shall be determined on
13722 an individual basis by the commissioner.

13723 ~~13.~~ L. Observation wells:

13724 ~~a. 1. Shall be constructed in accordance with the requirements for permanent wells if they~~
13725 ~~are to remain in service after completion of the groundwater study; and of DEQ if they are~~
13726 ~~constructed in a GWMA. Otherwise, they shall be constructed in accordance with~~
13727 ~~12VAC5-590-630 if they are to remain in service as observation wells after completion of~~
13728 ~~the groundwater study.~~

13729 ~~b. 2. Shall be protected at the upper terminal to preclude the entrance of contamination.~~

13730 ~~14. Well abandonment:~~

13731 ~~a. Observation wells and groundwater sources which are not in use shall be sealed by~~
13732 ~~methods which will restore the controlling geological conditions which existed before~~
13733 ~~they were constructed;~~

13734 b. Temporary abandonment.

13735 ~~(1) Any water well temporarily removed from service, or completed but not put into~~

13736 ~~service, shall be sealed with a watertight cap or well-head seal.~~

13737 ~~(2) Such well shall be so maintained that it will not be a source or channel of~~

13738 ~~contamination during temporary abandonment; and~~

13739 c. Permanent abandonment.

13740 ~~(1) All casing and screen materials may be salvaged.~~

13741 ~~(2) The well shall be checked from land surface to the entire depth of the well before~~

13742 ~~it is plugged to ascertain freedom from obstructions that may interfere with plugging~~

13743 ~~(sealing) operations.~~

13744 ~~(3) The well shall be thoroughly chlorinated prior to plugging (sealing).~~

13745 ~~(4) Bored wells shall be completely filled with cement grout or dry clay compacted in~~

13746 ~~place.~~

13747 ~~(5) Wells constructed in unconsolidated formations shall be completely filled with~~

13748 ~~cement grout or clay slurry by introduction through a pipe initially extending to the~~

13749 ~~bottom of the well. Such pipe shall be raised, but remain submerged in grout, as the~~

13750 ~~well is filled.~~

13751 ~~(6) Wells constructed in consolidated rock formations or which penetrate zones of~~

13752 ~~consolidated rock may be filled with sand or gravel opposite the zones of consolidated~~

13753 ~~rock. The top of the sand or gravel fill shall be at least five feet below the top of the~~

13754 ~~consolidated rock. The remainder of the well shall be filled with sand-cement grout~~

13755 ~~only.~~

13756 15. M. Sealing of select zones. All zones containing water of undesirable quality or zones to
13757 be protected but excluded from final well completion shall be grouted from a point at least five
13758 feet above the zone to a point at least five feet below the zone.

13759 C. ~~Special requirements for various groundwater sources:~~

13760 4. N. Gravel packed wells:

13761 a. 1. The gravel utilized shall be free of foreign material, properly sized, washed, and then
13762 disinfected ~~prior to~~ before or during placement;

13763 b. 2. The gravel refill pipes, when used, shall be incorporated within the pump foundation
13764 or concrete apron and terminated with screwed or welded caps at least 12 inches above
13765 the ~~pumphouse~~ pump house floor or concrete apron;

13766 c. 3. ~~Gravel~~ The gravel refill pipes in the grouted annular opening shall be surrounded by
13767 a minimum of ~~4-1/2~~ 1-1/2 inches of grout;

13768 d. 4. ~~Means~~ A means for the prevention of leakage of grout into the gravel pack of the
13769 screen shall be provided; ~~and~~

13770 e. 5. The minimum protective casing and grouted depth shall be acceptable to the ~~division~~
13771 commissioner.

13772 6. Wells located in a GWMA shall have gravel packing installed in accordance with
13773 12VAC5-590-840 B 3.

13774 2. O. Radial water collectors will collector systems shall be considered on an individual basis
13775 by the ~~division~~ commissioner.

13776 3. ~~Multiple aquifer wells. The annular space between producing aquifers should be grouted~~
13777 ~~to prevent the mixing of waters of different qualities (see subdivision B 15). An approved~~
13778 ~~bentonite material specifically manufactured as a grout may be considered.~~

13779 4. P. Flowing artesian wells located outside a GWMA will be considered on an individual basis
13780 by the division on an individual basis by the commissioner.

13781 1. The well shall be equipped with a pitless adapter specifically designed for pressurized
13782 artesian wells.

13783 2. Special well construction, casing, and sealing may need to be considered for flowing
13784 artesian wells.

13785 Q. Capacity determination of wells used for community waterworks shall meet the daily water
13786 demand.

13787 1. Capacity of wells located in consolidated rock formations shall be determined by the
13788 well sustainable yield and the actual installed (production) well pump capacity, whichever
13789 value is less. The sustainable yield shall be calculated as follows:

13790 (A x 1440 min/day) / 1.8 = gpd well sustainable yield, where A = well yield (gpm)

13791 determined by the yield and drawdown test conducted in accordance with 12VAC5-590-
13792 840 H.

13793 2. Capacity of wells located in unconsolidated formations shall be determined by the well
13794 yield and the actual installed (production) well pump capacity, whichever value is less.

13795 R. Waterworks serving 50 or more residential connections employing only wells providing the
13796 source water shall include at least two wells. If only two wells are provided, then the second well
13797 shall be rated for at least 30% of the waterworks' permit capacity.

13798 S. The owner of a waterworks serving less than 50 residential connections with a single well
13799 providing the source water shall provide or have ready access to a replacement pump and other
13800 components and materials needed for pump replacement. Instead of this requirement, the owner

13801 may provide 48 hours of total finished water storage volume based on the maximum daily water
13802 demand.

13803 ~~5. Springs:~~

13804 ~~a. Springs may be considered only when it is not possible to develop an acceptable~~
13805 ~~well or other source;~~

13806 ~~b. Springs may be approved only after an extensive sanitary survey and~~
13807 ~~bacteriological, turbidity, chemical, and flow data over a time period sufficient to~~
13808 ~~establish year-round quality and quantity. The amount of land required for protection~~
13809 ~~of the spring shall be determined by the division on a case-by-case basis;~~

13810 ~~c. Springs shall be considered as surface water sources if they are influenced by~~
13811 ~~surface conditions. Indicators of such influence include turbidity, bacteriological, and~~
13812 ~~chemical quality that varies with surface conditions;~~

13813 ~~d. Springs shall be protected from entry of surface water;~~

13814 ~~e. Springs shall be housed in a permanent structure; and~~

13815 ~~f. Springs shall be continuously chlorinated.~~

13816 T. Springs.

13817 1. The water quality of spring sources shall be established by obtaining samples over a
13818 period of time, agreeable to the commissioner, to assess the bacteriological, physical,
13819 chemical, and radiological characteristics.

13820 2. Springs shall be housed in a permanent structure and protected from entry of surface
13821 water.

13822 3. The amount of land required for protection of the spring source shall be determined by
13823 the owner and approved by the commissioner.

- 13824 4. The design of spring sources shall provide for continuous disinfection.
- 13825 5. The capacity of spring sources shall be determined using actual flow data.
- 13826 a. Sufficient daily flow data shall be collected to conduct a frequency distribution
- 13827 analysis. The capacity of a spring source is defined as the low flow rate for one day
- 13828 with a projected recurrence period of 30 years (i.e., 30-year 1-day low flow).
- 13829 b. The Log-Pearson Type III method of frequency distribution analysis shall be used
- 13830 to make the determination, with a minimum of 1000 daily flow measurements.
- 13831 c. If sufficient data is not available to conduct the analysis specified in this subsection,
- 13832 then the lowest recorded daily flow rate may be considered to be the spring capacity.
- 13833 Sufficient flow records shall be available to capture the spring flow during drought
- 13834 conditions, and shall be acceptable to the commissioner.

13835 _____

13836 Article 3

13837 Processes and Devices

13838 **12VAC5-590-850. General Appropriate treatment.**

13839 A. The design of water treatment ~~processes and devices~~ facilities shall depend upon the

13840 evaluation of the nature and quality of the particular source water to be treated and the ~~desired~~

13841 ~~required~~ quality of the finished water as set forth in Article 1 of Part II, Drinking Water Standards,

13842 ~~and Article 2 of Part III, Source Development. All surface water shall receive treatment by~~

13843 ~~chemical addition, for coagulation, flocculation, clarification, filtration, and disinfection unless~~

13844 ~~otherwise approved by the division. Some types of treatment processes may require~~

13845 ~~presedimentation. Operation and maintenance manuals are required. Treatment process~~

13846 ~~selection shall follow the requirements of 12VAC5-590-680.~~

13847 B. The design of water treatment facilities shall address safety considerations as required in

13848 12VAC5-590-560.

13849 **12VAC5-590-860. Chemical application.**

13850 ~~Only chemicals authorized in the construction permit or subsequently authorized by the~~

13851 ~~division and in compliance with National Sanitation Foundation Standards 60 and 61 shall be~~

13852 ~~used to treat drinking water or as an additive to drinking water.~~

13853 A. Plans and specifications shall be submitted for ~~review~~ evaluation and approval, as provided

13854 ~~for~~ required in Part I, and shall include:

13855 1. Descriptions of feed equipment, including maximum and minimum feed ranges;

13856 2. Location of feeders, piping layout, and points of application;

13857 3. ~~Storage~~ Chemical storage and handling facilities;

13858 4. Specifications for chemicals to be used;

13859 5. Operating and control ~~procedures~~ features; and

13860 6. Descriptions of testing equipment and procedures.

13861 B. Chemicals shall be applied to the water at such points and by such means as to:

13862 1. Assure maximum efficiency of treatment;

13863 2. Provide maximum protection to the consumer;

13864 3. Provide maximum safety to operators;

13865 4. Assure satisfactory mixing of the chemicals with the water;

13866 5. Provide maximum flexibility of operation through various points of application, when

13867 appropriate;

13868 6. Prevent backflow or ~~back-siphonage~~ backsiphonage between multiple points of feed
13869 through common manifolds; and

13870 7. Provide for the application of pH-affecting chemicals to the ~~raw source water~~ prior to
13871 before the addition of the coagulant in turbidity removal processes.

13872 C. Feed equipment.

13873 1. Where chemical feed is necessary for the treatment of the source water supply, such
13874 as chlorination, coagulation, or other essential processes: ~~a. A minimum of two feeders~~
13875 ~~shall be provided; and b. A standby unit or combination of units of sufficient capacity, a~~
13876 standby feeder or combination of feeders shall be available to ~~replace~~ provide the required
13877 chemical dose with the largest unit during shutdowns ~~feeder out of service.~~

13878 2. Feeders shall be of such design and capacity to meet the following requirements:

13879 a. Feeders shall be able to supply ~~at all times~~ the necessary amounts of chemical at
13880 an accurate rate throughout the range of feed; at all times.

13881 b. Proportioning of chemical feed to the rate of flow shall be provided where the water
13882 flow is not constant; or where specifically required by the commissioner.

13883 c. Positive displacement type solution feed pumps, or gravity feed through ~~rotometers~~
13884 rotameters, shall be used to feed liquid chemicals, but should not normally be used to
13885 feed chemical slurries; ~~and,~~

13886 ~~d. Chemical solutions shall be prevented from being siphoned into the water supply~~
13887 ~~by:~~

13888 ~~(1) Providing vacuum relief,~~

13889 ~~(2) Providing a suitable air gap, or~~

13890 ~~(3) Other approved devices or piping arrangements;~~

- 13891 e. ~~The service water supply shall be protected from contamination by chemical~~
13892 ~~solutions by:~~
- 13893 ~~(1) Equipping the supply line with backflow or back-siphonage prevention devices or~~
13894 ~~(2) Providing an air gap between supply line and solution tank;~~
- 13895 fd. Chemical contact materials and surfaces shall be resistant to the aggressiveness
13896 of the chemical solution;
- 13897 ge. Dry chemical feeders shall:
- 13898 (1) Measure chemicals volumetrically or gravimetrically;
13899 (2) Provide effective solution of the chemical in the solution pot;
13900 (3) ~~Preferably provide~~ Provide gravity feed from solution pots; and
13901 (4) Completely enclose chemicals to prevent emission of dust to the ~~operation~~ room;
- 13902 hf. No direct connection ~~may~~ shall exist between any sewer and a drain or overflow
13903 from the feeder or solution chamber or tank; ~~and~~
- 13904 ig. A separate chemical waste tank should be considered.
- 13905 3. Chemical feed equipment:
- 13906 a. Shall be located near points of application to minimize length of feed lines;
13907 b. Shall be readily accessible for servicing and repair, and observation of operation;
13908 and
13909 c. Shall be located within a ~~and~~ protective ~~curbing~~ curbing ~~provided~~ so that chemicals
13910 resulting from equipment failure, spillage, or accidental drainage shall not enter the
13911 water in conduits or treatment or storage basins.
- 13912 4. Control:

13913 a. Feeders ~~may shall~~ be capable of both manually or automatically controlled manual
13914 or automatic control with the automatic control reverting to manual control as
13915 necessary;

13916 b. ~~The feeders~~ Feeders shall be manually started following shutdown, unless
13917 otherwise approved by the ~~division~~ commissioner; and

13918 c. Automatic chemical dose ~~or controls with~~ residual analyzers ~~may be approved for~~
13919 ~~use and~~ shall provide alarms for critical values, and shall include indicating and
13920 ~~recording charts~~ equipment.

13921 5. Solution tanks. All solution tanks shall be manufactured of materials suitable ~~as a for~~
13922 ~~food contact surface;~~ or that meet the requirements of 12VAC5-590-810.

13923 a. Means shall be provided to maintain uniform strength of solution, consistent with
13924 the nature of the chemical solution. Continuous agitation ~~is necessary~~ shall be
13925 provided to maintain slurries in suspension;_

13926 b. ~~Two solution tanks of specific capacity may be required for a chemical to assure~~
13927 ~~continuity of chemical application during servicing;~~ Solution tanks shall be of sufficient
13928 number and capacity to assure continuous chemical application during tank servicing,
13929 and the access openings shall be curbed and fitted with tight covers.

13930 c. Each tank exceeding 30 gallons in capacity or fixed in place shall be provided with
13931 a drain unless other means of dewatering the tank are provided.

13932 (1) ~~No direct~~ Direct connection between any tank or drain and a sewer ~~shall be~~
13933 ~~permitted~~ is prohibited.

13934 (2) All drains shall terminate at least two pipe diameters, but not less than two inches,
13935 above the rim of the receiving sump, conduit, or waste receptacle;_

- 13936 d. Means shall be provided to indicate the solution level in the tank;₂
- 13937 e. ~~Make-up~~Process water shall enter the tank above the rim at a distance of two pipe
- 13938 diameters but not less than two inches;₂
- 13939 f. Chemical solutions shall be kept covered.
- 13940 ~~(1) Polyphosphate solutions shall be disinfected by carrying a chlorine residual when~~
- 13941 ~~added to unchlorinated water.~~
- 13942 ~~(2) Large tanks with access openings shall have such openings curbed and fitted with~~
- 13943 ~~tight covers;~~
- 13944 g. ~~Subsurface locations for~~ Buried or subsurface chemical storage or solution tanks
- 13945 ~~shall:~~ are prohibited.
- 13946 ~~(1) Be free from sources of possible contamination;~~
- 13947 ~~(2) Assure positive drainage for groundwaters, accumulated water, chemical spills,~~
- 13948 ~~and overflows; and~~
- 13949 h. Overflow pipes, when provided, shall:
- 13950 (1) Be turned downward, ~~with end screened~~ and when located outside, be provided
- 13951 with an appropriately sized screened end to prevent entry of insects and small animals;
- 13952 (2) Have free discharge;
- 13953 (3) Be located where noticeable; and
- 13954 (4) Be directed so as not to contaminate the water or be a hazard to operating
- 13955 personnel.
- 13956 6. Weighing scales;₂

- 13957 a. Shall be provided for weighing cylinders at all water treatment plants utilizing
13958 chlorine gas; for large water treatment plants, indicating and recording type are
13959 desirable;
- 13960 b. Shall be ~~required for fluoride solution~~ provided for fluorosilicic acid feed systems in
13961 conjunction with a ~~loss-of-weight~~ loss-of-weight recorder;
- 13962 c. ~~Should be required~~ Shall be considered for volumetric dry chemical feeders; and
13963 d. Shall be accurate to measure increments of 0.5% of load.
- 13964 7. Feed lines:;
- 13965 a. Shall be as short as possible in length of run and be:
- 13966 (1) Of durable, ~~corrosion resistant~~ corrosion-resistant material;
- 13967 (2) Easily accessible throughout the entire length;
- 13968 (3) Protected against freezing; and
13969 (4) Readily cleanable.
- 13970 b. Shall slope upward from chemical source to feeder, when conveying gases;
- 13971 c. Shall introduce corrosive chemicals in ~~such a~~ manner as to minimize potential for
13972 corrosion;
- 13973 d. Shall be designed consistent with scale forming solids depositing properties of the
13974 water, chemical solution, or mixture conveyed;
- 13975 e. Shall not carry chlorine gas beyond the chlorine feeder room unless the chlorine is
13976 under vacuum; and
- 13977 f. Shall be designed so that liquid alum does not mix with water ~~prior to~~ before the point
13978 of application.

- 13979 8. ~~Service water supply:~~ Process water.
- 13980 a. Water used for dissolving dry chemicals, diluting liquid chemicals, or operating
- 13981 chemical feeders shall be:
- 13982 (1) ~~Only from~~ From a safe, approved source;
- 13983 (2) Protected from contamination by appropriate means;
- 13984 (3) Ample in supply and adequate in pressure;
- 13985 (4) Provided with means for measurement when preparing specific solution
- 13986 concentrations by dilution; and
- 13987 (5) Properly treated for hardness when necessary.
- 13988 b. Where a booster pump is required, ~~duplicate equipment~~ a spare pump shall be
- 13989 provided ~~and, when necessary, standby power.~~
- 13990 c. Backflow prevention shall be achieved by appropriate means such as:
- 13991 (1) An air gap between the fill pipe and overflow rim of the solution or dissolving tank,
- 13992 and equivalent to two pipe diameters but not less than two inches;
- 13993 (2) An approved reduced pressure zone backflow preventer, consistent with the
- 13994 degree of hazard, aggressiveness of chemical solution, back pressure sustained,
- 13995 location, and available means for maintaining and testing the device; or
- 13996 (3) A satisfactory vacuum relief device.
- 13997 D. Chemicals.
- 13998 1. ~~Quality.~~ a. Chemical containers shall be fully labeled to include:
- 13999 (1) ~~Chemical name, purity and concentration;~~
- 14000 (2) ~~Supplier name and address;~~

- 14001 ~~(3) Precautions in handling; and~~
- 14002 ~~(4) Requirements of Virginia Department of Labor and Industry, Virginia Occupational~~
- 14003 ~~Safety and Health Standards for General Industry, section 1910.1200(f).~~
- 14004 ~~b. Chemicals shall meet American Water Works Association standards, where~~
- 14005 ~~applicable, and be stamped or certified accordingly.~~
- 14006 ~~c. Provisions may be required for assay of the chemicals delivered where the quality is in~~
- 14007 ~~doubt.~~
- 14008 ~~d. Chemicals having a distinguishing color may be used, providing the coloring~~
- 14009 ~~material is not toxic in concentrations used and will not impart taste, odor, or color to~~
- 14010 ~~the water supply.~~
- 14011 21. Storage.
- 14012 a. Space shall be provided where at least 30 days of chemical supply can be stored,
- 14013 in dry storage conditions based on the average dose and average annual water
- 14014 treatment plant flow rate. Storage shall be at a location that is convenient for efficient
- 14015 handling unless local suppliers and safety. Lesser storage capacity may be approved
- 14016 if the owner can demonstrate that the local suppliers or other conditions indicate lesser
- 14017 storage is adequate will provide an uninterrupted source of chemicals.
- 14018 b. Cylinders of chlorine gas shall be:
- 14019 (1) Isolated from operating areas;
- 14020 (2) Restrained in position to prevent upset; and
- 14021 (3) Stored in rooms separate from ammonia storage.
- 14022 c. Liquid chemical storage tanks shall:
- 14023 (1) Have a liquid level indicator; and

14024 (2) Have an overflow and a receiving basin or drain capable of receiving accidental
14025 spills or overflows.

14026 d. Special precautions shall be taken with: ~~(1) Sodium~~ sodium chlorite, to eliminate
14027 any danger of explosion; ~~and,~~

14028 ~~(2)e. Activated carbon, which is a potentially combustible material, requiring isolated,~~
14029 ~~fireproof storage and explosion proof electrical outlets, lights, and motors in areas of~~
14030 ~~dry handling. Special precautions (listed below) shall be taken in areas where activated~~
14031 ~~carbon is stored, handled, and fed.~~

14032 (1) Isolated, cool, and dry areas free from sources of ignition shall be provided for
14033 activated carbon storage.

14034 (2) Electrical equipment, devices, and materials shall comply with applicable codes.

14035 (3) Ventilation in areas associated with the storage, handling, and feeding of activated
14036 carbon shall be ~~local~~ localized so as not to cause dust or material to be drawn into
14037 other areas.

14038 (4) Activated carbon shall not be stored with strong oxidants such as ozone, liquid
14039 chlorine (i.e., compressed chlorine gas), and permanganate. ~~Liquid chlorine means~~
14040 ~~liquefied, compressed chlorine gas.~~

14041 ef. Chemicals shall be stored in covered or unopened shipping containers, unless the
14042 chemical is transferred into an approved covered storage unit.

14043 fg. Solution storage or day tanks supplying feeders directly should have sufficient
14044 capacity for one day of operation.

14045 gh. Acid storage tanks shall be vented to the outside atmosphere, but not through
14046 vents in common with day tanks.

14047 32. Handling.

14048 a. Provisions shall be made for measuring quantities of chemicals used to prepare
14049 feed solutions.

14050 b. Storage tanks and pipelines for liquid chemicals shall be specific to the chemicals
14051 and not for alternates.

14052 c. Chemicals that are incompatible shall not be fed, stored, or handled together.

14053 d. Provisions shall be made for the proper transfer of dry chemicals from shipping
14054 containers to storage bins or hoppers ~~in such a way as to minimize~~ to mitigate the
14055 quantity of dust ~~which~~ that may enter the room in which the equipment is installed.
14056 Control shall be provided by use of:

14057 (1) Vacuum pneumatic equipment or closed conveyor systems;

14058 (2) Facilities for emptying shipping containers in special enclosures; or

14059 (3) Exhaust fans and dust filters ~~which~~ that put the hoppers or bins under negative
14060 pressure.

14061 e. Precautions shall be taken with electrical equipment to prevent explosions,
14062 ~~particularly in the use of sodium chlorite and activated carbon~~ and other hazards.

14063 f. Acids shall:

14064 (1) Be kept in closed, ~~acid-resistant~~ acid-resistant shipping containers or storage units;
14065 and

14066 (2) Not be handled in open vessels, but should be pumped in undiluted form from
14067 original containers, through a suitable hose, to the point of treatment or to a covered
14068 day tank.

14069 g. Carts, elevators, and other appropriate means shall be provided for lifting chemical
14070 containers to ~~minimize~~ mitigate excessive lifting by operators.

14071 h. Provisions shall be made for disposing of empty containers by an approved
14072 procedure ~~which~~ that will ~~minimize~~ mitigate exposure to the chemical.

14073 E. Housing.

14074 1. Structures, rooms, and areas accommodating chemical feed equipment shall provide
14075 convenient access for servicing, repair, and observation of operation.

14076 2. Floor surfaces shall be smooth and impervious, slip-proof, and well drained ~~with a slope~~
14077 ~~of $\frac{1}{8}$ inch per foot, minimum.~~

14078 3. Open basins, tanks, and conduits shall be protected from chemical spills or accidental
14079 drainage.

14080 F. Operator safety. Safety provisions shall protect people at the waterworks from chemical
14081 exposures in accordance with VOSH laws and regulations.

14082 1. Gases from feeders, storage, and equipment exhausts shall be conveyed to the outside
14083 atmosphere, above grade and remote from air intakes.

14084 2. See 12VAC5-590-1000 and 12VAC5-590-1001 for special provisions for handling and
14085 storing chlorine.

14086 3. A plastic bottle of hydrochloric acid (muriatic acid in commercial form) shall be available
14087 for ammonia leak detection where ammonia gas is used or stored.

14088 4. At least one pair of rubber gloves with long gauntlets, a dust respirator of a type
14089 ~~approved by the Virginia Occupational Safety and Health Standards for General Industry,~~
14090 ~~Section 1910.134~~ that complies with the VOSH laws and regulations for toxic dusts, and

14091 an apron or other protective clothing shall be provided for each operator in any shift who
14092 will handle dry chemicals.

14093 ~~5. Rubber gloves, clothing protection, and goggles shall be provided for each operator~~
14094 ~~preparing chemical solutions.~~

14095 ~~65. Facilities such as emergency eye wash and showers shall be provided for washing of~~
14096 ~~the face, gloves, and protective equipment.~~

14097 ~~7. See 12VAC5-590-1000 E.~~

14098 **12VAC5-590-865. Conventional filtration treatment.**

14099 A. Conventional filtration treatment is generally used for surface water sources. It is defined
14100 as a series of four processes: coagulation, flocculation, sedimentation, and filtration. The specific
14101 design parameters shall consider the water supply characteristics and variability in quality due to
14102 seasonal and climatic events.

14103 B. Conventional filtration treatment plants shall provide staged, multiple treatment process
14104 units, to allow individual units to be taken out of service without disrupting operation.

14105 C. The commissioner may require presedimentation of waters containing high turbidity or
14106 organics (as measured by TOC).

14107 1. Presedimentation basins utilizing a coagulant feed shall have hoppers bottoms or shall
14108 be provided with continuous sludge removal equipment. The minimum hydraulic detention
14109 time shall be three hours. The commissioner may require greater detention times
14110 depending on the source water quality and the level of pretreatment required.

14111 2. Presedimentation basins without coagulant feed shall provide a minimum hydraulic
14112 detention time of 24 hours. The design shall address future needs for solids removal and
14113 handling.

14114 3. Incoming water shall be dispersed across the full width of the line of travel as quickly
14115 as possible; short circuiting shall be minimized. The commissioner may require baffling on
14116 large basins.

14117 4. Provisions for bypassing presedimentation basins shall be provided.

14118 5. Surface runoff shall be prevented from entering presedimentation basins or reservoirs.

14119 6. Dikes shall be structurally sound and protected against wind action and erosion.

14120 **12VAC5-590-870. Mixing and sedimentation.(Repealed.)**

14121 A. ~~Plants designed for processing surface waters shall:~~

14122 ~~1. Provide multiple units for coagulation, flocculation, and sedimentation at plants having~~
14123 ~~a rated capacity greater than 100 gallons per minute;~~

14124 ~~2. Permit operation of flocculation basins in series or parallel;~~

14125 ~~3. Be constructed to permit units to be taken out of service without disrupting operation;~~
14126 ~~and~~

14127 ~~4. Provide multiple stage treatment facilities when required by the division.~~

14128 B. ~~Water containing high turbidity or coliform organisms may require pretreatment, usually~~
14129 ~~sedimentation, either with or without the addition of chemicals. When pretreatment is used, the~~
14130 ~~following requirements must be met:~~

14131 ~~1. Presedimentation basins utilizing a coagulant shall have hoppers bottoms or shall be~~
14132 ~~equipped with continuous sludge removal apparatus;~~

14133 ~~2. Incoming water shall be dispersed across the full width of the line of travel as quickly~~
14134 ~~as possible; short circuiting must be prevented;~~

14135 ~~3. Provisions for bypassing sedimentation basins shall be included; and~~

14136 4. ~~Three hours detention is the minimum period required. Greater detention may be~~
14137 ~~required depending on raw water quality.~~

14138 C. ~~Flash mixing is the rapid dispersion of chemicals throughout the water to be treated, usually~~
14139 ~~by violent agitation, to enhance coagulation.~~

14140 1. ~~Turbidity removal plants other than those of the solids contact type shall provide flash~~
14141 ~~mixing facilities.~~

14142 2. ~~Basins shall be equipped with mechanical mixing devices; other arrangements, such as~~
14143 ~~baffling, may be acceptable only under special conditions. Where mechanical mixing~~
14144 ~~devices are utilized, duplicate units or spare mixing equipment shall be provided.~~

14145 3. ~~Design parameters:~~

14146 a. ~~The detention period shall not be less than 10 seconds;~~

14147 b. ~~The design of the flash mixing unit should be based upon the mean temporal velocity~~
14148 ~~gradient G (expressed as units of seconds⁻¹). Typical values for G and T are:~~

| T (seconds) | G (seconds⁻¹) |
|------------------------|-------------------------------------|
| 20 | 1,000 |
| 30 | 900 |
| 40 | 700 |
| Longer time | 790 |

14149 ~~For optimization, the engineer should determine the appropriate G value and detention~~
14150 ~~time through experimentation;~~

14151 c. ~~The point of application of the coagulant shall be at the point of maximum mixing~~
14152 ~~intensity;~~

14153 d. ~~The physical configuration of the mixing basin shall be designed to eliminate~~
14154 ~~vortexing; and~~

14155 e. ~~Flash mix units should be designed to allow speed variation throughout at a range~~
14156 ~~of one to three.~~

14157 4. ~~Properly designed static mixers may be utilized.~~

14158 D. ~~Flocculation mixing is the agitation of treated water at low velocity gradients for sufficient~~
14159 ~~time to agglomerate coagulated particles.~~

14160 1. ~~Basin inlet and outlet design shall prevent short circuiting and destruction of floc. A drain~~
14161 ~~and overflow shall be provided. Multiple units shall be provided for continuous operability~~
14162 ~~and each basin shall be designed so that individual basins may be isolated without~~
14163 ~~disrupting plant operation.~~

14164 2. ~~Design parameters:~~

14165 a. ~~The minimum detention time shall be 30 minutes;~~

14166 b. ~~The design of the flocculation units shall be based upon the value of GT (mean~~
14167 ~~temporal velocity gradient in seconds¹) X (detention time in seconds) which is~~
14168 ~~ordinarily in the range of 20,000 to 200,000. The engineer should establish the value~~
14169 ~~of GT through experimentation;~~

14170 c. ~~Variable speed drive units shall be designed to provide speed variations throughout~~
14171 ~~a range of four to one;~~

14172 d. ~~To control short circuiting in mechanical flocculators, at least three successive~~
14173 ~~compartments should be provided. In addition, special attention should be given to the~~
14174 ~~ports between compartments to further suppress short circuiting;~~

14175 e. ~~To accomplish maximum power input and reduce particle shearing, tapered~~
14176 ~~flocculation should be provided;~~

14177 f. In basins utilizing vertical shaft flocculators, wing walls, or stators shall be provided
14178 to prevent vortexing; and

14179 g. The flocculation basins must be so designed that individual basins may be isolated
14180 without disrupting plant operation.

14181 3. Flocculation and sedimentation basins shall be as close together as possible. The
14182 velocity gradient of the flocculated water through pipes or conduits to settling basins shall
14183 not be greater than the velocity gradient utilized in flocculating the water. Where velocity
14184 gradient is not used as a design parameter, the linear velocity in pipes and conduits from
14185 the flocculators to the settling basin shall not exceed 0.5 feet per second. Allowances must
14186 be made to minimize turbulence at bends and changes in direction.

14187 4. Baffling may be used to provide for flocculation in small plants only after consultation
14188 with the division. The design should be such that the velocity gradients noted above may
14189 be maintained. Turbidity removal plants other than solids contact shall provide flocculation
14190 basins.

14191 5. Safety. Guard rails and adequate lighting shall be provided.

14192 E. Sedimentation shall follow flocculation/mixing. The detention time for effective clarification
14193 is dependent upon a number of factors relating to basin design and the nature of the raw water.
14194 The number of basins required is dependent upon the plant size, turbidity, color, colloidal matter,
14195 and taste and odor causing compounds to be removed.

14196 1. Plants utilizing rapid rate gravity filters in conjunction with conventional sedimentation
14197 shall provide a minimum of four hours effective settling (detention) time. Effective settling
14198 time shall be calculated using the volume of the basins from the stilling wall to the
14199 submerged effluent orifice or weir.

14200 ~~2. Inlets shall be designed to distribute the water equally and at uniform velocities. Open~~
14201 ~~ports, submerged ports, stilling walls, and similar entrance arrangements are required.~~
14202 ~~Where stilling walls are not provided, a baffle shall be constructed across the basin close~~
14203 ~~to the inlet and shall project several feet below the water surface to dissipate inlet velocities~~
14204 ~~and provide uniform flows across the basin.~~

14205 ~~3. Outlet devices shall be designed to maintain velocities suitable for settling in the basin~~
14206 ~~and to minimize short circuiting. The use of submerged orifices or submerged weirs is~~
14207 ~~required. The maximum velocity gradient in pipes and conduits from the settling basins to~~
14208 ~~the filters shall not exceed that used in flocculation. Where velocity gradient is not used~~
14209 ~~as a parameter the linear velocity in pipes and conduits from settling basins shall not~~
14210 ~~exceed 1.0 foot per second.~~

14211 ~~4. Rectangular sedimentation basins should be designed with a length to width ratio of at~~
14212 ~~least four to one. Surface overflow rates should be within the range of 0.25 to 0.38 gallons~~
14213 ~~per minute per square foot in processes utilizing flocculation, the lower limit being utilized~~
14214 ~~for cold waters and the higher limit being applied to warm waters.~~

14215 ~~5. The circular clarifiers of the center feed, peripheral feed, and spiral flow type will be~~
14216 ~~considered on an individual basis.~~

14217 ~~6. Basins shall be provided with a means for dewatering. Basin bottoms shall slope toward~~
14218 ~~the drain not less than one foot in twelve feet unless mechanical sludge collection~~
14219 ~~equipment is provided.~~

14220 ~~7. Superstructures are acceptable at specific plant locations where necessary. In areas~~
14221 ~~where settling basins are subject to high and frequent cross winds, consideration should~~
14222 ~~be given to the provision of windbreaks.~~

14223 ~~8. The velocity through settling basins shall not exceed 1.0 foot per minute. The basins~~
14224 ~~shall be designed to minimize short circuiting. Baffles shall be provided as necessary to~~
14225 ~~minimize short circuiting.~~

14226 ~~9. An overflow weir (or pipe) shall be installed which will establish the maximum water~~
14227 ~~level desired on top of the filters. It shall discharge with a free fall at a location where the~~
14228 ~~discharge will be noted.~~

14229 ~~10. Permanent ladders or handholds shall be provided for safety on the inside walls of~~
14230 ~~basins above the water level. Guard rails shall be included. Flushing lines or hydrants shall~~
14231 ~~not include interconnection of the potable water with nonpotable water.~~

14232 ~~11. For plants having a capacity of 100 gallons per minute or more, multiple basins are~~
14233 ~~required and shall be so designed that individual basins may be isolated without disrupting~~
14234 ~~plant operation.~~

14235 ~~12. Mechanical sludge collecting equipment shall be considered for all plants with a~~
14236 ~~capacity of 100 gallons per minute or more.~~

14237 ~~13. Facilities are required by the State Water Control Board for disposal of sludge (see~~
14238 ~~12VAC5-590-990). Provision shall be made for the operator to observe or sample sludge~~
14239 ~~being withdrawn from unit.~~

14240 ~~F. Units that combine softening and clarification are acceptable where water characteristics~~
14241 ~~are not variable and flow rates are uniform. Before solids contact units are considered as clarifiers~~
14242 ~~without softening, specific approval of the division shall be obtained. Clarifiers shall be designed~~
14243 ~~for the maximum uniform rate and shall be adjustable to changes in flow which are less than the~~
14244 ~~design rate and for changes in water characteristics. A minimum of two units is required.~~

14245 ~~1. A representative of the manufacturer shall supervise the installation and initial operation~~
14246 ~~of each unit.~~

- 14247 2. ~~The following equipment shall be provided for plant operation.~~
- 14248 a. ~~Complete outfit of tools and accessories; and~~
- 14249 b. ~~Adequate piping with suitable sampling taps so located as to permit the collection~~
- 14250 ~~of samples of water from critical portions of the units.~~
- 14251 3. ~~Chemical feed requirements are those listed in 12VAC5-590-860.~~
- 14252 4. ~~Mixing devices shall be constructed to:~~
- 14253 a. ~~Provide good mixing of the raw water with previously formed sludge particles; and~~
- 14254 b. ~~Prevent deposition of solids in the mixing zone.~~
- 14255 5. ~~Flocculation equipment:~~
- 14256 a. ~~Shall be adjustable;~~
- 14257 b. ~~Shall insure that coagulation occurs in a separate chamber or baffled zone within~~
- 14258 ~~the unit; and~~
- 14259 c. ~~Shall provide a flocculation and mixing period of at least 30 minutes.~~
- 14260 6. ~~The sludge equipment shall provide either internal or external sludge concentrators in~~
- 14261 ~~order to obtain a concentrated sludge with a minimum of waste water.~~
- 14262 7. ~~Sludge removal design shall provide that:~~
- 14263 a. ~~Sludge pipes shall be not less than three inches in diameter and so arranged as to~~
- 14264 ~~facilitate cleaning;~~
- 14265 b. ~~Entrance to sludge withdrawal piping will prevent clogging;~~
- 14266 c. ~~Valves are located outside the tank for accessibility;~~
- 14267 d. ~~The operator may observe or sample sludge being withdrawn from the unit; and~~
- 14268 e. ~~A timeclock with proportional timer shall be provided for automatic blowoff.~~

- 14269 8. Cross connections:
- 14270 a. ~~Blowoff outlets and drains shall terminate and discharge at a place satisfactory to~~
- 14271 ~~the division; and~~
- 14272 b. ~~Cross connection control shall be included for the potable water mains used to~~
- 14273 ~~backflush sludge lines.~~
- 14274 9. ~~The detention time shall be established on basis of the raw water characteristics and~~
- 14275 ~~other local conditions that affect the operation of the unit. Based on design flow rates, the~~
- 14276 ~~minimum detention time shall be:~~
- 14277 a. ~~Two hours for suspended solids contact clarifiers; and~~
- 14278 b. ~~One hour for the suspended solids contact softeners.~~
- 14279 10. ~~Softening units should be designed so that continuous slurry concentrates of 1.0% or~~
- 14280 ~~more, by weight, can be satisfactorily maintained.~~
- 14281 11. ~~Water losses:~~
- 14282 a. ~~Solids contact units shall be provided with suitable controls for sludge withdrawal;~~
- 14283 b. ~~Total water losses should not exceed:~~
- 14284 (1) ~~Five percent for clarifiers; and~~
- 14285 (2) ~~Three percent for softening units; and~~
- 14286 c. ~~The solids concentration of sludges bled to waste should be:~~
- 14287 (1) ~~Three percent by weight for clarifiers,~~
- 14288 (2) ~~Five percent by weight for softeners.~~
- 14289 12. ~~Units used as clarifiers should be equipped with orifices. Units used for softening~~
- 14290 ~~should be equipped with either overflow weirs or orifices. Weirs shall be:~~

- 14291 a. Adjustable;
- 14292 b. At least equivalent in length to the perimeter of the tank; and
- 14293 c. ~~Constructed so that surface water does not travel over 10 feet horizontally to the~~
- 14294 ~~collection trough.~~

14295 ~~13. Weir loading:~~

- 14296 a. ~~Weir loading shall not exceed 20 gallons per minute per foot of weir length for units~~
- 14297 ~~used as softeners; and~~
- 14298 b. ~~Orifices shall produce uniform rising rates over the entire area of the tank and shall~~
- 14299 ~~provide for an exit velocity not to exceed 1.0 foot per second.~~

14300 ~~14. Upflow rates shall not:~~

- 14301 a. ~~Exceed 1.75 gpm/ft² of area at the slurry separation line for units used as softeners;~~
- 14302 ~~or~~
- 14303 b. ~~Exceed 1.0 gpm/ft² of area at the sludge separation line for units used as clarifiers.~~

- 14304 ~~15. Consideration shall be given to providing a superstructure to enclose the solids contact~~
- 14305 ~~unit, to enhance the treatment process, and for the protection of piping and associated~~
- 14306 ~~sampling valves.~~

14307 **12VAC5-590-871. Coagulation and flocculation.**

- 14308 A. Rapid mixing is the rapid dispersion of chemicals throughout the water to be treated, usually
- 14309 by violent agitation, to promote coagulation.

- 14310 1. Rapid mix basins or in-line static mixers shall be provided.

- 14311 2. Basins shall be equipped with mechanical mixing devices. Other arrangements, such
- 14312 as baffling, may be acceptable under special conditions and only when approved by the

14313 commissioner. Where mechanical mixing devices are utilized, duplicate units or spare
14314 mixing equipment shall be provided.

14315 3. Rapid mix basins with mechanical mixers should be based upon the mean temporal
14316 velocity gradient "G" (expressed as units of seconds⁻¹). The owner's engineer shall submit
14317 the basis for the selected velocity gradient considering the chemicals to be added and
14318 water temperature. Typical values for G and T are:

14319

TABLE 871.1.
Rapid Mix Basin GT Values.

| <u>T (seconds)</u> | <u>G (seconds⁻¹)</u> |
|--------------------|---------------------------------|
| <u>20</u> | <u>1,000</u> |
| <u>30</u> | <u>900</u> |
| <u>40</u> | <u>700</u> |
| <u>60</u> | <u>600</u> |

14320 a. The point of application of the coagulant shall be at the point of maximum mixing
14321 intensity;

14322 b. The physical configuration of the mixing basin shall be designed to eliminate
14323 vortexing; and

14324 c. Mechanical mixers should be designed to allow speed variation with a highest speed
14325 of at least three times the lowest speed.

14326 B. Flocculation mixing is the agitation of treated water at low velocity gradients for sufficient
14327 time to agglomerate coagulated particles.

14328 1. Basin inlet and outlet design shall prevent short circuiting and destruction of floc. A drain
14329 and overflow shall be provided. Multiple units shall be provided for continuous operability,
14330 and each basin shall be designed so that individual basins may be isolated without

14331 disrupting plant operation. Basins shall be arranged to allow for either series or parallel
14332 operation.

14333 2. Design parameters:

14334 a. The minimum detention time shall be 30 minutes for water treatment plants
14335 employing rapid rate gravity filters, and 20 minutes for water treatment plants using
14336 high rate gravity filters. Basin flow-through velocity should not be less than 0.5 ft/min
14337 or greater than 1.5 ft/min.

14338 b. The design of the flocculation units shall be based upon the value of GT, which is
14339 ordinarily in the range of 20,000 - 200,000. The owner's engineer should establish the
14340 value of GT through experimentation.

14341 c. Agitators shall be driven by variable speed drive units with peripheral tip speed of
14342 the paddles ranging from 0.5 - 3.0 ft/sec.

14343 d. To control short circuiting in mechanical flocculators, at least three successive
14344 compartments should be provided. In addition, special attention should be given to the
14345 ports between compartments to further suppress short circuiting.

14346 e. To accomplish maximum power input and reduce particle shearing, tapered
14347 flocculation should be provided.

14348 f. In basins utilizing vertical shaft flocculators, wing walls or stators shall be provided
14349 to prevent vortexing.

14350 3. Flocculation and sedimentation basins shall be as close together as possible. The
14351 velocity gradient of the flocculated water through pipes or conduits to settling basins shall
14352 not be greater than the velocity gradient utilized in flocculating the water. Where velocity
14353 gradient is not used as a design parameter, the linear velocity in pipes and conduits from
14354 the flocculators to the settling basin shall not exceed 0.5 ft/sec unless otherwise approved

14355 by the commissioner. Allowances shall be made to minimize turbulence at bends and
14356 changes in direction.

14357 4. Baffling may be used for flocculation in small water treatment plants only when approved
14358 by the commissioner. The design should allow the velocity gradients noted in subdivision
14359 B 3 of this subsection to be maintained.

14360 **12VAC5-590-872. Sedimentation.**

14361 A. The water treatment plant capacity, source water quality, and filtration process used shall
14362 be considered in determining the number and design of sedimentation basins.

14363 B. The minimum settling time shall be four hours for water treatment plants employing rapid
14364 rate gravity filters, and a minimum of three hours for water treatment plants using high rate gravity
14365 filters. Reduced settling times may be approved by the commissioner where effective settling is
14366 demonstrated. Effective settling time shall be calculated using the volume of the basins from the
14367 stilling wall to the submerged effluent orifice or weir, including the volume under launders or finger
14368 weirs.

14369 C. Inlets shall be designed to distribute the water equally and at uniform velocities. Open ports,
14370 submerged ports, stilling walls, and similar entrance arrangements are required. Port velocities
14371 should be in the range of 0.5 - 1.5 ft/sec. Where stilling walls are not provided, a baffle shall be
14372 constructed across the basin close to the inlet and shall project several feet below the water
14373 surface to dissipate inlet velocities and provide uniform flows across the basin.

14374 D. Outlet weirs or submerged orifices shall be designed to maintain settling velocities in the
14375 basin and minimize short circuiting. Outlet weirs and submerged orifices shall be designed as
14376 follows:

14377 1. The rate of flow over the outlet weir shall not exceed 20,000 gpd/ft of the outlet launder.

14378 2. Submerged orifices shall not be located lower than 3 ft below the normal water surface.

14379 3. The entrance velocity through the submerged orifices shall not exceed 0.5 ft/sec.

14380 E. The linear velocity in pipes and conduits from settling basins shall not exceed 1.0 ft/sec.

14381 F. Rectangular sedimentation basins shall be designed with a length-to-width ratio of at least
14382 4:1.

14383 G. Surface overflow rates shall be within the range of 0.25 - 0.38 gpm/ft² in water treatment
14384 plants using rapid rate filters, and a maximum of 0.5 gpm/ft² for water treatment plants using high
14385 rate filters. Increased surface overflow rates and reduced settling times may be approved by the
14386 commissioner where effective settling is demonstrated. The length and area between launders
14387 and finger weirs may be included in determining length-to-width ratio and overflow rates.

14388 H. Basins shall be provided with a means for dewatering. Basin bottoms shall slope toward
14389 the drain not less than one foot in 12 feet unless mechanical sludge collection equipment is
14390 provided.

14391 I. In areas where settling basins are subject to high and frequent cross winds, windbreaks
14392 shall be considered. Covers or enclosures shall be considered in locations subject to freezing.

14393 J. The velocity through settling basins shall not exceed 1.0 ft/min. The basins shall be
14394 designed to minimize short circuiting. Baffles shall be provided as necessary to minimize short
14395 circuiting.

14396 K. Multiple basins shall be provided for continuous operability and each basin shall be
14397 designed so that individual basins may be isolated without disrupting plant operation.

14398 L. Mechanical sludge collecting equipment shall be considered for all plants.

14399 M. Sedimentation basins with tube or plate settlers shall meet the following design
14400 requirements:

- 14401 1. Inlet and outlets shall be designed to maintain velocities suitable for settling in the basin
- 14402 and minimize short circuiting. Plate units shall be designed to ensure even flow distribution
- 14403 across the units.
- 14404 2. Drain piping from the settler units shall be sized to facilitate a quick flush of the basin
- 14405 and to prevent flooding other portions of the plant.
- 14406 3. Where units are located outdoors, adequate freeboard shall be provided above the top
- 14407 of the settlers to prevent freezing.
- 14408 4. The maximum loading for tube settlers shall be 2 gpm/ft² of cross-sectional area unless
- 14409 higher rates are demonstrated through pilot plant or in-plant demonstration studies.
- 14410 5. The maximum loading for plate settlers shall be 0.5 gpm/ft² based upon 80% of the
- 14411 projected horizontal plate area.
- 14412 6. Flushing lines shall be provided to facilitate maintenance and shall be properly protected
- 14413 against backflow or backsiphonage.
- 14414 **12VAC5-590-873. Solids contact treatment units.**
- 14415 A. Solids contact units shall be acceptable for combined flocculation and clarification where
- 14416 source water characteristics are not variable and flow rates are uniform. When approved, these
- 14417 units shall be designed for the maximum uniform rate and shall be adjustable to changes in flow
- 14418 that are less than the design rate and for changes in water characteristics.
- 14419 B. A minimum of two units shall be provided.
- 14420 C. A rapid mix device designed in accordance with 12VAC5-590-871 A shall be provided.
- 14421 Mixing devices shall be constructed to:
- 14422 1. Provide good mixing of the source water with previously formed sludge particles; and
- 14423 2. Prevent deposition of solids in the mixing zone.

- 14424 D. Flocculation equipment designed in accordance with 12VAC5-590-871 B shall:
- 14425 1. Be equipped with an adjustable drive mechanism;
- 14426 2. Insure that coagulation occurs in a separate chamber or baffled zone within the unit;
- 14427 and
- 14428 3. Provide a flocculation period of at least 20 minutes.
- 14429 E. The sludge equipment shall provide either internal or external sludge concentrators in order
- 14430 to obtain a concentrated sludge with a minimum of waste water. Sludge removal systems shall
- 14431 provide:
- 14432 1. Sludge pipe sizes of not less than three inches in diameter;
- 14433 2. Piping arrangements to prevent clogging and to facilitate cleaning;
- 14434 3. Valves that are located outside the tank for accessibility;
- 14435 4. A means to observe or sample sludge being withdrawn from the unit;
- 14436 5. A time clock with proportional timer with automatic blowoff; and
- 14437 6. Suitable controls for sludge withdrawal.
- 14438 F. Cross-connections.
- 14439 1. Blowoff outlets and drains shall terminate and discharge at a place satisfactory to the
- 14440 commissioner; and
- 14441 2. Cross-connection control shall be included for the potable water mains used to flush
- 14442 sludge lines.
- 14443 G. The detention time shall be established on the basis of the source water characteristics
- 14444 and other local conditions that affect the operation of the unit. The minimum detention time shall
- 14445 be two hours for suspended solids contact clarifiers.

14446 H. Orifices shall produce uniform rising rates over the entire area of the tank and shall provide
14447 for an exit velocity not to exceed 1.0 ft/sec.

14448 I. Upflow rates shall not exceed 1.0 gpm/ft² of area at the sludge separation line.

14449 **12VAC5-590-874. Gravity filtration.**

14450 A. At least two gravity filter units shall be provided in conventional filtration treatment plants
14451 and direct filtration treatment plants.

14452 B. Filter loading rates shall not exceed 2.0 gpm/ft² of filter area for rapid rate filters, and shall
14453 not exceed 4.0 gpm/ft² for high rate filters, during normal operation. Alternative loading rates may
14454 be approved by the commissioner when effective filtration is demonstrated.

14455 C. The filter structure shall be so designed as to comply with the following:

14456 1. The walls within the filter shall be vertical;

14457 2. The filter walls shall not protrude into the filter media;

14458 3. There shall be no common wall between filtered or finished water and any lesser quality
14459 water;

14460 4. The filter shall be covered by a superstructure if determined necessary under local
14461 climatic conditions;

14462 5. There shall be head room to allow normal inspection and operation;

14463 6. A curb at least four inches high shall surround each filter to prevent floor drainage into
14464 the filter;

14465 7. The maximum velocity gradient of treated water in pipes and conduits to the filters shall
14466 not exceed that used in flocculation. Where velocity gradient is not used as a design
14467 parameter, the linear velocity in pipes and conduits from settling basins to filters shall not
14468 exceed 1.0 ft/sec;

- 14469 8. Influent pipes or conduits, where solids loading is heavy, shall be straight and equipped
14470 with cleanouts;
- 14471 9. Backwash water drain capacity shall be sufficient to carry the maximum flow;
- 14472 10. Access in the form of walkways not less than 24 inches in width shall be provided to
14473 each filter; and
- 14474 11. The normal operating water surface on a filter shall be at the same hydraulic grade
14475 level as the sedimentation basin, if no intermediate treatment process is provided.
- 14476 D. Backwash water troughs shall be so designed as to provide:
- 14477 1. Bottom elevation of the trough above the maximum level of expanded media during
14478 backwashing;
- 14479 2. At least a two-inch freeboard inside the trough at the maximum rate of wash;
- 14480 3. A level top or edge;
- 14481 4. Spacing so that each trough serves an equal area of each filter; and
- 14482 5. Maximum horizontal travel of suspended particles to reach the trough not to exceed 3.0
14483 ft.
- 14484 E. Filter media shall be free from detrimental chemical or bacterial contaminants. Acceptable
14485 filter media shall include anthracite coal, silica sand, garnet sand, and GAC. Other natural or
14486 synthetic media may be approved by the commissioner when pilot-scale or full-scale
14487 demonstration studies demonstrate that the media is capable of meeting the filter effluent turbidity
14488 treatment technique requirements in Part II of this chapter.
- 14489 1. Filters may be of single media, dual media, or multimedia design depending upon the
14490 water to be treated and the specific filtration process employed. A total media depth of not
14491 less than 27 inches shall be provided after cleaning and scraping.

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2. Types of filter media:

a. Anthracite coal. A sieve analysis shall be provided. Anthracite media shall have:

(1) An effective size of from 0.45 - 0.55 mm with a uniformity coefficient of not greater than 1.65 when used alone.

(2) An effective size from 0.8 - 1.2 mm with a uniformity coefficient not greater than 1.85 when used in dual or multimedia filters.

b. Silica sand. A sieve analysis shall be provided. The media shall be clean silica sand having an effective size of from 0.35 - 0.55 mm and a uniformity coefficient not greater than 1.65.

c. Garnet sand. A sieve analysis shall be provided. The media shall have an effective size of from 0.15 - 0.35 mm.

d. Granular activated carbon (GAC) may be used as a media for filtration. The commissioner may require pilot studies where precursor or organics removal is a treatment objective. The design shall include the following:

(1) GAC media shall meet the basic specifications for filter media contained in this section, except the uniformity coefficient shall not be greater than 2.0. The commissioner may allow larger size media based upon pilot-scale or full-scale demonstration testing. The commissioner may require that a layer of sand media be placed below the GAC.

(2) Provisions shall be made for periodic treatment of GAC filter material for the control of bacteria and other growths.

(3) Provisions shall be made for GAC media replacement or regeneration.

(4) Only materials suitable for use with GAC media filters shall be utilized.

14515 F. Support media.

14516 1. Sand. A sieve analysis shall be provided. A three-inch layer of sand shall be used as a
14517 supporting media for the filter media where supporting gravel is used and shall have an
14518 effective size from 0.8 - 2.0 mm and a uniformity coefficient not greater than 1.7.

14519 2. Gravel, when used as the supporting media, shall consist of hard, rounded particles
14520 and shall not include flat or elongated particles. The coarsest gravel shall be ~~2½~~ 2-1/2
14521 inches in size when the gravel rests directly on the strainer system, and shall extend above
14522 the top of the perforated laterals or strainer nozzles. Not less than four layers of gravel
14523 shall be provided in accordance with the size and depth distribution specified in Table
14524 874.1.

14525 3. Changes of gravel depths and sizes may be considered by the commissioner where
14526 proprietary filter bottoms are proposed.

TABLE 874.1.
Gravity Filter Gravel Support Bed.

| <u>SIZE</u> | <u>DEPTH</u> |
|-----------------------------|---------------------|
| <u>2-1/2 - 1-1/2 inches</u> | <u>5 - 8 inches</u> |
| <u>1-1/2 - 3/4 inches</u> | <u>3 - 5 inches</u> |
| <u>3/4 - 1/2 inches</u> | <u>3 - 5 inches</u> |
| <u>1/2 - 3/16 inches</u> | <u>2 - 3 inches</u> |
| <u>3/16 - 3/32 inches</u> | <u>2 - 3 inches</u> |

14527 G. Filter bottoms and strainer systems. The commissioner may allow deviations from
14528 requirements of this subdivision for high rate filters and for proprietary filter bottoms. Porous plate
14529 bottoms shall not be used where iron or manganese or hard water may result in clogging. The
14530 design of manifold-type collection systems shall:

14531 1. Minimize loss of head in the manifold and laterals;

14532 2. Assure even distribution of backwash water and an even rate of filtration over the entire
14533 area of the filter;

14534 3. Provide a ratio of the area of the final openings of the strainer systems to the area of
14535 the filter of about 0.003;

14536 4. Provide a total cross-sectional area of the laterals at about twice the total area at the
14537 final openings; and

14538 5. Provide a manifold that has a cross-sectional area which is 1-1/2 to two times the total
14539 area of the laterals.

14540 H. Surface wash or air scouring of filters shall be provided.

14541 1. All rotary surface wash devices shall be designed with:

14542 a. Provisions for water pressures of at least 45 psig;

14543 b. A vacuum breaker or other device or assembly to prevent backsiphonage;

14544 c. Adequate surface wash water to provide 0.5 - 1.0 gpm/ft² of filter area.

14545 2. Air scouring shall provide for:

14546 a. An air flow rate of three to five scfm/ft² of filter area when air is introduced in the
14547 underdrain. A lower air flow rate shall be used when the air scour distribution system
14548 is placed above the underdrain.

14549 b. A method for avoiding loss of filter media during backwashing.

14550 c. A fluidization backwash following air scour sufficient to re-stratify the filter media.

14551 The backwash water delivery system shall be in accordance with this section except

14552 the rate of flow should not exceed 8.0 gpm/ft² unless operating experience

14553 demonstrates that a higher rate is necessary to remove scoured particles from the

14554 filter media.

14555 I. Turbidity monitoring.

14556 1. Indicating and recording turbidimeters meeting the requirements of 12VAC5-590-770 B

14557 shall be provided for:

14558 a. The source water;

14559 b. The settled water from each sedimentation basin;

14560 c. The filter effluent from each filter; and

14561 d. The CFE.

14562 2. Finished water indicating and recording turbidimeters shall be considered if chemical

14563 pH adjustment occurs following filtration.

14564 3. The location of the turbidity sample tap shall allow turbidity to be monitored for both the

14565 filtered water and the filter-to-waste water.

14566 4. The design may incorporate an operator selected filter effluent high turbidity alarm.

14567 J. Appurtenances.

14568 1. A sampling tap shall be placed between each filter and the effluent rate-of-flow controller

14569 to sample filtered water and filter-to-waste water. The location of sample taps shall allow

14570 turbidity to be monitored of both the filtered water and the filter-to-waste water.

14571 2. Indicating and recording loss-of-head gauges shall be provided on all filters having a

14572 capacity of greater than 100 gpm. An indicating loss-of-head gauge shall be provided on

14573 all filters having a capacity of 100 gpm or less.

14574 3. Indicating and recording rate-of-flow gauges shall be provided on all filters having a

14575 capacity of greater than 100 gpm. An indicating and totalizing water meter may be used

14576 instead of an indicating and recording gauge on filters having a capacity of 100 gpm or

14577 less.

14578 4. Effluent rate-of-flow controllers of the direct acting, indirect acting, or constant rate types
14579 shall be provided on each filter.

14580 a. All control devices used shall incorporate an auxiliary shutoff valve in the filter
14581 effluent line. Indirect and direct acting effluent rate-of-flow control devices shall start
14582 operation from the closed position. Failure of indirect acting controllers shall not result
14583 in any increase in the rate of flow.

14584 b. Filter effluent rate-of-flow control that simply maintains a constant water level on the
14585 filter is prohibited.

14586 c. Control devices shall be configured to prevent exceeding the design filter hydraulic
14587 loading rate when any filter is taken out of service.

14588 5. Provisions for draining the filter-to-waste (rewash) with appropriate backflow prevention
14589 and rate control shall be provided on each filter. The filter-to-waste design flow rate shall
14590 be equal to the filtration rate.

14591 6. A high pressure hose and hose rack shall be provided to allow washing down filter walls.

14592 K. Backwash provisions.

14593 1. Filtered or finished water shall be applied uniformly across the filter in an upflow
14594 direction to provide at least 50% media expansion during all operating conditions. This will
14595 normally require backwash flow rates of up to 20 gpm/ft² depending on media size, media
14596 specific gravity, uniformity coefficient, and water temperature.

14597 2. The backwash water shall be provided at the required rate by backwash pumps,
14598 backwash water tanks, the high service main, or a combination of these methods.
14599 Consideration should be given to including provisions to obtain backwash water from the
14600 distribution system or other sources and to supply backwash water during plant start-up
14601 or during catastrophic events.

- 14602 3. At least two backwash water pumps shall be installed unless an alternate means of
14603 obtaining backwash water is available.
- 14604 4. The volume of backwash water provided shall be sufficient to backwash one filter at the
14605 design backwash flow rate and duration during the warmest water temperature. This
14606 backwash water volume shall be in addition to any other water storage requirements.
- 14607 5. A backwash water controller or valve shall be provided on the main backwash water
14608 supply line to obtain the desired rate of filter wash with the backwash water valves on the
14609 individual filters open wide.
- 14610 6. Consideration shall be given to provide for seasonal adjustments of the backwash flow
14611 rate, to ensure proper backwashing while preventing media loss, and to conserve water.
- 14612 7. The rate-of-flow indicator on the main backwash water supply line shall be located so
14613 that it may easily be read by the operator during the backwashing process.
- 14614 8. Where backwash water pumps are provided, a means for air release shall be installed
14615 between the backwash water pump and the backwash water valve.
- 14616 L. Other design considerations.
- 14617 1. Roof drains shall not discharge into the filter or basins and conduits preceding the filters.
- 14618 2. Provision shall be made for continuous operation of all other filtering units while one
14619 filtering unit is out of operation.
- 14620 3. High rate filtration shall be provided with precise coagulation control. A multiple six-
14621 gang stirring machine for performing jar tests shall be provided in addition to one or more
14622 of the following means of controlling the coagulation process:
- 14623 a. Zeta potential, as measured by microelectrophoresis.

14624 b. Pilot filters. Where dual pilot filters are used, two units shall be provided. Each pilot
14625 filter shall consist of a small filter (about six inches in diameter) containing the same
14626 type and depth of media as the plant filters. The pilot filter shall be equipped with
14627 recording turbidimeters on the effluent to measure the filterability of the water as
14628 reflected by turbidity monitoring.

14629 c. Streaming current monitor, defined as a continuous sampling instrument that
14630 measures the electric current generated when water flows past suspended particles
14631 contained in the water.

14632 4. High rate filtration shall be provided with indicating and recording pH monitoring
14633 equipment for:

14634 (1) The source water;

14635 (2) The rapid mix effluent; and

14636 (3) The finished water leaving the treatment plant.

14637 _____
14638 **12VAC5-590-875. Direct filtration.**

14639 A. Direct filtration is defined as a series of treatment processes including coagulation and
14640 filtration, but excluding sedimentation. Direct filtration shall be considered only for treatment of
14641 high quality and seasonally consistent surface water sources or GUDI sources.

14642 B. An in-plant demonstration study or pilot study shall be required to demonstrate acceptable
14643 performance of direct filtration. The study shall be conducted over a sufficient time to treat all
14644 expected source water conditions throughout the year. The pilot plant filter shall be of a similar
14645 type and operated in the same manner as proposed for full-scale operation.

14646 C. The department may require presedimentation meeting the requirements of 12VAC5-590-
14647 865 C to be provided prior to direct filtration treatment plants.

14648 D. Rapid mix coagulation and flocculation shall be provided, meeting the requirements of
14649 12VAC5-590-871.

14650 E. Filters shall be dual media or multimedia gravity filters. Design of filtration units shall meet
14651 requirements for rapid rate or high rate gravity filters in 12VAC5-590-874, including filter structure,
14652 filter media, support gravel, backwash provisions, rate-of-flow control, surface wash, or air scour.
14653 Alternative designs may be considered by the department.

14654 F. Turbidity monitoring.

14655 1. Indicating and recording turbidimeters meeting the requirements of 12VAC5-590-770 B
14656 shall be provided for:

14657 a. The source water;

14658 b. The filter effluent from each filter; and

14659 c. The CFE.

14660 2. Finished water indicating and recording turbidimeters shall be considered if chemical
14661 softening occurs following filtration.

14662 G. Where automatic unit process control is provided, manual override of all automatic features
14663 shall be provided.

14664 1. Automatic start-up of treatment plant unit processes is prohibited.

14665 2. Valve actuators shall be provided with manual override capability.

14666 _____

14667 **12VAC5-590-880. Filtration Diatomaceous earth filtration.**

14668 ~~A. Rapid rate gravity filters acceptable for the treatment of water from surface water sources~~
14669 ~~or groundwater sources under the direct influence of surface water.~~

- 14670 1. Pretreatment is required where rapid rate gravity filters are utilized. Pretreatment shall
14671 include but not be limited to disinfection, coagulation, flocculation, and sedimentation.
- 14672 2. At least two filtering units shall be provided at plants having a rated capacity of more
14673 than 100 gpm and less than 2 MGD. The total number of filters necessary at plants having
14674 a rated capacity equal to or greater than 2 MGD may be estimated utilizing the following
14675 formula:
- 14676
$$N = 2.7 (Q)^{0.5}$$
- 14677 (Formula as per Morrell and Wallace from Hardenbergh and Rodie's "WATER
14678 SUPPLY AND WASTE DISPOSAL 1960").
- 14679 Where N equals number of filter units and Q equals plant capacity in million gallons
14680 per day.
- 14681 3. The design rate of filtration shall be two gallons per minute per square foot of filter area.
- 14682 4. The filter structure shall be so designed as to comply with the following requirements:
- 14683 a. The walls within the filter shall be vertical;
- 14684 b. The filter walls shall not protrude into the filter media;
- 14685 c. The filter shall be covered by a superstructure if determined necessary under local
14686 climatic conditions;
- 14687 d. There shall be head room to permit normal inspection and operation;
- 14688 e. The filter shall have a minimum depth of 8½ feet as measured from the normal
14689 operating water surface to the bottom of the underdrainage system;
- 14690 f. A minimum water depth of three feet as measured from the normal operating water
14691 surface to the surface of the filter sand;

- 14692 ~~g. There shall be a water seal on the effluent line to prevent backflow of air to the~~
- 14693 ~~filters;~~
- 14694 ~~h. A curb at least four inches high shall surround each filter to prevent floor drainage~~
- 14695 ~~into the filter;~~
- 14696 ~~i. A hand rail shall enclose each filter or filter bank;~~
- 14697 ~~j. The maximum velocity gradient of treated water in pipes and conduits to the filters~~
- 14698 ~~shall not exceed that used in flocculation. Where velocity gradient is not used as a~~
- 14699 ~~parameter, the linear velocity in pipes and conduits from settling basins to filters shall~~
- 14700 ~~not exceed 1.0 foot per second;~~
- 14701 ~~k. Influent pipes or conduits where solids loading is heavy, or following lime soda~~
- 14702 ~~softening, shall be straight and equipped with cleanouts.~~
- 14703 ~~l. Washwater drain capacity shall be sufficient to carry the maximum flow;~~
- 14704 ~~m. Access in the form of walkways not less than 24 inches in width shall be provided~~
- 14705 ~~to each filter; and~~
- 14706 ~~n. The normal operating water surface on a filter shall be at the same hydraulic grade~~
- 14707 ~~level as the sedimentation basin.~~
- 14708 ~~5. Washwater troughs shall be so designed as to provide:~~
- 14709 ~~a. Bottom elevation of the trough above the maximum level of expanded media during~~
- 14710 ~~washing;~~
- 14711 ~~b. A top elevation of the trough above the filter surface, not to exceed 30 inches;~~
- 14712 ~~c. A two inch freeboard at the maximum rate of wash;~~
- 14713 ~~d. A level top or edge;~~

- 14714 e. ~~Spacing so that each trough serves the same number of square feet of filter area;~~
14715 and
- 14716 f. ~~Maximum horizontal travel of suspended particles to reach trough not to exceed~~
14717 ~~three feet.~~
- 14718 6. ~~Filter material.~~
- 14719 a. ~~Sand—A sieve analysis shall be provided by the design engineer. The media shall~~
14720 ~~be clean silica sand having:~~
- 14721 (1) ~~A depth of not less than 27 inches and generally not more than 30 inches after~~
14722 ~~cleaning and scraping; and~~
- 14723 (2) ~~An effective size of from 0.35mm to 0.5mm, depending upon the quality of the raw~~
14724 ~~water and a uniformity coefficient not greater than 1.6.~~
- 14725 b. ~~Supporting media for the filter sand—A sieve analysis shall be provided by the design~~
14726 ~~engineer. A three-inch layer of torpedo sand shall be used as a supporting media for~~
14727 ~~the filter sand; such torpedo sand shall have:~~
- 14728 (1) ~~An effective size of 0.8mm to 2.0mm; and~~
- 14729 (2) ~~A uniformity coefficient not greater than 1.7.~~
- 14730 c. ~~Anthracite—A sieve analysis shall be provided by the design engineer. Clean crushed~~
14731 ~~anthracite or a combination of sand and anthracite may be considered on the basis of~~
14732 ~~data specific to the project; this media shall have:~~
- 14733 (1) ~~An effective size from 0.45mm to 0.8mm; and~~
- 14734 (2) ~~A uniformity coefficient not greater than 1.7.~~
- 14735 d. ~~Gravel, when used as the supporting media, shall consist of hard, rounded particles~~
14736 ~~and shall not include flat or elongated particles. The coarsest gravel shall be 2 ½~~

14737 inches in size when the gravel rests directly on the strainer system, and must extend
 14738 above the top of the perforated laterals or strainer nozzles. Not less than four layers
 14739 of gravel shall be provided in accordance with the following size and depth distribution:

| SIZE | DEPTH |
|-----------------------|---------------|
| 2-1/2 to 1-1/2 inches | 5 to 8 inches |
| 1-1/2 to 3/4 inches | 3 to 5 inches |
| 3/4 to 1/2 inches | 3 to 5 inches |
| 1/2 to 3/16 inches | 2 to 3 inches |
| 3/16 to 3/32 inches | 2 to 3 inches |

14740 Reduction of gravel depths may be considered upon application to the division where
 14741 proprietary filter bottoms are proposed.

14742 e. Granular activated carbon – See 12VAC5-590-960 B 6.

14743 7. Porous plate bottoms shall not be used where iron or manganese may clog them or
 14744 with waters softened by lime. The design of manifold type collection systems shall be such
 14745 as to:

14746 a. Minimize loss of head in the manifold and laterals;

14747 b. Assure even distribution of washwater and an even rate of filtration over the entire
 14748 area of the filter;

14749 c. Provide a ratio of the area of the final openings of the strainer systems to the area
 14750 of the filter of about 0.003;

14751 d. Provide a total cross sectional area of the laterals at about twice the total area at
 14752 the final openings; and

14753 e. Provide a manifold which has a cross sectional area which is 1 ½ to two times the
 14754 total area of the laterals.

- 14755 ~~8. Surface wash facilities are required. Revolving type surface washers shall be provided;~~
14756 ~~however, other types may be considered. All rotary surface wash devices shall be~~
14757 ~~designed with:~~
- 14758 ~~a. Provisions for water pressures of 45 to 100 psi;~~
 - 14759 ~~b. A vacuum breaker or other device to prevent backsiphonage;~~
 - 14760 ~~c. Provisions for adequate surface wash water to provide 0.5 to one gallon per minute~~
14761 ~~per square foot of filter area; and~~
 - 14762 ~~d. Air washing may be considered.~~
- 14763 ~~9. The following shall be provided for every filter:~~
- 14764 ~~a. A sampling tap shall be placed between the filter and the effluent rate of flow~~
14765 ~~controller and shall be equipped with an auxiliary spigot at the point of connection to~~
14766 ~~the effluent line;~~
 - 14767 ~~b. Indicating and recording loss of head gauges shall be required on all filters having~~
14768 ~~a capacity of greater than 100 gallons per minute. An indicating loss of head gauge~~
14769 ~~shall be required on all filters having a capacity of 100 gallons per minute or less;~~
 - 14770 ~~c. Indicating and recording rate of flow gauges shall be required on all filters having a~~
14771 ~~capacity of greater than 100 gallons per minute. An indicating and totalizing water~~
14772 ~~meter may be used in lieu of an indicating and recording gauge on filters having a~~
14773 ~~capacity of 100 gallons per minute or less;~~
 - 14774 ~~d. Effluent rate of flow controllers of the direct acting, indirect acting, constant rate, or~~
14775 ~~declining rate types shall be required on each filter. All control devices used must~~
14776 ~~incorporate an auxiliary shutoff valve in the filter effluent line. Indirect and direct acting~~
14777 ~~effluent rate of flow control devices shall start operation from the closed position;~~

14778 Failure of indirect acting controllers shall not result in any increase in the rate of flow,
14779 at the time of failure;

14780 e. Provisions for draining the filter to waste (rewash) with appropriate measure for
14781 backflow prevention are required;

14782 f. Hose bibb, hose, and suitable rack for storage of hoses are required; and

14783 g. Indicating and recording turbidimeters on filter effluent with automatic high turbidity
14784 alarm are required at all plants having a capacity of 10 MGD or more.

14785 10. Provisions shall be made for washing filters (backwashing) as follows:

14786 a. A minimum rate of 15 gallons per square foot per minute, consistent with water
14787 temperatures and specific gravity of the filter media; a rate of 20 gallons per square
14788 foot per minute or more is recommended to provide for adequate expansion of the
14789 filter media;

14790 b. Filtered water shall be provided at the required rate by washwater tanks, a
14791 washwater pump, from the high service main, or a combination of these;

14792 c. Washwater pumps shall be in duplicate unless an alternate means of obtaining
14793 washwater is available;

14794 d. The volume of washwater shall provide for not less than 15 minutes wash of one
14795 filter at the design rate of wash;

14796 e. A washwater controller or valve shall be provided on the main washwater line to
14797 obtain the desired rate of filter wash with the washwater valves on the individual filters
14798 open wide;

14799 f. The rate of flow indicator on the main washwater line shall be located so that it can
14800 be easily read by the operator during the washing process; and

14801 g. ~~Where backwash pumps are provided, a means for air release must be provided~~
14802 ~~between the backwash pump and the washwater valve.~~

14803 ~~11. Miscellaneous:~~

14804 a. ~~Roof drains shall not discharge into the filter or basins and conduits preceding the~~
14805 ~~filters;~~

14806 b. ~~Provisions must be made for continuous operation of all other filtering units while~~
14807 ~~one filtering unit is out of operation; and~~

14808 c. ~~Automatic startup of filtering units is prohibited.~~

14809 B. ~~High rate gravity filters are acceptable for the treatment of water from surface water sources~~
14810 ~~or groundwater sources under the direct influence of surface water. See 12VAC5-590-890 for~~
14811 ~~design requirements.~~

14812 C. ~~Slow sand gravity filters are acceptable for the treatment of water from certain surface~~
14813 ~~water sources or certain groundwater sources under the direct influence of surface water.~~

14814 1. ~~Source restrictions. Raw water quality for application to a slow sand filter without~~
14815 ~~pretreatment shall meet the following requirements:~~

14816 a. ~~Not exceed a turbidity level of 5 NTU monthly average or 30 NTU peak day over a~~
14817 ~~one year period;~~

14818 b. ~~Not exceed 800 total coliforms in 80% of a minimum of 50 samples taken over a~~
14819 ~~minimum of a 52 week period;~~

14820 c. ~~Not exceed an apparent color level of 15 CU monthly average over a one year~~
14821 ~~period; and~~

- 14822 ~~d. Groundwater sources under the direct influence of surface water shall pilot test to~~
14823 ~~determine if the water contains sufficient nutrients for slow sand filtration to be a viable~~
14824 ~~option.~~
- 14825 ~~2. Pretreatment. Raw waters that cannot meet the criteria listed in 12VAC5-590-880 C 1~~
14826 ~~a through c shall be treated to that quality prior to application to a slow sand gravity filter.~~
- 14827 ~~a. Presedimentation may be an appropriate pretreatment depending on the size and~~
14828 ~~specific gravity of the turbidity particles.~~
- 14829 ~~b. Coarse media filtration of either a horizontal or vertical flow configuration may be~~
14830 ~~appropriate for reducing levels of smaller size particles. Normally such roughing filters~~
14831 ~~would be designed to accommodate periodic media removal, cleaning, and~~
14832 ~~replacement.~~
- 14833 ~~c. Chemical flocculation and coagulation is normally not appropriate pretreatment for~~
14834 ~~slow sand gravity filters.~~
- 14835 ~~d. Preoxidation is normally not appropriate pretreatment for slow sand gravity filters.~~
- 14836 ~~3. Number of filters. At least two filters shall be provided. In all cases the filters shall be~~
14837 ~~capable of meeting the design maximum daily water demand with one filter out of service.~~
- 14838 ~~4. Filter media. Sand shall be clean silica sand that meets the following criteria:~~
- 14839 ~~a. The effective size shall be between 0.15 mm and 0.35 mm.~~
- 14840 ~~b. The uniformity coefficient shall not exceed 2.5.~~
- 14841 ~~c. The sand depth shall not exceed 55 inches. A minimum depth of 30 inches is~~
14842 ~~required for normal operation.~~
- 14843 ~~5. Supporting media. Gravel shall meet the requirements of 12VAC5-590-880 A 6 d.~~
- 14844 ~~6. Structural details.~~

- 14845 a. Sufficient head room shall be provided for normal movement on the filter by
14846 operating personnel for periodic sand removal operations.
- 14847 b. Adequate manholes and access ports shall be provided for moving sand off and
14848 onto the filter.
- 14849 c. There shall be no common wall between finished water and any lesser quality water.
- 14850 d. Consideration should be given to providing facilities for dirty sand storage and
14851 washing, as well as for clean sand storage.
- 14852 e. All slow sand filters should be covered.
- 14853 7. Hydraulic design.
- 14854 a. Filter to waste shall be provided for all slow sand filters.
- 14855 b. Water entering the filter shall be distributed in a manner such that the surface of the
14856 filter shall not be disturbed in any way.
- 14857 c. The nominal rate of filtration may range from 45 to 150 gpd/ft² (0.031 to 0.10gpm/ft²)
14858 of sand area.
- 14859 d. The minimum depth of water over the filters shall be three feet. The maximum depth
14860 of water over the filters shall not exceed five feet. An overflow capable of handling the
14861 maximum flow to the filter shall be provided at the maximum filter water level.
- 14862 e. Underdrains shall be provided to assure an even rate of filtration across the filter
14863 surface. The maximum velocity of water in the lateral underdrains shall be 1.0 ft/sec.
14864 The underdrain spacing shall not exceed 12 feet.
- 14865 f. Each filter shall be capable of being filled with water from the bottom up.
- 14866 g. Each filter shall be equipped with a loss-of-head guage; a rate-of-flow control device
14867 such as an orifice, weir, or butterfly valve; a weir or effluent pipe designed to assure

14868 ~~that the water level over the filter never drops below the sand surface; and filtered~~
14869 ~~water sample taps.~~

14870 ~~8. Performance report. At the conclusion of at least 12 months but no more than 18 months~~
14871 ~~operation of the full scale plant an engineering report shall be submitted to the division~~
14872 ~~that summarizes operating conditions and establishes optimum filter curing time, optimum~~
14873 ~~filter run times, raw and finished water bacteriological and turbidity data, and any other~~
14874 ~~pertinent factors.~~

14875 ~~D. A. Diatomaceous earth filtration is essentially a straining process. The use of these filters~~
14876 ~~is acceptable for application to surface waters or groundwaters under the direct influence of~~
14877 ~~surface water shall be limited to treatment of either a surface water source or a GUDI source or~~
14878 ~~both with low turbidity and low bacterial contamination, and may be used for iron removal for~~
14879 ~~groundwaters from groundwater.~~

14880 ~~1. Source restrictions. Raw water quality for application to a diatomaceous earth filter~~
14881 ~~without pretreatment shall meet the following requirements:~~

14882 ~~a. Bacteria shall not exceed 50 total coliforms in any sample.~~

14883 ~~b. Color shall not exceed 15 apparent CU units in any sample.~~

14884 ~~c. Turbidity shall not exceed 5 NTU in any sample.~~

14885 ~~2. Pretreatment. If the raw water can be treated to meet the above source restrictions~~
14886 ~~diatomaceous earth filtration may be utilized.~~

14887 ~~3. B. Pilot plant study. Installation of a diatomaceous earth filtration system shall be preceded~~
14888 ~~by a pilot plant study on the water to be treated.~~

14889 a. ~~Conditions of the the study, such as duration, filter rates, head loss accumulation,~~
14890 ~~slurry feed rates, turbidity removal, bacteria removal, and other relative information~~
14891 ~~shall be approved by the division prior to the study.~~

14892 b. ~~Satisfactory pilot plant results shall be obtained prior to submission of final~~
14893 ~~construction plans and specifications.~~

14894 c. ~~The pilot plant study shall demonstrate the ability of the system to meet applicable~~
14895 ~~drinking water standards at all times.~~

14896 4. C. Types of filters. Pressure or vacuum diatomaceous earth filtration units will be considered
14897 for approval.

14898 5. D. Treated water storage. Treated water storage capacity in excess of normal requirements
14899 shall be provided to:

14900 a. 1. Allow operation of the filters at a uniform rate during all conditions of system demand
14901 at or below the approved filtration rate, and

14902 b. 2. Guarantee continuity of service during adverse ~~raw~~ source water conditions without
14903 bypassing the system.

14904 6. E. Number of units. At least two filtering units shall be provided at plants having a rated
14905 capacity of more than 100 gpm.

14906 7. F. Precoat.

14907 a. 1. Application. A uniform precoat shall be applied hydraulically to each septum by
14908 introducing a slurry to the tank influent line and employing a filter-to-waste or recirculation
14909 system.

14910 b. 2. Quantity. Diatomaceous earth in the amount of 0.2 lb/ft² of filter area ~~or an amount~~
14911 ~~sufficient to apply a minimum of $\frac{1}{5}$ inch coating shall be used with recirculation.~~

14912 &. G. Body feed. A body feed system to apply additional amounts of diatomaceous earth slurry
14913 during the filter run is required.

14914 a. 1. Quantity. Rate of body feed is dependent on ~~raw~~ source water quality and
14915 characteristics and must be determined in the pilot plant study.

14916 b. 2. Adequate accessibility to the feed system and slurry lines is required.

14917 c. 3. Continuous mixing of the body feed slurry is required.

14918 d. 4. Consideration should be given to providing a coagulant coating (alum or suitable
14919 polymer) of the body feed.

14920 9. Filtration.

14921 a. H. Rate of filtration. The ~~recommended nominal rate is 1.0 gpm/ft² of filter area and~~ hydraulic
14922 loading rate shall not exceed 1.5 gpm/ft² of filter area. The filtration rate shall be controlled.

14923 b. I. Head loss. The head loss shall not exceed 30 psi for pressure diatomaceous earth filters,
14924 or a vacuum of 15 inches of mercury for a vacuum system.

14925 c. J. Recirculation. A recirculation or holding pump shall be employed to maintain a differential
14926 pressure across the filter when the unit is not in operation ~~in order~~ to prevent the filter cake from
14927 dropping off the filter elements. A minimum recirculation rate of 0.1 gpm/ft² filter area shall be
14928 provided.

14929 d. K. Septum or filter element. The filter elements shall be structurally capable of withstanding
14930 maximum pressure and velocity variations during filtration and backwash cycles, and shall be
14931 spaced ~~such so~~ that no less than one inch is provided between elements or between any element
14932 and a wall. Means shall be provided to check the ~~septum(s)~~ septum or septums for cleanliness or
14933 damage. Consideration should be given to providing septum assemblies where an individual
14934 ~~septums~~ septum can be removed, cleaned, repaired, and replaced.

14935 e. L. Inlet design. The filter influent shall be designed to prevent scour of the diatomaceous
14936 ~~each earth~~ from the filter element.

14937 10. M. Backwash. Provision shall be made for periodic backwashing of the filter. A satisfactory
14938 method to thoroughly remove and dispose of spent filter cake shall be provided.

14939 11. N. Appurtenances. The following shall be provided for every filter:

14940 a. 1. Sampling taps for ~~raw~~ source and filtered water;_i

14941 b. 2. ~~Loss of head~~ A loss-of-head or a differential pressure gauge;_i

14942 c. 3. ~~Rate of flow~~ A rate-of-flow indicator, preferable with totalizer;_i and

14943 d. 4. A throttling valve used to reduce rates below normal during adverse ~~raw~~ source water
14944 conditions.

14945 12. ~~Monitoring. Turbidity monitoring is required for filter effluent. The monitoring may be~~
14946 ~~done by recorder or daily periodic measurements.~~

14947 O. Turbidity monitoring. Indicating and recording turbidimeters meeting requirements of
14948 12VAC5-590-770 B shall be provided for:

14949 1. The source water;

14950 2. The effluent from each filter unit; and

14951 3. The CFE.

14952 P. An operation and maintenance manual shall be provided for all diatomaceous earth filtration
14953 units. The manual shall include the following:

14954 1. A detailed description of the treatment units and the control of each unit for optimal
14955 performance;

14956 2. A preventative maintenance schedule;

14957 3. The manual adjustment and override procedures for all automatic control features; and

14958 4. A troubleshooting guide for typical problems.

14959 Q. The owner shall require the equipment manufacturer to provide onsite start-up and follow-
14960 up training.

14961 ~~E. Direct filtration.~~

14962 ~~1. General. Direct filtration refers to the filtration of high quality and seasonally consistent~~
14963 ~~raw water without prior sedimentation. Design shall be preceded by a pilot study~~
14964 ~~acceptable to the division. An in-plant demonstration study may be appropriate where a~~
14965 ~~conventional treatment plant is to be converted to direct filtration.~~

14966 ~~2. Preliminary engineering report. A report shall be prepared and submitted to the division~~
14967 ~~which included the following specific items, in addition to those listed in 12VAC5-590-200~~

14968 ~~C:~~

14969 ~~a. Historical summary of meteorological conditions.~~

14970 ~~b. Historical summary of raw water quality covering a period of at least one year with~~
14971 ~~special reference to fluctuation in quality and possible sources of contamination. The~~
14972 ~~following raw water parameters should be evaluated:~~

14973 ~~(1) Apparent color~~

14974 ~~(2) Turbidity~~

14975 ~~(3) Bacterial concentration~~

14976 ~~(4) Microscopic biological organisms~~

14977 ~~(5) Temperature~~

14978 ~~(6) Total solids~~

- 14979 ~~(7) General inorganic and organic chemical characteristics~~
- 14980 ~~(8) Additional parameters as required by the division.~~
- 14981 ~~c. Description of the pilot plant study methods and work to be done.~~
- 14982 ~~3. The pilot plant or in-plant demonstration study shall be conducted over a sufficient time~~
- 14983 ~~to treat all expected raw water conditions throughout the year. The pilot plant filter shall~~
- 14984 ~~be of a similar type and operated in the same manner as proposed for full-scale operation.~~
- 14985 ~~The following items, as a minimum, shall be addressed:~~
- 14986 ~~a. Chemical mixing conditions including shear gradients and detention periods.~~
- 14987 ~~b. Chemical feed rates.~~
- 14988 ~~c. Use of various coagulant and filtration aids including polymers.~~
- 14989 ~~d. Flocculation conditions and contact time necessary for optimum filtration for each~~
- 14990 ~~coagulant proposed.~~
- 14991 ~~e. Filtration rates.~~
- 14992 ~~f. Filter gradation, types of media, and depth of media.~~
- 14993 ~~g. Filter breakthrough conditions and backwash requirements.~~
- 14994 ~~4. Final engineering report. A final report including the engineer's design recommendation~~
- 14995 ~~shall be prepared and submitted prior to the submission of plans and specifications.~~
- 14996 ~~5. Treatment facilities.~~
- 14997 ~~a. Flash mixing and flocculation. The design shall be based on the results of the pilot~~
- 14998 ~~plant or in-plant demonstration study and the requirements in 12VAC5-590-870 C and~~
- 14999 ~~D.~~

15000 ~~b. Filtration. Filters shall be dualmedia or multimedia gravity filters. The final design~~
15001 ~~shall be based on the results of the pilot plant or in-plant demonstration study and the~~
15002 ~~requirements in 12VAC5-590-890. Turbidity at the sand-coal interface of each filter~~
15003 ~~shall be monitored by indicating and recording equipment.~~

15004 ~~6. Plant siting. The plant design should allow for the future installation of sedimentation~~
15005 ~~basing.~~

15006 ~~F. Rapid rate pressure filters.~~

15007 ~~The use of these filters may be considered for iron and manganese and other clarification~~
15008 ~~processes. Pressure filters shall not be used in the filtration of polluted water, water from surface~~
15009 ~~water sources, groundwater under the direct influence of surface water, or following lime-soda~~
15010 ~~softening.~~

15011 ~~1. Minimum criteria relative to number, rate of filtration, structural details and hydraulics,~~
15012 ~~filter media, etc. provided for rapid rate gravity filters also apply to pressure filters where~~
15013 ~~appropriate.~~

15014 ~~2. The normal rate of filtration shall be 3 gpm/ft² of filter area.~~

15015 ~~3. The filters shall be designed to provide:~~

15016 ~~a. Loss of head gauges on the inlet and outlet pipes of each filter;~~

15017 ~~b. An easily readable meter or flow indicator on each battery of filters. A flow indicator~~
15018 ~~is recommended for each filtering unit;~~

15019 ~~c. Filtration and backwashing of each filter individually with an arrangement of piping~~
15020 ~~as simple as possible to accomplish these purposes;~~

15021 ~~d. Minimum sidewall shell height of five feet. A corresponding reduction in sidewall~~
15022 ~~height is acceptable where proprietary bottoms permit reduction of the gravel depth;~~

- 15023 e. ~~The top of the washwater collection trough to be at least 18 inches above the surface~~
15024 ~~of sand;~~
- 15025 f. ~~The underdrain system to collect efficiently the filtered water and to distribute the~~
15026 ~~backwash water at a rate not less than 15 gpm/ft² of filter area;~~
- 15027 g. ~~Location of flow indicators and controls that is easily readable while operating the~~
15028 ~~control valves;~~
- 15029 h. ~~Air release valve on the highest point of each filter;~~
- 15030 i. ~~Accessible manhole to facilitate inspections and repairs;~~
- 15031 j. ~~Means to observe the wastewater during backwashing; and~~
- 15032 k. ~~Construction to prevent cross connection.~~

15033 **12VAC5-590-881. Slow sand filtration.**

15034 A. Slow sand filters shall be approved only after a pilot study demonstrates that the water
15035 supply contains sufficient nutrients for use of this treatment technology.

15036 B. At least two filters shall be provided. In all cases, the filters shall be capable of meeting the
15037 design maximum daily water demand with one filter out of service.

15038 C. Sand shall be clean silica sand that meets the following criteria:

15039 1. The effective size shall be between 0.15 mm and 0.35 mm;

15040 2. The uniformity coefficient shall not exceed 2.5; and

15041 3. The sand depth shall not exceed 55 inches. A minimum depth of 30 inches is required
15042 for normal operation.

15043 D. Supporting media gravel shall meet the requirements of 12VAC5-590-874 F.

15044 E. Structural details.

- 15045 1. All slow sand filters shall be covered.
- 15046 2. Sufficient head room shall be provided for normal movement on the filter by operating
15047 personnel for periodic sand removal operations.
- 15048 3. Adequate manholes and access ports shall be provided for moving sand off and onto
15049 the filter.
- 15050 4. There shall be no common wall between the finished water and any water of lesser
15051 quality.
- 15052 5. All filters shall be protected from freezing.

15053 F. General design requirements.

- 15054 1. Filter to waste shall be provided for all slow sand filters.
- 15055 2. Water entering the filter shall be distributed in a manner so that the surface of the filter
15056 shall not be disturbed in any way.
- 15057 3. The nominal rate of filtration range shall be from 45 - 150 gpd/ft² (0.031 - 0.10 gpm/ft²)
15058 of sand area.
- 15059 4. The minimum depth of water over the filters shall be three feet. The maximum depth of
15060 water over the filters shall not exceed five feet. An overflow capable of handling the
15061 maximum flow to the filter shall be provided at the maximum filter water level.
- 15062 5. Underdrains shall be provided to assure an even rate of filtration across the filter
15063 surface. The maximum velocity of water in the lateral underdrains shall be 0.75 ft/sec. The
15064 underdrain spacing shall not exceed three feet.
- 15065 6. Each filter shall be capable of being filled with water from the bottom up.
- 15066 7. Each filter shall be equipped with: a loss-of-head gauge; a rate-of-flow control device
15067 such as an orifice, weir, or butterfly valve; a weir or effluent pipe designed to assure that

15068 the water level over the filter never drops below the sand surface; and filtered water
15069 sample taps.

15070 8. Monitoring, indicating, and recording turbidimeters meeting the requirements of
15071 12VAC5-590-770 B shall be provided for:

15072 a. The source water;

15073 b. The filter effluent from each filter unit; and

15074 c. The CFE.

15075 9. The filters shall be designed to operate to waste after scraping or replacement of the
15076 sand, until the ripening process is complete and the turbidity meets the requirements of
15077 12VAC5-590-395 A 2 b (3).

15078 **12VAC5-590-882. Membrane filtration.**

15079 A. Applicability. This section pertains to the use of membrane filtration as follows:

15080 1. For pathogen and turbidity log removal credits in accordance with Table 500.1 in 12VAC5-
15081 590-500, the use of MF and UF are allowed.

15082 2. For softening, TDS removal, organics removal, and other treatment purposes, RO and
15083 NF are allowed in accordance with 12VAC5-590-680 G.

15084 B. Membrane filtration systems shall meet all requirements contained in 12VAC5-590-401 E
15085 6 b to be granted removal credit for Giardia lamblia and Cryptosporidium.

15086 C. A demonstration study shall be conducted on the water to be treated before the installation
15087 of a membrane filtration system unless the owner can demonstrate to the satisfaction of the
15088 commissioner that the source water quality range over all four seasons of a year will be
15089 adequately treated by the proposed design.

15090 D. All membrane treatment units for pathogen and turbidity removal shall employ MF or UF
15091 using hollow fiber, positive pressure-driven membrane filtration technology. They may employ
15092 either an inside-to-outside or outside-to-inside flow direction.

15093 E. The number of membrane units shall be a function of the overall treatment facility capacity,
15094 waterworks capacity, and water demand. Multiple membrane units shall be provided where the
15095 treatment facility design capacity exceeds 0.5 MGD.

15096 F. Approved materials and chemicals.

15097 1. All membrane materials, associated piping, and other components in contact with the
15098 water shall be in accordance with 12VAC5-590-810.

15099 2. Chemicals used in any membrane cleaning process shall be in accordance with
15100 12VAC5-590-515.

15101 G. Turbidity monitoring. Continuous indicating and recording equipment meeting the
15102 requirements of 12VAC5-590-770 B shall be provided for the following locations:

15103 1. Source water;

15104 2. Pretreated water, such as by coagulation, flocculation, and sedimentation (if
15105 applicable);

15106 3. Filtrate from each membrane unit; and

15107 4. Combined filter effluent, where more than one membrane unit is installed.

15108 H. Indicating and recording equipment for entry point chlorine residual monitoring shall be
15109 provided. Indicating and recording equipment for filtered water temperature monitoring shall be
15110 provided.

15111 I. Pressure monitoring;

- 15112 1. Indicating equipment shall be provided for monitoring the pressure drop across any
15113 prefilter.
- 15114 2. Indicating and recording equipment shall be provided for monitoring the pressure drop
15115 across membrane modules, i.e., transmembrane pressure.
- 15116 3. Integrity monitoring. Indicating and recording equipment for direct integrity test
15117 monitoring shall be provided and shall document the date, time, and results of every test
15118 performed on each unit.
- 15119 J. Flow measurement. Equipment shall be provided for measuring or calculating the following
15120 flows:
- 15121 1. Source water, gpm and totalized;
- 15122 2. Filtrate from each unit, gpm and totalized;
- 15123 3. Flux from each unit, gpd/sf;
- 15124 4. Recirculation to each unit, gpd or percent of feed flow, if applicable;
- 15125 5. Entry point, gpm and totalized; and
- 15126 6. Waste.
- 15127 K. An alarm system shall be provided that will report alarm conditions and shut down the
15128 treatment plant and entry point flow as necessary.
- 15129 1. All alarms shall be reported to a location manned 24 hours per day or to a person on-
15130 call and shall report alarm conditions audio-visually at the water treatment plant.
- 15131 2. At a minimum, the following points shall be monitored by the alarm system. Alarm and
15132 shut down set point conditions will be determined by the commissioner on an individual
15133 basis.
- 15134 a. Feed water flow:

- 15135 b. Feed water turbidity, if required by the commissioner;
- 15136 c. Filtrate turbidity from each unit exceeding operational control criteria;
- 15137 d. Membrane direct integrity test initiation, failure, and exceeding operational control
- 15138 criteria; and
- 15139 e. Entry point disinfectant residual.
- 15140 L. Sample taps shall be provided to monitor the following:
- 15141 1. Source water;
- 15142 2. Source water storage tank effluent;
- 15143 3. Feed water after prefiltration;
- 15144 4. Filtrate from each membrane unit;
- 15145 5. Combined filtrate from all units;
- 15146 6. Entry point; and
- 15147 7. Additional sample taps to monitor the presence of cleaning solutions used in either the
- 15148 backwash or cleaning operations.
- 15149 M. Equipment shall be provided, using variable frequency drive or other suitable means, to
- 15150 adjust the feed pump output in order not to exceed the design flux in the event modules are taken
- 15151 off line.
- 15152 N. Pressure gauges.
- 15153 1. A portable, pocket-type pressure gauge, of the correct range and accuracy for the
- 15154 application and with the capability of being calibrated, shall be provided to check the
- 15155 pressure readings of the pressure transducers installed on the membrane units.

15156 2. At each location of a pressure transducer, a 1/4-inch diameter pressure gauge with
15157 American National Standard Taper Threads (NPT) connection shall be provided to
15158 facilitate the connection of a portable, pocket-type test gauge.

15159 O. Clean-in-place systems, including tanks, piping, all joints, and valves shall be compatible
15160 with the cleaning solution and shall be corrosion resistant.

15161 P. An operation and maintenance manual shall be provided for all membrane filtration
15162 treatment units. The operation and maintenance manual shall include the following:

15163 1. A maintenance schedule for each piece of equipment.

15164 2. Operation procedures, including software user instructions.

15165 3. A troubleshooting guide.

15166 4. Identification of specific proprietary equipment or software not available to the owner or
15167 operator.

15168 5. A service call number.

15169 6. DIT requirements.

15170 7. Chemical cleaning instructions.

15171 8. A detailed description of the treatment units and the control of each unit for optimal
15172 performance.

15173 Q. A means shall be provided to isolate a compromised module or fiber or both. A means to
15174 visually inspect modules while simultaneously conducting the DIT shall be provided. Alternatively,
15175 sonic testing equipment that provides a relative accelerometer reading shall be provided where
15176 visual inspection cannot be performed.

15177

15178 _____

15179 **12VAC5-590-883. Bag and cartridge filtration.**

15180 A. Bag or cartridge filtration shall be limited to treating either a surface water source or a GUDI
15181 source or both with low turbidity.

15182 B. A pilot plant study shall be conducted on the water to be treated before the installation of a
15183 bag or cartridge filter system.

15184 C. Bag and cartridge filtration systems shall be granted removal credit for Giardia lamblia and
15185 Cryptosporidium in accordance with 12VAC5-590-401 E 6 a, provided that they meet the
15186 requirements of this section.

15187 D. General design requirements.

15188 1. All system components such as housing, bags, cartridges, gaskets, O-rings, and other
15189 components in contact with water shall be in accordance with [12VAC5-590-810](#). All
15190 cartridge filter housing shall be certified by the ASME certification program, or equivalent,
15191 for pressure vessels, and stamped with the appropriate certification mark.

15192 2. Indicating and recording turbidimeters meeting requirements of [12VAC5-590-770 B](#)
15193 shall be provided for the source water and the CFE. The commissioner may require
15194 indicating and recording effluent turbidimeters for each filter unit.

15195 3. The maximum flux rate across the final filter shall not exceed 0.2 gpm/ft².

15196 4. Maximum differential pressure across the cartridge filter shall not exceed 20 psi.

15197 5. Pressure gauges and sampling taps shall be provided before and after each bag or
15198 cartridge filter.

15199 6. Provisions to accomplish filter-to-waste shall be provided.

15200 7. Automatic start-up of bag or cartridge filters is prohibited.

15201 8. An alarm system shall be provided that will report alarm conditions and shut down the
15202 treatment plant and entry point flow.

15203 a. All alarms shall be reported to a location manned 24 hours per day or to a person
15204 on-call and shall report alarm conditions audio-visually at the water treatment plant.

15205 b. The following shall be monitored by the alarm system:

15206 (1) Source water turbidity;

15207 (2) Feed water flow;

15208 (3) If applicable, filtrate turbidity from each unit exceeding operational control criteria;

15209 (4) Combined filter effluent turbidity exceeding operational control criteria;

15210 (5) Differential pressure at each unit; and

15211 (6) Entry point disinfectant residual.

15212 9. At least two filtering units shall be provided at plants having a rated capacity of greater
15213 than 100 gpm.

15214 E. Operation and maintenance documents shall be provided for all bag or cartridge filter units
15215 and shall include:

15216 1. Detailed description of the bag or cartridge treatment units and the control of each unit
15217 for optimal performance.

15218 2. Procedural criteria (such as pressure differential, turbidity, and other parameters) and
15219 expected frequency of bag or cartridge filter replacement.

15220 3. A preventative maintenance schedule.

15221 4. Manual adjustment and override procedures for any automatic control features.

15222 5. Troubleshooting guide for typical problems.

15223 F. The owner shall require the equipment manufacturer to provide onsite start-up and follow-
15224 up training.

15225 **12VAC5-590-890. High rate treatment processes. (Repealed.)**

15226 A. General.

15227 High rate treatment processes are characterized by:

15228 1. Precise coagulation control;

15229 2. Turbidity monitoring throughout the process;

15230 3. pH monitoring throughout the process;

15231 4. Reduced flocculation time;

15232 5. Reduced sedimentation time;

15233 6. Use of multimedia filters incorporating anthracite and silica or other types of filter
15234 materials; and

15235 7. Filter rates greater than two gallons per minute per square foot of filter area and not
15236 exceeding four gallons per minute per square foot of filter area.

15237 B. Instrumentation.

15238 1. The coagulation process shall be controlled by:

15239 a. Zeta potential shall be measured by microelectrophoresis;

15240 b. Dual pilot filters shall be required. The pilot filter shall consist of a small filter (about
15241 six inches in diameter) containing the same type and depth of media as the plant filters,
15242 and which is operated in the same manner as the larger plant units except that the
15243 plant raw water after the treatment chemicals have been added rather than the
15244 coagulated and settled water is applied to the pilot filter. The pilot filter shall be

15245 ~~equipped with recording turbidimeters on the effluent to measure the filterability of the~~
15246 ~~water as reflected by turbidity monitoring. Departures from these standards using~~
15247 ~~proprietary pilot filters may be considered;~~

15248 ~~c. Streaming current monitor—a continuous sampling instrument which measures the~~
15249 ~~electric current generated when water flows past suspended particles contained in the~~
15250 ~~water; and~~

15251 ~~d. In addition to one of the above devices, a multiple six-gang stirring machine for~~
15252 ~~performing jar tests shall be provided.~~

15253 ~~2. Indicating and recording turbidity monitoring shall be provided for monitoring the~~
15254 ~~turbidity of:~~

15255 ~~a. The raw water;~~

15256 ~~b. Settled water from each sedimentation basin;~~

15257 ~~c. Filter effluent from each filter; and~~

15258 ~~d. Finished water leaving the treatment plant.~~

15259 ~~3. Indicating and recording pH monitoring equipment shall be provided for monitoring:~~

15260 ~~a. The raw water;~~

15261 ~~b. The flash mix effluent; and~~

15262 ~~c. The finished water leaving the treatment plant.~~

15263 ~~C. Unit processes.~~

15264 ~~1. Flash mix facilities shall conform with 12VAC5-590-870 C.~~

15265 ~~2. Flocculation design shall comply with 12VAC5-590-870 D, except the minimum~~
15266 ~~detention time shall be 20 minutes.~~

15267 3. ~~Sedimentation design shall comply with 12VAC5-590-870 E, except the minimum~~
15268 ~~effective detention time shall be three hours.~~

15269 4. ~~Filtration.~~

15270 a. ~~The maximum rate of filtration shall not exceed four gallons per minute per square~~
15271 ~~foot of filter area.~~

15272 b. ~~Number of filter units. At least two units shall be provided at plants having a rated~~
15273 ~~capacity less than two million gallons per day. The total number of filters necessary at~~
15274 ~~plants having a rated capacity equal to or greater than two million gallons per day may~~
15275 ~~be estimated using the following formula:~~

15276
$$N = 1.35 (Q)^{0.5}$$

15277 ~~(Based upon the formula as per Morrell and Wallace from Hardenbergh and Redie's~~
15278 ~~"WATER SUPPLY AND WASTE DISPOSAL 1960" and modified for the high rate~~
15279 ~~process).~~

15280 ~~Where N equals the number of filter units, Q equals the plant capacity in million gallons~~
15281 ~~per day.~~

15282 c. ~~Filters incorporated in the high rate treatment process shall be of the dual media or~~
15283 ~~multimedia type. The media shall consist of anthracite, silica sand, or other suitable~~
15284 ~~filter materials. Both dual media and mixed media filters will be considered. Since filters~~
15285 ~~media designs utilized in the high rate treatment process are generally proprietary in~~
15286 ~~nature, no attempt will be made to set standards for the minimum filter media depth,~~
15287 ~~the effective size and uniformity coefficient of the filter media, or the specific gravity.~~
15288 ~~However, beds having a minimum total depth of 27 inches of filter media with a~~
15289 ~~minimum of 10 inches of fine sand will be considered. Other proposals for high rate~~
15290 ~~processes shall be considered individually by the division.~~

- 15291 ~~d. Structural details and hydraulics -- see 12VAC5-590-880 A 4.~~
- 15292 ~~e. Washwater trough -- see 12VAC5-590-880 A 5.~~
- 15293 ~~f. Filter bottoms and strainers -- see 12VAC5-590-880 A 7.~~
- 15294 ~~g. Surface wash -- see 12VAC5-590-880 A 8.~~
- 15295 ~~h. Appurtenances -- see 12VAC5-590-880 A 9.~~
- 15296 ~~i. Backwash -- see 12VAC5-590-880 A 10.~~
- 15297 ~~j. Miscellaneous -- see 12VAC5-590-880 A 11.~~
- 15298 ~~5. Chemical application.~~
- 15299 ~~a. Suitable equipment for application of filter aids (polymers) to the influent of the filters~~
- 15300 ~~shall be provided.~~
- 15301 ~~b. See 12VAC5-590-860.~~
- 15302 **12VAC5-590-895. Pre-engineered package treatment units.**
- 15303 A. Pre-engineered package treatment units are defined as pre-designed, factory built, and
- 15304 transported virtually assembled to the operation site. The provisions of [12VAC5-590-290](#) shall
- 15305 apply.
- 15306 B. General design considerations.
- 15307 1. A rapid mix unit process shall be provided. The design shall meet requirements of
- 15308 12VAC5-590-871 A.
- 15309 2. Flocculation units shall meet requirements of 12VAC5-590-871 B or as identified and
- 15310 justified in the approved PER.
- 15311 3. Sedimentation units shall meet requirements of 12VAC5-590-872 or as identified and
- 15312 justified in the approved PER.

15313 4. Filters shall be dual media or multimedia gravity filters. Design of filtration units shall
15314 meet the requirements of 12VAC5-590-874 or as identified and justified in the approved
15315 PER.

15316 5. Indicating and recording turbidimeters meeting requirements of [12VAC5-590-770 B](#)
15317 shall be provided for the:

15318 a. source water;

15319 b. applied water to each filter;

15320 c. filter effluent from each filter; and

15321 d. CFE.

15322 6. Sufficient overflows and drains shall be provided to maintain a maximum water level
15323 within the plant, including the depth of water over the filters, and to facilitate complete
15324 draining of the package unit.

15325 7. Where automatic unit process control is provided, operator adjustment of chemical feed
15326 rates, times, and sequences shall be provided as well as a manual override of all automatic
15327 features.

15328 a. Automatic start-up of water treatment unit processes is prohibited.

15329 b. Valve actuators shall be provided with manual override capability.

15330 8. Treatment units installed at ground level shall be provided with stairways, walkways, or
15331 other suitable means to allow access for operation and maintenance and observation of
15332 all treatment process units. Filters shall be adequately accessible to facilitate evaluation
15333 of the entire filter bed for media condition and placement, fluidization during backwashing,
15334 and evaluation of compaction during filtration.

15335 C. An operation and maintenance manual shall be provided for all pre-engineered package
15336 treatment units. The operation and maintenance manual shall include the following:

15337 1. A detailed description of the treatment units and the control of each unit for optimal
15338 performance.

15339 2. A preventative maintenance schedule.

15340 3. Manual adjustment and override procedures for any automatic control features.

15341 4. A troubleshooting guide for typical problems.

15342 **12VAC5-590-900. Softening Cation exchange softening.**

15343 ~~Softening shall not be used as the sole treatment method for surface waters or~~
15344 ~~bacteriologically contaminated groundwater. The softening process design selected shall be~~
15345 ~~based upon the mineral qualities of the raw source water and the desired finished water quality~~
15346 ~~in conjunction with requirements for disposal of sludge or brine water, cost of the plant, cost of~~
15347 ~~the chemicals, and the plant location.~~

15348 ~~A. Lime, excess lime, and excess lime soda processes. The applicable design standards for~~
15349 ~~mixing, flocculation, and sedimentation are the same for the lime, excess lime, and excess lime~~
15350 ~~soda processes as for conventional clarification except that the minimum flash mix time is five~~
15351 ~~minutes, flocculation time is 40 minutes, and settling time is two hours. Where softening is~~
15352 ~~included as a treatment process in conjunction with clarification, the greater detention time criteria~~
15353 ~~shall govern. For criteria pertaining to softening with solids contact units, see [12VAC5-590-870](#)~~

15354 ~~F.~~

15355 ~~1. Mechanical sludge removal equipment shall be provided in the sedimentation basin.~~

15356 ~~2. Determinations shall be made of the CO₂ content of the raw water. When concentrations~~
15357 ~~exceed 10 milligrams per liter, the economics of removal by aeration as opposed to~~
15358 ~~removal with lime should be considered.~~

15359 ~~3. Equipment for stabilization of water softened by the excess lime and excess lime-soda~~
15360 ~~processes is required.~~

15361 ~~4. Staging shall be considered when the excess lime-soda process is employed.~~

15362 ~~5. Provision shall be included for proper disposal of softening sludges.~~

15363 ~~6. The use of excess lime shall not be considered an acceptable substitution for~~
15364 ~~chlorination.~~

15365 ~~B. Cation exchange process.~~

15366 ~~A. Iron, manganese, or a combination of the two, in the oxidized state or unoxidized state,~~
15367 ~~should shall not exceed 0.3 milligrams per liter mg/L in the water as applied to the ion cation~~
15368 ~~exchange material. Pretreatment shall should be required when the content of iron, manganese,~~
15369 ~~or a combination of the two, is one milligram per liter 1.0 mg/L or more.~~

15370 ~~1. B. The units may shall be of pressure or gravity type, or of either an upflow or downflow~~
15371 ~~design, using automatic or manual regeneration. Automatic regeneration is suggested~~
15372 ~~recommended for small plants.~~

15373 ~~2. C. The design capacity for hardness removal should shall not exceed 20,000 grains per~~
15374 ~~cubic foot grains/ft³ when the resin is regenerated with 0.3 pounds of salt per kilograin of hardness~~
15375 ~~removed.~~

15376 ~~3. D. The depth of the cation exchange material should shall not be less than three feet.~~

15377 4. ~~E.~~ The hydraulic loading rate of softening should not exceed ~~seven gallons per square foot~~
15378 ~~per minute~~ 7 gpm/ft² and the backwash rate should be ~~six to eight gallons per square foot per~~
15379 ~~minute~~ 6 - 8 gpm/ft².

15380 5. ~~F.~~ The freeboard shall depend upon the specific gravity of the media and the direction of
15381 the water flow.

15382 6. ~~G.~~ The bottoms, strainer systems, and support for the cation exchange material shall
15383 conform to criteria provided for rapid rate gravity filters; see also 12VAC5-590-874.

15384 7. ~~H.~~ Facilities shall be included for even distribution of brine over the entire surface of both
15385 upflow and downflow units. Backwash, rinse, and air relief discharge pipes shall be installed in
15386 ~~such~~ a manner as to prevent any possibility of backsiphonage.

15387 8. ~~I.~~ A bypass shall be provided around ~~softening~~ the cation exchange units to produce a
15388 blended water of desirable hardness. Meters shall be installed to measure total water delivered
15389 to the distribution system and on each softener unit. An automatic proportioning or regulating
15390 device and shutoff valve should be provided on the bypass line. In some installations, it may be
15391 necessary to treat the bypassed water to obtain acceptable levels of iron and manganese in the
15392 finished water.

15393 9. ~~J.~~ Waters having turbidity of five units NTUs or more ~~turbidity~~ shall not be applied directly
15394 to the cation exchange softener. Silica gel materials should be used for water having a pH above
15395 8.4 and should not be used when iron is present. When the applied water contains a chlorine
15396 residual, the cation exchange material shall be a type that is not damaged by the chlorine residual
15397 ~~chlorine~~. Phenolic resin shall not be used.

15398 10. ~~K.~~ ~~Smooth nose sampling~~ Sampling taps shall be provided for the collection of
15399 representative samples for both bacteriological and chemical analyses. The taps shall be located
15400 to provide for sampling of the softener influent, softener effluent, and the blended water. The

15401 sampling taps for the blended water shall be at least 20 ~~feet~~ ft downstream from the point of
15402 blending.

15403 11. L. Brine measuring or ~~salt-dissolving~~ salt-dissolving tanks and wet salt storage facilities
15404 shall be covered. The makeup water inlet shall have a free fall discharge of two pipe diameters
15405 but not less than two inches above the maximum liquid level of the unit or be protected from
15406 backsiphonage. Water for filling the tank should be distributed over the entire surface by pipes
15407 above the maximum brine level in the tank. The salt shall be supported on graduated layers of
15408 gravel under which is a suitable means of collecting the brine. Wet salt storage basins must be
15409 equipped with manhole or hatchway openings having raised curbs and watertight covers ~~having~~
15410 with overhanging edges similar to those required for finished water reservoirs. Overflows, where
15411 provided, shall be turned down, have a proper free fall discharge and be protected with
15412 noncorrodible screens or self-closing flap valves.

15413 12. M. Wet salt storage basins shall have sufficient capacity to store at least a 30-day ~~30-~~
15414 day operating supply.

15415 13. N. Stabilization of the finished water for corrosion control ~~shall be provided~~ shall be
15416 considered.

15417 14. O. Suitable disposal must be provided for the brine waste.

15418 15. P. Pipes and contact materials shall be resistant to the aggressiveness of the salt.

15419 16. ~~Salt storage tanks and feed equipment should be enclosed and separated from other~~
15420 ~~operating areas in order to prevent damage to equipment.~~

15421 **12VAC5-590-910. Aeration. (Also see 12VAC5-590-970.)**

15422 A. Aeration treatment ~~devices as described herein may be used~~ is acceptable for oxidation,
15423 separation of gases, or for taste and odor control. General design requirements include the
15424 following:

15425 A. Natural draft aeration.

15426 The design of natural draft aeration shall provide the following:

15427 1. The water shall be distributed uniformly onto the top tray;

15428 2. The water shall be discharged through a series of three or more trays with the
15429 separation of trays not less than six inches;

15430 3. The trays shall be loaded at a rate ranging from one gallon per minute to five gallons
15431 per minute for each square foot of total tray area;

15432 4. The trays shall have slotted, woven wire cloth, or perforated bottoms;

15433 5. The perforations shall be $\frac{3}{16}$ to $\frac{1}{2}$ inches in diameter and spaced one to three inches
15434 on centers when perforations are used;

15435 6. Eight to 12 inches of inert media shall be used, such as coke or limestone which shall
15436 be two to six inches in size, and will not readily disintegrate due to freezing cycles;

15437 7. The aerated water shall receive disinfection treatment; and

15438 8. The trays shall be designed using materials resisting deterioration with consideration
15439 being given to corrosion, slime, and algae control.

15440 B. Forced or induced draft aeration devices shall be designed to:

15441 1. Provide an adequate liquid distribution and countercurrent of air through the enclosed
15442 aeration column;

15443 2. Be insectproof and lightproof;

15444 3. Be such that air introduced into column shall be screened through insect proof screen
15445 and be as free of dust as possible;

15446 4. Ensure that water outlet is adequately sealed to prevent unwanted loss of air; and

15447 5. ~~Ensure that the sections of the aerator can be easily reached and removed for~~
15448 ~~maintenance.~~

15449 C. ~~Pressure aeration may be used for oxidation purposes if a pilot plant study indicates the~~
15450 ~~method is applicable; it is not acceptable for removal of dissolved gases. Filters following pressure~~
15451 ~~aeration shall have adequate exhaust devices for release of air. Pressure aeration devices shall~~
15452 ~~be designed to:~~

15453 1. ~~Give thorough mixing of compressed air with the water being treated; and~~
15454 2. ~~Provide screened and filtered air, free of obnoxious fumes, dust, dirt, and other~~
15455 ~~contaminants.~~

15456 1. The aerated water shall be chlorinated following aeration.
15457 2. The equipment shall incorporate materials resistant to deterioration and corrosion, and
15458 shall be designed to eliminate the potential for fouling problems from calcium carbonate
15459 and iron precipitation, and from algae, slime, and bacteriological growth. Disinfection
15460 capability shall be provided before the aeration treatment units.

15461 3. The equipment shall be easily accessed and serviced.

15462 4. The air introduced into the treatment units shall be filtered, and shall be free of insects,
15463 obnoxious fumes, dust, dirt, and other contaminants. If blowers are located inside a
15464 building, then the air intakes shall extend to the outside and be furnished with appropriate
15465 air filters.

15466 5. Air exhaust outlets shall be located to avoid induced contaminants, particularly at or
15467 near occupied areas or blower intakes.

15468 6. Duplicate blowers, motors, or multiple treatment units shall be required for treatment
15469 processes designed to meet the drinking water quality standards in 12VAC5-590-340.

15470 B. Natural, forced, or induced draft aeration units shall be designed to provide an adequate
15471 liquid distribution and countercurrent of air through the enclosed aeration column, and adequately
15472 seal the water outlet to prevent unwanted loss of air.

15473 C. Pressure aeration means the injection of compressed air into the water to be treated,
15474 typically for oxidation. Pressure aeration shall not be approved for removal of dissolved gases.
15475 Filters following pressure aeration shall have adequate exhaust devices for the release of air.
15476 Pressure aeration devices shall be designed to provide thorough mixing of compressed air with
15477 the water being treated.

15478 D. Packed tower aeration (air stripping) is suitable for removing VOCs, THMs, carbon dioxide,
15479 and radon.

15480 1. Justification shall be provided for the selected design parameters (e.g., height and
15481 diameter of the unit, air-to-water ratio, packing depth, surface loading rate, and other
15482 features). The design shall consider the effects of temperature change and the resulting
15483 impact in contaminant removal efficiency. Pilot plant studies may be required to
15484 substantiate the design.

15485 2. The packing material used shall be resistant to the aggressiveness of the water,
15486 dissolved gases, and cleaning materials, and shall meet requirements of 12VAC5-590-
15487 810.

15488 3. Water shall be evenly distributed at the top of the tower using spray nozzles or orifice-
15489 type distributor trays that will prevent short circuiting. A mist eliminator above the water
15490 distribution system may be required.

15491 4. A means to allow for discharge and wasting of water or chemicals used to clean the
15492 tower shall be provided.

15493 5. Sample taps shall be provided in the influent and effluent piping.

- 15494 6. The design shall prevent freezing of the influent riser and effluent piping.
- 15495 7. An overflow pipe discharging 12 - 24 inches above the ground and over a drainage inlet
- 15496 structure or splash pad shall be provided.
- 15497 8. A sufficient number of access ports with a minimum diameter of 24 inches shall be
- 15498 provided to facilitate inspection, media replacement, media cleaning, and maintenance of
- 15499 the unit interior.
- 15500 9. A positive air flow sensing device and a pressure gauge shall be installed on the air
- 15501 influent line. If the aeration unit is designed to remove a contaminant with a PMCL, then
- 15502 the positive air flow sensing device shall be an integral part of an automatic control system
- 15503 that will turn off the influent water if positive air flow is not detected.
- 15504 ~~D.E. Other methods of aeration may be used if applicable to the treatment needs. Such~~
- 15505 ~~methods include, but are not restricted to, spraying, diffused air, and mechanical aeration. The~~
- 15506 ~~treatment processes shall be designed to meet the particular needs of the water to be treated and~~
- 15507 ~~are subject to the approval of the division commissioner.~~
- 15508 ~~E. Aerators that discharge through the atmosphere should be protected from wind by being~~
- 15509 ~~placed in a louvered enclosure designed to provide easy access to the interior.~~
- 15510 ~~F. Aerators that are used for oxidation or removal of dissolved gases from waters that will be~~
- 15511 ~~given no further treatment other than chlorination shall be protected from contamination from~~
- 15512 ~~insects and birds.~~
- 15513 ~~G. Ventilation shall be provided to prevent the accumulation of released gases in the building~~
- 15514 ~~housing the treatment facilities.~~

15515 **12VAC5-590-920. Iron and manganese control.**

15516 A. Iron and manganese control, as used herein in this section, refers solely to treatment
15517 processes designed specifically for this purpose. The treatment process used will depend upon
15518 the character of the ~~raw~~-source water. The selection of one or more treatment processes shall
15519 meet specific local conditions as determined by engineering investigations, including chemical
15520 analyses of representative samples of water to be treated, and receive the approval of the ~~division~~
15521 commissioner. The commissioner may require that pilot studies be conducted.

15522 ~~It may be necessary to operate a pilot plant in order to gather all information pertinent to the~~
15523 ~~design.~~

15524 ~~A. Removal~~ B. Iron and manganese removal by oxidation, ~~detention,~~ and filtration.

15525 1. ~~Oxidation may be by aeration or by chemical oxidation with~~ shall be accomplished by
15526 aeration, or by chemicals such as chlorine ~~or,~~ potassium permanganate, sodium
15527 permanganate, or a combination thereof.

15528 ~~2. A minimum detention of 30 minutes shall be provided following oxidation by aeration in~~
15529 ~~order to insure that the oxidation reactions are as complete as possible. This minimum~~
15530 ~~detention time shall be reduced only when a pilot plant using the water under study~~
15531 ~~demonstrates a lesser detention time. The detention basin shall be designed as a holding~~
15532 ~~tank with no provision for sludge collection but with sufficient baffling to prevent short~~
15533 ~~circuiting. Sedimentation basins shall be provided when treating water with high iron or~~
15534 ~~manganese content or where chemical coagulation is used to reduce the load on the~~
15535 ~~filters. The detention time shall be in a range of one to four hours where sedimentation is~~
15536 ~~necessary prior to filtration. Pilot studies should be made of the water to determine the~~
15537 ~~necessary detention time.~~

15538 3. ~~Filtration – see 12VAC5-590-880.~~

15539 ~~B. Removal by lime-soda process – see 12VAC5-590-900 A.~~

15540 2. The design shall consider:

15541 a. pH adjustment to promote rapid oxidation;

15542 b. A pre-settling tank located ahead of the filters to remove oxidized iron and increase
15543 filter run times;

15544 c. A manganese-oxide coating on the filter media, such as manganese greensand.
15545 The total depth of media shall not be less than 30 inches. Media shall have an effective
15546 size from 0.3 - 0.35 mm and a uniformity coefficient of no more than 1.6. Following
15547 initial placement of the media, care shall be taken to remove fines by backwashing
15548 and skimming the surface; and

15549 d. An anthracite cap layer over the manganese-oxide coated media, having a depth of
15550 6 – 18 inches.

15551 3. Aeration shall be designed in accordance with 12VAC5-590-910.

15552 4. Flow proportional chemical feeders shall be provided, and the feed rate shall be
15553 adequately controlled by using feeders that are paced by water meters to prevent an over-
15554 dosage of chemical. A flow switch in place of a flow proportional feeder may be
15555 permissible.

15556 5. Sample taps shall be provided before the application of the oxidant, immediately ahead
15557 of filtration, and at the filter effluent.

15558 6. Pressure filters shall include provisions for:

15559 a. Pressure gauges on the inlet and outlet pipes of each filter, or a differential pressure
15560 gauge on each filter;

- 15561 b. An easily readable meter or flow indicator on each battery of filters. A flow indicator
15562 is recommended for each filtering unit;
- 15563 c. Filtration, backwashing, and filter-to-waste of each filter individually:
- 15564 (1) Backwash water shall be evenly distributed in an adequate quantity to achieve at
15565 least a 30% media bed expansion during backwashing. The backwash rate shall be
15566 based on the media.
- 15567 (2) The top of the backwash water collection trough shall be at least 18 inches above
15568 the media surface;
- 15569 (3) An underdrain system to efficiently collect the filtered water and to distribute an
15570 adequate quantity of backwash water to achieve at least a 30% media bed expansion
15571 during backwashing;
- 15572 d. Flow indicators and controls are located so that they are easily readable while
15573 operating the control valves;
- 15574 e. An air release valve on the highest point of each filter;
- 15575 f. An accessible manhole to facilitate inspections and repairs for filters greater than 36
15576 inches in diameter;
- 15577 g. A means to observe the wastewater during backwashing; and
- 15578 h. Construction to prevent cross-connection.

15579 ~~C. Removal by units using continuous potassium permanganate regeneration.~~

- 15580 ~~1. This process consists of a continuous feed of potassium permanganate to the influent~~
15581 ~~of a manganese greensand filter. Positive displacement type feeders shall be provided,~~
15582 ~~and the feed rate shall be adequately controlled by using feeders which are paced by~~

15583 water meters or ratio type feeders (which are a combination type feeder and flow meter)
15584 to prevent an overdosage of potassium permanganate.

15585 1. The permanganate shall be applied following pH affecting chemicals.
15586 2. Other oxidizing agents or processes such as chlorination or aeration may be used prior
15587 to the permanganate feed to reduce the cost of the chemical.

15588 3. The normal filtration rate is three gallons per minute per square foot. Lower filtration
15589 rates may be required or higher filtration rates may be permitted if justified by field studies
15590 and approved by the division

15591 4. The normal wash rate is eight to 12 gallons per minute per square foot.
15592 5. Air washing may be provided.
15593 6. Sample taps shall be provided.

15594 a. Prior to application of permanganate;
15595 b. Immediately ahead of filtration;
15596 c. At a point between the anthracite coal media and the manganese treated
15597 greensand;
15598 d. Halfway down the manganese treated greensand; and
15599 e. For filter effluent.

15600 D. Removal by ion exchange. This process of iron and manganese removal may not be
15601 acceptable for waters containing high concentrations (more than 1.0 milligrams per liter) of iron,
15602 manganese, or combination thereof. Applications may be limited based on the media used. This
15603 process may not be acceptable where either the raw water or wash water contains dissolved
15604 oxygen. (See 12VAC5-590-900 B for general cation exchange information.)

15605 C. Iron and manganese removal by ion exchange shall only be approved for removing low
15606 concentrations (less than 0.5 mg/L) of combined iron and manganese. The commissioner may
15607 require pilot studies be conducted to determine post-exchange pH/alkalinity adjustment. See
15608 12VAC5-590-900 for general ion exchange design requirements.

15609 ~~E. D.~~ Sequestering – see 12VAC5-590-950 E iron and manganese.

15610 1. Sequestration with polyphosphates shall be considered for polishing filtered water;
15611 however, it shall not be used where the residual iron, manganese, or combination thereof
15612 exceeds 1.0 mg/L.

15613 2. Phosphate feed rates shall be determined by the product manufacturer and shall not
15614 exceed 10 mg/L.

15615 3. Feed equipment shall be in accordance with the requirements of 12VAC5-590-860.

15616 4. Stock phosphate solution shall be disinfected in accordance with the manufacturer's
15617 recommendations unless the phosphate solution is fed directly from the covered shipping
15618 container.

15619 5. Sodium silicate or other silicate-based chemicals for the sequestration of iron and
15620 manganese shall be approved by the commissioner on an individual basis. Operational
15621 data from actual full-scale facilities treating waters of similar quality or pilot tests may be
15622 required.

15623 ~~F. E.~~ Sampling taps shall be provided for control purposes. Taps shall be located on each raw
15624 source water source, each treatment unit influent, and each treatment unit effluent.

15625 ~~G. Testing equipment shall be provided for all plants~~ F. Iron and manganese testing equipment
15626 shall be provided. The Iron testing equipment shall have the capacity to accurately measure the
15627 iron content to a minimum of 0.1 milligrams per liter and to indicate manganese removal. be
15628 capable of accurately measuring iron concentration as low as 0.1 mg/L. Manganese testing

15629 equipment shall be capable of accurately measuring manganese concentration as low as 0.05
15630 mg/L.

15631 G. The commissioner may approve proprietary treatment processes for the removal of iron
15632 and manganese on an individual basis. Operational data from actual full-scale facilities treating
15633 waters of similar quality or pilot tests may be required. The provisions of 12VAC5-590-290 may
15634 apply.

15635 **12VAC5-590-930. Fluoridation.**

15636 ~~Where practicable and feasible, the board may require owners of waterworks to provide~~
15637 ~~artificial fluoridation so as to bring the fluoride ion concentration to the optimum level as set forth~~
15638 ~~in Article 1 of Part II.~~

15639 A. The board recommends that all community waterworks in Virginia be optimally fluoridated.
15640 ~~Prior to the issuance of a permit for fluoridation, plans, specifications, operating procedures, and~~
15641 ~~methods of supervision shall be submitted to the division. These shall be in conformity with~~
15642 ~~requirements to be determined for each individual installation by the division. Fluoridation feed~~
15643 ~~systems shall be designed to deliver the optimum fluoride ion concentration of 0.7 mg/L as~~
15644 ~~determined by the U.S. Department of Health and Human Services.~~

15645 B. Fluoride compounds. Commercial sodium fluoride, sodium silicofluoride fluorosilicate (also
15646 called sodium silicofluoride) and fluorosilicic acid (also called hydrofluorosilicic acid) shall conform
15647 to the applicable AWWA standards or NSF/ANSI Standard 60-2017, as appropriate. Use of other
15648 ~~chemicals which may be made available must be approved by the division.~~

15649 C. Fluoride compound storage. Fluoride chemicals shall be isolated from other chemicals to
15650 prevent cross contamination. Compounds shall be stored in covered or unopened shipping
15651 containers in a separate room (except sodium fluoride saturators) with the chemical feeder. The
15652 ~~room must be provided with mechanical ventilation to the outside of the building.~~

- 15653 D. Chemical feed installations.
- 15654 1. Chemical feed installations shall conform to 12VAC5-590-860.
- 15655 ~~2.1.~~ Scales and ~~loss-of-weight~~ loss-of-weight recorders for dry chemical feeders and
- 15656 hydrofluorosilicic acid feeders shall be provided.
- 15657 ~~3. Feeders~~ 2. Fluoride metering pumps shall have an accuracy so that the actual feed rate
- 15658 will be within 5.0% of the intended feed rate.
- 15659 3. The point of application shall be located to provide adequate mixing.
- 15660 4. The point of application of hydrofluorosilicic acid, if into a pipe, shall be so located as to
- 15661 provide adequate mixing.
- 15662 ~~5.4.~~ All fluoride feed lines shall be provided with adequate ~~antisiphon~~ anti-siphon devices.
- 15663 5. Design of fluoride saturators shall consider:
- 15664 a. The source water hardness. The water applied to the sodium fluoride saturator
- 15665 feeders shall be softened if the hardness exceeds 50 mg/L.
- 15666 b. The fluoride source. Use only sodium fluoride in the saturators.
- 15667 c. A flow restrictor with a maximum flow of 2.0 gpm on all upflow saturators.
- 15668 ~~6. The water applied to sodium fluoride saturator feeders shall be softened if hardness~~
- 15669 ~~exceeds 75 milligrams per liter.~~
- 15670 ~~7. Unless otherwise approved, fluoride shall be applied to the raw water with the feeder~~
- 15671 ~~paced by the raw water meter.~~
- 15672 6. Adequate fluoride feed rate control and mixing shall be provided.
- 15673 ~~8.~~ Provisions shall be made for venting ~~hydrofluorosilicic~~ fluorosilicic acid carboys to the
- 15674 outside of the building when the carboys are in use.

15675 E. Suitable protective equipment shall be provided which includes gloves, aprons, dust mask,
15676 and goggles.

15677 F. Suitable equipment shall be provided for ~~wetmopping~~ wet mopping and hosing dust that
15678 might accumulate in the plant. Dry feeders shall be equipped with bag loading hoppers.

15679 G. Equipment shall be provided for measuring the quantity of fluoride ion in the water. Testing
15680 equipment shall be colorimetric or electrode type as approved by the ~~division~~ commissioner.

15681 **12VAC5-590-940. Fluoride removal.**

15682 A. Fluoride removal may be accomplished by blending with a different quality water or by
15683 removal treatment. Where fluoride removal is required, the treatment units shall be designed to
15684 achieve a finished water fluoride concentration that is below the SMCL.

15685 ~~A.~~ B. Blending. Blended water ~~must~~ shall result in all water delivered to the distribution system
15686 being of the same quality.

15687 ~~B.~~ C. Treatment.

15688 ~~1. Chemical feed shall conform to 12VAC5-590-860.~~

15689 ~~2. 1. Treatment includes use of shall include, but not be limited to, ion exchange, activated~~
15690 ~~alumina, bone char, reverse osmosis RO, or electrodialysis. Other processes may be~~
15691 ~~utilized if they adequately defluoridate. The selected design is to shall be supported by~~
15692 ~~pilot studies; unless at least two pilot studies, or two prototype plants, have demonstrated~~
15693 ~~that the selected design is feasible. ~~Such~~ These studies or prototypes ~~should~~ shall be for~~
15694 ~~waters having characteristics similar to the water that is to be treated.~~

15695 ~~3. Raw water~~ 2. Water pH shall be adjustable to an optimum level to achieve the best
15696 fluoride removal.

15697 4. ~~3.~~ With any one unit out of service, the remaining unit or units ~~must~~ shall be capable of
15698 handling ~~peak day flows~~ treating the maximum plant flow rate.

15699 5. ~~4.~~ Filter clogging constituents such as iron having a concentration greater than 1.0
15700 milligrams per liter should mg/L shall be removed ~~prior to~~ before defluoridation fluoride
15701 removal. ~~If applicable, chlorination is to be applied after defluoridation.~~

15702 6. ~~5.~~ Test equipment ~~must~~ shall be provided and must be accurate to at least 0.1 milligrams
15703 per liter mg/L.

15704 7. ~~6.~~ An operation and maintenance (O & M) manual ~~must~~ shall be provided.

15705 **12VAC5-590-950. Stabilization Corrosion control or stabilization.**

15706 A. Water that is unstable due either to natural causes or to the treatment ~~given~~ applied to the
15707 water ~~should~~ shall be stabilized. ~~Water treated with excess lime for softening or manganese~~
15708 ~~removal shall be treated by carbon dioxide or acid.~~

15709 ~~A. Carbon dioxide addition.~~

15710 1. ~~The recarbonation chamber design should provide:~~

15711 a. ~~A detention time of three to 10~~ 20 minutes;

15712 b. ~~A depth of about eight feet; and~~

15713 c. ~~A reaction tank with a detention time of 20 minutes.~~

15714 2. ~~Adequate precautions shall be taken to prevent the possibility of carbon monoxide~~
15715 ~~entering the plant from the recarbonation and reaction chamber.~~

15716 ~~B. Sulfuric acid.~~

15717 1. ~~Feed equipment for sulfuric acid shall conform to~~ 12VAC5-590-860.

15718 2. ~~Adequate precautions shall be taken for safety.~~

15719 C. Removal of free carbon dioxide. Carbon dioxide may be removed by an alkali, following
15720 aeration. The addition of an alkali following aeration may not be necessary when the alkalinity of
15721 the aerated water is greater than 80 milligrams per liter.

15722 DB. Deposition of calcium carbonate film. The desired calcium carbonate film may be obtained
15723 by using either soda ash or caustic soda when the alkalinity of the water exceeds about 35
15724 milligrams per liter mg/L. Soft waters should be treated with lime to provide the required calcium.
15725 Soft waters ~~which~~ that also have a low carbon dioxide content may need a mixture of lime and
15726 soda ash to provide both calcium and carbonate for the calcium carbonate film.

15727 E. Polyphosphates. Polyphosphates are applicable for sequestering dissolved minerals.

15728 C. Phosphates or other corrosion inhibitors may be used for corrosion control when applied
15729 in accordance with the manufacturer's recommendations, and meeting the requirements of
15730 12VAC5-590-515. Stock phosphate solution shall be disinfected in accordance with the
15731 manufacturer's recommendations unless the phosphate solution is fed directly from the covered
15732 shipping container.

15733 1. Feed equipment shall conform to [12VAC5-590-860](#).

15734 2. Phosphate chemicals shall be food grade.

15735 3. ~~Stock phosphate solution shall be kept covered and disinfected by carrying~~
15736 ~~approximately 10 milligrams per liter chlorine residual.~~

15737 4. ~~Satisfactory chlorine residuals should be maintained in the distribution system when~~
15738 ~~phosphates are used.~~

15739 F. ~~Under some conditions, softening plants can be designed using split treatment in which~~
15740 ~~raw water is blended with softened water to partially stabilize the water. Treatment plants~~
15741 ~~designed to utilize split treatment should, in most cases, also contain facilities for further~~
15742 ~~stabilization by other means.~~

15743 ~~G. Water unstable due to biochemical action in the distribution system. Residual chlorine~~
15744 ~~throughout the distribution systems may be used to prevent corrosion due to decomposition of~~
15745 ~~organic matter (especially in dead-ended mains), the biochemical action within tubercles and the~~
15746 ~~reduction of sulfates to sulfides.~~

15747 ~~HD. Cathodic protection may be used to prevent or minimize~~ shall be acceptable for
15748 preventing or reducing corrosion of the inner surfaces of water storage tanks and standpipes and
15749 the outer surfaces surface of metal conduits pipe.

15750 ~~IE. Laboratory equipment shall be provided for determining the effectiveness of stabilization~~
15751 ~~treatment and the~~ concentration of chemicals in the treated water.

15752 **12VAC5-590-960. Taste and odor control.**

15753 ~~Tastes and odors found in water are primarily organic in nature. Since the presence of taste~~
15754 ~~and odor problems in a water supply suggests to the consumer that the water may contain~~
15755 ~~potentially toxic agents, expenditures are justified to improve the aesthetic quality of the water~~
15756 ~~and maintain the consumers' confidence in the water utility.~~

15757 ~~A. Source treatment. Taste and odor problems in raw~~ surface ~~water sources are most~~
15758 ~~frequently caused by the presence of plankton, or more specifically, algae. The treatment~~
15759 ~~methods and dosages listed below have been found effective in some applications.~~

15760 ~~4. The continuous or periodic treatment of raw water~~ source waters with copper sulfate and
15761 other copper compounds to kill algae or other growths shall be controlled to prevent a copper
15762 concentration in excess of 1.0 ~~milligrams per liter~~ mg/L, as copper, in the finished water leaving
15763 the treatment plant finished water.

15764 ~~B. Surface water aerators or diffused aeration systems shall be acceptable for de-stratifying~~
15765 ~~reservoirs, reducing or eliminating seasonal turnover, and the releasing of compounds in the~~
15766 ~~anaerobic or anoxic zones.~~

15767 C. Addition of chemical oxidants at the source water intake, in the source water pump station
15768 discharge line, at the head of the treatment plant, or within the treatment train shall be acceptable
15769 for treating tastes and odors. Effective oxidants include chlorine, chlorine dioxide, potassium
15770 permanganate, and ozone. If breakpoint chlorination is proposed, then the actual breakpoint of
15771 the water shall be determined accurately. "Breakpoint chlorination" means the addition of chlorine
15772 to water until the chlorine demand has been satisfied, chlorine and ammonia nitrogen reactions
15773 are near completion, and further additions of chlorine result in a free chlorine residual that is
15774 directly proportional to the amount of chlorine added.

15775 ~~2. The periodic treatment of the shallow areas of a reservoir with an activated carbon~~
15776 ~~dosage of 0.2 to 0.5 pounds per 1,000 square feet of water surface has been found~~
15777 ~~effective in some applications.~~

15778 ~~3. A potassium permanganate dosage from 0.4 to 4.0 milligrams per liter has been found~~
15779 ~~effective in some applications.~~

15780 ~~4. 3. Chlorine dosages that produce 0.2 to 1.0 milligrams per liter of free chlorine in the~~
15781 ~~treated water have been found effective in some applications. Prior to treatment, this~~
15782 ~~treatment method should be evaluated to determine that it will not cause any objectionable~~
15783 ~~tastes or odors in the treated water.~~

15784 ~~B. Treatment methods. The waterworks shall be designed to produce high quality water~~
15785 ~~regardless of any changes or emergencies that may arise with the raw water source. Provisions~~
15786 ~~to handle taste and odor problems should be included in all designs regardless of the anticipated~~
15787 ~~raw water quality.~~

15788 ~~1. Provisions shall be included in the design of the treatment plant to add chlorine or other~~
15789 ~~approved oxidizing chemicals at the reservoir or at the head of the treatment plant. If~~
15790 ~~breakpoint chlorination is proposed to treat taste and odor problems, extreme caution is~~

15791 warranted to insure that the actual breakpoint of the water is determined accurately.
15792 Dechlorination may be required if deemed necessary.

15793 2. Chlorine dioxide can be utilized to treat any taste and odor problems susceptible to
15794 oxidation.

15795 3. Potassium permanganate has oxidizing capabilities that can be utilized to treat taste
15796 and odor problems. It is normally fed to the raw water during the flash mix operation in a
15797 dosage such that the pink color formed during its solution travels only 1/2 to 2/3 of the
15798 length of the sedimentation basins.

15799 4. Aeration has been used successfully to treat tastes and odors attributed to volatile
15800 organic matter but has shown limited success in treating tastes and odors associated with
15801 dissolved and suspended organic matter. Aeration facilities shall be designed in
15802 accordance with the provisions of [12VAC5-590-910](#).

15803 5. When taste and odor problems are anticipated on an intermittent basis, treatment
15804 facilities shall be included in the water treatment plant design for the addition of powdered
15805 activated carbon. The dosage of powdered activated carbon required to treat taste and
15806 odor problems will vary with each individual raw water, and extensive lab work should be
15807 undertaken to ascertain that the carbon feed equipment is properly sized. The carbon feed
15808 equipment shall be capable of adding at least 40 milligrams per liter of powdered activated
15809 carbon regardless of the anticipated raw water quality. In the water treatment plant design,
15810 facilities should be provided to add powdered activated carbon to the flash mixer, to the
15811 flocculation basins, at the midpoint of sedimentation basins, and to the conduits leading
15812 to the filters.

15813 The carbon can be added as a premixed slurry, or by means of a dry feed machine as
15814 long as it is assured that the carbon is properly wetted. All mechanisms for handling dry

15815 carbon should be tightly sealed and dust collection is required on all installations. The feed
15816 machine hopper wall should be on at least a 60 degree angle to the horizontal.

15817 The carbon feed lines to the application points should be sized to handle the carbon
15818 suspension and should be equipped with flushing provisions.

15819 D. Powdered activated carbon (PAC). When taste and odor problems are anticipated on an
15820 intermittent basis, the addition of PAC shall be considered, and a pilot study shall be conducted
15821 to determine the optimum dosage. Multiple PAC feed locations shall be evaluated to provide
15822 maximum contact time, including the rapid mixer, the flocculation basins, and at the midpoint of
15823 the sedimentation basins.

15824 1. PAC shall not be applied near the point of chlorine or other oxidant application.

15825 2. Continuous agitation or re-suspension equipment shall be required to keep the PAC
15826 from depositing in the slurry/storage tank.

15827 3. All mechanisms for handling dry PAC shall be tightly sealed. Dust collection is required
15828 at all installations.

15829 4. The PAC feed lines to the application points shall be sized to handle the PAC
15830 suspension and should be equipped with flushing provisions.

15831 6. Granular activated carbon units may be used in place of filters described in [12VAC5-590-](#)
15832 [880](#) with appropriate pretreatment described in [12VAC5-590-870](#). Rates of flow shall be
15833 consistent with the type and intensity of the problem. The design of the facilities must be supported
15834 by the results of pilot plant studies

15835 E. GAC media shall be acceptable in conventional gravity filters or in separate contactors to
15836 reduce taste and odor.

15837 F. Ozonation shall be acceptable for taste and odor control.

15838 **~~12VAC5-590-970. Removal of volatile synthetic organic chemicals (VOCs). (Repealed.)~~**

15839 ~~Appropriate processes or technologies (either specified as BAT in Appendix N or a division-~~
15840 ~~approved alternative, such as other aeration techniques) that treat all the water in the waterworks~~
15841 ~~shall be applied to achieve compliance. The selected design is to be supported by pilot studies~~
15842 ~~unless at least two pilot studies, or two prototype plants, have demonstrated that the selected~~
15843 ~~design is feasible. Such studies or prototypes shall be for waters having characteristics similar to~~
15844 ~~the water that is to be treated.~~

15845 ~~A. Granular Activated Carbon (GAC). As in taste and odor control, GAC units may be used~~
15846 ~~with appropriate pretreatment described in 12VAC5-590-870 B. The elements of a GAC system~~
15847 ~~include carbon contactors, a carbon storage and transfer system, a regeneration system and a~~
15848 ~~control system.~~

15849 ~~The selected GAC shall meet AWWA Standards. Multiple units shall be provided to process~~
15850 ~~at least the peak day flow rate with one unit out of service. As carbon is corrosive, the use of~~
15851 ~~noncorrosive piping and storage materials is mandatory.~~

15852 ~~B. Packed tower aeration. (Also see 12VAC5-590-910.)~~

15853 ~~1. Usually more efficient than other types of waterfall (natural) aeration.~~

15854 ~~2. With one unit out of service, the remaining unit(s) must be capable of handling peak~~
15855 ~~day flows.~~

15856 **12VAC5-590-975. Removal of radionuclides.**

15857 ~~A. Processes for the removal of radionuclides specified as BAT are identified in 40 CFR~~
15858 ~~141.66. The specific process and equipment proposed for removal of radionuclides shall, to the~~
15859 ~~satisfaction of the commissioner, have a demonstrated history of successful performance with~~
15860 ~~similar water quality characteristics and performance requirements. Otherwise, the procedures of~~
15861 ~~12VAC5-590-290 shall apply.~~

15862 B. When manganese greensand filter systems are utilized, the design shall meet the
15863 requirements of 12VAC5-590-920 B. In addition, a chemical contact tank with a minimum
15864 detention time of 30 minutes shall be provided. Laboratory or pilot studies may be required to
15865 demonstrate compliance with the radium standard when using a filtering treatment system for
15866 groundwater with total radium greater than 10 pCi/L.

15867 C. Waste handling, disposal, and permitting shall be given special consideration early in the
15868 design process.

15869 D. Occupational exposure shall be considered in the project design.

15870 E. Provisions for operational control monitoring of the radionuclides requiring removal or of
15871 acceptable surrogates shall be included in the project design.

15872 **12VAC5-590-980. Microscreening. (Repealed.)**

15873 ~~A microscreen is a mechanical supplement to treatment capable of removing suspended~~
15874 ~~matter from water by straining. It shall not be used as a substitute for clarification or filtration.~~

15875 ~~A. The design of microscreening facilities shall give due consideration to:~~

15876 ~~1. A sanitary survey and chemical and biological evaluation;~~

15877 ~~2. The nature of suspended matter to be removed;~~

15878 ~~3. The corrosiveness of water;~~

15879 ~~4. The effect of chlorination when required as pretreatment; and~~

15880 ~~5. Control of the hydraulic capacity of the microscreen.~~

15881 ~~B. The design shall provide:~~

15882 ~~1. For durable, corrosion resistant screens;~~

15883 ~~2. A bypass and cleaning arrangement;~~

- 15884 ~~3. Duplicate units for continuous operation;~~
- 15885 ~~4. Protection against back siphonage when potable water is used for washing; and~~
- 15886 ~~5. Proper disposal of wash water.~~

15887 **12VAC5-590-985. GAC contactors.**

15888 A. GAC contactors may be used to adsorb natural organic compounds, taste and odor

15889 compounds, and SOCs. The most common applications of GAC contactors in drinking water

15890 treatment plants are (i) post-filtration adsorption and (ii) filtration-adsorption, in which some or all

15891 of the filter media in a granular media filter is replaced with GAC.

15892 B. General requirements.

15893 1. A demonstration study using bench-scale or pilot-scale tests shall be conducted to

15894 determine the GAC media effectiveness, adsorption efficiency, and regeneration

15895 frequency.

15896 2. GAC contactors shall be sized for the optimum empty bed contact time.

15897 3. A minimum of two contactor units shall be provided.

15898 4. Bypassing the GAC facility may be permissible under certain circumstances to

15899 accommodate seasonal water quality fluctuations and allow for blending water.

15900 C. Hydraulic configuration.

15901 1. Pressure vessel installation may be configured in parallel or in series.

15902 2. For pressure contactors, pre-filter and post-filter pressure gauges shall be installed at

15903 each individual contactor unit.

15904 3. The rate of flow through the contactors shall be controlled either manually or

15905 automatically to ensure equal flow through each contactor.

15906 D. Design details.

15907 1. For pressure contactors, the maximum pressure loss through the vessels shall be as
15908 determined by the product manufacturer.

15909 2. Sample taps, isolation valves, and bypass piping shall be provided before and after
15910 each individual contactor unit.

15911 3. Pipes, tanks, and appurtenances shall be corrosion resistant.

15912 4. The GAC facility shall provide the ability to filter-to-waste to prevent carbon fines in the
15913 effluent water.

15914 5. Unless otherwise approved by the commissioner, disinfection shall be accomplished
15915 following the GAC contactors.

15916 6. If backwashing of GAC specific units is required, then unchlorinated filtered water shall
15917 be used.

15918 7. Turbidity monitoring of contactor effluent shall be considered.

15919 8. The facility design shall include provisions for spent carbon disposal, GAC delivery, and
15920 storage.

15921 **12VAC5-590-990. Waterworks waste.**

15922 A. With the exception of sanitary sewage and flows recycled through the water treatment
15923 system, the wastes generated during the operation of water filtration plants constitute industrial
15924 wastes and are subject to the State Water Control Law (Chapter 3.1 (§ 62.1-44.2 et seq.) of Title
15925 62.1 of the Code of Virginia).

15926 Industrial wastes generated by water treatment facilities include, but are not limited to, the
15927 following:

15928 1. Filter backwash water;

- 15929 2. Coagulant ~~sludges~~ residuals;
- 15930 3. Softening ~~sludges~~ residuals;
- 15931 4. ~~Microscreening sludges~~;
- 15932 5. ~~4. Iron and manganese sludges~~ residuals;
- 15933 6. ~~5. Sludges~~ Settled solids from presedimentation units; and
- 15934 7. ~~6. Brine wastes~~.

15935 B. After receipt and review of plans and specifications from the consulting engineer for the
 15936 water treatment facilities, the ~~division~~ commissioner will advise DEQ ~~the State Water Control~~
 15937 ~~Board~~ of any proposal to treat and discharge industrial wastes into state waters. The ~~division~~
 15938 commissioner will submit ~~to the State Water Control Board~~ a letter or report to DEQ which includes
 15939 the following:

- 15940 1. Capacity of the proposed treatment facilities;
- 15941 2. Location of the proposed facilities;
- 15942 3. Proposed final disposition of the treated waste effluent;
- 15943 4. Name and address of the consulting engineer; and
- 15944 5. Name and address of the owner.

15945 C. Except for recycle flows as described in ~~12VAC5-590-420 K~~ 12VAC5-590-395 C, the owner
 15946 ~~State Water Control Board~~ will need to satisfy DEQ's requirements for ~~then deal directly with the~~
 15947 ~~consulting engineer in reference to the final disposal of these wastes and.~~

15948 D. The sanitary wastes from water treatment plants must receive treatment. Wastes from
 15949 these facilities ~~must~~ shall be discharged either directly to a sanitary sewer system or to an
 15950 ~~approved individual waste disposal facility providing suitable treatment~~ approved by the State
 15951 Water Control Board.

15952 **12VAC5-590-1000. Disinfection.**

15953 A. ~~Objective. To~~ The objective of disinfection is to prevent the occurrence of waterborne
15954 diseases from the consumption of drinking water.

15955 B. ~~Methods. Disinfection shall be accomplished by the application of chlorine. The specific~~
15956 ~~chlorine compound shall be selected on the basis of water flow rates, application rates, pH of the~~
15957 ~~water, cost of equipment and chemicals, availability of disinfectant, and reliability of feed~~
15958 ~~equipment. Alternate chemicals and methods for disinfection are to be handled as unconventional~~
15959 ~~and the procedures of 12VAC5-590-300 apply.~~

15960 B. Primary disinfection shall be provided for all surface water sources, all spring sources, all
15961 GUDI sources, and all well sources determined to be of questionable bacteriological quality as
15962 required by the commissioner. Consideration shall be given to minimizing the formation of DBPs
15963 when designing a disinfection process. Waterworks with groundwater sources requiring
15964 disinfection under this section shall meet the requirement of 12VAC5-590-421 A 1 d.

15965 C. All pipes, tanks, and equipment that convey, store, or treat potable water shall be
15966 disinfected with chlorine before being placed in service, in accordance with the following AWWA
15967 standards, where applicable: C651-14, C652-11, and C653-13.

15968 D. All residual disinfectant determinations shall be made using methods identified in 12VAC5-
15969 590-440.

15970 1. The project documents shall outline the procedures and include the disinfectant dosage,
15971 contact time, and method of testing the results of the procedure.

15972 2. Methods of disinfection other than chlorination may be considered by the commissioner
15973 on a individual basis.

15974 ~~G. Equipment.~~

- 15975 1. ~~Solution feed vacuum type gas chlorinators are generally preferred. The use of~~
15976 ~~hypochlorite feeders of the positive displacement type may be considered for small~~
15977 ~~installations.~~
- 15978 2. ~~Chlorinator capacities will vary, depending on the use and point of application of the~~
15979 ~~chlorine and the raw water quality. Chlorination capacity shall be such that a minimum~~
15980 ~~dosage of 15 milligrams per liter may be fed at all times.~~
- 15981 3. ~~Standby chlorination equipment shall be provided and chlorination capacities shall~~
15982 ~~comply with 12VAC5-590-1000 G 2 with any unit out of operation for repairs. Spare parts~~
15983 ~~shall be available for all chlorinators to replace parts which are subject to wear and~~
15984 ~~breakage. All chlorinators shall be properly maintained and operated.~~
- 15985 4. ~~An ample supply of potable water shall be available for operating the chlorinator. Where~~
15986 ~~a booster pump is required, duplicate equipment shall be provided, and, when necessary,~~
15987 ~~standby power as well. Equipment for backflow prevention shall be provided. A pressure~~
15988 ~~gauge shall be provided on each chlorinator water supply line.~~
- 15989 5. ~~Scales for weighing cylinders shall be provided at all waterworks using chlorine gas. At~~
15990 ~~large waterworks, scales of the indicating and recording type are recommended. Scales~~
15991 ~~shall be recessed unless they are of the low platform type.~~
- 15992 6. ~~Where manifolding of several cylinders is required to evaporate sufficient chlorine,~~
15993 ~~consideration shall be given to the installation of gas evaporators.~~
- 15994 7. ~~A bottle of ammonia hydroxide solution shall be available for detecting chlorine gas~~
15995 ~~leaks. Consideration shall also be given to the provision of caustic soda solution reaction~~
15996 ~~tanks for absorbing the contents of leaking one-ton cylinders where such cylinders are in~~
15997 ~~use. At large installations, consideration should be given to the installation of automatic~~

15998 ~~gas detection and related alarm equipment. Emergency cylinder repair kits shall be~~
15999 ~~provided.~~

16000 ~~8. Piping and connections for chlorine gas.~~

16001 ~~a. Piping arrangements should be as simple as possible. Pressure gauges shall be~~
16002 ~~installed on the piping to each chlorinator. The number of screwed or flanged joints~~
16003 ~~should be held to a minimum. Piping systems should be well supported and adequately~~
16004 ~~sloped to allow drainage; low spots should be avoided. Suitable allowance should be~~
16005 ~~provided for pipe expansion due to changes in temperature. Liquid chlorine has a high~~
16006 ~~coefficient of thermal expansion. If liquid chlorine (containing no gas bubbles) is~~
16007 ~~trapped between two valves, high pressure will develop upon increase in the~~
16008 ~~temperature of the chlorine. This pressure may lead to hydrostatic rupture of the line.~~
16009 ~~The effects of possible rupture should be considered in the design of any piping~~
16010 ~~system. Where such rupture would present an undue hazard to personnel or~~
16011 ~~equipment by allowing large quantities of chlorine to escape, protection of the system~~
16012 ~~against hydrostatic pressure should be provided.~~

16013 ~~b. Condensation or reliquefaction of chlorine may occur in chlorine gas lines which~~
16014 ~~pass through areas where the temperature is below the temperature pressure~~
16015 ~~equilibrium indicated in the vapor pressure curve. Where adequate superheat is not~~
16016 ~~provided by a vaporizer, condensation can be prevented by reducing the pressure with~~
16017 ~~a pressure reducing valve.~~

16018 ~~c. It is recommended that joints in chlorine piping be flanged or welded. If threaded~~
16019 ~~joints are used, extreme care should be taken to obtain clean, sharp threads. A~~
16020 ~~lubricating pipe dope suitable for chlorine should be used. All threading oil must be~~
16021 ~~thoroughly cleaned from the pipe. For permanent joints, linseed oil and graphite,~~

16022 glycerine or Teflon tape may be used. If Teflon tape is used, all remnants must be
16023 removed before joints are remade.

16024 d. Fittings and appurtenances must be suitable for handling dry chlorine.

16025 9. Chlorine solution is very corrosive to all of the common construction metals. At low
16026 pressures, chlorine solution can be handled in chemical stoneware, glass or porcelain
16027 equipment, and by certain alloys. Hard rubber, unplasticized polyvinylchloride, glassfiber
16028 reinforced polyester, polyvinylidene chloride, and fully halogenated fluorocarbon resins
16029 have been used successfully. Low molecular weight polyethylene, fiber reinforced rubber
16030 hose, and wrapped rubber hose have been used successfully for small capacity
16031 chlorinators. All of these materials must be selected with great care. For higher pressures,
16032 combinations using resistant lining materials (rubber, kynar, saran, Teflon, etc.) with the
16033 common metals for strength should be used.

16034 Titanium may be used with chlorine solution, but must not be used with chlorine gas.
16035 Tantalum is inert to chlorine solution at temperatures up to 300°F. Hastelloy Alloy C® and
16036 Monel Alloy® are widely used. Platinum and silver find special applications. In general,
16037 operations involving chlorine solution require individual study.

16038 Chlorine and equipment suppliers shall make recommendations only after careful survey
16039 of all factors involved.

16040 10. Chlorine solution and hypochlorite solution piping shall be arranged such that
16041 prechlorination or postchlorination may be accomplished by any or all chlorinators.

16042 D. Engineering design.

16043 1. Any building to house chlorine equipment or containers should be designed and
16044 constructed to protect all elements of the chlorine system from fire hazards. If flammable

16045 ~~materials are stored or processed in the same building, a fire wall should be erected to~~
16046 ~~separate the two areas. Fire resistive construction is recommended.~~

16047 ~~If gas chlorination equipment and chlorine cylinders are to be in a building used for other~~
16048 ~~purposes, a gas tight partition shall separate this room from any other portion of the~~
16049 ~~building. Doors to this room shall open only to the outside of the building, and shall be~~
16050 ~~equipped with panic hardware. Such rooms shall be at ground level, and should be~~
16051 ~~separated from the feed area.~~

16052 ~~At least two means of exit should be considered from each separate room or building in~~
16053 ~~which chlorine is stored, handled, or used. All exit doors shall open outward.~~

16054 ~~A clear glass, gas tight window shall be installed in an interior wall of the chlorinator room~~
16055 ~~to permit the chlorinators to be viewed without entering the room.~~

16056 ~~Feed lines shall not carry chlorine gas beyond the chlorine feeder room unless the chlorine~~
16057 ~~is under vacuum.~~

16058 ~~2. Chlorinator rooms shall be provided with a means of heating so that a temperature of~~
16059 ~~at least 60°F can be maintained, but the room should be protected from excess heat.~~
16060 ~~Cylinders shall be kept at essentially room temperature for at least 24 hours prior to use~~
16061 ~~unless an evaporator is employed.~~

16062 ~~3. Forced, mechanical ventilation which will provide one complete air change per minute~~
16063 ~~shall be installed in all chlorine feed rooms and rooms where chlorine cylinders are stored.~~
16064 ~~The entrance to the air exhaust duct from the room shall be near the floor and the point of~~
16065 ~~discharge shall be located so as not to contaminate the air inlet to any building or inhabited~~
16066 ~~areas. Air inlets shall be located so as to provide cross ventilation with air and at such~~
16067 ~~temperature that will not adversely affect the chlorination equipment. The vent hose shall~~

16068 run without traps from the chlorinator and shall discharge to the outside atmosphere above
16069 grade.

16070 4. The electrical controls for the fans and lights shall be such that they will automatically
16071 operate when the door is opened and can be manually operated from the outside without
16072 opening the door.

16073 E. Respiratory protection. The use of self-contained breathing apparatus (SCBA) in
16074 compliance with OSHA Respiratory Protection Standard 1910.134, "VIRGINIA OSHA
16075 STANDARDS" for General Industry, is required whenever anyone is dealing with an accidental
16076 release of chlorine. All waterworks that use chlorine gas at their treatment facility shall maintain a
16077 respiratory protection plan including emergency procedures, evacuation plans, designated SCBA
16078 personnel and any special site specific requirements. All respiratory protection devices shall be
16079 stored to protect against dust, sunlight, heat, extreme cold, excessive moisture or damaging
16080 chemicals; and in a location remote from the chlorine area.

16081 F. Application of chlorine.

16082 1. Provisions shall be made to ensure uniform mixing of the chlorine solution or
16083 hypochlorite solution with the water near the point of application.

16084 2. Residual and contact time.

16085 a. Waterworks with surface water sources shall provide a minimum residual (C) and
16086 contact time (T) as calculated in accordance with Appendix L. Appendix L contains
16087 information on CT calculations and methods, as well as information on contact tank
16088 baffling arrangements.

16089 b. Waterworks with groundwater sources shall provide a minimum 30 minute hydraulic
16090 detention period (based on design flow) for chlorine contact.

16091 G. Evaluation of effectiveness.

16092 1. Sampling ~~see 12VAC5-590-770.~~
16093 2. Equipment shall be provided for measuring chlorine residual employing any method
16094 listed in the most recent edition of "Standard Methods for the Examination of Water and
16095 Wastewater."

16096 ~~The equipment should enable residual chlorine measurement to the nearest 0.1 milligram per~~
16097 ~~liter in the range below 0.5 milligram per liter, and to an accuracy of approximately 25% above~~
16098 ~~0.5 milligram per liter. The installation of continuous automatic chlorine residual analyzers~~
16099 ~~recording and proportioning systems may be required on large installations.~~

16100 **12VAC5-590-1001. Chlorination.**

16101 A. General design requirements.

16102 1. Chlorine feed capacity shall be capable of meeting the disinfection requirements under
16103 all operating conditions.

16104 a. Chlorine feed systems for primary disinfection at a waterworks using either a surface
16105 water source or a GUDI source or both shall provide sufficient capacity to achieve the
16106 required microbial log inactivation specified in Table 500.1.

16107 b. Chlorine feed systems for primary disinfection at a waterworks using groundwater
16108 sources shall provide sufficient capacity to achieve 4-log virus inactivation and
16109 removal.

16110 c. Chlorine feed systems for secondary disinfection at a waterworks shall provide
16111 sufficient capacity to achieve a minimum chlorine residual at the entry point of 0.2 mg/L
16112 for more than 4 hours.

16113 2. Chlorine feed systems for disinfection at a waterworks using either a surface water
16114 source or a GUDI source or both shall be sized to deliver the required dose with the largest

16115 unit out of operation. Small hypochlorination installations for groundwater source
16116 waterworks shall have a spare metering pump, unless it can be demonstrated to the
16117 satisfaction of the commissioner that spare equipment is readily available from a local
16118 supplier. Spare parts shall be available for all chlorinators to replace parts that are subject
16119 to wear and breakage.

16120 3. Consideration shall be given to providing multiple chlorine feed points at all waterworks.
16121 For conventional filtration treatment plants, chlorine feed points shall be provided for the
16122 source water, applied water to the filters, and filter effluent.

16123 4. The piping providing the water for preparing the chlorine solution shall be designed to
16124 prevent contamination of the "bulk treated" finished water.

16125 a. At all facilities treating surface water, pre-filtration and post-filtration disinfection
16126 systems shall operate independently of each other to prevent possible siphoning of
16127 partially treated water into the clearwell.

16128 b. The water piping to each ejector shall have a separate shutoff valve. A master
16129 shutoff valve is prohibited.

16130 5. Provisions shall be made to ensure uniform mixing of the chlorine with the water near
16131 the point of application.

16132 6. Residual and contact time.

16133 a. The owner of a waterworks using either a surface water source or a GUDI source
16134 or both shall provide a minimum residual (C) and contact time (T) as calculated in
16135 accordance with 12VAC5-590-500.

16136 b. The owner of a waterworks using a groundwater source that is required to disinfect
16137 shall provide a minimum residual (C) and contact time (T) to achieve 4-log virus
16138 inactivation and removal, based on maximum design flow rate. Provisions shall be

16139 made to prevent short circuiting. The contact basin shall be designed utilizing the
16140 appropriate baffle factors referenced in Table 500.15 of 12VAC5-590-500.

16141 7. Automatic proportioning chlorinators shall be provided where the rate of flow is not
16142 reasonably constant.

16143 8. Equipment shall be provided for measuring the chlorine residual, employing any method
16144 specified in 12VAC5-590-440. The equipment shall be capable of a chlorine residual
16145 measurement to the nearest 0.1 mg/L.

16146 9. Continuous chlorine residual analyzers shall be provided at all waterworks that are
16147 required to filter and that serve 3,300 or more persons, or at any waterworks required by
16148 the commissioner. Where a continuous chlorine residual analyzer is provided, the
16149 commissioner may require that the design incorporate an operator-selected high or low
16150 chlorine residual alarm.

16151 B. Gas chlorine feed systems.

16152 1. Equipment.

16153 a. An ample supply of potable water shall be available for operating the chlorinator.
16154 Where a booster pump is required, duplicate equipment shall be provided, and, when
16155 necessary, standby power as well. Equipment for backflow prevention shall be
16156 provided. A pressure gauge shall be provided on each chlorinator mixing water piping.

16157 b. Scales for weighing cylinders shall be provided at all waterworks using chlorine gas.
16158 At large waterworks, scales of the indicating and recording type shall be considered.
16159 Scales shall be recessed unless they are of the low-platform type.

16160 c. Where a manifold of several cylinders is required to evaporate sufficient chlorine,
16161 consideration shall be given to the installation of gas evaporators.

- 16162 d. Automatic switch-over of chlorine cylinders shall be provided to assure continuous
16163 disinfection.
- 16164 2. Chlorine gas leak detection.
- 16165 a. Automatic chlorine gas leak detection, with strategically located sensors and related
16166 alarm equipment, shall be provided for all installations.
- 16167 b. A bottle of ammonia hydroxide solution shall be provided for detecting chlorine gas
16168 leaks.
- 16169 3. Emergency cylinder repair kits shall be provided.
- 16170 4. Consideration shall be given to the provision of caustic soda solution reaction tanks for
16171 absorbing the contents of leaking one-ton cylinders where the cylinders are in use.
- 16172 5. Piping and connections for chlorine gas.
- 16173 a. Pressure gauges shall be installed on the piping to each chlorinator. Piping systems
16174 shall be well supported and adequately sloped to allow drainage. Suitable allowance
16175 shall be made for pipe expansion due to changes in temperature.
- 16176 b. Fittings and appurtenances shall be suitable for handling dry chlorine.
- 16177 6. Building design.
- 16178 a. Any building to house chlorine equipment or containers shall be designed and
16179 constructed to protect all components of the chlorine system from fire hazards. See
16180 [12VAC5-590-720](#).
- 16181 b. If gas chlorination equipment and chlorine cylinders are to be in a building used for
16182 other purposes, a gas-tight partition shall separate this room from any other portion of
16183 the building. Doors to this room shall open only to the outside of the building, and shall

16184 be equipped with panic hardware. These rooms shall be at ground level, and should
16185 be separated from the feed area.

16186 c. At least two means of exit shall be considered from each separate room or building
16187 in which chlorine is stored, handled, or used. All exit doors shall open outward.

16188 d. A clear glass, gas-tight window shall be installed in an interior wall of the chlorinator
16189 room to permit the chlorinators to be viewed without entering the room.

16190 e. Feed lines shall not carry chlorine gas beyond the chlorine feeder room unless the
16191 chlorine is under vacuum.

16192 f. Chlorinator rooms shall be provided with a means of heating so that a temperature
16193 of at least 60°F can be maintained, but the room should be protected from excess
16194 heat. Cylinders shall be kept at essentially room temperature for at least 24 hours
16195 before use unless an evaporator is employed.

16196 g. Forced, mechanical ventilation that provides one complete air change per minute
16197 shall be installed in all chlorine feed rooms and rooms where chlorine cylinders are
16198 stored. The inlet to the air exhaust duct from the room shall be near the floor, and the
16199 point of discharge shall be located so as not to contaminate the air inlet to any building
16200 or inhabited areas. Air inlets shall be located so as to provide cross ventilation with air
16201 and at a temperature that will not adversely affect the chlorination equipment. The vent
16202 hose shall run without traps from the chlorinator and shall discharge to the outside
16203 atmosphere above grade.

16204 h. The electrical controls for the fans and lights shall automatically operate when the
16205 door is opened and can be manually operated from the outside without opening the
16206 door.

16207 C. Calcium hypochlorite and sodium hypochlorite feed systems.

- 16208 1. Both calcium hypochlorite and sodium hypochlorite shall be acceptable for disinfection.
- 16209 2. Hypochlorite solution feeders of the positive displacement type shall be provided.
- 16210 3. Adequate mixing of the calcium hypochlorite or sodium hypochlorite solutions shall be
- 16211 provided.
- 16212 4. Special design considerations for bulk delivery systems:
- 16213 a. Bulk sodium hypochlorite storage tanks shall be constructed of corrosion-proof
- 16214 materials. Pumps, piping, materials, and appurtenances exposed to the sodium
- 16215 hypochlorite shall be suitable for such use.
- 16216 b. Sodium hypochlorite storage facilities shall be designed to keep ambient
- 16217 temperature and lighting low. Sodium hypochlorite fumes are corrosive and tanks shall
- 16218 be vented to the outside. Tanks shall be designed for ease of filling, draining, and
- 16219 transfer of contents.
- 16220 c. Piping, valves, pumps, and pipe accessories shall be designed and configured so
- 16221 as not to allow accumulation of gases that could cause air locking or loss of prime in
- 16222 chemical feed piping or pumps.
- 16223 d. The design shall provide a system of local or general exhaust features to keep
- 16224 employee exposures below the airborne exposure limits, as described in the Safety
- 16225 Data Sheet for the chemical used, in accordance with federal occupational safety and
- 16226 health standards (29 CFR § 1910.1200 (g)). Local exhaust ventilation is generally
- 16227 preferred because it controls contaminant emissions at the source and thus,
- 16228 preventing dispersion into the general work area which could result in
- 16229 corrosion/exposure. Exhaust equipment and accessories shall be corrosion proof.
- 16230 e. An eye wash fountain and quick-drench facilities in the immediate work area shall
- 16231 be provided.

16232 **12VAC5-590-1002. Chloramination.**

16233 A. Chloramines shall be acceptable for secondary disinfection. Chloramines are formed by
16234 the reaction of ammonia and chlorine. Multiple chemical species may be created; however,
16235 monochloramine is the desired form.

16236 B. The process shall be controlled to minimize formation of dichloramine and nitrogen
16237 trichloride, which can create objectionable taste and odors. Control should be sufficient to limit
16238 free ammonia leaving the chloramination facility to no more than 0.1 mg/L as nitrogen.

16239 C. pH adjustment facilities shall be provided to maintain pH in the range of 7 - 8.

16240 D. When use of chloramines is proposed, the potential increase of lead leaching within the
16241 distribution system shall be considered. Additional distribution system monitoring may be required
16242 by the commissioner.

16243 E. The owner shall inform the public before initiating any disinfection process involving
16244 chloramines, as directed by the commissioner.

16245 **12VAC5-590-1003. Chlorine dioxide addition.**

16246 A. Chlorine dioxide may be considered as a pre-oxidant to control tastes and odors, reduce
16247 color, oxidize iron and manganese, and reduce DBPPs. Chlorine dioxide may be used for primary
16248 disinfection. Where chlorine dioxide is used, consideration shall be given to the formation of the
16249 byproducts chlorite and chlorate.

16250 B. Chlorine dioxide is generated onsite from sodium chlorite and either chlorine gas or
16251 hypochlorite solution. Chlorine dioxide generation equipment shall be factory assembled, pre-
16252 engineered units with a minimum efficiency of 95%. The excess free chlorine shall not exceed
16253 3.0% of the theoretical stoichiometric concentration required.

16254 C. The owner shall inform the public before using chlorine dioxide, as directed by the
16255 commissioner.

16256 **12VAC5-590-1004. Ozonation.**

16257 A. Ozone may be considered as a pre-oxidant to control tastes and odors, reduce color,
16258 oxidize iron and manganese, reduce DBPPs, and used for primary disinfection. Where ozone is
16259 used, consideration shall be given to the level of bromide and formation of brominated byproducts.

16260 B. Ozone systems are typically comprised of four basic subsystems: ozone generation, feed
16261 gas preparation, ozone contactors, and off-gas disposal.

16262 C. The PER shall evaluate water and gas flow rates, oxygen source, generator selection and
16263 sizing, contactor design, treatment process location, exhaust gas collection and destruction, and
16264 operator requirements.

16265 D. Treatability studies using bench-scale or pilot-scale tests may be required as part of the
16266 PER to address the following:

16267 1. Alternate points of ozone application;

16268 2. Ozone demand tests, applied dose, transferred dose, and decay rates; and

16269 3. Ozone byproducts, including bromide/bromate analyses.

16270 E. Ozone systems shall be granted disinfection credit for Giardia lamblia, Cryptosporidium,
16271 and viruses, in accordance with 12VAC5-590-401 E 7 and 12VAC5-590-500, provided that they
16272 meet the requirements of this section.

16273 1. Ozone residual levels shall be monitored continuously and recorded. For waterworks
16274 that claim inactivation credit for ozone, a minimum of two dedicated, online monitors per
16275 ozone contactor shall be provided. The location of the monitors shall be acceptable to the
16276 commissioner. A portable ozone monitor shall be provided as a backup.

16277 2. Ozone systems using multiple, consecutive contact chambers, with gaseous ozone
16278 injected in the initial chambers, shall be designed to measure the ozone residual and
16279 compute log inactivation of Giardia and virus using the $C_{\text{effluent}}T_{10}$ Method or the Log
16280 Integration CT_{10} Method, as described in the “Long Term 2 Enhanced Surface Water
16281 Treatment Rule Toolbox Guidance Manual,” EPA Office of Water (4606), EPA 815-R-09-
16282 016, April 2010.

16283 3. Sampling lines shall be designed to minimize the reaction time (typically less than 10
16284 sec conveyance time).

16285 F. Alarms shall be provided for ozone process control safety. Automatic shutdown features
16286 shall be considered.

16287 **12VAC5-590-1005. Ultraviolet light (UV) disinfection.**

16288 A. All UV reactors shall conform to NSF/ANSI standards.

16289 B. Each reactor train shall be equipped with an individual flow meter, or a single flow meter in
16290 conjunction with differential pressure sensors in each treatment train. Reactors shall be sized to
16291 treat the design flow.

16292 C. Hydraulic design shall ensure that lamps are submerged, and that the entrance of air,
16293 negative pressure, or pressure surges in the reactors is prevented. Open channel flow reactors
16294 are prohibited.

16295 D. A pressure gauge shall be provided upstream of each reactor. The design shall ensure that
16296 the reactor’s maximum rated pressure cannot be exceeded.

16297 E. Water quality parameters that may affect UV disinfection system performance shall be
16298 evaluated, including calcium, iron, manganese, hardness, and alkalinity. Pretreatment shall be
16299 considered for water quality parameters that may result in lamp sleeve fouling.

16300 F. A building to enclose and protect all UV equipment shall be provided. Adequate space
16301 between control panels, power supply, and the reactor equipment shall be provided to allow for
16302 routine operation and maintenance, including removing lamp and wiper assemblies and for off-
16303 line chemical cleaning of reactor lamps.

16304 G. An operation and maintenance manual shall be provided for all UV reactors.

16305 H. UV systems may be used for primary disinfection and shall be granted log inactivation
16306 credit for Giardia lamblia, Cryptosporidium, and viruses in accordance with Table 401.7, provided
16307 that they meet the requirements of 12VAC5-590-401 E 7 c and this subsection.

16308 1. Only UV reactors that have undergone independent, third-party oversight of the
16309 validation testing on a fully assembled system to determine the operating conditions under
16310 which the reactors deliver the required UV dose shall be considered for log inactivation
16311 credit.

16312 2. The dose-monitoring strategy shall be either the UV intensity set point approach or the
16313 calculated dose approach as described in the "Ultraviolet Disinfection Guidance Manual
16314 For The Final Long Term 2 Enhanced Surface Water Treatment Rule," Office of Water
16315 (4601), EPA 815-R-06-007, November 2006. The dose-monitoring strategy shall be
16316 demonstrated through the UV reactor validation testing.

16317 3. At least two reactors shall be provided. Reactors shall be sized to treat the design flow
16318 with the largest reactor out of service.

16319 4. Continuous monitoring sensors shall be provided to measure UV intensity. A continuous
16320 sensor shall also be provided to measure ultraviolet transmittance (UVT) if the calculated
16321 dose approach is utilized.

16322 a. The number of sensors provided shall be the same as that used in validation testing of
16323 the reactor.

16324 b. Output from a continuous UVT analyzer shall be capable of being input directly into a
16325 control loop for each UV reactor, a SCADA system, or both. A bench-top
16326 spectrophotometer may be provided instead of a continuous UVT analyzer.

16327 c. All signals from the sensors shall be displayed for operator response and for
16328 recordation.

16329 d. At least one reference sensor for calibration of online UV intensity sensors shall be
16330 provided. Reference sensors shall be capable of calibration against a traceable standard.

16331 e. Continuous recording equipment shall be provided with the monitoring sensors to store
16332 in memory or print one data point at least every 4 hours.

16333 5. A means of flow distribution and control among multiple reactors shall be provided. The
16334 hydraulic flow profiles and piping configuration shall be identical to or more protective than
16335 that tested during equipment validation.

16336 a. For onsite validation, the inlet and outlet piping configuration for the UV facility shall be
16337 designed according to the manufacturer's recommendations and to accommodate any
16338 site-specific constraints.

16339 b. To avoid jetting flow and swirling flow, consideration shall be given to exclude
16340 expansions for at least 10 pipe diameters upstream of the reactor and to exclude out-of-
16341 plane 90-degree bends in series.

16342 c. Each UV reactor shall be capable of being isolated and removed from service. Isolation
16343 valves upstream and downstream of each reactor, a drain, and sample taps for each
16344 reactor treatment train shall be provided. If the isolation valves are also used for flow
16345 control, then the flow control valve shall be located downstream of the UV reactor to limit
16346 the disturbance of the flow entering the UV reactor. Bypass piping shall not be allowed.

16347 d. The lateral piping for each UV reactor train shall be sized and configured to provide
16348 approximately equal head loss through each UV reactor train over the validated range of
16349 flow rates.

16350 6. The control system shall be capable of meeting the monitoring and reporting
16351 requirements in 12VAC5-590-401 and 12VAC5-590-570.

16352 7. Automatic shutdown capability under critical alarm conditions shall be provided,
16353 including lamp/ballast failure, low liquid level, and high temperature. Alarms shall be
16354 provided for low UV validated dose, low UV intensity, low UV transmittance, high flow rate,
16355 and mechanical wiper failure.

16356 8. Ground-fault circuit interrupters shall be provided for all lamps. Backup power shall be
16357 considered.

16358 9. The owner shall develop a start-up plan and submit the plan to the department for
16359 approval. The plan shall include functional testing, determination of validated operating
16360 conditions and control settings, performance testing, development of an operation and
16361 maintenance manual, and inspection schedules.

16362 I. UV systems not intended for primary disinfection may be used provided that they meet
16363 the requirements of this subsection.

16364 1. Continuous sensors to measure UV intensity shall be considered.

16365 2. Each UV reactor shall be capable of being isolated, removed from service, and be
16366 provided with bypass piping.

16367 3. Automatic shutdown capabilities shall be provided in the event of lamp/ballast failure.

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Article 4

Pumping Facilities

12VAC5-590-1010. General Basic pumping facility design criteria.

Pumping facilities shall be designed to maintain the sanitary quality of pumped water. ~~Subsurface pits or pump rooms and inaccessible installations should be avoided.~~ All pumps shall be accessible for servicing and repair.

12VAC5-590-1020. Location.

A. ~~The pumping station shall be located so that the proposed site will meet the requirements of the sanitary protection of the water quality and the hydraulics of the system and be protected against interruption of service by fire, flood, or any other hazard~~ to meet the hydraulic needs of the distribution system, preserve the quality of the water pumped, and shall consider the availability of a power or a fuel supply.

B. The station shall be:

1. Elevated to a minimum of one foot above the 100-year flood elevation or protected to ~~such~~ that elevation;
2. Accessible at all times unless ~~permitted~~ allowed to be out of service for a period of ~~inaccessibility by the commissioner;~~
3. Graded around the station so as to lead surface drainage away from the station; and
4. Protected to prevent vandalism and entrance by animals or unauthorized persons;
5. ~~Located with respect to availability of a power or a fuel supply.~~

12VAC5-590-1030. Groundwater facilities. (Repealed.)

~~Where pumping facilities are used, wells and springs shall be vented by properly hooded and screened pipe extending at least 12 inches above the pump floor or ground surface. Where~~

16392 necessary, provisions shall be made for lubricating the pump from a point at least six inches above
16393 the top of the well cover by means which will prevent contamination of the water supply.

16394 A. General well appurtenances.

16395 The following well appurtenances are required:

16396 1. A sanitary seal shall be provided on the top of the well casing;

16397 2. A properly screened vent with the end elbowed downward shall be provided for the well
16398 casing;

16399 3. A sampling tap shall be provided for raw water sampling which discharges in a
16400 downward direction and away from the well casing;

16401 4. Adequate control switches, etc., for the pumping equipment shall be provided;

16402 5. A water meter is required to determine water production for each well and the meter
16403 shall be located upstream of the well blow-off;

16404 6. The well casing shall extend at least 12 inches above the concrete floor or apron
16405 surrounding the well;

16406 7. Adequate support for the well pump and drop pipe shall be provided; and

16407 8. Each well casing shall be equipped with a drawdown gauge, airline, and appurtenances
16408 for measuring the change in the elevation of the water level in the well.

16409 B. Drilled wells with the prime mover mounted on the casing shall:

16410 1. Have the casing extend 12 inches above the floor, and be equipped with a flange or
16411 suitable sanitary seal;

16412 2. Have the casing firmly connected to the pump structure or have the casing inserted into
16413 a recess extending at least one inch into the base of the pump if a watertight connection
16414 is not provided;

- 16415 3. Have the base of the pump not less than 12 inches above the pump room floor or apron;
- 16416 and
- 16417 4. Have the pump foundation and base designed to prevent water from coming into contact
- 16418 with the joint between the casing and the prime mover.
- 16419 ~~C. Submersible pumps. Where a submersible pump is used, the top of the casing shall be~~
- 16420 ~~effectively sealed against entrance of water under all conditions of vibration or movement of~~
- 16421 ~~conductors or cables and shall have a gooseneck vent with a screen covered opening.~~
- 16422 ~~D. Discharge piping. The discharge piping shall be provided with separate means to pump~~
- 16423 ~~(blowoff) water of unsatisfactory quality to a point away from the groundwater source but shall not~~
- 16424 ~~be directly connected to a sewer. The discharge line shall:~~
- 16425 1. Have control valves located above the pump floor;
- 16426 2. Be protected against freezing;
- 16427 3. Be valved to permit testing and control of each well;
- 16428 4. Have watertight joints;
- 16429 5. Have all exposed valves protected; and
- 16430 6. Have erosion protection at the point of waste discharge.
- 16431 ~~E. General well pump house construction requirements.~~
- 16432 1. The well pump house floor or apron surrounding the well shall:
- 16433 a. Be of good quality concrete with adequate reinforcement;
- 16434 b. Be a minimum of six inches in thickness;
- 16435 c. Extend a minimum of three feet in all directions from the well; and

16436 ~~d. Slope at least ¼ inch per foot towards a screened four inch floor drain to~~
16437 ~~atmosphere.~~

16438 ~~2. Well houses or well pump stations in pits are prohibited.~~

16439 ~~3. Well pump stations housing chlorination equipment shall meet the requirements of~~
16440 ~~12VAC5-590-1000.~~

16441 **12VAC5-590-1040. Pump stations.**

16442 ~~A. Pump stations associated with surface water sources, treatment facilities, and finished~~
16443 ~~water shall:~~

16444 ~~1. Have adequate space for the installation of additional units if needed and for the safe~~
16445 ~~servicing of all equipment;~~

16446 ~~2. Be of durable construction, fire and weather resistant, and furnished with outward~~
16447 ~~opening doors;~~

16448 ~~3. Have the floor elevation at least six inches above the finished grade, if possible;~~

16449 ~~4. Have the underground structure waterproofed;~~

16450 ~~5. Have all floors drained without impairing the quality of water being handled, and, if~~
16451 ~~equipment is contained on the floor, the floor shall slope at least $\frac{1}{8}$ inch in every~~
16452 ~~foot to the point of discharge; and~~

16453 ~~6. Provide suitable outlet for drainage from pump glands without discharging onto the floor.~~

16454 ~~B. Suction wells. Suction wells shall:~~

16455 ~~1. Be watertight;~~

16456 ~~2. Have floors sloped to permit removal of water and entrained solids; and~~

- 16457 ~~3. Be covered or otherwise protected against contamination, including contamination by~~
16458 ~~pump lubricants.~~
- 16459 ~~C. Equipment servicing in pump stations.~~
- 16460 ~~1. Craneways, hoist beams, eyebolts, or other adequate facilities for servicing or removal~~
16461 ~~of pumps, motors, or other heavy equipment shall be provided.~~
- 16462 ~~2. Walkways shall be provided to lubrication points of equipment if these are located at~~
16463 ~~intermediate points between floors.~~
- 16464 ~~3. Openings in floors, roofs, or wherever else needed for removal of heavy or bulky~~
16465 ~~equipment shall be provided.~~
- 16466 ~~4. A convenient tool board or other facilities shall be provided as needed for proper~~
16467 ~~maintenance of the equipment.~~
- 16468 ~~D. Stairways and ladders. Stairs are preferred in areas where there is frequent traffic or where~~
16469 ~~supplies are transported by hand. They shall have risers not exceeding nine inches and treads~~
16470 ~~wide enough for safety. Where ladders are used, intermediate landings should be provided if the~~
16471 ~~vertical distance exceeds 10 feet. Stairways and ladders shall:~~
- 16472 ~~1. Be provided between all floors and in pits or compartments which must be entered and;~~
16473 ~~2. Have handrails on both sides and treads of nonslip material.~~
- 16474 ~~E. Heating. In pump houses not occupied by personnel, only enough heat need be provided~~
16475 ~~to prevent freezing of equipment or treatment process. Provision shall be made for adequate~~
16476 ~~heating for the comfort of the operator and the safe and efficient operation of the equipment.~~
- 16477 ~~F. Ventilation. Adequate ventilation shall be provided for all pumping stations. Forced draft~~
16478 ~~ventilation of at least six changes of air per hour (continuous operation) shall be provided for:~~
- 16479 ~~1. All rooms, compartments, pits and other enclosures below the grade floor; and~~

16480 2. Any area where an unsafe atmosphere may develop or where excessive heat may build
16481 up.

16482 G. Dehumidification. In areas where excess moisture could cause hazards to safety or
16483 damage to equipment, means for dehumidification shall be provided.

16484 H. Lighting. Pump stations shall be adequately lighted throughout. All electrical work shall
16485 conform to the requirements of the state codes.

16486 I. Pumps. At least two pumping units shall be provided. If only two units are provided, each
16487 shall be capable of delivering the peak demand. If more than two units are installed, they shall
16488 have sufficient capacity so that if any one pump is out of service, the remaining pumps are capable
16489 of carrying the peak demand. The pumping units shall:

16490 1. Have ample capacity to supply the peak demand without overloading;

16491 2. Be driven by a prime mover able to operate against the maximum head and air
16492 temperature which may be encountered; and

16493 3. Have maintenance parts and tools readily available.

16494 J. Suction lift. If suction lift is necessary, provision shall be made for priming the pumps.
16495 Suction lift should be less than 15 feet.

16496 K. Priming. Prime water must not be of lesser sanitary quality than that of the water being
16497 pumped. Means shall be provided to prevent back siphonage. When an air operated ejector is
16498 used, the screened intake shall draw clean air from a point at least 10 feet above the ground or
16499 other source of contamination, unless the air is filtered by an apparatus approved by the Division.

16500 Vacuum priming may be used.

16501 A. Enclosures.

16502 1. The structure that houses a pump shall be of durable construction, fire and weather
16503 resistant, and furnished with lockable, outward opening doors. Underground structures
16504 shall be waterproofed.

16505 2. Floors.

16506 a. Pump house floors shall be of good quality concrete with adequate reinforcement
16507 and have a minimum thickness of six inches.

16508 b. Pump house floors shall slope at least 1/8 inch per foot towards a screened four-
16509 inch-diameter floor drain to the atmosphere or other provisions for gravity drainage.

16510 c. The pump house finished floor elevation should be at least six inches above the
16511 finished grade.

16512 3. Openings in floors, roofs, or elsewhere for removal of heavy or bulky equipment shall
16513 be provided.

16514 a. Craneways, hoist beams, eyebolts, or other adequate facilities for servicing or
16515 removal of pumps, motors, or other heavy equipment shall be provided.

16516 b. Adequate means of access shall be provided to lubrication points of equipment if
16517 these are located at intermediate points between floors.

16518 4. Heat shall be provided for the safe and efficient operation of the equipment.

16519 5. Adequate ventilation shall be provided for all pumping stations. Forced draft ventilation
16520 of at least six changes of air per hour (continuous operation) shall be provided for:

16521 a. All rooms, compartments, pits, and other enclosures below grade; and

16522 b. Any area where an unsafe atmosphere may develop or where excessive heat may
16523 build up.

16524 6. In areas where excess moisture could cause hazards to safety or damage to equipment,

16525 means for dehumidification shall be provided.

16526 7. Pump stations shall be adequately lighted throughout. All electrical work shall conform

16527 to the requirements of the applicable codes.

16528 8. Stair design shall be in accordance with the USBC.

16529 9. Pump stations shall have adequate space for the installation of additional units if

16530 needed and for the safe servicing of all equipment.

16531 10. Pump stations shall be designed so that each pump has an individual suction line or

16532 the lines shall be so manifolded to ensure similar hydraulic and operational conditions.

16533 B. Suction wells shall:

16534 1. Be watertight;

16535 2. Have floors sloped to allow removal of water and entrained solids;

16536 3. Be covered or otherwise protected against contamination, including contamination by

16537 pump lubricants; and

16538 4. Have two pumping compartments or other means to allow the suction well to be taken

16539 out of service for inspection, maintenance, or repair.

16540 C. Groundwater well enclosures and aprons.

16541 1. The floor at the well pump house shall meet the requirements of subdivision A 2 of this

16542 section.

16543 2. Well pump aprons surrounding the well shall (i) be of quality reinforced concrete, (ii)

16544 extend a minimum of three feet in all directions from the well casing, (iii) be at least six

16545 inches thick, and (iv) be sloped 1/8 inch per foot away from the well.

16546 3. Well houses or well pump stations in pits are prohibited.

16547 12VAC5-590-1050. ~~Booster pumps~~ Pumps and controls.

16548 A. General.

16549 1. Pumps, their motors, and all accessories shall be controlled in a manner that they will
16550 operate at their rated capacity. Where two or more pumps are installed, provision shall be
16551 made for proper alternation of the pumps. Alternation may be automatic or manual.
16552 Provision shall be made to prevent operation of the pump in the event of a backspin cycle.

16553 2. All pumps shall be driven by motors designed to operate over the full range of operating
16554 conditions.

16555 3. All pumps shall be served by control equipment that has overload protection for the air
16556 temperature encountered.

16557 4. Electrical controls shall be protected to the 100-year flood elevation and should be
16558 located above grade.

16559 5. If standby power is provided by onsite generators or engines, then the provisions for
16560 filling the fuel storage tank, the fuel tank itself, and the fuel line shall be designed to protect
16561 the waterworks and source water from contamination.

16562 6. Pumps shall be lubricated with water of equal or better quality than the water being
16563 pumped or with food grade oil. Water seals shall not be supplied with water of a lesser
16564 sanitary quality than that of the water being pumped. Where pumps are sealed with
16565 potable water and are pumping water of lesser sanitary quality, the seal shall:

16566 a. Have an air gap of at least two inches or two pipe diameters, whichever is greater,
16567 where a break-tank is provided; or

16568 b. Be provided with an approved RPZ assembly.

16569 7. When automatic pre-lubrication of pump bearings is necessary and an auxiliary power
16570 supply is provided, the pre-lubrication line shall be provided with a valved bypass around
16571 the automatic control.

16572 8. A suitable outlet for drainage from pump glands shall be provided without discharging
16573 onto the floor.

16574 ~~AB.~~ Booster pumps;

16575 1. Booster pumps, except those connected to supply mains not containing service
16576 connections and except those taking suction directly from storage facilities, shall be
16577 located or controlled so that:

16578 1. a. They will not produce negative gauge pressure in their suction line; and

16579 2. b. The intake pressure shall be at least 20 psi when the pump is in normal operation;

16580 ~~3. 2.~~ An automatic pressure cutoff or a ~~pressure-regulating~~ pressure-regulating valve shall
16581 be provided to prevent the suction line pressure from dropping to below 10 psi; ~~and.~~

16582 ~~4. 3.~~ Automatic or remote control devices shall have a sufficient range between the start
16583 and cutoff pressure, or another mechanism ~~which~~ that will prevent excessive cycling of
16584 the pumps.

16585 ~~B. In-line booster pumps. In addition to the other requirements of this section, in-line booster~~
16586 ~~pumps shall be accessible for servicing and repairs.~~

16587 4. At least two pumping units shall be provided.

16588 a. If only two units are provided, then each shall be capable of delivering the peak hour
16589 demand, taking into account storage contributions.

16590 b. If more than two units are installed, then they shall have sufficient capacity so that
16591 if any one pump is out of service, the remaining pumps are capable of meeting the
16592 peak hour demand, taking into account storage contributions.

16593 c. When using booster pumps to transfer water from atmospheric storage tanks to
16594 hydropneumatic tanks located upstream of an entry point into the distribution system,
16595 the combined capacity of the two pumps shall equal or exceed the peak hour demand.
16596 If fire flow is provided, then a pump or pumps separate from the transfer pumps shall
16597 be provided to deliver the required fire flow.

16598 d. When booster pumping is required for small noncommunity systems, the reserve
16599 capacity requirements may be reduced in accordance with the type and size of system
16600 served.

16601 5. Controls shall be provided to shut off pumps in the event that suction conditions may
16602 result in cavitation.

16603 **12VAC5-590-1060. Automatic and remote controlled stations. (Repealed.)**

16604 ~~All automatic stations should be provided with an automatic signaling apparatus which will~~
16605 ~~report to a facility manned 24 hours per day when the station is out of service. All remote controlled~~
16606 ~~stations shall be electrically operated and controlled and shall have a signaling apparatus of~~
16607 ~~proven performance. Installation of electrical equipment shall conform with the appropriate state~~
16608 ~~codes.~~

16609 **12VAC5-590-1065. Piping, valves, and meters.**

16610 A. Piping shall:

16611 1. Be adequately sized to minimize energy losses;

16612 2. Not be subject to contamination;

- 16613 3. Have watertight joints;
- 16614 4. Be properly anchored to prevent movement;
- 16615 5. Be protected against surge or water hammer;
- 16616 6. Have proper labels to identify the contents of the pipes ([12VAC5-590-720 C](#)); and
- 16617 7. Have all exposed piping, valves, and appurtenances protected against physical damage
- 16618 and freezing.
- 16619 B. Pumps shall be adequately valved to allow satisfactory operation, maintenance, and repair.
- 16620 1. If foot valves are necessary, then they shall have a net valve area of at least 2-1/2 times
- 16621 the area of the suction pipe and they shall be screened.
- 16622 2. Each pump shall have shutoff valves on both suction and discharge sides of the pump.
- 16623 3. Each pump shall have a positive-acting check valve on the discharge side between the
- 16624 pump and shutoff valve or suitable control features to prevent flow reversal.
- 16625 4. Surge relief valves or slow-acting check valves shall be designed to minimize hydraulic
- 16626 transients.
- 16627 5. Discharge control valves and appurtenances shall be located above the pump floor
- 16628 when an above-ground discharge is provided.
- 16629 6. Pumps shall be equipped with an air release/vacuum relief valve located upstream from
- 16630 the check valve, with exhaust/relief piping terminating in a down-turned position at least
- 16631 18 inches above the floor and covered with a corrosion-resistant screen.
- 16632 C. Gauges. Each pump shall have a standard pressure gauge on its discharge line capable
- 16633 of displaying the maximum allowable pressure of the pump and shall have a standard pressure
- 16634 gauge, or a compound gauge when appropriate, on its suction line.
- 16635 D. Meters.

16636 1. All booster pump stations located within the distribution system should be fitted with a
16637 flow rate indicating and totalizing meter with recording capabilities.

16638 2. A totalizing water meter to measure water production shall be provided for each well
16639 and shall be located upstream of the well blowoff.

16640 E. Additional requirements for well discharge piping.

16641 1. Valves shall be provided to allow testing and control of each well.

16642 2. A non-threaded sampling tap shall be provided for water sampling that discharges in a
16643 downward direction and away from the well casing.

16644 3. A standard pressure gauge shall be provided to indicate well discharge pressure. The
16645 gauge shall be capable of displaying pressure under all operating conditions.

16646 4. Blowoff.

16647 a. A separate means to pump (i.e., blowoff) water of unsatisfactory quality to a point
16648 away from the groundwater source shall be provided. Blowoff discharge shall not
16649 create a cross-connection.

16650 b. Systems shall be equipped with a watertight cap or a screened discharge.

16651 **12VAC5-590-1070. Appurtenances. (Repealed.)**

16652 ~~A. Valves.~~

16653 ~~Pumps shall be adequately valved to permit satisfactory operation, maintenance, and repair~~
16654 ~~of the equipment. If foot valves are necessary, they shall have a net valve area of at least two and~~
16655 ~~one half times the area of the suction pipe and they shall be screened. Each pump shall have a~~
16656 ~~positive acting check valve on the discharge side between the pump and shutoff valve.~~

16657 ~~B. Piping, in general, shall:~~

16658 ~~1. Be designed so that the friction head will be low;~~

- 16659 ~~2. Not be subject to contamination;~~
- 16660 ~~3. Be sloped in one direction to drains;~~
- 16661 ~~4. Have adequate cleanouts;~~
- 16662 ~~5. Have watertight joints;~~
- 16663 ~~6. Be protected against surge or water hammer;~~
- 16664 ~~7. Be such that each pump has an individual suction line or the lines shall be so manifolded~~
- 16665 ~~that they will insure similar hydraulic and operational conditions; and~~
- 16666 ~~8. Have proper legends to identify the contents of the pipes (see 12VAC5-590-720 L).~~

16667 ~~C. Gauges and meters.~~

16668 ~~The station should have indicating, totalizing, and recording metering of the total water~~
16669 ~~pumped. Each pump shall:~~

- 16670 ~~1. Have a standard pressure gauge on its discharge line;~~
- 16671 ~~2. Have a compound gauge on its suction line; and~~
- 16672 ~~3. Have recording gauges in the larger stations as required by the division.~~

16673 ~~D. Water seals.~~

16674 ~~Water seals shall not be supplied with water of a lesser sanitary quality than that of the water~~
16675 ~~being pumped. Where pumps are sealed with potable water and are pumping water of lesser~~
16676 ~~sanitary quality, the seal shall:~~

- 16677 ~~1. Be provided with a break tank open to atmospheric pressure; and~~
- 16678 ~~2. Have an air gap between feeder line and spill line of the tank, at least two inches or two~~
- 16679 ~~pipe diameters, whichever is greater.~~

16680 ~~E. Controls.~~

16681 Pumps, their prime movers, and all accessories shall be controlled in such a manner that they
16682 will operate at their rated capacity without overloading. Where two or more pumps are installed,
16683 provision shall be made for proper alternation. Alternation may be automatic or manual. Provision
16684 shall be made to prevent operation of the pump during the backspin cycle. Electrical controls
16685 should be located above grade.

16686 F. Power.

16687 When power failure would result in cessation of the minimum essential service, the power
16688 supply shall be provided from at least two independent sources or an auxiliary source shall be
16689 provided.

16690 G. Auxiliary power supply.

16691 When automatic prelubrication of pump bearings is necessary and an auxiliary power supply
16692 is provided, the prelubrication line shall be provided with a valved by-pass around the automatic
16693 control.

16694 Article 5

16695 Finished Water Storage Structures

16696 12VAC5-590-1080. **General Basic finished water storage structure design criteria.**

16697 A. The materials and designs used for finished water storage structures, including associated
16698 pipe and valves, shall provide stability and durability as well as protect the quality of the stored
16699 water. ~~Steel structures shall follow the current available American Water Works Association~~
16700 ~~standards concerning steel tanks, standpipes, reservoirs, and elevated tanks wherever they are~~
16701 ~~applicable. Other materials of construction are acceptable when properly designed to meet the~~
16702 ~~requirements of this section. Steel, concrete, composite, and plastic storage structures shall be~~
16703 ~~designed, constructed, cleaned, disinfected, and tested in accordance with the following AWWA~~

16704 standards, where applicable: D100-11, D103-09, D107-16, D108-10, D110-13, D115-06, D120-
16705 09, D121-12, and C652-11.

16706 B. Safety cages, rest platforms, roof-ladder handrails, and other safety devices shall be
16707 provided as required by VOSH laws and regulations.

16708 A. C. Location of finished water storage structuresfacilities.

16709 1. The bottom of ~~ground level~~ ground-level reservoirs, storage tanks, and standpipes
16710 should be placed at the ~~normal ground surface~~ above finished grade to ensure positive
16711 drainage away from the structure.

16712 2. Where the bottom must be below normal ground surface, it shall be placed above the
16713 groundwater table. Sewers, drains, standing water, and similar sources of contamination
16714 shall be kept at least 50 feet from the finished water~~reservoir-storage structure~~facility.
16715 ~~AWWA approved water pipe~~ Pipe conforming to water distribution pipe standards of
16716 12VAC5-590-1110, pressure tested in place without leakage, shall be used for gravity
16717 sewers at lesser separations.

16718 3. The top of all storage facilities shall not be less than two feet above the normal ground
16719 surface and shall be above the 100-year flood elevation~~level~~. ~~Clearwells~~ Any clearwell
16720 constructed under filters may be ~~excepted~~ exempted from this requirement when the total
16721 design gives the same protection.

16722 D. Pressure variation. The maximum variation between normal operational high and low water
16723 levels in finished water storage structures which float on a distribution system shall not exceed 30
16724 feet.

16725 E. Level controls.

16726 1. Adequate controls shall be provided to enable sufficient tank turnover, water quality
16727 maintenance, avoidance of overflows, and efficient operations.

16728 2. A telemetry system with recording capability shall be considered to transmit the
16729 operating levels in distribution system storage facilities to a location where qualified
16730 personnel may access the data at all times.

16731 3. Altitude valves or equivalent controls shall be provided.

16732 4. For tanks with a monitoring system, warnings or alarms indicating overflow, low level,
16733 and pump malfunction shall be provided.

16734 ~~B. All new finished water storage structures shall have suitable watertight roofs or covers~~
16735 ~~which exclude birds, animals, insects, and dust.~~

16736 ~~C. No drain on a water storage structure shall have a direct connection to a sewer or storm~~
16737 ~~drain.~~

16738 ~~All finished water storage structures shall be equipped with separate drains discharging~~
16739 ~~to the atmosphere. Drainage of finished water storage structures to the distribution system~~
16740 ~~through inlet and outlet piping shall not be allowed.~~

16741 ~~D. The overflow pipe of a finished water storage structure shall be brought down near the~~
16742 ~~ground surface where any discharge will be visible and into a drainage inlet structure or a splash~~
16743 ~~plate which will divert the overflow away from the storage structure. No overflow may be~~
16744 ~~connected directly to a sewer or storm drain.~~

16745 ~~1. When an internal overflow pipe is used it shall be located in the access tube.~~

16746 ~~2. The overflow of a ground level finished water storage structure shall be high enough~~
16747 ~~above normal or graded ground surface to prevent the entrance of surface water.~~

16748 ~~3. All nonpressure type finished water storage structures shall be provided with a~~
16749 ~~downward discharging screened overflow.~~

- 16750 ~~E. Finished water storage structures shall be designed with convenient access to the interior~~
16751 ~~for cleaning and maintenance. Manholes or scuttles above the waterline shall be:~~
- 16752 ~~1. Framed at least four inches, preferably six inches, above the surface of the roof at the~~
16753 ~~opening; on ground level structures, manholes should be elevated 24 to 36 inches above~~
16754 ~~the top or covering sod;~~
 - 16755 ~~2. Fitted with a solid watertight cover which overlaps the framed opening and extends~~
16756 ~~vertically down around the frame at least two inches (shoebox type);~~
 - 16757 ~~3. Hinged at one side; and~~
 - 16758 ~~4. Fitted with a locking device.~~
- 16759 ~~F. Finished water storage structures shall be vented by separate vent structures. Open~~
16760 ~~construction between the side wall and roof is not permissible.~~
- 16761 ~~1. Vents shall prevent the entrance of surface water.~~
 - 16762 ~~2. Vents shall exclude birds and animals.~~
 - 16763 ~~3. Vents shall exclude insects and dust, as much as this function can be compatible with~~
16764 ~~effective venting, for elevated tanks and standpipes, four mesh noncorrodible screen may~~
16765 ~~be used.~~
 - 16766 ~~4. Vents on ground level structures shall terminate in an inverted U construction the~~
16767 ~~opening of which is 24 to 36 inches above the roof or sod and is covered with~~
16768 ~~noncorrodible screen cloth to exclude insects.~~
- 16769 ~~G. The roof and sidewalls of all structures must be watertight with no openings except properly~~
16770 ~~constructed vents, manholes, overflows, risers, drains, pump mountings, control ports, or piping~~
16771 ~~for inflow and outflow.~~

16772 1. Any pipes running through the roof or sidewall of a finished water storage structure must
16773 be welded or properly gasketed in metal tanks or should be connected to standard wall
16774 castings which were poured in place during the forming of a concrete structure; these wall
16775 castings shall have flanges imbedded in the concrete.

16776 2. Openings in a storage structure roof or top designed to accommodate control apparatus
16777 or pump columns shall be curbed and sleeved with proper additional shielding and
16778 shoebox type cover to prevent the access of surface water into the structure.

16779 3. Valves and controls shall be located outside the storage structure so that valve stems
16780 and similar projections will not pass through the roof or top of the structure.

16781 H. The roof or cover of the storage structure should be well drained, but downspout pipes
16782 shall not enter or pass through the reservoir.

16783 I. The safety of employees shall be considered in the design of the storage structure. As a
16784 minimum, such matters shall conform to pertinent building codes, laws, and regulations of the
16785 area where the reservoir is constructed.

16786 1. Ladders, ladder guards, balcony railings, and safe location of entrance hatches shall be
16787 provided.

16788 2. Elevated tanks with riser pipes over eight inches in diameter shall have protective bars
16789 over the riser opening inside the tank.

16790 J. All finished water storage structures and their appurtenances, especially the riser pipes,
16791 overflows, and vents, shall be designed to prevent freezing which will interfere with proper
16792 functioning.

16793 K. Every catwalk over finished water in a storage structure shall have a solid floor with raised
16794 edges so designed that shoe scrapings and dirt will not fall into the water.

16795 ~~L. The area surrounding a ground level structure should be graded in a manner that will~~
16796 ~~prevent surface water from standing within 50 feet of the structure.~~

16797 ~~M. Proper protection should be given to metal surfaces by paints or other protective coatings,~~
16798 ~~by cathodic protective devices, or both. Paint systems consistent with the most current available~~
16799 ~~American Water Works Association standards and otherwise acceptable to the division shall be~~
16800 ~~used. Cathodic protection should be designed and installed by competent technical personnel.~~

16801 ~~N. All finished water storage facilities shall be cleaned to remove all dirt and loose materials~~
16802 ~~prior to disinfection of the structure. Only potable water shall be used to clean and rinse the water~~
16803 ~~storage facilities. All equipment including brooms, brushes, spray equipment and workmen's~~
16804 ~~boots shall be disinfected before they are used to clean the storage facilities.~~

16805 ~~O. All finished water storage facilities shall be satisfactorily disinfected prior to being placed~~
16806 ~~in operation. The disinfection of the storage facilities shall be repeated until it is determined, by~~
16807 ~~bacteriological testing, that the water is free of coliform bacteria.~~

16808 ~~1. One of the following disinfection methods shall be used. Other methods of disinfection~~
16809 ~~may be approved on a case-by-case basis by the division.~~

16810 ~~a. The tank shall be filled to the overflow level with potable water to which enough~~
16811 ~~chlorine has been added to produce an initial chlorine concentration of 50 mg/L in the~~
16812 ~~full tank. The full tank should stand for 24 hours; however, in no case shall it stand~~
16813 ~~less than six hours. At the end of the holding period, the chlorinated water shall be~~
16814 ~~drained to waste, the tank refilled with potable water, and tested for satisfactory~~
16815 ~~bacteriological quality before placing the tank in service.~~

16816 ~~b. All interior surfaces of the tank shall have applied a chlorine solution containing at~~
16817 ~~least 200 mg/L of free available chlorine. The chlorine solution shall be applied with~~
16818 ~~either spray equipment or brushes. Any equipment used to apply the chlorine solution~~

16819 shall either be new or previously used only for disinfection purposes. The chlorine
16820 solution shall remain in contact with the tank surfaces for at least 30 minutes. The tank
16821 shall then be filled with potable water to the overflow level and tested for satisfactory
16822 bacteriological quality before placing the tank in service; or

16823 c. Potable water containing a free chlorine residual of 50 mg/L shall be placed in the
16824 tank to such a depth that when the tank is filled, the resulting chlorine concentration in
16825 the water will be at least two mg/L. The water containing 50 mg/L of chlorine shall
16826 stand in the tank for 24 hours. The tank shall then be filled with potable water and
16827 allowed to stand for 24 additional hours. At the end of the second 24 hour period, the
16828 chlorine residual shall be at least two mg/L. After analyses of the water for satisfactory
16829 bacteriological quality, the tank may be placed in service without draining the water
16830 used to disinfect it.

16831 2. Testing of the water following disinfection shall be in accordance with 12VAC5-590-800

16832 G.

16833 _____

16834 **12VAC5-590-1081. Atmospheric tank storage.**

16835 A. Protection.

16836 1. All finished water storage structures shall have suitable watertight roofs or covers that
16837 exclude birds, animals, and insects.

16838 2. All finished water storage structures shall be designed to prevent vandalism and
16839 entrance by animals or unauthorized persons.

16840 B. The finished water storage structure shall be designed to facilitate turnover of water.

16841 Consideration shall be given to locating inlet and outlet pipes at different elevations and locations,

16842 tank mixers, and other acceptable means to avoid stagnation. Excessive storage capacity shall
16843 be avoided to prevent water quality deterioration. See 12VAC5-590-640 B 3.

16844 C. Drains.

16845 1. No drain on a finished water storage structure shall create a cross-connection hazard.

16846 2. All finished water storage structures shall be equipped with separate drains discharging
16847 to the atmosphere. Drainage of finished water storage structures to the distribution system
16848 through inlet and outlet piping is prohibited.

16849 D. Overflows.

16850 1. Finished water storage structures shall be provided with a downward-discharging,
16851 screened overflow pipe. The discharge pipe shall be brought down near the ground
16852 surface and into a drainage inlet structure or a splash plate that will divert the overflow
16853 away from the storage structure. The overflow pipe discharge shall be high enough above
16854 normal or graded ground surface to prevent the entrance of surface water.

16855 2. Overflow pipe screens shall be installed so as to withstand the force of overflows.
16856 Properly designed flapper valves or rubber flex-type valves may be used instead of
16857 screens if approved by the commissioner.

16858 E. Inlet and discharge pipes.

16859 1. Elevated tanks with riser pipes over eight inches in diameter shall have protective bars
16860 over the riser opening inside the tank.

16861 2. Inlet and outlet pipes from water storage facilities shall be located in a manner that will
16862 prevent the flow of sediment into the distribution system.

16863 F. Finished water storage structures shall be designed with convenient access to the interior
16864 for cleaning and maintenance. Ladders, ladder guards, balcony railings, and safely located

16865 entrance hatches shall be provided where applicable. Hatches, manholes, or scuttles above the

16866 waterline shall be:

16867 1. Framed at least four inches, preferably six inches, above the surface of the roof at the

16868 opening; on ground-level structures, manholes should be elevated 24 - 36 inches above

16869 finished grade;

16870 2. Fitted with a solid watertight cover that overlaps the framed opening and extends

16871 vertically down around the frame at least two inches (shoebox type);

16872 3. Hinged at one side; and

16873 4. Fitted with a locking device.

16874 G. Finished water storage structures shall be vented by separate vent structures. Open

16875 construction between the side wall and roof is prohibited.

16876 1. Vents shall prevent the entrance of surface water.

16877 2. Vents shall exclude birds, animals, and insects, and be constructed of non-corrodible

16878 material. Screens shall be designed to be frost-free or capable of relieving pressure or

16879 vacuum in the event of frosting or clogging.

16880 3. Vents on ground-level structures shall terminate in an inverted U construction, with the

16881 vent terminating 24 - 36 inches above roof or finished grade.

16882 H. Penetrations. The roof and sidewalls of all structures shall be watertight with no openings

16883 except properly constructed vents, manholes, overflows, risers, drains, pump mountings, control

16884 ports, or piping for inflow and outflow.

16885 1. Any pipes running through the roof or sidewall of a finished water storage structure shall

16886 be welded or properly gasketed in metal tanks or should be connected to standard wall

16887 castings that were placed during the forming of a concrete structure; these wall castings
16888 shall have flanges imbedded in the concrete.

16889 2. Valves and controls shall be located outside the finished water storage structure so that
16890 valve stems and similar projections will not pass through the roof or top of the structure.

16891 3. Downspout pipes for roof drainage shall not enter or pass through the structure.

16892 I. All finished water storage structures and their appurtenances, especially the riser pipes,
16893 overflows, and vents, shall be designed to prevent freezing that will interfere with proper
16894 functioning.

16895 J. Every catwalk over finished water in a storage structure shall have a solid floor with raised
16896 edges designed so that shoe scrapings and dirt will not fall into the water.

16897 K. The area surrounding a ground-level structure shall be graded in a manner that will prevent
16898 surface water from standing within 50 feet of the structure.

16899 L. Proper protection shall be given to metal surfaces by paints or other protective coatings, by
16900 cathodic protective devices, or both, in accordance with the NSF/ANSI Standard 61-2016, AWWA
16901 Standards D102-14, D104-11, and D106-16, or an approved equivalent, where applicable.

16902 M. All finished water storage facilities shall be cleaned to remove all dirt and loose materials
16903 before disinfection of the structure. Only potable water shall be used to clean and rinse the water
16904 storage facilities. All equipment including brooms, brushes, spray equipment and worker's boots
16905 shall be disinfected before they are used to clean the storage facilities.

16906 N. Disinfection. All finished water storage facilities shall be satisfactorily disinfected in
16907 accordance with AWWA Standard C652-11 before being placed in operation. The disinfection of
16908 the storage facilities shall be repeated until it is determined, by bacteriological testing, that the
16909 water is free of coliform bacteria.

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16912 **12VAC5-590-1082. Pressure tank storage.**

16913 When hydropneumatic tanks are used, they shall comply with the requirements of state and
16914 local laws and regulations for the construction and installation of unfired pressure vessels.

16915 1. Pressure tanks shall be located above the normal ground surface with the operating
16916 end of the tank containing the inlet pipe, the pressure gauge, and other appurtenances
16917 projecting into a building with climate controls to prevent freezing. Alternatively, it may be
16918 completely housed, if adequate access is provided for inspection, removal, and
16919 replacement.

16920 2. Pressure tanks shall have bypass piping to permit operation of the system while the
16921 tank is being cleaned, repaired, or painted.

16922 3. Pressure tanks shall have an access manway, a drain, and control equipment consisting
16923 of a pressure gauge, water sight glass, automatic or manual air blowoff, pressure and
16924 vacuum relief valves, and mechanical means for adding air. Pressure tanks less than 120
16925 gallons and bladder tanks are not required to have an access manway, sight glass, or
16926 vacuum relief valve.

16927 _____
16928 **12VAC5-590-1090. Plant storage.**

16929 The applicable design standards of [12VAC5-590-1080](#) shall be followed for plant storage.

16930 A. ~~Washwater~~ Backwash water storage tanks shall be sized in conjunction with available
16931 pump units and finished water storage to ~~give~~ provide the filter backwash water required.
16932 Consideration ~~must~~ shall be given to the possibility of having to wash more than one filter at a
16933 time or several filters in succession.

16934 B. Clearwell storage ~~should~~ shall be sized, in conjunction with distribution system storage, to
16935 relieve the filters from having to follow fluctuations in water use or meet peak demands, including
16936 filter backwash water. When finished water storage is used to provide proper contact time for
16937 chlorine disinfection, special attention ~~must~~ shall be given to size, drawdown, and baffling. Plant
16938 clearwells shall be equipped with a raised viewing port having a clear glass or plastic viewing
16939 window and a submerged, ~~waterproof~~ waterproofed electric light.

16940 C. Finished water shall not be stored or conveyed in a compartment adjacent to ~~unsafe~~
16941 nonpotable water when the two compartments are separated by a single wall.

16942 D. Receiving basins and pump wet wells for finished water shall be designed as finished water
16943 storage structures.

16944 E. ~~Hydropneumatic (pressure) tanks may be acceptable in small water systems. When used,~~
16945 ~~they shall comply with the requirements of state and local laws and regulations for the construction~~
16946 ~~and installation of unfired pressure vessels.~~

16947 ~~1. The tank shall be located above the normal ground surface with the tank end containing~~
16948 ~~the inlet pipe, the pressure gauge and other appurtenances projecting into an operating~~
16949 ~~house to prevent freezing or be completely housed.~~

16950 ~~2. The tank shall have bypass piping to permit operation of the system while the tank is~~
16951 ~~being cleaned, repaired, or painted.~~

16952 ~~3. Pressure or level-pressure operated start-stop controls shall be installed on the~~
16953 ~~discharge piping to permit operation of the water supply system.~~

16954 ~~4. Each tank shall have an access manhole, a drain, and control equipment consisting of~~
16955 ~~pressure gauge, water sight glass, automatic or manual air blowoff, pressure and vacuum~~
16956 ~~relief valves and mechanical means for adding air. Appurtenances to small capacity tanks~~
16957 ~~shall be determined by the division on a case-by-case basis.~~

16958 ~~5. Tanks and pumps shall be designed to minimize pump cycling and shall have at least~~
16959 ~~the following capacity:~~

16960 ~~a. When the hydropneumatic tank is fed directly by a well or wells, the effective storage~~
16961 ~~volume is one-third of the hydropneumatic tank's gross volume;~~

16962 ~~b. When the hydropneumatic tank is fed directly from ground storage, the effective storage~~
16963 ~~volume is the effective volume of the ground storage tank plus the effective volume of the~~
16964 ~~hydropneumatic tank; and~~

16965 **12VAC5-590-1100. Distribution storage. (Repealed.)**

16966 ~~The applicable design standards of 12VAC5-590-1080 shall be followed for distribution~~
16967 ~~storage.~~

16968 ~~A. The maximum variation between high and low water levels in finished water storage~~
16969 ~~structures which float on a distribution system should not exceed 30 feet. Large diameter, shallow-~~
16970 ~~depth reservoirs are preferable over small diameter, deep-depth reservoirs.~~

16971 ~~B. Adequate controls shall be provided to maintain levels in distribution system storage~~
16972 ~~structures at all times.~~

16973 ~~C. Pressure tanks. (Also see 12VAC5-590-1090 E.)~~

16974 ~~1. A telemetering system and recording equipment should be provided, to a location where~~
16975 ~~qualified personnel are available at all times, for the transmission and recording of storage~~
16976 ~~levels in the distribution system.~~

16977 ~~2. Altitude valves or equivalent controls may be required for subsequent structures on the~~
16978 ~~system.~~

16979 ~~3. Overflow, low level, and pump malfunction warnings or alarms should be transmitted to~~
16980 ~~a location where qualified personnel are available for surveillance on a 24-hour basis.~~

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Article 6

Water Distribution Systems

12VAC5-590-1110. ~~Materials~~ Distribution system materials.

~~A. The pipe selected shall have been manufactured in conformity with the current available standards issued by the American Water Works Association if such standards exist or be approved by the National Sanitation Foundation for water distribution piping.~~

~~B. In the absence of such standards, pipe meeting applicable commercial standards and acceptable to the division may be considered.~~

~~C. Used water mains that meet these standards may be used again after the pipe has been thoroughly cleaned and restored.~~

~~D. Packing and joint materials used in the joints of pipe shall meet the standards of the American Water Works Association or the National Sanitation Foundation.~~

~~E. Mechanical joints or slip joints with resilient gaskets are preferred.~~

Pipe, fittings, joints, valves, hydrants, and coatings shall conform to AWWA standards.

12VAC5-590-1120. Minimum pipe size.

A. The minimum size pipe for water distribution systems mains shall be four inches in diameter. Pipes of lesser diameter may be used in the following instances:

1. When the run is less than 300 feet, two-inch diameter pipe may be used; ~~and~~.
2. When the run is less than 600 feet but more than 300 feet, three-inch diameter pipe may be used.
3. Any departure in sizing shall be justified by hydraulic analysis and future water demands.

17003 B. ~~The minimum size of pipe where fire protection is to be provided or required shall be six~~
17004 ~~inches in diameter. Fire hydrants shall not be connected to water mains that are not designed to~~
17005 ~~carry fire flows. Connection of a fire hydrant to a pipe of less than six inches in diameter is~~
17006 ~~prohibited.~~

17007 C. ~~The standard grading schedule of the Insurance Services Office and other related~~
17008 ~~organizations shall be followed in other cases.~~

17009 D. ~~Any departure in sizing shall be justified by hydraulic analysis and future water use and~~
17010 ~~can be considered only in special circumstances.~~

17011 E. ~~Water mains not sized to carry fire flows shall not be connected to fire hydrants. Where a~~
17012 ~~noncommunity waterworks serves a single building, the plumbing shall be in accordance with the~~
17013 ~~USBC. Where a noncommunity waterworks serves two or more buildings, the pipe shall be of~~
17014 ~~sufficient size to provide adequate flow and pressure in order to meet the system demands.~~

17015 **12VAC5-590-1130. System Distribution system design.**

17016 A. Dead-ends should be minimized by the looping of all water mains.

17017 B. Where dead-end lines water mains occur, ~~they shall be provided with a fire hydrant, flushing~~
17018 ~~hydrant, or blowoff for flushing purposes a~~ means of effective flushing shall be provided.

17019 **12VAC5-590-1140. Installation and testing of water mains.**

17020 A. Adequate supports and restraints shall be provided for all pipes.

17021 B. A continuous and uniform bedding shall be provided in the trench for all buried pipe.

17022 C. Stones and rocks found in the trench shall be removed ~~for~~ to a depth of at least six inches
17023 below the bottom of the pipe and selected fill bedding provided.

17024 D. The specifications for installation shall include:

17025 1. ~~Pressure testing on installed pipe;~~

17026 ~~2. Allowable leakage of installed pipe; and~~
17027 ~~3. Reference to applicable American Water Works Association standards or~~
17028 ~~manufacturers' recommended installation procedures. Installed pipe shall be pressure-~~
17029 ~~tested and meet allowable leakage as specified in accordance with AWWA Standards~~
17030 ~~C600-10, C604-11, and C605-13, where applicable.~~

17031 E. Any plastic or other nonmetallic pressurized ~~conduit pipe~~ installed underground shall ~~have~~
17032 ~~affixed thereto~~ be provided with a material conductive of electricity or some other means of
17033 locating the ~~conduit while it is underground~~ buried pipe.

17034 _____
17035 **12VAC5-590-1150. Separation of water mains and sanitary sewers.**

17036 A. The following factors shall be considered in providing adequate separation of water mains
17037 and sanitary sewers:

- 17038 1. Materials and types of joints for water and sanitary sewer mains;
- 17039 2. Soil conditions;
- 17040 3. Service branch connections into the water main and sanitary sewer mains;
- 17041 4. Compensating variations in the horizontal and vertical separations;
- 17042 5. Space for repairs and alterations of water and sanitary sewer mains;
- 17043 6. Offsetting of pipes around manholes; and
- 17044 7. Identification of the physical restraints preventing normal separation.

17045 B. Parallel installation of water mains and sanitary sewers.

17046 1. Under normal conditions, water mains shall be laid at least 10 feet horizontally from a
17047 sanitary sewer or sewer manhole. The distance shall be measured edge-to-edge.

17048 2. Under unusual ~~conditions~~ situations when local conditions prevent a horizontal
17049 separation of 10 feet, the water main may be laid closer to a sanitary sewer or sewer
17050 manhole provided that:

17051 a. The bottom (invert) of the water main shall be at least 18 inches above the top
17052 (crown) of the sanitary sewer;

17053 b. Where this vertical separation cannot be obtained, the sanitary sewer shall be
17054 constructed of ~~AWWA approved water pipe~~ water distribution pipe, and pressure
17055 tested in place ~~without leakage prior to backfilling; and in accordance with 12VAC5-~~
17056 590-1110 and 12VAC5-590-1140;

17057 c. The commissioner may approve concrete encasement of the water main or other
17058 physical barrier;

17059 ~~e. d.~~ The sewer manhole shall be of watertight construction and tested in place; and

17060 e. No water pipes shall pass through or come into contact with any part of a sewer
17061 manhole.

17062 C. Crossing- of water mains and sanitary sewers.

17063 1. Under normal conditions, ~~water lines~~ mains crossing sanitary sewers shall be laid to
17064 provide a separation of at least 18 inches between the bottom of the water ~~line~~ main and
17065 the top of the sanitary sewer whenever possible.

17066 2. Under unusual ~~conditions~~ situations when local conditions prevent a vertical separation
17067 described in subdivision C 1 of this section, the following construction shall be used:

17068 a. ~~Sewers~~ Sanitary sewers passing over or under water mains shall be constructed of
17069 the materials described in ~~subdivision B-2-b~~ subsection B of this section and shall be
17070 constructed to a point 10 feet beyond, and on each side of the crossing; and

17071 b. Water ~~lines~~ mains passing under sanitary sewers shall, in addition, be protected by
17072 providing:

17073 (1) A vertical separation of at least 18 inches between the bottom of the sanitary sewer
17074 and the top of the water ~~line~~ main;

17075 (2) Adequate structural support for the sanitary sewers to prevent excessive deflection
17076 of the joints and the settling on and breaking of the ~~waterline~~ water main; and

17077 (3) That the length of the water ~~line~~ main be centered at the point of the crossing so
17078 that joints shall be equidistant and as far as possible from the sanitary sewer.

17079 D. ~~No water pipes shall pass through or come in contact with any part of a sewer manhole.~~
17080 The minimum horizontal separation distance between water mains and septic tanks and
17081 drainfields, measured edge-to-edge, shall be 10 feet. Greater separation distances shall be
17082 provided wherever practical.

17083 E. Water mains shall be located a safe horizontal distance from sources of contamination not
17084 already mentioned in this section, such as sewage treatment works and industrial complexes. The
17085 owner's engineer shall contact the department to determine the safe separation distances.

17086 **12VAC5-590-1160. Valve, air relief, meter, and blowoff chambers.**

17087 A. ~~Air and sediment accumulations may be removed through a standard fire hydrant;~~
17088 ~~compressed air and pumping may be used for dewatering mains through hydrants.~~ Standard fire
17089 hydrants or blowoffs shall be considered to enable removal of sediment and air accumulations.

17090 B. ~~Chambers~~ Drains in chambers or pits ~~containing~~ that contain valves, blowoffs, meters, or
17091 other ~~such~~-appurtenances to a distribution system shall not be connected directly to any storm
17092 drain or sanitary sewer, nor shall blowoffs or air relief valves be connected directly to any sanitary
17093 sewer.

17094 C. ~~Such chambers~~ Chambers or pits shall be drained to the surface of the ground where they
17095 are not subject to flooding by surface water or to absorption pits located above the seasonal
17096 groundwater table elevation. The backfill material for the water main may serve as an absorption
17097 pit if granular embedment material is laid from the pipe bedding up through the final backfill layer
17098 for the entire length of pipe in the chamber. Sump pumps may be used where other means are
17099 not practicable.

17100 D. Chambers or pits shall be designed to facilitate air-valve inspection and servicing.

17101 E. Air relief and blowoff piping.

17102 ~~D.~~ 1. The open end of an air relief pipe shall be extended from the manhole or enclosing
17103 chamber to a point at least one foot above ground and provided with a screened,
17104 downward facing elbow. The exposed pipe and appurtenances shall be protected from
17105 vandalism and other damage.

17106 2. When an above-ground extension is not practical or desired, the open end of the air
17107 relief pipe or blowoff shall be extended.

17108 a. Where the pit or chamber is provided with proper drainage, and is not otherwise
17109 subject to high groundwater levels, surface flooding, ponding, and contaminant or
17110 pollutant spills, the open end may be provided with a screened, downward facing
17111 elbow. The valve chamber or pit shall be vented to provide sufficient air flow to allow
17112 proper operation of the air valve. Air valves fitted with a smooth vent port and screened
17113 hood are allowable under these conditions.

17114 b. Where the pit or chamber is not properly drained or is otherwise subject to high
17115 groundwater levels, surface flooding, ponding, and contaminant or pollutant spills, a
17116 manually operated valve or blowoff shall be used and the open end shall be fitted with

17117 a watertight cap or other means to prevent contamination from entering the pipe and
17118 valve.

17119 c. The installation and testing specifications shall require field verification by the
17120 owner's engineer of the groundwater elevation and surface water drainage prior to
17121 placement of the pit or chamber.

17122 **12VAC5-590-1170. Hydrants.**

17123 A. Where hydrant drains are not plugged, they shall be drained to the ground surface or to dry
17124 wells provided exclusively for this purpose in a manner that will avoid contamination of the hydrant
17125 or water main from high groundwater, surface flooding and ponding, and contaminant or pollutant
17126 spills.

17127 B. Hydrant drains shall not be connected to sanitary sewers or storm drains.

17128 C. Fire hydrants shall be connected only to water ~~systems~~ mains adequately designed for fire
17129 flows ~~in addition to domestic flow~~ in accordance with the requirements of 12VAC5-590-1120 B.

17130 **12VAC5-590-1180. Surface water crossings.**

17131 A. Surface water crossings, both over and under water, present special ~~problems and should~~
17132 challenges and shall be discussed with the ~~division~~ department before ~~final plans~~ project
17133 documents are prepared.

17134 ~~A. Above~~ B. Aerial water crossings. The pipe above water crossings shall be:

- 17135 1. Adequately supported;
- 17136 2. Protected from freeze damage;
- 17137 3. Accessible for repair or replacement; and
- 17138 4. Above the 100-year flood elevation~~level~~.

17139 ~~B.-C.~~ Under water crossings.

17140 1. The pipe shall be of special construction, suitable to the method of installation and
17141 having flexible watertight joints.

17142 2. ~~Valves~~ Where rigid pipe is used, valves and taps shall be provided at both ends of the
17143 water crossing so that the section can be isolated for tests or repair; the valves and taps
17144 shall be easily accessible and not subject to flooding.

17145 3. ~~Sample taps shall be available at each end of the crossing and at a reasonable~~
17146 ~~distance from each side of the crossing and not subject to flooding.~~

17147 4. ~~Permanent taps shall be made for testing and locating leaks.~~

17148 **12VAC5-590-1190. ~~Water services and plumbing. (Repealed.)~~**

17149 ~~Water services and plumbing shall conform to the Uniform Statewide Building Code.~~

17150 **12VAC5-590-1200. ~~Water pressure in systems. (Repealed.)~~**

17151 **12VAC5-590-1210. Disinfection and testing of water mains.**

17152 A. All water mains shall be disinfected in accordance with AWWA Standard C651-14 prior to
17153 before being placed in operation. The disinfection of the mains shall be repeated until it is
17154 determined, by bacteriological testing, that the water is free of coliform bacteria.

17155 B. ~~Prior to disinfection all water mains shall be flushed unless the tablet method of disinfection~~
17156 ~~is used. All valves and hydrants shall be operated during this operation. Flushing velocities should~~
17157 ~~not be less than 2.5 feet per second.~~

17158 ~~C. Methods of chlorine application.~~

17159 1. ~~Continuous feed method -- Potable water shall be introduced into the pipe main at a~~
17160 ~~constant flow rate. Chlorine shall be added at a constant rate to this flow so that the~~
17161 ~~chlorine concentration in the water in the pipe is at least 50 mg/L. The chlorinated water~~
17162 ~~shall remain in the main at least 24 hours, after which, the chlorine concentration in the~~

17163 water shall be at least 10 mg/L. All valves and appurtenances shall be operated while the
17164 chlorinated water remains in the main;

17165 2. Slug method -- Potable water shall be introduced into the main at a constant flow rate.
17166 This water shall receive a chlorine dosage which will result in a chlorine concentration of
17167 100 mg/L in a "slug" of the water. The chlorine shall be added long enough to insure that
17168 all portions of the main are exposed to the 100 mg/L chlorine solution for at least three
17169 hours. The chlorine residual shall be checked at regular intervals not to exceed 2,000 feet
17170 to insure that adequate residual is maintained. As the chlorinated water passes valves
17171 and appurtenances, they shall be operated to insure disinfection of these appurtenances;

17172 or

17173 3. Tablet method -- Tablets shall be placed in each section and in all appurtenances.
17174 Enough tablets shall be used to insure that a chlorine concentration of 25 mg/L is provided
17175 in the water. They shall be attached by an adhesive to the top of the pipe sections and
17176 crushed or rubbed in all appurtenances. The adhesive shall be acceptable to the division.
17177 The velocity of the potable water in the main shall be less than 1 foot per second. The
17178 water shall then remain in contact with the pipe for 24 hours. All valves and appurtenances
17179 shall be operated while the chlorinated water is in the main.

17180 This method shall not be used if nonpotable water or foreign materials have entered the
17181 mains or if the water temperature is below 5°C (41°F).

17182 D. Final flushing. After the required retention period, the chlorinated water shall be flushed
17183 from the main using potable water.

17184 E. Testing. After the mains have been flushed, the water mains shall be tested in accordance
17185 with [12VAC5-590-800](#) C. Samples shall be collected at regular intervals, not exceeding 2,000
17186 feet, throughout the length of main.

17187 F. ~~Repairs. Cleaning, disinfecting, flushing, testing, or similar operational actions shall be in~~
17188 ~~accordance with the current standard issued by AWWA (AWWA C-601). Project documents shall~~
17189 ~~provide the details of the procedure and include the disinfectant application technique, dosage,~~
17190 ~~contact time, method of testing the results of the procedure, and use or disposal of the disinfecting~~
17191 ~~water.~~

17192 **12VAC5-590-1220. ~~Cover~~ Pipe cover.**

17193 All ~~distribution mains~~ buried distribution pipe shall be provided with sufficient earth or other
17194 suitable cover or encasement to prevent from freezing and provide protection from damage by
17195 external forces.

17196 **12VAC5-590-1230. ~~Metering.~~ Service connection metering.**

17197 A. ~~Each~~ All new service connections in community waterworks service connection should shall
17198 be metered.

17199 B. Water pipe and appurtenances between the water main and the service connection shall
17200 conform to all applicable codes.

17201 **12VAC5-590-1235. Water loading stations.**

17202 A. The station and its piping and valving arrangement shall be designed to prevent
17203 unauthorized use, tampering, and vandalism.

17204 B. An air gap or RPZ assembly shall be provided on the potable water fill connection to prevent
17205 backflow into the waterworks.

17206 C. The piping and valving arrangement shall prevent contaminants from being transferred
17207 from a hauling tank or vessel to others subsequently using the water loading station.

17208 D. Hoses used to fill potable water tanks and vessels shall be approved for potable water
17209 contact.

17210 E. Hoses shall not come into contact with the ground or other contaminated surface and shall
17211 otherwise be handled, maintained, and stored in a manner to prevent contamination.

17212 ~~Part IV. Exceptions for Noncommunity Waterworks to Specific Sections of the Manual of~~
17213 ~~Practice (Part III)~~

17214 ~~12VAC5-590-1240. General. (Repealed.)~~

17215 ~~Noncommunity waterworks design shall conform to Part III of this chapter. Due to the types of~~
17216 ~~service provided and size of some noncommunity waterworks, certain exceptions to the design~~
17217 ~~requirement specified in Part III may be allowed. Each of the following subsections will refer to~~
17218 ~~exceptions in corresponding sections of Part III.~~

17219 ~~12VAC5-590-1250. Exceptions to Article 1 of Part III. (Repealed.)~~

17220 ~~A. The evaluation of source requirements shall consider the type and use of the~~
17221 ~~noncommunity system. Minimum storage for noncommunity waterworks, in conjunction with the~~
17222 ~~source, must provide system peak hour demand.~~

17223 ~~B. A minimum laboratory facility of a sink and workbench shall be provided.~~

17224 ~~12VAC5-590-1260. Exceptions to Article 2 of Part III. (Repealed.)~~

17225 ~~A. Exceptions to the minimum size well lot may be made for noncommunity waterworks, based~~
17226 ~~upon site availability and other factors.~~

17227 ~~B. When the source requirements for a noncommunity system are determined to be three~~
17228 ~~gallons per minute or less the 48-hour minimum drawdown test may be reduced to no less than~~
17229 ~~eight hours. The drawdown test, approved by the division and based upon system demands and~~
17230 ~~geological conditions, shall be performed to determine well yield.~~

17231 ~~12VAC5-590-1270. Exceptions to Article 5 of Part III. (Repealed.)~~

17232 ~~When booster pumping is required for small noncommunity systems, the duplicity and~~
17233 ~~capacity requirements may be reduced in accordance with the type and size of system served.~~

17234 ~~12VAC5-590-1280. Exceptions to Article 6 of Part III. (Repealed.)~~

17235 ~~In the instance where a noncommunity water system serves a single building, the water line~~
17236 ~~plumbing (including size) shall be in accordance with the most recent edition of the Uniform~~
17237 ~~Statewide Building Code.~~

17238 ~~When a noncommunity water system serves two or more buildings, the water line shall be of~~
17239 ~~sufficient size to provide adequate flow and pressure in order to meet the system demands.~~

17240 ~~APPENDIX A. [RESERVED] (Repealed.)~~

17241 ~~APPENDIX B. BACKGROUND USED IN DEVELOPING THE CHEMICAL, PHYSICAL AND~~
17242 ~~RADIOLOGICAL LIMITS OF THE DRINKING WATER STANDARDS. (Repealed.)~~

17243 ~~COPPER~~

17244 ~~ACTION LEVEL—1.3 mg/L~~

17245 ~~Copper is an essential and beneficial element in human metabolism. The daily copper~~
17246 ~~requirement for adults has been estimated to be 2.0 mg. Preschool age children require about~~
17247 ~~0.1 mg daily for normal growth. Copper at high doses has, however, been shown to cause~~
17248 ~~stomach and intestinal distress, liver and kidney damage, and anemia.~~

17249 ~~A primary source of high concentrations of copper in drinking water is from the internal~~
17250 ~~corrosion of copper plumbing within the home. The EPA has established an action level of 1.3~~
17251 ~~mg/L of copper in first draw tap sample which may result in public waterworks installing measures~~
17252 ~~to control corrosion.~~

17253 ~~CORROSION~~

17254 Corrosion is responsible for many problems in the water distribution system including
17255 tuberculation with loss of carrying capacity and increased pumping costs, leaks, main ruptures,
17256 discoloration and loss of chlorine residual. The corrosivity of drinking water is a parameter which
17257 has not only esthetic and economic significance, but is health significant as well. The products of
17258 corrosion having the greatest health significance at the present time, cadmium and lead, are
17259 addressed as primary maximum contaminants, but there is also a sufficient basis to include
17260 corrosivity as a secondary maximum contaminant level.

17261 Corrosivity is controlled by pH adjustment, the use of chemical stabilizers, or other means
17262 which are dependent upon the specific conditions of the water. The two major corrosion indicators
17263 utilized in Virginia are the Langelier Index (L.I.) and the Aggressive Index (A.I.). Other indicators
17264 also exist. The L.I. and A.I. are determined by utilizing some or all of the following parameters:

17265 -pH

17266 -Calcium Hardness

17267 -Alkalinity

17268 -Temperature

17269 -TDS

17270 All waterworks owners will be notified periodically of the corrosivity of their drinking water by
17271 the commissioner, either as L.I., A.I. or other appropriate index. Noncorrosive water should be
17272 the goal of each waterworks owner.

17273 Furthermore, EPA requires each owner to be aware of type of materials used in the distribution
17274 system (including service connections and household plumbing) such as:

LEAD

Pipe

Solder

COPPER

Piping

Service Lines

| | |
|------------------------------|--------------------------------------|
| Caulking | Household Plumbing |
| Lining of Distribution Mains | - |
| Household Plumbing | - |
| - | - |
| GALVANIZED | Ferrous Piping (cast iron and steel) |
| Service Lines | Asbestos Cement Pipe |
| Household Plumbing | Vinyl Lined Asbestos Cement Pipe |
| - | Coal Tar Lined Pipes |
| - | Plastic Pipe |
| - | Piping |
| - | Service Line |
| - | Household Plumbing |

17275 FLUORIDE

17276 When the fluoride concentration in drinking water is maintained within the recommended
17277 ranges of 0.8 mg/L minimum and 1.0 mg/L maximum with the optimum being 0.9 mg/L, the
17278 consumer will realize a reduction in dental caries. When supplemental fluoridation is practiced, it
17279 is particularly advantageous to maintain a fluoride concentration at or near the optimum. The
17280 reduction in dental caries experienced at optimal fluoride concentrations will be diminished by as
17281 much as 50% when the concentration is 0.2 mg/L below the optimum. An approval limit slightly
17282 higher than the optimum can be tolerated without any mottling of teeth, so where fluorides are
17283 native to the water supply, these concentrations are acceptable. Higher levels should be reduced
17284 by treatment or blending with other sources lower in fluoride content. The U.S. Environmental
17285 Protection Agency has determined that the PMCL for fluoride is 4.0 mg/L based on long term
17286 toxicity data. The EPA has also determined that the SMCL for fluoride is 2.0 mg/L based on the
17287 potential formation of cosmetically objectionable dental fluorosis as a result of long term exposure.
17288 The level of the SMCL was based on a balancing of the beneficial and undesirable effects of
17289 fluoride.

17290 FOAMING AGENTS

17291 Foaming is an undesirable property of drinking water because it is esthetically displeasing and
17292 therefore should be absent. Because no convenient standardized formability test exists, and
17293 because surfactants are one major class of substances that cause foaming, this property is
17294 determined indirectly by measuring the anionic surfactant concentration of substances measured
17295 by the methylene blue method and should not exceed 0.5 mg/L as methylene blue active
17296 substances (MBAS).

17297 LEAD

17298 ACTION LEVEL—0.015 mg/L

17299 Lead is a toxic metal that tends to accumulate in the bone of man and animals. Signs of lead
17300 intoxication include gastrointestinal disturbances, fatigue, anemia, muscular paralysis, and
17301 encephalopathy. Irreversible damage to the brain is the frequent result of lead intoxication in
17302 children because of their eating lead containing paint still found in older homes. The most serious
17303 effects on the nervous system are seldom seen in the adult population however.

17304 Household plumbing has been identified as a significant contributor of lead to our drinking
17305 water; therefore, any notice to the public concerning lead should advise persons served by the
17306 system to use only the cold water faucet for drinking and for use in cooking or preparing baby
17307 formula, and to run the water until it gets as cold as it is going to get before each use. If there has
17308 recently been major water use in the household, such as showering or bathing, flushing toilets, or
17309 doing laundry with cold water, flushing the pipes should take 5 to 30 seconds, if not, flushing the
17310 pipes could take as long as several minutes. Each notice (see 12VAC5-590-520 A-8) should also
17311 advise persons served by the system to check to see if lead pipes, solder, or flux have been used
17312 in plumbing that provides tap water and to ensure that new plumbing and plumbing repairs use
17313 lead free materials.

17314 The EPA's national primary drinking water regulation requires all public water systems to
17315 optimize corrosion control to minimize lead contamination resulting from the corrosion of plumbing
17316 materials. Public water systems serving 50,000 people or fewer that have lead concentrations
17317 below 15 parts per billion (ppb) in more than 90% of tap water samples (the EPA "action level")
17318 have optimized their corrosion control treatment. Any water system that exceeds the action level
17319 must also monitor their source water to determine whether treatment to remove lead in source
17320 water is needed. Any water system that continues to exceed the action level after installation of
17321 corrosion control and/or source water treatment must eventually replace all lead service lines
17322 contributing in excess of 15 ppb of lead to drinking water. Any water system that exceeds the
17323 action level must also undertake a public education program to inform consumers of ways they
17324 can reduce their exposure to potentially high levels of lead in drinking water.

17325 NITRATE

17326 Nitrate nitrogen ($\text{NO}_3\text{-N}$) levels not exceeding 20 mg/L may be allowed in a noncommunity
17327 waterworks if the owner demonstrates:

- 17328 1. Such water will not be available to children under 6 months of age; and
17329 2. There will be continuous posting of the fact that $\text{NO}_3\text{-N}$ levels exceed 10 mg/L and the
17330 potential health effects of exposure; and
17331 3. Health officials will be notified annually of $\text{NO}_3\text{-N}$ levels that exceed 10 mg/L; and
17332 4. No adverse health effects will result.

17333 NOTE: Nitrite in water poses a greater health hazard but fortunately it seldom occurs in high
17334 concentrations. Waters with nitrite nitrogen concentrations over 1 mg/L should not be used for
17335 infant feedings.

17336 MANMADE RADIONUCLIDES

17337 ~~To determine compliance with subsection B of Table 2.5, the detection limits shall not exceed~~

17338 ~~the concentrations listed in the following table:~~

~~DETECTION LIMITS FOR MAN-MADE BETA
PARTICLE PHOTON EMITTERS~~

| RADIONUCLIDE | DETECTION LIMIT |
|--------------------------------|---|
| Tritium | 1,000 pCi/L |
| Strontium-89 | 10 pCi/L |
| Strontium-90 | 2 pCi/L |
| Iodine-131 | 1 pCi/L |
| Cesium-134 | 10 pCi/L |
| Gross Beta | 4 pCi/L |
| Other radionuclides | 1/10 of the applicable limit |

17339 ~~RADIONUCLIDES~~

17340 ~~To determine compliance with subsection B of Table 2.5, the detection limits shall not exceed~~

17341 ~~the concentrations listed in the following table:~~

~~DETECTION LIMITS FOR GROSS ALPHA
PARTICLE ACTIVITY, RADIUM-226, RADIUM-228,
AND URANIUM~~

| Contaminant | Detection Limit |
|--|----------------------------|
| Gross alpha particle activity | 3 pCi/L |
| Radium-226 | 1 pCi/L |
| Radium-228 | 1 pCi/L |
| Uranium | 1 µg/L |

17342 ~~TURBIDITY~~

17343 ~~Operational requirement: Conventional water filtration plants utilizing surface waters as a~~

17344 ~~source of supply are capable of producing filtered water with a turbidity consistently less than 0.1~~

17345 ~~NTU. Therefore, for water filtration plants the filter effluent turbidity for each filter, before any post-~~

17346 ~~filtration chemical addition, operational limit is 0.1 NTU.~~

17347 ~~APPENDIX C. FIELD OFFICE COUNTIES AND CITIES SERVED. (Repealed.)~~

~~Regional Office~~

~~Counties and Cities Served~~

ABINGDON
454 E. Main Street
P.O. Box 1985
Abingdon, VA 24210
703-628-5161

Planning Districts 1, 2, 3, and 4

CULPEPER
102 N. Main Street
3rd Floor
Culpeper, VA 22701
703-825-6772

Planning Districts 8, 9, & 16

DANVILLE
1347 Piney Forest Road
Danville, VA 24540
804-791-5222

Planning Districts 11, 12, 13, & 14

LEXINGTON
129 S. Randolph Street
Lexington, VA 24450
703-463-7136

Planning Districts 5, 6, 7, and 10

RICHMOND
1500 E. Main Street,
Room 109,
P.O. Box 2448,
Richmond, VA 23218
804-662-9530

SOUTHEAST VIRGINIA
5700 Thurston Avenue
Suite 203
Virginia Beach, VA 23455
804-363-3876

Planning Districts 19, 20, 21, and 22

17348

17349 APPENDIX D. [RESERVED] (Repealed.)

17350 APPENDIX E. [RESERVED] (Repealed.)

17351 APPENDIX F. [REPEALED] (Repealed.)

17352 APPENDIX G. ~~MONITORING AND REPORTING.~~ (Repealed.)

17353 Analytical laboratory control testing, monitoring, and analyses at waterworks are made to
17354 control plant operation, to record plant performance, and to monitor conditions in the distribution
17355 system. Test results properly recorded, compiled and reported can be invaluable in improving
17356 plant performance, efficiency and cost effectiveness. Operational control testing should present
17357 evidence that the water has been properly prepared for each step in the treatment process.
17358 Testing should provide evidence that each process has proceeded according to its intended
17359 purpose and that finished water is clean, free from taste and odor, free from undesirable chemicals
17360 and considered safe.

17361 Analytical equipment used to determine compliance with 12VAC5-590-510 D shall be of the
17362 laboratory type (continuous monitoring equipment may be acceptable if demonstrated to be
17363 accurate by correlation with a laboratory type instrument each shift) approved for use at the
17364 waterworks per 12VAC5-590-760.

17365 These suggested monitoring and reporting requirements should be used as a guide in
17366 preparing, modifying, and reviewing operation monthly reports.

17367 The field office of the Office of Water Programs will notify in writing each individual waterworks
17368 of the operation monthly report requirements and supply the waterworks with a standard example
17369 report form or will assist in the development of system specific report forms.

17370 The following are suggested operation monthly report requirements that should be reported
17371 to the appropriate field office:

17372 ALL SURFACE WATER SYSTEMS:

17373 Number of hours in operation

- 17374 ~~–hours per day in operation~~
- 17375 Raw water treated
- 17376 ~~–gpd and monthly total at each entry point~~
- 17377 Finished water produced
- 17378 ~~–gpd and monthly total~~
- 17379 Finished water used for treatment process
- 17380 ~~–monthly total~~
- 17381 Finished water delivered to consumers
- 17382 ~~–monthly total~~
- 17383 ~~accountability (water lost) in distribution system~~
- 17384 ~~–percentage~~
- 17385 Raw water temperature
- 17386 ~~–average °C or °F~~
- 17387 Number of connections
- 17388 ~~–monthly average~~
- 17389 Population served
- 17390 ~~–monthly average~~
- 17391 Treatment plant maintenance activities
- 17392 ~~–brief summary of major activities~~
- 17393 ~~Chemical feeder laboratory and instrument calibration as appropriate~~

- 17394 ~~– quarterly for each chemical feeder or instrument unless specified elsewhere, i.e.,~~
- 17395 ~~fluoride feeders or manufacturer recommended~~
- 17396 ~~Waterworks not requiring operators in attendance whenever the plant is in operation may~~
- 17397 ~~reduce some of the daily requirements.~~
- 17398 ~~WATERWORKS THAT PROVIDE DISINFECTION BY CHLORINATION:~~
- 17399 ~~Water plant monitoring:~~
- 17400 ~~Chlorine compound used~~
- 17401 ~~– liquid, dry, calcium hypochlorite or sodium hypochlorite~~
- 17402 ~~Amount of chlorine compound used at each application point~~
- 17403 ~~daily gallons or pounds~~
- 17404 ~~Date chlorine compound replenished~~
- 17405 ~~– for each application point~~
- 17406 ~~Free chlorine residual testing after the chlorine contact period~~
- 17407 ~~– every two hours of plant operation for waterworks requiring operators in attendance~~
- 17408 ~~whenever the plant is in operation (see 12VAC5-590-440 B). Records must be kept of~~
- 17409 ~~each residual determination. The daily lowest/highest residuals measured and the~~
- 17410 ~~number of measurements taken should be reported.~~
- 17411 ~~– once per day for waterworks providing treatment or only disinfection and serving 400~~
- 17412 ~~or more persons and not requiring operators in attendance whenever the plant is in~~
- 17413 ~~operation.~~
- 17414 ~~– frequency for waterworks providing only disinfection and serving less than 400~~
- 17415 ~~persons shall be set by the division on an individual basis.~~

- 17416 ~~–daily or at the same time as chlorine residual testing if less than daily.~~
- 17417 ~~Distribution system monitoring:~~
- 17418 ~~Free chlorine testing~~
- 17419 ~~–seven days per week for waterworks serving 400 or more persons~~
- 17420 ~~–five days per week for waterworks serving less than 400 persons~~
- 17421 ~~–number of tests per test day and test locations shall be set by the division on an~~
- 17422 ~~individual basis. Records must be kept of each residual determination. The lowest,~~
- 17423 ~~highest and average residuals measured and the number of measurements taken~~
- 17424 ~~should be reported.~~
- 17425 ~~Total chlorine residual testing~~
- 17426 ~~–once per week at locations reflecting the maximum residence time of the water in the~~
- 17427 ~~system~~
- 17428 ~~–number of tests per test day and test locations shall be set by the division on an~~
- 17429 ~~individual basis. Records must be kept of each residual determination. The average~~
- 17430 ~~residual measured and the number of measurements should be reported.~~
- 17431 ~~pH~~
- 17432 ~~–daily or at the same time of chlorine residual testing if less than daily.~~
- 17433 ~~NOTE: If the system performs disinfection utilizing the combined chlorine residual process,~~
- 17434 ~~total residual testing should be substituted for free residual testing.~~
- 17435 ~~WATERWORKS EMPLOYING TURBIDITY REMOVAL:~~
- 17436 ~~Raw water monitoring:~~
- 17437 ~~pH~~

- 17438 ~~–electrometrically, every two hours~~
- 17439 Alkalinity
- 17440 ~~–total, once per shift~~
- 17441 Hardness
- 17442 ~~–total, once per shift~~
- 17443 Turbidity
- 17444 ~~–NTU, every two hours~~
- 17445 Raw water chemical treatment:
- 17446 Coagulant
- 17447 ~~–type, weight applied, dosage~~
- 17448 Coagulant aids
- 17449 ~~–type, weight applied, dosage~~
- 17450 Stabilizing chemicals
- 17451 ~~–type, weight applied, dosage~~
- 17452 ~~Taste and odor control chemicals~~
- 17453 ~~–type, weight applied, dosage~~
- 17454 Treated water (postflash mix) monitoring:
- 17455 pH
- 17456 ~~–electrometrically, twice per shift~~
- 17457 Coagulation control
- 17458 ~~–set on an individual basis~~

- 17459 Alkalinity
- 17460 ~~-total, once per shift~~
- 17461 Settled water (applied water) monitoring:
- 17462 Turbidity
- 17463 ~~-NTU, must be from each sedimentation basin for high rate, may be from top of filter~~
- 17464 ~~for rapid rate, every two hours~~
- 17465 Chlorine residual
- 17466 ~~-type and daily average, every two hours~~
- 17467 Settled water (applied water) chemical treatment:
- 17468 Chemical
- 17469 ~~-type, weight applied and dosage~~
- 17470 Filter aids
- 17471 ~~-type, weight applied and dosage~~
- 17472 Filtered water monitoring:
- 17473 Turbidity
- 17474 ~~-NTU, from each filter, every two hours, report maximum for the day~~
- 17475 Filter operation:
- 17476 Filters in operation
- 17477 ~~-number~~
- 17478 Filter run time
- 17479 ~~-number hours between backwashes~~

- 17480 Head loss
- 17481
 - each filter, end of each day or prior to backwash
- 17482 Backwash time
- 17483
 - average, minutes
- 17484 Backwash rate
- 17485
 - maximum, gpm
- 17486 Backwash water
- 17487
 - gallons used
- 17488 Rewash time
- 17489
 - if provided, average, minutes
- 17490 Filter drop test results
- 17491
 - each filter tested quarterly
- 17492 Filter rise rate test results
- 17493
 - each filter tested semiannually
- 17494 Filtered water chemical treatment:
- 17495 Stabilizing chemical
- 17496
 - type, weight applied per day, average dosage
- 17497 Finished water monitoring:
- 17498 pH
- 17499
 - electrometrically, every two hours
- 17500 Alkalinity

- 17501 ~~–total, once per shift~~
- 17502 Hardness
- 17503 ~~–total and calcium, once per shift~~
- 17504 Turbidity
- 17505 ~~–NTU, every two hours~~
- 17506 Chlorine residual
- 17507 ~~–every two hours low/high average~~
- 17508 NOTES:
- 17509 1. ~~Daily averages and highest daily reading of the results of the required number of tests or~~
- 17510 ~~measurements should be reported except for filtered water turbidity. Records of each test should~~
- 17511 ~~be kept.~~
- 17512 2. ~~Frequency of testing is on a per shift basis unless otherwise indicated.~~
- 17513 3. ~~Number of tests per shift shall be set by the division on an individual basis.~~
- 17514 4. ~~Exact location of sample collection or testing shall be set by the division on an individual~~
- 17515 ~~basis.~~
- 17516 5. ~~Where multiple sources are available, raw water data must be reported for each source.~~
- 17517 WATERWORKS PRACTICING RECYCLE:
- 17518 ~~Recycle flow monitoring:~~
- 17519 ~~–total flows recycled, gallons~~
- 17520 ~~–average and maximum return rate of combined recycle flows~~

- 17521 ~~WATERWORKS FLUORIDATING:~~
- 17522 ~~Type of compound used~~
- 17523 ~~–chemical name~~
- 17524 ~~Amount of compound used at each application point~~
- 17525 ~~–pounds, daily~~
- 17526 ~~Feeder calibration date~~
- 17527 ~~–monthly~~
- 17528 ~~Hardness of water applied to sodium fluoride saturate feeders (where softeners is required)~~
- 17529 ~~–weekly~~
- 17530 ~~Fluoride ion concentration in finished water~~
- 17531 ~~–one test per shift, minimum of one daily (monthly split sample with DCLS)~~
- 17532 ~~Fluoride ion concentration in the distribution system where two or more entry points contain~~
- 17533 ~~fluoride~~
- 17534 ~~–frequency and location of tests shall be set by the division on an individual basis,~~
- 17535 ~~both the minimum and maximum values must be reported~~
- 17536 ~~WATERWORKS EMPLOYING SOFTENING:~~
- 17537 ~~Lime, excess lime, and excess lime-soda processes:~~
- 17538 ~~–type, frequency and location of tests shall be set by the division on an individual basis~~
- 17539 ~~Cation exchange process:~~
- 17540 ~~Ion exchange material~~
- 17541 ~~–type, trade name~~

- 17542 Regeneration
- 17543 ~~–date and method, each unit~~
- 17544 Backwashing
- 17545 ~~–date and duration of washing, each unit~~
- 17546 Softener influent hardness
- 17547 ~~–daily, each source~~
- 17548 Softener effluent hardness
- 17549 ~~–daily, each unit~~
- 17550 Blended water hardness
- 17551 ~~–daily, where appropriate~~
- 17552 Stabilization chemical
- 17553 ~~–type, weight, applied daily dosage, stabilized pH, alkalinity, hardness~~
- 17554 ~~WATERWORKS EMPLOYING IRON AND MANGANESE CONTROL:~~
- 17555 ~~Removal by oxidation using continuous potassium permanganate regeneration, detention,~~
- 17556 ~~and filtration:~~
- 17557 ~~Raw water iron and manganese concentrations~~
- 17558 ~~–daily, each source~~
- 17559 ~~Pre-oxidation chemical (usually chlorine prior to application of permanganate)~~
- 17560 ~~–type, amount applied daily at each source and average dosage~~
- 17561 ~~Iron and manganese concentration prior to application of permanganate~~
- 17562 ~~–daily~~

- 17563 Potassium permanganate
- 17564 ~~– amount applied daily and average dosage~~
- 17565 ~~Filter influent iron and manganese concentrations~~
- 17566 ~~– daily, each filter~~
- 17567 ~~Filter effluent iron and manganese concentrations~~
- 17568 ~~– daily, each filter~~
- 17569 Removal by ion exchange:
- 17570 Ion exchange material
- 17571 ~~– type, trade name~~
- 17572 Regeneration
- 17573 ~~– date, each unit and method~~
- 17574 Backwashing
- 17575 ~~– date and duration of washing each unit~~
- 17576 ~~Raw water iron and manganese concentrations~~
- 17577 ~~– daily, each source~~
- 17578 ~~Exchange unit iron and manganese influent concentrations~~
- 17579 ~~– daily, each unit~~
- 17580 ~~Exchange unit iron and manganese effluent concentrations~~
- 17581 ~~– daily, each unit~~
- 17582 NOTES:

17583 1. Ion exchange process may also remove barium and radium which should be included or
17584 substituted in reporting.

17585 2. Testing for other removal processes will be set by the division on an individual basis.

17586 ~~WATERWORKS EMPLOYING STABILIZATION BY:~~

17587 ~~The addition of carbon dioxide or acid to waters treated with excess lime for softening or~~
17588 ~~manganese removal;~~

17589 ~~The addition of an alkali to reduce free carbon dioxide;~~

17590 ~~The addition of either soda ash or caustic soda to produce the desired calcium carbonate film~~
17591 ~~where the alkalinity exceeds 35 mg/L;~~

17592 ~~The addition of lime to produce the desired calcium carbonate film where the water is soft;~~

17593 ~~The addition of a mixture of lime and soda ash to produce the desired calcium carbonate film~~
17594 ~~where the water is soft and has a low carbon dioxide content;~~

17595 ~~The addition of polyphosphates for sequestering dissolved minerals.~~

17596 ~~Each chemical addition process should be monitored to determine the effectiveness of~~
17597 ~~stabilization treatment and concentration of chemicals in the treated water. The type, frequency,~~
17598 ~~and location of tests shall be set by the division on an individual basis.~~

17599 ~~WATERWORKS EMPLOYING TASTE AND ODOR CONTROL BY:~~

17600 ~~The addition of copper sulfate or other copper compounds to the reservoir;~~

17601 ~~The addition of activated carbon to the shallow areas of the reservoir;~~

17602 ~~The addition of potassium permanganate, chlorine, chlorine dioxide, or oxygen through~~
17603 ~~aeration to the raw water;~~

17604 ~~The addition of powdered activated carbon to the treatment process at various locations; or~~

17605 The use of granular activated carbon absorption units.

17606 Each process should be monitored to ensure the threshold odor number does not exceed
17607 three. The dosage or application rates should be monitored to ensure correct control. The type,
17608 frequency, and location of tests and the reporting of usage shall be set by the division on an
17609 individual basis.

| WATERWORKS EMPLOYING COLOR REMOVAL: | |
|-------------------------------------|--------------------------|
| Raw water color- | platinum - cobalt method |
| Settled water color- | platinum - cobalt method |
| Finished water color- | platinum - cobalt method |

17610 Monitoring, reporting, and frequencies shall be set by the division on an individual basis.

17611 CONSECUTIVE WATERWORKS:

17612 Finished water purchased

17613 -gallons per month per source

17614 Finished water delivered to consumers

17615 -gallons per month

17616 Accountability

17617 -percentage

17618 Number of connections

17619 -monthly average

17620 Population served

17621 -monthly average

17622 Free chlorine residual testing in the distribution system

17623 -same as for waterworks that provide disinfection by chlorination

- 17624 Total chlorine residual testing in the distribution system
- 17625 ~~– same as for waterworks that provide disinfection by chlorination~~
- 17626 APPENDIX H. ~~[REPEALED]~~ (Repealed.)
- 17627 APPENDIX I. ~~SUGGESTED OUTLINE OF CONTENTS OF A CROSS CONNECTION~~
- 17628 ~~CONTROL PROGRAM.~~ (Repealed.)
- 17629 Adopted ordinance (municipalities) – Make part of the program
- 17630 Administration – name of individual responsible to carry out requirements of the program.
- 17631 Procedures:
- 17632 1. ~~New facilities.~~
- 17633 2. ~~Existing facilities.~~
- 17634 Records:
- 17635 1. ~~Locations of devices and types.~~
- 17636 2. ~~Inspections/questionnaires.~~
- 17637 3. ~~Testing and maintenance.~~
- 17638 Notification:
- 17639 1. ~~Inspections of new and existing facilities.~~
- 17640 2. ~~Testing due.~~
- 17641 3. ~~Test results.~~
- 17642 4. ~~Device or means required.~~
- 17643 5. ~~Violations.~~
- 17644 6. ~~Termination or denial of service.~~

17645 Reporting procedures to follow in the event of or suspicion of contamination through a cross
17646 connection.

17647 Backflow prevention device tester list.

17648 Approved devices list.

17649 Consumer education literature.

17650 SUGGESTED OUTLINE OF CONTENTS OF AN ORDINANCE FOR A CROSS
17651 CONNECTION CONTROL PROGRAM

17652 Purpose of the ordinance -- to eliminate cross connections and protect the public health.

17653 Authority for ordinance -- required by waterworks regulations.

17654 Administration of the ordinance:

17655 1. Who is responsible to carry out the requirements of the ordinance, by position?

17656 2. Reference to an established program or policy procedures.

17657 3. Responsibility to carry out the program or policy.

17658 Enforcement of the ordinance:

17659 1. Right of entry for inspection or testing.

17660 2. Right to terminate or deny service.

17661 3. Notice of violations.

17662 4. Penalties.

17663 Definitions -- those in 12VAC5-590-20 of Article 1 of Part I which apply.

17664 General requirements of purveyor and consumer -- applicable provisions of Article 3 of Part II
17665 should be adopted and included as part of the ordinance. Modifications should be made to identify
17666 specific responsibilities.

17667 APPENDIX L. DETERMINATION OF CT. (Repealed.)

17668 Disinfection Criteria

17669 A treatment system must provide a minimum 3-log (99.9%) reduction of Giardia cysts and a
17670 4-log (99.99%) reduction of viruses, respectively. Table L-1 lists the log removal credits
17671 associated with four filtration processes and the inactivation levels that must be achieved by
17672 disinfection.

17673 Determination of Compliance With Inactivation

17674 To determine compliance with the inactivation requirements, a system must comply with the
17675 CT value(s) that is (are) based on disinfection conditions in the system during peak hourly flow.
17676 The "T" is the time in minutes it takes for the water during peak hourly flow to move between the
17677 point of disinfectant application and a point where "C", the residual concentration in mg/L, is
17678 measured before the water reaches the first customer. Contact time may be determined either by
17679 calculations, tracer studies, or an equivalent method as approved by the office. The contact time
17680 to be used for calculating CT is T_{10} , which is defined as the detention time at which 90 percent of
17681 the water passing through a unit is retained within that unit (e.g. mixing basins, sedimentation
17682 basins, clearwells, storage reservoirs, etc.)

17683 Systems with only one point of disinfectant application may determine the total inactivation on
17684 the basis of residual measurements at a single point prior to the first customer or at several points
17685 within the treatment train after the point of disinfectant application. In the latter instance, the
17686 residual profile is determined and the total inactivation is calculated as follows: (1) Determine the
17687 disinfectant residual, C, in mg/L at any number of points within the treatment train; (2) Determine
17688 the travel time, T, in minutes between the point of disinfectant application and the point where C
17689 is measured within the first section. For subsequent measurements of C, T is the time required
17690 for water to move from the previous residual measurement point to the next; (3) Calculate CT

17691 corresponding to each residual measurement point (CT_{calc}); (4) Determine the log inactivation for
17692 each section; and (5) Sum the log inactivations for each section to determine the total log
17693 inactivation. Tables L-2 through L-7 give CT values required for 99.9 percent inactivation (3 logs)
17694 of Giardia cysts at various pHs and temperatures. Tables L-9 through L-15 give CT values
17695 required for Giardia cysts and viruses at various temperatures using free chlorine, chlorine
17696 dioxide, chloramines and ozone. The minimum expected temperature and the maximum expected
17697 pH should be used for the calculations. Generally, if the CT required for 3 logs inactivation of
17698 Giardia cysts is achieved, the CT required for 4 logs inactivation of viruses is also achieved.

17699 Determination of Disinfectant Contact Time

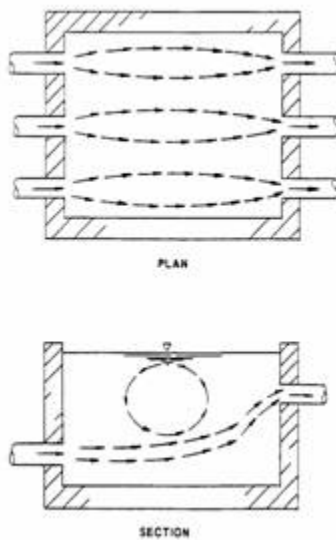
17700 The time within contact units (including mixing basins and storage reservoirs) that is to be
17701 used in calculations of CT should be the T_{40} value, as defined earlier. This value can be
17702 determined either by calculations that involve the theoretical hydraulic detention time (volume
17703 divided by flow rate) and factors that account for the degree of short-circuiting that might be
17704 expected through any given unit or by tracer studies.

17705 When T_{40} values are calculated, the theoretical, hydraulic detention time in a particular unit is
17706 reduced by some fraction, the magnitude of which is dictated by the degree of short-circuiting that
17707 is possible within that unit. The significant design characteristics that determine the degree of
17708 short-circuiting include the length-to-width ratio, the degree of baffling within the basins, and the
17709 effect of inlet baffling and outlet weir configurations. The use of these factors to obtain a T_{40} value
17710 effectively reduces the magnitude of T for use in CT calculations so that achieving a required CT
17711 requires the application of more disinfectant (i.e. a higher concentration).

17712 The purposes of baffling are to (1) maximize utilization of basin volume, (2) increase the plug-
17713 flow zone in the basin, and (3) minimize short-circuiting. Three general classifications of baffling
17714 conditions (poor, average, and superior) have been developed to categorize the results of tracer

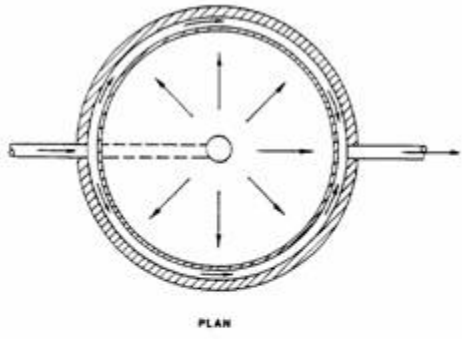
17715 studies for use in T_{10} determinations. The T_{10}/T ratios associated with each degree of baffling are
17716 summarized in Table L-8.

17717 The three types of basin inlet baffling configurations are: a target-baffle pipe inlet, an overflow
17718 weir entrance, and a baffled, submerged orifice or port inlet. Typical intra-basin baffling structures
17719 include: diffuser (perforated) walls; launders; cross-, longitudinal-, or maze baffling to cause
17720 either horizontal or vertical serpentine flow; and longitudinal divider walls, which prevent mixing
17721 by increasing the length-to-width ratio of the basins. Commonly used baffled outlet structures
17722 include free-discharging weirs, such as sharp-crested and V-notch, and submerged ports or weirs.
17723 Weirs that do not span the width of the basin, such as Cipolletti weirs, should not be used, as they
17724 may substantially increase weir overflow rates and the dead-space zone within the basin. Figures
17725 L-I through L-VI give examples of poor, average, and superior baffling conditions for rectangular
17726 and circular tanks.

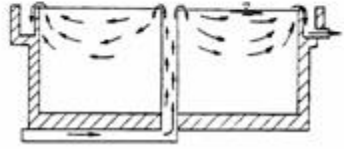


17727

17728 Figure L-1 Poor Baffling Condition—Rectangular Contact Basin



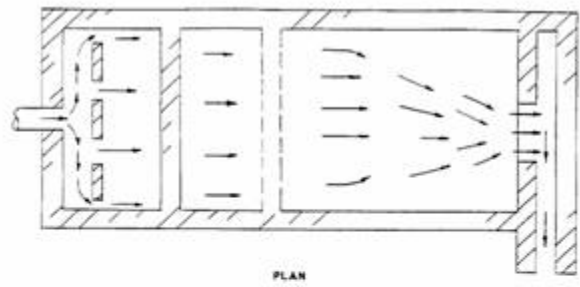
PLAN



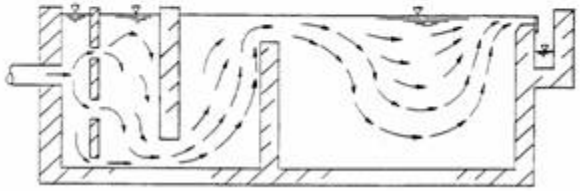
SECTION

17729

17730 ~~Figure L-2 Poor Baffling Condition—Circular Contact Basin~~



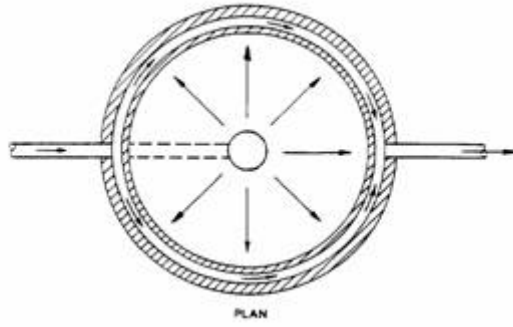
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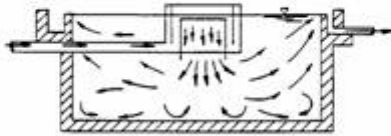
SECTION

17731

17732 ~~Figure L-3 Average Baffling Condition—Rectangular Contact Basin~~



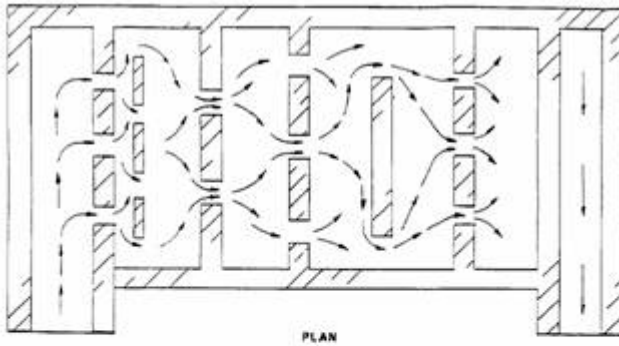
PLAN



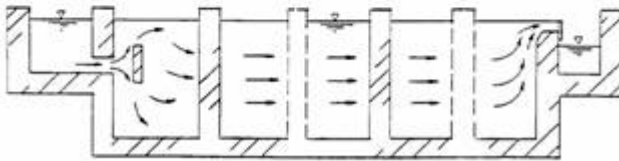
SECTION

17733

17734 Figure L-4 Average Baffling Condition—Circular Contact Basin



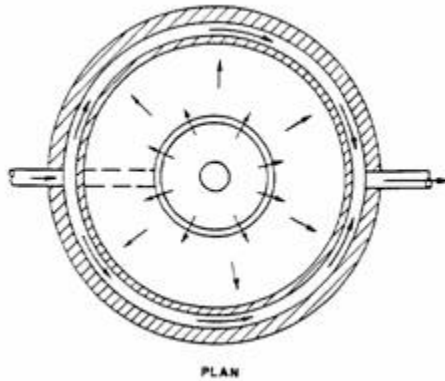
PLAN



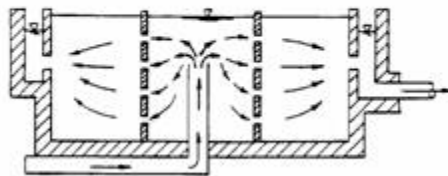
SECTION

17735

17736 Figure L-5 Superior Baffling Conditions—Rectangular Contact Basin



PLAN



SECTION

17737

17738 Figure L-6 Superior Baffling Conditions—Circular Contact Basin

17739 The following is a sample problem based on the inactivation tables and $T_{4.0}$ values calculated
 17740 from information regarding the design features of the contact unit and the theoretical detention
 17741 time. The disinfectant in this example is chlorine which is added just prior to the contact unit and
 17742 the flow rate, pH, chlorine residual, and water temperature are assumed to be 1.5 MGD, 7.5, 1.0
 17743 mg/L, and 5 degrees C, respectively. The contact unit has a baffled inlet, intra-basin baffles, and
 17744 a theoretical detention time of 90 minutes.

17745 $T_{4.0}/T = 0.5$ (see Table L-8)

17746 $T_{4.0} = 0.5 \times 90 \text{ minutes} = 45 \text{ minutes}$

17747 $CT_{\text{calc}} = 1.0 \text{ mg/L} \times 45 \text{ minutes} = 45 \text{ mg-min/L}$

17748 Note Required inactivation is 0.5 logs since this particular disinfection process follows a
 17749 conventional water treatment plant.

17750 From Table L-3, 5°C

17751 At pH = 7.5, C = 1.0 mg/L and CT_{calc} = 45 mg-min/L, interpolate the log inactivation.

17752 CT_{calc} of 45 mg-min/L falls between CTs of 30 (0.5 log) and 60 (1.0 log) mg-min/L. The

17753 corresponding log inactivation would be as follows:

17754
$$0.5 + [(45-30)/(60-30)] \times (1.0-0.5) = 0.75 \text{ logs}$$

17755 Therefore, the log inactivation requirement of 0.5 logs has been satisfied.

17756 Although the detention time is proportional to flow, the relationship generally is not linear.

17757 Therefore, tracer studies may be used to establish detention times for the range of flow rates

17758 experienced within each disinfectant section.

17759 Ideally, tracer tests should be conducted at a minimum of four flow rates that span the entire

17760 range of flows for the section being tested. The flow rates should be separated by approximately

17761 equal intervals to span the range of operation, with one near average flow, two greater than

17762 average, and one less than average. The flows should also be selected so that the highest is at

17763 least 91 percent of the highest flow rate expected to ever occur in that section. Four data points

17764 will ensure a good definition of the section's hydraulic profile.

17765 Systems can perform just one tracer test for each disinfectant residual at a flow rate of not

17766 less than 91 percent of the highest flow rate experienced in that section. If only one tracer test is

17767 performed, the detention time determined by the test may be used to provide a conservative

17768 estimate in CT calculations for that section for all flow rates less than or equal to the flow rate

17769 during the tracer test. Since T₁₀ is inversely proportional to flow rate, the T₁₀ at a flow rate other

17770 than that occurring during the tracer study can be determined by multiplying the T₁₀ determined

17771 from the tracer study by the ratio of the tracer study flow rate to the desired flow rate. That is:

17772
$$T_{10S} = T_{10T} \times Q_T / Q_S$$

17773 Where:

17774 $T_{10S} = T_{10}$ at system flow rate

17775 $T_{10T} = T_{10}$ at tracer flow rate

17776 $Q_T =$ tracer study flow rate

17777 $Q_S =$ system flow rate

17778 When tracer studies are performed, several variables other than flow rate will affect the
17779 detention time, including varying water levels in tanks, seasonal fluctuations in flow, and
17780 differences in water temperature, which may cause thermal stratification. If these variables are
17781 significant, additional tracer studies to determine the appropriate T_{10} values may be warranted.

17782 Two methods of tracer addition are commonly used in water treatment evaluations: the step-
17783 dose method and the slug dose method. In general, tracer studies involve the application of a
17784 chemical to a system and tracking the effluent concentrations over time. The effluent
17785 concentration profile is evaluated to determine the detention time T_{10} .

17786 Step-dose tracer studies are frequently employed in drinking water applications because the
17787 necessary chemical feed equipment is available and the resulting profile of normalized
17788 concentrations versus time is used directly to determine the detention time (T_{10}) required for
17789 calculating CT. The T_{10} value obtained from the studies is actually the time at which the effluent
17790 concentration of the tracer chemical is 10 percent of the added concentration.

17791 The slug-dose method requires the addition of a large, initial dose of tracer to the incoming
17792 water. Samples are collected at the exit end of the unit for a period of time until the tracer passes
17793 through the unit. Disadvantages of this method include: (1) extremely concentrated solutions of
17794 chemicals are required; (2) intensive mixing is required to minimize potential density currents and
17795 to obtain uniform distribution; (3) the concentration and volume of the initial tracer dose must be
17796 calculated carefully to provide an adequate tracer profile; (4) the resulting profile of concentration
17797 versus time cannot be used directly to determine T_{10} ; and (5) a mass balance on the treatment

17798 section is required to determine whether the tracer was completely recovered. One advantage of
17799 this method is that it may be applied where chemical feed equipment is not available at the desired
17800 point of application or where the equipment that is available does not have adequate capacity.

17801 Disinfection Profile and Benchmark

17802 1. A disinfection profile is prepared by calculating the log inactivation for each disinfection
17803 segment of the treatment plant, from initial point of disinfectant addition to the entrance to
17804 the distribution system. The log inactivations for each segment are summed to yield the
17805 total plant log inactivation.

17806 2. The procedure for computing the log inactivation is as follows:

17807 a. Collect data daily (plants serving 10,000 or more people), or weekly on the same
17808 calendar day (plants serving less than 10,000 people), at each disinfectant residual
17809 sampling point during peak hourly flow, for:

17810 (1) Water temperature ($^{\circ}\text{C}$)

17811 (2) Water pH (required for free chlorine calculation)

17812 (3) Disinfectant residual concentration ("C," in mg/L)

17813 b. Calculate contact time ("T," in minutes) for each disinfectant segment based on
17814 baffling factors or tracer studies.

17815 c. Calculate CT_{actual} for each disinfection segment under actual operating conditions.

17816 d. Determine the CT_{required} for 3-log Giardia inactivation ($CT_{3\text{-log-Giardia}}$) and/or 4-log virus
17817 ($CT_{4\text{-log-virus}}$) inactivation from the CT Tables.

17818 e. Calculate the log inactivation for Giardia and/or viruses for each segment using:

17819 (1) Log Inactivation of Giardia = $3.0 * CT_{\text{actual}} / CT_{3\text{-log-Giardia}}$

17820 (2) Log inactivation of viruses = $4.0 * CT_{\text{actual}} / CT_{4\text{-log-viruses}}$

17821 f. ~~Sum the segment log inactivations to determine the plant log inactivation.~~

17822 3. The disinfection profile is charted over the year and the benchmark is determined based

17823 on 12VAC5-590-500.

TABLE L-1 MAXIMUM LOG REMOVAL CREDITS ALLOWED FOR FILTRATION AND MINIMUM REQUIRED LEVELS OF INACTIVATION BY DISINFECTION

| Minimum Required Disinfection | | | | |
|-------------------------------|-----------------------------|---------|---------------------|---------|
| Type of Filtration | Maximum Log Removal Credits | | (Log Inactivations) | |
| | Giardia | Viruses | Giardia | Viruses |
| Conventional | 2.5 | 2.0 | 0.5 | 2.0 |
| Direct | 2.0 | 1.0 | 1.0 | 3.0 |
| Slow Sand | 2.0 | 2.0 | 1.0 | 2.0 |
| Diatomaceous Earth | 2.0 | 1.0 | 1.0 | 3.0 |

NOTE - The sum of the log removals for filtration plus disinfection must equal 3.0 for Giardia and 4.0 for viruses.

17824 -

TABLE L-2
CT VALUES FOR INACTIVATION OF GIARDIA CYSTS BY FREE CHLORINE AT 0.5 C OR LOWER

| CHLORINE CONCENTRATION (mg/L) | LOG INACTIVATIONS | | | | | | - | LOG INACTIVATIONS | | | | | |
|-------------------------------------|-------------------|-----|-----|-----|-----|-----|-----|-------------------|-----|-----|-----|-----|-----|
| | pH ≤ 6 | | | | | | - | pH = 6.5 | | | | | |
| | 0.5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 0.5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | |
| ≤ 0.4 | 23 | 46 | 69 | 91 | 114 | 137 | - | 27 | 54 | 82 | 110 | 138 | 166 |
| 0.6 | 24 | 47 | 71 | 94 | 118 | 142 | - | 28 | 56 | 84 | 112 | 140 | 168 |
| 0.8 | 24 | 48 | 73 | 97 | 121 | 145 | - | 29 | 57 | 86 | 114 | 142 | 170 |
| 1.0 | 25 | 49 | 74 | 99 | 123 | 147 | - | 29 | 59 | 88 | 116 | 144 | 172 |
| 1.2 | 25 | 51 | 76 | 101 | 125 | 149 | - | 30 | 60 | 90 | 118 | 146 | 174 |
| 1.4 | 26 | 52 | 78 | 103 | 127 | 151 | - | 31 | 61 | 92 | 120 | 148 | 176 |

| | | | | | | | | | | | | | |
|-----|----|----|----|---------|---------|---------|---|----|----|---------|---------|---------|---------|
| 1.6 | 26 | 52 | 79 | 10 5 | 13 4 | 15 7 | - | 32 | 63 | 95 | 12 6 | 15 8 | 18 9 |
| 1.8 | 27 | 54 | 81 | 10 8 | 13 5 | 16 2 | - | 32 | 64 | 97 | 12 9 | 16 4 | 19 3 |
| 2.0 | 28 | 55 | 83 | 11 0 | 13 8 | 16 5 | - | 33 | 66 | 99 | 13 4 | 16 4 | 19 7 |
| 2.2 | 28 | 56 | 85 | 11 3 | 14 4 | 16 9 | - | 34 | 67 | 10 4 | 13 4 | 16 8 | 20 4 |
| 2.4 | 29 | 57 | 86 | 11 5 | 14 3 | 17 2 | - | 34 | 68 | 10 3 | 13 7 | 17 4 | 20 5 |
| 2.6 | 29 | 58 | 88 | 11 7 | 14 6 | 17 5 | - | 35 | 70 | 10 5 | 13 9 | 17 4 | 20 9 |
| 2.8 | 30 | 59 | 89 | 11 9 | 14 8 | 17 8 | - | 36 | 71 | 10 7 | 14 2 | 17 8 | 21 3 |
| 3.0 | 30 | 60 | 91 | 12 4 | 15 4 | 18 4 | - | 36 | 72 | 10 9 | 14 5 | 18 4 | 21 7 |

| | pH=7.0 | | | | | | | pH=7.5 | | | | | |
|--------|---------|-----|---------|---------|---------|---------|---|---------|-----|---------|---------|---------|---------|
| (mg/L) | 0. 5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | - | 0. 5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 |
| ≤0.4 | 33 | 65 | 98 | 13 0 | 16 3 | 19 5 | - | 40 | 79 | 11 9 | 15 8 | 19 8 | 23 7 |
| 0.6 | 33 | 67 | 10 0 | 13 3 | 16 7 | 20 0 | - | 40 | 80 | 12 0 | 15 9 | 19 9 | 23 9 |
| 0.8 | 34 | 68 | 10 3 | 13 7 | 17 4 | 20 5 | - | 41 | 82 | 12 3 | 16 4 | 20 5 | 24 6 |
| 1.0 | 35 | 70 | 10 5 | 14 0 | 17 5 | 21 0 | - | 42 | 84 | 12 7 | 16 9 | 21 4 | 25 3 |
| 1.2 | 36 | 72 | 10 8 | 14 3 | 17 9 | 21 5 | - | 43 | 86 | 13 0 | 17 3 | 21 6 | 25 9 |
| 1.4 | 37 | 74 | 11 4 | 14 7 | 18 4 | 22 4 | - | 44 | 89 | 13 3 | 17 7 | 22 2 | 26 6 |
| 1.6 | 38 | 75 | 11 3 | 15 4 | 18 8 | 22 6 | - | 46 | 91 | 13 7 | 18 2 | 22 8 | 27 3 |
| 1.8 | 39 | 77 | 11 6 | 15 4 | 19 3 | 23 4 | - | 47 | 93 | 14 0 | 18 6 | 23 3 | 27 9 |
| 2.0 | 39 | 79 | 11 8 | 15 7 | 19 7 | 23 6 | - | 48 | 95 | 14 3 | 19 4 | 23 8 | 28 6 |
| 2.2 | 40 | 81 | 12 4 | 16 4 | 20 2 | 24 2 | - | 50 | 99 | 14 9 | 19 8 | 24 8 | 29 7 |
| 2.4 | 41 | 82 | 12 4 | 16 5 | 20 6 | 24 7 | - | 50 | 99 | 14 9 | 19 9 | 24 8 | 29 8 |

| | | | | | | | | | | | | | |
|--------|----------|-----|---------|---------|---------|---------|---|----------|---------|---------|---------|---------|---------|
| 2.6 | 42 | 84 | 12 6 | 16 8 | 21 0 | 25 2 | - | 51 | 10 4 | 15 2 | 20 3 | 25 3 | 30 4 |
| 2.8 | 43 | 86 | 12 9 | 17 4 | 21 4 | 25 7 | - | 52 | 10 3 | 15 5 | 20 7 | 25 8 | 31 0 |
| 3.0 | 44 | 87 | 13 4 | 17 4 | 21 8 | 26 4 | - | 53 | 10 5 | 15 8 | 21 4 | 26 3 | 31 6 |
| - | pH = 8.0 | | | | | | - | pH = 8.5 | | | | | |
| (mg/L) | 0. 5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | - | 0. 5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 |
| ≤0.4 | 46 | 92 | 13 9 | 18 5 | 23 4 | 27 7 | - | 55 | 11 0 | 16 5 | 21 9 | 27 4 | 32 9 |
| 0.6 | 48 | 95 | 14 3 | 19 4 | 23 8 | 28 6 | - | 57 | 11 4 | 17 4 | 22 8 | 28 5 | 34 2 |
| 0.8 | 49 | 98 | 14 8 | 19 7 | 24 6 | 29 5 | - | 59 | 11 8 | 17 7 | 23 6 | 29 5 | 35 4 |
| 1.0 | 51 | 10 | 15 4 | 20 2 | 25 3 | 30 4 | - | 61 | 12 2 | 18 3 | 24 3 | 30 4 | 36 5 |
| 1.2 | 52 | 10 | 15 4 | 20 7 | 26 9 | 31 4 | - | 63 | 12 5 | 18 8 | 25 4 | 31 3 | 37 6 |
| 1.4 | 54 | 10 | 16 7 | 21 4 | 26 4 | 32 8 | - | 65 | 12 9 | 19 4 | 25 8 | 32 3 | 38 7 |
| 1.6 | 55 | 11 | 16 0 | 21 5 | 27 9 | 32 4 | - | 66 | 13 2 | 19 9 | 26 5 | 33 4 | 39 7 |
| 1.8 | 56 | 11 | 16 3 | 22 9 | 28 5 | 33 2 | - | 68 | 13 6 | 20 4 | 27 4 | 33 9 | 40 7 |
| 2.0 | 58 | 11 | 17 5 | 23 3 | 28 4 | 34 8 | - | 70 | 13 9 | 20 9 | 27 8 | 34 8 | 41 7 |
| 2.2 | 59 | 11 | 17 8 | 23 7 | 29 5 | 35 4 | - | 71 | 14 2 | 21 3 | 28 4 | 35 5 | 42 6 |
| 2.4 | 60 | 12 | 18 0 | 24 4 | 30 4 | 36 4 | - | 73 | 14 5 | 21 8 | 29 0 | 36 3 | 43 5 |
| 2.6 | 61 | 12 | 18 3 | 24 4 | 30 5 | 36 7 | - | 74 | 14 8 | 22 2 | 29 6 | 37 0 | 44 4 |
| 2.8 | 63 | 12 | 18 5 | 25 8 | 31 0 | 37 3 | - | 75 | 15 4 | 22 6 | 30 4 | 37 7 | 45 2 |
| 3.0 | 64 | 12 | 19 7 | 25 4 | 31 5 | 38 8 | - | 77 | 15 3 | 23 0 | 30 7 | 38 3 | 46 0 |
| - | pH = 9.0 | | | | | | - | - | - | - | - | - | - |
| (mg/L) | 0. 5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | - | - | - | - | - | - | - |

| | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|---|---|---|---|---|---|---|
| ≤0.4 | 65 | 13 | 19 | 26 | 32 | 39 | - | - | - | - | - | - | - |
| | 0 | 5 | 0 | 5 | 0 | | | | | | | | |
| 0.6 | 68 | 13 | 20 | 27 | 33 | 40 | - | - | - | - | - | - | - |
| | 6 | 4 | 4 | 9 | 7 | | | | | | | | |
| 0.8 | 70 | 14 | 21 | 28 | 35 | 42 | - | - | - | - | - | - | - |
| | 4 | 4 | 4 | 2 | 2 | | | | | | | | |
| 1.0 | 73 | 14 | 21 | 29 | 36 | 43 | - | - | - | - | - | - | - |
| | 6 | 9 | 4 | 4 | 7 | | | | | | | | |
| 1.2 | 75 | 15 | 22 | 30 | 37 | 45 | - | - | - | - | - | - | - |
| | | 6 | 4 | 6 | 4 | | | | | | | | |
| 1.4 | 77 | 15 | 23 | 30 | 38 | 46 | - | - | - | - | - | - | - |
| | 5 | 2 | 9 | 7 | 4 | | | | | | | | |
| 1.6 | 80 | 15 | 23 | 31 | 39 | 47 | - | - | - | - | - | - | - |
| | 9 | 9 | 8 | 8 | 7 | | | | | | | | |
| 1.8 | 82 | 16 | 24 | 32 | 40 | 48 | - | - | - | - | - | - | - |
| | 3 | 5 | 6 | 8 | 9 | | | | | | | | |
| 2.0 | 83 | 16 | 25 | 33 | 41 | 50 | - | - | - | - | - | - | - |
| | 7 | 0 | 3 | 7 | 0 | | | | | | | | |
| 2.2 | 85 | 17 | 25 | 34 | 42 | 51 | - | - | - | - | - | - | - |
| | 0 | 6 | 4 | 6 | 4 | | | | | | | | |
| 2.4 | 87 | 17 | 26 | 34 | 43 | 52 | - | - | - | - | - | - | - |
| | 4 | 4 | 8 | 5 | 2 | | | | | | | | |
| 2.6 | 89 | 17 | 26 | 35 | 44 | 53 | - | - | - | - | - | - | - |
| | 8 | 7 | 5 | 4 | 3 | | | | | | | | |
| 2.8 | 91 | 18 | 27 | 36 | 45 | 54 | - | - | - | - | - | - | - |
| | 4 | 2 | 2 | 3 | 3 | | | | | | | | |
| 3.0 | 92 | 18 | 27 | 36 | 46 | 55 | - | - | - | - | - | - | - |
| | 4 | 6 | 8 | 0 | 2 | | | | | | | | |

17825 -

TABLE L-3
 CT VALUES FOR INACTIVATION OF GIARDIA CYSTS BY FREE CHLORINE AT 5 C

| CHLORINE CONCENTRA TION | LOG INACTIVATIONS | | | | | | - | LOG INACTIVATIONS | | | | | |
|-------------------------------|-------------------|---------|---------|---------|---------|---------|---|-------------------|---------|---------|---------|---------|---------|
| | pH ≤ 6 | | | | | | | pH = 6.5 | | | | | |
| (mg/L) | 0. 5 | 1. 0 | 1. 5 | 2. 0 | 2. 5 | 3. 0 | - | 0. 5 | 1. 0 | 1. 5 | 2. 0 | 2. 5 | 3. 0 |
| ≤0.4 | 4 6 | 32 | 49 | 65 | 84 | 97 | - | 2 0 | 39 | 59 | 78 | 98 | 14 7 |
| 0.6 | 4 7 | 33 | 50 | 67 | 83 | 10 0 | - | 2 0 | 40 | 60 | 80 | 10 0 | 12 0 |

| | | | | | | | | | | | | | | |
|-------|---------|----------|---------|---------|---------|---------|---|---------|----------|---------|---------|---------|---------|--|
| 0.8 | 1 7 | 34 | 52 | 69 | 86 | 10 3 | - | 2 0 | 41 | 61 | 81 | 10 2 | 12 2 | |
| 1.0 | 1 8 | 35 | 53 | 70 | 88 | 10 5 | - | 2 4 | 42 | 63 | 83 | 10 4 | 12 5 | |
| 1.2 | 1 8 | 36 | 54 | 71 | 89 | 10 7 | - | 2 4 | 42 | 64 | 85 | 10 6 | 12 7 | |
| 1.4 | 1 8 | 36 | 55 | 73 | 94 | 10 9 | - | 2 2 | 43 | 65 | 87 | 10 8 | 13 0 | |
| 1.6 | 1 9 | 37 | 56 | 74 | 93 | 11 4 | - | 2 2 | 44 | 66 | 88 | 11 0 | 13 2 | |
| 1.8 | 1 9 | 38 | 57 | 76 | 95 | 11 4 | - | 2 3 | 45 | 68 | 90 | 11 3 | 13 5 | |
| 2.0 | 1 9 | 39 | 58 | 77 | 97 | 11 6 | - | 2 3 | 46 | 69 | 92 | 11 5 | 13 8 | |
| 2.2 | 2 0 | 39 | 59 | 79 | 98 | 11 8 | - | 2 3 | 47 | 70 | 93 | 11 7 | 14 0 | |
| 2.4 | 2 0 | 40 | 60 | 80 | 10 0 | 12 0 | - | 2 4 | 48 | 72 | 95 | 11 9 | 14 3 | |
| 2.6 | 2 0 | 41 | 61 | 81 | 10 2 | 12 2 | - | 2 4 | 49 | 73 | 97 | 12 2 | 14 6 | |
| 2.8 | 2 1 | 41 | 62 | 83 | 10 3 | 12 4 | - | 2 5 | 49 | 74 | 99 | 12 3 | 14 8 | |
| 3.0 | 2 1 | 42 | 63 | 84 | 10 5 | 12 6 | - | 2 5 | 50 | 76 | 10 4 | 12 6 | 15 4 | |
| - | | pH = 7.0 | | | | | | - | pH = 7.5 | | | | | |
| mg/L) | 0. 5 | 1. 0 | 1. 5 | 2. 0 | 2. 5 | 3. 0 | - | 0. 5 | 1. 0 | 1. 5 | 2. 0 | 2. 5 | 3. 0 | |
| ≤0.4 | 2 3 | 46 | 70 | 93 | 11 6 | 13 9 | - | 2 8 | 55 | 83 | 11 4 | 13 8 | 16 6 | |
| 0.6 | 2 4 | 48 | 72 | 95 | 11 9 | 14 3 | - | 2 9 | 57 | 86 | 11 4 | 14 3 | 17 4 | |
| 0.8 | 2 4 | 49 | 73 | 97 | 12 2 | 14 6 | - | 2 9 | 58 | 88 | 11 7 | 14 6 | 17 5 | |
| 1.0 | 2 5 | 50 | 75 | 99 | 12 4 | 14 9 | - | 3 0 | 60 | 90 | 11 9 | 14 9 | 17 9 | |
| 1.2 | 2 5 | 51 | 76 | 10 4 | 12 7 | 15 2 | - | 3 4 | 61 | 92 | 12 2 | 15 3 | 18 3 | |
| 1.4 | 2 6 | 52 | 78 | 10 3 | 12 9 | 15 5 | - | 3 4 | 62 | 94 | 12 5 | 15 6 | 18 7 | |
| 1.6 | 2 6 | 53 | 79 | 10 5 | 13 2 | 15 8 | - | 3 2 | 64 | 96 | 12 8 | 16 0 | 19 2 | |

| | | | | | | | | | | | | | | |
|-------|---------|---------|---------|---------|---------|---------|---|---------|---------|---------|---------|---------|---------|--|
| 1.8 | 2 7 | 54 | 84 | 10 8 | 13 5 | 16 2 | - | 3 3 | 65 | 98 | 13 4 | 16 3 | 19 6 | |
| 2.0 | 2 8 | 55 | 83 | 11 0 | 13 8 | 16 5 | - | 3 3 | 67 | 10 0 | 13 3 | 16 7 | 20 0 | |
| 2.2 | 2 8 | 56 | 85 | 11 3 | 14 4 | 16 9 | - | 3 4 | 68 | 10 2 | 13 6 | 17 0 | 20 4 | |
| 2.4 | 2 9 | 57 | 86 | 11 5 | 14 3 | 17 2 | - | 3 5 | 70 | 10 5 | 13 9 | 17 4 | 20 9 | |
| 2.6 | 2 9 | 58 | 88 | 11 7 | 14 6 | 17 5 | - | 3 6 | 71 | 10 7 | 14 2 | 17 8 | 21 3 | |
| 2.8 | 3 0 | 59 | 89 | 11 9 | 14 8 | 17 8 | - | 3 6 | 72 | 10 9 | 14 5 | 18 4 | 21 7 | |
| 3.0 | 3 0 | 61 | 91 | 12 1 | 15 2 | 18 2 | - | 3 7 | 74 | 11 4 | 14 7 | 18 4 | 22 4 | |
| - | | pH=8.0 | | | | | | - | pH=8.5 | | | | | |
| mg/L) | 0. 5 | 1. 0 | 1. 5 | 2. 0 | 2. 5 | 3. 0 | - | 0. 5 | 1. 0 | 1. 5 | 2. 0 | 2. 5 | 3. 0 | |
| ≤0.4 | 3 3 | 66 | 99 | 13 2 | 16 5 | 19 8 | - | 3 9 | 79 | 11 8 | 15 7 | 19 7 | 23 6 | |
| 0.6 | 3 4 | 68 | 10 2 | 13 6 | 17 0 | 20 4 | - | 4 4 | 81 | 12 2 | 16 3 | 20 3 | 24 4 | |
| 0.8 | 3 5 | 70 | 10 5 | 14 0 | 17 5 | 21 0 | - | 4 2 | 84 | 12 6 | 16 8 | 21 0 | 25 2 | |
| 1.0 | 3 6 | 72 | 10 8 | 14 4 | 18 0 | 21 6 | - | 4 3 | 87 | 13 0 | 17 3 | 21 7 | 26 0 | |
| 1.2 | 3 7 | 74 | 11 4 | 14 7 | 18 4 | 22 4 | - | 4 5 | 89 | 13 4 | 17 8 | 22 3 | 26 7 | |
| 1.4 | 3 8 | 76 | 11 4 | 15 4 | 18 9 | 22 7 | - | 4 6 | 91 | 13 7 | 18 3 | 22 8 | 27 4 | |
| 1.6 | 3 9 | 77 | 11 6 | 15 5 | 19 3 | 23 2 | - | 4 7 | 94 | 14 4 | 18 7 | 23 4 | 28 4 | |
| 1.8 | 4 0 | 79 | 11 9 | 15 9 | 19 8 | 23 8 | - | 4 8 | 96 | 14 4 | 19 4 | 23 9 | 28 7 | |
| 2.0 | 4 1 | 81 | 12 2 | 16 2 | 20 3 | 24 3 | - | 4 9 | 98 | 14 7 | 19 6 | 24 5 | 29 4 | |
| 2.2 | 4 1 | 83 | 12 4 | 16 5 | 20 7 | 24 8 | - | 5 0 | 10 0 | 15 0 | 20 0 | 25 0 | 30 0 | |
| 2.4 | 4 2 | 84 | 12 7 | 16 9 | 21 4 | 25 3 | - | 5 4 | 10 2 | 15 3 | 20 4 | 25 5 | 30 6 | |
| 2.6 | 4 3 | 86 | 12 9 | 17 2 | 21 5 | 25 8 | - | 5 2 | 10 4 | 15 6 | 20 8 | 26 0 | 31 2 | |

| | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|---|---|----|----|----|----|----|
| 2.8 | 4 | 88 | 13 | 17 | 21 | 26 | - | 5 | 10 | 15 | 21 | 26 | 31 |
| | 4 | | 2 | 5 | 9 | 3 | | 3 | 6 | 9 | 2 | 5 | 8 |
| 3.0 | 4 | 89 | 13 | 17 | 22 | 26 | - | 5 | 10 | 16 | 21 | 27 | 32 |
| | 5 | | 4 | 9 | 3 | 8 | | 4 | 8 | 2 | 6 | 0 | 4 |
| pH = 9.0 | | | | | | | | | | | | | |
| (mg/L) | 0. | 1. | 1. | 2. | 2. | 3. | - | - | - | - | - | - | - |
| | 5 | 0 | 5 | 0 | 5 | 0 | | | | | | | |
| ≤0.4 | 4 | 93 | 14 | 18 | 23 | 27 | - | - | - | - | - | - | - |
| | 7 | | 0 | 6 | 3 | 9 | | | | | | | |
| 0.6 | 4 | 97 | 14 | 19 | 24 | 29 | - | - | - | - | - | - | - |
| | 9 | | 6 | 4 | 3 | 4 | | | | | | | |
| 0.8 | 5 | 10 | 15 | 20 | 25 | 30 | - | - | - | - | - | - | - |
| | 0 | 0 | 4 | 4 | 4 | 4 | | | | | | | |
| 1.0 | 5 | 10 | 15 | 20 | 26 | 31 | - | - | - | - | - | - | - |
| | 2 | 4 | 6 | 8 | 0 | 2 | | | | | | | |
| 1.2 | 5 | 10 | 16 | 21 | 26 | 32 | - | - | - | - | - | - | - |
| | 3 | 7 | 0 | 3 | 7 | 0 | | | | | | | |
| 1.4 | 5 | 11 | 16 | 21 | 27 | 32 | - | - | - | - | - | - | - |
| | 5 | 0 | 5 | 9 | 4 | 9 | | | | | | | |
| 1.6 | 5 | 11 | 16 | 22 | 28 | 33 | - | - | - | - | - | - | - |
| | 6 | 2 | 9 | 5 | 4 | 7 | | | | | | | |
| 1.8 | 5 | 11 | 17 | 23 | 28 | 34 | - | - | - | - | - | - | - |
| | 8 | 5 | 3 | 0 | 8 | 5 | | | | | | | |
| 2.0 | 5 | 11 | 17 | 23 | 29 | 35 | - | - | - | - | - | - | - |
| | 9 | 8 | 7 | 5 | 4 | 3 | | | | | | | |
| 2.2 | 6 | 12 | 18 | 24 | 30 | 36 | - | - | - | - | - | - | - |
| | 0 | 0 | 4 | 4 | 4 | 4 | | | | | | | |
| 2.4 | 6 | 12 | 18 | 24 | 30 | 36 | - | - | - | - | - | - | - |
| | 4 | 3 | 4 | 5 | 7 | 8 | | | | | | | |
| 2.6 | 6 | 12 | 18 | 25 | 31 | 37 | - | - | - | - | - | - | - |
| | 3 | 5 | 8 | 0 | 3 | 5 | | | | | | | |
| 2.8 | 6 | 12 | 19 | 25 | 31 | 38 | - | - | - | - | - | - | - |
| | 4 | 7 | 4 | 5 | 8 | 2 | | | | | | | |
| 3.0 | 6 | 13 | 19 | 25 | 32 | 38 | - | - | - | - | - | - | - |
| | 5 | 0 | 5 | 9 | 4 | 9 | | | | | | | |

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TABLE L-4
 CT VALUES FOR INACTIVATION OF GIARDIA CYSTS BY FREE CHLORINE AT 10°C

| CHLORINE CONCENTRA TION | LOG INACTIVATIONS | - | LOG INACTIVATIONS |
|-------------------------------|-------------------|---|-------------------|
|-------------------------------|-------------------|---|-------------------|

| | pH ≤ 6 | | | | | | | pH = 6.5 | | | | | |
|--------|--------|-----|-----|-----|-----|-----|---|----------|-----|-----|-----|-----|-----|
| (mg/L) | 0.5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | - | 0.5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 |
| ≤ 0.4 | 12 | 24 | 37 | 49 | 61 | 73 | - | 15 | 30 | 44 | 59 | 73 | 88 |
| 0.6 | 13 | 26 | 38 | 50 | 63 | 75 | - | 16 | 32 | 45 | 60 | 75 | 90 |
| 0.8 | 14 | 28 | 39 | 52 | 65 | 78 | - | 17 | 34 | 46 | 61 | 77 | 92 |
| 1.0 | 15 | 30 | 40 | 53 | 66 | 79 | - | 18 | 36 | 47 | 63 | 78 | 94 |
| 1.2 | 16 | 32 | 40 | 53 | 67 | 80 | - | 19 | 38 | 48 | 63 | 79 | 95 |
| 1.4 | 17 | 34 | 41 | 55 | 68 | 82 | - | 20 | 40 | 49 | 65 | 82 | 98 |
| 1.6 | 18 | 36 | 42 | 55 | 69 | 83 | - | 21 | 42 | 50 | 66 | 83 | 99 |
| 1.8 | 19 | 38 | 43 | 57 | 72 | 86 | - | 22 | 44 | 51 | 67 | 84 | 101 |
| 2.0 | 20 | 40 | 44 | 58 | 73 | 87 | - | 23 | 46 | 52 | 69 | 87 | 104 |
| 2.2 | 21 | 42 | 45 | 59 | 74 | 89 | - | 24 | 48 | 53 | 70 | 88 | 105 |
| 2.4 | 22 | 44 | 45 | 60 | 75 | 90 | - | 25 | 50 | 54 | 71 | 89 | 107 |
| 2.6 | 23 | 46 | 46 | 61 | 77 | 92 | - | 26 | 52 | 55 | 73 | 92 | 110 |
| 2.8 | 24 | 48 | 47 | 62 | 78 | 93 | - | 27 | 54 | 56 | 74 | 93 | 111 |
| 3.0 | 25 | 50 | 48 | 63 | 79 | 95 | - | 28 | 56 | 57 | 75 | 94 | 113 |

| | pH = 7.0 | | | | | | | pH = 7.5 | | | | | |
|--------|----------|-----|-----|-----|-----|-----|---|----------|-----|-----|-----|-----|-----|
| (mg/L) | 0.5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | - | 0.5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 |
| ≤ 0.4 | 17 | 34 | 52 | 69 | 87 | 104 | - | 21 | 42 | 63 | 83 | 104 | 125 |
| 0.6 | 18 | 36 | 54 | 71 | 89 | 107 | - | 22 | 44 | 64 | 85 | 107 | 129 |
| 0.8 | 19 | 38 | 55 | 73 | 92 | 111 | - | 23 | 46 | 66 | 87 | 110 | 133 |

| | | | | | | | | | | | | | |
|-----|--------|--------|----|----|---------|---------|---|--------|--------|----|---------|---------|---------|
| 1.0 | 1 9 | 3 7 | 56 | 75 | 93 | 11 2 | - | 2 2 | 4 5 | 67 | 89 | 11 2 | 13 4 |
| 1.2 | 1 9 | 3 8 | 57 | 76 | 95 | 11 4 | - | 2 3 | 4 6 | 69 | 91 | 11 4 | 13 7 |
| 1.4 | 1 9 | 3 9 | 58 | 77 | 97 | 11 6 | - | 2 3 | 4 7 | 70 | 93 | 11 7 | 14 0 |
| 1.6 | 2 0 | 4 0 | 60 | 79 | 99 | 11 9 | - | 2 4 | 4 8 | 72 | 96 | 12 0 | 14 4 |
| 1.8 | 2 0 | 4 1 | 61 | 81 | 10 2 | 12 2 | - | 2 5 | 4 9 | 74 | 98 | 12 3 | 14 7 |
| 2.0 | 2 1 | 4 1 | 62 | 83 | 10 3 | 12 4 | - | 2 5 | 5 0 | 75 | 10 0 | 12 5 | 15 0 |
| 2.2 | 2 1 | 4 2 | 64 | 85 | 10 6 | 12 7 | - | 2 6 | 5 1 | 77 | 10 2 | 12 8 | 15 3 |
| 2.4 | 2 2 | 4 3 | 65 | 86 | 10 8 | 12 9 | - | 2 6 | 5 2 | 79 | 10 5 | 13 1 | 15 7 |
| 2.6 | 2 2 | 4 4 | 66 | 87 | 10 9 | 13 1 | - | 2 7 | 5 3 | 80 | 10 7 | 13 3 | 16 0 |
| 2.8 | 2 2 | 4 5 | 67 | 89 | 11 2 | 13 4 | - | 2 7 | 5 4 | 82 | 10 9 | 13 6 | 16 3 |
| 3.0 | 2 3 | 4 6 | 69 | 91 | 11 4 | 13 7 | - | 2 8 | 5 5 | 83 | 11 1 | 13 8 | 16 6 |

| | pH = 8.0 | | | | | | | pH = 8.5 | | | | | |
|--------|----------|---------|---------|---------|---------|---------|---|----------|---------|---------|---------|---------|---------|
| (mg/L) | 0. 5 | 1. 0 | 1. 5 | 2. 0 | 2. 5 | 3. 0 | - | 0. 5 | 1. 0 | 1. 5 | 2. 0 | 2. 5 | 3. 0 |
| ≤0.4 | 2 5 | 5 0 | 75 | 99 | 12 4 | 14 9 | - | 3 0 | 5 9 | 89 | 11 8 | 14 8 | 17 7 |
| 0.6 | 2 6 | 5 1 | 77 | 10 2 | 12 8 | 15 3 | - | 3 1 | 6 1 | 92 | 12 2 | 15 3 | 18 3 |
| 0.8 | 2 6 | 5 3 | 79 | 10 5 | 13 2 | 15 8 | - | 3 2 | 6 3 | 95 | 12 6 | 15 8 | 18 9 |
| 1.0 | 2 7 | 5 4 | 81 | 10 8 | 13 5 | 16 2 | - | 3 3 | 6 5 | 98 | 13 0 | 16 3 | 19 5 |
| 1.2 | 2 8 | 5 5 | 83 | 11 1 | 13 8 | 16 6 | - | 3 3 | 6 7 | 10 0 | 13 3 | 16 7 | 20 0 |
| 1.4 | 2 8 | 5 7 | 85 | 11 3 | 14 2 | 17 0 | - | 3 4 | 6 9 | 10 3 | 13 7 | 17 2 | 20 6 |
| 1.6 | 2 9 | 5 8 | 87 | 11 6 | 14 5 | 17 4 | - | 3 5 | 7 0 | 10 6 | 14 1 | 17 6 | 21 1 |
| 1.8 | 3 0 | 6 0 | 90 | 11 9 | 14 9 | 17 9 | - | 3 6 | 7 2 | 10 8 | 14 3 | 17 9 | 21 5 |

| | | | | | | | | | | | | | |
|--------|---------|---------|---------|---------|---------|---------|---|--------|--------|---------|---------|---------|---------|
| 2.0 | 3 0 | 6 4 | 94 | 12 4 | 15 2 | 18 2 | - | 3 7 | 7 4 | 11 4 | 14 7 | 18 4 | 22 4 |
| 2.2 | 3 4 | 6 2 | 93 | 12 4 | 15 5 | 18 6 | - | 3 8 | 7 5 | 11 3 | 15 0 | 18 8 | 22 5 |
| 2.4 | 3 2 | 6 3 | 95 | 12 7 | 15 8 | 19 0 | - | 3 8 | 7 7 | 11 5 | 15 3 | 19 2 | 23 0 |
| 2.6 | 3 2 | 6 5 | 97 | 12 9 | 16 2 | 19 4 | - | 3 9 | 7 8 | 11 7 | 15 6 | 19 5 | 23 4 |
| 2.8 | 3 3 | 6 6 | 99 | 13 4 | 16 4 | 19 7 | - | 4 0 | 8 0 | 12 0 | 15 9 | 19 9 | 23 9 |
| 3.0 | 3 4 | 6 7 | 10 | 13 4 | 16 8 | 20 4 | - | 4 4 | 8 4 | 12 2 | 16 2 | 20 3 | 24 3 |
| pH=9.0 | | | | | | | | | | | | | |
| (mg/L) | 0. 5 | 1. 0 | 1. 5 | 2. 0 | 2. 5 | 3. 0 | - | - | - | - | - | - | - |
| ≤0.4 | 3 5 | 7 0 | 10 5 | 13 9 | 17 4 | 20 9 | - | - | - | - | - | - | - |
| 0.6 | 3 6 | 7 3 | 10 9 | 14 5 | 18 2 | 21 8 | - | - | - | - | - | - | - |
| 0.8 | 3 8 | 7 5 | 11 3 | 15 4 | 18 8 | 22 6 | - | - | - | - | - | - | - |
| 1.0 | 3 9 | 7 8 | 11 7 | 15 6 | 19 5 | 23 4 | - | - | - | - | - | - | - |
| 1.2 | 4 0 | 8 0 | 12 0 | 16 0 | 20 0 | 24 0 | - | - | - | - | - | - | - |
| 1.4 | 4 1 | 8 2 | 12 4 | 16 5 | 20 6 | 24 7 | - | - | - | - | - | - | - |
| 1.6 | 4 2 | 8 4 | 12 7 | 16 9 | 21 4 | 25 3 | - | - | - | - | - | - | - |
| 1.8 | 4 3 | 8 6 | 13 0 | 17 3 | 21 6 | 25 9 | - | - | - | - | - | - | - |
| 2.0 | 4 4 | 8 8 | 13 3 | 17 7 | 22 4 | 26 5 | - | - | - | - | - | - | - |
| 2.2 | 4 5 | 9 0 | 13 6 | 18 4 | 22 6 | 27 4 | - | - | - | - | - | - | - |
| 2.4 | 4 6 | 9 2 | 13 8 | 18 4 | 23 0 | 27 6 | - | - | - | - | - | - | - |
| 2.6 | 4 7 | 9 4 | 14 4 | 18 7 | 23 4 | 28 4 | - | - | - | - | - | - | - |
| 2.8 | 4 8 | 9 6 | 14 4 | 19 4 | 23 9 | 28 7 | - | - | - | - | - | - | - |

3.0 4 9 14 19 24 29 - - - - - -
 9 7 6 5 3 2

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TABLE L-5
 CT VALUES FOR INACTIVATION OF GIARDIA CYSTS BY FREE CHLORINE AT 15 C

| CHLORINE CONCENTRATION (mg/L) | LOG INACTIVATIONS pH ≤ 6.0 | | | | | | LOG INACTIVATIONS pH = 6.5 | | | | | |
|-------------------------------------|-------------------------------|-----|-----|-----|-----|-----|-------------------------------|-----|-----|-----|-----|-----|
| | 0.5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 0.5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 |
| ≤ 0.4 | 8 | 16 | 24 | 33 | 41 | 49 | 4 | 8 | 12 | 16 | 20 | 24 |
| 0.6 | 8 | 12 | 16 | 21 | 26 | 31 | 4 | 8 | 12 | 16 | 20 | 24 |
| 0.8 | 9 | 12 | 16 | 21 | 26 | 31 | 4 | 8 | 12 | 16 | 20 | 24 |
| 1.0 | 9 | 12 | 16 | 21 | 26 | 31 | 4 | 8 | 12 | 16 | 20 | 24 |
| 1.2 | 9 | 12 | 16 | 21 | 26 | 31 | 4 | 8 | 12 | 16 | 20 | 24 |
| 1.4 | 9 | 12 | 16 | 21 | 26 | 31 | 4 | 8 | 12 | 16 | 20 | 24 |
| 1.6 | 9 | 12 | 16 | 21 | 26 | 31 | 4 | 8 | 12 | 16 | 20 | 24 |
| 1.8 | 10 | 12 | 16 | 21 | 26 | 31 | 4 | 8 | 12 | 16 | 20 | 24 |
| 2.0 | 10 | 12 | 16 | 21 | 26 | 31 | 4 | 8 | 12 | 16 | 20 | 24 |
| 2.2 | 10 | 12 | 16 | 21 | 26 | 31 | 4 | 8 | 12 | 16 | 20 | 24 |
| 2.4 | 10 | 12 | 16 | 21 | 26 | 31 | 4 | 8 | 12 | 16 | 20 | 24 |
| 2.6 | 10 | 12 | 16 | 21 | 26 | 31 | 4 | 8 | 12 | 16 | 20 | 24 |
| 2.8 | 10 | 12 | 16 | 21 | 26 | 31 | 4 | 8 | 12 | 16 | 20 | 24 |
| 3.0 | 10 | 12 | 16 | 21 | 26 | 31 | 4 | 8 | 12 | 16 | 20 | 24 |
| | pH = 7.0 | | | | | | pH = 7.5 | | | | | |

| | | | | | | | | | | | | | |
|--------|----------|---------|---------|---------|---------|---------|---|----------|---------|---------|---------|---------|---------|
| (mg/L) | 0. 5 | 1. 0 | 1. 5 | 2. 0 | 2. 5 | 3. 0 | - | 0. 5 | 1. 0 | 1. 5 | 2. 0 | 2. 5 | 3. 0 |
| ≤0.4 | 1 2 | 2 3 | 3 5 | 47 | 58 | 70 | - | 1 4 | 2 8 | 4 2 | 55 | 69 | 83 |
| 0.6 | 1 2 | 2 4 | 3 6 | 48 | 60 | 72 | - | 1 4 | 2 9 | 4 3 | 57 | 72 | 86 |
| 0.8 | 1 2 | 2 4 | 3 7 | 49 | 64 | 73 | - | 1 5 | 2 9 | 4 4 | 59 | 73 | 88 |
| 1.0 | 1 3 | 2 5 | 3 8 | 50 | 63 | 75 | - | 1 5 | 3 0 | 4 5 | 60 | 75 | 90 |
| 1.2 | 1 3 | 2 5 | 3 8 | 51 | 63 | 76 | - | 1 5 | 3 1 | 4 6 | 61 | 77 | 92 |
| 1.4 | 1 3 | 2 6 | 3 9 | 52 | 65 | 78 | - | 1 6 | 3 1 | 4 7 | 63 | 78 | 94 |
| 1.6 | 1 3 | 2 6 | 4 0 | 53 | 66 | 79 | - | 1 6 | 3 2 | 4 8 | 64 | 80 | 96 |
| 1.8 | 1 4 | 2 7 | 4 1 | 54 | 68 | 81 | - | 1 6 | 3 3 | 4 9 | 65 | 82 | 98 |
| 2.0 | 1 4 | 2 8 | 4 2 | 55 | 69 | 83 | - | 1 7 | 3 3 | 5 0 | 67 | 83 | 10 0 |
| 2.2 | 1 4 | 2 8 | 4 3 | 57 | 71 | 85 | - | 1 7 | 3 4 | 5 1 | 68 | 85 | 10 2 |
| 2.4 | 1 4 | 2 9 | 4 3 | 57 | 72 | 86 | - | 1 8 | 3 5 | 5 3 | 70 | 88 | 10 5 |
| 2.6 | 1 5 | 2 9 | 4 4 | 59 | 73 | 88 | - | 1 8 | 3 6 | 5 4 | 71 | 89 | 10 7 |
| 2.8 | 1 5 | 3 0 | 4 5 | 59 | 74 | 89 | - | 1 8 | 3 6 | 5 5 | 73 | 91 | 10 9 |
| 3.0 | 1 5 | 3 0 | 4 6 | 61 | 76 | 91 | - | 1 9 | 3 7 | 5 6 | 74 | 93 | 11 1 |
| - | pH = 8.0 | | | | | | - | pH = 8.5 | | | | | |
| (mg/L) | 0. 5 | 1. 0 | 1. 5 | 2. 0 | 2. 5 | 3. 0 | - | 0. 5 | 1. 0 | 1. 5 | 2. 0 | 2. 5 | 3. 0 |
| ≤0.4 | 1 7 | 3 3 | 5 0 | 66 | 83 | 99 | - | 2 0 | 3 9 | 5 9 | 79 | 98 | 11 8 |
| 0.6 | 1 7 | 3 4 | 5 1 | 68 | 85 | 10 2 | - | 2 0 | 4 1 | 6 1 | 81 | 10 2 | 12 2 |
| 0.8 | 1 8 | 3 5 | 5 3 | 70 | 88 | 10 5 | - | 2 1 | 4 2 | 6 3 | 84 | 10 5 | 12 6 |
| 1.0 | 1 8 | 3 6 | 5 4 | 72 | 90 | 10 8 | - | 2 2 | 4 3 | 6 5 | 87 | 10 8 | 13 0 |

| | | | | | | | | | | | | | |
|-----|--------|--------|--------|----|-----|---------|---|--------|--------|--------|-----|---------|---------|
| 1.2 | 4 9 | 3 7 | 5 6 | 74 | 93 | 11 4 | - | 2 2 | 4 5 | 6 7 | 89 | 11 2 | 13 4 |
| 1.4 | 4 9 | 3 8 | 5 7 | 76 | 95 | 11 4 | - | 2 3 | 4 6 | 6 9 | 94 | 11 4 | 13 7 |
| 1.6 | 4 9 | 3 9 | 5 8 | 77 | 97 | 11 6 | - | 2 4 | 4 7 | 7 4 | 94 | 11 8 | 14 4 |
| 1.8 | 2 0 | 4 0 | 6 0 | 79 | 99 | 11 9 | - | 2 4 | 4 8 | 7 2 | 96 | 12 0 | 14 4 |
| 2.0 | 2 0 | 4 4 | 6 4 | 81 | 102 | 12 2 | - | 2 5 | 4 9 | 7 4 | 98 | 12 3 | 14 7 |
| 2.2 | 2 4 | 4 4 | 6 2 | 83 | 103 | 12 4 | - | 2 5 | 5 0 | 7 5 | 100 | 12 5 | 15 0 |
| 2.4 | 2 4 | 4 2 | 6 4 | 85 | 106 | 12 7 | - | 2 6 | 5 4 | 7 7 | 102 | 12 8 | 15 3 |
| 2.6 | 2 2 | 4 3 | 6 5 | 86 | 108 | 12 9 | - | 2 6 | 5 2 | 7 8 | 104 | 13 0 | 15 6 |
| 2.8 | 2 2 | 4 4 | 6 6 | 88 | 110 | 13 2 | - | 2 7 | 5 3 | 8 0 | 106 | 13 3 | 15 9 |
| 3.0 | 2 2 | 4 5 | 6 7 | 89 | 112 | 13 4 | - | 2 7 | 5 4 | 8 4 | 108 | 13 5 | 16 2 |

| | pH = 9.0 | | | | | | - | - | - | - | - | - | - |
|--------|----------|---------|---------|---------|---------|---------|---|---|---|---|---|---|---|
| (mg/L) | 0. 5 | 1. 0 | 1. 5 | 2. 0 | 2. 5 | 3. 0 | - | - | - | - | - | - | - |
| ≤0.4 | 2 3 | 4 7 | 7 0 | 93 | 11 7 | 14 0 | - | - | - | - | - | - | - |
| 0.6 | 2 4 | 4 9 | 7 3 | 97 | 12 2 | 14 6 | - | - | - | - | - | - | - |
| 0.8 | 2 5 | 5 0 | 7 6 | 104 | 12 6 | 15 4 | - | - | - | - | - | - | - |
| 1.0 | 2 6 | 5 2 | 7 8 | 104 | 13 0 | 15 6 | - | - | - | - | - | - | - |
| 1.2 | 2 7 | 5 3 | 8 0 | 107 | 13 3 | 16 0 | - | - | - | - | - | - | - |
| 1.4 | 2 8 | 5 5 | 8 3 | 110 | 13 8 | 16 5 | - | - | - | - | - | - | - |
| 1.6 | 2 8 | 5 6 | 8 5 | 113 | 14 4 | 16 9 | - | - | - | - | - | - | - |
| 1.8 | 2 9 | 5 8 | 8 7 | 115 | 14 4 | 17 3 | - | - | - | - | - | - | - |
| 2.0 | 3 0 | 5 9 | 8 9 | 118 | 14 8 | 17 7 | - | - | - | - | - | - | - |

| | | | | | | | | | | | | | |
|-----|--------|--------|--------|---------|---------|---------|---|---|---|---|---|---|---|
| 2.2 | 3 0 | 6 0 | 9 4 | 12 4 | 15 4 | 18 4 | - | - | - | - | - | - | - |
| 2.4 | 3 4 | 6 4 | 9 2 | 12 3 | 15 3 | 18 4 | - | - | - | - | - | - | - |
| 2.6 | 3 4 | 6 3 | 9 4 | 12 5 | 15 7 | 18 8 | - | - | - | - | - | - | - |
| 2.8 | 3 2 | 6 4 | 9 6 | 12 7 | 15 9 | 19 4 | - | - | - | - | - | - | - |
| 3.0 | 3 3 | 6 5 | 9 8 | 13 0 | 16 3 | 19 5 | - | - | - | - | - | - | - |

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TABLE L-6
CT VALUES FOR INACTIVATION OF GIARDIA CYSTS BY FREE CHLORINE AT 20 C

| CHLORINE CONCENTRAT ION (mg/L) | LOG INACTIVATIONS pH ≤ 6.0 | | | | | | - | LOG INACTIVATIONS pH = 6.5 | | | | | |
|---|-------------------------------|---------|---------|---------|---------|---------|---|-------------------------------|---------|---------|---------|---------|---------|
| | 0. 5 | 1. 0 | 1. 5 | 2. 0 | 2. 5 | 3. 0 | - | 0. 5 | 1. 0 | 1. 5 | 2. 0 | 2. 5 | 3. 0 |
| ≤ 0.4 | 6 | 4 2 | 4 8 | 2 4 | 30 | 36 | - | 7 | 4 5 | 2 2 | 2 9 | 37 | 44 |
| 0.6 | 6 | 4 3 | 4 9 | 2 5 | 32 | 38 | - | 8 | 4 5 | 2 3 | 3 0 | 38 | 45 |
| 0.8 | 7 | 4 3 | 2 0 | 2 6 | 33 | 39 | - | 8 | 4 5 | 2 3 | 3 4 | 38 | 45 |
| 1.0 | 7 | 4 3 | 2 0 | 2 6 | 33 | 39 | - | 8 | 4 6 | 2 4 | 3 4 | 39 | 47 |
| 1.2 | 7 | 4 3 | 2 0 | 2 7 | 33 | 40 | - | 8 | 4 6 | 2 4 | 3 2 | 40 | 48 |
| 1.4 | 7 | 4 4 | 2 4 | 2 7 | 34 | 41 | - | 8 | 4 6 | 2 5 | 3 3 | 41 | 49 |
| 1.6 | 7 | 4 4 | 2 4 | 2 8 | 35 | 42 | - | 8 | 4 7 | 2 5 | 3 3 | 42 | 50 |
| 1.8 | 7 | 4 4 | 2 2 | 2 9 | 36 | 43 | - | 9 | 4 7 | 2 6 | 3 4 | 43 | 51 |
| 2.0 | 7 | 4 5 | 2 2 | 2 9 | 37 | 44 | - | 9 | 4 7 | 2 6 | 3 5 | 43 | 52 |
| 2.2 | 7 | 4 5 | 2 2 | 2 9 | 37 | 44 | - | 9 | 4 8 | 2 7 | 3 5 | 44 | 53 |
| 2.4 | 8 | 4 5 | 2 3 | 3 0 | 38 | 45 | - | 9 | 4 8 | 2 7 | 3 6 | 45 | 54 |

| | | | | | | | | | | | | | |
|--------|----------|---------|---------|---------|---------|---------|---|----------|---------|---------|---------|---------|---------|
| 2.6 | 8 | 4 5 | 2 3 | 3 4 | 38 | 46 | - | 9 | 1 8 | 2 8 | 3 7 | 46 | 55 |
| 2.8 | 8 | 4 6 | 2 4 | 3 4 | 39 | 47 | - | 9 | 1 9 | 2 8 | 3 7 | 47 | 56 |
| 3.0 | 8 | 4 6 | 2 4 | 3 4 | 39 | 47 | - | 1 0 | 1 9 | 2 9 | 3 8 | 48 | 57 |
| - | pH = 7.0 | | | | | | - | pH = 7.5 | | | | | |
| (mg/L) | 0. 5 | 1. 0 | 1. 5 | 2. 0 | 2. 5 | 3. 0 | - | 0. 5 | 1. 0 | 1. 5 | 2. 0 | 2. 5 | 3. 0 |
| ≤0.4 | 9 | 1 7 | 2 6 | 3 5 | 43 | 52 | - | 1 0 | 2 4 | 3 4 | 4 4 | 52 | 62 |
| 0.6 | 9 | 1 8 | 2 7 | 3 6 | 45 | 54 | - | 1 4 | 2 4 | 3 2 | 4 3 | 53 | 64 |
| 0.8 | 9 | 1 8 | 2 8 | 3 7 | 46 | 55 | - | 1 4 | 2 2 | 3 3 | 4 4 | 55 | 66 |
| 1.0 | 9 | 1 9 | 2 8 | 3 7 | 47 | 56 | - | 1 4 | 2 2 | 3 4 | 4 5 | 56 | 67 |
| 1.2 | 1 0 | 1 9 | 2 9 | 3 8 | 48 | 57 | - | 1 2 | 2 3 | 3 5 | 4 6 | 58 | 69 |
| 1.4 | 1 0 | 1 9 | 2 9 | 3 9 | 48 | 58 | - | 1 2 | 2 3 | 3 5 | 4 7 | 58 | 70 |
| 1.6 | 1 0 | 2 0 | 3 0 | 3 9 | 49 | 59 | - | 1 2 | 2 4 | 3 6 | 4 8 | 60 | 72 |
| 1.8 | 1 0 | 2 0 | 3 4 | 4 4 | 51 | 61 | - | 1 2 | 2 5 | 3 7 | 4 9 | 62 | 74 |
| 2.0 | 1 0 | 2 4 | 3 4 | 4 4 | 52 | 62 | - | 1 3 | 2 5 | 3 8 | 5 0 | 63 | 75 |
| 2.2 | 1 4 | 2 4 | 3 2 | 4 2 | 53 | 63 | - | 1 3 | 2 6 | 3 9 | 5 4 | 64 | 77 |
| 2.4 | 1 4 | 2 2 | 3 3 | 4 3 | 54 | 65 | - | 1 3 | 2 6 | 3 9 | 5 2 | 65 | 78 |
| 2.6 | 1 4 | 2 2 | 3 3 | 4 4 | 55 | 66 | - | 1 3 | 2 7 | 4 0 | 5 3 | 67 | 80 |
| 2.8 | 1 4 | 2 2 | 3 4 | 4 5 | 56 | 67 | - | 1 4 | 2 7 | 4 4 | 5 4 | 68 | 81 |
| 3.0 | 1 4 | 2 3 | 3 4 | 4 5 | 57 | 68 | - | 1 4 | 2 8 | 4 2 | 5 5 | 69 | 83 |
| - | pH = 8.0 | | | | | | - | pH = 8.5 | | | | | |
| (mg/L) | 0. 5 | 1. 0 | 1. 5 | 2. 0 | 2. 5 | 3. 0 | - | 0. 5 | 1. 0 | 1. 5 | 2. 0 | 2. 5 | 3. 0 |

| | | | | | | | | | | | | | |
|------|--------|--------|--------|--------|----|---------|---|--------|--------|--------|--------|---------|---------|
| ≤0.4 | 1 2 | 2 5 | 3 7 | 4 9 | 62 | 74 | - | 1 5 | 3 0 | 4 5 | 5 9 | 74 | 89 |
| 0.6 | 1 3 | 2 6 | 3 9 | 5 1 | 64 | 77 | - | 1 5 | 3 1 | 4 6 | 6 4 | 77 | 92 |
| 0.8 | 1 3 | 2 6 | 4 0 | 5 3 | 66 | 79 | - | 1 6 | 3 2 | 4 8 | 6 3 | 79 | 95 |
| 1.0 | 1 4 | 2 7 | 4 1 | 5 4 | 68 | 81 | - | 1 6 | 3 3 | 4 9 | 6 5 | 82 | 98 |
| 1.2 | 1 4 | 2 8 | 4 2 | 5 5 | 69 | 83 | - | 1 7 | 3 3 | 5 0 | 6 7 | 83 | 10 0 |
| 1.4 | 1 4 | 2 8 | 4 3 | 5 7 | 71 | 85 | - | 1 7 | 3 4 | 5 2 | 6 9 | 86 | 10 3 |
| 1.6 | 1 5 | 2 9 | 4 4 | 5 8 | 73 | 87 | - | 1 8 | 3 5 | 5 3 | 7 0 | 88 | 10 5 |
| 1.8 | 1 5 | 3 0 | 4 5 | 5 9 | 74 | 89 | - | 1 8 | 3 6 | 5 4 | 7 2 | 90 | 10 8 |
| 2.0 | 1 5 | 3 0 | 4 6 | 6 1 | 76 | 91 | - | 1 8 | 3 7 | 5 5 | 7 3 | 92 | 11 0 |
| 2.2 | 1 6 | 3 1 | 4 7 | 6 2 | 78 | 93 | - | 1 9 | 3 8 | 5 7 | 7 5 | 94 | 11 3 |
| 2.4 | 1 6 | 3 2 | 4 8 | 6 3 | 79 | 95 | - | 1 9 | 3 8 | 5 8 | 7 7 | 96 | 11 5 |
| 2.6 | 1 6 | 3 2 | 4 9 | 6 5 | 81 | 97 | - | 2 0 | 3 9 | 5 9 | 7 8 | 98 | 11 7 |
| 2.8 | 1 7 | 3 3 | 5 0 | 6 6 | 83 | 99 | - | 2 0 | 4 0 | 6 0 | 7 9 | 99 | 11 9 |
| 3.0 | 1 7 | 3 4 | 5 1 | 6 7 | 84 | 10 1 | - | 2 0 | 4 1 | 6 1 | 8 1 | 10 2 | 12 2 |

| pH=9.0 | | | | | | | | | | | | | |
|--------|---------|---------|---------|---------|---------|---------|---|---|---|---|---|---|---|
| (mg/L) | 0. 5 | 1. 0 | 1. 5 | 2. 0 | 2. 5 | 3. 0 | - | - | - | - | - | - | - |
| ≤0.4 | 1 8 | 3 5 | 5 3 | 7 0 | 88 | 10 5 | - | - | - | - | - | - | - |
| 0.6 | 1 8 | 3 6 | 5 5 | 7 3 | 91 | 10 9 | - | - | - | - | - | - | - |
| 0.8 | 1 9 | 3 8 | 5 7 | 7 5 | 94 | 11 3 | - | - | - | - | - | - | - |
| 1.0 | 2 0 | 3 9 | 5 9 | 7 8 | 98 | 11 7 | - | - | - | - | - | - | - |
| 1.2 | 2 0 | 4 0 | 6 0 | 8 0 | 10 0 | 12 0 | - | - | - | - | - | - | - |

| | | | | | | | | | | | | | |
|-----|--------|--------|--------|--------|---------|---------|---|---|---|---|---|---|---|
| 1.4 | 2 4 | 4 4 | 6 2 | 8 2 | 10 3 | 12 3 | - | - | - | - | - | - | - |
| 1.6 | 2 4 | 4 2 | 6 3 | 8 4 | 10 5 | 12 6 | - | - | - | - | - | - | - |
| 1.8 | 2 2 | 4 3 | 6 5 | 8 6 | 10 8 | 12 9 | - | - | - | - | - | - | - |
| 2.0 | 2 2 | 4 4 | 6 6 | 8 8 | 11 0 | 13 2 | - | - | - | - | - | - | - |
| 2.2 | 2 3 | 4 5 | 6 8 | 9 0 | 11 3 | 13 5 | - | - | - | - | - | - | - |
| 2.4 | 2 3 | 4 6 | 6 9 | 9 2 | 11 5 | 13 8 | - | - | - | - | - | - | - |
| 2.6 | 2 4 | 4 7 | 7 1 | 9 4 | 11 8 | 14 1 | - | - | - | - | - | - | - |
| 2.8 | 2 4 | 4 8 | 7 2 | 9 5 | 11 9 | 14 3 | - | - | - | - | - | - | - |
| 3.0 | 2 4 | 4 9 | 7 3 | 9 7 | 12 2 | 14 6 | - | - | - | - | - | - | - |

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TABLE L-7
CT VALUES FOR INACTIVATION OF GIARDIA CYSTS BY FREE CHLORINE

| CHLORINE CONCENTRATION (mg/L) | LOG INACTIVATIONS pH ≤ 6.0 | | | | | | - | LOG INACTIVATIONS pH = 6.5 | | | | | |
|-------------------------------------|-------------------------------|-----|-----|-----|-----|-----|---|-------------------------------|-----|-----|-----|-----|-----|
| | 0.5 | 1.5 | 1.5 | 2.5 | 2.5 | 3.5 | | 0.5 | 1.5 | 1.5 | 2.5 | 2.5 | 3.5 |
| ≤ 0.4 | 4 | 8 | 12 | 16 | 20 | 24 | - | 5 | 10 | 15 | 19 | 24 | 29 |
| 0.6 | 4 | 8 | 13 | 17 | 21 | 25 | - | 5 | 10 | 15 | 20 | 25 | 30 |
| 0.8 | 4 | 9 | 13 | 17 | 22 | 26 | - | 5 | 10 | 16 | 21 | 26 | 31 |
| 1.0 | 4 | 9 | 13 | 17 | 22 | 26 | - | 5 | 10 | 16 | 21 | 26 | 31 |
| 1.2 | 5 | 9 | 14 | 18 | 23 | 27 | - | 5 | 11 | 16 | 21 | 27 | 32 |
| 1.4 | 5 | 9 | 14 | 18 | 23 | 27 | - | 6 | 11 | 17 | 22 | 28 | 33 |
| 1.6 | 5 | 9 | 14 | 19 | 23 | 28 | - | 6 | 11 | 17 | 22 | 28 | 33 |
| 1.8 | 5 | 10 | 15 | 19 | 24 | 29 | - | 6 | 11 | 17 | 23 | 28 | 34 |
| 2.0 | 5 | 10 | 15 | 19 | 24 | 29 | - | 6 | 12 | 18 | 23 | 29 | 35 |
| 2.2 | 5 | 10 | 15 | 20 | 25 | 30 | - | 6 | 12 | 18 | 23 | 29 | 35 |

| | | | | | | | | | | | | | |
|--------|---------|---------|---------|---------|---------|---------|---|---------|---------|---------|---------|---------|---------|
| 2.4 | 5 | 1 0 | 15 | 20 | 25 | 30 | - | 6 | 12 | 18 | 24 | 30 | 36 |
| 2.6 | 5 | 1 0 | 16 | 21 | 26 | 31 | - | 6 | 12 | 19 | 25 | 31 | 37 |
| 2.8 | 5 | 1 0 | 16 | 21 | 26 | 31 | - | 6 | 12 | 19 | 25 | 31 | 37 |
| 3.0 | 5 | 1 1 | 16 | 21 | 27 | 32 | - | 6 | 13 | 19 | 25 | 32 | 38 |
| - | | | pH=7.0 | | | | - | pH=7.5 | | | | | |
| (mg/L) | 0. 5 | 1. 0 | 1. 5 | 2. 0 | 2. 5 | 3. 0 | - | 0. 5 | 1. 0 | 1. 5 | 2. 0 | 2. 5 | 3. 0 |
| ≤0.4 | 6 | 1 2 | 18 | 23 | 29 | 35 | - | 7 | 14 | 21 | 28 | 35 | 42 |
| 0.6 | 6 | 1 2 | 18 | 24 | 30 | 36 | - | 7 | 14 | 22 | 29 | 36 | 43 |
| 0.8 | 6 | 1 2 | 19 | 25 | 31 | 37 | - | 7 | 15 | 22 | 29 | 37 | 44 |
| 1.0 | 6 | 1 2 | 19 | 25 | 31 | 37 | - | 8 | 15 | 23 | 30 | 38 | 45 |
| 1.2 | 6 | 1 3 | 19 | 25 | 32 | 38 | - | 8 | 15 | 23 | 31 | 38 | 46 |
| 1.4 | 7 | 1 3 | 20 | 26 | 33 | 39 | - | 8 | 16 | 24 | 31 | 39 | 47 |
| 1.6 | 7 | 1 3 | 20 | 27 | 33 | 40 | - | 8 | 16 | 24 | 32 | 40 | 48 |
| 1.8 | 7 | 1 4 | 21 | 27 | 34 | 41 | - | 8 | 16 | 25 | 33 | 41 | 49 |
| 2.0 | 7 | 1 4 | 21 | 27 | 34 | 41 | - | 8 | 17 | 25 | 33 | 42 | 50 |
| 2.2 | 7 | 1 4 | 21 | 28 | 35 | 42 | - | 9 | 17 | 26 | 34 | 43 | 51 |
| 2.4 | 7 | 1 4 | 22 | 29 | 36 | 43 | - | 9 | 17 | 26 | 35 | 43 | 52 |
| 2.6 | 7 | 1 5 | 22 | 29 | 37 | 44 | - | 9 | 18 | 27 | 35 | 44 | 53 |
| 2.8 | 8 | 1 5 | 23 | 30 | 38 | 45 | - | 9 | 18 | 27 | 36 | 45 | 54 |
| 3.0 | 8 | 1 5 | 23 | 31 | 38 | 46 | - | 9 | 18 | 28 | 37 | 46 | 55 |
| - | | | pH=8.0 | | | | - | pH=8.5 | | | | | |

| | | | | | | | | | | | | | |
|--------|---------|---------|---------|---------|---------|---------|---|---------|---------|---------|---------|---------|---------|
| (mg/L) | 0. 5 | 1. 0 | 1. 5 | 2. 0 | 2. 5 | 3. 0 | - | 0. 5 | 1. 0 | 1. 5 | 2. 0 | 2. 5 | 3. 0 |
| ≤0.4 | 8 | 1 7 | 25 | 33 | 42 | 50 | - | 40 | 20 | 30 | 39 | 49 | 59 |
| 0.6 | 9 | 1 7 | 26 | 34 | 43 | 51 | - | 40 | 20 | 31 | 41 | 51 | 64 |
| 0.8 | 9 | 1 8 | 27 | 35 | 44 | 53 | - | 41 | 21 | 32 | 42 | 53 | 63 |
| 1.0 | 9 | 1 8 | 27 | 36 | 45 | 54 | - | 41 | 22 | 33 | 43 | 54 | 65 |
| 1.2 | 9 | 1 8 | 28 | 37 | 46 | 55 | - | 41 | 22 | 34 | 45 | 56 | 67 |
| 1.4 | 1 0 | 1 9 | 29 | 38 | 48 | 57 | - | 42 | 23 | 35 | 46 | 58 | 69 |
| 1.6 | 1 0 | 1 9 | 29 | 39 | 48 | 58 | - | 42 | 23 | 35 | 47 | 58 | 70 |
| 1.8 | 1 0 | 2 0 | 30 | 40 | 50 | 60 | - | 42 | 24 | 36 | 48 | 60 | 72 |
| 2.0 | 1 0 | 2 0 | 31 | 41 | 51 | 61 | - | 42 | 25 | 37 | 49 | 62 | 74 |
| 2.2 | 1 0 | 2 1 | 31 | 41 | 52 | 62 | - | 43 | 25 | 38 | 50 | 63 | 75 |
| 2.4 | 1 1 | 2 1 | 32 | 42 | 53 | 63 | - | 43 | 26 | 39 | 51 | 64 | 77 |
| 2.6 | 1 1 | 2 2 | 33 | 43 | 54 | 65 | - | 43 | 26 | 39 | 52 | 65 | 78 |
| 2.8 | 1 1 | 2 2 | 33 | 44 | 55 | 66 | - | 43 | 27 | 40 | 53 | 67 | 80 |
| 3.0 | 1 1 | 2 2 | 34 | 45 | 56 | 67 | - | 44 | 27 | 41 | 54 | 68 | 84 |

| | pH = 9.0 | | | | | | | | | | | | |
|--------|----------|---------|---------|---------|---------|---------|---|---|---|---|---|---|---|
| (mg/L) | 0. 5 | 1. 0 | 1. 5 | 2. 0 | 2. 5 | 3. 0 | - | - | - | - | - | - | - |
| ≤0.4 | 1 2 | 2 3 | 35 | 47 | 58 | 70 | - | - | - | - | - | - | - |
| 0.6 | 1 2 | 2 4 | 37 | 49 | 61 | 73 | - | - | - | - | - | - | - |
| 0.8 | 1 3 | 2 5 | 38 | 50 | 63 | 75 | - | - | - | - | - | - | - |
| 1.0 | 1 3 | 2 6 | 39 | 52 | 65 | 78 | - | - | - | - | - | - | - |

| | | | | | | | | | | | | |
|-----|--------|--------|----|----|----|----|---|---|---|---|---|---|
| 1.2 | 1 3 | 2 6 | 40 | 53 | 67 | 80 | - | - | - | - | - | - |
| 1.4 | 1 4 | 2 7 | 44 | 55 | 68 | 82 | - | - | - | - | - | - |
| 1.6 | 1 4 | 2 8 | 42 | 56 | 70 | 84 | - | - | - | - | - | - |
| 1.8 | 1 4 | 2 9 | 43 | 57 | 72 | 86 | - | - | - | - | - | - |
| 2.0 | 1 5 | 2 9 | 44 | 59 | 73 | 88 | - | - | - | - | - | - |
| 2.2 | 1 5 | 3 0 | 45 | 60 | 75 | 90 | - | - | - | - | - | - |
| 2.4 | 1 5 | 3 1 | 46 | 61 | 77 | 92 | - | - | - | - | - | - |
| 2.6 | 1 6 | 3 1 | 47 | 63 | 78 | 94 | - | - | - | - | - | - |
| 2.8 | 1 6 | 3 2 | 48 | 64 | 80 | 96 | - | - | - | - | - | - |
| 3.0 | 1 6 | 3 2 | 49 | 65 | 81 | 97 | - | - | - | - | - | - |

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TABLE L-8
BAFFLING CLASSIFICATIONS

| Baffling Condition | T_{10}/T | Baffling Description |
|------------------------|--------------------|--|
| Unbaffled (mixed flow) | 0.1 | None, agitated basin, very low length to width ratio, high inlet and outlet flow velocities |
| Poor | 0.3 | Single or multiple unbaffled inlets and outlets, no intrabasin baffles |
| Average | 0.5 | Baffled inlet or outlet with some intrabasin baffles |
| Superior | 0.7 | Perforated inlet baffle, serpentine or perforated intrabasin baffles, outlet weir or perforated launders |
| Excellent | 0.9 | Serpentine baffling throughout basin, very high length to width ratio |
| Perfect (plug flow) | 1.0 ⁽⁴⁾ | Very high length to width ratio (pipeline flow), perforated inlet, outlet, and intrabasin baffles |

⁽⁴⁾At perfect plug flow conditions, T_{10} is equal to T .

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Table L-9.
CT Values for Inactivation of Viruses by Free Chlorine, pH 6.0-9.0

| | Temperature (°C) |
|--|------------------|
|--|------------------|

| | | | | | | | | | | | | | |
|--------------------|------------------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Inactivation (log) | 0.5 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 2 | 6.0 | 5.8 | 5.3 | 4.9 | 4.4 | 4.0 | 3.8 | 3.6 | 3.4 | 3.2 | 3.0 | 2.8 | 2.6 |
| 3 | 9.0 | 8.7 | 8.0 | 7.3 | 6.7 | 6.0 | 5.6 | 5.2 | 4.8 | 4.4 | 4.0 | 3.8 | 3.6 |
| 4 | 12.0 | 11.6 | 10.7 | 9.8 | 8.9 | 8.0 | 7.6 | 7.2 | 6.8 | 6.4 | 6.0 | 5.6 | 5.2 |
| Inactivation (log) | Temperature (°C) | | | | | | | | | | | | |
| | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| 2 | 2.4 | 2.2 | 2.0 | 1.8 | 1.6 | 1.4 | 1.2 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| 3 | 3.4 | 3.2 | 3.0 | 2.8 | 2.6 | 2.4 | 2.2 | 2.0 | 1.8 | 1.6 | 1.4 | 1.2 | 1.0 |
| 4 | 4.8 | 4.4 | 4.0 | 3.8 | 3.6 | 3.4 | 3.2 | 3.0 | 2.8 | 2.6 | 2.4 | 2.2 | 2.0 |

17832 Source: AWWA, 1991. Modified by linear interpolation between 5°C increments.
 17833 -

Table L-10.
 CT Values for Inactivation of Giardia Cysts by Chlorine Dioxide, pH 6.0-9.0

| Inactivation (log) | Temperature (°C) | | | | | | | | | | | | |
|--------------------|------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 0.5 | 10.0 | 8.6 | 7.2 | 5.7 | 4.3 | 4.2 | 4.2 | 4.1 | 4.1 | 4.0 | 3.8 | 3.7 | 3.5 |
| 1 | 21.0 | 17.9 | 14.9 | 11.8 | 8.7 | 8.5 | 8.3 | 8.1 | 7.9 | 7.7 | 7.4 | 7.1 | 6.9 |
| 1.5 | 32.0 | 27.3 | 22.5 | 17.8 | 13.0 | 12.8 | 12.6 | 12.4 | 12.2 | 12.0 | 11.6 | 11.2 | 10.8 |
| 2 | 42.0 | 35.8 | 29.5 | 23.3 | 17.0 | 16.6 | 16.2 | 15.8 | 15.4 | 15.0 | 14.6 | 14.2 | 13.8 |
| 2.5 | 52.0 | 44.5 | 37.0 | 29.5 | 22.0 | 21.4 | 20.8 | 20.2 | 19.6 | 19.0 | 18.4 | 17.8 | 17.2 |
| 3 | 63.0 | 53.8 | 44.5 | 35.3 | 26.0 | 25.5 | 24.8 | 24.2 | 23.6 | 23.0 | 22.2 | 21.4 | 20.6 |
| | Temperature (°C) | | | | | | | | | | | | |

| | | | | | | | | | | | | | |
|--------------------|------|------|------|------|------|------|------|------|------|------|------|------|---|
| Inactivation (log) | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | - |
| 0.5 | 3.4 | 3.2 | 3.1 | 2.9 | 2.8 | 2.6 | 2.5 | 2.4 | 2.3 | 2.2 | 2.1 | 2.0 | - |
| 1 | 6.6 | 6.3 | 6.0 | 5.8 | 5.5 | 5.3 | 5.0 | 4.7 | 4.5 | 4.2 | 4.0 | 3.7 | - |
| 1.5 | 10.4 | 10.0 | 9.5 | 9.0 | 8.5 | 8.0 | 7.5 | 7.1 | 6.7 | 6.3 | 5.9 | 5.5 | - |
| 2 | 13.4 | 13.0 | 12.4 | 11.8 | 11.2 | 10.6 | 10.0 | 9.5 | 8.9 | 8.4 | 7.8 | 7.3 | - |
| 2.5 | 16.6 | 16.0 | 15.4 | 14.8 | 14.2 | 13.6 | 13.0 | 12.2 | 11.4 | 10.6 | 9.8 | 9.0 | - |
| 3 | 19.8 | 19.0 | 18.2 | 17.4 | 16.6 | 15.8 | 15.0 | 14.2 | 13.4 | 12.6 | 11.8 | 11.0 | - |

17834 Source: AWWA, 1991. Modified by linear interpolation between 5°C increments.
17835 -

Table L-11.
CT Values for Inactivation of Viruses by Chlorine Dioxide, pH 6.0-9.0

| Inactivation (log) | Temperature (°C) | | | | | | | | | | | | |
|--------------------|------------------|------|------|------|------|------|------|------|------|------|-----|-----|------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 2 | 8.4 | 7.7 | 7.0 | 6.3 | 5.6 | 5.0 | 4.3 | 3.6 | 2.9 | 2.2 | 1.5 | 0.8 | 0.1 |
| 3 | 25.6 | 23.5 | 21.4 | 19.2 | 17.1 | 14.9 | 12.7 | 10.5 | 8.3 | 6.1 | 3.9 | 1.7 | -0.5 |
| 4 | 50.1 | 45.9 | 41.8 | 37.6 | 33.4 | 29.2 | 25.0 | 20.8 | 16.6 | 12.4 | 8.2 | 4.0 | -0.2 |
| Inactivation (log) | Temperature (°C) | | | | | | | | | | | | |
| | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | - |
| 2 | 3.1 | 2.8 | 2.7 | 2.5 | 2.4 | 2.2 | 2.1 | 2.0 | 1.8 | 1.7 | 1.5 | 1.4 | - |
| 3 | 9.4 | 8.6 | 8.2 | 7.7 | 7.3 | 6.8 | 6.4 | 6.0 | 5.6 | 5.1 | 4.7 | 4.3 | - |
| 4 | 18.4 | 16.7 | 15.9 | 15.0 | 14.2 | 13.3 | 12.5 | 11.7 | 10.9 | 10.0 | 9.2 | 8.4 | - |

17836 Source: AWWA, 1991. Modified by linear interpolation between 5°C increments.
 17837 -

Table L-12.
 CT Values for Inactivation of Giardia Cysts by Chloramine, pH 6.0-9.0

| Inactivation (log) | Temperature (°C) | | | | | | | | | | | | |
|--------------------|------------------|---------------|---------------|-----------|-----------|---------------|---------------|---------------|-----------|---------------|---------------|---------------|---------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 0.5 | 63 5 | 56 8 | 500 | 43 3 | 36 5 | 35 4 | 34 3 | 33 2 | 32 1 | 31 0 | 29 8 | 28 6 | 27 4 |
| 1 | 1, 27 0 | 1, 13 6 | 1,0 03 | 86 9 | 73 5 | 71 1 | 68 7 | 66 3 | 63 9 | 61 5 | 59 2 | 56 9 | 54 6 |
| 1.5 | 1, 90 0 | 1, 70 0 | 1,5 00 | 1,3 00 | 1,1 00 | 1, 06 6 | 1, 03 2 | 99 8 | 96 4 | 93 0 | 89 4 | 85 8 | 82 2 |
| 2 | 2, 53 5 | 2, 26 9 | 2,0 03 | 1,7 36 | 1,4 70 | 1, 42 2 | 1, 37 4 | 1, 32 6 | 1,2 78 | 1, 23 0 | 1, 18 4 | 1, 13 8 | 1, 09 2 |
| 2.5 | 3, 17 0 | 2, 83 5 | 2,5 00 | 2,1 65 | 1,8 30 | 1, 77 2 | 1, 71 4 | 1, 65 6 | 1,5 98 | 1, 54 0 | 1, 48 2 | 1, 42 4 | 1, 36 6 |
| 3 | 3, 80 0 | 3, 40 0 | 3,0 00 | 2,6 00 | 2,2 00 | 2, 13 0 | 2, 06 0 | 1, 99 0 | 1,9 20 | 1, 85 0 | 1, 78 0 | 1, 71 0 | 1, 64 0 |
| Inactivation (log) | Temperature (°C) | | | | | | | | | | | | |
| | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | - |
| 0.5 | 26 2 | 25 0 | 23 7 | 224 | 211 | 198 | 18 5 | 17 3 | 16 1 | 149 | 13 7 | 12 5 | - |
| 1 | 52 3 | 50 0 | 47 4 | 448 | 422 | 396 | 37 0 | 34 6 | 32 2 | 298 | 27 4 | 25 0 | - |
| 1.5 | 78 6 | 75 0 | 71 0 | 670 | 630 | 590 | 55 0 | 51 5 | 48 0 | 445 | 41 0 | 37 5 | - |
| 2 | 1, 04 6 | 1, 00 0 | 94 7 | 894 | 841 | 788 | 73 5 | 68 8 | 64 1 | 594 | 54 7 | 50 0 | - |
| 2.5 | 1, 30 8 | 1, 25 0 | 1, 18 3 | 1,1 16 | 1,0 49 | 982 | 91 5 | 85 7 | 79 9 | 741 | 68 3 | 62 5 | - |
| 3 | 1, 57 0 | 1, 50 0 | 1, 42 0 | 1,3 40 | 1,2 60 | 1,1 80 | 1, 10 0 | 1, 03 0 | 96 0 | 890 | 82 0 | 75 0 | - |

17838 Source: AWWA, 1991. Modified by linear interpolation between 5°C increments.

17839 -

Table L-13.
CT Values for Inactivation of Viruses by Chloramine

| Inactivation (log) | Temperature (°C) | | | | | | | | | | | | |
|--------------------|------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 2 | 1,243 | 1,147 | 1,050 | 954 | 857 | 814 | 774 | 729 | 686 | 643 | 600 | 557 | 514 |
| 3 | 2,063 | 1,903 | 1,743 | 1,583 | 1,423 | 1,263 | 1,103 | 1,209 | 1,113 | 1,017 | 996 | 925 | 854 |
| 4 | 2,883 | 2,659 | 2,436 | 2,212 | 1,988 | 1,764 | 1,540 | 1,616 | 1,515 | 1,414 | 1,312 | 1,210 | 1,108 |
| Inactivation (log) | Temperature (°C) | | | | | | | | | | | | |
| | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | - |
| 2 | 474 | 428 | 407 | 385 | 364 | 342 | 324 | 300 | 278 | 257 | 235 | 214 | - |
| 3 | 783 | 712 | 676 | 644 | 605 | 570 | 534 | 498 | 463 | 427 | 392 | 356 | - |
| 4 | 1,093 | 994 | 944 | 895 | 845 | 796 | 746 | 696 | 646 | 597 | 547 | 497 | - |

17840 Source: AWWA, 1991. Modified by linear interpolation between 5°C increments.

17841 -

Table L-14.
CT Values for Inactivation of Giardia Cysts by Ozone

| Inactivation (log) | Temperature (°C) | | | | | | | | | | | | |
|--------------------|------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 0.5 | 0.48 | 0.44 | 0.40 | 0.36 | 0.32 | 0.30 | 0.28 | 0.27 | 0.25 | 0.23 | 0.22 | 0.20 | 0.19 |
| 1.0 | 0.97 | 0.89 | 0.80 | 0.72 | 0.63 | 0.60 | 0.57 | 0.54 | 0.51 | 0.48 | 0.45 | 0.42 | 0.38 |
| 1.5 | 1.50 | 1.36 | 1.23 | 1.10 | 0.95 | 0.90 | 0.86 | 0.81 | 0.77 | 0.72 | 0.67 | 0.62 | 0.58 |
| 2.0 | 1.90 | 1.75 | 1.60 | 1.45 | 1.30 | 1.23 | 1.16 | 1.10 | 1.02 | 0.95 | 0.89 | 0.82 | 0.76 |
| 2.5 | 2.40 | 2.20 | 2.00 | 1.80 | 1.60 | 1.52 | 1.44 | 1.36 | 1.28 | 1.20 | 1.12 | 1.04 | 0.95 |

| | | | | | | | | | | | | | |
|--------------------|------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| 3.0 | 2.90 | 2.65 | 2.40 | 2.15 | 1.90 | 1.84 | 1.74 | 1.62 | 1.52 | 1.43 | 1.33 | 1.24 | 1.14 |
| Inactivation (log) | Temperature (°C) | | | | | | | | | | | | |
| | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | - |
| 0.5 | 0.17 | 0.16 | 0.15 | 0.14 | 0.14 | 0.13 | 0.12 | 0.11 | 0.10 | 0.10 | 0.09 | 0.08 | - |
| 1.0 | 0.35 | 0.32 | 0.30 | 0.29 | 0.27 | 0.26 | 0.24 | 0.22 | 0.21 | 0.19 | 0.18 | 0.16 | - |
| 1.5 | 0.53 | 0.48 | 0.46 | 0.43 | 0.41 | 0.38 | 0.36 | 0.34 | 0.31 | 0.29 | 0.26 | 0.24 | - |
| 2.0 | 0.69 | 0.63 | 0.60 | 0.57 | 0.54 | 0.51 | 0.48 | 0.45 | 0.42 | 0.38 | 0.35 | 0.32 | - |
| 2.5 | 0.87 | 0.79 | 0.75 | 0.71 | 0.68 | 0.64 | 0.60 | 0.56 | 0.52 | 0.48 | 0.44 | 0.40 | - |
| 3.0 | 1.05 | 0.95 | 0.90 | 0.86 | 0.81 | 0.77 | 0.72 | 0.67 | 0.62 | 0.58 | 0.53 | 0.48 | - |

17842 Source: AWWA, 1991. Modified by linear interpolation between 5°C increments.
17843 -

Table L-15.
CT Values for Inactivation of Viruses by Ozone

| | | | | | | | | | | | | | |
|--------------------|------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Inactivation (log) | Temperature (°C) | | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 2 | 0.90 | 0.83 | 0.75 | 0.68 | 0.60 | 0.58 | 0.56 | 0.54 | 0.52 | 0.50 | 0.46 | 0.42 | 0.38 |
| 3 | 1.40 | 1.28 | 1.15 | 1.03 | 0.90 | 0.88 | 0.86 | 0.84 | 0.82 | 0.80 | 0.74 | 0.68 | 0.62 |
| 4 | 1.80 | 1.65 | 1.50 | 1.35 | 1.20 | 1.16 | 1.12 | 1.08 | 1.04 | 1.00 | 0.92 | 0.84 | 0.76 |
| Inactivation (log) | Temperature (°C) | | | | | | | | | | | | |
| | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | - |
| 2 | 0.34 | 0.30 | 0.29 | 0.28 | 0.27 | 0.26 | 0.25 | 0.23 | 0.21 | 0.19 | 0.17 | 0.15 | - |
| 3 | 0.56 | 0.50 | 0.48 | 0.46 | 0.44 | 0.42 | 0.40 | 0.37 | 0.34 | 0.31 | 0.28 | 0.25 | - |
| 4 | 0.68 | 0.60 | 0.58 | 0.56 | 0.54 | 0.52 | 0.50 | 0.46 | 0.42 | 0.38 | 0.34 | 0.30 | - |

17844 Source: AWWA, 1991. Modified by linear interpolation between 5°C increments

17845 APPENDIX M. LEAD AND COPPER [REPEALED]

17846

APPENDIX M. LEAD AND COPPER

17847

Table M1

17848

Monitoring Frequency for Initial Sampling Requirements

| PWS Size | Monitoring Type | Location | No. Samples | Frequency | |
|------------------------------|---------------------------|--------------------------|---------------------|--------------------|--------------------|
| Large PWSs ≥100,000 | - | - | - | - | |
| | Lead and Copper | Taps | 100 | 6 months | |
| | Water Quality Parameters | Distribution System | 25 | Twice per 6 months | |
| | Source Water | Entry Points | - | - | |
| | —Lead and Copper | - | 4 | 6 months* | |
| | —Water Quality Parameters | - | 4 | Twice per 6 months | |
| | 50,001-100,000 | Lead and Copper | Taps | 60 | 6 months |
| | | Water Quality Parameters | Distribution System | 10 | Twice per 6 months |
| | | Source Water | Entry Points | - | - |
| | | —Lead and Copper | - | 4 | 6 months* |
| —Water Quality Parameters | | - | 4 | Twice per 6 months | |
| Medium PWSs 10,001-50,000 | - | - | - | - | |
| | Lead and Copper | Taps | 60 | 6 months | |
| | If ALs Exceeded | - | - | - | |
| | Water Quality Parameters | Distribution System | 10 | Twice per 6 months | |
| | Source Water | Entry Points | - | - | |
| | —Lead and Copper | - | 4 | 6 months | |
| | —Water Quality Parameters | - | 4 | Twice per 6 months | |
| | 3,301-10,000 | Lead and Copper | Taps | 40 | 6 months |
| | | If ALs Exceeded | - | - | - |
| | | Water Quality Parameters | Distribution System | 3 | Twice per 6 months |
| Source Water | | Entry Points | - | - | |

| | | | | |
|---|--|--------------------------------|--|--------------------|
| - | —Lead and Copper | - | 4 | 6 months |
| - | —Water Quality Parameters | - | 4 | Twice per 6 months |
| Small PWSs 501-3,300 | - Lead and Copper* If ALs Exceeded | - Taps | - 20 | - 6 months |
| - | Water Quality Parameters | Distribution System | 2 | Twice per 6 months |
| - | Source Water | Entry Points | - | - |
| - | —Lead and Copper | - | 4 | 6 months |
| - | —Water Quality Parameters | - | 4 | Twice per 6 months |
| 101-500 | Lead and Copper If ALs Exceeded | Taps | 10 | 6 months |
| - | Water Quality Parameters | Distribution System | 4 | Twice per 6 months |
| - | Source Water | Entry Points | - | - |
| - | —Lead and Copper | - | 4 | 6 months |
| - | —Water Quality Parameters | - | 4 | Twice per 6 months |
| £100 | Lead and Copper* If ALs Exceeded | Taps | 5 | 6 months |
| - | Water Quality Parameters | Distribution System | 4 | Twice per 6 months |
| - | Source Water | Entry Points | - | - |
| - | —Lead and Copper | - | 4 | 6 months |
| - | —Water Quality Parameters | - | 4 | Twice per 6 months |
| Nontransient Noncommunity Water Systems | Lead and Copper Water Quality Parameters | Taps Distribution System | No more than one per building per monitoring period | |

17849 *If system wants to attempt to demonstrate optimization based on difference between source
17850 water levels and 90% tap level. Otherwise, one sample per entry point required if an AL is
17851 exceeded.

17852

LEAD AND COPPER

17853

Table M2

17854

Monitoring Frequency for Follow-up and Routine Sampling Requirements

| PWS Size | Monitoring Type | Location | No. Samples | Frequency | |
|------------------------------|---------------------------|--------------------------|---------------------|--------------------|--------------------|
| Large PWSs ≥100,000 | - | - | - | - | |
| | Lead and Copper | Taps | 100 | 6 months | |
| | Water Quality Parameters | Distribution System | 25 | Twice per 6 months | |
| | Source Water | Entry Points | - | - | |
| | —Lead and Copper | - | 4 | 6 months* | |
| | —Water Quality Parameters | - | 4 | Biweekly | |
| | 50,001-100,000 | Lead and Copper | Taps | 60 | 6 months |
| | | Water Quality Parameters | Distribution System | 10 | Twice per 6 months |
| | | Source Water | Entry Points | - | - |
| | | —Lead and Copper | - | 4 | 6 months* |
| —Water Quality Parameters | | - | 4 | Biweekly | |
| Medium PWSs 10,001-50,000 | - | - | - | - | |
| | Lead and Copper | Taps | 60 | 6 months | |
| | Water Quality Parameters | Distribution System | 10 | Twice per 6 months | |
| | Source Water | Entry Points | - | - | |
| | —Lead and Copper | - | 4 | 6 months* | |
| | —Water Quality Parameters | - | 4 | Biweekly | |
| | 3,301-10,000 | Lead and Copper | Taps | 40 | 6 months |
| | | Water Quality Parameters | Distribution System | 3 | Twice per 6 months |
| | | Source Water | Entry Points | - | - |
| | | —Lead and Copper | - | 4 | 6 months* |
| - | | - | - | - | |

| | | | | |
|---|--|--------------------------------|--|--------------------|
| - | —Water Quality Parameters | - | 4 | Biweekly |
| Small PWSs 501-3,300 | - Lead and Copper | - Taps | - 20 | - 6 months |
| - | Water Quality Parameters | Distribution System | 2 | Twice per 6 months |
| - | Source Water | Entry Points | - | - |
| - | —Lead and Copper | - | 4 | 6 months* |
| - | —Water Quality Parameters | - | 4 | Biweekly |
| 101-500 | Lead and Copper* | Taps | 10 | 6 months |
| - | Water Quality Parameters | Distribution System | 4 | Twice per 6 months |
| - | Source Water | Entry Points | - | - |
| - | —Lead and Copper | - | 4 | 6 months |
| - | —Water Quality Parameters | - | 4 | Biweekly |
| £100 | Lead and Copper* | Taps | 5 | 6 months |
| - | Water Quality Parameters | Distribution System | 4 | Twice per 6 months |
| - | Source Water | Entry Points | - | - |
| - | —Lead and Copper | - | 4 | 6 months* |
| - | —Water Quality Parameters | - | 4 | Biweekly |
| Nontransient Noncommunity Water Systems | Lead and Copper Water Quality Parameters | Taps Distribution System | No more than one per building per monitoring period | |

17855 *If source water treatment installed; otherwise, see reduced monitoring requirements.

17856 LEAD AND COPPER

17857 Table M3

17858 Monitoring Frequency for Reduced Sampling Requirements

| PWS Size | Monitoring Type | Reduced Monitoring | Ultimate Reduced Monitoring |
|----------|-----------------|--------------------|-----------------------------|
|----------|-----------------|--------------------|-----------------------------|

| | | | |
|------------------------------|--|--|--|
| Large PWSs >100,000 | - Lead and Copper Water Quality Parameters | - 50 per year 10 twice per 6 months | - 50 per 3 years 10 twice per year |
| - | Points of Entry Lead and Copper | - | - |
| - | —Groundwater Supply | 1 per 3 years | 1 per 9 years |
| - | —Surface Water Supply | Annually | 1 per 9 years |
| - | Water Quality Parameters | Biweekly | Biweekly |
| 50,001-100,000 | Lead and Copper | 30 per year | 30 per 3 years |
| - | Water Quality Parameters | 7 twice per 6 months | 7 twice per year |
| - | Points of Entry Lead and Copper | - | - |
| - | —Groundwater Supply | 1 per 3 years | 1 per 9 years |
| - | —Surface Water Supply | Annually | 1 per 9 years |
| - | Water Quality Parameters | Biweekly | Biweekly |
| Medium PWSs 10,001-50,000 | - Lead and Copper | - 30 per year | - 30 per 3 years |
| - | Water Quality Parameters | 7 twice per 6 months | 7 twice per year |
| - | Points of Entry Lead and Copper | - | - |
| - | —Groundwater Supply | 1 per 3 years | 1 per 9 years |
| - | —Surface Water Supply | Annually | 1 per 9 years |
| - | Water Quality Parameters | Biweekly | Biweekly |
| 3,301-10,000 | Lead and Copper | 20 per year | 20 per 3 years |
| - | Water Quality Parameters | 3 twice per 6 months | 3 twice per year |
| - | Points of Entry Lead and Copper | - | - |
| - | —Groundwater Supply | 1 per 3 years | 1 per 9 years |
| - | —Surface Water Supply | Annually | 1 per 9 years |
| - | Water Quality Parameters | Biweekly | Biweekly |
| Small PWSs 501-3,300 | - Lead and Copper | - 10 per year | - 10 per 3 years |
| - | Water Quality Parameters | 2 twice per 6 months | 2 twice per year |

| | | | |
|---------|---------------------------------|----------------------|------------------|
| - | Points of Entry Lead and Copper | - | - |
| - | — Groundwater Supply | 1 per 3 years | 1 per 9 years |
| - | — Surface Water Supply | Annually | 1 per 9 years |
| - | Water Quality Parameters | Biweekly | Biweekly |
| 401-500 | Lead and Copper | 5 per year | 5 per 3 years |
| - | Water Quality Parameters | 1 twice per 6 months | 1 twice per year |
| - | Points of Entry Lead and Copper | - | - |
| - | — Groundwater Supply | 1 per 3 years | 1 per 9 years |
| - | — Surface Water Supply | Annually | 1 per 9 years |
| - | Water Quality Parameters | Biweekly | Biweekly |
| £100 | Lead and Copper | 5 per year | 5 per 3 years |
| - | Water Quality Parameters | 1 twice per 6 months | 1 twice per year |
| - | Points of Entry Lead and Copper | - | - |
| - | — Groundwater Supply | 1 per 3 years | 1 per 9 years |
| - | — Surface Water Supply | Annually | 1 per 9 years |
| - | Water Quality Parameters | Biweekly | Biweekly |

17859

Table M4

17860

SUMMARY OF MONITORING REQUIREMENTS FOR WATER QUALITY PARAMETERS⁴

| Monitoring Period | Parameters ² | Location | Frequency |
|---|--|--|--|
| Initial Monitoring | pH, alkalinity, orthophosphate or silica, ³ calcium, conductivity, temperature | Taps and at entry point(s) to distribution system | Every 6 months |
| After Installation of Corrosion Control | pH, alkalinity, orthophosphate or silica, ³ calcium ⁴ pH, alkalinity dosage rate and concentration (if alkalinity adjusted as part of corrosion control), inhibitor dosage rate and inhibitor residual ⁵ | Taps Entry point(s) to distribution system ⁶ | Every 6 months No less frequently than every two weeks. |
| After State Specifies | pH, alkalinity, orthophosphate or silica, ³ calcium ⁴ | Taps | Every 6 months |

| | | | |
|--|---|---------------------------------------|--|
| Parameter Values For Optimal Corrosion Control | 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 distribution system | No less frequently than every two weeks. |
| Reduced Monitoring | pH, alkalinity, orthophosphate or silica, ³ calcium ⁴ | Taps | Every six months, annually ⁷ or every 3 years ⁸ at a 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 distribution system | No less frequently than every two weeks. |

17861 ¹Table is for illustrative purposes; consult the text of this section for precise regulatory
17862 requirements.

17863 ²Small and medium-size systems have to monitor for water quality parameters only during
17864 monitoring periods in which the system exceeds the lead or copper action level.

17865 ³Orthophosphate must be measured only when an inhibitor containing a phosphate compound is
17866 used. Silica must be measured only when an inhibitor containing silicate compound is used.

17867 ⁴Calcium must be measured only when calcium carbonate stabilization is used as part of corrosion
17868 control.

17869 ⁵Inhibitor dosage rates and inhibitor residual concentrations (orthophosphate or silica) must be
17870 measured only when an inhibitor is used.

17871 ⁶Groundwater systems may limit monitoring to representative locations throughout the system.

17872 ⁷Waterworks may reduce frequency of monitoring for water quality parameters at the tap from
17873 every six months to annually if they maintain the minimum values or range of values for water
17874 quality parameters reflecting optimal corrosion control treatment during three consecutive years
17875 of monitoring.

17876 ^aWaterworks may further reduce the frequency of monitoring for water quality parameters at the
 17877 tap from annually to once every three years if they have maintained the minimum values or range
 17878 of values for water quality parameters reflecting optimal corrosion control treatment during three
 17879 consecutive years of annual monitoring. Waterworks may accelerate the triennial monitoring for
 17880 water quality parameters at the tap if they have maintained 90th percentile lead levels less than
 17881 or equal to 0.005 mg/L, 90th percentile copper levels less than or equal to 0.65 mg/L, and the
 17882 range of water quality parameters designated by the Commissioner under 12 VAC 5-590-420 C
 17883 1 f as representing optimal corrosion control during two consecutive six-month periods.

17884 APPENDIX N. INORGANIC COMPOUNDS AND ORGANIC CHEMICALS. (Repealed.)

17885 APPENDIX N. INORGANIC COMPOUNDS AND ORGANIC CHEMICALS.

17886 TABLE I

17887 INORGANIC COMPOUNDS

| Contaminant | BAT(s) |
|----------------------|---|
| Arsenic ^d | 1, 2, 5, 6, 7, 9, 12 ^e |
| Antimony | 2, 7 |
| Asbestos | 2, 3, 8 |
| Barium | 5, 6, 7, 9 |
| Beryllium | 1, 2, 5, 6, 7 |
| Cadmium | 2, 5, 6, 7 |
| Chromium | 2, 5, 6 ^b , 7 |
| Cyanide | 5, 7, 13 |
| Fluoride | 1, 7, 9 |
| Mercury | 2 ^a , 4, 6 ^a , 7 ^a |
| Nickel | 5, 6, 7 |
| Nitrate | 5, 7, 9 |
| Nitrite | 5, 7 |
| Selenium | 1, 2 ^c , 6, 7, 9 |
| Thallium | 1, 5 |

17888 Key to Best Available Technologies/Treatment Techniques

- 17889 1. Activated Alumina
- 17890 2. Coagulation/Filtration (except for waterworks serving less than 500 service
- 17891 connections)
- 17892 3. Direct or Diatomite Filtration
- 17893 4. Granular Activated Carbon
- 17894 5. Ion Exchange
- 17895 6. Lime Softening (except for waterworks serving less than 500 service connections)
- 17896 7. Reverse Osmosis
- 17897 8. Corrosion Control
- 17898 9. Electrodialysis/Electrodialysis Reversing
- 17899 10. Chlorine
- 17900 11. Ultraviolet
- 17901 12. Oxidation/Filtration
- 17902 13. Alkaline Chlorination pH \geq 8.5
- 17903 ~~NOTES ON BAT DESIGNATIONS~~
- 17904 a. ~~BAT only if influent mercury concentrations are less than or equal to 10 µg/l~~
- 17905 b. ~~BAT for Chromium III only~~
- 17906 c. ~~BAT for Selenium IV only~~
- 17907 d. ~~BATs for Arsenic V. Preoxidation may be required to convert Arsenic III to Arsenic V.~~
- 17908 e. ~~To obtain high removals, iron to arsenic ratio must be at least 20:1.~~

17909

TABLE II

17910

ORGANIC CHEMICALS

| Contaminant | BAT(s) |
|-----------------------------|--------|
| Acrylamide | 3 |
| Alachlor | 4 |
| Aldicarb | 4 |
| Aldicarb sulfoxide | 4 |
| Aldicarb sulfone | 4 |
| Atrazine | 4 |
| Benzene | 1,2 |
| Carbofuran | 4 |
| Carbon tetrachloride | 1,2 |
| Chlordane | 4 |
| 2,4-D | 4 |
| Dibromochloropropane (DBCP) | 1,2 |
| o-Dichlorobenzene | 1,2 |
| p-Dichlorobenzene | 1,2 |
| 1,2-Dichloroethane | 1,2 |
| 1,1-Dichloroethylene | 1,2 |
| cis-1,2-Dichloroethylene | 1,2 |
| trans-1,2-Dichloroethylene | 1,2 |
| 1,2-Dichloropropane | 1,2 |
| Epichlorohydrin | 3 |
| Ethylene dibromide (EDB) | 1,2 |
| Ethylbenzene | 1,2 |
| Heptachlor | 4 |
| Heptachlor epoxide | 4 |
| Lindane | 4 |
| Methoxychlor | 4 |
| Monochlorobenzene | 1,2 |
| PCBs | 4 |
| Pentachlorophenol | 4 |
| Styrene | 1,2 |

| | |
|---------------------------|-----|
| 2,4,5-TP (Silvex) | 4 |
| Tetrachloroethylene | 1,2 |
| 1,1,1-Trichloroethane | 1,2 |
| Trichloroethylene | 1,2 |
| Toluene | 1,2 |
| Toxaphene | 4 |
| Vinyl chloride | 2 |
| Xylenes (total) | 1,2 |
| Benzo(a)pyrene | 4 |
| Dalapon | 4 |
| Dichloromethane | 2 |
| Di(2-ethylhexyl)adipate | 1,2 |
| Di(2-ethylhexyl)phthalate | 4 |
| Dinoseb | 4 |
| Diquat | 4 |
| Endothall | 4 |
| Endrin | 4 |
| Glyphosate | 4 |
| Hexachlorobenzene | 4 |
| Hexachloropentadiene | 1,2 |
| Oxamyl (Vydate) | 4 |
| Picloram | 4 |
| Simazine | 4 |
| 1,2,4-Trichlorobenzene | 1,2 |
| 1,1,2-Trichloroethane | 1,2 |
| 2,3,7,8-TCDD (Dioxin) | 4 |

17911 Key to Best Available Technologies/Treatment Techniques

17912 1. Granular Activated Carbon

17913 2. Packed Tower Aeration

17914 3. Polymer Addition Practices

17915 4. Oxidation (chlorination, with the exception of water having cyanide (as free cyanide)
 17916 exceeding 0.2 mg/l, or ozonation)

17917 Statutory Authority

17918 APPENDIX O.

17919 REGULATED CONTAMINANTS FOR CONSUMER CONFIDENCE REPORTS AND PUBLIC

17920 NOTIFICATION (Repealed.)

17921 Key

17922 AL = Action Level

17923 PMCL = Primary Maximum Contaminant Level

17924 MCLG = Maximum Contaminant Level Goal

17925 MFL = million fibers per liter

17926 mrem/year = milirems per year (a measure of radiation absorbed by the body)

17927 MRDL = Maximum Residual Disinfectant Level

17928 MRDLG = Maximum Residual Disinfectant Level Goal

17929 NTU = Nephelometric Turbidity Units

17930 pCi/l = picocuries per liter (a measure of radioactivity)

17931 ppb = parts per billion, or micrograms per liter (µg/L)

17932 ppm = parts per million, or milligrams per liter (mg/L)

17933 ppq = parts per quadrillion, or picograms per liter

17934 ppt = parts per trillion, or nanograms per liter

17935 TT = Treatment Technique

| Contaminant (units) | Traditional PMCL in mg/l | To convert for CCR, multiply by | MCL in CCR units | MCLG | Major Sources in Drinking Water | Health Effects Language |
|-------------------------------------|--------------------------|---------------------------------|------------------|------|--------------------------------------|---|
| Microbiological Contaminants | | | | | | |
| (1) Total coliform bacteria | TT | | | n/a | 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, waterborne pathogens may be present or that a potential pathway exists through which contamination |

| | | | | |
|-------------|---|-----|------------------------------|--|
| | | | | may enter the waterworks. |
| (2) E. coli | PMCL: In compliance unless (i) the waterworks has an E. coli-positive repeat sample following a total coliform-positive routine sample; (ii) the waterworks has a total coliform-positive repeat sample following an E. coli-positive routine sample; (iii) the waterworks owner fails to take all required repeat samples following an E. coli-positive routine sample; or (iv) the waterworks owner fails to test for E. coli when any repeat sample tests positive for total coliform. | 0 | Human and animal fecal waste | E. coli are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Human pathogens in these wastes can cause short-term effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a greater health risk for infants, young children, the elderly, and people with severely-compromised immune systems. |
| (3) E. coli | FF | n/a | Human and animal fecal waste | E. coli are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Human pathogens in these wastes can cause short-term effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a greater health risk for infants, young children, the elderly, and people with severely |

| | | | | | | |
|--|----|---|----|---------------|------------------------------|--|
| | | | | | | compromised immune systems. |
| (4) Source water fecal indicator (E. coli) | II | - | II | 0 for E. coli | 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 system. |
| (5) Groundwater rule II violations other than (4) above ¹ | II | - | - | II | - | Inadequately treated or inadequately protected water may contain disease-causing organisms. These organisms can cause symptoms such as diarrhea, nausea, cramps, and associated headaches. |
| (6) Turbidity | II | - | II | n/a | Soil runoff | Turbidity has no health effects. However, turbidity can interfere with disinfection and provide a medium for microbial |

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|---|-----------------|---|-----|---|--|--|
| | | | | | | 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. |
| (7) Giardia lamblia, viruses, Heterotrophic plate count, Legionella, Cryptosporidium ¹ | MP ³ | - | n/a | 0 | n/a | 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. |
| Radioactive Contaminants | | | | | | |
| (8) Beta/photon emitters (mrem/yr) | 4 mrem/yr f | - | 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 and photon emitters in excess of the MCL over many years may have an increased risk of getting cancer. |
| (9) Alpha emitters (pCi/L) | 15 pCi/L | - | 15 | 0 | Erosion of natural deposits | Certain minerals are radioactive and may emit a form of radiation |

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|-------------------------------|---------|------|----|---|---|---|
| | | | | | | 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. |
| (10) Combined radium (pCi/L) | 5 pCi/L | - | 5 | 0 | Erosion of natural deposits | Some people who drink water containing radium-226 or radium-228 in excess of the MCL over many years may have an increased risk of getting cancer. |
| (11) Uranium (ppb) | 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 Contaminants | | | | | | |
| (12) 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. |

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| (13) Arsenic (ppb) | 0.010 | 1000 | 10. | 0 ² | 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. |
| (14) 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. |
| (15) 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. |
| (16) 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. |
| (17) Cadmium (ppb) | 0.005 | 1000 | 5 | 5 | Corrosion of galvanized pipes; Erosion of | Some people who drink water containing cadmium in |

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|---------------------|--------|------|--------|-----|--|---|
| | | | | | natural deposits; Discharge from metal refineries; Run-off from waste batteries and paints | excess of the MCL over many years could experience kidney damage. |
| (18) Chromium (ppb) | 0.1 | 1000 | 100 | 100 | Discharge from steel and pulp mills; Erosion of natural deposits | Some people who drink water containing chromium well in excess of the MCL over many years could experience allergic dermatitis. |
| (19) 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. |
| (20) 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 |

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|---------------------|--------------|------|-------|---|---|--|
| | | | | | | problems with their thyroid. |
| (21) Fluoride (ppm) | 4 | - | 4 | 4 | Erosion of natural deposits; Water additive which 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. |
| (22) Lead (ppb) | AL=0.0 15 | 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 |

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|--------------------------------|------|------|-----|----|--|---|
| | | | | | | problems or high blood pressure. |
| (23) Mercury [inorganic] (ppb) | .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. |
| (24) 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. |
| (25) 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. |
| (26) Total Nitrate and Nitrite | 10 | - | n/a | 10 | n/a | 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. |
| (27) 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. |
| (28) 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 Contaminants including Pesticides and Herbicides | | | | | | |
| (29) 2,4-D (ppb) | 0.07 | 1000 | 70 | 70 | Runoff from herbicides 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. |
| (30) 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 |

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| | | | | | | experience liver problems. |
| (31) Acrylamide | FF | - | FF | 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. |
| (32) 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. |
| (33) Atrazine (ppb) | 0.003 | 1000 | 3 | 3 | Runoff from herbicide used on row crops | Some people who drink water containing the atrazine well in excess of the MCL over many years could experience problems with their cardiovascular system or reproductive difficulties. |
| (34) Benzo(a)pyrene[P AH] - | 0.0002 | 1,000,000 | 200 | 0 | Leaching from linings of water storage tanks and | Some people who drink water containing benzo(a)pyrene in excess of the MCL over many years |

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| | | | | | distribution lines | could experience reproductive difficulties and may have an increased risk of getting cancer. |
| (35) 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. |
| (36) 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. |
| (37) 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. |
| (38) 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 |

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| | | | | | | weight loss, liver enlargement or possible reproductive difficulties. |
| (39) 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 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. |
| (40) Dibromochloropropane (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 well in excess of the MCL over many years could experience reproductive problems and may have an increased risk of getting cancer. |
| (41) 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. |
| (42) 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. |

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| (43) Dioxin [2,3,7,8-TCDD] (ppq) | 0.0000 0003 | 1,000,00 0,000 | 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. |
| (44) 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. |
| (45) Endrin (ppb) | 0.002 | 1000 | 2 | 2 | Runoff of banned insecticide | Some people who drink water containing endrin in excess of the MCL over many years could experience liver problems. |
| (46) Epichlorohydrin | ∓∓ | - | ∓∓ | 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. |
| (47) Ethylene dibromide (ppt) | 0.0000 5 | 1,000,00 0 | 50 | 0 | Discharge from petroleum refineries | Some people who drink water containing ethylene dibromide in |

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| | | | | | | 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. |
| (48) 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. |
| (49) 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. |
| (50) 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. |

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| (51) 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. |
| (52) Hexachlorocyclopentadiene (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 stomach or kidneys. |
| (53) 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. |
| (54) 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. |

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| (55) Oxamyl [Vydate] (ppb) | 0.2 | 1000 | 200 | 200 | Runoff/leaching from insecticide used on apples, potatoes and tomatoes | Some people who drink water containing ethylene oxamyl in excess of the MCL over many years could experience slight nervous system effects. |
| (56) 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. |
| (57) Pentachlorophenol (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. |
| (58) 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 |

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| | | | | | | problems with their liver. |
| (59) 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. |
| (60) 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 experience problems with their thyroid, kidneys, or liver and may have an increased risk of getting cancer. |
| Volatile Organic Contaminants | | | | | | |
| (61) 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. |
| (62) 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 |

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| | | | | | | risk of getting cancer. |
| (63) 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. |
| (64) 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 spleen, or changes in their blood. |
| (65) 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 circulatory systems. |
| (66) 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. |

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| (67) 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. |
| (68) 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. |
| (69) 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. |
| (70) 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. |
| (71) 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 |

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| | | | | | | may have an increased risk of getting cancer. |
| (72) 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. |
| (73) 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 experience problems with their liver, kidneys, or circulatory system. |
| (74) Tetrachloroethylene (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. |
| (75) 1,2,4-Trichlorobenzene (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. |

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| (76) 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. |
| (77) 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. |
| (78) Trichloroethylene (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. |
| (79) 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. |
| (80) Vinyl Chloride (ppb) | 0.002 | 1000 | 2 | 0 | Leaching from PVC piping; | Some people who drink water containing vinyl |

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| | | | | | Discharge from plastic factories | chloride in excess of the MCL over many years may have an increased risk of getting cancer. |
| (81) 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. |
| Disinfection By-Products, Precursors, and Residuals | | | | | | |
| (82) TTHMs [total trihalomethanes] (ppb) | 0.080 | 1000 | 80 | n/a | By-product of drinking water disinfection | Some people who drink water containing trihalomethanes in excess of the MCL over many years could experience problems with their liver, kidneys, or central nervous systems, and may have an increased risk of getting cancer. |
| (83) 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. |
| (84) 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. |

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| (85) Chloramines (ppm) | MRDL= 4.0 | - | MRDL =4.0 | MRDLG =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. |
| (86) Chlorine (ppm) | MRDL= 4.0 | - | MRDL =4.0 | MRDLG =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. |
| (87) Chlorine dioxide (ppb) ² | 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 |

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| | | | | | | pregnant women who drink water containing chlorine dioxide in excess of the MRDL. Some people may experience anemia. |
| (87a) Chlorine dioxide, where any two consecutive daily samples taken at the entrance to the distribution system are above the MRDL. ⁴ | MRDL= 0.8 | - | - | MRDLG =0.8 | - | 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. |
| (87b) Chlorine dioxide, where one or more distribution system samples are above the MRDL. ⁴ | MRDL= 0.8 | - | - | MRDLG =0.8 | - | The chlorine dioxide violations reported today include exceedances of the EPA 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, |

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| | | | | | | including fetuses, infants, and young children, may be especially susceptible to nervous system effects from excessive chlorine dioxide exposure. |
| (88) Chlorite (ppm) | 1.0 | - | 1.0 | 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. |
| (89) Total organic carbon (ppm) | FF | - | FF | 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 byproducts. 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 |

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| | | | | | | kidney problems, or nervous systems effects, and may lead to an increased risk of getting cancer. |
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¹This information is for public notification purposes only.

²This information is for Consumer Confidence Report purposes only.

³Violations of the treatment technique requirements for filtration and disinfection that involve turbidity exceedances may use the health effects language for turbidity instead.

17936 APPENDIX P (Repealed.)

17937 Best available technologies (BATs) for radionuclides. The commissioner identifies as indicated in

17938 the following table the best technology available for achieving compliance with the maximum

17939 contaminant levels for combined radium-226 and radium-228, uranium, gross alpha particle

17940 activity, and beta particle and photon radioactivity.

Table I.

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. | 1. Ion exchange, reverse osmosis, lime softening. |
| 2. Uranium. | 2. Ion exchange, reverse osmosis, lime softening, coagulation/ filtration. |
| 3. Gross alpha particle activity (excluding Radon and Uranium). | 3. Reverse osmosis. |

4. Beta particle and photon radioactivity.

4. Ion exchange, reverse osmosis.

17941 Small systems compliance technologies list for radionuclides.

Table II.
List of Small Systems Compliance Technologies for Radionuclides and Limitations to Use.

| Unit technologies | Limitations (see footnotes) ⁴ | Operator Skill Level required ² | Raw water quality range and considerations. ² |
|--|--|--|--|
| 1. Ion exchange (IE). | (a) | Intermediate. | All ground waters. |
| 2. Point of use (POU ³) IE. | (b) | Basic. | All ground waters. |
| 3. Reverse osmosis (RO). | (c) | Advanced. | Surface waters usually require pre-filtration. |
| 4. POU ³ RO. | (b) | Basic. | Surface waters usually require pre-filtration. |
| 5. Lime softening. | (d) | Advanced. | All waters. |
| 6. Green sand filtration. | (e) | Basic. | All waters. |
| 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. | (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. |

17942 ⁴Limitations Footnotes: Technologies for Radionuclides:

17943 a. The regeneration solution contains high concentrations of the contaminant ions.

17944 Disposal options should be carefully considered before choosing this technology.

17945 b. When POU devices are used for compliance, programs for long-term operation,
17946 maintenance, and monitoring must be provided by water utility to ensure proper
17947 performance.

17948 c. Reject water disposal options should be carefully considered before choosing this
17949 technology. See other RO limitations described in the SWTR Compliance Technologies
17950 Table.

17951 d. The combination of variable source water quality and the complexity of the water
17952 chemistry involved may make this technology too complex for small surface water
17953 systems.

17954 e. Removal efficiencies can vary depending on water quality.

17955 f. This technology may be very limited in application to small systems. Since the process
17956 requires static mixing, detention basins, and filtration, it is most applicable to systems with
17957 sufficiently high sulfate levels that already have a suitable filtration treatment train in place.

17958 g. This technology is most applicable to small systems that already have filtration in place.

17959 h. Handling of chemicals required during regeneration and pH adjustment may be too
17960 difficult for small systems without an adequately trained operator.

17961 i. Assumes modification to a coagulation/filtration process already in place.

17962 ²National Research Council (NRC). Safe Water from Every Tap: Improving Water Service to Small
17963 Communities. National Academy Press. Washington, D.C. 1997.

17964 ³A POU, or "point-of-use" technology is a treatment device installed at a single tap used for the
17965 purpose of reducing contaminants in drinking water at that one tap. POU devices are typically
17966 installed at the kitchen tap. See the April 21, 2000, NODA for more details.

Table III.
Compliance Technologies by System Size Category for Radionuclide NPDWR's.

| Contaminant | Compliance technologies ¹ for system size categories (population served) | | |
|--|---|----------------------------|----------------------------|
| | 25—500 | 501—3,300 | 3,300—10,000 |
| 1. 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. |
| 2. Gross alpha particle activity. | 3,4. | 3,4. | 3,4. |
| 3. Beta particle activity and photon activity. | 1, 2, 3, 4, 1, 2, 4, 10, 11. | 1, 2, 3, 4. | 1, 2, 3, 4. |
| 4. Uranium. | - | 1, 2, 3, 4, 5, 10, 11. | 1, 2, 3, 4, 5, 10, 11. |

17967 Note: ¹Numbers correspond to those technologies found listed in Table II.

17968 DOCUMENTS INCORPORATED BY REFERENCE (12VAC5-590)

17969 ~~"Maximum Permissible Body Burdens and Maximum Permissible Concentration of~~
17970 ~~Radionuclides in Air or Water for Occupational Exposure," National Bureau of Standards~~
17971 ~~Handbook 69.~~

17972 ~~Standard Methods for the Examination of Water and Wastewater, 18th edition, American~~
17973 ~~Public Health Association, American Waterworks Association, and Water Pollution Control~~
17974 ~~Federation, 1992.~~

17975 ~~ANSI/NSF Standard for Drinking Water Treatment System Components, ANSI/NSF 61,~~
17976 ~~American National Standard Institute, November, 1994.~~

17977 ~~AWWA Standard for American National Standard for Cement-Mortar Lining for Ductile-Iron~~
17978 ~~Pipe and Fittings for Water, C-104, American Waterworks Association.~~

17979 ~~AWWA Standard for American National Standard for Polyethylene Encasement for Ductile-~~
17980 ~~Iron Pipe and Fittings for Water, C-105, American Waterworks Association.~~

17981 ~~AWWA Standard for American National Standard for Ductile-Iron and Gray-Iron Fittings 3 Inch~~
17982 ~~Through 48 Inch for Water, C-110, American Waterworks Association.~~

- ~~17983 AWWA Standard for American National Standard for Rubber Gasket Joints for Ductile-Iron
17984 Pressure Pipe and Fittings, C-111, American Waterworks Association.~~
- ~~17985 AWWA Standard for American National Standard for Flanged Ductile-Iron Pipe with Threaded
17986 Flanges, C-115, American Waterworks Association.~~
- ~~17987 AWWA Standard for American National Standard for the Thickness Design of Ductile-Iron
17988 Pipe, C-150, American Waterworks Association.~~
- ~~17989 AWWA Standard for American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for
17990 Water or Other Liquids, C-151, American Waterworks Association.~~
- ~~17991 AWWA Standard for American National Standard for Ductile-Iron Pipe, Compact Fittings, 3
17992 Inch Through 16 Inch, for Water and Other Liquids, C-153, American Waterworks Association.~~
- ~~17993 AWWA Standard for Steel Water Pipe, 6 Inch and Larger, C-200, American Waterworks
17994 Association.~~
- ~~17995 AWWA Standard for Coal-Tar Protective Coatings and Linings for Steel Water Pipelines-
17996 Enamel and Tape-Hot Applied, C-203, American Waterworks Association.~~
- ~~17997 AWWA Standard for Cement-Mortar Protective Lining and Coating for Steel Water Pipe 4 Inch
17998 and Larger Shop Applied, C-205, American Waterworks Association.~~
- ~~17999 AWWA Standard for Field Welding of Steel Water Pipe, C-206, American Waterworks
18000 Association.~~
- ~~18001 AWWA Standard for Steel Pipe Flanges for Waterworks Service 4 Inch and Larger Shop
18002 Applied, C-207, American Waterworks Association.~~
- ~~18003 AWWA Standard for Dimensions for Fabricated Steel Water Pipe Fittings, C-208, American
18004 Waterworks Association.~~

~~18005 AWWA Standards for Cold-Applied Coatings for the Exterior of Special Sections,
18006 Connections, and Fittings for Steel Water Pipelines, C-209, American Waterworks Association.~~

~~18007 AWWA Standard for Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water
18008 Pipelines, C-210, American Waterworks Association.~~

~~18009 AWWA Standard for Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water
18010 Pipelines, C-213, American Waterworks Association.~~

~~18011 AWWA Standards for Tape Coating Systems for the Exterior of Steel Water Pipelines, C-214,
18012 American Waterworks Association.~~

~~18013 AWWA Standard for Extruded Polyolefin Coatings for the Exterior of Steel Water Pipelines,
18014 C-215, American Waterworks Association.~~

~~18015 AWWA Standard for Cross-Linked Polyolefin Coatings for the Exterior of Special Sections,
18016 Connections, and Fittings for Buried Steel Water Pipelines, C-216, American Waterworks
18017 Association.~~

~~18018 AWWA Standard for Cold-Applied Petrolatum Tape and Petroleum Wax Tape Coatings for
18019 the Exterior of Special Sections, Connections, and Fittings for Buried Steel Water Pipelines, C-
18020 217, American Waterworks Association.~~

~~18021 AWWA Standard for Coating the Exterior of Aboveground Steel Water Pipelines and Fittings,
18022 C-218, American Waterworks Association.~~

~~18023 AWWA Standard for Bolted, Sleeve-Type Couplings for Plain-End Pipe, C-219, American
18024 Waterworks Association.~~

~~18025 AWWA Standard for Stainless Steel Pipe, 4 Inch and Larger, C-220, American Waterworks
18026 Association.~~

- ~~18027 AWWA Standard for Reinforced Concrete Pressure Pipe, Steel-Cylinder Type, for Water and
18028 Other Liquids, C-300, American Waterworks Association.~~
- ~~18029 AWWA Standard for Prestressed Concrete Pressure Pipe, Steel-Cylinder Type, for Water and
18030 Other Liquids, C-301, American Waterworks Association.~~
- ~~18031 AWWA Standard for Reinforced Concrete Pressure Pipe, Noncylinder Type, for Water and
18032 Other Liquids, C-302, American Waterworks Association.~~
- ~~18033 AWWA Standard for Reinforced Concrete Pressure Pipe, Noncylinder Type, Pretensioned,
18034 for Water and Other Liquids, C-303, American Waterworks Association.~~
- ~~18035 AWWA Standard for Design of Prestressed Concrete Cylinder Pipe, C-304, American
18036 Waterworks Association.~~
- ~~18037 AWWA Standard for the Selection of Asbestos-Cement Transmission and Feeder Main Pipe,
18038 C-403, American Waterworks Association.~~
- ~~18039 AWWA Standard for Cement-Mortar Lining of Water Pipelines-4 Inch (1000 mm) and Larger-
18040 In Place, C-602, American Waterworks Association.~~
- ~~18041 AWWA Standard for Underground Service Line Valves and Fittings, C-800, American
18042 Waterworks Association.~~
- ~~18043 AWWA Standard for Polyvinyl Chloride Pressure Pipe, 4 Inch Through 12 Inch for Water
18044 Distribution, C-900, American Waterworks Association.~~
- ~~18045 AWWA Standard for Polybutylene Pressure Pipe and Tubings, 1/2 Inch Through 3 Inch, for
18046 Water Service, C-902, American Waterworks Association.~~
- ~~18047 AWWA Standard for Polyethylene Pressure Pipe and Fittings, 4 Inch Through 63 Inch, for
18048 Water Distribution, C-906, American Waterworks Association.~~

~~18049 AWWA Standard for Polyethylene Pressure Pipe and Tubing, 1/2 Inch Through 3 Inch, for
18050 Water Service, C-901, American Waterworks Association.~~

~~18051 AWWA Standard for Polyvinyl Chloride Water Transmission Pipe, Nominal Diameters 14 Inch
18052 Through 36 Inch, C-905, American Waterworks Association.~~

~~18053 AWWA Standard for Polyvinyl Chloride Pressure Fittings, 4 Inch Through 8 Inch, C-907,
18054 American Waterworks Association.~~

~~18055 AWWA Standard for Fiberglass Pressure Pipe, C-950, American Waterworks Association.~~

~~18056 AWWA Standard for Asbestos-Cement Pressure Pipe, 4 Inch Through 16 Inch, for Water
18057 Distribution Systems, C-400, American Waterworks Association.~~

~~18058 AWWA Standard for Selection of Asbestos-Cement Pressure Pipe, 4 Inch Through 16 Inch,
18059 for Water Distribution Systems, C-401, American Waterworks Association.~~

~~18060 AWWA Standard for Asbestos-Cement Transmission Pipe, 18 Inch Through 42 Inch, for
18061 Potable Water and Other Liquids, C-402, American Waterworks Association.~~

~~18062 AWWA Standard for Installation of Ductile-Iron Pipe and Their Appurtenances, C-600,
18063 American Waterworks Association.~~

~~18064 AWWA Standard for Installation of Asbestos-Cement Pressure Pipe, C-603, American
18065 Waterworks Association.~~

~~18066 AWWA Standard for Grooved and Shouldered Joints, C-606, American Waterworks
18067 Association.~~

~~18068 AWWA Standard for Disinfecting Water Mains, C-651, American Waterworks Association.~~

~~18069 Control of Communicable Diseases in Man, 15 edition, American Public Health Association,
18070 1990.~~

- 18071 Maximum Permissible Body Burdens and Maximum Permissible Concentrations of
18072 Radionuclides in Air and in Water for Occupational Exposure, NBS Handbook 69 issued June 5,
18073 1959 and amended August 1963, U.S. Department of Commerce.
- 18074 Ultraviolet Disinfection Guidance Manual For The Final Long Term 2 Enhanced Surface Water
18075 Treatment Rule, EPA 815-R-06-007, Office of Water, November 2006.
- 18076 Enhanced Coagulation and Enhanced Precipitative Softening Guidance Manual, EPA 815-R-
18077 99-012, Office of Water, May 1999.
- 18078 Consensus Method for Determining Groundwaters Under the Direct Influence of Surface
18079 Water Using Microscopic Particulate Analysis (MPA), EPA 910/9-92-029, Environmental Services
18080 Division, October 1992.
- 18081 Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 DBPR) - Implementation
18082 Guidance, EPA 816-R-07-007, Office of Water, August 2007.
- 18083 Long Term 2 Enhanced Surface Water Treatment Rule Toolbox Guidance Manual, EPA 815-
18084 R-09-016, Office of Water, April 2010.
- 18085 NSF International, P.O. Box 130140, 789 N. Dixboro Road, Ann Arbor, MI 48105
18086 (<http://www.nsf.org/>):
- 18087 NSF/ANSI Standard 60-2017, Drinking Water Treatment Chemicals - Health Effects, April 23,
18088 2017.
- 18089 NSF/ANSI Standard 61-2017, Drinking Water System Components - Health Effects, March
18090 13, 2017.
- 18091 ASTM F480 -14, Standard Specification for Thermoplastic Well Casing Pipe and Couplings
18092 Made in Standard Dimension Ratios (SDR), SCH 40 and SCH 80, March 1, 2014, American

- 18093** Society of Testing Materials International, 100 Barr Harbor Drive, P.O. Box C700, West
- 18094** Conshohocken, PA 19428-2959 (<https://www.astm.org/>).
- 18095** American Water Works Association, 666 W. Quincy Avenue, Denver, CO 80235
- 18096** (<https://www.awwa.org/>):
- 18097** AWWA Standard, ANSI/AWWA C600-17, Installation of Ductile-Iron Mains and Their
- 18098** Appurtenances, July 1, 2017.
- 18099** AWWA Standard, ANSI/AWWA C604-17, Installation of Buried Steel Water Pipe – 4 In. (100
- 18100** mm) and Larger, August 1, 2017.
- 18101** AWWA Standard, ANSI/AWWA C605-13, Underground Installation of Polyvinyl Chloride
- 18102** (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings, February
- 18103** 1, 2014.
- 18104** AWWA Standard, ANSI/AWWA C651-14, Disinfecting Water Mains, February 1, 2015.
- 18105** AWWA Standard, ANSI/AWWA C652-11, Disinfection of Water-Storage Facilities, October 1,
- 18106** 2011.
- 18107** AWWA Standard, ANSI/AWWA C653-13, Disinfection of Water Treatment Plants, December
- 18108** 1, 2013.
- 18109** AWWA Standard, ANSI/AWWA C654-13, Disinfection of Wells, July 1, 2013.
- 18110** AWWA Standard, ANSI/AWWA D100-11, Welded Carbon Steel Tanks for Water Storage, July
- 18111** 1, 2011.
- 18112** AWWA Standard, ANSI/AWWA D102-17, Coating Steel Water-Storage Tanks, December 1,
- 18113** 2017.
- 18114** AWWA Standard, ANSI/AWWA D103-09, Factory-Coated Bolted Carbon Steel Tanks for
- 18115** Water Storage, November 1, 2009.

- 18116 AWWA Standard, ANSI/AWWA D104-17, Automatically Controlled, Impressed-Current
18117 Cathodic Protection for the Interior Submerged Surfaces of Steel Water Storage Tanks,
18118 December 1, 2017.
- 18119 AWWA Standard, ANSI/AWWA D106-16, Sacrificial Anode Cathodic Protection Systems for
18120 the Interior Submerged Surfaces of Steel Water Storage Tanks, June 1, 2016.
- 18121 AWWA Standard, ANSI/AWWA D107-16, Composite Elevated Tanks for Water Storage,
18122 January 1, 2017.
- 18123 AWWA Standard, ANSI/AWWA D108-10, Aluminum Dome Roofs for Water Storage Facilities,
18124 June 1, 2010.
- 18125 AWWA Standard, ANSI/AWWA D110-13 (R-18), Wire- and Strand-Wound, Circular,
18126 Prestressed Concrete Water Tanks, August 1, 2018.
- 18127 AWWA Standard, ANSI/AWWA D115-17, Tendon-Prestressed Concrete Water Tanks, July
18128 1, 2017.
- 18129 AWWA Standard, ANSI/AWWA D120-09, Thermosetting Fiberglass-Reinforced Plastic
18130 Tanks, October 1, 2009.
- 18131 AWWA Standard, ANSI/AWWA D121-12, Bolted Aboveground Thermosetting Fiberglass-
18132 Reinforced Plastic Panel-Type Tanks for Water Storage, June 1, 2012.
- 18133 AWWA Standard, ANSI/AWWA A100-15, Water Wells, December 1, 2015.
- 18134 AWWA Standard, ANSI/AWWA B114-16, Reverse Osmosis and Nanofiltration Systems for
18135 Water Treatment, May 1, 2016.
- 18136



COMMONWEALTH of VIRGINIA

Department of Health

P O BOX 2448

RICHMOND, VA 23218

M. NORMAN OLIVER, MD, MA
STATE HEALTH COMMISSIONER

TTY 7-1-1 OR
1-800-828-1120

MEMORANDUM

DATE: November 29, 2018

TO: Virginia State Board of Health

FROM: Dwayne Roadcap, Director, Office of Drinking Water

SUBJECT: Omission from Section 411 of the Proposed Amendments to the Waterworks Regulations

The language highlighted on the next page (12VAC5-590-411 C) should be inserted between lines 8258 and 8259 on page 379 of the proposed amendments to the Waterworks Regulations. Due to a technical error, Office of Drinking Water (ODW) staff inadvertently omitted subsection C from the proposed amendments.

This subsection is not a new requirement or a change from an existing requirement. It comes directly from 12VAC5-590-420 J (p. 437 of the proposed amendments, starting at line 9456). ODW proposes to re-organize section 420 into new, smaller sections, such as section 411, to improve readability and clarity in the Waterworks Regulations.

8258

the disinfected water that a consecutive waterworks buys or otherwise receives:

| <u>DISINFECTION BYPRODUCT</u> | <u>BEST AVAILABLE TECHNOLOGY</u> |
|-------------------------------|--|
| <u>TTHM and HAA5</u> | <u>A waterworks serving equal to or greater than 10,000 people: Improved distribution system and storage tank management to reduce residence time, plus the use of chloramines for residual disinfectant maintenance</u> <u>A waterworks serving less than 10,000 people: Improved distribution system and storage tank management to reduce residence time</u> |

C. The BAT, treatment techniques, or other means available for achieving compliance with the MRDLs identified in Table 340.7 is the control of treatment processes to reduce disinfectant demand and control of disinfection treatment processes to reduce disinfectant levels.

8259

12VAC5-590-415. Uncovered finished water storage.



COMMONWEALTH of VIRGINIA

Department of Health

M. NORMAN OLIVER, MD, MA
STATE HEALTH COMMISSIONER

PO BOX 2448
RICHMOND, VA 23218

TTY 7-1-1 OR
1-800-828-1120

MEMORANDUM

DATE: August 22, 2018

TO: Virginia State Board of Health

FROM: Laurie Forlano, DO, MPH
State Epidemiologist & Director, Office of Epidemiology

SUBJECT: Fast-Track Amendment to the Regulations for Disease Reporting and Control

The Virginia Department of Health (VDH) recommends that the State Board of Health approve the enclosed fast-track amendments to the Regulations for Disease Reporting and Control. The fast-track approach is being taken because the amendments are not expected to be controversial and the agency would like to promulgate these changes as quickly as possible.

The Regulations for Disease Reporting and Control specify which conditions must be reported by the clinical care community to the local health department and how such reporting must occur. The regulations also specify measures that must be taken to control the spread of these conditions. This set of amendments includes many minor modifications, which are explained in more detail in the enclosed Town Hall form and regulatory text. Specifically, the amendments make the following changes to disease reporting requirements:

- Add, remove, and update definitions to provide clarity;
- Update the timelines for laboratories to submit isolates or specimens to the state public health laboratory;
- Remove the list of isolates or specimens that must be forwarded for public health laboratory testing from 12VAC5-90-90 in this amendment because it is being added to 12VAC5-90-80 in another regulatory action;
- Remove the requirement that physicians and directors of medical care facilities submit weekly counts of cases of influenza;
- Replace reporting by using a paper-based Epi-1 form with reporting via VDH's online morbidity reporting portal;
- Add language that states if a laboratory ascertains that the reference laboratory that tests a specimen reports to VDH electronically, then those reference laboratory findings do not need to be reported by the laboratory of origin;
- Add language that clarifies that if a facility director reports on behalf of the laboratory, the laboratory is still responsible for submitting isolates or specimens for public health

testing “unless the laboratory has submitted an exemption request that has been approved by the department”, providing an opt-out provision for isolate submission;

- Remove language referencing the commissioner’s role in enforcement of isolation and quarantine because similar language has been removed from the Code of Virginia;
- Modify language to refer only to medications that are available in the United States for the treatment of ophthalmia neonatorum;
- Clarify that confirmatory testing is not required for blood lead levels that are below the CDC reference range on a screening test;
- Clarify that “dangerous microbes and pathogens” are “select agents and toxins” and limit the reporting of select agents and toxins to only an annual report and those scenarios in which such agents and toxins are released, lost, or stolen;
- Require that hospitals share any data with VDH that they supply to CDC as a result of a requirement of the Centers for Medicare and Medicaid Services and not limited to the Hospital Inpatient Quality Reporting Program of that agency.

These changes will improve VDH’s ability to detect and control conditions of public health concern that are affecting the residents of Virginia. Following approval by the Board, VDH will submit the regulatory packet to the Virginia Town Hall for expedited Executive Branch review.



townhall.virginia.gov

Fast-Track Regulation Agency Background Document

| | |
|---|--|
| Agency name | Virginia Department of Health |
| Virginia Administrative Code (VAC) citation(s) | 12VAC5-90 |
| Regulation title(s) | Disease Reporting and Control |
| Action title | Amendment to comply with changes in public health practice |
| Date this document prepared | 8/21/2018 |

This information is required for executive branch review and the Virginia Registrar of Regulations, pursuant to the Virginia Administrative Process Act (APA), Executive Order 14 (as amended, July 16, 2018), the Regulations for Filing and Publishing Agency Regulations (1 VAC7-10), and the *Virginia Register Form, Style, and Procedure Manual for Publication of Virginia Regulations*.

Brief Summary

Please provide a brief summary (preferably no more than 2 or 3 paragraphs) of this regulatory change (i.e., new regulation, amendments to an existing regulation, or repeal of an existing regulation). Alert the reader to all substantive matters. If applicable, generally describe the existing regulation.

The Regulations for Disease Reporting and Control provide information about the process and procedures for reporting diseases to the Virginia Department of Health (VDH), including what diseases must be reported, who must report them and other details related to reporting and disease control. VDH is proposing an amendment to the regulations to bring them into compliance with recent changes in the field of communicable disease detection and control and to allow greater flexibility with respect to reporting requirements in light of rapidly changing laboratory technologies and the emergence of new pathogens that are of public health concern.

This amendment removes, edits, and adds definitions as necessary to reflect current public health definitions and needs; removes the requirement to report weekly counts of influenza diagnoses; modifies the timelines for laboratories to submit isolates or specimens for further public health laboratory testing to improve the viability of material available for testing; replaces reporting by use of the Epi-1 form with reporting via an online web portal. The list of isolates or specimens that must be forwarded for further public health testing has been removed from 12VAC5-90-90 in this action because it is being added to

12VAC5-90-80 in a separate exempt regulatory action. The section on select agent reporting has been modified to clarify that VDH requires an annual report and an immediate report of a loss, theft, or release. Other, minor changes are listed below under Detail of Changes.

Acronyms and Definitions

Please define all acronyms used in the Agency Background Document. Also, please define any technical terms that are used in the document that are not also defined in the “Definition” section of the regulations.

No acronyms are used that are not defined in context.

Statement of Final Agency Action

Please provide a statement of the final action taken by the agency including: 1) the date the action was taken; 2) the name of the agency taking the action; and 3) the title of the regulation.

Mandate and Impetus

Please identify the mandate for this regulatory change, and any other impetus that specifically prompted its initiation (e.g., new or modified mandate, petition for rulemaking, periodic review, board decision, etc.). For purposes of executive branch review, “mandate” has the same meaning as defined in Executive Order 14 (as amended, July 16, 2018), “a directive from the General Assembly, the federal government, or a court that requires that a regulation be promulgated, amended, or repealed in whole or part.”

As required by Virginia Code § 2.2-4012.1, please also explain why this rulemaking is expected to be noncontroversial and therefore appropriate for the fast-track process.

The impetus for this regulatory action is a board decision to bring the regulations into compliance with recent changes in the field of communicable disease detection and control, and to provide greater flexibility with respect to reporting requirements.

This regulatory action is being promulgated as a fast track because it is expected to be non-controversial. The proposed changes will assure timelier reporting of diseases while at the same time reducing the overall burden of disease reporting.

Legal Basis

Please identify (1) the agency or other promulgating entity, and (2) the state and/or federal legal authority for the regulatory change, including the most relevant citations to the Code of Virginia or Acts of Assembly chapter number(s), if applicable. Your citation must include a specific provision, if any, authorizing the promulgating entity to regulate this specific subject or program, as well as a reference to the agency or promulgating entity’s overall regulatory authority.

Chapter 2 of Title 32.1 of the Code of Virginia, §§ 32.1-12 and 32.1-35 through 32.1-73, contains mandatory language authorizing the State Board of Health to promulgate the proposed regulations. Specifically, § 32.1-35 directs the Board of Health to promulgate regulations specifying which diseases occurring in the Commonwealth are to be reportable and the method by which they are to be reported.

Further, § 32.1-42 of the Code of Virginia authorizes the Board of Health to promulgate regulations and orders to prevent a potential emergency caused by a disease dangerous to public health. The Board of Health is empowered to adopt such regulations as are necessary to carry out provisions of laws of the Commonwealth administered by the state health commissioner by § 32.1-12 of the Code of Virginia.

Purpose

Please explain the need for the regulatory change, including a description of: (1) the rationale or justification, (2) the specific reasons the regulatory change is essential to protect the health, safety or welfare of citizens, and (3) the goals of the regulatory change and the problems it's intended to solve.

The proposed changes are essential to protect the health and safety of citizens because they will improve the ability of VDH to conduct surveillance and implement disease control for conditions of public health concern. The changes will position the agency to better detect and respond to these illnesses to protect the health of the public.

Substance

Please briefly identify and explain the new substantive provisions, the substantive changes to existing sections, or both. A more detailed discussion is provided in the "Detail of Changes" section below.

Amendments to current regulations will:

- Add, remove, and update definitions to enhance clarity;
- Specify new timelines for submission of isolates or specimens for state public health laboratory testing;
- Remove the list of isolates or specimens that must be forwarded for public health laboratory testing from 12VAC5-90-90 in this amendment because it is being added to 12VAC5-90-80 in another regulatory action;
- Remove the requirement that physicians and directors of medical care facilities submit weekly counts of cases of influenza;
- Replace reporting by way of the Epi-1 form with reporting through the VDH's online morbidity reporting portal;
- Add language that states that if a laboratory ascertains that the reference laboratory that tests a specimen reports to VDH electronically, then those reference laboratory findings do not need to be reported by the laboratory of origin;
- Add language that clarifies that if a facility director reports on behalf of the laboratory, the laboratory is still responsible for submitting isolates or specimens for public health testing "unless the laboratory has submitted an exemption request that has been approved by the department", thereby providing a process for opting out of the specimen forwarding requirement;
- Remove language referencing the commissioner's role in enforcement of isolation and quarantine because it has been removed from the Code of Virginia;
- Modify language to refer only to medications that are available in the United States for the treatment of ophthalmia neonatorum;
- Clarify that confirmatory testing is not required for blood lead levels that are below the CDC reference range on screening test;
- Limit the reporting of select agents to only an annual report and those scenarios in which such agents are released, lost, or stolen;
- Require that hospitals share with VDH any data they supply to CDC as a result of a requirement of the Centers for Medicare and Medicaid Services and not limited to the Hospital Inpatient Quality Reporting Program of that agency

Issues

Please identify the issues associated with the regulatory change, including: 1) the primary advantages and disadvantages to the public, such as individual private citizens or businesses, of implementing the new or amended provisions; 2) the primary advantages and disadvantages to the agency or the Commonwealth; and 3) other pertinent matters of interest to the regulated community, government officials, and the public. If there are no disadvantages to the public or the Commonwealth, include a specific statement to that effect.

The primary advantages to the public are the improved ability of the agency to control the risk of disease in the community based on timelier reporting through VDHs online morbidity reporting portal as well as removing the requirement to report weekly influenza counts or to report routine, non-emergency changes in select agent inventory. No disadvantages have been identified.

The primary advantage to the agency is that the proposed changes improve the focus of surveillance and ability of VDH to conduct surveillance and implement disease control for conditions of public health concern in a timely manner. The changes will position the agency to better detect and respond to these illnesses to protect the health of the public. No disadvantages have been identified.

Requirements More Restrictive than Federal

Please identify and describe any requirement of the regulatory change which is more restrictive than applicable federal requirements. Include a specific citation for each applicable federal requirement, and a rationale for the need for the more restrictive requirements. If there are no applicable federal requirements, or no requirements that exceed applicable federal requirements, include a specific statement to that effect.

None of these requirements is more restrictive than federal requirements.

Agencies, Localities, and Other Entities Particularly Affected

Please identify any other state agencies, localities, or other entities particularly affected by the regulatory change. "Particularly affected" are those that are likely to bear any identified disproportionate material impact which would not be experienced by other agencies, localities, or entities. "Locality" can refer to either local governments or the locations in the Commonwealth where the activities relevant to the regulation or regulatory change are most likely to occur. If no agency, locality, or entity is particularly affected, include a specific statement to that effect.

Other State Agencies Particularly Affected

DCLS will receive isolates or specimens from other laboratories in a more timely fashion.

Localities Particularly Affected

The impact of these changes is anticipated to be the same for all localities.

Other Entities Particularly Affected

All healthcare providers and medical care facilities who are subject to these regulations would be equally impacted by these amendments.

Economic Impact

Pursuant to § 2.2-4007.04 of the Code of Virginia, please identify all specific economic impacts (costs and/or benefits), anticipated to result from the regulatory change. When describing a particular economic impact, specify which new requirement or change in requirement creates the anticipated economic impact. Please keep in mind that this is change versus the status quo.

Impact on State Agencies

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| <p><i>For your agency:</i> projected costs, savings, fees or revenues resulting from the regulatory change, including:</p> <ul style="list-style-type: none"> a) fund source / fund detail; b) delineation of one-time versus on-going expenditures; and c) whether any costs or revenue loss can be absorbed within existing resources | <p>Cost to the state will be related to communicating the changed requirements to the regulated community. Disease reporting requirements are usually summarized on posters and distributed to laboratories, infection preventionists, and others involved in disease reporting. The cost was \$4,500 when the regulations were last amended: (1) \$1800 to print 600 copies of the Regulations for Disease Reporting and Control, (2) \$200 to print 600 posters of Conditions Reportable by Directors of Laboratories in Virginia, and (3) \$2500 to print 20,000 posters of the Virginia Reportable Disease List. This cost will be paid by existing funds available at the time the regulations are finalized.</p> |
| <p><i>For other state agencies:</i> projected costs, savings, fees or revenues resulting from the regulatory change, including a delineation of one-time versus on-going expenditures.</p> | <p>No additional expenditures anticipated by any other state agency.</p> |
| <p><i>For all agencies:</i> Benefits the regulatory change is designed to produce.</p> | <p>Benefits include more complete reporting of diseases of public health importance to VDH so that actions can be taken to minimize the spread of diseases in Virginia’s communities and a better understanding of the magnitude of these health problems in Virginia will be gained.</p> |

Impact on Localities

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| <p>Projected costs, savings, fees or revenues resulting from the regulatory change.</p> | <p>The proposed changes should not incur a cost to local governments. Local health department staff are already engaged in the duties relative to emerging infections and tracking reported cases of disease.</p> |
| <p>Benefits the regulatory change is designed to produce.</p> | <p>Benefits include more complete reporting of diseases of public health importance to VDH so that actions can be taken to minimize the spread of diseases in Virginia’s communities and a better understanding of the magnitude of these health problems in Virginia will be gained.</p> |

Impact on Other Entities

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| <p>Description of the individuals, businesses, or other entities likely to be affected by the regulatory change. If no other entities will be</p> | <p>The regulations pertain to physicians, laboratory directors, medical facility directors and directors of other settings where disease outbreaks may</p> |
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| <p>affected, include a specific statement to that effect.</p> | <p>occur. The proposed amendments apply to each of those entities; however, the removal of the requirement that physicians and directors of medical care facilities submit weekly counts of cases of influenza, and limiting the reporting of select agents to only the Code-required annual report plus those scenarios in which such agents are released, lost, or stolen, and adding the requirement for morbidity reporting to be done through VDH's online morbidity reporting portal should reduce the burden of reporting among these entities.</p> |
| <p>Agency's best estimate of the number of such entities that will be affected. Please include an estimate of the number of small businesses affected. Small business means a business entity, including its affiliates, that:</p> <ul style="list-style-type: none"> a) is independently owned and operated and; b) employs fewer than 500 full-time employees or has gross annual sales of less than \$6 million. | <p>20,000 physicians 125 laboratories 100 hospitals 250 nursing homes</p> <p>Some of these may be small businesses.</p> |
| <p>All projected costs for affected individuals, businesses, or other entities resulting from the regulatory change. Please be specific and include all costs including, but not limited to:</p> <ul style="list-style-type: none"> a) projected reporting, recordkeeping, and other administrative costs required for compliance by small businesses; b) specify any costs related to the development of real estate for commercial or residential purposes that are a consequence of the regulatory change; c) fees; d) purchases of equipment or services; and e) time required to comply with the requirements. | <p>No additional costs are expected based on changes proposed to the existing regulations.</p> |
| <p>Benefits the regulatory change is designed to produce.</p> | <p>Benefits include more complete reporting of diseases of public health importance to VDH so that actions can be taken to minimize the spread of diseases in Virginia's communities and a better understanding of the magnitude of these health problems in Virginia will be gained.</p> |

Alternatives

Please describe any viable alternatives to the regulatory change that were considered, and the rationale used by the agency to select the least burdensome or intrusive alternative that meets the essential purpose of the regulatory change. Also, include discussion of less intrusive or less costly alternatives for small businesses, as defined in § 2.2-4007.1 of the Code of Virginia, of achieving the purpose of the regulatory change.

In light of the clear, specific and mandatory authority of the State Board of Health to promulgate the proposed amendments to the regulations, no alternatives are available that are advisable.

Regulatory Flexibility Analysis

Pursuant to § 2.2-4007.1B of the Code of Virginia, please describe the agency’s analysis of alternative regulatory methods, consistent with health, safety, environmental, and economic welfare, that will accomplish the objectives of applicable law while minimizing the adverse impact on small business. Alternative regulatory methods include, at a minimum: 1) establishing less stringent compliance or reporting requirements; 2) establishing less stringent schedules or deadlines for compliance or reporting requirements; 3) consolidation or simplification of compliance or reporting requirements; 4) establishing performance standards for small businesses to replace design or operational standards required in the proposed regulation; and 5) the exemption of small businesses from all or any part of the requirements contained in the regulatory change.

VDH has assessed the requirements of the regulatory requirements and has not identified alternative methods of achieving the goals of this regulatory action. Reporting requirements have been removed when possible, such as for weekly counts of influenza diagnoses and routine reporting of select agent transfers, and the replacement of reporting by paper with reporting by way of an electronic portal should be less cumbersome for the regulated community. Complete and timely reporting is necessary to prevent and control the spread of communicable diseases, leaving few alternatives to exempt any healthcare providers from their responsibility to report disease to VDH.

Public Participation

If an objection to the use of the fast-track process is received within the 30-day public comment period from 10 or more persons, any member of the applicable standing committee of either house of the General Assembly or of the Joint Commission on Administrative Rules, the agency shall: 1) file notice of the objections with the Registrar of Regulations for publication in the Virginia Register; and 2) proceed with the normal promulgation process with the initial publication of the fast-track regulation serving as the Notice of Intended Regulatory Action.

Detail of Changes

Please list all regulatory changes and the consequences of the changes. Explain the new requirements and what they mean rather than merely quoting the text of the regulation.

If the regulatory change will be a new chapter, describe the intent of the language and the expected impact. Please describe the difference between existing regulation(s) and/or agency practice(s) and what is being proposed in this regulatory change. Delete inapplicable tables.

If the regulatory change is intended to replace an emergency regulation, please follow the instructions in the text following the three chart templates below. Please include citations to the specific section(s) of the regulation that are changing.

For changes to existing regulation(s), please use the following chart:

| Current section number | New section number, if applicable | Current requirement | Change, intent, rationale, and likely impact of new requirements |
|------------------------|-----------------------------------|---------------------|--|
| 12VAC5-90-10 | | Definitions | <ul style="list-style-type: none"> Healthcare-associated infection (also known as nosocomial infection) – |

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| | | | <p>Replaced the term “hospital” with “medical care facility” to reflect infections that may occur in hospitals or nursing homes.</p> <ul style="list-style-type: none"> • Hepatitis C, acute – Remove definition. This definition was needed when this infection was newly defined, but now the disease is better recognized and understood. • Hepatitis C, chronic – Remove definition. The infection is well understood in the regulated community so the definition is no longer needed. • Influenza A, novel virus – Modify definition to indicate that genetic reassortment of human and animal influenza viruses represent novel virus. Helps more clearly define what is meant by influenza A novel virus. • Lead, reportable levels – Remove definition. The proposed amendment requires all lead results to be reported, so the definition of a lead, reportable levels is no longer relevant. • Tubercle bacilli – Modify definition to include Mycobacterium bovis, Mycobacterium canetti, Mycobacterium microti, and Mycobacterium caprae as additional species included in the Mycobacterium tuberculosis complex. More clearly defines the tubercle bacilli of interest. • Tuberculin skin test (TST) – Remove definition. No longer needed because reporting is based on a positive result from any test. • Tuberculosis – Remove definition. This definition is not needed because more specific definitions for TB active disease and infection are already included in the regulations. • Tuberculosis, active disease – In the definition, change from “disease” to “communicable disease” to indicated that TB is spread from person to person. • Tuberculosis infection in children age <4 years – Modify definition name to Tuberculosis infection to account for the change being made in a separate regulatory action to require reporting of tuberculosis infection among all ages, not just persons <4 years of |
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| | | | <p>age. Also change “tuberculin skin testing” to “positive result from a test for tuberculosis infection” to reflect a broader range of acceptable diagnostic test types.</p> |
| 12VAC5-90-80 | | Directors of laboratories | <ul style="list-style-type: none"> • Change from submitting the isolate or clinical specimen within seven days to the Division of Consolidated Laboratory or other specified public health laboratory to submitting the isolate within five days and the clinical specimen within two days of a positive result. |
| 12VAC5-90-90 | | Physicians | <ul style="list-style-type: none"> • Clarify that the list of elements to be reported on a case (e.g., name, address) represent the minimum reporting requirements. • Remove language stating that influenza should be reported by number of cases only. This is no longer required under this proposal. • Language added to reflect morbidity reporting through VDH’s online morbidity reporting portal. • Add language referring to “disease-specific” surveillance form instead of surveillance form. • Modify language to reflect that reporting timeframes are as established in 12VAC5-90-80 rather than listing them again in this subsection. |
| 12VAC5-90-90 | | Directors of laboratories | <ul style="list-style-type: none"> • Language added that if a laboratory ascertains that the reference laboratory that tests a specimen reports to VDH electronically, then those reference laboratory findings do not need to be reported by the laboratory of origin. • Language added to reflect morbidity reporting through VDH’s online morbidity reporting portal. • Modify language to reflect that reporting timeframes are as established in 12VAC5-90-80 rather than listing them again in this subsection. • Language in subsection B pertaining to the submission of an initial isolate or other initial specimen to DCLS has been stricken because it has been updated and moved to 12VAC5-90-80 in a separate exempt regulatory action. |

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| | | | <ul style="list-style-type: none"> • Add language that clarifies that if a facility director reports on behalf of the laboratory, the laboratory is still responsible for submitting isolates or specimens for public health testing “unless the laboratory has submitted an exemption request that has been approved by the department”. |
| 12VAC5-90-90 | | Persons in charge of a medical facility | <ul style="list-style-type: none"> • Remove language stating that influenza should be reported by number of cases only. This is no longer required under this proposed amendment. • Modify language to reflect that reporting timeframes are as established in 12VAC5-90-80 rather than listing them again in this subsection. • Add language to reflect morbidity reporting through VDH’s online morbidity reporting portal. • Add language referring to “disease-specific” surveillance forms instead of surveillance forms. |
| 12VAC5-90-90 | | Persons in charge of hospitals, nursing facilities or nursing homes, assisted living facilities, and correctional facilities | <ul style="list-style-type: none"> • List reportable organisms next to disease names so the reportable disease lists are equally meaningful to practicing clinicians and laboratorians. |
| 12VAC5-90-103 | | Isolation for communicable disease of public health threat. | <ul style="list-style-type: none"> • Remove language referencing the commissioner’s role in enforcement. This is no longer contained in the Code of Virginia. |
| 12VAC5-90-107 | | Quarantine | <ul style="list-style-type: none"> • Remove language referencing the commissioner’s role in enforcement. This is no longer contained in the Code of Virginia. |
| 12VAC5-90-140 | | Procedure for preventing ophthalmia neonatorum | <ul style="list-style-type: none"> • Modify language to refer only to medications that are available in the United States. |
| 12VAC5-90-215 | | Schedule and criteria for and confirmation of blood lead testing and information to be provided | <ul style="list-style-type: none"> • Change language “built before 1960” to “built before 1950”. • Add language stating that confirmatory testing is not required if the result of the capillary test is below CDC’s reference value. Reflects current national guidance on confirmatory testing. • Changed numbering under, “D. Confirmation of blood lead levels” to reflect the addition of language noted above. |
| 12VAC5-90-225 | | Additional data to be reported related to persons with active tuberculosis | <ul style="list-style-type: none"> • Replace “tuberculin skin test (TST)” with “tests for tuberculosis infection” |

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| | | disease (confirmed or suspected) | <p>to reflect the availability of other tests for infection.</p> <ul style="list-style-type: none"> Remove the examples provided for Mycobacterium tuberculosis complex. Not needed because this is defined earlier in the regulations. Replaced “tubercle bacilli” with “M. tuberculosis complex” Add language that laboratories are required to submit results of tests for tuberculosis infection. Changed numbering under, “B. Laboratories are required to submit the following” to reflect the addition of language noted above. |
| 12VAC5-90-280 | | Reporting of dangerous microbes and pathogens | <ul style="list-style-type: none"> Removed the definitions for “Biologic agent”, “CDC”, “Diagnosis”, “Proficiency testing”, “Responsible official”, “Toxin”, and “Verification” because they are no longer needed. Clarified that “dangerous microbes and pathogens” are “select agents and toxins”. Removed subsections on Administration, Reportable agents, Those required to report, and Exemption from reporting as they are no longer necessary. This section of the regulations is being streamlined to require annual reporting as specified in the Code of Virginia and reporting of instances in which agency response would be necessary. Section D. Items to report. Renumbered to Section B. Removed the requirement that a report shall be made on a form determined by VDH, contain information on the objectives of the work with the agent, location (including building and room) where each select agent is stored or used, identification information of persons with access to each agent, identification information of the person in charge of the agents, or that the laboratory has to report that it is registered with the CDC Select Agent Program. These requirements are no longer needed. Added that the name and address of the laboratory must be reported. Section E. Renumbered to Section C. Timing of reports. Language has been modified to define who at a laboratory submits the required reports annually |

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| | | | <p>and in instances involving a release, loss, or theft of a select agent of toxin, to whom at VDH and when. Language pertaining to reports that will no longer be required has been removed.</p> <ul style="list-style-type: none"> • Section H. Release of reported information. Renumbered to Section D and the statement about exemptions from liability has been moved to this subsection. |
| 12VAC5-90-370 | | Reporting of healthcare-associated infections | <ul style="list-style-type: none"> • The term "facilities" has been replaced with the term "acute care hospitals" to comply with the language in the Code of Virginia. The data that hospitals share with VDH will be any they supply to CDC as a result of a requirement of the Centers for Medicare and Medicaid Services and not limited to the Hospital Inpatient Quality Reporting Program of that agency. |
| 12VAC5-90-370 | | FORMS | <p>Removed reference to the following forms; Confidential Morbidity Report, Epi1 (rev. 10/2011), and the Virginia Cancer Registry Reporting Form (rev. 1/1998). These forms are no longer used by VDH.</p> |

DEPARTMENT OF HEALTH
Office of Epi Regulation Review 2017-18 (5-90-10, 5-90-90-5-90-999)

Part I
Definitions

1 12VAC5-90-10. Definitions.

2 The following words and terms when used in this chapter shall have the following meanings
3 unless the context clearly indicates otherwise:

4 "Affected area" means any part or the whole of the Commonwealth, which has been identified
5 as where persons reside, or may be located, who are known to have been exposed to or infected
6 with, or who are reasonably suspected to have been exposed to or infected with, a communicable
7 disease of public health threat. "Affected area" shall include, but not be limited to, cities, counties,
8 towns, and subsections of such areas, public and private property, buildings, and other structures.

9 "Arboviral infection" means a viral illness that is transmitted by a mosquito, tick, or other
10 arthropod. This includes, but is not limited to, chikungunya (CHIK), dengue, eastern equine
11 encephalitis (EEE), LaCrosse encephalitis (LAC), also known as California encephalitis, St. Louis
12 encephalitis (SLE), West Nile virus (WNV), and Zika virus (Zika) infection.

13 "Board" means the State Board of Health.

14 "Cancer" means all carcinomas, sarcomas, melanomas, leukemias, and lymphomas
15 excluding localized basal and squamous cell carcinomas of the skin, except for lesions of the
16 mucous membranes.

17 "CDC" means the Centers for Disease Control and Prevention of the U.S. Department of
18 Health and Human Services.

19 "Child care center" means a child day center, child day program, family day home, family day
20 system, or registered family day home as defined by § 63.2-100 of the Code of Virginia, or a
21 similar place providing day care of children by such other name as may be applied.

22 "Clinic" means any facility, freestanding or associated with a hospital, that provides preventive,
23 diagnostic, therapeutic, rehabilitative, or palliative care or services to outpatients.

24 "Commissioner" means the State Health Commissioner or his duly designated officer or agent,
25 unless stated in a provision of this chapter that it applies to the State Health Commissioner in his
26 sole discretion.

27 "Communicable disease" means an illness due to an infectious agent or its toxic products
28 which is transmitted, directly or indirectly, to a susceptible host from an infected person, animal,

29 or arthropod or through the agency of an intermediate host or a vector or through the inanimate
30 environment.

31 "Communicable disease of public health significance" means an illness caused by a specific
32 or suspected infectious agent that may be transmitted directly or indirectly from one individual to
33 another. This includes but is not limited to infections caused by human immunodeficiency viruses,
34 bloodborne pathogens, and tubercle bacillus. The State Health Commissioner may determine that
35 diseases caused by other pathogens constitute communicable diseases of public health
36 significance.

37 "Communicable disease of public health threat" means an illness of public health significance,
38 as determined by the State Health Commissioner in accordance with this chapter, caused by a
39 specific or suspected infectious agent that may be reasonably expected or is known to be readily
40 transmitted directly or indirectly from one individual to another and has been found to create a
41 risk of death or significant injury or impairment; this definition shall not, however, be construed to
42 include human immunodeficiency viruses or the tubercle bacilli, unless used as a bioterrorism
43 weapon.

44 "Companion animal" means, consistent with the provisions of § 3.2-6500 of the Code of
45 Virginia, any domestic or feral dog, domestic or feral cat, nonhuman primate, guinea pig, hamster,
46 rabbit not raised for human food or fiber, exotic or native animal, reptile, exotic or native bird, or
47 any feral animal or any animal under the care, custody, or ownership of a person or any animal
48 that is bought, sold, traded, or bartered by any person. Agricultural animals, game species, or any
49 animals regulated under federal law as research animals shall not be considered companion
50 animals for the purpose of this chapter.

51 "Condition" means any adverse health event, such as a disease, an infection, a syndrome, or
52 as indicated by a procedure (including but not limited to the results of a physical exam, laboratory
53 test, or imaging interpretation) suggesting that an exposure of public health importance has
54 occurred.

55 "Contact" means a person or animal known to have been in such association with an infected
56 person or animal as to have had an opportunity of acquiring the infection.

57 "Contact services" means a broad array of services that are offered to persons with infectious
58 diseases and their contacts. Contact services include contact tracing, providing information about
59 current infections, developing risk reduction plans to reduce the chances of future infections, and
60 connecting to appropriate medical care and other services.

61 "Contact tracing" means the process by which an infected person or health department
62 employee notifies others that they may have been exposed to the infected person in a manner
63 known to transmit the infectious agent in question.

64 "Coronavirus infection, severe" means suspected or confirmed infection with severe acute
65 respiratory syndrome (SARS)-associated coronavirus (SARS-CoV), Middle East respiratory
66 syndrome (MERS)-associated coronavirus (MERS-CoV), or another coronavirus causing a
67 severe acute illness.

68 "Decontamination" means the use of physical or chemical means to remove, inactivate, or
69 destroy hazardous substances or organisms from a person, surface, or item to the point that such
70 substances or organisms are no longer capable of causing adverse health effects and the surface
71 or item is rendered safe for handling, use, or disposal.

72 "Department" means the State Department of Health, also referred to as the Virginia
73 Department of Health (VDH).

74 "Designee" or "designated officer or agent" means any person, or group of persons,
75 designated by the State Health Commissioner, to act on behalf of the commissioner or the board.

76 "Ehrlichiosis/Anaplasmosis" means human infections caused by *Ehrlichia chaffeensis*
77 (formerly included in the category "human monocytic ehrlichiosis" or "HME"), *Ehrlichia ewingii* or
78 *Anaplasma phagocytophilum* (formerly included in the category "human granulocytic ehrlichiosis"
79 or "HGE").

80 "Epidemic" means the occurrence in a community or region of cases of an illness clearly in
81 excess of normal expectancy.

82 "Essential needs" means basic human needs for sustenance including but not limited to food,
83 water, clothing, and health care (e.g., medications, therapies, testing, and durable medical
84 equipment).

85 "Exceptional circumstances" means the presence, as determined by the commissioner in his
86 sole discretion, of one or more factors that may affect the ability of the department to effectively
87 control a communicable disease of public health threat. Factors to be considered include but are
88 not limited to: (i) characteristics or suspected characteristics of the disease-causing organism or
89 suspected disease-causing organism such as virulence, routes of transmission, minimum
90 infectious dose, rapidity of disease spread, the potential for extensive disease spread, and the
91 existence and availability of demonstrated effective treatment; (ii) known or suspected risk factors
92 for infection; (iii) the potential magnitude of the effect of the disease on the health and welfare of
93 the public; and (iv) the extent of voluntary compliance with public health recommendations. The

94 determination of exceptional circumstances by the commissioner may take into account the
95 experience or results of investigation in Virginia, another state, or another country.

96 "Foodborne outbreak" means two or more cases of a similar illness acquired through the
97 consumption of food contaminated with chemicals or an infectious agent or its toxic products.
98 Such illnesses include but are not limited to heavy metal intoxication, staphylococcal food
99 poisoning, botulism, salmonellosis, shigellosis, Clostridium perfringens food poisoning, hepatitis
100 A, and Shiga toxin-producing Escherichia coli infection.

101 "Healthcare-associated infection" (also known as nosocomial infection) means a localized or
102 systemic condition resulting from an adverse reaction to the presence of an infectious agent or
103 agents or its toxin or toxins that (i) occurs in a patient in a health care setting (e.g., a
104 hospital/medical care facility or outpatient clinic), and (ii) was not found to be present or incubating
105 at the time of admission unless the infection was related to a previous admission to the same
106 setting, ~~and (iii) if the setting is a hospital, meets the criteria for a specific infection site as defined~~
107 ~~by CDC.~~

108 ~~"Hepatitis C, acute" means the following clinical characteristics are met: (i) discrete onset of~~
109 ~~symptoms indicative of viral hepatitis and (ii) jaundice or elevated serum aminotransferase levels~~
110 ~~and the following laboratory criteria are met: (a) serum alanine aminotransferase levels (ALT)~~
111 ~~greater than 200 IU/L; (b) IgM anti-HAV negative (if done); (c) IgM anti-HBc negative (if done);~~
112 ~~and (d) hepatitis C virus antibody (anti-HCV) positive, HCV antigen positive, or HCV RNA positive~~
113 ~~by nucleic acid test.~~

114 ~~"Hepatitis C, chronic" means that the laboratory criteria specified in clauses (b), (c) and (d)~~
115 ~~listed above for an acute case are met but clinical signs or symptoms of acute viral hepatitis are~~
116 ~~not present and serum alanine aminotransferase (ALT) levels do not exceed 200 IU/L. This~~
117 ~~category will include cases that may be acutely infected but not symptomatic.~~

118 "Immunization" means a procedure that increases the protective response of an individual's
119 immune system to specified pathogens.

120 "Independent pathology laboratory" means a nonhospital or a hospital laboratory performing
121 surgical pathology, including fine needle aspiration biopsy and bone marrow specimen
122 examination services, which reports the results of such tests directly to physician offices, without
123 reporting to a hospital or accessioning the information into a hospital tumor registry.

124 "Individual" means a person or companion animal. When the context requires it, "person or
125 persons" shall be deemed to include any individual.

126 "Infection" means the entry and multiplication or persistence of a disease-causing organism
127 (prion, virus, bacteria, fungus, parasite, or ectoparasite) in the body of an individual. An infection

128 may be inapparent (i.e., without recognizable signs or symptoms but identifiable by laboratory
129 means) or manifest (clinically apparent).

130 "Influenza A, novel virus" means infection of a human with an influenza A virus subtype that
131 is different from currently circulating human influenza H1 and H3 viruses. Novel subtypes include
132 H2, H5, H7, and H9 subtypes or influenza H1 and H3 subtypes originating from a nonhuman
133 species or from genetic reassortment of human and animal influenza viruses.

134 "Invasive" means the organism is affecting a normally sterile site, including but not limited to
135 blood or cerebrospinal fluid.

136 "Investigation" means an inquiry into the incidence, prevalence, extent, source, mode of
137 transmission, causation of, and other information pertinent to a disease occurrence.

138 "Isolation" means the physical separation, including confinement or restriction of movement,
139 of an individual or individuals who are infected with, or are reasonably suspected to be infected
140 with, a communicable disease in order to prevent or limit the transmission of the communicable
141 disease to uninfected and unexposed individuals.

142 "Isolation, complete" means the full-time confinement or restriction of movement of an
143 individual or individuals infected with, or reasonably suspected to be infected with, a
144 communicable disease in order to prevent or limit the transmission of the communicable disease
145 to uninfected and unexposed individuals.

146 "Isolation, modified" means a selective, partial limitation of freedom of movement or actions
147 of an individual or individuals infected with, or reasonably suspected to be infected with, a
148 communicable disease. Modified isolation is designed to meet particular situations and includes
149 but is not limited to the exclusion of children from school, the prohibition or restriction from
150 engaging in a particular occupation or using public or mass transportation, or requirements for
151 the use of devices or procedures intended to limit disease transmission.

152 "Isolation, protective" means the physical separation of a susceptible individual or individuals
153 not infected with, or not reasonably suspected to be infected with, a communicable disease from
154 an environment where transmission is occurring, or is reasonably suspected to be occurring, in
155 order to prevent the individual or individuals from acquiring the communicable disease.

156 "Laboratory" means a clinical laboratory that examines materials derived from the human body
157 for the purpose of providing information on the diagnosis, prevention, or treatment of disease.

158 "Laboratory director" means any person in charge of supervising a laboratory conducting
159 business in the Commonwealth of Virginia.

160 "Law-enforcement agency" means any sheriff's office, police department, adult or youth
161 correctional officer, or other agency or department that employs persons who have law-

162 enforcement authority that is under the direction and control of the Commonwealth or any local
163 governing body. "Law-enforcement agency" shall include, by order of the Governor, the Virginia
164 National Guard.

165 ~~"Lead, reportable levels" means any detectable blood lead level in children 15 years of age~~
166 ~~and younger and levels greater than or equal to 5 µg/dL in a person older than 15 years of age.~~

167 "Least restrictive" means the minimal limitation of the freedom of movement and
168 communication of an individual while under an order of isolation or an order of quarantine that
169 also effectively protects unexposed and susceptible individuals from disease transmission.

170 "Medical care facility" means any hospital or nursing home licensed in the Commonwealth, or
171 any hospital operated by or contracted to operate by an entity of the United States government
172 or the Commonwealth of Virginia.

173 "Midwife" means any person who is licensed as a nurse midwife by the Virginia Boards of
174 Nursing and Medicine or who is licensed by the Board of Medicine as a certified professional
175 midwife.

176 "National Healthcare Safety Network" or "NHSN" means a surveillance system created by the
177 CDC for accumulating, exchanging, and integrating relevant information on infectious adverse
178 events associated with health care delivery.

179 "Nucleic acid detection" means laboratory testing of a clinical specimen to determine the
180 presence of deoxyribonucleic acid (DNA) or ribonucleic acid (RNA) specific for an infectious agent
181 using any method, including hybridization, sequencing, or amplification such as polymerase chain
182 reaction.

183 "Nurse" means any person licensed as a professional nurse or as a licensed practical nurse
184 by the Virginia Board of Nursing.

185 "Occupational outbreak" means a cluster of illness or disease that is indicative of a work-
186 related exposure. Such conditions include but are not limited to silicosis, asbestosis, byssinosis,
187 pneumoconiosis, and tuberculosis.

188 "Outbreak" means the occurrence of more cases of a disease than expected.

189 "Period of communicability" means the time or times during which the etiologic agent may be
190 transferred directly or indirectly from an infected person to another person, or from an infected
191 animal to a person.

192 "Physician" means any person licensed to practice medicine or osteopathy by the Virginia
193 Board of Medicine.

194 "Quarantine" means the physical separation, including confinement or restriction of
195 movement, of an individual or individuals who are present within an affected area or who are

196 known to have been exposed, or may reasonably be suspected to have been exposed, to a
197 communicable disease and who do not yet show signs or symptoms of infection with the
198 communicable disease in order to prevent or limit the transmission of the communicable disease
199 of public health threat to unexposed and uninfected individuals.

200 "Quarantine, complete" means the full-time confinement or restriction of movement of an
201 individual or individuals who do not have signs or symptoms of infection but may have been
202 exposed, or may reasonably be suspected to have been exposed, to a communicable disease of
203 public health threat in order to prevent the transmission of the communicable disease of public
204 health threat to uninfected individuals.

205 "Quarantine, modified" means a selective, partial limitation of freedom of movement or actions
206 of an individual or individuals who do not have signs or symptoms of the infection but have been
207 exposed to, or are reasonably suspected to have been exposed to, a communicable disease of
208 public health threat. Modified quarantine may be designed to meet particular situations and
209 includes but is not limited to limiting movement to the home, work, or one or more other locations,
210 the prohibition or restriction from using public or mass transportation, or requirements for the use
211 of devices or procedures intended to limit disease transmission.

212 "Reportable disease" means an illness due to a specific toxic substance, occupational
213 exposure, or infectious agent, which affects a susceptible individual, either directly, as from an
214 infected animal or person, or indirectly through an intermediate host, vector, or the environment,
215 as determined by the board.

216 "School" means (i) any public school from kindergarten through grade 12 operated under the
217 authority of any locality within the Commonwealth, (ii) any private or religious school that offers
218 instruction at any level or grade from kindergarten through grade 12; and (iii) any private or
219 religious nursery school or preschool, or any private or religious child care center required to be
220 licensed by the Commonwealth.

221 "Serology" means the testing of blood, serum, or other body fluids for the presence of
222 antibodies or other markers of an infection or disease process.

223 "Surveillance" means the ongoing systematic collection, analysis, and interpretation of
224 outcome-specific data for use in the planning, implementation, and evaluation of public health
225 practice. A surveillance system includes the functional capacity for data analysis as well as the
226 timely dissemination of these data to persons who can undertake effective prevention and control
227 activities.

228 "Susceptible individual" means a person or animal who is vulnerable to or potentially able to
229 contract a disease or condition. Factors that affect an individual's susceptibility include but are not

230 limited to physical characteristics, genetics, previous or chronic exposures, chronic conditions or
231 infections, immunization history, or use of medications.

232 "Toxic substance" means any substance, including any raw materials, intermediate products,
233 catalysts, final products, or by-products of any manufacturing operation conducted in a
234 commercial establishment, that has the capacity, through its physical, chemical or biological
235 properties, to pose a substantial risk of death or impairment either immediately or over time, to
236 the normal functions of humans, aquatic organisms, or any other animal but not including any
237 pharmaceutical preparation which deliberately or inadvertently is consumed in such a way as to
238 result in a drug overdose.

239 ~~"Tubercle bacilli" means disease-causing organisms belonging to the Mycobacterium~~
240 ~~tuberculosis complex and includes Mycobacterium tuberculosis, Mycobacterium bovis, and~~
241 ~~Mycobacterium africanum or other members as may be established by the commissioner.~~

242 "Tubercle bacilli" means disease-causing organisms belonging to the Mycobacterium
243 tuberculosis complex and includes Mycobacterium tuberculosis, Mycobacterium africanum,
244 Mycobacterium bovis, Mycobacterium canetti, Mycobacterium microti, Mycobacterium caprae or
245 other members as may be established by the commissioner.

246 ~~"Tuberculin skin test (TST)" means a test for demonstrating infection with tubercle bacilli,~~
247 ~~performed according to the Mantoux method, in which 0.1 ml of 5-TU strength tuberculin purified~~
248 ~~protein derivative (PPD) is injected intradermally on the volar surface of the arm. Any reaction is~~
249 ~~observed 48-72 hours after placement and palpable induration is measured across the diameter~~
250 ~~transverse to the long axis of the arm. The measurement of the indurated area is recorded in~~
251 ~~millimeters and the significance of the measured induration is based on existing national and~~
252 ~~department guidelines.~~

253 ~~"Tuberculosis" means a disease caused by tubercle bacilli.~~

254 "Tuberculosis, active disease" (also "active tuberculosis disease" and "active TB disease"),
255 as defined by § 32.1-49.1 of the Code of Virginia, means a communicable disease caused by an
256 airborne microorganism and characterized by the presence of either (i) a specimen of sputum or
257 other bodily fluid or tissue that has been found to contain tubercle bacilli as evidenced by culture
258 or nucleic acid amplification, including preliminary identification by rapid methodologies; (ii) a
259 specimen of sputum or other bodily fluid or tissue that is suspected to contain tubercle bacilli as
260 evidenced by smear, and where sufficient clinical and radiographic evidence of active tuberculosis
261 disease is present as determined by a physician licensed to practice medicine in Virginia; or (iii)
262 sufficient clinical and radiographic evidence of active tuberculosis disease as determined by the

263 commissioner is present, but a specimen of sputum or other bodily fluid or tissue containing, or
264 suspected of containing, tubercle bacilli is unobtainable.

265 "Tuberculosis infection in children age <4 years" means a significant reaction resulting from a
266 tuberculin skin test (TST) or other approved test for latent infection without positive result from a
267 test for tuberculosis infection without clinical or radiographic other evidence of active tuberculosis
268 disease, in children from birth up to their fourth birthday.

269 "Vaccinia, disease or adverse event" means vaccinia infection or serious or unexpected
270 events in persons who received the smallpox vaccine or their contacts, including but not limited
271 to bacterial infections, eczema vaccinatum, erythema multiforme, generalized vaccinia,
272 progressive vaccinia, inadvertent inoculation, post-vaccinal encephalopathy or
273 encephalomyelitis, ocular vaccinia, and fetal vaccinia.

274 "Waterborne outbreak" means two or more cases of a similar illness acquired through the
275 ingestion of or other exposure to water contaminated with chemicals or an infectious agent or its
276 toxic products. Such illnesses include but are not limited to giardiasis, viral gastroenteritis,
277 cryptosporidiosis, hepatitis A, cholera, and shigellosis. A single case of laboratory-confirmed
278 primary amebic meningoencephalitis or of waterborne chemical poisoning is considered an
279 outbreak.

Part III

Reporting of Disease

280 **12VAC5-90-80. Lists of diseases that shall be reported.**

281 A. Reportable disease list. The board declares suspected or confirmed cases of the following
282 named diseases, toxic effects, and conditions to be reportable by the persons enumerated in
283 12VAC5-90-90. Conditions identified by an asterisk (*) require immediate communication to the
284 local health department by the most rapid means available upon suspicion or confirmation, as
285 defined in subsection C of this section. Other conditions should be reported within three days of
286 suspected or confirmed diagnosis, unless otherwise specified in this section. Neonatal Abstinence
287 Syndrome shall be reported as specified in subsection E of this section.

288 Amebiasis (*Entamoeba histolytica*)

289 *Anthrax (*Bacillus anthracis*)

290 Arboviral infections (e.g., CHIK, dengue, EEE, LAC, SLE, WNV, Zika)

291 Babesiosis (*Babesia* spp.)

292 *Botulism (*Clostridium botulinum*)

293 *Brucellosis (*Brucella* spp.)

294 Campylobacteriosis (*Campylobacter* spp.)

| | |
|-----|---|
| 295 | Candida auris, infection or colonization |
| 296 | Carbapenemase-producing organism, infection or colonization |
| 297 | Chancroid (<i>Haemophilus ducreyi</i>) |
| 298 | Chickenpox (<i>Varicella virus</i>) |
| 299 | Chlamydia trachomatis infection |
| 300 | *Cholera (<i>Vibrio cholerae</i> O1/O139) |
| 301 | *Coronavirus infection, severe |
| 302 | Cryptosporidiosis (<i>Cryptosporidium</i> spp.) |
| 303 | Cyclosporiasis (<i>Cyclospora</i> spp.) |
| 304 | *Diphtheria (<i>Corynebacterium diphtheriae</i>) |
| 305 | *Disease caused by an agent that may have been used as a weapon |
| 306 | Ehrlichiosis/Anaplasmosis (<i>Ehrlichia</i> spp., <i>Anaplasma phagocytophilum</i>) |
| 307 | Giardiasis (<i>Giardia</i> spp.) |
| 308 | Gonorrhea (<i>Neisseria gonorrhoeae</i>) |
| 309 | Granuloma inguinale (<i>Calymmatobacterium granulomatis</i>) |
| 310 | * <i>Haemophilus influenzae</i> infection, invasive |
| 311 | Hantavirus pulmonary syndrome |
| 312 | Hemolytic uremic syndrome (HUS) |
| 313 | *Hepatitis A |
| 314 | Hepatitis B (acute and chronic) |
| 315 | Hepatitis C (acute and chronic) |
| 316 | Hepatitis, other acute viral |
| 317 | Human immunodeficiency virus (HIV) infection |
| 318 | Influenza, confirmed |
| 319 | *Influenza-associated deaths if younger than 18 years of age |
| 320 | Lead, blood levels |
| 321 | Legionellosis (<i>Legionella</i> spp.) |
| 322 | Leprosy (Hansen's disease) (<i>Mycobacterium leprae</i>) |
| 323 | Leptospirosis (<i>Leptospira interrogans</i>) |
| 324 | Listeriosis (<i>Listeria monocytogenes</i>) |
| 325 | Lyme disease (<i>Borrelia</i> spp.) |
| 326 | Lymphogranuloma venereum (<i>Chlamydia trachomatis</i>) |
| 327 | Malaria (<i>Plasmodium</i> spp.) |
| 328 | *Measles (<i>Rubeola</i>) |

- 329 *Meningococcal disease (*Neisseria meningitidis*)
- 330 Mumps
- 331 Neonatal abstinence syndrome (NAS)
- 332 Ophthalmia neonatorum
- 333 *Outbreaks, all (including foodborne, healthcare-associated, occupational, toxic
- 334 substance-related, waterborne, and any other outbreak)
- 335 *Pertussis (*Bordetella pertussis*)
- 336 *Plague (*Yersinia pestis*)
- 337 *Poliovirus infection, including poliomyelitis
- 338 *Psittacosis (*Chlamydia psittaci*)
- 339 *Q fever (*Coxiella burnetii*)
- 340 *Rabies, human and animal
- 341 Rabies treatment, post-exposure
- 342 *Rubella, including congenital rubella syndrome
- 343 Salmonellosis (*Salmonella* spp.)
- 344 Shiga toxin-producing *Escherichia coli* infection
- 345 Shigellosis (*Shigella* spp.)
- 346 *Smallpox (*Variola virus*)
- 347 Spotted fever rickettsiosis (*Rickettsia* spp.)
- 348 Streptococcal disease, Group A, invasive or toxic shock
- 349 *Streptococcus pneumoniae* infection, invasive, if younger than five years of age
- 350 Syphilis (*Treponema pallidum*), report *congenital, *primary, *secondary, and other
- 351 Tetanus (*Clostridium tetani*)
- 352 Toxic substance-related illness
- 353 Trichinosis (Trichinellosis) (*Trichinella spiralis*)
- 354 *Tuberculosis, active disease (*Mycobacterium tuberculosis* complex)
- 355 Tuberculosis infection
- 356 *Tularemia (*Francisella tularensis*)
- 357 *Typhoid/Paratyphoid fever (*Salmonella Typhi*, *Salmonella Paratyphi*)
- 358 *Unusual occurrence of disease of public health concern
- 359 *Vaccinia, disease or adverse event
- 360 Vancomycin-intermediate or vancomycin-resistant *Staphylococcus aureus* infection
- 361 *Vibriosis (*Vibrio* spp.)
- 362 *Viral hemorrhagic fever

363 *Yellow fever
364 Yersiniosis (*Yersinia* spp.)
365 B. Conditions reportable by directors of laboratories. Laboratories shall report all test results
366 indicative of and specific for the diseases, infections, microorganisms, conditions, and toxic
367 effects specified below for humans. Such tests include but are not limited to: microbiological
368 culture, isolation, or identification; assays for specific antibodies; and identification of specific
369 antigens, toxins, or nucleic acid sequences. Additional condition-specific requirements are noted
370 in this section. Conditions identified by an asterisk (*) require immediate communication to the
371 local health department by the most rapid means available upon suspicion or confirmation, as
372 defined in subsection C of this section. Other conditions should be reported within three days of
373 suspected or confirmed diagnosis.
374 Amebiasis (*Entamoeba histolytica*)
375 *Anthrax (*Bacillus anthracis*)
376 Arboviral infection, for example, CHIK, dengue, EEE, LAC (also known as California
377 encephalitis), SLE, WNV, Zika
378 Babesiosis (*Babesia* spp.)
379 *Botulism (*Clostridium botulinum*)
380 *Brucellosis (*Brucella* spp.)
381 Campylobacteriosis (*Campylobacter* spp.)
382 *Candida auris* – Include available antimicrobial susceptibility findings in report.
383 Carbapenemase-producing organism – Include available antimicrobial susceptibility
384 findings in report.
385 Chancroid (*Haemophilus ducreyi*)
386 Chickenpox (*Varicella* virus)
387 Chlamydia trachomatis infection
388 *Cholera (*Vibrio cholerae* O1/O139)
389 *Coronavirus infection, severe (for example, SARS-CoV, MERS-CoV)
390 Cryptosporidiosis (*Cryptosporidium* spp.)
391 Cyclosporiasis (*Cyclospora* spp.)
392 *Diphtheria (*Corynebacterium diphtheriae*)
393 Ehrlichiosis/Anaplasmosis (*Ehrlichia* spp., *Anaplasma phagocytophilum*)
394 Giardiasis (*Giardia* spp.)
395 Gonorrhea (*Neisseria gonorrhoeae*) - Include available antimicrobial susceptibility findings
396 in report-

- 397 *Haemophilus influenzae infection, invasive
- 398 Hantavirus pulmonary syndrome
- 399 *Hepatitis A
- 400 Hepatitis B (acute and chronic) - For all hepatitis B patients, also report available results
- 401 of serum alanine aminotransferase (ALT) and all available results from the hepatitis panel.
- 402 Hepatitis C (acute and chronic) - For all patients with any positive HCV test, also report all
- 403 results of HCV viral load tests, including undetectable viral loads and report available
- 404 results of serum alanine aminotransferase (ALT) and all available results from the hepatitis
- 405 panel.
- 406 Hepatitis, other acute viral – any finding indicative of acute infection with hepatitis D, E, or
- 407 other cause of viral hepatitis. For any reportable hepatitis finding, submit all available
- 408 results from the hepatitis panel.
- 409 Human immunodeficiency virus (HIV) infection - For HIV-infected patients, report all
- 410 results of CD4 and HIV viral load tests, including undetectable viral loads. For HIV-infected
- 411 patients, report all HIV genetic nucleotide sequence data associated with HIV drug
- 412 resistance tests by electronic submission. For children younger than three years of age,
- 413 report all tests regardless of the test findings (for example, negative or positive).
- 414 Influenza, confirmed - by culture, antigen detection by direct fluorescent antibody (DFA),
- 415 or nucleic acid detection
- 416 Lead, blood levels - all lead results from tests of venous or capillary blood performed by a
- 417 laboratory certified by the federal Centers for Medicare and Medicaid Services in
- 418 accordance with 42 USC § 263a, the Clinical Laboratory Improvement Amendment of
- 419 1988 (CLIA-certified).
- 420 Legionellosis (*Legionella* spp.)
- 421 Leptospirosis (*Leptospira interrogans*)
- 422 Listeriosis (*Listeria monocytogenes*) - invasive, or if associated with miscarriage or
- 423 stillbirth, from placental or fetal tissue
- 424 Lyme disease (*Borrelia* spp.)
- 425 Malaria (*Plasmodium* spp.)
- 426 *Measles (*Rubeola*)
- 427 *Meningococcal disease (*Neisseria meningitidis*), invasive – including identification of
- 428 gram-negative diplococci
- 429 Mumps
- 430 *Mycobacterial diseases - (See 12VAC5-90-225 B) Report any of the following:

- 431 1. Acid fast bacilli;
- 432 2. *M. tuberculosis* complex or any other mycobacteria;
- 433 3. Antimicrobial susceptibility test results for *M. tuberculosis* complex.
- 434 *Pertussis (*Bordetella pertussis*)
- 435 *Plague (*Yersinia pestis*)
- 436 *Poliovirus infection
- 437 *Psittacosis (*Chlamydia psittaci*)
- 438 *Q fever (*Coxiella burnetii*)
- 439 *Rabies, human and animal
- 440 *Rubella
- 441 Salmonellosis (*Salmonella* spp.)
- 442 Shiga toxin-producing *Escherichia coli* infection
- 443 Shigellosis (*Shigella* spp.)
- 444 *Smallpox (*Variola virus*)
- 445 Spotted fever rickettsiosis (*Rickettsia* spp.)
- 446 Streptococcal disease, Group A, invasive or toxic shock
- 447 *Streptococcus pneumoniae* infection, invasive, if younger than five years of age
- 448 *Syphilis (*Treponema pallidum*)
- 449 Toxic substance-related illness - by blood or urine laboratory findings above the normal
- 450 range, including but not limited to heavy metals, pesticides, and industrial-type solvents
- 451 and gases. When applicable and available, report speciation of metals when blood or urine
- 452 levels are elevated in order to differentiate the chemical species (elemental, organic, or
- 453 inorganic).
- 454 Trichinosis (Trichinellosis) (*Trichinella spiralis*)
- 455 Tuberculosis infection
- 456 *Tularemia (*Francisella tularensis*)
- 457 *Typhoid/Paratyphoid fever (*Salmonella Typhi*, *Salmonella Paratyphi A*, *Salmonella*
- 458 *Paratyphi B*, *Salmonella Paratyphi C*)
- 459 *Vaccinia, disease or adverse event
- 460 Vancomycin-intermediate or vancomycin-resistant *Staphylococcus aureus* infection –
- 461 Include available antimicrobial susceptibility findings in report.
- 462 *Vibriosis (*Vibrio* spp., *Photobacterium damsela*, *Grimontia hollisae*), other than toxigenic
- 463 *Vibrio cholera* O1 or O139, which are reportable as cholera
- 464 *Viral hemorrhagic fever

465 *Yellow fever
466 Yersiniosis (*Yersinia* spp.)
467 C. Reportable diseases requiring rapid communication. Certain of the diseases in the list of
468 reportable diseases, because of their extremely contagious nature, potential for greater harm, or
469 both, availability of a specific intervention that must be administered in a timely manner, require
470 immediate identification and control. Reporting of persons confirmed or suspected of having these
471 diseases, listed in this subsection, shall be made immediately by the most rapid means available,
472 preferably by telephone to the local health department. (These same diseases are also identified
473 by an asterisk (*) in subsections A and B, where applicable, of this section.)
474 Anthrax (*Bacillus anthracis*)
475 Botulism (*Clostridium botulinum*)
476 Brucellosis (*Brucella* spp.)
477 Cholera (*Vibrio cholerae* O1/O139)
478 Coronavirus infection, severe
479 Diphtheria (*Corynebacterium diphtheriae*)
480 Disease caused by an agent that may have been used as a weapon
481 Haemophilus influenzae infection, invasive
482 Hepatitis A
483 Influenza-associated deaths if younger than 18 years of age
484 Influenza A, novel virus
485 Measles (*Rubeola* virus)
486 Meningococcal disease (*Neisseria meningitidis*)
487 Outbreaks, all
488 Pertussis (*Bordetella pertussis*)
489 Plague (*Yersinia pestis*)
490 Poliovirus infection, including poliomyelitis
491 Psittacosis (*Chlamydophila psittaci*)
492 Q fever (*Coxiella burnetii*)
493 Rabies, human and animal
494 Rubella, including congenital rubella syndrome
495 Smallpox (~~Variola~~)(*Variola* virus)
496 Syphilis, congenital, primary, and secondary (*Treponema pallidum*)
497 Tuberculosis, active disease (*Mycobacterium tuberculosis* complex)
498 Tularemia (*Francisella tularensis*)

- 499 Typhoid/Paratyphoid fever (Salmonella Typhi, Salmonella Paratyphi (all types))
- 500 Unusual occurrence of disease of public health concern
- 501 Vaccinia, disease or adverse event
- 502 Vibriosis (Vibrio spp., Photobacterium damsela, Grimontia hollisae), other than toxigenic
- 503 Vibrio cholerae O1 or O139, which are reportable as cholera
- 504 Viral hemorrhagic fever
- 505 Yellow fever
- 506 D. Submission of initial isolate or other specimen for further public health testing. A laboratory
- 507 identifying evidence of any of the following conditions in this subsection shall notify the local health
- 508 department of the positive culture or other positive test result within the timeframes specified in
- 509 subsection B of this section and submit the initial isolate (preferred) ~~or other initial specimen~~ within
- 510 five days or the clinical specimen within two days of a positive result to the Division of
- 511 Consolidated Laboratory Services or other public health laboratory where specified below ~~within~~
- 512 ~~seven days of identification~~. All specimens must be identified with the patient and physician
- 513 information required in 12VAC5-90-90 B.
- 514 Anthrax (Bacillus anthracis)
- 515 Botulism (Clostridium botulinum)
- 516 Brucellosis (Brucella sp.)
- 517 Candida auris
- 518 Candida haemulonii
- 519 Carbapenem-resistant Enterobacteriaceae
- 520 Carbapenem-resistant Pseudomonas aeruginosa
- 521 Cholera (Vibrio cholerae O1/O139)
- 522 Coronavirus infection, severe (e.g., SARS-CoV, MERS-CoV)
- 523 Diphtheria (Corynebacterium diphtheriae)
- 524 Haemophilus influenzae infection, invasive
- 525 Influenza, unsubtypeable
- 526 Listeriosis (Listeria monocytogenes)
- 527 Meningococcal disease (Neisseria meningitidis)
- 528 Plague (Yersinia pestis)
- 529 Poliovirus infection
- 530 Q fever (Coxiella burnetii)
- 531 Salmonellosis (Salmonella spp.)

532 Shiga toxin-producing *E. coli* infection (Laboratories that identify a Shiga toxin but do not
533 perform simultaneous culture for Shiga toxin-producing *E. coli* should forward all positive
534 stool specimens or positive enrichment broths to the DCLS for confirmation and further
535 characterization.)
536 Shigellosis (*Shigella* spp.)
537 Streptococcal disease, Group A, invasive
538 Tuberculosis (A laboratory identifying *Mycobacterium tuberculosis* complex (see 12VAC5-
539 90-225) shall submit a representative and viable sample of the initial culture to the Division
540 of Consolidated Laboratory Services or other laboratory designated by the board to
541 receive such specimen.)
542 Tularemia (*Francisella tularensis*)
543 Typhoid/Paratyphoid fever (*Salmonella Typhi*, *Salmonella Paratyphi* (all types))
544 Vancomycin-intermediate or vancomycin-resistant *Staphylococcus aureus* infection
545 Vibriosis (*Vibrio* spp., *Photobacterium damsela*, *Grimontia hollisae*)
546 Yersiniosis (*Yersinia* spp.)
547 Other diseases as may be requested by the health department
548 E. Neonatal abstinence syndrome. Neonatal abstinence syndrome shall be reported by
549 physicians and directors of medical care facilities when a newborn has been diagnosed with
550 neonatal abstinence syndrome, a condition characterized by clinical signs of withdrawal from
551 exposure to prescribed or illicit drugs. Reports shall be submitted within one month of diagnosis
552 by entering the information into the Department of Health's online Confidential Morbidity Report
553 portal (<http://www.vdh.virginia.gov/clinicians>).
554 F. Outbreaks. The occurrence of outbreaks or clusters of any illness that may represent a
555 group expression of an illness that may be of public health concern shall be reported to the local
556 health department immediately by the most rapid means available, preferably by telephone.
557 G. Toxic substance-related illnesses. All toxic substance-related illnesses, including pesticide
558 and heavy metal poisoning or illness resulting from exposure to an occupational dust or fiber or
559 radioactive substance, shall be reported.
560 If such illness is verified or suspected and presents an emergency or a serious threat to public
561 health or safety, the report of such illness shall be made immediately by the most rapid means
562 available, preferably by telephone.
563 H. Unusual occurrence of disease of public health concern. Unusual or emerging conditions
564 of public health concern shall be reported to the local health department immediately by the most
565 rapid means available, preferably by telephone. In addition, the commissioner or his designee

566 may establish surveillance systems for diseases or conditions that are not on the list of reportable
567 diseases. Such surveillance may be established to identify cases (delineate the magnitude of the
568 situation), to identify the mode of transmission and risk factors for the disease, and to identify and
569 implement appropriate action to protect public health. Any person reporting information at the
570 request of the department for special surveillance or other epidemiological studies shall be
571 immune from liability as provided by § 32.1-38 of the Code of Virginia.

572 **12VAC5-90-90. Those required to report.**

573 A. Physicians. Each physician who treats or examines any person who is suffering from or
574 who is suspected of having a reportable disease or condition shall report, at a minimum, that
575 person's name, address, age, date of birth, race, sex, and pregnancy status for females; name of
576 disease diagnosed or suspected; the date of onset of illness; available laboratory tests and
577 results; and the name, address, and telephone number of the physician and medical facility where
578 the examination was made, ~~except that influenza should be reported by number of cases only~~
579 ~~(and type of influenza, if available)~~. Reports are to be made to the local health department serving
580 the jurisdiction where the physician practices. A physician may designate someone to report on
581 his behalf, but the physician remains responsible for ensuring that the appropriate report is made.
582 Any physician, designee, or organization making such report as authorized herein shall be
583 immune from liability as provided by § 32.1-38 of the Code of Virginia.

584 Such reports shall be made within the timeframes specified in 12VAC5-90-80 to the local
585 health department serving the jurisdiction in which the facility is located. Reports shall be made
586 ~~on a Form Epi-1, a computer generated printout containing the data items requested on Form~~
587 ~~Epi-1, via the Department of Health's online Confidential Morbidity Report portal~~
588 ~~(<http://www.vdh.virginia.gov/clinicians>) or a CDC or VDH disease-specific surveillance form that~~
589 ~~provides the same information and shall be made within three days of the suspicion or~~
590 ~~confirmation of disease except that those identified in 12VAC5-90-80 C shall be reported~~
591 ~~immediately by the most rapid means available, preferably by telephone, to the local health~~
592 ~~department serving the jurisdiction in which the facility is located~~. Reporting may be done by
593 means of secure electronic transmission upon agreement of the physician and the department.

594 Additional elements are required to be reported for individuals with confirmed or suspected
595 active tuberculosis disease. Refer to Part X (12VAC5-90-225 et seq.) for details on these
596 requirements.

597 B. Directors of laboratories. Laboratory directors shall report any laboratory examination of
598 any clinical specimen, ~~whether performed in-house or referred to an out-of-state laboratory,~~ which
599 yields evidence, ~~by the laboratory method(s) indicated or any other confirmatory test,~~ of a disease

600 listed in 12VAC5-90-80 B. Laboratory directors shall report results that are performed in-house or
601 referred to a reference laboratory, with the following exception: if the laboratory director ascertains
602 that the reference laboratory that tests a specimen reports to the department electronically, then
603 those reference laboratory findings do not need to be reported by the laboratory of origin.

604 Each report shall give the source of the specimen and the laboratory method and result; the
605 name, address, age, date of birth, race, sex, and pregnancy status for females (if known) of the
606 person from whom the specimen was obtained; and the name, address, and telephone number
607 of the physician at whose request and medical facility at which the examination was made. When
608 the influenza virus is isolated, the type should be reported, if available. Reports shall be made
609 within ~~three days of identification of evidence of disease, except that those identified in 12VAC5-~~
610 ~~90-80 C shall be reported immediately by the most rapid means available, preferably by~~
611 ~~telephone, the timeframes specified in 12VAC5-90-80~~ to the local health department serving the
612 jurisdiction in which the laboratory is located. Reports shall be made ~~on Form Epi-1~~ via the
613 Department's online Confidential Morbidity Report portal or on the laboratory's own form if it
614 includes the required information. Computer generated reports containing the required
615 information may be submitted. Reporting may be done by means of secure electronic
616 transmission upon agreement of the laboratory director and the department. Reports of HIV
617 genetic nucleotide sequence data associated with HIV drug resistance tests must be submitted
618 electronically. Any person making such report as authorized herein shall be immune from liability
619 as provided by § 32.1-38 of the Code of Virginia.

620 ~~A laboratory identifying evidence of any of the following conditions shall notify the local health~~
621 ~~department of the positive culture or other positive test result within the timeframes specified in~~
622 ~~12VAC5-90-80 and submit the initial isolate or other initial specimen to the Division of~~
623 ~~Consolidated Laboratory Services within seven days of identification. All specimens must be~~
624 ~~identified with the patient and physician information required in this subsection.~~

625 Anthrax

626 Botulism

627 Brucellosis

628 Cholera

629 Diphtheria

630 ~~E. coli infection, Shiga toxin-producing. (Laboratories that use a Shiga toxin EIA~~
631 ~~methodology but do not perform simultaneous culture for Shiga toxin-producing E. coli~~
632 ~~should forward all positive stool specimens or positive enrichment broths to the Division~~
633 ~~of Consolidated Laboratory Services for confirmation and further characterization.)~~

- 634 Haemophilus influenzae infection, invasive
- 635 Influenza A, novel virus
- 636 Listeriosis
- 637 Meningococcal disease
- 638 Pertussis
- 639 Plague
- 640 Poliovirus infection
- 641 Q fever
- 642 Salmonellosis
- 643 Shigellosis
- 644 Streptococcal disease, Group A, invasive
- 645 Tuberculosis (A laboratory identifying Mycobacterium tuberculosis complex (see 12VAC5-
- 646 90-225) shall submit a representative and viable sample of the initial culture to the Division
- 647 of Consolidated Laboratory Services or other laboratory designated by the board to
- 648 receive such specimen.)
- 649 Tularemia
- 650 Typhoid/Paratyphoid fever
- 651 Vancomycin-intermediate or vancomycin-resistant Staphylococcus aureus infection
- 652 Vibrio infection, including infections due to Photobacterium damsela and Grimontia
- 653 hollisae
- 654 Yersiniosis
- 655 Other diseases as may be requested by the health department

656 When a clinical specimen yields evidence indicating the presence of a select agent or toxin
 657 as defined by federal regulations in 42 CFR Part 73, the person in charge of the laboratory shall
 658 contact the Division of Consolidated Laboratory Services and arrange to forward an isolate for
 659 confirmation. If a select agent or toxin has been confirmed in a clinical specimen, the laboratory
 660 director shall consult with Division of Consolidated Laboratory Services or CDC regarding isolate
 661 transport or destruction.

662 Laboratories operating within a medical care facility shall be considered to be in compliance
 663 with the requirement to notify the local health department when the director of that medical care
 664 facility assumes the reporting responsibility; however, laboratories are still required to submit
 665 isolates to the Division of Consolidated Laboratory Services or other designated laboratory as
 666 noted in ~~this subsection~~ 12VAC5-90-80 D unless the laboratory has submitted an exemption
 667 request that has been approved by the department.

668 C. Persons in charge of a medical care facility. Any person in charge of a medical care facility
669 shall make a report to the local health department serving the jurisdiction where the facility is
670 located of the occurrence in or admission to the facility of a patient with a reportable disease listed
671 in 12VAC5-90-80 A unless he has evidence that the occurrence has been reported by a physician.
672 Any person making such report as authorized herein shall be immune from liability as provided
673 by § 32.1-38 of the Code of Virginia. The requirement to report shall include all inpatient,
674 outpatient, and emergency care departments within the medical care facility. Such report shall
675 contain the patient's name, address, age, date of birth, race, sex, and pregnancy status for
676 females; name of disease being reported; available laboratory tests and results; the date of
677 admission; hospital chart number; date expired (when applicable); and attending physician.
678 ~~Influenza should be reported by number of cases only (and type of influenza, if available).~~ Reports
679 shall be made ~~within three days of the suspicion or confirmation of disease except that those~~
680 ~~identified in 12VAC5-90-80 C shall be reported immediately by the most rapid means available,~~
681 ~~preferably by telephone, the timeframes specified in 12VAC5-90-80 to the local health department~~
682 ~~serving the jurisdiction in which the facility is located. Reports shall be made on Form Epi-1, a~~
683 ~~computer generated printout containing the data items requested on Form Epi-1, via the~~
684 Department of Health's online Confidential Morbidity Report portal
685 (<http://www.vdh.virginia.gov/clinicians>), or a CDC or VDH disease-specific surveillance form that
686 ~~provides the same information.~~ Reporting may be done by means of secure electronic
687 transmission upon agreement of the medical care facility and the department.

688 A person in charge of a medical care facility may assume the reporting responsibility on behalf
689 of the director of the laboratory operating within the facility.

690 D. Persons in charge of a residential or day program, service, or facility licensed or operated
691 by any agency of the Commonwealth, or a school, child care center, or summer camp. Any person
692 in charge of a residential or day program, service, or facility licensed or operated by any agency
693 of the Commonwealth, or a school, child care center, or summer camp as defined in § 35.1-1 of
694 the Code of Virginia shall report immediately to the local health department the presence or
695 suspected presence in his program, service, facility, school, child care center, or summer camp
696 of persons who have common symptoms suggesting an outbreak situation. Such persons may
697 report additional information, including identifying and contact information for individuals with
698 communicable diseases of public health concern or individuals who are involved in outbreaks that
699 occur in their facilities, as necessary to facilitate public health investigation and disease control.
700 Any person so reporting shall be immune from liability as provided by § 32.1-38 of the Code of
701 Virginia.

702 E. Local health directors. The local health director shall forward any report of a disease or
703 report of evidence of a disease which has been made on a resident of his jurisdiction to the Office
704 of Epidemiology within three days of receipt. This report shall be submitted immediately by the
705 most rapid means available if the disease is one requiring rapid communication, as required in
706 12VAC5-90-80 C. All such rapid reporting shall be confirmed in writing and submitted to the Office
707 of Epidemiology, by either a paper report or entry into a shared secure electronic disease
708 surveillance system, within three days. Furthermore, the local health director shall immediately
709 forward to the appropriate local health director any disease reports on individuals residing in the
710 latter's jurisdiction or to the Office of Epidemiology on individuals residing outside Virginia. The
711 Office of Epidemiology shall be responsible for notifying other state health departments of
712 reported illnesses in their residents and for notifying CDC as necessary and appropriate.

713 F. Persons in charge of hospitals, nursing facilities or nursing homes, assisted living facilities,
714 and correctional facilities. In accordance with § 32.1-37.1 of the Code of Virginia, any person in
715 charge of a hospital, nursing facility or nursing home, assisted living facility, or correctional facility
716 shall, at the time of transferring custody of any dead body to any person practicing funeral
717 services, notify the person practicing funeral services or his agent if the dead person was known
718 to have had, immediately prior to death, an infectious disease which may be transmitted through
719 exposure to any bodily fluids. These include any of the following infectious diseases:

- 720 Creutzfeldt-Jakob disease
- 721 Human immunodeficiency virus (HIV) infection
- 722 Hepatitis B (acute and chronic)
- 723 Hepatitis C (acute and chronic)
- 724 Rabies
- 725 Smallpox (Variola virus)
- 726 Syphilis, infectious (Treponema pallidum)
- 727 Tuberculosis, active disease (Mycobacterium tuberculosis complex)
- 728 Vaccinia, disease or adverse event
- 729 Viral hemorrhagic fever

730 G. Employees, conditional employees, and persons in charge of food establishments.
731 12VAC5-421-80 of the Food Regulations requires a food employee or conditional employee to
732 notify the person in charge of the food establishment when diagnosed with certain diseases that
733 are transmissible through food and requires the person in charge of the food establishment to
734 notify the regulatory authority. Refer to 12VAC5-421-80 for further guidance and clarification
735 regarding these reporting requirements.

736 **12VAC5-90-103. Isolation for communicable disease of public health threat.**

737 A. Application. The commissioner, in his sole discretion, may invoke the provisions of Article
738 3.02 (§ 32.1-48.05 et seq.) of Chapter 2 of Title 32.1 of the Code of Virginia and may declare the
739 isolation of any individual or individuals upon a determination that:

- 740 1. Such individual or individuals are known to have been infected with or are reasonably
741 suspected to have been infected with a communicable disease of public health threat;
- 742 2. Exceptional circumstances render the procedures of Article 3.01 (§ 32.1-48.01 et seq.)
743 of Chapter 2 of Title 32.1 of the Code of Virginia to be insufficient, or the individual or
744 individuals have failed or refused to comply voluntarily with the control measures directed
745 by the commissioner in response to a communicable disease of public health threat; and
- 746 3. Isolation is the necessary means to contain a communicable disease of public health
747 threat, to ensure that such isolated individual or individuals receive appropriate medical
748 treatment subject to the provisions of § 32.1-44 of the Code of Virginia, or to protect health
749 care providers and others who may come into contact with such infected individual or
750 individuals.

751 The commissioner, in his sole discretion, may also order the isolation of an affected area if, in
752 addition to the above, the Governor has declared a state of emergency for such affected area of
753 the Commonwealth.

754 B. Documentation. For isolation for a communicable disease of public health threat,
755 information about the infection or suspected infection, the individual, individuals, and/or affected
756 area, and the nature or suspected nature of the exposure shall be duly recorded by the local
757 health department in consultation with the Office of Epidemiology. This information shall be
758 sufficient to enable documenting a record of findings and to enable the commissioner to prepare
759 the order of isolation, including the information required in § 32.1-48.12 of the Code of Virginia. In
760 addition, sufficient information on individuals shall be maintained by the local health department
761 to enable appropriate follow-up of individuals for health status evaluation and treatment as well
762 as compliance with the order of isolation.

763 The commissioner shall ensure that the protected health information of any individual or
764 individuals subject to the order of isolation is disclosed only in compliance with state and federal
765 law.

766 C. Means of isolation. The local health department shall assess the situation, and in
767 consultation with the Office of Epidemiology, identify the least restrictive means of isolation that
768 effectively protects unexposed and susceptible individuals. The place of isolation selected shall
769 allow the most freedom of movement and communication with family members and other contacts

770 without allowing disease transmission to other individuals and shall allow the appropriate level of
771 medical care needed by isolated individuals to the extent practicable. The commissioner, in his
772 sole discretion, may order the isolated individual or individuals to remain in their residences, to
773 remain in another place where they are present, or to report to a place or places designated by
774 the commissioner for the duration of their isolation.

775 The commissioner's order of isolation shall be for a duration consistent with the known period
776 of communicability of the communicable disease of public health threat or, if the course of the
777 disease is unknown or uncertain, for a period anticipated as being consistent with the period of
778 communicability of other similar infectious agents. In the situation where an area is under
779 isolation, the duration of isolation shall take into account the transmission characteristics and
780 known or suspected period of communicability.

781 D. Delivery. The local health department shall deliver the order of isolation, or ensure its
782 delivery by an appropriate party such as a law-enforcement officer or health department
783 employee, to the affected individual or individuals in person to the extent practicable. If, in the
784 opinion of the commissioner, the scope of the notification would exceed the capacity of the local
785 health department to ensure individual notification in a timely manner, then print, radio, television,
786 Internet, and/or other available means shall be used to inform those affected.

787 E. Enforcement. ~~Upon finding that there is probable cause to believe that any individual or~~
788 ~~individuals who are subject to an order of isolation may fail or refuse to comply with such order,~~
789 ~~the commissioner in his sole discretion may include in the order a requirement that such individual~~
790 ~~or individuals are to be taken immediately into custody by law-enforcement agencies and detained~~
791 ~~for the duration of the order of isolation or until the commissioner determines that the risk of~~
792 ~~noncompliance is no longer present.~~ For any individual or individuals identified as, or for whom
793 probable cause exists that he may be, in violation of any order of isolation, or for whom probable
794 cause exists that he may fail or refuse to comply with any such order, the enforcement authority
795 directed by the commissioner to law-enforcement agencies shall include but need not be limited
796 to the power to detain or arrest.

797 Any individual or individuals so detained shall be held in the least restrictive environment that
798 can provide any required health care or other services for such individual. The commissioner shall
799 ensure that law-enforcement personnel responsible for enforcing an order or orders of isolation
800 are informed of appropriate measures to take to protect themselves from contracting the disease
801 of public health threat.

802 F. Health status monitoring. The local health department shall monitor the health of those
803 under isolation either by regular telephone calls, visits, self-reports, or by reports of caregivers or
804 healthcare providers or by other means.

805 G. Essential needs. Upon issuance of an order of isolation to an individual or individuals by
806 the commissioner, the local health department shall manage the isolation, in conjunction with local
807 emergency management resources, such that individual essential needs can be met to the extent
808 practicable. Upon issuance of an order of isolation by the commissioner for an affected area,
809 existing emergency protocols pursuant to Chapter 3.2 (§ 44-146.13 et seq.) of Title 44 of the Code
810 of Virginia shall be utilized for mobilizing appropriate resources to ensure essential needs are
811 met.

812 H. Appeals. Any individual or individuals subject to an order of isolation or a court-ordered
813 confirmation or extension of any such order may file an appeal of the order of isolation in
814 accordance with the provisions of § 32.1-48.13 of the Code of Virginia. An appeal shall not stay
815 any order of isolation.

816 I. Release from isolation. Once the commissioner determines that an individual or individuals
817 no longer pose a threat to the public health, the order of isolation has expired, or the order of
818 isolation has been vacated by the court, the individual or individuals under the order of isolation
819 shall be released immediately. If the risk of an infected individual transmitting the communicable
820 disease of public health threat to other individuals continues to exist, an order of isolation may be
821 developed to extend the restriction prior to release from isolation.

822 J. Affected area. If the criteria in subsection A of this section are met and an area is known or
823 suspected to have been affected, then the commissioner shall notify the Governor of the situation
824 and the need to order isolation for the affected area during the known or suspected time of
825 exposure. In order for an affected area to be isolated, the Governor must declare a state of
826 emergency for the affected area.

827 If an order of isolation is issued for an affected area during the known or suspected time of
828 exposure, the commissioner shall cause the order of isolation to be communicated to the
829 individuals residing or located in the affected area. The use of multiple forms of communication,
830 including but not limited to radio, television, internet, and/or other available means, may be
831 required in order to reach the individuals who were in the affected area during the known or
832 suspected time of exposure.

833 The provisions for documentation, means of isolation, enforcement, health status monitoring,
834 essential needs, and release from isolation described above will apply to the isolation of affected
835 areas. Appropriate management of a disease of public health threat for an affected area may

836 require the coordinated use of local, regional, state, and national resources. In specifying one or
837 more affected areas to be placed under isolation, the objective will be to protect as many people
838 as possible using the least restrictive means. As a result, defining the precise boundaries and
839 time frame of the exposure may not be possible, or may change as additional information
840 becomes available. When this occurs, the commissioner shall ensure that the description of the
841 affected area is in congruence with the Governor's declaration of emergency and shall ensure
842 that the latest information is communicated to those in or exposed to the affected area.

843 **12VAC5-90-107. Quarantine.**

844 A. Application. The commissioner, in his sole discretion, may invoke the provisions of Article
845 3.02 (§ 32.1-48.05 et seq.) of Chapter 2 of Title 32.1 of the Code of Virginia and may order a
846 complete or modified quarantine of any individual or individuals upon a determination that:

- 847 1. Such individual or individuals are known to have been exposed to or are reasonably
848 suspected to have been exposed to a communicable disease of public health threat;
- 849 2. Exceptional circumstances render the procedures of Article 3.01 (§ 32.1-48.01 et seq.)
850 of Chapter 2 of Title 32.1 of the Code of Virginia to be insufficient, or the individual or
851 individuals have failed or refused to comply voluntarily with the control measures directed
852 by the commissioner in response to a communicable disease of public health threat; and
- 853 3. Quarantine is the necessary means to contain a communicable disease of public health
854 threat to which an individual or individuals have been or may have been exposed and thus
855 may become infected.

856 The commissioner, in his sole discretion, may also order the quarantine of an affected area if,
857 in addition to the above, the Governor has declared a state of emergency for such affected area
858 of the Commonwealth.

859 B. Documentation. For quarantine for a communicable disease of public health threat,
860 information about the infection or suspected infection; the individual, individuals, and/or affected
861 area; and the nature or suspected nature of the exposure shall be duly recorded by the local
862 health department, in consultation with the Office of Epidemiology. This information shall be
863 sufficient to enable documenting a record of findings and enable the commissioner to prepare a
864 written order of quarantine, including the information required in § 32.1-48.09 of the Code of
865 Virginia. In addition, sufficient information on individuals shall be maintained by the local health
866 department to enable appropriate follow-up of individuals for health status evaluation and
867 treatment as well as compliance with the order of quarantine.

868 The commissioner shall ensure that the protected health information of any individual or
869 individuals subject to the order of quarantine is disclosed only in compliance with state and federal
870 law.

871 C. Means of quarantine. The local health department shall assess the situation, and in
872 consultation with the Office of Epidemiology, shall recommend to the commissioner the least
873 restrictive means of quarantine that effectively protects unexposed and susceptible individuals.
874 The place of quarantine selected shall allow the most freedom of movement and communication
875 with family members and other contacts without allowing disease transmission to others.

876 The commissioner, in his sole discretion, may order the quarantined individual or individuals
877 to remain in their residences, to remain in another place where they are present, or to report to a
878 place or places designated by the commissioner for the duration of their quarantine.

879 The commissioner's order of quarantine shall be for a duration consistent with the known
880 incubation period of the communicable disease of public health threat or, if the incubation period
881 is unknown or uncertain, for a period anticipated as being consistent with the incubation period
882 for other similar infectious agents. In the situation where an area is under quarantine, the duration
883 of quarantine shall take into account the transmission characteristics and known or suspected
884 incubation period.

885 D. Delivery. The local health department shall deliver the order of quarantine, or ensure its
886 delivery by an appropriate party such as a law-enforcement officer or health department
887 employee, to the affected individual or individuals in person to the extent practicable. If, in the
888 opinion of the commissioner, the scope of the notification would exceed the capacity of the local
889 health department to ensure notification in a timely manner, then print, radio, television, Internet,
890 and/or other available means shall be used to inform those affected.

891 E. Enforcement. ~~Upon finding that there is probable cause to believe that any individual or~~
892 ~~individuals who are subject to an order of quarantine may fail or refuse to comply with such order,~~
893 ~~the commissioner in his sole discretion may include in the order a requirement that such individual~~
894 ~~or individuals are to be taken immediately into custody by law enforcement agencies and detained~~
895 ~~for the duration of the order of quarantine or until the commissioner determines that the risk of~~
896 ~~and from noncompliance is no longer present.~~ For any individual or individuals identified as, or for
897 whom probable cause exists that he may be, in violation of any order of quarantine, or for whom
898 probable cause exists that he may fail or refuse to comply with any such order, the enforcement
899 authority directed by the commissioner to law-enforcement agencies shall include but need not
900 be limited to the power to detain or arrest.

901 Any individual or individuals so detained shall be held in the least restrictive environment that
902 can provide any required health care or other services for such individual. The commissioner shall
903 ensure that law-enforcement personnel responsible for enforcing an order or orders of quarantine
904 are informed of appropriate measures to take to protect themselves from contracting the disease
905 of public health threat.

906 F. Health status monitoring. The local health department shall monitor the health of those
907 under quarantine either by regular telephone calls, visits, self-reports, or by reports of caregivers
908 or healthcare providers or by other means. If an individual or individuals develop symptoms
909 compatible with the communicable disease of public health threat, then 12VAC5-90-103 would
910 apply to the individual or individuals.

911 G. Essential needs. Upon issuance of an order of quarantine to an individual or individuals by
912 the commissioner, the local health department shall manage the quarantine, in conjunction with
913 local emergency management resources, such that individual essential needs can be met to the
914 extent practicable. Upon issuance of an order of quarantine by the commissioner for an affected
915 area, existing emergency protocols pursuant to Chapter 3.2 (§ 44-146.13 et seq.) of Title 44 of
916 the Code of Virginia shall be utilized for mobilizing appropriate resources to ensure essential
917 needs are met.

918 H. Appeals. Any individual or individuals subject to an order of quarantine or a court-ordered
919 confirmation or extension of any such order may file an appeal of the order of quarantine in
920 accordance with the provisions of § 32.1-48.10 of the Code of Virginia. An appeal shall not stay
921 any order of quarantine.

922 I. Release from quarantine. Once the commissioner determines that an individual or
923 individuals are no longer at risk of becoming infected and pose no risk of transmitting the
924 communicable disease of public health threat to other individuals, the order of quarantine has
925 expired, or the order of quarantine has been vacated by the court, the individuals under the order
926 of quarantine shall be released immediately. If the risk of an individual becoming infected and
927 transmitting the communicable disease of public health threat to other individuals continues to
928 exist, an order of quarantine may be developed to extend the restriction prior to release from
929 quarantine.

930 J. Affected area. If the criteria in subsection A of this section are met and an area is known or
931 suspected to have been affected, then the commissioner shall notify the Governor of the situation
932 and the need to order quarantine for the affected area. In order for an affected area to be
933 quarantined, the Governor must declare a state of emergency for the affected area.

934 If an order of quarantine is issued for an affected area, the commissioner shall cause the order
935 of quarantine to be communicated to the individuals residing or located in the affected area. The
936 use of multiple forms of communication, including but not limited to radio, television, Internet,
937 and/or other available means, may be required in order to reach the individuals who were in the
938 affected area during the known or suspected time of exposure.

939 The provisions for documentation, means of quarantine, enforcement, health status
940 monitoring, essential needs, and release from quarantine described above will apply to the
941 quarantine of affected areas. Appropriate management of a disease of public health threat for an
942 affected area may require the coordinated use of local, regional, state, and national resources. In
943 specifying one or more affected areas to be placed under quarantine, the objective will be to
944 protect as many people as possible using the least restrictive means. As a result, defining the
945 precise boundaries and time frame of the exposure may not be possible, or may change as
946 additional information becomes available. When this occurs, the commissioner shall ensure that
947 the description of the affected area is in congruence with the Governor's declaration of emergency
948 and shall ensure that the latest information is communicated to those in or exposed to the affected
949 area.

Part VII

Prevention of Blindness from Ophthalmia Neonatorum

950 **12VAC5-90-140. Procedure for preventing ophthalmia neonatorum.**

951 The physician, nurse, or midwife in charge of the infant's care after delivery of a baby shall
952 ensure that ~~one of the following is administered in each eye of that newborn baby as soon as~~
953 ~~possible after birth: (i) two drops of a 1.0% silver nitrate solution; (ii) a 1-cm ribbon of 1.0%~~
954 ~~tetracycline ophthalmic ointment; or (iii) a 1-cm ribbon of 0.5% erythromycin ophthalmic ointment~~
955 is administered in each eye of that newborn baby as soon as possible. This treatment shall be
956 recorded in the medical record of the infant.

957 _____

Part X

Protocol for Identification of Children with Elevated Blood Lead Levels

958 **12VAC5-90-215. Schedule and criteria for and confirmation of blood lead testing and**
959 **information to be provided.**

960 A. Schedule for testing. Every child shall be tested to determine the blood lead level at 12
961 months and 24 months of age if the health care provider determines that the child meets any of
962 the criteria listed in subsection B of this section. Children 25 months through 72 months of age
963 who present for medical care and meet any of criteria of subsection B of this section shall also be

964 tested if they have either not previously been tested for blood lead level or were previously tested
965 but experienced a change since testing that has resulted in an increased risk of lead exposure
966 based on the criteria listed in subsection B of this section.

967 B. Criteria for testing.

- 968 1. The child is eligible for or receiving benefits from Medicaid or the Special Supplemental
969 Nutrition Program for Women, Infants and Children (WIC);
- 970 2. The child is living in or regularly visiting a house, apartment, dwelling, structure, or child
971 care facility built before ~~1960~~1950;
- 972 3. The child is living in or regularly visiting a house, apartment, dwelling, structure, or child
973 care facility built before 1978 that has (i) peeling or chipping paint or (ii) recent (within the
974 last six months) ongoing or planned renovations;
- 975 4. The child is living in or regularly visiting a house, apartment, dwelling, or other structure
976 in which one or more persons have blood lead testing yielding evidence of lead exposure;
- 977 5. The child is living with an adult whose job, hobby, or other activity involves exposure to
978 lead;
- 979 6. The child is living near an active lead smelter, battery recycling plant, or other industry
980 likely to release lead;
- 981 7. The child's parent, guardian, or other person standing in loco parentis requests the
982 child's blood be tested due to any suspected exposure; or
- 983 8. The child is a recent refugee or immigrant or is adopted from outside of the United
984 States.

985 C. Exceptions. A child who does not meet any of the schedule or criteria provided in
986 subsection A or B of this section is considered to be at low risk, and testing is not required but
987 may be conducted at the discretion of the health care provider. The testing requirement shall be
988 waived if the parent, guardian, or other person standing in loco parentis of a child objects to the
989 testing on the basis that the procedure conflicts with his religious tenets or practices.

990 D. Confirmation of blood lead levels. Blood lead level testing shall be performed on venous or
991 capillary blood. Tests of venous blood performed by a laboratory certified by the federal Centers
992 for Medicare & Medicaid Services in accordance with 42 USC § 263a, the Clinical Laboratory
993 Improvement Amendment of 1988 (CLIA-certified), are considered confirmatory. Tests of venous
994 blood performed by any other laboratory and tests of capillary blood shall be confirmed by a repeat
995 blood test, preferably venous, performed by a CLIA-certified laboratory. Such confirmatory testing
996 shall be performed in accordance with the following schedule:

- 997 1. Confirmatory testing is not required if the result of the capillary test is below CDC's
998 reference value.
- 999 4.2. Within one to three months if the result of the capillary test is at or above the CDC's
1000 reference value and up to 9 micrograms of lead per deciliter of whole blood (µg/dL).
- 1001 2.3. Within one week to one month if the result of the capillary test is 10-44 µg/dL. The
1002 higher this test result, the more urgent the need for a confirmatory test.
- 1003 3.4. Within 48 hours if the result of the capillary test is 45-59 µg/dL.
- 1004 4.5. Within 24 hours if the result of the capillary test is 60-69 µg/dL.
- 1005 5.6. Immediately as an emergency laboratory test if the result of the capillary test is 70
1006 µg/dL or higher.
- 1007 E. Information to be provided. As part of regular well-check visits for all children, the health
1008 care provider shall make available to parents, guardians, or other persons standing in loco
1009 parentis information on the dangers of lead poisoning, potential sources of lead and ways to
1010 prevent exposure, and a list of available lead-related resources. When blood lead level testing is
1011 performed, the health care provider shall share the child's blood lead level test result with the
1012 child's parent, guardian, or other person standing in loco parentis and report to the local health
1013 department in accordance with the requirements of 12VAC5-90-80.

Part XI

Tuberculosis Control

1014 **12VAC5-90-225. Additional data to be reported related to persons with active tuberculosis**
1015 **disease (confirmed or suspected).**

- 1016 A. Physicians and directors of medical care facilities are required to submit all of the following:
- 1017 1. An initial report to be completed when there are reasonable grounds to suspect that a
1018 person has active TB disease, but no later than when antituberculosis drug therapy is
1019 initiated. The reports must include the following: the affected person's name; age; date of
1020 birth; gender; address; pertinent clinical, radiographic, microbiologic and pathologic
1021 reports, whether pending or final; such other information as may be needed to locate the
1022 patient for follow-up; and name, address, and telephone number of the treating physician.
- 1023 2. A secondary report to be completed simultaneously or within one to two weeks following
1024 the initial report. The report must include: the date, method, and results of ~~tuberculin skin~~
1025 ~~test (TST)~~ tests for tuberculosis infection; the date and results of the initial and any follow-
1026 up chest radiographs; the dates and results of bacteriologic or pathologic testing, the
1027 antituberculosis drug regimen, including names of the drugs, dosages and frequencies of
1028 administration, and start date; the date and results of drug susceptibility testing; HIV

1029 status; contact screening information; and name, address, and telephone number of
1030 treating physician.

1031 3. Subsequent reports are to be made when updated information is available. Subsequent
1032 reports are required when: clinical status changes, the treatment regimen changes;
1033 treatment ceases for any reason; or there are any updates to laboratory results, treatment
1034 adherence, name, address, and telephone number of current provider, patient location or
1035 contact information, or other additional clinical information.

1036 4. Physicians and/or directors of medical care facilities responsible for the care of a patient
1037 with active tuberculosis disease are required to develop and maintain a written treatment
1038 plan. This plan must be in place no later than the time when antituberculosis drug therapy
1039 is initiated. Patient adherence to this treatment plan must be documented. The treatment
1040 plan and adherence record are subject to review by the local health director or his
1041 designee at any time during the course of treatment.

1042 5. The treatment plan for the following categories of patients must be submitted to the
1043 local health director or his designee for approval no later than the time when
1044 antituberculosis drug therapy is started or modified:

1045 a. For individuals who are inpatients or incarcerated, the responsible provider or facility
1046 must submit the treatment plan for approval prior to discharge or transfer.

1047 b. Individuals, whether inpatient, incarcerated, or outpatient, who also have one of the
1048 following conditions:

1049 (1) HIV infection.

1050 (2) Known or suspected active TB disease resistant to rifampin, rifabutin, rifapentine
1051 or other rifamycin with or without resistance to any other drug.

1052 (3) A history of prior treated or untreated active TB disease, or a history of relapsed
1053 active TB disease.

1054 (4) A demonstrated history of nonadherence to any medical treatment regimen.

1055 B. Laboratories are required to submit the following:

1056 1. Results of smears that are positive for acid fast bacilli.

1057 2. Results of cultures positive for any member of the Mycobacterium tuberculosis complex
1058 (i.e., *M. tuberculosis*, *M. bovis*, *M. africanum*) or any other mycobacteria.

1059 3. Results of rapid methodologies, including acid hybridization or nucleic acid
1060 amplification, which are indicative of *M. tuberculosis* complex or any other mycobacteria.

1061 4. Results of tests for antimicrobial susceptibility performed on cultures positive for
1062 ~~tubercle bacilli~~ *M. tuberculosis* complex.

1063 5. Results of tests for tuberculosis infection.
1064 ~~5.6.~~ Laboratories, whether testing is done in-house or referred to an out-of-state
1065 laboratory, shall submit a representative and viable sample of the initial culture positive
1066 for any member of the M. tuberculosis complex to the Virginia Division of Consolidated
1067 Laboratory Services or other laboratory designated by the board to receive such
1068 specimen.

Part XIII

Reporting of Dangerous Microbes and Pathogens

1069 **12VAC5-90-280. Reporting of dangerous microbes and pathogens.**

1070 A. Definitions. The following words and terms when used in this part shall have the following
1071 meanings unless the context clearly indicates otherwise:

1072 ~~"Biologic agent" means any microorganism (including, but not limited to, bacteria, viruses,~~
1073 ~~fungi, rickettsiae, or protozoa), or infectious substance, or any naturally occurring, bioengineered,~~
1074 ~~or synthesized component of any such microorganism or infectious substance, capable of causing~~
1075 ~~death, disease, or other biological malfunction in a human, an animal, a plant, or other living~~
1076 ~~organism; deterioration of food, water, equipment, supplies, or material of any kind; or deleterious~~
1077 ~~alteration of the environment.~~

1078 ~~"CDC" means the Centers for Disease Control and Prevention of the U.S. Department of~~
1079 ~~Health and Human Services.~~

1080 ~~"Diagnosis" means the analysis of specimens for the purpose of identifying or confirming the~~
1081 ~~presence or characteristics of a select agent or toxin, provided that such analysis is directly related~~
1082 ~~to protecting the public health or safety.~~

1083 ~~"Proficiency testing" means a sponsored, time-limited analytical trial whereby one or more~~
1084 ~~analytes, previously confirmed by the sponsor, are submitted to the testing laboratory for analysis~~
1085 ~~and where final results are graded, scores are recorded and provided to participants, and scores~~
1086 ~~for participants are evaluated.~~

1087 ~~"Responsible official" means any person in charge of directing or supervising a laboratory~~
1088 ~~conducting business in the Commonwealth of Virginia. At colleges and universities, the~~
1089 ~~responsible official shall be the president of the college or university or his designee. At private,~~
1090 ~~state, or federal organizations, the responsible official shall be the laboratory director or a chief~~
1091 ~~officer of the organization or his designee.~~

1092 "Select agent or toxin" or "select agent and toxin" means all those biological agents or toxins
1093 as defined by federal regulations in 42 CFR Part 73, including Health and Human Services select

1094 agents and toxins and overlap select agents and toxins. “Dangerous microbes and pathogens”
1095 will be known as “select agents and toxins”.

1096 "Toxin" means the toxic material or product of plants, animals, microorganisms (including but
1097 not limited to bacteria, viruses, fungi, rickettsiae, or protozoa); or infectious substances; or a
1098 recombinant or synthesized molecule, whatever the origin and method of production; and includes
1099 any poisonous substance or biological product that may be engineered as a result of
1100 biotechnology or produced by a living organism; or any poisonous isomer or biological product,
1101 homolog, or derivative of such a substance.

1102 "Verification" means the process required to assure the accuracy, precision, and the analytical
1103 sensitivity and specificity of any procedure used for diagnosis.

1104 B. Administration. ~~The dangerous microbes and pathogens will be known as "select agents~~
1105 ~~and toxins." The select agent and toxin registry will be maintained by the Virginia Department of~~
1106 ~~Health, Office of Epidemiology, Division of Surveillance and Investigation.~~

1107 C. Reportable agents. ~~The board declares the select agents and toxins and overlap select~~
1108 ~~agents and toxins outlined in 42 CFR Part 73 to be reportable and adopts it herein by reference~~
1109 ~~including subsequent amendments and editions. The select agents and toxins are to be reportable~~
1110 ~~by the persons enumerated in subsection F of this section.~~

1111 ~~D.B. Items to report. Each report shall be made on a form determined by the department and~~
1112 ~~shall contain the following: name, source and characterization information on select agents and~~
1113 ~~toxins and quantities held; objectives of the work with the agent; location (including building and~~
1114 ~~room) where each select agent or toxin is stored or used; identification information of persons~~
1115 ~~with access to each agent; identification information of the person in charge of each of the agents;~~
1116 ~~and the name and address of the laboratory and the name, position and identification information~~
1117 ~~of one responsible official as a single point of contact for the organization. The report shall also~~
1118 ~~indicate whether the laboratory is registered with the CDC Select Agent Program and may contain~~
1119 ~~additional information as required by 42 CFR Part 73 or the department.~~

1120 ~~E.C. Timing of reports. Reports shall be made to the department within seven calendar days~~
1121 ~~of submission of an application to the CDC Select Agent Program. By January 31 of every year,~~
1122 ~~laboratoriesthe responsible official at a laboratory as designated by the federal select agent~~
1123 ~~program shall provide a written update to the department, which shall include a copy of the federal~~
1124 ~~registration certificate received through the CDC Select Agent ProgramDivision of Surveillance~~
1125 ~~and Investigation in the Office of Epidemiology containing the information specified in subsection~~

1126 B.

1127 ~~In the event that a select agent or toxin that has previously been reported to the department~~
1128 ~~is destroyed, a copy of federal forms addressing the destruction of the select agent or toxin must~~
1129 ~~be submitted to the department within seven calendar days of submission to the CDC Select~~
1130 ~~Agent Program.~~

1131 ~~In the event that a select agent or toxin, or a specimen or isolate from a specimen containing~~
1132 ~~a select agent or toxin, has previously been reported to the department and is subsequently~~
1133 ~~transferred to a facility eligible for receiving the items, a copy of federal forms addressing the~~
1134 ~~transfer of the select agent or toxin must be submitted to the department within seven calendar~~
1135 ~~days of submission to the CDC Select Agent Program.~~

1136 ~~In the event of a suspected release, loss, or theft of any select agent or toxin, the responsible~~
1137 ~~official at a laboratory as designated by the federal select agent program shall make a report to~~
1138 ~~the department immediately by the most rapid means available, preferably by telephone. The~~
1139 ~~report shall be submitted to the Division of Surveillance and Investigation in the Office of~~
1140 ~~Epidemiology. The rapid report shall be followed up by a written report within seven calendar days~~
1141 ~~and shall include the following information:~~

- 1142 ~~1. The name of the biologic agent and any identifying information (e.g., strain or other~~
1143 ~~characterization information);~~
- 1144 ~~2. An estimate of the quantity released, lost, or stolen;~~
- 1145 ~~3. An estimate of the time during which the release, loss, or theft occurred; and~~
- 1146 ~~4. The location (building, room) from or in which the release, loss, or theft occurred. The~~
1147 ~~report may contain additional information as required by 42 CFR Part 73 or the~~
1148 ~~department.~~

1149 ~~If a release has occurred, the report shall also include the nature, environment, and location~~
1150 ~~of the release; number, names, and position of exposed individuals; and actions taken as a result~~
1151 ~~of the release.~~

1152 ~~The department shall be notified in writing of any change to information previously submitted~~
1153 ~~to the department. If a new application or an amendment to an existing application is filed with~~
1154 ~~the CDC Select Agent Program, a copy of the application or amendment shall be submitted to the~~
1155 ~~department within seven calendar days of submission to the CDC Select Agent Program.~~

1156 ~~F. Those required to report. The laboratory director shall be responsible for annual reporting~~
1157 ~~of select agents and toxins to the Virginia Department of Health and for the reporting of any~~
1158 ~~changes within the time periods as specified within these regulations. Such reports shall be made~~
1159 ~~on forms to be determined by the department. Any person making such reports as authorized~~
1160 ~~herein shall be immune from liability as provided by § 32.1-38 of the Code of Virginia.~~

1161 ~~G. Exemption from reporting. A person who detects a select agent or toxin for the purpose of~~
1162 ~~diagnosing a disease, verification, or proficiency testing and either transfers the specimens or~~
1163 ~~isolates containing the select agent or toxin to a facility eligible for receiving them or destroys~~
1164 ~~them on site is not required to make a report except as required by 12VAC5-90-80 and 12VAC5-~~
1165 ~~90-90. Proper destruction of the agent shall take place through autoclaving, incineration, or by a~~
1166 ~~sterilization or neutralization process sufficient to cause inactivation. The transfer or destruction~~
1167 ~~shall occur within seven calendar days after identification of a select agent or toxin used for~~
1168 ~~diagnosis or testing and within 90 calendar days after receipt for proficiency testing.~~

1169 ~~Any additional exemptions from reporting under 42 CFR Part 73, including subsequent~~
1170 ~~amendments and editions, are also exempt from reporting under this regulation; however, the~~
1171 ~~department shall be notified of the exemption by submitting a copy of federal forms addressing~~
1172 ~~the exemption within seven calendar days of submission to the CDC Select Agent Program.~~

1173 H.D. Release of reported information. Reports submitted to the select agent and toxin registry
1174 shall be confidential and shall not be a public record pursuant to the Freedom of Information Act,
1175 regardless of submitter. Release of information on select agents or toxins shall be made only by
1176 order of the State Health Commissioner to the CDC and state and federal law-enforcement
1177 agencies in any investigation involving the release, theft, or loss of a select agent or toxin required
1178 to be reported to the department under this regulation. Any person making such reports as
1179 authorized herein shall be immune from liability as provided by § 32.1-38 of the Code of Virginia.

Part XIV

Reporting of Healthcare-Associated Infections

1180 **12VAC5-90-370. Reporting of healthcare-associated infections.**

1181 A. Reportable infections. ~~Facilities~~Acute care hospitals that report data into the Centers for
1182 Disease Control and Prevention's National Healthcare Safety Network (NHSN) ~~for~~as a
1183 requirement of the Centers for Medicare and Medicaid Services ~~Hospital Inpatient Quality~~
1184 ~~Reporting Program~~ shall share the data, through the NHSN, with the department.

1185 B. Liability protection and data release. Any person making such report as authorized herein
1186 shall be immune from liability as provided by § 32.1-38 of the Code of Virginia. Infection rate data
1187 may be released to the public by the department upon request. Data shall be aggregated to
1188 ensure that no individual patient may be identified.

1189

1190 FORMS (12VAC5-90)

1191 [Confidential Morbidity Report, Epi-1 \(rev. 10/2011\)](#)

1192 ~~Virginia Cancer Registry Reporting Form (rev. 1/1998)~~



COMMONWEALTH of VIRGINIA

Department of Health

M. NORMAN OLIVER, MD, MA
STATE HEALTH COMMISSIONER

PO BOX 2448
RICHMOND, VA 23218

TTY 7-1-1 OR
1-800-828-1120

MEMORANDUM

DATE: August 20, 2018

TO: Virginia State Board of Health

FROM: Laurie Forlano, DO, MPH
State Epidemiologist & Director, Office of Epidemiology

SUBJECT: Fast Track Regulation: Recreational Water Advisories

The agency is proposing to establish regulations within the Virginia Administrative Code to establish the Virginia Department of Health's (VDH) role in issuing and lifting recreational water advisories based on the Beach Action Value (BAV). This regulatory action is necessary to comply with a forthcoming change in the Department of Environmental Quality's (DEQ) regulation 9VAC25-260-170.

DEQ is promulgating a revision of this regulation which would remove 9VAC25-260-170(A)(5) which reads:

“For beach advisories or closures, a single sample maximum of 235 E. coli CFU/100 ml in freshwater and a single sample maximum of 104 enterococci CFU/100 ml in saltwater and transition zones shall apply.”

In order for VDH to continue to manage beach advisories in recreational water, promulgation of the proposed regulation is necessary in the Department of Health section of the Virginia Administrative Code. The proposed regulation will be promulgated in 12VAC5-135.

The Board of Health is requested to approve the fast track regulation. Should the Board of Health approve the regulation, it will be submitted to the Office of the Attorney General to begin the executive branch review process, as specified by the Administrative Process Act. Following executive branch review and approval, the regulation will be published in the Virginia Register of Regulations and on the Virginia Regulatory Town Hall website. The regulation will become effective 45-days following publication in the Virginia Register of Regulations.



townhall.virginia.gov

Fast-Track Regulation Agency Background Document

| | |
|---|--|
| Agency name | Virginia Department of Health |
| Virginia Administrative Code (VAC) citation(s) | 12VAC5-135 |
| Regulation title(s) | Recreational Water Advisories |
| Action title | Establish Regulations for Recreational Water |
| Date this document prepared | 8/20/18 |

This information is required for executive branch review and the Virginia Registrar of Regulations, pursuant to the Virginia Administrative Process Act (APA), Executive Order 14 (as amended, July 16, 2018), the Regulations for Filing and Publishing Agency Regulations (1 VAC7-10), and the *Virginia Register Form, Style, and Procedure Manual for Publication of Virginia Regulations*.

Brief Summary

Please provide a brief summary (preferably no more than 2 or 3 paragraphs) of this regulatory change (i.e., new regulation, amendments to an existing regulation, or repeal of an existing regulation). Alert the reader to all substantive matters. If applicable, generally describe the existing regulation.

Regulations will be promulgated within the Virginia Administrative Code to establish the Virginia Department of Health's (VDH) role in issuing and lifting recreational water advisories based on the Beach Action Value (BAV). The BAV is the concentration of an indicator organism equal to or above which beach advisories shall be issued and below which beach advisories shall be lifted. The regulation will include procedures for issuing and lifting beach advisories. Currently, beach advisories are issued by VDH, however, the authority lies within the Department of Environmental Quality's (DEQ) regulation 9VAC25-260-170. DEQ is promulgating a revision of this regulation which would remove 9VAC25-260-170(A)(5) which reads:

"For beach advisories or closures, a single sample maximum of 235 E. coli CFU/100 ml in freshwater and a single sample maximum of 104 enterococci CFU/100 ml in saltwater and transition zones shall apply."

In order for VDH to continue to manage beach advisories in recreational water, promulgation of the proposed regulation is necessary in the VDH section of the Virginia Administrative Code. The proposed regulation will be promulgated in 12VAC5-135. Substantive changes include the removal of individual

reference values for the single sample maximum (235 *E. coli* CFU/100 ml in freshwater and 104 enterococci CFU/100 ml in saltwater and transition zones) and establishing in the new regulation reference to a BAV. The BAV will be maintained in the VDH Beach Monitoring and Notification Protocol. The BAV threshold is set at 104 enterococci CFU/100 ml in salt water and transition zones. There is no established VDH monitoring protocol for *E. coli* in recreational fresh water for the issuance of advisories.

Acronyms and Definitions

Please define all acronyms used in the Agency Background Document. Also, please define any technical terms that are used in the document that are not also defined in the "Definition" section of the regulations.

VDH – Virginia Department of Health
DEQ – Department of Environmental Quality
BAV – Beach Action Value
VAC – Virginia Administrative Code
CFU – Colony Forming Units

Statement of Final Agency Action

Please provide a statement of the final action taken by the agency including: 1) the date the action was taken; 2) the name of the agency taking the action; and 3) the title of the regulation.

Mandate and Impetus

Please identify the mandate for this regulatory change, and any other impetus that specifically prompted its initiation (e.g., new or modified mandate, petition for rulemaking, periodic review, board decision, etc.). For purposes of executive branch review, "mandate" has the same meaning as defined in Executive Order 14 (as amended, July 16, 2018), "a directive from the General Assembly, the federal government, or a court that requires that a regulation be promulgated, amended, or repealed in whole or part."

As required by Virginia Code § 2.2-4012.1, please also explain why this rulemaking is expected to be noncontroversial and therefore appropriate for the fast-track process.

This regulatory action was initiated as the result of a board decision in response to an action by DEQ. The DEQ Regulatory Advisory Panel (RAP), which included representatives of VDH, other local and state agencies, and non-profit organizations, reached consensus on the removal of the beach advisory and closure language provided VDH promulgated regulations in the Virginia Administrative Code to manage beach advisories in recreational water. VDH does not expect this rulemaking to be controversial. Further, promulgation of this regulation will not result in any changes to the current practice of issuing and lifting recreational water advisories, other than it is moving from one VAC chapter to another and adding procedures for issuing and lifting beach advisories.

Legal Basis

Please identify (1) the agency or other promulgating entity, and (2) the state and/or federal legal authority for the regulatory change, including the most relevant citations to the Code of Virginia or Acts of

Assembly chapter number(s), if applicable. Your citation must include a specific provision, if any, authorizing the promulgating entity to regulate this specific subject or program, as well as a reference to the agency or promulgating entity's overall regulatory authority.

Statutory authority to promulgate these regulations is granted to the State Board of Health pursuant to Va. Code §§ 32.1-2, 32.1-12, and 32.1-23 of the Code of Virginia.

Purpose

Please explain the need for the regulatory change, including a description of: (1) the rationale or justification, (2) the specific reasons the regulatory change is essential to protect the health, safety or welfare of citizens, and (3) the goals of the regulatory change and the problems it's intended to solve.

This regulation is necessary to ensure the continued public notification whenever there is a higher risk of illness when swimming in public beach water. VDH participated in a RAP with DEQ to amend regulations in 9VAC25-260-170. The RAP participants came to the consensus that DEQ would eliminate regulatory language related to issuing beach advisories and closures, given this is a primary function of VDH's Beach Monitoring and Notification Program. In order for VDH to continue to manage beach advisories in recreational water, promulgation of the proposed regulation is necessary in the VDH section of the Virginia Administrative Code. The proposed regulation will be promulgated in 12VAC5-135.

Substance

Please briefly identify and explain the new substantive provisions, the substantive changes to existing sections, or both. A more detailed discussion is provided in the "Detail of Changes" section below.

DEQ is promulgating a revision to repeal 9VAC25-260-170(A)(5) which reads:

"For beach advisories or closures, a single sample maximum of 235 E. coli CFU/100 ml in freshwater and a single sample maximum of 104 enterococci CFU/100 ml in saltwater and transition zones shall apply."

In order for VDH to continue to manage beach advisories in recreational water, promulgation of the proposed regulation is necessary in the VDH section of the Virginia Administrative Code. While VDH is maintaining the principle of the DEQ regulation, there are some minor differences as well as the establishment of procedures for issuing and lifting beach advisories. Substantive changes include the removal of individual reference values for the single sample maximum (235 *E. coli* CFU/100 ml in freshwater and 104 enterococci CFU/100 ml in saltwater and transition zones). The VDH regulation will instead use a BAV. The BAV is set at 104 enterococci CFU/100 ml in salt water and transition zones. There is no established VDH monitoring protocol for *E. coli* in recreational fresh water for the issuance of advisories. Further, through promulgation of this regulation, VDH will establish procedures for issuing and lifting beach advisories. The VDH Beach Monitoring and Notification Program, funded by the United State Environmental Protection Agency BEACH Act Grant, requires the use of a BAV. The BAV is contained within the VDH Beach Monitoring and Notification Protocol. The proposed regulation will direct readers to the Protocol.

Issues

Please identify the issues associated with the regulatory change, including: 1) the primary advantages and disadvantages to the public, such as individual private citizens or businesses, of implementing the new or amended provisions; 2) the primary advantages and disadvantages to the agency or the

Commonwealth; and 3) other pertinent matters of interest to the regulated community, government officials, and the public. If there are no disadvantages to the public or the Commonwealth, include a specific statement to that effect.

- 1) The primary advantage to the public is that VDH currently has this authority through 9VAC25-260-170(A)(5) and therefore, there will be no additional impact to the management of recreational water advisories.
- 2) There are no known disadvantages to promulgating this regulation.
- 3) There are no other pertinent matters of interest to the regulated community, government officials, and the public.

Requirements More Restrictive than Federal

Please identify and describe any requirement of the regulatory change which is more restrictive than applicable federal requirements. Include a specific citation for each applicable federal requirement, and a rationale for the need for the more restrictive requirements. If there are no applicable federal requirements, or no requirements that exceed applicable federal requirements, include a specific statement to that effect.

There are no requirements in this proposal that that more restrictive than applicable federal requirements.

Agencies, Localities, and Other Entities Particularly Affected

Please identify any other state agencies, localities, or other entities particularly affected by the regulatory change. "Particularly affected" are those that are likely to bear any identified disproportionate material impact which would not be experienced by other agencies, localities, or entities. "Locality" can refer to either local governments or the locations in the Commonwealth where the activities relevant to the regulation or regulatory change are most likely to occur. If no agency, locality, or entity is particularly affected, include a specific statement to that effect.

Other State Agencies Particularly Affected

None

Localities Particularly Affected

Currently, localities that participate in the VDH Beach Monitoring and Notification Program are provided guidance on the procedures of issuing and lifting beach advisories. The establishment of this regulation will require those same actions by law. Localities which participate in the program include Gloucester, Mathews, Hampton, Newport News, York, Norfolk, Virginia Beach, Northumberland, and Accomack.

Other Entities Particularly Affected

None

Economic Impact

Pursuant to § 2.2-4007.04 of the Code of Virginia, please identify all specific economic impacts (costs and/or benefits), anticipated to result from the regulatory change. When describing a particular economic

impact, specify which new requirement or change in requirement creates the anticipated economic impact. Please keep in mind that this is change versus the status quo.

Impact on State Agencies

| | |
|--|---|
| <i>For your agency:</i> projected costs, savings, fees or revenues resulting from the regulatory change, including: a) fund source / fund detail; b) delineation of one-time versus on-going expenditures; and c) whether any costs or revenue loss can be absorbed within existing resources | There will be no fiscal impact. |
| <i>For other state agencies:</i> projected costs, savings, fees or revenues resulting from the regulatory change, including a delineation of one-time versus on-going expenditures. | There will be no fiscal impact. |
| <i>For all agencies:</i> Benefits the regulatory change is designed to produce. | Continued management of beach advisories in recreational water. |

Impact on Localities

| | |
|--|---|
| Projected costs, savings, fees or revenues resulting from the regulatory change. | There will be no fiscal impact. |
| Benefits the regulatory change is designed to produce. | Continued management of beach advisories in recreational water. |

Impact on Other Entities

| | |
|---|--|
| Description of the individuals, businesses, or other entities likely to be affected by the regulatory change. If no other entities will be affected, include a specific statement to that effect. | There will be no individuals, businesses, or other entities affected by the new regulation. |
| Agency's best estimate of the number of such entities that will be affected. Please include an estimate of the number of small businesses affected. Small business means a business entity, including its affiliates, that: a) is independently owned and operated and; b) employs fewer than 500 full-time employees or has gross annual sales of less than \$6 million. | Zero. |
| All projected costs for affected individuals, businesses, or other entities resulting from the regulatory change. Please be specific and include all costs including, but not limited to: a) projected reporting, recordkeeping, and other administrative costs required for compliance by small businesses; b) specify any costs related to the development of real estate for commercial or residential purposes that are a consequence of the regulatory change; c) fees; | VDH projects no additional costs as a result of this regulation. Changes will not place any additional reporting or record keeping requirements upon individuals, businesses, or other entities. |

| | |
|---|---|
| d) purchases of equipment or services; and e) time required to comply with the requirements. | |
| Benefits the regulatory change is designed to produce. | The agency that is responsible for administering recreational water advisories will maintain the authority for the regulation and will have greater flexibility in the management of advisory thresholds within programmatic protocols. |

Alternatives

Please describe any viable alternatives to the regulatory change that were considered, and the rationale used by the agency to select the least burdensome or intrusive alternative that meets the essential purpose of the regulatory change. Also, include discussion of less intrusive or less costly alternatives for small businesses, as defined in § 2.2-4007.1 of the Code of Virginia, of achieving the purpose of the regulatory change.

There is no alternative given that VDH is the sole administrator of the Beach Monitoring and Notification Program.

Regulatory Flexibility Analysis

Pursuant to § 2.2-4007.1B of the Code of Virginia, please describe the agency’s analysis of alternative regulatory methods, consistent with health, safety, environmental, and economic welfare, that will accomplish the objectives of applicable law while minimizing the adverse impact on small business. Alternative regulatory methods include, at a minimum: 1) establishing less stringent compliance or reporting requirements; 2) establishing less stringent schedules or deadlines for compliance or reporting requirements; 3) consolidation or simplification of compliance or reporting requirements; 4) establishing performance standards for small businesses to replace design or operational standards required in the proposed regulation; and 5) the exemption of small businesses from all or any part of the requirements contained in the regulatory change.

The Commonwealth has no other authority or alternatives present to manage recreational water advisories given the pending removal of DEQ’s 9VAC25-260-170(A)(5). This regulation is necessary to ensure the continued public notification whenever there is a higher risk of illness when swimming in public beach water.

Public Participation

If an objection to the use of the fast-track process is received within the 30-day public comment period from 10 or more persons, any member of the applicable standing committee of either house of the General Assembly or of the Joint Commission on Administrative Rules, the agency shall: 1) file notice of the objections with the Registrar of Regulations for publication in the Virginia Register; and 2) proceed with the normal promulgation process with the initial publication of the fast-track regulation serving as the Notice of Intended Regulatory Action.

Detail of Changes

Please list all regulatory changes and the consequences of the changes. Explain the new requirements and what they mean rather than merely quoting the text of the regulation.

If the regulatory change will be a new chapter, describe the intent of the language and the expected impact. Please describe the difference between existing regulation(s) and/or agency practice(s) and what is being proposed in this regulatory change. Delete inapplicable tables.

If the regulatory change is intended to replace an emergency regulation, please follow the instructions in the text following the three chart templates below. Please include citations to the specific section(s) of the regulation that are changing.

If a new regulation is being promulgated, that is not replacing an existing regulation, please use this chart:

| New chapter-section number | New requirements | Other regulations and law that apply | Intent and likely impact of new requirements |
|-----------------------------------|--|---|--|
| 135-10 | Establish definitions section for recreational advisories | None. | To define words and terms used in the chapter. No economic or family impact is anticipated. |
| 135-20 | Establish the application section for recreational advisories. | None. | To establish that this chapter applies to the issuance of beach advisories and beach warnings for public beach water. No economic or family impact is anticipated. |
| 135-30 | Establish who can issue and lift beach advisories and how that occurs in practice. | None. | To establish what the threshold is for beach advisories and warnings, who has the authority to issue, and acceptable means of public notification. No economic or family impact is anticipated. |
| 135-40 | Require that advisories to protect recreational uses in coastal public beach water be issued and lifted in accordance with the VDH Beach Monitoring and Notification Protocol. | None. | <p>Currently, localities that participate in the VDH Beach Monitoring and Notification Program are provided guidance on the procedures of issuing and lifting beach advisories. The promulgation of this regulation will require those same actions by law.</p> <p>This regulation will provide greater flexibility for the management of advisory thresholds under programmatic protocols. No economic or family impact is anticipated.</p> |

DEPARTMENT OF HEALTH
135 Recreational Advisories

CHAPTER 135
RECREATIONAL ADVISORIES

1 **12VAC5-135-10. Definitions.**

2 The following words and terms when used in this chapter shall have the following meaning,
3 unless the context clearly indicates otherwise:

4 “Beach action value” (BAV) means the concentration of an indicator organism equal to or
5 above which beach advisories shall be issued and below which beach advisories shall be lifted.

6 “Beach advisory” or “beach advisories” means a public announcement that the Beach Action
7 Value has been met or exceeded and informing the public of a higher risk of illness when
8 swimming.

9 “Beach warning” or “beach warnings” means a public announcement issued as a result of the
10 Department suspecting a public beach water hazard to be present, such as during extreme
11 weather events or chemical spills, or when the Department has been unable to test public beach
12 water as scheduled.

13 “Commissioner” means the State Health Commissioner or his designee.

14 “Department” means the Virginia Department of Health.

15 “Public beach” means a sandy beach located on a tidal shoreline adjacent to water that is
16 suitable for swimming and that remains open and accessible for public use.

17 “Public beach water” means the water adjacent to a public beach.

18 **12VAC5-135-20. Application.**

19 This chapter applies to the issuance of beach advisories and beach warnings for public beach
20 water.

21 **12VAC5-135-30. Issuance and Lifting of Beach Advisories and Beach Warnings.**

22 A. The BAV is equal to 104 colony forming units (cfu)/100 mL enterococci.

23 B. The Commissioner shall issue beach advisories whenever public beach water samples are
24 equal to or above the BAV. After the issuing of the beach advisory, if the results of subsequent
25 testing of public beach water samples are below the BAV, the Commissioner shall lift the beach
26 advisory.

27 C. The Commissioner shall issue beach warnings whenever it is not possible for Department
28 staff to collect samples of the public beach water on the scheduled day as a result of practical or
29 safety concerns, or if the proximity of other imminent hazards, such as those of a chemical spill,
30 pose a health risk to public beach water users. The Commissioner shall lift beach warnings when
31 the event or imminent health hazard has passed or public beach water sampling has resumed.
32 The appropriate laboratory analysis for the hazard shall be used when available to demonstrate
33 public beach water conditions are safe for public use.

34 D. Acceptable means of public notification of beach advisories and beach warnings include
35 public beach signage, press releases, contacting of local government officials, social media posts,
36 and other forms of communication to convey a beach advisory or beach warning.

37 **12VAC5-135-40. Procedures for Beach Monitoring.**

38 1. The Department shall collect public beach water samples on a weekly basis from mid-May
39 through September or as otherwise determined by the Department based on factors such as the
40 size of the beach-going population and the climate at any particular public beach.

41 2. The Department shall analyze public beach water samples using US Environmental
42 Protection Agency-approved methods.

43 3. If the Department does not collect and test a public beach water sample as scheduled, the
44 Commissioner shall issue a beach warning, or if there is an existing beach advisory, the
45 Commissioner shall continue the beach advisory.

46 4. If multiple public beach water samples are taken at several sites within public beach water,
47 the Department may average and compare them with the BAV. If the average result of the public
48 beach water samples is equal to or above the BAV, then the Commissioner shall issue a beach
49 advisory.

50 5. If a public beach water sample is equal to or above the BAV, the Commissioner-issued
51 beach advisory remains in effect until follow-up samples can be taken which demonstrate that
52 levels are below the BAV.

53 6. In the event of the issuance of a beach advisory, the Department shall collect and analyze
54 follow-up public beach water samples as soon as reasonably possible. Follow-up public beach
55 water samples that are equal to or above the BAV shall result in a continuation of the beach
56 advisory.



COMMONWEALTH of VIRGINIA

Department of Health

M. Norman Oliver, MD, MA
State Health Commissioner

P O Box 2448
RICHMOND, VA 23218

TTY 7-1-1 OR
1-800-828-1120

October 27, 2018

MEMORANDUM

TO: State Board of Health

FROM: Allen L. Knapp, Director, Office of Environmental Health Services
Julie Henderson, Director, Division of Food and General Environmental Services

RE: Regulations Governing Tourist Establishment Swimming Pools and Other Public Pools (12VAC5-460)

Fast track amendments to the Commonwealth of Virginia Board of Health Regulations Governing Tourist Establishment Swimming Pools and Other Public Pools are attached for your review and consideration. We are recommending that the Board adopt the fast track amendments to these regulations.

DISCUSSION:

The Regulations Governing Tourist Establishment Swimming Pools and Other Public Pools (hereafter, "Regulations") were promulgated on March 1, 1962, to protect the health, safety, and welfare of patrons using swimming pools at Virginia's tourist lodging facilities. At that time, Virginia's building codes contained few requirements for the design and construction of swimming pools. However, on July 14, 2014, the 2012 International Swimming Pool and Spa Code was adopted by reference into the Virginia Uniform Statewide Building Code.

Virginia Code § 36-98 specifies that the design and construction criteria of the Virginia Uniform Statewide Building Code supersede the regulations of other state agencies. Therefore, swimming pool design and construction criteria contained in the Regulations are effectively void; this regulatory action removes the void provisions from the Regulation.

The superseded design and construction provisions of the Regulations do not legally exist, and their removal affects no significant change in the requirements borne by tourist lodging pool and spa operators, as design and construction of swimming pools are currently regulated under the Board of Housing and the Department of Housing and Community Development (DHCD). The

major effect of the regulatory action will be that the Regulations will accurately reflect the health requirements in place, and the authority of VDH.

VDH completed a periodic review of the Regulations on October 14, 2016, and concluded that the Regulations should be amended. Agency staff determined the necessary reasons for amendment were the removal of superseded provisions and a general modernization of the regulation. Agency staff considered incorporating the removal of superseded provisions into a non-fast track action that also modernized existing standards, but this choice would leave superseded, and therefore void, provisions in the existing regulation for a greater amount of time. Due to the possibility of a misapplication of VDH authority under the current regulation, the agency wishes to address these non-controversial and necessary amendments in a fast-track action. VDH plans to convene a stakeholder group for a full review of the regulation in 2019, with a publication of a Notice of Intended Regulatory Action to closely follow the adoption of these fast-track amendments.

A brief summary of the proposed amendments follows:

1. Four sections that pertain only to construction and design are repealed.
2. Two sections containing administrative provisions have been revised to accurately reflect VDH authority. These sections now contain procedures that differ only semantically from previous requirements and practices. These procedures will not present any additional burden to the regulated industry.
3. All other amendments in this action shift the intent of each section from design and construction to maintenance and operation of existing features. In several sections, existing operational standards are maintained in the text, but are in effect only for pools constructed under a prior building code that did not address that operational standard.

The fast track amendments have been reviewed and approved by the DHCD's State Building Codes Office, and the Assistant Attorneys General for both VDH and DHCD. Please note that for ease of reading, only the sections of the regulations that are proposed to be amended have been included in this packet. Several sections of the Regulations pertaining only to water quality and safe operation did not require amendment.

The fast track amendments are necessary to maintain the integrity of the Regulations Governing Tourist Establishment Swimming Pools and Other Public Pools. As such, VDH recommends that the Board act pursuant to its authority provided in § 35.1-11 of the Code of Virginia and adopt the fast track amendments to the Regulations Governing Tourist Establishment Swimming Pools and Other Public Pools.



townhall.virginia.gov

Fast-Track Regulation Agency Background Document

| | |
|---|--|
| Agency name | Department of Health |
| Virginia Administrative Code (VAC) citation(s) | 12VAC5-460 |
| Regulation title(s) | Regulations Governing Tourist Establishment Swimming Pools and Other Public Pools |
| Action title | Fast-track Amendments to Remove Conflict with Virginia Uniform Statewide Building Code |
| Date this document prepared | November 8, 2018 |

This information is required for executive branch review and the Virginia Registrar of Regulations, pursuant to the Virginia Administrative Process Act (APA), Executive Order 14 (as amended, July 16, 2018), the Regulations for Filing and Publishing Agency Regulations (1 VAC7-10), and the *Virginia Register Form, Style, and Procedure Manual for Publication of Virginia Regulations*.

Brief Summary

Please provide a brief summary (preferably no more than 2 or 3 paragraphs) of this regulatory change (i.e., new regulation, amendments to an existing regulation, or repeal of an existing regulation). Alert the reader to all substantive matters. If applicable, generally describe the existing regulation.

The Regulations Governing Tourist Establishment Swimming Pools and Other Public Pools (hereafter, "Regulations") were promulgated on March 1, 1962, to protect the health, safety, and welfare of patrons using swimming pools at Virginia's tourist lodging facilities. Environmental Health staff inspect these facilities for water quality and safe operation during hotel, campground, and summer camp annual inspections. At the time of the regulation's promulgation, Virginia's building codes contained few requirements for swimming pools and spas, and design and construction requirements for tourist lodging pools were incorporated into the Regulations. On July 14, 2014, the 2012 International Swimming Pool and Spa Code (ISPSC) was adopted by reference into the Virginia Uniform Statewide Building Code (USBC), increasing the specificity of pool design and construction standards found in the USBC. Virginia Code § 36-98 specifies that the design and construction criteria of the Virginia Uniform Statewide Building Code supersede the regulations of other state agencies. Therefore, design and construction

criteria contained in the Regulations are effectively void; this regulatory action removes the void provisions from the Regulation.

Acronyms and Definitions

Please define all acronyms used in the Agency Background Document. Also, please define any technical terms that are used in the document that are not also defined in the "Definition" section of the regulations.

- APA- Administrative Process Act
- DCHD- Department of Housing and Community Development
- ISPSC- International Swimming Pool and Spa Code
- Swimming pool- any swimming, wading, or spray pool, including all appurtenant equipment, structures, and facilities provided for the use of guests by transient lodging establishments.
- USBC- Virginia Uniform Statewide Building Code
- VDH- Virginia Department of Health

Statement of Final Agency Action

Please provide a statement of the final action taken by the agency including: 1) the date the action was taken; 2) the name of the agency taking the action; and 3) the title of the regulation.

Intentionally left blank

Mandate and Impetus

Please identify the mandate for this regulatory change, and any other impetus that specifically prompted its initiation (e.g., new or modified mandate, petition for rulemaking, periodic review, board decision, etc.). For purposes of executive branch review, "mandate" has the same meaning as defined in Executive Order 14 (as amended, July 16, 2018), "a directive from the General Assembly, the federal government, or a court that requires that a regulation be promulgated, amended, or repealed in whole or part."

As required by Virginia Code § 2.2-4012.1, please also explain why this rulemaking is expected to be noncontroversial and therefore appropriate for the fast-track process.

As outlined above, the Regulations contain provisions for the design and construction of tourist lodging pools and spas, but these provisions are superseded by those contained in the ISPSC of the USBC. These superseded provisions must be removed from the Regulations to avoid confusion by regulated entities and VDH field staff.

This action is noncontroversial for two reasons:

- 1) The superseded design and construction provisions of the Regulations have no legal basis, and their removal affects no significant change in the requirements borne by tourist lodging pool and spa operators. The major effect of the action will be that the text of the Regulations will accurately reflect the health requirements in place, and the authority of VDH.
- 2) The Regulations will continue to be protective of the health, safety, and welfare of tourist lodging pool and spa patrons. Current maintenance and operation requirements will remain in place and unaltered by this regulatory action.

Legal Basis

Please identify (1) the agency or other promulgating entity, and (2) the state and/or federal legal authority for the regulatory change, including the most relevant citations to the Code of Virginia or Acts of Assembly chapter number(s), if applicable. Your citation must include a specific provision, if any, authorizing the promulgating entity to regulate this specific subject or program, as well as a reference to the agency or promulgating entity's overall regulatory authority.

The Virginia Department of Health has general authority to promulgate regulations pursuant to Virginia Code § 35.1-11, which states the Board shall make, adopt, promulgate, and enforce regulations necessary to carry out the provisions of this title to protect the public health and safety. Virginia Code § 35.1-13 states that the Board shall promulgate regulations for hotels, including minimum standards for swimming pools and spas. Additionally, Virginia Code §§ 35.1-16 and 35.1-17 authorize the Board to regulate swimming facilities at summer camps and campgrounds, respectively.

Virginia Code § 36-98 directs and authorizes the Board of Housing to adopt the USBC, and outlines that this code shall supersede any building codes and regulations of other state agencies, with the exception of public water supply systems, sewage treatment facilities, and solid waste facilities. Virginia Code § 36-98 also provides that state agencies are not prevented from requiring the maintenance of facilities in accordance with provisions of the USBC.

Purpose

Please explain the need for the regulatory change, including a description of: (1) the rationale or justification, (2) the specific reasons the regulatory change is essential to protect the health, safety or welfare of citizens, and (3) the goals of the regulatory change and the problems it's intended to solve.

1. Design and construction provisions of the Regulations have been superseded by the USBC.
2. This regulatory action will remove the superseded provisions, and where possible, reword existing requirements to accurately reflect VDH's authority to enforce standards already in the regulation. This approach, rather than repealing the entire regulation, is essential to protecting the health and safety of pool patrons, as it keeps the majority of health standards intact without misrepresenting VDH authority.
3. The goal of this action is to remove superseded and void provisions, make clear to the regulated public and VDH staff where VDH authority lies, and retain standards protective of the health and safety of tourist lodging pool and spa patrons.

Substance

Please briefly identify and explain the new substantive provisions, the substantive changes to existing sections, or both. A more detailed discussion is provided in the "Detail of Changes" section below.

1. Four sections that pertain only to construction and design are repealed. (Shape and slopes, Diving boards, Suction cleaners, Spray pools: Slopes)
2. Two sections containing administrative provisions that conflict with the boundaries of VDH authority have been revised. The new language reflects VDH authority and describes procedures that differ only semantically from previous requirements and practices, or prescribes current practices in more detail than previously included in the regulation. These procedures will not present any additional burden to the regulated public. (Permits/Plan review, Commissioner approval)
3. Provisions that include both construction and operational regulations have been reworded; language is shifted from design and construction requirements to maintenance and operation.
4. Where operational standards are found in the ISPSC of the USBC (flow and circulation parameters, entrapment prevention and barrier protection), the language has been reworded to

retain existing standards only for pools constructed under a prior building code that did not address that operational standard.

Issues

Please identify the issues associated with the regulatory change, including: 1) the primary advantages and disadvantages to the public, such as individual private citizens or businesses, of implementing the new or amended provisions; 2) the primary advantages and disadvantages to the agency or the Commonwealth; and 3) other pertinent matters of interest to the regulated community, government officials, and the public. If there are no disadvantages to the public or the Commonwealth, include a specific statement to that effect.

This regulatory action's primary advantage to the public and the agency is an increase in transparency regarding the authority of VDH, and an increase in clarity regarding health and safety regulations governing tourist lodging pools and spas. There is no disadvantage to either the public or the agency.

There are no other pertinent matters of interest to the regulated community, government officials, or the public.

Requirements More Restrictive than Federal

Please identify and describe any requirement of the regulatory change which is more restrictive than applicable federal requirements. Include a specific citation for each applicable federal requirement, and a rationale for the need for the more restrictive requirements. If there are no applicable federal requirements, or no requirements that exceed applicable federal requirements, include a specific statement to that effect.

There are no requirements created by this regulatory change that exceed applicable federal requirements.

Agencies, Localities, and Other Entities Particularly Affected

Please identify any other state agencies, localities, or other entities particularly affected by the regulatory change. "Particularly affected" are those that are likely to bear any identified disproportionate material impact which would not be experienced by other agencies, localities, or entities. "Locality" can refer to either local governments or the locations in the Commonwealth where the activities relevant to the regulation or regulatory change are most likely to occur. If no agency, locality, or entity is particularly affected, include a specific statement to that effect.

No state agencies will bear any identified disproportionate material impact not experienced by other localities. While the Department of Housing and Community Development (DHCD), which oversees the USBC, has been involved in the development of the amendments, the changes proposed in this regulatory action do not affect how DHCD or local building officials implement the USBC.

No locality will bear any identified disproportionate material impact not experienced by other localities.

Owners and operators of tourist lodging facilities with swimming pools and spas will be positively affected by this regulatory action. The effect of this action will be these entities will experience greater transparency and clarity regarding the division of authority over tourist lodging facility pools and spas, specifically, including how the USBC solely governs the construction and design of tourist lodging facility pools and spas. No entity will bear a negative impact from this regulatory action.

Economic Impact

Pursuant to § 2.2-4007.04 of the Code of Virginia, please identify all specific economic impacts (costs and/or benefits), anticipated to result from the regulatory change. When describing a particular economic impact, specify which new requirement or change in requirement creates the anticipated economic impact. Please keep in mind that this is change versus the status quo.

Impact on State Agencies

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| <p><i>For your agency:</i> projected costs, savings, fees or revenues resulting from the regulatory change, including:</p> <ul style="list-style-type: none"> a) fund source / fund detail; b) delineation of one-time versus on-going expenditures; and c) whether any costs or revenue loss can be absorbed within existing resources | <p>Revision to reflect correct VDH authority may result in incidental cost savings to the agency related to legal defense or staff time spent on administrative actions resulting from improper application of authority.</p> |
| <p><i>For other state agencies:</i> projected costs, savings, fees or revenues resulting from the regulatory change, including a delineation of one-time versus on-going expenditures.</p> | <p>No economic impacts to other state agencies are expected to result from this regulatory action.</p> |
| <p><i>For all agencies:</i> Benefits the regulatory change is designed to produce.</p> | <p>See above impact on VDH.</p> |

Impact on Localities

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| <p>Projected costs, savings, fees or revenues resulting from the regulatory change.</p> | <p>No economic impacts to localities are expected to result from this regulatory action.</p> |
| <p>Benefits the regulatory change is designed to produce.</p> | <p>Revision to reflect correct VDH authority may result in incidental benefits to local administrators of the USBC.</p> |

Impact on Other Entities

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| <p>Description of the individuals, businesses, or other entities likely to be affected by the regulatory change. If no other entities will be affected, include a specific statement to that effect.</p> | <p>Little to no effect will be felt by other entities. Tourist lodging establishments that would have previously sought a construction permit from VDH will now undergo a plan review of items similar to those previously reviewed prior to the issuance of a construction permit, minus design and construction criteria. Local building official approval procedures will not be changed by this regulatory change.</p> |
| <p>Agency's best estimate of the number of such entities that will be affected. Please include an estimate of the number of small businesses</p> | <p>There are approximately 1,000 tourist lodging pools and spas in the Commonwealth, the majority of which are estimated to be small businesses.</p> |

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| <p>affected. Small business means a business entity, including its affiliates, that:</p> <ul style="list-style-type: none"> a) is independently owned and operated and; b) employs fewer than 500 full-time employees or has gross annual sales of less than \$6 million. | |
| <p>All projected costs for affected individuals, businesses, or other entities resulting from the regulatory change. Please be specific and include all costs including, but not limited to:</p> <ul style="list-style-type: none"> a) projected reporting, recordkeeping, and other administrative costs required for compliance by small businesses; b) specify any costs related to the development of real estate for commercial or residential purposes that are a consequence of the regulatory change; c) fees; d) purchases of equipment or services; and e) time required to comply with the requirements. | <p>As the regulatory revision removes design and construction criteria and maintains operations standards already in place, there are no costs associated with this regulatory action.</p> |
| <p>Benefits the regulatory change is designed to produce.</p> | <p>Owners and operators of tourist lodging pools will benefit from greater transparency and clarity regarding the division of authority over tourist lodging facility pools and spas.</p> |

Alternatives

Please describe any viable alternatives to the regulatory change that were considered, and the rationale used by the agency to select the least burdensome or intrusive alternative that meets the essential purpose of the regulatory change. Also, include discussion of less intrusive or less costly alternatives for small businesses, as defined in § 2.2-4007.1 of the Code of Virginia, of achieving the purpose of the regulatory change.

There are no viable alternatives to a regulatory change; the current regulations in place have been superseded by the ISPC of the USBC, and are effectively null and void. The agency considered incorporating these amendments into a non-fast track action that also modernized existing standards, but this choice would leave superseded, and therefore void, provisions in the existing regulation for a greater amount of time. Due to the possibility of a misapplication of VDH authority under the current regulation, VDH elected to address these non-controversial and necessary amendments in a fast-track action. There is no other less intrusive or costly method to address the necessary changes in this regulatory action.

Regulatory Flexibility Analysis

Pursuant to § 2.2-4007.1B of the Code of Virginia, please describe the agency’s analysis of alternative regulatory methods, consistent with health, safety, environmental, and economic welfare, that will accomplish the objectives of applicable law while minimizing the adverse impact on small business. Alternative regulatory methods include, at a minimum: 1) establishing less stringent compliance or reporting requirements; 2) establishing less stringent schedules or deadlines for compliance or reporting requirements; 3) consolidation or simplification of compliance or reporting requirements; 4) establishing performance standards for small businesses to replace design or operational standards required in the proposed regulation; and 5) the exemption of small businesses from all or any part of the requirements contained in the regulatory change.

1. There are no substantially different compliance or reporting requirements established by this regulatory action.
2. There are no compliance or reporting schedules in this regulation.
3. The regulatory action simplifies the understanding of compliance requirements, in that it removes superseded provisions.
4. The regulatory action removes design standards, and replaces several prescriptive requirements with performance standards.
5. This regulation cannot exempt small businesses and still provide equal health and safety protection to those who patronize the Commonwealth’s tourist lodging pools and spas.

Public Participation

If an objection to the use of the fast-track process is received within the 30-day public comment period from 10 or more persons, any member of the applicable standing committee of either house of the General Assembly or of the Joint Commission on Administrative Rules, the agency shall: 1) file notice of the objections with the Registrar of Regulations for publication in the Virginia Register; and 2) proceed with the normal promulgation process with the initial publication of the fast-track regulation serving as the Notice of Intended Regulatory Action.

Detail of Changes

Please list all regulatory changes and the consequences of the changes. Explain the new requirements and what they mean rather than merely quoting the text of the regulation.

If the regulatory change will be a new chapter, describe the intent of the language and the expected impact. Please describe the difference between existing regulation(s) and/or agency practice(s) and what is being proposed in this regulatory change. Delete inapplicable tables.

For changes to existing regulation(s), please use the following chart:

| Current section number | New section number, if applicable | Current requirement | Change, intent, rationale, and likely impact of new requirements |
|-------------------------------|--|--|--|
| 30 | | A construction permit issued by the VDH Commissioner is required before the installation of any tourist lodging swimming pool. Prior to permit issuance, plans and specification for the pool shall be submitted to VDH. | The written approval is renamed a plan review, and timing of approval is shifted from before construction to before operation. Plan review topics are itemized in new language; these items reflect those already currently reviewed in the previously-issued construction permits. Language regarding APA rights and procedures is added; this language is consistent with the APA. |
| 40 | | Water used in pools must be from an approved source, and piping arrangements cannot allow for contamination with wastewater. | Reference to piping arrangements removed and emphasis placed on prohibition of contamination with wastewater. There is no change in language regarding requirement for an approved water source. |
| 60 | | Section contains criteria for the material of a pool shell: shell must be reinforced | Criteria for materials and finishes was removed. Operational criteria have some overlap with topics covered in the ISPSC, |

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| | | concrete or equivalent, easily cleanable, and have a light-colored finish (to facilitate seeing to the bottom of the pool). | so for these topics, existing language was reworked to emphasize performance instead of prescriptive design criteria (the cleanliness of the pool shell and the ability to see any object or surface in all parts of the pool). |
| 70 | | Section contains design and construction criteria for the slopes and shapes of pool walls and bottoms | Entire section repealed; all existing subject matter is under the authority of the USBC. |
| 80 | | Pool decks must have a four-foot wide deck and constructed of impervious material with a specific slope to promote drainage. Decks must be constructed of material with a smooth and nonslip finish. | Construction criteria removed; decks shall be maintained to retain a smooth and nonslip finish and drain surface water away from the pool. |
| 90 | | All pools shall be surrounded by a fence that is at least three feet in height.. | Language regarding fence design specifics removed. Operational criteria (continued protection from undesired access and drowning) have some overlap with the ISPSC. Language was reworked to require maintenance of barriers required by the USBC. Where this topic is not prescriptively addressed in the building code in effect at the time of pool construction, there is a performance criterion of an effective barrier(s) against unsecure entry. |
| 100 | | Section contains number and arrangement criteria for pool steps and ladders, and materials used shall be of nonslip design. | Language revised to eliminate design specifics, but states that numbers and arrangements required by the USBC must be maintained. Steps and ladders shall be maintained in good condition, and finishes shall be maintained to perform as nonslip. |
| 110 | | Section contains detailed design and construction criteria for pool recirculation (overflow facilities and recessed gutters) that facilitates the removal of floating material or scum. | All design and construction criteria were removed, and replaced with language reworked to include with the performance standard that floating material and scum are not permissible. |
| 120 | | Section outlines requirements for the design and configuration of inlets and outlets. Outlet drains shall be covered with grates that cannot be removed by or be a hazard to bathers. | Design and construction criteria have been removed |
| 130 | | Depth markers are required at specific intervals along the pool wall, and these must be at least five inches in size. | Section revised to remove design requirement and emphasize maintenance of markers required by the USBC. Where the building code in effect at the time of the pool's construction may |

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| | | | not require depth markers, a performance standard (depth of all sections can be determined by bathers) is established. |
| 140 | Repealed | Section contains design criteria, including height, water depth, and headboard requirements, for diving boards. | Entire section repealed; all existing subject matter is under the authority of the USBC. |
| 150 | | Section contains requirement for pools used after dark to be equipped with lighting systems that illuminate all parts of the pool. | Language reworked to remove installation reference, and emphasize maintenance, use, and performance of the lighting system. |
| 170 | | Recirculation systems are required, and shall be designed for an eight hour turnover of the pool water. | Language reworded to emphasize maintenance and operation; design requirement is in effect only for facilities where rate of flow indicators are not prescribed by the building code in effect at the time of the pool's construction. |
| 200 | | Section contains specifics for the installation of hair and lint catchers, and states that they shall be easily cleanable. | Section reworded to replace installation specifics with performance function of hair and lint catchers (debris may not accumulate in water). |
| 210 | | Section describes requirement for a pool's recirculation system to filter water at a specific rate. Filtering requirements for sand and other filter types, and maintenance for these filters is addressed. Section includes the statement that the design of the systems are at the discretion of the State Health Commissioner. | Specific language regarding turnover rates is removed; this material is covered in the USBC. Specifics on filter types are unchanged, as these topics are not addressed by the USBC. Statement on Commissioner authority removed; while partially correct, it is not necessary in the regulation. |
| 220 | | Rate of flow indicators are required, specifics for function are included. | Language reworded to emphasize maintenance and operation; design requirement is in effect only for facilities where rate of flow indicators are not prescribed by the building code in effect at the time of the pool's construction. *note: this section uses similar terms as section 170; 170 addresses turnover of water, 220 addresses filtration of that water during turnover. |
| 230 | Repealed | Section required construction to include suction cleaners and specifics for their orientation and flow throttling. | Entire section repealed; all existing subject matter is under the authority of the USBC. |
| 240 | | Section requires the installation of specific types of chemical feeding equipment. | Language reworded to emphasize the operational nature of the existing requirements and remove reference to installation. |
| 330 | | Section describes that the VDH Commissioner is | Design and construction language is removed and text reworded to describe |

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| | | authorized to require certain materials and methods of construction and design for swimming pool features. | the Commissioner's authority regarding pool operation and maintenance. |
| 350 | | Wading pools must be constructed with specific slopes, and may not be located where drainage of the surrounding area can contaminate the pool. | Language regarding specific slopes was removed, other language on contamination remains unchanged. |
| 360 | | Wading pool decks must have a four-foot wide deck and constructed of impervious material with a specific slope. Decks must be constructed of material with a smooth and nonslip finish. | Construction criteria removed; decks shall be maintained to retain a smooth and nonslip finish. |
| 370 | | Section requires protection features (barriers, fencing) between wading pools and main swimming pools. | Language reworded to state this requirement for facilities where a barrier or barrier type is not prescribed by the USBC. |
| 380 | | Section requires the installation of a wading pool recirculation system, and establishes a specific water turnover rate. | Language reworked to remove installation requirements and emphasize maintenance. Existing provisions for turnover rate are applicable when not otherwise prescribed by the building code in effect at the time of the pool's construction. |
| 400 | | Spray pool water supplies must be approved, and must be installed in a way where submergence and clogging cannot occur. | Language reworked to remove installation requirements and emphasize maintenance. Water approval requirements are not changed. |
| 410 | | Section contains specifics for spray pool finish construction. | Language reworded to remove reference to construction and emphasize maintenance of finish. |
| 420 | | Section contains requirements for spray pool slopes. | Entire section repealed; all existing subject matter is under the authority of the USBC. |
| 430 | | Section contains requirements for the design of spray pool drains. | Reference to design is removed and replaced with operation and maintenance. |
| 440 | | Spray pool decks must have a three-foot wide deck and constructed of impervious material with a specific slope. Decks must be constructed of material with a smooth and nonslip finish. | Construction criteria removed; decks shall be maintained to retain a smooth and nonslip finish. |

DEPARTMENT OF HEALTH
Ch 460 Fast Track Amendments

CHAPTER 460
REGULATIONS GOVERNING TOURIST ESTABLISHMENT SWIMMING POOLS AND OTHER
PUBLIC POOLS

1 **12VAC5-460-30. Permits Plan Review.**

2 A. A permit shall be obtained from the State Health Commissioner before the construction,
3 remodeling, or major alteration of any swimming pool. Plans and specifications shall have been
4 approved by the State Health Commissioner prior to the issuance of such permit. Plans and
5 specifications must be submitted in triplicate to the State Health Commissioner, and one set of
6 plans and specifications, when approved, will be so stamped and returned to the applicant.
7 Original tracings will not be stamped for approval. In order to ensure the health and safety of all
8 swimming pool patrons, any person planning to initially open a swimming pool after construction,
9 remodeling, or major alteration at a tourist lodging facility must, prior to operation of the swimming
10 pool, submit to the local health department in the locality in which the tourist lodging facility is
11 located, complete plans or statements that show the following:

12 1. Plans for the safe operation of the pump and recirculation system.

13 2. Plans for the operation and maintenance of the pool disinfection and filtration system,
14 including plans for the filtration room.

15 3. The proposed source and location of the pool water supply, and proposed method and
16 location of all wastewater disposal systems.

17 4. The name and mailing address of the person operating the pool, and the physical address
18 of the pool.

19 5. Such other pertinent information as the Health Commissioner may deem necessary to
20 ensure a safe and healthy environment for users of the swimming pool.

21 B. When, upon review of the plans, the Health Commissioner is satisfied that the proposed
22 plans, if executed, will meet the requirements of this chapter and other pertinent laws and
23 regulations designed to protect the public health, written approval shall be issued by the Health
24 Commissioner.

25 C. When upon review of the plans, the Health Commissioner determines that the proposed
26 plans prevent a safe, sanitary operation, the plans shall be disapproved and the applicant shall
27 be notified in writing of any deficiency in the plans that constitute the basis for disapproval. The

28 applicant shall be notified of the opportunity for administrative process as provided by the
29 Administrative Process Act (§ 2.2-4000 et seq. of the Code of Virginia).

30 D. No person shall operate a tourist establishment swimming pool or spa until written approval
31 has been granted by the Health Commissioner.

32 E. Any person whose plans have been disapproved may request and shall be granted an
33 appeal as described by the Administrative Process Act (§ 2.2-4000 et seq. of the Code of Virginia).

Part II

Swimming Pools; Design and Construction

34 **12VAC5-460-40. Water supplies.**

35 All water used in swimming pools shall be from sources that are approved by the State Health
36 Commissioner. ~~No piping arrangements shall exist which, under any conditions, will permit~~
37 ~~sewage or waste water shall be allowed to enter the swimming pool water system, or water from~~
38 ~~the swimming pool to enter the make-up water supply.~~

39 **12VAC5-460-60. Materials of pool shell.**

40 ~~Swimming pool shells shall be constructed of reinforced concrete or its equivalent in strength~~
41 ~~and durability, designed and built to withstand anticipated stresses, water tight, and shall have~~
42 ~~smooth and easily cleanable surfaces kept clean. A white or light colored waterproof The interior~~
43 ~~finish which will withstand repeated brushings, scrubbing, and cleaning procedures shall~~
44 ~~completely line the pool to the coping shall be maintained so that it does not obscure objects or~~
45 ~~surfaces within the pool or spa.~~

46 **12VAC5-460-70. Shape and slopes. (Repealed.)**

47 ~~The pool shall be designed and constructed of such shape, contour, etc., that efficient and~~
48 ~~safe control of the bathers can be accomplished. In water depths under five feet, the slope of the~~
49 ~~bottom shall not exceed one foot in 12 feet. Pool walls shall be vertical from the break point toward~~
50 ~~the deep end for at least three feet below the water line and vertical from the break point to the~~
51 ~~shallow end to within one foot of the finished floor of the pool.~~

52 **12VAC5-460-80. Pool decks.**

53 ~~There shall be a deck at least four feet wide extending around the entire perimeter of the pool.~~
54 ~~The deck shall be constructed of concrete or other approved material. The material shall Decks~~
55 ~~shall be maintained to have a nonslip but smooth finish. The deck shall have a pitch of not less~~
56 ~~than 1/8 of an inch nor more than 5/8 of an inch to the foot and be so designed as to conduct~~

57 drainage Drainage shall be directed away from the pool area in a manner that will not create or
58 maintain pools of water or a nuisance.

59 **12VAC5-460-90. Fences.**

60 All Any fences or other barriers, and any gates and latches, required by the Virginia Uniform
61 Statewide Building Code (Building Code) outdoor swimming pools shall be enclosed by a
62 substantial barrier or fence of at least three feet in height to promote safety and cleanliness of
63 water properly maintained, and in good operable condition. A gate at least three feet in height and
64 of material as substantial as the fence or barrier shall be provided. When safety criteria for barriers
65 are not prescribed by the Building Code in effect at the time of the pool's construction, steps shall
66 be taken to protect against undesired access into the pool area.

67 **12VAC5-460-100. Steps and ladders.**

68 Two or more ladders shall be provided for all pools having a perimeter greater than 100 feet
69 and one means of egress for pools having a perimeter of 100 feet or less. Steps projecting into
70 the pool area are prohibited. All ladders, steps, and handrails required by the Virginia Uniform
71 Statewide Building Code shall be properly maintained, and in operable condition. Treads of
72 Nonslip finishes shall be maintained on all pool steps, ladders, or other means of ingress or egress
73 shall be of nonslip construction. Each recessed step area shall be provided with one or more
74 handrails.

75 **12VAC5-460-110. Overflow facilities.**

76 Provision shall be made for removal The presence of floating material and scum is prohibited;
77 pools shall have adequate water circulation and filtration equipment sufficient to keep floating
78 material or scum from accumulating on from the surface of the water.

79 If a recessed type of gutter located near the top of the walls is to be used, the gutter shall have
80 a minimum depth of three inches and shall be of a design which will permit satisfactory cleaning
81 of the overflow channel. The gutter drain outlets shall be spaced around the pool not more than
82 15 feet on centers. The gutter bottom shall slope toward these outlets with a minimum slope of
83 1/8 of an inch to the foot. The drains shall not be less than 2 1/2 inches in diameter and the total
84 orifice area of the grating shall be at least twice the cross-sectional area of the outlet pipe.

85 For pools with overflowing gutters, a water level control tank shall be provided which will
86 effectively provide for maintenance of the water level so as to produce constant surface skimming
87 action at all times.

88 The above described gutter may be replaced by an arrangement of overflow devices in the
89 pool walls which provides the proper removal of scum and floating material. There shall be one

90 such device for each 400 square feet of pool area with a minimum of four per pool, each of which
91 shall be individually controlled.

92 If the recirculation system is designed for water to enter the bottom portion of the pool and
93 overflow the top, then adequate drainage of the scum and floating material from the deck must
94 be provided. This drainage may be by a continuous drain or multiple drains. (See also 12VAC5-
95 460-80.) In multiple drains, each drain grating shall have a total orifice area of as least four times
96 the cross-sectional area of drain pipe, which shall have a minimum diameter of 2 ½ inches. In the
97 use of drain channels, continuous to and around the perimeter of the pool, the channel grating
98 shall be designed so as not to create a hazard to fingers and toes and be restraint to corrosion.

99 **12VAC5-460-120. Inlets and outlets.**

100 The inlets for recirculation shall be submerged and located to Pool circulation systems shall
101 produce uniform circulation of water throughout the swimming pool without the existence of dead
102 spots. Wall inlets should be located on not more than 20 foot centers entirely around the perimeter
103 of the swimming pool. Bottom inlets shall be spaced, depending on the pool dimensions, so as to
104 produce uniform water circulation. The number of bottom inlets shall be the same as required of
105 wall inlets. Each inlet is to be designed as an adjustable orifice or provided with a valve.

106 An outlet drain shall be provided for completely emptying the swimming pool. Direct
107 connection to a sanitary sewer shall not be permitted. Disposal of waste water to a storm sewer
108 or natural watercourse shall be subject to approval of the State Health Commissioner. When not
109 otherwise prescribed by the Building Code in effect at the time of the pool's construction, The the
110 outlet drain shall be covered with a grate of such design that it cannot be readily removed by, or
111 produce any hazard to, the bathers.

112 **12VAC5-460-130. Depth marking.**

113 The depth of the water in the swimming pool shall be marked at every foot increment of depth
114 in water depths five feet and under on both sides of the pool. In water deeper than five feet the
115 markings need not be closer than three feet apart. Numerals and lettering shall be at least five
116 inches in size and of good contrast with the walls and decks. Depth markers shall be plainly visible
117 and maintained in accordance with the Virginia Uniform Statewide Building Code. When depth
118 markers are not prescribed by the Building Code in effect at the time of the pool's construction,
119 steps shall be taken to ensure that the depth of all sections of the pool can be determined by
120 swimmers.

121 **12VAC5-460-140. Diving boards. (Repealed.)**

122 At least 12 feet of free and obstructed headroom shall be provided above the diving boards.

123 The minimum depth of water in the diving area shall be determined as follows:

| Elevation of Diving Point Above Water Surface | Depth of Water | DIMENSIONS | |
|---|----------------|---------------------------|------------------------|
| | | End-wall to Maximum Depth | Maximum Depth to 5 ft. |
| 0 to 24 in. inclusive | 8 ft. | 12 ft. | 12 ft. |
| 24 in. to 30 in. inclusive | 8 ft. | 13 ft. | 17 ft. |
| 30 in. plus to 1 meter inclusive | 8 ft. 6 in. | 15 ft. | 20 ft. |
| 1 meter plus to 3 meters inclusive | 10 ft. | 15 ft. | 20 ft. |
| 3 meters plus 5 meters | 14 ft. 6 in. | 17 ft. | 23 ft. |

124 The minimum length of any diving area terminating at a vertical wall shall be 30 feet.

125 Where multiple diving boards are used, the space between center lines shall not be less than
126 10 feet, and the center of no board shall be closer than 10 feet to a side wall. These dimensions
127 shall apply both from a point of projection four feet from the end wall and the point of maximum
128 depth.

129 The space between center lines of three-meter and five-meter diving boards shall be not less
130 than 15 feet and between five-meter and 10-meter boards shall be not less than 18 feet. The
131 minimum distances from center lines of five-meter and 10-meter boards shall be the same as to
132 the side walls.

133 **12VAC5-460-150. Lighting.**

134 Where ~~When~~ pools are to be used after dark, the swimming pool area shall be equipped with
135 lighting fixtures of such number and design as to light all parts of the pool, the water therein, and
136 the entire area shall be well lit. Fixtures should be installed in such a manner as to shall not create
137 ~~no~~ a hazard to the bathers. The design and installation maintenance and operation of the fixtures
138 ~~should~~ shall be such that lifeguards can clearly see every part of the swimming pool including
139 decks, spring boards, and other appurtenances without being blinded by glare. ~~If installed,~~
140 submarine lights shall provide at least one watt per square foot of pool area. ~~Each~~ The electrical
141 grounding of all submarine light ~~lights~~ shall be properly connected to a ground wire maintained.

142 **12VAC5-460-170. Recirculation systems.**

143 All swimming pools shall be equipped with a The recirculation system, including all consisting
144 of pumps, hair and lint catchers, filters, disinfection equipment, and necessary pipe connections

145 to the inlets and outlets, shall be maintained in working order as designed. Adequate provision
146 shall be made for backwashing filters. When not prescribed by the Building Code in effect at the
147 time of the pool's construction, Recirculation recirculation systems shall be designed for an eight
148 hour or less turnover of the swimming pool water.

149 **12VAC5-460-200. Hair and lint catchers, gutters.**

150 Hair and lint catchers shall be installed ~~ahead of the filter pump and be designed and located~~
151 ~~so that they can~~ able to be easily and simply be dismantled for cleaning and inspection. Floating
152 material and scum shall not be allowed to collect on the surface of the water.

153 **12VAC5-460-210. Filters.**

154 The ~~recirculation system shall be equipped with a filtration system that will filter the entire~~
155 ~~contents of the swimming pool within eight hours or less at the rate of three gallons or less per~~
156 ~~square foot per minute~~ shall be maintained and operated as designed. In sand filters, the layer of
157 filter sand shall be at least 20 inches in depth, properly supported by uniform layers of clean
158 graded gravel to a minimum depth of 12 inches or supported by porous plates. The filter sand
159 shall have an effective size of between 0.45 and 0.55 millimeters with a uniformity co-efficient not
160 greater than 1.7. In anthracite coal filters, the anthracite shall have a depth of at least 24 inches
161 and shall have an effective size between 0.6 and 0.8 millimeters with a uniformity co-efficient of
162 not greater than 1.8. Pressure filters shall be equipped with readily accessible air relief valves and
163 access holes large enough to permit inspections, maintenance, and repair work. Each pressure
164 filter system shall be equipped with a pressure gauge at least four inches in diameter on the inlet
165 and outlet to indicate the pressure in pounds per square inch, and a sight glass that can be easily
166 removed for cleaning shall be provided on the waste discharge line. Gravity type filters shall be
167 equipped with loss of head gauges.

168 The filtration rate for diatomaceous earth filters and similar equipment may not exceed 1-1/2
169 gallons per square foot of filter area with eight hours turn-over of pool volume unless continuous
170 slurry feed is provided, in which case, the rate shall not exceed three gallons per minute per
171 square foot of filter area.

172 Arrangements or equipment shall be provided for application of filter aid and proper precoating
173 and cleaning of filter elements. All filters shall be capable of being cleaned or backwashed by use
174 of the washwater pump and the manipulation of valves. ~~In view of the constant change of design~~
175 ~~of such equipment, it will be necessary to evaluate each system individually. Approval or rejection~~
176 ~~of systems will be at the discretion of the State Health Commissioner, based upon the need for~~
177 ~~protecting the health and safety of those using any such pool.~~

178 **12VAC5-460-220. Rate of flow indicators.**

179 Recirculation When not prescribed by the Building Code in effect at the time of the pool's
180 construction, the recirculation system shall be equipped with a rate of flow indicator reading in
181 gallons per minute. Indicators shall be properly maintained, easily readable, and located so as to
182 indicate both the rate of flow of the effluent from the filter and the rate of backwash in gallons per
183 minute in sand or anthracite coal filters.

184 **12VAC5-460-230. Suction cleaners. (Repealed.)**

185 ~~Suction cleaners shall be provided. Where the suction cleaner is operated by the recirculating~~
186 ~~pump, a device shall be provided for throttling the flow from the pool outlet, and the suction cleaner~~
187 ~~line shall be connected through the hair and lint catcher.~~

188 **12VAC5-460-240. Chemical feeding equipment.**

189 ~~Means shall be provided for regulating the feeding of chemicals~~ Chemicals shall be
190 automatically fed into the water in the recirculation system. ~~The installation of~~ by mechanically
191 operated, positive, chemical feeders or open-type chemical machines ~~is required. The installation~~
192 ~~of closed-type~~ Closed-type solution pots ~~is~~ are prohibited.

193 **12VAC5-460-330. Commissioner approval.**

194 For any items not specifically covered in this chapter or the Virginia Uniform Statewide
195 Building Code, the State Health Commissioner is authorized to require that all ~~materials, methods~~
196 ~~of construction and design~~ swimming pool features shall be ~~proven to~~ function adequately,
197 effectively and without excessive maintenance and operational difficulties ~~before he grants~~
198 approval thereof, and such approval shall be based upon the need for protecting to protect the
199 health and safety of those using swimming pools.

200 It shall be the duty of the applicant to provide such data, tests, or other adequate proof that
201 the device, material, or product will satisfactorily perform the function for which it is intended
202 before such item shall be approved or accepted for tests.

203 **12VAC5-460-350. Location and slopes.**

204 Wading pools shall be located so that drainage from surrounding areas will not wash
205 contamination into pools during rainfall. ~~The bottom of wading pools shall slope not less than three~~
206 ~~inches in 10 feet toward the drain.~~

207 **12VAC5-460-360. Deck area.**

208 ~~Wading pools shall be entirely surrounded by a deck at least four feet in width. Decks~~ pool
209 decks shall be constructed of a permanently impervious material which shall maintained to have

210 and retain a finish as smooth as possible that is nonslip to bare feet. ~~The deck shall slope not less~~
211 ~~than three inches in 10 feet away from the pool edge, and the water on the deck shall be~~
212 ~~discharged to waste.~~

213 **12VAC5-460-370. Protection.**

214 Wading When not prescribed by the Building Code in effect at the time of the facility's
215 construction, wading pools and wading areas shall be separated from swimming pools by
216 appropriate ~~protectional~~ protection features.

217 **12VAC5-460-380. Water circulation systems.**

218 ~~A complete recirculation system shall be installed at wading pools which cannot be served~~
219 ~~adequately by an adjacent swimming pool recirculation system. The recirculation system of~~
220 wading pools shall be maintained in working order as designed. When not prescribed by the
221 Building Code in effect at the time of the pool's construction, the recirculation system shall provide
222 a pool volume turn-over rate of once in three hours or less or have a-

223 ~~An alternate method to the water circulation system is the continuous addition of water~~
224 ~~properly treated~~ water continuously added at a rate of flow sufficient to replace all of the water in
225 the wading pool once in three hours or less. The overflow water, with this method, shall be
226 continuously discharged to waste.

Part III
Spray Pools

227 **12VAC5-460-400. Water supplies.**

228 Water sprayed into a pool shall be from an approved supply. Spray heads shall be installed
229 properly maintained as designed so that there will be no possibility of their submergence and, as
230 a result, of clogged drains.

231 **12VAC5-460-410. Materials.**

232 Spray pools shall be ~~constructed of permanently impervious material which shall~~ maintained
233 to have and retain a finish as smooth as possible that is , but nonslip to bare feet.

234 **12VAC5-460-420. Slopes. (Repealed.)**

235 ~~Spray pool bottoms shall slope not less than three inches in 10 feet toward the drains.~~

236 **12VAC5-460-430. Drains.**

237 ~~Spray pools shall be equipped at low points with an unvalved drain to waste. The drain~~ Drains
238 of spray pools shall be of such size and design maintained and operated in a manner so that
239 water sprayed into the pool will not pond in the pool bottom.

240 12VAC5-460-440. Deck areas.

241 Spray pools shall be entirely surrounded by a deck at least four feet in width. Decks shall be
242 ~~constructed of a permanently impervious material which shall~~ maintained to have and retain a
243 finish as smooth as possible and nonslip to bare feet. ~~The deck shall slope not less than three~~
244 ~~inches in 10 feet away from the pool edge and the water on the deck discharged to waste.~~

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