8 WATER QUALITY

This chapter reviews current federal and state drinking water regulations in accordance with the Safe Drinking Water Act (SDWA) and evaluates the District's compliance for the 6-year period from 2007 through 2012. This chapter also discusses upcoming regulations and their impact on the District.

8.1 State and Regulatory Framework

8.1.1 Safe Drinking Water Act

The SDWA, passed in 1974, is the main federal law that ensures the quality of drinking water in the United States. The U.S. Environmental Protection Agency (EPA) sets the standards for water quality and oversees the implementation of these standards by every state. Originally, the main focus of the SDWA was on treatment; that is, providing safe drinking water at the tap. EPA subsequently issued two amendments in 1986 and 1996 that include protection of the water source, operator training, and funding for water system improvements and for providing information to the public regarding water quality. With these amendments, SDWA provides protection of water quality from source to tap.

8.1.2 Washington Administrative Code

The Washington State law that incorporates the SDWA and its amendments is Chapter 246-290 of the Washington Administrative Code (WAC 246-290). The Washington State Department of Health (DOH) is the primacy agency responsible for implementing and enforcing state and federal drinking water laws.

The District's Judy Reservoir System is a Group A public water system (PWS) (# 79500E) serving a population of 65,000 as of 2012. The District is responsible for maintaining compliance with all applicable state and federal regulations for Group A public water systems that pertain to source water protection, treatment, monitoring, and water quality. The Judy System serves the cities of Burlington, Mount Vernon, and Sedro-Woolley and the surrounding rural and suburban areas. The District also operates remote water systems including Fidalgo Island, Alger, Cedargrove, Marblemount, Mountain View, Potlach Beach, Rockport, and Skagit View Village.

8.2 Treatment Overview

Judy Reservoir Water Treatment Plant (ID # 79500 E)

The District operates a multi-media direct filtration water treatment plant (WTP). Raw water flows by gravity into Judy Reservoir from four creeks—Gilligan, Salmon, Mundt, and Turner creeks—or alternatively, the water can be pumped from the Skagit River. The raw water is disinfected with chlorine dioxide and pumped up to the control building; carbon dioxide and coagulant aids are also added at this stage. The water flows through an in-line static flash mixer to four 2-stage flocculation basins. Then the water flows to the filter basins. There are eight filter basins, 500 square feet each, utilizing a high-speed filtration process through coal and sand filter media. The filtered water is disinfected again with chlorine and flows by gravity to the three finished water reservoirs (clearwells) near the WTP; these include one steel 3-million-gallon (MG) tank and two steel 1.22-MG tanks. Caustic soda and ammonia are added before the clearwells to adjust pH and form chloramine residual. Finished water from the clearwells flows by gravity down the transmission lines to the distribution system and the District's customers.

The WTP filters are alternated to maintain finished water production, and backwashed regularly to remove suspended solids, including microorganisms, which are trapped by the filter media. The filter backwash water is diverted to the backwash water recycle basin; filter-to-waste water is also diverted to the recycle basin. Two recycle pumps send the backwash and filter-to-waste from the recycle basin to one of two 19,000-square-foot settling lagoons. The majority of the water from the lagoons is decanted back to Judy Reservoir and the backwash solids remain. The District contracts for the solids to be removed and disposed of off-site.

The District maintains a variety of on-line analyzers at discrete stages of the treatment process to monitor water quality and treatment performance, and for process control and optimization. These include a streaming current monitor for raw water and coagulant dose charge, turbidimeters for raw water from Judy Reservoir and filter effluent, particle counters for raw water and effluent, free and total chlorine analyzers, and finished water pH analyzer. Along with the continuous on-line monitoring, grab samples are taken during the day for total and free chlorine, pH, temperature, turbidity, chlorite, color, and alkalinity.

8.3 Current Water Quality Regulations

Table 8-1 lists all drinking water quality regulations applicable to the District for the period of 2006 through 2012. These regulations are separated into three categories: source water and treatment, distribution system, and other. Each regulation and how it applies to the District is discussed below.

Table 8-1. Applicable Safe Drinking Water Act Regulations

Water Regulation	Contaminants Affected	Date Rule Took Effect	District Status
Current Source Water and Treatment Regulations			
Surface Water Treatment Rule	Turbidity, *Giardia lamblia*, heterotrophic bacteria, *Legionella*, enteric viruses, disinfectant residual	December 1990	Monitoring
Interim Enhanced Surface Water Treatment Rule	Turbidity, *Cryptosporidium*	January 2002	Monitoring
Long Term 2 Enhanced Surface Water Treatment Rule	*Cryptosporidium*	March 2006	Started monitoring in 2013
Phase I Rules	Volatile Organic Compounds	January 1989	Monitoring
Phase II and V Rules	Inorganic and Synthetic Organic Compounds	January 1993	Monitoring
Arsenic Rule	Arsenic	January 2006	Monitoring
Radionuclides Rule	Combined radium, gross alpha, beta and photon emitters, and uranium	December 2003	Monitoring
Unregulated Contaminant Monitoring Rule 2	25 parameters	January 2007	Monitoring
Unregulated Contaminant Monitoring Rule 3	30 parameters	April 2012	Start monitoring in 2014
Filter Backwash Recycling Rule	Recycle flow	May 2001	Not applicable
Current Distribution System Regulations			
Total Coliform Rule	Total and fecal coliform, *E. coli*	December 1990	Monitoring
Lead and Copper Rule and revisions	Lead and copper, water quality parameters	December 1992 December 2007	Monitoring
Stage 1 Disinfectants and Disinfection By-products Rule	Trihalomethanes, haloacetic acids, disinfectant, total organic carbon	February 1999	Completed
Stage 2 Disinfectants and Disinfection By-products Rule	Chlorite, trihalomethanes, haloacetic acids	March 2006	Monitoring
Ground Water Rule*	Total/ Fecal coliform	November 2006	Monitoring
Other Current Regulations			
Consumer Confidence Reports	Annual report addressing drinking water quality	September 1998	Reporting annually
Operator Certification	Minimum standards for operator certification	February 2001	Up-to-date

*Not applicable for Judy Reservoir

8.3.1 Surface Water Treatment Rule

8.3.1.1 Regulatory Elements

Public water systems (PWSs) using surface or groundwater under the direct influence of surface water as supply are prone to microbial contamination of their source. Pathogenic microorganisms can be removed or inactivated by water treatment through sedimentation, filtration, and disinfection. EPA issued the Surface Water Treatment Rule (SWTR), which sets maximum contaminant level goals (MCLGs) for pathogens like *Legionella*, *Giardia lamblia*, and viruses at zero, because any exposure to these contaminants is considered a health risk.

The SWTR took effect in 1990 and requires that PWSs have sufficient treatment to reduce source water concentrations of *Giardia lamblia* and viruses by at least 99.9% (3.0 log) and 99.99% (4.0 log), respectively. Subpart B of Part 6 of Chapter 246-290 WAC details specific requirements to achieve sufficient treatment by (a) filtration (WAC 246-290-660); (b) disinfection to ensure that pre-treatment, filtration, and disinfection in combination achieve at least 3.0 log reduction of *Giardia lamblia* cysts and at least 4.0 log reduction for viruses (WAC 246-290-662); (c) monitoring of source water coliform and source and filtered water turbidity; (d) monitoring to determine inactivation levels for *Giardia lamblia* cysts and viruses; and (e) monitoring of disinfectant residual concentrations entering and within the distribution system (WAC 246-290-664). The SWTR also includes requirements for reporting by filtered systems (WAC 246-290-666) and watershed control (WAC 246-290-668).

The SWTR requires after-treatment disinfection residuals of at least 0.2 milligrams per liter (mg/L) at the entry point and continuous disinfectant residual monitoring for water systems serving more than 3,300 people. If the residual level drops below 0.2 mg/L for more than 4 hours, the system is considered in treatment violation. Under the rule, systems are also required to maintain detectable disinfectant residual for at least 95% of the monthly distribution system water samples (taken concurrently with routine and repeat total coliform samples). Alternatively, samples may be analyzed for heterotrophic bacteria using a plate count method. A heterotrophic plate count (HPC) level of 500 colony forming units (cfu) per millimeter or less is considered equivalent to a detectable disinfectant residual.

8.3.1.2 District's Status

Based on the direct filtration treatment and effluent turbidity levels achieved at the WTP, Judy Reservoir receives the following physical treatment/removal credits:

- 2.0 log (99.0%) for *Giardia lamblia* removal
- 1.0 log (90.0%) for viruses

The credits for *Giardia lamblia* are achieved based on the direct filtration system (no sedimentation) listed in WAC 256-290-660 (2). To achieve 3.0-log removal of *Giardia*, the WTP is required to provide

1.0-log inactivation of *Giardia lamblia* by disinfection. Chlorine dioxide is injected at the raw water pump station into the raw water line that comes to the WTP. This is considered Stage 1. Chlorine also can be added at three discrete points (stages), which are as follows: (1) Stage 2 – prior to in-line static mixer (currently not in use), (2) Stage 3 – flocculation basin effluent, (3) Stage 4 – filter effluent line. At Stage 5, ammonia is injected just before the finished water tanks (clearwells) and it forms chloramines, which result in a reaction between the ammonia and chlorine solution.

The credits for *Giardia lamblia* and virus inactivation are based on pre- and post-chlorination and filtration. WTP personnel on a daily basis determine the level of inactivation achieved and then determine whether this level is sufficient to meet the required level of inactivation. For the years 2007 through 2012, the WTP has maintained inactivation ratios (IR) well above 1; below this value would be considered a treatment technique violation. The highest IR value achieved was 8. The WTP does not get extra credits for maintaining higher IR values.

In 1993, the District conducted a tracer study (at flow rates ranging from 4,800 gallons per minute [gpm] up to 8,200 gpm) to determine the T_{10}/T for each disinfection stage to assist with the development of daily disinfection contact time (CT) profiles. Using the results of this tracer study, a disinfection contacting model for the WTP was developed that allows assessments of the levels of disinfection under the ranges of water temperatures and flow rates that normally occur at the WTP. As a requirement of the SWTR, CT values are calculated daily on each stage of disinfection. Figures 8-1 through 8-6 show minimum, average, and maximum CT values for each year from 2007 through 2012.

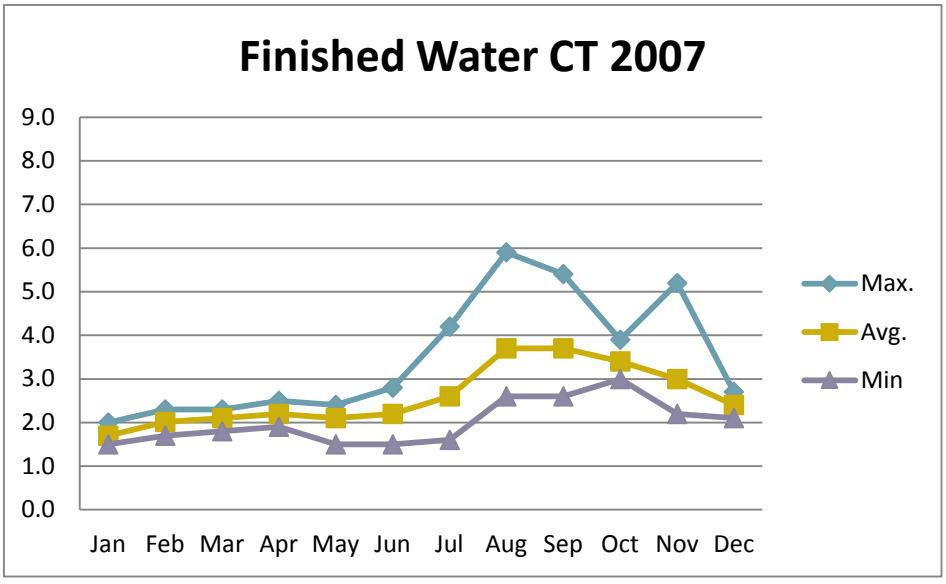

Figure 8-1. 2007 Minimum, Average, and Maximum CT Values

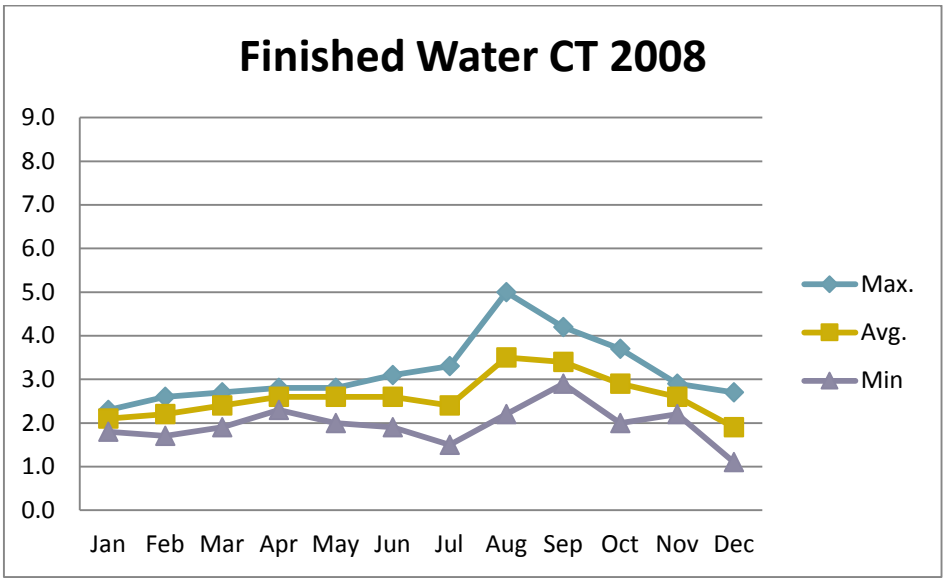

Figure 8-2. 2008 Minimum, Average, and Maximum CT Values

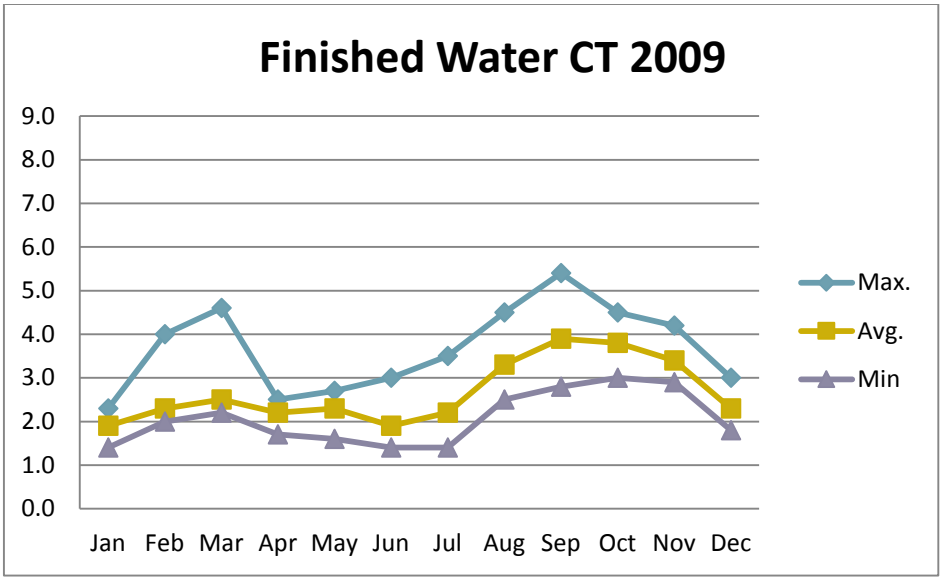

Figure 8-3. 2009 Minimum, Average, and Maximum CT Values

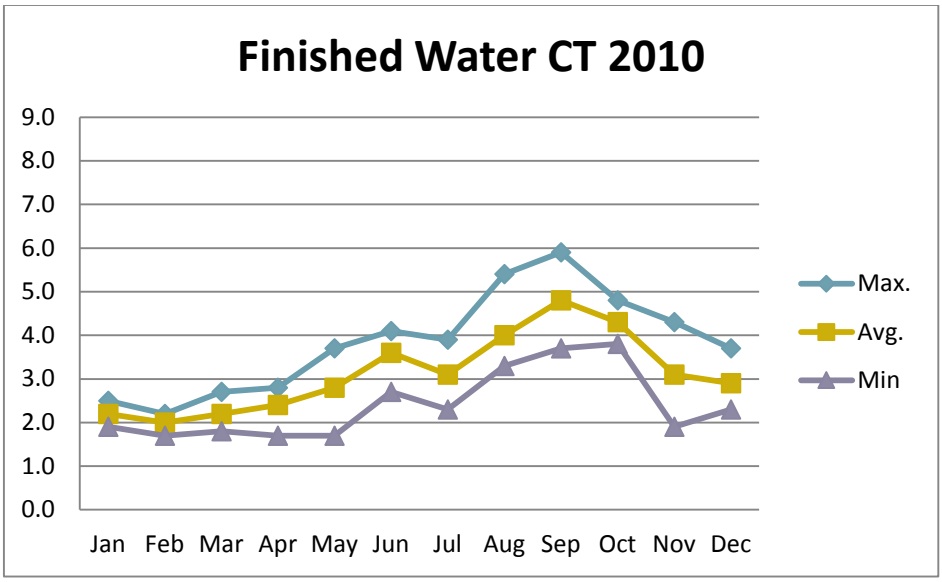

Figure 8-4. 2010 Minimum, Average, and Maximum CT Values

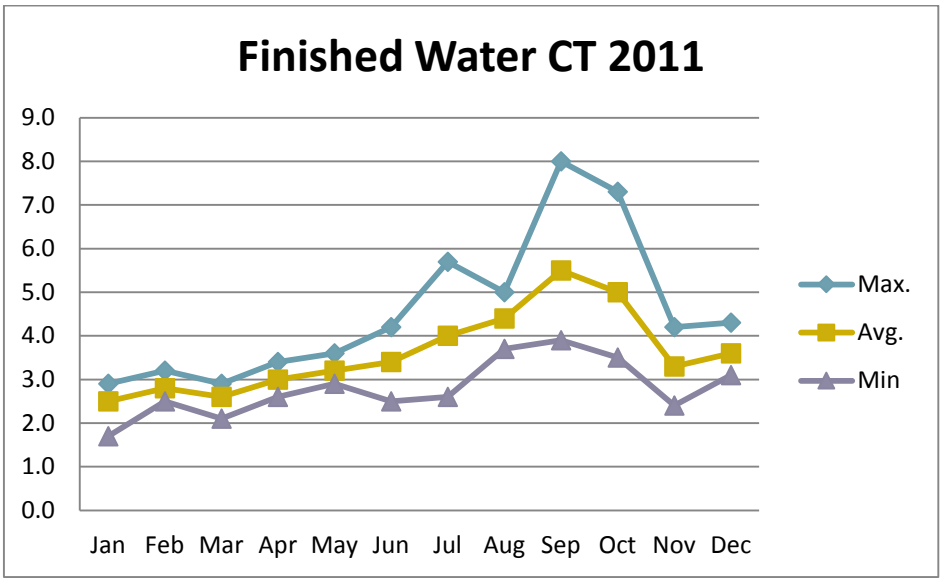

Figure 8-5. 2011 Minimum, Average, and Maximum CT Values

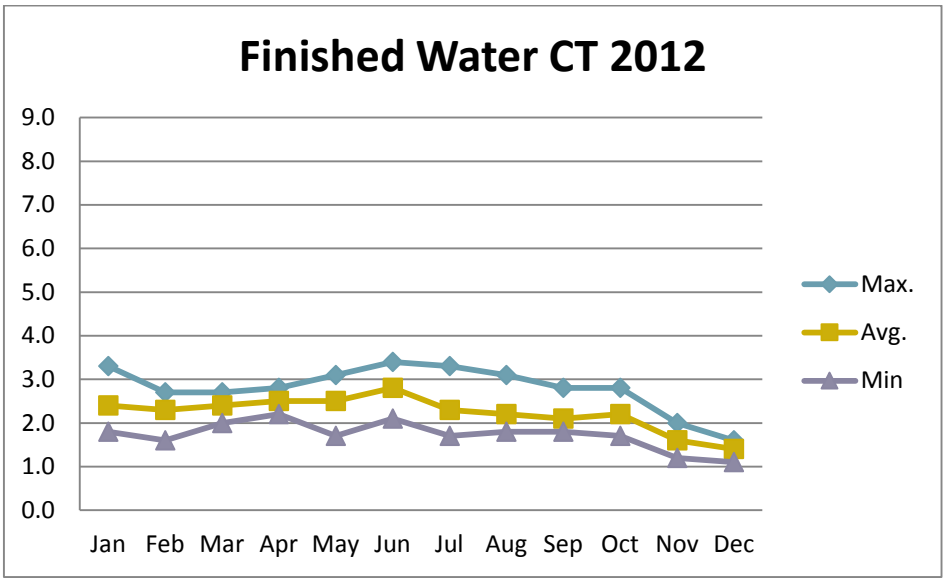

Figure 8-6. 2012 Minimum, Average, and Maximum CT Values

The WTP currently targets a total chlorine residual level of at least 1.2 mg/L at the CT determination point for Stage 5 (at the clearwells), which is also the entry point to the distribution system. The WTP provides continuous on-line chlorine residual monitoring at this location for process control and reporting purposes. Since 2007, the entry-point total chlorine residual has not fallen under 0.2 mg/L. The total chlorine residual is typically maintained in the range 1.2 to 1.5 mg/L. There have been no treatment technique violations based on this requirement. Figures 8-7 through 8-12 represent Stage 5 total chlorine residuals from 2007 through 2012.

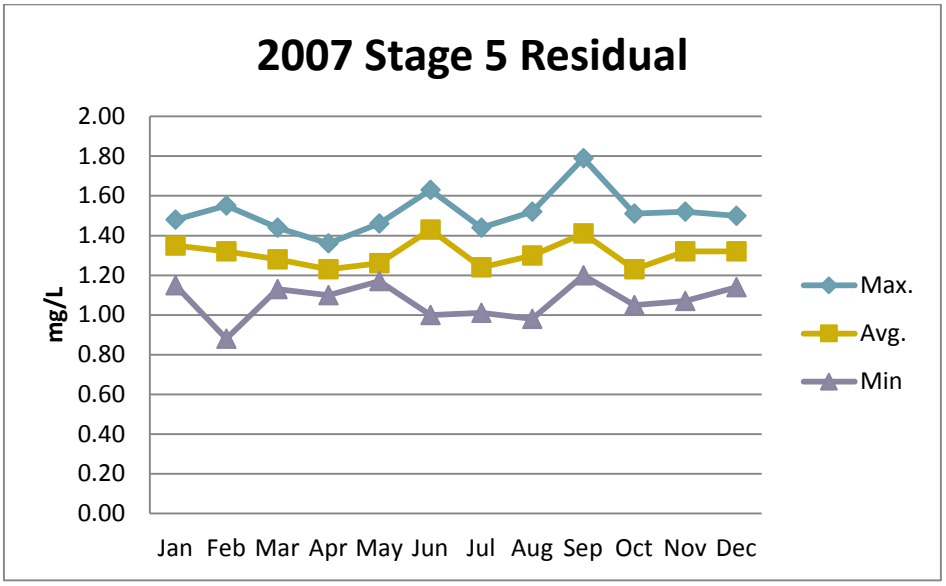

Figure 8-7. 2007 Stage 5 Total Chlorine Residual

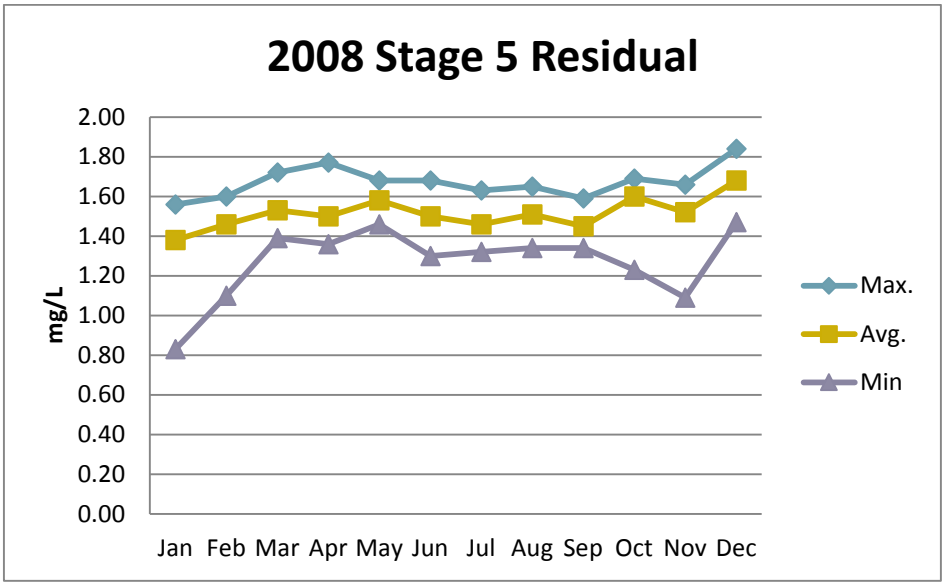

Figure 8-8. 2008 Stage 5 Total Chlorine Residual

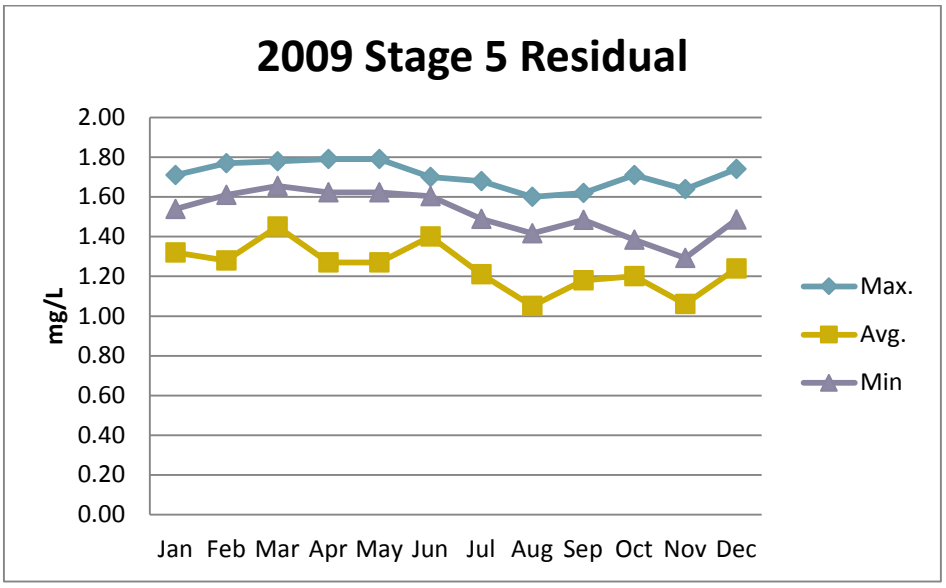

Figure 8-9. 2009 Stage 5 Total Chlorine Residual

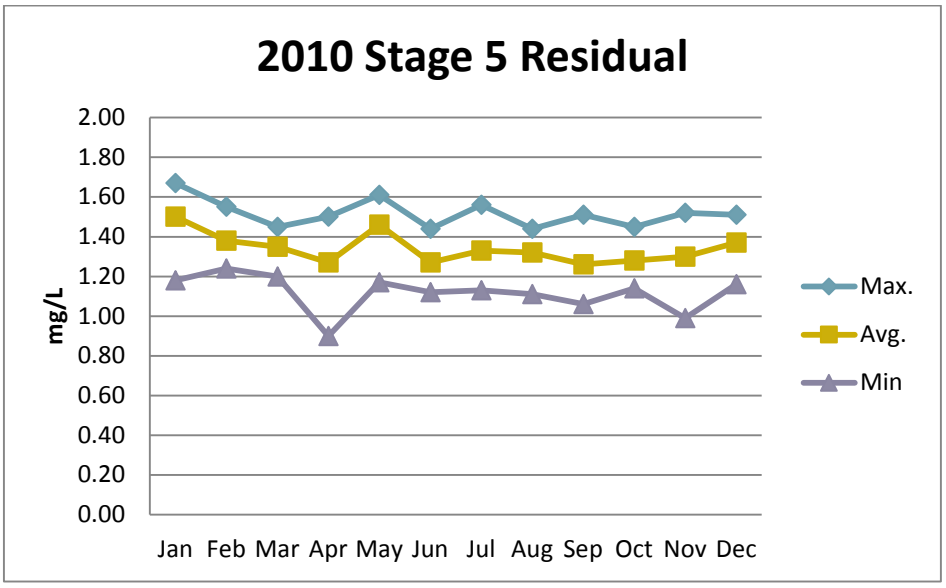

Figure 8-10. 2010 Stage 5 Total Chlorine Residual

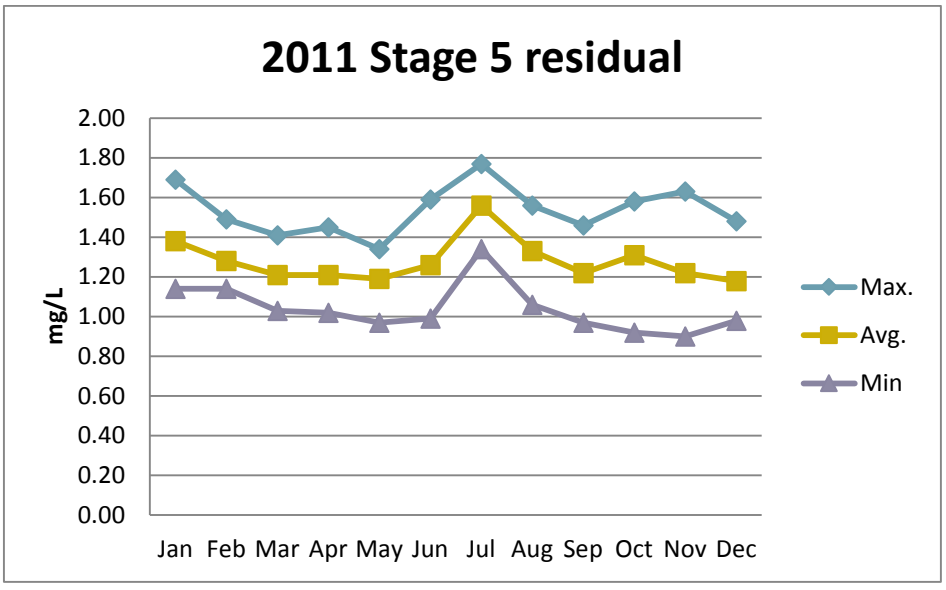

Figure 8-11. 2011 Stage 5 Total Chlorine Residual

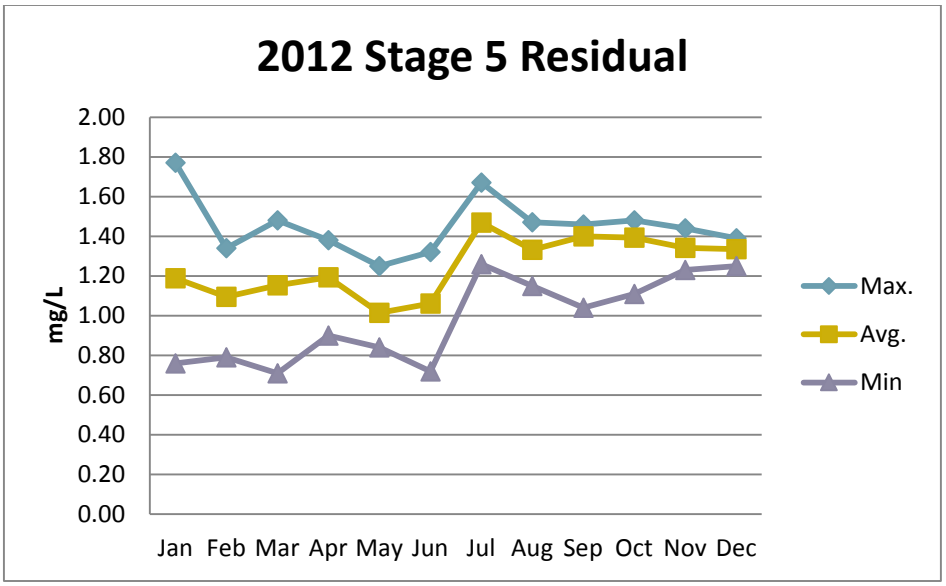

Figure 8-12. 2012 Stage 5 Total Chlorine Residual

The District monitors chlorine residuals with each coliform sample, about 70 samples per month. Figures 8-13 through 8-16 illustrate the minimum, average, and maximum monthly total chlorine residual levels for the period 2009 through 2012.

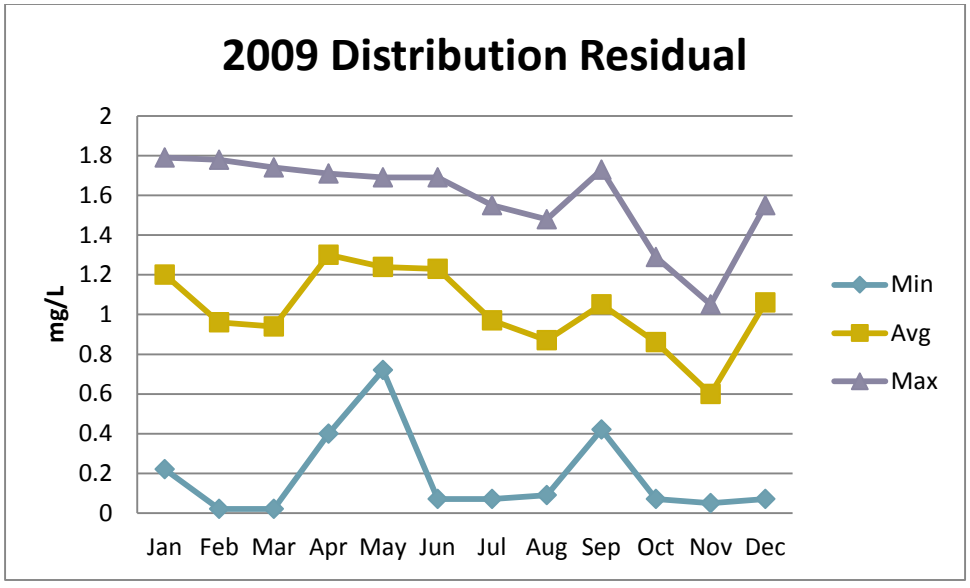

Figure 8-13. 2009 Minimum, Average, and Maximum Monthly Total Chlorine Residual

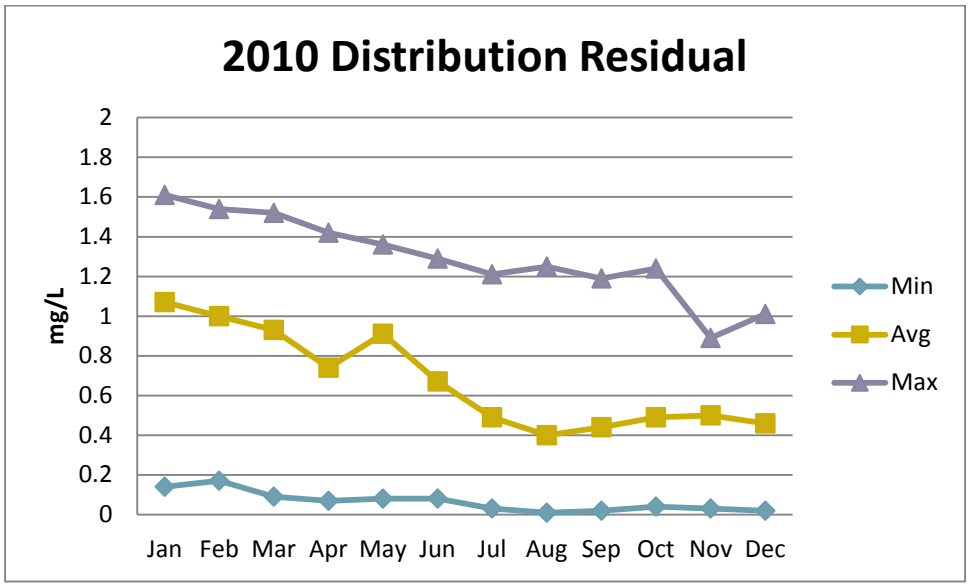

Figure 8-14. 2010 Minimum, Average, and Maximum Monthly Total Chlorine Residual

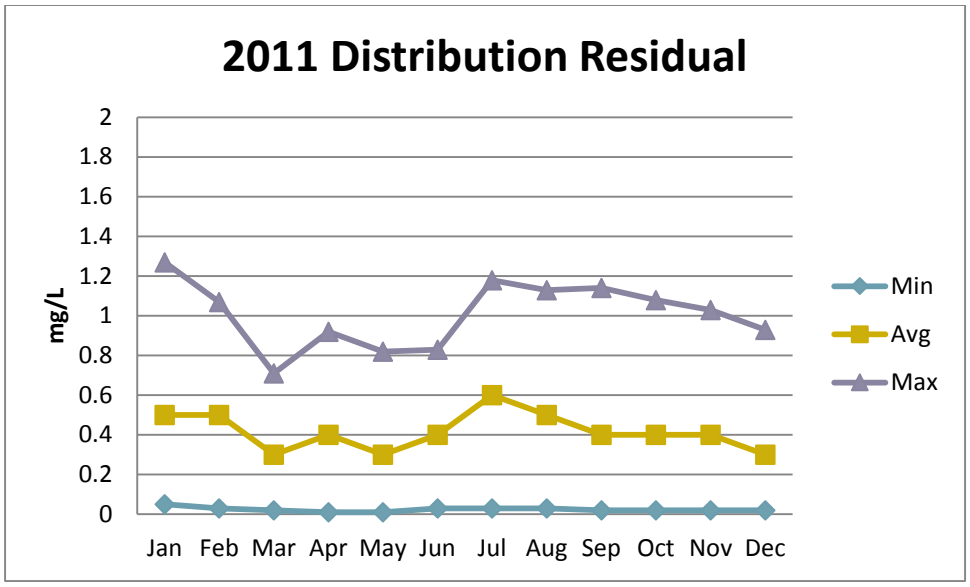

Figure 8-15. 2011 Minimum, Average, and Maximum Monthly Total Chlorine Residual

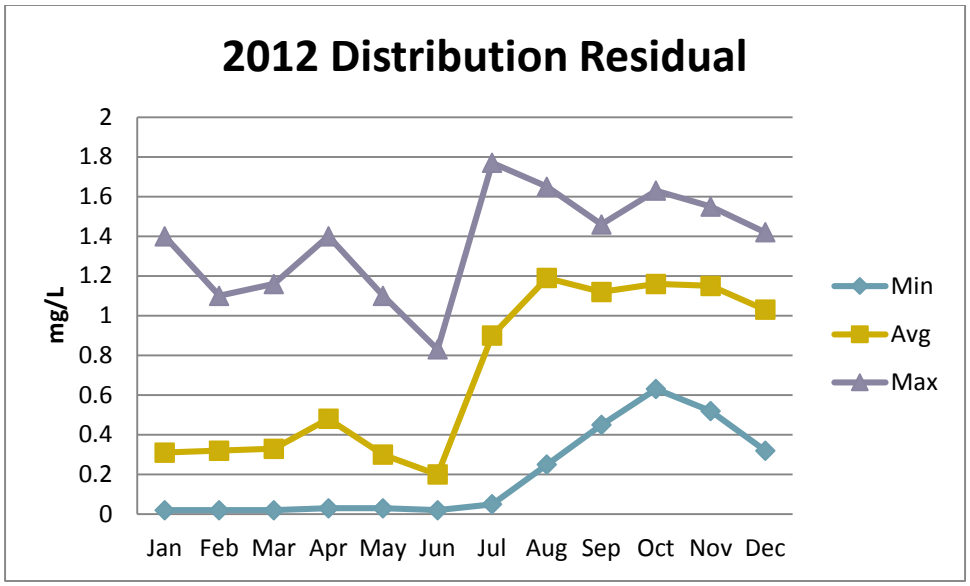

Figure 8-16. 2012 Minimum, Average, and Maximum Monthly Total Chlorine Residual

These results show fairly inconsistent chlorine residuals over the examined period. These changes can be attributed to chlorine demand changes, areas with low water use, seasonal fluctuations, plant optimizations, etc. These figures do not show the free residual chlorine measures at the sample stations of Bayview Edison Road, Peterson Road, and Airport Drive, which were measured by the City of Anacortes. With the completion of the Josh Wilson Road pipeline project, this area is now supplied by water from the Judy Reservoir and the total chlorine residual will be measured.

None of the monthly samples for the 6-year period from 2007 through 2012 have had non-detectable chlorine residual. The District has maintained detectable chlorine in at least 95% of the monthly samples for the entire period from 2007 through 2012. The District has established a procedure to test for HPCs if the sample has non-detectable chlorine residual.

Under the SWTR, the District performs monthly testing of the raw water from Judy Reservoir for fecal coliform (seven samples per month). In the months when Skagit River water is taken, the District is required to analyze one sample for fecal coliform per week.

8.3.2 Interim Enhanced Surface Water Treatment Rule

8.3.2.1 Regulatory Elements

The Interim Enhanced Surface Water Treatment Rule (IESWTR) builds on the SWTR by adding protection from *Cryptosporidium*. The IESWTR requires filtered systems to meet new turbidity standards for combined filter effluent (CFE) and individual filter effluent (IFE). Under the IESWTR, the CFE turbidity must be ≤0.3 Nephelometric Turbity Units (NTU) (for 95% sample in 4-hour intervals) and the maximum turbidity 1.0 NTU for filtered water. Additionally, the rule requires unfiltered systems to include control of *Cryptosporidium* in their watershed control plans. The IESWTR applies

to systems that serve more than 10,000 people. The IESWTR builds on the Total Coliform Rule by requiring sanitary surveys for all PWSs using surface water, regardless of their size. The rule also requires covers for all new finished water storage facilities and includes disinfection profiling and benchmarking provisions to ensure that systems provide continued levels of pathogen protection while taking the necessary steps to comply with the disinfection byproducts standards.

8.3.2.2 District's Status

The District has established continuous turbidity monitoring of the source water and filtered water (from each individual filter) for the purposes of process control, performance assessment, and compliance reporting.

Judy Reservoir raw water turbidity is affected by seasonal changes and events affecting the Cultus Mountain Watershed and the Skagit River. These changes include wind storms, algae blooms, and rain runoff, and turbidity can fluctuate significantly over a short period of time. When individual stream turbidities exceed 5 NTU or color exceeds 35 color units, water from that stream is typically not diverted into Judy Reservoir. A description of the strategy on when the water is diverted into Judy Reservoir can be found in Chapter 9. A maximum turbidity criterion of 10 NTU is used when deciding whether to divert Skagit River water into Judy Reservoir. Figures 8-17 and 8-18 represent minimum and maximum turbidity levels (NTU) of the raw water from Judy Reservoir.

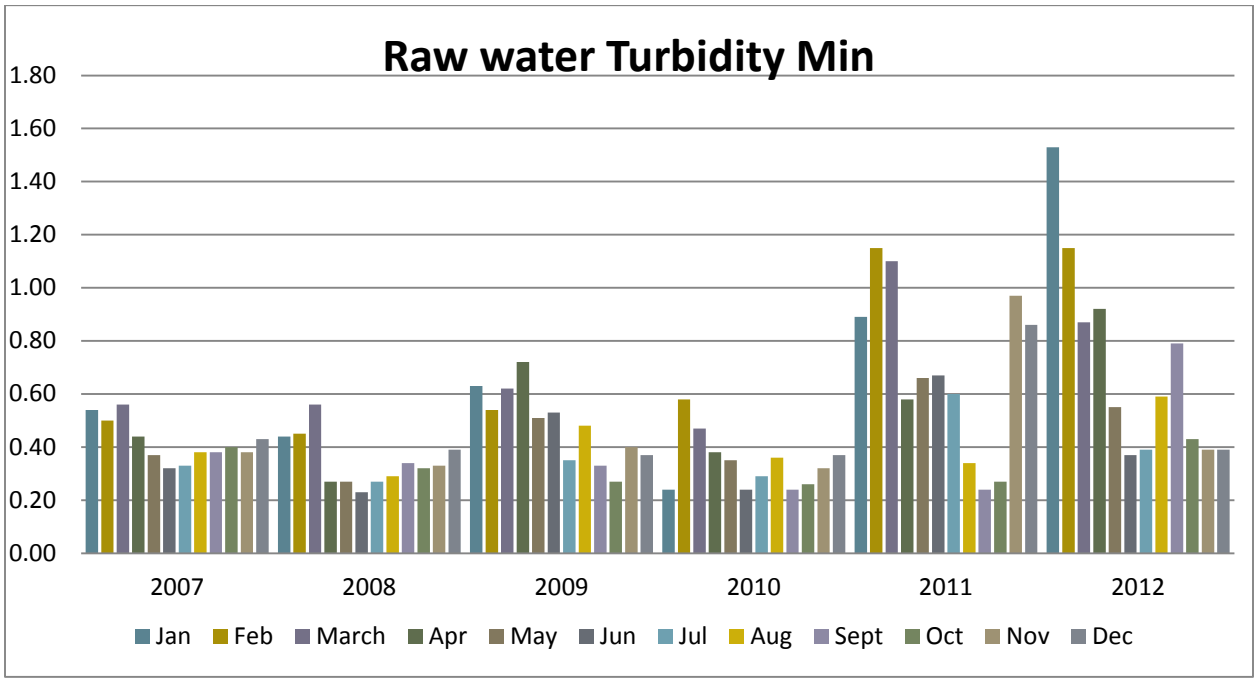

Figure 8-17. Minimum Monthly Raw Water Turbidity (NTU), 2007–2012

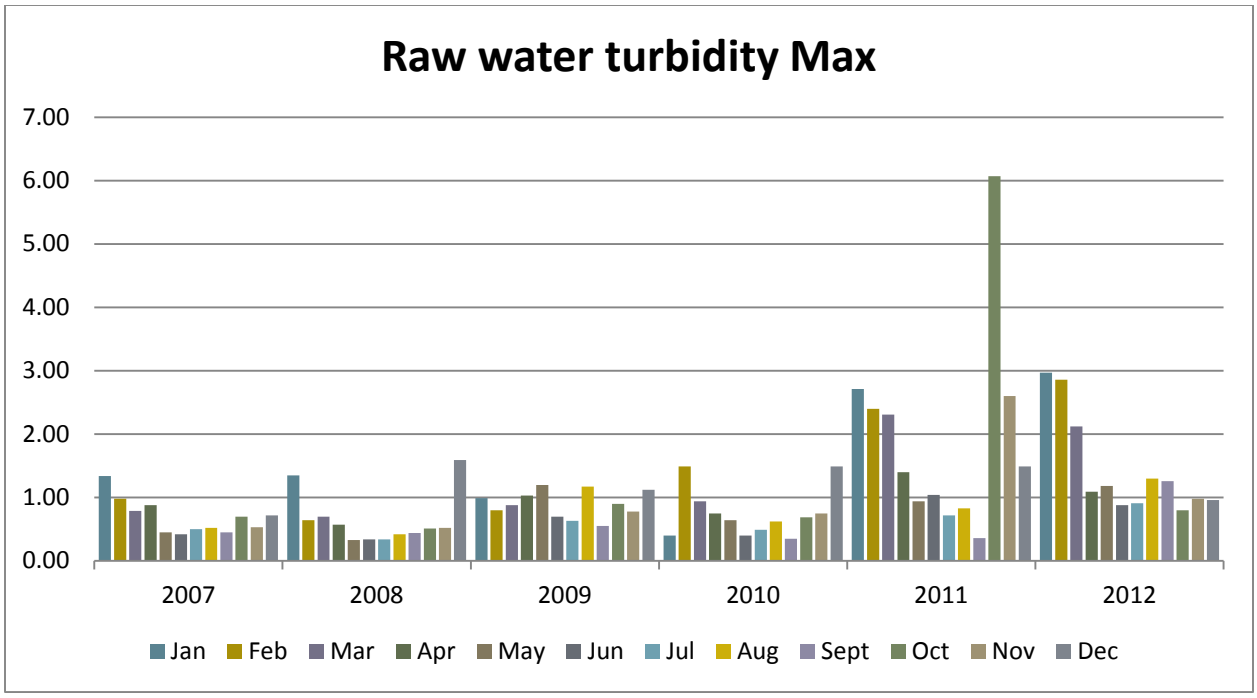

Figure 8-18. Maximum Monthly Raw Water Turbidity (NTU), 2007–2012

Turbidity levels shown on Figures 8-17 and 8-18 represent the relatively low turbidity of the source water and some seasonal fluctuations. High levels of turbidity in the source water can protect microorganisms from the effect of disinfection and may indicate that *Cryptosporidium* can break through the filters and enter the water supply. In addition to disinfection, to reduce turbidity levels the WTP employs flocculation and coagulations prior to filtration.

Inorganic and organic liquid coagulants are used for flocculation and coagulation. All coagulants are NSF- or UL-approved. Combined dosage of these chemicals is rarely above 7.0 mg/L. Coagulant dosage is reported in the Monthly Surface Water Treatment Report and annually in the DOH certification form.

With regard to IESWTR compliance, the District conducts continuous turbidity monitoring of each IFE and CFE, with recordings taken at 15-minute intervals. As required per WAC 246-290-664, the CFE data recorded at 4-hour intervals are reported for IESWTR compliance purposes. The WTP consistently achieves over 99.5% removal of source water turbidity, well above the 80% removal requirement specified in WAC 246-290-654.

Figures 8-19 and 8-20 show monthly effluent turbidity (minimum and maximum) for the 2007 through 2012 period. It is evident from these figures that finished water turbidity is significantly below the established maximum level of 1.0 NTU for treated water under the IEWSTR. Based on these low turbidity (below 0.1 NTU) results, the District consistently meets turbidity limits established under the SWTR. In addition, the District meets optimized treatment goals established by

EPA. In 2009, the District's WTP ranked in the top three treatment plants in Washington based on turbidity performance.

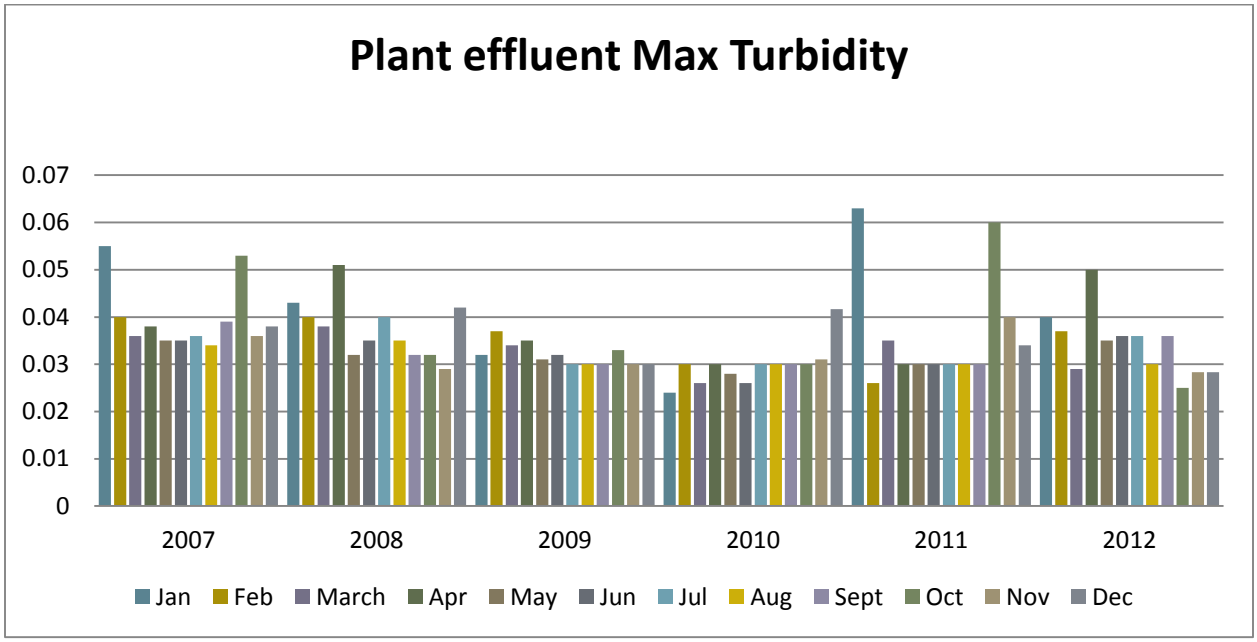

Figure 8-19. Maximum Monthly Plant Effluent Turbidity (NTU), 2007–2012

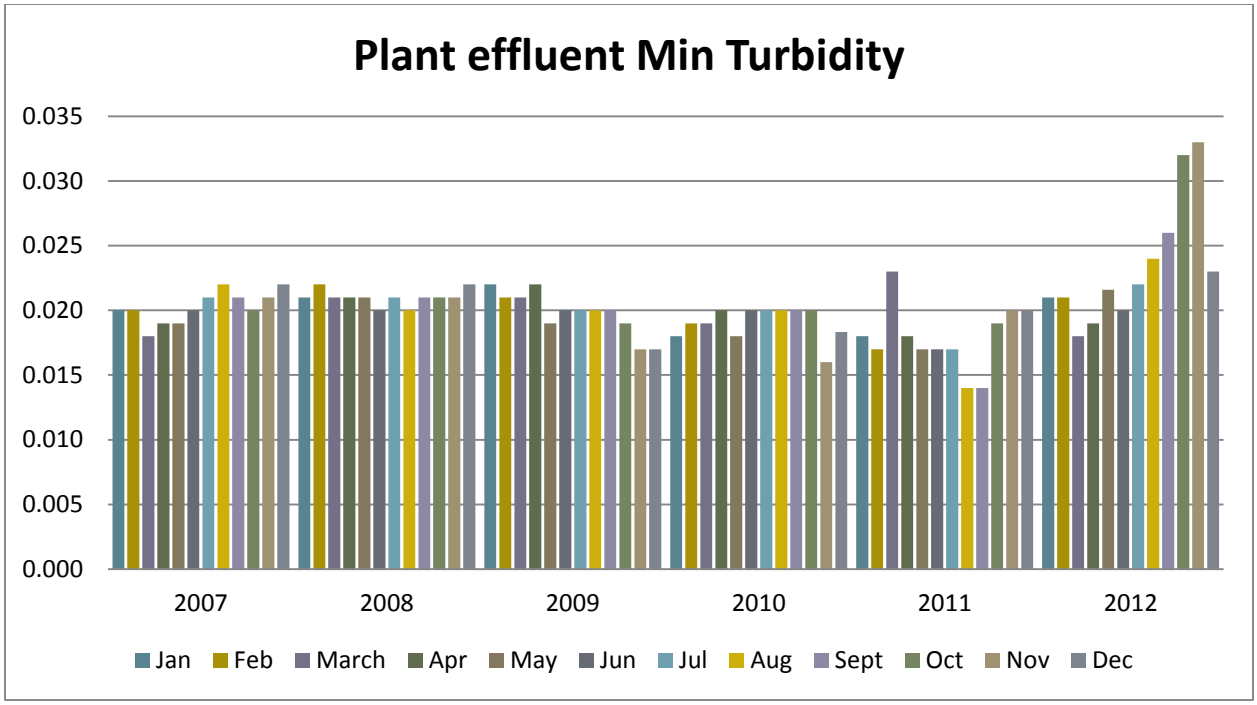

Figure 8-20. Minimum Monthly Plant Effluent Turbidity (NTU), 2007–2012

8.3.3 Long Term 2 Enhanced Surface Water Treatment Rule

8.3.3.1 Regulatory Elements

The Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) builds upon the SWTR and IESWTR by supplementing existing microbial treatment requirements for systems where additional public health protection is needed against *Cryptosporidium*. The rule was developed in conjunction with the Stage 2 Disinfectants/Disinfection Byproducts Rule (D/DBPR) requiring systems to provide microbial protection while trying to minimize the health effects from disinfection byproducts. This rule took effect in March 2006 and applies to water systems using surface water or groundwater under direct influence (GWUDI) as the source. Based on system size and filtration type, systems need to monitor for *Cryptosporidium*, *E. coli*, and turbidity.

The LT2ESWTR requires systems to monitor their water sources for *Cryptosporidium* to determine treatment requirements, ensuring less than 1 oocyst per 10,000 liters of finished water. This approach involves identification of source water vulnerability to *Cryptosporidium* and strategies minimalizing occurrence risk of *Cryptosporidium*. The LT2ESWTR establishes the following types of requirements:

- Two distinct rounds of source water monitoring for *Cryptosporidium*
- Determination of risk bin classification based on initial monitoring
- Microbial toolbox for meeting additional treatment requirements
- Profiling and benchmarking requirements
- Covering finished water storage facilities
- Sanitary surveys

The source water monitoring requirements of the LT2ESWTR apply to all Subpart H PWSs. Filtered and unfiltered systems must conduct 24 months of source water monitoring for *Cryptosporidium*. Filtered systems must also record source water *E. coli* and turbidity levels. Filtered systems are classified into one of the four "bins" based on the results of their source water monitoring (Table 8-2). Unfiltered systems calculate a mean *Cryptosporidium* level to determine treatment requirements. Systems may also use previously collected data (i.e., grandfathered data).

Table 8-2. Bin Classification

For systems that are:	Mean *Cryptosporidium* Concentration[1]	Bin Classification
Required to monitor for *Cryptosporidium*	< 0.075 oocysts/ L	Bin 1
	From 0.075 to < 1.0 oocysts/ L	Bin 2
	From 1.0 to < 3.0 oocysts/L	Bin 3
	≥ 3.0 oocysts/ L	Bin 4

[1] Samples analyzed by an approved laboratory and EPA method 1622 or 1623.

For filter plants classified in Bin 1, no additional *Cryptosporidium* treatment is required under the LT2ESWTR. Plants classified in Bins 2 through 4 need to provide the additional treatment for *Cryptosporidium* outlined in the EPA Microbial Toolbox. Filter plants classified in Bins 3 and 4 must achieve at least 1.0 log (90%) of additional *Cryptosporidium* treatment using one or more of the following, as specified in the Microbial Toolbox: bag filters, bank filtration, cartridge filters, membrane filtration, chlorine dioxide, ozone, and/or ultraviolet disinfection. The deadline for meeting the treatment requirements was October 2012 (Schedule 2).

Water systems are required to conduct a second round of source water monitoring 6 years after the initial bin classification to confirm or revise the initial assessment. For Schedule 2 (between 50,000 and 99,000 people), that will be October 2015.

Under the LT2ESWTR, water systems that propose changes to their disinfection strategy must develop *Giardia lamblia* and virus disinfection profiles. The profiling requirements for large systems include daily measurements of operational data for periods of 12 months in order to calculate inactivation ratios. This builds upon the requirements for disinfection profiling under the IESWTR, which were triggered based on distribution system disinfection byproduct levels.

8.3.3.2 District's Status

The District belongs to Schedule 2 systems (service population between 50,000 and 99,999), which involves the following:

- Begin initial source water monitoring (ISWM) or submit intent to grandfather historical data by April 1, 2007.
- Submit source water occurrence bin classification to DOH by October 1, 2009.
- Install treatment as needed to ensure compliance by October 1, 2012.
- Submit a sampling plan for follow-up source water monitoring (FSWM) by July 1, 2015.
- Begin FSWM by October 1, 2015.

In order to comply with the LT2ESWTR, in April 2007 the District submitted a report to EPA with the test results of 26 samples for *Cryptosporidium* collected between January 2004 and December 2005. In a letter dated July 2, 2007, DOH indicated its approval of the submitted data for grandfathering based on CFR 141. 707. This approval letter is provided in Appendix L.

The mean *Cryptosporidium* concentration of the 26 grandfathered samples in Judy Reservoir source was 0 oocysts/L. Based on these results, the District was approved for Bin 1 classification, and under this classification, no additional treatment for *Cryptosporidium* is required. This bin classification satisfies the requirements under CFR 141.710.

A second round of source water monitoring is required as part of the LT2ESWTR. The sampling plan for Round 2 is due by July 1, 2015, and sampling must start by October 1, 2015. Based on the future results, the District might change its bin classification.

Regarding disinfection profiling and microbial benchmarking, the District has developed daily pre- and post-filter chlorine contacting disinfection profiles for *Giardia lamblia* (all five stages).

8.3.4 Additional Source Monitoring

This section describes some of the preventive tests the District performs to monitor source/drinking water quality.

8.3.4.1 Algae

In 2003, Judy Reservoir experienced serious taste and odor issues, resulting in consumer complaints and media attention. Since then the District has been more closely monitoring algal communities in Judy Reservoir and trying to prevent similar events. Since October 2006, the District has had a contract with Western Washington University for identifying and counting phytoplankton, measuring chlorophyll, and determining total nitrogen and total phosphorus levels in the raw water from Judy Reservoir. Weekly raw water samples are collected from the pump station and submitted for analysis. Western Washington University has provided the District with annual reports for 2007, 2008, 2010, 2011, and 2012. These reports include descriptions of the water quality and algal data collected since October 2006. The data are described in a series of annotated figures regarding biovolumes, counts, and nutrients, as well as photographs of the most common phytoplankton in Judy Reservoir.

Figure 8-21 shows algal density for the 7 year period of 2006 through 2012. From the data it is obvious that the highest algal count is in late summer to late fall. This gives the District information on seasonal trends and changes in algal species, which could be used as a tool for treatment changes in case of algal blooms.

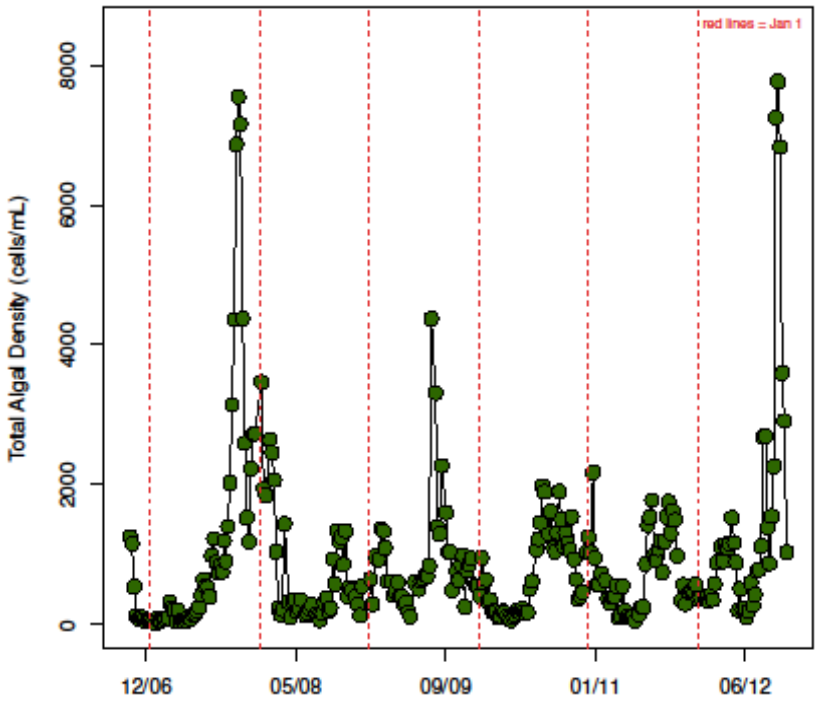

Figure 6: Algal density is determined by settling a known volume of water, then counting and identifying the settled algae. The highest algal counts usually occurred from summer to late fall, which is typical for lakes in our region, or in the winter. High winter counts are unusual for most lakes, but consistent with occasional high winter chlorophyll concentrations in Judy Reservoir (Figures 1 and 2). Although the 2011 algal densities lacked extreme peaks, the median density was higher than 2007–2010. The data from 2012 are incomplete; the 2012 median will probably be lower after the November/December counts are added to the data set.

	All Data	2007	2008	2009	2010	2011	2012†
Median density (cells/mL)	571	416	354	670	506	570	888

†partial year – 2012 does not include November/December

Figure 8-21. Algal Density from 2006 to 2012

8.3.4.2 Total Organic Carbon

As result of total trihalomethane (TTHM) exceedances in 2012, the District started to monitor on a monthly basis total organic carbon (TOC) from Judy Reservoir raw water and Skagit River raw water. Over the years, sporadic TOC tests have been done on source water that shows high organic presence. The Skagit River is known to have low TOC levels, which helps lower overall TOC levels when blended with Judy Reservoir water. Based on collected data, Judy Reservoir TOC levels vary from 1.5 mg/L to 2.5 mg/L; Skagit River (when in use) levels are usually below 1.0 mg/L; and Cultus Mountain Creek levels are between 5.0 and 6.0 mg/L.

8.3.4.3 Free Residual Chlorine

Free residual chlorine is tested on an as-needed basis in the distribution system, except in locations using Anacortes water. As result of the TTHM exceedances of the maximum contaminant level (MCL) values in 2012, and replacement of the chlorine dioxide generator, the District started to monitor its free residual chlorine in the distribution system between August and November. In August the distribution system had some higher than trace amount free chlorine residuals, which could explain why the TTHMs exceeded the MCL limits.

8.3.5 Phase I, II, and V Rules

8.3.5.1 Regulatory Elements

Phase I, II, and V rules, also known as Chemical Phase Rules, define regulations regarding contaminants in three different groups: inorganic chemicals (IOCs), synthetic organic chemicals (SOCs), and volatile organic chemicals (VOCs), a total of 65 contaminants. EPA sets the MCL for each contaminant as well as the standardized monitoring framework where monitoring cycles are established for each contaminant group. EPA has established 9-year cycles divided into 3-year compliance periods, which could be further subdivided to annual and quarterly periods.

As part of the Phase II Rule, systems with a significant amount of asbestos-cement (AC) pipe must conduct periodic asbestos monitoring in the distribution system. In Washington state, DOH requires systems that contain more than 10% AC pipe in their distribution system to comply with this monitoring requirement. These systems must collect one sample in the distribution system at locations served by AC pipe and under conditions where asbestos contamination is most likely to occur.

8.3.5.2 District's Status

The District performs routine finished water monitoring for VOCs, SOCs, and IOCs based on the annual DOH-issued water quality monitoring reports.

During the 6-year period from 2007 through 2012, none of these compounds exceeded the MCL levels. IOC monitoring is performed on an annual basis, and the only parameter close to MCL (15 color units [CU]) is color, with 15 CU.

DOH requires testing for asbestos once every 9 years. The District performed asbestos monitoring in 2009 and 2010. The values for both samples were with 1.4 million fibers per liter (MFL), and the MCL for asbestos is 7.0 MFL.

8.3.6 Arsenic Rule

8.3.6.1 Regulatory Elements

Arsenic is either a naturally occurring element or is introduced via agricultural or industrial practices into the drinking water supply. Arsenic is known to cause a number of organ failures. EPA sets the MCL of arsenic at 0.010 mg/L and it is based on the running annual average of results collected for each entry point to the distribution system. Systems could be eligible for reduced monitoring if their results are below the MCL; however, if arsenic is detected above the MCL in any individual sample, the monitoring frequency will be increased to quarterly.

8.3.6.2 District's Status

Arsenic is monitored annually as part of the suite of 16 primary IOCs. Over the period of 2007 through 2012, arsenic was 0.0030 mg/L, which is below the MCL limit of 0.010 mg/L. Based on these results, the District is in compliance with the Arsenic Rule.

8.3.7 Radionuclides Rule

8.3.7.1 Regulatory Elements

The original Radionuclides Rule was in effect in 1977 and in 2000 was revised and finalized. This rule includes requirements for uranium (30 picoCuries per liter [pCi/L]), combined radium-226 and radium-228 (5 pCi/L), gross alpha particle radioactivity (15 pCi/L), and beta particle and photon radioactivity (4 millirem per year [mrem/year]).

This rule establishes monitoring for radionuclides at each entry point of the distribution system. Systems were required to conduct an initial round of monitoring between 2003 and 2007, unless earlier radionuclide data were accepted for use in grandfathering by DOH. Systems were eligible for reduced monitoring (once every 9 years) if the average of the initial monitoring results for all contaminants was below detection limits.

8.3.7.2 District's Status

The District tested for radionuclides in 2009. No violation was found and none of the following contaminants were detected: gross beta, gross alpha, or radium 228.

8.3.8 Unregulated Contaminant Monitoring Rule 2

8.3.8.1 Regulatory Elements

The Unregulated Contaminant Monitoring Rule 2 (UCMR2) was proposed in August 2005 and requires systems to monitor for 25 contaminants for a 12-month period between 2008 and 2010. EPA divided the 25 contaminants into two lists. Based on the population served, systems monitor for List 1 (10 contaminants) or List 2 (15 contaminants). List 1 (Assessment Monitoring) contaminants are monitored using testing methods that are widely used. The List 1 contaminants include flame

retardants, chemicals used in explosives, and insecticides. List 2 (Screening Survey) contaminants are monitored using testing methods that are relatively new (EPA methods 527 and 529). The List 2 contaminants include nitrosamines and herbicides. Systems serving more than 100,000 people are required to conduct screening monitoring for 15 contaminants on the Screening Survey List (i.e., List 2).

8.3.8.2 District's Status

Between 2009 and 2010, the District performed entry-point sampling for the 10 contaminants on the Assessment Monitoring List (List 1). The analyses (based on EPA methods 527 and 529) were performed in the EPA-certified laboratory Edge Analytical in Burlington, Washington. None of the contaminants were detected in the samples.

8.3.9 Unregulated Contaminant Monitoring Rule 3

8.3.9.1 Regulatory Elements

The Unregulated Contaminant Monitoring Rule 3 (UCMR3) was signed in April 2012 and systems will start monitoring from 2013 to 2015 depending on their schedules. The monitoring for UCMR3 includes 30 contaminants (28 chemicals and 2 viruses). UCMR3 builds on the established structure of UCMR 1 and 2, and makes minor changes to improve the rule design. Per the cyclical nature of the UCMR, a new list of contaminants and analytical methods are defined. Some of the changes in UCMR3 are as follows:

- Redefines applicability to include PWSs that purchase all of their water
- Clarifies the terms of representative groundwater sampling
- Updates the reporting elements (including adding a data element for zip codes for the customers served by PWSs)

UCMR3 established three lists under which PWSs will be monitoring:

- Assessment Monitoring (List 1 contaminants) monitors for 21 contaminants
- Screening Survey (List 2 contaminants) monitors for 7 contaminants
- Pre-screen Testing (List 3 contaminants) monitors for 2 viruses

8.3.9.2 District's Status

The District is scheduled to start monitoring in 2014.

8.3.10 Filter Backwash Recycling Rule

8.3.10.1 Regulatory Elements

The federal Filter Backwash Recycling Rule (FBRR) was published in the Federal Register on June 8, 2001. This rule is intended to reduce the opportunity for recycling practices to adversely affect the performance of drinking water treatment plants and help prevent microbes, particularly *Cryptosporidium*, from passing through treatment systems and into finished water. The FBRR requires systems that recycle to return specific recycle flow (spent filter backwash water, thickener supernatant, or liquids from dewatering processes) through all processes of the system's existing conventional or direct filtration system or at an alternative location approved by the state.

8.3.10.2 District's Status

The filter backwash water at the WTP is diverted to the recycle basin, then sent to the two settling lagoons, where the decanted water is sent back to Judy Reservoir. Even though the WTP recycles its filter backwash water, this practice does not fall under this rule because the distance between the intake and recycle location is more than 800 feet (approximately 1,000 feet).

8.3.11 Total Coliform Rule

8.3.11.1 Regulatory Elements

The Total Coliform Rule (TCR) applies to all PWSs. Coliforms are easily detected in water and are used to assess a water system's vulnerability to pathogens. It requires systems to sample for coliform bacteria, which are used as an indicator of contamination. In the TCR, EPA set an MCLG of zero for total coliforms. EPA also set an MCL for total coliforms and required testing of total coliform-positive cultures for the presence of *E. coli* or fecal coliforms, which indicate more immediate health risks from sewage or fecal contamination. If more than 5% of the monthly samples (for systems with at least 40 samples per month) contain total coliform, PWSs must report this to the state and to the public. The TCR requires the use of a sample monitoring plan and sanitary surveys for systems collecting less than 5 samples per month.

Community water systems with service populations between 59,001 and 70,000 are required to collect 70 representative samples monthly from locations throughout the distribution system. All samples testing positive for total coliform must be followed by repeat sampling and additional testing to determine if *E. coli* is present.

Under the TCR, there are two types of violations: acute and non-acute. An acute MCL violation for coliform is based on the presence of either fecal coliform or *E. coli* in a repeat sample, or coliform presence in a repeat sample collected as a follow-up to a sample indicating the presence of fecal coliform or *E. coli*. A non-acute MCL violation for coliform occurs under the following conditions: a water system that collects ≥40 routine coliform samples per month (corresponding to a service population of at least 33,001) has more than 5% of the samples test positive for the presence of total

coliform; or, a system that collects fewer than 40 routine coliform samples per month has more than one positive total coliform detection.

8.3.11.2 District's Status

The District performs monitoring as outlined in its Coliform Monitoring Plan (updated July 2014), which is included in Appendix M. This includes collection of at least 70 routine coliform samples per month from 29 dedicated sample sites located throughout its retail distribution system. These sample sites and their associated typical monitoring frequency are summarized in Table 8-3.

Table 8-3. Routine Sampling Sites for Coliform Bacteria

Location	Address	Sample Frequency
Lake Sixteen Pump Station	21193 Lake 16 Rd	3/Month
Rawlins Road Sample Station	S of 14937 Rawlins Rd.	3/Month
Dodge Valley Road Sample Station	13459 Rawlins Rd.	3/Month
Bradshaw Road Pump Station	15011 Bradshaw Rd/ Summers Dr.	3/Month
Mclean Rd. and Penn Rd. N Side Sample Station	15621 Penn Rd. (Christmas tree farm)	2/Month
City Hall and Cleveland St. W Side Sample Station	1019 Cleveland St. (S of City Hall)	3/Month
Hillcrest Park W Side Sample Station	W of 1624 13th St.	3/Month
Cedardale Fire Department S Side Sample Station	19746 E Hickox Rd.	2/Month
Eaglemont Golf Course/Grille Sample Station	4129 Eaglemont Dr.	3/Month
Old Hwy 99 South W Side	Across from 3228 Old Hwy 99 S.	2/Month
Big Lake Blvd. and Big Lake Grocery E Side Sample Station	16818 W Big Lake Blvd.	3/Month
Cascade Ridge Pump Station #1	20463 Cascade Ridge Dr.	3/Month
Cascade Ridge Pump Station #2	20690 Cascade Ridge Dr.	2/Month
Cascade Ridge Pump Station #3	20962 Cascade Ridge Dr.	2/Month
Swan Rd. and Sherman Ln. Sample Station	21254 Sherman Ln.	2/Month
Conway Church	18101 Fir Island Rd.	2/Month
Northern State E Side - Fruitdale Rd. Entry Sample Station	E of 1704 Wildflower Way	2/Month
Bow Hill Rd. Sample Station	18994 Bow Hill Rd.	3/Month
Holiday Inn Express W Parking Lot Sample Station	900/1000 Andis Rd	3/Month
Airport Dr./Bayview Airport Sample Station	15290 Airport Dr.	2/Month

Location	Address	Sample Frequency
Bayview Edison Rd. N Side	10901 Bayview Edison	3/Month
Allen West Church	16775 Allen West Rd.	3/Month
Grip Road and Bridgewater Road	22958 Grip Rd.	2/Month
25th Street N of Section	SW Corner Baseball Field	3/Month
Burlington Hill Pump Station	963 Hillcrest Dr.	2/Month
Peterson Road/Sunrise Lane Sample Station	Peterson/Sunrise Intersection	2/Month
Otter Pond Dr. and Gunderson Rd.	15784 Otter pond Dr.	2/Month
Teak Lane Sample Station	13247 Teak Ln.	3/Month
Clear Lake School Sample Station	23631 Lake St.	2/Month

Of the 5,040 coliform samples collected over the period from 2007 through 2012, only 3 tested positive for total coliform (July 2010, July 2011, and August 2011). None of these samples tested positive for *E. coli* or fecal coliform bacteria. In these three instances, the District collected repeat samples per WAC 246-290-300 requirements. None of the repeat samples confirmed the coliform presence indicated in the routine samples. Therefore, the District has maintained compliance with the provisions of the TCR and WAC 246-290-300 (3).

8.3.12 Lead and Copper Rule

8.3.12.1 Regulatory Elements

Lead and copper are heavy metals that primarily enter the drinking water through plumbing materials. Exposure to lead and copper may cause health problems ranging from stomach distress to brain damage. In 1991, EPA established regulations for control of lead and copper known as the Lead and Copper Rule (LCR).

Under the LCR, systems are required to monitor drinking water at customer taps. If lead concentrations exceed an action level of 15 parts per billion (ppb) or copper concentrations exceed an action level of 1.3 parts per million (ppm) in more than 10% of customer taps sampled, the system must take actions for corrosion control. If the action level for lead is exceeded, the system must inform the public about steps they should take to protect their health, which may include replacing lead service lines under their control.

In 2004, EPA initiated a review of LCR implementation across the nation. This effort was focused on determining whether national lead levels are increasing. As a result of this effort, EPA identified several targeted changes to the existing rule that would meet short-term goals for improving

implementation of the LCR. These revisions, which were finalized in October 2007 and became effective in December 2007, are summarized in Table 8-4. The revisions are intended to enhance LCR implementation in the areas of monitoring, treatment, customer awareness, and lead service replacement.

Table 8-4. Lead and Copper Rule Revisions

Activity	Rule Revision
Monitoring	• Clarifies language in the rule regarding the number of samples required and the number of sites from which samples should be collected. • Modifies definitions for monitoring and compliance periods to make it clear that all samples must be taken in the same calendar year. • Clarifies the reduced monitoring criteria that would prevent small and medium water systems above the lead action level or large systems deemed to no longer meet Optimum Corrosion Control treatment from remaining on a reduced monitoring schedule.
Treatment or Source Water Changes	• Requires water systems to provide advanced notification to the primacy agency of intended changes in treatment or source water that could impact long-term water quality. • Requires the primacy agency to approve the planned changes using a process that will allow the states and water systems to take as much time as needed for systems and states to consult about potential problems.
Customer Awareness and Public Education	• Requires utilities to provide a notification of tap water monitoring results for lead to owners and/or occupants of homes and buildings that are part of the utility's sampling program. • Changes the content, delivery, and time frame of public education regarding lead action level exceedances. Systems must partner with additional organizations to disseminate the message to at-risk populations. • Requires that educational statements about lead in drinking water be included in all Consumer Confidence Reports.
Lead Service Line Replacement	• Requires utilities to reconsider previously "tested-out" lead service lines when resuming lead service line replacement programs.

8.3.12.2 District's Status

The District collects samples for lead and copper from its customers' taps. Due to historically low lead and copper levels at customer taps, the District has approval from DOH for a reduced monitoring schedule requiring collection of 30 tap samples every 3-year cycle. For the 6-year monitoring period from 2007 through 2012, the District collected samples in 2009 and 2012. The 90th percentile results from each of these rounds are summarized in Table 8-5. The District has continued to maintain compliance with lead and copper action levels and the broader requirements of the LCR.

Table 8-5. Lead and Copper Tap Monitoring Results

Sampling Date	Number of Samples	90th Percentile Lead Result	90th Percentile Copper Result
August 2009	30	0.003 mg/L	0.087 mg/L
September 2012	30	0.002 mg/L	0.070 mg/L

8.3.13 Stage 1 Disinfectants/Disinfection By-Products Rule

8.3.13.1 Regulatory Elements

Use of disinfectants is a highly effective measure for protection from water-borne diseases. However, disinfectants themselves can react with naturally occurring materials (NOM) in the water to form unintended byproducts posing certain health risks. A result from toxicological research has shown that many disinfection byproducts (DBP) are carcinogenic and can cause adverse reproductive or developmental effects in laboratory animals. In 1979, EPA enacted the Total Trihalomethane Rule, which set an interim MCL for TTHM of 0.1 mg/L as a running annual system-wide average based on quarterly monitoring within the distribution system. This rule applies to water systems using a chemical disinfectant and serving over 10,000 customers.

In 1998, EPA promulgated the Stage 1 Disinfectants/Disinfection By-Products Rule (D/DBPR) to further reduce the DBP levels in drinking water. The Stage 1 D/DBPR (effective since January 2002) applies to all community and non-transient non-community water systems that treat their water with a chemical disinfectant for either primary or residual treatment. The rule establishes maximum residual disinfectant level goals (MRDLGs) and maximum residual disinfectant levels (MRDLs) for three chemical disinfectants: chlorine, chloramine, and chlorine dioxide. It also establishes maximum contaminant level goals (MCLGs) and MCLs for TTHM, haloacetic acids, chlorite, and bromate.

The Stage 1 D/DBPR lowered the MCL for TTHM to 0.080 mg/L, established an MCL of 0.060 mg/L for five haloacetic acids (HAA5) and 1.0 mg/L for chlorite, established a maximum residual disinfection level of 4.0 mg/L for chlorine residual and 0.8 mg/L for chlorine dioxide, and established TOC removal requirements for systems using conventional filtration (with TOC removal requirements based on source water TOC and alkalinity levels).

The Stage 1 D/DBPR also established new monitoring requirements to ensure compliance with these standards. For chlorinated surface water systems that serve over 10,000 people, the Stage 1 D/DBPR requires the collection of four paired TTHM and HAA5 samples (per treatment plant) from the distribution system each quarter. Compliance with MCLs is based on the system-wide running annual average (RAA) of quarterly results. At least 25% of the samples collected each quarter must be from locations representing maximum residence time in the system. The remaining samples must be taken at locations representing average residence time and providing thorough spatial coverage. The rule

allows reduced monitoring if the RAA of TTHM and HAA5 levels drops below 0.04 mg/L and 0.03 mg/L, respectively, over a 12-month sampling period.

8.3.13.2 District's Status

To comply with the Stage 1 D/DBPR, the District has been collecting paired samples for TTHM and HAA5 on a quarterly basis from the following locations in its distribution system:

- Site 1: Township Street
- Site 2: Mclean Road (maximum residence time)
- Site 3: Fruitdale Road
- Site 4: Hillcrest Park (average residence time)

Figures 8-22 and 8-23 depict site-specific results and the system RAA for TTHM and HAA5, respectively, for the period 2007 through 2012. The results indicate that DBP formation has been relatively high and that the District had TTHM exceedances in 2010, 2011, and 2012, and HAA5 exceedances in 2007, 2008, 2010, and 2011.

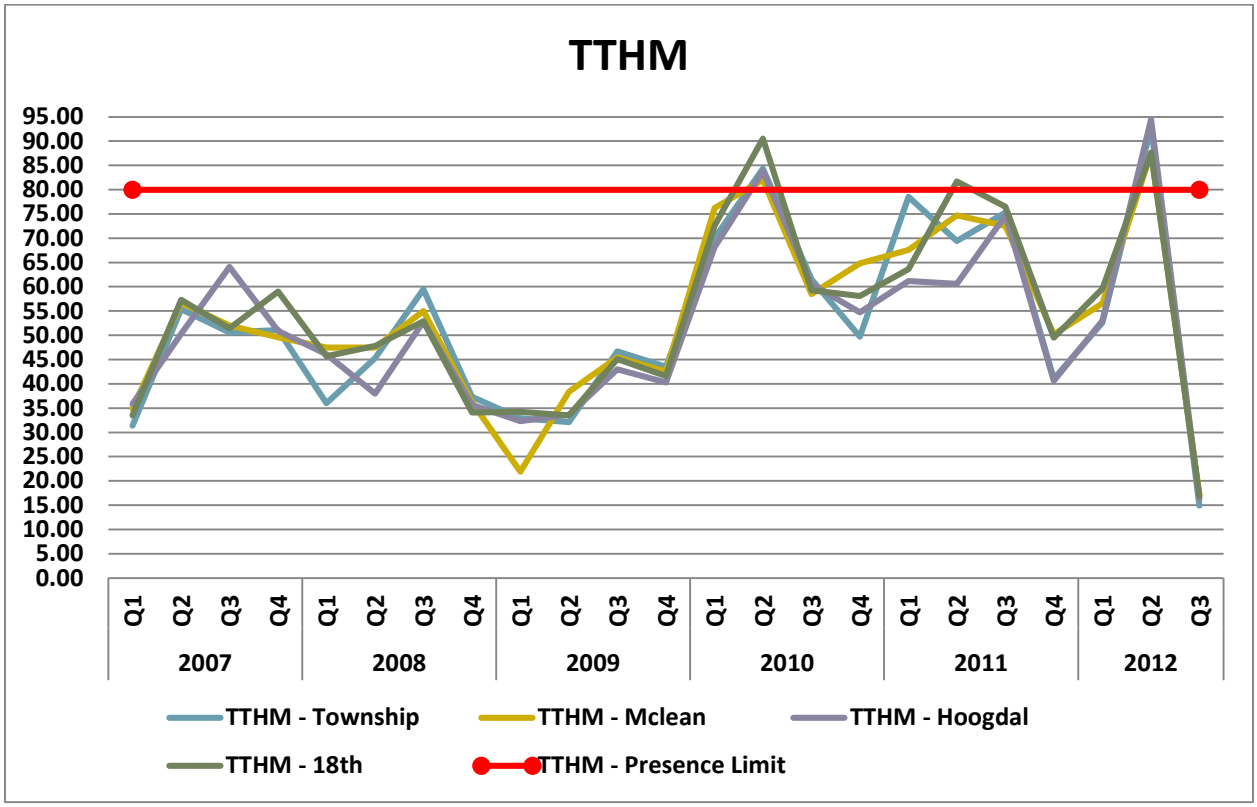

Figure 8-22. Distribution System TTHM, 2007–2012

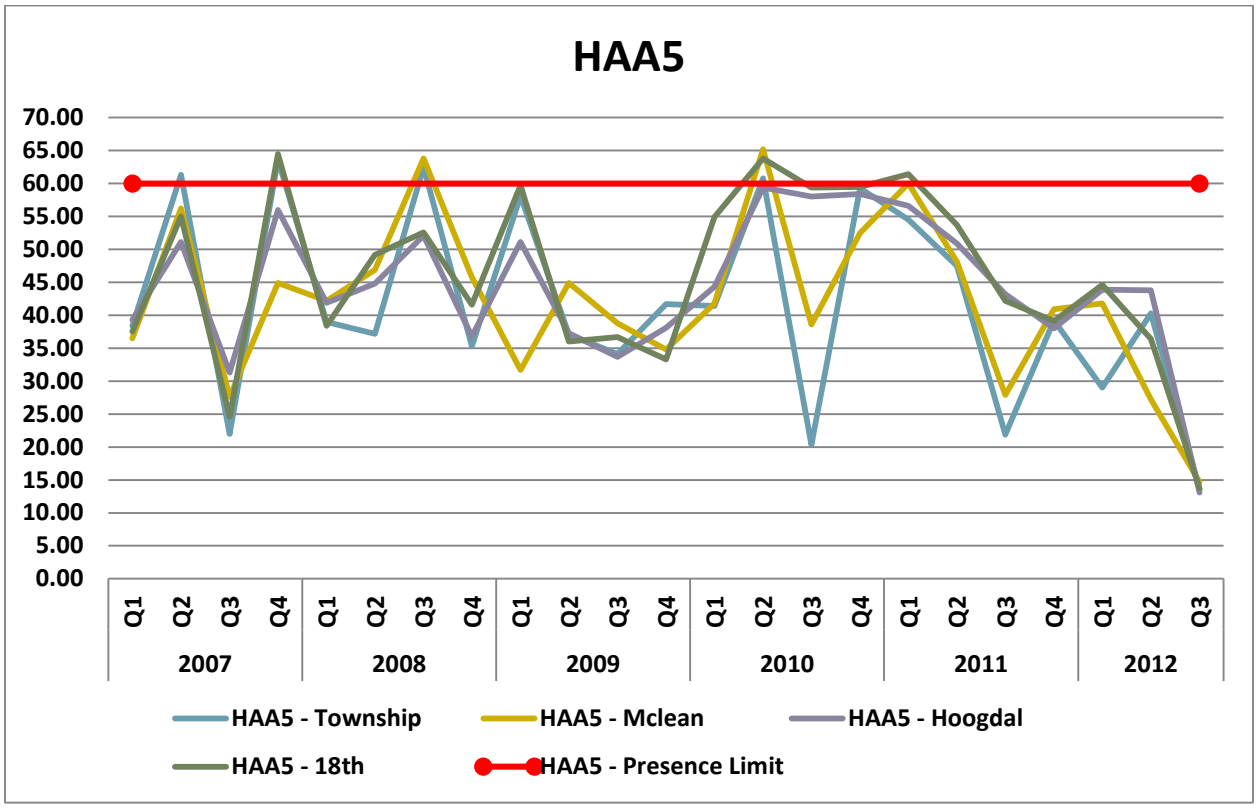

Figure 8-23. Distribution System HAA5, 2007–2012

The high DBP observations are attributed to higher TOC (above 2 mg/L) levels in the source water and presence of free residual chlorine in the finished water. These figures also show some significant variations in the TTHM and HAA5 results based on location, residence time, and seasonal changes (water temperature). The District took steps for reducing high levels of TTHMs and HAA5s by replacing its chlorine dioxide generator with a more efficient model, upgrading the chlorine generator with two discrete injection points for better control of the free residual chlorine. Significant improvement in Stage 1 (TTHMs and HAA5s) results were observed in the third quarter of 2012 and the first quarter of 2012 for Stage 2.

As discussed in Section 8.3.1.2, the District typically obtains a total of 70 to 80 distribution system chlorine residual measurements each month. Since January 2007, the system RAA chlorine residual has varied between 0.67 and 0.75 mg/L; therefore, the District has maintained compliance with the chlorine MRDL.

As part of Stage 1 D/DBPR, chlorine dioxide must be monitored daily at an entry point of the distribution system when in use and should not exceed an MRDL of 0.8 mg/L. Daily operational chlorite levels are measured as part of this rule at the WTP, and 3 samples a month from the distribution systems are submitted to a certified laboratory. The 3 sample locations are as follows:

- WTP (entry point to distribution system)
- 9th and Highland Street (average residence time)
- Fir Island Road (maximum residence time)

No exceedances for chlorine dioxide or chlorite levels for the 6-year period from 2007 through 2012 have been observed.

8.3.14 Stage 2 Disinfection By-Products Rule

8.3.14.1 Regulatory Elements

The Stage 2 Disinfection By-Products Rule builds upon the existing rule and is tightening compliance monitoring requirements for TTHMs and HAA5. This rule requires systems to meet maximum contaminant levels as an average at each compliance monitoring location in the distribution system (instead of as a running annual average [RAA]) for TTHM and HAA5. The goal of this rule is to reduce DBP exposure and related health risks.

Under this rule, systems are required to conduct an evaluation of their distribution systems, known as the Initial Distribution System Evaluation (IDSE), to establish locations with high DBP levels. Based on the results, these locations will be used for sampling sites for Stage 2 DBP rule compliance monitoring. Systems may receive an exemption from the IDSE based on 40/30 Certification if 2 years of eligible DBP data can be provided showing that all individual TTHM and HAA5 results are below 0.040mg/L and 0.030 mg/L, respectively.

The Stage 2 DBP rule also requires each system to establish whether it has exceeded an operational evaluation level, which is identified using the compliance monitoring results. The operational evaluation level provides early warning of possible future MCL violation and gives the system opportunity to review and change its operational practices in order to remain in compliance.

8.3.14.2 District's Status

As part of Schedule 2 (service population 50,000 to 99,999) under the LT2ESWTR, the District began compliance for Stage 2 DBP in October 2012. To comply with the Stage 2 DBP rule, the District was required to do the following:

- Submit an IDSE Plan or 40/30 Certification to DOH by April 1, 2007

- Complete a Standard Monitoring Plan or System-Specific Study, if required, to DOH by March 31, 2009
- Submit an IDSE report to DOH by July 1, 2009
- Begin monitoring per the Stage 2 DBP rule monitoring plan by October 1, 2012

In 2007, the District submitted its IDSE Plan for monitoring DBPs and identifying sites with the highest values for TTHMs and HAA5 based on water age and average chlorine residuals. Based on the IDSE Plan, 16 sites were scheduled to be monitored for TTHMs and HAA5s for 6 quarters and locational running annual average (LRAA) per site to be calculated. The plan was approved and the monitoring was performed from April 2008 through February 2009. The IDSE report was submitted to DOH on July 1, 2009, including results for TTHM and HAA5s for 16 locations, LRAA calculated for each location, and results from Stage 1 locations for 4 quarters and their LRAA. Based on this IDSE report and Stage 2 DBP requirements, 8 sites were identified for monitoring under the Stage 2 DBP rule. These 8 sites represent the highest TTHM (3), highest HAA5 (3), and existing Stage 1. In October 2012 the District collected its first round of dual samples for Stage 2. Table 8-6 lists the sites and results.

Table 8-6. Stage 2 DBP Monitoring Locations

Location	TTHM (mg/L)	HAA5 (mg/L)
Big Lake	17.0	20.5
Eaglemont	14.6	23.5
Hillcrest Park	14.8	22.7
Cascade Ridge #2	14.7	19.7
Swan Rd	15.1	15.8
Clear Lake	13.8	15
Fruitdale Rd	13.5	20
Bow Hill	16.5	18.7

8.3.15 Ground Water Rule

The Ground Water Rule applies only to the small satellite systems—Marblemount, Cedargrove, Skagit View Village, Alger, Mountain View, and Rockport. The purpose of this rule is to provide for increased protection against microbial pathogens, especially fecal contamination in PWSs using groundwater. Under this rule, systems must conduct compliance monitoring or triggered source monitoring. Systems that provide at least 4-log virus inactivation, removal, or a state-approved combination of these technologies are subject to compliance monitoring. Systems that do not

provide at least 4-log treatment or that do not purchase 100% of their water are subject to triggered source monitoring.

8.3.16 Consumer Confidence Reports and Public Notification Rule

8.3.16.1 Regulatory Elements

The Consumer Confidence and Public Notification Rule require systems to provide customers with water quality information on an annual basis, and when a regulatory violation occurs. The annual report must include the following information:

- Description of the source of drinking water
- Definition of terms used
- MCL for regulated contaminants and their levels in the drinking water
- Any violations and potential health effects
- Educational information on unregulated contaminants, if required
- Minimum requirements of the contents of the report per WAC 246-290-72001

While the Consumer Confidence Report (CCR) provides annual information regarding contaminant levels in the water, the Public Notification Rule (PNR) directs utilities in notifying customers of acute violations when they occur. The PNR was revised in May 2000 and outlines public notification requirements for violation of MCLs, treatment techniques, testing procedures, monitoring requirements, and violations of a variance or exemption. If violations have the potential for "serious adverse effect", consumers and the State must be notified within 24 hours of the violation. The notice must explain the violation, potential health effects, corrective actions, and whether consumers need to use an alternative water source. Notice must be provided to consumers within 30 days in an annual report, or by mail or direct delivery service within 1 year depending on the severity of the violation.

8.3.16.2 District's Status

The District prepares and distributes CCRs to its customers every year by July 1. A copy of the current CCR is included as Appendix N and is also available on the District's website. Regarding the PNR, because no acute violations have occurred since the promulgation of this rule, "timely" public notification has not been necessary.

8.3.17 Operator Certification

8.3.17.1 Regulatory Elements

Operator certification helps protect human health and the environment by setting minimum professional qualifications for individual operation of public water systems. EPA established in 1999 certification program guidelines for certification and recertification of operators of community and non-transient non-community public water systems. Each state is responsible for establishing the minimum of these guidelines, including the following:

- Each treatment facility or distribution system must be operated by a certified operator.
- Operator certification must be equal to or greater than the system classification being operated.
- All process control personnel must be certified.
- At least one certified operator must be available on every shift.
- Operators must sit for, and pass, a validated exam demonstrating skills, knowledge, ability, and judgment necessary for the system classification.
- Each operator must have a high school diploma, a General Educational Development (GED) degree, or state-approved experience and training.

8.3.17.2 District's Status

The District fully complies with EPA and DOH operator certification requirements. More details are provided in Chapter 9, Operations and Maintenance, regarding the appropriate levels of certification for each position in the District.

8.4 Anticipated Water Quality Regulations

Every year new water regulations are issued or updated. This section discusses the anticipated water regulations and their impact on the District. The EPA Contaminant Candidate List (CCL) is the primary source for tracking upcoming regulations or updates. The District makes changes to its system and/or procedures when necessary to comply with the new regulations.

8.4.1 Radon Rule

EPA proposed in 1999 new regulations on radon in order to reduce health risks. The proposed standards apply only to community water systems that regularly serve 25 or more people and that use groundwater or mixed ground and surface water. This will not apply to systems using surface water where radon levels are very low. This proposal also provides states with flexibility in how to limit exposure to radon by allowing them to focus on indoor air as a greater risk for radon exposure than drinking water. Based on this, states can choose to develop a Multimedia Mitigation (MMM) program assessing the health risks of radon exposure due to its presence in indoor air, while individual water systems reduce radon levels below 4,000 pCi/L. A second option allows states to not

develop MMM programs, but requires systems to reduce radon levels below 300 pCi/L. This rule would apply to the District whether or not Washington state develops an MMM program. So far it is not clear when this rule will be finalized.

8.4.2 Revised Total Coliform Rule

8.4.2.1 Regulatory Elements

The SDWA 1996 amendment requires EPA to review and revise each national primary drinking water regulation every 6 years. The Total Coliform Rule (TCR) has been effective since December 1990 and provides the following: (1) MCLG and MCL for total coliform and *E. coli*, (2) number of samples based on population served, (3) follow-up samples if total coliform or *E. coli* tests are positive, and (4) public notifications for violations. The Revised Total Coliform Rule (RTCR) was implemented and will be effective from April 1, 2016. Under the new RTCR a few changes are expected:

- Non-acute MCL violation for total coliforms under the TCR will be replaced under the RTCR by a coliform treatment technique.
- Level 1 and level 2 assessments depending on the violations.
- Total coliform positive samples do not result in public notifications.
- Reduced monitoring for smaller systems.
- Uncorrected or unexplored contamination results in violation.
- Failure to perform corrective action recommended by the State in a timely manner will result in a violation.

8.4.2.2 District's Status

The District will continue to follow any developments in the RTCR and will make the necessary changes to comply when the rule is adopted. Some of these changes will include preparation for system assessment in case of violation. The District will focus on better understanding its distribution system by hydraulic modeling and water quality modeling, evaluation of potential vulnerabilities (main break protocols, seasonal water quality issues, water age, representative sample sites, protocols for accepting new construction, etc.), and collaboration with the State.

8.4.3 Drinking Water Laboratory Certification and Data Reporting Rule (Lab Rule)

8.4.3.1 Regulatory Elements

The Drinking Water Laboratory Certification and Data Reporting Rule (Lab Rule) applies to all laboratories testing water samples for water systems. The rule was proposed in June 2006 because there were no specific requirements for labs to submit analytical results for drinking water compliance samples to DOH. Instead, water systems were responsible for submitting results to DOH. The goals of the Lab Rule are as follows: (1) labs must meet accreditation requirements established by the Washington State Department of Ecology (WAC 173-50), and (2) labs must meet reporting requirements under this rule.

Under the proposed changes in 2010 of the Lab Rule, labs must report results, submitting either hard copies (written data report forms) or electronic data (digital file). When labs submit analytical results on written forms to the State, labs need to include State Reporting Level (SRL) and Minimum Detection Limit (MDL) when they report electronically. Beginning in January 2014, all labs must submit their analytical results electronically. If labs are out of compliance with this rule, their certification may be revoked by the Washington State Department of Ecology (Ecology).

8.4.3.2 District's Status

Because the District has a certified laboratory, it will be affected by any changes in this rule. Currently, all water samples for total and fecal coliforms are processed in the WTP lab. The WTP lab submits two sets of hard copy results to DOH; a third copy is on file at the District. The WTP lab also has electronic copies of all results. The District will be storing the results of all monitoring in a database that will be accessible by the appropriate staff.

8.4.4 Waterworks Operator Certification Rule

8.4.4.1 Regulatory Elements

WAC 246-292-020 requires Group A water systems with surface water or groundwater under the influence of surface water as their source to be operated by certified operators. To become certified, operators must meet minimum education and experience requirements and pass an examination. In addition, certified operators must meet professional growth requirements every 3 years to maintain their certification status. Some of the new rule changes include the following:

- Strengthening DOH's authority to take immediate enforcement actions in cases of gross negligence.
- Clarifying DOH's authority to certify backflow assembly testers and cross-connection control specialists.

- Amending the definition of "Group A public water system" to be consistent with other related statutes.
- Adding a reference to Chapter 18.106 RCW for the specialty plumbers licensing requirements that cover some activities performed by a backflow assembly.
- Addressing large public water system recruitment issues to allow broader substitution options for minimum education requirements.
- Adding duties for operators in responsible charge and responsibilities for cross-connection control specialists and backflow assembly testers.
- Revising temporary certification requirements for surface water treatment plant operators to increase public health protections for these high-risk water systems.
- Adding minimum requirements for field test and inspection reports completed and submitted by backflow assembly testers.
- Improving overall clarity, simplifying language, and adding existing program practices and guidelines to the rule.

8.4.4.2 District's Status

This rule was changed in 2013 and affects the certification requirements for operators working with the satellite systems, as well as all certified operators in the District.

8.5 Regulatory Compliance Status

A review of monitoring procedures and water quality results from 2007 through 2012 indicates that the District has maintained compliance with all current and applicable state and federal drinking water regulations during the review period. The following recommendations and action items are intended to assist the District with near-term planning activities and continued compliance:

- Update of the District's Coliform Monitoring Plan to reflect additional monitoring requirements regarding change in service population.
- Develop and retain formal monitoring plans for regulated VOCs, SOCs, IOCs, and radiological parameters. These plans should document monitoring locations, frequencies, sample collection and preservation techniques, analytical and reporting requirements, and laboratory coordination issues.
- Prepare a *Cryptosporidium* monitoring plan and start monitoring in 2013.
- Prepare and evaluate the system for potential vulnerability to reflect with the new RTCR.

8.6 Laboratory Certification

Each testing parameter is performed in an Ecology- or EPA-accredited laboratory, except algae. All microbiological samples have been processed in the District's certified laboratory since June 2012 (prior to this date the samples were processed by Edge Analytical). The WTP lab is certified for SM 9223 B detection and enumeration, SM 9222 D&G, and Simplate. Edge Analytical in Burlington was used for all other parameters required by the State until the end of 2012. Historically, the District contracted with Western Washington University in Bellingham to analyze samples for algae count and identification, but now the algae analysis will be conducted in the District's lab by the Lab Analyst.

In 2012 the District reviewed its policies for selecting analytical labs for its compliance testing and established new policies to assess lab cost and performance. After a bidding process, the District selected Avocet Environmental Testing for providing laboratory services in 2013. The laboratories' names and associated contact information are provided below. Each of these laboratories is certified for the tested parameters.

Skagit PUD No.1 WTP Lab
11932 Morford Rd.
Sedro-Woolley, WA 98284

Edge Analytical
1620 S Walnut Street
Burlington, WA 98233

Avocet Environmental Testing
1500 State Street
Bellingham, WA 98225

8.7 Customer Water Quality Inquiries

The District is establishing a formal process for handling customer inquiries or complaints regarding water quality. Customer complaints are addressed within 24 hours. Currently, all calls regarding any water issues are transferred and processed by the Water Quality Program Facilitator. If a call is about water quality issues, staff members visit the customer's home and try to determine the problem. Usually on-site staff members measure chlorine residual and pH, and collect samples for coliform bacteria, if necessary. Other parameters could be analyzed as well if the staff member determines it is necessary. Once the results are complete, the customer is informed. All water quality complaints are recorded and included in the end of the month report submitted to DOH.

8.8 Future Monitoring Requirements

Table 8-7, Monitoring Roadmap for 2014 through 2019, provides a summary of upcoming water quality monitoring requirements for the next 6-year period from 2014 to 2019. The table is intended to serve as a monitoring roadmap. The District will consult with DOH and refer to its annual water quality monitoring report (WQMR) for DOH-mandated sampling and monitoring requirements. Table 8-7 does not take into account monitoring requirements associated with potential new or revised regulations, nor does it consider potential future waivers that may take effect.

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Table 8-7. Monitoring Roadmap for 2014 through 2019

Group	Regulation	Parameters	Locations	2013	2014	2015	2016	2017	2018	Notes
Inorganic Compounds	Lead and Copper Rule	Lead, Copper	Customer Taps	No Activity	No Activity	Sample at 30 Locations	No Activity	No Activity	Sample at 30 Locations	The District collects 30 samples once every 3 years (between June and September).
	Phase II and V Rules	Inorganic Compounds, including arsenic (As), nitrogen dioxide (NO_2), nitrate (NO_3)	Finished Water at Entry Point	Conduct Sampling	Conduct Sampling	Conduct Sampling	Conduct Sampling	Conduct Sampling	Conduct Sampling	Annual IOC monitoring.
	Phase II and V Rules	Asbestos	Distribution System – A-C pipe area	Conduct sampling	No Activity	No Activity	No Activity	No Activity	No Activity	Asbestos monitoring is more frequent than 9 years and is based on WQMR from DOH.
Organic Compounds	Phase I Rule	Volatile Organic Compounds	Finished Water at Entry Point	No Activity	Conduct Sampling	No Activity	Conduct Sampling	No Activity	Conduct Sampling	Based on WQMR reports.
	Phase II and V Rules	Synthetic Organic Compounds	Finished Water at Entry point	No Activity	Conduct Sampling	No Activity	No Activity	No Activity	No Activity	SOC monitoring twice every 5 years.
Radionuclides	Radionuclides Rule	Gross Alpha, Combined Radium	Finished Water at Entry Point	No Activity	No Activity	Conduct Sampling	No Activity	No Activity	No activity	Monitoring frequency is based on WQMR, currently is once every 6 years.
		Beta/Photon Emitters	Finished Water at Entry Point	No activity	No activity	Conduct Sampling	No Activity	No activity	No activity	Monitoring frequency is based on WQMR, currently is once every 6 years.
Microbiological Contaminants	Total Coliform Rule	Coliform Bacteria	Distribution System – TCR sites	Sample Monthly	Sample Monthly	Sample Monthly	Sample Monthly	Sample Monthly	Sample Monthly	Collect 70 routine coliform samples per month.
	SWTR and IESWTR	Fecal Coliform Bacteria	Source Water	Sample Monthly	Sample Monthly	Sample Monthly	Sample Monthly	Sample Monthly	Sample Monthly	Sample at a frequency ≥10% of the number of routine monthly total coliform samples collected in the distribution system.
		Turbidity	Source Water; IFE and CFE	Continuous; Continuous	Continuous; Continuous	Continuous; Continuous	Continuous; Continuous	Continuous; Continuous	Continuous; Continuous	Monitor continuously and record readings at 15-minute intervals.
	LT2ESWTR	*Cryptosporidium, E. coli*	Start Monitoring	Monitoring	Monitoring	No Activity	No Activity	No activity	No activity	Early start, because of combined source.
Disinfectant	SWTR	Disinfectant Residual	Entry Point Distribution System	Continuous; Monthly	Continuous; Monthly	Continuous; Monthly	Continuous; Monthly	Continuous; Monthly	Continuous; Monthly	Maintain a disinfectant residual ≥0.2 mg/L at entry point; maintain a detectable residual in ≥95% of monthly distribution system samples.
	Stage 1 D/DBP Rule	Disinfectant Residual, Chlorite	Distribution System	Sample Monthly	Sample Monthly	Sample Monthly	Sample Monthly	Sample Monthly	Sample Monthly	Maintain chlorine residual below the MRDL of 4.0 mg/L and chlorite below 1.0 mg/L.
Disinfection By-Products	Stage 2 DBP Rule	TTHM, HAA5	Distribution System – eight locations	Sample Quarterly	Sample Quarterly	Sample Quarterly	Sample Quarterly	Sample Quarterly	Sample Quarterly	For routine monitoring, collect eight pair DBP samples per quarter from Stage 2 locations.
Consumer Confidence Report	Consumer Confidence Report	All Regulated Contaminants	Not Applicable	Annual CCR	Annual CCR	Annual CCR	Annual CCR	Annual CCR	Annual CCR	Prepare and Distribute CCR prior to July 1 of each year.

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