HELENA MONTANA

QUEEN CITY OF THE ROCKIES

Helena Water Facilities Plan

CHAPTER 4 – WATER QUALITY AND REGULATORY REVIEW

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Introduction

Water quality is the biggest factor in determining what type of water treatment options will be both cost effective and provide the highest quality drinking water to the customer. This chapter provides a summary of raw water quality at both Helena treatment plants and an in depth look at future and upcoming EPA and MDEQ regulations impacting municipal water treatment.

Water Quality

Missouri River Raw Water Quality

Historical raw water quality data for turbidity, temperature, pH, and alkalinity is summarized in Table 4-1. Statistical water quality data for arsenic and algae is also listed in the table because these constituents are commonly found in the raw water supply.

Except for the occurrence of arsenic and algae, raw water quality of the Missouri River supply could be characterized as reasonably high. The maximum turbidity measured in the raw water over the past fifteen years was 15 NTU with an average of 1.9 NTU. Since the construction of the TTP, the MRTP is normally operated only during the summer months and water quality data obtained since 1990 is only representative of the May through September season. Wintertime data is currently being collected by City staff.

Table 4-1 Raw Water Quality Summary [1] – Missouri River Water Treatment Plant

Parameter	Units	Minimum	Maximum	Average
TOC[3]	mg/L	1.7	3.1	2.3
Color[2]	CU	2	20	7
Turbidity	NTU	0.6	15	1.9
Temperature	Deg. C	1	16.5	10.8
pH	Std units	6.3	9.0	7.7
Alkalinity[2]	mg/L $CaCO_3$	180	210	200
Total Hardness[2]	mg/L $CaCO_3$	74	190	141
Arsenic[2]	μg/L	22	34	27
Algae Counts	#/mL	1,109	20,900	7,790

[1] Taken from plant operation records for years 1989 through 2004.
[2] Taken from USGS water quality data of Missouri River downstream of Canyon Ferry Reservoir.
[3] Taken from 2001 through 2004 Disinfection By-Product reports.

The data shown in Table 4-1 shows temperatures experienced during the months of May through September and does not reflect wintertime operations. The raw water pH typically ranges between 7 and 8 pH units. The raw water alkalinity is greater than 100 mg/L (as $CaCO_3$) 90 percent of the time. This parameter is important in the coagulation process since hydrolysis of aluminum sulfate consumes approximately 0.5 mg/L of alkalinity for every 1 mg/L of coagulant added. There is sufficient alkalinity in the raw water for stable coagulation.

The raw water arsenic concentration exceeds the current finished water MCL of 10 μg/L (effective January 2006) in all of the raw water supply samples.

Two other water quality parameters of concern are total organic carbon (TOC) and color. Raw water TOC was measured in the range of 2 to 3 mg/L. It is anticipated that raw water TOC concentrations fluctuate seasonally, with the highest organic levels experienced during the late summer and fall months corresponding to algae growth in the reservoirs. These data reflect summer season operation only.

Color analyses during treatability testing in 1997 found color measurements ranging between 30 and 50 CU. Color exerts a demand for coagulant and is normally associated with the presence of TOC in raw waters. TOC is a measure of precursors to disinfection by-products that are formed upon addition of chlorine. The by-products, such as total triholomethanes and haloacetic acids, are regulated under the Disinfection By-Products (DBP) Rule. The removal of organic material in the treatment process prior to disinfection is an important step at the MRTP for meeting current and future DBP regulations.

Missouri River Raw Water Algae

A significant algae population can be found in the raw water supply due to the algae growth in the Regulating Reservoir. Algal growth is more abundant in warm summer months, creating adverse by-products in the form of taste- and odor-causing compounds. Severe tastes and odors have infrequently occurred in the Missouri River water supply during the late summer and fall months. The Regulating Reservoir is currently managed to provide continual inflow and outflow of water to aid in prevention of severe taste and odor occurrences. Algae populations during plant operations have exceeded 7,000 counts per milliliter of water.

Fire Risk

One advantage of the Missouri River source over the Tenmile source is the reduced risk of severe impact by forest fires. The Missouri River draws from a much larger watershed than the Tenmile and the MRTP supply draws downstream of two reservoirs (Canyon Ferry and the Regulating Reservoir) where solids could settle out. As a result, the impact of a forest fire on raw water quality would be far less dramatic. No noticeable effect on water quality was observed due to the 2000 or 2003 forest fires in the Missouri watershed and any sediment from future forest fires would likely settle out in the Canyon Ferry or Regulating Reservoirs prior to reaching the MRTP.

The MRTP has a lower risk of fire-related water quality impacts than TTP.

Tenmile Raw Water Quality

Historical raw water quality data for turbidity, temperature, pH, and alkalinity is summarized in Table 4-2. In general, water quality is good, with low turbidity and moderate pH. Color and TOC levels, however, are above average and indicate the presence of dissolved organics.

Table 4-2 Raw Water Quality Summary[1] -Tenmile Water Treatment Plant

Parameter	Units	Minimum	Maximum	Average
Turbidity [1]	NTU	1.0	>100[2]	--
Temperature	Deg F	3	19	8
Color [1]	CU	2	126	31
pH [1]	Std units	5.9	7.9	7.0
Alkalinity	Mg/L $CaCO_3$	15	70	24
TOC	mg/L	2	25	4.4

[1] Taken from plant operation records for years 1991 through 2004.
[1] Based on event spikes recorded at TTP influent turbidemeter.

The maximum turbidity measured in the raw water over the past six years was >100 NTU. Elevated turbidity levels (780 NTU) are recorded four to five times per year, typically during spring runoff. The raw water pH typically ranges between 6.5 and 7.5 pH units. The alkalinity data indicates that raw water alkalinity is low, always less than 30 mg/L as $CaCO_3$.

Raw water TOC was measured in the range of 3 to 5 mg/L, with highest levels coming in May associated with runoff events. Color analyses found color measurements ranging between 2 and 126 CU with an average of 31 units.

Elevated turbidity levels are recorded at TTP four to five times per year.

Color exerts a demand for coagulant and is normally associated with the presence of TOC in raw waters. TOC is also a measure of the level of precursors to disinfection by-products that are formed upon addition of chlorine. The by-products, triholomethanes and haloacetic acids, are regulated under the Stage 1 Disinfection By-Products (DBP) Rule. The removal of organic material in the treatment process prior to disinfection is an important step at the TTP for meeting current and future DBP regulations.

The Tenmile water supply has only been tested once for radon levels. The sample measured 246 pCi/L, which is below the proposed MCL, which is 300 pCi/L.

Treating Tenmile for Taste and Odor

Historically, algae and taste/odor compounds have been effectively managed at the TTP. A significant algae population can be found in Chessman Reservoir every year. Each July, City staff adds 10,000 pounds of copper sulfate to control algae. In addition, 0.5-1.5 ppm of powdered activated carbon is added at the TTP whenever Chessman Reservoir is in service to control taste and odor compounds.

Tenmile Raw Water Challenges

The TTP is sensitive to blending of water from Chessman and Scott Reservoirs. The plant experiences treatability problems characterized by extremely short run times (a few hours) and rapidly increasing headloss. These problems occur when the fraction of raw water from Chessman exceeds more than 60 percent. The plant operates successfully with high fractions of water used from Scott Reservoir.

In addition, the Tenmile watershed is faced with forest fire risks and drought risk. In 1997, reservoir levels dropped to below normal operating levels in both reservoirs, requiring the City to operate the MRTP. In addition, the smaller watershed at the Tenmile faces greater risk of water quality impacts associated with forest fires. A healthy forest is critical to providing a safe, reliable supply. The City has been working with the Forest Service to develop a management plan that meets both City and forest needs.

Hale Water Quality

Hale raw water quality data for TOC and alkalinity from 2002 and 2003 is summarized in Table 4-3. The water quality data are typical of a ground water source, with low TOC levels and high alkalinities.

Table 4-3 Raw Water Quality Summary - Hale Supply

Parameter	Units	Minimum	Maximum	Average
TOC	mg/L	0	0.588	0.56
Alkalinity	mg/L $CaCO_3$	190	280	207

Orofino

MDEQ has conducted microscopic particulate analyses (MPAs) on the Orofino supply. MPA is intended to identify organisms that occur only in surface water and whose presence in groundwater clearly indicates that at least some surface water has been mixed with it. Similarly, if macroscopic surface water indicators are found in the groundwater source, then the conclusion is that microscopic sized pathogens could also be present.

MDEQ classified Orofino as under the influence of surface water.

The MPA results are shown in Table 4-4. The MPA score was primarily derived from diatoms. MDEQ applies the following relative risk factors:

- High Risk - > 19
- Moderate Risk - 10-19
- Low Risk - < 10

Table 4-4 Orofino Supply Microscopic Particulate Analysis

Date	Score	Risk
5/31/99	11	Moderate
8/30/99	14	Moderate
5/29/00	12	Moderate

These results indicate there is moderate risk of surface water influence in the supply. MDEQ issued a letter dated August 20, 2004 that classified Orofino as groundwater under the direct influence of surface water.

Eureka

The Eureka MPA analysis scored 1, indicating a low risk for surface water influence. MDEQ has classified the Eureka source as groundwater.

Summary of Finished Water Quality

Table 4-5 summarizes the finished water quality for the City of Helena from 2003. There are currently no parameters that exceed existing MCLs.

Table 4-5 2003 Finished Water Quality

Parameter	Units	Highest Level Detected	Range Detected	MCLG	MCL
Turbidity TTP MRTP	ntu	 0.28 0.31	100% of samples taken meet state requirements	NA	Treatment Technique
TOC TTP MRTP	ppm	 4.33 1.88		NA	Treatment Technique
Arsenic MRTP	ppm	 5.0		NA	10
Copper	ppm	0.42% 90th % of samples taken	No samples exceed the Action Level	1.3	Action Level = 1.3
Lead	ppb	6 90th % of samples taken	No samples exceed the Action Level	0	Action Level =15
Nitrate plus Nitrate as N (Hale/Eureka)	ppm	0.92		10	10
Fluoride TTP MRTP Hale/Eureka	ppm	 0.13 1.16 0.11		4	4
Total THMs[1] TTP MRTP Hale/Eureka	ppb	 54.0 42.0 5.0	 22.0 – 51.0 19.0 – 51.0 3.0 – 13.0		80.0 Running Annual Average
Total HAAs[2] TTP MRTP Hale/Eureka	ppb	 43.0 37.0 3.0	 22.0 – 51.0 19.0 – 51.0 3.0 – 13.0		60.0 Running Annual Average

[1] Trihalomethanes
[2] Haloacetic Acids

Regulations

The following section discusses current and future regulations and their impact to the City.

Current Regulations

Taken as a group, the thrust of the current drinking water regulations is to ensure that drinking water is microbially safe, that it contains minimal disinfection by-products, and that it does not contain excess levels of metals due to corrosion of piping materials. Compliance with the rules requires each treatment plant not only to produce water that meets the regulated water quality standards, but also to meet specific monitoring requirements and treatment techniques.

Current regulations that will impact the treatment practices of the water treatment plant are listed below and summarized briefly. Some of these rules regulate contaminants or set up treatment techniques that must be met by water treatment plants. In addition, there is a long list of organic and inorganic chemicals that are regulated with maximum contaminant levels in drinking water. Sampling for this suite of contaminants is part of the routine monitoring for all treatment plants. On a day-to-day basis, many of these contaminants will not be a major concern at the treatment plant, but for reference purposes, the EPA listing of all the National Primary Drinking Water Standards is included as Appendix 4-A.

Lead and Copper Rule and Revisions

The Lead and Copper Rule (LCR) and its revisions require utilities to have a corrosion control strategy. Each treatment plant must establish a corrosion control program that is approved by the State. Potentially, the Lead and Copper Rule can have a significant impact on sampling, analytical and operating costs, as well as a substantial capital cost for treatment facilities. Water treatment processes must incorporate treatment schemes which ensure that stable, noncorrosive water is produced at the plant. If source water is corrosive, chemical addition can be employed for pH and/or alkalinity adjustment, calcium adjustment, or to inhibit corrosion. The action level for lead is exceeded if more than 10 percent of the targeted tap samples are greater than 0.015 mg/L. The action level for copper is exceeded if more than 10 percent of the targeted tap samples are greater than 1.3 mg/L. If the action levels are exceeded, the corrosion control strategy must be reviewed and adjusted to reduce lead and copper levels at the tap.

Applicability to Helena

The City of Helena was within the action limits set for lead and copper for the required two consecutive monitoring periods. Due to this compliance, the system is said to have optimum corrosion control and the frequency of sampling has been reduced to 30 samples every three years.

Surface Water Treatment Rule (SWTR)

Treatment, in conjunction with disinfection, provides 3-log *Giardia* reduction and 4-log virus reduction. The MRTP is given a 2.5-log *Giardia* removal and 2-log virus removal credit by DEQ for the conventional treatment process, resulting in a required 0.5-log *Giardia* and 2-log virus inactivation through disinfection. The TTP is given a 2-log *Giardia* removal and 1-

log virus removal credit by DEQ for the direct filtration process, resulting in a required 1-log *Giardia* and 3-log virus inactivation through disinfection.

- The residual disinfectant entering the distribution system cannot be less than 0.2 mg/L for more than four hours, and
- Residual disinfectant must be detectable in more than 95 percent of samples taken in the distribution system each month.

The SWTR required that plants meet specific turbidity levels for the combined filter effluent. These requirements are superseded by the new turbidity limits and monitoring requirements set forth in the Interim Enhanced Surface Water Treatment Rule (IESWTR).

Applicability to Helena

Since the City of Helena uses surface water as their supply, this rule is very significant. Both of the City's treatment facilities currently meet the *Giardia* and virus reduction criteria established by DEQ through removal and inactivation. The City also monitors residual chlorine in the water entering the distribution system continuously and throughout the distribution system to ensure compliance with the rule.

Interim Enhanced Surface Water Treatment Rule (IESWTR)

The IESWTR sets up new turbidity requirements for both the combined filter effluent and the individual filter effluent. The combined filter effluent must not exceed 0.3 NTU for 95 percent of the 4-hour readings each month and at no time exceed 1 NTU. Individual filter effluent turbidity levels must be monitored continuously and must be evaluated monthly. Monitoring individual filters continuously requires the ability to tap each filter effluent line before the filter effluent is combined. In addition, the turbidity must be recorded electronically for plant operations staff to be able to handle and review the quantity of turbidity data generated by this requirement. Turbidimeters at the plant must be maintained and calibrated at regular intervals and documentation of maintenance and calibration is required.

Individual filter turbidity performance requirements in the rule set up a required action if one of the triggers is exceeded. All individual turbidity triggers are based on two consecutive 15-minute measurements. An exception report to the State is required if:

- Individual filter effluent is greater than 1.0 NTU at any time during filter operation; or
- Individual filter effluent is greater than 0.5 NTU after the first four hours of operation.

Filter profiles, or a graphical representation of individual filter performance over time, for individual filters must be produced within seven days of the exceedance for inclusion in the exception report. A filter self-assessment, consisting of a more comprehensive review of filter operations and media, is required when the effluent from an individual filter is greater than 1.0 NTU in two consecutive 15 minute readings for three consecutive months. A State or third party Comprehensive Performance Evaluation of the plant is required when the effluent for an individual filter is greater than 2.0 NTU in two consecutive 15 minute readings for two consecutive months.

In addition to the IESWTR requirements, Montana DEQ requires:

- Individual filter turbidity must be at or below 0.3 NTU in 95 percent of the samples taken and at no time be more than 5.0 NTU; and
- Residual disinfectant concentration cannot be below 0.2 mg/L using the DPD Method or 0.1 mg/L using the amperometric titration method.

Applicability to Helena

The City of Helena is in compliance with IESWTR and the additional DEQ requirements for turbidity limits. The City installed all the required turbidimeters and is able to monitor individual effluent filter turbidity.

Total Coliform Rule

All drinking water systems must continue to comply with the Total Coliform Rule (TCR), which limits the number of positive total coliform samples allowed each month in the distribution system. The Federal regulatory process is beginning to move towards drafting a new distribution system rule, which may modify the TCR to include best management practices in distribution systems and other suggestions. The best management practices may consist of a systematic evaluation of the distribution system to ensure water quality is maintained, to identify areas with potential for microbial regrowth, and to establish a systematic flushing program for distribution system management. This new rule is not likely to be proposed until 2006.

Applicability to Helena

The State of Montana has adopted the federal TCR. Public notification is required when detections of total coliform are found. The State has developed a set of standards for wording to be used for public notifications, detailing potential heath effects from bacteria, and specific recommendations for water use during times of violation.

Stage 1 Disinfection/Disinfection By-Products (DBP) Rule

The Stage 1 DBP Rule sets maximum contaminant levels (MCLs) for disinfection byproducts, including total trihalomethanes (TTHM) at 80 µg/L and five of the haloacetic acids (HAA5) at 60 µg/L. Compliance with these MCLs is based on a running annual average of quarterly averages of all the required samples. Monitoring must take place quarterly for TTHM and HAA5 at four sites in the distribution system for each plant in the system. Based on the historic values of TTHMs and HAA5s, Helena is on reduced monitoring at one location (maximum residence time) within the distribution system each quarter.

The rule also sets maximum residual disinfectant levels (MRDL) for disinfectants commonly used in water treatment. The enforceable standard is set at 4.0 mg/L as Cl_2 for chlorine. Chlorine is measured regularly each month at total coliform sample sites and the results are averaged monthly. Each quarter, the running annual average of the monthly averages is calculated and it must be below the MRDL to maintain compliance.

In addition to regulating levels of DBPs and disinfectants in finished water, the Stage 1 DBP Rule requires plants that use conventional treatment to remove a specified percentage of the total organic carbon (TOC) found in the raw water (see Table 4-6). Removal of TOC is a

treatment technique for DBP precursor control. The interaction between free chlorine and natural organic matter is known to be the source of the regulated DBPs and numerous other disinfection byproducts. By reducing the precursors, the level of DBP development is reduced.

Table 4-6 Total Organic Carbon (TOC) Removal Requirements

Source Water TOC (mg/L)	Source Water Alkalinity (mg/L)		
	0-60	**> 60-120**	**>120**
> 2.0 to 4.0	35%	25%	15%
> 4.0 to 8.0	45%	35%	25%
> 8.0	50%	40%	30%

Applicability to Helena

The City of Helena is in compliance with Stage 1 monitoring requirements. The City has measured TOC and alkalinity as required at MRTP and has achieved adequate TOC removal. The City is also on reduced TTHM and HAA5 distribution monitoring based on historic monitoring and now monitors one sample per quarter at the point of maximum residence time within the distribution system.

Filter Backwash Recycling Rule

The Filter Backwash Recycling Rule (FBRR) required existing systems to notify the State by December 2003 if the system recycles spent filter backwash water, thickener supernatant, or liquids from dewatering processes. In addition, any plant that recycles is required to return its recycle flow to the head of the plant, where it will be completely retreated through all processes. Records must be kept for State review of the following:

- Copy of the recycle notification;
- List of all recycle flows and the frequency of return;
- Average and maximum backwash flow rate and duration of backwash;
- Typical filter run length and written description of how filter run length is determined;
- Type of treatment provided for recycle flow; and
- Design data on the plant treatment units, hydraulic loading rates, chemicals used with dose and frequency, and frequency of solids removal.

Applicability to Helena

Filter backwash recycling is not practiced at either water plant, so FBRR does not apply to the City of Helena.

Radionuclides Rule

The Radionuclides Rule sets MCLs for combined radium (Ra-226 and Ra-228) at 5 pCi/L, for Gross alpha at 15 pCi/L, for Uranium at 30 µg/L, and for beta/photon radioactivity at

≤ 4 millirem/year. While compliance with this rule may not be an issue for many plants, the rule has generated an adjunct problem. When systems with significant levels of radionuclides practice enhanced coagulation, it is possible that the resultant sludge can have concentrations of radionuclides that can be problematic from a disposal standpoint.

Applicability to Helena

The City of Helena is in compliance with all required radionuclides monitoring. Since radionuclides are monitored at the entry point (post-treatment), it is difficult to assess the presence of radionuclides in raw water and if radionuclides are present in sludge, spent filter backwash, or other waste streams. The City may want to invest the resources in obtaining raw water radionuclide values (combined Radium 226 and 228 and Gross Alpha) to determine if these radionuclides could be present in residuals.

Arsenic Rule

The Arsenic Rule sets a new MCL for arsenic at 10 µg/L with a compliance date of January 2006. The required monitoring for arsenic will occur in conjunction with other inorganic contaminant monitoring. For systems that have arsenic above 5 µg/L and below 10 µg/L, additional treatment is not required, but specific arsenic language must be included in the Consumer Confidence Report.

Applicability to Helena

Influent water to the Helena water treatment plants is above the current arsenic MCL. The existing treatment systems with significant alum doses (50 mg/L) are effective in consistently removing arsenic to below the MCL.

Consumer Confidence Report Rule

The Consumer Confidence Report (CCR) Rule requires every public water supply system to summarize information from regulatory compliance monitoring in a report that is sent to all customers once a year in July. The rule went into effect in 1998, with the first report due to customers in 1999. The CCR includes information on a system's source water, levels of detected contaminants, compliance with drinking water rules, and some educational material.

Applicability to Helena

Helena is in compliance with CCR.

Future Regulations

Two future rules, the Stage 2 DBP Rule and the Long-term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR), are in the proposal stage. EPA published official proposals for these rules in August 2003 and expects to finalize the rules in July or August 2005. Jointly, these rules are referred to as the Stage 2 M/DBP (Microbial/Disinfection By-Products) Rules.

One other future rule that will impact the City of Helena is the Groundwater Rule. This rule was officially proposed by EPA in May of 2000 and was expected to be finalized in June 2005; however, the finalization has been postponed to late 2005.

Stage 2 DBP Rule

The Stage 2 DBP Rule will change chlorinated DBP compliance to a locational running annual averages (LRAA) basis, rather than system-wide averages. The same MCLs as the Stage 1 DBP Rule, 80 µg/L for TTHM and 60 µg/L for HAA5, will apply at each sampling location. Implementation of the LRAA concept will occur in two stages, labeled Stage 2A and Stage 2B. In addition, the Stage 2 DBP Rule will require utilities to do an Initial Distribution System Evaluation (IDSE) to find those sites in the distribution system that have the highest DBPs. The three compliance steps are as follows:

- Initial Distribution System Evaluation must be complete two years after the rule publication. (Projected date for completion is 2007);
- Stage 2A must be met 36 months after rule publication. Stage 2A requires systems to meet 120 µg/L and 100 µg/L for TTHMs and HAA5s, respectively, as an LRAA at the current sampling sites being used for Stage 1 DBP Rule compliance. Systems must continue to meet the Stage 1 DBP Rule requirements. (Projected date for compliance is 2008); and
- Stage 2B must be met 90 months after rule publication. Stage 2B requires systems to meet 80 µg/L and 60 µg/L for TTHMs and HAA5s, respectively, as an LRAA at the newly defined sample sites selected as a result of the IDSE. (Projected date for compliance is 2012).

Monitoring under the IDSE requirement will consist of sampling at additional sites beyond those currently sampled for compliance. The proposed rule requires sampling at eight additional sites for each treatment plant; however, EPA has solicited comments on basing the number of sampling sites on population served rather than on the number of treatment plants. Samples must be taken every other month for a year at the additional sampling site and analyzed for TTHM and HAA5. Using these sampling results, systems must select one compliance site where DBPs are the highest. The rule will allow alternative methods of finding the highest TTHM sites in the system using modeling. The modeling approach requires combining a calibrated hydraulic model with water quality information on the kinetics of DBP formation in the particular system being modeled.

Applicability to Helena

The City will be required to complete the three compliance steps listed above, which will be initiated by the Distribution System Evaluation to determine concentrations of DBPs. Results of this evaluation will determine further required action.

Long-term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR)

The objective of the LT2ESWTR is to reduce the risk associated with *Cryptosporidium* in drinking water. Sampling of raw water sources for *Cryptosporidium* will be required for large systems (like Helena) under the LT2ESWTR.

Once the level of treatment for *Cryptosporidium* is defined, a number of methods of meeting the treatment requirement can be considered. For conventional treatment plants, the most likely treatment change will be the addition of ultraviolet disinfection after filtration, with ozone disinfection being another option. Membrane filtration will also provide the level of treatment required.

Table 4-7 EPA Proposed Bins for Treatment Requirements Based on *Cryptosporidium* Concentration

Bin	Average *Cryptosporidium* Concentration	Additional treatment requirements for systems with conventional treatment
1	*Crypto* < 0.075/L	No action
2	0.075/L ≤ *Crypto* < 1.0/L	1.0-log treatment (0.5-log removal + 0.5-log inactivation or 1.0 log from microbial toolbox
3	1.0 ≤ *Crypto* < 3.0/L	2-log treatment (at least 1.0 log inactivation by UV, O_3, ClO_2, membranes, bag filters or bank filtration)
4	*Crypto* ≥ 3.0/L	3-log treatment (at least 1.0 log inactivation by UV, O_3, ClO_2, membranes, bag filters or bank filtration)

Applicability to Helena

The City will be required to sample raw water supplies for *Cryptosporidium* and provide any treatment required based on their bin classification.

Groundwater Rule

Microbial contamination has historically not been a concern for groundwater sources. Recent research, however, indicates that some groundwaters can be a source of waterborne disease. EPA's proposed rule establishes multiple barriers to prevent bacteria and viruses that may be present in groundwater from entering a distribution system. Under the rule, groundwaters will be assessed and systems at high risk for fecal contamination will be identified. The rule will also specify when corrective action will need to be taken.

Systems that currently chlorinate will be required to monitor residuals to ensure that 4-log virus inactivation is maintained. Systems that chlorinate at the well head as water enters the distribution system will be required to devise ways to maintain specified contact time between the disinfectant and water.

Applicability to Helena

This will impact the Eureka source in Helena. It will be necessary for the City to remove the direct connection from Eureka to the distribution system in order to meet required contact times. The City will be required to comply with the rule within three years of finalization.

Contaminant Candidate List and Unregulated Contaminant Monitoring

EPA has an ongoing requirement to maintain a list of contaminants that may be of concern in drinking water. The contaminant candidate list includes some contaminants for which there are insufficient analytical methods and some that are suspected to be in water but in unknown quantities. For those contaminants that do not have analytical methods, research has been initiated by EPA to develop methods. The unregulated contaminant monitoring program provides EPA with a vehicle for developing an occurrence database for those contaminants that are suspected to be in water. These programs, along with the regular 6-year review of existing regulations, will continue into the future to provide EPA with information for determining what additional regulations should be developed.

Regulatory Schedule

The Stage 2 M/DBP Rules have been under development for several years. Based on the proposed rules, required compliance is expected three years from publication of the final

rules. The official proposed rules were published in August 2003 and are expected to be finalized in July or August 2005.

If this sequence of events is not delayed further, the expected compliance date for the IDSE monitoring DBP 2A will be 2008, and DBP Stage 2B and the LT2ESWTR requirement for *Cryptosporidium* monitoring will be in 2012. Compliance with the treatment technique specified by the *Cryptosporidium* bin classification will be required by 2011. This means that by 2011, if the utility is classified in *Cryptosporidium* Bin 2 or higher, treatment such as ultraviolet (UV) disinfection must in place and operating in order to be in compliance. Table 4-8 presents a summary of regulations and compliance dates.

Table 4-8 Current and Future Safe Drinking Water Act (SDWA) Regulation Summary

SDWA Regulation	Required Compliance Date	Key Provisions
Surface Water Treatment Rule (SWTR)	1989	Turbidity standard superseded by IESWTR; Disinfection required: 4-log reduction of viruses, 3-log reduction of *Giardia*
Total Coliform Rule (TCR)	1990	No more than 5% positive total coliform samples in a distribution system each month
Lead and Copper Rule	1992	Corrosion control and ongoing monitoring for lead and copper
Consumer Confidence Report Rule	April 1999	Yearly summary report on water system (CCR) must be sent to all customers by July of each year
Filter Backwash Recycle Rule	Dec 2003	Notify State in writing regarding recycle practices: plant schematic, typical flows Return all recycle flows to the head of the plant Maintain records: Recycle notification, recycle flows, backwash flow rates, filter run lengths, recycle treatment, design data
Radionuclides	Dec 2003	Sets MCLs for radioactive contaminants: Beta/photon emitters $\leq$ 4 mrem/hr; Alpha emitters $\leq$ 15 pCi/L; Combined radium $\leq$ 5 pCi/L; Uranium $\leq$ 30 µg/L
IESWTR	Jan 2004	Sanitary Survey once every three years; System must have specific records on file 2-log *Cryptosporidium* removal Combined filter effluent 0.3 NTU 95 percent of time, not to exceed 1 NTU Continuous turbidity monitoring of individual filters Disinfection profile if TTHM > 64 ug/l or HAA5 > 48 µg/L Record-keeping, reporting and public notice

SDWA Regulation	Required Compliance Date	Key Provisions
Stage 1 DBP Rule	Jan 2004	TTHM/HAA5 ≤ 80/60 µg/L (Running annual averages) Chlorine residual maximum = 4.0 as Cl_2 TTHM/HAA5 compliance monitoring (4 samples per plant per quarter) TOC Removal 15-50 %, depending on raw water TOC and alkalinity, OR meet alternative compliance criteria Monitoring Plan (complete by 4/1/02)
Arsenic	Jan 2006	Sets MCL for arsenic ≤ 10 µg/L
Stage 2 DBP Rule	2007 (IDSE)	Initial Distribution System Evaluation (IDSE) requiring 8 additional sampling sites per plant (starting 2005)
	2008 (2A)	TTHM/HAA5 ≤ 120/100 µg/L as LRAA *and* TTHM/HAA5 ≤ 80/60 µg/L as RAA at Stage 1 DBP Rule sampling sites (Stage 2A)
	2011 (2B)	TTHM/HAA5 ≤ 80/60 µg/L as LRAA at new sampling sites (Stage 2B)
LT2ESWTR	2008 (Crypto Bin)	Source water monitoring for assignment of Bin classification (starting 2006) *Giardia*/virus inactivation profiling
	2011 (Treatment Technique)	Possible additional log treatment for *Cryptosporidium* depending on Bin classification (by 2011) (options include UV disinfection or membranes)

Expected Future Regulatory Impacts and Concerns

The initial major impacts from the Stage 2 M/DBP rules will be the monitoring requirements. The LT2ESWTR requires that within 6 months of the rule being finalized, large systems must begin monitoring their source water for *Cryptosporidium* for a 24-month period. In addition, because the IDSE monitoring required under the Stage 2 DBP Rule must cover one year, systems must begin to monitor for TTHMs and HAA5s at additional sites in the distribution system in order to complete the IDSE within six months after the Stage 2 DBP Rule is finalized. For systems that have begun monitoring prior to the rule being finalized, these timeframes will be less burdensome.

Once the *Cryptosporidium* monitoring is complete, bin classifications can be calculated for each plant to determine what level of additional treatment, if any, is required. All water treatment plants would be well advised to consider all the options in obtaining treatment credit. The rule will contain treatment options known as the "Microbial Toolbox" for use in obtaining *Cryptosporidium* removal credit. Microbial Toolbox "tools" range from showing extremely tight and consistent operations with a low turbidity limit of 0.15 NTU to installation of additional treatment processes, such as UV disinfection or membranes.

Licensed labs are anticipated to provide out-sourced analysis for samples that require more complex work such as TTHM, HAA5, and *Cryptosporidium* analyses.

Appendix 4-A National Primary Drinking Water Standards

EPA National Primary Drinking Water Standards

	Contaminant	MCL or TT[1] (mg/L)[2]	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal
OC	Acrylamide	TT[8]	Nervous system or blood problems;	Added to water during sewage/wastewater increased risk of cancer treatment	zero
OC	Alachlor	0.002	Eye, liver, kidney or spleen problems; anemia; increased risk of cancer	Runoff from herbicide used on row crops	zero
R	Alpha particles	15 picocuries per Liter (pCi/L)	Increased risk of cancer	Erosion of natural deposits of certain minerals that are radioactive and may emit a form of radiation known as alpha radiation	zero
IOC	Antimony	0.006	Increase in blood cholesterol; decrease in blood sugar	Discharge from petroleum refineries; fire retardants; ceramics; electronics; solder	0.006
IOC	Arsenic	0.010 as of 1/23/06	Skin damage or problems with circulatory systems, and may have increased risk of getting cancer	Erosion of natural deposits; runoff from orchards, runoff from glass & electronics production wastes	0
IOC	Asbestos (fibers >10 micrometers)	7 million fibers per Liter (MFL)	Increased risk of developing benign intestinal polyps	Decay of asbestos cement in water mains; erosion of natural deposits	7 MFL
OC	Atrazine	0.003	Cardiovascular system or reproductive problems	Runoff from herbicide used on row crops	0.003
IOC	Barium	2	Increase in blood pressure	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits	2
OC	Benzene	0.005	Anemia; decrease in blood platelets; increased risk of cancer	Discharge from factories; leaching from gas storage tanks and landfills	zero
OC	Benzo(a)pyrene (PAHs)	0.0002	Reproductive difficulties; increased risk of cancer	Leaching from linings of water storage tanks and distribution lines	zero
IOC	Beryllium	0.004	Intestinal lesions	Discharge from metal refineries and coal-burning factories; discharge from electrical, aerospace, and defense industries	0.004
R	Beta particles and photon emitters	4 millirems per year	Increased risk of cancer	Decay of natural and man-made deposits of certain minerals that are radioactive and may emit forms of radiation known as photons and beta radiation	zero
DBP	Bromate	0.010	Increased risk of cancer	Byproduct of drinking water disinfection	zero
IOC	Cadmium	0.005	Kidney damage	Corrosion of galvanized pipes; erosion of natural deposits; discharge from metal refineries; runoff from waste batteries and paints	0.005
OC	Carbofuran	0.04	Problems with blood, nervous system, or reproductive system	Leaching of soil fumigant used on rice and alfalfa	0.04
OC	Carbon tetrachloride	0.005	Liver problems; increased risk of cancer	Discharge from chemical plants and other industrial activities	zero
D	Chloramines (as Cl_2)	MRDL=4.0[1]	Eye/nose irritation; stomach discomfort, anemia	Water additive used to control microbes	MRDLG=4[1]

LEGEND

D	Dinsinfectant	IOC	Inorganic Chemical	OC	Organic Chemical
DBP	Disinfection Byproduct	M	Microorganism	R	Radionuclides

	Contaminant	MCL or TT[1] (mg/L)[2]	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal
OC	Chlordane	0.002	Liver or nervous system problems; increased risk of cancer	Residue of banned termiticide	zero
D	Chlorine (as Cl_2)	MRDL=4.0[1]	Eye/nose irritation; stomach discomfort	Water additive used to control microbes	MRDLG=4[1]
D	Chlorine dioxide (as ClO_2)	MRDL=0.8[1]	Anemia; infants & young children: nervous system effects	Water additive used to control microbes	MRDLG=0.8[1]
DBP	Chlorite	1.0	Anemia; infants & young children: nervous system effects	Byproduct of drinking water disinfection	0.8
OC	Chlorobenzene	0.1	Liver or kidney problems	Discharge from chemical and agricultural chemical factories	0.1
IOC	Chromium (total)	0.1	Allergic dermatitis	Discharge from steel and pulp mills; erosion of natural deposits	0.1
IOC	Copper	TT[7]; Action Level = 1.3	Short term exposure: Gastrointestinal distress. Long term exposure: Liver or kidney damage. People with Wilson's Disease should consult their personal doctor if the amount of copper in their water exceeds the action level	Corrosion of household plumbing systems; erosion of natural deposits	1.3
M	*Cryptosporidium*	TT[3]	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste	zero
IOC	Cyanide (as free cyanide)	0.2	Nerve damage or thyroid problems	Discharge from steel/metal factories; discharge from plastic and fertilizer factories	0.2
OC	2,4-D	0.07	Kidney, liver, or adrenal gland problems	Runoff from herbicide used on row crops	0.07
OC	Dalapon	0.2	Minor kidney changes	Runoff from herbicide used on rights of way	0.2
OC	1,2-Dibromo-3-chloropropane (DBCP)	0.0002	Reproductive difficulties; increased risk of cancer	Runoff/leaching from soil fumigant used on soybeans, cotton, pineapples, and orchards	zero
OC	o-Dichlorobenzene	0.6	Liver, kidney, or circulatory system problems	Discharge from industrial chemical factories	0.6
OC	p-Dichlorobenzene	0.075	Anemia; liver, kidney or spleen damage; changes in blood	Discharge from industrial chemical factories	0.075
OC	1,2-Dichloroethane	0.005	Increased risk of cancer	Discharge from industrial chemical factories	zero
OC	1,1-Dichloroethylene	0.007	Liver problems	Discharge from industrial chemical factories	0.007
OC	cis-1,2-Dichloroethylene	0.07	Liver problems	Discharge from industrial chemical factories	0.07
OC	trans-1,2-Dichloroethylene	0.1	Liver problems	Discharge from industrial chemical factories	0.1
OC	Dichloromethane	0.005	Liver problems; increased risk of cancer	Discharge from drug and chemical factories	zero
OC	1,2-Dichloropropane	0.005	Increased risk of cancer	Discharge from industrial chemical factories	zero
OC	Di(2-ethylhexyl) adipate	0.4	Weight loss, live problems, or possible reproductive difficulties	Discharge from chemical factories	0.4
OC	Di(2-ethylhexyl) phthalate	0.006	Reproductive difficulties; liver problems; increased risk of cancer	Discharge from rubber and chemical factories	zero
OC	Dinoseb	0.007	Reproductive difficulties	Runoff from herbicide used on soybeans and vegetables	0.007
OC	Dioxin (2,3,7,8-TCDD)	0.00000003	Reproductive difficulties; increased risk of cancer	Emissions from waste incineration and other combustion; discharge from chemical factories	zero
OC	Diquat	0.02	Cataracts	Runoff from herbicide use	0.02
OC	Endothall	0.1	Stomach and intestinal problems	Runoff from herbicide use	0.1

LEGEND

D	Dinsinfectant	IOC	Inorganic Chemical	OC	Organic Chemical
DBP	Disinfection Byproduct	M	Microorganism	R	Radionuclides

	Contaminant	MCL or TT[1] (mg/L)[2]	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal
OC	Endrin	0.002	Liver problems	Residue of banned insecticide	0.002
OC	Epichlorohydrin	TT[8]	Increased cancer risk, and over a long period of time, stomach problems	Discharge from industrial chemical factories; an impurity of some water treatment chemicals	zero
OC	Ethylbenzene	0.7	Liver or kidneys problems	Discharge from petroleum refineries	0.7
OC	Ethylene dibromide	0.00005	Problems with liver, stomach, reproductive system, or kidneys; increased risk of cancer	Discharge from petroleum refineries	zero
IOC	Fluoride	4.0	Bone disease (pain and tenderness of the bones); Children may get mottled teeth	Water additive which promotes strong teeth; erosion of natural deposits; discharge from fertilizer and aluminum factories	4.0
M	*Giardia lamblia*	TT[3]	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste	zero
OC	Glyphosate	0.7	Kidney problems; reproductive difficulties	Runoff from herbicide use	0.7
DBP	Haloacetic acids (HAA5)	0.060	Increased risk of cancer	Byproduct of drinking water disinfection	n/a[6]
OC	Heptachlor	0.0004	Liver damage; increased risk of cancer	Residue of banned termiticide	zero
OC	Heptachlor epoxide	0.0002	Liver damage; increased risk of cancer	Breakdown of heptachlor	zero
M	Heterotrophic plate count (HPC)	TT[3]	HPC has no health effects; it is an analytic method used to measure the variety of bacteria that are common in water. The lower the concentration of bacteria in drinking water, the better maintained the water system is.	HPC measures a range of bacteria that are naturally present in the environment	n/a
OC	Hexachlorobenzene	0.001	Liver or kidney problems; reproductive difficulties; increased risk of cancer	Discharge from metal refineries and agricultural chemical factories	zero
OC	Hexachlorocyclopentadiene	0.05	Kidney or stomach problems	Discharge from chemical factories	0.05
IOC	Lead	TT[7]; Action Level = 0.015	Infants and children: Delays in physical or mental development; children could show slight deficits in attention span and learning abilities; Adults: Kidney problems; high blood pressure	Corrosion of household plumbing systems; erosion of natural deposits	zero
M	*Legionella*	TT[3]	Legionnaire's Disease, a type of pneumonia	Found naturally in water; multiplies in heating systems	zero
OC	Lindane	0.0002	Liver or kidney problems	Runoff/leaching from insecticide used on cattle, lumber, gardens	0.0002
IOC	Mercury (inorganic)	0.002	Kidney damage	Erosion of natural deposits; discharge from refineries and factories; runoff from landfills and croplands	0.002
OC	Methoxychlor	0.04	Reproductive difficulties	Runoff/leaching from insecticide used on fruits, vegetables, alfalfa, livestock	0.04
IOC	Nitrate (measured as Nitrogen)	10	Infants below the age of six months who drink water containing nitrate in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits	10
IOC	Nitrite (measured as Nitrogen)	1	Infants below the age of six months who drink water containing nitrite in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits	1

LEGEND

D	Dinsinfectant	IOC	Inorganic Chemical	OC	Organic Chemical
DBP	Disinfection Byproduct	M	Microorganism	R	Radionuclides

	Contaminant	MCL or TT[1] (mg/L)[2]	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal
OC	Oxamyl (Vydate)	0.2	Slight nervous system effects	Runoff/leaching from insecticide used on apples, potatoes, and tomatoes	0.2
OC	Pentachlorophenol	0.001	Liver or kidney problems; increased cancer risk	Discharge from wood preserving factories	zero
OC	Picloram	0.5	Liver problems	Herbicide runoff	0.5
OC	Polychlorinated biphenyls (PCBs)	0.0005	Skin changes; thymus gland problems; immune deficiencies; reproductive or nervous system difficulties; increased risk of cancer	Runoff from landfills; discharge of waste chemicals	zero
R	Radium 226 and Radium 228 (combined)	5 pCi/L	Increased risk of cancer	Erosion of natural deposits	zero
IOC	Selenium	0.05	Hair or fingernail loss; numbness in fingers or toes; circulatory problems	Discharge from petroleum refineries; erosion of natural deposits; discharge from mines	0.05
OC	Simazine	0.004	Problems with blood	Herbicide runoff	0.004
OC	Styrene	0.1	Liver, kidney, or circulatory system problems	Discharge from rubber and plastic factories; leaching from landfills	0.1
OC	Tetrachloroethylene	0.005	Liver problems; increased risk of cancer	Discharge from factories and dry cleaners	zero
IOC	Thallium	0.002	Hair loss; changes in blood; kidney, intestine, or liver problems	Leaching from ore-processing sites; discharge from electronics, glass, and drug factories	0.0005
OC	Toluene	1	Nervous system, kidney, or liver problems	Discharge from petroleum factories	1
M	Total Coliforms (including fecal coliform and *E. coli*)	5.0%[4]	Not a health threat in itself; it is used to indicate whether other potentially harmful bacteria may be present[5]	Coliforms are naturally present in the environment as well as feces; fecal coliforms and *E. coli* only come from human and animal fecal waste.	zero
DBP	Total Trihalomethanes (TTHMs)	0.10 0.080 after 12/31/03	Liver, kidney or central nervous system problems; increased risk of cancer	Byproduct of drinking water disinfection	n/a[6]
OC	Toxaphene	0.003	Kidney, liver, or thyroid problems; increased risk of cancer	Runoff/leaching from insecticide used on cotton and cattle	zero
OC	2,4,5-TP (Silvex)	0.05	Liver problems	Residue of banned herbicide	0.05
OC	1,2,4-Trichlorobenzene	0.07	Changes in adrenal glands	Discharge from textile finishing factories	0.07
OC	1,1,1-Trichloroethane	0.2	Liver, nervous system, or circulatory problems	Discharge from metal degreasing sites and other factories	0.20
OC	1,1,2-Trichloroethane	0.005	Liver, kidney, or immune system problems	Discharge from industrial chemical factories	0.003
OC	Trichloroethylene	0.005	Liver problems; increased risk of cancer	Discharge from metal degreasing sites and other factories	zero
M	Turbidity	TT[3]	Turbidity is a measure of the cloudiness of water. It is used to indicate water quality and filtration effectiveness (e.g., whether disease-causing organisms are present). Higher turbidity levels are often associated with higher levels of disease-causing micro-organisms such as viruses, parasites and some bacteria. These organisms can cause symptoms such as nausea, cramps, diarrhea, and associated headaches.	Soil runoff	n/a
R	Uranium	30 ug/L as of 12/08/03	Increased risk of cancer, kidney toxicity	Erosion of natural deposits	zero

LEGEND

D	Dinsinfectant	IOC	Inorganic Chemical	OC	Organic Chemical
DBP	Disinfection Byproduct	M	Microorganism	R	Radionuclides

	Contaminant	MCL or TT[1] (mg/L)[2]	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal
OC	Vinyl chloride	0.002	Increased risk of cancer	Leaching from PVC pipes; discharge from plastic factories	zero
M	Viruses (enteric)	TT[3]	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste	zero
OC	Xylenes (total)	10	Nervous system damage	Discharge from petroleum factories; discharge from chemical factories	10

NOTES

1 Definitions

- Maximum Contaminant Level Goal (MCLG)—The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.
- Maximum Contaminant Level (MCL)—The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to MCLGs as feasible using the best available treatment technology and taking cost into consideration. MCLs are enforceable standards.
- Maximum Residual Disinfectant Level Goal (MRDLG)—The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.
- Maximum Residual Disinfectant Level (MRDL)—The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.
- Treatment Technique (TT)—A required process intended to reduce the level of a contaminant in drinking water.

2 Units are in milligrams per liter (mg/L) unless otherwise noted. Milligrams per liter are equivalent to parts per million (ppm).

3 EPA's surface water treatment rules require systems using surface water or ground water under the direct influence of surface water to (1) disinfect their water, and (2) filter their water or meet criteria for avoiding filtration so that the following contaminants are controlled at the following levels:

- *Cryptosporidium* (as of 1/1/02 for systems serving >10,000 and 1/14/05 for systems serving <10,000) 99% removal.
- *Giardia lamblia*: 99.9% removal/inactivation
- Viruses: 99.99% removal/inactivation
- *Legionella:* No limit, but EPA believes that if *Giardia* and viruses are removed/inactivated, *Legionella* will also be controlled.
- Turbidity: At no time can turbidity (cloudiness of water) go above 5 nephelolometric turbidity units (NTU); systems that filter must ensure that the turbidity go no higher than 1 NTU (0.5 NTU for conventional or direct filtration) in at least 95% of the daily samples in any month. As of January 1, 2002, for systems servicing >10,000, and January 14, 2005, for systems servicing <10,000, turbidity may never exceed 1 NTU, and must not exceed 0.3 NTU in 95% of daily samples in any month.
- HPC: No more than 500 bacterial colonies per milliliter
- Long Term 1 Enhanced Surface Water Treatment (Effective Date: January 14, 2005); Surface water systems or (GWUDI) systems serving fewer than 10,000 people must comply with the applicable Long Term 1 Enhanced Surface Water Treatment Rule provisions (e.g. turbidity standards, individual filter monitoring, *Cryptosporidium* removal requirements, updated watershed control requirements for unfiltered systems).
- Filter Backwash Recycling: The Filter Backwash Recycling Rule requires systems that recycle to return specific recycle flows through all processes of the system's existing conventional or direct filtration system or at an alternate location approved by the state.

4 No more than 5.0% samples total coliform-positive in a month. (For water systems that collect fewer than 40 routine samples per month, no more than one sample can be total coliform-positive per month.) Every sample that has total coliform must be analyzed for either fecal coliforms or *E. coli* if two consecutive TC-positive samples, and one is also positive for *E. coli* fecal coliforms, system has an acute MCL violation.

5 Fecal coliform and *E. coli* are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Disease-causing microbes (pathogens) in these wastes can cause diarrhea, cramps, nausea, headaches, or other symptoms. These pathogens may pose a special health risk for infants, young children, and people with severely compromised immune systems.

6 Although there is no collective MCLG for this contaminant group, there are individual MCLGs for some of the individual contaminants:

- Haloacetic acids: dichloroacetic acid (zero); trichloroacetic acid (0.3 mg/L)
- Trihalomethanes: bromodichloromethane (zero); bromoform (zero); dibromochloromethane (0.06 mg/L)

7 Lead and copper are regulated by a Treatment Technique that requires systems to control the corrosiveness of their water. If more than 10% of tap water samples exceed the action level, water systems must take additional steps. For copper, the action level is 1.3 mg/L, and for lead is 0.015 mg/L.

8 Each water system must certify, in writing, to the state (using third-party or manufacturers certification) that when it uses acrylamide and/or epichlorohydrin to treat water, the combination (or product) of dose and monomer level does not exceed the levels specified, as follows: Acrylamide = 0.05% dosed at 1 mg/L (or equivalent); Epichlorohydrin = 0.01% dosed at 20 mg/L (or equivalent).

LEGEND

D	Dinsinfectant	IOC	Inorganic Chemical	OC	Organic Chemical
DBP	Disinfection Byproduct	M	Microorganism	R	Radionuclides

National Secondary Drinking Water Standards

National Secondary Drinking Water Standards are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. EPA recommends secondary standards to water systems but does not require systems to comply. However, states may choose to adopt them as enforceable standards.

Contaminant	Secondary Standard
Aluminum	0.05 to 0.2 mg/L
Chloride	250 mg/L
Color	15 (color units)
Copper	1.0 mg/L
Corrosivity	noncorrosive
Fluoride	2.0 mg/L
Foaming Agents	0.5 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Odor	3 threshold odor number
pH	6.5-8.5
Silver	0.10 mg/L
Sulfate	250 mg/L
Total Dissolved Solids	500 mg/L
Zinc	5 mg/L

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