DENVER WATER

2012 Treated Water Quality Summary

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DENVER WATER

2012 TREATED WATER SUMMARY

Introduction

Denver Water provides its customers with high-quality drinking water. We want you to be aware of how that quality is maintained and learn more about the water treatment process. We take great care and effort into providing the Denver-metro area with water that meets the most stringent standards. This report was prepared to provide you with important information about Denver's water quality.

Table 1: Measurement Units Interpretation Table

Unit	Full Name	Equivalent to:
General Terms		
SU	Standard Units (a measurement of pH)	
µS	Micro Siemens (a measurement of Specific Conductance)	Micro mhos
°C	Degrees Celsius (a measurement of temperature)	25°C ≈ (= approx.) 77°F (Fahrenheit)
Chemical Terms		
mg/L	Milligrams per Liter	Parts per million (ppm)
µg/L	Micrograms per Liter	Parts per billion (ppb)
ng/L	Nanograms per Liter	Parts per trillion (ppt)
NTU	Nephalometric Turbidity Units (a measurement of clarity, fine particulate matter)	
pCi/L	PicoCuries per Liter (a measurement of radioactivity)	
AU	Absorbance units (a measurement of the absorbance at a specific wavelength)	
g/g	Grains per gallon (a measure of water hardness, approximately = to 17.1 mg/L)	
Microbiological Terms		
CFU/100 ml	Colony forming units per 100 milliliters (a bacterial unit)	
Count/ml	Count of organisms per milliliter of sample (a bacterial unit)	

Explanation of Terms

To better understand this report, please refer to Table 1, which gives brief explanations of terms and measurement units that are used in the document. Parameters such as temperature and turbidity (which is a measure of the discoloration or particulates in the water that interferes with the clarity of the water) are measurements of physical characteristics and are expressed in units specific to their analyses. Chemical results are generally expressed in terms of concentration, weight or amount per unit volume, for example, mg/L or µg/L. Microbiological results are generally expressed in terms of a count of organisms per volume of sample, for example, CFU/100 ml.

Report Data

This report includes graphs and tables summarizing data for samples collected throughout 2012 from the potable (drinking) water leaving Denver Water's treatment plants. This report also includes data from the source water to the treatment plants, and data from the distributed water. The data in this report are directly related to drinking water compliance criteria. Denver Water uses these analyses to ensure the safety and aesthetic quality of the water.

Some of the data is presented in graphs to highlight changes over time or dynamic ranges in the parameters. Results are expressed primarily as averages unless otherwise specified. On page 10 of this report, treated water results are displayed in tables that include the regulatory limit for the analysis where applicable.

Water quality is monitored both at the treatment plants and at more than 130 locations in the distribution system for various parameters each week. Total coliform bacteria are used as an indicator of water's potability. The percent of positive coliform samples each month is calculated and reported to the Colorado Department of Public Health and Environment, the primacy agency that enforces the Environmental Protection Agency regulations in Colorado. No more than five percent of the samples may be positive per month for total coliform. As evident from the table on page 3, Denver Water is well below the five percent level.

Where Does Denver Get Its Water?

Denver Water collects its water from two sources. The South Platte Collection System combines water from high mountain regions on the east slope of the Rocky Mountains, with water diverted from Summit County and water from Dillon Reservoir on the west slope of the Continental Divide. The Moffat Collection System spans both sides of the Continental Divide, with the majority of it located in Grand County on the West Slope. Raw water from the Moffat Collection System

is sent through the Moffat Tunnel to facilities northwest of Denver for storage and treatment. These sources provide high quality water, but their characteristics are quite different, and the source water mineral concentration varies seasonally with the amount of flow. In general, the water in the South Platte System has a higher mineral content than the water in the Moffat System.

How Is Water Treated To Make It Drinkable?

Denver Water has three treatment plants that process water for drinking, with a combined maximum treatment capacity of 715 million gallons per day. Two treatment plants, Foothills and Marston, process water from the South Platte Collection System. The third plant, Moffat, treats water from the Moffat Collection System. The treatment process begins with the addition of coagulants to raw water. These coagulants are commonly referred to as alum and polymer. Alum is aluminum sulfate, a chemical that attaches to dirt and other particles in the water. Through a process of slow mixing, the particles collide and stick together; as this process continues, the particles grow, becoming large enough to see. The larger particles are called floc. Polymer enhances the process. These now larger and heavier particles settle to the bottom of the sedimentation basin. The clarified water at the top of the basin is then sent through silica sand filters at Moffat Treatment Plant and sand and anthracite coal dual media filters at Marston and Foothills treatment plants. Filtration removes virtually all of the particles carried over from the sedimentation process. Each treatment plant produces extremely clear water, evidenced by low turbidities (a measure of clarity). Less than 0.20 turbidity units represents clear, clean water. Potassium permanganate or powdered activated carbon may also be added to control excess manganese or odors, respectively.

Most of Denver Water's supply has naturally occurring fluoride. The Colorado Department of Public Health and Environment and the Centers for Disease Control and Prevention set the recommended level of fluoride. After filtration, the water may be supplemented to bring the total concentration of fluoride up to 0.70 mg/L. The health department and the Centers for Disease Control and Prevention have determined that 0.70 mg/L is the optimal level to prevent tooth decay. Caustic soda may be used to control the pH (acidity/alkalinity) of the water. It is added to adjust the pH of the water to greater than 7.5 standard units. Finally, the water is thoroughly disinfected to maintain its high quality as it travels to homes and businesses.

Watershed Collection System

Why Is The Water Treated This Way?

The treatment process is designed to remove dirt, particulate matter, naturally occurring organic matter, and microscopic organisms, such as bacteria, that are found in surface waters. Disinfection kills potentially harmful microorganisms. See Table 2. Disinfection of drinking water has saved millions of lives over the past century by preventing waterborne diseases such as typhoid and cholera.

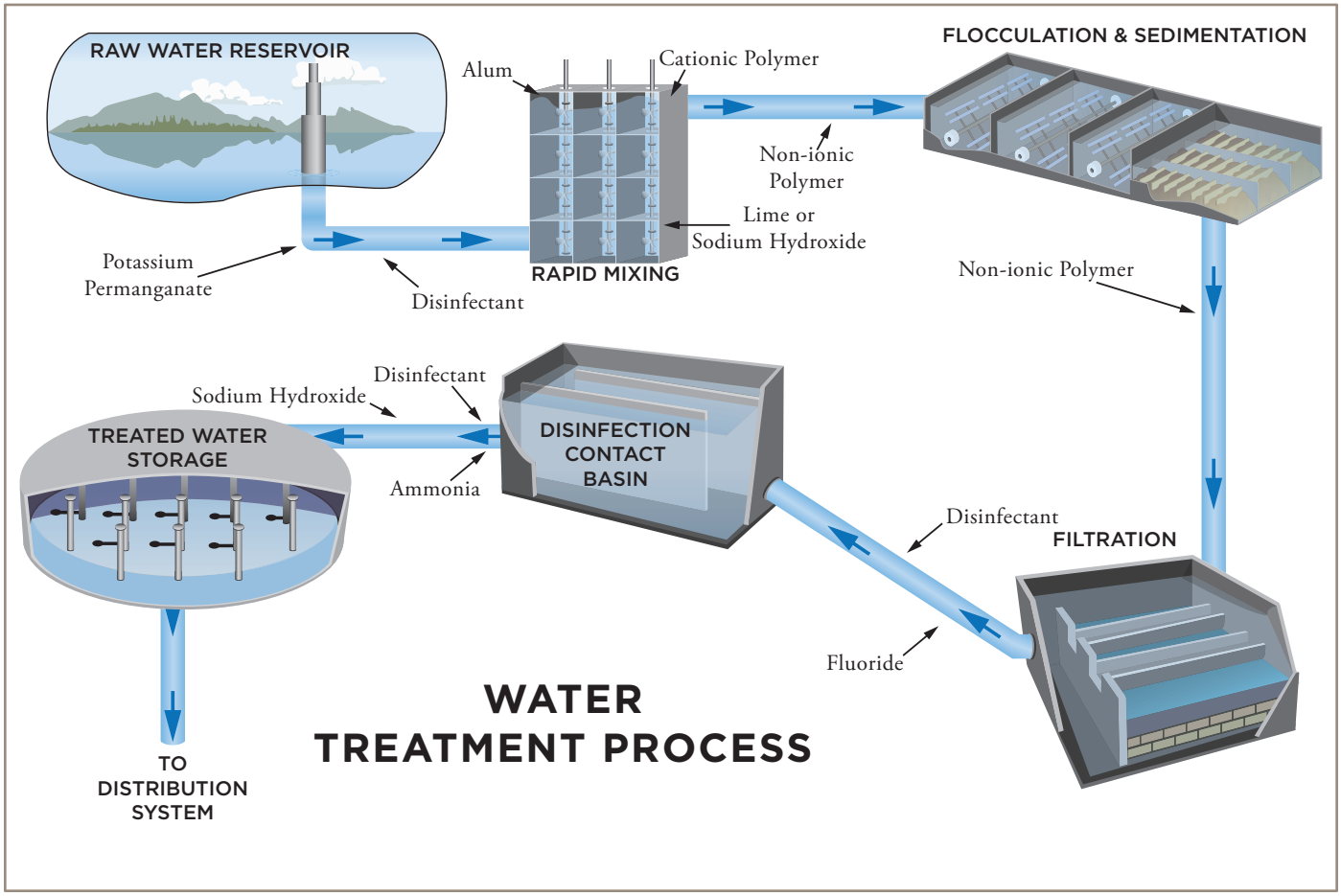
Table 2: Treatment Plant Treated Water and Distribution System Total Coliform Samples for 2012

Month	Number of Samples	Number of Positives	% Positive
January	446	0	0.00%
February	400	0	0.00%
March	445	0	0.00%
April	415	0	0.00%
May	434	0	0.00%
June	412	0	0.00%
July	436	0	0.00%
August	379	0	0.00%
September	405	0	0.00%
October	442	1	0.23%
November	349	0	0.00%
December	376	0	0.00%
Totals	**4,939**	**1**	**0.02%**

Denver Water uses a very effective long-lasting disinfectant, chloramine. This produces lower concentrations of disinfection by products, such as total trihalomethanes and haloacetic acids, than would free chlorine. Disinfection by products above their regulatory limits are potentially harmful; therefore minimization of them is very important.

The Environmental Protection Agency establishes the water quality regulations for all water utilities in the United States. In Colorado, the Colorado Department of Public Health and Environment is the agency that oversees and enforces these regulations. These regulations are very strict and require that drinking water is made safe for consumption over a person's lifetime. At present, there are more than 90 contaminants and groups of contaminants that are regulated in drinking water. Some of these contaminants, such as lead, are clearly a threat, while others are merely suspected of being health risks but are still considered serious enough to regulate.

The Environmental Protection Agency has set regulatory limits for these compounds. Regulatory limits are levels of safety that must not be exceeded in order to maintain safe drinking water. Some contaminants are regulated based on the possibility of their occurrence in water. Regulatory limits or levels were determined based on the best available data from health effects studies. The majority of the EPA's drinking water regulations apply to the treated water entering the distribution system before it reaches the first customer. Denver Water is



happy to report that we have never violated a regulatory limit for any contaminant to date.

How Well Is Denver Water Doing?

Table 3 illustrates the effectiveness of treatment for a few parameters of note.

Turbidity is a measurement of the clarity of the water; thus, a low turbidity indicates very clear water. Most microorganisms, including bacteria, are attached to particulate matter (fine dirt and debris). Particulate matter accounts for much of the turbidity in water. Therefore, turbidity is an extremely important parameter and has been regulated by the EPA for many years. The turbidity regulation requires that turbidities in the treated water be less than or equal to 0.30 NTU (turbidity units) in 95 percent of the samples each month. In 2012, 100 percent of the samples were below 0.30 NTU. The water was extremely clean and clear entering the distribution system. See Graph 2.

The total coliform test is a measure of all types of coliform bacteria in the water. Coliform bacteria are ubiquitous they are even found in soils and on plants. We test for coliform bacteria, which includes *E. coli* (found in the intestines of all mammals, including humans) to determine the cleanliness of the water. We test for total coliform in our plant's source and treated waters, as well as throughout our entire distribution system.

On the rare occasion when a sample has tested positive for total coliform, additional samples had to be taken at locations upstream and downstream of the original test site and again at the site itself. This resampling is mandated by the state health department to assure the safety of the water and also to satisfy Denver Water's internal operating procedures. When a total coliform analysis is performed, we also test for *Escherichia coli*, a member of the fecal coliform group of bacteria, and has been given much media attention in the past. The occurrence of *E. coli* is a specific indicator of fecal contamination and the possible presence of other harmful bacteria.

Are There More Serious Contaminants in the Water?

Denver Water has tested for all of the EPA-regulated compounds for years, and in anticipation of upcoming regulations, has tested for newly identified contaminants as well. Contaminants that have been seen in news headlines

Graph 2:

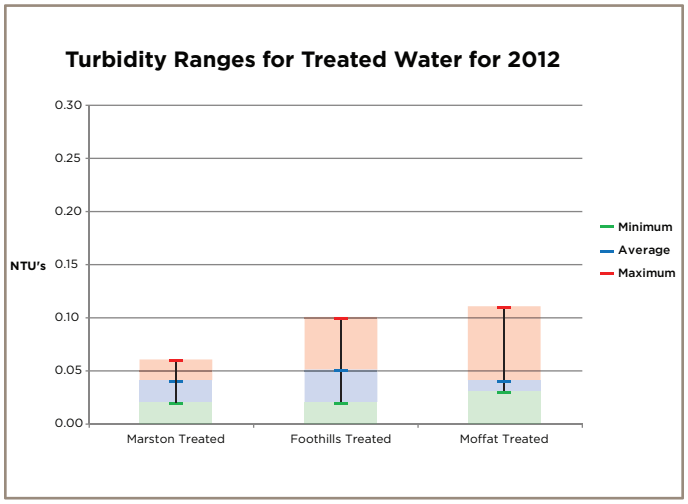


Table 3: Denver Water Average Values for 2012

PARAMETER	TREATMENT PLANT	RAW WATER RESULT	TREATED WATER RESULT	EPA REGULATORY LIMIT
Lead (ppb)	Marston	None detected	None detected	15 ppb (action level)
	Foothills			
	Moffat			
Arsenic (ppb)	Marston			10 ppb
	Foothills			
	Moffat			
Mercury (ppb)	Marston			2 ppb
	Foothills			
	Moffat			
Giardia (Cysts/L)	Marston	0.58		Treatment Technique
	Foothills	0.67		
	Moffat	None detected		
Cryptosporidium (Oocysts/L)	Marston	None detected		Treatment Technique
	Foothills	None detected		
	Moffat	None detected		
E. Coli (MPN/100 ml)	Marston	2		Ø
	Foothills	2		
	Moffat	None detected		

include lead, arsenic, mercury, *Cryptosporidium*, *Giardia*, and *E. coli,* among others. Denver Water has tested for these for more than 20 years and has not detected them in the treated water. *Giardia, E. coli* and *Cryptosporidium* have occasionally been detected in the source water, but the effective treatment system in our treatment plants, as outlined on page 3, removes or inactivates these microorganisms.

Minerals In Nature That Are Found In Water

All natural waters contain minerals found in the earth's crust. These mineral salts result from the natural erosion of soils, rocks and/or the decay of plants and aquatic life. The amounts of these minerals in water also determine the characteristics of the water, such as its hardness. Minerals in water give water its flavor. Mineral-rich water often tastes chalky. Of the minerals shown below, only barium and aluminum are regulated in the treated water. Barium has a maximum contaminant level of 2,000 ppb, while aluminum has a secondary maximum contaminant level, which is a non-enforceable drinking water regulation (does not pose a health risk)of 50- 200 ppb.

Most minerals are not removed by conventional treatment. Calcium, magnesium, iron and manganese amounts may be reduced by water treatment, but not completely removed. Please note that these comparisons, though from the same treatment plants, are not always from samples collected on the same dates for the source and the treated waters, and therefore are general comparisons. Drinking water naturally contains several minerals that are beneficial to humans and mammals. The minerals in Table 4 are beneficial at prescribed levels. However, at levels *above* the regulatory limits (where applicable), some of these minerals may cause detrimental effects over a lifetime. If there is no regulatory limit, or maximum contaminant level, listed in the table, then the amount of the mineral that might cause a potential health concern is much higher than would ever be found in water

Comparison of Fluoride Between Untreated and Treated Water

Denver Water's source water has natural fluoride. When needed, Denver Water supplements the water with fluoride to bring the total fluoride content up to 0.70 mg/L, to comply with the recommendation of the state health department and the Center for Disease Control and Prevention for the prevention of tooth decay. Water from the Moffat Collection System has lower amounts of natural fluoride and must be fortified to meet the recommended standard (Graph 4).

Natural fluoride levels from the South Platte Collection System generally meet or exceed the recommended level in the untreated water, but both the Foothills and Marston treatment plants can supplement when needed (Graph 5 & 6). Note: Fluoride is tested monthly for the source water and six times daily for treated water. Moffat treatment plant was out of service during March, April, November and December of 2012. Foothills treatment plant was out of service in January 2012.

pH

We measure the pH range of water to prevent it from corroding residential and distribution system plumbing. The pH of water does not impact the safety of the water; it relates to the aggressiveness of it toward plumbing materials. Denver Water is required to maintain a pH greater than 7.5 SU to ensure that the water does not leach potentially harmful metals from plumbing, see Graph 3.

Table 4: Denver Water Average Values for 2012

PARAMETER	TREATMENT PLANT	RAW WATER RESULT	TREATED WATER RESULT	EPA REGULATORY LIMIT
Aluminum (ppb)	Marston	64	27	50 - 200 (SMCL)
	Foothills	102	34	50 - 200 (SMCL)
	Moffat	136	None detected	50 - 200 (SMCL)
Barium (ppb)	Marston	39	38	2,000
	Foothills	39	36	2,000
	Moffat	18	17	2,000
Calcium (ppm)	Marston	31	31	None
	Foothills	31	29	
	Moffat	8	12	
Magnesium (ppm)	Marston	7.9	7.7	
	Foothills	7.4	7.1	
	Moffat	2.0	2.0	
Potassium (ppm)	Marston	1.9	1.8	
	Foothills	1.9	1.8	
	Moffat	0.7	0.7	
Sodium (ppm)	Marston	17	20	
	Foothills	15	18	
	Moffat	3	6	

Water Hardness

The hardness of water is a result of calcium and magnesium salts dissolved in water. Other minerals such as potassium and iron can contribute to water hardness. In Denver's water, the iron levels are nondetectable, but iron can come from old cast-iron water mains and the plumbing in buildings or homes. The units of measure for water hardness are in mg/L, but most customers' appliances state water hardness in grains per gallon, g/g. In the laboratory, we measure hardness in mg/L (ppm). Graph 7 on page 8, lists hardness in both mg/L and g/g.

Denver's water sources are considered soft to moderately hard. The South Platte source water from Antero Reservoir to Strontia Springs Reservoir in Waterton Canyon is moderately hard and varies between 70—130 mg/L or 4—7 g/g. The water that feeds our Moffat Treatment Plant is all snowmelt around the Winter Park area and is considered soft water, and varies seasonally between 30—60 mg/L or 2—4 g/g. Most customers calling about water hardness are inquiring for detergent usage amounts for dishwashers and clothes washers or water amounts for their iron or other appliances. Our water tends to form a mineral scale on the inside of plumbing; this is purely aesthetic and does not impact the safety or health of the water.

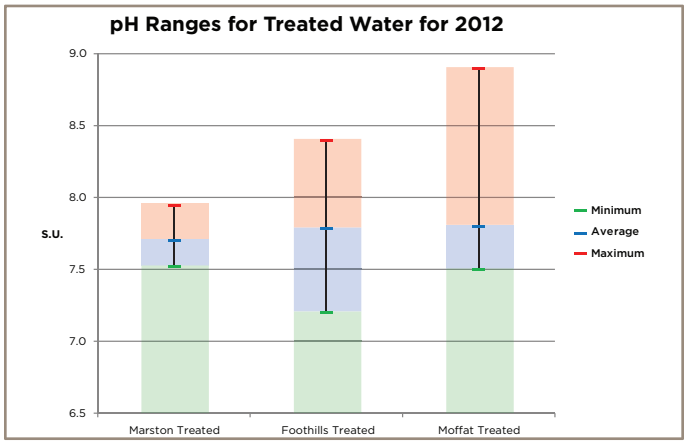
Many cities across the nation have much harder water than Denver's. Graph 7 shows the seasonal fluctuations in hardness over the year. Gaps in data indicate times when the treatment plant was not in service (off-line).

Which Treatment Plant Serves My Area?

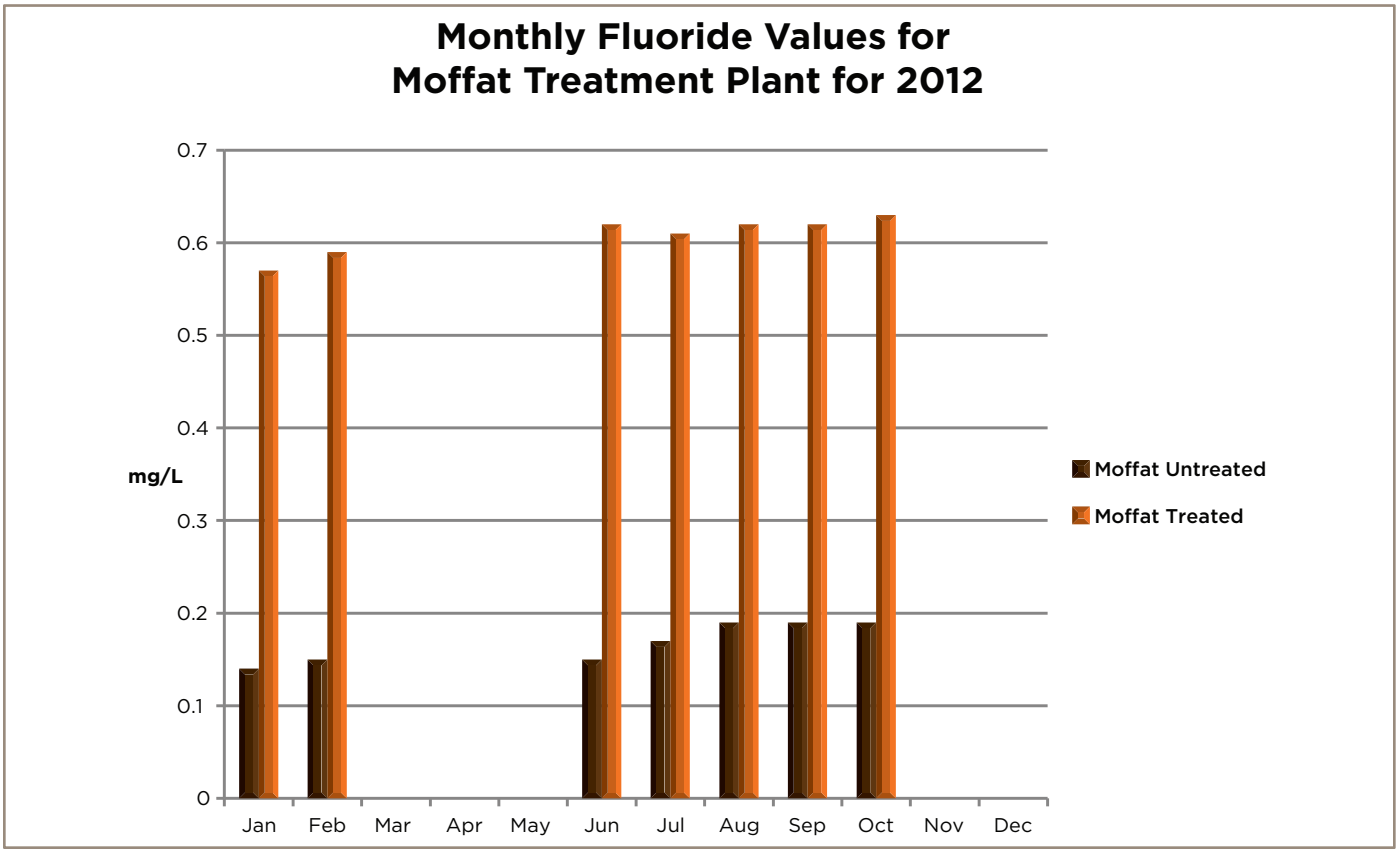
Denver Water's distribution system is completely integrated. This means that we can distribute water from any of our three potable treatment plants to anywhere in our system. Water is usually routed based on demand. Foothills Treatment plant is our largest gravity fed potable water plant. It is often in service and serves much of the system.

However, we can blend water from Foothills with Moffat or Marston or blend the water from any two potable treatment plants and send it anywhere in our system. This complete redundancy is rather unique compared to other distribution systems in the United States. When wondering which treatment plant serves you, it is best to assume that the water can come from any of the three treatment plants to your home

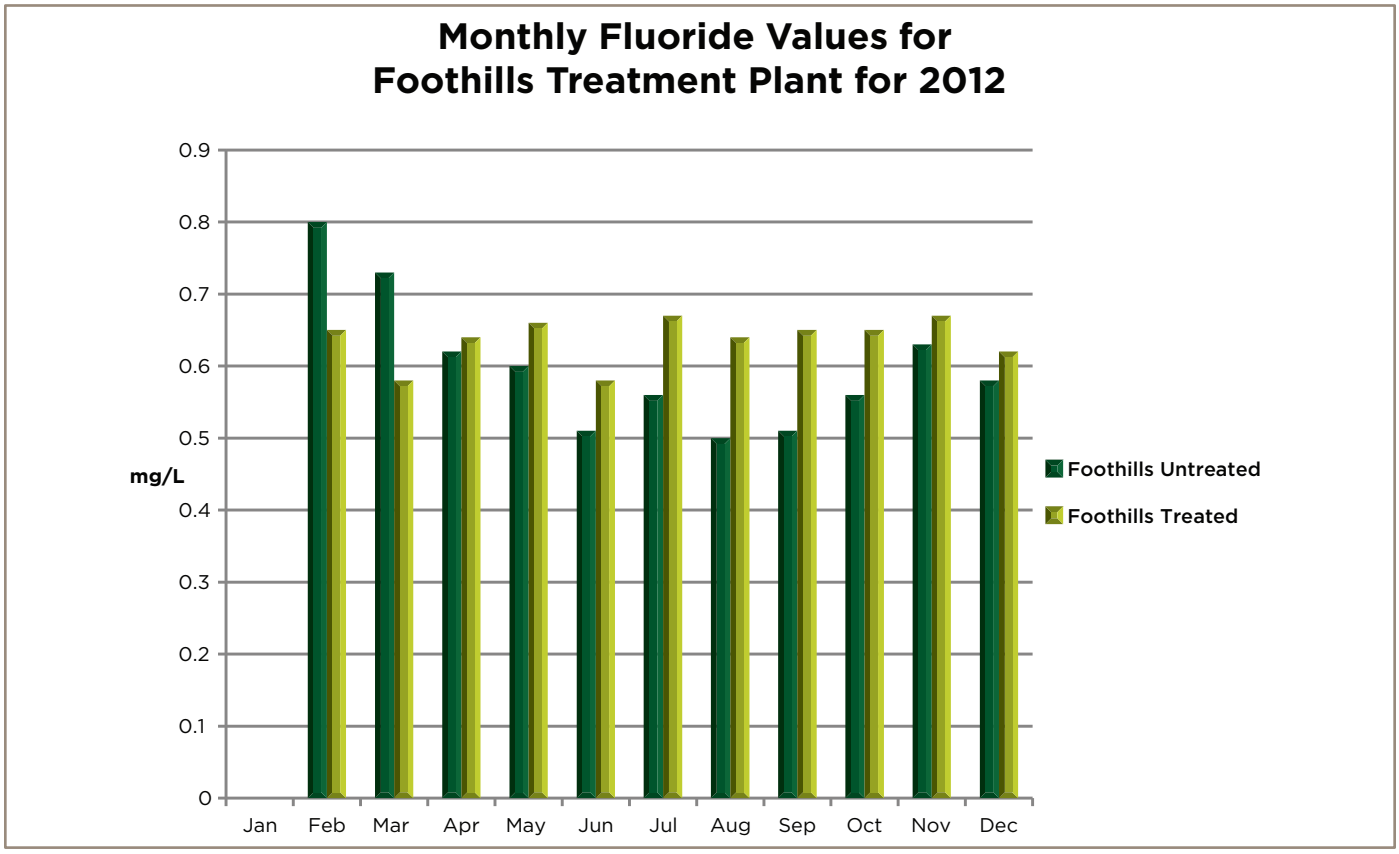
Graph 3:



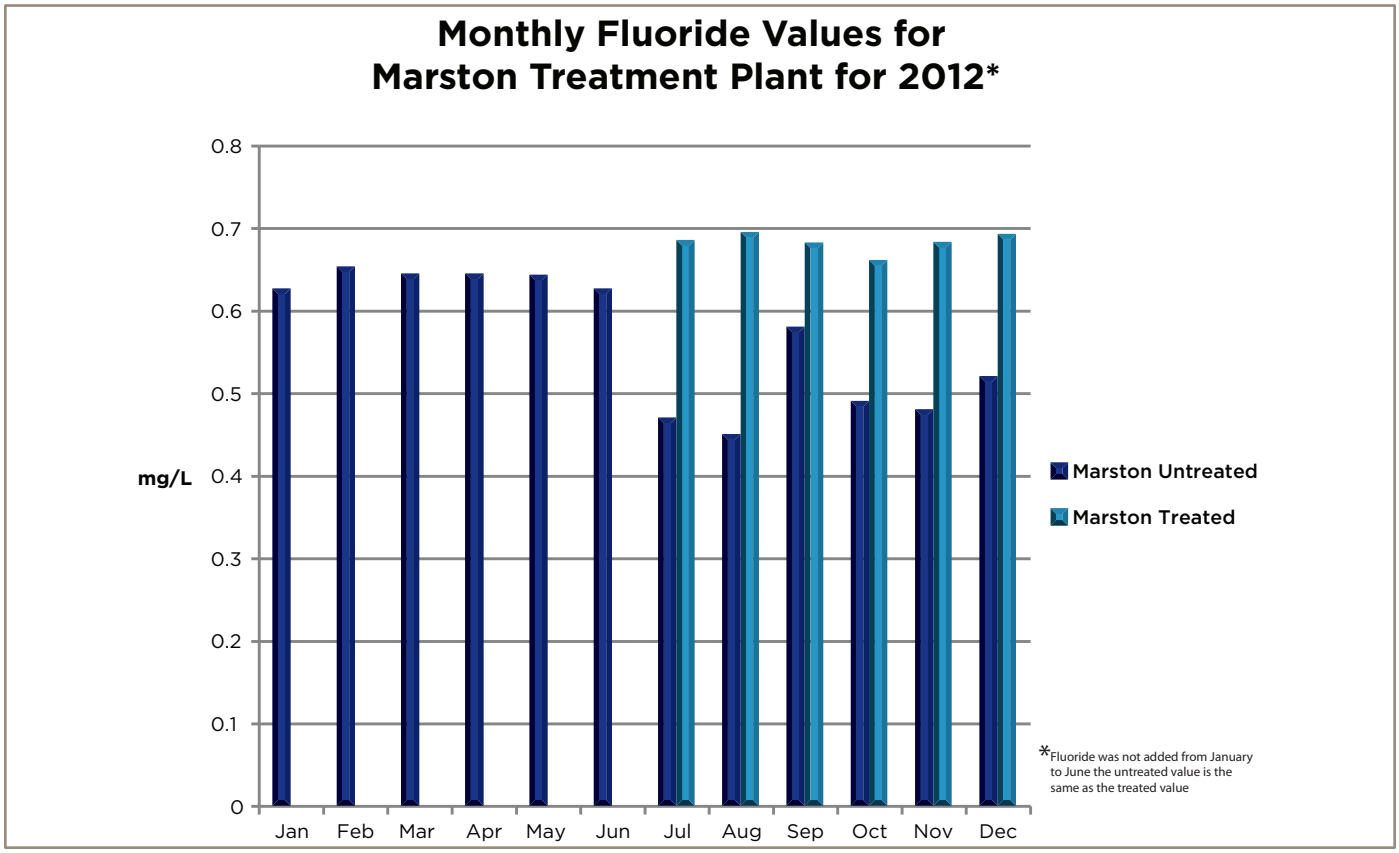
Graph 4:



Graph 5:



Graph 6:



or business at any given time, and if need be, to adjust your appliances or equipment accordingly.

Looking Down the Road

Water quality remains of the highest importance to Denver Water. As part of ensuring high-quality drinking water, protection of source water is vital.

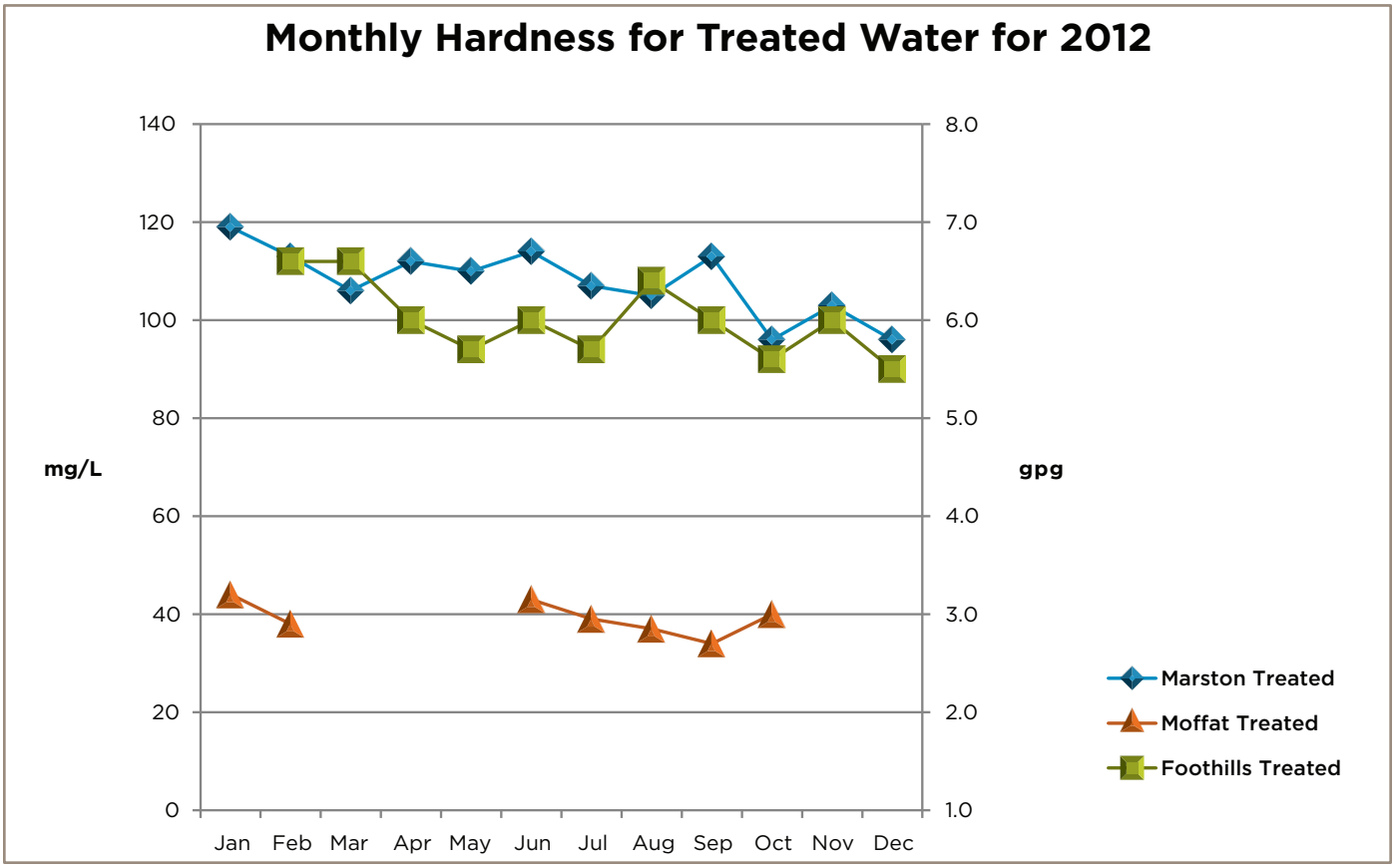
Recent media reports have highlighted the presence of pharmaceuticals in municipal water supplies. Denver Water proactively participated in some of the earliest research projects looking for these compounds in a 2005 project with Colorado State University. The study was limited in scope and scale but detected trace amounts of antibiotics at part per trillion (nanogram per liter) levels (one part per trillion is equivalent to one drop of water in 20 Olympic sized swimming pools). In 2012, as in previous years, we continue to test for these contaminants, and rarely find them, but on occasion they are found at very minute levels. We will continue to test for them annually. Scientists do not yet know what the presence of these substances in water means to human health. In fact, the testing technology is so new, most commercial laboratories are not yet equipped to analyze for these compounds. Consequently, the Environmental Protection Agency has no current regulations for these substances. Denver Water has and always will strive to deliver the highest quality water to our customers. If future research indicates that certain substances should be removed from water, we will work to find the best method of removal.

Many new challenges await us in the drinking water industry. We can all help protect our water supplies simply by not dumping medications down the drains or toilets. Many pharmacies will dispose of unused drugs for you. Ask your pharmacist today if they have a disposal program. If not, remove medications from their original containers, mix them with used coffee grounds and dispose of them in the trash.

Denver Water regularly monitors for hexavalent chromium (chromium-+6), as well as total chromium. Scientists do not yet know at what levels the hexavalent form of chromium may present a health concern. It is occasionally found in our water at trace levels. Denver Water will continue to monitor and remain engaged in EPA's effort to investigate it more fully. Currently EPA requires utilities to monitor for hexavalent chromium as part of a year-long study called UCMR 3 (Unregulated Contaminant Monitoring Rule – number 3). Denver Water is performing this monitoring in 2013.

We drink the water we produce, and so we have a stake in making sure that the water is safe for all of us. We are environmental scientists and we care about the preservation of our watershed and the natural beauty that surrounds it. Though we have caretakers who live near our mountain reservoirs and monitor them, customers help with this effort and we appreciate it. We are committed to meeting your water needs by continuing to provide high-quality drinking water and excellent service. If you have any concerns, questions or comments regarding water quality, call Denver Water at 303-893-2444.

Graph 7:



Regulatory Terminology

Pages 10 through 15 are tables of data for compounds found in the treated water. The tables contain the name of the compound, the maximum contaminant level (see below) where applicable, the average result, the range of detections for the year, and the number of times for which it was tested in 2012. Most of the compounds found are not regulated and do not pose a health or safety risk. Regulatory abbreviations are explained below.

AL: Action levels are enforceable triggers for compliance that force public notification and treatment optimization.

MCL: Maximum contaminant level, which are the U.S. Environmental Protection Agency's drinking water regulatory limits. Based on health and toxicology studies, results at or below these levels in drinking water are considered safe. These are usually numeric values; sometimes they are designated as DS or TT. (see below)

SMCL: Secondary maximum contaminant level, the U.S. Environmental Protection Agency's nonenforceable, but recommended guideline level of a contaminant or compound. When the fluoride secondary maximum contaminant level exceeds 2 mg/L, we must notify the public.

DS: Distribution system is how the total coliform regulation is decreed. This means that the total coliform regulation (less than 5 percent total coliform positive samples per month) applies to the water in the distribution system (service area) not just the treatment plant effluents.

TT: Treatment Technique refers to the water treatment process used in the plants, which must be optimized to control the levels of contaminants, such as the corrosion control process (maintaining a pH greater than 7.5 and alkalinity greater then 15) used to control lead and copper. To date, we have not detected lead in the raw, treated or distribution system water, and only small amounts of copper (less than a tenth of the regulatory limit 1.3 mg/L) have been found.

Compounds that were below reporting levels in Denver's water are listed on pages 16-17. We test for all of these compounds and contaminants at least annually. Contaminants that have been in the news recently, such as arsenic, lead, and TCE, are on the *not found* list.

Data Tables For Treated Water

Marston Treated Water

Analysis	MCL	Average	Range	No.
General (mg/L)				
Total Alkalinity as $CaCO_3$		64	48 - 78	732
Bicarbonate		77	62 - 87	12
Total Chlorine		1.60	1.40 - 1.85	4,390
Hardness as $CaCO_3$		108	96 - 119	12
pH (SU)	>7.5 daily average	7.70	7.52 - 7.95	4,392
Specific Conductance (µS)		336	290 - 370	52
Temperature (°C)		13	5 - 22	366
Total Dissolved Solids		189	168 - 205	12
Turbidity (NTU)	Treatment Technique	0.040	0.02 - 0.06	4,391
Metals (µg/L)				
Aluminum		27	<20 - 48	12
Barium	2,000	38	34 - 42	12
Boron		13	9 - 17	12
Calcium (mg/L)		31	28 - 33	12
Magnesium (mg/L)		7.7	5.7 - 8.9	12
Manganese		<2	<2 - 3	12
Molybdenum		7	4 - 10	12
Potassium (mg/L)		1.8	1.6 - 2.0	12
Sodium (mg/L)		20	15 - 24	12
Strontium (mg/L)		0.19	n/a	1

Data Tables For Treated Water

Marston Treated Water

Analysis	MCL	Average	Range	No.
Ions (mg/L)				
Chloride		24.7	18.7 - 29.4	11
Fluoride	4.0	0.61	0.56 - 0.69	15
Nitrate + Nitrite-Nitrogen	10 Nitrate, Nitrite is 1 ppm	0.08	<0.04 - 0.14	11
Silicon		1.8	1.0 - 2.4	12
Sulfate		57	53 - 61	11
Disinfection By Products (µg/L)				
Bromochloroacetic acid		3.3	1.9 - 4.0	8
Bromodichloroacetic acid		<2	<2 - 2.9	3
Bromodichloromethane		8.1	6.6 - 9.8	11
Chloral hydrate		1.2	0.7 - 1.7	6
Chlorodibromoacetic acid		3.4	<2.0 - 6.9	3
Chloroform		9.9	6.4 - 14.6	11
Chloropicrin		<0.5	<0.5 - 0.5	2
Cyanogen Chloride		1.1	0.9 - 1.3	2
Dibromochloromethane		3.3	1.5 - 4.7	11
Dichloroacetic acid		7.2	5.2 - 12.4	12
Haloacetic Acids (5)	60(DS)	15	10 - 25	12
Total Trihalomethanes	80(DS)	21	16 - 26	12
Trichloroacetic acid		4.6	3.3 - 5.6	12
Non Specific Organics				
Total Organic Carbon (mg/L)		1.6	1.1 - 2.1	52
Total Organic Halogen (µg/L)		118	105 - 134	4

South Platte River near Cheesman Reservoir

Data Tables For Treated Water

Foothills Treated Water

Analysis	MCL	Average	Range	No.
General (mg/L)				
Total Alkalinity as $CaCO_3$		59	42 - 84	656
Bicarbonate		71	55 - 96	11
Total Chlorine		1.7	1.43 - 2.00	3,939
Hardness as $CaCO_3$		103	94 - 112	11
pH (SU)	>7.5 daily average	7.78	7.17 - 8.41	3,937
Specific Conductance (µS)		315	280 - 390	46
Temperature (°C)		12	2 - 19	674
Total Dissolved Solids		179	163 - 205	11
Turbidity (NTU)	Treatment Technique	0.050	0.02 - 0.10	3,939
Metals (µg/L)				
Aluminum		34	23 - 54	11
Barium	2,000	36	34 - 41	11
Boron		11	8 - 16	11
Calcium (mg/L)		29	28 - 31	11
Magnesium (mg/L)		7.1	5.5 - 9.6	11
Manganese		<2	<2 - 6	11
Molybdenum		8	2 - 11	11
Nickel		<1	<1 - 1	11
Potassium (mg/L)		1.8	1.7 - 2.0	11
Sodium (mg/L)		18	14 - 26	11
Strontium (mg/L)		0.18	na	1
Zinc		<5	<5 - 6	11
Ions (mg/L)				
Chloride		21.4	15.5 - 35.0	10
Fluoride	4.0	0.63	0.58 - 0.67	14
Nitrate + Nitrite-Nitrogen	10 Nitrate, Nitrite is 1 ppm	0.13	0.06 - 0.16	10
Silicon		2.2	1.8 - 2.7	11
Sulfate		57	51 - 67	10
Disinfection By Products (µg/L)				
Bromochloroacetic acid		2.7	2.0 - 3.6	7
Bromodichloromethane		4.8	4.0 - 6.1	10
Chloral hydrate		1	0.5 - 1.5	5
Chlorodibromoacetic acid		3.7	<2.0 - 7.5	3
Chloroform		8.5	4.2 - 11.9	10
Chloropicrin		<0.5	<0.5 - 0.5	2
Cyanogen Chloride		1.2	1.1 - 1.2	2
Dibromoacetic acid		<1.0	<1.0 - 1.2	11

Data Tables For Treated Water

Foothills Treated Water

Analysis	MCL	Average	Range	No.
Disinfection By Products (µg/L)				
Dibromochloromethane		1.5	0.9 - 2.7	10
Dichloroacetic acid		7.9	5.3 - 13.8	11
Haloacetic Acids (5)	60(DS)	14	9 - 27	11
Monobromoacetic Acid		1.5	<1.0 - 7.5	11
Monochloroacetic Acid		<2.0	<2.0 - 2.4	11
Total Trihalomethanes	80(DS)	15	10 - 19	10
Trichloroacetic acid		4.8	3.6 - 6.5	11
Non Specific Organics				
Total Organic Carbon (mg/L)		1.5	1.1 - 2.0	46
Total Organic Halogen (µg/L)		113	102 - 126	4


View from the top of Jones Pass


Mine tailings near Jones Pass


Moose outside of caretaker's cabin

Data Tables For Treated Water

Moffat Treated Water

Analysis	MCL	Average	Range	No.
General (mg/L)				
Total Alkalinity as $CaCO_3$		25	19 - 35	380
Bicarbonate		30	27 - 32	7
Total Chlorine		1.64	1.32 - 1.96	2,259
Hardness as $CaCO_3$		39	34 - 44	7
pH (SU)	>7.5 daily average	7.83	7.50 - 8.89	1,128
Specific Conductance (µS)		106	92 - 120	26
Temperature (°C)		15	4 - 20	379
Total Dissolved Solids		64	32 - 74	7
Turbidity (NTU)	Treatment Technique	0.040	0.03 - 0.11	2,260
Metals (µg/L)				
Aluminum		<20	<20 - 28	7
Barium	2,000	17	15 - 20	7
Boron		5	4 - 6	7
Calcium (mg/L)		12	11 - 14	7
Magnesium (mg/L)		2.0	1.6 - 2.6	7
Manganese		<2	<2 - 2	7
Molybdenum		<1	<1 - 1	7
Potassium (mg/L)		0.7	0.6 - 0.7	7
Sodium (mg/L)		6	5 - 7	7
Strontium (mg/L)		0.05	n/a	1
Ions (mg/L)				
Chloride		4.1	3.5 - 4.7	6
Fluoride	4.0	0.57	0.23 - 0.63	9
Nitrate + Nitrite-Nitrogen	10 Nitrate, Nitrite is 1 ppm	0.04	<0.04 - 0.05	6
Silicon		2.8	2.3 - 3.2	7
Sulfate		20	18 - 23	6
Sulfate		20	17 - 23	12
Disinfection By Products (µg/L)				
Bromochloroacetic acid		<1.0	<1.0 - 1.3	5
Bromodichloroacetic acid		<2	<2 - <2	5
Bromodichloromethane		2.1	1.7 - 2.3	4
Chloral hydrate		0.8	0.6 - 0.9	2
Chlorodibromoacetic acid		3.4	<2.0 - 5.9	2
Chloroform		11	8.8 - 13.0	4
Chloropicrin		<0.5	<0.5 - 0.7	2
Cyanogen Chloride		2.3	1.3 - 3.3	2
Dibromochloromethane		<0.5	<0.5 - <1.0	4

Data Tables For Treated Water

Moffat Treated Water

Analysis	MCL	Average	Range	No.
Disinfection By Products (µg/L)				
Dichloroacetic acid		6.9	5.3 - 9.0	6
Haloacetic Acids (5)	60(DS)	13	9 - 18	6
Total Trihalomethanes	80(DS)	13	11 - 15	5
Trichloroacetic acid		5.1	4.1 - 6.1	6
Non Specific Organics				
Total Organic Carbon (mg/L)		1.2	1.1 - 1.4	26
Total Organic Halogen (µg/L)		93	87 - 101	3

Reservior view of Strontia Spring spillway

Conduit 20 Diversion Structure in Waterton Canyon

Big horn sheep resting in Waterton Canyon

Contaminants Not Found In Denver's Drinking Water

The following analyses were performed, and each of these constituents was either below the reporting limit or the average result was less than the reporting limit. VOCs are volatile organic chemicals (easily airborne), and SOCs are synthetic organic chemicals, (typically man made). The maximum contaminant level (MCL) is listed after the analysis in parentheses, if regulated in drinking water. The unit of measure is also listed if different than that listed for the subsection.

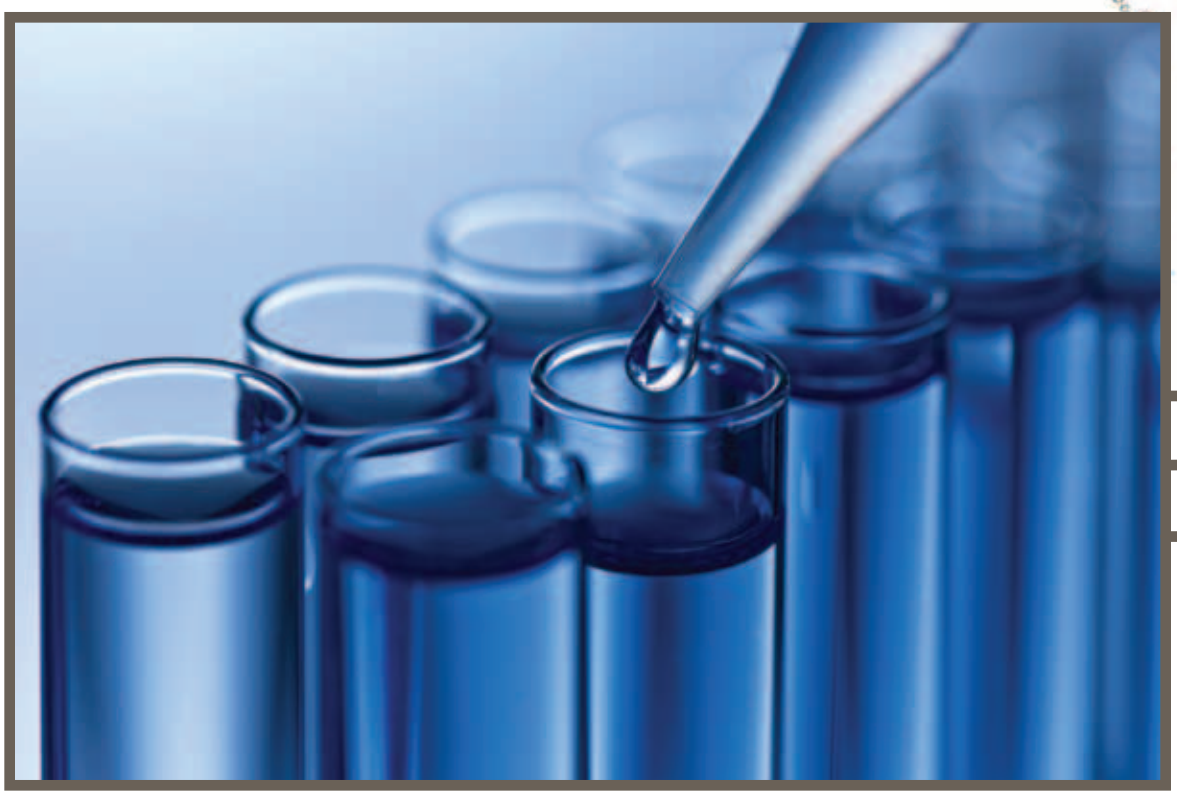
General (mg/L)	Nodularin	Hexachlorocyclopentadiene	**Pesticides (µg/L)**
Chlorine, Free	Total Coliform (DS)	Indeno(1,2,3-cd)pyrene	4,4′-DDE
Asbestos (7 MFL)	**Disinfection By Products -reaction between the disinfectant and natural organic matter (µg/L)**	Isophorone	4,4′-DDT
Metals - plumbing, mining, natural errosion (µg/L)		Methacrylonitrile	alpha-Chlordane
		Methylacrylate	Acifluourfen
Antimony (6)	Monochloroacetic Acid	Methyl methacrylate	Alachlor (2)
Arsenic (10)	n-Nitrosodiethylamine Nitrosamine)	Naphthalene	Aldicarb
Beryllium (4)	n-Nitrosodimethylamine (NDMA)	n-Butyl Acrylate	Aldicarb sulfone
Cadmium (5)	n-Nitrosodi-n-butylamine	Nitrobenzene	Aldicarb sulfoxide
Chromium (100)	n-Nitrosodi-n-propylamine	Nonylphenol isomer mix	Aldrin
Cobalt	n-Nitrosomethylethylamine	Phenanthrene	Atrazine (3)
Copper (TT)	n-Nirtosopyrollidine	Pyrene	Azoxystrobin
Iron	Tribromoacetic Acid	Quinoline	Baygon
Lead (TT)	Chloroacetonitrile	TCPP	Bendiocarb
Lithium	N-nitrosodiethylamine	TDCPP	Bensulide
Mercury (2)	N-nitrosodimethylamine	**SOC - Plastizers, Surfactants, Personal Care Products (µg/L, ng/L)**	Bentazon
Selenium (50)	N-nitrosodi-n-butylamine		β-BHC (beta-BHC)
Silver	N-nitrosodi-n-propylamine		Bromacil
Thallium (2)	N-nitrosomethylethylamine	2,4,5-Trichlorobiphenyl	Butachlor
Titanium	N-nitrosopiperidine	4-nonylphenol - semi quantitative	Carbaryl
Vanadium	N-nitrosopyrollidine	Bis(2-ethylhexyl)adipate	Carbofuran
Ions - from natural errosion, farming, and industry (µg/L, mg/L)	**Synthetic Organic Compounds - from feedstock/ combustion by-products, flame retardants (µg/L)**	Bis(2-ethylhexyl)phthalate	Chloridazon
		Bisphenol A	Chlorobenzilate
Bromide		Butyl benzyl phthalate	Chloroneb
Carbonate		Butylparaben	Chlorothalonil
Hydroxide	2,4-Dinitrotoluene	Di-n-octyl phthalate	Chlorotoluron
Nitrite-Nitrogen (1)	2,6-Dinitrotoluene	Ethylparaben	Clomazone
Ortho Phosphorus, Dissolved	3,5-Dichlorobenzoic acid	Galaxolide	Cyanazine
Perchlorate	4-tert-Octylphenol	Isobutylparaben	Dacthal
Radiological errosion of natural deposits/mining (pCi/L)	Acenaphthene	Isopropyl ether	Dalapon (200)
	Acenaphthylene	Methyl paraben	DCPA acid metabolites
Alpha	Anthracene	Propylparaben	Desisopropylatrazine (DIA)
Beta	Benzo(a)anthracene	TCEP	delta–BHC
Radium 226/228 (5)	Benzo(a)pyrene (0.2)	TCPP	Dicamba
Uranium (30 µg/L)	Benzo(b)fluoranthene	TDCPP	Dichlorvos
Microbiological–animal and human activity, Algal toxins	Benzo(g,h,i)perylene	tert-Amyl Methyl ether (TAME)	Dieldrin
	Benzo(k)fluoranthene	tert-Butyl alcohol	Diflubenzuron
Cryptosporidium (oocysts/L)	Chloroprene	Tetrabromobisphenol A	Dinoseb
E. coli (count/100 ml)	Chrysene	Triclosan	Diuron
Giardia (TT) (cysts/L)	Cyclohexanone	**Pesticides (µg/L)**	Dursban
Legionella (TT)	Dibenzo(a,h)anthracene	1,2-Dibromo-3-chloropropane (0.2)	Endosulfan sulfate
Plankton	Diethanolmine (DEA)	2,4,5-T	Endosulfan–A
Microcystin-LA (Algal Toxin)	Ethyl acrylate	2,4-D (70)	Endosulfan–B
Microcystin-LR	Ethyl tert-butyl ether	2,4-DB	Endrin (2)
Microcystin-RR	Fluoranthene	3-Hydroxycarbofuran	Endrin Aldehyde
Microcystin-YR	Fluorene	4,4′-DDD	EPTC

Contaminants Not Found In Denver's Drinking Water

Pesticides (µg/L)	**Volatile Organic Compounds (VOC)-from solvents, feedstock/ fuels, Flame retardants (µg/L, ng/L)**	n-Propylbenzene	Gemfibrozil
Ethylene dibromide		o-Chlorotoluene	Ibuprofen
Fenuron		o-Dichlorobenzene (600)	Iohexol
Fluometuron		p-Chlorotoluene	Iopromide
Halofenozide	1,1,1,2-Tetrachloroethane	p-Dichlorobenzene (78.5)	Ketoprofen
Halosulfuron methyl	1,1,1-Trichloroethane (200)	Pentechloroethane	Ketorolac
Heptachlor (0.4)	1,1,2,2-Tetrachloroethane	p-Isopropyltoluene (Cymene)	Levothyroxine (Synthroid)
Heptachlor Epoxide (0.2)	1,1,2-Trichloroethane (5)	Propionitrile	Lidocaine
Hexachlorobenzene	1,1-Dichloroethane	sec-Butylbenzene	Lincomycin
Imidacloprid	1,1-Dichloroethene (7)	Styrene (100)	Lopressor
Iodomethane	1,1-Dichloropropene	tert-Butylbenzene	Meclofenamic Acid
Isoproturon	1,2,3-Trichlorobenzene	Tetrachloroethene (5)	Meprobamate
Lindane	1,2,3-Trichloropropane	Tetrahydrofuran	Naproxen (Aleve)
Linuron	1,2,3-Trimethylbenzene	Toluene (1000)	Narasin
Malathion	1,2,4-Trichlorobenzene (70)	trans-1,2-Dichloroethene (100)	Nifedipine
Metalaxyl	1,2,4-Trimethylbenzene	trans-1,3-Dichloropropene	Norethisterone
Metazachlor	1,2-Dichloroethane (5)	trans-1,4-Dichloro-2-butene	Norfloxacin
Methiocarb	1,2-Dichloropropane (5)	Trichloroethylene (5)	Oleandomycin
Methomyl	1,3,5-Trimethylbenzene	Vinyl acetate	Oxolinic acid
Methoxychlor	1,3-Dichloropropane	Vinyl Chloride (2)	Paraxanthine
Methyl paraoxon	1,3-Dichloropropene	Xylenes (10000)	Penicillin G
Metribuzin	1,4-Dioxane	**Pharmaceuticals/Hormones (µg/L, ng/L)**	Penicillin V
Molinate	1-Chlorobutane		Pentoxifylline (Aventis)
Monuron	2,2-Dichloropropane	17alpha-Ethynyl estradiol	Phenazone
Neburon	2-Butanone (MEK)	Acetaminophen (Tylenol)	Primidone
Oryzalin	2-Hexanone	Albuterol	Progesterone
Oxadiazon	2-Nitropropane	Amoxicillin (semi-quantitative)	Salicylic acid (Aspirin)
Oxamyl (200)	4-Methyl-2-Pentanone (MIBK)	Andorostenedione	Salinomycin
Paclobutrazol	Acrylonitrile	Atenolol	Simvastatin
Pebulate	Allyl chloride	Azithromycin	Sulfachloropyridazine
Pentachlorophenol (1)	Benzene (5)	Bendroflumethiazide	Sulfadiazine
Permathrin Isomers	Bromobenzene	Bezafibrate	Sulfadimethoxine
Picloram	Bromoethane	Butalbital	Sulfamerazine
Propachlor	Bromomethane	Carbadox	Sulfamethazine
Propanil	Carbon disulfide	Carbamazepine	Sulfamethizole
Propargite	Chlorobenzene (100)	Carisoprodol (Soma)	Sulfamethoxazole
Propazine	Chlorodifluoromethane (CFC 22)	Chloramphenicol	Sulfasalazine
Propoxur	Chloroethane	Cimetidine	Sulfathiazole
Siduron, Total	Chloromethane	Ciprofloxacin	Testosterone
Silvex (50)	cis-1,2-Dichloroethene (70)	Clofibric acid	Tetracycline
Simazine (4)	cis-1,3-Dichloropropene	Dehydronifedipine	Theophylline
Stirofos	Dibromomethane	Diazepam (Valium)	trans-Testosterone
Terbacil	Dichlorodifluoromethane (CFC-12)	Diclofenac	Trimethoprim
Terbuthiuron	Dichloromethane (5)	Diethylstilbestrol (DES)	Tylosin
Thidiazuron	Diethyl ether	Dilantin	Virginiamycin M1
Triademefon	Epichlorohydrin	Erythromycin	Warfarin
Triadimenol	Ethyl Benzene (700)	Estradiol	
Tricyclazole	Isopropylbenzene (Cumene)	Estrone	
Trifluralin	m-Dichlorobenzene	Fluoxetine (Prozac)	

Upper fork of the Williams Fork river

Report prepared by: Maria Rose, Data and Analytical Support, Nicole Peschel, Graphics, Format and Design



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