Denver Water's 2009 Treated Water Quality Summary Report

DENVER WATER

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Introduction

Denver Water provides its customers with high quality drinking water. We want you to be aware of how that quality is maintained and to feel comfortable with and be knowledgeable of the water treatment process. We take great care and effort into providing the Denver Metropolitan Area with water that meets the most stringent standards.

This report was prepared to provide you with important information about Denver's water quality. We want you to see why we have confidence in the quality of Denver's drinking water.

Explanation of Terms

To better understand this report, please refer to the table below which gives brief explanations of terms and measurement units that are used in the document. Parameters such as temperature and turbidity (turbidity is a measure of the discoloration or particulates in the water that interfere 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, e.g. mg/L or µg/L. Microbiological results are generally expressed in terms of a count of organisms per volume of sample, e.g. CFU/100 ml.

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)	

Report Data

This report includes graphs and tables summarizing data for samples collected throughout 2009 from the potable (drinking) water leaving Denver Water's treatment plants (treated water). This report also includes some data from the source water to the treatment plants, and some data from the distributed water. The data in this report is 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 18 of this report, treated water results are displayed in tables that include the regulatory limit for the analysis where applicable. This year trace levels of Cyanide were detected in our Foothills and Moffat Treated Water. It is possible it is a by-product of disinfection. Most of the time it was not present but a few times it was detected at measurable levels.

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 is one of the parameters. Total Coliform bacteria are used as an indicator of drinking water potability (pōtability). The percent of positive Coliform samples each month is calculated and reported to the state health department (The Colorado Department of Public Health and Environment (CDPHE)) the primacy agency that enforces the EPA regulations in Colorado. No more than five percent (5%) of the samples may be positive per month for total Coliform. As evident from the table below, Denver Water is well below the five percent level.

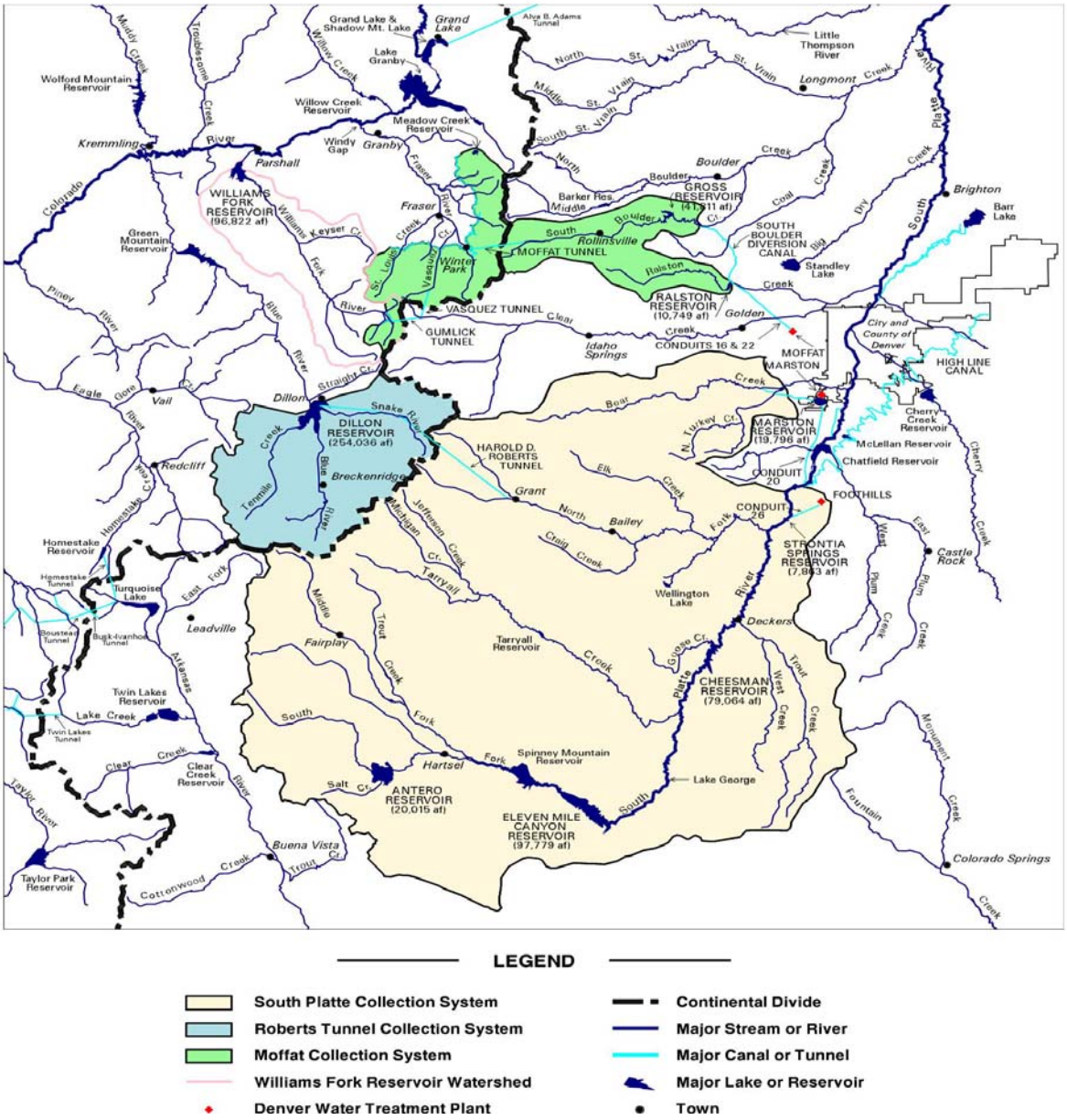
Treatment Plant Treated Water and Distribution System
Total Coliform Samples for 2009

Month	Number of Samples	Number of Positives	% Positive
January	445	0	0.00%
February	450	0	0.00%
March	458	0	0.00%
April	493	0	0.00%
May	447	0	0.00%
June	536	0	0.00%
July	491	0	0.00%
August	496	1	0.20%
September	493	2	0.41%
October	425	0	0.00%
November	413	0	0.00%
December	468	0	0.00%
Totals	5,615	3	0.05%

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 the Dillon collection system 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. Both 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 and the water in the Moffat system has a lower mineral content.

Water Collection System

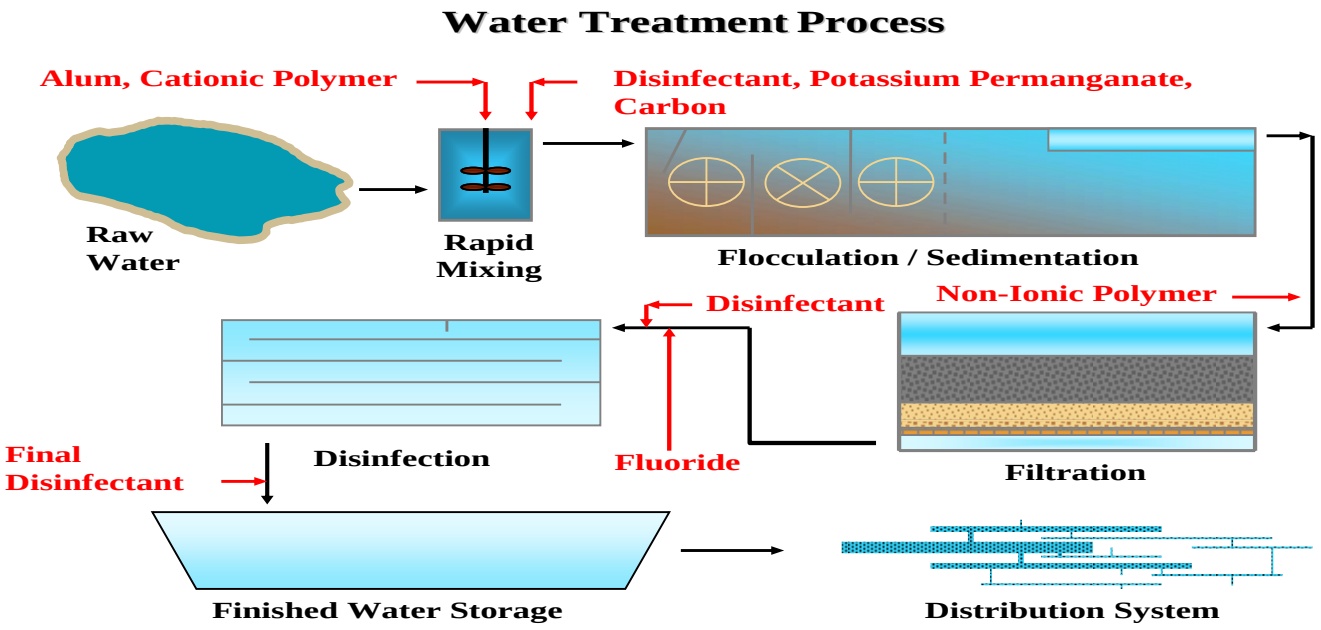


How Water Is Treated To Make It Drinkable

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 the 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 filters - 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 0.10 turbidity units is a measure of clear, clean water. Potassium Permanganate or 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 (CDPHE) and the Centers for Disease Control and Prevention (CDC) recommend optimal fluoridation. After filtration, the water may be supplemented to bring the total concentration of Fluoride up to 0.90 mg/L. CDPHE and the CDC have determined that 0.90 mg/L is the optimal level to prevent tooth decay. Caustic soda may also 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 S.U. Finally, the water is thoroughly disinfected to maintain its high quality as it travels to homes and businesses.

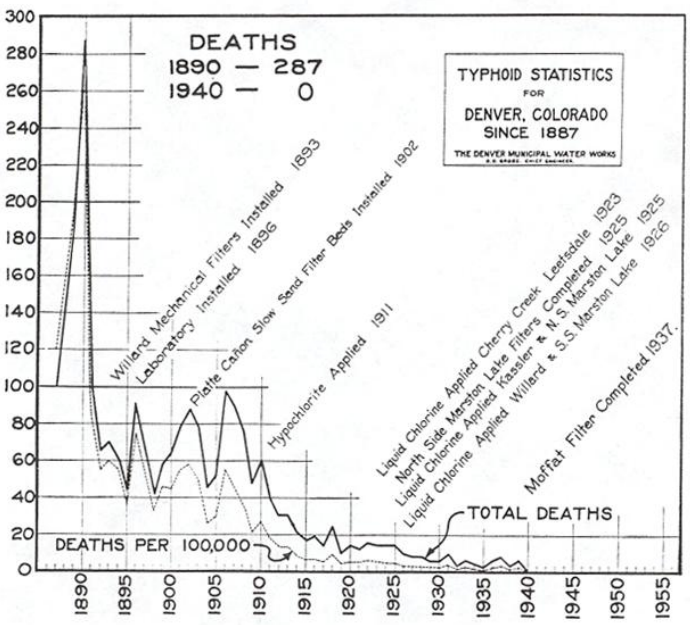


Why Is The Water Treated This Way?

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

Denver Water uses a very effective long lasting disinfectant that produces lower concentrations of disinfection by-products (DBPs), such as Total Trihalomethanes (TTHMs) and Haloacetic Acids (HAAs) than would free Chlorine. DBPs above their regulatory limits are potentially harmful, therefore minimization of them is very important.

The Environmental Protection Agency (EPA) establishes the water quality regulations for all water utilities in the United States. In Colorado, the Colorado Department of Public Health and Environment (CDPHE, state health department) 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 over 85 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. EPA 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. We're happy to report that Denver Water has not violated any regulation to date.



How Well Is Denver Water Doing?

The tables below and on the following pages, illustrate 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 micro-organisms 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% of the samples each month. For the last several years Denver Water has maintained treated water turbidities consistently less than 0.30 NTU. In 2009 100% of the samples were below 0.30 NTU and all averages were below 0.10 NTU.

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, samples must be taken at upstream and downstream addresses of the original test site and at the site itself. This re-sampling is mandated by the CDPHE 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 *E. Coli (Escherichia Coli)*. *E. Coli* is 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.

Average Values for 2009

Parameter	Treatment Plant	Raw Water Result	Treated Water Result
Turbidity (NTU)	Marston	1.0	0.04
Turbidity (NTU)	Foothills	5.7	0.05
Turbidity (NTU)	Moffat	3.0	0.05
Total Coliform (MPN/100 ml)	Marston	282	None detected
Total Coliform (MPN/100 ml)	Foothills	271	None detected
Total Coliform (MPN/100 ml)	Moffat	51	None detected

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 include lead, arsenic, mercury, *Cryptosporidium, Giardia,* and *E. coli* (*Escherichia Coli*) among others. Denver Water has tested for these for over 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 7, removes or inactivates these microorganisms.

Denver Water Average Values for 2009

Parameter	Treatment Plant	Raw Water Result	Treated Water Result
Lead (ppb)	Marston	None Detected	None Detected
Lead (ppb)	Foothills	None Detected	None Detected
Lead (ppb)	Moffat	None Detected	None Detected
Arsenic (ppb)	Marston	None Detected	None Detected
Arsenic (ppb)	Foothills	None Detected	None Detected
Arsenic (ppb)	Moffat	None Detected	None Detected
Mercury (ppb)	Marston	None Detected	None Detected
Mercury (ppb)	Foothills	None Detected	None Detected
Mercury (ppb)	Moffat	None Detected	None Detected

Denver Water Average Values for 2009

Parameter	Treatment Plant	Raw Water Result	Treated Water Result
Giardia (Cysts/L)	Marston	0.08	None Detected
Giardia (Cysts/L)	Foothills	1.9	None Detected
Giardia (Cysts/L)	Moffat	None Detected	None Detected
Cryptosporidium (Oocysts/L)	Marston	None Detected	None Detected
Cryptosporidium (Oocysts/L)	Foothills	None Detected	None Detected
Cryptosporidium (Oocysts/L)	Moffat	None Detected	None Detected
E. Coli (MPN/100 ml)	Marston	5	None Detected
E. Coli (MPN/100 ml)	Foothills	4	None Detected
E. Coli (MPN/100 ml)	Moffat	None Detected	None Detected

Minerals In Nature That Are Found In Water

All natural waters contain 'minerals' from the earth. 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 above only barium and aluminum are regulated in the treated water. Barium has a MCL (maximum contaminant level) of 2,000 ppb, while aluminum has a SMCL (secondary MCL), which is a non-enforceable drinking water regulation of 50 — 200 ppb.

Denver Water Average Values for 2009

Parameter	Treatment Plant	Raw Water Result	Treated Water Result	EPA Regulatory Limit
Aluminum (ppb)	Marston	60	30	50 — 200
Aluminum (ppb)	Foothills	200	37	50 — 200
Aluminum (ppb)	Moffat	120	<20	50 — 200
Barium (ppb)	Marston	40	37	2,000
Barium (ppb)	Foothills	36	33	2,000
Barium (ppb)	Moffat	20	18	2,000
Calcium (ppm)	Marston	31	30	None
Calcium (ppm)	Foothills	27	26	None
Calcium (ppm)	Moffat	9	15	None

Denver Water Average Values for 2009

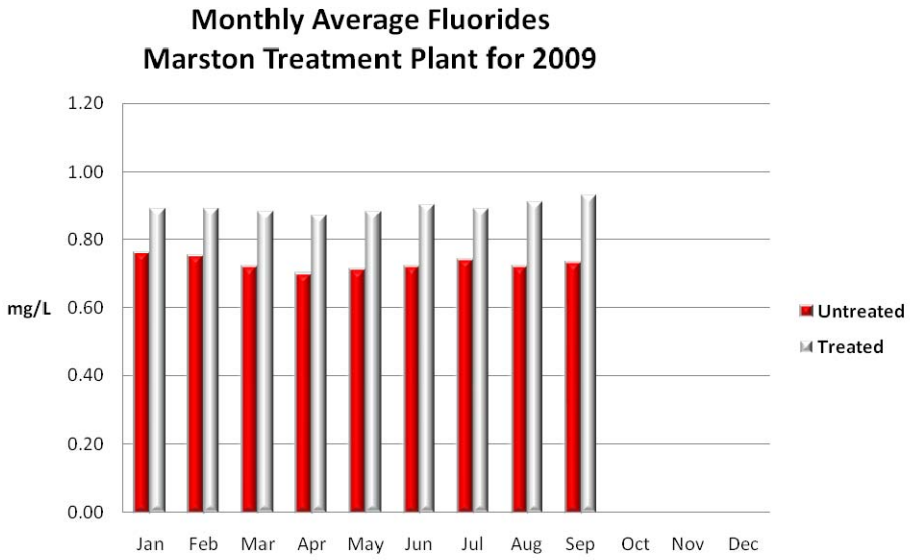
Parameter	Treatment Plant	Raw Water Result	Treated Water Result
Magnesium (ppm)	Marston	8.0	7.9
Magnesium (ppm)	Foothills	7.4	7.4
Magnesium (ppm)	Moffat	2.3	2.3
Potassium (ppm)	Marston	2.0	1.9
Potassium (ppm)	Foothills	1.8	1.8
Potassium (ppm)	Moffat	0.8	0.8
Sodium (ppm)	Marston	16	21
Sodium (ppm)	Foothills	15	19
Sodium (ppm)	Moffat	3	9

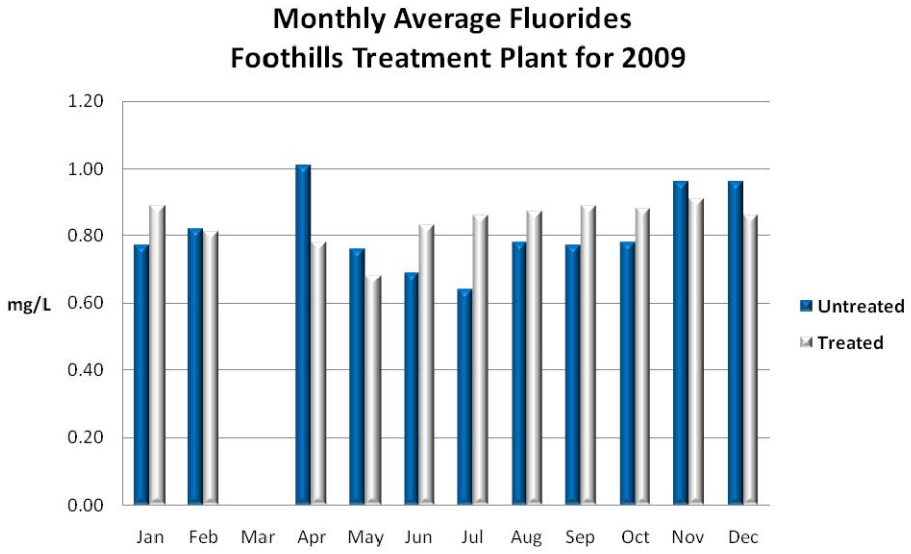
Most minerals are not removed by conventional treatment. Calcium, magnesium, iron and manganese amounts may be reduced by water treatment, but not completely removed. Please note that the comparisons above, though from the same treatment plants are not always from samples collected on the same dates for the source and the treated waters, and therefore, are general comparisons. Drinking water naturally contains several minerals that are in fact beneficial to humans and mammals. The minerals in both of the tables above, 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.

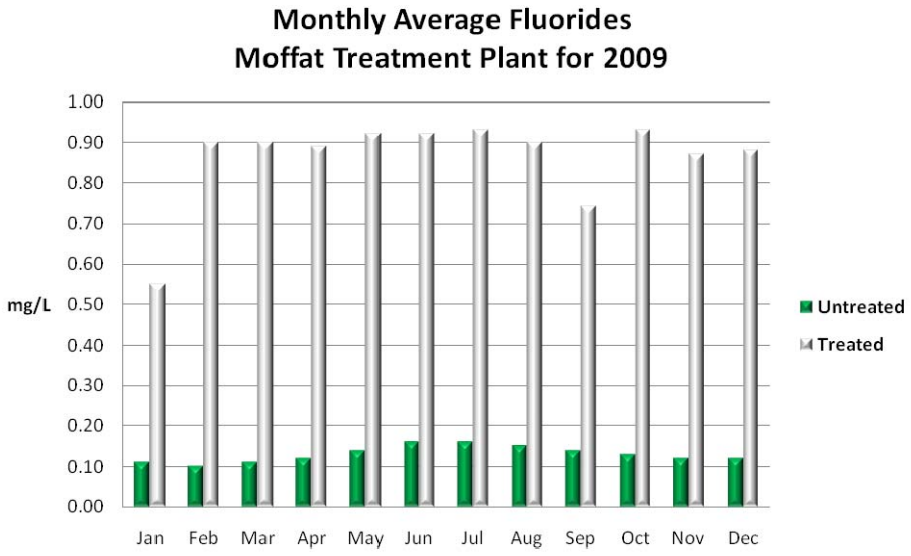
If there is no regulatory limit, or MCL, listed in the above tables, then the amount of the mineral that might cause a potential health concern is much higher than would ever be found in water. It would be a waste of time and resources to regulate it.

Fluoride compounds are naturally occurring in Denver Water's source water. When needed, Denver Water supplements the Fluoride level to adhere to the recommendation of 0.90 mg/L set forth by the U.S. Centers for Disease Control and Prevention (CDC) and American Dental Association and the CDPHE 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. 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. Note: Fluoride is tested monthly for the source water and six times daily for treated water. Marston Treatment Plant was out of service after September and Foothills was out in March of 2009.

Comparison of Fluoride Between Untreated And Treated Water

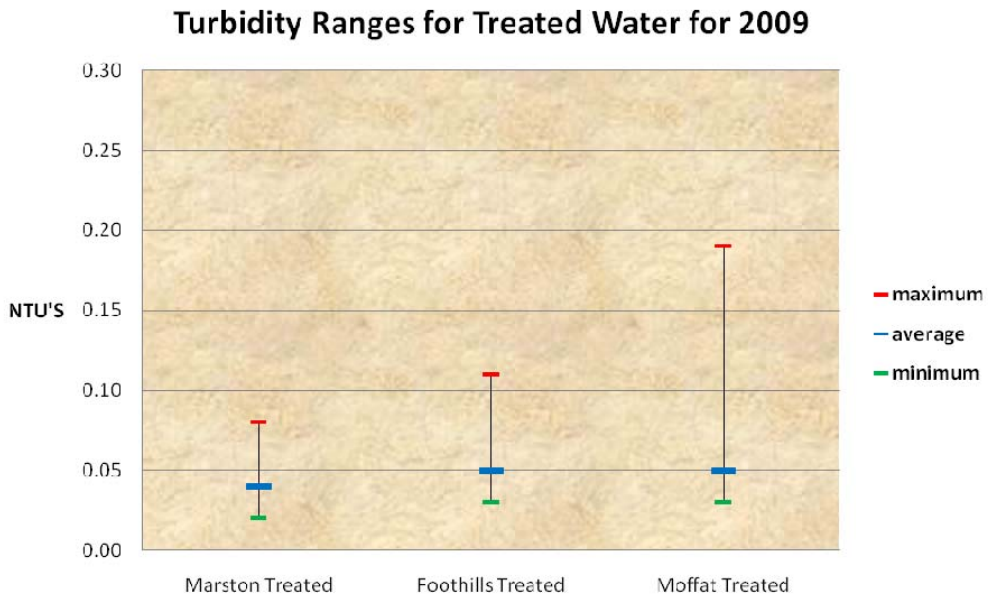




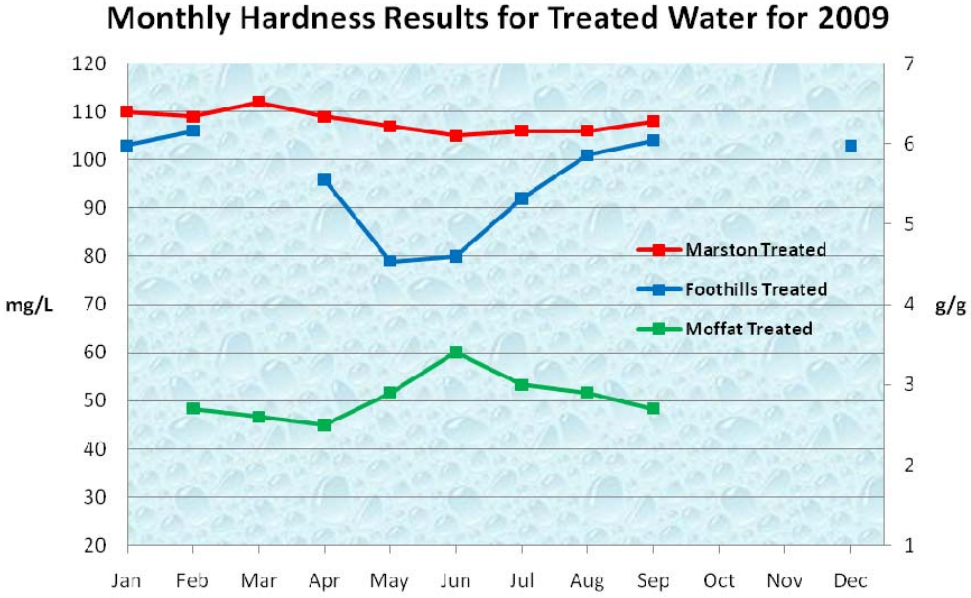


Turbidity and Hardness Graphs

Turbidity refers to the clarity of the water. The EPA has established a Maximum Contaminant Level (MCL) for turbidity where at least 95% of the samples/month must be less than or equal to 0.30 NTU in the treated water . For Denver's water, 100 percent of the samples were below 0.30 NTU in 2009, and the average for each plant was at or below 0.05 NTU.

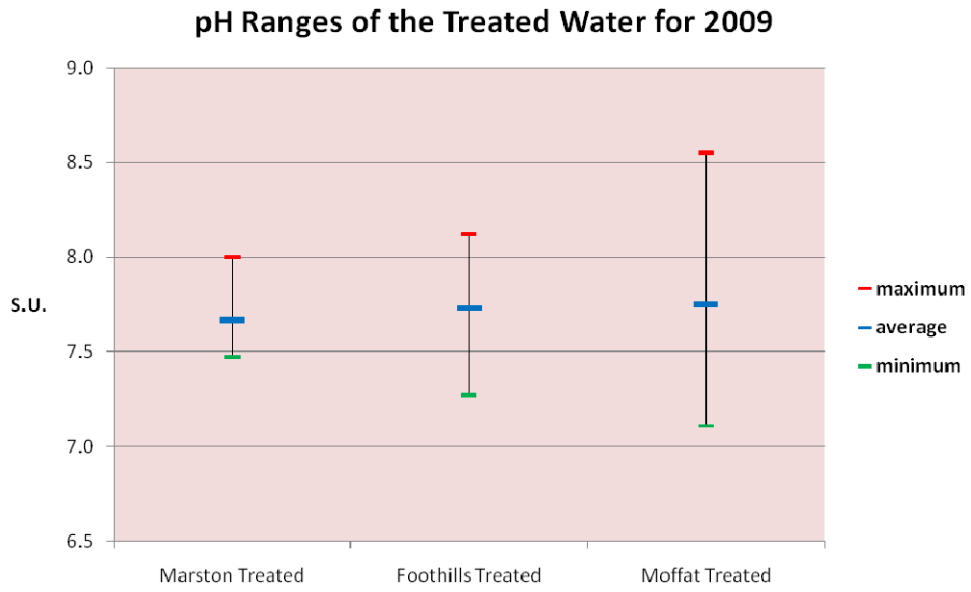


Water hardness is a result of Calcium and Magnesium salts dissolved in water. High concentrations of these minerals make water "hard." The South Platte source water is considered moderately hard to hard. At times it is greater than 5.8 g/g or 100 mg/L and it varies seasonally between 4 to 7 g/g of hardness. The Moffat source is softer, and varies seasonally between 1 to 3 g/g. Most customers calling about hardness are inquiring for detergent usage amounts, or adding tap water to their irons or humidifiers. The units of measure for most customers appliances are in grains per gallon (g/g), but in the lab we measure in mg/L. The graph below presents the hardness in both units. Our water is scale forming and harder water will form a mineral scale on 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. Gaps in data indicate that the plant was not in service (off-line) during those months.

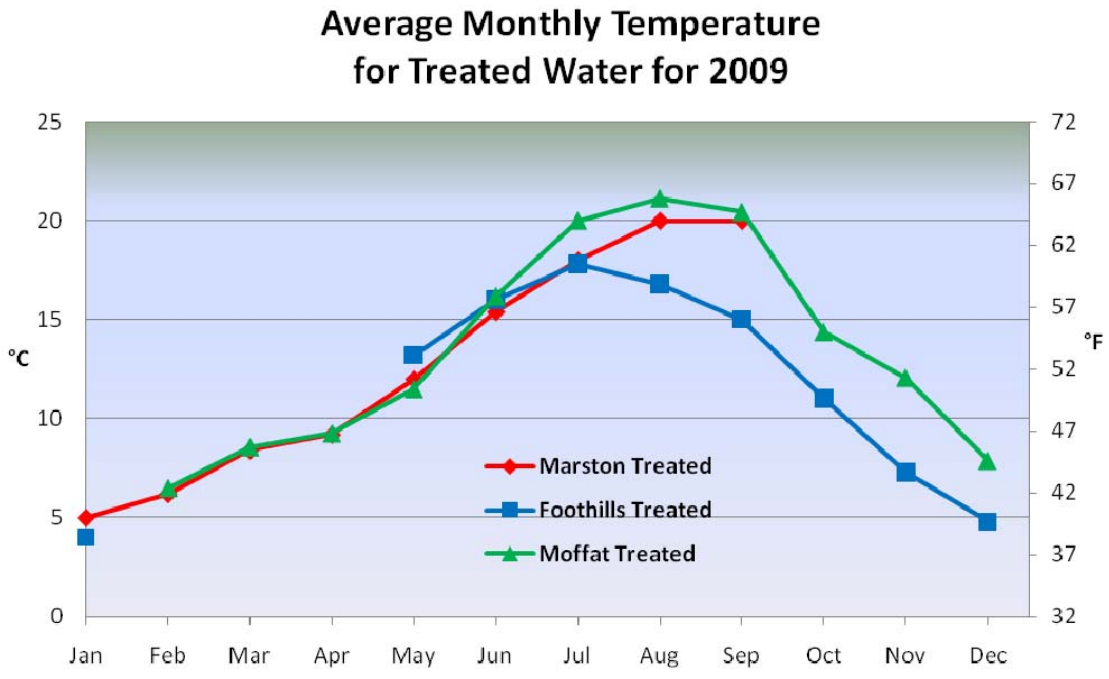


pH and Temperature Graphs

The pH range of the water is measured to ensure that the water is non-corrosive toward the water distribution system and residential plumbing. The pH of the water does not impact the safety of the water, it relates to the aggressiveness of the water towards pipe materials. Denver Water is required to maintain a pH in the Distribution System of 7.5 S.U or higher to ensure that the water does not leach potentially harmful metals from plumbing.



The water temperatures leaving the treatment plants fluctuate seasonally. This is due to the temperatures of the flows from the mountain runoff, very cold in the winter and warmer in the summer. At higher temperatures, the disinfectant is more likely to dissipate allowing for bacterial re-growth. Disinfectant residuals can be increased, usually during the summer, to ensure thorough disinfection. Breaks in the lines of the graphs indicate periods when the plants were not in service.



Regulatory Terminology

Pages 18 through 23 are tables of data for compounds detected in the treated water. The tables contain the name of the compound, the MCL (see below) where applicable, the average result, the range of detections for the year, and the number of times for which it was tested. Most of the compounds detected are not regulated and do not pose a health or safety risk.

AL—Action Levels are enforceable triggers for compliance that force public notification and treatment optimization.

MCL—Maximum Contaminant Level, 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 non-enforceable, but recommended guideline level of a contaminant or compound. However, the Fluoride SMCL of 2 mg/L, when exceeded, triggers public notification.

DS—Distribution System is how the total Coliform regulation is decreed. This means that the total Coliform regulation (less than 5% 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 **not** detected in Denver's water are listed below and on the next page. 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 <u>not detected</u> list.

Methiocarb	Thiobencarb	Acetaminophen	Paclobutrazol	MGK 264 isomer b
Methomyl	Thionazin	Antipyrine	Paraxanthine	MGK 326
Methoxychlor	trans-Permethrin	Azinphos-ethyl	PCNB	Paclobutrazo
Methyl paraoxon	Triademefon	Azinphos-methyl	Penicillin G	l RDX
Metolachlor	Tribufos	Azithromycin	Penicillin V	trans-Nonachlor
Metribuzin	Trichloronate	Azoxystrobin	Phenylphenol	Triadimenol
Mevinphos	Triclopyr	Bacitracin	Prednisone	Z-Phosphamidon
Mirex	Tricyclazole	Baygon	Progesterone	
Molinate	Trifluralin	Bensulide	Propargite	
Monocrotophos	Vernolate	Bezafibrate	Roxithromycin	
Naled	Vinclozolin	Bisphenol A	Salinomycin	
Napropamide	Vinyl acetate	Caffeine	Siduron, Total	
Norflurazon	2,4-Dinitrotoluene	Carbadox	Simvastatin	
n-Butyl acrylate	2,6-Dinitrotoluene	Carbamazepine	Sulfachloropyridazine	
Oryzalin	Acenaphthylene	Chloramphenicol	Sulfadiazine	
Oxadiazon	Ametryn	Chlorotetracycline	Sulfadimethoxine	
Oxamyl (200)	Anthracene	Ciprofloxacin	Sulfamethazine	
Oxychlordane	Benzo(a)anthracene	cis-Testosterone	Sulfamerazine	
Oxyfluorfen	Benzo(a)pyrene (0.2)	Clofibric acid	Sulfamethizole	
Parathion	Benzo(b)fluoranthene	Diclofenac	Sulfamethoxazole	
Pebulate	Benzo(g,h,i)perylene	Diethylstilbestrol (DES)	Sulfathiazole	
Pendimethalin	Benzo(k)fluoranthene	Diflubenzuron	tert-Amyl Methyl ether	
Permethrin Isomers	Bis(2-ethylhexyl)adipate (400)	Dilantin	tert-Butyl alcohol	
Phorate	Bis(2-ethylhexyl)phthalate	Diltiazem	Tetrabromobisphenol A	
Phosmet	Butyl benzyl phthalate	Doxycycline	Theobromine	
Picloram	Chrysene	Enrofloxacin	Theophylline	
Profluralin	Cyclohexanone	Erythromycin	Thidiazuron	
Prometon	Dibenzo(a,h)anthracene	Estriol	trans-Testosterone	
Prometryn	DCEE	Estrone	Triadimenol	
Pronamide	Diethyl phthalate	Fenuron	Triclosan	
Propanil	Dimethyl phthalate	Fluoxetine (Prozac)	Trimethoprim	
Propachlor	Di-n-butyl phthalate	Freon113	Tylosin	
Propazine	Di-n-octyl phthalate	Gemfibrozil	Virginiamycin	
Propionitrile	Diuron	Halofenozide	M1	
Propoxur	Fluoranthene	Halosulfuron	2244 tetrabromodiphenyl ether	
Prothiophos	Fluorene	methyl Ibuprofen	22445 Pentabromodiphenyl ether	
Silvex (50)	Indeno(1,2,3-cd)pyrene	Imidacloprid	(HBB) 224455 hexabromodiphenyl ether	
Simazine (4)	Isophorone	Lasalocid	22446 pentabromodiphenyl ether	
Simetryn	Pentachlorobenzene	Levothyroxine (Synthroid)	Acetochlor ESA	
Stirofos	Pentachloroethane	Lincomycin	Acetochlor OA	
Sulfotep	Pentachlorophenol (1)	Monensin	Alachlor ESA	
TAME	Phenanthrene	Monuron	Alachlor OA	
TEPP	Propiconazole isomer a	Naproxen	Azoxystrobin	
Terbufos	Propiconazole isomer b	Narasin	BrA	
Terbufos sulfone	Polychlorinated Biphenyls (0.5)	Neburon	E-Phosphamidon	
Terbacil	Pyrene	Nicotine	Fluazifop-butyl	
Terbuthiuron	17alpha-Ethynyl estradiol	Nonylphenol, isomer mix	gamma-Chlordane	
Terbutryn	17beta-Estradiol	Norfloxacin	Metolachlor ESA	
Tetrahydrofuran	4-n-Octylphenol	Oleandomycin	Metolachlor OA	
Thiabendazole	4-tert-Octylphenol	Oxytetracycline	MGK 264 isomer a	

Contaminants Not Found In Denver's Drinking Water

Denver's water was analyzed for the following parameters. They were either not detected or the average result was less than the detection limits. The MCL is listed after the component in parenthesis where applicable. The unit of measure is also listed if different than that listed for the subsection. These potential contaminants are on EPA's nation-wide list of regulatory concerns.

General	1,2-Dichloroethane (5)	methyl Naphthalene	Desisopropylatrazine
Alkalinity, Phenolphthalein as CaCO3	1,2-Dichloropropane (5)	n-Butyl Benzene	Diazinon
Chlorine, Free	1,3,5-Trimethylbenzene	Nitrobenzene	Dicamba
Asbestos (7 MFL)	1,3-Dichloropropane	n-Propyl Benzene	Dichlorprop
Metals (mg/L)	1,3-Dichloropropene	o-Chlorotoluene	Dichlorvos
Antimony (0.006)	1,3-Dinitrobenzene	o-Dichlorobenzene (600)	Dichlobenil
Arsenic (0.010)	1-Methylnaphthalene	p-Chlorotoluene	Dichlofenthion
Beryllium (0.004)	2-Methylnaphthalene	p-Dichlorobenzene (78.5)	Dichloran
Cadmium (0.005)	2,2-Dichloropropane	p-Isopropyl Toluene	Dicrotophos
Chromium (0.1)	2,3-Dichlorobiphenyl	sec-Butyl Benzene	Dieldrin
Cobalt	2-Butanone	Styrene (100)	Diethyl ether
Copper (TT^1)	2-Chlorobiphenyl	tert-Butyl Benzene	Diflubenzuron
Iron	2-Hexanone	Tetrachloroethene (5)	Dimethoate
Lead (TT^1)	2-Methyl-4,6-dinitrophenol	Toluene (1000)	Dinoseb
Lithium	2-Methylphenol	Toxaphene	Dioxathion
Mercury, Total (0.002)	2-Nitropropane	trans-1,2-Dichloroethene (100)	Disulfoton
Selenium (0.05)	2,2",3,4,6-Pentachlorobiphenyl	Trichloroethylene (5)	Disulfoton sulfone
Silver	2,2",3,3",4,4",6-Heptachlorobiphenyl	Trichlorofluoromethane	Disulfoton sulfoxide
Thallium (0.002)	2,2",3,3",4,5",6,6"-Octachlorobiphenyl	Trichlorotrifluoromethane	Diphenamid
Titanium	2,2",4,4",5",6-Hexachlorobiphenyl	Vinyl Chloride (2)	Dursban
Vanadium	2,2",4,4"-Tetrachlorobiphenyl	Xylenes (10000)	Endosulfan –A
Uranium	2,4,6-Trinitrotoluene (TNT)	1,2-Dibromo-3-chloropropane (0.2)	Endosulfan – B
Zinc	2,4,5-Trichlorobiphenyl	2,4,5-T	Endosulfan sulfate
Ions (mg/L)	4-Methyl-2-Pentanone	2,4-D (70)	Endrin (2)
Bromide	Acenaphthene	2,4-DB	Endrin Aldehyde
Carbonate	Acrylonitrile	3,5-Dichlorobenzoic acid	Epichlorohydrin
Hydroxide	Aldrin	3-Hydroxycarbofuran	EPN
Nitrite-Nitrogen (1)	Allyl chloride	4,4'-DDD	EPTC
Ortho Phosphorus, Dissolved	Anilazine	4,4'-DDE	Erucylamide
Perchlorate	Aspon	4,4'-DDT	Esfenvalerate
Radiological (pCi/L)	Bendiocarb	α-BHC	Ethalfluralin
Radium $^{226/228(5)}$	Benfluralin	α-Chlordane	Ethion
Microbiological	Benzene (5)	Acetochlor	Ethofumesate
Cryptosporidium	Bolstar	Acifluourfen	Ethoprop
E. Coli	Bromobenzene	Alachlor (2)	Ethyl methacrylate
Giardia (TT^1)	Bromochloromethane	Aldicarb	Ethyl tert-butyl ether
Plankton	Bromomethane	Aldicarb sulfoxide	Ethylene dibromide
Total Coliform (DS)	Carbon disulfide	Aldicarb sulfone	Etridiazole
Disinfection By-Products (µg/L)	Carbophenothion	Atraton	Famphur
Bromoform	Carboxin	Atrazine (3)	Fenamiphos
Monobromoacetic Acid	Chloramben	Bentazon	Fenarimol
Monochloroacetic Acid	Chlorfenvinphos	β-BHC	Fenitrothion
n-Nitrosodiethylamine	Chloroacetonitrile	Bromacil	Fensulfothion
n-Nitrosodimethylamine (NDMA)	Chlorobenzene (100)	Butachlor	Fenthion
n-Nitrosodi-n-butylamine	Chloroethane	Butylate	Fenoxaprop-ethyl
n-Nitrosodi-n-propylamine	Chloromethane	Carbaryl	Fluometuron
n-Nitrosomethylethylamine	Chloropropylate	Carbofuran	Fluridone
n-Nirtosopyrollidine	Clomazone	Chlordane	Fonofos
Trichloroacetonitrile	Clopyralid	Chlorneb	Heptachlor (0.4)
Organic Compounds (µg/L) and **MicroConstituents** (µg/L or ng/L)	cis-1,2-Dichloroethene (70)	Chlorobenzilate	Heptachlor Epoxide (0.2)
1,1,1,2-Tetrachloroethane	cis-1,3-Dichloropropene	Chlorothalonil	Hexachloroethane
1,1,1-Trichloroethane (200)	Dibromomethane	Chlorpropham	Hexazinone
1,1,2,2-Tetrachloroethane	Dichlorodifluoromethane	cis-Permethrin	Iprodione
1,1,2-Trichloroethane (5)	Dichloromethane (5)	Coumaphos	Isofenphos
1,1-Dichloroethane	Ethyl Benzene (700)	Crotoxyphos	Leptophos
1,1-Dichloroethene (7)	Hexachlorobenzene	Cyanazine	Lindane
1,1-Dichloropropene	Hexachlorobutadiene	Cycloate	Linuron
1-Chlorobutane	Hexachlorocyclopentadiene	Dacthal	Malathion
1,2,3-Trichlorobenzene	Iodomethane	Dalapon (200)	MCPA
1,2,3-Trichloropropane	Isopropyl Benzene	DCPA acid metabolites	Mecoprop
1,2,3-Trimethylbenzene	Isopropyl Ether	δ-BHC	Metalaxyl
1,2,4-Trichlorobenzene (70)	m-Dichlorobenzene	Demeton O	Methacrylonitrile
1,2,4-Trimethylbenzene	Methyl tert-butyl ether	Demeton S	Methylacrylate
1,2,4,5-Tetrachlorobenzene	Metsulfuron	Desethylatrazine	Methylmethacrylate

Data Tables For Treated Water

Marston Treated Water

Analysis	MCL	Range	Average	No.
General (mg/L)				
Alkalinity, Total as $CaCO_3$		57.2 - 74.4	65.2	267
Bicarbonate		77 - 83	80	9
Chlorine, Total		0.84 - 1.71	1.45	267
Hardness as $CaCO_3$		105 - 112	108	9
pH (SU)	>7.5 daily average	7.47 - 8.00	7.67	267
Specific Conductance (µS)		320 - 340	332	38
Temperature (°C)		5 - 20	12	39
Total Dissolved Solids		176 - 198	187	9
Turbidity (NTU)	TT	0.02 - 0.08	0.04	267
Metals (µg/L)				
Aluminum		20 - 30	30	9
Barium	2,000	34 - 40	37	9
Boron		12 - 16	14	9
Calcium (mg/L)		29 - 32	30	9
Magnesium (mg/L)		7.6 - 8.1	7.9	9
Manganese		<2 - 2	<2	9
Molybdenum		7 - 11	9	9
Nickel		<0.8 - 1.0	<0.8	9
Potassium (mg/L)		1.8 - 1.9	1.9	9
Sodium (mg/L)		19 - 23	21	9
Strontium (mg/L)		n/a	0.243	1
Ions (mg/L)				
Chloride		20.1 - 24.5	22.5	12
Cyanide, Total (regulated as free)	0.20	<0.02 - <0.02	<0.02	3
Fluoride	4.0	0.68 - 1.04	0.88	267
Nitrate-Nitrogen	10	0.05 - 0.08	0.06	12
Silicon		1.9 - 2.4	2.1	9
Sulfate		50.0 - 63.2	56.1	12

Marston cont.

Analysis	MCL	Range	Average	No.
Radiological (pCi/L)				
Alpha, Total	15	<2 - 2	<2	3
Beta, Total	Trigger Level = 15 pCi/L	<2 - 4	2	3
Uranium (µg/L)	30	<0.3 - <0.3	<0.3	9
Microbiological				
Heterotrophic Plate Count (CFU/mL)		0.01 - 0.06	0.03	10
Disinfection By-Products (µg/L)				
1,1,1-Trichloropropanone		1.4 - 2.1	1.7	3
1,1-Dichloropropanone		0.6 - 0.8	0.7	3
Bromochloroacetic acid		2.5 - 3.6	3.1	9
Bromochloroacetonitrile		5.4 - 6.6	6.0	3
Bromodichloromethane		5.3 - 11.6	8.4	9
Chloral hydrate		0.5 - 2.1	1.3	9
Chloroform		6.1 - 16.8	11.3	9
Chloropicrin		<0.5 - <0.5	<0.5	3
Cyanogen Chloride		1.6 - 5.5	3.6	2
Dibromoacetic acid		0.5 - 0.9	0.8	9
Dibromoacetonitrile		<0.5 - 0.6	<0.5	3
Dibromochloromethane		2.3 - 4.7	3.5	9
Dichloroacetic acid		5.5 - 10.2	7.1	9
Dichloroacetonitrile		1.8 - 2.3	2.1	3
Haloacetic Acids (5)	60	9 - 16	12	9
Total Trihalomethanes	80	14 - 33	23	9
Trichloroacetic acid		3.0 - 4.7	4.0	9
Non-Specific Organics				
Total Organic Carbon (mg/L)		1.6 - 2.2	1.8	37
Total Organic Halogen (µg/L)		110 - 149	131	3

Foothills Treated Water

Analysis	MCL	Range	Average	No.
General (mg/L)				
Alkalinity, Total as $CaCO_3$		31.0 - 70.0	56.2	291
Bicarbonate		59 - 78	68	11
Chlorine, Total		1.10- 2.14	1.61	292
Hardness as $CaCO_3$		79 - 106	96	9
pH (SU)	>7.5 daily average	7.27 - 8.12	7.73	292
Specific Conductance (µS)		240 - 340	290	41
Temperature (°C)		3 - 18	12	40
Total Dissolved Solids		143 - 198	172	11
Turbidity (NTU)	TT	0.03 - 0.24	0.05	292
Metals (µg/L)				
Aluminum		30 - 50	37	11
Barium	2,000	29 - 37	33	11
Boron		10 - 16	12	11
Calcium (mg/L)		21 - 30	26	11
Magnesium (mg/L)		6.5 - 8.3	7.4	11
Manganese		<2 - 5	2	11
Molybdenum		<3 - 10	6	11
Nickel		<0.8 - 1.3	0.8	11
Potassium (mg/L)		1.5 - 2.1	1.8	11
Sodium (mg/L)		17 - 22	19	11
Strontium (mg/L)		n/a	0.231	1
Ions (mg/L)				
Chloride		18.2 - 28.8	22.6	14
Cyanide, Total	0.2	<0.02 - 0.025	<0.02	4
Fluoride	4.0	0.37 - 1.14	0.85	292
Nitrate-Nitrogen	10	0.04 - 0.20	0.12	14
Silicon		2.8 - 4.1	3.4	11
Sulfate		40.6 - 60.0	48.6	14

Foothills cont.

Analysis	MCL	Range	Average	No.
Radiological (pCi/L)				
Alpha, Total	15	<2 - 3	<2	4
Beta, Total	Trigger Level = 15 pCi/L	<2 - 2	<2	4
Uranium (µg/L)	30	<0.3 - 0.3	<0.3	11
Microbiological				
Heterotrophic Plate Count (CFU/mL)		0.01 - 0.63	0.14	15
Disinfection By-Products (µg/L)				
1,1,1-Trichloropropanone		1.0 - 1.9	1.5	4
1,1-Dichloropropanone		0.6 - 1.1	0.8	4
Bromochloroacetic acid		2.0 - 3.2	2.6	8
Bromochloroacetonitrile		2.5 - 3.4	2.9	4
Bromodichloromethane		3.5 - 7.5	5.6	10
Chloral hydrate		<0.5 - 2.9	1.4	10
Chloroform		4.4 - 23.3	13.3	10
Chloropicrin		<0.5 - 0.5	<0.5	4
Cyanogen Chloride		2 - 5	4	2
Dibromochloromethane		<1.0 - 2.0	1.4	10
Dichloroacetic acid		4.3 - 23.3	12.6	8
Dichloroacetonitrile		1.4 - 2.8	2	4
Haloacetic Acids (5)	60	7 - 35	20	8
Total Trihalomethanes	80	10 - 30	20	10
Trichloroacetic acid		2.9 - 11.4	7.7	8
Non-Specific Organics				
Total Organic Carbon (mg/L)		1.3 - 2.5	1.9	41
Total Organic Halogen (µg/L)		86 - 213	148	4

Moffat Treated Water

Analysis	MCL	Range	Average	No.
General (mg/L)				
Alkalinity, Total as $CaCO_3$		24 - 52	36	339
Bicarbonate		37 - 51	44	11
Chlorine, Total		1.11 - 1.99	1.51	340
Hardness as $CaCO_3$		43 - 58	48	8
pH (SU)	>7.5 daily average	7.11 - 8.55	7.75	340
Specific Conductance (µS)		68 - 150	128	48
Temperature (°C)		5 - 19	12	49
Total Dissolved Solids		52 - 102	83	11
Turbidity (NTU)	TT	0.03 - 0.19	0.05	340
Metals (µg/L)				
Aluminum		<20 - 30	<20	11
Barium	2,000	16 - 21	18	11
Boron		4 - 6	5	11
Calcium (mg/L)		14 - 18	15	11
Magnesium (mg/L)		1.9 - 3.1	2.3	11
Manganese		<2 - <2	<2	11
Molybdenum		<3 - <3	<3	11
Nickel		<0.8 - 1.2	<0.8	11
Potassium (mg/L)		0.7 - 1.0	0.8	11
Sodium (mg/L)		7 - 11	9	11
Strontium (mg/L)		n/a	0.068	1
Ions (mg/L)				
Chloride		4.1 - 10.3	5.6	14
Cyanide, Total	0.20	<0.02 - 0.027	<0.02	4
Fluoride	4.0	0.10 - 1.15	0.88	339
Nitrate-Nitrogen	10	<0.02 - 0.07	0.05	14
Silicon		3.0 - 4.2	3.4	11
Sulfate		15.0 - 27.2	19.5	14

Moffat cont.

Analysis	MCL	Range	Average	No.
Radiological (pCi/L)				
Alpha, Total	15	<2 - 4	<2	4
Beta, Total	Trigger Level = 15 pCi/L	<2 - 2	<2	4
Uranium (µg/L)	30	<0.3 - <0.3	<0.3	11
Microbiological				
Heterotrophic Plate Count (CFU/mL)		0.01 - 10	1.9	17
Disinfection By-Products (µg/L)				
1,1,1-Trichloropropanone		1.4 - 1.8	1.6	4
1,1-Dichloropropanone		0.6 - 0.7	0.7	4
Bromochloroacetic acid		<0.5 - 1.5	0.8	10
Bromochloroacetonitrile		<0.5 - 0.6	<0.5	4
Bromodichloromethane		1.1 - 3.5	2.3	11
Chloral hydrate		<0.5 - 1.7	1.1	11
Chloroform		8.0 - 24.7	14.2	11
Chloropicrin		<0.5 - <0.5	<0.5	4
Cyanogen Chloride		0.98 - 3.8	2.4	2
Dibromochloromethane		<1.0 - <1.0	<1.0	11
Dichloroacetic acid		5.9 - 12.6	8.5	10
Dichloroacetonitrile		1.4 - 1.9	1.6	4
Haloacetic Acids (5)	60	11 - 21	14	10
Total Trihalomethanes	80	9 - 28	17	11
Trichloroacetic acid		4.4 - 8.4	6.0	10
Non-Specific Organics				
Total Organic Carbon (mg/L)		1.0 - 2.2	1.6	49
Total Organic Halogen (µg/L)		91 - 156	118	4

Looking Down The Road

Denver Water is upgrading its collection and distribution systems as well as its treatment plants. Marston Treatment Plant rehabilitated plant #2. The original filter plant was built in 1967 and was in dire need of upgrading in order to meet new more strict water quality standards. The improvements include, new filter media, new filter control systems, and the old surface wash sweeps were replaced with an air scour system. We now have the ability to filter the waste prior to placing a clean filter in service. The project started in September of 2009, and will be complete in the late spring of 2010.

Marston Northside Treatment Plant

Water quality remains of paramount importance to us. As part of ensuring high quality drinking water, protection of the source water is vital. Below is a vintage 20th Century photo of Cheesman Dam taken on August 1, 1926.

Report prepared by:
Maria Rose, Denver Water
Water Quality Laboratory

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 did detect trace amounts of antibiotics at part per trillion (nanogram per liter) levels (one part per trillion is equivalent to one drop of water in twenty Olympic –sized swimming pools).

Even the world's best scientists do not yet know what the presence of these substances in water mean to human health. In fact, the testing technology is so new, most commercial laboratories are not even equipped to analyze for these compounds yet. Consequently, EPA has no current or proposed 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.

Mike Leone and Nicole Peschel collecting a sample along Lake Dillon in 2009.

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

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 a water quality concern or just have questions, or comments regarding water quality, call Denver Water at 303-893-2444.

Denver Water's 2009 Treated Water Quality Summary Report

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