Denver Water's 2008 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 2008 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 20 of this report, treated water results are displayed in tables that include the regulatory limit for the analysis where applicable. This year Carbon Tetrachloride was detected in our Marston Treated Water. It was detected at very low levels that do not require corrective action, but do warrant additional monitoring and investigation. It is believed to be a contaminant in the disinfectant used to treat the water. Chlorine based disinfectants commonly have some Carbon Tetrachloride in the chemical. Most of the time it was not present but a few times it was detected at measurable levels. See page 21 for the data. The detections were well below the EPA regulatory limit for drinking water.

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.

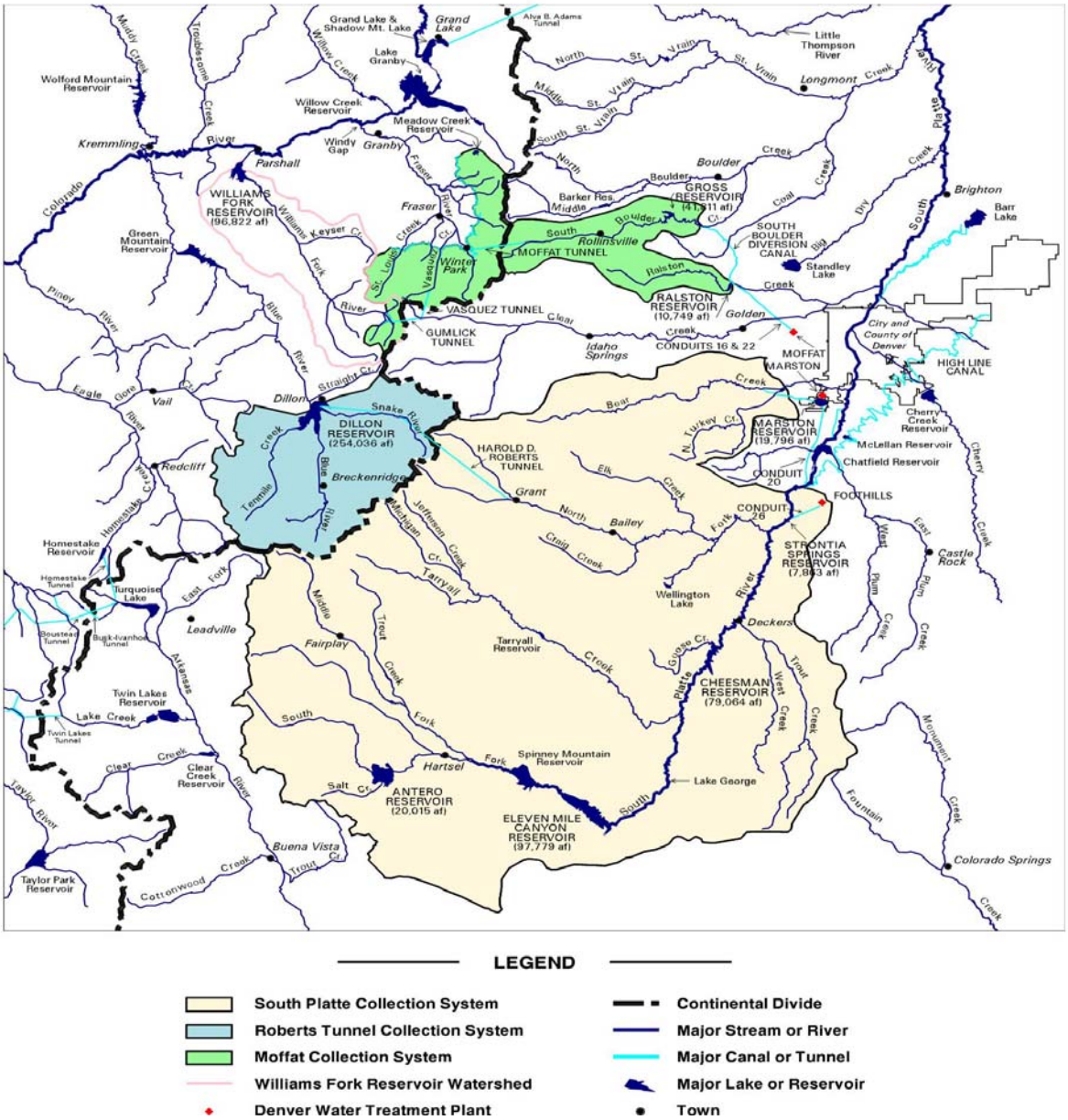
Treatment Plant Treated Water and Distribution System
Total Coliform Samples for 2008

Month	Number of Samples	Number of Positives	% Positive
January	520	0	0.00%
February	413	1	0.24%
March	449	0	0.00%
April	509	0	0.00%
May	487	1	0.21%
June	490	0	0.00%
July	501	1	0.20%
August	489	0	0.00%
September	512	0	0.00%
October	492	0	0.00%
November	374	0	0.00%
December	416	0	0.00%
Totals	5,652	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

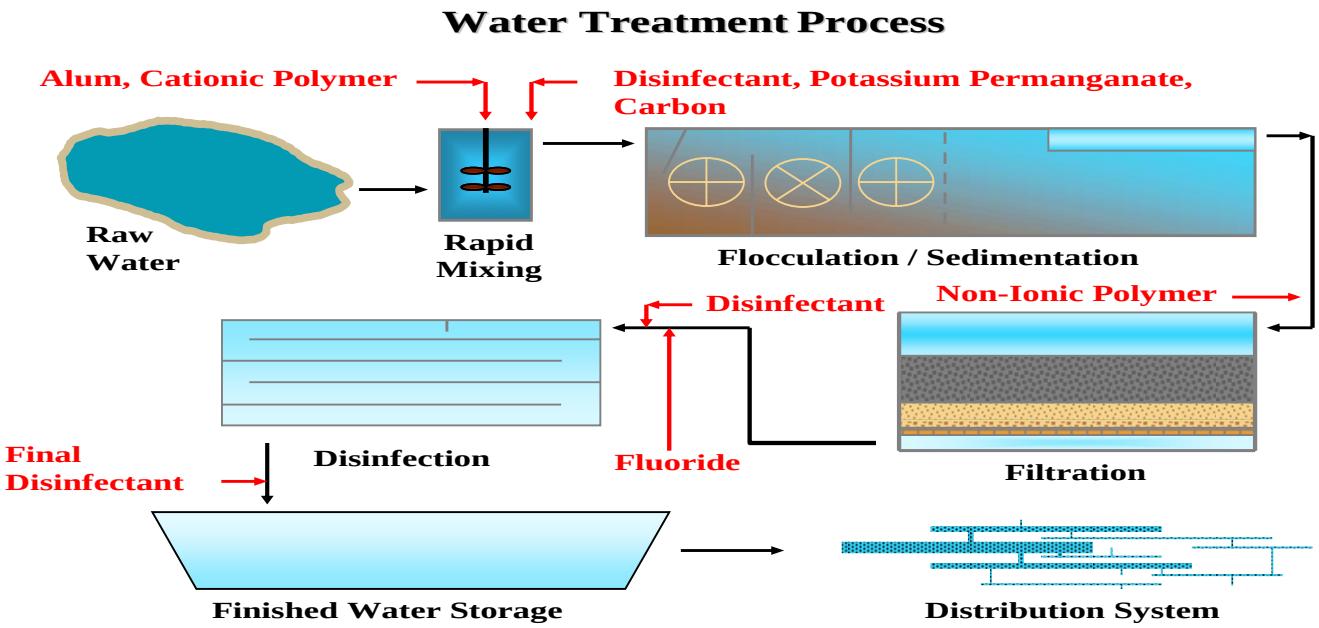


How Water Is Treated To Make It Drinkable

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.

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 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), and 95% of the samples must not exceed 1 NTU. For the last several years Denver Water has maintained treated water turbidities consistently less than 0.30 NTU. In 2008 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 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 upstream and downstream of the original test site and again 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 2008

Parameter	Treatment Plant	Raw Water Result	Treated Water Result
Turbidity (NTU)	Marston	1.2	0.04
Turbidity (NTU)	Foothills	2.4	0.05
Turbidity (NTU)	Moffat	3.4	0.04
Total Coliform (MPN/100 ml)	Marston	279	None detected
Total Coliform (MPN/100 ml)	Foothills	222	None detected
Total Coliform (MPN/100 ml)	Moffat	32	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 2008

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 2008

Parameter	Treatment Plant	Raw Water Result	Treated Water Result
Giardia (Cysts/L)	Marston	2	None Detected
Giardia (Cysts/L)	Foothills	3	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	4	None Detected
E. Coli (MPN/100 ml)	Foothills	3	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 2008

Parameter	Treatment Plant	Raw Water Result	Treated Water Result	EPA Regulatory Limit
Aluminum (ppb)	Marston	74	30	50 — 200
Aluminum (ppb)	Foothills	176	40	50 — 200
Aluminum (ppb)	Moffat	108	<20	50 — 200
Barium (ppb)	Marston	39	37	2,000
Barium (ppb)	Foothills	36	34	2,000
Barium (ppb)	Moffat	19	18	2,000
Calcium (ppm)	Marston	29	29	None
Calcium (ppm)	Foothills	27	27	None
Calcium (ppm)	Moffat	9	14	None

Denver Water Average Values for 2008

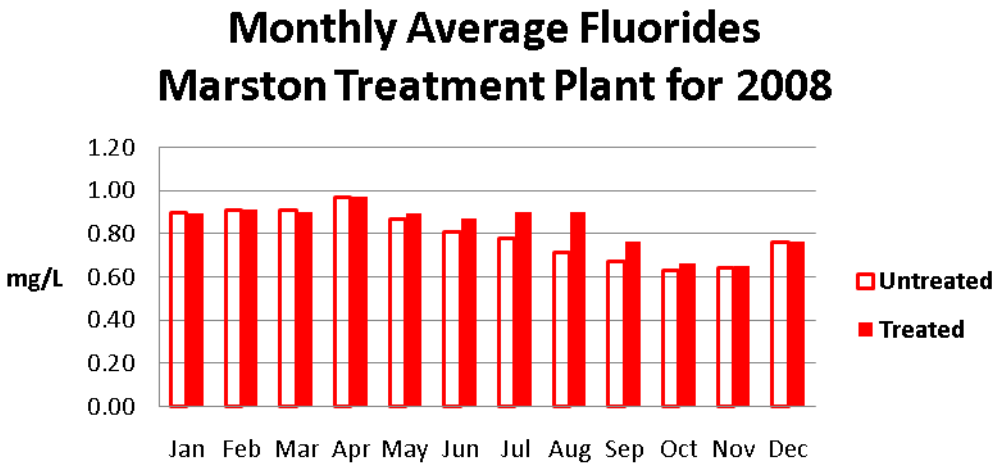
Parameter	Treatment Plant	Raw Water Result	Treated Water Result
Magnesium (ppm)	Marston	7.0	7.1
Magnesium (ppm)	Foothills	7.0	7.1
Magnesium (ppm)	Moffat	2.2	2.2
Potassium (ppm)	Marston	2.0	1.9
Potassium (ppm)	Foothills	1.8	1.8
Potassium (ppm)	Moffat	0.7	0.7
Sodium (ppm)	Marston	13.0	19.0
Sodium (ppm)	Foothills	13.0	16.0
Sodium (ppm)	Moffat	3.0	9.0

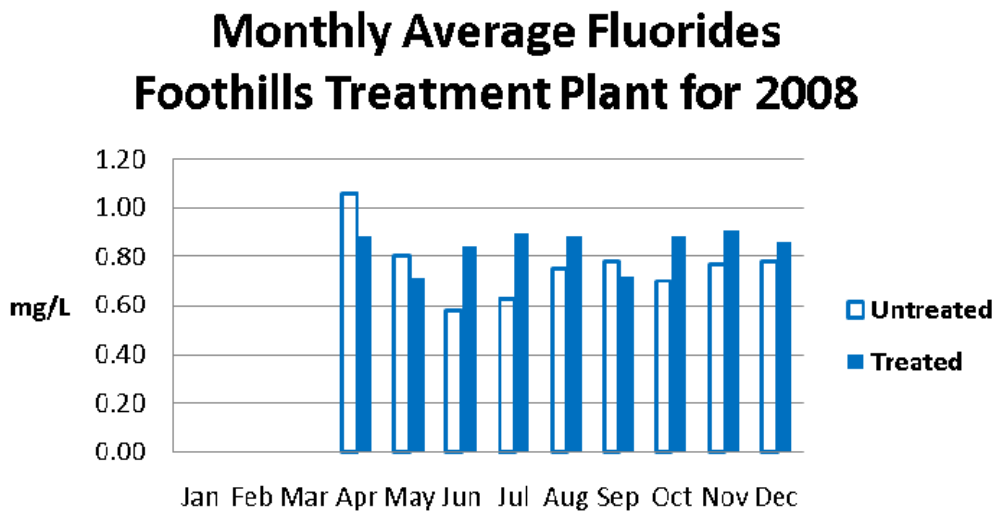
Most minerals are not removed by conventional treatment. Calcium, magnesium, iron and manganese amounts may be reduced by water treatment, but not completely removed. Please note that the comparisons above, though from the same treatment plants are not always from samples collected on the same dates 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.

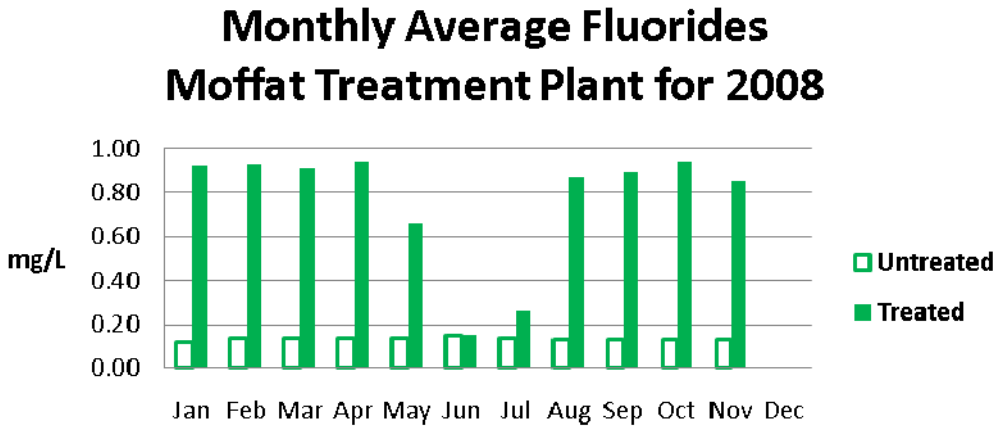
If there is no regulatory limit, or MCL, listed in the above tables, then the amount of the mineral that might cause a potential health concern is much higher than would ever be found in water. It would be a waste of time and resources to regulate it.

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. Foothills Treatment Plant was out of service January through March and Moffat was out of service in December; that is the reason for the gaps in the graphs.

Comparison of Fluoride Between Untreated And Treated Water

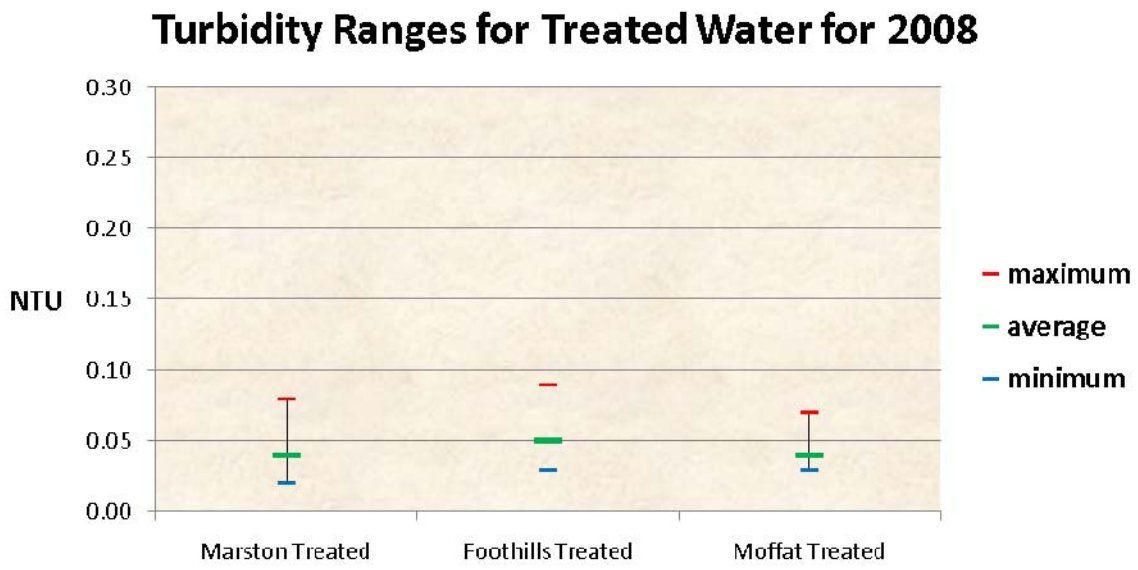




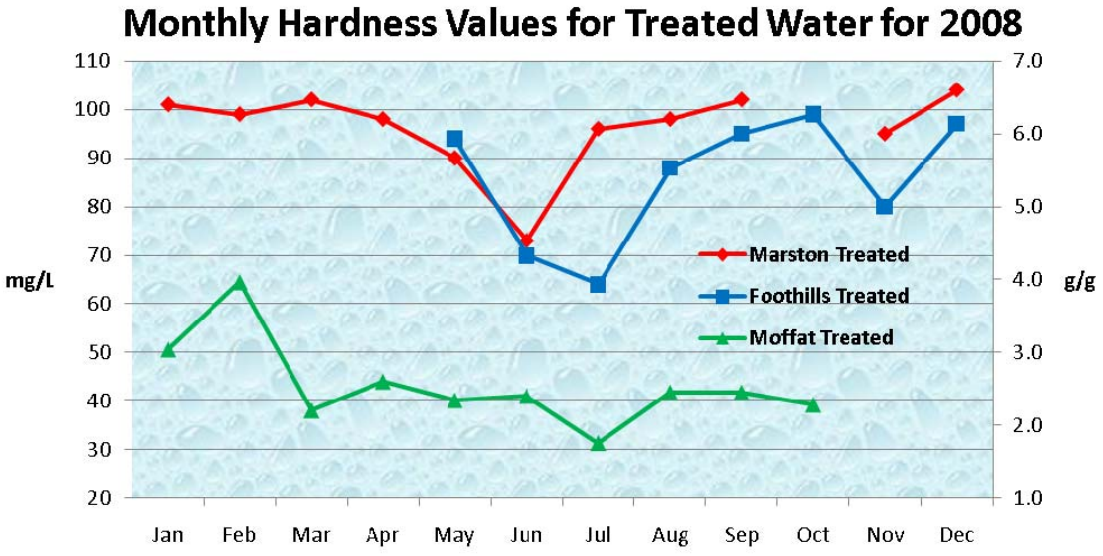


Turbidity and Hardness Graphs

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 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 2008, and the average for each plant was at or below 0.05 NTU.

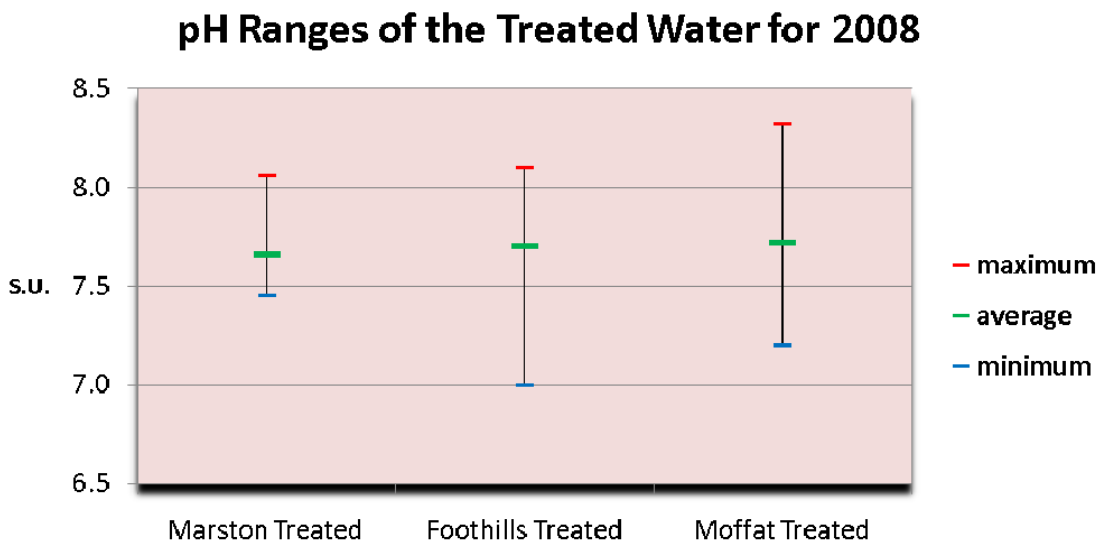


Water hardness is a result of Calcium and Magnesium salts dissolved in water. High concentrations of these minerals make water "hard." The South Platte source water is considered moderately hard to hard. At times it is greater than 5.8 g/g or 100 mg/L and it varies seasonally between 3 to 7 g/g of hardness. 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.

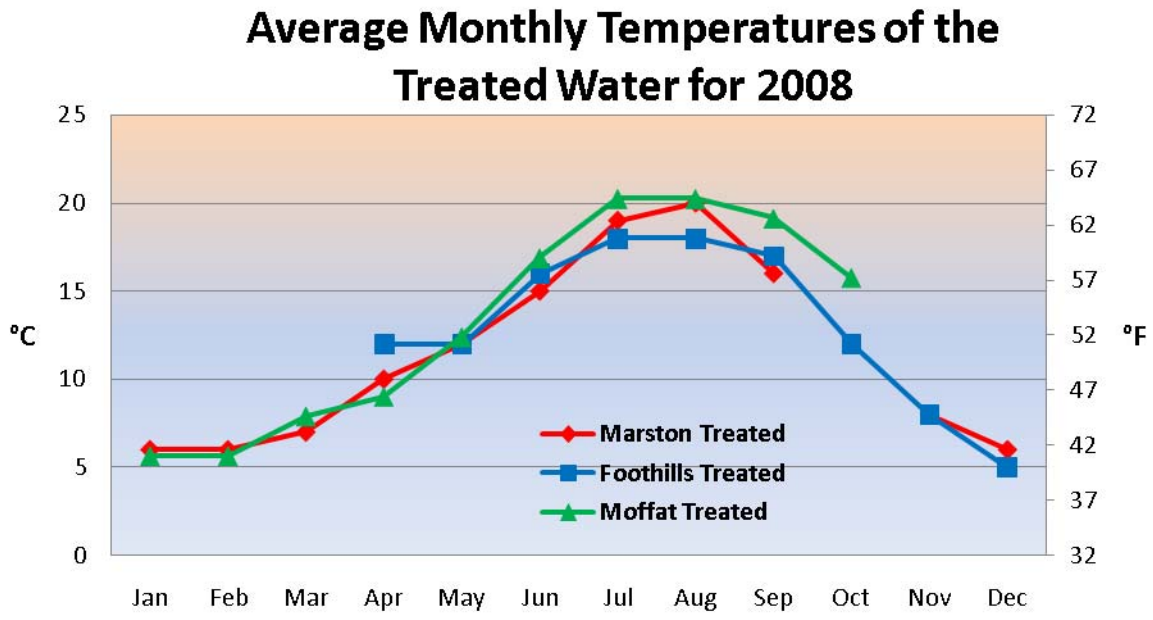


pH and Temperature Graphs

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 20 through 25 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 on the next two pages. We test for all of these compounds and contaminants at least annually. Contaminants that have been in the news recently, such as Arsenic, Lead, TCE, and Pharmaceuticals etc. are on the Not Detected list.

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	2-Butanone	Styrene (100)	Disulfoton
Alkalinity, Phenolphthalein as $CaCO_3$	2-Chlorobiphenyl	tert-Butyl Benzene	Disulfoton sulfone
Chlorine, Free	2-Chlorophenol	Tetrachloroethene (5)	Disulfoton sulfoxide
Metals (mg/L)	2-Hexanone	Toluene (1000)	Diphenamid
Antimony (0.006)	2-Methyl-4,6-dinitrophenol	Toxaphene	Dursban
Arsenic (0.010)	2-Methylphenol	trans-1,2-Dichloroethene (100)	Endosulfan –A
Beryllium (0.004)	2-Nitrophenol	trans-1,3-Dichloropropene	Endosulfan – B
Cadmium (0.005)	2-Nitropropane	Trichloroethene	Endosulfan sulfate
Chromium (0.1)	2,4-Dichlorophenol	Trichloroethylene (5)	Endrin (2)
Cobalt	2,4-Dimethylphenol	Trichlorofluoromethane	Endrin Aldehyde
Copper (TT[1])	2,4-Dinitrophenol	Vinyl Chloride (2)	Epichlorohydrin
Iron	2,4,5-Trichlorobiphenyl	Xylenes (10000)	EPN
Lead (TT[1])	2,4,6-Trichlorophenol	1,2-Dibromo-3-chloropropane (0.2)	EPTC
Lithium	4-Methyl-2-Pentanone	2,4,5-T	Erucylamide
Mercury, Total (0.002)	4-Chloro-3-methylphenol	2,4-D (70)	Esfenvalerate
Selenium (0.05)	4-Nitrophenol	2,4-DB	Ethalfluralin
Silver	Acenaphthene	3,5-Dichlorobenzoic acid	Ethion
Vanadium	Acrylonitrile	3-Hydroxycarbofuran	Ethofumesate
Thallium (0.002)	Aldrin	4,4'-DDD	Ethoprop
Titanium	Allyl chloride	4,4'-DDE	Ethyl acrylate
Zinc	Anilazine	4,4'-DDT	Ethyl methacrylate
Ions (mg/L)	Aspon	a-BHC	Ethyl tert-butyl ether
Bromide	Bendiocarb	Acetochlor	Ethylene dibromide
Carbonate	Benfluralin	Acifluourfen	Etridiazole
Cyanide, Total	Benzene (5)	Alachlor (2)	Famphur
Hydroxide	Bolstar	Aldicarb	Fenamiphos
Nitrite-Nitrogen (1)	Bromobenzene	Aldicarb sulfoxide	Fenarimol
Ortho Phosphorus, Dissolved	Bromochloromethane	Aldicarb sulfone	Fenitrothion
Radiological (pCi/L)	Bromomethane	Atraton	Fensulfothion
Radium $^{226/228}$(5)	Carbon disulfide	Atrazine (3)	Fenthion
Microbiological	Carbophenothion	Bentazon	Fluchloralin
Cryptosporidium	Carboxin	β-BHC	Fluometuron
E. Coli	Chloramben	Bromacil	Fluridone
Giardia (TT[1])	Chlorfenvinphos	Butachlor	Fonofos
Plankton	Chloroacetonitrile	Butylate	Heptachlor (0.4)
Total Coliform (DS)	Chlorobenzene (100)	Carbaryl	Heptachlor Epoxide (0.2)
Disinfection By-Products (µg/L)	Chloroethane	Carbofuran	Hexachloroethane
Bromoform	Chloromethane	Chlordane	Hexazinone
Carbon tetrachloride (5)	Chloropicrin	Chlorneb	Iprodione
Monobromoacetic Acid	Chloroprene	Chlorobenzilate	Isofenphos
Monochloroacetic Acid	Chloropropylate	Chlorothalonil	Leptophos
n-Nitrosodimethylamine (NDMA)	Clomazone	Chlorpropham	Lindane
Trichloroacetonitrile	Clopyralid	cis-Permethrin	Malathion
Organic Compounds (µg/L)	cis-1,2-Dichloroethene (70)	Coumaphos	Metalaxyl
1,1,1,2-Tetrachloroethane	cis-1,3-Dichloropropene	Crotoxyphos	Methacrylonitrile
1,1,1-Trichloroethane (200)	Dibromomethane	Cyanazine	Methylacrylate
1,1,2,2-Tetrachloroethane	Dichlorodifluoromethane	Cycloate	Methylmethacrylate
1,1,2-Trichloroethane (5)	Dichloromethane (5)	Dacthal	Methiocarb
1,1-Dichloroethane	Ethyl Benzene (700)	Dalapon (200)	Methomyl
1,1-Dichloroethene (7)	Hexachlorobenzene	DCPA acid metabolites	Methoxychlor
1,1-Dichloropropene	Hexachlorobutadiene	δ-BHC	Methyl paraoxon
1-Chlorobutane	Hexachlorocyclopentadiene	Demeton O	Metolachlor
1,2,3-Trichlorobenzene	Isopropyl Benzene	Demeton S	Metribuzin
1,2,3-Trichloropropane	m-Dichlorobenzene	Diazinon	Mevinphos
1,2,3-Trimethylbenzene	Methyl parathion	Dicamba	Mirex
1,2,4-Trichlorobenzene (70)	Methyl tert-butylether	Dichlorprop	Molinate
1,2,4-Trimethylbenzene	Naphthalene	Dichlorvos	Monocrotophos
1,2,4,5-Tetrachlorobenzene	n-Butyl Benzene	Dichlobenil	Naled
1,2-Dichloroethane (5)	Nitrobenzene	Dichlofenthion	Napropamide
1,2-Dichloropropane (5)	n-Propyl Benzene	Dichloran	Norflurazon
1,3,5-Trimethylbenzene	o-Chlorotoluene	Dicrotophos	n-Butyl acrylate
1,3-Dichloropropane	o-Dichlorobenzene (600)	Dieldrin	Oryzalin
1,4-Dioxane	p-Chlorotoluene	Diethyl ether	Oxadiazon
1-Methylnaphthalene	p-Dichlorobenzene (78.5)	Dimethoate	Oxamyl (200)
2,2-Dichloropropane	p-Isopropyl Toluene	Dinoseb	Oxyfluorfen
2,3-Dichlorobiphenyl	sec-Butyl Benzene	Dioxathion	Parathion

Contaminants Not Found In Denver's Drinking Water cont.

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.

Organic Compounds (µg/L) cont. from opposite page

Pendimethalin

Phenol

Phorate

Phosmet

Picloram

Profluralin

Prometon

Prometryn

Pronamide

Propanil

Propachlor

Propazine

Propionitrile

Propoxur

Prothiophos

Silvex (50)

Simazine (4)

Simetryn

Stirofos

Sulfotep

TAME

TEPP

Terbufos

Terbacil

Terbuthiuron

Terbutryn

Tetrahydrofuran

Thiabendazole

Thiobencarb

Thionazin

MicroConstituents (µg/L or ng/L)

Nicotine

Nonylphenol, isomer mix

Norfloxacin

Oleandomycin

Oxytetracycline

Paclobutrazol

Paraxanthine

Penicillin G

trans-Permethrin

Triademefon

Tribufos

Trichloronate

Triclopyr

Tricyclazole

Trifluralin

Vernolate

Vinclozolin

Vinyl acetate

2,4-Dinitrotoluene

2,6-Dinitrotoluene

Acenaphthylene

Ametryn

Anthracene

Benzo(a)anthracene

Benzo(a)pyrene (0.2)

Benzo(b)fluoranthene

Benzo(g,h,i)perylene

Benzo(k)fluoranthene

Bis(2-ethylhexyl)adipate (400)

Bis(2-ethylhexyl)phthalate

Butyl benzyl phthalate

Chrysene

Cyclohexanone

Dibenzo(a,h)anthracene

DCEE

Diethyl phthalate

Dimethyl phthalate

Di-n-butyl phthalate

Di-n-octyl phthalate

Penicillin V

Phenylphenol

Prednisone

Progesterone

Propargite

Roxithromycin

Salinomycin

Siduron, Total

Simvastatin

Diuron

Fluoranthene

Fluorene

Indeno(1,2,3-cd)pyrene

Isophorone

Pentachlorobenzene

Pentachlorophenol (1)

Phenanthrene

Polychlorinated Biphenyls (0.5)

Pyrene

MicroConstituents (µg/L or ng/L) cont.

17alpha-Estradiol

17alpha-Ethynyl estradiol

17beta-Estradiol

4-n-Octylphenol

4-tert-Octylphenol

Acetaminophen

Antipyrine

Azithromycin

Azoxystrobin

Bacitracin

Baygon

Bensulfide

Bezafibrate

Bisphenol A

Caffeine

Carbadox

Carbamazepine

Chloramphenicol

Chlorotetracycline

Ciprofloxacin

Sulfachloropyridazine

Sulfadiazine

Sulfadimethoxine

Sulfamethazine

Sulfamethizole

Sulfamethoxazole

Sulfathiazole

tert-Amyl Methyl ether

tert-Butyl alcohol

cis-Testosterone

Clofibric acid

Cotinine

DEET

Diclofenac

Diethylstilbestrol (DES)

Diflubenzuron

Dilantin

Diltiazem

Doxycycline

Enrofloxacin

Erythromycin

Estriol

Estrone

Fenuron

Fluoxetine (Prozac)

Freon113

Gemfibrozil

Halofenozide

Halosulfuron methyl

Ibuprofen

Imidacloprid

Lasalocid

Levothyroxine (Synthroid)

Lincomycin

Linuron

Monensin

Monuron

Naproxen

Narasin

Neburon

Tetrabromobisphenol A

Theobromine

Theophylline

Thidiazuron

trans-Testosterone

Triadimenol

Triclosan

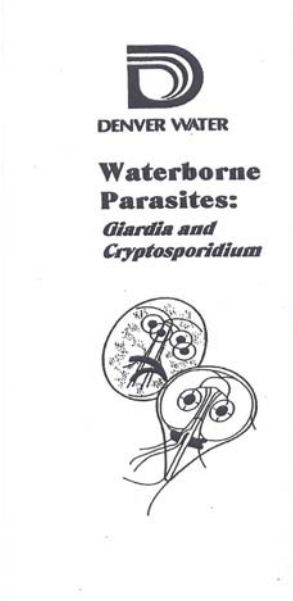
Trimethoprim

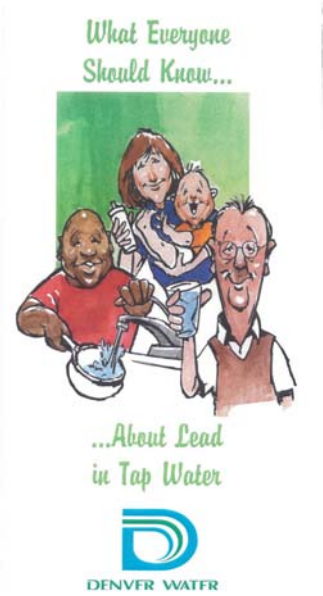
Tylosin

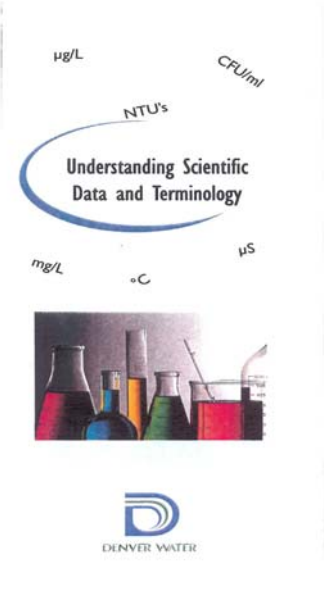
Virginiamycin M1

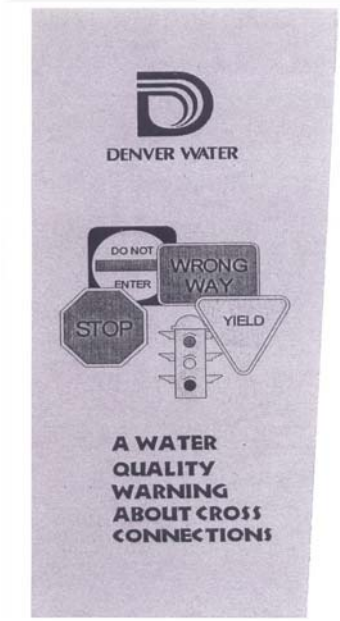
Water Quality Brochures

Below are brochures that are available from Denver Water's, Water Quality Section.
Just call 303-628-5996 to have a copy mailed to you.









Data Tables For Treated Water

Marston Treatment Plant
Treated Water

Analysis	MCL	Range	Average	No.
General (mg/L)				
Alkalinity, Total as $CaCO_3$		40 - 76	62	672
Bicarbonate		52 - 83	72	11
Chlorine, Total		1.26 - 1.98	1.62	4,034
Hardness as $CaCO_3$		73 - 104	96	11
pH (SU)	>7.5 daily average	7.45 - 8.06	7.66	4,034
Specific Conductance (µS)		250 - 320	300	49
Temperature (°C)		5 - 21	11	49
Total Dissolved Solids		149 - 186	171	11
Turbidity (NTU)	TT	0.02 - 0.08	0.040	4,036
Metals (µg/L)				
Aluminum		20 - 30	30	11
Barium	2,000	33 - 39	37	11
Boron		8 - 16	14	11
Calcium (mg/L)		24 - 31	29	11
Magnesium (mg/L)		5.5 - 8.0	7.0	11
Manganese		<2 - 5	<2	11
Molybdenum		6 - 14	11	11
Nickel		<0.8 - 1.7	0.9	11
Potassium (mg/L)		1.8 - 2.0	1.9	11
Sodium (mg/L)		16 - 21	19	11
Strontium (mg/L)		na	0.203	1
Ions (mg/L)				
Chloride		13.4 - 21.5	18.5	11
Fluoride	4.0	0.54 - 1.10	0.88	1,347
Nitrate-Nitrogen	10	0.05 - 0.19	0.12	11
Percholorate (µg/L)		na	0.07	1
Silicon		2.2 - 3.6	3.0	11
Sulfate		47.1 - 58.6	52.7	11

Marston cont.

Analysis	MCL	Range	Average	No.
Radiological (pCi/L)				
Alpha, Total	15	<2 - 2	<2	4
Beta, Total	Trigger Level = 15 pCi/L	<2 - 4	<2	4
Uranium (µg/L)	30	<0.3 - <0.3	<0.3	11
Microbiological				
Heterotrophic Plate Count (CFU/mL)		0.01 - 0.08	0.03	13
Disinfection By-Products (µg/L)				
1,1,1-Trichloropropanone		0.9 - 2.3	1.8	4
1,1-Dichloropropanone		0.7 - 0.8	0.8	4
Bromochloroacetic acid		2.2 - 3.7	2.8	11
Bromochloroacetonitrile		3.7 - 7.6	5.2	4
Bromodichloromethane		5.0 - 10.2	7.4	11
Chloral hydrate		0.5 - 2.2	1.3	10
Chloroform		7.1 - 22.3	12.3	11
Cyanogen Chloride		5.5 - 1.2	3.3	2
Dibromoacetic acid		<0.5 - 1.0	0.71	11
Dibromoacetonitrile		<0.5 - 0.8	<0.5	4
Dibromochloromethane		1.3 - 3.9	2.6	11
Dichloroacetic acid		4.8 - 13.2	8.0	11
Dichloroacetonitrile		1.5 - 2.6	2.3	4
Haloacetic Acids (5)	60	9 - 21	13	11
Total Trihalomethanes	80	15 - 35	22	11
Trichloroacetic acid		3.2 - 7.4	4.5	11
Non-Specific Organics				
Total Organic Carbon (mg/L)		1.1 - 2.2	1.8	49
Total Organic Halogen (µg/L)		97 - 132	114	2
Carbon Tetrachloride (µg/L)	5	<0.5 - 0.8	<0.5	8

Foothills Treatment Plant
Treated Water

Analysis	MCL	Range	Aver-age	No.
General (mg/L)				
Alkalinity, Total as $CaCO_3$		32 - 77	54	500
Bicarbonate		50 - 82	38	8
Chlorine, Total		1.11 - 2.12	1.76	3,003
Hardness as $CaCO_3$		64 - 99	86	8
pH (SU)	>7.5 daily average	7.00 - 8.10	7.70	3,000
Specific Conductance (µS)		220 - 330	280	37
Temperature (°C)		3 - 20	14	37
Total Dissolved Solids		133 - 187	164	8
Turbidity (NTU)	TT	0.03 - 0.09	0.050	3,003
Metals (µg/L)				
Aluminum		30 - 50	40	8
Barium	2,000	30 - 38	34	8
Boron		7 - 15	12	8
Calcium (mg/L)		21 - 29	27	8
Magnesium (mg/L)		5.1 - 8.3	7.0	8
Manganese		<2 - 2	<2	8
Molybdenum		<3 - 14	10	8
Nickel		0.9 - 1.8	1.1	8
Potassium (mg/L)		1.7 - 1.9	1.8	8
Sodium (mg/L)		13 - 22	16	8
Strontium (mg/L)		na	0.18	1
Ions (mg/L)				
Chloride				
Fluoride	4.0	0.43 - 1.45	0.87	1,490
Nitrate-Nitrogen	10	0.08 - 0.13	0.11	8
Percholorate (µg/L)		na	0.08	1
Silicon		2.8 - 3.9	3.3	8
Sulfate		38.3 - 55.4	48.9	8

Foothills cont.

Analysis	MCL	Range	Aver-age	No.
Radiological (pCi/L)				
Alpha, Total	15	<2 - 2	<2	3
Beta, Total	Trigger Level = 15 pCi/L	<2 - 2	<2	3
Uranium (µg/L)	30	<0.3 - 0.5	<0.3	8
Microbiological				
Heterotrophic Plate Count (CFU/mL)		0.01 - 0.63	0.12	9
Disinfection By-Products (µg/L)				
1,1,1-Trichloropropanone		1.7 - 2.9	2.1	3
1,1-Dichloropropanone		0.8 - 0.9	0.9	3
Bromochloroacetic acid		1.8 - 3.0	2.2	8
Bromochloroacetonitrile		2.8 - 5.8	4.0	3
Bromodichloromethane		3.4 - 12.4	5.9	9
Chloral hydrate		0.8 - 2.7	1.8	8
Chloroform		8.6 - 25.5	16.2	9
Cyanogen Chloride		1.79 - 6.4	4.1	2
Dibromochloromethane		0.7 - 2.9	1.6	9
Dichloroacetic acid		5.3 - 14.2	10	8
Dichloroacetonitrile		2.1 - 3.9	2.8	3
Haloacetic Acids (5)	60	10 - 23	16	8
Total Trihalomethanes	80	14 - 41	23	15
Trichloroacetic acid		3.4 - 10.0	6.6	8
Non-Specific Organics				
Total Organic Carbon (mg/L)		1.2 - 2.3	1.8	36
Total Organic Halogen (µg/L)		110 - 177	143	3

Moffat Treatment Plant
Treated Water

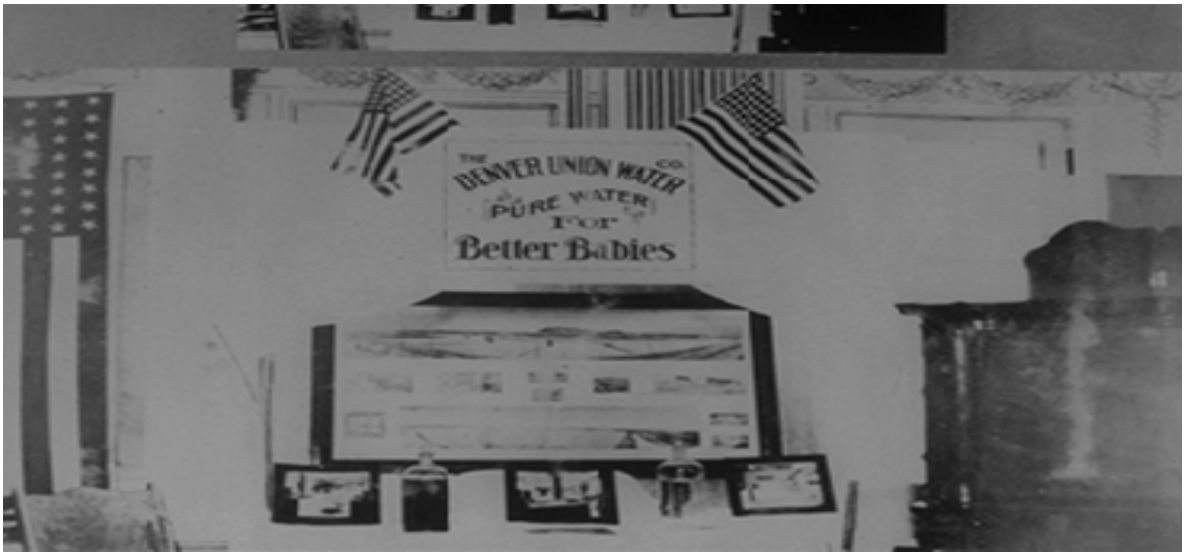
Analysis	MCL	Range	Average	No.
General (mg/L)				
Alkalinity, Total as $CaCO_3$		20 - 42	36	616
Bicarbonate		37 - 49	43	10
Chlorine, Total		1.25 - 1.90	1.60	3,689
Hardness as $CaCO_3$		30 - 68	44	10
pH (SU)	>7.5 daily average	7.20 - 8.32	7.72	1,848
Specific Conductance (µS)		110 - 170	134	44
Temperature (°C)		5 - 18	12	44
Total Dissolved Solids		61 - 85	75	10
Turbidity (NTU)	TT	0.03 - 0.07	0.050	3,690
Metals (µg/L)				
Aluminum		<20 - 30	<20	10
Barium	2,000	14 - 22	18	10
Boron		4 - 6	5	10
Calcium (mg/L)		12 - 17	14	10
Magnesium (mg/L)		1.5 - 3.3	2.2	10
Manganese		<2 - 7	<2	10
Molybdenum		<3 - <3	<3	10
Nickel		<0.8 - <0.8	<0.8	10
Potassium (mg/L)		0.7 - 0.8	0.7	10
Sodium (mg/L)		6 - 12	9	10
Strontium (mg/L)		na	0.04	1
Ions (mg/L)				
Chloride		3.8 - 5.5	4.5	10
Fluoride	4.0	0.10 - 1.19	0.89	1,845
Nitrate-Nitrogen	10	0.05 - 0.08	0.06	10
Percholorate (µg/L)		na	<0.05	1
Silicon		2.8 - 3.4	3.2	10
Sulfate		15.0 - 27.3	18.7	10

Moffat cont.

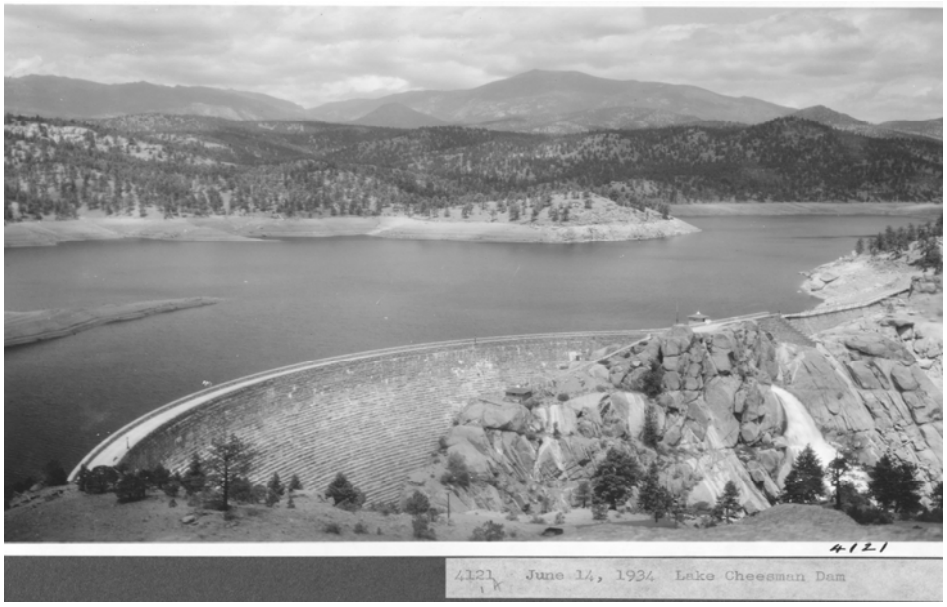
Analysis	MCL	Range	Average	No.
Radiological (pCi/L)				
Alpha, Total	15	<2 - 2	<2	4
Beta, Total	Trigger Level = 15 pCi/L	<2 - <2	<2	4
Uranium (µg/L)	30	<0.3 - <0.3	<0.3	10
Microbiological				
Heterotrophic Plate Count (CFU/mL)		0.01 - 6.8	1.1	13
Disinfection By-Products (µg/L)				
1,1,1-Trichloropropanone		1.3 - 2.3	1.8	4
1,1-Dichloropropanone		0.7 - 0.9	0.8	4
Bromochloroacetic acid		<0.5 - 1.0	<0.5	10
Bromochloroacetonitrile		<0.5 - 0.9	<0.5	4
Bromodichloromethane		1.5 - 2.3	1.9	10
Chloral hydrate		0.6 - 1.6	1.0	9
Chloroform		8.5 - 25.0	13.8	10
Cyanogen Chloride		0.82 - 18.6	9.7	2
Dibromoacetic acid		<0.5 - <0.5	<0.5	10
Dibromochloromethane		0.1 - 0.5	0.3	10
Dichloroacetic acid		5.4 - 12.7	8.7	10
Dichloroacetonitrile		1.3 - 2.3	1.8	4
Haloacetic Acids (5)	60	9 - 23	15	10
Total Trihalomethanes	80	10 - 27	16	10
Trichloroacetic acid		4.0 - 10.6	6.5	10
Non-Specific Organics				
Total Organic Carbon (mg/L)		1.2 - 2.0	1.4	44
Total Organic Halogen (µg/L)		75 - 132	109	3

Looking Down The Road

What does the future hold in terms of water treatment and drinking water? As with other utilities around the country, Denver Water is upgrading its' collection and distribution systems as well as its' treatment plants. We are exploring new treatment technologies to optimize treatment in preparation for upcoming regulations and to provide greater protection for our customers.



From early in the 20th Century, water quality has always been important to Denver Water, as evidenced by the photo above. 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 June 14, 1934.



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.

A 21st Century picture of Cheesman Dam spilling to the South Platte, taken in 2005 showing some recovery from the Hayman Fire.

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 or kitty litter 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 2008 Treated Water Quality Summary Report

Denver Water's Water Quality Laboratory
6100 W. Quincy Avenue
Denver, CO 80235

Phone: 303-628-5996
Fax:303-795-2495
Email: maria.rose@denverwater.org