
**WATER TREATMENT
DECISION GUIDE**



Instructions:

To use this Water Treatment Decision Guide, first obtain a copy of your laboratory report. Then, starting with the first question found on the back of this sheet, answer all questions found in the blue boxes. Each question will provide answers or lead you to more specific questions and answers. Following these questions and answers in sequence will provide you with information on what type(s) of treatment equipment your well water may need. This is only a guide. Before buying any equipment speak with one or more treatment professionals. Understand the costs and use of all equipment, before you buy. Water reports are reported in milligrams per liter (mg/L) which is equal to parts per million (ppm). Your water report may have a < sign which indicates levels not detected by lab instruments.

EPA Primary Drinking Water Standards

The Primary Drinking Water Standards are published, monitored, and enforced by the EPA. Primary standards regulate contaminants which pose serious health risks. These standards are only enforceable in public water systems and should be used as a guide for your personal drinking water well. <http://www.epa.gov/safewater/consumer/mcl.pdf>

Parameter	MCL-mg/L	Parameter	MCL- mg/L
Antimony	0.006	BTEX- Benzene	0.005
Arsenic	0.01	Toluene	1.0
Barium	2.0	Ethylbenzene	0.7
Beryllium	0.004	Xylenes	10
Cadmium	0.005	Trichloroethylene	0.005
Chromium	0.1	Cyanide	0.2
Copper	1.3	Radium 226+228	5 pCi/L
Lead	0.015	Radon	30 pCi/L
Mercury	0.002	Turbidity	1-5 NTU
Selenium	0.05	Total Coliform	0/100 mL
Thallium	0.002	<i>Giardia Lamblia</i>	1/100 mL
Fluoride	4	PCB's	0.0005
Nitrate/Nitrite –N	10	2,4-D	0.07
Nitrate-N	10	Chlorodane	0.002
Nitrite-N	1	(for additional standards see www.epa.gov)	

EPA Secondary Drinking Water Standards

The Secondary Drinking Water Standards are published by the EPA. Secondary Standards set desirable/recommended levels for nuisance contaminants, which affect taste, odor, color, and other aesthetic and functional qualities of the water supply. These secondary standards are not enforced by law, but rather are guidelines for municipal water treatment plants and your personal drinking water well.

Parameter	MCL –mg/L	Parameter	MCL- mg/L
Aluminum	0.05	Odor	3 threshold odor no.
Chloride	250	pH	6.5-8.5 units
Color	15 (color units)	Silver	0.10
Copper	1.0	Sulfate	250
Iron	0.3	Total Dissolved Solids	500
Manganese	0.05	Zinc	5

Water Quality Terminology

Acidic – A water sample having a pH less than 7 is acidic (can be corrosive).

Alkaline – A water sample having a pH greater than 7 is alkaline (non-acidic).

Alkalinity – This refers to the ability of water to neutralize acids. Total alkalinity (as calcium carbonate), carbonate, and bicarbonate alkalinity are alkalinity measures used. Values above 500 mg/L may dry skin and impact water taste.

Arsenic - Dangerous to humans and animals alike. May cause skin damage, circulatory system problems and an increased risk of cancer.

Bacteria – See BART and Coliform

BART™ – Biologic Activity Reaction Tests – Incubation tests designed to detect various types of non-pathogenic, bacterial colonies that are a nuisance and impact water well yield, water quality, color, odor, and taste. Moderately aggressive to aggressive colonies should be treated by disinfecting your well.

Calcium – Calcium is formed in most natural waters and with magnesium contributes to the hardness and scaling of water. The recommended level is 31 mg/L.

Chloride – Chlorides are present in most natural water. When sodium is present, chloride concentrations in excess of 250 mg/L give the water a salty taste. High chloride levels are not known to have toxic effects on humans; large amounts may corrode metal pipes and harm plant life. An MCL of 250 mg/L in drinking water has been established for reasons of taste rather than health.

Coliform Bacteria – Bacteria found in the intestinal tract of all animals, including humans. Although generally not harmful, these bacteria are associated with the presence of sewage or animal waste that may be contaminated with other disease-causing bacteria (pathogens). Unacceptable coliform tests are usually seen on your report as: TNTC (too numerous to count) and confluent growth. In such cases, disinfection treatment is advised. If disinfection does not remove the coliform bacteria, seek the assistance of your local Health Department.

Contaminants – Naturally-occurring substances that when present in high enough levels make water unfit for drinking and/or other household uses.

Corrosive water – Water that is acidic and/or “soft” may be corrosive, deteriorate plumbing, and leach toxic metals such as lead and copper from pipes and fixtures.

Detection limit – The minimum concentration of a substance that can be measured analytically. BDL and ND on indicate a substance is Below Detection Limits or Not Detectable (respectively).

Disinfection – The destruction of all pathogenic and related organisms, using high levels of chlorine, ozone, ultraviolet “UV” light, or boiling for five minutes.

Fluoride – Fluoride occurs naturally in ground and surface water. A level of about 1 mg/L is considered best for the possible prevention of dental problems. A level greater than 4 mg/L is considered toxic. Levels below 0.7 mg/L may require a supplement, consult your dentist or doctor.

Hardness – Large amounts of hardness suppresses lathering and leaves a residue on the surface of glasses, dishes, sinks and tubs. An amount of 175 mg/L is considered hard, anything over 500 mg/L may be undesirable for domestic use.

Heavy metals – Elements with high molecular weights, which are generally toxic in low concentrations to plant and animal life. Examples include mercury, chromium, cadmium, arsenic, selenium, and lead.

Hydrogen Sulfide – A hazardous, poisonous gas that smells like rotten eggs as it readily escapes from water. It can be found in local water wells at concentrations that are a nuisance or irritant, but are not poisonous. An acceptable level for dissolved hydrogen sulfide is less than 0.05 mg/L.

Iron – Iron can enter a water system by leaching natural deposits or from rusting of iron pipes and well casings. Iron in domestic water supply systems stains laundry and porcelain with a rusty color, causing more of a nuisance than a potential health hazard. Taste thresholds of iron in water are 0.1-0.2 mg/L giving a bitter taste. In the presence of hydrogen sulfide, iron will turn black, coloring water gray or black. Water containing more than 0.3 mg/L of iron can be treated using greensand filters.

IRB – Iron-Related Bacteria, quantified with BART tests, mobilize iron in water. They may appear as a slimy rust-colored coating on the interior surface of a toilet tank or as a glob of gelatinous material in the water. Large IRB colonies can coat and plug nearly everything in a water pumping and distribution system.

MCL : Maximum Containment Level – The maximum level of a contaminant permitted in public water supplies. MCLs are specified in the Primary Drinking Water Standards set by EPA for contaminants that affect the safety of public drinking water. MCLs are not regulated for private water supply systems.

Magnesium – Magnesium and calcium are the major contributors to hardness. In hot water heaters and water wells, high concentration of magnesium or calcium salts will cause scale to form. Concentration of magnesium over 125 mg/L can also cause a laxative effect. The recommended level is 19 mg/L.

Manganese – Manganese occurs in natural waters at a low level. A level of 0.1 mg/L is sufficient enough to cause taste and staining problems. Recommended level is 0.05 mg/L.

Methane – The most abundant natural hydrocarbon gas in nature. Dissolved methane in drinking water poses no toxic hazard to human health and is not regulated. Because methane escapes into the air upon contact, it can accumulate in unventilated spaces. When displacing oxygen in air, methane is an asphyxiant; between 5% and 15% by volume in air, it can explode. Dissolved methane levels less than 2 mg/L are usually not a concern. Between 7 and 10 mg/L, additional monitoring and treatment should be considered. Above 10 mg/L or if water is effervescent, treatment with aeration is recommended. Stable isotopes of methane are used to identify the source of high dissolved methane concentrations.

Nitrate/Nitrite (NO₃/NO₂) – High concentrations of nitrates and nitrites are usually derived from polluting agricultural sources. High nitrate levels can cause “blue baby” syndrome. 10 mg/L is the MCL in public water supplies.

Nuisance Contaminants – Contaminants that affect aesthetic or functional aspects of water quality and have little or no impact on health. They are managed by setting Secondary Maximum Contaminant Level Standards.

pH – pH is the measurement of the amount of acid or alkali present. The pH scale is 0-14 units. Above 7 is alkali and below 7 is acidic. The recommended range for drinking water is 6.5-8.5 mg/L.

Pollutants – Man-made substances introduced to the environment that at high enough levels can make water unfit for human consumption or use.

Potassium – Potassium is found in most water. For drinking water the recommended level is 7 mg/L.

Radon – A tasteless, odorless, and colorless radioactive gas formed from decay of uranium in rocks that has been found dissolved in some groundwater supplies. Activities that release radon as vapor from water include showering, bathing, and cooking. High concentrations of radon are known to be carcinogenic and are linked with increased risk of lung and other cancers.

Safe – The level of contaminant or pollutant is low enough that no health problems will occur.

Scale – White to tan-colored mineral deposits which accumulate on the inside of water wells, water pipes, and water-using appliances, like coffee pots. Associated with hard water, scale is primarily made of calcium carbonate and is removed with mild acid treatments.

Selenium – Dangerous to humans and animals alike. Horses and sheep are especially susceptible, exhibiting hoof damage, hair loss, still born foals, weight loss, and even death with long term exposure. Humans and other animals share many of the same symptoms.

Sodium – Sodium, found in both natural and treated waters, is considered a factor in hypertension and must be avoided by those with high blood pressure. Low sodium diets allow a recommended level of 20 mg/L.

SRB – Sulfate-Reducing Bacteria, quantified with BART tests, consume dissolved sulfate and generate hydrogen sulfide. If iron and sulfate are both present, SRB will turn water gray and black. Water has a slimy feel.

Sulfate – Sulfate appears in natural waters in a wide range of concentrations. Recommendations of less than 250 mg/L of sulfate are set because of its laxative effect. High sulfates in hard water form scale in boilers and heat exchangers. Anything over 500 mg/L is considered a high level in domestic drinking water.

Total Dissolved Solids (TDS) – A good general indicator of water quality, which measures the total amount of dissolved minerals, metals and salts. Water with between 500 and 1000 mg/L TDS is of marginal quality and may contain undesirable amounts of sodium, calcium, magnesium, sulfates, chlorides and/or other salts.

Toxicity – Toxicity (a poisonous effect) depends on the concentration of a contaminant in water, the amount of water consumed, and the length of time water is consumed. Any chemical can be toxic if you swallow enough of it. People react differently to different toxic substances; some people may be harmed more than others. Pregnant and nursing women, the elderly, infants, ill or malnourished, and people taking medication may be especially vulnerable to certain contaminants.

Turbidity – A cloudy condition in water due to suspended silt, fine sand, gas bubbles, and other matter.



Are there coliform bacteria in your water well?

YES
▼

Disinfect the well. Contract the Health Department or use a commercial disinfection kit. Always use care with dangerous chemicals.

Do bacteria keep coming back after disinfection of your well?

YES
▼

Disinfect the well. Contract the Health Department or use a commercial disinfection kit. Always use care with dangerous chemicals.

ALSO
▼

The well may require testing more often. Try to find the contamination source. Check the well seal, water piping system, and water heater. Have a professional check your well for surface water contamination. Shallow wells may need additional treatment technologies. If chlorinating, check leach fields.

NO >

Does your well have any color, taste, or odor?

YES
▼

Have your water tested (BART) for IRB, SRB, and slime-forming bacteria. Disinfect the well, the water piping and hot water distribution system.

Does your BART report show IRB >1,000 cfu/ml, or SRB > 1000 cfu/ml, or slime-forming bacteria > 100 cfu/ml? (cfu = colony-forming unit)

YES
▼

Disinfect your water well, the water piping and hot water distribution system. If chlorinating, check your leach fields.

NO >

Does your water well have any sand or suspended material?

YES
▼

Is the amount present high?

YES
▼

Consult a water professional about backwashable filters.

ALSO
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Consider the use of disposable or backwashable filters containing paper, fiber or activated charcoal.

ALSO
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Consider using filters with a clear housing so they can be monitored & changed as needed to avoid reduced water flow.

ALSO
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To conserve the life of the filter, filter only the water that needs to be filtered - don't filter irrigation water. Place the filter at the point of use, under sink or at the cold water faucet.

NO >

Does your well contain sodium or chloride above 250 mg/L or have a salty taste?

YES
▼

Install a reverse osmosis (RO) unit to remove the salt. Consult a professional to size the RO unit to your needs. Larger output RO units are more economical to operate on a per gallon of water basis.

ALSO
▼

Untreated water will damage house plants, lawns and flowers. It may be harmful to persons with high blood pressure.

ALSO
▼

If sodium is above 100 mg/L the water may do damage to delicate house plants.

ALSO
▼

RO-treated water is expensive. Therefore, treat only the water needed for you, your pets and your house plants.

NO >

Does the water quality vary during the year?

YES
▼

You may have more than one source of water in your well. Additional testing may be required, contact an environmental professional before beginning any type of treatment.

Does your well go dry during the year or can you pump it dry in a few minutes?

YES
▼

The well is in a water zone that is a poor producer of water. Hauling water may be an option for drinking water if the well goes dry when used for all household purposes. Consider installing a cistern for slow production or water storage.

ALSO
▼

The well may need to be cleaned and disinfected to remove bacteria and slime.

NO >

Water Treatment Decision Guide

The first step in using this guide is to obtain a lab report on your well water. Then proceed with the guide in making more educated decisions on the treatment that may be indicated.

Adapted from: Dr. Joe Bowden and Mike Matheson "San Juan Basin Water Treatment Guide", published by CDS Environmental Services

NO >

Is the TDS (total dissolved solids) of your well water about 500 mg/L?

YES
▼

Your well may require the installation of a reverse osmosis (RO) unit, if the taste of the water is a problem.

ALSO
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If the hardness is above 120 the water may have to be pre-softened. Soft water should be only for the RO unit and the hot water system. Soft water can harm plants and lawns. It is corrosive to uncoated copper and galvanized pipe so inspect your system on a regular basis.

ALSO
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If levels of sulfate are above 250 mg/L consult a professional before installing an RO unit.

Is the pH of your well water below 6.5 or above 8.5?

YES
▼

pH adjustment of the well water will require the services of a trained professional.

NO >

Is the hardness of your well water above 180 mg/L?

YES
▼

Your water may require softening of the hot water side of your system.

Above 200 mg/L?

YES
▼

Treated water may have a salty taste.

Above 300mg/L?

YES
▼

Seek the assistance of an experienced environmental professional, or a licensed and experienced pump installer. Or contact the local Health Department for additional assistance.

ALSO
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Weigh the advantages and the disadvantages before using a water softener.

NO >

Is the nitrate or nitrite N in your well water above 5 mg/L?

Lower than 10 mg/L?

YES
▼

Your well may require testing more often. Try to find the contamination source. Check the well seal, water piping system and water heater. Have a professional check for surface water contamination. Shallow wells may need additional treatment technologies.

Above 10 mg/L?

YES
▼

Stop drinking the water immediately and call the local Health Department.

ALSO
▼

Seek the assistance of an experienced environmental professional, a licensed and experienced pump installer or contact the local Health Department for additional assistance.

ALSO
▼

Is the nitrite level in your well water above 1.0 mg/L?

YES
▼

Stop drinking the water immediately and call the local Health Department.

NO >

Is the iron in your well water above 0.3 mg/L?

YES
▼

Does the water turn red or black after standing in a glass or does the water contain black flakes?

YES
▼

Seek the assistance of an experienced environmental professional, a licensed and experienced pump installer or contact the local Health Department for additional assistance. Your well and hot water heater may need disinfection.

ALSO
▼

Is the manganese above 0.05 mg/L?

YES
▼

Seek the assistance of an experienced environmental professional, a licensed and experienced pump installer or contact the local Health Department for additional assistance.

NO >

Is there a rotten egg smell in your well water?

YES
▼

The human nose detects hydrogen sulfide (a rotten egg smell) at a concentration lower than a laboratory can analyze. However, a little and a lot both smell the same. If you have hydrogen sulfide in your well and your home has a thick sweet odor that is unrecognizable, be careful. This is a sign that the level of hydrogen sulfide can be deadly. Call the Health Department or the local fire district.

ALSO
▼

Does your water contain more than 0.05mg/L of dissolved sulfide?

YES
▼

Consider disinfecting your well. If the smell and dissolved sulfides persist consider installing a charcoal activated filter system.

NO >

NO >

NO >

Does your well contain more than 2 mg/L of methane?

YES



NO > Below 2 mg/L there is usually no concern.

Between 2 mg/L - 7 mg/L?

YES



Make sure that there are no enclosed, unventilated air spaces in and around your water distribution system. Stable isotopic analysis will help differentiate a natural contaminant from a pollutant methane source.

Between 7 and 10 mg/L?

YES



Consider monitoring regularly for methane. Treatment using some form of aeration is recommended.

Above 10 mg/L or does your water effervesce?

YES



Treatment using some form of aeration system is highly recommended. Ventilate your well house and do not use an electric heater during the winter in an enclosed well house. Have your water sampled for stable isotopic analysis of methane to establish its source.

NO >

Is the fluoride in your well water higher than 2.0 mg/L or below 0.7 mg/L?

Below 0.7 mg/L?

YES



Your water may require a supplement, consult your dentist or doctor.

Between 2.0 mg/L and 4.0 mg/L?

YES



Your water system may require the installation of a reverse osmosis (RO) unit, if the taste of the water is a problem or directed by your health care provider.

Above 4.0 mg/L?

YES



Stop drinking the water. Call the local Health Department.

ALSO



Seek the assistance of an experienced environmental professional or a licensed and experienced pump installer.

NO >

Is the selenium value above 0.05 mg/L or are any trace metals in your water greater than the EPA Guidelines?

YES



NO > Selenium above or near .05 mg/L must be treated before it can be used as drinking water for humans and animals. Selenium values may vary during the year.

ALSO



Seek the assistance of an experienced environmental professional, a licensed and experienced pump installer or contact the local Health Department for additional assistance.

NO >

Have you checked your well, your pump and controls within the last 3 months?

YES



Congratulations! You are keeping up on the required maintenance of your water well, a valuable resource.

ALSO



A complete check at least four times each year and a check by a trained professional at least every two years is important to make sure that your water system is working properly.

ALSO



In connection with the inspections of your water well, make sure that the area around the well is free of possible pollutants. The ground around the well should be higher so that any water drains away. Keep all chemicals, fuel, fertilizers and the like at least 100 feet away from the water well.