

BE WELL PROJECT

ARSENIC IN YOUR DRINKING WATER

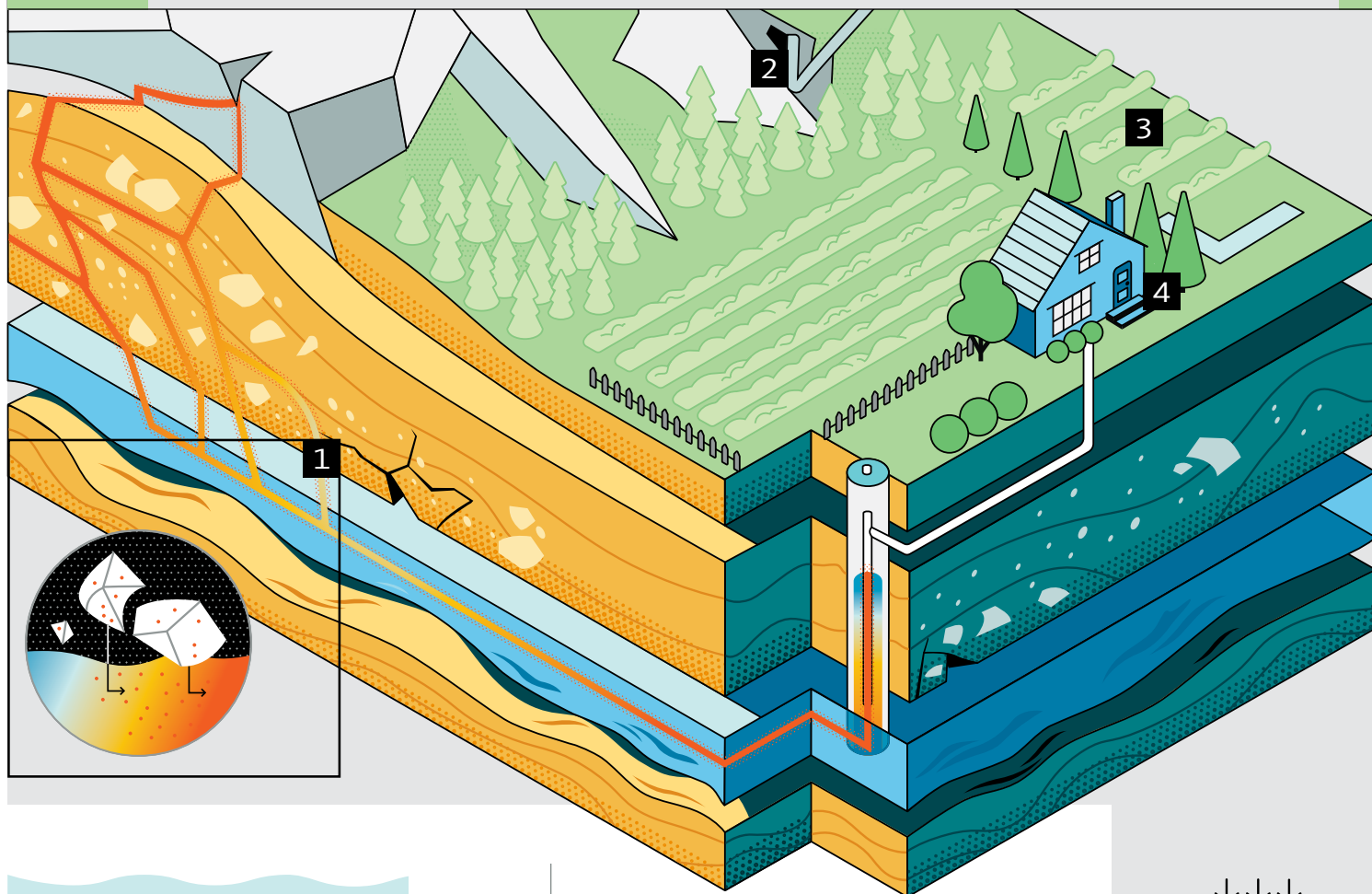
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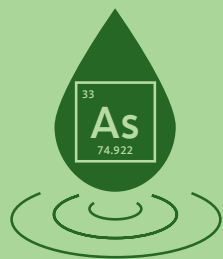
Oregon State
University

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What is arsenic?

Arsenic is a colorless, odorless and tasteless toxic metal.



Testing your water is the only way to know if arsenic is present.

How do you know if you have arsenic in your well water?

The government does not test private well water. It is up to you. **Testing your water is the only way to know if arsenic is present.**

How does arsenic get in your well water?

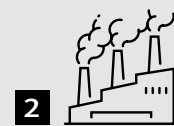
Arsenic in groundwater can come from natural sources (volcanic rock or soil), industrial processes (mining or smelting) or historical use of arsenic based pesticides and pressure-treated wood before 2004.

Why should you be concerned about drinking water contaminated with arsenic?

Arsenic is a known health hazard. It is **toxic even at very low levels**. When you drink water that contains elevated levels of arsenic over a long period of time, it will damage your body. That damage builds up over time and is linked to many health problems. Once you stop drinking water that contains arsenic, your body gets rid of it, but the damage may be irreversible.



1 Natural sources
(volcanic rock or soil)



2 Industrial processes



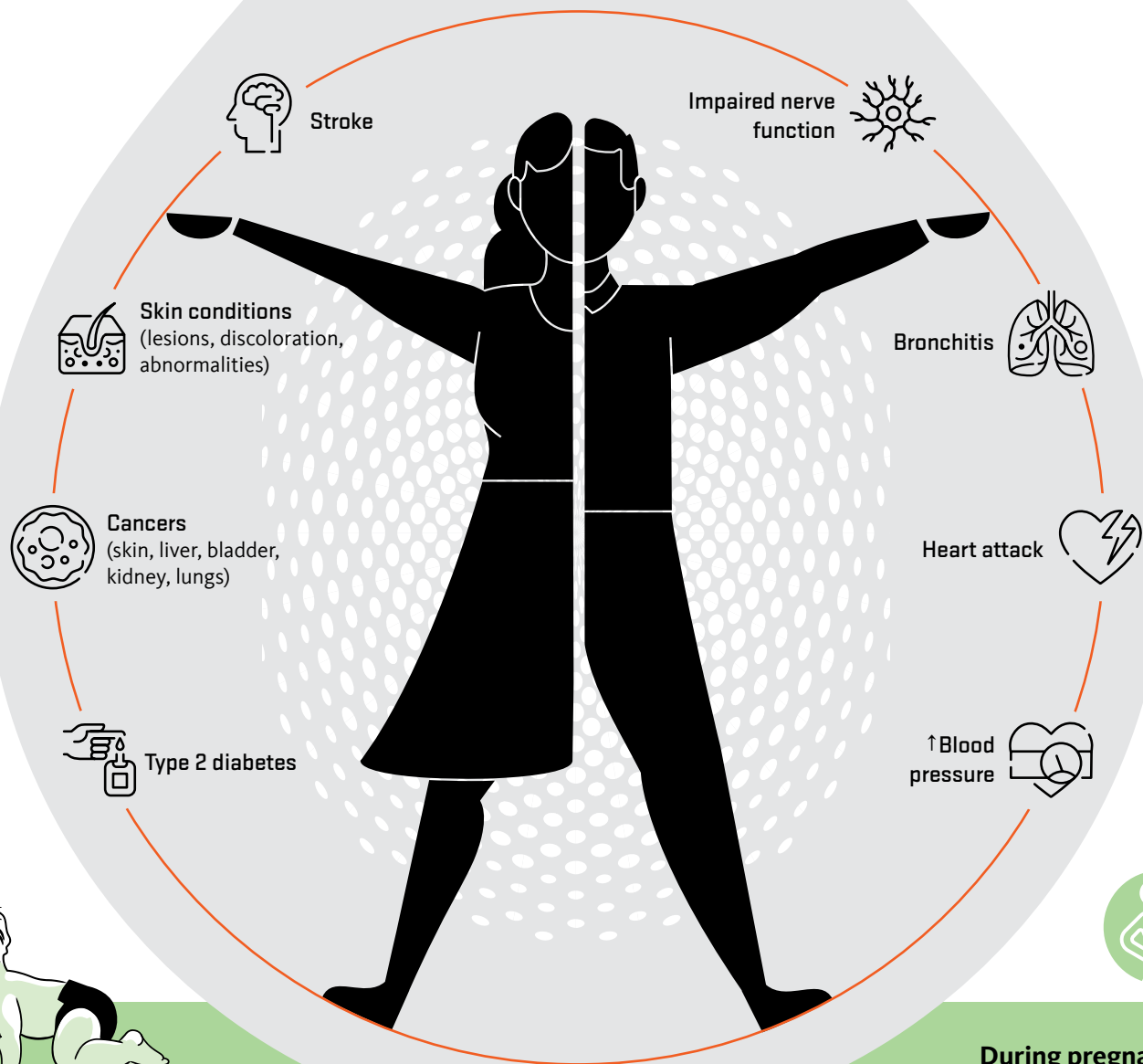
3 Historical use of pesticides



4 Pressure-treated wood
(before 2004)

What are the most common health effects linked to drinking water contaminated with arsenic?

For more details, please visit atsdr.cdc.gov/toxfaqs. Reach out to your health care provider if you are concerned about arsenic exposure.

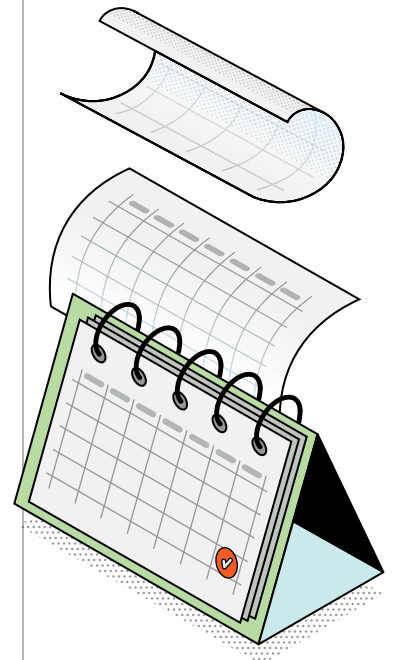


Arсенic can increase the risk of these health conditions in children:

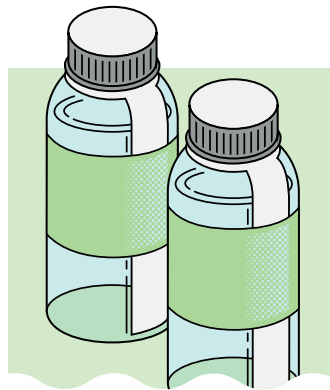
- Developmental defects
- Risk of respiratory illness

During pregnancy, arsenic can increase the risk of these health conditions:

- Stillbirth
- Miscarriage
- Premature birth
- Low birth weight



Keep a results journal and note any water quality issues. Regular inspections of your well can help identify potential problems early.



Where can you get your well water tested?

You can find accredited labs in Oregon by visiting healthoregon.org/wells.

The laboratory will supply a water collection kit with instructions on how to collect, store, and send your water sample.

How much will a test cost?

The test will cost between **\$30 and \$45**.

Be sure to contact several labs about price and logistics before ordering tests.

How often should you test for arsenic?

You should test your water for arsenic **every 1 to 3 years**. If you have never tested for arsenic, it is recommended that you **test your water for arsenic once in the wet season and once in the dry season** to get the most accurate assessment of seasonal changes in your well.

You should also test for arsenic any time you adjust your pump level and after an earthquake.

If you have a treatment system, test treated water at least once a year. Test untreated water (pretreatment unit) at least every 3 years.

If your water test results show the following levels of arsenic

	Water Usage	Recommendation
<p>up to 5 ppb ($\mu\text{g/L}$) .001 mg/L</p>	 <p>SAFE for all uses.</p>	<p>Test water every 1 to 3 years.</p>
<p>5-9.9 ppb ($\mu\text{g/L}$) .005-.0099 mg/L</p>	<p>Not recommended for infant formula or baby food.</p> <p>Pregnant women, immunocompromised people, and young children should try to avoid using untreated water (including drinking, mixing into beverages, cooking, washing fruits and vegetables, food preparation).</p>	<p>Test water every 1-3 years.</p> <p>Limit use of untreated water by young children and any people who are immunocompromised or pregnant.</p>
<p>10 ppb ($\mu\text{g/L}$) .01 mg/L</p>  <p>Public water system limit. If this were a public water supply, the public water system would be actively treating the water to reduce the arsenic level.</p>		
<p>10-99.9 ppb ($\mu\text{g/L}$) .01-.0999 mg/L</p>	<p>NOT SAFE for consumption by humans, pets or livestock. (It is unsafe for drinking, mixing into beverages, cooking, washing fruits and vegetables, food preparation).</p> <p>SAFE for other household uses (bathing, washing dishes, laundry, garden irrigation).</p>	<p>Treat contaminated water (See ACTION STEPS on following pages).</p> <p>Supervise children to ensure they do not swallow water while bathing or brushing teeth.</p>
<p>100-499.9 ppb ($\mu\text{g/L}$) .1-.49 mg/L</p>	<p>SAME restriction as above.</p> <p>NOT SAFE for garden irrigation.</p> <p>SAFE for other household uses (bathing, washing dishes, laundry, landscape irrigation).</p>	
<p>500+ ppb ($\mu\text{g/L}$) .5 mg/L</p>	<p>NOT SAFE for any use.</p>	

Test results can be reported in ppb (parts per billion), $\mu\text{g/L}$ (micrograms/L), or mg/L (milligrams/L); 1 ppb = 1 $\mu\text{g/L}$ = 0.001 mg/L



DO NOT BOIL TAP WATER. Boiling will not reduce arsenic levels and could actually make the level of arsenic higher. This is because water evaporates but arsenic does not.

DO NOT DISINFECT TAP WATER WITH CHLORINE TO REMOVE ARSENIC. Arsenic is a chemical. It cannot be “killed” like a germ, so adding chlorine will not make it safe to drink.

DO NOT RELY ON ACTIVATED CARBON FILTERS that are typically found in water pitchers or in your refrigerator. These do not remove arsenic.

If your water has elevated arsenic levels, the safest thing you can do is use **treated water** or **bottled water** for:

- 1 Drinking
- 2 Cooking food such as pasta and rice
- 3 Washing and cooking fruits and vegetables
- 4 Mixing juices, coffee, and tea
- 5 Infant formula
- 6 Brushing teeth

Only use bottled water if the label says it has been purified.

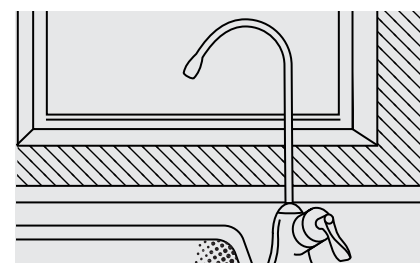
Arsenic is not readily absorbed through the skin. It is generally safe for adults to use water that contains arsenic (up to 500 ppb) for:

- Showering or bathing
- Washing laundry
- Cleaning dishes

Install a water treatment system to remove arsenic from your drinking water.

- Consult with a water quality professional.
- Treatment systems often need to be tailored to your water composition and your household needs.
- Other minerals in water, such as iron, manganese, and sulfur, can influence the performance of drinking water treatment systems.
- If water contains very high levels of arsenic, you may need to install multiple treatment systems.
- You should consider whether you need treated water for the entire house or just one faucet. In some cases larger treatment systems may overload the on-site septic.

Treatment systems require maintenance to operate effectively. Set reminders on your calendar to follow the recommended maintenance schedule for your treatment system.



Point-of-use water treatment at one faucet or one location (faucet attachment, under the sink).



Reverse osmosis, distillation, or anion exchange can be effective for arsenic removal. See the next page for more information about treatment options.

For health-related questions about arsenic in your water and additional resources regarding well maintenance, testing, and treatment, visit: wellwater.oregonstate.edu

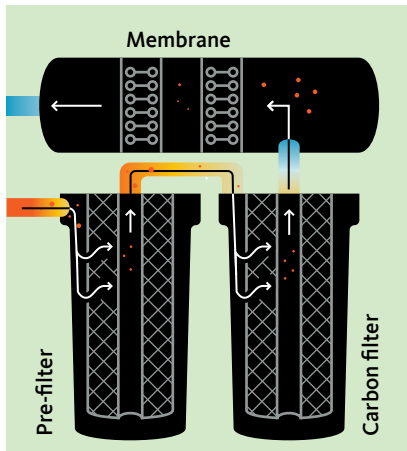
Types of water treatment and the contaminants they remove

This table shows the most common types of water treatment systems and the contaminants that they can remove. If you have multiple contaminants in your well water, you may need to combine water treatment systems.

- Removes or partially removes
- Only if the filter includes absorption media rated by the National Sanitation Foundation
- ▨ May be needed for pretreatment to remove arsenic

Contaminant	Recommended water treatment systems			Additional treatment systems may be required if multiple contaminants are present in your well water						
	Anion exchange	Reverse osmosis	Distillation	Aeration and filtration	Carbon filter	Chlorination	Oxidizing media filtration	Ozonation	Ultraviolet (UV) disinfection	Water softener
Arsenic	●	●	●					▨	▨	▨
Lead		●	●		○					
Nitrate	●	●	●							
Color, taste, or odor issues		●	●	●	●	●	●	●	●	
Bacteria and viruses		●	●			●		●	●	
Calcium and manganese (<i>water hardness</i>)		●	●							●
Chlorine				●	○					
Hydrogen sulfide				●	○	●	●	●		
Sulfate	●	●	●							
Iron		●	●	●			●	●		●
Radon				●	○					
Uranium	●	●	●							
Pesticides		●	●		○					
Perfluoroalkyl substances (PFAS)		●			○					
Trichloroethylene (TCE) and other volatile organic compounds (VOCs)		●		●	○					

Adapted from Home Water Treatment Fact Sheet, Minnesota Department of Health health.state.mn.us/communities/environment/water/factsheet/hometreatment.html



 **Reverse osmosis**

RO uses energy to push water through a membrane with tiny pores. The membrane stops many contaminants while allowing water to pass through.

Pros: Removes a wider variety and greater amount of contaminants than many other treatment options.

Cons: Can create a lot of wastewater. May require pretreatment to prevent the membrane from getting clogged.

Point-of-entry cost estimate *Initial:* \$5,000 to \$12,000
Maintenance: \$250 to \$500 every 1 to 2 years.

Point-of-use cost estimate *Initial:* \$300 to \$1,500
Maintenance: \$100 to \$200 every 1 to 2 years.



 **Distillation**

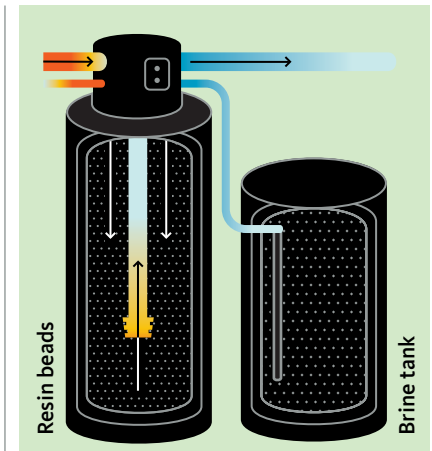
Distillers boil water, which makes steam. The steam rises and leaves contaminants behind. The steam hits a cooling section, where it condenses back to liquid water.

Pros: Removes a wider variety and greater amount of contaminants than many other treatment options. Kills 100% of bacteria, viruses and pathogens, so you can still drink your water during boil water advisories or if your well becomes contaminated.

Cons: Heating the water to create steam can be expensive. Water may taste “flat” because oxygen and minerals are reduced.

Point-of-entry cost estimate N/A

Point-of-use cost estimate *Initial:* \$300 to \$1,200
Cost consideration: Energy to boil water.



 **Anion exchange**

Anion exchange removes dissolved minerals in the water. The owner adds sodium chloride or potassium chloride (salt), which replaces negatively charged minerals in the water.

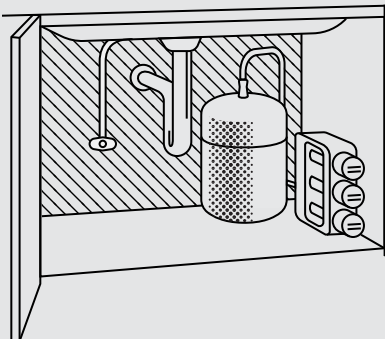
Pros: Sodium chloride and potassium chloride are safe to handle and easy to buy.

Cons: Anion exchange may affect how corrosive your water is and can corrode your pipes; this may be a health concern if you have copper or lead pipes. If not maintained properly, high concentrations of the contaminant can be dumped back into the water. Salt use can negatively affect the environment.

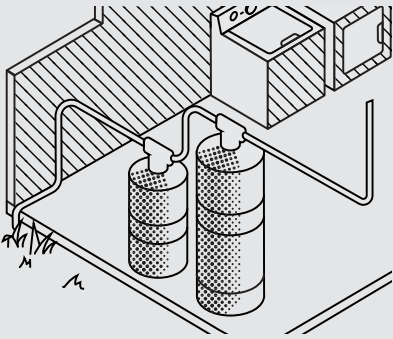
Point-of-entry cost estimate *Initial:* \$1,500 to \$2,500
Maintenance: \$700 to \$900 every 8 to 10 years.

Point-of-use cost estimate N/A

Adapted from Minnesota Department of Health Home Water Treatment Fact Sheet.

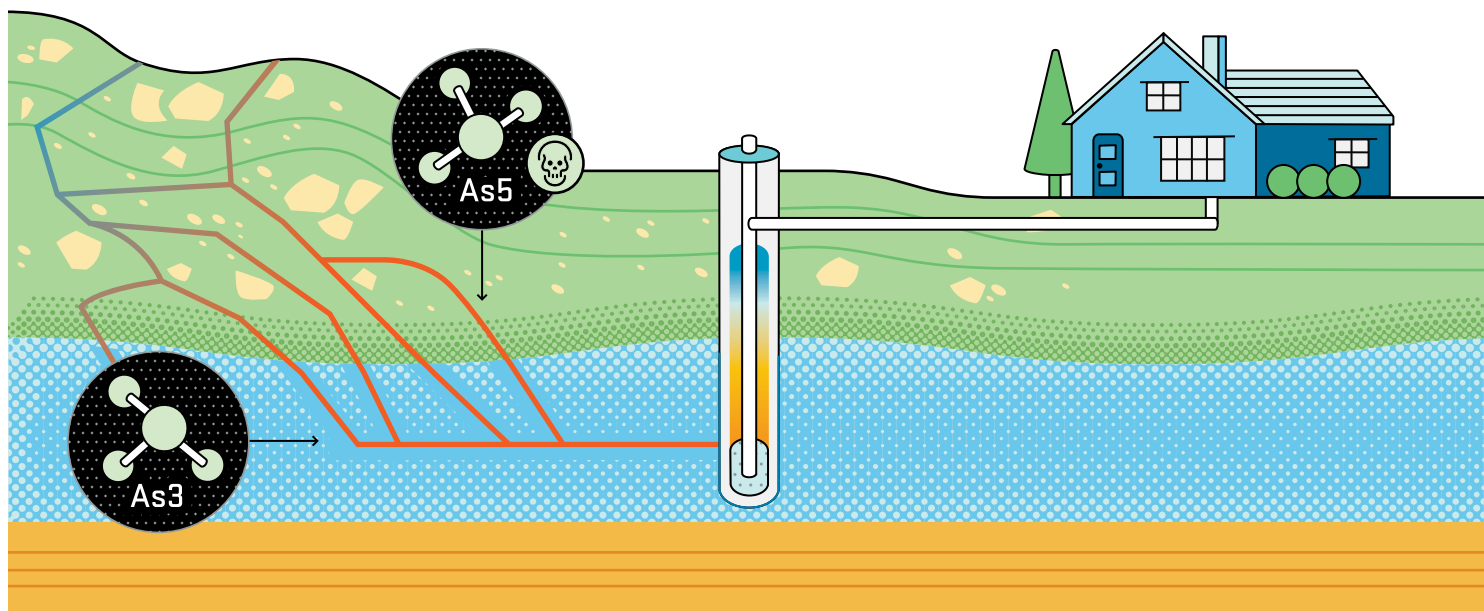


Point-of-use at one faucet or one location (faucet attachment and treatment unit under the sink).



Point-of-entry at the well. Provides treated water at all faucets.

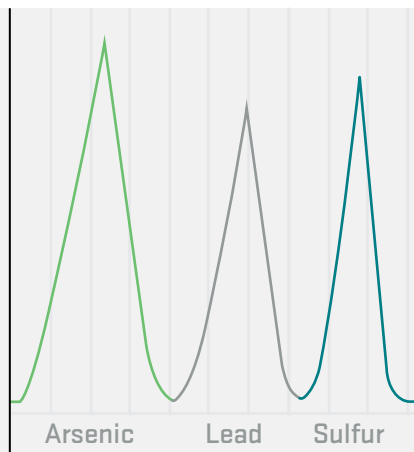
Cost estimates are based on quotes obtained in 2017 and research in 2018; actual costs may vary. In general, the low-end cost is for a treatment unit the homeowner installs; the high-end cost is for a treatment unit installed by a water treatment professional.



What do you need to know about the different types of arsenic?

Arsenic comes in different forms. You may come across the issue of arsenic speciation if you are choosing a water treatment system. Arsenic speciation is identifying which type of arsenic is in your water. Arsenic can exist as trivalent arsenic (also called arsenic 3) or pentavalent arsenic (also called arsenic 5). Trivalent arsenic is the most toxic form, and it is the common form of arsenic in well water.

Normal water tests will report total arsenic. This is the sum of trivalent arsenic and pentavalent arsenic. There are water tests that will measure these different types of arsenic (often called arsenic speciation tests). But these water tests are expensive and often unnecessary. Both forms of arsenic are toxic, and water treatment recommendations are based on total arsenic.

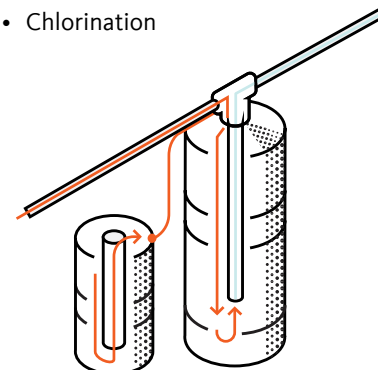
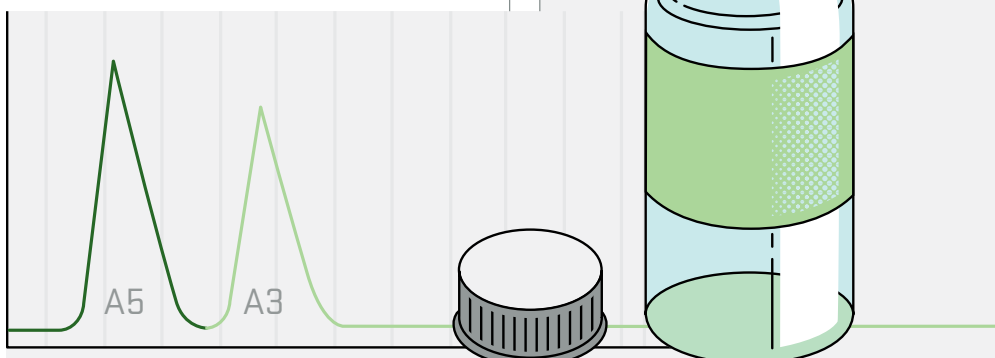


What if my water contains very high levels of arsenic or other metals?

Before you can treat your water to remove arsenic, you may need to install a pretreatment system. Pre-treatment systems do not remove arsenic, but they make water treatment more effective. This is important if you have very high levels of arsenic in your water or if there are other metals in your water like iron, sulfur, and manganese.

Options for pretreatment include:

- Water softeners (cation exchange)
- Iron oxidation filters
- Manganese dioxide filters
- Chlorination





What do you need to think about when choosing a water treatment system?

1. Multiple contaminants in water.
2. Size and placement in your house. Where will it go in your home?
3. Single faucet (point of use) vs entire house (point of entry).
4. Will the septic system be able to handle the volume of wastewater (point of entry)?
5. Ease of installation and operation.
6. Cost of installation, operation, and maintenance.
7. Volume of water to treat.
8. Vulnerable people in your home.



How do you know the treatment system will actually work?

The following organizations certify water treatment systems:

National Sanitation Foundation (NSF)
info.nsf.org/Certified/DWTU/

Water Quality Association (WQA)
wqa.org/find-products#/

Underwriter's Laboratory (UL)
productiq.ulprospector.com/en/search

You can search these databases by manufacturer or chemical contaminant. Often manufacturers will report the effectiveness by percent removal (the amount of contaminant that is removed from the water).

What are the financial considerations?

You can purchase and install a treatment unit on your own, or you can work with a treatment professional.

An alternative to water treatment is using a water delivery service or bottled water. This can be a cost-effective

solution for some individuals. Note that bottled water is not regulated to the same standards as tap water. Water labeled as "artesian" may not be treated. Only use bottled water if the label says it has been purified by reverse osmosis or distillation.

For more information, see EPA Bottled Water Basics: epa.gov/sites/production/files/2015-11/documents/2005_09_14_faq_fs_healthseries_bottledwater.pdf

Your household may also qualify for a loan (which you have to pay back) or grant (which you do not have to pay back) to help pay for water treatment. Visit wellwater.oregonstate.edu for information about loans and grants.

What should you consider when choosing bottled water?

Note: Beware of false claims, deceptive sales pitches, inaccurate water quality data, and scare tactics used by some water treatment companies to sell expensive and unnecessary home water treatment units. Here are some recommended questions to ask a water treatment professional: wqa.org/improve-your-water/questions-to-ask

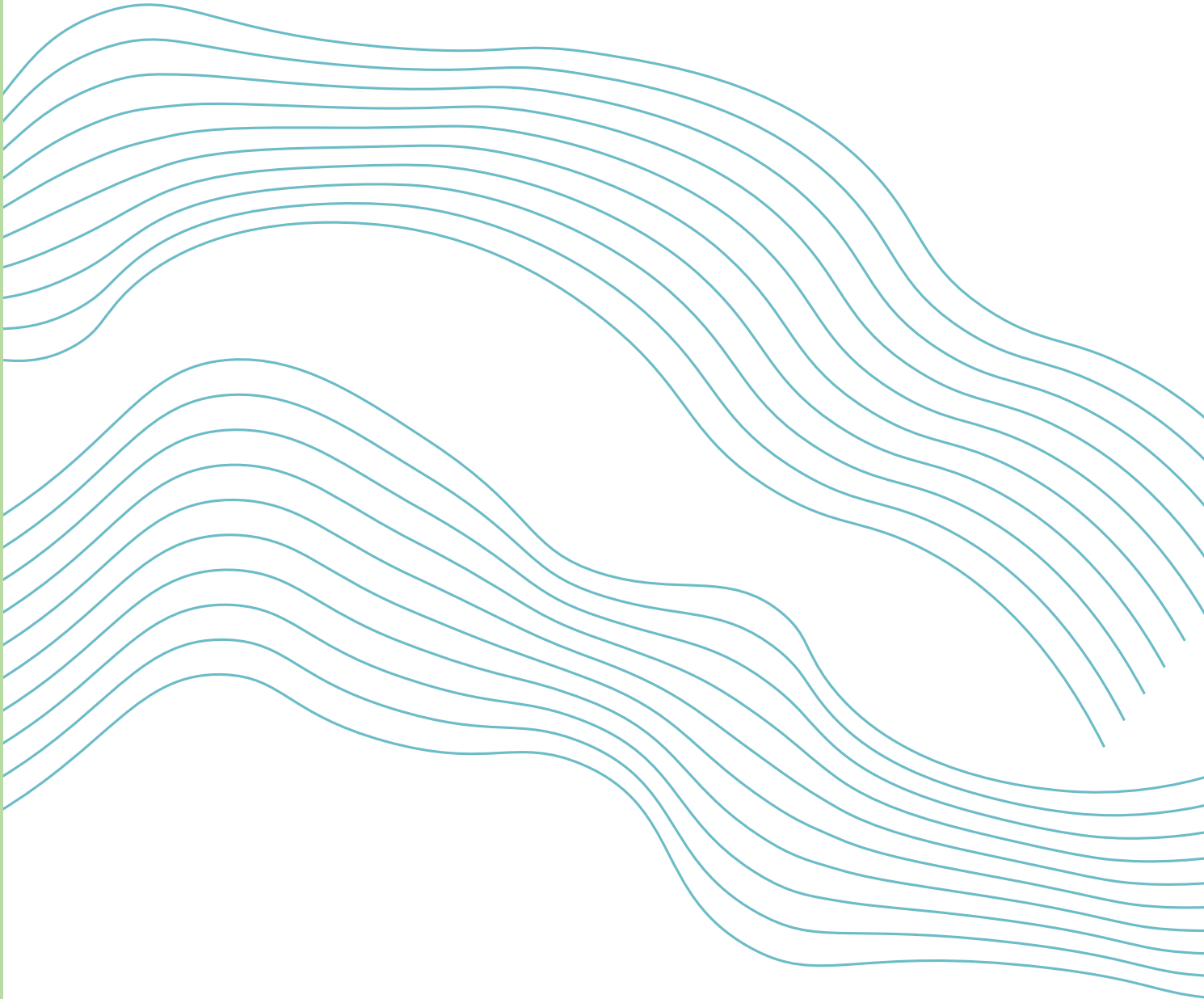
What if your water contains multiple contaminants?

Select the appropriate treatment for the contaminant you are trying to control. No single treatment unit can remove all contaminants from water, but some units can remove multiple contaminants.

How do you find a certified water quality professional?

Search listings in your telephone book, online, or at Find Water Treatment Providers: wqa.org/find-providers

If you work with a treatment professional, work with a licensed pump contractor or a licensed plumber. You can check this by using the Oregon Building Codes Division's license holder search: <https://www.oregon.gov/bcd/licensing/pages/search.aspx>.



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