



# Treating Arsenic in Well Water in Union County, NC

## How does arsenic get into well water?

Arsenic occurs naturally in the earth's crust. When rocks weather, minerals break down. If arsenic is present in these rocks, it can be released into the groundwater. Areas of North Carolina's piedmont, including Union County, that are underlain by metamorphosed volcanic and sedimentary rocks, commonly referred to as the "Carolina Slate Belt" have a greater number of drinking water wells with arsenic than other regions. In Union County, the slate belt area covers about two-thirds of the county. However, low levels of arsenic are found in groundwater throughout North Carolina.

## Can drinking arsenic impact my health?

Arsenic is a toxic element. Drinking inorganic arsenic over many years (chronic exposure) increases the risk of skin, bladder, kidney, liver, and lung cancer. It has also been found to have possible links to blood vessel damage, heart problems, diabetes and skin changes.

## How do I know if I'm drinking contaminated water?

Arsenic usually cannot be seen, smelled or tasted in drinking water. Testing your water is the only way to know if it is present. Union County Environmental Health offers well water testing for a variety of contaminants. The results of your water sample will indicate the level of arsenic in the water.

## What can I do if my water is contaminated?

Selection of the most appropriate method of treatment may vary depending on the homeowner's choice, chemical composition of the water and level of contamination. When selecting a water treatment unit, effectiveness, cost and maintenance requirements of the unit(s) should be considered. There are several options available to well owners for treatment.

- Treat all water that enters the dwelling with a "point of entry" treatment unit (also called a "whole-house" unit), or,
- Treat the water at a specific tap with a "point of use" unit (i.e., kitchen tap).
- Treat the water before use with a National Sanitation Foundation (NSF) certified pitcher filter to remove arsenic (such as "Zerowater®"). This is a low-cost option that can be purchased online and used until a permanent solution is in place. Please consult with the manufacturer for filter cartridge replacement recommendations.

It is important that the source water be analyzed for other contaminants that may interfere with the proper treatment to remove arsenic. Well owners should consult a certified water treatment specialist to determine if additional treatment is necessary.

## Additional Resources

[Union County Wells & Water Testing](#)

[NC Department of Health & Human Services Private Wells Information](#)

[NC Department of Environmental Quality-Private Wells](#)

[NC Department of Environmental Quality Certified Drinking Water Operators](#)

[EPA-Private Drinking Water Wells](#)

[North Carolina Geological Survey](#)

[National Drinking Water Clearinghouse](#)

[National Sanitation Foundation](#)

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# Water Treatment Technology Options

## Comparison of Arsenic Treatment Technologies

Technology	Type of Arsenic Removed	Waste Generated	Regeneration Required	Pre-Oxidation Required	Process & Maintenance
Special Iron Oxide Adsorptive Media	As III, As V	Low	No	No	Simple
Other Adsorbative Media: Activated Alumina (AA), Fe-AA	As V, (variable As III removal)	Low Disposable Type Only	No Disposable Type Only	Yes	Simple-Moderate
Anion Exchange	As V	High	Yes	Yes	Complex
Reverse Osmosis	As V, (variable As III removal)	Low	No	Yes	Moderate

### Special Iron Oxide Adsorptive Media

Also known as iron-based adsorption is a relatively new technology, which uses an iron oxide-based media. Variations of this type of media are emerging as viable arsenic removal alternatives. An arsenic water treatment evaluation program initiated by New Jersey found that this technology 1) effectively removed both species of arsenic from the source water, 2) was easy to operate and maintain and 3) did not return captured arsenic to the environment through regeneration (backwash). Once the media has depleted its adsorption capacity, it is removed from the canister and fresh media is added. Typical media life may be 2-3 years, depending on household water use. Small point of use, single tap iron oxide adsorption systems are becoming available for use.

### Activated Alumina Adsorption

Removes arsenic by exchanging the arsenic with the hydroxide ions on the alumina surface. A pre-oxidation step is required to convert Arsenic III to Arsenic V, since activated alumina does not effectively reduce Arsenic III. Preoxidation technology includes chlorination, potassium permanganate, ozone and solid phase media. Activated alumina may require pH adjustment since removal efficiency is reduced at higher pH values. Media replacement depends on household water usage. If chlorination is used as a pre-oxidation method, post treatment by passing water through a granular carbon filter to remove the chlorine is generally desired. More frequent operation and maintenance may be required given the complexity of additional treatment steps. Iron activated alumina (Fe-AA) is an iron-based variation. In addition, Point of Use activated alumina treatment with pre-oxidation may also be a feasible option.

### Anion Exchange

Can be effective in removing arsenic V. A pre-oxidation step is required to effectively convert arsenic III to arsenic V prior to treatment. If chlorination is used as a pre-oxidation method, post treatment by passing water through a granular carbon filter to remove the residual chlorine is generally desired. If sulfate is present in the drinking water above 50 ppm, efficiency is reduced. Anion exchange units require proper operation and maintenance. If the units are not regenerated on a timely basis, the anion resin can leach the adsorbed arsenic at much greater concentrations. The waste brine can contain high concentrations of arsenic and should be disposed of properly.

### Reverse Osmosis

A point of use, single tap treatment option. Reverse osmosis is effective in reducing arsenic V. A pre-oxidation step is required to convert the arsenic III to arsenic V. If chlorination is used as a pre-oxidation method, post treatment by passing water through a granular carbon filter to remove the chlorine is generally desired. Pre-softening the water is recommended when the raw water hardness is greater than 10 grains (170 mg/L). Reverse osmosis consists of a membrane filter, which will need to be replaced after 2 to 3 years depending on water use. Pre and post membrane cartridges may need to be replaced more frequently.