

Arsenic, Chromium, Selenium, and Uranium in Private Drinking Water Wells in the Garber Wellington/ Central Oklahoma Aquifer

The Central Oklahoma Aquifer, also known as the Garber-Wellington aquifer, is a major source of drinking water for central Oklahoma. Concentrations of arsenic, chromium, selenium, and uranium in regions of the aquifer occasionally exceed the Maximum Contaminant Level (MCL), as established by Federal Drinking Water Standards, for some or all of these chemicals. These high concentrations are found in both shallow and deep wells and are not confined to any particular area of the aquifer, so until chemical analysis has been performed, the risk is unknown.

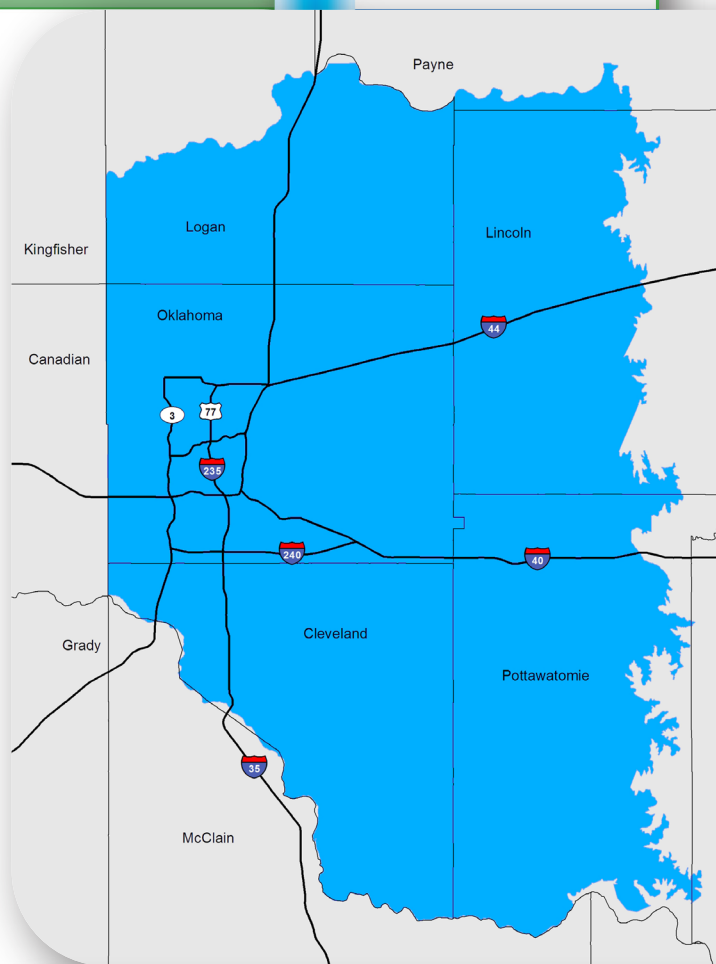
All public water systems are periodically checked for arsenic, chromium, selenium, and uranium to ensure they are safe for drinking. These are naturally-occurring elements but can present health problems if the concentration exceeds the MCL for that element. Testing of private water wells is not a requirement of the State of Oklahoma or the Department of Environmental Quality (DEQ); however, due to health concerns related to these chemicals, individuals on private water wells may want to have their water tested.

A sample kit can be obtained by contacting DEQ's State Environmental Laboratory at (405) 702-1000, (866) 412-3057, or selsd@deq.ok.gov. Results are usually returned in two weeks.

DEQ offers a special analytical fee for private drinking water wells drawing water from the Central Oklahoma Aquifer. The current fee schedule is available on our website at <https://go.usa.gov/xz8g4>.

Arsenic

Arsenic can enter water from various sources such as deposits in the earth, agricultural or industrial practices. It can cause various health effects from long term consumption, including skin disorders; irritation of the stomach, intestines and lungs; neurological disturbances; and cancer.



	Arsenic	Chromium	Selenium	Uranium
MCL (µg/L)	10	100	50	30

Chromium

Chromium is found in rocks, plants, volcanic dust and soil. In natural waters, it is most commonly found in the forms of trivalent chromium (chromium III) and hexavalent chromium (chromium VI). Trivalent chromium is also present in food and is an essential trace nutrient. Hexavalent chromium can enter the water from natural deposits in deep aquifers or from industrial practices. Ingesting large amounts of hexavalent chromium can cause stomach upsets and ulcers, convulsions, and kidney and liver damage. Some people are extremely sensitive to trivalent and hexavalent chromium and can develop allergic reactions consisting of severe redness and swelling of the skin. Both trivalent and hexavalent chromium are covered under the total chromium MCL since chromium can switch back and forth between forms in water and in the human body, depending upon environmental conditions.

Selenium

Selenium is an essential nutrient for humans and animals but can be harmful when regularly consumed in amounts higher than those needed for good health. People are exposed to low levels of selenium daily through food, water, and air. EPA has found people exposed to selenium levels above the MCL for relatively short periods of time may experience adverse health effects, including hair and fingernail changes, damage to the peripheral nervous system, fatigue and irritability. A lifetime exposure to selenium at levels above the MCL could lead to hair and fingernail loss, damage to kidney and liver tissue and damage to the nervous and circulatory systems.

Uranium

Uranium is a radioactive element found in rocks, soils, surface and underground water, air, plants and animals; however, it poses a small risk to humans because it gives off very small amounts of radiation. Cancer is not usually a result of exposure to naturally occurring uranium; however, health studies have shown elevated amounts of uranium can cause kidney damage. We do not know whether children differ from adults in their susceptibility to the health effects of uranium exposure.

Options for Private Well Owners

To reduce concerns with arsenic, chromium, selenium, and uranium in your private well, the best option, if feasible, is to purchase water from a public water system. Public water systems are required to conduct periodic testing and have processes in place to remove these elements. If purchasing water is not feasible, commercial water treatment systems, such as reverse osmosis and ion exchange, advertise the capability to remove arsenic, chromium, selenium, and uranium.

Two types of treatment options are available: point of entry into the household and point of use at the faucet.

- Point of entry treatment treats the water when it enters the house, thus treating all the water utilized by the household. These systems generally utilize sediment filters and iron granules to absorb the metals as water passes from the well to the house.
- Point of use treatment treats the water at the tap using granular ferric adsorption.

Both of these methods involve cost and system upkeep to ensure they are working properly. Each method should be carefully investigated before choosing a system.

More Information

A detailed study of the groundwater in the Oklahoma Aquifer was conducted by the US Geological Society in 1998. This study is titled “Ground-Water-Quality Assessment of the Central Oklahoma Aquifer, Oklahoma: Results of Investigations” (Water-Supply Paper 2357-A). It can be found at <https://go.usa.gov/xz84Q>.

References

ATSDR. 2013. Toxicological Profile for Uranium. Atlanta, GA: US Department of Health and Human Services, Public Health Service. <https://go.usa.gov/xz84k>

ATSDR. 2007. Toxicological Profile for Arsenic (Draft for Public Comment). Atlanta, GA: US Department of Health and Human Services, Public Health Service. <https://go.usa.gov/xz84q>

ATSDR. 2003. Toxicological Profile for Selenium (Update). Atlanta, GA: US Department of Health and Human Services, Public Health Service. <https://go.usa.gov/xz8gH>

ATSDR. 2012. Toxicological Profile for Chromium. Atlanta, GA: US Department of Health and Human Services, Public Health Service. <https://go.usa.gov/xz8gm>

EPA. 2016. Drinking Water Contaminants. <https://go.usa.gov/xz8g5>

USGS/DEQ. 2006. Comparison of Ground-Water Quality in Samples from Selected Shallow and Deep Wells in the Central Oklahoma Aquifer, 2003-2005. Reston, Virginia. US Department of the Interior, US Geological Survey. <https://go.usa.gov/xz8gk>