



2019 CITY OF LAKEVILLE PRIVATE WELL STUDY FACT SHEET

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Environmental Resources Dept.
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The water testing
was funded by
Dakota County.

WHY WERE WELLS TESTED?

The purpose of this study was to evaluate the drinking water quality in the City of Lakeville, Dakota County. Water samples were tested for the presence of naturally occurring manganese and arsenic, as well as human-caused chloride and nitrate. Previous sampling of private wells in Lakeville found that manganese is present at levels exceeding drinking water standards. Arsenic and nitrate were also detected.

This study builds upon previous water quality studies to determine where drinking water contaminants exceed standards in Lakeville, and what water treatment devices are effective at removing these contaminants.

STUDY APPROACH

The County mailed sample bottles to all 320 private well owners in Lakeville. One-hundred well owners (31%) participated. Residents were asked to collect a water sample from both an outside untreated spigot and an inside primary drinking water tap. All outside samples were tested for manganese, arsenic, nitrate, and chloride. If the outside sample result exceeded 3.0 milligrams per liter (mg/L) for nitrate, 0.05 micrograms per liter ($\mu\text{g/L}$) for arsenic, or 0.090 mg/L for manganese, then the sample collected from the inside tap was tested for that chemical parameter. In addition, all inside tap samples were analyzed for lead. A hardness test strip was provided to well owners to test and report when submitting samples. Wells were not tested for coliform bacteria in this study.

SUMMARY OF WATER TEST RESULTS:

	Parameter (units)	# of well samples	Drinking Water Standard	% above Drinking Water Standard	Mean (Average)	Min	Max
Outside Sample	Arsenic ($\mu\text{g/L}$)	100	10 No amount is safe	3%	2.36	< 0.05	12.30
	Manganese (mg/L)	100	0.100 (Infant < 1yr)	51%	0.127	< 0.005	0.539
			0.300 (All Others)	10%			
	Nitrate (mg/L)	100	10	2%	0.52	< 0.05	16.20
	Chloride (mg/L)	100	NA	NA	23	< 3.0	225
Hardness (mg/L)	95	NA	NA	377	50	425	
Inside Sample	Arsenic ($\mu\text{g/L}$)	46	10 No amount is safe	4%	2.10	< 0.05	19.40
	Manganese (mg/L)	58	0.100 (Infant < 1yr)	5%	0.024	< 0.005	0.383
			0.300 (All Others)	5%			
	Nitrate (mg/L)	3	10	0%	4.24	0.34	7.32
	Lead ($\mu\text{g/L}$)	100	15 No amount is safe	0%	0.60	< 0.5	5.2
Hardness (mg/L)	94	NA	NA	107	50	425	

mg/L - milligrams of chemical per liter of water or parts per million (ppm)

$\mu\text{g/L}$ - micrograms of chemical per liter of water or parts per billion (ppb)

NA - not applicable

< - Less than (result is below the level that the laboratory can detect)

CHEMICAL CONTAMINANT INFORMATION AND SIGNIFICANT FINDINGS:

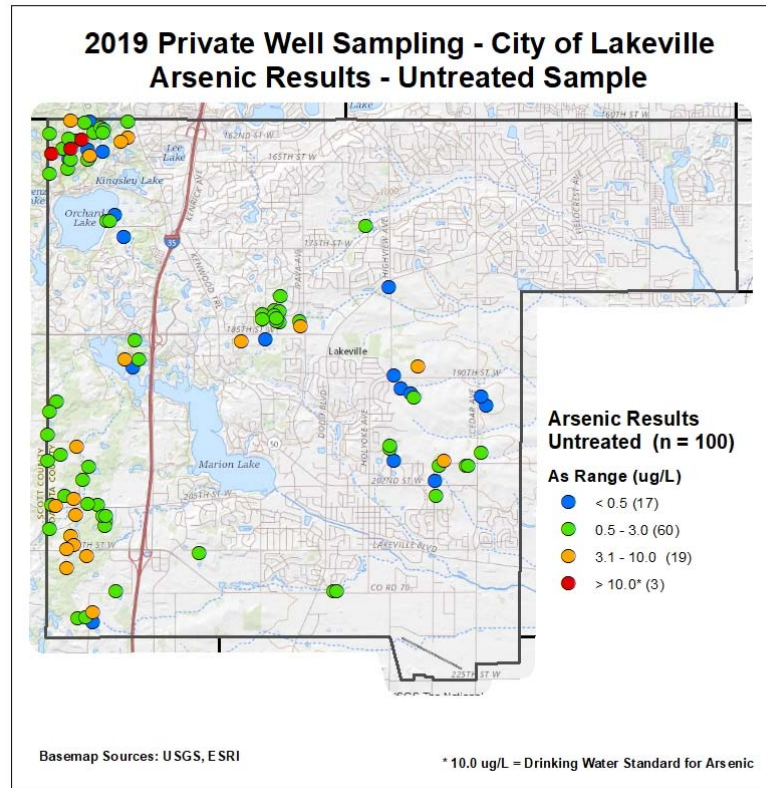
Arsenic: is a naturally occurring element found in rocks and soil across Minnesota. From these sources, arsenic can enter our groundwater and drinking water wells. Too much arsenic in drinking water has been linked to effects on the respiratory, nervous, immune, and endocrine systems. High levels of arsenic in drinking water are also associated with cancer. The U.S. Environmental Agency (USEPA) has set a drinking water standard of 10 µg/L for arsenic, to protect against potential health risks. However, this level is not low enough to completely eliminate all risk of cancer and other health effects from arsenic.

The Minnesota Department of Health (MDH) recommends that every private well be tested for arsenic at least once. Arsenic can be removed or reduced by using a reverse osmosis (RO) treatment system that is specifically designed for arsenic removal.

Results:

- Arsenic was found in 69% of the outside samples making it the second most commonly detected chemical parameter analyzed. Three percent (3%) of the sampled wells exceeded the drinking water standard of 10 µg/L.
- Arsenic was detected in all areas sampled. The presence and levels of arsenic are not correlated with well depth. Levels of arsenic and manganese are not correlated, suggesting that they originate from different sources.
- Effectiveness of arsenic removal by reverse osmosis (RO) treatment systems was variable. Overall, treatment reduced arsenic levels by an average of 80%. However, 20% of the RO systems tested did not reduce arsenic at all.

Arsenic exists in different forms and may require specialized treatment systems to remove completely.



Chloride: occurs naturally in the rocks and soil across Dakota County at very low levels. High levels of chloride in groundwater indicate human-caused contamination from the application of road salt, water softener brine discharge into septic systems, or deicing salt applied to sidewalks and parking lots. Elevated chloride can potentially leach metals, like lead, from plumbing into the drinking water. There is no health-based guideline for chloride, but USEPA recommends levels no higher than 250 mg/L to avoid undesirable tastes (salty).

Results:

- Chloride was found in 51% of the outside samples. The highest levels detected were in the densely populated area in the northwest of Lakeville, where wells are statistically shallower than Lakeville wells located in the southwest. The application of deicing salt and the discharge of water softening brine into drain fields are the suspected sources.
- There is no health standard for chloride but its detection in well water indicates that the well is vulnerable to surface contamination.
- Chloride levels decrease with increased depth of the well casing.

Further Water Testing

Request water sample bottles from Dakota County by calling (952) 891-7000 or ordering from www.dakotacounty.us Search: *Water Test Kit*.

- Coliform Bacteria (Every year) \$18
- Nitrate (Every other year) \$18
- Arsenic (At least once) \$18
- Lead (At least once) \$18
- Manganese (At least once) \$18

Lead: rarely occurs naturally in groundwater. Lead can leach into drinking water from lead pipes, lead solder on copper pipes, brass faucets, fittings and valves, including those advertised as lead-free. Brass fixtures, including fixtures that don't have a brass color can contribute lead to drinking water such as chrome plate brass products. The USEPA federal drinking water standard for lead is 15 µg/L, however, there is no safe level of lead. Lead exposure usually has no obvious health symptoms and goes unrecognized. Health concerns include impaired physical and mental development, hearing problems, and damage to the brain, kidneys, red blood cells and nervous system. Pregnant women, infants and children under six years of age are at the highest risk. The federal "Reduction in Lead in Drinking Water Act " (2014), reduced the amount of lead allowed in water systems and plumbing products by changing the definition of "lead free" from 8% lead content to not more than 0.25% lead in drinking water plumbing components.

Results:

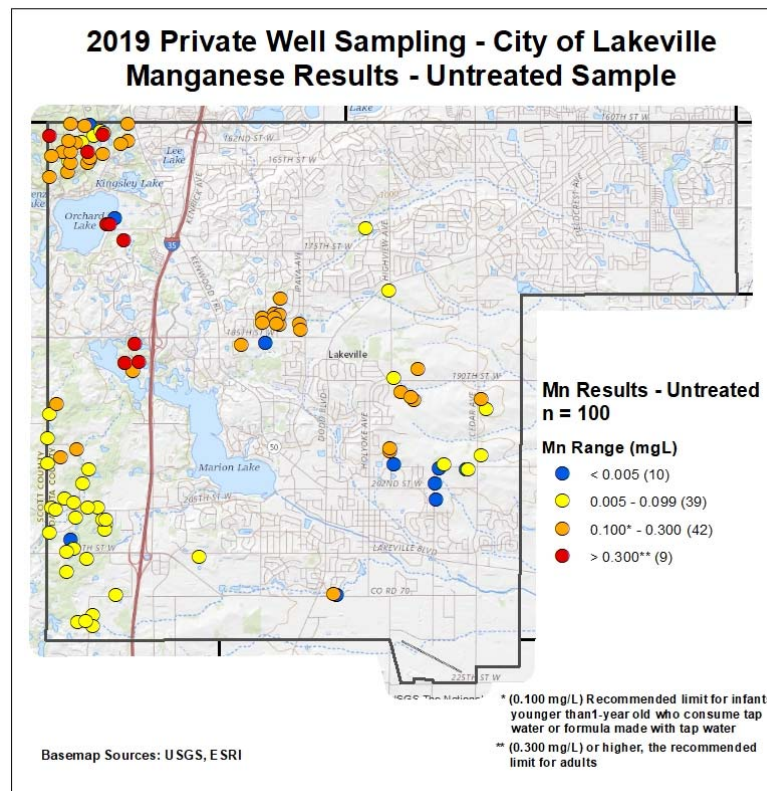
- All samples collected from the inside primary drinking water tap were tested for lead. Lead was detected in 7% of the samples. None of the samples exceeded 15 ug/L, the drinking water standard for lead; no amount of lead is safe to drink.
- Three of the RO systems did not completely remove lead. When purchasing a water treatment device look for one that is certified to reduce lead.

Manganese: occurs naturally in rocks and soil and dissolves into groundwater. Our bodies need a small amount of manganese to maintain health, and we get enough manganese from the foods we eat. Too much manganese in drinking water may cause neurological problems. Infants are more sensitive than children or adults to the effects. The current guidance value for manganese in drinking water is 0.100 mg/L for formula-fed infants and infants that drink tap water. The manganese guidance value for children and adults (including nursing mothers) is 0.300 µg/L.

Non-health related problems (metallic taste and staining of plumbing fixtures) may occur above 0.050 mg/L.

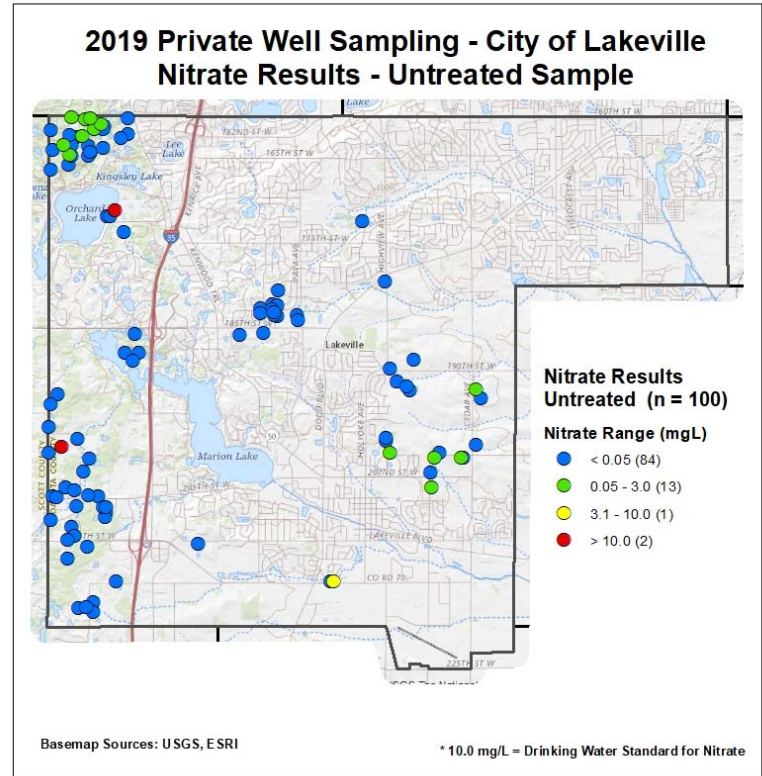
Results:

- Manganese is the **most commonly detected chemical parameter in Lakeville. It was detected in 90% of the outside untreated samples** and above the health standard of 0.100 mg/L in 3% of the inside taps.
- Although widely detected across Lakeville, wells located in the northwestern portion have statistically higher concentrations of manganese, than wells located in the southwestern area where wells are deeper. Heavy clay soils and glacial till on the western portion of Lakeville is the suspected source of manganese.
- Water softeners are effective at removing manganese. Seventy-six percent (76%) of the households soften their water. A comparison between outside and inside manganese levels shows that water softening reduced manganese levels by an average of 99%.
- Drinking softened water is generally safe and is typically free of manganese. Softening does not remove nitrate, arsenic, pesticides or lead however, and it is recommended that untreated or soften well water **not** be used to prepare infant formula.



Nitrate: occurs naturally at very low levels. Nitrates in groundwater are usually associated with human activities including row crop agriculture, septic systems, and animal feedlots. In Dakota County, the major source is the over-application of fertilizer on agricultural crops. However, elevated nitrate is observed in areas of high septic system density. A nitrate level above 10 mg/L in drinking water can be harmful to infants under six months old. Infants that consume water or formula mixed with water that is high in nitrate may develop “blue baby syndrome” (methemoglobinemia), a life-threatening condition. Always test for nitrate before giving water to an infant. High nitrate levels can also harm the respiratory and reproductive system, kidney, spleen, and thyroid in children and adults.

Groundwater pesticide studies conducted by Dakota County and the Minnesota Department of Agriculture have found a correlation between the detection of nitrate and herbicides. **The presence of nitrate above 3.0 mg/L is a strong indication that herbicides and herbicide breakdown products are also present.** Importantly, both nitrate and herbicides can be reduced by the use of a RO treatment system.



Results:

- Nitrate was found in 17% of the outside samples; 2% exceeded the drinking water standard of 10 mg/L. Nitrate is not widespread in Lakeville, due to the low presence of row crop agriculture, but concentrations can change over time.
- Nitrates, where present, are at low levels. Shallow wells generally have higher levels. The detection and concentration of nitrate decreases with greater well depth.
- The presence of nitrate and chloride are correlated. Both are derived from surface pollutants associated with human activities and concentrations are higher in shallow wells and decrease with increasing well casing depth.
- RO treatment systems are effective at reducing nitrate; nitrate was reduced by an average of 32%.

IF DRINKING WATER HAS ELEVATED LEVELS OF CHEMICALS, DO THE FOLLOWING:

- ◇ **Responsibility.** It is the responsibility of the well owner to maintain and test their water supply well.
- ◇ **Prepare infant formula with bottled water.**
- ◇ **Do not boil your drinking water.** Boiling water may concentrate contaminants, however, it is effective at killing bacteria.
- ◇ **Remove contamination sources.** Identify and, if possible, remove sources of contamination near the well. Fertilizers, animal wastes and sewage systems should be located far from the well and managed to avoid contamination.
- ◇ **Install a water treatment system.** Install a NSF, UL, or WQA certified water treatment system. Treatment systems require annual maintenance for effective operation. No single treatment process can remove all substances in water. If there are several substances you want removed from your water, you may need to combine several treatment processes. The MN Dept. of Health website has information on water treatment at www.health.state.mn.us search *water treatment*.
- ◇ **Continue sampling.** Test your drinking water after you install a treatment unit because there is often no other way to know if a treatment system is working properly. All home water treatment units require regular maintenance to work properly. You can have a water test kit mailed to you by calling Dakota County at 952-891-7000 or request a test kit online at www.dakotacounty.mn.us search *well testing*.