Dakota County
Targeted Drinking Water Quality Study FAQs

Why were these private drinking water wells sampled?

In 2017, Dakota County sampled 146 private wells as part of an ongoing County groundwater study. Owners of wells located where elevated levels of the herbicide cyanazine had previously been identified were invited to participate. Untreated well water was collected and analyzed for triazine herbicides (atrazine, cyanazine, bromacil, prometon, propazine, simazine, diuron, fluometuron and linuron), nitrate, arsenic, manganese and chloride. Triazine herbicides are a category of weed killers predominantly used on crops.

What was found in the sampled wells?

Thirty-eight percent of the wells sampled exceeded one or more drinking water guidelines.

- Cyanazine breakdown products were detected in 91 well samples (62 percent); 12 wells (8 percent) exceeded the drinking water guideline of 1.0 µg/L (micrograms per liter equivalent to parts per billion).
- Atrazine and its breakdown products were detected in 83 well samples (57 percent) but none were over the drinking water guideline of 3.0 µg/L.
- Nitrate was detected in 85 well samples (58 percent); 41 well samples (28 percent) exceeded the drinking water guideline of 10 mg/L (milligrams per liter equivalent to parts per million).
- Arsenic was detected in 18 percent of samples and exceeded the drinking water guideline of 10 µg/L in one sample.
- Manganese exceeded the drinking water guideline of 0.100 mg/L for infants in 10 percent of samples.
- Chloride was detected in 69 percent of samples; all results were below 250 mg/L (the level where water may start to taste salty).

What are the sources of nitrate in groundwater?

Nitrate occurs naturally in groundwater at very low levels, generally less than 1 mg/L. Elevated levels of nitrate in groundwater are related to human activities. In Dakota County, the major source is nitrogen fertilizer used on agricultural crops that leaches from the soil into the groundwater.

What are the health effects of high levels of nitrate?

Levels of nitrate in drinking water that are above 10 mg/L pose a special risk for infants. When an infant takes in nitrate, the infant's immature digestive system converts the nitrate to a related compound called nitrite. Nitrite binds to hemoglobin and forms methemoglobin, which is very ineffective at carrying oxygen. This creates a condition called methemoglobinemia, or "blue-baby syndrome." This is a

very serious condition and medical treatment should be sought immediately. To be safe, always prepare infant formula with bottled water.

Read more information about water quality and your infant on the Minnesota Department of Health webpage.

What are herbicides and how do they get into drinking water?

Herbicides are used to kill or control weeds and are toxic and dangerous by their nature. It was once believed that herbicides applied to crops would naturally degrade in the environment to simpler, nontoxic compounds called breakdown products. While most herbicides degrade in the soil, the resulting breakdown products are often toxic, persistent and mobile in water. Herbicides and their breakdown products become widely distributed in the broader environment, either through the air or when rain or snow melt carry them into surface water and groundwater.

Two of the herbicides analyzed in 2017 were atrazine and cyanazine.

Atrazine is one of the most widely used herbicides in the County and the U.S. Atrazine has been registered for use since 1959 and is still widely used on corn-growing cropland including Dakota County. The study found 40 percent of the wells sampled contained the parent compound atrazine and 57 percent contained atrazine breakdown products.

Cyanazine was registered for use in 1971 and was widely used on corn in Dakota County from the early 1970s to 2000. It was the fourth most widely used herbicide in the U.S. through the mid-1990s until being banned in 2002 due to human health and environmental concerns. The parent compound cyanazine was not found in any wells sampled. However, breakdown products of cyanazine were found in 62 percent of the wells, even though it has not been used for more than 15 years.

How are the health risks of herbicides determined?

The toxicity of herbicides to plants, animals and humans is studied as part of the herbicide registration process. Most of what we know about the toxicity of these compounds to humans is derived from studies of laboratory animals. These exposure studies help to understand the risks to human health and the environment and are used to establish health-based guidelines for drinking water for individual contaminants. These guidelines do not completely characterize the risk posed by herbicides in groundwater since mixtures of herbicides and herbicide breakdown products most often found in wells are not evaluated for health risks.

What are the health effects of drinking water with elevated levels of cyanazine and atrazine?

The U.S. Environmental Protection Agency (EPA) classifies cyanazine as a "*possible human carcinogen*;" In animal studies, cyanazine was associated with producing birth defects, development effects, female reproductive cycle problems and kidney damage.

The Minnesota Department of Health (MDH) set a drinking water guideline for chronic exposure to cyanazine in drinking water at 1 ug/L.

Atrazine is a restricted use herbicide meaning that only certified herbicide users and applicators can purchase or use it. In 2018, the EPA completed a human health risk assessment of atrazine and its primary breakdown products and concluded that they can cause changes in the blood hormone levels, which negatively affect human development and reproduction. The EPA determined that atrazine "*is not likely to be carcinogenic to humans*."

The MDH has established a drinking water guideline for chronic exposure to atrazine in drinking water at 3 ug/L.

What do I do if my water test results exceed health-based guidelines? Do I need to drill a new well or can I treat my existing well?

The results of this study indicate that the aquifers used for drinking water in the eastern portion of Dakota County are widely contaminated with agricultural chemicals. Drilling a new and deeper well might result in cleaner water, but this study found nitrate, herbicides and herbicide breakdown products in deep wells in Dakota County. This indicates that the pollutants are moving deeper and will, with time, likely contaminate a new, deeper well.

Treating your existing well is an option.

How should I treat my water to reduce nitrate and herbicides?

Distillation, select ion exchange systems and reverse osmosis (RO) systems can reduce a variety of chemicals, such as nitrate and herbicides. RO systems are comprised of a RO membrane and one or more carbon filters. Research studies have found that thin film composite RO membranes have superior performance in removing herbicides compared to those of polyamide or cellulose acetate membranes. If you are purchasing an RO system or already own one, check with the manufacturer to determine if it contains a thin film composite RO membrane.

Activated carbon filters, also known as granular activated carbon (GAC) filters, will reduce herbicides; however, a single pass through a GAC filter may only reduce herbicides by 50 percent. Some water wells in the County with high herbicide concentrations require two passes through carbon filtration to reduce the concentration to below drinking water guidelines. Carbon filters will not remove nitrate. If you live in an agricultural area in Dakota County and have no nitrate, we recommend that you treat your water with one or more carbon filters as a precaution.

To aid you in selecting water treatment, please read the Minnesota Department of Health "Home Water Treatment" factsheet.

Bottled water for drinking and cooking can be an alternative solution or a temporary one until you can install the appropriate water treatment device, especially if infants consume the water.

Will boiling my water reduce agricultural chemicals?

No, boiling the water will not reduce herbicides or nitrate: it will concentrate them and increase the level of the contaminant.

Should I treat my well water for uses other than drinking?

Water with elevated levels of agricultural chemicals can be safely used for purposes such as showering, bathing, washing hands, brushing teeth and watering lawns.

Where do I get more information about effective water treatment devices for all chemicals found in my water?

Find more information about additional water treatment options on the Minnesota Department of Health website.

What should I do if herbicides are detected in my well water sample, but at concentrations below the health-based guideline?

Because the health risks of consuming water with mixtures of herbicides and herbicide breakdown products has not been studied, it is recommended that, at a minimum, the water is treated with a GAC filter. If you want to reduce the nitrate level as well, a reverse osmosis system that includes one or more GAC filters should be installed.

If nitrate is detected, could my well water contain other contaminants?

Yes, cyanazine and other herbicides are typically found in combination with nitrate, and the presence of nitrate is an indication of probable herbicide contamination as well. Of the sampled wells, 89 percent with nitrate above 3 mg/L, also contained one or more herbicide or herbicide breakdown products, with an average of five detected per well.

If nitrate is not detected, is my well water free of herbicides?

Not necessarily, having levels of nitrate below 3 mg/L does not guarantee that your water is safe to drink. For example, in the sampling of 146 wells, two of the 12 wells (17 percent) with levels of cyanazine exceeding the HRL had nitrate levels below 3 mg/L. So, even if nitrate is not detected, it is recommended to, at a minimum, use a GAC filter to remove or reduce herbicides and herbicide breakdown products that may be present.

The sampling occurred in 2017, why are the results just now being released?

Samples collected in 2017 were submitted to the research laboratory operated by the United States Geologic Survey (USGS) in Lawrence, Kansas. This laboratory is the only laboratory in the United States capable of analyzing for the presence of the cyanazine breakdown products. Because it is a research

laboratory, the time it takes for processing samples can be quite long; in this case, the analysis took more than a year.

What kind of help can I expect from Dakota County?

The issue of widespread contamination of the primary drinking water aquifers with herbicides and nitrate is a very serious situation and responding to the public health threats and addressing the significant costs needed to monitor and treat contaminated water supplies is daunting. Developing a comprehensive response strategy will require coordinated efforts between the MDH, Minnesota Department of Agriculture (MDA), Department of Natural Resources (DNR) and Dakota County.

Dakota County is actively working with the MDH and MDA to ensure risk and treatment options are communicated to all affected private well owners. MDA is planning to conduct independent herbicide sampling that will include cyanazine breakdown products in 2019 to determine impacts within the County. Dakota County is collaborating with MDA on the sampling plan and will help ensure information is effectively communicated, as well as, assess the need for additional sampling of potentially impacted areas. The County supports protecting groundwater and the County's 2019 Legislative Platform supports establishing and funding a state program to reimburse public and private drinking water well owners for treatment of well water contaminated with agricultural chemicals that exceed health-based guidelines. In addition, the County is in the process of revising its Groundwater Plan, which will identify goals, objectives and strategies to help prevent future contamination issues and develop an effective response action plan for existing groundwater contamination.

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