



Land and Water Conservation

2020 PRIVATE WELL TESTING & GROUNDWATER SUMMARY

Groundwater is a valuable resource to Calumet County residents. Most residents, businesses, and municipalities rely on groundwater for drinking water and other uses. Calumet County Land and Water Conservation Department (LWCD) has provided a private well testing program for 15 years. Since 2004, 1919 wells have been sampled over 3600 times. Over that time, sample results from Calumet County private wells have indicated that between 21% and 56% of samples were unsafe due to coliform bacteria and/or nitrate contamination. Overall, the cumulative average (latest test from each well) is at 30%, which is the lowest since the data has been analyzed by well. In the County's most vulnerable areas (karst areas), the cumulative results indicate that 39% of the wells did not produce safe drinking water during the latest sample. In some neighborhoods, over 50% of wells can test unsafe.

The Calumet County Land and Water Conservation Department (LWCD) has administered a private well testing program for over 15 years, with the focus on educating private well owners on the importance of testing wells on a regular basis for contaminants. Well owners are recommended to sample their drinking water for coliform bacteria and nitrate every 12-15 months, more frequently if problems are found.

The following report provides information on the 2020 private well samples reported to the LWCD, including the 2020 annual group testing program held in September.

ANNUAL GROUP TESTING PROGRAM

In an effort to encourage private well owners to test their wells, the Calumet County LWCD offers an annual group testing program. The program targets two municipalities annually, rotating between 7 of the 8 municipalities in the county on a four year rotation. The Town of Chilton tests annually.

Benefits of the program include bottle pick up & drop off convenience, free shipping and an education night held approximately 5 weeks after the sampling day. The education night is an opportunity to learn how to interpret results and options to resolve problems with water

quality, including plumbing, proper well maintenance and at-home practices to improve your drinking water.

In 2020, the LWCD targeted private well owners in the Towns of Charlestown, Chilton and Stockbridge through a group testing program. Additional residents on the County Groundwater mailing list were also included. Even with the events of Covid-19, 194 test kits were reserved for the event. On September 21th of this year, samples were collected from 172 wells by residents. All samples were analyzed for coliform bacteria and nitrate. Forty-six samples were analyzed for a metals package. At the time of this report, the DACT screen, which is a screen for atrazine and its by-products, was unavailable. Thirty-six wells were new to the county program, 9 wells that have not been sampled since 2004, and the remaining wells had participated during the past 15 years. The results from the 2020 program are described in Figure (1). Nitrate results from treatment systems (such as a reverse osmosis or R.O. system) were not included in the data analysis.

Figure 1: 2020 Group Testing Program results. All samples drawn on September 21, 2020.

	Chilton # (percent)	Charlestown # (percent)	Stockbridge # (percent)	Other # (percent)	County # (percent)
Number of Wells	N = 70	N = 18	N = 52	N = 32	N = 172
Coliform Bacteria Positive	11 (15.7%)	2 (11%)	8 (15.3%)	5 (15.6%)	26 (15.1%)
E. coli	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Nitrate >10 mg/L	17 (24.3%)	4 (13.0%)	0 (0%)	2 (6.2%)	23 (13.4%)
Nitrate >2 mg/L	47 (67%)	16 (34.8%)	19 (36.5%)	12 (63.2%)	88 (51.1%)
Bacteria Present AND/OR Nitrate >10mg/L	25 (35.7%)	6 (33.3%)	8 (15.3%)	6 (18.7%)	45 (26.1%)

Overall, the percentages of exceedances are up slightly from 2019, but this can be attributed to more wells were tested in karst areas in 2020. However, 2020 is the first year that did not have a well test positive for E.coli during the group sampling event since the two-town rotation began in 2007.

WHAT HAPPENS IF A WELL IS BACTERIA POSITIVE?

The test for total coliform bacteria is sensitive to many different coliform bacteria, including fecal coliforms. Most non-fecal coliforms are not a public health concern, but rather are an indicator that a well is susceptible to contamination from local sources or neighboring land use practices. With a few exceptions, private well owners are not required to take corrective action. A well owner is encouraged to do one or more of the following:

- Perform a retest to ensure the result was not a false-positive result due to sampling error.
- Chlorinate the well. Instructions are made available to well owners to disinfect the well and/or contact a professional to provide this service.
- Perform a well inspection.
 - Is there a vermin-proof cap? Is the conduit cracked?
 - Are there landscaping features or structures around the well that would invite wildlife to nest near the well?
 - Is the area around the well graded to keep standing water away?
 - Does the well terminate at least 12" from grade?
 - Are there any contamination sources close to the well, including downspouts?
 - Is the well meeting state codes? Contact a well professional to inspect casing and well. Consider upgrading or replacing dug wells or pit wells.
- Is the private onsite waste treatment system (POWTS) functioning properly? Date of last inspection?
- Is there another unused or old well located on the property?

Some local (on-site) contamination sources discovered through conversations or site inspections in Calumet County:

- Well surrounded by landscaping or false rock.
- Chickens housed in the well house.
- No vermin proof cap.

WHAT HAPPENS WHEN NITRATE EXCEEDANCE OCCURS?

Short-term exposure to high nitrate levels are a concern for pregnant women, women who are trying to become pregnant, infants under 6 months of age, and others with compromised immune systems. It is recommended that all well owners reduce or eliminate long-term consumption. Well owners are encouraged to make sure their well is properly maintained, following the same guidelines and questions for bacteria positive wells above. Nitrate in groundwater tends to persist overtime, but can be treated with a point of use system such as a reverse osmosis system or a distillation system. A homeowner is encouraged to make sure the

device installed is certified by Wisconsin Dept. of Safety and Professional Services and test the device for efficiency if nitrate exceeds 15 mg/L.

Similar to total coliform bacteria, nitrate is used as an indicator to determine if the well is susceptible to contamination from local sources or neighboring land use practices.

GROUNDWATER EDUCATION NIGHT

On November 4th, participants were invited to an online event that focused on how to interpret the lab reports and provide information on how wells work and proper well maintenance. Calumet County staff and UW-Extension staff are available throughout the evening to answer questions that well owners may have. This event is always well attended, with 32 people in attendance in 2020. Slides from the event are available on the County's private well testing webpage at <https://www.calumetcounty.org/316/County-Private-Well-Testing-Day>

METALS AND PESTICIDES

Some metals cause problems that are considered aesthetic in nature, including sulfate, iron and sodium, while others are associated with health related risks, such as arsenic, lead and copper. Wells in the northern part of the county and along the L. Winnebago shoreline typically rely on the lower St. Peter Sandstone Aquifer, and are well known for having very hard water with a strong sulfur smell. Wells routinely test high for sulfate, sodium, hardness, and other inorganics in this aquifer, and some excessively exceed aesthetic limits. This can make it very challenging for a well owner to treat water enough to remove these aesthetic problems.

Arsenic is found in some county wells and levels occasionally exceed the safe drinking water standard of 10 parts per billion (ppb). However, most wells that do exceed safe drinking limits are rarely above 20 ppb, much lower than results in neighboring counties where wells test over 100 ppb (Outagamie, Winnebago). Well owners are encouraged to test for arsenic at least once. If found elevated, it is recommended to sample every 3-5 years to monitor for rising levels.

Arsenic levels may increase with declining water tables. A treatment system may be installed at the drinking water faucet to correct for high levels of arsenic.

Copper and lead are found in some homes in Calumet County. The presence of copper and lead is not related to geology or geographic distribution. The source of these two metals is primarily plumbing in the home. If levels exceed the safe drinking water standard, homeowners are encouraged to run the water a few minutes prior to drinking to flush out water that was in contact with the plumbing for an extended period of time.

Forty-one wells performed the DACT screen which tests for triazines, a class of pesticides that include atrazine, simazine and cyanazine. Four wells detected levels of triazines, but no samples exceeded the safe drinking water standard set at 3.0 parts per billion.

COUNTY-WIDE PRIVATE WELL DATA 2005-2020

Beyond the annual group testing program, the department receives test results from additional sources including the following:

- Year-round voluntary private well testing.
- County Land Division Ordinance.
- County Health Department; Infant Wellness Program (Bacteria, Nitrate, Metals, and more).
- County LWCD funding for investigating spills or brown water events.
- Occasional research or DNR investigations.

In 2020, 183 samples were taken throughout the county and reported to the LWCD. 2020 was the slowest participation rate since 2013 likely due to COVID 19.

Figure 2: Annual test results from private well samples in Calumet County. Cumulative Data (in yellow) represents the most recent sample from each participating well.

Private Well Test Results County-Wide 2005-2020										
	# Samples (Bars)	Coliform Bacteria Positive	% Coliform Bacteria Positive	E. coli Positive	% E.coli Positive	# Samples (Bars)	Nitrate > 10 mg/L	% Nitrate Exceedance	Unsafe	% Unsafe Wells (Bacteria or Nitrate)
2004	226	67	30%	13	6%	199	59	30%	102	45%
2005	277	74	27%	13	5%	237	63	27%	110	40%
2006	260	77	30%	20	8%	262	123	47%	156	53%
2007	422	109	26%	13	3%	416	148	36%	206	45%
2008	269	77	29%	13	5%	273	91	33%	140	45%
2009	261	53	20%	6	2%	261	53	20%	93	36%
2010	251	68	27%	14	6%	253	66	26%	108	43%
2011	190	39	21%	4	2%	190	44	d	69	36%
2012	191	30	16%	4	2%	186	38	20%	55	29%
2013	134	21	16%	1	1%	130	24	18%	43	32%
2014	193	45	23%	14	7%	167	33	20%	63	33%
2015	230	40	17%	6	3%	220	57	26%	84	37%
2016	209	59	28%	9	4%	201	45	22%	87	42%
2017	206	25	12%	2	1%	205	28	14%	43	21%
2018	259	57	22%	19	7%	226	28	12%	79	30%
2019	272	51	19%	8	3%	231	33	14%	74	27%
2020	183	31	17%	1	1%	181	26	14%	52	28%
Cumulative Data*	1919	383	20%	51	3%	1817	307	17%	606	30%

* Wells in the Calumet County Test Program may be sampled multiple years. These data represent the most recent sample from each participating well.

WATER QUALITY IN KARST AREAS OF CALUMET COUNTY

There are areas in the county that are more susceptible to groundwater contamination. These areas are delineated on the Silurian Dolomite Aquifer Susceptibility Map (Right Map: red and blue areas). These areas are defined as moderately to highly susceptible to contamination due to proximity of bedrock to the surface, presence of karst features characteristic of the dolomite (limestone) aquifer, and/or thin soils.

Well testing data indicate that contamination percentages increase in karst areas of Calumet County; cumulative rates of 39% of wells tested unsafe for bacteria and/or nitrate (Figure 3), compared to 30% county-wide.

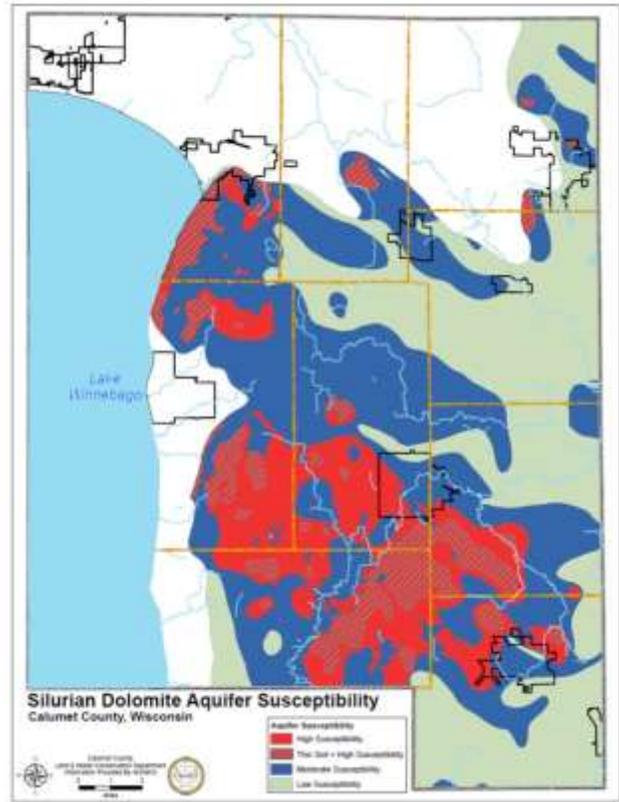


Figure (3): Annual test results from private well samples in Karst Areas of Calumet County. Cumulative Data (in yellow) represents the most recent sample from each participating well.

Private Well Test Results in Karst Areas 2005-2020										
Year	# Samples (Bars)	Coliform Bacteria Positive	% Coliform Bacteria Positive	E. coli Positive	% E.coli Positive	# Samples (Bars)	Unsafe ≥ 10 mg/L	% Nitrate Exceedance	Unsafe	% Unsafe (Bacteria or Nitrate)
2004	169	51	30%	12	7%	156	56	36%	83	49%
2005	255	62	24%	13	5%	194	62	32%	97	38%
2006	195	65	33%	18	9%	193	102	53%	126	62%
2007	272	83	31%	9	3%	267	123	46%	155	55%
2008	190	57	30%	11	6%	188	71	38%	101	50%
2009	166	42	25%	10	6%	163	65	40%	88	52%
2010	144	38	26%	13	9%	145	55	38%	70	47%
2011	124	31	25%	4	3%	122	42	34%	60	48%
2012	130	29	22%	4	3%	125	37	30%	53	40%
2013	85	16	19%	1	1%	83	22	27%	35	41%
2014	124	39	31%	13	10%	102	28	27%	53	43%
2015	152	26	17%	5	3%	142	54	38%	69	45%
2016	154	45	29%	8	5%	148	40	27%	69	45%
2017	123	20	16%	2	2%	123	27	22%	42	34%
2018	148	34	23%	18	12%	120	24	20%	52	35%
2019	165	38	23%	5	3%	138	33	24%	54	36%
2020	128	21	16%	1	1%	125	24	19%	40	31%
Cumulative	1035	229	22%	38	4%	988	267	27%	420	39%

* Wells in the Calumet County Test Program may be sampled multiple years. These data represent the most recent sample from each participating well.

The unique geology and soils of Calumet County present challenges in protecting groundwater. The upper layer of bedrock is a type of rock that is easily dissolved by water. Extensive networks of vertical and horizontal fractures (cracks) in the bedrock are continuously forming. These features, such as sinkholes, disappearing streams, and caves are called “karst” features.

Groundwater typically moves less than 1 foot per day, but in areas of thin soil and fractured bedrock, water and pollutants can move 100 feet or more per day. If a private well is connected to a fracture that has a direct conduit to the surface (karst feature), the well can be easily impacted by any land use near the karst feature.

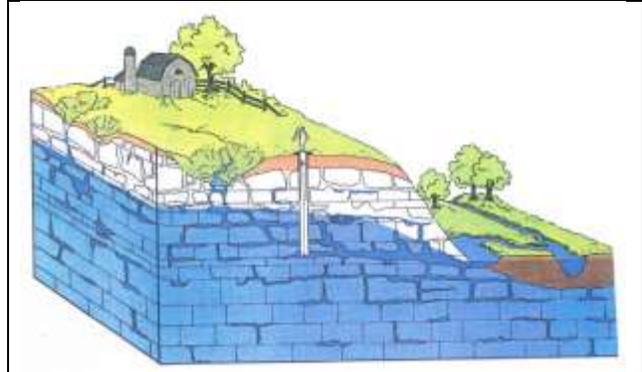


Diagram of a karst landscape showing how a private well intersects fractures that are connected to a karst feature at the surface, such as a sinkhole.

ANNUAL TESTING RECOMMENDATIONS

Private well owners are responsible for maintaining and testing their local drinking water supply. It is important to understand the quality of a private drinking water supply by testing on an annual basis for bacteria and nitrates - at a minimum. The programs offered by Calumet County are voluntary and well owners are not required to take corrective action if a problem is discovered. Recommendations are provided based on well test results, location in the County, and general water quality in the area. On occasion, staff will conduct site visits upon request. Bottles are available year-round in the LWCD office, Room 227 of the Calumet County Courthouse.

CONTACT INFORMATION FOR FURTHER QUESTIONS

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