2021 Targeted Sampling Summary Report

ANNUAL REPORT

Wisconsin Department of Agriculture, Trade and Consumer Protection
Agricultural Resource Management Division
Environmental Quality Unit

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Introduction

Wisconsin's groundwater law, Chapter 160, Wis. Stats., requires agencies to sample and monitor groundwater for substances related to facilities, activities and practices under their jurisdiction, that have a reasonable probability of entering the groundwater resources of the state. This includes determining if preventive action limits, enforcement standards, or advisories have been exceeded at points of standards application. The statute further specifies that agencies develop monitoring plans that include provisions for conducting four types of monitoring (Wis. Stats., Ch. §160.05 and §160.27):

- Problem assessment monitoring, to detect substances in the groundwater and to assess the significance of the concentrations of the detected substances;
- Regulatory monitoring, to determine if preventive action limits or enforcement standards are attained or exceeded and to obtain information necessary for the implementation of responses with respect to specific sites;
- At-risk monitoring, to define and sample at-risk potable wells in areas where substances are detected in the groundwater or where preventive action limits or enforcement standards are attained or exceeded; and
- Management practice monitoring, to assure practices are within compliance regulations.

A compilation of acronyms and definitions used throughout this document is provided in Appendix A - Acronyms and Definitions.

PURPOSE OF TARGETED SAMPLING

It is estimated that agriculture contributes $104.8 billion annually[1] to Wisconsin's economy. Growers use millions of pounds of pesticides and millions of tons of fertilizers annually to grow a wide variety of crops. Wisconsin's Department of Agriculture, Trade and Consumer Protection's (DATCP) Targeted Sampling Program (TSAMP) helps the agency meet its statutory obligation to monitor groundwater (problem assessment and regulatory monitoring). The agency utilizes a targeted approach to select drinking water wells that are at risk of being im

pacted by agricultural chemicals. The program tests private drinking water wells located in or near agricultural areas for pesticides and nitrogen as nitrate/nitrite (nitrogen).

PROGRAM APPROACH AND SELECTION CRITERIA

The potential for agricultural chemicals to influence groundwater quality at any particular location is dependent on site-specific conditions. Criteria used to select study areas for TSAMP testing focuses on conditions that make groundwater prone to contamination. These criteria vary from year to year and between study areas.

[1] Contribution-of-Ag-to-WI-Econ-4-Update.pdf (wisc.edu)

Criteria used for study area selection include:

- Areas susceptible to groundwater contamination due to geology (i.e. sandy soils with shallow groundwater, shallow depth to bedrock, or karst features).
- Areas where prior testing by others (county government, university, private owner, etc.) indicates elevated nitrogen, pesticides or other unusual test results.
- Areas in or near an existing atrazine prohibition area (PA), or areas where other restrictions on pesticide use has occurred out of concern for groundwater protection.
- Areas with little variation in crop rotation (e.g. corn, cranberry, and ginseng grown year after year) increasing the likelihood of repetitive pesticide-use in the area.
- Areas where crops are grown that require extensive chemical or fertilizer inputs and/or irrigation.
- Areas where pesticides with characteristics of high mobility and resistance to degradation are used.

TSAMP planning was performed early in the year for sample collection during the summer months. Planning starts with DATCP staff and management agreeing on the number of samples to be collected for the coming year. Program goals vary from year to year. Generally, about half of the wells sampled each year are new to the program, and half are repeat samples. Repeat testing is performed at wells previously sampled five or more years earlier. Using this approach, groundwater quality observations can be made for the target area while groundwater quality trends over time can be measured. Permission to sample private wells is typically obtained in advance, but staff may also seek permission from a well owner while in the area based on observations made the day of sampling.

Another goal of TSAMP is to identify the relationship between known well construction information including well depth, casing depth, well age, geologic formation, and groundwater quality observations. For example, water quality for wells that are 80 to 100 feet deep may be compared to other wells at similar depths in the target area rather than comparing results from shallower wells. Likewise, wells that are cased to the bedrock surface may be compared to wells cased at greater depth into bedrock.

Samples are collected using standard DNR and DATCP sampling protocols (Groundwater Sampling Field Manual, PUBL-DG-038 96 and Groundwater Sample Collection-Monitoring Well 1/21, respectively), and then hand delivered to the DATCP Bureau of Laboratory Services (BLS) for pesticide and nitrogen analyses. DATCP hydrogeologists provide homeowners with a copy of their analytical results within ten days of receiving the data from BLS. DATCP staff assist with interpretation of results and assist in resolving any water contamination issues.

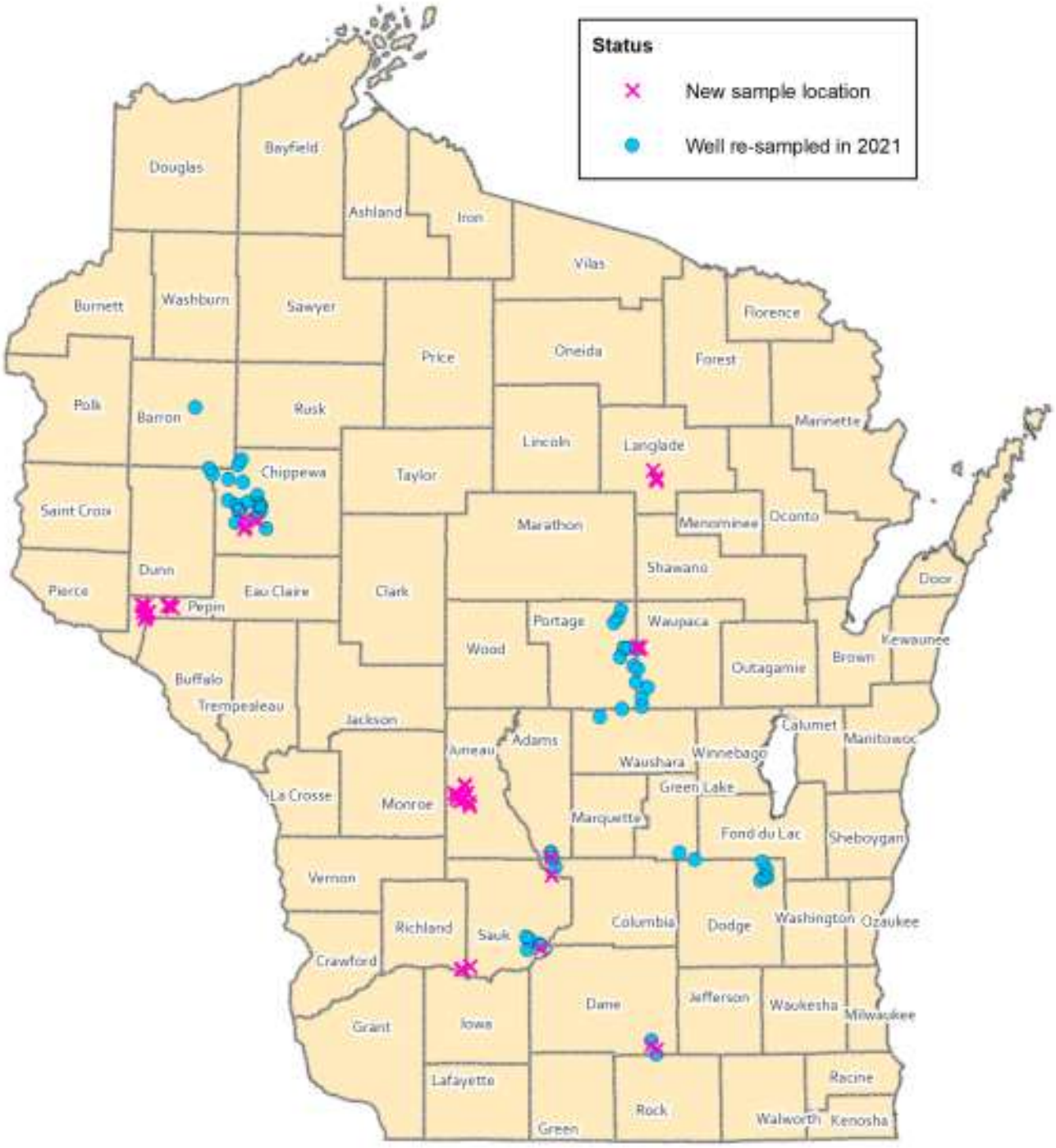
2021 Program Specifics

For 2021, staff planned for the collection and analysis of at least 100 samples. To reach this number, DATCP staff contacted about 170 homeowners. Approvals were gained from 53 homeowners whose wells were sampled in a prior year (2015 or 2016), and from 51 homeowners whose wells had not been a part of the TSAMP prior. A total of 104 samples were collected from private wells within agricultural areas in 16 counties between June and September (Figure 1). Table 1 shows the counties and communities tested in 2021 and the number of samples collected within each area. Figure 2 depicts where all TSAMP wells have been sampled since 2010.

Analytical Testing and Groundwater Standards

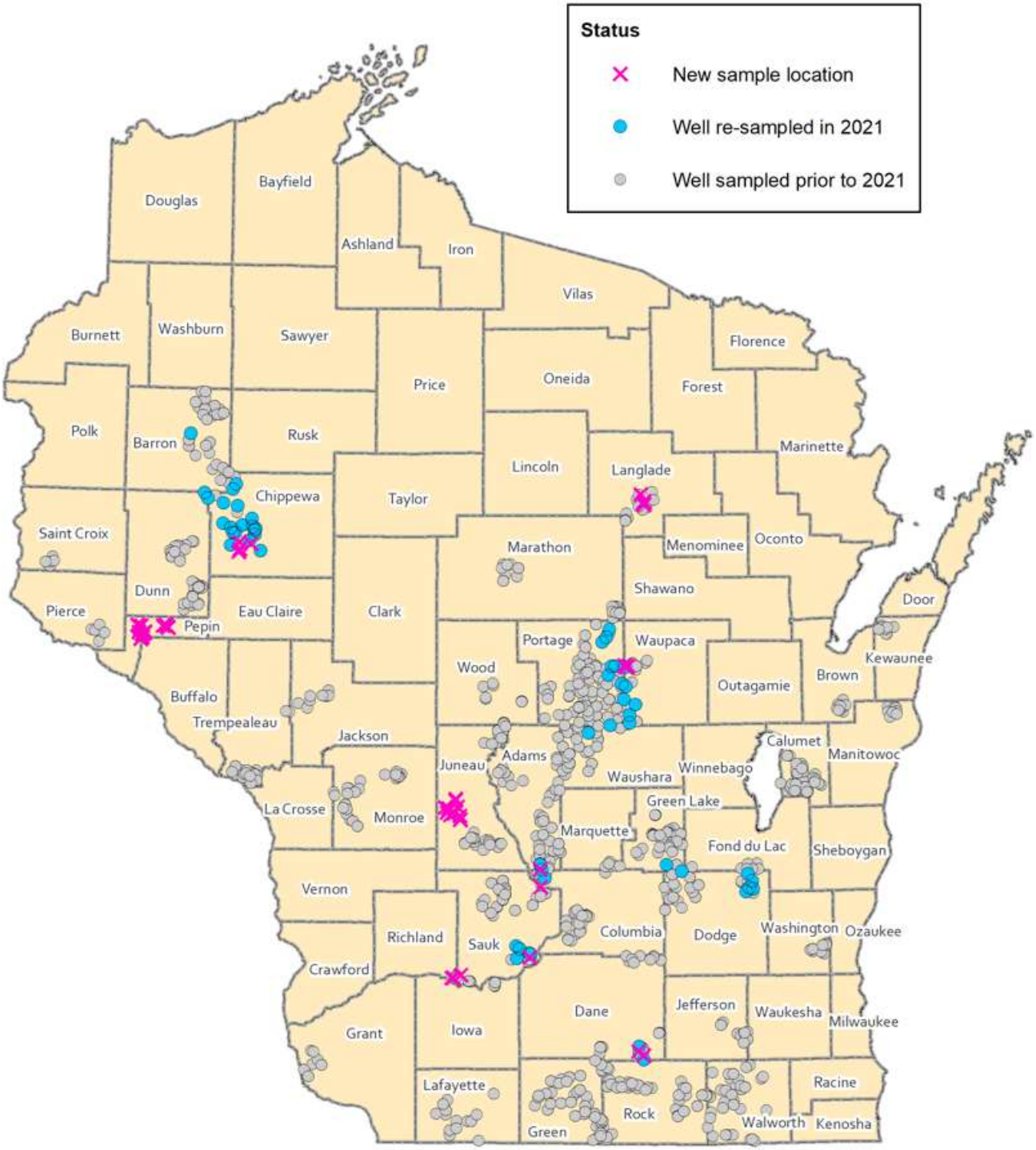
BLS performed all groundwater analytical testing using GC/MS/MS and LC/MS/MS in accordance with ISO 17025 accreditation standards. All samples were tested for 107 pesticides and nitrogen. A full listing of compounds analyzed is included in Appendix B along with Wisconsin's groundwater quality standards referencing both Wisconsin Administrative Code (Wis. Admin. Code) ch. NR 140 Preventive Action Limits (PALs) and Enforcement Standards (ESs), and Wisconsin Department of Health Services (WDHS) drinking water health advisories for each compound.

Figure 1: 2021 TSAMP Well Locations



Note: Figure 1 shows locations for all 104 TSAMP wells tested in 2021. A X shows locations of 51 new wells sampled, while ● shows locations of 53 wells previously sampled in 2015 or 2016 in addition to 2021.

Figure 2: TSAMP Well Locations since 2010



Note: Figure 2 shows first-time well locations sampled in 2021 (X), and those wells sampled in 2015 or 2016 and resampled in 2021 (●). Historic TSAMP locations from all samples collected since 2010 are shown as Grey dots (●). These areas also show where repeat sampling is likely to occur in future years.

Table 1: TSAMP Sample Location Summary for 2021

Community/Area	Counties	Number of Samples
Baraboo, North Freedom, Wisconsin Dells, Prairie du Sac, Lone Rock	Adams, Columbia, Sauk, Richland	16
Chippewa Falls, Bloomer, Chetek, New Auburn, Rice Lake	Barron, Dunn, Chippewa	24
New Lisbon, Tomah, Black River Falls	Juneau	12
Edgerton, Stoughton	Dane	4
Brownsville, Fox Lake, Mayville, Markesan, Waupun	Dodge, Green Lake	9
Antigo, Bryant	Langlade	4
Almond, Amherst, Plainfield, Rosholt, Waupaca, Scandanavia	Portage, Waushara, Waupaca	19
Arkansaw, Durand	Pepin	16

Results

A total of 104 groundwater samples were collected from private drinking water wells as a part of the TSAMP effort in 2021. A summary of all compounds detected above laboratory reporting limits is shown in Table 2. A copy of test results were mailed to all well owners upon receipt of the data from BLS. Owners that have an Enforcement Standard (ES) or drinking water health advisory exceedance receive drinking water advisory information for each compound that exceeds an ES or an advisory. Copies of drinking water advisories issued in 2021 are included in Appendix C.

NITROGEN

In 2021, nitrogen was measured above the detection limit in 81% of samples collected. Nitrogen exceeded the 10 milligram per liter (mg/L or parts per million [ppm]) ES in 37.5% of wells sampled. The percentage of wells with ES exceedances for 2021 is higher than results from the 2017 statewide sampling survey. In that random survey, only 8% of wells sampled exceeded the ES for nitrogen (Wisconsin DATCP, 2017). A greater exceedance rate was expected for the TSAMP survey because it is a biased method of sampling for pesticides and nitrogen.

Table 2: Summary of compounds detected in 2021 tsamp samples, relative to standards

Compound Detected	Range Detected *	Detections				PAL / ES *	WDHS *
		Total	>=PAL	>=ES	>=WDHS		
NITROGEN	0.537 - 35.6	85	77	39	---	2 / 10	---
ATRAZINE TCR	0.053 - 1.64	49	12	0	---	0.3 / 3.0	---
ATRAZINE	0.056 - 0.328	12	0	0	---	0.3 / 3.0	---
DE-ETHYL ATRAZINE	0.053 - 0.663	43	0	0	---	0.3 / 3.0	---
DEISOPROPYL ATRAZINE	0.059 - 0.128	13	0	0	---	0.3 / 3.0	---
DIAMINO ATRAZINE	0.203- 1.49	10	0	0	---	0.3 / 3.0	---
ACETOCHLOR ESA	0.052 - 1.29	22	0	0	---	46 / 230	---
ACIFLUORFEN	0.101	1	---	---	---	---	---
ALACHLOR	0.0971	1	0	0	---	0.2 / 2.0	---
ALACHLOR ESA	0.055 - 6	63	4	0	---	4 / 20	---
ALACHLOR OA	0.261 - 0.446	3	---	---	---	---	---
BENTAZON	0.073 - 1.5	9	0	0	---	60 / 300	---
CLOMAZONE	0.226	1	---	---	---	---	---
CLOTHIANIDIN	0.011 - 0.298	25	---	---	0	---	1,000
DIMETHENAMID ESA	0.062 - 1.26	9	---	---	---	---	---
DIMETHENAMID OA	0.146 - 0.731	6	---	---	---	---	---
FLUMETSULAM	0.058	1	---	---	0	---	10,000
FOMESAFEN	0.084 - 4.14	8	---	---	0	---	25
HEXAZINONE	0.378	1	---	---	0	---	400
IMAZAPYR	0.068	1	---	---	---	---	---
IMIDACLOPRID	0.0112 - 0.582	10	---	---	2	---	0.2
METALAXYL	0.074 - 1.52	6	---	---	0	---	800
METOLACHLOR	0.053 - 0.674	7	0	0	---	10 / 100	---
METOLACHLOR ESA	0.054 - 25.9	83	0	0	---	260/1,300	---
METOLACHLOR OA	0.288 - 21.2	22	0	0	---	260 / 1,300	---
METRIBUZIN	0.109 - 1.11	8	0	0	---	14 / 70	---
METRIBUZIN DADK	0.338 - 0.992	9	---	---	---	---	---
SAFLUFENACIL	0.065 - 0.202	3	---	---	0	---	460
SULFENTRAZONE	0.059	1	---	---	0	---	1,000
THIAMETHOXAM	0.014 - 1.17	7	---	---	0	---	100

Notes: Units: Nitrogen = mg/L (milligrams per liter, equivalent to parts per million) and Pesticides = µg/l (micrograms per liter, equivalent to parts per billion). Standard not established.

DADK Desaminodiketo
WDHS Wisconsin Department of Health Services Drinking Water Health Advisory
ES Enforcement Standard as defined in Wisconsin Administrative Code Chapter NR 140.
ESA Ethanesulonic acid
Nitrogen Nitrogen as nitrate and nitrite.
OA Oxanilic acid
PAL Preventive Action Limit as defined in Wisconsin Administrative Code Chapter NR 140.
TCR Total Chlorinated Residues of atrazine; which includes the sum of atrazine plus its metabolites de-ethyl atrazine, de-isopropyl atrazine, and di-amino atrazine.

One program goal is to resample wells on an approximate five-year cycle and evaluate trends in concentrations over time. Table 3 shows a summary of changes observed in nitrogen concentrations for samples collected from 53 wells in 2015 or 2016, and again in 2020. With only two years of data from these wells, limited conclusions can be made about trends in contaminant concentrations at any location. Additional samples from these wells will be needed in future years to further evaluate long-term trends.

Table 3: Nitrogen Concentration Changes within 2021 TSAMP Sampling

Nitrogen comparison for 53 wells sampled in 2015 or 2016, and again in 2020		
Increased Nitrogen - 20 Locations	No Change - 9 Locations	Decreased Nitrogen - 24 Locations
11 increased less than 2 mg/L	All were below detection limits in both sampling events	11 decreased less than 2 mg/L
5 increased by 2 to 5 mg/L		10 decreased by 2 to 5 mg/L
3 increased by 5 to 10 mg/L		3 decreased by 5 to 10 mg/L

Nitrogen occurrence data is further evaluated in four tables below. Each table summarizes a specific subset of wells sampled and presents the results relative to the nitrogen PAL (2 mg/L) and ES (10 mg/L). Table 4A summarizes nitrogen occurrence for all 104 wells sampled in 2021. Table 4B provides nitrogen occurrence data for the 51 wells sampled for the first time in 2020. Table 4C summarizes the nitrogen data for 53 wells sampled a second time in 2020, and Table 4D provides the data for those same 53 wells sampled in 2015 or 2016.

Table 4: Nitrogen Summary - Samples Results for all 104 wells tested in 2021

Nitrogen Occurrence Data--All 104 Wells Sampled in 2021		
27 wells sampled were between 0 and 2 mg/l	26%	62% <= 10 mg/L
17 wells sampled were between 2 and 5 mg/l	16%	
21 wells sampled were between 5 and 10 mg/l	20%	
22 wells sampled were between 10 and 20 mg/l	21%	37% > 10 mg/L
17 wells sampled exceeded 20 mg/l	16%	

Table 4A shows that 26% of samples collected in 2021 detected nitrogen less than or equal to 2 mg/L (PAL). Data indicated 36% of the samples contained nitrogen concentrations that were greater than the PAL level of 2.0 mg/L and less than the ES level of 10 mg/L. Overall, 62% of wells tested in 2021 detected nitrogen less than the ES. The ES was exceeded in the remaining 37% of wells tested.

Table 4B provides a similar summary for the 51 wells sampled for the first time in 2021. Similar results were observed for this smaller dataset; 59% of samples detected nitrogen at concentrations less than or equal to the ES while 41% exceeded the ES.

Table 5: Nitrogen Summary -Results for 51 new wells tested in 2021

Nitrogen Occurrence--51 Wells Sampled First Time in 2021		
14 wells sampled were between 0 and 2 mg/l	27%	59% <= 10 mg/L
6 wells sampled were between 2 and 5 mg/l	12%	
10 wells sampled were between 5 and 10 mg/l	20%	
10 wells sampled were between 10 and 20 mg/l	20%	41% > 10 mg/L
11 wells sampled exceeded 20 mg/l	21%	

Observations over time can also be made by comparing past data to the 2021 results. Table 4C compares nitrogen occurrence data for all 53 locations sampled in 2021 versus the results for those same wells sampled in 2015 or 2016.

Table 6: Nitrogen Occurrence Comparison - 53 locations sampled in 2021 vs in 2015 or 2016

Nitrogen Concentration Range		53 wells in 2021		53 wells in 2015 or 2016
Nitrogen from 0 to 2 mg/L	24%	66% <= 10 mg/L	23%	60% <= 10 mg/L
Nitrogen >2 to < 5 mg/L	21%		24%	
Nitrogen >5 to < 10 mg/L	21%		13%	
Nitrogen >10 to < 20 mg/L	23%	34% > 10 mg/L	34%	40% >10 mg/L
Nitrogen exceeds 20 mg/L	11%		6%	

As shown, the number of wells with nitrogen concentrations ranging from not-detected up to 10 mg/L increased by 6% (from 60 to 66%) in 2021. This suggests that water quality improved for some homeowners whose water had exceeded the ES five years earlier to concentrations less than 10 mg/l nitrogen in 2021. In 2021, there were fewer wells overall that exceeded the 10 mg/L ES, but the number of wells that tested greater than 20 mg/l nearly doubled in number compared to earlier sample years (6 to 11%).

Pesticides

DETECTIONS:

One or more pesticide or pesticide metabolite compounds were detected in 80% of samples collected in 2021 (83 of 104 samples). A total of 28 different pesticides or pesticide metabolites were detected in samples (see Table 2). The five most frequently detected compounds are listed below along with the number of times (n) each compound was detected.

- Metolachlor *ethanesulonic acid* (ESA) (n=83)
- Alachlor ESA (n=63)
- De-ethyl atrazine (n=43)
- Clothianidin (n=25)
- Acetochlor ESA (n=22)
- Metolachlor *oxanilic acid* (OA) (n=22)

Four of the most frequently detected compounds are metabolites of the herbicides metolachlor, alachlor, atrazine, and acetochlor. Each of these compounds are in products commonly used to control weeds in corn or other crops grown in the state. Metolachlor ESA and alachlor ESA were reported as the two most frequently detected pesticide residues in the 2016 statewide sampling of private wells conducted by DATCP (Wisconsin DATCP, 2017). Alachlor ESA concentrations are expected to decline over time because alachlor is a cancelled product, and use was significantly reduced by growers prior to cancellation in June 2016 (EPA, June 30, 2016). The compound clothianidin is a systemic neonicotinoid insecticide that is used to control insects in corn, small grains, soybeans, and vegetable crops. Two additional neonicotinoid insecticides that were also detected less frequently include imidacloprid (n=10) and thiamethoxam (n=7).

STANDARDS COMPARISON:

Pesticides or pesticide metabolites detected in 2021 TSAMP were compared to existing groundwater quality standards listed in Wis. Admin. Code ch. NR 140 (NR 140) and WDHS drinking water quality advisories. Of the 107 compounds tested for, there are 30 compounds with established regulatory groundwater standards and 17 compounds with drinking water health advisories. The 2021 analytical results are summarized in Table 2. The right column of Table 2 shows established Wis. Admin. Code ch. NR 140 PALs and ESs and WDHS drinking water health advisories for compounds detected. Seven pesticide compounds detected in 2021samples currently have no groundwater quality standard.

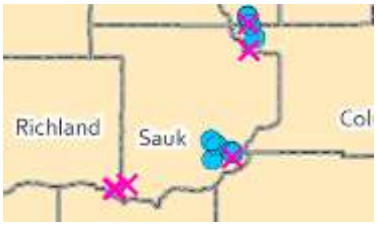
Several pesticides or pesticide metabolites were detected above groundwater standards and drinking water health advisories. One compound, imidacloprid was detected in excess of the DHS drinking water health advisory of 0.2 µg/l in two samples. Both homeowners were notified of the advisory exceedance and the wells will be retested in 2022 to confirm results. Nine additional pesticide compounds with drinking water health advisories were detected in 2020, including clothianidin, flumetsulam, fomesafen, hexazinone, imidacloprid, metalaxyl, saflufenacil, sufentrazone, and thiamethoxam. Atrazine TCR (the sum of atrazine plus its three metabolites) exceeded the 0.3 µg/l PAL in 12 samples, and alachlor ESA was detected in excess of the 4 µg/l PAL in four samples.

Data Summaries for 2021 TSAMP Study Areas

Results for all samples collected in 2021 TSAMP are presented in data summary tables that follow. Summary tables are organized by county in the order listed below.

- Adams, Columbia, Sauk and Richland
- Barron, Dunn and Chippewa
- Juneau
- Dane
- Dodge and Green Lake
- Langlade
- Portage, Waushara and Waupaca
- Pepin

SUMMARY - ADAMS, COLUMBIA, SAUK AND RICHLAND:



In 2021, DATCP collected groundwater samples from six wells in Adams and Columbia counties and from 10 wells in Sauk and Richland Counties. Samples from Adams and Columbia County were from homes with Wisconsin Dells mailing addresses. Samples from Sauk and Richland Counties were from homes with Prairie du Sac, Sauk City, Spring Green, or Lone Rock addresses. Well locations are shown on the image to the right.

Crops observed in these areas include mainly corn, soybeans, potatoes, and some hay and forage crops. Irrigation was common. Well records show that static water depths vary greatly with location, ranging from 12 to 216 feet below ground surface (bgs). Well water is drawn from sand and gravel deposits and underlying sandstone bedrock, and in one case, shale.

Nine of these wells were also sampled in 2015 or 2016. The remaining seven wells were sampled for the first time in 2021. Sampling results are summarized in Table 7.

Table 7: 2021 TSAMP Analytical Results for Adams, Columbia, Sauk and Richland Counties

WUWN	County	Sample Date (month/year)	Installation Date (month/year)	Well Depth (in feet)	Bedrock Depth (in feet)	Casing Depth (in feet)	Casing Diameter (in inches)	Static Water Depth (in feet)	ACETOCHLOR ESA	ALACHLOR	ALACHLOR ESA	ALACHLOR OA	ATRAZINE (TCR)	BENTAZON	CLOMAZONE	CLOTHIANIDIN	IMIDACLOPRID	METALAXYL	METOLACHLOR	METOLACHLOR ESA	METOLACHLOR OA	METRIBUZIN	METRIBUZIN DADK	SULFENTRAZONE	NITROGEN
JE191	Adams	Jun-21	May-05	200		190	8		0	0.097	0.165	0.261	0.336	0	0.226	0	0	0	0	0.636	0	0	0	0	10.
JE191	Adams	Jul-15	May-05	200		190	8		0	0.274		0.51	1.229	0	0.299	0	0	0	0	2.86	0	0		0	11.
JE192	Adams	Jun-21		140		136		115	0	0	0.105	0	0.06	0	0	0	0	0	0	0.217	0	0	0	0	3.1
JE192	Adams	Jul-15		140		136		115	0	0		0	0.155	0	0	0	0	0	0	1.88	0.295	0		0	8.2
JE193	Adams	Jun-21		144		140		130	0	0	0.342	0	0	0	0	0	0	0	0	0.182	0	0	0	0	0
JE193	Adams	Jul-15		144		140		130	0	0		0	0	0	0	0	0	0	0	0.188	0	0		0	0
WA878	Adams	Jun-21	Jun-83	200	121	123	6	140	0	0	0.372	0	0.499	0	0	0	0	0	0	0.417	0	0	0	0	6.6
OS874	Columbia	Jun-21	Nov-01	140	100	114	6	68	0	0	0.578	0	0.166	0	0	0	0	0	0	1.08	0	0	0	0	7.1
OS874	Columbia	Jun-15	Nov-01	140	100	114	6	68	0	0		0	0	0		0	0	0	0	0.262	0	0		0	5.
TE426	Columbia	Jun-21	Nov-05	35		31	2	16	0.0902	0	0.414	0	0	0	0	0.038	0	0	0	2.88	0.664	0	0	0	18.
FI810	Sauk	Jun-21	Jun-92	134	93	104	6	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FI810	Sauk	Oct-16	Jun-92	134	93	104	6	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VR808	Sauk	Jun-21							0	0	0.055	0	0	0	0	0	0	0	0	2.31	0.324	0	0	0	22.
VR808	Sauk	Oct-16							0	0	0.264	0	0	0	0	0	0	0	0	1.41	0	0	0	0	19.
VR812	Sauk	Jun-21							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VR812	Sauk	Oct-16							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
XI993	Sauk	Jun-21							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
XI993	Sauk	Oct-16							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VR811	Sauk	Jun-21							0	0	0	0	0	0	0	0.025	0	0	0	3.42	0	0	0	0	7.5
VR811	Sauk	Oct-16							0	0	0	0	0.097	0	0	0	0	0	0	5.22	0	0	0	0	10.
GC662	Sauk	Jun-21	Jan-94	260	214	216	6	167	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RR218	Sauk	Jun-21	Sep-97	31		27	2	12	0	0	0	0	0.087	0	0	0.012	0	0	0	4.45	1.48	0	0	0	0
SH432	Richland	Jun-21	Jun-04	70		67	4	16	0	0	0.623	0	0.413	0.499	0	0.123	0.096	0	0.557	24.2	19.7	1.11	0.492	0	28
TG815	Richland	Jun-21	Apr-06	66		59	4	17	0	0	0.436	0	0.104	0.538	0	0.182	0.087	0	0.231	25.9	21.2	0.289	0.357	0	27.
WA867	Richland	Jun-21							0	0	0.833	0	0	1.5	0	0.298	0.031	1.52	0.674	21.1	10.9	0.226	0.354	0.059	25.

Notes: **Units: Nitrogen = mg/l (milligrams per liter, equivalent to parts per million) and Pesticides = µg/l(micrograms per liter, equivalent to parts per billion).*

WDHS Wisconsin Department of Health Services Drinking Water Health Advisory
ES Enforcement Standard as defined in Wisconsin Administrative Code Chapter NR 140.
ESA Ethanesulonic acid
Nitrogen Nitrogen as nitrate and nitrite.
OA Oxanilic acid
PAL Preventive Action Limit as defined in Wisconsin Administrative Code Chapter NR 140.
TCR Total Chlorinated Residues of atrazine; which includes the sum of atrazine plus its metabolites de-ethyl atrazine, deisopropyl atrazine, and di-amino atrazine.
WUWN Wisconsin Unique Well Number

Shaded rows present data from a prior sample year (2015 or 2016).
Zero (0) No detection above laboratory reporting limits.
Blank cells indicate compound not-analyzed or data/information not available.
5.0 Indicates concentration greater than the respective Wis. Admin. Code ch NR 140 PAL.
5.0 Indicates concentration greater than the respective Wis. Admin. Code ch NR 140 ES.
5.0 Indicates concentration greater than the respective WDHS Drinking Water Health Advisory.

Result observations for Adams, Columbia, Sauk, and Richland Counties include:

- In 2021, nitrogen was detected in 10 of 16 well samples at concentrations ranging from 3.18 to 28 mg/l. Nitrogen exceeded the 10 mg/l ES in six of the 16 samples (37.5%). The greatest concentration was detected at well SH432, which is located in Richland County near the city of Lone Rock. Nearby wells TG815 and WA867 each had nitrogen concentrations of 27.5 and 25.1 mg/L, respectively.
- A comparison of nitrogen concentrations in samples collected in 2015 or 2016 to those collected in 2021 indicates that nitrogen concentrations increased in samples at two wells and decreased in samples at three. The three remaining wells had no nitrogen detected in either sample year.
- Pesticides or pesticide metabolites were detected in excess of laboratory reporting limits in 12 of 16 samples collected in 2021. 16 different pesticides were detected greater than laboratory reporting limits. The most frequently detected pesticides include metolachlor ESA (12), alachlor ESA (10) and atrazine TCR (7).
- No detected pesticide or a pesticide metabolite concentration exceeded a Wis. Admin. Code ch. NR 140 ES. However, three of the groundwater samples (wells JE191, WA878 and SH432) contained atrazine TCR levels that exceeded the Wis. Admin. Code ch. NR 140 PAL (0.3 µg/l).
- Two neonicotinoid insecticides, clothianidin and imidacloprid, were detected in excess of laboratory reporting limits in 2021 sampling. Clothianidin was detected in six samples and imidacloprid in three. However, none of the detected concentrations exceeded the respective DHS drinking water quality advisories.
- No detected pesticide concentrations exceeded any respective DHS drinking water health advisory.

SUMMARY - BARRON, DUNN AND CHIPPEWA:

In 2021, DATCP collected groundwater samples from 24 residential wells shown on the figure to the right. The wells were mostly in Chippewa County, but some were in Dunn and Barron Counties. These wells are in mainly agricultural areas extending from near Rice Lake and New Auburn in the northwest to Bloomer and Chippewa Falls farther southeast.

Crops observed at the time of sampling WERE mainly corn and soybean crops with alfalfa and forage crops. Well records obtained for these wells indicate the static water table present from just six feet to as much as 127 feet. Records indicate water is drawn from sand and gravel deposits or from sandstone at well depths ranging from 42 to 198 feet deep.

Twenty wells were sampled for the second time in 2021, with earlier sampling completed in 2015 or 2016. Four wells were tested for the first time in 2021. Sampling results are summarized in Table 8.

Table 8: 2021 TSAMP Analytical Results for Barron, Dunn and Chippewa Counties

WUWN	County	Sample Date (month/year)	Installation Date	Well Depth (in feet)	Bedrock Depth (in feet)	Casing Depth (in feet)	Casing Diameter (in inches)	Static Water Depth (in feet)	Formation	ACETOCHLOR ESA	ALACHLOR ESA	ATRAZINE (TCR)	CLOTHIANIDIN	DIMETHENAMID ESA	FOMESAFEN	METOLACHLOR	METOLACHLOR ESA	METOLACHLOR OA	NITROGEN
VS005	Barron	Jul-21								0	0.085	0	0	0	0	0	1.58	0	13.3
VS005	Barron	Jul-15								0		0	0	0	0	0	0.083	0	6.46
VS486	Dunn	Jul-21								0.405	0.078	0.063	0.042	0	0.09	0.062	2.29	0.449	11.7
VS486	Dunn	Sep-16								0	0.129	0.116	0	0	0.173	0	8.13	1.74	14.4
WI377	Dunn	Jul-21	Nov-06	120	6	55	6	61	Sandstone	0.249	0.341	0.13	0	0.093	0	0	1.3	0	13.7
WI377	Dunn	Sep-16	Nov-06	120	6	55	6	61	Sandstone	0.353	0.552	0.191	0	0.13	0	0	1.35	0	13.9
AF328	Chippewa	Jul-21	Mar-88	100	81	90	6	19	Sandstone	0	0.814	0.06	0	0	0	0	1.2	0.371	7.54
AF328	Chippewa	Sep-16	Mar-88	100	81	90	6	19	Sandstone	0	0.925	0.057	0	0	0	0	0.942	0	6.96
DE620	Chippewa	Jul-21	Nov-90	79		76	6	22	Sand & Gvl	0	0	0	0	0	0	0	0	0	3.63
DE620	Chippewa	Sep-16	Nov-90	79		76	6	22	Sand & Gvl	0	0	0	0	0	0	0	0.08	0	2.53
VR800	Chippewa	Jul-21								0	0	0	0	0	0	0	0.107	0	0
VR800	Chippewa	Sep-16								0	0	0	0	0	0	0	0.475	0.286	0
VR805	Chippewa	Jul-21								0	0	0.229	0.038	0	0	0	0.998	0	7.43
VR805	Chippewa	Sep-16								0	0	0.123	0	0.064	0	0	0.945	0	13.6
VR806	Chippewa	Jul-21								0	0.204	0.091	0	0	0	0	0.966	0	3.95
VR806	Chippewa	Sep-16								0	0.298	0.186	0	0	0	0	1.32	0.395	3.97
VS487	Chippewa	Jul-21								0	0	0.184	0.02	0.368	0	0	0.454	0	24.4
VS487	Chippewa	Sep-16								0	0	0.297	0	0	0	0	0.957	0	21
VS488	Chippewa	Jul-21								0.35	0.195	0.053	0	0	0	0	1.39	0	4.89
VS488	Chippewa	Sep-16								0	0	0	0	0	0	0	0.231	0	3.36
WQ747	Chippewa	Jul-21	Jun-11	99		96	6	6	Sand & Gvl	0.054	0.671	0	0	0	0	0	0.538	0	2.77
WQ747	Chippewa	Sep-16	Jun-11	99		96	6	6	Sand & Gvl	0	1.55	0	0	0	0	0	0.928	0	2.54
WR124	Chippewa	Jul-21	Aug-11	42		39	6	16	Sand & Gvl	0.053	0	0.517	0	0	0	0	2.36	0	6.9
WR124	Chippewa	Sep-16	Aug-11	42		39	6	16	Sand & Gvl	0	0	0.708	0	0.068	0	0	0.241	0	7.27
UM349	Chippewa	Jul-21	Apr-09	198	8	56	6	127	Sandstone	0	0.235	0.059	0	0	0	0	1.8	0.482	10.3
UM349	Chippewa	Sep-16	Apr-09	198	8	56	6	127	Sandstone	0	0.291	0.158	0	0	0	0	2.09	0.778	12.3
VR801	Chippewa	Jul-21								0.179	0	0.542	0	0	0	0	0.225	0	8.1
VR801	Chippewa	Sep-16								0.14	0.094	0.402	0	0	0	0	1.35	0.328	10.2
VR802	Chippewa	Jul-21								0	0.251	0	0	0	0	0	0.158	0	0
VR802	Chippewa	Sep-16								0.057	1.48	0	0	0	0	0	2.37	0	4.93
VR804	Chippewa	Jul-21								0	0.508	0.261	0	0	0	0	2.26	0	14.8
VR804	Chippewa	Sep-16								0.077	0.715	0.251	0	0.211	0	0	0.224	0	17.9
XG761	Chippewa	Jul-21	Oct-13	85	17	64	6	39	Sandstone	1.29	0.579	0.465	0.034	0	0	0	0.36	0	12.1
XG761	Chippewa	Sep-16	Oct-13	85	17	64	6	39	Sandstone	1.42	2.17	0.603	0	0.188	0	0	0.105	0	14.9
VS483	Chippewa	Jul-21								0	0	0	0	0	0	0	2.59	0	11.2
VS483	Chippewa	Sep-16								0.088	0	0	0	0	0	0	2.84	0	12.1
VS484	Chippewa	Jul-21								0	0.18	0.258	0	0	0	0	1.3	0.409	24.5
VS484	Chippewa	Sep-16								0	0.254	0	0	0	0	0	1.6	0.579	27.1
WL868	Chippewa	Jul-21	Aug-08	80		77	6	45	Sand & Gvl	0	0.298	0	0	0	0	0	0.129	0	4.2
WL868	Chippewa	Sep-16	Aug-08	80		77	6	45	Sand & Gvl	0	0.112	0	0	0	0	0	0	0	3.62
CM008	Chippewa	Jul-21	May-91	140	98	98	6	83	Sandstone	0.056	0.108	0.138	0	0	0	0	1.34	0	7.64
EW833	Chippewa	Jul-21	Sep-91	105	88	88	6	60	Sandstone	0.127	0.463	0.272	0	0	0	0	0.964	0.288	12.6
TV104	Chippewa	Jul-21	Jun-05	66.5		62.5	6	42	Sand & Gvl	0.601	0.194	0.176	0	0	0	0	0.602	0	8.25
WA882	Chippewa	Jul-21								0.172	1.71	0.058	0	0	0	0	2.49	0	26.9

Notes: **Units: Nitrogen = mg/L (milligrams per liter, equivalent to parts per million) and Pesticides = µg/l (micrograms per liter, equivalent to parts per billion).*

WDHS *Wisconsin Department of Health Services Drinking Water Health Advisory*

ES *Enforcement Standard as defined in Wisconsin Administrative Code Chapter NR 140.*

ESA *Ethanesulonic acid*

Nitrogen *Nitrogen as nitrate and nitrite.*

OA *Oxanilic acid*

PAL *Preventive Action Limit as defined in Wisconsin Administrative Code Chapter NR 140.*

TCR *Total Chlorinated Residues of atrazine; which includes the sum of atrazine plus its metabolites de-ethyl atrazine, de-isopropyl atrazine, and di-amino atrazine.*

WUWN *Wisconsin Unique Well Number*

Shaded rows present data from a prior sample year (2015 or 2016).

Zero (0) *No detection above laboratory reporting limits.*

Blank cells indicate compound not-analyzed or data/information not available.

5.0 *Indicates concentration greater than the respective Wis. Admin. Code ch NR 140 PAL.*

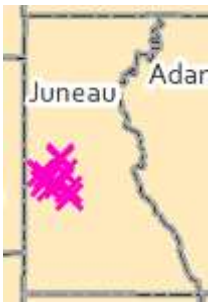
5.0 *Indicates concentration greater than the respective Wis. Admin. Code ch NR 140 ES.*

5.0 *Indicates concentration greater than the respective WDHS Drinking Water Health Advisory.*

Result observations for results from Barron, Dunn and Chippewa Counties include:

- Nitrogen was detected in 22 of 24 samples collected in 2021 ranging in concentrations from 2.77 (well WQ747) to 26.9 mg/L (well WA882). The average concentration for the 22 samples with detections is 10.9 mg/L. Nitrogen concentrations exceeded the Wis. Admin Code ch. NR 140 10 mg/L ES in 10 of the 20 samples.
- Nitrogen was detected in 19 of 20 samples collected in 2015 and 2016 with concentrations ranging from 2.53 to 27.4 mg/L. The average concentration for the 19 samples with detections was 10.5 mg/L. At that time, nitrogen concentrations exceeded the Wis. Admin Code ch. NR 140 10 mg/L ES also in 10 of 20 wells sampled.
- A comparison of nitrogen concentrations in samples collected in 2015/16 to those collected in 2021 indicates that nitrogen concentrations increased in samples collected at seven wells and decreased in samples collected at 12 wells. One well (well VR800) remained the same with no nitrogen detected.
- Pesticides or a pesticide metabolite were detected above laboratory reporting limits in 23 of 24 samples collected in 2021. Nine pesticides were detected in 2021 samples. The most frequently detected pesticides are metolachlor ESA (22), alachlor ESA (17), atrazine TCR (17), and acetochlor ESA (11).
- No pesticides or a pesticide metabolite exceeded a Wis. Admin. Code ch. NR 140 ES. However, three of the groundwater samples (wells WR124, VR801 and XG761) contained atrazine TCR levels that exceeded the Wis. Admin. Code ch. NR 140 PAL (0.3 µg/l).
- Clothianidin was the only neonicotinoid insecticide detected above laboratory reporting limits. It was detected in four samples at a concentrations ranging from 0.020 to 0.042 µg/l, which is significantly less than the DHS drinking water health advisory of 1,000 µg/l.
- No detected pesticide concentrations exceeded any respective WDHS drinking water health advisory.

SUMMARY - JUNEAU:



In 2021, DATCP collected groundwater samples from 12 residential wells in Juneau County. These wells are located near agricultural fields at rural addresses in New Lisbon, Camp Douglas and Tomah. Well locations sampled in Juneau County are shown on the figure to the right.

Crops observed at the time of sampling were mainly soybeans and corn with some hay and alfalfa forage crops. Well construction records for nine wells indicate the static water table is present from 5 to 25 feet deep. Available records suggest wells are cased into bedrock (sandstone) with one well finished in sand and gravel. Records show wells are constructed with 40 to 139 feet of casing, to depths ranging from 43 to 142 feet deep.

None of these wells were sampled by DATCP before 2021. Sampling results are summarized in Table 9.

Table 9: 2021 TSAMP Analytical Results for Juneau County

WUWN	County	Sample Date (month/year)	Installation Date	Well Depth (in feet)	Bedrock Depth (in feet)	Casing Depth (in feet)	Casing Diameter (in inches)	Static Water Depth (in feet)	Formation	ACETOCHLOR ESA	ALACHLOR ESA	ATRAZINE (TCR)	CLOTHIANIDIN	METOLACHLOR ESA	METOLACHLOR OA	NITROGEN
TC246	Juneau	Aug-21	May-06	142	97	139	6	23	Sandstone	0	0	0	0	0	0	0
WQ285	Juneau	Aug-21	Jan-11	56	44	51	4	10	Sandstone	0.083	0.081	0.36	0	21.9	0.477	12.3
YC816	Juneau	Aug-21	Sep-17	80	59	61	6	5	Sandstone	0	0	0	0	0	0	4.77
LE221	Juneau	Aug-21	May-02	61	43	39	6	19	Sandstone	0.408	6	0.991	0	2.99	1.38	16.1
LG799	Juneau	Aug-21	Aug-96	80	65	68	6	17	Sandstone	0	0.69	0.087	0	0.283	0	2.09
QP275	Juneau	Aug-21	Jul-03	80	58	58	6	15	Sandstone	0	0.077	0	0	0	0	0
RK443	Juneau	Aug-21	Jun-03	60	15	40	6	15	Sandstone	0	0	0	0.084	3.83	1.23	7.8
SU598	Juneau	Aug-21	Jun-05	60	9	41	6	8	Sandstone	0	0.355	0	0	2.66	0	0
TD230	Juneau	Aug-21	Aug-05	43		40	6	25	Sand & Gvl	0	0.343	0	0	0.054	0	1.63
WA879	Juneau	Aug-21								0	0	0	0	0.058	0	7.1
WA883	Juneau	Aug-21								0	0	0	0	0	0	0
WA884	Juneau	Aug-21								0	0.438	0	0	1.82	0	5.33

Notes: **Units: Nitrogen = mg/L (milligrams per liter, equivalent to parts per million) and Pesticides = µg/l(micrograms per liter, equivalent to parts per billion).*

WDHS *Wisconsin Department of Health Services Drinking Water Health Advisory*
ES *Enforcement Standard as defined in Wisconsin Administrative Code Chapter NR 140.*
ESA *Ethanesulonic acid*
Nitrogen *Nitrogen as nitrate and nitrite.*
OA *Oxanilic acid*
PAL *Preventive Action Limit as defined in Wisconsin Administrative Code Chapter NR 140.*
TCR *Total Chlorinated Residues of atrazine; which includes the sum of atrazine plus its metabolites de-ethyl atrazine, de-isopropyl atrazine, and di-amino atrazine.*
WUWN *Wisconsin Unique Well Number*

Shaded rows present data from a prior sample year (2015 or 2016).
Zero (0)No detection above laboratory reporting limits.
Blank cells indicate compound not-analyzed or data/information not available.
5.0 *Indicates concentration greater than the respective Wis. Admin. Code ch NR 140 PAL.*
5.0 *Indicates concentration greater than the respective Wis. Admin. Code ch NR 140 ES.*
5.0 *Indicates concentration greater than the respective WDHS Drinking Water Health Advisory.*

Result observations for Juneau County include:

- Nitrogen was detected in eight of 12 samples collected in 2021 with concentrations ranging from 1.63 (well TD230) to 16.1 mg/L (well LE221). The average detected nitrogen concentration for these samples is 7.1 mg/L. Nitrogen exceeded the Wis. Admin. Code ch. NR 140 10 mg/L ES in two samples collected (16.6 percent).
- Groundwater from four wells did not detect nitrogen concentrations in excess of laboratory reporting levels.

- Pesticides or a pesticide metabolite were detected in 10 samples collected in 2021. Six different pesticides were detected greater than laboratory reporting levels. The most frequently detected pesticides are metolachlor ESA (8) and alachlor ESA (7).
- The neonicotinoid insecticide, clothianidin was detected greater than laboratory reporting levels in one groundwater sample (well RK443).
- No detected pesticide or a pesticide metabolite concentration exceeded a Wis. Admin. Code ch. NR 140 ES. Atrazine TCR concentrations were detected in excess of the Wis. Admin. Code ch. NR 140 0.3 µg/l PAL in two samples (well WQ 285 and LF221).
- No detected pesticide concentrations exceeded any respective WDHS drinking water health advisory.

SUMMARY - DANE:

In 2021, DATCP collected groundwater samples from four residential wells in Dane County. Two wells have Stoughton mailing addresses and two have Edgerton mailing addresses. Approximate well locations sampled in Dane County are depicted in the figure to the right.

Crops observed during sampling included mainly corn and soybeans with some forage crops. No well construction records were found for any of the wells.

Two of the four wells sampled in 2021 were also sampled in 2015. Sampling results are summarized in Table 10.

Table 10: 2021 TSAMP Analytical Results for Dane County

WUWN	County	Sample Date (month/year)	Installation Date	Well Depth (in/feet)	Bedrock Depth (in/feet)	Casing Depth (in/feet)	Casing Diameter (in inches)	Static Water Depth (in feet)	ALACHLOR ESA	ATRAZINE (TCR)	CLOTHIANIDIN	FLUMETSULAM	IMAZAPYR	METOLACHLOR ESA	NITROGEN
VS021	Dane	Aug-21							0.072	0	0	0	0	0.61	4.3
VS021	Dane	Aug-15								0	0	0	0	0.118	0
VS016	Dane	Aug-21							0.281	0	0	0	0	0.307	4.89
VS016	Dane	Aug-15								0	0	0	0	0.161	4.63
PS260	Dane	Aug-21							0	0	0.013	0	0.068	0.981	1.81
WA885	Dane	Aug-21							0	0	0	0.058	0	0.143	7.05

Notes: **Units: Nitrogen = mg/L (milligrams per liter, equivalent to parts per million) and Pesticides = µg/l (micrograms per liter, equivalent to parts per billion).*

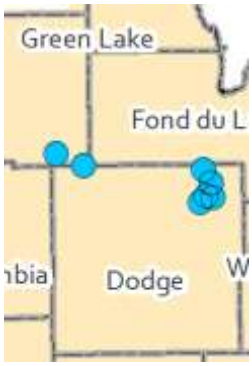
WDHS *Wisconsin Department of Health Services Drinking Water Health Advisory*
ES *Enforcement Standard as defined in Wisconsin Administrative Code Chapter NR 140.*
ESA *Ethanesulonic acid*
Nitrogen *Nitrogen as nitrate and nitrite.*
PAL *Preventive Action Limit as defined in Wisconsin Administrative Code Chapter NR 140.*
TCR *Total Chlorinated Residues of atrazine; which includes the sum of atrazine plus its metabolites de-ethyl atrazine, de-isopropyl atrazine, and di-amino atrazine.*
WUWN *Wisconsin Unique Well Number*

Shaded rows present data from a prior sample year (2015 or 2016).
Zero (0) No detection above laboratory reporting limits.
Blank cells indicate compound not-analyzed or data/information not available.
5.0 *Indicates concentration greater than the respective Wis. Admin. Code ch NR 140 PAL.*
5.0 *Indicates concentration greater than the respective Wis. Admin. Code ch NR 140 ES.*
5.0 *Indicates concentration greater than the respective WDHS Drinking Water Health Advisory.*

Result observations for results from Dane County include:

- Nitrogen was detected in excess of laboratory reporting limits in all four wells sampled in 2021. Concentrations ranged from 1.81 to 7.05 mg/L nitrogen with the average being 4.5 mg/l. All nitrogen detections are less than Wis. Admin. Code ch. NR 140 10 mg/L ES.
- In comparison to 2015 data, nitrogen was found to be similar at one well and increase at a second well. Nitrogen was detected greater than laboratory reporting limits in one of the two wells (VS016) sampled in 2015 at a concentration of 4.63 mg/L. A groundwater sample from this same well in 2021 had a nitrogen concentration of 4.89 mg/L. The second well (VS021) did not detect nitrogen above the laboratory reporting limits in 2015, but then detected nitrogen at of 4.3 mg/L in 2021.
- Pesticides or pesticide metabolites were detected in all four wells sampled in 2015 and 2021. Five different pesticides were detected in 2021, the most frequently being metolachlor ESA (4) and alachlor ESA (2).
- The neonicotinoid insecticide clothianidin was detected in excess of laboratory reporting limits in one sample (PS260).
- No detected pesticide or a pesticide metabolite concentrations exceeded a respective Wis. Admin. Code ch. NR 140 ES or PAL or WDHS drinking water health advisory.

SUMMARY - DODGE AND GREEN LAKE:



In 2021, DATCP collected groundwater samples from seven residential wells in Dodge County and two in Green Lake County as depicted in the figure to the right. These wells are located near agricultural fields in rural Brownsville, Fox Lake, Mayville, Markesan, and Waupun. Crops observed during sampling included mainly corn, soybeans and forage crops.

Well construction records were not found for six wells. Records for three wells indicate the presence of sandstone and/or carbonate formations (dolomite or limestone). The overall well depths varied from 145 to 625 feet deep and with casing depths of 98 to 380 feet. Static water levels ranged from 24 to 380 feet.

Each of the seven wells sampled in 2021 were also sampled in 2015 or 2016. Sampling results are summarized in Table 11.

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Table 11: 2021 TSAMP Analytical Results for Dodge and Green Lake Counties

WUWN	County	Sample Date (month-year)	Installation Date (month-year)	Well Depth (in feet)	Bedrock Depth (in feet)	Casing Depth (in feet)	Casing Diameter (in inches)	Static Water Depth (in feet)	Formation	ALACHLOR ESA	ALACHLOR OA	ATRAZINE (TCR)	ATRAZINE	CLOTHIANIDIN	FOMESAFEN	METOLACHLOR ESA	NITROGEN
RD288	Dodge	Jun-21	Nov-02	625	19	360	6	345	Carbonate/SS	0	0	0	0	0	0	0.386	0
RD288	Dodge	Aug-16	Nov-02	625	19	360	6	345	Carbonate/SS	0	0	0	0	0	0	0.236	0
VS492	Dodge	Jun-21								0	0	0.091	0	0.053	0.401	1.52	9.47
VS492	Dodge	Aug-16								0	0	0.172	0.052	0	0	1.21	13.4
VS490	Dodge	Jun-21								0	0	1.644	0	0	0	0.156	11.9
VS490	Dodge	Aug-16								0	0	2.683	0	0	0	0.067	12.7
VS494	Dodge	Jun-21								0	0	0	0	0	0	0.068	0.537
VS494	Dodge	Aug-16								0	0	0	0	0	0	0	0
WR809	Dodge	Jun-21	Apr-11	645	20	380	6	380	Carbonate/SS	0	0	0	0	0	0	0	0
WR809	Dodge	Aug-16	Apr-11	645	20	380	6	380	Carbonate/SS	0	0	0	0	0	0	0	0
WA887	Dodge	Sep-21								0	0	0	0	0	0	0	0
WA886	Dodge	Sep-21								0.187	0	0	0	0	0	0	0
SE643	Green Lake	Jun-21	Apr-04	145	69	98	6	24	Sandstone	1.74	0	0	0	0	0	0	0
SE643	Green Lake	Jun-15	Apr-04	145	69	98	6	24	Sandstone		0	0	0	0	0	0	0
PX968	Green Lake	Jun-21								0	0	0	0	0	0	0.344	0
PX968	Green Lake	Jun-15									0	0	0	0	0	0.392	0

Notes: **Units: Nitrogen = mg/l (milligrams per liter, equivalent to parts per million) and Pesticides = µg/l (micrograms per liter, equivalent to parts per billion).*

WDHS Wisconsin Department of Health Services Drinking Water Health Advisory
ES Enforcement Standard as defined in Wisconsin Administrative Code Chapter NR 140.
ESA Ethanesulonic acid
Nitrogen Nitrogen as nitrate and nitrite.
PAL Preventive Action Limit as defined in Wisconsin Administrative Code Chapter NR 140.
TCR Total Chlorinated Residues of atrazine; which includes the sum of atrazine plus its metabolites de-ethyl atrazine, de-isopropyl atrazine, and di-amino atrazine.
WUWN Wisconsin Unique Well Number

Shaded rows present data from a prior sample year (2015 or 2016).
Zero (0) No detection above laboratory reporting limits.
Blank cells indicate compound not-analyzed or data/information not available.
5.0 Indicates concentration greater than the respective Wis. Admin. Code ch NR 140 PAL.
5.0 Indicates concentration greater than the respective Wis. Admin. Code ch NR 140 ES.
5.0 Indicates concentration greater than the respective WDHS Drinking Water Health Advisory.

Result observation for Dodge and Green Lake Counties include:

- Nitrogen was detected in excess of laboratory reporting limits in three of the nine samples collected in 2021 ranging from 0.537 at well VS494 to 11.9 mg/L at well VS490. Nitrogen was not detected greater than laboratory reporting limits in the remaining six samples. The average detected nitrogen concentration is 7.3 mg/L. Concentrations of nitrogen exceeded the Wis. Admin. Code ch. NR 140 10 mg/L ES in one sample collected at well VS490 in 2021.
- In comparison to 2016 data, nitrogen was found to be similar at one well and to increase at a second well. In well VS492, nitrogen concentrations exceeded the Wis. Admin. Code NR 140 ES of 10 mg/L in the 2016 sample (13.4 mg/L), but decreased to less than the ES in the 2021 sample (9.47 mg/L). The second well (well VS490) had similar nitrogen concentrations, 12.7 and 11.9 mg/L, respectively, which both exceeded the Wis. Admin. Code ch NR 140 ES.

- Pesticides or pesticide metabolites were detected in excess of laboratory reporting limits in seven of the nine samples collected in 2021, and in four of seven samples collected in 2015 and 2016. The most frequently detected pesticide was metolachlor ESA in both sample years.
- The neonicotinoid insecticide, clothianidin was detected in excess of laboratory reporting limits in one sample (well VS492).
- No detected pesticide or a pesticide metabolite concentrations exceeded a respective Wis. Admin. Code ch. NR 140 ES or PAL or WDHS drinking water health advisory.

SUMMARY: LANGLADE

In 2021, DATCP collected groundwater samples from four residential wells near Antigo and Bryant in Langlade County. Many of the fields in the area are irrigated. Crops observed at the time of sampling included potatoes, snapbeans, corn, small grains, and forage crops. The approximate locations of wells sampled is shown on the figure to the right.

Well construction records were found for two wells and indicate that the water table is 21 to 25 feet deep. Those records also show the wells are installed in unconsolidated deposits of sand and gravel, and cased to depths between 60 to 71 feet deep with short screens. Construction records for the two remaining seven wells could not be located.

None of these wells were sampled by DATCP before 2021. Sampling results are summarized in Table 12.

Table 12: 2021 TSAMP Analytical Results for Langlade County

WUWN	County	Sample Date (month-year)	Installation Date (month-year)	Well Depth (in feet)	Bedrock Depth (in feet)	Casing Depth (in feet)	Casing Diameter (in inches)	Static Water Depth (in feet)	Formation	ACETOCHLOR ESA	ATRAZINE (TCR)	CLOTHIANIDIN	IMIDACLOPRID	METOLACHLOR ESA	THIAMETHOXAM	NITROGEN
QI475	Langlade	Jun-21	Aug-01	71		68	5	25	Sand & Gvl	0	0	0	0	0.237	0	4.38
WA877	Langlade	Jun-21								0	0.145	0.047	0	0.899	0	19.9
WA876	Langlade	Jun-21								0.052	0	0	0.011	0.562	0.071	10.5
XJ671	Langlade	Jun-21	May-14	60		57	5	21	Sand & Gvl	0	0.111	0	0	0	0	4.68

Notes: **Units: Nitrogen = mg/L (milligrams per liter, equivalent to parts per million) and Pesticides = µg/l (micrograms per liter, equivalent to parts per billion).*

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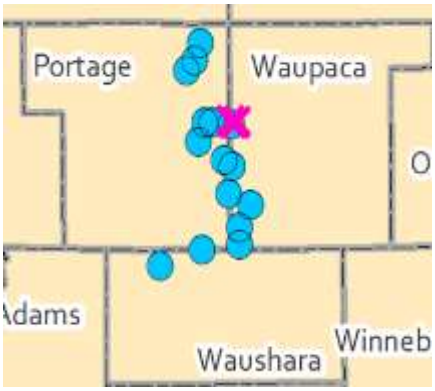
ES *Enforcement Standard as defined in Wisconsin Administrative Code Chapter NR 140.*
ESA *Ethanesulonic acid*
Nitrogen *Nitrogen as nitrate and nitrite.*
PAL *Preventive Action Limit as defined in Wisconsin Administrative Code Chapter NR 140.*
TCR *Total Chlorinated Residues of atrazine; which includes the sum of atrazine plus its metabolites de-ethyl atrazine, de-isopropyl atrazine, and di-amino atrazine.*
WUWN *Wisconsin Unique Well Number*

Shaded rows present data from a prior sample year (2015 or 2016).
Zero (0) No detection above laboratory reporting limits.
Blank cells indicate compound not-analyzed or data/information not available.
5.0 *Indicates concentration greater than the respective Wis. Admin. Code ch NR 140 PAL.*
5.0 *Indicates concentration greater than the respective Wis. Admin. Code ch NR 140 ES.*
5.0 *Indicates concentration greater than the respective WDHS Drinking Water Health Advisory.*

Result observations for Langlade County include:

- Nitrogen was detected in excess of laboratory reporting limits in all four samples collected in 2021 ranging from 4.38 at well QI475 to 19.9 mg/L at well WA877. The average detected nitrogen concentration is 9.79 mg/L. Concentrations of nitrogen exceeded the Wis. Admin. Code ch. NR 140 10 mg/L ES in two samples collected at wells WA977 and WA876.
- Pesticides or pesticide metabolites were detected above laboratory reporting limits in all four samples collected. A total of six different pesticides were detected. The most frequently detected pesticide exceeding laboratory reporting limits are metolachlor ESA (3), and atrazine TCR (2).
- Three neonicotinoid insecticides were also detected greater than laboratory reporting limits in samples from two wells. The compound clothianidin was detected at well WA877, and the compounds imidacloprid and thiamethoxam were each detected at well WA876.
- No pesticide or a pesticide metabolite were detected at concentrations greater than their respective Wis. Admin. Code ch. NR 140 ES or PAL or WDHS drinking water health advisory.

SUMMARY: PORTAGE, WAUSHARA, WAUPACA



In 2021, DATCP collected groundwater samples from 19 residential wells in the Central Sands (CS) vegetable growing region of Portage, Waupaca and Waushara Counties. Address locations included rural areas of Almond, Amherst, Plainfield, Rosholt, Waupaca, and Scandanavia. Crops observed at the time of sampling included vegetable crops (potatoes and bean varieties) intermixed with corn and hay or other forage and cover crops. Fields are composed of mostly sandy soils and irrigation is common. The approximate sample locations are shown on the figure to the right.

Records obtained for 11 wells show that wells range in depth from 30 feet to 146 feet deep. Static water depths are reported from 44 to 160 feet deep. Water is drawn from coarse unconsolidated deposits of sand and gravel. Construction records for the remaining wells could not be located.

Of the 19 wells sampled in 2021, 15 of these wells were also sampled in 2015 or 2016 (shaded rows). Sampling results are summarized in Table 13.

Table 13: 2021 TSAMP Analytical Results for Portage, Waushara and Waupaca Counties

WUWN	County	Sample Date (month-year)	Installation Date (month-year)	Well Depth (in feet)	Bedrock Depth	Casing Depth (in feet)	Casing Diameter (in inches)	Static Water Depth (in feet)	Formation	2,4-D	ACETOCHLOR ESA	ALACHLOR ESA	ATRAZINE (TCR)	CLOTHIANIDIN	DIMETHENAMID ESA	DIMETHENAMID OA	HEXAZINONE	IMIDACLOPRID	METALAXYL	METOLACHLOR ESA	METOLACHLOR OA	METRIBUZIN	METRIBUZIN DADK	THIAMETHOXAM	NITROGEN
WI234	Portage	Jun-21	Dec-06	160		156	6	132	Sand & Gvl	0	0	0	0.151	0.047	0	0	0.378	0	0	0.745	0	0	0	0	11.8
WI234	Portage	Sep-16	Dec-06	160		156	6	132	Sand & Gvl	0	0	0.085	0.159	0	0	0	0.807	0	0	0.655	0	0	0	0	13.3
PX973	Portage	Jun-21								0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.02
PX973	Portage	Jun-15								0	0		0	0	0	0	0	0	0	0	0	0		0	1.81
TB606	Portage	Jun-21	Jan-06	60		56	6	23	Sand & Gvl	0	0	0.128	0	0	0	0	0	0	0	0.443	0	0	0	0	4.79
TB606	Portage	Sep-16	Jan-06	60		56	6	23	Sand & Gvl	0	0	0.093	0.055	0	0	0	0	0	0	0.156	0	0	0	0	3.35
TO566	Portage	Jun-21	May-07	143		140	6	84	Sand & Gvl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.34
TO566	Portage	Sep-16	May-07	143		140	6	84	Sand & Gvl	0	0	0	0	0	0	0	0	0	0	0.24	0	0	0	0	2.34
WJ292	Portage	Jun-21	Mar-07	55		51	6	28	Sand & Gvl	0	0	0	0	0.022	0	0	0	0	0	0	0	0	0	0	35.6
WJ292	Portage	Sep-16	Mar-07	55		51	6	28	Sand & Gvl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19.9
UA541	Portage	Jun-21								0	0	0.062	0	0.02	0	0	0	0	0	1.25	0	0	0	0	27.9
UA541	Portage	Sep-16								0	0	0.34	0	0	0	0	0	0	0	5.55	0	0	0	0	20.5
VS482	Portage	Jun-21								0	0	0.576	0	0	0	0	0	0	0	1.03	0	0	0.467	0	7.93
VS482	Portage	Sep-16								0	0	1.11	0	0	0	0	0	0	0	0.273	0	0	0.267	0	4.63
ZJ366	Portage	Jun-21	Jun-20	44		40	6	26	Sand & Gvl	0	0	0.122	0.283	0	0	0	0	0	0	0.259	0	0	0	0	10.1
ZJ366	Portage	Jul-15	Jun-20	44		40	6	26	Sand & Gvl	0	0		0.701	0	0	0	0	0	0	0.278	0	0		0	12.5
VF197	Waushara	Jun-21	Sep-12	97		93	6	44	Sand & Gvl	0	0	0.834	1.3	0	0	0	0	0	0	1.68	0	0	0	0	9.75
VF197	Waushara	Jun-15	Sep-12	97		93	6	44	Sand & Gvl	0	0		1.713	0	0	0	0	0	0	1.49	0	0		0	9.83
DB719	Waupaca	Apr-21	May-90	62		58	4	17	Sand & Gvl	0	0	0.242	0.092	0.022	0.422	0.304	0	0.582	0.379	8.03	6.44	0	0	0	21.5
DB719	Waupaca	Sep-16	May-90	62		58	4	17	Sand & Gvl	0	0	0.975	0.869	0	0.089	0.069	0	0.187	0	4.7	4.42	0.094	0.288	0	19.4
QT190	Waupaca	Jun-21	Mar-03	99		96	6	35	Sand & Gvl	0	0.104	0.19	0.098	0	0	0	0	0	0	0.192	0	0	0	0	12.1
QT190	Waupaca	Sep-16	Mar-03	99		96	6	35	Sand & Gvl	0	0.067	0.267	0.065	0	0	0	0	0	0	0.192	0	0	0	0	4.58
SZ345	Waupaca	Jun-21	Nov-05	64		60	5	15	Sand & Gvl	0	0	0.127	0	0	0	0	0	0	0	0	0	0	0	0	4.36
SZ345	Waupaca	Jul-15	Nov-05	64		60	5	15	Sand & Gvl	0	0		0	0	0	0	0	0	0	0	0	0		0	3.34
VS496	Waupaca	Jun-21								0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.928
VS496	Waupaca	Sep-16								0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.11
VS498	Waupaca	Jun-21								0	0	0.091	0.238	0.088	0	0	0	0	0	1.48	0.959	0	0	0.014	7.77
VS498	Waupaca	Sep-16								0	0	0.204	0.129	0	0	0	0	0	0	0.805	0.498	0	0	0	9.33
VS480	Waupaca	Jun-21								0	0	0	0.091	0.027	0	0	0	0	0	0.139	0	0	0	0	9.14
VS480	Waupaca	Sep-16								0.071	0	0.055	0.116	0	0	0	0	0	0	0.316	0	0	0	0	14.8
DB488	Waupaca	Jun-21	Sep-91	48		44	4	29	Sand & Gvl	0	0	0.098	0.062	0	0	0	0	0	0	0.658	0	0	0	0	10.2
UA529	Waupaca	Jun-21	Jun-07	63		61	6	11	Sand	0	0	0.334	0.711	0	0	0	0	0	0	0.108	0	0	0	0	3.76
WA874	Waupaca	Jun-21								0	0	0.157	0.153	0.031	0	0	0	0	0	0.22	0	0	0	0	8.89
WA875	Waupaca	Jun-21								0	0	0	0	0	0	0	0	0	0	0.083	0	0	0	0	0

Notes: **Units: Nitrogen = mg/L (milligrams per liter, equivalent to parts per million) and Pesticides = µg/l (micrograms per liter, equivalent to parts per billion).*

WDHS Wisconsin Department of Health Services Drinking Water Health Advisory

ES Enforcement Standard as defined in Wisconsin Administrative Code Chapter NR 140.

ESA Ethanesulonic acid

Nitrogen Nitrogen as nitrate and nitrite.

OA Oxanilic acid

PAL Preventive Action Limit as defined in Wisconsin Administrative Code Chapter NR 140.

TCR Total Chlorinated Residues of atrazine; which includes the sum of atrazine plus its metabolites de-ethyl atrazine, de-isopropyl atrazine, and di-amino atrazine.

WUWN Wisconsin Unique Well Number

Shaded rows present data from a prior sample year (2015 or 2016).

Zero (0) No detection above laboratory reporting limits.

Blank cells indicate compound not-analyzed or data/information not available.

5.0 Indicates concentration greater than the respective Wis. Admin. Code ch NR 140 PAL.

5.0 Indicates concentration greater than the respective Wis. Admin. Code ch NR 140 ES.

5.0 Indicates concentration greater than the respective WDHS Drinking Water Health Advisory.

Result observations for Portage, Waushara, and Waupaca Counties include:

- Nitrogen was detected in excess of laboratory reporting limits in 18 of the 19 samples collected in 2021 ranging from 0.928 at well VS496 to 35.6 mg/L at well WJ292. Nitrogen was not detected in excess of laboratory reporting limits in only one groundwater sample. Concentrations of nitrogen exceeded the Wis. Admin. Code ch. NR 140 ES of 10 mg/L in seven groundwater samples collected in 2021.
- A comparison of nitrogen concentrations in groundwater samples collected in 2015-16 from the same wells collected in 2021 indicates that nitrogen concentrations increased in samples collected at eight wells and decreased in samples collected at six wells. Three wells had increases of at least 5 mg/L, while only one well experienced a decrease of at least 5 mg/L nitrogen. One well (well VF197) had virtually the same nitrogen concentrations from both sampling events.
- A comparison of nitrogen results for the same 15 wells sampled in 2015 and 2016 and again in 2021 shows that the average nitrogen concentration in 2021 was 11.1 mg/L compared to an average of 9.5 from the 2015 and 2016 sampling.
- Pesticides or pesticide metabolites were detected in excess of laboratory reporting limits in 15 of 19 samples collected in 2021. Thirteen different pesticides or a pesticide metabolite were detected in 2021 samples. The most frequently detected pesticides or pesticide metabolites are metolachlor ESA (14), alachlor ESA (12), atrazine TCR (10), and clothianidin (7).
- No pesticides or pesticide metabolites exceeded a Wis. Admin. Code ch. NR 140 ES. However, three of the groundwater samples collected at wells VF197, VS498 and UA529 contained atrazine TCR concentrations greater than the Wis. Admin. Code ch. NR 140 PAL (0.3 µg/l).

Two neonicotinoid insecticides were also detected in excess of laboratory reporting limits in the 2021 sampling. Clothianidin was detected in seven groundwater samples ranging from 0.02 to 0.088 µg/l, which are significantly less than the WDHS drinking water health advisory of 1,000 µg/l. Imidacloprid was detected in one groundwater sample collected at well DB719 (0.582 µg/l). This concentration is greater than the 2016 sample (0.187 µg/l). The 0.582 µg/l concentration does exceed the WDHS drinking water health advisory of 0.2 µg/l.

- No other pesticide concentrations were detected at concentration that exceeded any respective WDHS drinking water health advisory.

SUMMARY: PEPIN

In 2021, DATCP collected samples from 16 residential wells at address locations in Arkansaw and Durand in Pepin County. Crops observed at the time of sampling included corn, bean crops, some wheat and other small grains, and forage crops. Many fields in the area are irrigated. The approximate locations of wells sampled is shown on the figure to the right.

Well construction records were found for 10 of the wells sampled. Construction reports show that water is generally drawn from saturated unconsolidated sand or from sandstone bedrock. Well depths ranged from 60 to 122 feet deep. Static water depths vary from 22 to 90 feet deep. The wells in sand typically have short screens of 3 to 6 feet, while those in sandstone are cased 9 to 40 feet into the rock above open sandstone intervals of 10 to 30 feet.

None of these wells were sampled by DATCP before 2021. Sampling results are summarized in Table 14.

Table 14: 2021 TSAMP Analytical Results for Pepin County

WUWN	County	Sample Date (month-year)	Well Depth (in feet)	Bedrock Depth (in feet)	Casing Depth (in feet)	Casing Diameter (in inches)	Static Water Depth (in feet)	Formation	ACETOCHLOR ESA	ACIFLUORFEN	ALACHLOR ESA	ALACHLOR OA	ATRAZINE (TCR)	BENTAZON	FOMESAFEN	IMIDACLOPRID	METALAXYL	METOLACHLOR	METOLACHLOR ESA	METOLACHLOR OA	METRIBUZIN	METRIBUZIN DADK	SAFLUFENACIL	THIAMETHOXAM	NITROGEN
FU224	Pepin	Jul-21	121		117	6	83	Sand	0	0	4.95	0	0.066	0	0	0	0	0	1.72	0	0	0	0	0	20.6
GZ506	Pepin	Jul-21	109		106	6	81	Sand	0	0	0.504	0	0	0.278	1.7	0.094	0.074	0	14.7	9.99	0.109	0.862	0.065	0.79	21.7
GZ868	Pepin	Jul-21	120	90	107	6	32	Sandstone	0	0	0	0	0.074	0	0	0	0	0	0.143	0	0	0	0	0	4.48
KC266	Pepin	Jul-21	105		101	6	80	Sand	0.321	0	1.5	0.385	0.065	0.263	0.96	0.18	0.094	0.053	6.22	4.67	0.269	0.992	0	0.753	24.7
OJ561	Pepin	Jul-21	110	60	100	6	35	Sandstone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
QX159	Pepin	Jul-21	113		109	6	83	Sand	0	0	0.42	0	0.078	0.138	1.25	0.103	0	0	8.22	5.32	0.127	0.576	0.075	0.77	20
SN614	Pepin	Jul-21	122		118	6	90	Sand	0.409	0	5.96	0	0.158	0	0	0	0	0	1.83	0	0	0	0	0	17.9
WA868	Pepin	Jul-21							0.152	0	4.85	0	0.486	0.073	0.084	0	0	0	2.01	0.627	0	0	0	0	20.9
WA869	Pepin	Jul-21							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.66
WA881	Pepin	Jul-21							0	0.101	0.365	0	0	0.835	4.14	0.274	0.076	0.1	20.3	17.3	0.166	0.417	0.202	1.17	26
WV767	Pepin	Jul-21	122		118	6	88	Sand	0.082	0	3.39	0.446	0	0.438	0.112	0.068	0.096	0.113	11.2	8.03	0.331	0.338	0	0.074	23
YV126	Pepin	Jul-21	100	71	80	6	54	Sandstone	0	0	0.091	0	0.072	0	0	0	0	0	0.109	0	0	0	0	0	5.14
WA870	Pepin	Jul-21							0	0	1.2	0	0	0	0	0	0	0	0.082	0	0	0	0	0	1.61
WA871	Pepin	Jul-21							0.235	0	0.192	0	0	0	0	0	0	0	0.195	0	0	0	0	0	21.3
WA872	Pepin	Jul-21	60	32	43	6	22	Sandstone	1.21	0	0.276	0	0	0	0	0	0	0	0.567	0	0	0	0	0	16.7
WA873	Pepin	Jul-21							0	0	0.236	0	0.091	0	0	0	0	0	0.796	0	0	0	0	0	9.98

Notes: **Units: Nitrogen = mg/L (milligrams per liter, equivalent to parts per million) and Pesticides = µg/l (micrograms per liter, equivalent to parts per billion).*

WDHS *Wisconsin Department of Health Services Drinking Water Health Advisory*

ES *Enforcement Standard as defined in Wisconsin Administrative Code Chapter NR 140.*

ESA *Ethanesulonic acid*

Nitrogen *Nitrogen as nitrate and nitrite.*

OA *Oxanilic acid*

PAL *Preventive Action Limit as defined in Wisconsin Administrative Code Chapter NR 140.*

TCR *Total Chlorinated Residues of atrazine; which includes the sum of atrazine plus its metabolites de-ethyl atrazine, de-isopropyl atrazine, and di-amino atrazine.*

WUWN *Wisconsin Unique Well Number*

Shaded rows present data from a prior sample year (2015 or 2016).

Zero (0) No detection above laboratory reporting limits.

Blank cells indicate compound not-analyzed or data/information not available.

5.0 *Indicates concentration greater than the respective Wis. Admin. Code ch NR 140 PAL.*

5.0 *Indicates concentration greater than the respective Wis. Admin. Code ch NR 140 ES.*

5.0 *Indicates concentration greater than the respective WDHS Drinking Water Health Advisory.*

Result observations for Pepin County include:

- Nitrogen was detected in excess of laboratory reporting limits in groundwater samples collected from 15 of 16 wells at concentrations ranging from 1.61 at well WA870to 26 mg/L at well WA881. Nitrogen was detected in excess of laboratory reporting limits in only one groundwater sample (well OJ561). Concentrations of nitrogen exceeded the Wis. Admin. Code ch. NR 140 ES of 10 mg/L in 11 of the 16 (68.8%) groundwater samples collected in 2021
- The average concentration of nitrogen detected is 15.7 mg/L. The average concentration of nitrogen in the six wells known to draw groundwater from the shallow sandy aquifer is 21.3 mg/L, while the average nitrogen in four samples from wells installed in the underlying sandstone bedrock is 6.6 mg/L.
- Pesticides or pesticide metabolites were detected in excess of laboratory reporting limits in 14 of 16 samples. Sixteen different pesticides or pesticide metabolites were detected. The most frequently detected pesticide compounds are metolachlor ESA (14), alachlor ESA (13) and atrazine TCR (8).
- No pesticides or pesticide metabolites exceeded a Wis. Admin. Code ch. NR 140 ES. However, one of the groundwater samples (well WA868) contained atrazine TCR concentrations that exceeded the Wis. Admin. Code ch. NR 140 PAL (0.3 µg/l).
- The neonicotinoid insecticides imidacloprid and thiamethoxam were detected in excess of laboratory reporting limits in the same five wells, four of which are known to be set into sand.

- An imidacloprid detection identified in a groundwater samples collected from well WA881 exceeded the DHS drinking water quality advisory of 0.2 µg/l. No other detected pesticide concentrations exceeded any respective WDHS drinking water health advisory.

RECOMMENDATIONS

The occurrence of nitrogen and pesticides in groundwater is influenced by environmental factors including soil, geology, depth to groundwater, and weather events, as well as land management practices such as crops grown, cultivation, agrichemicals used, tile drainage, and irrigation, near the wells in this study. Other factors including well construction, casing depth, total depth, and proximity to agricultural fields may also influence potential impacts to groundwater quality. Identifying the extent to which these variables interact and contribute to the contaminants observed at each sample location presents challenges beyond the scope of this report. Regardless, information in this report may help others to make changes with local land management or influence chemical use decisions that benefit water quality.

DATCP will:

- Share this summary report with health departments and land conservation departments in the counties where sampling occurred.
- Share monitoring data and report findings with United States Environmental Protection Agency, Wisconsin Department of Natural Resources and WDHS to help identify pesticides of interest for national tracking purposes or state standards development.
- Share this report with Groundwater Coordinating Council (GCC) members and member agencies.
- Collect verification samples from wells where pesticide or pesticide metabolite concentrations exceed existing Wis. Admin. Code ch. NR 140 ES or WDHS drinking water quality advisories.
- Attempt to resample all wells in five years (2026) to further evaluate trends in groundwater quality.

Acknowledgments

ACM's financial information includes the state fiscal year (FY) 2021 from July 1, 2020 through June 30, 2021. Federal grants operate October 1, 2020 through September 30, 2021. This report covers those portions of the federal grants that occurred during the state fiscal year. The primary sources of revenue for ACM are industry fees for licenses, permits, registrations, and tonnage under the feed, fertilizer, soil and plant additive, lime, and pesticide programs. In addition, a federal grant provides some funding to cover annual pesticide program expenses. ACM recognizes these important partnerships with industry and the federal government and works hard to maximize the use of this funding for the benefit of the industry, consumers, and the environment.

The raw data required to reproduce the above findings are available upon request. For any questions and clarifications, please do not hesitate to reach out to us at DATCPGW@wisconsin.gov or at (608) 224-4502.

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APPENDIX A

The acronyms and terminology included on this list are generic definitions intended to help understand the Targeted Sampling Program. Some of these terms are more specifically defined in various regulations.

ACRONYMS

µg/l	Micrograms per liter (a liquid equivalent of ppb)
ACM	Bureau of Agrichemical Management
Bgs	Below ground surface
BLSDATCP	Bureau of Laboratory Services
CAS	Chemical Abstract Service
DATCP	Department of Agriculture, Trade and Consumer Protection
DADK	Desaminodiketo
ES	Enforcement Standard
ESA	Ethane Sulfonic Acid
GC	Gas Chromatography
GCC	Wisconsin Groundwater Coordinating Council
ISO	International Organization for Standardization
LC	Liquid Chromatography
mg/L	Milligrams per liter (a liquid equivalent of ppm)
MS	Mass Spectroscopy
N	Nitrogen
ND	No Detect concentrations are less than laboratory reporting limits
NOAA	National Oceanic and Atmospheric Administration
OA	Oxanilic Acid
PA	Prohibition Area
PAL	Preventive Action Limit
PPB	Parts per billion
PPM	Parts per million
TCR	Total chlorinated resides of atrazine
TSAMP	Targeted Sampling Program
USDA	U.S. Department of Agriculture
WDHS	Wisconsin Department of Health Services
WDNR	Wisconsin Department of Natural Resources
WGNHS	Wisconsin Geological and Natural History Survey
Wis. Admin. Code	Wisconsin Administrative Code
WUWN	Wisconsin Unique Well Number
US EPA	United States - Environmental Protection Agency

DEFINITIONS

Analyte - A chemical substance that has a defined Chemical Abstract Service (CAS) number

Atrazine Prohibition Area-- An area where atrazine use is currently prohibited under Administrative Code ATCP 30

Chronic Exposure value - he highest concentration of a chemical to which the organism can be exposed without causing chronic toxicity to the organism in question

Compound - A substance formed by the chemical union of two or more ingredients

Detection - When an analyte has a concentration that can be quantified (i.e., a concentration greater than the Laboratory Reporting Limit)

Herbicide - A pesticide used to kill or inhibit the growth of plants, weeds or grasses

Insecticide - A pesticide used to kill or inhibit the growth of insects

Metabolite or Residual compound or Breakdown product - A chemical substance left behind by a parent compound that has degraded through natural chemical breakdown and/or been metabolized by bacteria

Neonicotinoids - Insecticides that target the neurological systems of insects. The neonicotinoid family includes acetamiprid, clothianidin, dinotefuran, imidacloprid, nitenpyram, nithiazine, thiacloprid, and thiamethoxam

NR140 - Wisconsin Administrative Code which establishes groundwater quality standards and required responses when the standards are exceeded

Pesticide - Substance used to kill, repel, or control certain forms of plant or animal life that are considered to be pests. The pesticide category includes herbicides, insecticides, rodenticides, fungicides, and bactericides

Reporting limit - The minimum analyte concentration that can be reliably quantified and reported by the laboratory

Total chlorinated residues (TCR) of atrazine - Sum of atrazine and atrazine metabolites (de-ethyl atrazine, de-isopropyl atrazine, and diamino atrazine)

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APPENDIX B

List of compounds analyzed

2021 Sample Analytes, Applicable Wis. Admin. Code ch. NR 140 PALs & ESs, Drinking Water Health Advisories, and Reporting Limits

Analyte Description	PAL (µg/l)	ES (µg/l)	Advisory*	Reporting Limit (µg/l)
2,4,5-T				0.050
2,4,5-TP	5	50		0.050
2,4-D	7	70		0.050
2,4-DB				0.80
2,4-DP				0.050
ACETAMIPRID				0.010
ACETOCHLOR	0.7	7		0.050
ACETOCHLOR ESA	46	230		0.050
ACETOCHLOR OA	46	230		0.30
ACIFLUORFEN				0.050
ALACHLOR	0.2	2		0.050
ALACHLOR ESA	4	20		0.053
ALACHLOR OA				0.25
ALDICARB SULFONE				0.050
ALDICARB SULFOXIDE				0.071
AMINOPYRALID				0.150
ATRAZINE	0.3	3		0.050
DE-ETHYL ATRAZINE	0.3	3		0.050
DEISOPROPYL ATRAZINE	0.3	3		0.050
DIAMINO ATRAZINE	0.3	3		0.20
ATRAZINE TCR (calculated)	0.3 [2]	3 [2]		0.050
AZOXYSTROBIN				0.050
BENFLURALIN				0.050
BENTAZON	60	300		0.050
BICYCLOPYRONE				0.050
BROMACIL				0.050
BIFENTHRIN				0.005
CARBARYL	4	40		0.050
CARBOFURAN	8	40		0.050
CHLORAMBEN	30	150		0.32
CHLORANTRANILIPROLE			16,000	0.050
CHLOROTHALONIL				0.10
CHLORPYRIFOS	0.4	2		0.050
CHLORPYRIFOS OXYGEN ANALOG				0.050
CLOMAZONE				0.050
CLOPYRALID				0.050
CLOTHIANIDIN			1,000	0.010
CYANTRANILIPROLE				0.050
CYCLANILIPROLE				0.20
CYFLUTHRIN				0.050
CYPERMETHRIN				0.10
CYPROSULFAMIDE				0.050
DACTHAL	14	70		0.050
DACTHAL DI-ACID	14 [1]	70 [1]		0.050
DACTHAL MONO-ACID	14 [1]	70 [1]		0.050
DIAZINON				0.050
DIAZINON OXYGEN ANALOG				0.050
DICAMBA	60	300		0.30
DICHLOBENIL				0.050
DIMETHENAMID	5	50		0.050
DIMETHENAMID ESA				0.050
DIMETHENAMID OA				0.050
DIMETHOATE	0.4	2		0.050
DINOTEFURAN				0.010
DIURON				0.050

Analyte Description	PAL (µg/l)	ES (µg/l)	Advisory*	Reporting Limit (µg/l)
EPTC	50	250		0.050
ESFENVALERATE				0.025
ETHALFLURALIN				0.050
ETHOFUMESATE				0.050
FLUMETSULAM			10,000	0.050
FLUPYRADIFURONE				0.050
FLUROXYPYR				0.070
FOMESAFEN			25	0.050
GLYPHOSATE			10,000	0.500
GLYPHOSATE AMMONIUM				0.500
AMPA			10,000	0.500
HALOSULFURON METHYL				0.050
HEXAZINONE			400	0.050
IMAZAPYR				0.050
IMAZETHAPYR				0.050
IMIDACLOPRID			0.2	0.010
ISOXAFLUTOLE			3	0.050
ISOXAFLUTOLE RPA202248 (DKN)			3	0.050
LAMBDA-CYHALOTHRIN				0.020
LINURON				0.050
MALATHION				0.050
MCPA				0.050
MCPB				0.10
MCPP				0.050
MESOTRIONE				0.10
METALAXYL			800	0.050
METHYL PARATHION				0.050
METOLACHLOR	10	100		0.050
METOLACHLOR ESA	260	1,300		0.050
METOLACHLOR OA	260	1,300		0.27
METRIBUZIN	14	70		0.050
METRIBUZIN DA				0.10
METRIBUZIN DADK				0.12
METSULFURON-METHYL				0.050
NICOSULFURON				0.050
NORFLURAZON				0.050
OXADIAZON				0.050
PENDIMETHALIN				0.050
PERMETHRIN				0.030
PICLORAM	100	500		0.050
PROMETONE	20	100		0.050
PROMETRYN				0.050
PROPICONAZOLE				0.050
PROTHIOCONAZOLE-DESTHIO				0.050
SAFLUFENACIL			460	0.050
SIMAZINE	0.4	4		0.050
SULFENTRAZONE			1,000	0.050
SULFOMETURON-METHYL				0.050
TEBUPIRIMPHOS				0.050
TEMBOTRIONE				0.10
THIACLOPRID				0.010
THIAMETHOXAM			100	0.010
THIENCARBAZONE-METHYL			800	0.050
TRICLOPYR				0.050
TRIFLURALIN	0.75	7.5		0.050
NITROGEN-NITRATE/NITRITE (mg/l)	2	10		0.50 mg/l

* Wisconsin Department of Health Services Drinking Water Health Advisory (June 2019, November 2020, Revised February 2022).

[1] Combined sum of metabolites (Di- and Mono-acid) and parent Dacthal.

[2] Total Chlorinated Residue for Atrazine. Combined sum of metabolites (De-ethyl, De-isopropyl and di-amino) and parent Atrazine.

APPENDIX C

2021 Driking Water Advisories Issued for Nitrate and Imidacloprid

Nitrate in Private Well Water

Drinking water with high levels of nitrate is unsafe for everyone.

Babies and women who are or may become pregnant women are especially sensitive to nitrate. Immediate action should be taken if levels are high. High levels of nitrate can cause methemoglobinemia (blue baby syndrome) in babies less than 6 months old and increase the risk for certain types of birth defects in pregnant women.

Recent studies have shown that high levels of nitrate may cause thyroid problems and increase the risk of certain types of cancers in **everyone**.

Test your well for nitrate every year.

Because **you cannot smell, taste, or see nitrate in your water**, we recommend that you test for nitrate at least once a year.

Test more often if:

- Babies or pregnant women use the water. You notice a change in color, taste, or smell of the water. → **Test right away**
- A new well is constructed. You have not tested your well in the past five years. → **Test twice a year** (6 months apart)

Nitrate has been found in wells in every county in Wisconsin.

Nitrate naturally occurs in plants and animals.

Nitrate can enter groundwater from fertilizers and animal and human waste (poop).

Take action if nitrate levels are high!

If your nitrate-nitrogen level is:

Less than 10 mg/L

You can use the water for all activities including drinking, brushing teeth, preparing food, handwashing, and bathing.

10 mg/L or greater

Women who are or may become pregnant and babies should immediately stop using the water for drinking and preparing foods that use a lot of water like infant formula, soup, and rice.

Everyone should avoid long-term use of water for these purposes.

Everyone can use the water for other activities like handwashing, brushing teeth, and bathing.

Take steps to fix your well.

As a well owner, you are responsible for your own water. Your local health department can help explain your test results and options for fixing and improving your well. **The next page has options for keeping you and your family safe.**

WISCONSIN DEPARTMENT OF HEALTH SERVICES
Division of Public Health | Bureau of Environmental and Occupational Health
www.dhs.wisconsin.gov/eh | dhsenvhealth@wi.gov
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Steps to take if your well has high nitrate:

1. Retest your well to confirm results.

- Collect a second sample (called a "confirmation sample") to determine if the first result is accurate.
- Consider testing for pesticides as they can be found in wells with high nitrate.

2. Inspect and protect your well.

- Inspect the seal on the well cap and the above-ground casing for holes or other signs that surface contaminants may be entering the well.
- Consider having the well inspected by a licensed well driller or pump installer.
- Reduce your fertilizer use.
- Make sure your septic system is well maintained and pumped regularly to prevent overflow.

3. Use a safe water source.

- Use bottled water or water from a well without a nitrate problem for drinking and preparing food until you find a long-term solution.
- Do not boil the water from your well as this does not remove the nitrate.

4. Find a long-term solution.

The following are long-term solutions to find a way to drink safe water.

$$ Install a water treatment system

- Work with a water treatment professional to select a certified treatment device.
  DNR approval may be required before installing a water treatment system.
- These systems require regular maintenance and testing to ensure they are working properly.
- **Point-of-use (POU)** systems treat water coming from one faucet like a kitchen sink, but can use a lot of water and are not as effective with high levels.
- **Point-of-entry (POE)** systems treat all water coming into the house and provide safe drinking water throughout the house.

$$$ Drill a new well

- A new well is often a permanent solution, although there is no guarantee that it will be free from contaminants. It is always important to work with a licensed well driller or pump installer.
- Financial help may be available in limited situations. Check out DNR's Well Compensation Grant Program for more information.

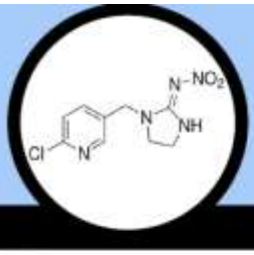
$$$ Connect to a public water supply or community well

- Connecting to a public water supply can provide a permanent safe water supply; however, annexation may be required. Contact your local government with questions.
- Connecting to a community well can also provide a permanent safe water supply where costs for maintaining and testing the well are shared by multiple families.

Web Links and Additional Resources

The links in this document can be found at dhs.wisconsin.gov/water/nitrate.htm.

To learn about other common health concerns for private wells, visit dhs.wisconsin.gov/water/hazards.htm.



Imidacloprid

If the level of imidacloprid in your water is over **0.2 µg/L**, you should find a different source of water for drinking and preparing foods that take up a lot of water.*

What is imidacloprid?

Imidacloprid is a neonicotinoid pesticide that is used to control a variety of indoor and outdoor insects.

- In Wisconsin, imidacloprid is used in agricultural fields, gardens, and pet collars.
- Imidacloprid has been found in private wells and monitoring wells in Wisconsin.

Can imidacloprid affect our health?

Animal studies have shown that imidacloprid can cause health effects.

- No studies have evaluated the effect of imidacloprid among people.
- However, studies in research animals have shown that high levels of imidacloprid can cause thyroid, neurological, reproductive, and glucose regulation problems.

What can you do to protect your health?

Wisconsin recommends a groundwater standard of 0.2 micrograms per liter (µg/L) for imidacloprid.

If the level of imidacloprid in your drinking water is above this, you should find a way to obtain safe water. Options include:

- Installing a certified treatment device.
- Drilling a new well.
- Connecting to a public water system or community well.

*Examples of foods that take up a lot of water include soup, rice, jello, and oatmeal.

Looking for more information?

- See the factsheet by the Wisconsin Department of Agriculture, Trade, and Consumer Protection (DATCP) for more information on the use of imidacloprid in Wisconsin.
- Visit the DHS website for more information on Wisconsin's recommended groundwater standards.

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Wisconsin Department of Health Services | Division of Public Health
dhsenvhealth@dhs.wi.gov