2024 Targeted Sampling Program

ANNUAL REPORT

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

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Table of Contents

List of Figures

List of Tables

Introduction

In 2024, the Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP) resumed its Targeted Sampling Program. The 2023 Statewide Survey was completed in place of the Targeted Sampling Program in 2023. This program aims to assess the impact of pesticide use on specific private potable wells across Wisconsin. In total, 92 private potable wells were sampled between May and August in Dane, Dunn, and Marathon counties. Each sample was tested for Nitrate plus Nitrite as nitrogen (N) and 112 pesticides compounds. This document provides a narrative of the activities and summarizes the analytical data of the DATCP 2024 Targeted Sampling Program.

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

Purpose of Targeted Sampling

Agriculture contributes about $116.3 billion annually to Wisconsin's economy (Wisconsin Department of Agriculture, Trade and Consumer Protection, 2024). Growers use millions of pounds of pesticides and millions of tons of fertilizers annually to grow a wide variety of crops. Through the Targeted Sampling Program, DATCP utilizes a targeted approach to select private potable wells that are at risk of being impacted by agricultural chemicals. DATCP Targeted Sampling Program helps the agency meet its statutory obligation to monitor groundwater. Wisconsin's groundwater law, Chapter 160, requires regulatory agencies to sample and monitor groundwater for substances that have a reasonable probability of entering the groundwater resources of the state. The regulation applies to activities such as waste disposal, agricultural practices, and industrial activities that have the potential to contaminate groundwater. Under this regulation, agencies are required to determine whether Preventive Action Limits (PALs) or Enforcement Standards (ESs)[1] of a substance in groundwater have been exceeded at a specific location, depth, or distance from a facility, activity, or practice. 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 PALs or ESs are attained or exceeded and to obtain information necessary for the implementation of responses for specific sites;
- At-risk monitoring, to define and sample at-risk potable wells in areas where substances are detected in the groundwater or where PALs or ESs are attained or exceeded; and
- Management practice monitoring, to assure practices are within compliance regulations.

Program Approach and Selection Criteria

The potential for agricultural chemicals to affect groundwater quality at any particular location depends on site-specific conditions. Criteria used to select study areas for the Targeted Sampling Program testing focus on conditions that make groundwater prone to contamination. These criteria vary from year to year and between study areas.

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 concerning concentrations of nitrate, pesticides, or other compounds;

[1] An essential part of Wisconsin's groundwater protection laws was the creation of water quality standards for different substances, outlined in Wis. Admin. Code Chapter NR 140. The Wisconsin Department of Natural Resources sets groundwater standards for substances of public health concern based on recommendations from Wisconsin Department of Health Services. Groundwater standards have two components: an enforcement standard (ES) and a preventative action limit (PAL). The ES is a concentration that, if exceeded, requires intervention from the appropriate authority. The PAL is a percentage of the ES; 10% of the ES for carcinogenic, mutagenic, or teratogenic properties; and 20% of the ES for the remaining substances. The intention of the PAL is for it to act as a trigger for intervention before a pollutant becomes a serious risk to public health or the environment.

- Areas in or near an existing atrazine prohibition area (PA), or areas where other restrictions on pesticide use have occurred out of concern for groundwater protection;
- Areas with little to no crop rotation (e.g. corn, soybeans, potatoes grown year after year) and a high likelihood of repetitive pesticide use in the area;
- Areas where the grown crops require extensive chemical or fertilizer inputs and/or irrigation; and
- Areas where pesticides with characteristics of high mobility in soil and resistance to degradation are used.

Planning for the Targeted Sampling Program is usually performed early in the year, 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. Relationships between groundwater quality observations and well construction properties, such as well depth, casing depth, well age, and geologic formation at the screen, are also explored through analysis of data collected through the program.

Permission to sample private potable wells is generally obtained in advance through letters and permission slips mailed to the well owners. Once the sample is collected and analyzed through the DATCP Bureau of Laboratory Services (BLS), DATCP hydrogeologists provide homeowners with a copy of their analytical results. DATCP staff assist with the interpretation of results and in resolving any water contamination issues. Whenever a concentration of a certain compound exceeds an ES or a Wisconsin Department of Health Services (DHS) Health Advisory Level (HAL), the owner receives drinking water advisory information.

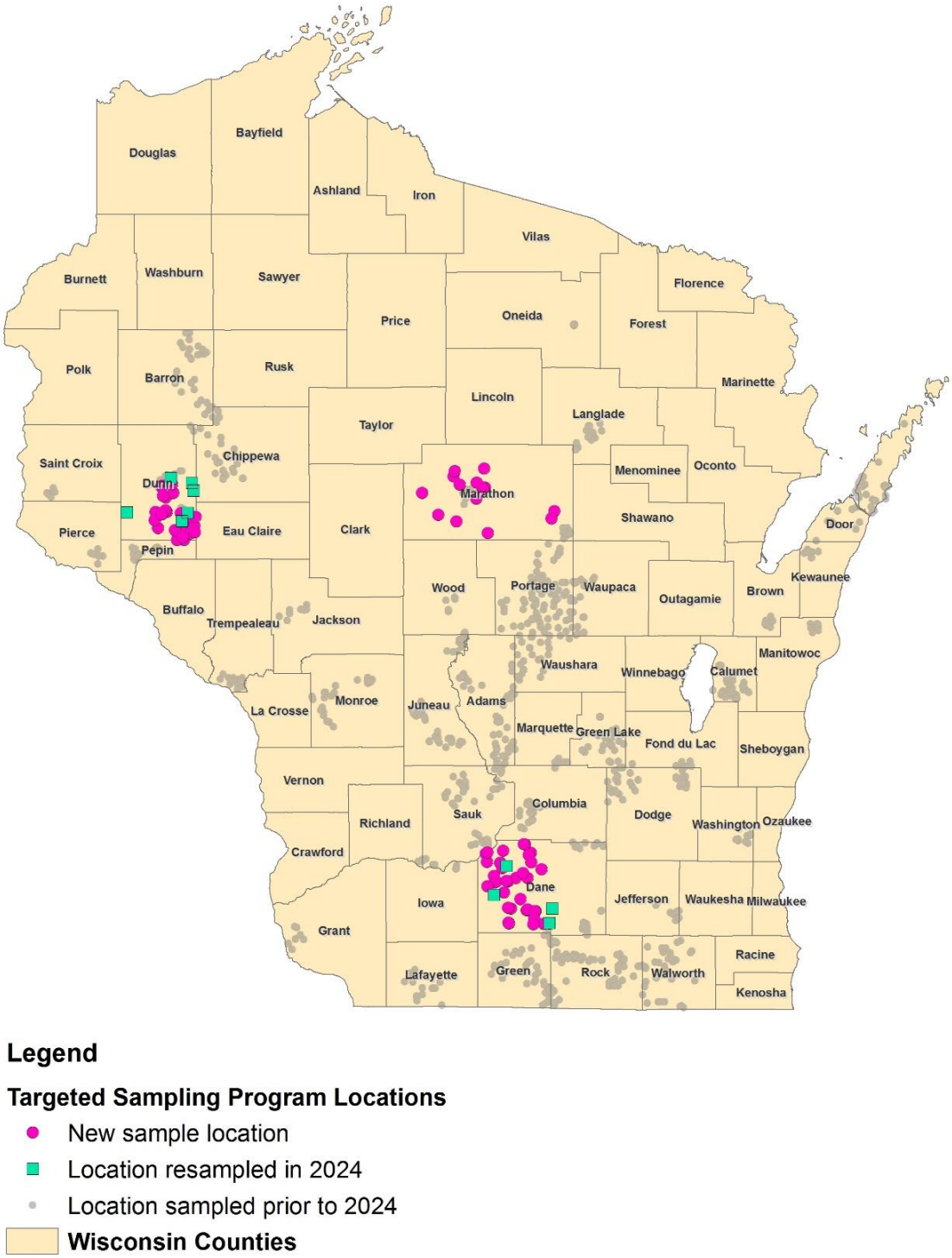
2024 PROGRAM SPECIFICS

In 2024, DATCP reached out to 176 homeowners inviting them to participate in the Targeted Sampling Program. Ultimately, 92 homeowners agreed to have their private potable wells tested. Among these participants, 80 homeowners had wells that had not previously been evaluated by DATCP. The remaining 12 homeowners had already undergone sampling by DATCP in prior years and granted approvals for more testing in 2024. Program staff subsequently collected 92 samples from private potable wells in agricultural areas across three counties between May and August 2024. Specifically, 41 samples were collected in Dane County, 36 samples in Dunn County, and 16 samples in Marathon County. The number of samples collected and their locations in each county are listed in Table 1. The sampling locations of 2024, and those sampled in previous years, are shown on Figure 1.

Table 1. 2024 Targeted Sampling Program Sample Location Summary

County	Municipalities	Number of Samples
Dane	Berry, Black Earth, Cross Plains, Dane, Dunn, Fitchburg, Mazomanie, Middleton, Oregon, Primrose, Roxbury, Springdale, Springfield, Vermont, Verona, Westport	41
Dunn	Colfax, Dunn, Elk Mound, Peru, Red Cedar, Rock Creek, Spring Brook, Tainter, Weston	36
Marathon	Rietbrock, Marathon, Reid, Rib Falls, Cassel, Stratford	15

Figure 1. 2024 Targeted Sampling Program Locations



Notes: Figure 1 shows locations for all 92 Targeted Program wells tested in 2024. Wells that were sampled through the Targeted Sampling Program in 2024 for the first time are marked with a pink dot. Wells that were sampled prior and through the Trageted Sampling Program in 2024 are marked as a green box. Wells that were sampled prior to 2024 through the Targeted Sampling Program are marked with a light gray circle.

Sample Collection and Analysis

Sample collection followed Wisconsin Department of Natural Resources (DNR) and DATCP standard opertating procedures (Wisconsin Department of Natural Resources, 1996). Groundwater samples were collected from either an outside spigot or a valve/sampling port at the water system pressure tank to ensure the collection of raw and untreated water (i.e. water not passing through a water treatment system). Whenever a sample was collected from an outside spigot, the water ran through a pumping cycle to ensure the water was fresh from the underground water supply. Groundwater samples were collected by directly filling one laboratory-provided one-liter amber-colored glass sampling bottle at the designated sampling location. Bottles were then placed in a cooler on ice along with a properly completed sample collection form. Packages were hand delivered to the DATCP Bureau of Laboratory Services (BLS) for pesticides and nitrate analyses. A summary of the analytical data for the 2024 Targeted Sampling Program is included in Appendix B. Detailed analytical reports are available upon request.

BLS performed groundwater analytical testing using GC/MS/MS and LC/MS/MS methods in accordance with ISO 17025 accreditation standards. Each sample was tested for 112 pesticides (pesticide active ingredients or metabolites), and Nitrate plus Nitrite as nitrogen (N). As of April 2024, BLS expanded the list of pesticides tested from 106 to 112, adding the following analytes: boscalid, hydroxyatrazine, pyroxasulfone, pyroxasulfone M-1, sulfentrazone 3- carboxylic acid, and tebuconazole. Table B 1 of Appendix B lists the parameters and corresponding laboratory reporting limits. The laboratory reporting limit is the minimum analyte concentration that can be reliably quantified and reported by the laboratory. If the concentration of a certain compound is reported to be less than the respective laboratory reporting limit, we consider the compound ***not detected*** in the water sample. If the concentration of a certain compound is reported to be greater than the respective laboratory reporting limit, we consider the compound ***detected*** in the water sample. We are unable to determine if the water samples contain other compounds than those listed in Table B 1 of Appendix B.

Results

A total of 92 groundwater samples were collected and submitted for chemical analysis as a part of the DATCP's 2024 Targeted Sampling Program. A full listing of compounds analyzed and compounds' concentrations are included in Table B 1 of Appendix B along with Wisconsin's groundwater quality standards referencing both Wisconsin Administrative Code (Wis. Admin. Code) ch. NR 140 PALs and ESs, and Wisconsin Department of Health Services (DHS) Health Advisory Levels (HALs).

SUMMARY

Below is a summary of the sampling results, followed by a detailed narrative for the 2024 data. For a more comprehensive understanding of the compounds detected, the ranges of concentrations, and exceedances of established groundwater standards, please refer to Table 2.

Detections

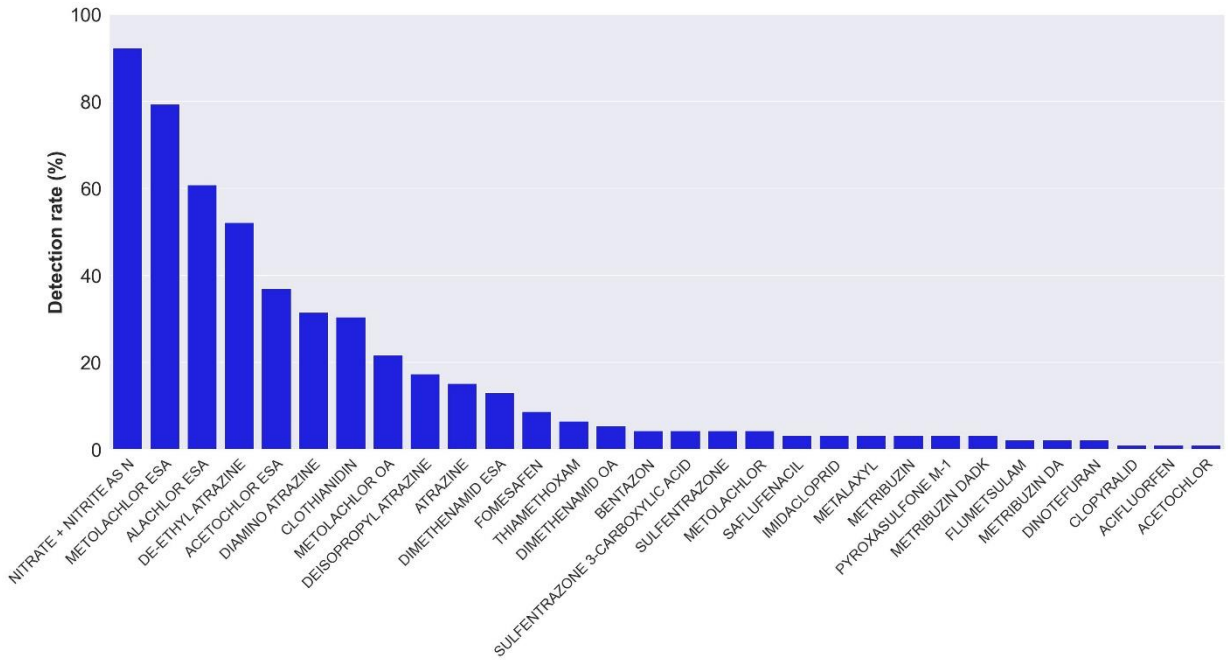
Detected compounds and respective detection rates[2] for the 2024 Targeted Sampling Program are shown on Figure 2.

- Of the 112 pesticide analytes included in the laboratory testing methods, 29 were detected in the 2024 Targeted Sampling Program data. Detections include 11 herbicides, 13 herbicide metabolites, four insecticides, and one fungicide.
- No nitrate or pesticide compounds were detected in four of the 92 samples collected.
- Nitrate was detected in 85 samples, or 92.41% of the samples.
- One or more pesticide compounds were detected in 84 samples, or 91.3% of the samples.
- The highest number of pesticides detected in a single sample was 19, found in a well located in Dunn County.

[2] The detection rate (%) is calculated as follow: $\frac{number\ of\ detects}{total\ number\ of\ samples}\ x\ 100$

- Metolachlor Ethane Sulfonic Acid (ESA), a metabolite of the herbicide metolachlor, was the most detected pesticide compound, found in 73 samples (79.3% detection rate).
- The second most detected compound overall was alachlor ESA (a metabolite of alachlor), found in 56 samples (60.9% detection rate).
- De-ethyl atrazine, a metabolite of atrazine, was the third most detected compound, found in 48 samples (52.2% detection rate).
- Atrazine Total Chlorinated Residues (TCR), i.e. the sum of atrazine parent material and its breakdown products (de-ethyl atrazine, de-isopropyl atrazine, and diamino atrazine), was found in 55 samples, or in 59.8% of the samples collected.
- At least one neonicotinoid compound (clothianidin, dinotefuran, imidacloprid, and thiamethoxam) was detected in 30 samples, or about 32.6% of the samples. Clothianidin was the most frequently detected neonicotinoid compound.
- Pyroxasulfone M-1 and sulfentrazone 3-carboxylic acid were detected for the first time by DATCP in private potable wells. These compounds were added to the BLS testing list in April 2024.

Figure 2. Compounds Detected Through the 2024 Targeted Sampling Program and Respective Detection Rates



Notes: *On the x-axis, the list of compounds detected (i.e. found with concentrations greater than laboratory reporting limits). On the y-axis, the detection rate in percentage for each detected compound. The most frequently detected compound was Nitrate plus Nitrite as N, followed by metolachlor ESA and alachlor ESA.*

Table 2. Summary of Compounds Detected Through the 2024 DATCP Targeted Sampling Program

Compound Detected	*Range Detected (µg/L)*	*Detections*				*PAL - ES (µg/L)*	*HAL (µg/L)*
		Total	*>=PAL*	*>=ES*	*>=HAL*		
Nitrate plus Nitrite as N	0.526 - 31.0 mg/L	85	82	39	---	2 - 10 mg/L	---
Acetochlor	0.0712	1	0	0	---	46 - 230	---
Acetochlor ESA	0.0537 - 1.52	34	0	0	---	46 - 230	---
Acifluorfen	0.0891	1	---	---	---	---	---
Alachlor ESA	0.0507 - 3.83	56	0	0	---	46 - 230	---
Atrazine	0.0516 - 0.523	14	1	0	---	0.3 - 3.0	---
Atrazine (TCR)	0.0516 - 1.4773	55	25	0	---	0.3 - 3.0	---
Bentazon	0.276 - 0.715	4	0	0	---	60 - 300	---
Clopyralid	0.379	1	---	---	---	---	---
Clothianidin	0.0108 - 1.18	28	---	---	0	---	1,000
De-Ethyl Atrazine	0.0516 - 0.469	48	4	0	---	0.3 - 3	---
Deisopropyl Atrazine	0.0502 - 0.269	16	0	0	---	0.3 - 3	---
Diamino Atrazine	0.156 - 1.14	29	17	0	---	0.3 - 3	---
Dimethenamid ESA	0.0507 - 2.41	12	---	---	---	---	---
Dimethenamid OA	0.0614 - 0.987	5	---	---	---	---	---
Dinotefuran	0.0176 - 0.0179	2	---	---	---	---	---
Flumetsulam	0.0849 - 0.324	2	---	---	0	---	10,000
Fomesafen	0.096 - 3.18	8	---	---	0	---	25
Imidacloprid	0.0462 - 0.38	3	---	---	2	---	0.2
Metalaxyl	0.0962 - 0.42	3	---	---	0	---	800
Metolachlor	0.0545 - 1.33	4	0	0	---	10 - 100	---
Metolachlor ESA	0.0599 - 26.8	73	0	0	---	260 - 1300	---
Metolachlor OA	0.284 - 9.69	20	0	0	---	260 - 1300	---
Metolachlor metabolites	0.0599 - 35.25	73	0	0	---	260 - 1300	---
Metribuzin	0.051 - 0.961	3	0	0	---	14 - 70	---
Metribuzin DA	0.146 - 0.243	2	---	---	---	---	---
Metribuzin DADK	0.192 - 0.697	3	---	---	---	---	---
Pyroxasulfone M-1	0.0766 - 0.181	3	---	---	---	---	---
Saflufenacil	0.194 - 0.64	3	---	---	0	---	460
Sulfentrazone	0.078 - 0.214	4	---	---	0	---	1,000
Sulfentrazone 3-carboxylic acid	0.121 - 0.158	4	---	---	---	---	---
Thiamethoxam	0.0105 - 2.25	6	---	---	0	---	120

Notes: *Units: Nitrate plus Nitrite as N = 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.*
DA *Desamino*
DADK *Desaminodiketo*
ES *Enforcement Standard as defined in Wisconsin Administrative Code Chapter NR 140.*
ESA *Ethanesulonic acid*
HAL *Wisconsin Department of Health Services Health Advisory Level*
Metolachlor metabolites = Sum of Metolachlor ESA and Metolachlor OA
OA *Oxanilic acid*
PAL *Preventive Action Limit as defined in Wisconsin Administrative Code Chapter NR 140.*
TCR *Total Chlorinated Residues of atrazine. It is the sum of atrazine (parent material) and its three metabolites (de-ethyl, deisopropyl, and diamino atrazine).*

Exceedances of Drinking Water Standards

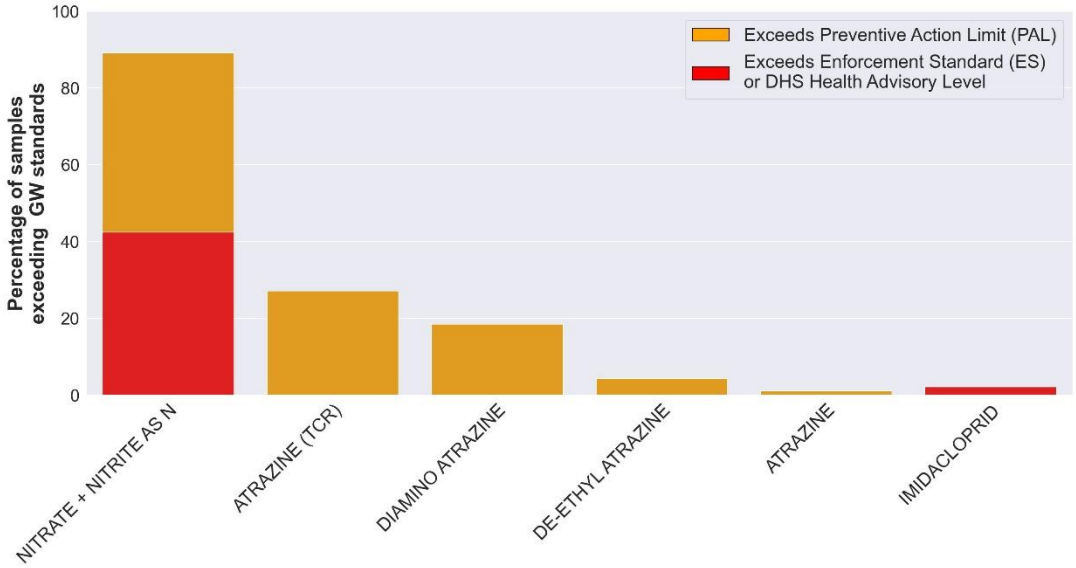
Figure 3 shows the compounds that exceed NR 140 groundwater standards, including Preventive Action Limits (PALs) and Enforcement Standards (ESs), along with their respective percentage of exceedances for the 2024 Targeted Sampling Program. In cases where a compound lacks an established NR 140 Enforcement Standard, we refer to the Wisconsin Department of Health Services (DHS) Health Advisory Level, if available.

- Nitrate was detected in exceedance of the Wis. Admin. Code ch. NR 140 PAL of 2 milligram per liter (mg/L) in 82 samples (89.1%).
- Nitrate was detected in exceedance of the Wis. Admin. Code ch. NR 140 ES of 10 mg/L in 39 samples (42.4%).
- Imidacloprid was detected in exceedance of the DHS Health Advisory Level of 0.2 micrograms per liter (µg/L) in two samples (2.2%)

No pesticide analytes were detected at a concentration exceeding respective Wis. Admin. Code ch. NR 140 ES. Exceedances of the NR 140 PAL are as follows:

- Atrazine TCR was detected in exceedance of the Wis. Admin. Code ch. NR 140 PAL of 0.3 microgram per liter (µg/L) in 25 samples (27.2%)
- Diamino atrazine was detected in exceedance of the Wis. Admin. Code ch. NR 140 PAL of 0.3 microgram per liter (µg/L) in 17 samples (18.5%)
- De-ethyl atrazine was detected in exceedance of the Wis. Admin. Code ch. NR 140 PAL of 0.3 microgram per liter (µg/L) in four samples (4.3%)
- Atrazine was detected in exceedance of the Wis. Admin. Code ch. NR 140 PAL of 0.3 microgram per liter (µg/L) in one sample (1.1%)

Figure 3. Compounds Exceeding the Preventive Action Limit (PAL), Enforcement Standard (ES), or DHS Health Advisory Level and Respective Exceedances Rates

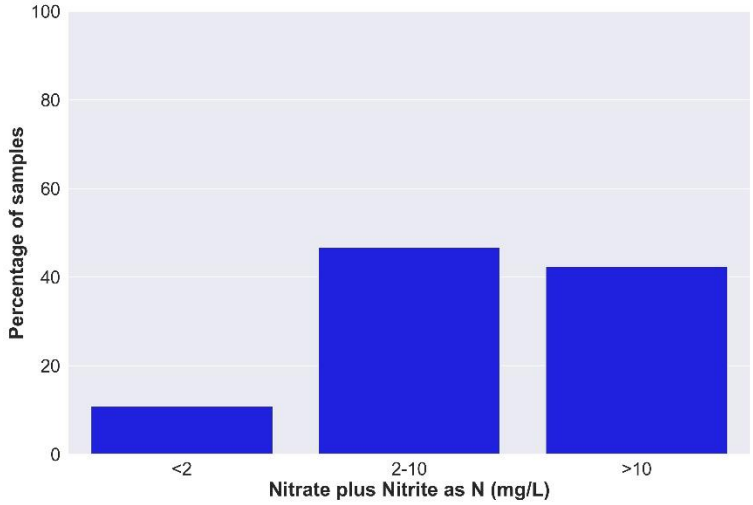


NITRATE PLUS NITRITE AS N

Nitrate plus Nitrite as N was detected in 92% of samples collected through the 2024 DATCP Targeted Sampling Program. Nitrate plus Nitrite as N occurrence data is summarized below and shown on Figure 4.

- <2 mg/L: 10 wells (11%)
- >2 to 10 mg/L: 43 wells (47%)
- >10 mg/L: 39 wells (42%)

Figure 4. Nitrate plus Nitrite as N Occurrence Data



The PAL of 2 mg/L and the ES of 10 mg/L for Nitrate plus Nitrite as N was exceeded in 89% and 42% of the samples, respectively. The percentage of samples (and wells) exceeding the ES is higher than results from the 2023 statewide sampling survey. In that survey, 380 randomly selected samples were collected from private potable wells. Based on survey results, the statewide exceedance rate of the ES for Nitrate plus Nitrite as N was estimated to be 7.3% (Wisconsin Department of Agriculture, Trade and Consumer Protection & U.S. Department of Agriculture - National Agricultural Statistics Service, 2024). A greater exceedance rate was expected for the DATCP Targeted Sampling Program data because it is a biased method of sampling for pesticides and nitrate.

PESTICIDES

One or more pesticide or pesticide metabolite compounds were detected in 91% of samples collected in 2024 (84 of the 92 samples). A total of 29 different pesticides or pesticide metabolites were detected in samples (Table 2 and Figure 2). The most frequently detected compounds (with more than a 10% detection rate) are listed below along with the number of times (n) and detection rate (%) each compound was detected.

- Metolachlor Ethanesulonic Acid (ESA) (herbicide metabolite; n=73, detection rate=79.3%)
- Alachlor ESA (herbicide metabolite; n=56, detection rate=60.9%)
- De-ethyl atrazine (herbicide metabolite; n=48, detection rate=52.2%)
- Acetochlor ESA (herbicide metabolite; n=34, detection rate=37%)
- Diamino atrazine (herbicide metabolite; n=29, detection rate=31.5%)
- Clothianidin (insecticide; n=28, detection rate=30.4%)
- Metolachlor Oxalic Acid (OA) (herbicide metabolite; n=20, detection rate=21.7%)
- Deisopropyl atrazine (herbicide metabolite; n=16, detection rate=17.4%)
- Atrazine (herbicide; n=14, detection rate=15.2%)
- Dimethenamid ESA (herbicide metabolite; n=12, detection rate=13%)

Out of the 10 most detected compounds, eight are metabolites of the herbicides metolachlor, alachlor, acetochlor, atrazine, and dimethenamid. Each of these compounds is 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 2023 statewide sampling of private wells conducted by DATCP in 2023 (Wisconsin Department of Agriculture, Trade and Consumer Protection & U.S. Department of Agriculture - National Agricultural Statistics Service, 2024). Alachlor ESA concentrations are expected to decline over time because alachlor is a cancelled product and growers significantly reduced use prior to cancellation in June 2016 (Environmental Protection Agency, 2016). The compound clothianidin is a systemic neonicotinoid insecticide that is used to control insects in corn, small grains, soybeans, and vegetable crops. Three additional neonicotinoid insecticides that were also detected less frequently include dinotefuran

(n=two, detection rate= 2.2%), imidacloprid (n=three, detection rate= 3.3%), and thiamethoxam (n=six, detection rate= 6.5%).

Pesticides or pesticide metabolites detected in 2024 Targeted Sampling Program were compared to existing groundwater quality standards listed in Wis. Admin. Code ch. NR 140 (NR 140) and DHS Health Advisory Levels. Of the 29 detected pesticide compounds, there are 13 compounds with established regulatory groundwater standards, eight compounds with DHS Health Advisory Levels, and eight compounds that do not currently have either groundwater standards or DHS Health Advisory Levels. Table 2 shows established Wis. Admin. Code ch. NR 140 PALs, ESs, and DHS Health Advisory Levels (HALs) for the compounds detected.

Three pesticide compounds – atrazine, de-ethyl atrazine, and diamino atrazine – were detected above the Wis. Admin. Code ch. NR 140 Preventive Action Limits (PALs). Atrazine was detected in exceedance of the PAL of 0.3 µg/L in 1.1% of the samples (1 sample). De-ethyl atrazine was detected in exceedance of the PAL of 0.3 µg/L in 4.3% of the samples (4 samples). Diamino atrazine was detected in exceedance of the PAL of 0.3 µg/L in 18.5% of the samples (17 samples). Atrazine TCR (the sum of atrazine plus its three metabolites) exceeded the 0.3 µg/L PAL in 27.2% of the sample (25 samples).

Eight pesticide compounds – clothianidin, flumetsulam, fomesafen, imidacloprid, metalaxyl, saflufenacil, sulfentrazone, and thiamethoxam – were detected in one or more samples. While DHS Health Advisory Levels are currently available, no groundwater standards have been established for these compounds at this time. Nine pesticide compounds – acifluorfen, clopyralid, dimethenamid ESA, dimethenamid OA, dinotefuran, metribuzin DA, metribuzin DADK, pyroxasulfone M-1, and sulfentrazone 3-carboxylic acid – were detected in one or more samples, but currently have no groundwater quality standards or DHS Health Advisory Levels. Pyroxasulfone M-1 and sulfentrazone 3-carboxylic acid are two compounds that we added to our testing list starting from April 2024. This is the first time these compounds were detected in private potable wells by DATCP.

Dane County – Detailed Summary

DATCP collected water samples from 41 private potable wells in western Dane County in the summer of 2024 as part of the Targeted Sampling Program (Figure 5).

Dane County is moderately to highly susceptible to groundwater contamination (Schmidt, Robin R; Kessler, Kevin, 1989). Dane County's bedrock geology consists of Precambrian crystalline rock overlain by a sequence of Paleozoic sandstone, shale, and dolomite formations. The Precambrian rocks, which are primarily igneous and metamorphic, have very low porosity and hydraulic conductivity, forming the base of the regional groundwater system. Above this, the Elk Mound Group includes three key formations: the Mount Simon, Eau Claire, and Wonewoc. The Mount Simon Formation, a thick layer of coarse- to medium-grained sandstone, is one of the county's most important aquifers, providing water for many high-capacity wells. The Eau Claire Formation, composed largely of shale and siltstone, serves as a regional aquitard, restricting water flow between the Mount Simon and the overlying aquifers. The Wonewoc Formation, a fine- to medium-grained sandstone, acts as another important aquifer, though its thickness and extent are reduced in areas affected by preglacial erosion (within portions of the Yahara River, Black Earth Creek, and Wisconsin River valleys). The Tunnel City Group, which lies above the Elk Mound Group, consists of glauconitic sandstone and is an additional, although less productive, groundwater source. The St. Lawrence Formation, a silty dolostone, has very low vertical conductivity, while the overlying Jordan Formation, a sandstone, acts as a minor aquifer. Above these units are the upper Paleozoic formations, composed of sandstone, siltstone, and dolomite with varying hydraulic properties. Dane County also contains a critical Quaternary-age sand and gravel aquifer, formed by unconsolidated sediments that range from clay to well-sorted sand and gravel (Bradbury, et al., 1999; Parsen, et al., 2016).

In Dane County, about 50% of the land is devoted to agricultural procedures (Figure 5) (Wisconsin Department of Natural Resources, 2019). While it is acknowledged that agriculture operations favor regional economic development, concern is continuously raised about long term impacts to water quality.

Results of the 2024 DATCP sampling effort show that Nitrate plus Nitrite as N and several pesticides, such as atrazine metabolites and neonicotinoids, were detected in groundwater samples. Out of the 41 samples collected, only six wells exceeded the NR 140 Enforcement Standard of 10 mg/L for Nitrate plus Nitrite as N. No other compound was found at a concentration exceeding the respective NR 140 Enforcement Standards or DHS Health Advisory Levels.

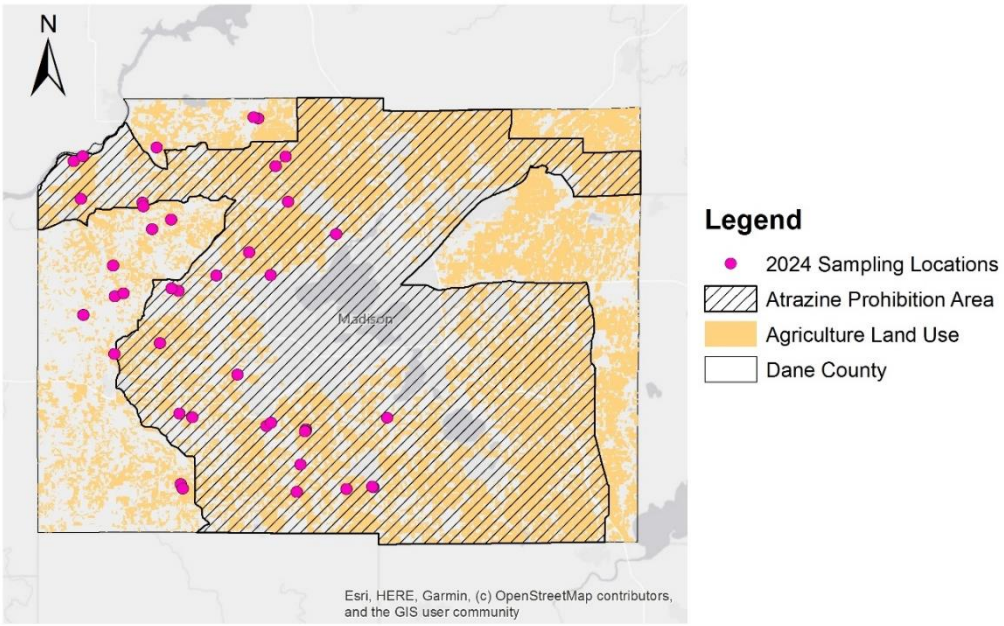
SELECTION OF SAMPLING LOCATIONS AND SAMPLING METHOD

Approximately 70% of Dane County is designated as an Atrazine Prohibition Area (Figure 5). Atrazine and its metabolites have been detected in past DATCP sampling events at Syene, Nevin, and Big Springs (Wisconsin Department of Agriculture, Trade and Consumer Protection, 2023). Groundwater flow models indicate that groundwater in these areas likely moves from southwest to northwest (Parsen, et al., 2016). A 2023 statewide survey identified several wells located in western Dane County where atrazine concentrations exceeded the PAL of 0.3 µg/L (Wisconsin Department of Agriculture, Trade and Consumer Protection & U.S. Department of Agriculture - National Agricultural Statistics Service, 2024). Due to these findings, the western part of the county was targeted for further investigation.

Historical data from the DATCP database was reviewed, focusing on wells and areas where atrazine concentrations have been increasing. Data from public water systems between 2009 and 2023 was also considered (Wisconsin Department of Natural Resources, 2024a). Given that atrazine is predominantly used in corn production, we downloaded corn field frequency data from Cropscape (U.S. Department of Agriculture - National Agricultural Statistics Service, 2024). Approximately 7,000 wells were identified in western Dane County, with about 700 selected based on their proximity (within 500 meters) to corn fields that have not experienced crop rotation over the past 14 to 15 years. From these, around 80 wells were selected to cover the full range of water depth and casing depth variations.

Letters and permission slips were mailed to 77 well owners and 41 granted DATCP permission to test their wells (a 53% positive response rate). A total of 41 private potable wells were sampled by DATCP in May and July 2024. Out of these 41 wells, four were previously tested by DATCP. Groundwater sample collection followed procedure explained in the Sample Collection and Analysis section.

Figure 5. 2024 Sampling Locations, Land Use, and Prohibition Areas in Dane County



***Notes**: Agricultural land use from Wiscland 2.0 (Wisconsin Department of Natural Resources, 2019).*

RESULTS

Detections and Comparisons to Standards

Nitrate plus Nitrite as N and 17 pesticides were detected in 2024 Dane County Targeted Program samples (Figure 6 and Table B 2 in Appendix B). Nitrate was the sole compound to be found in exceedance of the Wis. Admin. Code ch. NR 140 Enforcement Standard (ES) of 10 mg/L. No pesticide compound exceeded any DHS Health Advisory Levels, whenever groundwater standards were not established for a particular compound. Atrazine Total Chlorinated Residues (TCR), diamino atrazine, and de-ethyl atrazine were found at concentrations exceeding the Wis. Admin. Code ch. NR 140 Preventive Action Limit (PAL) of 0.3 µg/L (Figure 7). Below is a summary of the detection rate, the range of values detected for each compound, and the exceedance rate of the respective PAL and ES or DHS Health Advisory Level.

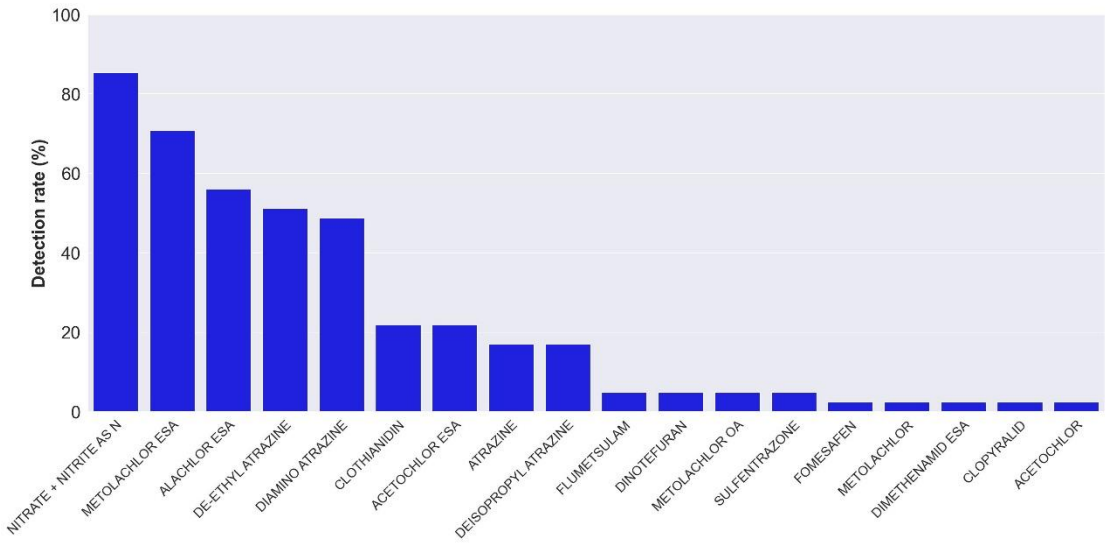
- Nitrate plus Nitrite as N was detected at 35 wells (detection rate of 85.4%) at concentrations between 0.526 mg/L and 24.4 mg/L. The 2 mg/L PAL was exceeded at 33 wells (80.5%), and the 10 mg/L ES was exceeded at six wells (14.6%).
- Metolachlor ESA, a metabolite of the herbicide metolachlor, was detected at 29 wells (70.7%) at concentrations between 0.0606 µg/L and 8.18 µg/L. None of the samples exceeded the 260 µg/L PAL or the 1,300 µg/L ES for the sum of metolachlor ESA and metolachlor OA.
- Alachlor ESA, a metabolite of the herbicide alachlor, was detected at 23 wells (56.1%) at concentrations between 0.0507 µg/L and 0.875 µg/L. No samples exceeded the 4 µg/L PAL or the 20 µg/L ES for this compound.
- De-ethyl atrazine, a metabolite of the herbicide atrazine, was detected at 21 wells (51.2%) at concentrations between 0.0562 µg/L and 0.32 µg/L. One sample exceeded the 0.3 µg/L PAL (2.4%) for atrazine TCR (the sum of atrazine parent material and its metabolites). No samples exceeded the 3 µg/L ES for atrazine TCR.
- Diamino atrazine, a metabolite of atrazine, was detected at 20 wells (48.8%) at concentrations between 0.159 µg/L and 1.14 µg/L. The 0.3 µg/L PAL was exceeded at 14 wells (34.4%). No samples exceeded the 3 µg/L ES for atrazine TCR (the sum of atrazine parent material plus its metabolites).
- Clothianidin, a neonicotinoid insecticide, was detected at nine wells (22%) at concentrations between 0.0132 µg/L and 0.154 µg/L. No PAL and ES standards have been established for this compound at this time. The Wisconsin Department of Health Services (DHS) has set the Health Advisory Level for clothianidin at 1,000 µg/L. No samples exceeded DHS Health Advisory Level for this compound.
- Acetochlor ESA, a metabolite of the herbicide acetochlor, was detected at nine wells (22%) at concentrations between 0.0537 µg/L and 0.701 µg/L. No samples exceeded the 46 µg/L PAL or the 230 µg/L ES for this compound.
- Atrazine was detected at seven wells (17.1%) at concentrations between 0.0538 µg/L and 0.0993 µg/L. No samples sample exceeded the 0.3 µg/L PAL or the 3 µg/L ES for atrazine TCR.
- Deisopropyl atrazine, a metabolite of atrazine, was detected at seven wells (17.1%) at concentrations between 0.0502 µg/L and 0.269 µg/L. No samples exceeded the 0.3 µg/L PAL or the 3 µg/L ES for this compound.
- Metolachlor OA, a metabolite of metolachlor, was detected at two wells (4.9%) at concentrations of 0.854 µg/L and 2.6 µg/L. None of the samples exceeded the 260 µg/L PAL or the 1,300 µg/L ES for the sum of metolachlor ESA and metolachlor OA.
- Sulfentrazone, an herbicide, was detected at two wells (4.9%) at concentrations of 0.183 µg/L and 0.214 µg/L. No PAL and ES standards have been established for this compound at this time. DHS has set the Health Advisory Level for sulfentrazone at 1,000 µg/L. No samples exceeded DHS Health Advisory Level for this compound.
- Flumetsulam, an herbicide, was detected at two wells (4.9%) at concentrations of 0.0849 µg/L and 0.324 µg/L. No PAL and ES standards have been established for this compound at this time. DHS has set the Health Advisory Level for flumetsulam at 10,000 µg/L. No samples exceeded DHS Health Advisory Level for this compound.
- Dinotefuran, a neonicotinoid insecticide, was detected at two wells (4.9%) at concentrations of 0.0176 µg/L and 0.0179 µg/L. No PAL, ES, or DHS Health Advisory Level has been established for this compound at this time. Before this sampling effort, DATCP had not detected dinotefuran in groundwater in Dane County.

- Fomesafen, an herbicide, was detected at one well (2.4%) at a concentration of 0.152 µg/L. No PAL and ES standards have been established for this compound at this time. DHS has set the Health Advisory Level for fomesafen at 25 µg/L. No samples exceeded DHS Health Advisory Level for this compound.
- Metolachlor was detected at one well (2.4%) at a concentration of 0.0545 µg/L. The concentration did not exceed the 10 µg/L PAL or the 100 µg/L ES for this compound.
- Dimethenamid ESA, a metabolite of the herbicide dimethenamid, was detected at one well (2.4%) at a concentration of 0.0771 µg/L. No PAL, ES, or DHS Health Advisory Level has been established for this compound at this time.
- Clopyralid, an herbicide, was detected at one well (2.4%) at a concentration of 0.379 µg/L. No PAL, ES, or DHS Health Advisory Level has been established for this compound at this time. Before this sampling effort, DATCP had not detected clopyralid in groundwater in Dane County.
- Acetochlor was detected at one well (2.4%) at a concentration of 0.0712 µg/L. The concentration did not exceed the 0.7 µg/L PAL or the 7 µg/L ES for this compound.

Atrazine Total Chlorinated Residues (TCR) is the sum of atrazine and its metabolites. Atrazine TCR was found at 25 wells (61% of the samples). Atrazine TCR yielded concentrations between 0.0586 µg/L and 1.4773 µg/L. Atrazine TCR exceeded the PAL of 0.3 µg/L at seven wells (41.4%), but it did not exceed the 3 µg/L ES.

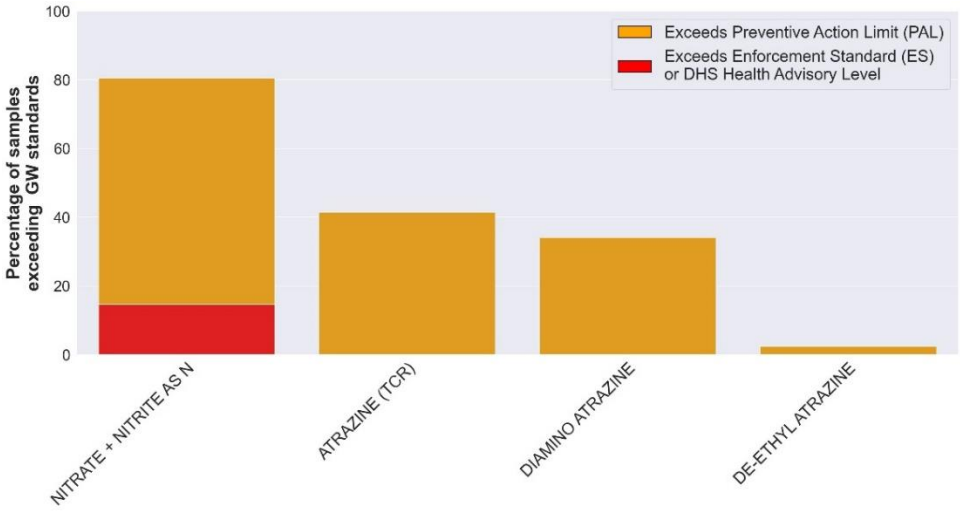
Metolachlor metabolites is the sum of metolachlor ESA and metolachlor OA (or OXA). Metolachlor metabolites were found at 29 wells (70.7% of the samples). Metolachlor metabolites yielded concentrations between 0.0606 µg/L and 10.78 µg/L. No PAL (260 µg/L) or ES (1,300 µg/L) standards were exceeded.

Figure 6. Compounds Detected Through the 2024 Targeted Sampling Program in Dane County and Respective Detection Rates



Notes: *On the x-axis, the list of compounds detected, i.e. found with concentrations greater than laboratory reporting limits. On the y-axis, the detection rate in percentage for each detected compound.*

Figure 7. Compounds Exceeding the Preventive Action Limit (PAL), Enforcement Standard (ES), or DHS Health Advisory Level in Dane County and Respective Exceedances Rates

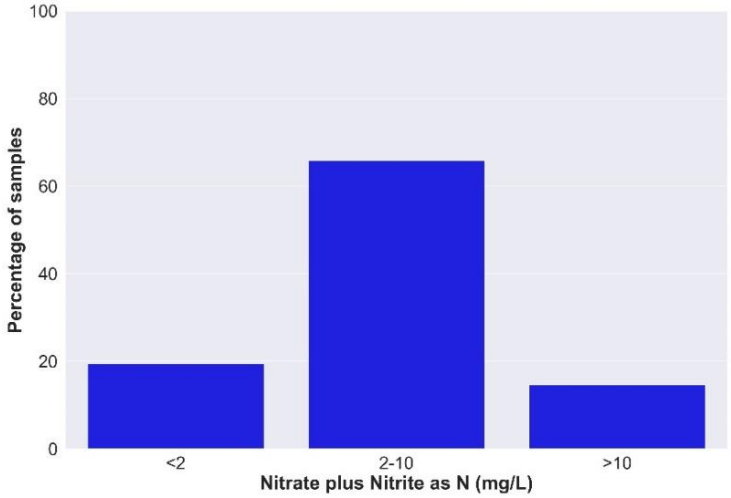


Nitrate

Although Nitrate plus Nitrite as N was detected in 35 of 41 samples collected, it only exceeded the 10 mg/L ES at six wells. It was most frequently detected between 2 and 10 mg/L. The distribution of Nitrate plus Nitrite as nitrate concentrations is summarized below and shown on Figure 8.

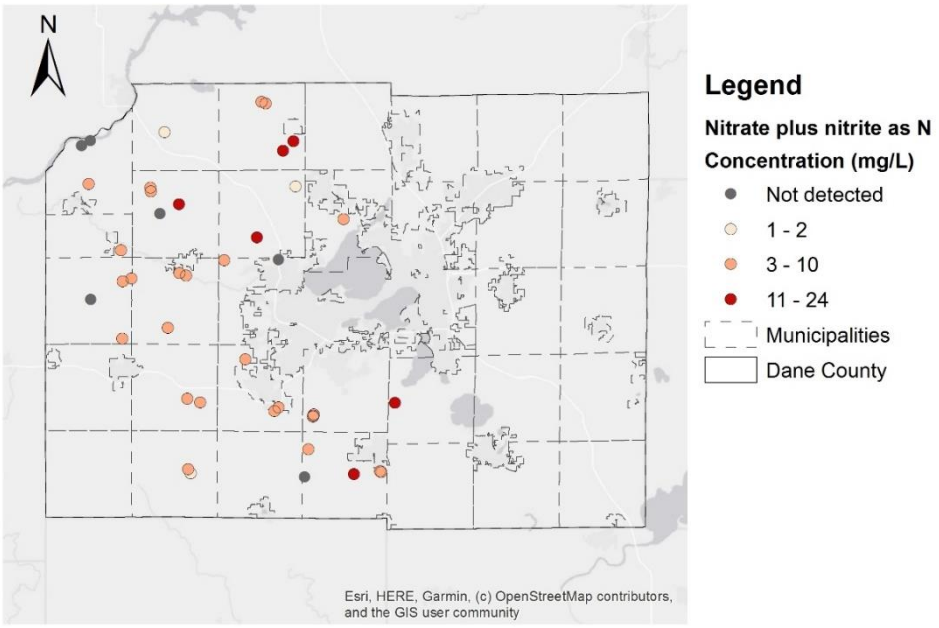
- <2 mg/L: 13 wells (19%)
- >2 to 10 mg/L: 16 wells (66%)
- >10 mg/L: five wells (15%)

Figure 8. Nitrate plus Nitrite as N Occurrence Data in Dane County



As shown on Figure 9, wells with nitrate concentrations exceeding the ES of 10 mg/L were mostly found in northwestern and southern Dane County, particularly within the municipalities of Dane, Springfield, Berry, Dunn, and Oregon.

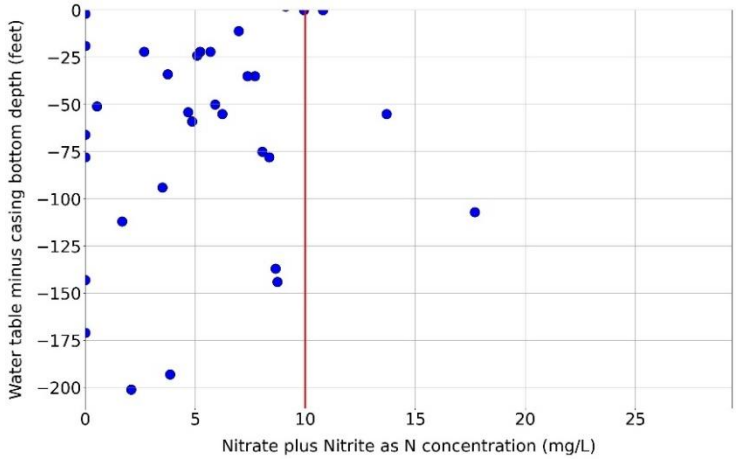
Figure 9. Locations of Nitrate plus Nitrite as N Detections in Dane County



To track the nitrate contamination in-depth and to better identify what factors control the contaminant migration, we retrieved information on well depth, casing bottom depth, static water level, bedrock depth, and installation date from publicly available construction reports. Only 33 of the 41 well samples had complete construction reports.

Figure 10 shows the nitrate concentration versus the difference between the depth of the water table at the time of construction (static water level) and the bottom depth of the well casing. This plot shows how deep below the water table nitrate exceeds the ES of 10 mg/L. As shown, nitrate exceeded 10 mg/L at depths ranging from zero to 107 feet below the water table.

Figure 10. Nitrate plus Nitrite as N Versus the Difference Between the Water Level and the Casing Depth in Dane County

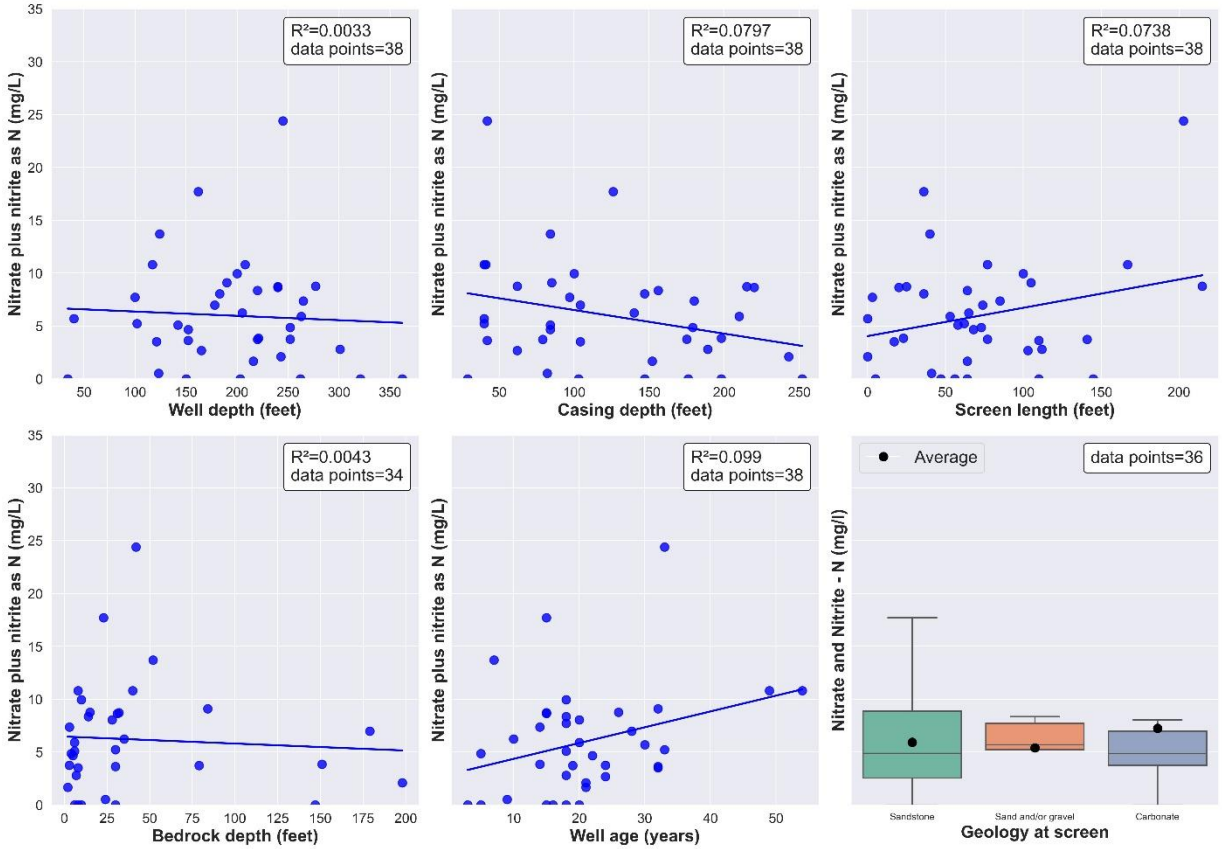


Notes: *The red line represents the ES for nitrate as N (10 mg/L).*

No relationships were found between nitrate concentration and well depth or bedrock depth (Figure 11). Nitrate concentration was negatively correlated with casing depth: shallower casing depths were associated with higher nitrate concentrations. However, the linear relationship between nitrate concentration and casing depth had a very low goodness of fit (R^2 = 0.0797) and was not statistically significant (Figure 11). Nitrate concentration showed a positive correlation with screen length and well age. Specifically, longer screen lengths or greater open intervals to the surrounding geology were associated with greater nitrate concentrations. Older wells tended to have higher nitrate concentrations. Nevertheless, the goodness of fit for these relationships was low, with R^2 values of 0.0738 for screen length and 0.099 for well age, indicating that these correlations are not statistically significant (Figure 11). Figure 11 also displays a boxplot of nitrate concentration based on the geology at the well screen, with the average concentration marked by a black circle. The analysis revealed no substantial differences in average nitrate concentration among the various geological deposits at the well screen. The most notable variation in nitrate concentration were observed in wells with screens installed in sandstone deposits.

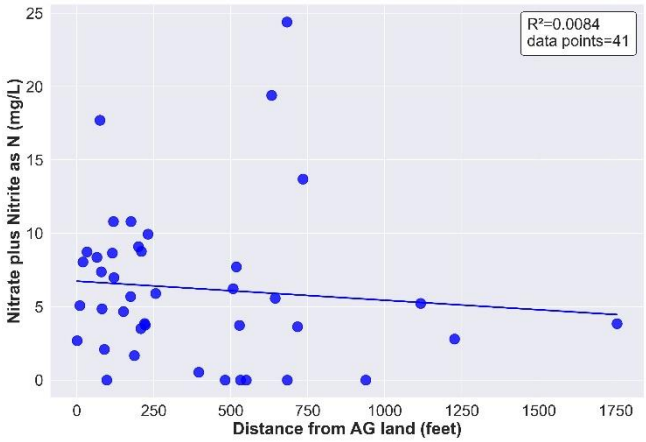
Through Geographic Information Systems (ArcMap), we calculated the distance between each sampling point and the nearest agricultural field (Figure 12). Wiscland 2.0 was used as land cover data (Wisconsin Department of Natural Resources, 2019). Although the goodness of fit is low (R2=0.0084), the data show a weak negative correlation between nitrate levels and the distance of each sampling location to the nearest agricultural field. The greater the distance from an agricultural field, the lower the nitrate concentration. The wells with nitrate concentrations exceeding 10 mg/L are all located within 750 feet from an agricultural field.

Figure 11. Nitrate plus Nitrite as N as a Function of Well Depth, Casing Depth, Static Water Level, Bedrock Depth, and Well Age in Dane County



Notes: The well age is defined as the difference between the year of sampling (2024) and the year of the well construction. The well screen length defined as the difference between the well depth and the casing depth. The box on the top right includes the goodness of fit (R^2) and the number of data used for each relationship.

Figure 12. Nitrate plus Nitrite as N Versus the Distance from an Agricultural Field in Dane County



As mentioned in the Selection of Sampling Locations and Sampling Method section, out of the 41 wells, DATCP had previously tested four wells between 2000 and 2017. Additionally, one more well was listed in the DATCP database and tested by NOVARTIS, bringing the total number of historical nitrate data points in the DATCP database to five. Further nitrate data, including both nitrate as N and Nitrate plus Nitrite as N, were found for 25 wells on the DNR Groundwater Retrieval Network website, spanning from 1990 to 2023 (Wisconsin Department of Natural Resources, 2024). This dataset includes samples collected by either the Wisconsin DNR or the well constructor (driller) during the well construction process.

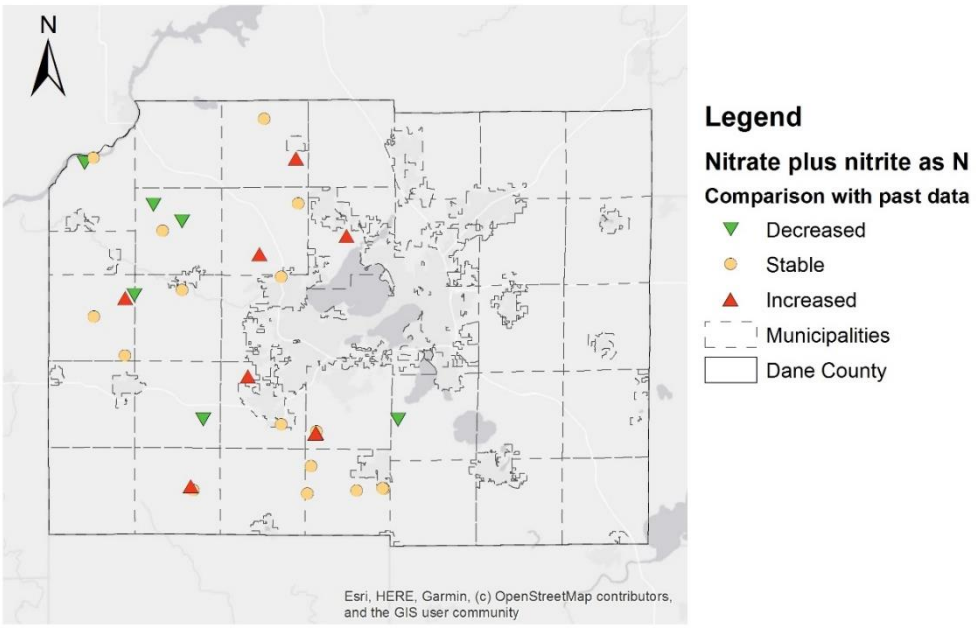
Using a threshold of ±2 mg/L to denote no or minimal change in nitrate concentrations, and given that nitrite concentrations are typically negligible, nitrate as N and Nitrate plus Nitrite as N were treated as equivalent for analysis. Results showed that nitrate levels increased in eight wells, remained stable (no or minimal change) in 16 wells, and decreased in six wells. Overall, nitrate concentrations recorded during the 2024 DATCP Targeted Sampling program did not significantly differ from historical nitrate data (Table 3).

Figure 13 shows that the distribution of wells experiencing an increase in nitrate concentrations occurs across various parts of the county. This suggests that nitrate increases are widespread and not confined to a particular region within Dane County.

Table 3. Nitrate Concentration Changes for the Wells That at Least Once Were Tested for Nitrate Prior the 2024 DATCP Sampling Effort in Dane County

Nitrate Comparison for 30 Wells Sampled Between 1990 and 2024		
Increased Nitrate Eight locations	**No or Minimal Change 16 locations**	**Decreased Nitrate Six locations**
Five increased by 2 to 5 mg/L	10 decreased less than 2 mg/L Six increased less than 2 mg/L	Two decreased by 2 to 5 mg/L
Three increased by 5 to 10 mg/L		Three decreased by 5 to 10 mg/L
None increased more than 10 mg/L		One decreased more than 10 mg/L

Figure 13. Nitrate Trends at Individual Sampling Locations in Dane County



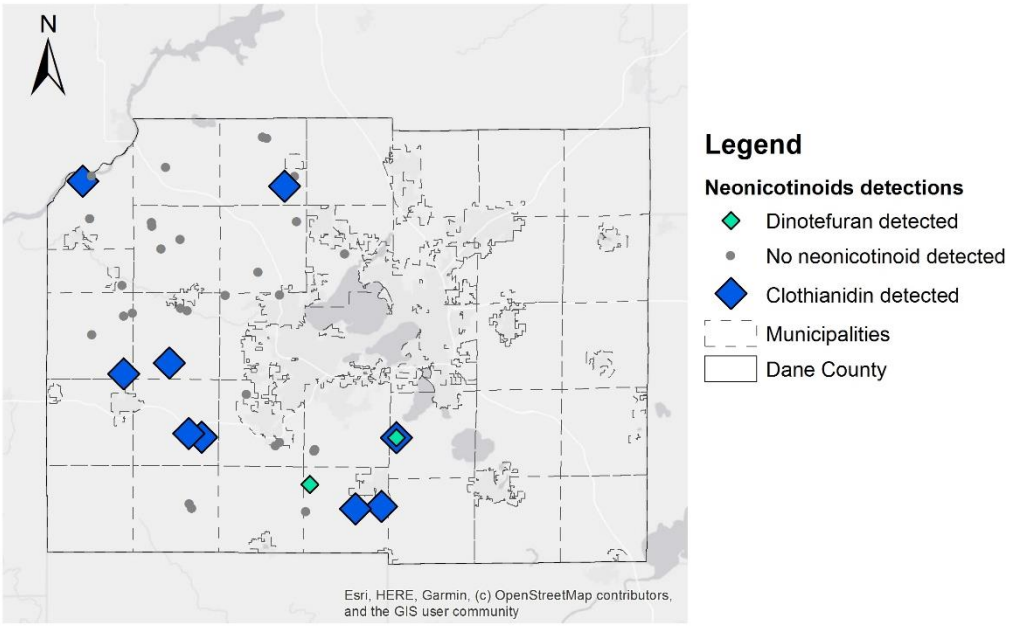
Neonicotinoids

Neonicotinoids are a class of insecticides widely used in Wisconsin. These insecticides are usually applied as seed treatments on major Wisconsin crops, such as corn, soybeans, beans, potatoes, small grains, vegetables, fruit crops, and more. DATCP began testing for neonicotinoids in 2008, starting with thiamethoxam. Currently, the BLS analyzes six neonicotinoid compounds: acetamiprid, clothianidin, dinotefuran, imidacloprid, thiacloprid, and thiamethoxam. Of these, four (clothianidin, dinotefuran, imidacloprid, and thiamethoxam) have been detected multiple times in groundwater and surface water samples across Wisconsin. These four compounds are active ingredients in over 500 registered pesticide products in the state (Kelly Solutions, 2024). While dinotefuran, imidacloprid, and thiamethoxam are active ingredients, clothianidin can be either an active ingredient or a metabolite of thiamethoxam, making it potentially linked to the use of insecticides containing either clothianidin or thiamethoxam.

Prior to 2024, clothianidin, imidacloprid, and/or thiamethoxam were detected in 15 samples from six private potable wells in Dane County. Clothianidin was the most frequently detected compound, found in nine samples from six of these wells. The 2024 sampling effort showed similar findings, with clothianidin being the most neonicotinoid compound detected. It was found in nine wells scattered across various areas of Dane County, as shown in Figure 14. The clothianidin concentrations detected in the 2024 samples remained below DHS Health Advisory Level of 1,000 µg/L.

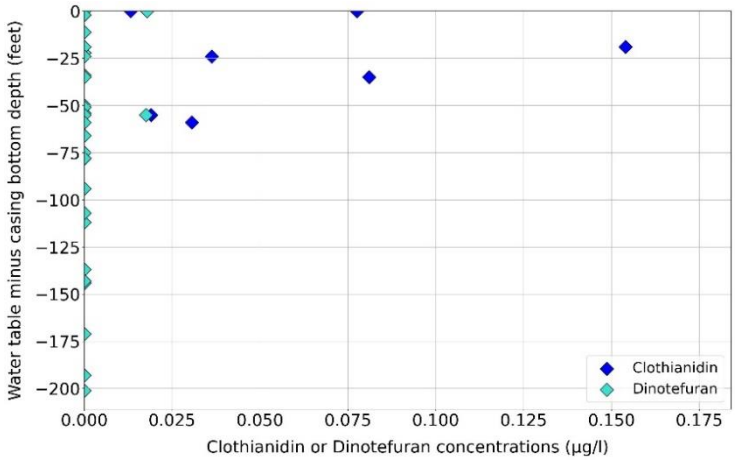
Additionally, dinotefuran was detected in two wells, marking the first occurrence of this neonicotinoid compound in groundwater samples from Dane County. Detections of dinotefuran occurred in the southern part of the county (Figure 14). No ES, PAL, or DHS Health Advisory Levels have been established for dinotefuran.

Figure 14. Locations of Neonicotinoids Detections in Dane County



The clothianidin and dinotefuran concentrations were evaluated in relation to the difference between the water depth and the casing depth (Figure 15). Information on the well properties is available for seven of the nine locations where clothianidin was detected, and for both wells where dinotefuran was detected. Clothianidin was detected at a maximum depth of 59 feet below the water table. Dinotefuran was detected at a maximum depth of 55 feet below the water table

Figure 15. Neonicotinoids Concentrations Versus the Difference Between the Water Level and the Casing Depth in Dane County

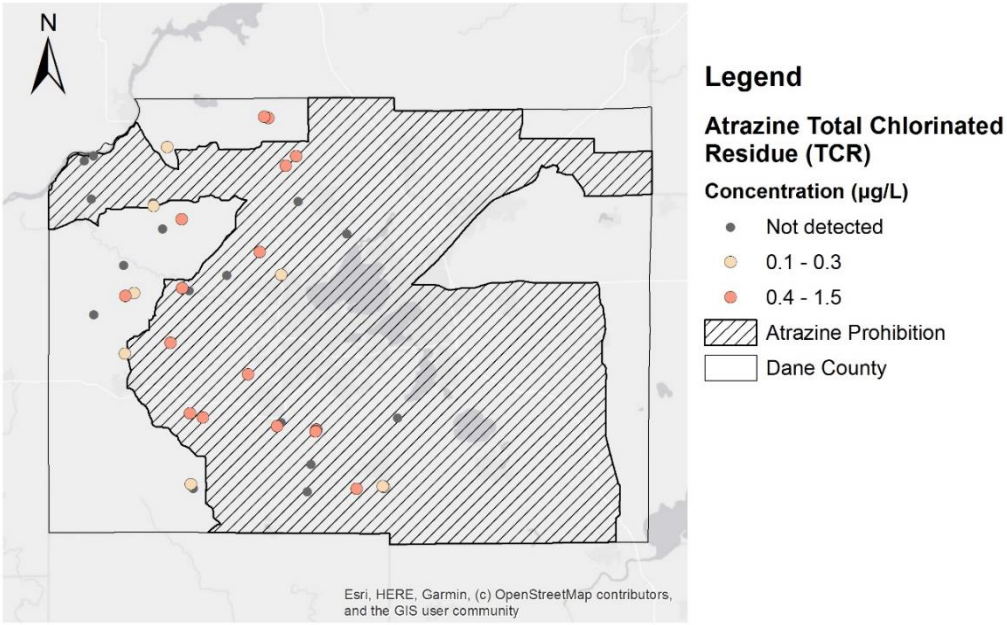


Atrazine

Atrazine is an herbicide used to selectively control weeds on several crops, such as field corn, sweet corn, sorghum, and sugarcane. In Wisconsin, it is registered as a restricted-use pesticide and prohibited in 101 areas (prohibition areas). Approximately 70% of Dane County is designated as an Atrazine Prohibition Area. Atrazine Prohibition Areas in Dane County were established in the early 1990s.

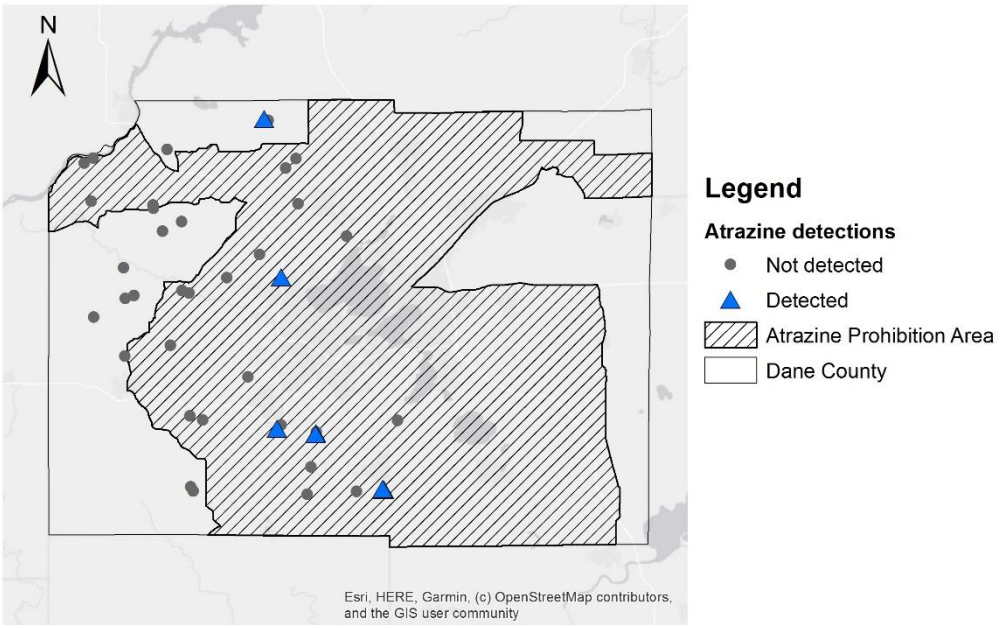
Atrazine or atrazine metabolites (Atrazine TCR) were detected at 25 wells. Atrazine TCR concentrations exceeded the PAL of 0.3 µg/L at 17 locations. Atrazine TCR was found across the sampling area and within the Atrazine Prohibition Area (Figure 16).

Figure 16. Locations of Atrazine Total Chlorinated Residues (TCR) Detections in in Dane County



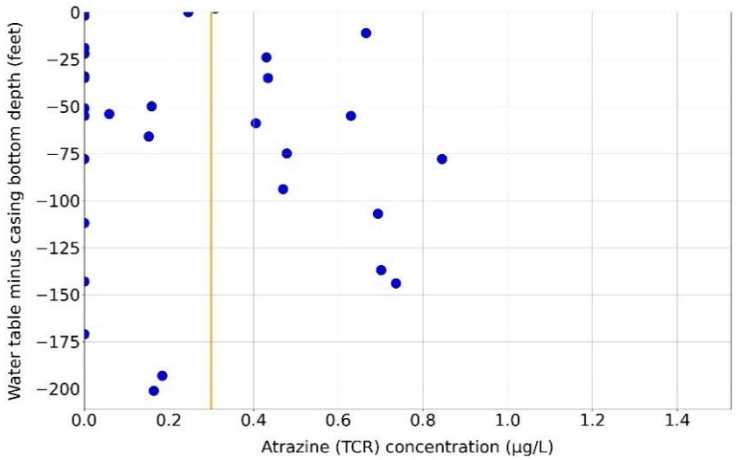
Atrazine parent material was primarily detected within the Atrazine Prohibition Area (Figure 17). Atrazine concentrations did not exceed the 0.3 µg/L PALf. The detection of atrazine within the Atrazine Prohibition Area could be attributed to several factors: these concentrations might reflect residual concentrations in groundwater, despite the fact that atrazine use has been discontinued for approximately 30 years; residual atrazine could remain in the soil or rock matrix; or there may be instances of illegal application. Since 2008, DATCP Environmental Enforcement Specialists (EES) have conducted annual inspections for illegal atrazine use statewide. To date, 10 inspections have been conducted in Dane County resulting in two violations. One of these violations occurred in 2008 at a field located in the southwest part of the county, within a prohibition area and within the sampling area targeted for 2024.

Figure 17. Locations of Atrazine Detections in Dane County



Atrazine TCR was evaluated in relation to the difference between the water depth and the casing depth. Atrazine TCR concentrations in exceedance of the PAL of 0.3 µg/L were found at a max depth of 144 feet below the water table (Figure 19).

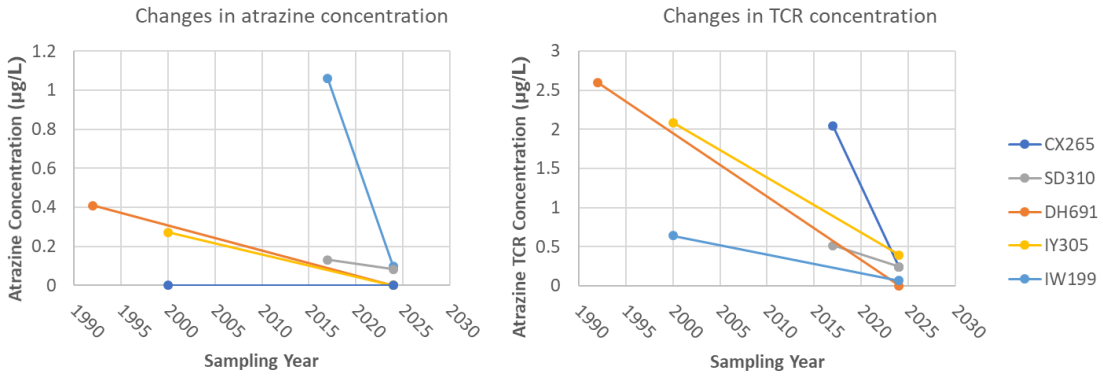
Figure 18. Atrazine Total Chlorinated Residues (TCR) Concentration Versus the Difference Between the Water Level and the Casing Depth in Dane County



Notes: The orange line represents the PAL for Atrazine TCR (0.3 µg/L).

As mentioned in the Selection of Sampling Locations and Sampling Method section, out of the 41 wells, DATCP had previously tested four between 2000 and 2017. Additionally, one more well was listed in the DATCP database and tested by NOVARTIS, bringing the total number of wells with historical atrazine and atrazine TCR data in the DATCP database to five. With the exception of one well that had no change in atrazine concentration over time, a decrease in concentration for both atrazine and atrazine TCR was observed at all five wells (Figure 19). Three of these wells are located within the Atrazine Prohibition Area.

Figure 19. Changes in Atrazine and Atrazine TCR Concentrations Over Time in Dane County



CONCLUSION AND RECOMMENDATIONS

Groundwater samples collected between May and July 2024 from 41 Dane County wells were tested for nitrate and 112 pesticides. Nitrate was detected between 2 and 10 mg/L in 66% of the wells sampled. Six samples (14%) exceeded the 10 mg/L ES for nitrate as N. DATCP advised well owners to conduct annual tests at the wells where exceedances occurred. By comparing the 2024 results with prior data collected either by DATCP or included in the DNR Groundwater Retrieval Network, we found that for 16 of the wells tested, nitrate concentrations has not changed over time; for six wells tested, nitrate concentrations decreased, and for eight wells tested, nitrate concentrations increased. Resampling these wells annually could provide additional data to better assess nitrate concentration trends. No strong linear relationships were found between nitrate concentrations and well properties or nitrate concentration and distance to an agricultural field. Additional data are needed to confirm these trends.

A total of 17 individual pesticides were detected, but no pesticide concentrations exceeded their respective ES groundwater standard or DHS Health Advisory Levels. Atrazine Total Chlorinated Residues (TCR – the sum of atrazine and atrazine metabolites) was found in exceedance of the Preventive Action Limit (PAL, 0.3 µg/L) in 17 wells. In 2023, corn production covered over 194,000 acres in Dane County, making it the predominant crop in the county (U.S. Department of Agriculture - National Agricultural Statistics Service, 2024). Since the early 1990s, atrazine use had been prohibited in approximately 70% of Dane County. While it is unexpected to detect atrazine and atrazine metabolites in this prohibition area, several factors might explain their presences, which can be divided into two categories: natural attenuation or illegal use. To date, out of 10 inspections for illegal atrazine use, DATCP has recorded two violations in Dane County. One of these violations occurred in 2008 within the area sampled through the 2024 Targeted Sampling Program. Analysis of data from five wells tested at least twice reveals a consistent decline in both atrazine and atrazine TCR (the sum of atrazine and its metabolites) concentrations over time. This trend supports the hypothesis that natural attenuation may still be occurring, even after approximately 30 years since the discontinuation of atrazine use.

Clothianidin and dinotefuran, both neonicotinoid insecticides, were detected in 2024 groundwater samples collected in Dane County. While neonicotinoids have previously been detected in private potable wells in this area, this marks the first instance of dinotefuran being identified in Dane County. In none of the samples, clothianidin concentrations exceeded the DHS Health Advisory Level of 1,000 µg/L. No PAL, ES, or DHS Health Advisory Level has been established for dinotefuran. Additional sampling is needed to better understand neonicotinoids trends and occurrence. (Note: DATCP is unable to track the type or amount of pesticide used on any specific field, county, or statewide.)

DATCP will consider resampling wells where pesticides of interest (atrazine, clothianidin, and dinotefuran) were detected. Because no PAL, ES, or DHS Health Advisory Level have been established for clopyralid, dimethenamid ESA, and dinotefuran, we are currently unable to assess the health risk associated with the detection of these compounds. The detection of other pesticides does not raise noteworthy concerns regarding risks to human health and the environment.

Dunn County – Detailed Summary

The Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP) collected water samples from 36 private potable wells in southwestern Dunn County, in the summer of 2024 as part of the Targeted Sampling Program (Figure 20).

Due to its geologic characteristics, Dunn County is generally moderately susceptible to groundwater contamination. However, certain areas, such as the southwestern region, are highly vulnerable (Schmidt, Robin R; Kessler, Kevin, 1989). Dunn County is primarily underlain by Cambrian-age sandstone, which is overlain by Ordovician-age dolomite in some areas of the western and southern parts of the county. Beneath the sandstone lies crystalline bedrock, including granites, which do not contain significant quantity of water. Approximately 30,000 years ago, a melting glacier left behind thick deposits of sand and gravel outwash. The bedrock hills and uplands have only a thin layer of glacial deposits, typically between 30 to 50 feet, while the buried bedrock valleys contain much thicker deposits. Groundwater in the county is primarily sourced from the sandstone bedrock and the glacially derived sand and gravel (Lippelt & Madison, 1988; Olcott, et al., 1967)

In Dunn County, about 40% of the land is devoted to agricultural procedures (Wisconsin Department of Natural Resources, 2019). While it is acknowledged that agriculture operations favor regional economic development, concern is continuously raised about long-term impacts to water quality.

Results of the 2024 DATCP sampling effort show that nitrate and 25 pesticides, such as atrazine metabolites and neonicotinoids, were detected in groundwater samples. Nitrate ES of 10 mg/L was exceeded in 19 samples. Imidacloprid DHS Health Advisory Level of 0.2 µg/L was exceeded in two wells. No other compound was found at a concentration exceeding the respective NR 140 Enforcement Standards or DHS Health Advisory Levels.

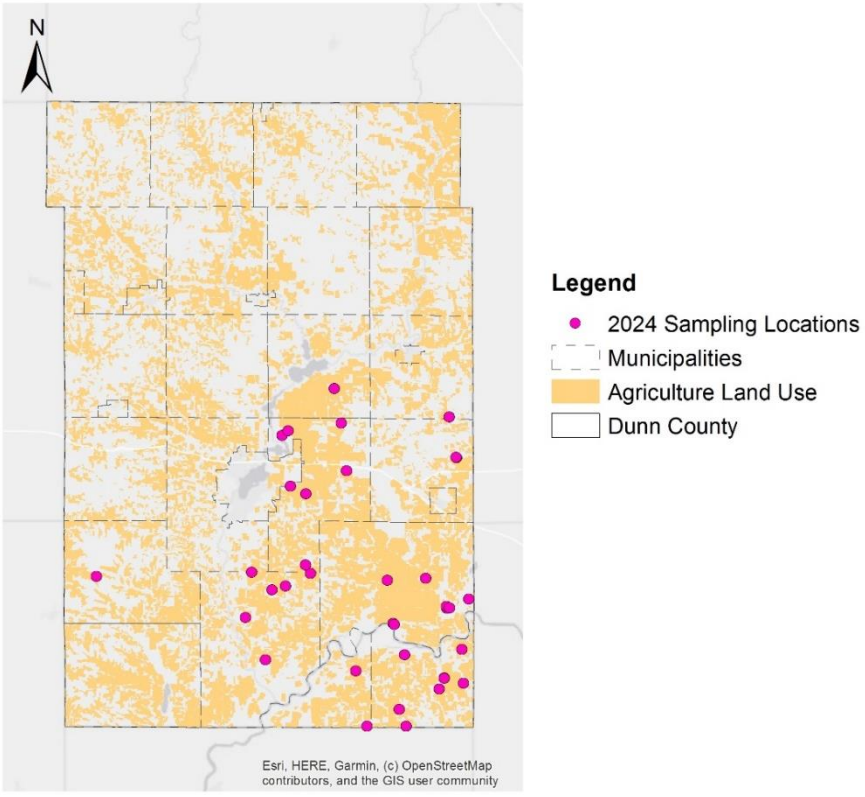
SELECTION OF SAMPLING LOCATIONS AND SAMPLING METHOD

In 2023, Dunn County collected water samples from several private potable wells for testing. Among the analytes examined was diaminochlorotriazine (DACT), a metabolite of the herbicide atrazine. DATCP coordinated with county staff to obtain contact information for well owners whose wells showed detectable concentrations of diamino atrazine, with the owners' consent. As a result, Dunn County provided DATCP with contact information for 16 well owners. Additionally, the county shared information for 14 more owners interested in having their wells tested. Out of 30 private well owners contacted, 28 agreed to participate in the testing.

DATCP staff selected 18 wells that had previously been sampled under DATCP programs for resampling to monitor pesticide concentrations over time. Of those, seven well owners consented to have their wells tested. One additional sample was also collected from a second well for one of the owners. In total, 36 private potable wells were sampled in Dunn County as part of the 2024 Targeted Sampling Program.

In total, 36 private potable wells were sampled in Dunn County as part of the 2024 Targeted Sampling Program between June and July 2024 (Figure 20). The wells selected were primarily located within the southwestern part of the county due to higher susceptibility to groundwater contamination. Groundwater sample collection followed procedures explained in the Sample Collection and Analysis section.

Figure 20. 2024 Sampling Locations in Dunn County



RESULTS

Detections and Comparisons to Standards

Nitrate and 25 pesticides were detected in 2024 Dunn County samples (Figure 21 and Table B 3 in Appendix B). Nitrate was the sole compound to be found in exceedance of the Wis. Admin. Code ch. NR 140 Enforcement Standard (ES) of 10 mg/L. Imidacloprid was the sole pesticide compound found in exceedance of the DHS Health Advisory Level of 0.2 µg/L. Diamino atrazine and de-ethyl atrazine were found at concentrations exceeding the Wis. Admin. Code ch. NR 140 PAL of 0.3 µg/L (Figure 22). Below is a summary of the detection rate, the range of values detected for each compound, and the exceedance rate of the respective PAL and ES or DHS Health Advisory Level.

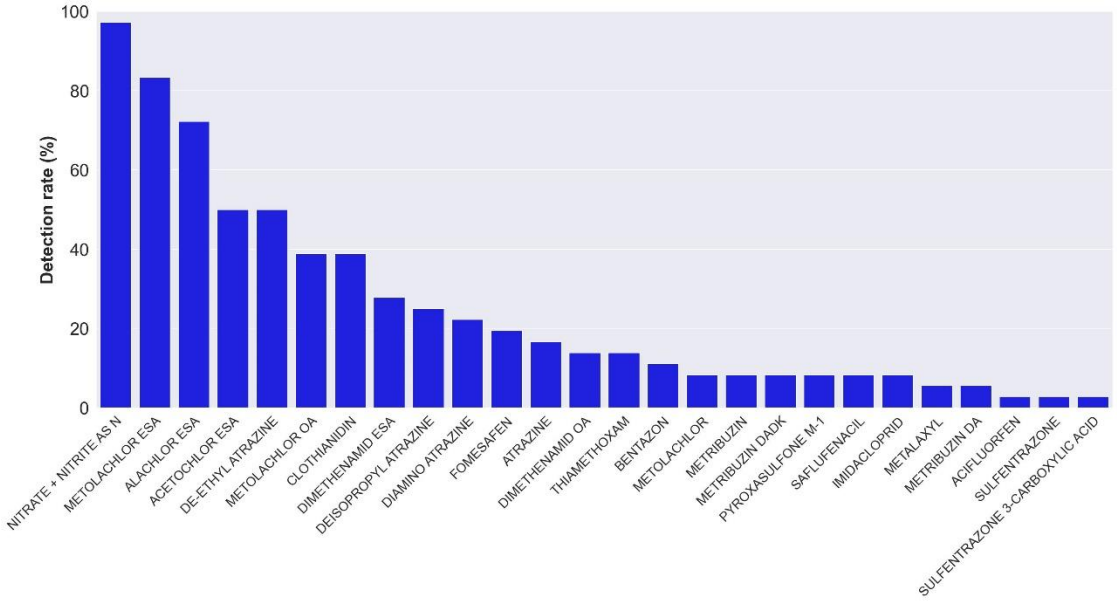
- Nitrate plus Nitrite as N was detected at 35 wells (detection rate of 97.2%) at concentrations between 1.8 mg/L and 31 mg/L. The 2 mg/L PAL was exceeded at 34 wells (94.4%), and the 10 mg/L ES was exceeded at 19 wells (52.8%).
- Metolachlor ESA, a metabolite of the herbicide metolachlor, was detected at 30 wells (83.3%) at concentrations between 0.0648 µg/L and 26.8 µg/L. No samples exceed the 260 µg/L PAL or the 1,300 µg/L ES for this compound.
- Alachlor ESA, a metabolite of the herbicide alachlor, was detected at 26 wells (72.2%) at concentrations between 0.0908 µg/L and 3.83 µg/L. No samples exceeded the 4 µg/L PAL or the 20 µg/L ES for this compound.
- Acetochlor ESA, a metabolite of the herbicide acetochlor, was detected at 18 wells (50%) at concentrations between 0.0541 µg/L and 1.52 µg/L. No samples exceeded the 46 µg/L PAL or the 230 µg/L ES for this compound.
- De-ethyl atrazine, a metabolite of the herbicide atrazine, was detected at 18 wells (50%) at concentrations between 0.0516 µg/L and 0.457 µg/L. Two samples exceeded the 0.3 µg/L PAL (5.6%) for atrazine TCR (the sum of atrazine parent material and its metabolites). No samples exceeded the 3 µg/L ES for atrazine TCR.
- Metolachlor OA, a metabolite of the herbicide metolachlor, was detected at 14 wells (38.9%) at concentrations between 0.284 µg/L and 9.69 µg/L. None of the samples exceeded the 260 µg/L PAL or the 1,300 µg/L ES for the sum of metolachlor ESA and metolachlor OA.
- Clothianidin, a neonicotinoid insecticide, was detected at 14 wells (38.9%) at concentrations between 0.0108 µg/L and 1.18 µg/L. No PAL and ES standards have been established for this compound at this time. The Wisconsin Department of Health Services (DHS) has set the Health Advisory Level for clothianidin at 1,000 µg/L. No samples exceeded DHS Health Advisory Level for this compound.
- Dimethenamid ESA, a metabolite of the herbicide dimethenamid, was detected at 10 wells (27.8%) at concentrations between 0.0652 and 2.41 µg/L. No PAL, ES, or DHS Health Advisory Level has been established for this compound at this time.
- Deisopropyl atrazine, a metabolite of atrazine, was detected at nine wells (25%) at concentrations between 0.0734 µg/L and 0.188 µg/L. No samples exceeded the 0.3 µg/L PAL or the 3 µg/L ES for atrazine TCR (the sum of atrazine parent material plus its metabolites).
- Diamino atrazine, a metabolite of atrazine, was detected at eight wells (22.2%) at concentrations between 0.156 µg/L and 0.575 µg/L. The 0.3 µg/L PAL was exceeded at three wells (8.3%). No samples exceeded the 3 µg/L ES for atrazine TCR (the sum of atrazine parent material plus its metabolites).
- Fomesafen, an herbicide, was detected at seven wells (19.4%) at concentrations between 0.096 µg/L and 3.18 µg/L. No PAL and ES standards have been established for this compound at this time. DHS has set the Health Advisory Level for fomesafen at 25 µg/L. No samples exceeded DHS Health Advisory Level for this compound.
- Atrazine was detected at six wells (16.7%) at concentrations between 0.0516 µg/L and 0.523 µg/L. The 0.3 µg/L PAL was exceeded at one well (2.8%). No samples exceeded the 3 µg/L ES for atrazine TCR (the sum of atrazine parent material plus its metabolites).
- Thiamethoxam, a neonicotinoid insecticide, was detected at five wells (13.9%) at concentrations between 0.0109 µg/L and 2.25 µg/L. No PAL and ES standards have been established for this compound at this time. DHS has set the Health Advisory Level for thiamethoxam at 120 µg/L. No samples exceeded DHS Health Advisory Level for this compound.

- Dimethenamid OA, a metabolite of the herbicide dimethenamid, was detected at five wells (13.9%) at concentrations between 0.0614 and 0.987 µg/L. No PAL, ES, or DHS Health Advisory Level has been established for this compound at this time.
- Bentazon, an herbicide, was detected at four wells (11.1%) at concentrations between 0.276 and 0.751 µg/L. No samples exceed the 60 µg/L PAL or the 300 µg/L ES for this compound.
- Metolachlor was detected at three wells (8.3%) at concentrations between 0.137 µg/L and 1.33 µg/L. The concentrations did not exceed the 10 µg/L PAL or the 100 µg/L ES for this compound.
- Metribuzin, an herbicide, was detected at three wells (8.3%) at concentrations between 0.051 µg/L and 0.961 µg/L. The concentrations did not exceed the 70 µg/L PAL or the 14 µg/L ES for this compound.
- Metribuzin DADK, a metabolite of metribuzin, was detected at three wells (8.3%) at concentrations between 0.192 µg/L and 0.697 µg/L. No PAL, ES, or DHS Health Advisory Level has been established for this compound at this time.
- Pyroxasulfone M-1, a metabolite of the herbicide pyroxasulfone, was detected at three wells (8.3%) at concentrations between 0.0766 µg/L and 0.181 µg/L. No PAL, ES, or DHS Health Advisory Level has been established for this compound at this time.
- Saflufenacil, an herbicide, was detected at three wells (8.3%) at concentrations between 0.194 µg/L and 0.64 µg/L. No PAL and ES standards have been established for this compound at this time. DHS has set the Health Advisory Level for saflufenacil at 460 µg/L. No samples exceeded the saflufenacil DHS Health Advisory Level.
- Imidacloprid, a neonicotinoid insecticide, was detected at three wells (8.3%) at concentrations between 0.0462 µg/L and 0.38 µg/L. No PAL and ES standards have been established for this compound at this time. DHS has set the Health Advisory Level for imidacloprid at 0.2 µg/L. Two samples (5.6%) exceeded the imidacloprid DHS Health Advisory Level.
- Metalaxyl, a fungicide, was detected at two wells (5.6%) at concentrations of 0.179 µg/L and 0.42 µg/L. No PAL and ES standards have been established for this compound at this time. DHS has set the Health Advisory Level for metalaxyl at 800 µg/L. No samples exceeded DHS Health Advisory Level for this compound.
- Metribuzin DA, a metabolite of the herbicide metribuzin, was detected at two wells (5.6%) at concentrations of 0.146 µg/L and 0.243 µg/L. No PAL, ES, or DHS Health Advisory Level has been established for this compound at this time.
- Acifluorfen, an herbicide, was detected at one well (2.8%) at a concentration of 0.0891 µg/L. No PAL, ES, or DHS Health Advisory Level has been established for this compound at this time.
- Sulfentrazone, an herbicide, was detected at one well (2.8%) at a concentration of 0.116 µg/L. No PAL and ES standards have been established for this compound at this time. DHS has set the Health Advisory Level for sulfentrazone at 1,000 µg/L. No samples exceeded DHS Health Advisory Level for this compound.
- Sulfentrazone 3-carboxylic acid, a metabolite of sulfentrazone, was detected at one well (2.8%) at a concentration of 0.132 µg/L. No PAL, ES, or DHS Health Advisory Level has been established for this compound at this time.

Atrazine Total Chlorinated Residues (TCR) is the sum of atrazine and its metabolites. Atrazine TCR was detected at 21 wells (58.3% of the samples). Atrazine TCR yielded concentrations between 0.0516 µg/L and 1.1136 µg/L. Atrazine TCR exceeded the PAL of 0.3 µg/L at seven wells (19.4%), but it did not exceed the 3 µg/L ES.

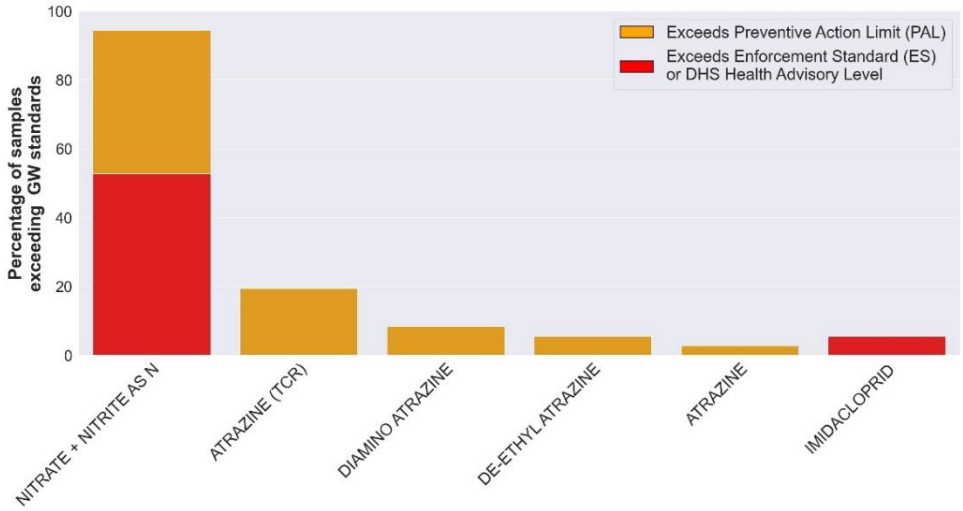
Metolachlor metabolites is the sum of metolachlor ESA and metolachlor OA (or OXA). Metolachlor metabolites were detected at 30 wells (83.3% of the samples). Metolachlor metabolites yielded concentrations between 0.0648 µg/L and 35.25 µg/L. No PAL (260 µg/L) or ES (1,300 µg/L) standards were exceeded.

Figure 21. Compounds Detected Through the 2024 Targeted Sampling Program in Dunn County and Respective Detection Rates



Notes: On the x-axis, the list of compounds detected (i.e. found with concentrations greater than laboratory reporting limits). On the y-axis, the detection rate in percentage for each detected compound.

Figure 22. Compounds Exceeding the Preventive Action Limit (PAL), Enforcement Standard (ES), or DHS Health Advisory Level in Dane County and Respective Exceedances Rates

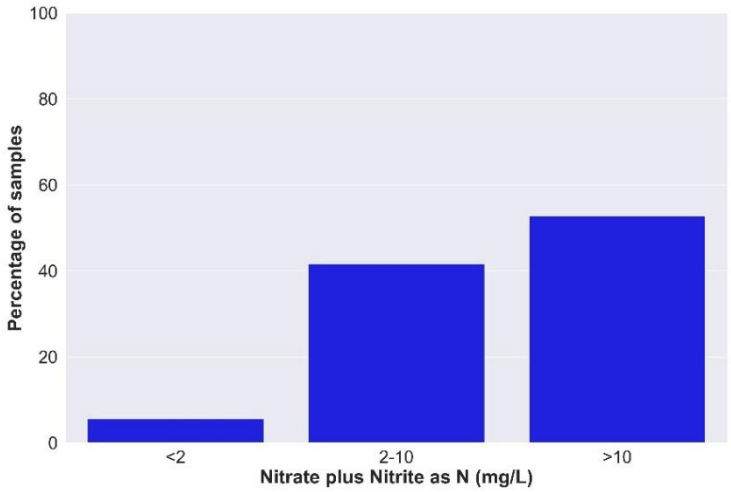


Nitrate

Nitrate plus Nitrite as N was detected in 35 of the 36 samples collected, and the 10 mg/L ES was exceeded at 19 wells. The distribution of Nitrate plus Nitrite as nitrate concentrations is summarized below and shown on Figure 23.

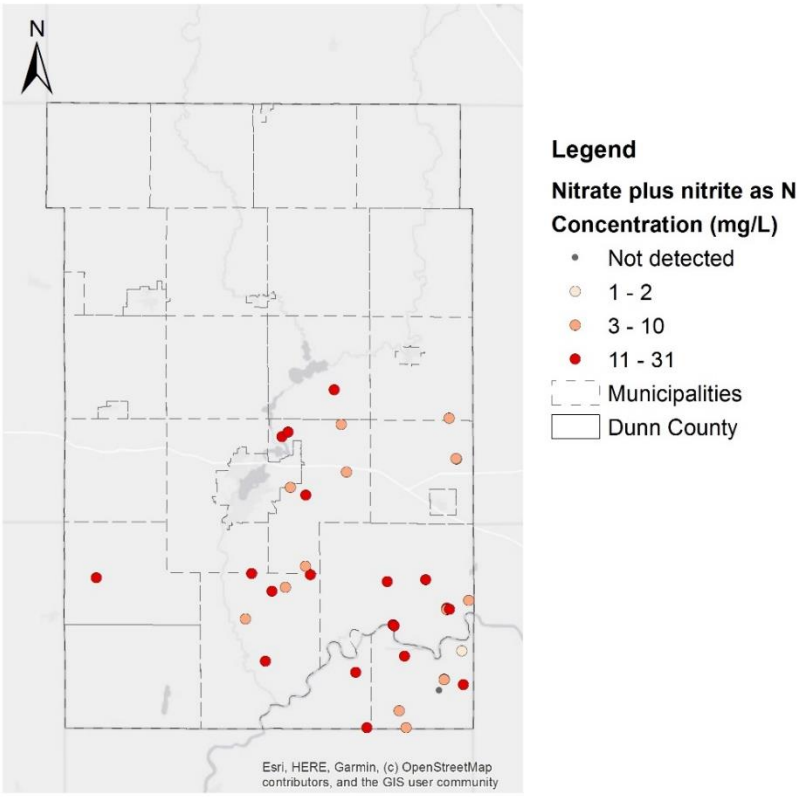
- <2 mg/L: 13 wells (5%)
- >2 to 10 mg/L: 16 wells (42%)
- >10 mg/L: five wells (53%)

Figure 23. Nitrate plus Nitrite as N Occurrence Data in Dunn County



Exceedances of the 10 mg/L were found across the sampling area and no regional pattern could be identified (Figure 24).

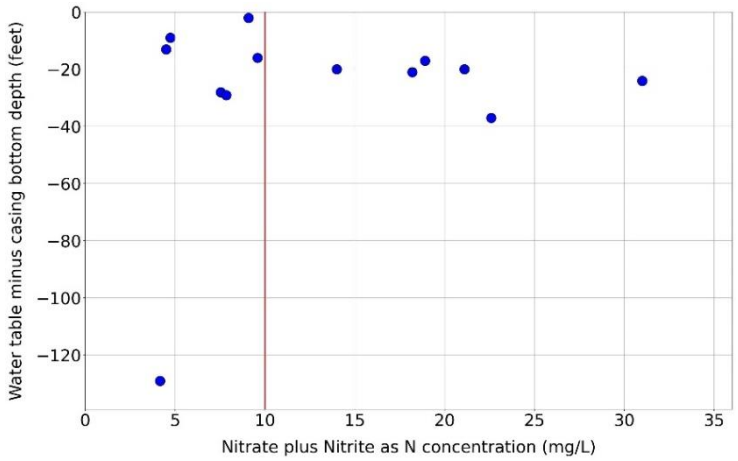
Figure 24. Locations of Nitrate plus Nitrite as N Detections in Dunn County



To track the nitrate contamination in-depth and to better identify what factors control contaminant migration, we retrieved information on well depth, casing bottom depth, static water level, bedrock depth, and installation date from publicly available construction reports.

Figure 25 shows the nitrate concentration versus the difference between the depth of the water table at the time of construction (static water level) and the bottom depth of the well casing. This plot shows how deep below the water table nitrate exceeds the ES of 10 mg/L. As shown, nitrate exceeded concentrations of 10 mg/L at depths ranging from 17 to 37 feet below the water table.

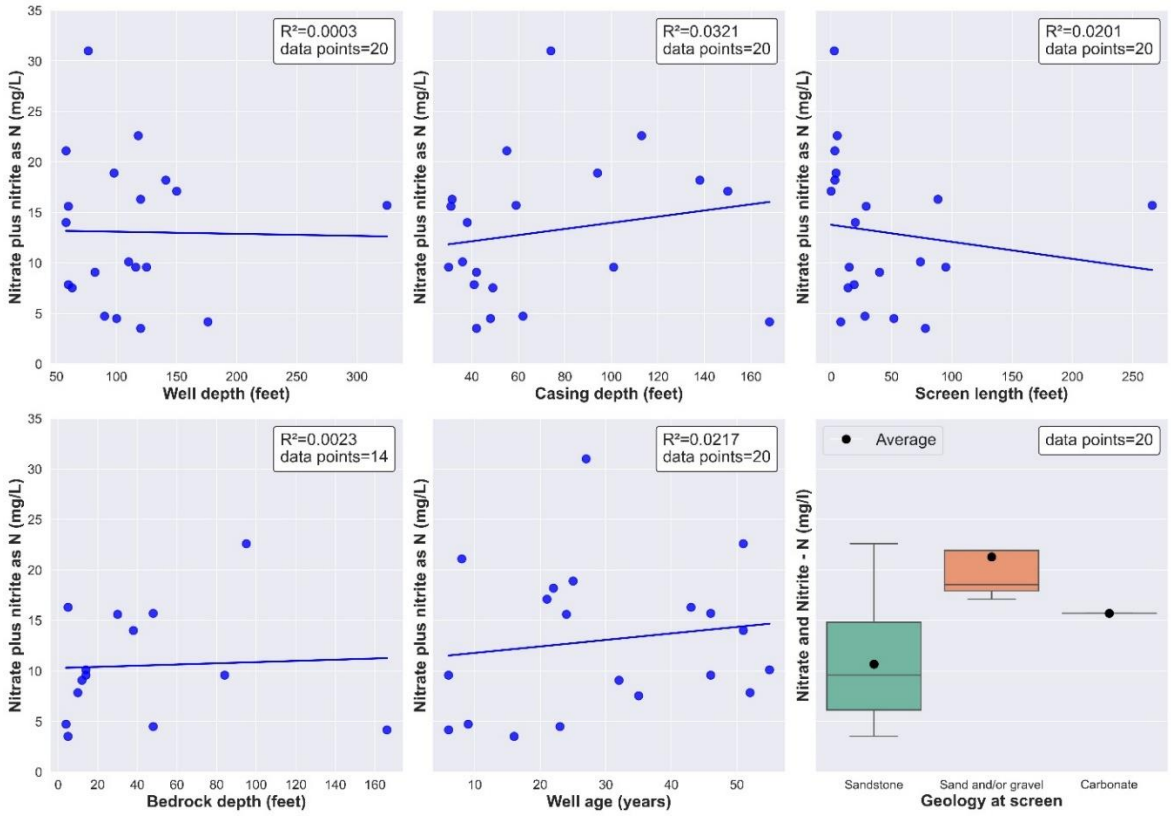
Figure 25. Nitrate plus Nitrite as N Versus the Difference Between the Water Level and the Casing Depth in Dunn County



Notes: The red line represents the ES for Nitrate plus Nitrite as N (10 mg/L).

No significant relationships were found between nitrate concentration and any of the well properties considered (Figure 26). Figure 26 also displays a boxplot of nitrate concentration based on the geology at the well screen, with the average concentration marked by a black circle. The analysis revealed that while the highest variation in nitrate concentrations is observed in wells open to sandstone, on average, higher nitrate concentrations are observed in wells that have the screen open to sand and gravel.

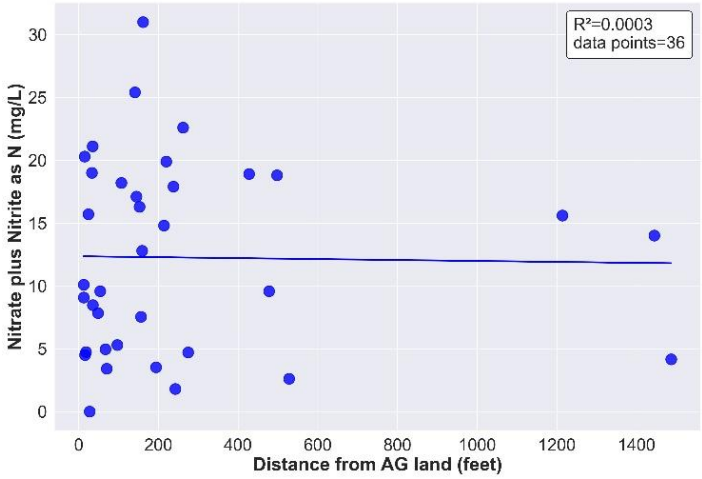
Figure 26. Nitrate plus Nitrite as N as a Function of Well Depth, Casing Depth, Static Water Level, Bedrock Depth, and Well Age in Dunn County



Notes: The well age is defined as the difference between the year of sampling (2024) and the year of the well construction. The well screen length defined as the difference between the well depth and the casing depth. The box on the top right includes the goodness of fit (R^2) and the number of data used for each relationship.

Through Geographic Information Systems (ArcMap), we calculated the distance between each sampling point and the nearest agricultural field (Figure 27). Wiscland 2.0 was used as land cover data (Wisconsin Department of Natural Resources, 2019). No relationships was found between nitrate levels and the distance of each sampling location to the nearest agricultural field.

Figure 27. Nitrate plus Nitrite as N Versus the Distance from an Agricultural Field in Dunn County



As mentioned in the Selection of Sampling Locations and Sampling Method section, out of the 36 wells, DATCP had previously tested seven between 1990 and 2019. Further nitrate data collected between 2016 and 2019, including both nitrate as N and Nitrate plus Nitrite as N, were found for two wells on the DNR Groundwater Retrieval Network website (Wisconsin Department of Natural Resources, 2024). This dataset includes samples collected by either the Wisconsin DNR or the well constructor (driller) during the well construction process.

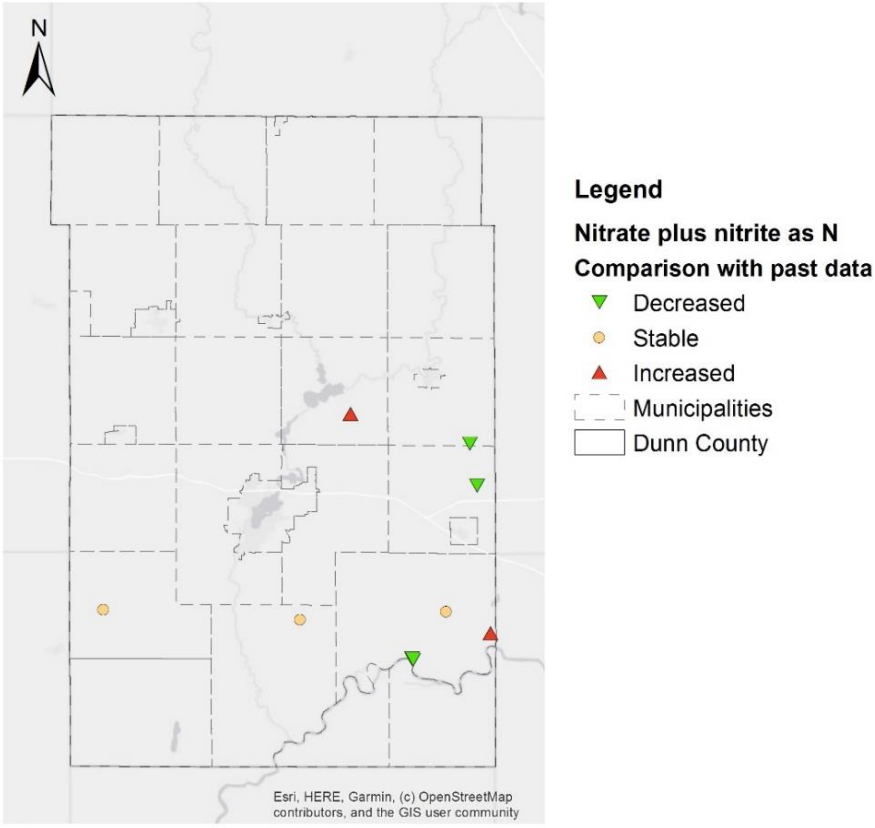
Using a threshold of ±2 mg/L to denote no or minimal change in nitrate concentrations, and given that nitrite concentrations are typically negligible, nitrate as N and Nitrate plus Nitrite as N were treated as equivalent for analysis. Results showed that nitrate levels increased in two wells, remained stable (no or minimal change) in three wells, and decreased in four wells (Table 4).

Figure 28 shows that wells with decreasing nitrate concentrations are distributed across multiple areas in the eastern part of the county. However, there is insufficient data to determine any regional trends.

Table 4. Nitrate Concentration Changes for the Wells That at Least Once Were Tested for Nitrate Prior the 2024 DATCP Sampling Effort in Dunn County

Nitrate comparison for nine wells sampled between 1990 and 2024		
Increased Nitrate Two locations	**No or Minimal Change Three locations**	**Decreased Nitrate Four locations**
Two increased by 2 to 5 mg/L	Two decreased less than 2 mg/L One increased less than 2 mg/L	Two decreased by 2 to 5 mg/L
None increased by 5 to 10 mg/L		Two decreased by 5 to 10 mg/L
None increased more than 10 mg/L		None decreased more than 10 mg/L

Figure 28. Nitrate Trends at Individual Sampling Locations in Dunn County



Neonicotinoids

Neonicotinoids are a class of insecticides widely used in Wisconsin. These insecticides are usually applied as seed treatments on major Wisconsin crops, such as corn, soybeans, beans, potatoes, small grains, vegetables, fruit crops, and more. DATCP began testing for neonicotinoids in 2008, starting with thiamethoxam. Currently, the BLS analyzes six neonicotinoid compounds: acetamiprid, clothianidin, dinotefuran, imidacloprid, thiacloprid, and thiamethoxam. Of these, four (clothianidin, dinotefuran, imidacloprid, and thiamethoxam) have been detected multiple times in groundwater and surface water samples across Wisconsin. These four compounds are active ingredients in over 500 registered pesticide products in the state (Kelly Solutions, 2024). While dinotefuran, imidacloprid, and thiamethoxam are active ingredients, clothianidin can be either an active ingredient or a metabolite of thiamethoxam, making it potentially linked to the use of pesticides containing either clothianidin or thiamethoxam.

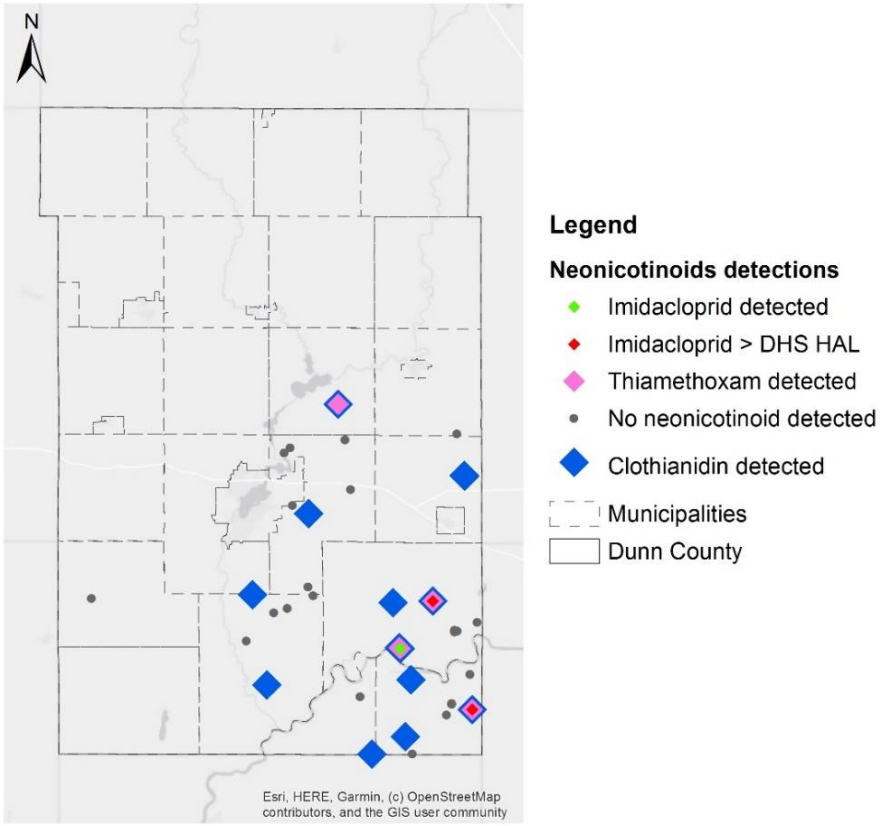
Before 2024, clothianidin, imidacloprid, and/or thiamethoxam were detected in 11 samples from seven private drinking wells in Dunn County, with clothianidin being the most frequently detected compound. The 2024 sampling effort showed similar findings. Due to the characteristics of sandy soils, the high water solubility of neonicotinoid compounds, and the widespread use of crops like potatoes, beans, and corn — where these pesticides are commonly applied — it is not surprising that neonicotinoids were detected in the sampling area.

- Clothianidin was the most frequently detected compound, found in 14 samples. Clothianidin was detected throughout the entire sampling area in the southwestern part of the county (Figure 30). All clothianidin concentrations in the 2024 samples remained below the DHS Health Advisory Level (HAL) of 1,000 µg/L.
- Imidacloprid was detected in three samples, and it was often detected alongside clothianidin and thiamethoxam (Figure 29). Two of the tree samples detected imidacloprid at concentrations exceeding the DHS HAL of 0.2 µg/L. Imidacloprid detections and exceedances were primarily found in the southwestern corner of the county (Figure 29). One of the samples was collected from a well that had previously exceeded the DHS HAL for imidacloprid (0.2 µg/L) in both 2018 and 2021. The imidacloprid concentration at this well in 2024 was generally consistent with the concentrations found

in previous tests. The other well, where an exceedance occurred, was tested for the first time in 2024.

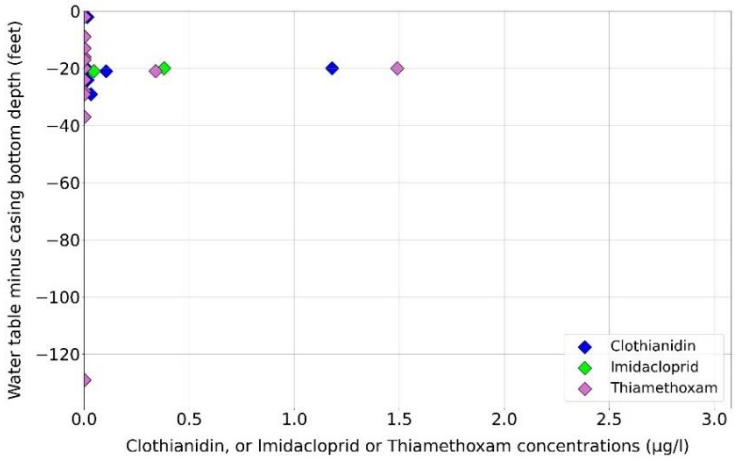
- Thiamethoxam was detected in five samples. Thiamethoxam was found in wells where clothianidin was also detected, predominantly in the southwestern corner of the county (Figure 29). The concentrations remained below the DHS HAL of 120 µg/L.

Figure 29. Locations of Neonicotinoids Detections in Dunn County



The neonicotinoid concentrations (either clothianidin, imidacloprid, or thiamethoxam) were evaluated in relation to the difference between the water depth and the casing depth (Figure 30). Clothianidin was detected at a maximum depth 29 feet below the water table. Imidacloprid and thiamethoxam were detected at a maximum depth of 21 feet below the water table.

Figure 30. Neonicotinoids Concentrations Versus the Difference Between the Water Level and the Casing Depth in Dunn County

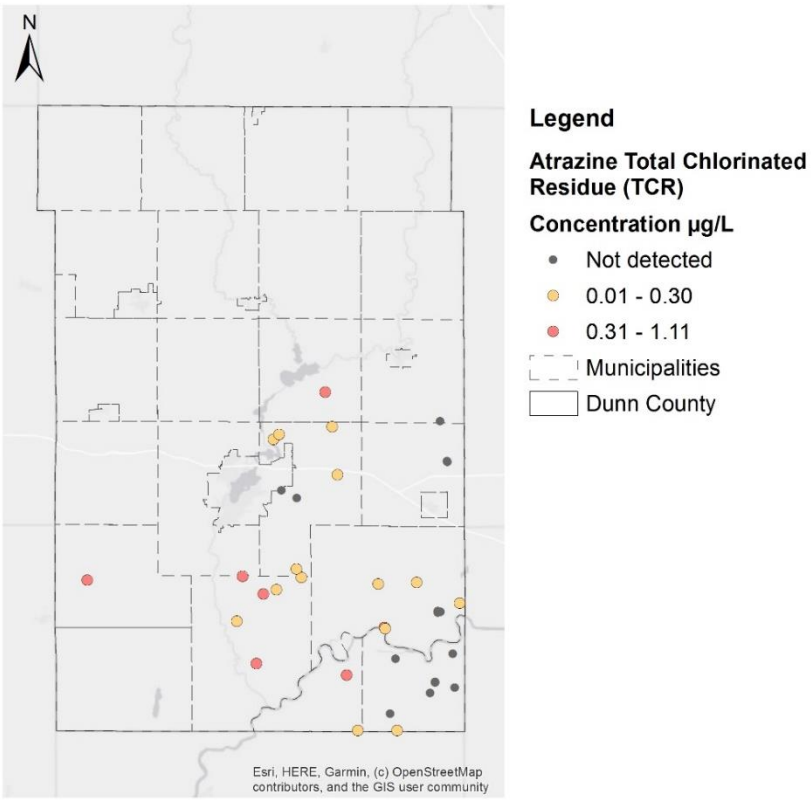


Atrazine

Atrazine is an herbicide used to selectively control weeds on several crops, such as field corn, sweet corn, sorghum, and sugarcane. In Wisconsin, it is registered as a restricted-use pesticide and prohibited in 101 areas (prohibition areas). There are currently no Atrazine Prohibition Areas established in Dunn County.

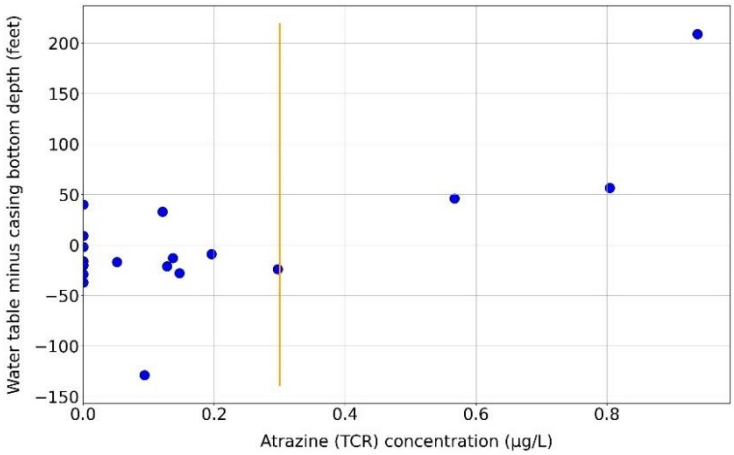
Atrazine TCR is the sum of atrazine and atrazine metabolites. Atrazine TCR was found at 21 wells (58.3%). Atrazine TCR exceeded the PAL of 0.3 µg/L at seven locations (19.4%). Atrazine TCR was found across the sampling area (Figure 31).

Figure 31. Locations of Atrazine Total Chlorinated Residues (TCR) Detections in Dunn County



Atrazine TCR was evaluated in relation to the difference between the water depth and the casing depth. Atrazine TCR concentrations in exceedance of the PAL of 0.3 µg/L were only found in wells were the casing bottom depths were shallower that the static water table depths (Figure 32).

Figure 32. Atrazine Total Chlorinated Residues (TCR) Concentration Vversus the Difference Between the Water Level and the Casing Depth in Dunn County



Notes: *The orange line represents the PAL for Atrazine TCR (0.3 µg/L).*

CONCLUSION AND RECOMMENDATIONS

Groundwater samples collected between July and August 2024 from 36 Dunn County wells were tested for nitrate and 112 pesticides. Nitrate was detected between 2 and 31 mg/L in 42% of the wells sampled. Nineteen samples (53%) exceeded the 10 mg/L ES for nitrate as N. DATCP advised well owners to conduct annual tests at the wells where exceedances occurred. By comparing the 2024 results with prior data collected either by DATCP or included in the DNR Groundwater Retrieval Network (Wisconsin Department of Natural Resources, 2024b), we found that for three of the wells tested, nitrate concentrations have not changed over time; for four wells tested, nitrate concentrations decreased, and for two wells tested, nitrate concentrations increased. Resampling wells annually could provide additional data to better assess nitrate concentration trends. No strong linear relationships were found between nitrate concentrations and well properties or nitrate concentration and distance to an agricultural field. Additional data are needed to confirm these trends.

A total of 25 individual pesticides were detected. Atrazine Total Chlorinated Residues (TCR – the sum of atrazine and atrazine metabolites) was found in exceedance of the Preventive Action Limit (PAL, 0.3 µg/L) in 21 wells. In 2023, over 110,000 acres of Dunn County (20% of the county area) were devoted to corn production (U.S. Department of Agriculture - National Agricultural Statistics Service, 2024). Since atrazine may be used on this crop and is not prohibited in Dunn County, it was foreseeable that atrazine and atrazine metabolites would be detected.

Clothianidin, imidacloprid, and thiamethoxam – neonicotinoid insecticides – were detected in 2024 groundwater samples collected in Dunn County. Imidacloprid was found in exceedance of the DHS Health Advisory Level of 0.2 µg/L in two wells. One of these wells already showed an imidacloprid exceedance in 2018 and 2021. The imidacloprid concentration at this well in 2024 was generally consistent with the concentrations found in previous tests. Clothianidin and thiamethoxam concentrations were found below the DHS Health Advisory Levels of 1,000 µg/L and 120 µg/L, respectively. Given the sandy soil in the sampling area and the presence of crops like beans, potatoes, and corn, it is expected that neonicotinoids applied to these crops would be detected. Additional sampling is needed to better understand neonicotinoids trends and occurrence. (Note: DATCP is unable to track the type or amount of pesticide used on any specific field, county, or statewide.)

DATCP will consider resampling wells where pesticides of interest (atrazine TCR, clothianidin, imidacloprid, and thiamethoxam) were detected. Because no PAL, ES, or DHS Health Advisory Level have been established for acifluorfen, dimethenamid ESA, dimethenamid OA, pyroxasulfone M-1, and sulfentrazone 3-carboxylic acid, we are currently unable to assess the health risk associated with the detection of these compounds. The detection of other pesticides does not raise noteworthy concerns regarding risks to human health and the environment.

Marathon County – Detailed Summary

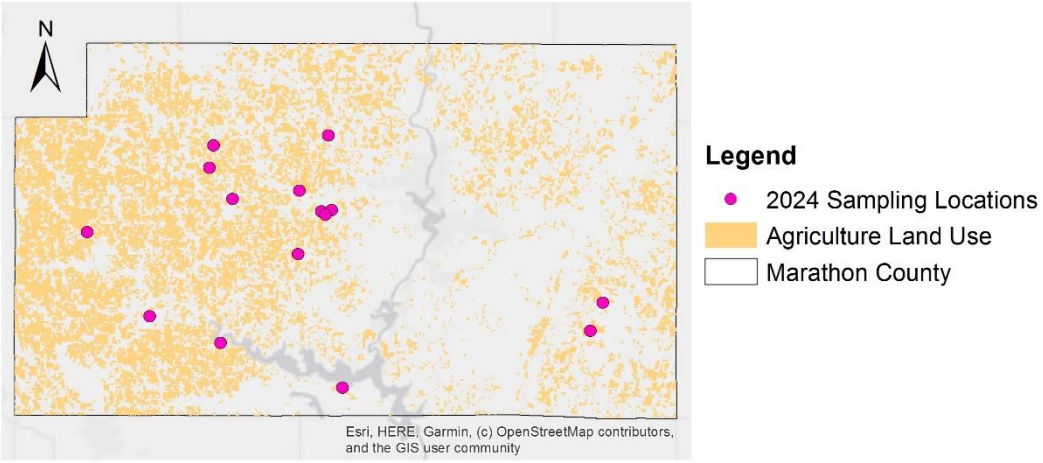
The Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP) collected water samples from 15 private potable wells in Marathon County between July and August 2024 as part of the Targeted Sampling Program (Figure 33).

Marathon County exhibits a range of susceptibility to groundwater contamination from low to high. The areas with the highest susceptibility are primarily found in the eastern regions of the county and along the Wisconsin River Valley (Schmidt, Robin R; Kessler, Kevin, 1989). Marathon County features diverse hydrogeology shaped by glacial activity and its underlying Precambrian bedrock. The county's aquifers are primarily composed of glacial drift deposits (sand and gravel) and fractured crystalline bedrock, including granite and metamorphic rocks. In some areas in the southern and western Marathon County, Cambrian sandstone overlies Precambrian rock. Precambrian rocks yields sufficient water to be used as a water source by many rural residents in Marathon County while the Cambrian sandstone serves as a reliable and moderately productive groundwater source. Additionally, Pleistocene sand and gravel aquifer supplies numerous municipalities in the area (Attig & Muldoon, 1989; Kendy & Bradbury, 1988).

In Marathon County, approximately 29% of the land is devoted to agricultural procedures (Wisconsin Department of Natural Resources, 2019). While it is acknowledged that agriculture operations favor regional economic development, concern is continuously raised about how these affect water quality.

Results of the 2024 DATCP sampling effort show that nitrate and 13 pesticides, including atrazine metabolites and neonicotinoids, were detected in groundwater samples. Out of the 15 samples collected, 14 samples exceeded the NR 140 Enforcement Standard of 10 mg/L for Nitrate plus Nitrite as N. No other compound was found at a concentration exceeding the respective NR 140 Enforcement Standards or DHS Health Advisory Levels.

Figure 33. 2024 Sampling Locations in Marathon County



Notes: Agricultural land use from Wiscland 2.0 (Wisconsin Department of Natural Resources, 2019).

SELECTION OF SAMPLING LOCATIONS AND SAMPLING METHOD

Between the end of 2023 and the beginning of 2024, Marathon County collected hundreds of water samples from private potable wells to test for various contaminants, including nitrate and diaminochlorotriazine (DACT or diamino atrazine), a metabolite of atrazine. DATCP collaborated with county staff to gather contact information for well owners whose wells had detectable concentrations of diamino atrazine. Recognizing that nitrogen-based fertilizers are often used alongside pesticides, DATCP also obtained information on wells where nitrate concentrations exceeded the ES of 10 mg/L. In total, Marathon County provided DATCP with information for 92 wells. However, due to laboratory capacity constraints, DATCP selected 51 wells based on their proximity to those that had previously shown high concentrations of nitrate and pesticides. Letters and permission slips were mailed to these 51 well owners, and 15 granted permission for DATCP to test their wells, none of which had been previously sampled by the agency. Groundwater sample collection followed procedure explained in the Sample Collection and Analysis section.

RESULTS

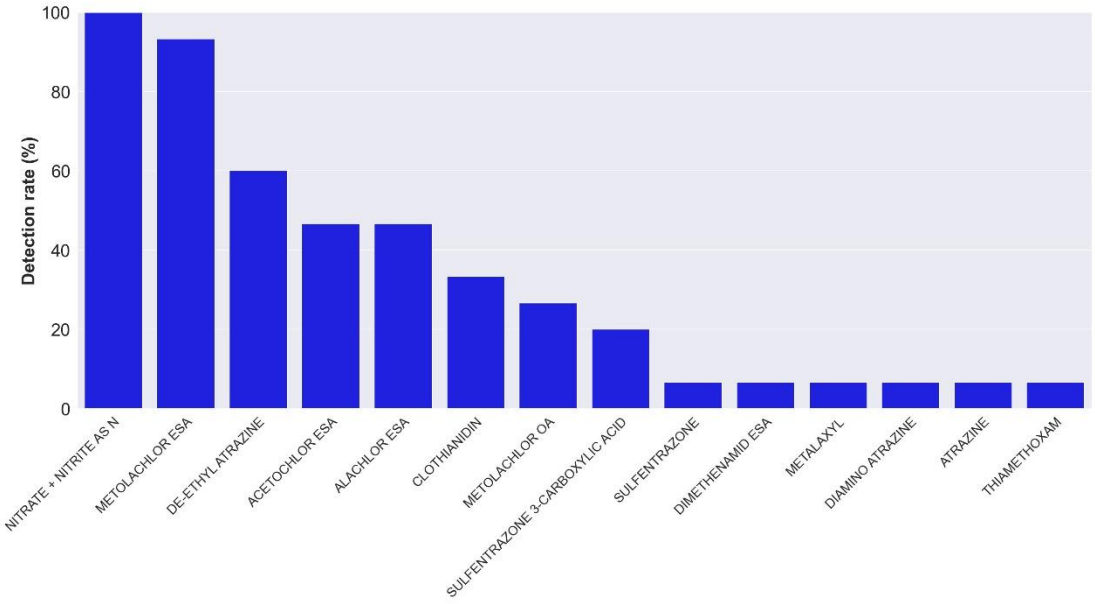
Detections and comparisons to standards

Nitrate and 13 pesticides were detected in 2024 Marathon County samples (Figure 34 and Table B 4 in Appendix B). Nitrate was the sole compound to be found in exceedance of the Wis. Admin. Code ch. NR 140 ES of 10 mg/L. De-ethyl atrazine was the only pesticide compound found at concentrations exceeding the Wis. Admin. Code ch. NR 140 PAL of 0.3 µg/L (Figure 35). Below is a summary of the detection rate, the range of values detected for each compound, and the exceedance rate of the respective PAL and ES or Department of Health Services (DHS) Health Advisory Level.

- Nitrate plus Nitrite as nitrogen (N) was detected at 15 wells (detection rate of 100%) at concentrations between 2.42 mg/L and 29.7 mg/L. The 2 mg/L PAL was exceeded at 15 wells (100%), and the 10 mg/L ES was exceeded at 14 wells (93.3%). The high rate of exceedance was anticipated, as we specifically targeted wells known to have high nitrate concentrations.
- Metolachlor ESA, a metabolite of the herbicide metolachlor, was detected at 14 wells (93.3%) at concentrations between 0.0599 µg/L and 8.65 µg/L. None of the samples exceeded the 260 µg/L PAL or the 1,300 µg/L ES for this compound.
- De-ethyl atrazine, a metabolite of the herbicide atrazine, was detected at nine wells (60%) at concentrations between 0.0518 µg/L and 0.469 µg/L. The PAL of 0.3 µg/L for atrazine TCR (the sum of atrazine parent material and its metabolites) was exceeded in one samples (6.7%). No samples exceeded the 3 µg/L ES for atrazine TCR.
- Acetochlor ESA, a metabolite of the herbicide acetochlor, was detected at seven wells (46.7%) at concentrations between 0.0542 µg/L and 0.883 µg/L. No samples exceeded the 46 µg/L PAL or the 230 µg/L ES for this compound.
- Alachlor ESA, a metabolite of the herbicide alachlor, was detected at seven wells (46.7%) at concentrations between 0.0753 µg/L and 2.18 µg/L. No samples exceeded the 4 µg/L PAL or the 20 µg/L ES for this compound.
- Clothianidin, a neonicotinoid insecticide, was detected at five wells (33.3%) at concentrations between 0.0125 µg/L and 0.0622 µg/L. No PAL and ES standards have been established for this compound at this time. DHS has set the Health Advisory Level for clothianidin at 1,000 µg/L. All clothianidin detections did not exceeded the DHS Health Advisory Level.
- Metolachlor OA (or OXA), a metabolite of metolachlor, was detected at four wells (26.7%) at concentrations between 0.332 µg/L and 4.79 µg/L. No samples exceeded the 260 µg/L PAL or the 1,300 µg/L ES for this compound.
- Sulfentrazone 3-carboxylic acid, a metabolite of sulfentrazone, was detected at three wells (20%) at concentrations between 0.121 µg/L and 0.158 µg/L. No PAL, ES, or DHS Health Advisory Levels have been established for this compound at this time.
- Sulfentrazone, an herbicide, was detected at one well (6.7%) at a concentration of 0.078 µg/L. No PAL and ES standards have been established for this compound at this time. DHS has set the Health Advisory Level for sulfentrazone at 1,000 µg/L. The concentration detected did not exceed the DHS Health Advisory Level.
- Dimethenamid ESA, a metabolite of the herbicide dimethenamid, was detected at one well (6.7%) at a concentration of 0.0507 µg/L. No PAL, ES, or DHS Health Advisory Levels have been established for this compound at this time.
- Metalaxyl, a fungicide, was detected at one well (6.7%) at a concentration of 0.0962 µg/L. No PAL and ES standards have been established for this compound at this time. DHS has set the Health Advisory Level for metalaxyl at 800 µg/L. The concentration detected did not exceed the DHS Health Advisory Level.
- Diamino atrazine, a metabolite of atrazine, was detected at one well (6.7%) at a concentration of 0.158 µg/L. No samples exceeded the 0.3 µg/L PAL or the 3 µg/L ES for atrazine TCR.
- Atrazine was detected at one well (6.7%) at a concentration of 0.068 µg/L. No samples exceeded the 0.3 µg/L PAL or the 3 µg/L ES for atrazine TCR.

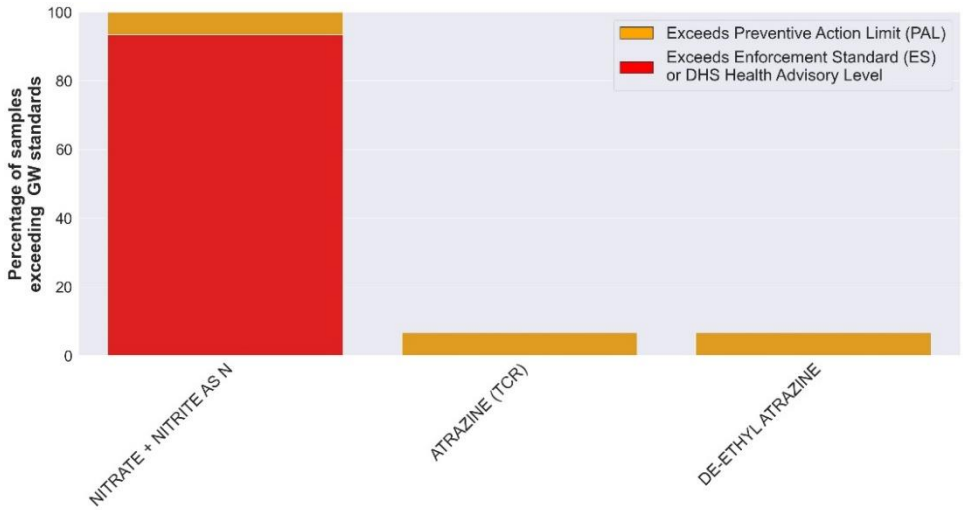
- Thiamethoxam, a neonicotinoid insecticide, was detected at one well (6.7%) at a concentration of 0.0105 µg/L. DHS has set the Health Advisory Level for thiamethoxam at 120 µg/L. The concentration detected did not exceed the DHS Health Advisory Level.

Figure 34. Compounds Detected Through the 2024 Targeted Sampling Program in Marathon County and Respective Detection Rates



Notes: On the x-axis, the list of compounds detected (i.e. found with concentrations greater than laboratory reporting limits). On the y-axis, the detection rate in percentage for each detected compound.

Figure 35. Compounds Exceeding the Preventive Action Limit (PAL), Enforcement Standard (ES), or DHS Health Advisory Level in Marathon County and Respective Exceedances Rates



Atrazine Total Chlorinated Residues (TCR) is the sum of atrazine parent material and its metabolites. Atrazine parent material or atrazine metabolites (de-ethyl atrazine and diamino atrazine) were detected at nine wells (60%). Atrazine TCR yielded concentrations between 0.0518 µg/L and 0.537 µg/L. The 0.3 µg/L PAL for Atrazine TCR was exceeded at one well (6.7%). No samples exceeded the 3 µg/L ES for Atrazine TCR.

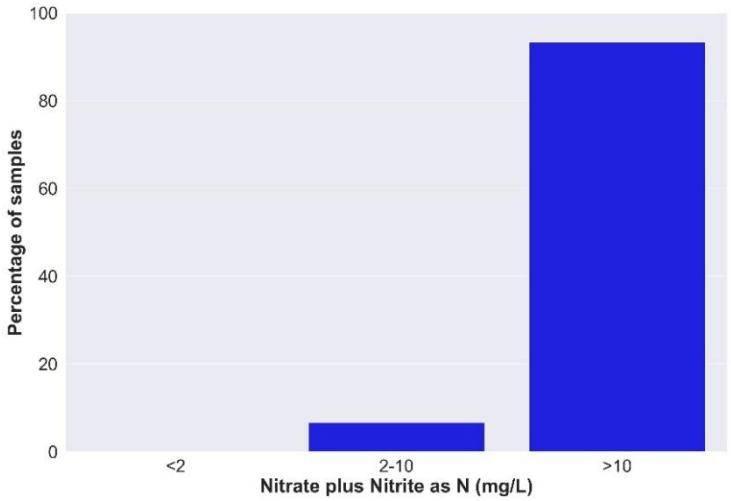
Metolachlor metabolites is the sum of metolachlor ESA and metolachlor OA (or OXA). Metolachlor metabolites were found at 14 wells (93.3%). Metolachlor metabolites yielded concentrations between 0.0599 µg/L and 13.23 µg/L. No PAL (260 µg/L) or ES (1,300 µg/L) standards were exceeded.

Nitrate

Nitrate plus Nitrite as N was detected in all the 15 samples collected. Nitrate concentrations exceeded the 10 mg/L ES at 14 wells. The high rate of exceedance was expected, as wells known to have high nitrate concentration were targeted s. Nitrate was most frequently detected between 10 and 20 mg/L. The distribution of Nitrate plus Nitrite as nitrate concentrations is summarized below and shown on Figure 36.

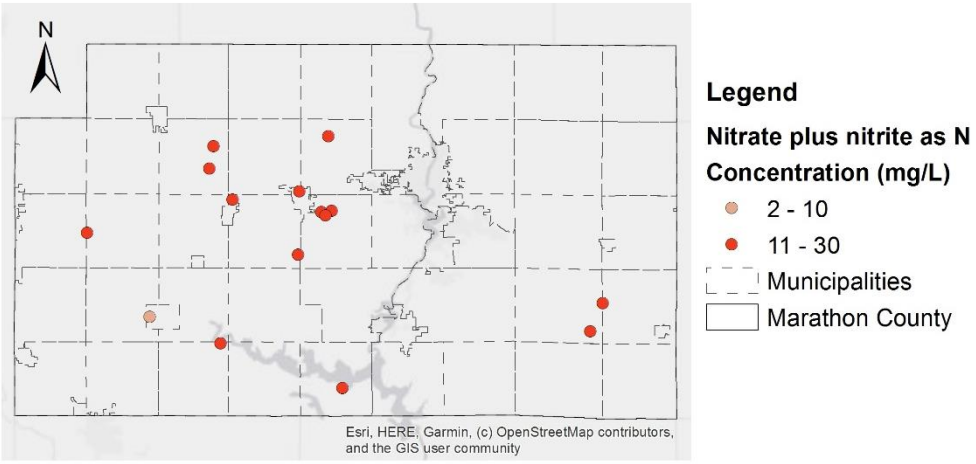
- <2 mg/L: 0 wells (5%)
- >2 to 10 mg/L: 1 well (6.7%)
- >10 mg/L: 14 wells (93.3%)

Figure 36. Nitrate plus Nitrite as N Occurrence Data in Marathon County



As shown on Figure 37, the wells with nitrate concentrations greater than 10 mg/L are located in different areas of the county. The only well with nitrate concentration not exceeding the ES of 10 mg/L was located in the municipality of Stratford.

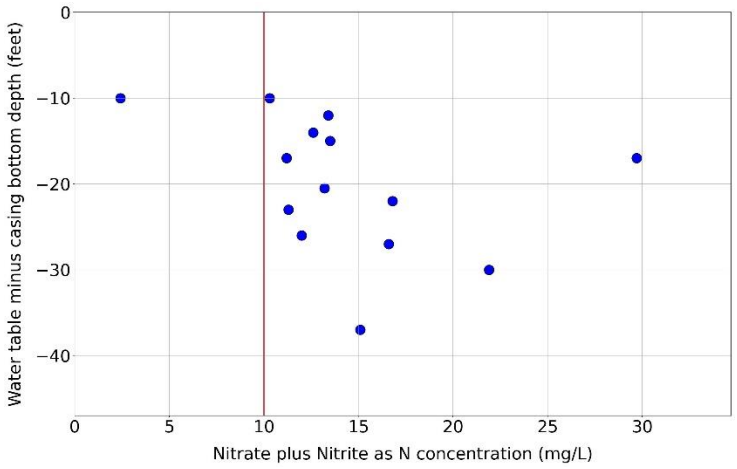
Figure 37. Locations of Nitrate plus Nitrite as N Detections in Marathon County



To track the nitrate contamination in-depth and to better identify what factors control contaminant migration, we retrieved information on well depth, casing bottom depth, static water level, bedrock depth, and installation date from publicly available construction reports.

Figure 38 shows the nitrate concentration versus the difference between the depth of the water table at the time of construction (static water level) and the bottom depth of the well casing. This plot shows how deep below the water table nitrate exceeds the ES of 10 mg/L. As shown, nitrate exceeded concentrations of 10 mg/L at depths ranging from 10 to 37 feet below the water table.

Figure 38. Nitrate plus Nitrite as N Versus the Difference Between the Water Level and the Casing Depth in Marathon County



Notes: The red line represents the ES for nitrate as N (10 mg/L).

No significant relationships were found between nitrate concentration and any of the well properties considered, with the exception of bedrock depth (Figure 39). Nitrate concentration is negatively correlated with the bedrock depth: the shallower the bedrock, the higher the nitrate concentration. However, this linear relationship is strongly affected by a single data point with a bedrock depth of 57 feet (Figure 39). Figure 39 also displays a boxplot of nitrate concentration based on the geology at the well screen, with the average concentration marked by a black circle. The analysis revealed that on average higher nitrate concentrations are experiences in wells that have the screen open to sand and gravel.

Through Geographic Information Systems (ArcMap), we calculated the distance between each sampling point and the nearest agricultural field (Figure 40). Wiscland 2.0 was used as land cover data (Wisconsin Department of Natural Resources, 2019). The data show a weak positive correlation between nitrate levels and the distance of each sampling location to the nearest agricultural field. However, the goodness of fit is low (R2=0.0644), and the data shows no significant difference in nitrate concentrations between locations 0 to 500 feet from agricultural fields. The consistently high nitrate levels, even at greater distances, may be linked to other contamination sources or horizontal contaminant transport within the fractured bedrock aquifer.

Figure 39. Nitrate plus Nitrite as N as a Function of Well Depth, Casing Depth, Static Water Level, Bedrock Depth, and Well Age in Marathon County

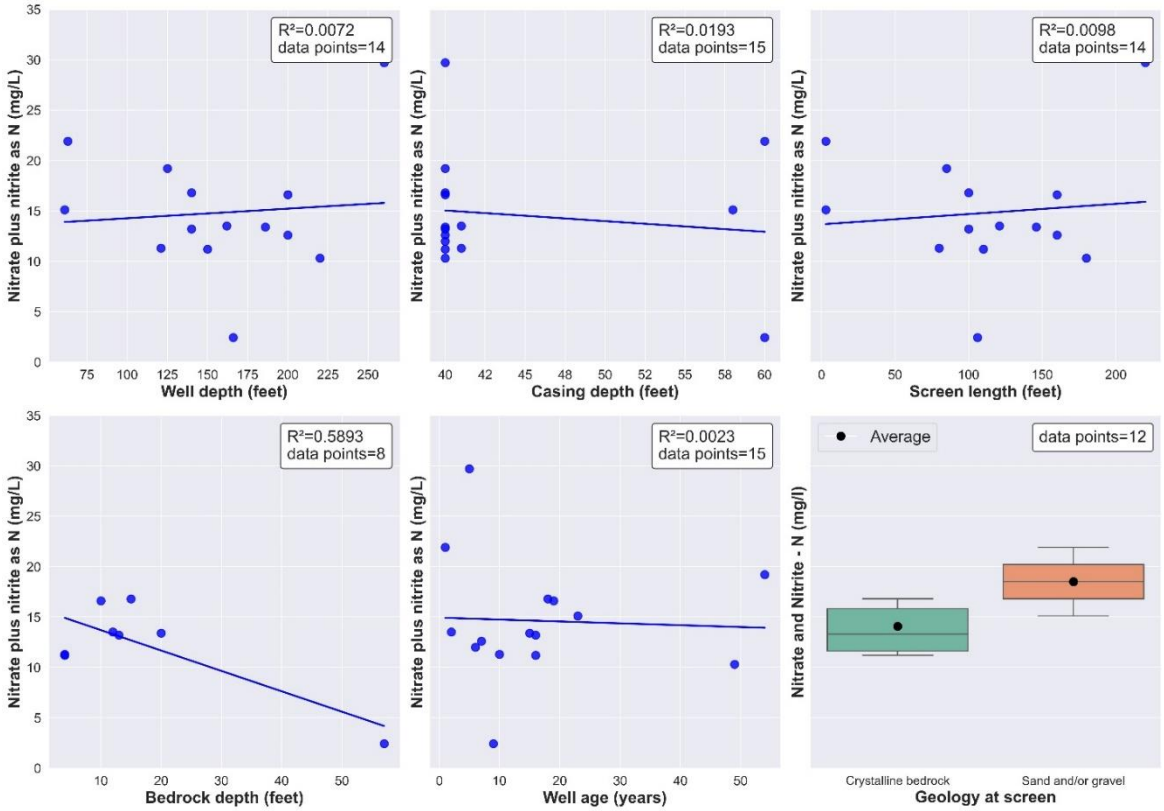
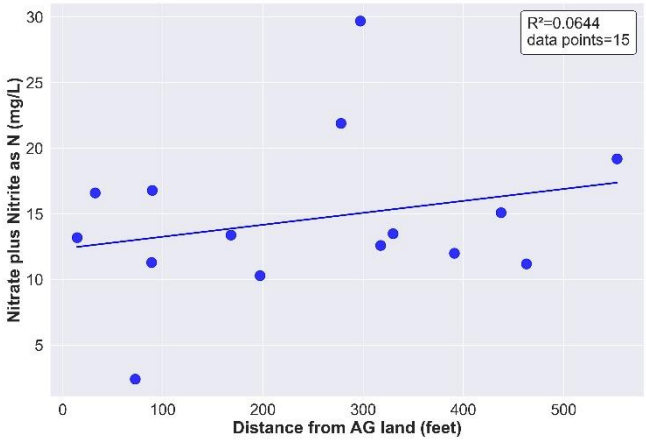


Figure 40. Nitrate plus Nitrite as N Versus the Distance from an Agricultural Field in Marathon County



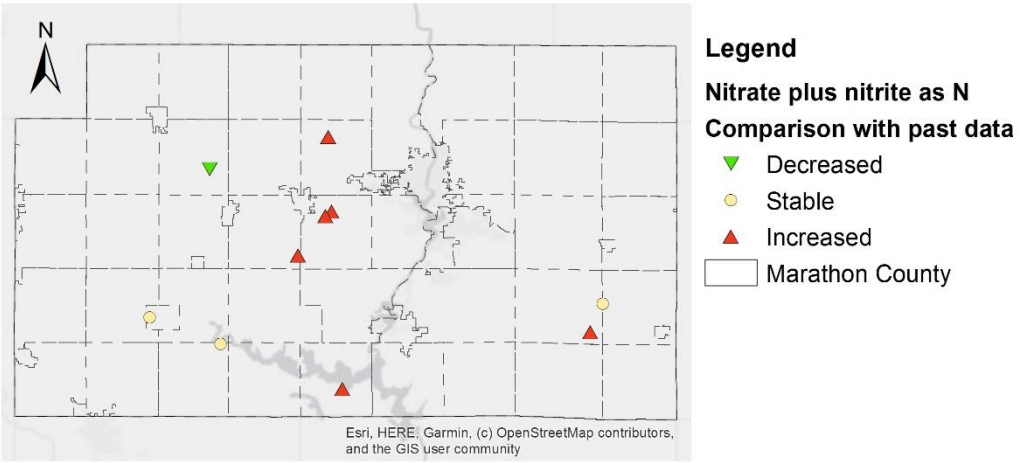
All 15 samples collected in Marathon County as part of the DATCP 2024 Targeted Program had previously undergone nitrate testing by Marathon County between 2023 and 2024. Due to the short interval between the DATCP testing and the earlier Marathon sampling events, no significant differences were observed in the nitrate concentrations at these wells. Additionally, 10 of the 15 wells sampled had been tested for nitrate between 1996 and 2021, with this data available on the Groundwater Retrieval Network website (Wisconsin Department of Natural Resources, 2024b). Over time, nitrate levels increased at six locations, remained relatively unchanged at three wells, and decreased at one location (Table 5).

Table 5. Nitrate Concentration Changes for the Wells That at Least Once Were Tested for Nitrogen Prior the 2024 DATCP Sampling Effort in Marathon County

Nitrate Comparison for 10 Wells Sampled Between 1996 and 2021		
Increased Nitrate Six locations	**No or Minimal Change Three locations**	**Decreased Nitrate One locations**
One increased by 2 to 5 mg/L	Three decreased less than 2 mg/L None increased less than 2 mg/L	None decreased by 2 to 5 mg/L
Four increased by 5 to 10 mg/L		One decreased by 5 to 10 mg/L
One increased more than 10 mg/L		None decreased more than 10 mg/L

Figure 41 shows that wells with decreasing nitrate concentrations are distributed across multiple areas in the western part of the county. Specifically wells located in the municipalities of Berge, Cassel, Marathon, Reid, and Stettin. However, there is insufficient data to determine any regional trends.

Figure 41. Nitrate Trends at Individual Sampling Locations in Marathon County



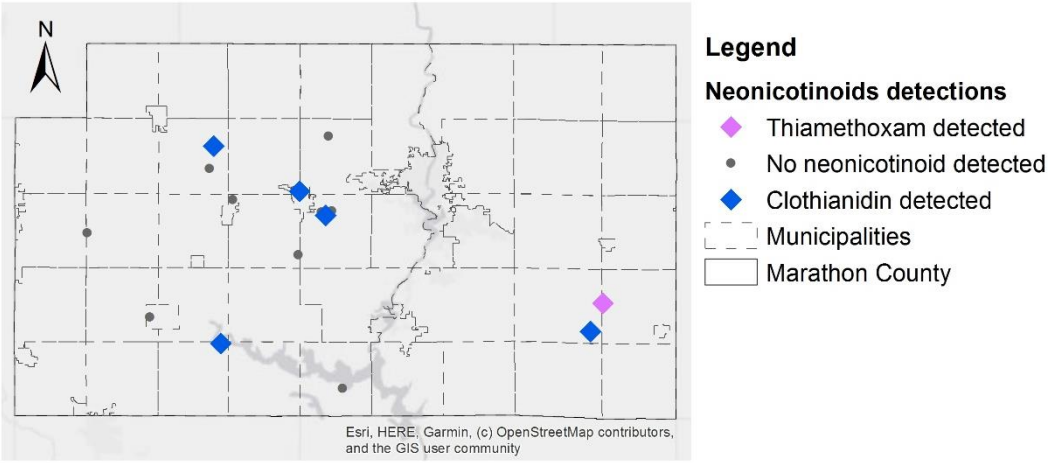
Neonicotinoids

Neonicotinoids are a class of insecticides widely used in Wisconsin. These insecticides are usually applied as seed treatments on major Wisconsin crops, such as corn, soybeans, beans, potatoes, small grains, vegetables, fruit crops, and more. DATCP began testing for neonicotinoids in 2008, starting with thiamethoxam. Currently, the BLS analyzes six neonicotinoid compounds: acetamiprid, clothianidin, dinotefuran, imidacloprid, thiacloprid, and thiamethoxam. Of these, four (clothianidin, dinotefuran, imidacloprid, and thiamethoxam) have been detected multiple times in groundwater and surface water

samples across Wisconsin. These four compounds are active ingredients in over 500 registered pesticide products in the state (Kelly Solutions, 2024). While dinotefuran, imidacloprid, and thiamethoxam are active ingredients, clothianidin can be either an active ingredient or a metabolite of thiamethoxam, making it potentially linked to the use of pesticides containing either clothianidin or thiamethoxam.

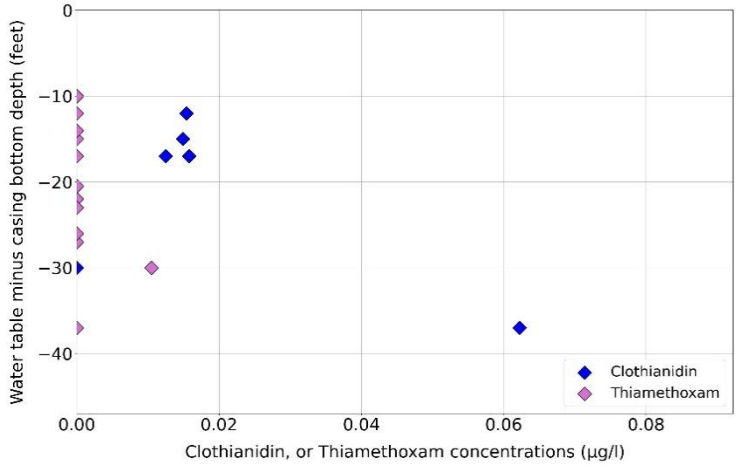
Prior to 2024, clothianidin was the only neonicotinoid compound detected in one private potable well in Marathon County. Through the 2024 sampling effort, we found that clothianidin was detected in five wells scattered across various areas of Marathon County, as shown in Figure 43. The clothianidin concentrations detected in the 2024 samples remained below DHS Health Advisory Level of 1,000 µg/L. Additionally, thiamethoxam was detected at one well, marking the first occurrence of this neonicotinoid compound in groundwater samples collected in private potable wells in Marathon County. Thiamethoxam was detected at a concentration that did not exceed the DHS Health Advisory Level of 120 µg/L.

Figure 42. Locations of Neonicotinoids Detections in Marathon County



Clothianidin and thiamethoxam concentrations were evaluated in relation to the difference between the water depth and the casing depth (Figure 43). Information on the well properties is available for six of the eight locations where neonicotinoids were detected. Clothianidin and thiamethoxam were detected to a maximum depth of 37 feet and 30 feet below the water table, respectively.

Figure 43. Neonicotinoids Concentrations Versus the Difference Between the Water Level and the Casing Depth in Marathon County

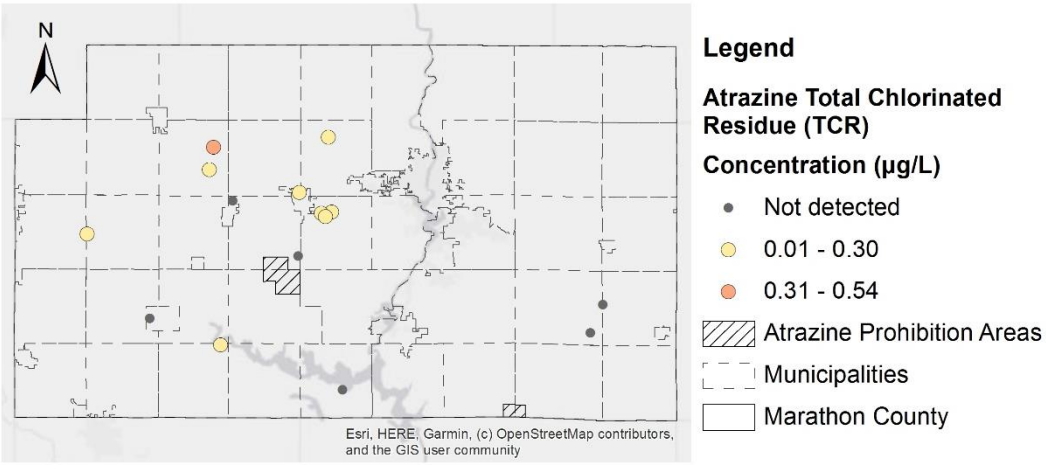


Atrazine

Atrazine is an herbicide used to selectively control weeds on several crops, such as field corn, sweet corn, sorghum, and sugarcane. In Wisconsin, it is registered as a restricted-use pesticide and prohibited in 101 areas (prohibition areas).

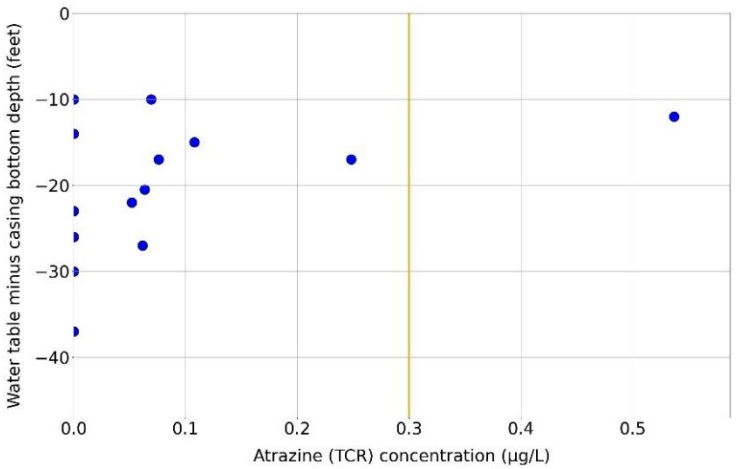
There are currently two atrazine prohibition areas in Marathon County, covering approximately 5,500 acres. (Figure 44). None of the samples collected through the 2024 Targeted Sampling Program are located within or nearby these prohibition areas. Atrazine or atrazine metabolites were detected at nine of the 15 wells. The sum of atrazine metabolites (atrazine TCR) exceeded the PAL of 0.3 µg/L at one well located in the municipality of Marathon (Figure 44).

Figure 44. Locations of Atrazine Total Chlorinated Residues (TCR) Detections in Marathon County



Atrazine TCR was evaluated in relation to the difference between the water depth and the casing depth. Atrazine TCR was found between 10 and 27 feet below the water table. A concentration of atrazine TCR exceeding the PAL of 0.3 µg/L was found at a max depth of 12 feet below the water table (Figure 45).

Figure 45. Atrazine Total Chlorinated Residues (TCR) Concentration Versus the Difference Between the Water Level and the Casing Depth in Marathon County



Notes: *The orange line represents the PAL for Atrazine TCR (0.3 µg/L).*

CONCLUSION AND RECOMMENDATIONS

Groundwater samples collected between July and August 2024 from 15 private potable wells in Marathon County were tested for nitrate and 112 pesticides. Nitrate was detected over the ES of 10 mg/L at 14 wells or 93.3% of the wells sampled. DATCP advised well owners to conduct annual tests at the wells where exceedances occurred. By comparing the 2024 results with prior data included in the DNR Groundwater Retrieval Network (Wisconsin Department of Natural Resources, 2024b), we found that for three of the wells tested, nitrate concentrations has not changed over time; for one well tested, nitrate concentrations decreased; and for six wells tested, nitrate concentrations increased. Resampling these wells annually could provide additional data to better assess nitrate concentration trends. No strong linear relationships were found between nitrate concentrations and well properties or nitrate concentration and distance to an agricultural field. Additional data are needed to confirm these trends.

A total of 13 individual pesticides were detected, but no pesticide concentrations exceeded their respective ES groundwater standard or DHS Health Advisory Levels. Atrazine Total Chlorinated Residues (TCR – the sum of atrazine and atrazine metabolites) was found in exceedance of the Preventive Action Limit (PAL, 0.3 µg/L) at one well. In 2023, corn production covered over 180,000 acres in Marathon County (about 18% of the total county area), making it the predominant crop in the county (U.S. Department of Agriculture - National Agricultural Statistics Service, 2024). Because atrazine may be used on this crop and none of the wells tested are within an atrazine prohibition area, it is foreseeable that atrazine and atrazine metabolites would be detected.

Clothianidin and thiamethoxam, both neonicotinoid insecticides, were detected in the 2024 groundwater samples collected in Marathon County. While neonicotinoids were previously detected in private potable wells in this area, this is the first time that thiamethoxam was detected in a private potable well in Marathon County. Clothianidin or thiamethoxam concentrations did not exceed the DHS Health Advisory Levels of 1,000 µg/L and 120 µg/L. respectively. Additional sampling is needed to better understand neonicotinoids trends and occurrence. (Note: DATCP is unable to track the type or amount of pesticide used on any specific field, county, or statewide.)

DATCP will consider resampling wells where pesticides of interest (de-ethyl atrazine, clothianidin, and thiamethoxam) were detected. Because no PAL, ES, or DHS Health Advisory Level have been established for dimethenamid ESA and sulfentrazone 3-carboxylic acid, we are currently unable to assess the health risk associated with the detection of these compounds. The detection of other pesticides does not raise noteworthy concerns regarding risks to human health and the environment.

Recommendations

The occurrence of nitrate and pesticides in groundwater is influenced by environmental factors including soil, geology, depth to groundwater, and weather events; as well as land management practices near the wells in this study, such as crops grown, cultivation, agrichemicals used, tile drainage, and irrigation. 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 samples results and 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 Wisconsin Department of Health Services 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 DHS drinking water quality advisories.
- Attempt to resample all wells in five years (2029) to further evaluate trends in groundwater quality.

Acknowledgments

DATCP's Bureau of Agrichemical Management's (ACM) financial information includes the state fiscal year (FY) 2023 from July 1, 2022 through June 30, 2023. Federal grants operated from October 1, 2022 through September 30, 2023. 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 cooperative agreement with the EPA provides some funding to cover annual pesticide program expenses. ACM recognizes these important partnerships with the 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) 224-4503.

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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
BLS	Bureau of Laboratory Services
DA	Desamino
DADK	Desaminodiketo
DATCP	Wisconsin Department of Agriculture, Trade and Consumer Protection
DHS	Wisconsin Department of Health Services
DNR	Wisconsin Department of Natural Resources
EPA	United States - Environmental Protection Agency
ES	Enforcement Standard
ESA	Ethane Sulfonic Acid
GC	Gas Chromatography
GCC	Wisconsin Groundwater Coordinating Council
HAL	Health Advisory Level
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
OA	Oxalic Acid
PAL	Preventive Action Limit
TCR	Total Chlorinated Residues
USDA	U.S. Department of Agriculture
WGNHS	Wisconsin Geological and Natural History Survey
Wis. Admin. Code	Wisconsin Administrative Code
WUWN	Wisconsin Unique Well Number

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

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)

Enforcement Standard (ES) - The Enforcement Standard (ES) is set to ensure that the concentration of a compound in groundwater does not exceed a specific level that could harm human health or the environment. If the ES for a certain compound in groundwater is exceeded, intervention from the appropriate authority is required

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 that 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 pests. The pesticide category includes herbicides, insecticides, rodenticides, fungicides, and bactericides

Preventive Action Limit (PAL) - The Preventive Action Limit (PAL) is a percentage of the Enforcement Standard (ES); 10% of the ES for carcinogenic, mutagenic, or teratogenic properties, and 20% of the ES for the remaining substances. The intention of the PAL is for it to act as a trigger for intervention before a pollutant becomes a serious risk to public health or the environment

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)

Appendix B

Table B 1. Summary of the Analytical Results for the 2024 Targeted Sampling Program

2024 Targeted Sampling Program Results					Wisconsin Admin. Code Chapter NR 140		Wisconsin Department of Health Services
Pesticide Name	Pesticide Class	Number of detects	Reporting Limit (µg/L)	Concentration Range (µg/L)	Preventive Action Limit (µg/L)	Enforcement Standards (µg/L)	Health Advisory Level (µg/L)
2,4,5-T	Herbicide	ND	0.05	---	---	---	---
2,4,5-TP	Herbicide	ND	0.05	---	5	50	---
2,4-D	Herbicide	ND	0.05	---	7	70	---
2,4-DB	Herbicide	ND	1	---	---	---	---
2,4-DP	Herbicide	ND	0.05	---	---	---	---
ACETAMIPRID	Insecticide	ND	0.01		---	---	---
ACETOCHLOR	Herbicide	1	0.05	0.0712	0.7	7	---
ACETOCHLOR ESA	Herbicide metabolite	34	0.05	0.0537 - 1.52	46	230	---
ACETOCHLOR OA	Herbicide metabolite	ND	0.3	---	46	230	---
ALACHLOR METABOLITES	Sum of acetochlor metabolites	34	---	0.0537 - 1.52	46	230	---
ACIFLUORFEN	Herbicide	1	0.05	0.0891	---	---	---
ALACHLOR	Herbicide	ND	0.05	---	0.2	2	---
ALACHLOR ESA	Herbicide metabolite	56	0.05	0.0507 - 3.83	4	20	---
ALACHLOR OA or OXA	Metabolite	ND	0.25	---	---	---	---
ALDICARB SULFONE	Insecticide	ND	0.05	---	---	---	---
ALDICARB SULFOXIDE	Insecticide	ND	0.071	---	---	---	---
AMINOPYRALID	Herbicide	ND	0.15	---	---	---	---
ATRAZINE	Herbicide	14	0.05	0.0516 - 0.523	0.3	3	---
DE-ETHYL ATRAZINE	Herbicide metabolite	48	0.05	0.0516 - 0.469	0.3	3	---
DEISOPROPYL ATRAZINE	Herbicide metabolite	16	0.05	0.0502 - 0.269	0.3	3	---
DIAMINO ATRAZINE	Herbicide metabolite	29	0.15	0.156 - 1.14	0.3	3	---
ATRAZINE (TCR)	Sum of atrazine and atrazine metabolites	55	---	0.0516 - 1.4773	0.3	3	---
HYDROXYATRAZINE	Herbicide metabolite (not included in Atrazine TCR)	ND	0.05	---	---	---	---
AZOXYSTROBIN	Fungicide	ND	0.05	---	---	---	---
BENFLURALIN	Herbicide	ND	0.05	---	---	---	---
BENTAZON	Herbicide	4	0.05	0.276 - 0.715	60	300	---
BICYCLOPYRONE	Herbicide	ND	0.05	---	---	---	---
BIFENTHRIN	Insecticide	ND	0.005	---	---	---	---
BOSCALID	Fungicide	ND	0.05	---	---	---	---
BROMACIL	Herbicide	ND	0.05	---	---	---	---
CARBARYL	Insecticide	ND	0.05	---	4	40	---
CARBOFURAN	Insecticide	ND	0.05	---	8	40	---
CHLORAMBEN	Herbicide	ND	0.32	---	30	150	---
CHLORANTRANILIPROLE	Insecticide	ND	0.05	---	---	---	16,000
CHLOROTHALONIL	Fungicide	ND	0.1	---	---	---	---
CHLORPYRIFOS	Insecticide	ND	0.05	---	0.4	2	---
CHLORPYRIFOS OXYGEN ANALOG	Insecticide metabolite	ND	0.05	---	---	---	---
CLOMAZONE	Herbicide	ND	0.05	---	---	---	---
CLOPYRALID	Herbicide	1	0.1	0.379	---	---	---

2024 Targeted Sampling Program Results					Wisconsin Admin. Code Chapter NR 140		Wisconsin Department of Health Services
Pesticide Name	Pesticide Class	Number of detects	Reporting Limit (µg/L)	Concentration Range (µg/L)	Preventive Action Limit (µg/L)	Enforcement Standards (µg/L)	Health Advisory Level (µg/L)
CLOTHIANIDIN	Insecticide	28	0.01	0.0108 - 1.18	---	---	1,000
CYANTRANILIPROLE	Insecticide	ND	0.05	---	---	---	16,000
CYCLANILIPROLE	Insecticide	ND	0.2	---	---	---	---
CYFLUTHRIN	Insecticide	ND	0.05	---	---	---	---
CYPERMETHRIN	Insecticide	ND	0.1	---	---	---	---
CYPROSULFAMIDE	Safener	ND	0.05	---	---	---	---
DACTHAL	Herbicide	ND	0.05	---	14	70	---
DACTHAL DI-ACID	Herbicide metabolite	ND	0.5	---	---	---	70
DACTHAL MONO-ACID	Herbicide metabolite	ND	0.5	---	---	---	70
DACTHAL TOTAL	Sum of dacthal and dacthal metabolites	ND	0.5	---	---	---	70
DESTHIO PROTHIOCONAZOLE	Fungicide metabolite	ND	0.05	---	---	---	---
DIAZINON	Insecticide	ND	0.05	---	---	---	---
DIAZINON OXYGEN ANALOG	Insecticide metabolite	ND	0.05	---	---	---	---
DICAMBA	Herbicide	ND	0.25	---	60	300	---
DICHLOBENIL	Herbicide	ND	0.05	---	---	---	---
DIMETHENAMID	Herbicide	ND	0.05	---	5	50	---
DIMETHENAMID ESA	Herbicide metabolite	12	0.05	0.0507 - 2.41	---	---	---
DIMETHENAMID OA	Herbicide metabolite	5	0.05	0.0614 - 0.987	---	---	---
DIMETHOATE	Insecticide	ND	0.05	---	0.4	2	---
DINOTEFURAN	Insecticide	2	0.01	0.0176 - 0.0179	---	---	---
DIURON	Herbicide	ND	0.05	---	---	---	---
EPTC	Herbicide	ND	0.05	---	50	250	---
ESFENVALERATE	Insecticide	ND	0.025	---	---	---	---
ETHALFLURALIN	Herbicide	ND	0.05	---	---	---	---
ETHOFUMESATE	Herbicide	ND	0.05	---	---	---	---
FLUMETSULAM	Herbicide	2	0.05	0.0849 - 0.324	---	---	10,000
FLUPYRADIFURONE	Insecticide	ND	0.05	---	---	---	---
FLUROXYPYR	Herbicide	ND	0.05	---	---	---	---
FOMESAFEN	Herbicide	8	0.05	0.096 - 3.18	---	---	25
HALOSULFURON METHYL	Herbicide	ND	0.05	---	---	---	---
HEXAZINONE	Herbicide	ND	0.05	---	---	---	400
IMAZAPYR	Herbicide	ND	0.05	---	---	---	---
IMAZETHAPYR	Herbicide	ND	0.05	---	---	---	---
IMIDACLOPRID	Insecticide	3	0.01	0.0462 - 0.38	---	---	0.2
ISOXAFLUTOLE	Herbicide	ND	0.05	---	---	---	3
ISOXAFLUTOLE DKN	Herbicide metabolite	ND	0.05	---	---	---	3
ISOXAFLUTOLE TOTAL	Sum of isoxaflutole (IFT) and IFT DKN	ND	0.05	---	---	---	3
LAMBDA-CYHALOTHRIN	Insecticide	ND	0.02	---	---	---	---
LINURON	Herbicide	ND	0.05	---	---	---	---
MALATHION	Insecticide	ND	0.05	---	---	---	---
MCPA	Herbicide	ND	0.05	---	---	---	---
MCPB	Herbicide	ND	0.1	---	---	---	---
MCPP	Herbicide	ND	0.05	---	---	---	---
MESOTRIONE	Herbicide	ND	0.1	---	---	---	---
METALAXYL	Fungicide	3	0.05	0.0962 - 0.42	---	---	800
METHYL PARATHION	Insecticide	ND	0.05	---	---	---	---

2024 Targeted Sampling Program Results					Wisconsin Admin. Code Chapter NR 140		Wisconsin Department of Health Services
Pesticide Name	Pesticide Class	Number of detects	Reporting Limit (µg/L)	Concentration Range (µg/L)	Preventive Action Limit (µg/L)	Enforcement Standards (µg/L)	Health Advisory Level (µg/L)
METOLACHLOR	Herbicide	4	0.05	0.0545 - 1.33	10	100	---
METOLACHLOR ESA	Herbicide metabolite	73	0.05	0.0599 - 26.8	260	1300	---
METOLACHLOR OA or OXA	Herbicide metabolite	20	0.27	0.284 - 9.69	260	1300	---
METOLACHLOR METABOLITES	Sum of metolachlor ESA and metolachlor OA	73	---	0.0599 - 35.25	260	1300	---
METRIBUZIN	Herbicide	3	0.05	0.051 - 0.961	14	70	---
METRIBUZIN DA	Herbicide metabolite	2	0.1	0.146 - 0.243	---	---	---
METRIBUZIN DADK	Herbicide metabolite	3	0.12	0.192 - 0.697	---	---	---
METSULFURON-METHYL	Herbicide	ND	0.05	---	---	---	---
NICOSULFURON	Herbicide	ND	0.05	---	---	---	---
NORFLURAZON	Herbicide	ND	0.05	---	---	---	---
OXADIAZON	Herbicide	ND	0.05	---	---	---	---
PENDIMETHALIN	Herbicide	ND	0.05	---	---	---	---
PERMETHRIN	Insecticide	ND	0.03	---	---	---	---
PICLORAM	Herbicide	ND	0.05	---	100	500	---
PROMETONE	Herbicide	ND	0.05	---	20	100	---
PROMETRYN	Herbicide	ND	0.05	---	---	---	---
PROPICONAZOLE	Fungicide	ND	0.05	---	---	---	---
PYROXASULFONE	Herbicide	ND	0.05	---	---	---	---
PYROXASULFONE M-1	Herbicide metabolite	3	0.05	0.0766 - 0.181	---	---	---
SAFLUFENACIL	Herbicide	3	0.05	0.194 - 0.64	---	---	460
SIMAZINE	Herbicide	ND	0.05	---	0.4	4	---
SULFENTRAZONE	Herbicide	4	0.05	0.078 - 0.214	---	---	1,000
SULFENTRAZONE-3-CARBOXYLIC ACID	Herbicide metabolite	4	0.1	0.121 - 0.158	---	---	---
SULFOMETURON-METHYL	Herbicide	ND	0.05	---	---	---	---
TEBUCONAZOLE	Fungicide	ND	0.05	---			
TEBUPIRIMPHOS	Insecticide	ND	0.05	---	---	---	---
TEMBOTRIONE	Herbicide	ND	0.1	---	---	---	---
THIACLOPRID	Insecticide	ND	0.01	---	---	---	---
THIAMETHOXAM	Insecticide	6	0.01	0.0105 - 2.25	---	---	120
THIENCARBAZONE-METHYL	Herbicide	ND	0.05	---	---	---	10,000
TRICLOPYR	Herbicide	ND	0.05	---	---	---	---
TRIFLURALIN	Herbicide	ND	0.05	---	0.75	7.5	---

Legend:

--- In columns Wisconsin Admin. Code Chapter NR 140 or Wisconsin Department of Health Services indicates that no standards or health advisory is established for that compound. In column Concentration Range indicates that the concentration was found below Reporting Limits.

ND = Not detected at a concentration greater than the reporting laboratory limit.

µg/L = Micrograms per liter or parts per billion.

TCR = Total Chlorinated Residues for Atrazine. Reflects an additive quantity of atrazine and its three metabolites (de-ethyl, de-isopropyl and di-amino atrazine).

Indicates no detects in excess of laboratory reporting limits.

Indicates no detects in excess of laboratory reporting limits, but not in excess of any Preventive Action Limits.

Indicates detects in excess of laboratory reporting limits and Wisc. Admin. Code ch. NR 140 Preventive Action Limit, but not Enforcement standards.

Indicates detects in excess of laboratory reporting limits and Wisc. Admin. Code ch. NR 140 Enforcement standards.

Table B 2. 2024 Targeted Sampling Program Analytical Results for Dane County

WUWN	Sample Date	NITRATE	METOLACHLOR	METOLACHLOR ESA	METOLACHLOR OA	METOLACHLOR METABOLITES	ATRAZINE	DE-ETHYL ATRAZINE	DEISOPROPYL ATRAZINE	DIAMINO ATRAZINE	ATRAZINE (TCR)	CLOTHIANIDIN	DINOTEFURAN	ACETOCHLOR	ACETOCHLOR ESA	ALACHLOR ESA	CLOPYRALID	DIMETHENAMID ESA	FLUMETSULAM	FOMESAFEN	SULFENTRAZONE	Number of individual pesticides detected
AD052	6/19/2024	3.51	ND	0.0606	ND	0.0606	ND	0.0922	ND	0.377	0.4692	ND	ND	ND	ND	0.0918	ND	ND	ND	ND	ND	4
AS413	5/30/2024	5.22	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0
AT541	7/5/2024	24.4	ND	5.45	0.854	6.304	ND	0.0683	0.269	1.14	1.4773	ND	ND	ND	0.701	0.231	ND	ND	0.0849	ND	ND	8
CX265	5/30/2024	3.63	ND	0.203	ND	0.203	0.0993	0.138	ND	ND	0.2373	ND	ND	0.0712	0.107	0.143	ND	ND	ND	ND	ND	6
CZ313	6/19/2024	9.1	ND	0.191	ND	0.191	ND	0.0654	ND	0.244	0.3094	ND	ND	ND	ND	0.14	ND	ND	ND	ND	ND	4
DH691	5/29/2024	10.8	ND	1.43	ND	1.43	ND	ND	ND	ND	ND	0.0776	0.0179	ND	ND	ND	ND	ND	ND	ND	ND	3
FL473	5/30/2024	5.69	ND	2.39	ND	2.39	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.399	ND	ND	ND	ND	ND	2
HD624	6/10/2024	6.98	0.0545	1.17	ND	1.17	0.0538	0.202	0.0564	0.353	0.6652	ND	ND	ND	0.061	0.363	ND	ND	ND	ND	ND	8
IW199	6/19/2024	5.58	ND	0.598	ND	0.598	ND	0.0673	ND	ND	0.0673	0.0529	ND	ND	ND	ND	ND	ND	ND	ND	ND	3
IY305	5/29/2024	10.8	ND	0.756	ND	0.756	ND	0.107	ND	0.289	0.396	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3
KV031	5/30/2024	8.77	ND	0.095	ND	0.095	0.0651	0.32	0.0559	0.38	0.821	ND	ND	ND	ND	0.875	ND	ND	ND	ND	ND	6
MQ840	6/19/2024	2.68	ND	0.131	ND	0.131	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
MQ974	5/29/2024	3.75	ND	0.497	ND	0.497	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
OH692	5/29/2024	4.67	ND	ND	ND	ND	ND	0.0586	ND	ND	0.0586	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
OQ294	6/19/2024	2.09	ND	ND	ND	ND	ND	ND	ND	0.164	0.164	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
PW532	5/30/2024	19.4	ND	6.23	ND	6.23	ND	0.0562	0.058	0.332	0.4462	0.0152	ND	ND	0.0598	0.594	ND	ND	ND	ND	ND	7
PW770	5/29/2024	3.84	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.1	ND	ND	ND	ND	ND	1
QN909	6/19/2024	ND	ND	8.18	2.6	10.78	ND	ND	ND	ND	ND	0.154	ND	ND	0.0621	0.111	ND	ND	ND	ND	ND	5
RX611	6/10/2024	1.67	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0
RX860	6/10/2024	8.05	ND	1.32	ND	1.32	ND	0.149	ND	0.329	0.478	ND	ND	ND	ND	0.247	ND	ND	ND	ND	ND	4
RY013	6/19/2024	5.9	ND	ND	ND	ND	ND	ND	ND	0.159	0.159	ND	ND	ND	ND	0.135	ND	ND	ND	ND	ND	2
SA631	6/10/2024	3.73	ND	0.193	ND	0.193	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0637	ND	ND	ND	ND	ND	2
SD310	5/30/2024	9.94	ND	0.645	ND	0.645	0.0831	0.162	ND	ND	0.2451	0.0132	ND	ND	ND	ND	ND	ND	ND	ND	ND	4
SG117	5/29/2024	2.8	ND	ND	ND	ND	ND	ND	ND	0.311	0.311	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
TQ748	5/30/2024	7.71	ND	0.385	ND	0.385	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.066	ND	ND	ND	ND	ND	2
TQ990	6/10/2024	5.08	ND	0.137	ND	0.137	ND	0.08	ND	0.35	0.43	0.0363	ND	ND	ND	ND	ND	ND	ND	ND	ND	4
TT722	6/10/2024	8.36	ND	0.844	ND	0.844	ND	0.145	0.0589	0.641	0.8449	ND	ND	ND	0.0612	0.134	ND	ND	ND	ND	ND	6
TT878	6/19/2024	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0
UB968	6/19/2024	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0
WG922	5/29/2024	ND	ND	0.0655	ND	0.0655	0.0583	0.0939	ND	ND	0.1522	ND	ND	ND	ND	0.722	ND	ND	ND	ND	ND	4
WI574	5/29/2024	8.65	ND	1.07	ND	1.07	0.0835	0.231	ND	0.386	0.7005	ND	ND	ND	ND	0.453	ND	ND	ND	ND	ND	5
WJ749	5/29/2024	17.7	ND	0.583	ND	0.583	ND	0.12	0.0611	0.512	0.6931	ND	ND	ND	ND	0.823	ND	ND	ND	ND	ND	5
WK140	6/10/2024	8.73	ND	1.51	ND	1.51	0.0727	0.218	ND	0.445	0.7357	ND	ND	ND	0.0537	0.337	ND	ND	ND	ND	ND	6
WM532	6/19/2024	7.37	ND	0.841	ND	0.841	ND	0.0888	ND	0.345	0.4338	0.081	ND	ND	0.0599	ND	ND	ND	ND	ND	0.183	6
WM918	5/30/2024	3.85	ND	0.408	ND	0.408	ND	ND	ND	0.184	0.184	ND	ND	ND	ND	0.0507	ND	ND	ND	ND	ND	3
XH407	6/19/2024	0.526	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0
YH568	6/10/2024	6.23	ND	0.236	ND	0.236	ND	ND	ND	ND	ND	ND	0.0176	ND	ND	0.197	ND	ND	ND	ND	ND	3
YM405	6/19/2024	13.7	ND	1.92	ND	1.92	ND	0.0621	0.0502	0.517	0.6293	0.019	ND	ND	0.0619	0.135	0.379	0.0771	0.324	0.152	0.214	12
YQ178	5/29/2024	4.85	ND	0.473	ND	0.473	ND	0.126	ND	0.279	0.405	0.0306	ND	ND	ND	0.272	ND	ND	ND	ND	ND	5
YU077	6/10/2024	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0
ZU266	5/29/2024	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0

Legend:

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

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

ND = Not detected at a concentration greater than the reporting laboratory limit.

Concentrations are reported in µg/L with the exception of Nitrate concentrations reported in mg/L.

TCR = Total Chlorinated Residues for Atrazine. Reflects an additive quantity of atrazine and its three metabolites (de-ethyl, de-isopropyl and di-amino atrazine).

Table B 3. 2024 Targeted Sampling Program Analytical Results for Dunn County

WUWN	Sample Date	NITRATE	METOLACHLOR	METOLACHLOR ESA	METOLACHLOR OA	METOLACHLOR METABOLITES	ATRAZINE	DE-ETHYL ATRAZINE	DEISOPROPYL ATRAZINE	DIAMINO ATRAZINE	ATRAZINE (TCR)	CLOTHIANIDIN	IMIDACLOPRID	THIAMETHOXAM	ACETOCHLOR ESA	ACIFLUORFEN	ALACHLOR ESA	BENTAZON	DIMETHENAMID ESA	DIMETHENAMID OA	FOMESAFEN	METALAXYL	METRIBUZIN	METRIBUZIN DA	METRIBUZIN DADK	PYROXASULFONE M-1	SAFLUFENACIL	SULFENTRAZONE	SULFENTRAZONE 3-CARBOXYLIC ACID	Number of individual pesticides detected
8BE495	7/8/2024	7.54	ND	0.208	ND	0.208	ND	ND	0.147	ND	0.147	ND	ND	ND	ND	ND	1.25	ND	0.0702	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4
8BF416	6/25/2024	22.6	ND	0.0648	ND	0.0648	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.745	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2
8BF443	6/25/2024	9.58	ND	0.208	ND	0.208	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.301	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2
8BF492	6/24/2024	16.3	ND	1.63	ND	1.63	ND	0.129	0.188	0.487	0.804	ND	ND	ND	0.0653	ND	1.27	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6
8BF730	6/24/2024	10.1	ND	0.478	ND	0.478	ND	0.233	ND	0.334	0.567	0.062	ND	ND	1.52	ND	0.49	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6
8BG040	7/8/2024	14	ND	4.59	0.715	5.305	ND	ND	ND	ND	ND	0.0108	ND	ND	0.203	ND	ND	ND	0.105	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5
CO337	6/24/2024	4.5	ND	ND	ND	ND	ND	0.137	ND	ND	0.137	ND	ND	ND	0.166	ND	3.83	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3
CO775	7/8/2024	9.08	ND	1.48	0.284	1.764	ND	ND	ND	ND	ND	0.0141	ND	ND	0.465	ND	1.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5
DI437	7/8/2024	2.61	ND	0.0656	ND	0.0656	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.26	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2
IY391	7/8/2024	7.84	ND	2.2	0.423	2.623	ND	ND	ND	ND	ND	0.0314	ND	ND	0.416	ND	0.122	ND	ND	ND	0.096	ND	ND	ND	ND	ND	ND	ND	ND	ND	6
KB929	6/24/2024	18.9	ND	6.64	2.89	9.53	0.0516	ND	ND	ND	0.0516	ND	ND	ND	ND	ND	ND	ND	0.413	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4
KM826	7/24/2024	31	ND	5.76	0.481	6.241	ND	0.134	0.163	ND	0.297	0.0153	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5
KQ832	7/8/2024	15.6	ND	4.83	0.338	5.168	ND	ND	ND	ND	ND	0.0342	ND	ND	0.107	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4
MG110	7/24/2024	17.1	ND	3.79	2.45	6.24	0.0745	0.0766	0.143	0.243	0.5371	0.0119	ND	0.059	0.146	ND	0.363	0.437	0.424	0.228	0.487	ND	ND	ND	ND	0.181	0.214	ND	ND	16
OH513	7/8/2024	18.2	0.137	4.23	2.74	6.97	ND	0.0523	0.0755	ND	0.1278	0.103	0.0462	0.339	0.271	ND	0.381	0.33	0.36	0.192	0.496	ND	0.051	ND	ND	0.127	0.194	ND	ND	17
PW533	6/24/2024	4.7	ND	0.635	ND	0.635	ND	0.284	ND	ND	0.284	ND	ND	ND	ND	ND	0.326	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3
PW534	6/24/2024	19.9	ND	8.62	0.675	9.295	ND	0.0917	ND	ND	0.0917	ND	ND	ND	0.149	ND	0.437	ND	0.645	ND	0.285	ND	ND	ND	ND	ND	ND	ND	0.132	8
PW535	6/24/2024	12.8	ND	3.13	ND	3.13	ND	0.14	ND	ND	0.14	ND	ND	ND	0.0646	ND	0.331	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4
PW536	6/24/2024	19	ND	4.11	ND	4.11	0.0816	0.457	ND	0.575	1.1136	0.0432	ND	ND	0.0541	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6
PW537	6/24/2024	8.47	ND	2.64	ND	2.64	ND	0.123	ND	ND	0.123	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2
PW538	6/25/2024	17.9	ND	0.78	ND	0.78	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.735	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2
PW539	6/25/2024	1.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0
PW540	6/25/2024	4.96	ND	0.555	ND	0.555	ND	ND	ND	ND	ND	ND	ND	ND	0.684	ND	0.767	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3
PW741	6/25/2024	3.4	ND	0.19	ND	0.19	ND	ND	ND	ND	ND	ND	ND	ND	0.494	ND	0.881	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3
PW742	7/8/2024	5.3	ND	0.226	ND	0.226	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
PW743	7/8/2024	14.8	ND	2.36	0.649	3.009	ND	0.0516	0.0734	0.156	0.281	0.0795	ND	ND	0.421	ND	0.135	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	8
PW744	7/24/2024	25.4	ND	3.78	1.29	5.07	ND	0.0745	0.119	0.205	0.3985	ND	ND	ND	0.709	ND	0.0908	ND	0.25	0.0614	ND	ND	ND	ND	0.192	0.0766	ND	ND	ND	11
PW745	7/24/2024	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.77	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
VR872	7/24/2024	20.3	0.338	9.97	7.63	17.6	0.117	0.08	ND	ND	0.197	0.85	0.379	2.25	ND	ND	0.229	0.715	2.41	0.987	3	0.179	0.189	0.243	0.697	ND	0.64	0.116	ND	19
VX332	6/24/2024	15.7	ND	0.195	ND	0.195	0.523	0.327	0.0879	ND	0.9379	ND	ND	ND	0.109	ND	0.668	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6
WA829	7/8/2024	18.8	ND	26.8	8.45	35.25	0.122	0.145	0.103	0.194	0.564	0.145	ND	0.0109	0.0808	ND	ND	ND	0.0652	ND	0.4	ND	ND	ND	ND	ND	ND	ND	ND	11
WH580	6/24/2024	3.52	ND	1.14	ND	1.14	ND	0.121	ND	ND	0.121	ND	ND	ND	ND	ND	0.248	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3
XB611	6/24/2024	4.74	ND	ND	ND	ND	ND	ND	ND	0.196	0.196	ND	ND	ND	ND	ND	0.548	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2
XH091	7/8/2024	21.1	1.33	10.1	9.69	19.79	ND	ND	ND	ND	ND	1.18	0.38	1.49	ND	0.0891	0.395	0.276	0.579	0.403	3.18	0.42	0.961	0.146	0.533	ND	ND	ND	ND	16
XU280	6/25/2024	4.16	ND	ND	ND	ND	ND	0.0934	ND	ND	0.0934	ND	ND	ND	ND	ND	1.23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2
YQ242	7/8/2024	9.58	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0122	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1

Legend:

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

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

ND = Not detected at a concentration greater than the reporting laboratory limit.

Concentrations are reported in µg/L with the exception of Nitrate concentrations reported in mg/L.

TCR = Total Chlorinated Residues for Atrazine. Reflects an additive quantity of atrazine and its three metabolites (de-ethyl, de-isopropyl and di-amino atrazine).

Table B 4. 2024 Targeted Sampling Program Analytical Results for Marathon County

WUWN	Sample Date	NITRATE	METOLACHLOR ESA	METOLACHLOR OA	METOLACHLOR METABOLITES	ATRAZINE	DE-ETHYL ATRAZINE	DIAMINO ATRAZINE	ATRAZINE (TCR)	CLOTHIANIDIN	THIAMETHOXAM	ACETOCHLOR ESA	ALACHLOR ESA	DIMETHENAMID ESA	METALAXYL	SULFENTRAZONE	SULFENTRAZONE 3-CARBOXYLIC ACID	Number of individual pesticides detected
AAD673	8/28/2024	13.5	6	0	6	0	0.108	0	0.108	0.0149	0	0.499	0	0	0	0	0	4
AAI327	8/28/2024	21.9	8.44	4.79	13.23	0	0	0	0	0	0.0105	0	0.0944	0	0	0	0	4
EW502	8/5/2024	19.2	0.315	0	0.315	0	0.0536	0	0.0536	0	0	0.0542	0.0847	0	0	0	0	4
IX497	8/5/2024	10.3	0.0599	0	0.0599	0	0.0692	0	0.0692	0	0	0	0	0	0	0	0	2
MV749	8/5/2024	15.1	5.4	2.33	7.73	0	0	0	0	0.0622	0	0	0.142	0	0	0	0	4
RN334	8/5/2024	16.6	2.76	0	2.76	0	0.0616	0	0.0616	0	0	0.0767	0.0753	0	0	0	0	4
SH924	8/28/2024	16.8	1.13	0	1.13	0	0.0518	0	0.0518	0	0	0	0	0	0	0	0	2
TJ807	8/28/2024	13.2	0.0693	0	0.0693	0	0.0635	0	0.0635	0	0	0	0	0	0.0962	0	0	3
TO699	7/15/2024	11.2	5.11	0	5.11	0	0.0759	0	0.0759	0.0158	0	0.244	0	0	0	0.078	0.158	6
UG042	8/5/2024	13.4	8.65	0.714	9.364	0.068	0.469	0	0.537	0.0154	0	0.114	2.18	0	0	0	0	7
WW370	7/15/2024	11.3	0.0985	0	0.0985	0	0	0	0	0	0	0	0	0	0	0	0	1
XC445	8/5/2024	2.42	0	0	0	0	0	0	0	0	0	0	0.161	0	0	0	0	1
XN844	7/15/2024	12.6	2.09	0.332	2.422	0	0	0	0	0	0	0	0	0	0	0	0	2
XW257	8/28/2024	12	1.15	0	1.15	0	0	0	0	0	0	0.261	0	0.0507	0	0	0.121	4
YC909	7/15/2024	29.7	2.9	0	2.9	0	0.09	0.158	0.248	0.0125	0	0.883	0.377	0	0	0	0.154	7

Legend:

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

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

ND = Not detected at a concentration greater than the reporting laboratory limit.

Concentrations are reported in µg/L with the exception of Nitrate concentrations reported in mg/L.

TCR = Total Chlorinated Residues for Atrazine. Reflects an additive quantity of atrazine and its three metabolites (de-ethyl, de-isopropyl and di-amino atrazine).