# 2018 Field-Edge Groundwater Monitoring Program Annual Report

ANNUAL REPORT

Wisconsin Department of Agriculture, Trade and Consumer Protection

*Agricultural Resource Management Division*

Environmental Quality Unit

Final (2-16-2021)

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# Introduction

In 2018, the Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP) Agrichemical Management (ACM) Bureau continued the Field-Edge Groundwater Monitoring Program to document the effect pesticide use is continually having on groundwater quality. Groundwater monitoring is performed at 24 established stations. At each station groundwater level measurements are recorded and samples are collected seasonally, which are submitted to DATCP's Bureau of Laboratory Services (BLS) for chemical analysis. This report has been prepared to document 2018 program activities, and includes a summary of groundwater level and analytical data results. Recommendations for 2019 Field-Edge Groundwater Monitoring Program plan based on 2018 and historic results are also presented in this report.

# Purpose of Field-Edge Groundwater Sampling

It is estimated that agriculture contributes $104.8-billion annually to Wisconsin's economy. Growers in Wisconsin use millions of pounds of pesticides and millions of tons of fertilizers annually to grow a wide variety of crops. DATCP's Field-Edge Groundwater Monitoring Program is one form of monitoring the agency performs to meet its statutory obligation to protect groundwater quality. Wisconsin's groundwater law, chapter 160, Wis. Stats., requires agencies to sample and monitor groundwater for substances related to facilities, activities and practices under their jurisdiction, that have a reasonable probability of entering the groundwater resources of the state, and to determine whether preventive action limits (PAL) or enforcement standards (ES) have been exceeded at points of standard application. The statute further specifies that agencies develop monitoring plans that include provisions for conducting four types of monitoring: problem assessment, regulatory, at-risk and management practice monitoring (§160.27; §160.05).

The purpose of the Field-Edge Groundwater Sampling Program (Program) is to evaluate agricultural practices and chemical uses on groundwater quality. Water level measurements and groundwater sample analysis are used to measure affects from agrichemical use within and adjacent to agricultural fields. Both localized and regional influences to the aquifers over time can be measured at each field-edge sampling site. Historic and current goals of the Program include the following:

- To provide an early warning system to detect new agrichemical compounds in groundwater before they cause widespread contamination in the aquifer;
- To identify and measure which pesticides that have a potential to migrate to groundwater and exceed groundwater quality standards;
- To determine which soil, geological and pesticide use settings are most vulnerable to being affected by agrichemicals;
- To gather and compile data on pesticide occurrences in groundwater so that health based groundwater quality standards can be established;
- To study the dissipation of atrazine and aldicarb in groundwater after prohibition areas are established and use is restricted;
- To gather and compile long-term data on nitrate contamination in groundwater and its relationship to application practices;
- To evaluate the effectiveness of nutrient management planning in protecting groundwater quality; and
- To evaluate groundwater quality relative to various land uses and related pesticide use (tree nurseries, infiltration basins, golf courses).

# Approach of Program

The Program's groundwater monitoring well network consists of wells installed at 24 strategic locations and at different depths (nested wells) around the state. DATCP and the property owner typically have access agreements which allow DATCP to install wells and piezometers to test shallow groundwater for agricultural chemicals. Typically, a monitoring nest is constructed at the edge of agricultural fields and are placed to avoid interference from any septic systems. Over time, monitoring well nests have been installed in a variety of geologic settings, often in areas prone to groundwater contamination, such as areas with sandy soil, shallow depths to bedrock, or shallow groundwater. Nested well locations typically have one to five groundwater monitoring wells or piezometers installed. Sites having a nest of multiple groundwater monitoring wells and piezometers have one of them screened across the shallow water table, with the others screened across (slightly) deeper intervals. Table 1 in Appendix A provides the construction specifications associated with the Program's groundwater monitoring wells and piezometers. Figure 1 in Appendix B depicts the Program's monitoring locations relative to State of Wisconsin and county boundaries.

Program data collection and documentation are completed in accordance with established protocols and guidance. Water level measurements and sample collection procedures are designed to collect reliable data in an unbiased fashion so that localized conditions and regional impacts to aquifers can be evaluated. Water level measurements are recorded and laboratory results are retained in a database maintained by DATCP.

Water level measurements and groundwater samples are collected in accordance with standard operating procedures. After unlocking the protective casing, removing the well cap, and allowing time for potential internal well pressurization to equilibrate, depth to water is measured and recorded at each well. Each well is then properly purged to remove a minimum of four well volumes. Samples are collected with either equipment dedicated to the well, or with equipment that is decontaminated prior to use. Water removal is performed either by using dedicated bailers and rope, peristatic pumps (low flow) with dedicated tubing, or variable-speed submersible pumps (whale pumps) with dedicated tubing. Purge and cleaning water is disposed of on the nearby ground surface. Field information is recorded in log books maintained by ACM staff.

Groundwater samples are collected by the same means as purging. Samples are collected by filling a 1-liter amber glass bottle provided by BLS. Bottles are then placed in a cooler on ice along with a properly completed chain-of-custody record and hand-delivered to BLS within 48 hours. During the 2018 Program, there were no shipping issues or bottle breakage.

BLS performed all groundwater analytical testing using GC/MS/MS and LC/MS/MS methods in accordance with ISO 17025 accreditation standards. All samples were tested for 100 pesticide analytes as well as nitrate and nitrite (reported as total nitrogen). Pesticide analytes are listed in Table 2 of Appendix A along with corresponding reporting limits. A summary of the 2018 program analytical data is provided as Table 3 in Appendix A. Individual monitoring well or piezometer analytical reports are available upon request.

DATCP provides annual Program findings for each site to the respective property owever/Grower. The summary letters provide the year's water level data and analytical results. There is some discussions regarding data trends over time for comparative purposes. As part of the letter, Growers are asked to reply with information regarding crops grown, pesticide use and the amount of nitrogen applied to the fields where the monitoring nests are adjacent to.

# Assets and Infrastructure of Program

The current Program assets are comprised of 75 groundwater monitoring wells (water table observation wells and piezometers) at 24 locations around the state, and associated sampling equipment. Table 1 in Appendix A provides the construction specifications associated with the Program's groundwater monitoring wells and piezometers. Figure 1 in Appendix B depicts the Program's monitoring location sites relative to State of Wisconsin and county boundaries. Construction logs (and abandonment forms) associated with the groundwater monitoring wells and piezometers are available upon request.

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## 1985-1989 ORIGINAL MONITORING WELLS AND PIEZOMETERS

The DATCP Field-Edge Groundwater Monitoring Program began in 1985. Originally, arrangements with Growers and land owners at 50 sites were established in areas highly susceptible to groundwater contamination (coarse soil over sand, shallow to groundwater and/or irrigated agricultural areas). Groundwater monitoring nests of three to four wells and/or piezometers screened across varying depths within the shallow aquifer were constructed adjacent to agricultural fields in the central sands region, Lower Wisconsin River Valley, and other sandy soil areas of the state. The original Field-Edge Study was designed so the uppermost groundwater in the shallow aquifer would be sampled and tested for agrichemicals and fertilizer to evaluate potential impacts from agricultural practices from adjacent fields. Data from the Program's initial years led to the establishment of statewide pesticide management plans for both atrazine and aldicarb.

Over the years, many of the Program's original monitoring wells and piezometers were abandoned due to changes in land ownership, urban encroachment, and/or damage. Of the original 50 sites, 16 sites still exist and were included in the 2018 monitoring program.

## 2005 MONITORING PROGRAM EXPANSION

In the fall of 2005, the DATCP expanded its groundwater monitoring network with funding from a United States (US) Environmental Protection Agency (EPA) grant. Monitoring wells and piezometers were constructed at six new sites selected from a subset of sites associated with a different DATCP groundwater monitoring study; the Evaluation of Renewed Use of Atrazine in Atrazine Prohibition Areas, also known as the Atrazine Reuse Study. The purpose of the Atrazine Reuse Study was to gather information to aid the department in determining if it should consider repealing atrazine prohibition areas. The study was completed in 2005. These six sites were selected based on nearby agricultural practices and groundwater quality susceptible based on the shallow geology composition.

Two groundwater monitoring wells were constructed hydraulically downgradient along the agricultural field edges at these six new sites. Through the Atrazine Reuse Study, groundwater flow direction was known at these sites. All six of these sites were included in the 2018 monitoring program.

## 2010 UNIVERSITY WISCONSIN – OSHKOSH MONITORING WELLS

In the spring of 2010, the DATCP became aware of a UW-Oshkosh graduate student and Wisconsin Geological and Natural History Survey study that included shallow bedrock monitoring wells constructed in a karst geological setting. The monitoring locations were in Brown, Calumet, Kewaunee and Manitowoc counties along the edge of agricultural fields. Additionally, the study team had a good understanding of the bedrock fracture locations within each well. Groundwater samples were collected and tested as part of this Program from 2010 to 2014. The study was completed and the bedrock monitoring wells were subsequently abandoned in 2014.

## 2011 MONITORING PROGRAM EXPANSION

In the summer and fall of 2011, the DATCP expanded its groundwater monitoring network again with additional funding from a US EPA grant. Monitoring wells were constructed at two new sites on an elevated terrace surface adjacent to the Mississippi River in La Crosse and Trempealeau Counties. Because the groundwater flow direction was known at each site, DATCP was able to install two groundwater monitoring wells hydraulically downgradient along the agricultural field edge. These two sites were included in the 2018 monitoring program.

## 2017 MONITORING PROGRAM EXPANSION

In the summer and fall of 2017, the DATCP expanded its groundwater monitoring network again with additional funding from a US EPA grant. Piezometers were constructed at three existing sites (two sites in Adams County and one in Portage County) and at one new site, the Hancock Agricultural Research Station (HARS). At each of these sites, two piezometers were installed near the existing groundwater monitoring nest with five-foot screens located at depths greater than 50 feet and 80 feet. The purpose was to evaluate groundwater quality relative to agrichemicals at deeper aquifer intervals and compare data to shallower aquifer depths. A water

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table observations well (screen placed to intersect the water table) was also constructed at HARS. The new site at HARS and additional piezometers at the Adams and Portage County sites were included in the 2018 monitoring program.

## 2018 Results

A total of 150 groundwater level measurements and 112 groundwater samples were collected and submitted for chemical analysis as a part of DATCP's 2018 Field-Edge Groundwater Monitoring Program. Table 3 in Appendix A summarizes 2018 Program analytical results and provides comparative risk values. The analytical data is compared to groundwater/drinking water standards to assess potential risk to human health and the environment. The risk values are sourced from the Wisconsin Administrative Code (WAC) Chapter NR 140 for groundwater qualitative health standard limits.

Key findings for 2018 are summarized below. A detailed narrative of these findings follows.

- Of the 23 sites where field pesticide- and fertilizer-use information was requested from Growers, 13 responses were received.
- Water level measurements identified higher than normal water table elevations, especially during the fall sampling event. This is likely indicative of the greater than average precipitation volume received over the southern half of the state.
- Of the 100 pesticide analytes included in the laboratory testing methods, 31 pesticides were detected in excess of laboratory reporting limits in the groundwater samples. This is a typical number compared to past years.
- Pesticides detected in excess of laboratory reporting limits in 2018 samples include 12 herbicides, 13 herbicide metabolites, five insecticides, and one fungicide.
- It appears that pesticides were detected at slightly greater concentrations during the spring sampling event compared to fall results.
- For the most part, analytical data is indicating greatest concentrations are present at deeper depths in the aquifer. This likely indicates the groundwater baseline flow conditions.
- Metolachlor ethanesulfonic acid (ESA) was detected in excess of laboratory reporting limits in nearly 94% of all samples collected, the most of any pesticide. This is an increase in the frequency of detections compared to past years. Additionally, metolachlor ESA was detected at each groundwater monitoring site.
- Alachlor ESA was the second most frequently detected compound. It was detected in excess of laboratory reporting limits in 66% of the samples collected and at 19 of the 24 groundwater monitoring sites. This is an increase in the frequency of detections compared to past years.
- Atrazine concentrations or one of its breakdown products (de-ethyl atrazine, de-isopropyl atrazine and di-amino atrazine) was detected in excess of laboratory reporting limits in nearly 49% of the samples collected. This is an increase in detection frequency compared to past years.
- Neonicotinoid compounds clothianidin, imidacloprid and thiamethoxam were detected in excess of laboratory reporting limits in 47%, 42% and 37%, respectively, of the samples. This is an increase in detection frequency compared to past years.
- There were no WAC Ch. NR 140 ES exceedances for established drinking water and groundwater quality health standards/advisory levels. Note; only 28 of the 100 pesticides tested for have established drinking water and groundwater quality health standards/advisory levels. However, there were exceedances of WAC Ch. NR 140 PAL for alachlor ESA, atrazine and total chlorinated residue (TCR) of atrazine.

- The Wisconsin Department of Health Services (DHS) recently proposed groundwater standards for several pesticides as part of the WAC Ch. NR 140 Cycle 10 recommendations (June 2019). Concentrations of imidacloprid were detected in groundwater samples collected from 33% of the sites in excess of the proposed ES of 0.2 micrograms per liter (µg/L) or parts per billion (ppb).
- A monitoring well at the DN1 site (DN1-1) was properly abandoned in December 2018. It appears a vehicle veered off the road and ran into DN1-1 compromising the integrity of the protective casing. Monitoring well DN1-2 also received some minor damage but was determined to be competent for continued use.

## GROWER RESPONSES

DATCP obtained limited information regarding 2018 crops grown, pesticide use and the amount of nitrogen applied to the fields adjacent to the monitoring nests. A request for this information was included with each summary letter sent to nearby property owners and Growers. DATCP received replies for 13 of the 23 sites. (Information was not requested from HARS, site WS7.). Table 4 in Appendix A summarizes the information provided by the growers along with available information from the previous two years. The following is a summary of the crops grown during 2018 and nitrogen use data.

| Crop | Number of Sites with Crop | Percent of Sites | Range of Nitrogen Applied (lbs/acre) |
|---|---|---|---|
| Carrots | 1 | 7.7% | 254.1 |
| Snap Beans | 2 | 15.4% | 77.0 - 89.0 |
| Soybeans | 3 | 23.1% | 0.0 - 14.0 |
| Corn (grain, silage) | 4 | 30.8% | 66.2 – 705.7 |
| Seed Corn | 1 | 7.7% | 164 - 256.0 |
| Sweet Corn | 2 | 15.4% | 228.6 |

Irrigation infrastructure is constructed at 18 of the 24 monitoring sites. Of the 18 sites with irrigation available, 11 sites provided water usage data for 2018. As provided by the Growers, the range of water irrigated on the fields in 2018 was 12.76 to 2.5 inches per acre, with an average of 5.5 inches.

Growers were also asked if they have state-approved Nutrient Management Plans for the adjacent fields. Of the 13 respondents, only five indicated they have approved plans.

As reported by the Growers, the type of pesticides used was a wide variety. Glyphosate was the most widely used active ingredient pesticide followed by metolachlor. Atrazine was also identified as being used at several sites; none of which was used in an atrazine prohibition area. Table 4 in Appendix A identifies the complete list of pesticides used in 2018 as reported by the Growers.

## WATER LEVEL MEASUREMENTS

Water level measurements are recorded for each well prior to samples being collected for chemical analysis. Water level data is then transferred to a DATCP database for future evaluation of historic trends. Water level data for 2018 was measured in the spring (February, May and/or June) and fall (October or November). Overall, water level measurements indicate higher water table conditions, in particular for the southern half of the state during the fall sampling event. Higher water table conditions correlate well with above normal precipitation for the southern half of the state during this period. Water level measurements for sites within the northern half of the state reflect a stable elevation graph.

The following three graphs provide typical examples observed for water level fluctuations over time in the monitoring program. Graphs showing water level measurements over time for any of the other sites or wells not provided are available upon request.

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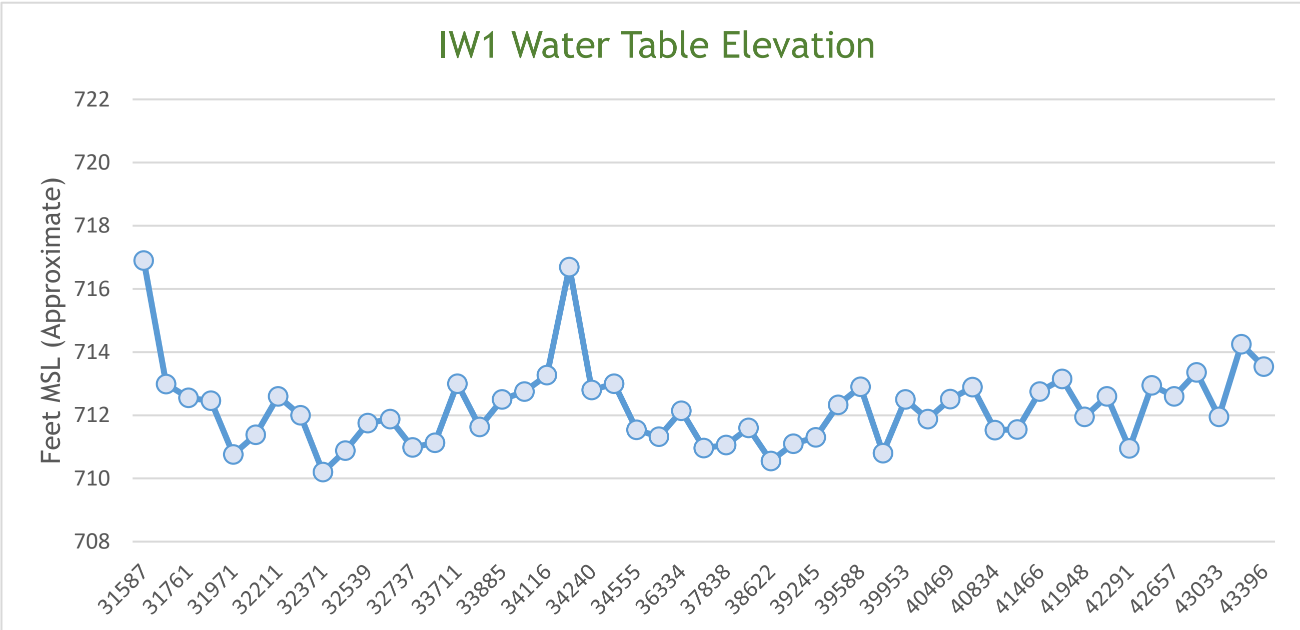
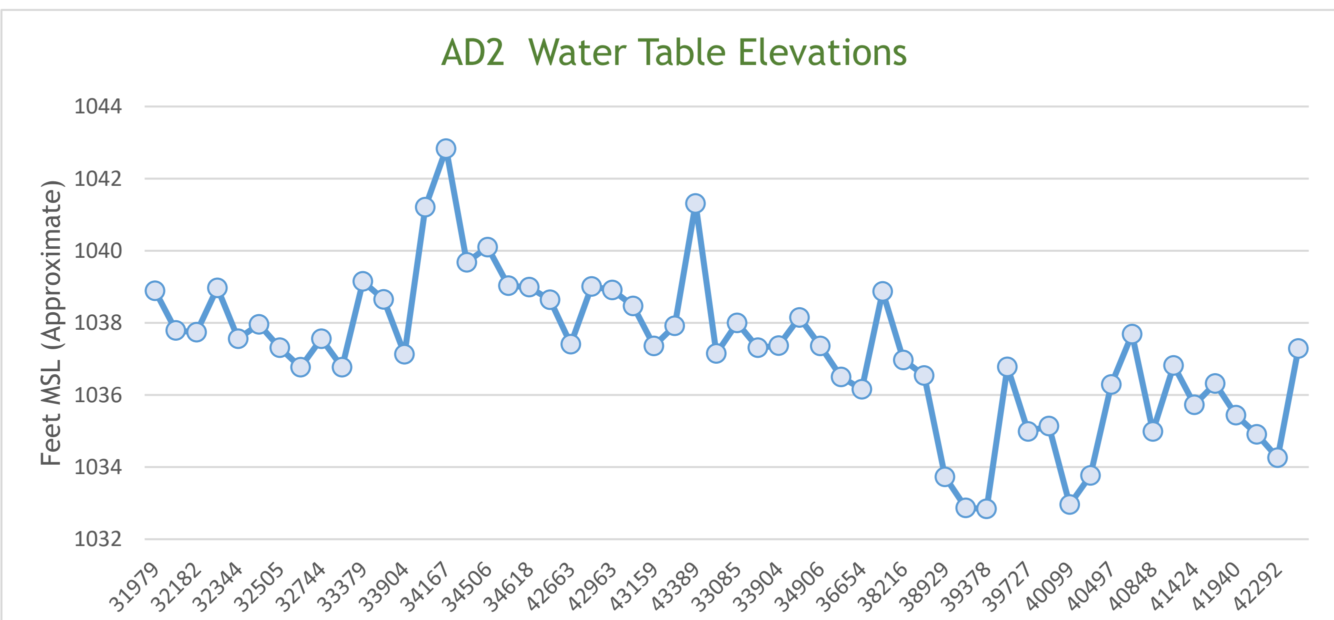
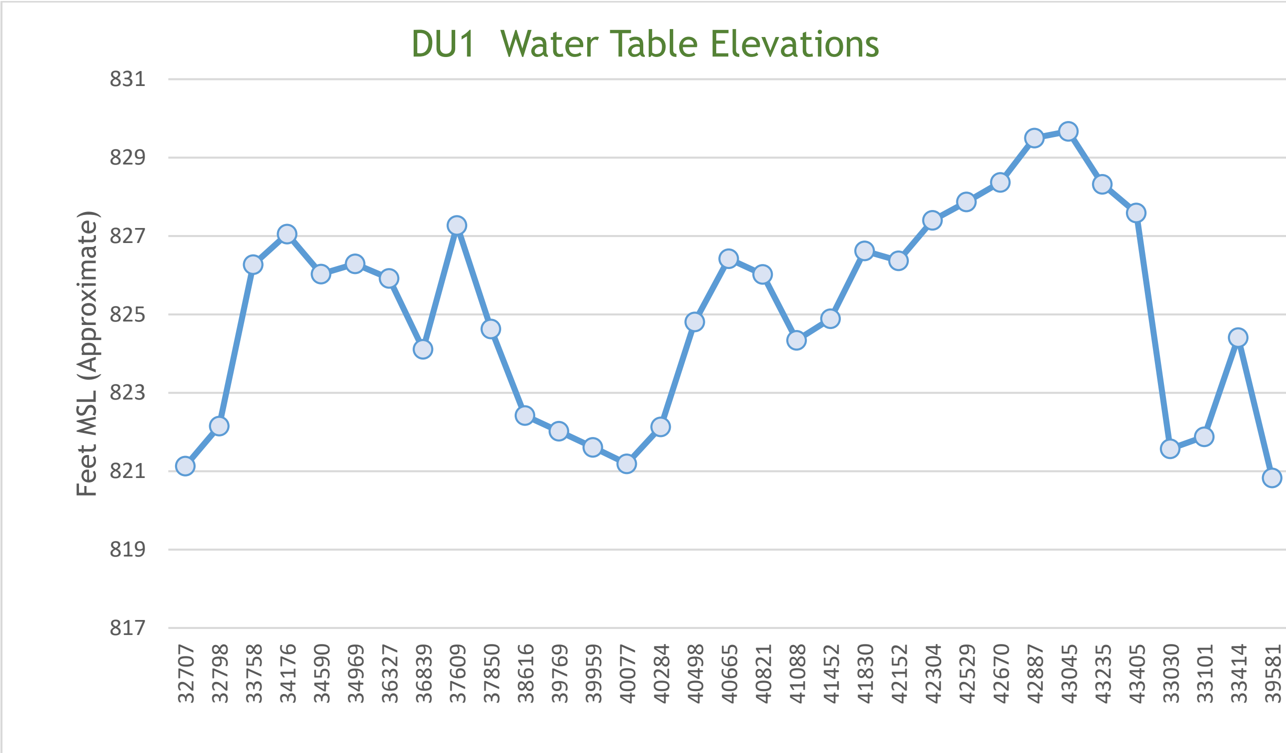
Water levels for an Iowa County site indicating 2018 data with a slight increase over previous years. The overall trend indicates a stable to slightly increasing trend over the past 20 years.




Water levels for an Adams County site indicating 2018 data with an increase over previous years, in particular for fall 2018. The overall trend appears to be much more variable with a slight increase over the past 15 years.




Water levels for a Dunn County site indicating 2018 data with a slight decrease compared to previous year. However, 2018 levels still reflect a higher water level relative to historical data.



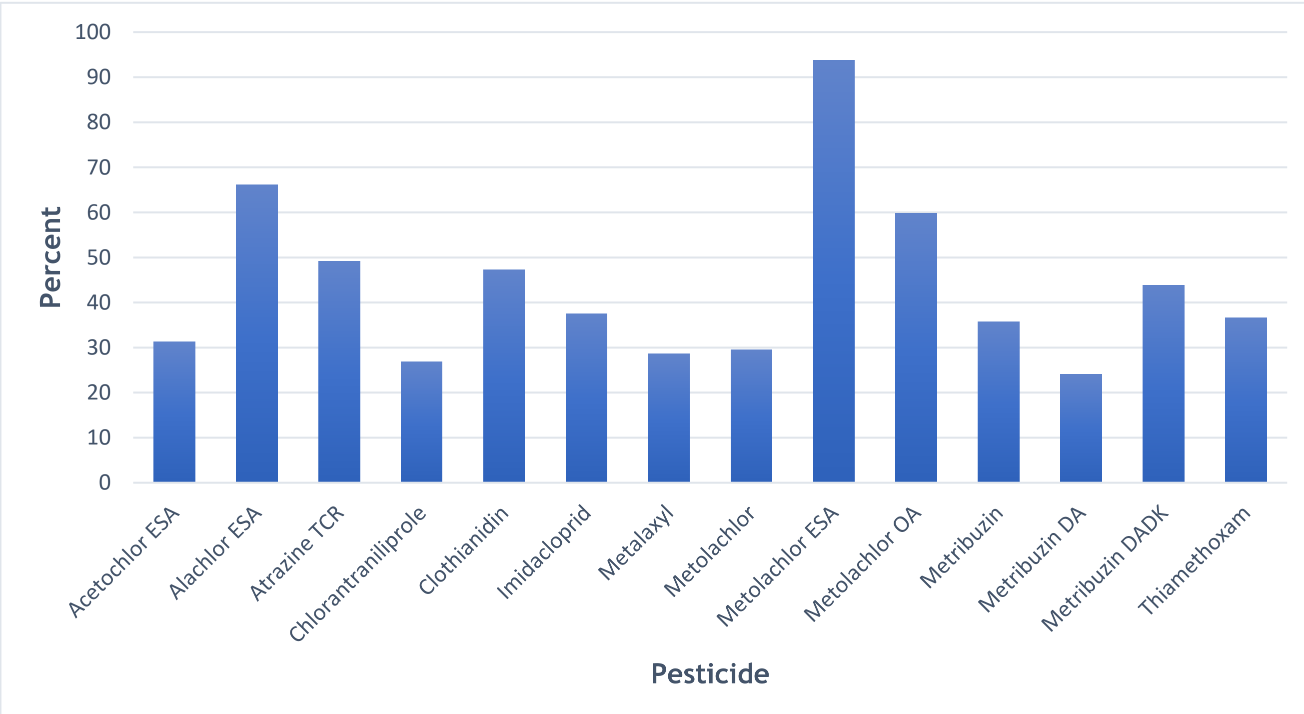

DATCP plans to complete additional interpretation of groundwater elevation data for each individual monitoring site as part of a detailed study. Historical water level monitoring data will be evaluated for each site and results will be documented in a separate report prepared for each site (*Historical Field-Edge Site Data Analysis*). This evaluation will include a comparison of water level trends to precipitation records. These reports will be completed over a three year period with the first group available in the spring of 2020.

## PESTICIDE DETECTED FREQUENCY

Of the 100 analytes tested for in DATCP's 2018 Field-Edge Groundwater Monitoring Program, only 31 analytes were detected in excess of laboratory reporting limits (69 analytes were not detected). This is a similar number of detected compounds compared to prior years. During the 2018 fall and spring sampling events, every groundwater sample contained a measureable concentration in excess of laboratory reporting limits of a pesticide or nitrogen. This is also similar when compared to analytical data from prior years.

Metolachlor ESA was the most frequently detected analyte in excessive of reporting limits. It is a breakdown product of metolachlor, which is an active ingredient in corn herbicides such as Dual, Halex GT, Lumax and many others. Metolachlor ESA was detected at all 24 sites and in nearly 94% of all samples collected. This is an increase in the frequency of detections compared to prior years. Alachlor ESA was the second most frequently detected compound. It was detected in excess of laboratory reporting limits at 19 of the sites, in 66% of the samples collected. This also is an increase in the frequency of detections compared to prior years. Table 5 depicts the pesticide analytes detected at a concentration greater than the laboratory reporting limit at a frequency greater than 20%.

Table 5: Percentage of 2018 Samples with Detectable Pesticide Concentrations (only showing analytes detected greater in more than 20%)




*Notes:* *Atrazine TCR is total chlorinated residues of atrazine; includes the sum of atrazine plus its metabolites de-ethyl atrazine, de-isopropyl atrazine, and di-amino atrazine*

*Metolachlor ESA is also the most widely reported pesticide metabolite observed in drinking water wells according to the 2016 Statewide Survey (32% of all wells), which is followed by alachlor ESA (21.5% of all wells).*

## COMPARISON TO STANDARDS

Pesticide concentrations identified during DATCP's 2018 Program were compared to WAC Ch. NR 140 Drinking Water and Groundwater Quality Health Standards/Advisory Levels. Table 3 in Appendix A provides the standard alongside the range of the detected pesticide analyte concentrations observed during the 2018 Program. There were no WAC Ch. NR 140 ES exceedances.

It should be noted that WAC Ch. NR 140 also includes PAL's, which is a groundwater quality standard that is either 5 or 10 times less than the respective ES for that compound. NR140 PAL's serve as indicators of potential contamination problems. Table 3 in Appendix A identifies the pesticides and metabolite exceedances for NR 140 PAL standards. As shown in Table 3, alachlor ESA, atrazine and atrazine TCR (total chlorinated residues, which are the sum of atrazine plus its metabolites de-ethyl atrazine, de-isopropyl atrazine, and di-amino atrazine) were detected in excess of the NR 140 PAL standards.

As noted in Table 3 in Appendix A, several pesticides and their metabolites have no WAC Ch. NR 140 ES or PAL established at this time (71 out of 100). A review of all 2018 data shows that 31 different pesticides were detected in excess of laboratory reporting limits; 16 of the 31 analytes have no established standard. Of the 16 analytes with no established standard, five have proposed standards as part of DNR's Cycle 10 Recommendation (June 2019), and five are metabolites for either alachlor, dimethenamid, or metribuzin. The six analytes that have no standard (established or proposed) or are not a metabolite are listed in Table 6.

Table 6: Detected Compounds that have No Established or Proposed WAC ch. NR 140 Standard

| Analyte | Sites with Detects (out of 24) | Number of Detects (out of 112) | % of Samples Detected | Concentration Range (in µg/L) |
|---|---|---|---|---|
| Chlorantraniliprole | 11 | 30 | 26.8 | 0.0665 – 2.03 |
| Flumetsulam | 4 | 10 | 8.9 | 0.577 – 0.635 |
| Fomesafen | 1 | 1 | 0.9 | 0.196 |
| Imazethapyr | 1 | 1 | 0.9 | 0.185 |
| Metalaxyl | 9 | 32 | 28.6 | 0.0631 – 4.06 |
| Saflufenacil | 2 | 2 | 1.8 | 0.0778 – 0.148 |

All of the analytes listed in Table 6, except for imazethapyr, have been forward by DATCP to DHS for consideration of inclusion in Cycle 11 evaluations.

Comparisons of detected pesticide and their metabolite concentrations to published groundwater quality standards are based on exposure to a single compound. These comparisons do not fully evaluate the risk to human health when two or more compounds are present. Currently, there are no calculations to predict potential risk when multiple compounds are present. Because the current approach does not account for potential cumulative risk, potential toxicity may be underestimated.

## OTHER NOTABLE OBSERVATIONS

### Neonicotinoids:

Interest in the neonicotinoid class of insecticides has increased greatly in recent years due to concerns over possible effects on pollinators. DATCP began testing for these compounds in 2008 with thiamethoxam. BLS now analyzes for six neonicotinoid compounds. Three of these compounds, clothianidin, imidacloprid and thiamethoxam (CIT) were detected in at least 50% of all field-edge groundwater samples collected in 2018. The other three neonicotinoid compounds; acetamiprid, dinotefuran and thiacloprid; were not detected in excess of laboratory reporting limits in any groundwater samples. The presence of the three CIT compounds in groundwater is not unexpected because these compounds are known to readily leach in sandy soils, and they are used in many insecticide products. CIT compounds are labeled for use on most crops grown in the state including corn, soybeans, potatoes, many other vegetables, as well as fruit crops, and most small grains.

It is apparent that the CIT compounds are becoming more prevalent in groundwater over time, but not necessarily increasing in concentrations. Since testing for neonicotinoid compounds began, thiamethoxam and imidacloprid have been detected in field-edge samples, primarily at monitoring sites located within the Central Sands Agricultural Region and Lower Wisconsin River Valley. (DATCP's Historical *Field-Edge Site Data Analysis Report* will further evaluate historical trends and observations.) One observation regarding the 2018 data suggests that the imidacloprid and thiamethoxam is likely part of the aquifer's baseline flow within the Central Sands, and not just associated with seasonal fluctuations. Greatest concentrations are being detected in the deeper screened wells (AD2-5, AD5-5 and WS7-3) compared to shallower aquifer groundwater samples, and detected in nearby surface water samples (see DATCP's *2018 Surface Water Sampling Report*).

None of the CIT compounds have an established WAC Ch NR 140 ES or PAL groundwater quality standard. However, DHS has proposed standards for the CIT compounds under the Cycle 10 Recommendation (June 2019). Clothianidin and thiamethoxam were detected less than the proposed standards in all 2018 and historic field-edge samples. However, 33% of the sites with imidacloprid detections were at concentrations in excess of the proposed 0.2 µg/L ES. These sites are located in the Central Sands Agricultural Region and Lower Wisconsin River Valley (Adams, Iowa, Sauk and Waushara Counties). Proposed PAL exceedances were also identified within these same counties and at sites within Juneau and Portage Counties. The imidacloprid data relative to each monitoring location is presented in Table 7 in Appendix A.

Lower Wisconsin River Valley sites IW1 and IW2 in Iowa County are within 0.25 miles of each other. Based on the locations relative to the Wisconsin River, it is likely that IW1 is hydraulically downgradient from IW2. The following observation were made following an evaluation of imidacloprid concentrations at both locations and at depth.

- When comparing shallow well results for both sites, data indicate greater imidacloprid concentrations are identified in groundwater at the downgraident monitoring nest (site IW1). (Imidacloprid concentrations were not detected in excess of laboratory limits in samples collected from shallow upgradient well IW2-1). Additionally, the greatest concentration of imidacloprid (0.2 µg/L) was detected during the spring sampling event. These results would indicate that imidacloprid was applied to fields between the well nests. The Grower has reported that imidacloprid was not applied to either field during the 2018 season, but it was applied on the field between the two groundwater monitoring well nests in 2016 when potatoes were grown.
- Inspection of groundwater sample results for deeper wells at both sites shows that imidacloprid concentrations were statistically within close proximity of each other (range from 0.2 to 0.214 µg/L). This likely represents and aquifer baseline flow condition.

Additional interpretation of imidacloprid use and mobility in groundwater over multiple years is needed to validate these observations. Results from DATCP's Field-Edge Groundwater Monitoring Program should be compared to nearby Surface Water Sampling Program results data to further evaluate mobility, persistence, and discharge to surface water. This evaluation will be included as part of DATCP's detailed comprehensive report; *Historical Field-Edge Site Data Analysis Report*.

### Alachlor:

As noted previously, alachlor ESA was the second most frequently detected compound in excess of laboratory reporting limits at 19 of the sites and 66% of the groundwater samples. This is an increase in the frequency of detections compared to past years. Alachlor ESA is a breakdown product of alachlor, an active ingredient of Lasso or Temic. Alachlor production ceased in December 2014 with field application no longer allowable in Wisconsin after August 2018. The alachlor ESA data relative to each monitoring location is presented in Table 8 in Appendix A. In the 2018 groundwater sampling program, there were no detectable concentrations in excess of laboratory reporting limits for the parent alachlor analyte. However, alachlor ESA is still widely detected in surface water and groundwater samples collected throughout the state. It is expected that these metabolite concentrations will decline over time since the parent compound can no longer be field applied.

Alachlor ESA concentrations ranged from 0.0652 to 9.38 µg/L. Groundwater samples collected from deeper wells AD5-5 and WS7-3 during the spring and fall events exhibited concentrations in excess of the WAC ch. NR 140 PAL of 4.0 µg/L. However, no PAL exceedances were observed in samples collected from shallower depths at these sites. This likely indicates that the groundwater baseline flow within the aquifer is affected by alachlor ESA at concentrations in excess of the PAL, but the nearby fields are currently not the source of the contaminants. Additional interpretation of pesticide data from multiple years is needed to validate these observations.

### Atrazine:

There are currently 101 atrazine Prohibition Areas (PAs) covering approximately 1.2 million acres within Wisconsin. It is illegal to apply any pesticide containing the active ingredient atrazine within an atrazine PA. In non-PAs, atrazine use is restricted but not prohibited. Because the PAs have been in place for over ten years, it is anticipated that atrazine and its metabolite concentrations in groundwater would be limited, or not present at all. Of the 24 field-edge sites in the Program, 11 are located within a PA.

Atrazine concentrations or one of its breakdown products (de-ethyl atrazine, de-isopropyl atrazine and di-amino atrazine) were detected in excess of laboratory reporting limits in nearly 49% of the samples collected. This is an increase in detection frequency compared to past years. None of the detected concentrations exceeded the WAC Ch. NR 140 ES of 3.0 µg/L. However, detected concentrations in eight of the 24 sites were in excessive of the WAC Ch. NR 140 PAL of 0.3 µg/L. Of those eight sites, four are located in PAs; Iowa (IW1-7, during the spring sampling event), St. Croix (SC1-1, spring and fall sampling events), Waupaca (WP2-1, spring and fall sampling events), and Waushara (WS6-1, during the spring sampling event) counties. (Interestingly, none of these four have detected the parent atrazine analyte in excess of laboratory reporting limits.) The atrazine and metabolite data relative to each monitoring location is presented in Table 9 in Appendix A.

The parent compound atrazine was detected in excess of the laboratory reporting limit (0.05 µg/L) in groundwater samples collected from only Adams (AD2, AD4 and AD5) and Waushara (WS7) counties. Atrazine was not detected in excess of reporting limits in samples collected from shallow wells at these sites. However, groundwater samples collected from these same monitoring well nests but at deeper depths within the aquifer contained greater parent compound concentrations. This may be an indication that atrazine concentrations reflect an aquifer baseline flow condition.

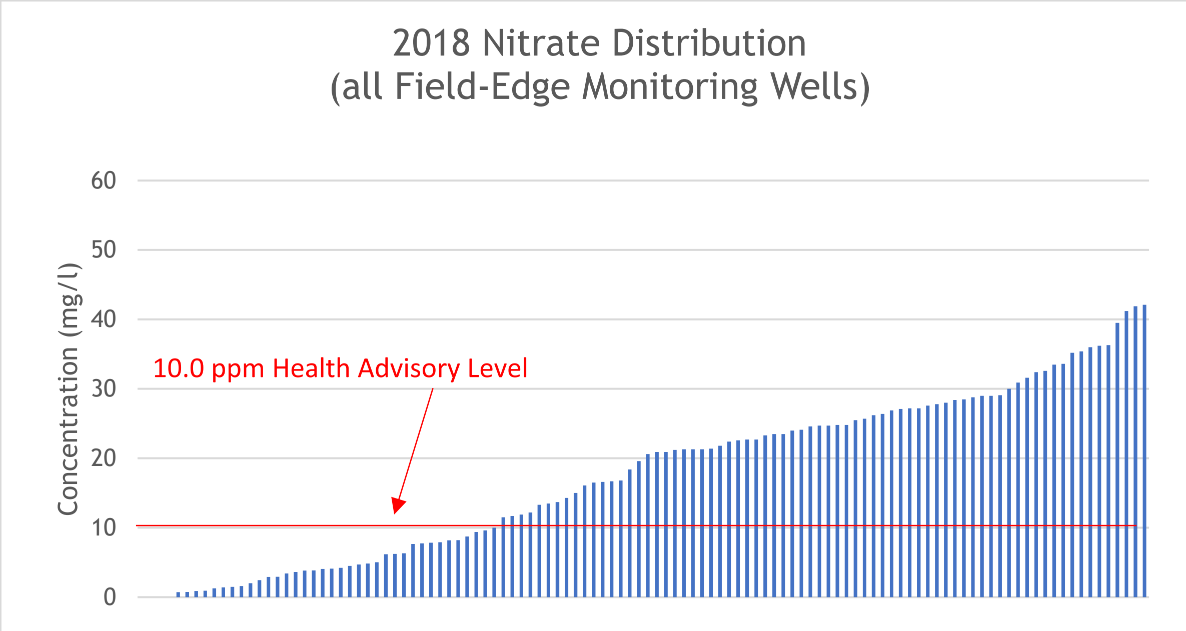
Atrazine TCR is the sum of atrazine plus its metabolites de-ethyl atrazine, de-isopropyl atrazine, and di-amino atrazine. At all sites, metabolite concentrations were greater than the parent atrazine concentrations. As observed for parent atrazine concentration, no atrazine TCR was detected in excess of laboratory reporting limits in groundwater samples collected from the shallow aquifer wells. However, it was detected in samples collected from adjacent deeper wells. These results indicate that atrazine degrades as it migrates vertically within the aquifer, and that metabolites also remains in groundwater for an extended period of time following field applications.

Based on atrazine TCR concentrations observed across the aquifer depth, it is also possible that atrazine is applied at nearby agricultural fields at rates that are not affecting shallow groundwater quality. A trend analysis would be needed to be completed for all historical groundwater data to determine if the atrazine TCR concentrations are decreasing within PAs as intended. This analysis will be performed for DATCP's *Historical Field-Edge Site Data Analysis Report*.

### Total Nitrogen:

DATCP's Field-Edge Groundwater Monitoring Program focuses on agrichemical impacts to groundwater quality. In addition to pesticides, BLS includes nitrate and nitrite analyses. Total nitrogen (as nitrate and nitrite) impacts are the responsibility of Wisconsin Department of Natural Resources (DNR). However, BLS include nitrate and nitrite analyses as part of this program, and that data is shared with DNR.

Total nitrogen was detected in excess of laboratory reporting limits in 108 of the 112 field edge groundwater samples collected in DATCP's 2018 Program. The average groundwater total nitrogen concentration for all wells sampled in the 2018 Program was calculated to be 17.72 milligram per liter (mg/l or parts per million [ppm]). This is a decrease from last year (17.9 ppm). The following graph depicts the nitrogen concentration distribution.




Of the 112 groundwater samples, 73 exceeded the 10 mg/L ES for total nitrogen, and 27 samples detected total nitrogen concentrations in between the 2.0 mg/l PAL and ES. The greatest concentration (42.1 mg/l) was detected in a sample collected during the fall from a site in Waushara County (WS7-3). Total nitrogen was also detected at a similar concentration (41.9 mg/l) in the spring sample collected from that same well. Sites with total nitrogen less than the ES were limited to Barron, Jackson, and Waupaca Counties. The total nitrogen data relative to each monitoring location is summarized in Table 10 in Appendix A.

Total nitrogen concentrations were also compared to samples collected from nested wells screened at different depths at each site and seasonally. Overall, it appears greater total nitrogen concentrations are present at depth compared to shallow aquifer samples, and little to no fluctuation was observed between spring and fall samples. These results indicate that the total nitrogen migrates vertically from nearby field applications (which may also include applications at other upgradient fields) to deeper portions of the aquifer. Lower concentrations at shallow depths indicate that total nitrogen concentrations may decline in response to dilution from recharge, but it is persistent in the deeper aquifer. Evaluation of nitrogen data from multiple years is needed to validate these observations.

## 2019 Program Goals and Objectives

The Field-Edge Groundwater Monitoring Program mission is to monitor groundwater quality at strategic geographic locations within a watershed to characterize agrichemical movements and act as an early warning signal for nearby drinking water wells. The program will continue in 2019. Program goals for 2019 are as follows.

- Collaborate with BLS and develop a 2019 Field-Edge Groundwater Monitoring Program Sampling Plan.
- Conduct a groundwater sampling event in the spring and fall from the Program's groundwater monitoring network. All results will be incorporated into DATCP's database.
- Document annual activities completed and summarize results for each site in letter sent to each grower.
- Document the annual activities completed and summarize results in a 2019 Field-Edge Groundwater Monitoring Program Summary Report.

2019 data will be added to the existing database to ensure that long-term water level and groundwater monitoring data can be used to identify trends in groundwater quality over time. Long-term groundwater quality trends may be used to further evaluate the effectiveness of atrazine PAs. Long-term groundwater data will also be compared to surface water data from within the watershed to identify potential relationships between surface water and groundwater quality. This evaluation may also be used to evaluate seasonal surface water flow variations and baseline flow groundwater discharge to surface water.

## ADDITIONAL PROGRAM ACTIVITIES

In 2019, additional effort and focus beyond typical annual activities will include the following:

- In addition to testing for standard pesticide analyte list and nitrate testing, a limited number of sample will also be tested for glyphosate in the spring and fall;
- Initiate a three-year program to prepare comprehensive summary reports for each current field edge monitoring site, *Historical Field-Edge Site Data Analysis*; and
- Develop and implement a program outreach and branding plan.

These activities were proposed in the 2019 Field-Edge Monitoring Work Plan and are further described below.

New in 2019, ten groundwater samples collected during the spring and ten groundwater samples collected during the fall will be analyzed for glyphosate. Glyphosate (i.e. Roundup) is the most used active pesticide ingredient on fields planted with corn. Glyphosate is not currently on the BLS analyte list. BLS has developed a method to analyze for glyphosate, and will pilot test this method to evaluate adding glyphosate to the BLS analyte list. The 2019 Sampling Plan will identify which locations are to be sampled in the spring and fall for glyphosate based on historic crop use.

DATCP intends to complete a comprehensive summary report entitled, *Historical Field-Edge Site Data Analysis*, for each of the current monitoring sites between 2019 and 2021. Data collection at current field edge sites has spanned as little as two years to more than 30 years. Though site-specific data hasd been complied since the Field Edge monitoring program began, an overall comprehensive report summarizing the findings, conclusions, and recommendations has not been prepared. The report's objective would be to document groundwater quality and trends relative to land-use and agrichemical applications. Information to be complied includes the following:

- Grower agreements, if completed;
- Site location/maps;
- Property ownerships/project contacts;
- Geology/hydrogeology and soil types;
- Well construction documentation;
- Private drinking water wells in the area;
- Cropping history for the adjacent field and surrounding area, if available;
- Growing season (rainfall) history;
- Water level trends and anticipated groundwater flow direction;
- Pesticide and fertilizer use history;
- Agrichemical concentration trends in groundwater over time;
- Data gaps and shortcomings; and
- Conclusions and recommendations.

The proposed schedule is to complete eight reports a year for 2019, 2020, and 2021. Each report would then be updated every three years. Additionally, a master spreadsheet will be developed in 2019 and updated annually to provide a "snapshot" of Program's data for each of the 24 existing monitoring sites. The plan is to have the first reports completed late in 2019.

Findings and conclusions for the Field-Edge Groundwater Monitoring Program are not widely known to potential stakeholders (i.e. private citizens, and other State Agencies). There are significant findings and conclusions from the data that could aid with discussion and program/regulatory direction. Two outreach deliverables are being proposed for this activity. The first would be the completion and showing of a PowerPoint presentation for internal audiences. The intent is to share with DATCP (BLS) and/or DNR staff the program work that is being completed and what their role is within the program. It would include some of the observations and conclusions associated with the annual and comprehensive reports. The second deliverable is a PowerPoint presentation intended for an outside audience (including US EPA Region 5 and headquarters of Pesticide and Water Programs), and a short memo listing potential presentation opportunities. The presentation would be more technically based and intended for a science-based audience. The potential conference and/or professional organization events would be scheduled for 2020 and 2021. Approval of the presentation content and intended conferences or organizations will be a part of this action.

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# APPENDIX A

## Report Tables

# Table 1

### Field-Edge Groundwater Monitoring Program
### Monitoring Wells and Piezometers Construction Specifications

| County | Site (Grower) | Well Identification | WUWN | Year Constructed | Prohibition Area | Irrigation Available | Ground Elevation (MSL) | TPVC Elevation (MSL) | Well Depth (ft) | Bottom of Well (MSL) | Screen Length (ft) | Top of Screen (ft) | Sampling Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Adams | AD2 | AD2-1 | BH954 | 1987 | No | Yes | 1,051.7 | 1,053.96 | 17.87 | 1,036.09 | 5 | 1,053.96 | Peristolic Pump |
| | | AD2-2 | BH953 | 1987 | | | | 1,054.14 | 22.83 | 1,031.31 | 5 | 1,054.14 | |
| | | AD2-3 | BH952 | 1987 | | | | 1,054.17 | 27.62 | 1,026.55 | 5 | 1,054.17 | |
| | | AD2-4 | VR844 | 2017 | | | | 1,054.44 | 54.70 | 999.74 | 5 | 1,054.44 | Dedicated Bailer |
| | | AD2-5 | VR845 | 2017 | | | | 1,054.35 | 85.70 | 968.65 | 5 | 1,054.35 | |
| | AD3 | AD3-1 | BH999 | 1987 | No | Yes | 1,008.0 | 1,010.48 | 14.93 | 995.55 | 5 | 1,010.48 | Peristolic Pump |
| | | AD3-2 | BI000 | 1987 | | | | 1,010.34 | 19.64 | 990.70 | 5 | 1,010.34 | |
| | | AD3-3 | BI001 | 1987 | | | | 1,010.44 | 24.69 | 985.75 | 5 | 1,010.44 | |
| | AD4 | AD4-1[1] | BH996 | 1987 | | | | 1,017.38 | 24.71 | 992.67 | 5 | 1,017.38 | |
| | | AD4-2 | BH997 | 1987 | No | Yes | 1,013.9 | 1,017.26 | 29.69 | 987.57 | 5 | 1,017.26 | Dedicated Bailer |
| | | AD4-3 | BH998 | 1987 | | | | 1,016.56 | 34.57 | 981.99 | 5 | 1,016.56 | |
| | AD5 | AD5-1 | CL461 | 1988 | No | Yes | 1,051.1 | 1,053.18 | 15.24 | 1,037.94 | 5 | 1,053.18 | Peristolic Pump |
| | | AD5-2 | CL455 | 1988 | | | | 1,053.31 | 19.91 | 1,033.40 | 5 | 1,053.31 | |
| | | AD5-3 | CL456 | 1988 | | | | 1,053.27 | 25.23 | 1,028.04 | 5 | 1,053.27 | |
| | | AD5-4 | VR846 | 2017 | | | | 1,053.63 | 53.20 | 1,000.43 | 5 | 1,053.63 | Whale Pump and Dedicated Tubing |
| | | AD5-5 | VR847 | 2017 | | | | 1,053.68 | 85.70 | 967.98 | 5 | 1,053.68 | |
| Barron | BR3 | BR3-1 | BR279 | 1987 | No | Yes | 1,052.7 | 1,055.79 | 15.03 | 1,040.76 | 5 | 1,055.79 | Peristolic Pump |
| | | BR3-2 | BR280 | 1987 | | | | 1,055.37 | 20.02 | 1,035.35 | 5 | 1,055.37 | |
| | | BR3-3 | BR281 | 1987 | | | | 1,054.93 | 25.02 | 1,029.91 | 5 | 1,054.93 | |
| Dane | DN1 | DN1-1[2] | BR250 | 1985 | | | | 744.38 | 12.10 | 732.28 | 5 | 744.38 | |
| | | DN1-2 | BR251 | 1985 | 93-57-04 | Yes | 741.9 | 744.22 | 17.40 | 726.82 | 5 | 744.22 | Peristolic Pump |
| | | DN1-3 | BR252 | 1985 | | | | 744.97 | 22.20 | 722.77 | 5 | 744.97 | |
| Dunn | DU1 | DU1-1 | AO384 | 1989 | No | Yes | 852.5 | 853.92 | 34.90 | 819.02 | 5 | 853.92 | Dedicated Bailer |
| | | DU1-2 | AO385 | 1989 | | | | 854.87 | 40.80 | 814.07 | 5 | 854.87 | |
| | | DU1-3 | AO386 | 1989 | | | | 855.12 | 46.10 | 809.02 | 5 | 855.12 | |
| | DU2 | DU2-1 | AO387 | 1989 | No | Yes | 856.2 | 858.05 | 26.70 | 831.35 | 5 | 858.05 | Peristolic Pump |
| | | DU2-2 | AO388 | 1989 | | | | 858.17 | 31.30 | 826.87 | 5 | 858.17 | |
| | | DU2-3 | AO389 | 1989 | | | | 858.48 | 36.60 | 821.88 | 5 | 858.48 | |
| Grant | GR1 | GR1-1 | BR255 | 1985 | 93-57-04 | No | 683.8 | 686.32 | 12.50 | 673.82 | 5 | 686.32 | Peristolic Pump |
| | | GR1-2 | BR256 | 1985 | | | | 686.48 | 17.30 | 669.18 | 5 | 686.48 | |
| | | GR1-3 | BR257 | 1985 | | | | 686.12 | 21.60 | 664.52 | 5 | 686.12 | |
| Iowa | IW1 | IW1-1[3] | BH955 | 1986 | | | | | 14.90 | | 5 | | |
| | | IW1-2[3] | BH956 | 1986 | | | | | 19.90 | | 5 | | |
| | | IW1-3[3] | BH957 | 1986 | | | | | 24.90 | | 5 | | |
| | | IW1-4 | BR259 | 1986 | 93-57-04 | Yes | 724.7 | 726.35 | 17.10 | 709.25 | 5 | 726.35 | Peristolic Pump |
| | | IW1-5 | BR260 | 1986 | | | | 726.47 | 21.30 | 705.17 | 5 | 726.47 | |
| | | IW1-6 | BR261 | 1986 | | | | 726.49 | 26.70 | 699.79 | 5 | 726.49 | |
| | | IW1-7 | BH967 | 1987 | | | | 726.60 | 61.99 | 664.61 | 5 | 726.60 | Whale Pump and Dedicated Tubing |
| | IW2 | IW2-1 | BR036 | 1986 | 93-57-04 | Yes | 725.0 | 727.52 | 14.80 | 712.72 | 5 | 727.52 | Peristolic Pump |
| | | IW2-2 | BR037 | 1986 | | | | 727.42 | 19.70 | 707.72 | 5 | 727.42 | |
| | | IW2-3 | BR038 | 1986 | | | | 727.13 | 24.70 | 702.43 | 5 | 727.13 | |
| Jackson | JK3 | JK3-1 | JH991 | 2005 | 94-27-04 | No | 1,025.3 | 1,028.06 | 27.33 | 1,000.73 | 10 | 1,028.06 | Peristolic Pump |
| | | JK3-2 | JH981 | 2005 | | | 1,023.7 | 1,026.44 | 25.77 | 1,000.67 | 10 | 1,026.44 | |
| Juneau | JN1 | JN1-1 | BR046 | 1985 | No | Yes | 939.7 | 941.26 | 11.70 | 929.56 | 5 | 941.26 | Peristolic Pump |
| | | JN1-2 | BR047 | 1985 | | | | 941.21 | 16.70 | 924.51 | 5 | 941.21 | |
| | | JN1-3 | BR048 | 1985 | | | | 941.34 | 21.50 | 919.84 | 5 | 941.34 | |
| | JN3 | JN3-1 | JH937 | 2005 | 94-29-01 | No | 901.5 | 903.84 | 20.42 | 883.42 | 10 | 903.84 | Peristolic Pump |
| | | JN3-2 | JH936 | 2005 | | | 902.0 | 905.20 | 18.14 | 887.06 | 10 | 905.20 | |
| La Crosse | LC2 | LC2-1 | VZ391 | 2011 | No | Yes | 684.1 | 686.40 | 49.22 | 637.18 | 10 | 686.40 | Dedicated Bailer |
| | | LC2-2 | VZ392 | 2011 | | | 687.8 | 681.91 | 43.98 | 637.93 | 10 | 681.91 | |
| Langlade | LN1 | LN1-1 | BH964 | 1986 | No | No | 1,471.6 | 1,473.85 | 14.80 | 1,459.05 | 5 | 1,473.85 | Peristolic Pump |
| | | LN1-2 | BH965 | 1986 | | | | 1,474.44 | 19.70 | 1,454.74 | 5 | 1,474.44 | |
| | | LN1-3 | BH966 | 1986 | | | | 1,473.74 | 24.80 | 1,448.94 | 5 | 1,473.74 | |
| Portage | PR1 | PR1-1 | BR207 | 1986 | No | Yes | 1,079.7 | 1,082.01 | 12.70 | 1,069.31 | 5 | 1,082.01 | Peristolic Pump |
| | | PR1-2 | BR208 | 1988 | | | | 1,081.94 | 17.60 | 1,064.34 | 5 | 1,081.94 | |
| | | PR1-3 | BR209 | 1988 | | | | 1,081.72 | 22.50 | 1,059.22 | 5 | 1,081.72 | |
| | | PR1-4 | VR848 | 2017 | | | | 1,082.83 | 55.30 | 1,027.53 | 5 | 1,082.83 | Whale Pump and Dedicated Tubing |
| | | PR1-5 | VR849 | 2017 | | | | 1,082.77 | 84.70 | 998.07 | 5 | 1,082.77 | |
| St. Croix | SC1 | SC1-1 | JH938 | 2005 | 94-56-02 | No | 1,006.8 | 1,010.14 | 24.87 | 985.27 | 10 | 1,010.14 | Peristolic Pump |
| | | SC1-1 (D) | VZ390 | 2011 | | | | 1,009.16 | 30.10 | 979.06 | 10 | 1,009.16 | |
| | | SC1-2 | JH939 | 2005 | | | 1,003.9 | 1,006.63 | 21.87 | 984.76 | 10 | 1,006.63 | |
| | | SC1-2(D) | VZ393 | 2011 | | | | 1,006.40 | 30.17 | 976.23 | 10 | 1,006.40 | |
| Sauk | SK6 | SK6-1 | BB246 | 1988 | 93-57-04 | Yes | 712.5 | 714.57 | 14.92 | 699.65 | 5 | 714.57 | Peristolic Pump |
| | | SK6-2 | BB247 | 1988 | | | | 714.84 | 20.04 | 694.80 | 5 | 714.84 | |
| | | SK6-3 | BB248 | 1988 | | | | 714.70 | 25.10 | 689.60 | 5 | 714.70 | |
| Trempealeau | TR1 | TR1-1 | PX201 | 2005 | No | Yes | 730.4 | 733.29 | 75.55 | 657.74 | 10 | 733.29 | Dedicated Bailer |
| | | TR1-2 | PX202 | 2005 | | | 731.1 | 733.83 | 75.20 | 658.63 | 10 | 733.83 | |
| Waupaca | WP2 | WP2-1 | JH985 | 2005 | 94-69-01 | No | 908.4 | 911.03 | 20.45 | 890.58 | 10 | 911.03 | Peristolic Pump |
| | | WP2-2 | JH984 | 2005 | | | 905.7 | 908.82 | 20.43 | 888.39 | 10 | 908.82 | |
| Waushara | WS4 | WS4-1 | BB258 | 1988 | 93-70-01 | Yes | 1,082.4 | 1,084.97 | 17.13 | 1,067.84 | 5 | 1,084.97 | Peristolic Pump |
| | | WS4-2 | BB259 | 1988 | | | | 1,085.03 | 22.02 | 1,063.01 | 5 | 1,085.03 | |
| | | WS4-3 | BB260 | 1988 | | | | 1,084.98 | 27.16 | 1,057.82 | 5 | 1,084.98 | |
| | | WS4-4 | BB261 | 1988 | | | | 1,084.88 | 31.94 | 1,052.94 | 5 | 1,084.88 | |
| | WS6 | WS6-1 | JH989 | 2005 | 93-70-01 | Yes | 1,076.8 | 1,080.90 | 18.27 | 1,062.63 | 10 | 1,080.90 | Peristolic Pump |
| | | WS6-2 | JH990 | 2005 | | | | 1,079.07 | 17.02 | 1,062.05 | 10 | 1,079.07 | |
| | WS7 (Hancock Agricultural Research Station) | WS7-1 | VR841 | 2017 | No | Yes | 1,075.7 | 1,078.65 | 18.40 | 1,060.25 | 10 | 1,078.65 | Peristolic Pump |
| | | WS7-2 | VR842 | 2017 | | | | 1,078.79 | 54.70 | 1,024.09 | 5 | 1,078.79 | Whale Pump and Dedicated Tubing |
| | | WS7-3 | VR843 | 2017 | | | | 1,078.78 | 84.80 | 993.98 | 5 | 1,078.78 | |

Notes:

| | |
|---|---|
| 1 | Monitoring well was abandoned on May 30, 2019 because integrity of protective casing was compromised during spring 2019 sampling. |
| 2 | Monitoring well was abandoned on December 13, 2018 because integrity of protective casing was compromised by a vehicle prior to fall 2018 sampling. |
| 3 | Monitoring wells were abandoned June 11, 1993 because they were no longer needed for the monitoring program. |
| WUWN | Wisconsin Unique Well Number |
| MSL | Mean sea level |
| TPVC | Top of well casing (PVC) |
| | Monitoring Well/Piezometer abandoned. |
| | Monitoring Well/Piezometer construction was financed by a 2017 U.S. EPA grant. |
| | Monitoring Well/Piezometer construction was financed by a 2011 U.S. EPA grant. |
| | Monitoring Well/Piezometer construction was financed by a 2005 U.S. EPA grant. |
| | Monitoring Wells/Piezometers associated with initial program activities and financed by State. |

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# Table 2
## Field-Edge Groundwater Monitoring Program
## 2018 Sample Analytes and Applicable WAC ch. NR 140 ESs and PALs

| Analyte | PAL (µg/l) | ES (µg/l) |
|---|---|---|
| 2,4,5-T | | |
| 2,4,5-TP | 5 | 50 |
| 2,4-D | 7 | 70 |
| 2,4-DB | | |
| 2,4-DP | | |
| ACETAMIPRID | | |
| ACETOCHLOR | 0.7 | 7 |
| ACETOCHLOR ESA | 46 | 230 |
| ACETOCHLOR OA | 46 | 230 |
| ACIFLUORFEN | | |
| ALACHLOR | 0.2 | 2 |
| ALACHLOR ESA | 4 | 20 |
| ALACHLOR OA | | |
| ALDICARB SULFONE | | |
| ALDICARB SULFOXIDE | | |
| AMINOPYRALID | | |
| ATRAZINE | 0.3 | 3 |
| DE-ETHYL ATRAZINE | 0.3 | 3 |
| DEISOPROPYL ATRAZINE | 0.3 | 3 |
| DIAMINO ATRAZINE | 0.3 | 3 |
| ATRAZINE TCR | 0.3 | 3 |
| AZOXYSTROBIN | | |
| BENFLURALIN | | |
| BENTAZON | 60 | 300 |
| BICYCLOPYRONE | | |
| BROMACIL | | |
| CARBARYL | 4 | 40 |
| CARBOFURAN | 8 | 40 |
| CHLORAMBEN | 30 | 150 |
| CHLORANTRANILIPROLE | | |
| CHLOROTHALONIL | | |
| CHLORPYRIFOS | 0.4 | 2 |
| CHLORPYRIFOS OXYGEN ANALOG | | |
| CLOMAZONE | | |
| CLOPYRALID | | |
| CLOTHIANIDIN | | |
| CYCLANILIPROLE | | |
| CYFLUTHRIN | | |
| CYPERMETHRIN | | |
| CYPROSULFAMIDE | | |
| DACTHAL | 14 | 70 |
| DIAZINON | | |
| DIAZINON OXYGEN ANALOG | | |
| DICAMBA | 60 | 300 |
| DICHLOBENIL | | |
| DIMETHENAMID | 5 | 50 |
| DIMETHENAMID ESA | | |
| DIMETHENAMID OA | | |
| DIMETHOATE | 0.4 | 2 |
| DINOTEFURAN | | |
| DIURON | | |

| Analyte | PAL (µg/l) | ES (µg/l) |
|---|---|---|
| EPTC | 50 | 250 |
| ESFENVALERATE | | |
| ETHALFLURALIN | | |
| ETHOFUMESATE | | |
| FLUMETSULAM | | |
| FLUPYRADIFURONE | | |
| FLUROXYPYR | | |
| FOMESAFEN | | |
| HALOSULFURON METHYL | | |
| HEXAZINONE | | |
| IMAZAPYR | | |
| IMAZETHAPYR | | |
| IMIDACLOPRID | | |
| ISOXAFLUTOLE | | |
| ISOXAFLUTOLE RPA202248 (DKN) | | |
| LAMBDA-CYHALOTHRIN | | |
| LINURON | | |
| MALATHION | | |
| MCPA | | |
| MCPB | | |
| MCPP | | |
| MESOTRIONE | | |
| METALAXYL | | |
| METHYL PARATHION | | |
| METOLACHLOR | 10 | 100 |
| METOLACHLOR ESA | 260 | 1300 |
| METOLACHLOR OA | 260 | 1300 |
| METRIBUZIN | 14 | 70 |
| METRIBUZIN DA | | |
| METRIBUZIN DADK | | |
| METSULFURON-METHYL | | |
| NICOSULFURON | | |
| NORFLURAZON | | |
| OXADIAZON | | |
| PENDIMETHALIN | | |
| PICLORAM | 100 | 500 |
| PROMETONE | 20 | 100 |
| PROMETRYN | | |
| PROPICONAZOLE | | |
| SAFLUFENACIL | | |
| SIMAZINE | 0.4 | 4 |
| SULFENTRAZONE | | |
| SULFOMETURON-METHYL | | |
| TEBUPIRIMPHOS | | |
| TEMBOTRIONE | | |
| THIACLOPRID | | |
| THIAMETHOXAM | | |
| THIENCARBAZONE-METHYL | | |
| TRICLOPYR | | |
| TRIFLURALIN | 0.75 | 7.5 |
| NITROGEN-NITRATE/NITRITE (mg/l) | 2 | 10 |

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# Table 3

## Field-Edge Groundwater Monitoring Program 2018
## Groundwater Analytical Results

| 2018 GroundWater Project Results (all concentrations in ug/l) | | | | | | | Wisconsin Admin. Code Chapter NR 140 | |
|---|---|---|---|---|---|---|---|---|
| Pesticide Name | Pesticide Class | Reporting Limit | Number of Sites with Detects[1] | Number of Total Detects[2] | Percent of Samples with Detects | Concentration Range | Enforcement Standard | Preventive Action Limit |
| 2,4-D | Herbicide | 0.05 | 0 | 0 | | -- | 70 | 7 |
| 2,4-DB | Herbicide | 0.57 | 0 | 0 | | -- | -- | -- |
| 2,4-DP | Herbicide | 0.058 | 0 | 0 | | -- | -- | -- |
| 2,4,5-T | Herbicide | 0.05 | 0 | 0 | | -- | -- | -- |
| 2,4,5-TP | Herbicide | 0.05 | 0 | 0 | | -- | 50 | 5 |
| Acetamiprid | Insecticide | 0.05 | 0 | 0 | | -- | -- | -- |
| Acetochlor | Herbicide | 0.05 | 0 | 0 | | -- | 7 | 0.7 |
| Acetochlor ESA | Herbicide | 0.05 | 12 | 35 | 31.3% | 0.0502 - 13.7 | 230 | 46 |
| Acetochlor OA | Herbicide | 0.3 | 2 | 7 | 6.3% | 0.347 - 10.3 | 230 | 46 |
| Acifluorfen | Herbicide | 0.056 | 0 | 0 | | -- | -- | -- |
| Alachlor | Herbicide | 0.05 | 0 | 0 | | -- | 2 | 0.2 |
| Alachlor ESA | Herbicide | 0.05 | 19 | 74 | 66.1% | 0.0652 - 9.38 | 20 | 4 |
| Alachlor OA | Herbicide | 0.25 | 2 | 9 | 8.0% | 0.375 - 5.0 | -- | -- |
| Aldicarb Sulfone | Insecticide | 0.059 | 0 | 0 | | -- | -- | -- |
| Aldicarb Sulfoxide | Insecticide | 0.13 | 0 | 0 | | -- | -- | -- |
| Aminopyralid | Herbicide | 0.05 | 0 | 0 | | -- | -- | -- |
| Atrazine | Herbicide | 0.05 | 4 | 16 | 14.3% | 0.0508 - 0.686 | 3 | 0.3 |
| De-ethyl atrazine | Herbicide | 0.05 | 12 | 44 | 39.3% | 0.0506 - 0.925 | 3 | 0.3 |
| De-isopropyl atrazine | Herbicide | 0.05 | 12 | 30 | 26.8% | 0.0505 - 0.302 | 3 | 0.3 |
| Di-amino atrazine | Herbicide | 0.28 | 7 | 12 | 10.7% | 0.201 - 0.521 | 3 | 0.3 |
| Atrazine (TCR) | Herbicide | -- | 17 | 55 | 49.1% | 0.0506 - 1.688 | 3 | 0.3 |
| Azoxystrobin | Fungicide | 0.05 | 0 | 0 | | -- | -- | -- |
| Benfluralin | Herbicide | 0.05 | 0 | 0 | | -- | -- | -- |
| Bentazon | Herbicide | 0.05 | 4 | 13 | 11.6% | 0.103 - 25.0 | 300 | 60 |
| Bicyclopyrone | Herbicide | 0.05 | 0 | 0 | | -- | -- | -- |
| Bromacil | Herbicide | 0.084 | 0 | 0 | | -- | -- | -- |
| Carbaryl | Insecticide | 0.067 | 0 | 0 | | -- | 40 | 4 |
| Carbofuran | Insecticide | 0.051 | 0 | 0 | | -- | 40 | 8 |
| Chloramben | Herbicide | 0.57 | 0 | 0 | | -- | 150 | 30 |
| Chlorantraniliprole | Insecticide | 0.2 | 11 | 30 | 26.8% | 0.0665 - 2.03 | -- | -- |
| Chlorothalonil | Fungicide | 0.16 | 0 | 0 | | -- | -- | -- |
| Chlorpyrifos | Insecticide | 0.05 | 0 | 0 | | -- | 2 | 0.4 |
| Chlorpyrifos Oxon | Insecticide | 0.05 | 0 | 0 | | -- | -- | -- |
| Clomazone | Herbicide | 0.05 | 0 | 0 | | -- | -- | -- |
| Clopyralid | Herbicide | 0.078 | 0 | 0 | | -- | -- | -- |
| Clothianidin | Insecticide | 0.067 | 18 | 53 | 47.3% | 0.0563 - 1.69 | 1,000[3] | 200[3] |
| Cyclaniliprole | Insecticide | 2 | 0 | 0 | | -- | -- | -- |
| Cyfluthrin | Insecticide | 0.1 | 0 | 0 | | -- | -- | -- |
| lambda- Cyhalothrin | Insecticide | 0.05 | 0 | 0 | | -- | -- | -- |
| Cypermethrin | Insecticide | 0.15 | 0 | 0 | | -- | -- | -- |
| Cyprosulfamide | Safener | 0.074 | 0 | 0 | | -- | -- | -- |
| Dacthal | Herbicide | 0.05 | 0 | 0 | | -- | 70 | 14 (7[4]) |
| Diazinon | Insecticide | 0.05 | 0 | 0 | | -- | -- | -- |
| Diazinon oxon | Insecticide | 0.05 | 0 | 0 | | -- | -- | -- |
| Dicamba | Herbicide | 0.89 | 1 | 1 | 0.9% | 9.65 | 300 | 60 |
| Dichlobenil | Herbicide | 0.05 | 0 | 0 | | -- | -- | -- |
| Dichlorvos | Insecticide | 0.076 | 0 | 0 | | -- | -- | -- |
| Dimethenamid | Herbicide | 0.05 | 1 | 1 | 0.9% | 0.0644 | 50 | 5 |
| Dimethenamid ESA | Herbicide | 0.05 | 6 | 13 | 11.6% | 0.0547 - 2.58 | -- | -- |
| Dimethenamid OA | Herbicide | 0.054 | 2 | 2 | 1.8% | 0.518 - 0.0961 | -- | -- |
| Dimethoate | Insecticide | 0.05 | 0 | 0 | | -- | 2 | 0.4 |
| Dinotefuran | Insecticide | 0.05 | 0 | 0 | | -- | -- | -- |
| Diuron | Herbicide | 0.18 | 0 | 0 | | -- | -- | -- |

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# Table 3 - continued

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| EPTC | Herbicide | 0.05 | 0 | 0 | | -- | 250 | 50 |
| Esfenvalerate | Insecticide | 0.05 | 0 | 0 | | -- | -- | -- |
| Ethalfluralin | Herbicide | 0.074 | 0 | 0 | | -- | -- | -- |
| Ethofumesate | Herbicide | 0.05 | 0 | 0 | | -- | -- | -- |
| Flumetsulam | Herbicide | 0.17 | 4 | 10 | 8.9% | 0.577 - 0.635 | -- | -- |
| Flupyradifurone | Insecticide | 0.05 | 0 | 0 | | -- | -- | -- |
| Fluroxypyr | Insecticide | 0.32 | 0 | 0 | | -- | -- | -- |
| Fomesafen | Insecticide | 0.05 | 1 | 1 | 0.9% | 0.196 | -- | -- |
| Halosulfuron methyl | Insecticide | 0.08 | 0 | 0 | | -- | -- | -- |
| Hexazinone | Herbicide | 0.05 | 0 | 0 | | -- | -- | -- |
| Imazapyr | Herbicide | 0.05 | 0 | 0 | | -- | -- | -- |
| Imazethapyr | Herbicide | 0.05 | 1 | 1 | 0.9% | 0.185 | -- | -- |
| Imidacloprid | Insecticide | 0.05 | 11 | 42 | 37.5% | 0.0512 - 0.998 | 0.2[3] | 0.02[3] |
| Isoxaflutole | Herbicide | 0.32 | 0 | 0 | | -- | 3[3] | 0.3[3] |
| Isoxaflutole DKN | Herbicide | 0.47 | 0 | 0 | | -- | 3[3] | 0.3[3] |
| Linuron | Herbicide | 0.087 | 0 | 0 | | -- | -- | -- |
| MCPA | Herbicide | 0.05 | 0 | 0 | | -- | -- | -- |
| MCPB | Herbicide | 0.21 | 0 | 0 | | -- | -- | -- |
| MCPP | Herbicide | 0.055 | 0 | 0 | | -- | -- | -- |
| Malathion | Insecticide | 0.05 | 0 | 0 | | -- | -- | -- |
| Mesotrione | Herbicide | 0.18 | 0 | 0 | | -- | -- | -- |
| Metalaxyl | Fungicide | 0.05 | 9 | 32 | 28.6% | 0.0631 - 4.06 | -- | -- |
| Methyl Parathion | Insecticide | 0.078 | 0 | 0 | | -- | -- | -- |
| Metolachlor | Herbicide | 0.05 | 10 | 33 | 29.5% | 0.0848 - 6.82 | 100 | 10 |
| Metolachlor ESA | Herbicide | 0.05 | 24 | 105 | 93.8% | 0.126 - 44.6 | 1,300 | 260 |
| Metolachlor OA | Herbicide | 0.27 | 16 | 67 | 59.8% | 0.286 - 43.9 | 1,300 | 260 |
| Metribuzin | Herbicide | 0.05 | 9 | 40 | 35.7% | 0.0729 - 9.0 | 70 | 14 |
| Metribuzin DA | Herbicide | 0.1 | 9 | 27 | 24.1% | 0.109 - 0.911 | -- | -- |
| Metribuzin DADK | Herbicide | 0.12 | 12 | 49 | 43.8% | 0.313 - 4.99 | -- | -- |
| Metsulfuron methyl | Herbicide | 0.094 | 0 | 0 | | -- | -- | -- |
| Nicosulfuron | Herbicide | 0.05 | 0 | 0 | | -- | -- | -- |
| Norflurazon | Herbicide | 0.058 | 0 | 0 | | -- | -- | -- |
| Oxadiazon | Herbicide | 0.05 | 0 | 0 | | -- | -- | -- |
| Pendimethalin | Herbicide | 0.05 | 0 | 0 | | -- | -- | -- |
| Picloram | Herbicide | 0.05 | 0 | 0 | | -- | 500 | 100 |
| Prometone | Herbicide | 0.05 | 0 | 0 | | -- | 100 | 20 |
| Prometryn | Herbicide | 0.05 | 0 | 0 | | -- | -- | -- |
| Propiconazole | Fungicide | 0.055 | 0 | 0 | | -- | -- | -- |
| Saflufenacil | Herbicide | 0.2 | 2 | 2 | 1.8% | 0.0778 - 0.148 | -- | -- |
| Simazine | Herbicide | 0.05 | 2 | 2 | 1.8% | 0.0509 - 0.0559 | 4 | 0.4 |
| Sulfentrazone | Herbicide | 0.75 | 1 | 2 | 1.8% | 0.0661 - 0.0969 | 1,000[3] | 100[3] |
| Sulfometuron methyl | Herbicide | 0.05 | 0 | 0 | | -- | -- | -- |
| Tebupirimphos | Insecticide | 0.05 | 0 | 0 | | -- | -- | -- |
| Tembotrione | Herbicide | 0.21 | 0 | 0 | | -- | -- | -- |
| Thiacloprid | Insecticide | 0.067 | 0 | 0 | | -- | -- | -- |
| Thiamethoxam | Insecticide | 0.067 | 12 | 41 | 36.6% | 0.0578 - 2.78 | 100[3] | 10[3] |
| Thiencarbazone methyl | Herbicide | 0.38 | 1 | 1 | 0.9% | 0.0667 | 10[3] | 2[3] |
| Triclopyr | Herbicide | 0.1 | 0 | 0 | | -- | -- | -- |
| Trifluralin | Herbicide | 0.05 | 0 | 0 | | -- | 7.5 | 0.75 |

Notes:

1 Total number of sites were 24.
2 Total number of samples were 112.
3 Standard or limit is proposed as part of Wisconsin Department of Health Services Cycle 10 Recommendations (June 2019).
4 Limt change is proposed as part of Wisconsin Department of Health Services Cycle 10 Recommendations (June 2019).
'--- Indicates that Health Advisory Level value in Wisconsin not established.
µg/L micrograms per liter or parts per billion
TCR Total Chlorinated Residue 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 detects in excess of laboraotry reporting limits.
Indicates detects in excess of laboraotry reporting limits and WAC ch. NR 140 Preventive Action Limit (and proposed Cycle 10 Recommendations).
Indicates detects in excess of laboraotry reporting limits and WAC ch. NR 140 Enforcement Standard (and proposed Cycle 10 Recommendations).

# Table 4

## Field-Edge Groundwater Monitoring Program
## 2018 Land-, Pesticide/Nitrogen- and Irrigation-Use (as Provided by Growers)

| COUNTY | SITE (Grower) | YEAR | CROP | NUTRIENT MANAGEMENT PLAN | IRRIGATION APPLIED (in inches) | NITROGEN APPLIED (in lbs/acre) | PESTICIDE PRODUCT APPLIED |
|---|---|---|---|---|---|---|---|
| Adams | AD2 | 2016 | corn silage | | 6.45 | 374.8 | glyphosate |
| | | | | | | | N-serve |
| | | | | | | | atrazine |
| | | | | | | | dicamba |
| | | 2017 [1] | --- | --- | --- | --- | --- |
| | | 2018 [1] | --- | --- | --- | --- | --- |
| | AD3 | 2016 [1] | --- | --- | --- | --- | --- |
| | | 2017 [1] | --- | --- | --- | --- | --- |
| | | 2018 | snap beans | yes | 6.59 | 89.0 | metolachlor |
| | | | | | | | halosulfuron-methyl |
| | | | | | | | sethoxydim |
| | | | | | | | imazamox, bentazon |
| | | | | | | | thiamethoxam |
| | | | | | | | bifenthrin |
| | | | | | | | glyphosate |
| | AD4 | 2016 [1] | --- | --- | --- | --- | --- |
| | | 2017 [1] | --- | --- | --- | --- | --- |
| | | 2018 | soybeans | yes | 7.66 | 14.0 | metribuzin |
| | | | | | | | metolachlor |
| | | | | | | | Clethodim |
| | | | | | | | bentazon |
| | | | | | | | thiamethoxam |
| | | | | | | | chlothianidin |
| | | | | | | | glyphosate |
| | AD5 | 2016 | --- | --- | --- | --- | --- |
| | | 2017 | --- | --- | --- | --- | --- |
| | | 2018 | --- | --- | --- | --- | --- |
| Barron | BR3 | 2016 | --- | --- | --- | --- | --- |
| | | 2017 | --- | --- | --- | --- | --- |
| | | 2018 | --- | --- | --- | --- | --- |
| Dane | DN1 | 2016 | seed corn | | 3 | 216.7 | simazine |
| | | | | | | | metolachlor |
| | | | | | | | mesotrione |
| | | | | | | | topramezone |
| | | | | | | | bifenthrin |
| | | | | | | | pyraclastrobin, metconazole |
| | | | | | | | 2,4-D |
| | | | | | | | glyphosate |
| | | | | | | | sodium chlorate |
| | | 2017 | soybeans | | 2 | 6.0 | glyphosate |
| | | | | | | | Clethodim |
| | | | | | | | lambda-cyhalothrin |
| | | | | | | | glufosinate |
| | | 2018 [1] | --- | --- | --- | --- | --- |
| Dunn | DU1 | 2016 | soybeans | | 3.43 | 100.0 | dimethenamid |
| | | | | | | | flumioxazin |
| | | | | | | | clethodim |
| | | | | | | | benzoic acid |
| | | 2017 | horseradish | | 0.8 | 140.5 | peroxyacetic acid, hydrogen peroxide |
| | | | | | | | oxyfluorfen |
| | | | | | | | sulfentrazone |
| | | | | | | | glyphosate |
| | | | | | | | clethodim |
| | | | | | | | boscolid |
| | | | | | | | chlorothalonil |
| | | 2018 | corn (grain) | no | 3.97 | 193.3 | glyphosate |
| | | | | | | | dicamba |
| | | | | | | | dimethenamid, saflufenacil |
| | DU2 | 2016 | corn | | 8 | 241.0 | glyphosate |
| | | | | | | | dimethenamid, saflufenacil |
| | | 2017 | kidney beans | | 4 | 85.0 | pendimethalin |
| | | | | | | | s-metolachlor |
| | | | | | | | bentazon |
| | | | | | | | fomesafen |
| | | | | | | | imazamox |
| | | | | | | | clethodim |
| | | | | | | | saflufenacil |
| | | | | | | | thiamethoxam, fludioxonil |
| | | 2018 | corn | --- | 5 | 66.2 | dimethenamid, saflufenacil |
| | | | | | | | glyphosate |
| | | | | | | | atrazine |
| Grant | GR1 | 2016 [1] | --- | --- | na | --- | --- |
| | | 2017 [1] | --- | --- | na | --- | --- |
| | | 2018 [1] | --- | --- | na | --- | --- |
| Iowa | IW1 | 2016 | potatoes | | 18.4 | 374.4 | metam sodium |
| | | | | | | | azoxystrobib, difenoconazole |
| | | | | | | | metalaxyl |
| | | | | | | | imidacloprid |
| | | | | | | | azoxystrobin |
| | | | | | | | metribuzin |
| | | | | | | | novaluron |
| | | | | | | | spinosad |
| | | | | | | | beta-cyfluthrin |
| | | | | | | | rimsulfuron |
| | | | | | | | chlorothalonil |
| | | | | | | | pyraclostrobin |
| | | | | | | | boscolid |
| | | | | | | | abamectin |
| | | | | | | | pyrimethanil |
| | | | | | | | fentin hydroxide |
| | | | | | | | mancozeb |
| | | | | | | | diquat bromide |
| | | 2017 | seed corn | | 8.9 | 198.5 | glyphosate |
| | | | | | | | bifenthrin |
| | | | | | | | glufosinate |
| | | | | | | | MCPA, bromoxynil |
| | | | | | | | pendimethalin |
| | | | | | | | pyraclostrobin, metconazole |
| | | | | | | | propiconazole, azoxystrobin |
| | | 2018 | snap beans | no | 5.7 | 77.0 | thiamethoxam |
| | | | | | | | halosulfuron-methyl |
| | | | | | | | s-metolachlor |
| | | | | | | | imazamox, bentazon |

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# Table 4 - continued

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | | sethoxydim |
| | IW2 | 2016 | seed corn | | 12.8 | 195.5 | glyphosate |
| | | | | | | | bifenthrin |
| | | | | | | | metolachlor |
| | | | | | | | pendimethalin |
| | | | | | | | tembotrione |
| | | | | | | | bromoxynil |
| | | | | | | | azoxystrobin |
| | | 2017 | snap beans | | 6.6 | 72.2 | glyphosate |
| | | | | | | | EPTC |
| | | | | | | | thiamethoxam |
| | | | | | | | bifenthrin |
| | | | | | | | imazamox, bentazon |
| | | | | | | | copper hydroxide and copper chloride |
| | | 2018 | seed corn | no | 12.1 | 256.0 | bifenthrin |
| | | | | | | | bicyclopyrone, metolachlor, mesotrione |
| | | | | | | | pendimethalin |
| | | | | | | | thiamethoxam |
| | | | | | | | azoxystrobin |
| Jackson | JK3 | 2016 [1] | --- | --- | na | --- | --- |
| | | 2017 [1] | --- | --- | na | --- | --- |
| | | 2018 [1] | --- | --- | na | --- | --- |
| Juneau | JN1 | 2016 | sweet corn | | 8 | 211.0 | atrazine |
| | | | | | | | s-metolachlor |
| | | 2017 | snap beans | | 2.9 | 122.0 | s-metolachlor |
| | | | | | | | halosulfuron-methyl |
| | | 2018 | sweet corn | no | 8 | 228.6 | atrazine |
| | | | | | | | s-metolachlor |
| | JN3 | 2016 [1] | --- | --- | na | --- | --- |
| | | 2017 [1] | --- | --- | na | --- | --- |
| | | 2018 [1] | --- | --- | na | --- | --- |
| La Crosse | LC2 | 2016 | corn silage | | --- | 179.5 | glyphosate |
| | | | | | | | lorsban |
| | | | | | | | acetochlor |
| | | | | | | | dicamba |
| | | 2017 | soybeans | | --- | 0.0 | glyphosate |
| | | | | | | | 2,4-D |
| | | | | | | | imazethapyr |
| | | 2018 | corn | yes | 2.5 | 705.7 | glyphosate |
| | | | | | | | atrazine, acetochlor |
| | | | | | | | mesotrione |
| Langlade | LN1 | 2016 [1] | --- | --- | --- | --- | --- |
| | | 2017 [1] | --- | --- | --- | --- | --- |
| | | 2018 [1] | --- | --- | --- | --- | --- |
| Portage | PR1 | 2016 [1] | --- | --- | --- | --- | --- |
| | | 2017 [1] | --- | --- | --- | --- | --- |
| | | 2018 [1] | sweet corn | yes | 4.6 | 164.0 | s-metolachlor |
| | | | | | | | atrazine |
| St. Croix | SC1 | 2016 | soybeans | | na | --- | glyphosate |
| | | 2017 | corn | | na | 250.0 | glyphosate |
| | | | | | | | tembotrione |
| | | | | | | | acetochlor |
| | | 2018 | soybeans | no | na | 0.0 | glyphosate |
| Sauk | SK6 | 2016 [1] | --- | --- | na | --- | --- |
| | | 2017 [1] | --- | --- | na | --- | --- |
| | | 2018 [1] | --- | --- | na | --- | --- |
| Trempealeau | TR1 | 2016 [1] | --- | --- | --- | --- | --- |
| | | 2017 [1] | --- | --- | --- | --- | --- |
| | | 2018 [1] | --- | --- | --- | --- | --- |
| Waupaca | WP2 | 2016 | corn | | na | 132.0 | acetochlor |
| | | | | | | | clopyralid |
| | | | | | | | flumetsulam |
| | | 2017 | soybeans | | na | 0.0 | glyphosate |
| | | 2018 | soybeans | yes | na | 0.0 | glyphosate |
| Waushara | WS4 | 2016 | carrots | | 9.08 | 176.0 | glyphosate |
| | | | | | | | pendimethalin |
| | | | | | | | chlorothalonil |
| | | | | | | | esfenvalerate |
| | | | | | | | clethodim |
| | | | | | | | azoxystrobin |
| | | 2017 | potatoes | | 13.62 | 115.1 | glyphosate |
| | | | | | | | thiamethoxam, fludioxonil |
| | | | | | | | mancozeb |
| | | | | | | | azoxystrobin |
| | | | | | | | pentachloronitrobenzene |
| | | | | | | | s-metolachlor |
| | | | | | | | metribuzin |
| | | | | | | | rimsulfuron |
| | | | | | | | chlorothalonil |
| | | | | | | | novaluron |
| | | | | | | | metalaxyl |
| | | | | | | | copper hydroxide and copper chloride |
| | | | | | | | spinosad |
| | | | | | | | boscolid |
| | | | | | | | cyantraniliprole, abamectin |
| | | | | | | | pyraclostrobin |
| | | | | | | | oxathiapiprolin |
| | | | | | | | fentin hydroxide |
| | | | | | | | diquat bromide |
| | | 2018 | corn | no | 9.1 | 70.6 | metolachlor |
| | | | | | | | simazine |
| | | | | | | | glyphosate |
| | | | | | | | ammonium sulfamate |
| | WS6 | 2016 | corn | | 8.35 | 70.4 | glyphosate |
| | | | | | | | simazine |
| | | | | | | | metolachlor |
| | | 2017 | beans | | 6 | 105.6 | glyphosate |
| | | | | | | | ammonium sulfamate |
| | | | | | | | metolachlor |
| | | | | | | | phosphorus oxide |
| | | | | | | | halosulfuron-methyl |
| | | 2018 | carrots | no | 12.76 | 254.1 | clethodim |
| | | | | | | | carfentrazone-ethyl |
| | | | | | | | cypermethrin-S |
| | | | | | | | azoxystrobin |
| | WS7 (Hancock Agricultural Research Station) | 2016 | | | | | |
| | | 2017 | | | | | |
| | | 2018 | | | | | |

Notes:

1 Grower did not provide information in Annual Reporting Form.

(green shading) Site is located within an atrazine Prohibition Area.

--- Information not provided by Grower.

na Fields are not equipped to irrigate.

(hatched shading) Site is a research location with multiple crops and herbicide types and application rates.

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# Table 7

## Field-Edge Groundwater Monitoring Program
## 2018 Imidacloprid Concentrations in Groundwater Samples

| COUNTY | SITE (Grower) | WELL IDENTIFICATION | WUWN | SAMPLE DATE (2018) | IMIDACLOPRID (in µg/L) |
|---|---|---|---|---|---|
| Adams | AD2 | AD2-1 | BH954 | 2/28 | 0 |
| | | | | 5/4 | 0 |
| | | | | 10/16 | 0 |
| | | AD2-4 | VR844 | 2/28 | 0.277 |
| | | | | 5/4 | 0.268 |
| | | | | 10/16 | 0.267 |
| | | AD2-5 | VR845 | 2/28 | 0.39 |
| | | | | 5/4 | 0.428 |
| | | | | 10/16 | 0.457 |
| | AD3 | AD3-1 | BH999 | 5/4 | 0.136 |
| | | | | 10/16 | 0 |
| | | AD3-3 | BI001 | 5/4 | 0.279 |
| | | | | 10/16 | 0.171 |
| | AD4 | AD4-1 | BH996 | 10/16 | 0 |
| | | AD4-2 | BH997 | 5/4 | 0 |
| | AD5 | AD5-1 | CL461 | 2/28 | 0 |
| | | | | 5/4 | 0 |
| | | | | 11/8 | 0 |
| | | AD5-4 | VR846 | 2/28 | 0.208 |
| | | | | 5/4 | 0.244 |
| | | | | 11/8 | 0.188 |
| | | AD5-5 | VR847 | 2/28 | 0.227 |
| | | | | 5/4 | 0.328 |
| | | | | 11/8 | 0.432 |
| Barron | BR3 | BR3-1 | BR279 | 5/15 | 0 |
| | | | | 11/1 | 0 |
| | | BR3-3 | BR281 | 5/15 | 0 |
| | | | | 11/1 | 0 |
| Dane | DN1 | DN1-1 | BR250 | 5/9 | 0 |
| | | | | 11/8 | 0 |
| | | DN1-3 | BR252 | 5/9 | 0 |
| | | | | 11/8 | 0 |
| Dunn | DU1 | DU1-1 | AO384 | 5/15 | 0 |
| | | | | 11/1 | 0 |
| | | DU1-3 | AO386 | 11/13 | 0 |
| | DU2 | DU2-1 | AO387 | 5/15 | 0 |
| | | | | 11/1 | 0 |
| | | DU2-3 | AO389 | 5/15 | 0 |
| | | | | 11/1 | 0 |
| Grant | GR1 | GR1-1 | BR255 | 5/8 | 0 |
| | | | | 10/23 | 0 |
| | | GR1-3 | BR257 | 5/8 | 0 |
| | | | | 10/23 | 0 |
| Iowa | IW1 | IW1-4 | BR259 | 5/8 | 0.2 |
| | | | | 10/23 | 0.0666 |
| | | IW1-7 | BH967 | 5/8 | 0.205 |
| | | | | 10/23 | 0.214 |
| | IW2 | IW2-1 | BR036 | 5/8 | 0 |
| | | | | 10/23 | 0 |
| | | IW2-3 | BR038 | 5/8 | 0.2 |
| | | | | 10/23 | 0.208 |
| Jackson | JK3 | JK3-1 | JH982 | 5/15 | 0 |
| | | | | 11/6 | 0 |
| | | JK3-2 | JH981 | 5/15 | 0 |
| | | | | 11/6 | 0 |
| Juneau | JN1 | JN1-1 | BR046 | 6/8 | 0 |
| | | | | 11/15 | 0 |
| | | JN1-3 | BR048 | 6/8 | 0.0982 |
| | | | | 11/15 | 0.162 |
| | JN3 | JN3-1 | JH937 | 6/8 | 0 |
| | | | | 11/15 | 0 |
| | | JN3-2 | JH936 | 6/8 | 0 |
| | | | | 11/15 | 0 |
| La Crosse | LC2 | LC2-1 | VZ391 | 5/16 | 0 |
| | | | | 11/6 | 0 |
| | | LC2-2 | VZ392 | 5/16 | 0 |
| | | | | 11/6 | 0 |
| Langlade | LN1 | LN1-1 | BH964 | 5/23 | 0 |
| | | | | 10/30 | 0 |
| | | LN1-3 | BH966 | 5/23 | 0 |
| | | | | 10/30 | 0 |
| Portage | PR1 | PR1-1 | BR207 | 5/23 | 0 |
| | | | | 10/30 | 0 |
| | | PR1-2 | BR208 | 2/27 | 0 |
| | | PR1-4 | VR848 | 2/27 | 0.0955 |
| | | | | 5/23 | 0.0702 |
| | | | | 10/30 | 0.0546 |
| | | PR1-5 | VR849 | 2/27 | 0.0943 |
| | | | | 5/23 | 0.0701 |
| | | | | 10/30 | 0.0535 |
| St. Croix | SC1 | SC1-1 | JH938 | 5/15 | 0 |
| | | | | 11/13 | 0 |
| | | SC1-2 | JH939 | 5/15 | 0 |
| | | | | 11/13 | 0 |
| Sauk | SK6 | SK6-1 | BB246 | 5/8 | 0.206 |
| | | | | 10/23 | 0.136 |
| | | SK6-3 | BB248 | 5/8 | 0.236 |
| | | | | 10/23 | 0.265 |
| Trempealeau | TR1 | TR1-1 | PX201 | 5/16 | 0 |
| | | | | 11/6 | 0 |
| | | TR1-2 | PX202 | 5/16 | 0 |
| | | | | 11/6 | 0 |
| Waupaca | WP2 | WP2-1 | JH985 | 5/23 | 0 |
| | | | | 10/30 | 0 |
| | | WP2-2 | JH984 | 5/23 | 0 |
| | | | | 10/30 | 0 |
| Waushara | WS4 | WS4-1 | BB258 | 5/31 | 0.613 |
| | | | | 10/25 | 0.72 |
| | | WS4-4 | BB261 | 10/25 | 0 |
| | WS6 | WS6-1 | JH989 | 5/31 | 0.0682 |
| | | | | 10/25 | 0 |
| | | WS6-2 | JH990 | 5/31 | 0 |
| | | | | 10/25 | 0 |
| | WS7 (Hancock Agricultural Research Station) | WS7-1 | VR841 | 2/27 | 0.176 |
| | | | | 5/31 | 0.0902 |
| | | | | 10/25 | 0 |
| | | WS7-2 | VR842 | 2/27 | 0 |
| | | | | 5/31 | 0.0512 |
| | | | | 10/25 | 0 |
| | | WS7-3 | VR843 | 2/27 | 0.716 |
| | | | | 5/31 | 0.814 |
| | | | | 10/25 | 0.998 |

Notes:

WUWN Wisconsin Unique Well Number
µg/L Micrograms per liter or parts per billion
0 Concentration does not exceed laboratory reporting limit of 0.05 µg/L.
Detected concentration exceeds the proposed Cycle 10 Recommendations for Preventive Action Limit of 0.02 µg/L.
Detected concentration exceeds the proposed Cycle 10 Recommendations for Enforcement Standard of 0.2 µg/L.

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# Table 8

## Field-Edge Groundwater Monitoring Program
## 2018 Alachlor ESA Concentrations in Groundwater Samples

| COUNTY | SITE (Grower) | WELL IDENTIFICATION | WUWN | SAMPLE DATE (2018) | ALACHLOR ESA (in µg/L) |
|---|---|---|---|---|---|
| Adams | AD2 | AD2-1 | BH954 | 2/28 | 0 |
| | | | | 5/4 | 0 |
| | | | | 10/16 | 0.0702 |
| | | AD2-4 | VR844 | 2/28 | 0.64 |
| | | | | 5/4 | 0.646 |
| | | | | 10/16 | 0.595 |
| | | AD2-5 | VR845 | 2/28 | 1.17 |
| | | | | 5/4 | 1.09 |
| | | | | 10/16 | 1.11 |
| | AD3 | AD3-1 | BH999 | 5/4 | 0.572 |
| | | | | 10/16 | 0.48 |
| | | AD3-3 | BI001 | 5/4 | 0.413 |
| | | | | 10/16 | 0.318 |
| | AD4 | AD4-1 | BH996 | 10/16 | 0.471 |
| | | AD4-2 | BH997 | 5/4 | 0 |
| | AD5 | AD5-1 | CL461 | 2/28 | 0 |
| | | | | 5/4 | 0 |
| | | | | 11/8 | 0 |
| | | AD5-4 | VR846 | 2/28 | 2.9 |
| | | | | 5/4 | 2.55 |
| | | | | 11/8 | 2.22 |
| | | AD5-5 | VR847 | 2/28 | 9.38 |
| | | | | 5/4 | 8.63 |
| | | | | 11/8 | 6.14 |
| Barron | BR3 | BR3-1 | BR279 | 5/15 | 0 |
| | | | | 11/1 | 0 |
| | | BR3-3 | BR281 | 5/15 | 0 |
| | | | | 11/1 | 0 |
| Dane | DN1 | DN1-1 | BR250 | 5/9 | 0 |
| | | | | 11/8 | 0 |
| | | DN1-3 | BR252 | 5/9 | 0.0878 |
| | | | | 11/8 | 0.0824 |
| Dunn | DU1 | DU1-1 | AO384 | 5/15 | 0.183 |
| | | | | 11/1 | 0.12 |
| | | DU1-3 | AO386 | 11/13 | 0.176 |
| | DU2 | DU2-1 | AO387 | 5/15 | 0.135 |
| | | | | 11/1 | 0.124 |
| | | DU2-3 | AO389 | 5/15 | 0.146 |
| | | | | 11/1 | 0.145 |
| Grant | GR1 | GR1-1 | BR255 | 5/8 | 0 |
| | | | | 10/23 | 0 |
| | | GR1-3 | BR257 | 5/8 | 0 |
| | | | | 10/23 | 0.0943 |
| Iowa | IW1 | IW1-4 | BR259 | 5/8 | 0.666 |
| | | | | 10/23 | 0.309 |
| | | IW1-7 | BH967 | 5/8 | 1.4 |
| | | | | 10/23 | 1.41 |
| | IW2 | IW2-1 | BR036 | 5/8 | 0.55 |
| | | | | 10/23 | 0.789 |
| | | IW2-3 | BR038 | 5/8 | 1.05 |
| | | | | 10/23 | 1.1 |
| Jackson | JK3 | JK3-1 | JH982 | 5/15 | 0 |
| | | | | 11/6 | 0 |
| | | JK3-2 | JH981 | 5/15 | 0 |
| | | | | 11/6 | 0 |
| Juneau | JN1 | JN1-1 | BR046 | 6/8 | 0 |
| | | | | 11/15 | 0 |
| | | JN1-3 | BR048 | 6/8 | 0.958 |
| | | | | 11/15 | 0.755 |
| | JN3 | JN3-1 | JH937 | 6/8 | 1.87 |
| | | | | 11/15 | 1.03 |
| | | JN3-2 | JH936 | 6/8 | 0.0848 |
| | | | | 11/15 | 0.107 |
| La Crosse | LC2 | LC2-1 | VZ391 | 5/16 | 0 |
| | | | | 11/6 | 0 |
| | | LC2-2 | VZ392 | 5/16 | 0 |
| | | | | 11/6 | 0 |
| Langlade | LN1 | LN1-1 | BH964 | 5/23 | 0 |
| | | | | 10/30 | 0 |
| | | LN1-3 | BH966 | 5/23 | 0 |
| | | | | 10/30 | 0 |
| Portage | PR1 | PR1-1 | BR207 | 5/23 | 0 |
| | | | | 10/30 | 0 |
| | | PR1-2 | BR208 | 2/27 | 0.127 |
| | | PR1-4 | VR848 | 2/27 | 1.42 |
| | | | | 5/23 | 1.38 |
| | | | | 10/30 | 1.19 |
| | | PR1-5 | VR849 | 2/27 | 1.07 |
| | | | | 5/23 | 0.976 |
| | | | | 10/30 | 0.905 |
| St. Croix | SC1 | SC1-1 | JH938 | 5/15 | 0.407 |
| | | | | 11/13 | 0.322 |
| | | SC1-2 | JH939 | 5/15 | 0.171 |
| | | | | 11/13 | 0.162 |
| Sauk | SK6 | SK6-1 | BB246 | 5/8 | 0.893 |
| | | | | 10/23 | 0.897 |
| | | SK6-3 | BB248 | 5/8 | 0.609 |
| | | | | 10/23 | 0.512 |
| Trempealeau | TR1 | TR1-1 | PX201 | 5/16 | 0 |
| | | | | 11/6 | 0 |
| | | TR1-2 | PX202 | 5/16 | 0 |
| | | | | 11/6 | 0 |
| Waupaca | WP2 | WP2-1 | JH985 | 5/23 | 0.107 |
| | | | | 10/30 | 0 |
| | | WP2-2 | JH984 | 5/23 | 0.0825 |
| | | | | 10/30 | 0.0736 |
| Waushara | WS4 | WS4-1 | BB258 | 5/31 | 0.596 |
| | | | | 10/25 | 1.21 |
| | | WS4-4 | BB261 | 10/25 | 0.419 |
| | WS6 | WS6-1 | JH989 | 5/31 | 0.104 |
| | | | | 10/25 | 0.366 |
| | | WS6-2 | JH990 | 5/31 | 0 |
| | | | | 10/25 | 0 |
| | WS7 (Hancock Agricultural Research Station) | WS7-1 | VR841 | 2/27 | 0.298 |
| | | | | 5/31 | 0.308 |
| | | | | 10/25 | 0.298 |
| | | WS7-2 | VR842 | 2/27 | 0.632 |
| | | | | 5/31 | 0.724 |
| | | | | 10/25 | 0.6 |
| | | WS7-3 | VR843 | 2/27 | 6.51 |
| | | | | 5/31 | 6.44 |
| | | | | 10/25 | 5.53 |

Notes:

| | |
|---|---|
| WUWN | Wisconsin Unique Well Number |
| Alachlor ESA | Alachlor ethanesulfonic acid |
| µg/L | Micrograms per liter or parts per billion |
| 0 | Concentration does not exceed laboratory reporting limit of 0.05 µg/L. |
| (yellow highlight) | Detected concentration exceeds the Wisconsin Administrative Code ch. NR 140 Preventive Action Limit of 4.0 µg/L. |

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# Table 9

## Field-Edge Groundwater Monitoring Program
## 2018 Atrazine and Metabolite Concentrations in Groundwater Samples

| COUNTY | SITE (Grower) | WELL IDENTIFICATION | WUWN | SAMPLE DATE (2018) | Atrazine | De-ethyl Atrazine | De-isopropyl Atrazine | Di-amino Atrazine | Atrazine TCR |
|---|---|---|---|---|---|---|---|---|---|
| Adams | AD2 | AD2-1 | BH954 | 2/28 | 0 | 0 | 0 | 0 | 0 |
| | | | | 5/4 | 0 | 0 | 0 | 0 | 0 |
| | | | | 10/16 | 0 | 0 | 0 | 0 | 0 |
| | | AD2-4 | VR844 | 2/28 | 0.289 | 0.561 | 0.0546 | 0 | 0.9046 |
| | | | | 5/4 | 0.376 | 0.742 | 0.0559 | 0 | 1.1739 |
| | | | | 10/16 | 0.686 | 0.925 | 0.077 | 0 | 1.6880 |
| | | AD2-5 | VR845 | 2/28 | 0.082 | 0.163 | 0 | 0 | 0.2450 |
| | | | | 5/4 | 0.0902 | 0.142 | 0 | 0 | 0.2322 |
| | | | | 10/16 | 0.128 | 0.166 | 0.0527 | 0 | 0.3467 |
| | AD3 | AD3-1 | BH999 | 5/4 | 0 | 0.0631 | 0 | 0 | 0.0631 |
| | | | | 10/16 | 0 | 0.0506 | 0 | 0 | 0.0506 |
| | | AD3-3 | BI001 | 5/4 | 0 | 0.188 | 0 | 0 | 0.1880 |
| | | | | 10/16 | 0 | 0.108 | 0 | 0 | 0.1080 |
| | AD4 | AD4-1 | BH996 | 10/16 | 0.0508 | 0.143 | 0.147 | 0.521 | 0.8618 |
| | | AD4-2 | BH997 | 5/4 | 0 | 0.129 | 0.0673 | 0.23 | 0.4263 |
| | AD5 | AD5-1 | CL461 | 2/28 | 0 | 0 | 0 | 0 | 0 |
| | | | | 5/4 | 0 | 0 | 0 | 0 | 0 |
| | | | | 11/8 | 0 | 0 | 0 | 0 | 0 |
| | | AD5-4 | VR846 | 2/28 | 0.114 | 0.476 | 0.0545 | 0 | 0.6445 |
| | | | | 5/4 | 0.134 | 0.877 | 0.0661 | 0.293 | 1.3701 |
| | | | | 11/8 | 0.122 | 0.565 | 0.0611 | 0 | 0.7481 |
| | | AD5-5 | VR847 | 2/28 | 0.135 | 0.852 | 0 | 0.392 | 1.3790 |
| | | | | 5/4 | 0.194 | 0.799 | 0 | 0.302 | 1.2950 |
| | | | | 11/8 | 0.172 | 0.565 | 0.0535 | 0 | 0.7905 |
| Barron | BR3 | BR3-1 | BR279 | 5/15 | 0 | 0 | 0 | 0 | 0 |
| | | | | 11/1 | 0 | 0 | 0 | 0 | 0 |
| | | BR3-3 | BR281 | 5/15 | 0 | 0 | 0 | 0 | 0 |
| | | | | 11/1 | 0 | 0 | 0 | 0 | 0 |
| Dane | DN1 | DN1-1 | BR250 | 5/9 | 0 | 0 | 0 | 0 | 0 |
| | | | | 11/8 | 0 | 0 | 0 | 0 | 0 |
| | | DN1-3 | BR252 | 5/9 | 0 | 0 | 0 | 0 | 0 |
| | | | | 11/8 | 0 | 0 | 0.0607 | 0 | 0.0607 |
| Dunn | DU1 | DU1-1 | AO384 | 5/15 | 0 | 0 | 0.236 | 0 | 0.2360 |
| | | | | 11/1 | 0 | 0 | 0.219 | 0 | 0.2190 |
| | | DU1-3 | AO386 | 11/13 | 0 | 0 | 0.302 | 0 | 0.3020 |
| | DU2 | DU2-1 | AO387 | 5/15 | 0 | 0 | 0 | 0 | 0 |
| | | | | 11/1 | 0 | 0 | 0 | 0 | 0 |
| | | DU2-3 | AO389 | 5/15 | 0 | 0 | 0 | 0 | 0 |
| | | | | 11/1 | 0 | 0 | 0 | 0 | 0 |
| Grant | GR1 | GR1-1 | BR255 | 5/8 | 0 | 0 | 0 | 0 | 0 |
| | | | | 10/23 | 0 | 0 | 0.0626 | 0 | 0.0626 |
| | | GR1-3 | BR257 | 5/8 | 0 | 0 | 0.0719 | 0 | 0.0719 |
| | | | | 10/23 | 0 | 0 | 0.0925 | 0 | 0.0925 |
| Iowa | IW1 | IW1-4 | BR259 | 5/8 | 0 | 0 | 0 | 0 | 0 |
| | | | | 10/23 | 0 | 0 | 0 | 0 | 0 |
| | | IW1-7 | BH967 | 5/8 | 0 | 0.0564 | 0.0995 | 0.212 | 0.3679 |
| | | | | 10/23 | 0 | 0.0562 | 0.0893 | 0 | 0.1455 |
| | IW2 | IW2-1 | BR036 | 5/8 | 0 | 0 | 0 | 0 | 0 |
| | | | | 10/23 | 0 | 0 | 0 | 0 | 0 |
| | | IW2-3 | BR038 | 5/8 | 0 | 0 | 0 | 0 | 0 |
| | | | | 10/23 | 0 | 0 | 0 | 0 | 0 |
| Jackson | JK3 | JK3-1 | JH982 | 5/15 | 0 | 0 | 0 | 0 | 0 |
| | | | | 11/6 | 0 | 0 | 0 | 0 | 0 |
| | | JK3-2 | JH981 | 5/15 | 0 | 0 | 0 | 0 | 0 |
| | | | | 11/6 | 0 | 0 | 0 | 0 | 0 |
| Juneau | JN1 | JN1-1 | BR046 | 6/8 | 0 | 0 | 0 | 0 | 0 |
| | | | | 11/15 | 0 | 0 | 0 | 0 | 0 |
| | | JN1-3 | BR048 | 6/8 | 0 | 0.0589 | 0 | 0 | 0.0589 |
| | | | | 11/15 | 0 | 0.0532 | 0 | 0 | 0.0532 |
| | JN3 | JN3-1 | JH937 | 6/8 | 0 | 0 | 0 | 0 | 0 |
| | | | | 11/15 | 0 | 0 | 0 | 0 | 0 |
| | | JN3-2 | JH936 | 6/8 | 0 | 0 | 0 | 0 | 0 |
| | | | | 11/15 | 0 | 0 | 0 | 0 | 0 |
| La Crosse | LC2 | LC2-1 | VZ391 | 5/16 | 0 | 0.11 | 0 | 0 | 0.1100 |
| | | | | 11/6 | 0 | 0 | 0 | 0 | 0.0000 |
| | | LC2-2 | VZ392 | 5/16 | 0 | 0.155 | 0 | 0 | 0.1550 |
| | | | | 11/6 | 0 | 0.153 | 0 | 0 | 0.1530 |
| Langlade | LN1 | LN1-1 | BH964 | 5/23 | 0 | 0 | 0 | 0 | 0 |
| | | | | 10/30 | 0 | 0 | 0 | 0 | 0 |
| | | LN1-3 | BH966 | 5/23 | 0 | 0 | 0 | 0 | 0 |
| | | | | 10/30 | 0 | 0 | 0 | 0 | 0 |
| Portage | PR1 | PR1-1 | BR207 | 5/23 | 0 | 0 | 0 | 0 | 0 |
| | | | | 10/30 | 0 | 0 | 0 | 0 | 0 |
| | | PR1-2 | BR208 | 2/27 | 0 | 0.222 | 0 | 0 | 0.2220 |
| | | PR1-4 | VR848 | 2/27 | 0 | 0.0825 | 0 | 0 | 0.0825 |
| | | | | 5/23 | 0 | 0.0792 | 0 | 0 | 0.0792 |
| | | | | 10/30 | 0 | 0.0853 | 0 | 0 | 0.0853 |
| | | PR1-5 | VR849 | 2/27 | 0 | 0.103 | 0 | 0 | 0.1030 |
| | | | | 5/23 | 0 | 0.104 | 0 | 0 | 0.1040 |
| | | | | 10/30 | 0 | 0.105 | 0 | 0 | 0.1050 |
| St. Croix | SC1 | SC1-1 | JH938 | 5/15 | 0 | 0.0716 | 0 | 0.246 | 0.3176 |
| | | | | 11/13 | 0 | 0.0874 | 0.0659 | 0.332 | 0.4853 |
| | | SC1-2 | JH939 | 5/15 | 0 | 0.0519 | 0 | 0 | 0.0519 |
| | | | | 11/13 | 0 | 0.0596 | 0 | 0 | 0.0596 |
| Sauk | SK6 | SK6-1 | BB246 | 5/8 | 0 | 0 | 0 | 0 | 0 |
| | | | | 10/23 | 0 | 0 | 0 | 0 | 0 |
| | | SK6-3 | BB248 | 5/8 | 0 | 0 | 0 | 0 | 0 |
| | | | | 10/23 | 0 | 0 | 0 | 0 | 0 |
| Trempealeau | TR1 | TR1-1 | PX201 | 5/16 | 0 | 0 | 0 | 0 | 0 |
| | | | | 11/6 | 0 | 0 | 0 | 0 | 0 |
| | | TR1-2 | PX202 | 5/16 | 0 | 0 | 0 | 0.212 | 0.2120 |
| | | | | 11/6 | 0 | 0.143 | 0 | 0 | 0.1430 |
| Waupaca | WP2 | WP2-1 | JH985 | 5/23 | 0 | 0.134 | 0.0766 | 0.357 | 0.5676 |
| | | | | 10/30 | 0 | 0.225 | 0.0821 | 0.304 | 0.6111 |
| | | WP2-2 | JH984 | 5/23 | 0 | 0.0834 | 0.0521 | 0 | 0.1355 |
| | | | | 10/30 | 0 | 0.11 | 0.051 | 0 | 0.1610 |
| Waushara | WS4 | WS4-1 | BB258 | 5/31 | 0 | 0 | 0 | 0 | 0 |
| | | | | 10/25 | 0 | 0 | 0 | 0 | 0 |
| | | WS4-4 | BB261 | 10/25 | 0 | 0 | 0.0505 | 0 | 0.0505 |
| | WS6 | WS6-1 | JH989 | 5/31 | 0 | 0 | 0.181 | 0.216 | 0.3970 |
| | | | | 10/25 | 0 | 0 | 0.151 | 0 | 0.1510 |
| | | WS6-2 | JH990 | 5/31 | 0 | 0 | 0 | 0 | 0 |
| | | | | 10/25 | 0 | 0 | 0 | 0 | 0 |
| | WS7 (Hancock Agricultural Research Station) | WS7-1 | VR841 | 2/27 | 0 | 0 | 0 | 0 | 0 |
| | | | | 5/31 | 0 | 0 | 0 | 0 | 0 |
| | | | | 10/25 | 0 | 0 | 0 | 0 | 0 |
| | | WS7-2 | VR842 | 2/27 | 0 | 0 | 0 | 0 | 0 |
| | | | | 5/31 | 0 | 0 | 0 | 0 | 0 |
| | | | | 10/25 | 0 | 0 | 0 | 0 | 0 |
| | | WS7-3 | VR843 | 2/27 | 0.124 | 0.217 | 0.111 | 0 | 0.4520 |
| | | | | 5/31 | 0.131 | 0.185 | 0.138 | 0 | 0.4540 |
| | | | | 10/25 | 0.119 | 0.219 | 0.191 | 0 | 0.5290 |

Notes:

Concentrations identified as micrograms per liter or parts per billion.
TCR Total Chlorinated Residue for Atrazine. Reflects an additive quantity of atrazine and its three metabolites (de-ethyl, de-isopropyl and di-amino atrazine).
WUWN Wisconsin Unique Well Number
µg/L Micrograms per liter or parts per billion.
0 Concentration does not exceed laboratory reporting limit of 0.05 µg/L.
Site is located within an atrazine Prohibition Area.
Detected concentration exceeds the Wisconsin Administrative Code ch. NR 140 Preventive Action Limit of 0.3 µg/L.

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# Table 10

## Field-Edge Groundwater Monitoring Program
## 2018 Nitrogen - Nitrate/Nitrite Concentrations in Groundwater Samples

| COUNTY | SITE (Grower) | WELL IDENTIFICATION | WUWN | SAMPLE DATE (2018) | TOTAL NITROGEN (in mg/L) |
|---|---|---|---|---|---|
| Adams | AD2 | AD2-1 | BH954 | 2/28 | 4.07 |
| | | | | 5/4 | 2.93 |
| | | | | 10/16 | 7.85 |
| | | AD2-4 | VR844 | 2/28 | 35.4 |
| | | | | 5/4 | 41.2 |
| | | | | 10/16 | 39.5 |
| | | AD2-5 | VR845 | 2/28 | 26.4 |
| | | | | 5/4 | 27.8 |
| | | | | 10/16 | 23.5 |
| | AD3 | AD3-1 | BH999 | 5/4 | 23.5 |
| | | | | 10/16 | 28.5 |
| | | AD3-3 | BI001 | 5/4 | 21.3 |
| | | | | 10/16 | 30.9 |
| | AD4 | AD4-1 | BH996 | 10/16 | 19.6 |
| | | AD4-2 | BH997 | 5/4 | 36 |
| | AD5 | AD5-1 | CL461 | 2/28 | 0 |
| | | | | 5/4 | 3.83 |
| | | | | 11/8 | 0 |
| | | AD5-4 | VR846 | 2/28 | 27.6 |
| | | | | 5/4 | 30 |
| | | | | 11/8 | 32.4 |
| | | AD5-5 | VR847 | 2/28 | 24 |
| | | | | 5/4 | 31.6 |
| | | | | 11/8 | 36.3 |
| Barron | BR3 | BR3-1 | BR279 | 5/15 | 2.46 |
| | | | | 11/1 | 1.41 |
| | | BR3-3 | BR281 | 5/15 | 7.66 |
| | | | | 11/1 | 4.84 |
| Dane | DN1 | DN1-1 | BR250 | 5/9 | 3.85 |
| | | | | 11/8 | 1.59 |
| | | DN1-3 | BR252 | 5/9 | 22.7 |
| | | | | 11/8 | 20.9 |
| Dunn | DU1 | DU1-1 | AO384 | 5/15 | 21.2 |
| | | | | 11/1 | 16.6 |
| | | DU1-3 | AO386 | 11/13 | 20.9 |
| | DU2 | DU2-1 | AO387 | 5/15 | 8.21 |
| | | | | 11/1 | 8.75 |
| | | DU2-3 | AO389 | 5/15 | 0.732 |
| | | | | 11/1 | 0.934 |
| Grant | GR1 | GR1-1 | BR255 | 5/8 | 29 |
| | | | | 10/23 | 26.9 |
| | | GR1-3 | BR257 | 5/8 | 35.2 |
| | | | | 10/23 | 32.6 |
| Iowa | IW1 | IW1-4 | BR259 | 5/8 | 16.7 |
| | | | | 10/23 | 5.04 |
| | | IW1-7 | BH967 | 5/8 | 27.2 |
| | | | | 10/23 | 27.2 |
| | IW2 | IW2-1 | BR036 | 5/8 | 0.74 |
| | | | | 10/23 | 0 |
| | | IW2-3 | BR038 | 5/8 | 26.2 |
| | | | | 10/23 | 28 |
| Jackson | JK3 | JK3-1 | JH982 | 5/15 | 4.11 |
| | | | | 11/6 | 3.41 |
| | | JK3-2 | JH981 | 5/15 | 4.22 |
| | | | | 11/6 | 3.62 |
| Juneau | JN1 | JN1-1 | BR046 | 6/8 | 8.18 |
| | | | | 11/15 | 6.33 |
| | | JN1-3 | BR048 | 6/8 | 28.4 |
| | | | | 11/15 | 24.7 |
| | JN3 | JN3-1 | JH937 | 6/8 | 6.22 |
| | | | | 11/15 | 2.91 |
| | | JN3-2 | JH936 | 6/8 | 2.02 |
| | | | | 11/15 | 0 |
| La Crosse | LC2 | LC2-1 | VZ391 | 5/16 | 21.3 |
| | | | | 11/6 | 23.3 |
| | | LC2-2 | VZ392 | 5/16 | 24.1 |
| | | | | 11/6 | 21.8 |
| Langlade | LN1 | LN1-1 | BH964 | 5/23 | 1.28 |
| | | | | 10/30 | 12.2 |
| | | LN1-3 | BH966 | 5/23 | 18.4 |
| | | | | 10/30 | 16.1 |
| Portage | PR1 | PR1-1 | BR207 | 5/23 | 11.9 |
| | | | | 10/30 | 4.51 |
| | | PR1-2 | BR208 | 2/27 | 29 |
| | | PR1-4 | VR848 | 2/27 | 21.4 |
| | | | | 5/23 | 22.7 |
| | | | | 10/30 | 22.6 |
| | | PR1-5 | VR849 | 2/27 | 21.3 |
| | | | | 5/23 | 25.5 |
| | | | | 10/30 | 24.6 |
| St. Croix | SC1 | SC1-1 | JH938 | 5/15 | 7.92 |
| | | | | 11/13 | 9.62 |
| | | SC1-2 | JH939 | 5/15 | 13.5 |
| | | | | 11/13 | 15 |
| Sauk | SK6 | SK6-1 | BB246 | 5/8 | 24.7 |
| | | | | 10/23 | 16.8 |
| | | SK6-3 | BB248 | 5/8 | 33.6 |
| | | | | 10/23 | 25.7 |
| Trempealeau | TR1 | TR1-1 | PX201 | 5/16 | 27.1 |
| | | | | 11/6 | 28.8 |
| | | TR1-2 | PX202 | 5/16 | 29.1 |
| | | | | 11/6 | 22.4 |
| Waupaca | WP2 | WP2-1 | JH985 | 5/23 | 7.74 |
| | | | | 10/30 | 9.38 |
| | | WP2-2 | JH984 | 5/23 | 4.72 |
| | | | | 10/30 | 6.19 |
| Waushara | | WS4-1 | BB258 | 5/31 | 36.2 |
| | | | | 10/25 | 20.6 |
| | | WS4-4 | BB261 | 10/25 | 24.8 |
| | WS6 | WS6-1 | JH989 | 5/31 | 10 |
| | | | | 10/25 | 24.8 |
| | | WS6-2 | JH990 | 5/31 | 0.881 |
| | | | | 10/25 | 1.49 |
| | WS7 (Hancock Agricultural Research Station) | WS7-1 | VR841 | 2/27 | 13.7 |
| | | | | 5/31 | 14.3 |
| | | | | 10/25 | 11.5 |
| | | WS7-2 | VR842 | 2/27 | 13.3 |
| | | | | 5/31 | 16.5 |
| | | | | 10/25 | 11.7 |
| | | WS7-3 | VR843 | 2/27 | 33.5 |
| | | | | 5/31 | 41.9 |
| | | | | 10/25 | 42.1 |

Notes:

WUWN Wisconsin Unique Well Number
mg/L Milligrams per liter or parts per million
0 Concentration does not exceed laboratory reporting limit of 0.5 mg/L.
Detected concentration exceeds the Wisconsin Administrative Code ch. NR 140 Preventive Action Limit of 2.0 mg/L.
Detected concentration exceeds the Wisconsin Administrative Code ch. NR 140 Enforcement Standard of 10.0 mg/L.

# APPENDIX B

## Report Figures