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EMERGENT CONTAMINANT SCREENING IN PRIVATE POTABLE WELLS

DOOR COUNTY

Spring & Fall 2024

Prepared for: Door County Board of Supervisors
January 28, 2024



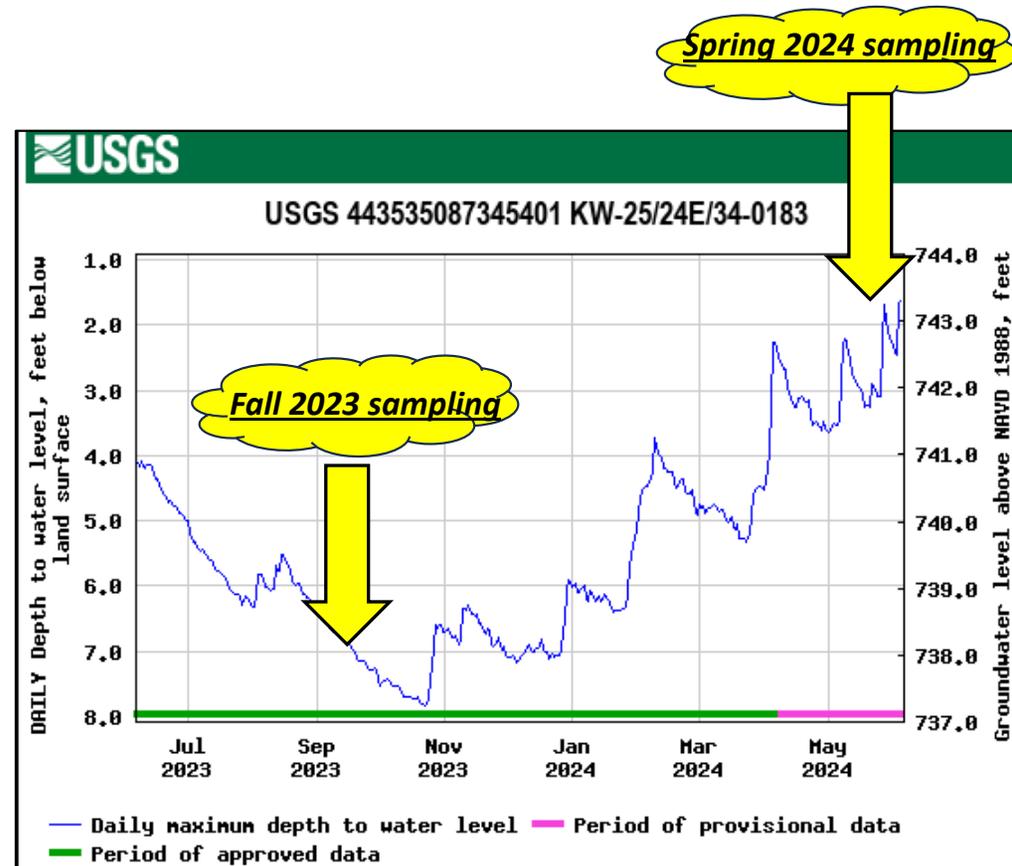
Sheryl I. Stephenson, P.G.

Spring 2024 Well Selection

- Broad Sweep:** Resample Fall 2023 wells to capture recharge
 - Personal Care Product and Pharmaceuticals (PCPP)
 - Microplastics
 - N+P Pesticides
- Localized Sampling:** Sample additional wells in areas of select Fall 2023 detections
 - Arsenic > 10 ug/L (1 area)
 - Nitrate > 8 mg/L (3 areas)
 - PFAS > 1 ng/L (4 areas)

UWGB collaboration

- Hydrogen v oxygen isotope samples
- Isoscape maps of NE WI aquifers
- MVT Mineralization Evaluation





Spring 2024 Sampling

- **PFAS (96 samples)**
- **Nitrate (95 samples)**
- **Arsenic (63 samples)**
- **Bacteria (68 samples)**
- **DACT Screen (76 samples)**
- **Personal Care Products and Pharmaceuticals (10 samples)**
- **Microplastics (10 samples)**

- **Chloride: 84 wells sampled → No ES exceedances**
- **VOCs: 33 samples → 1 detection (same as Fall 2023)**
- **PAHs: 7 samples (Fall 2023 detections) → No detections**
- **N+P Pesticides: 3 samples (Fall 2023 DACT detections) → No detections**

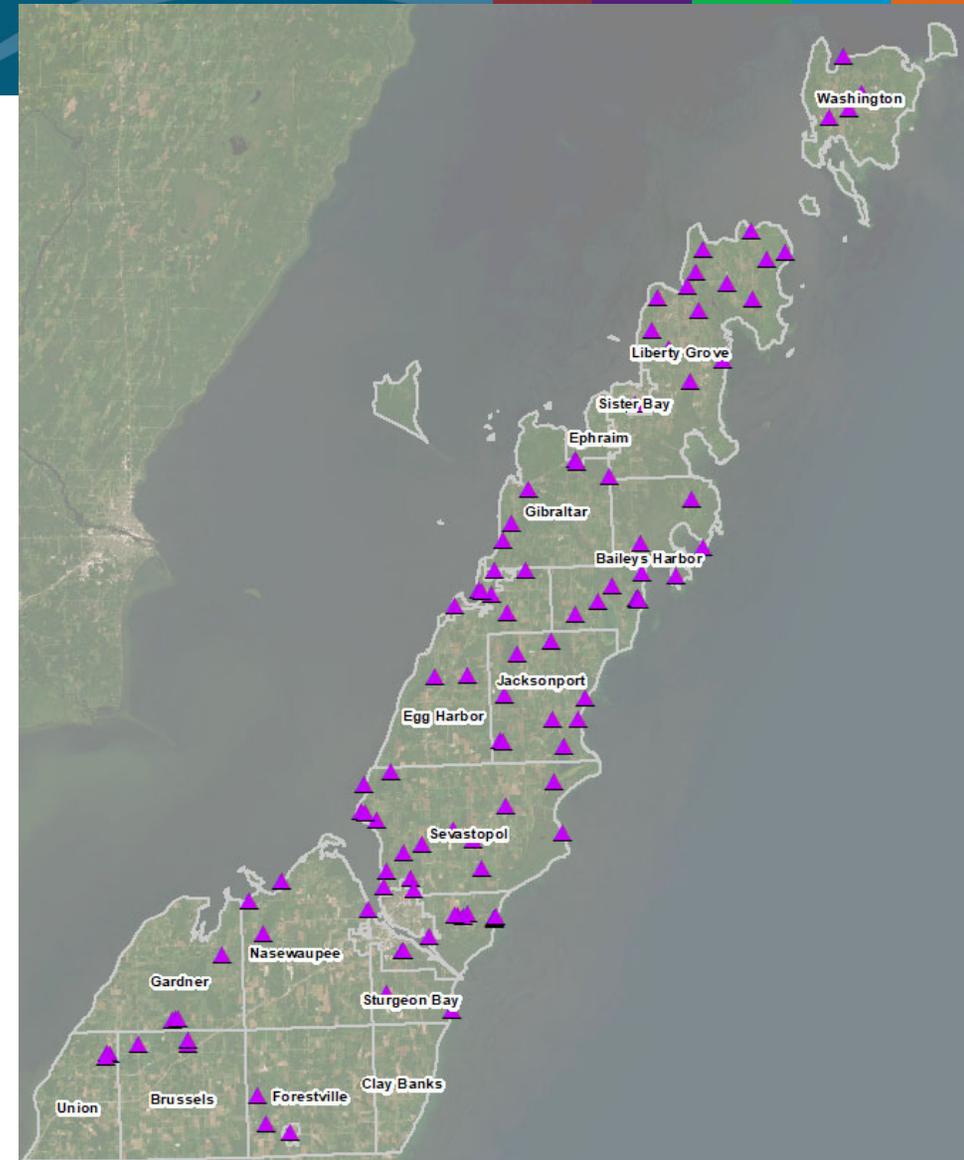


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Spring 2024 Sampling

103 selected (sampled 6/3/24 - 6/7/2024)

MUNICIPALITY	NO. OF WELLS	MUNICIPALITY	NO. OF WELLS
CLAY BANKS	0	EGG HARBOR	9
FORESTVILLE	3	JACKSONPORT	9
BRUSSELS	3	BAILEYS HARBOR	13
UNION	3	GIBRALTAR	4
GARDNER	4	EPHRAIM	2
NASEWAUPEE	4	SISTER BAY	1
STURGEON BAY	13	LIBERTY GROVE	14
SEVASTOPOL	17	WASHINGTON	4



Spring 2024 Sampling Protocol

- Same sampling methodology as Fall 2023
- 2 teams of 2 – clean hands / dirty hands
- Prescheduled appointments
- Localized Sampling – mailers & door to door calls



GZA Request for Groundwater Sampling

Free Groundwater Sampling available till 6/7/24

If interested, see contact information on attached Flyer



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ENVIRONMENTAL
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WATER
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17925 West Sarah Lane
Suite 100
Brookfield, WI 53045
T: 262-754-2560
F: 262-923-7758
www.gza.com

April 4, 2024
File No. 20.0158368.00

Re: Private Potable Well Sampling Request

Dear Homeowner:

On behalf of the Door County Soil and Water Conservation Department, GZA GeoEnvironmental, Inc. (GZA) is conducting a multi-year, County-wide screening of emerging contaminants in private wells. Based on the results of the initial groundwater samples collected in Fall 2023, GZA is interested in sampling your private well in Spring 2024, to further evaluate the distribution of low-level contaminants in your area. The sampling process takes less than 15 minutes and can be performed from the outside spigot if you are not available. After receipt of the analytical results, GZA will issue you a copy of your sample results via both regular and electronic mail.

If you are interested in participating in the emerging contaminant sampling program, please contact Sheryl Stephenson as soon as possible at sheryl.stephenson@gza.com or 262-202-1716. Additionally, if you know your well Unique Well ID code and/or well depth, please provide us with that information.

Thank you for your consideration in participating in this important study.

Very truly yours,

GZA GeoEnvironmental, Inc.

Sheryl I. Stephenson, P.G.
Project Hydrogeologist

James F. Drought, P.H.
Principal Hydrogeologist

I:\158302\158399\158368 Door City\Report\Mailing - Private Well Sampling Request - 4-4-24;
FINAL 20.0158368.00 Private Well Sampling Request - 4-4-24.docx





Interpretation of Results

- PFAS results are compared to USEPA's National Primary Drinking Water Regulations (NPDWR)
 - PFOS and PFOA: **4 ng/l**
 - PFHXS, PFNA, HFPO-DA (Gen X): **10 ng/l**
 - Hazard index of **1.0** for mixture of 2 or more (PFHxS, PFNA, HFPO-DA, and PFBS)
- Remaining analyte results are compared to WAC Chapter NR 140 Groundwater Quality Standards
 - **ES** = maximum allowable concentration in groundwater/cleanup goal
 - **PAL** = % of ES, used in facility design
 - Values pertain to regulated facilities but serve as a reference for groundwater quality



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Results – PFAS

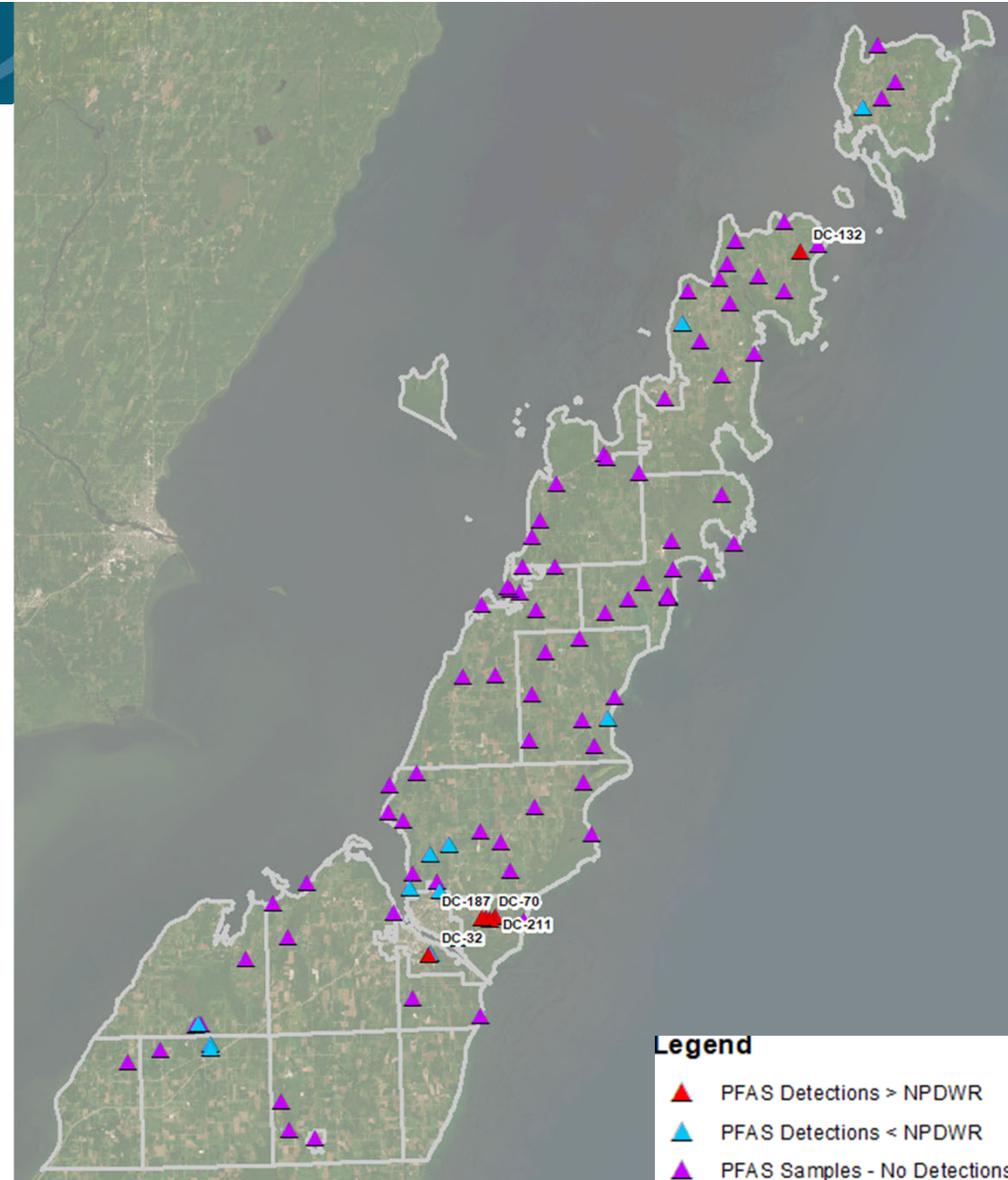
- 96 wells sampled
- 18 wells with detections
- 12 wells with detections < NPDWR
- 6 wells with detections > NPDWR

Spring 2024

Sample ID	Well Depth (ft)	PFOA	PFOS	PFHxS	PFNA	Gen X	Units
		4	4	10	10	10	
DC-32	-	2.4	4.7	13.5	ND	ND	ng/L
DC-70	262	14.5	4	31	ND	ND	ng/L
DC-187	242	60.3	28.7	76.4	0.5	ND	ng/L
DC-211	99	0.63	7.3	0.76	ND	ND	ng/L
DC-212	300	9.2	2.8	20.6	ND	ND	ng/L
DC-132	260	4.7	ND	ND	ND	ND	ng/L

Red bold text = NPDWR exceedance
ND = non-detect

ng/L = nanograms per liter





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Results - Nitrate

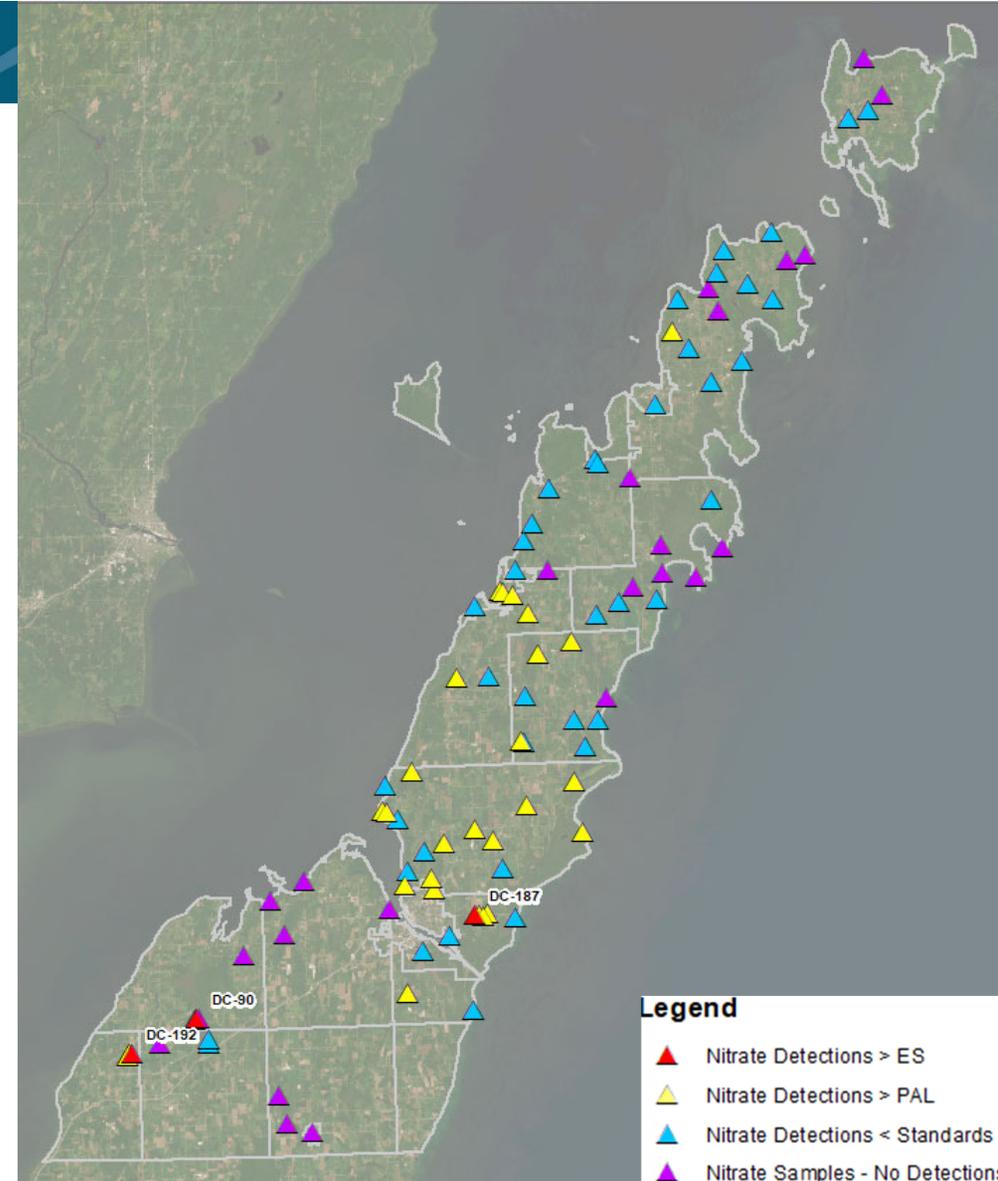
- 95 wells sampled
- 71 wells with detections
- ND – 12.5 mg/L

- 41 wells with detection < standards
- 27 wells with detections > PAL
- 3 wells with detections > ES

Spring 2024

Sample ID	Well Depth (ft)	Nitrate	NR140 PAL	NR140 ES	Units
DC-90	-	12.5	1	10	mg/l
DC-187	-	11.5	1	10	mg/l
DC-192	130	10.1	1	10	mg/l

Red bold text = ES exceedance
mg/L = milligrams per liter





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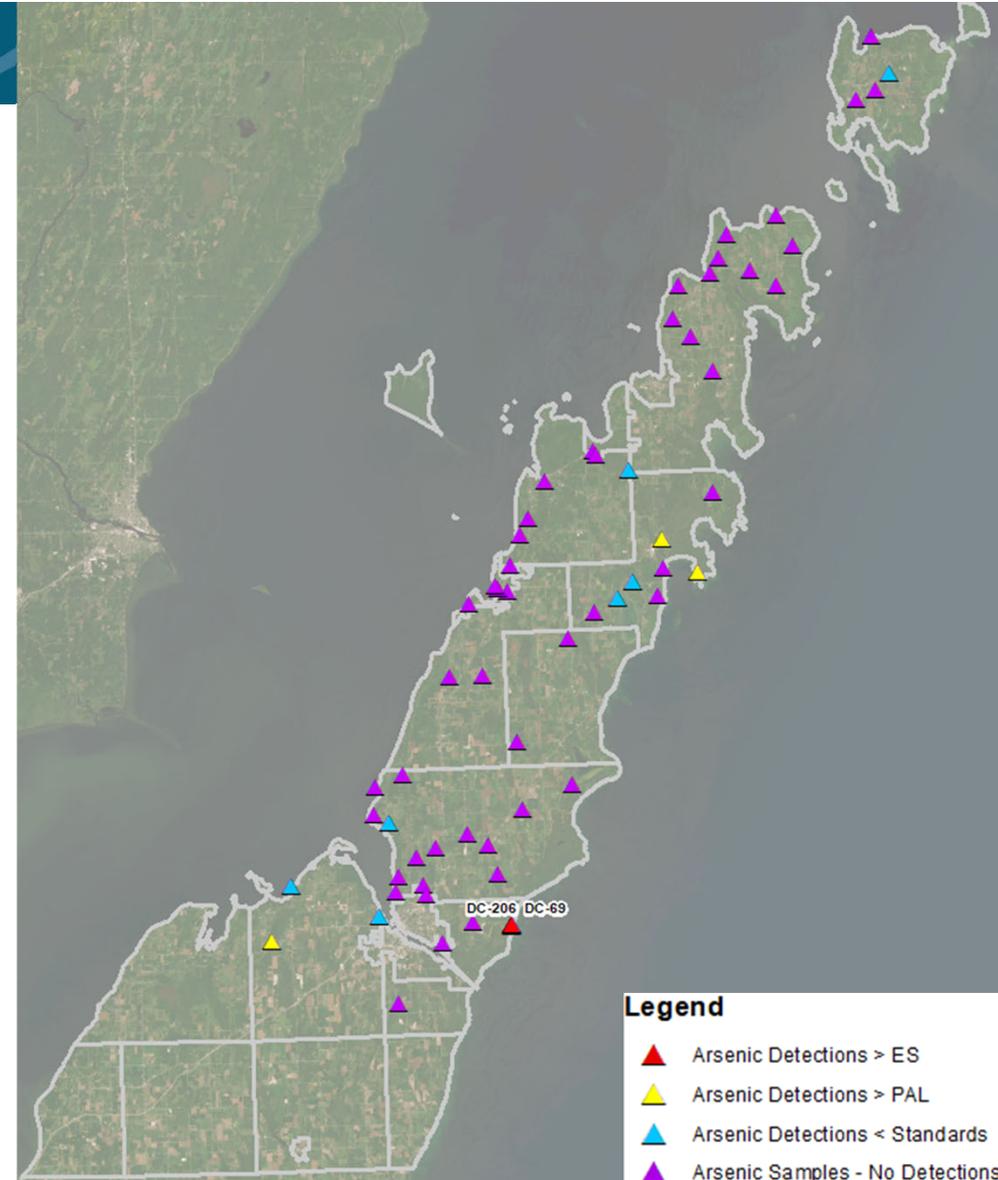
Results - Arsenic

- 63 wells sampled
- 12 wells with detections
- ND – 27 ug/L
- 7 wells with detection < standards
- 4 wells with detections >PAL
- 1 well (2 samples) with detections >ES

Spring 2024

Sample ID	Well Depth (ft)	Arsenic	NR140 PAL	NR140 ES	Units
DC-69	-	25.1	1	10	ug/l
DC-206	-	27	1	10	ug/l

Red bold text = ES exceedance
ug/L = micrograms per per liter





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Results - Bacteria

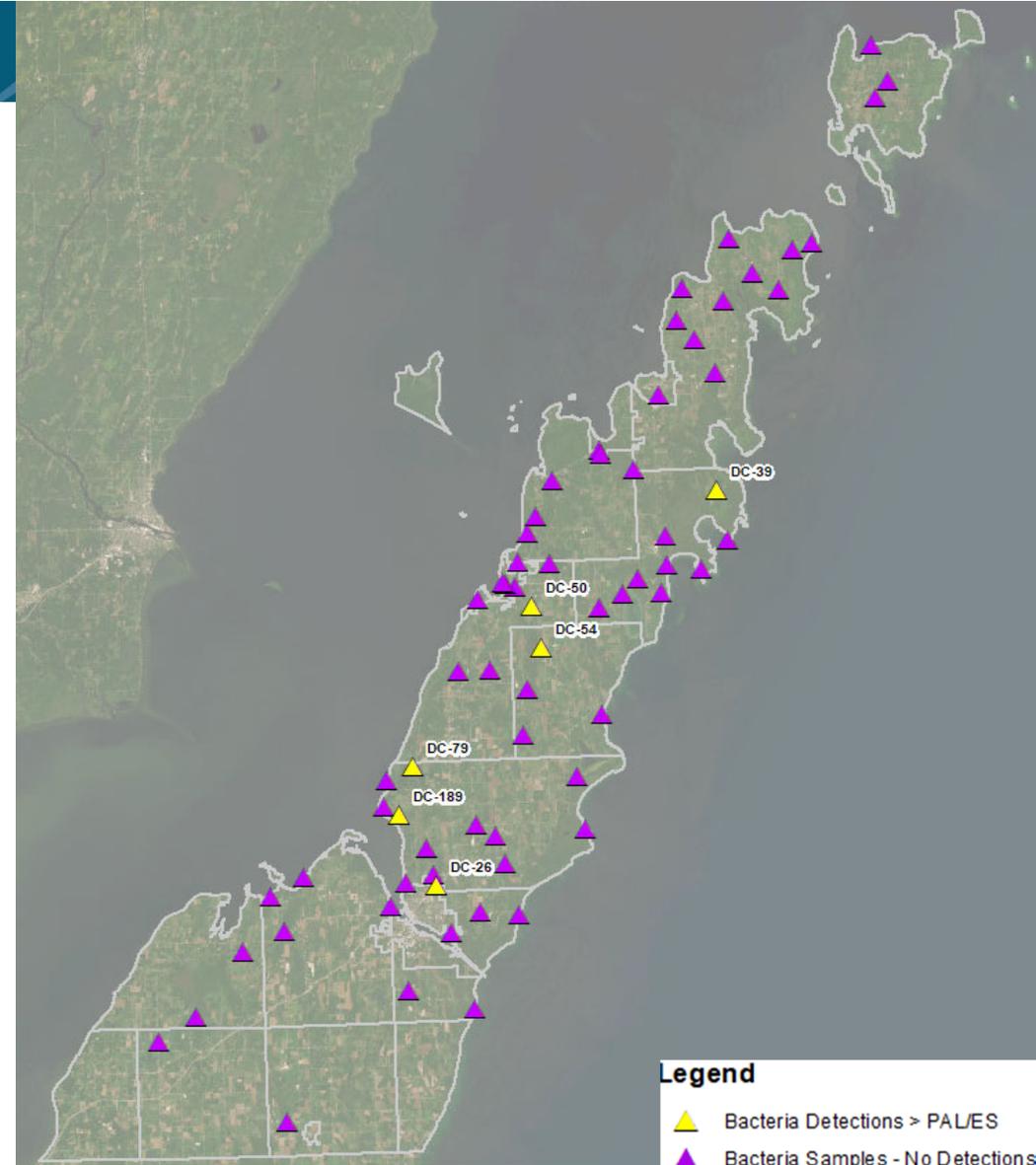
- 68 wells sampled
- 6 wells with detections
- Coliform= ND - 165.8 MPN
- E-coli = ND – 8.6 MPN

Spring 2024

Sample ID	Well Depth (ft)	Coliform	E-Coli	NR140 PAL	NR140 ES	Units
DC-54	242	4.1	<1	0	0	MPN
DC-26	260	1	<1	0	0	MPN
DC-50	202	3.1	2	0	0	MPN
DC-79	283	1	<1	0	0	MPN
DC-189	242	3.1	8.6	0	0	MPN
DC-39	241	165.8	<1	0	0	MPN

Red bold text = ES exceedance

MPN = most probably number



Results – DACT Screen

- Diaminochlorotriazine (breakdown of Atrazine)
- 76 wells sampled
- 3 wells with detections
- ND – 0.33 ug/L

- 1 well with detection > PAL

Spring 2024

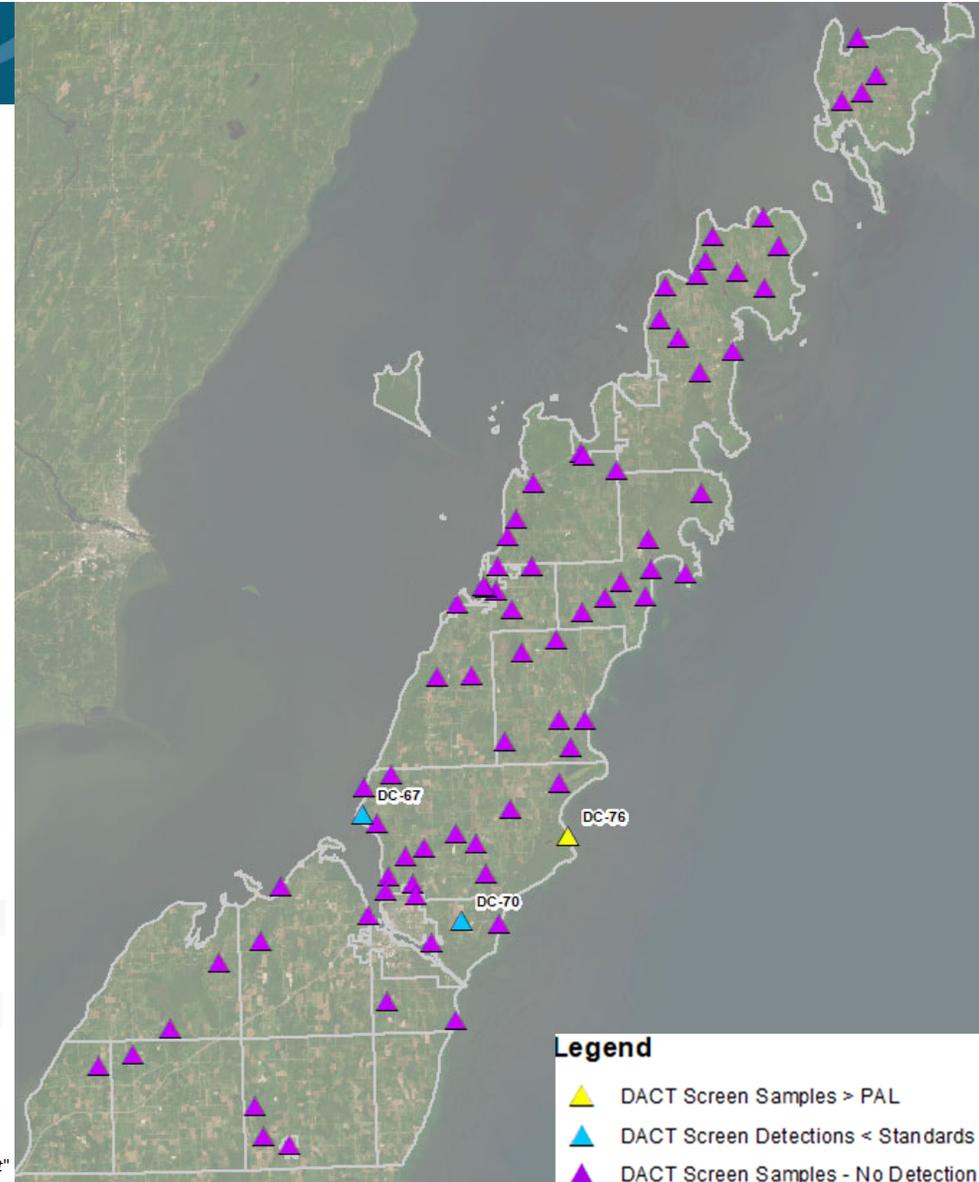
Sample ID	Well Depth (ft)	DACT Screen	NR140 PAL	NR140 ES	Units
DC-67	261	0.11	0.3	3	ug/L
DC-76	263	<i>0.33</i>	0.3	3	ug/L
DC-70	262	0.17	0.3	3	ug/L

Black italicized text = PAL exceedance
 ug/L = micrograms per per liter

IF YOUR DACT SCREEN IS –

- LESS THAN 0.1 µg/l – NO TRIAZINE HERBICIDES WERE DETECTED IN YOUR WATER SAMPLE.
- 0.1 TO 1.0 µg/l, TRIAZINE HERBICIDES WERE DETECTED BUT IT IS UNLIKELY THAT YOUR WATER EXCEEDS THE 3.0 µg/l TOTAL ATRAZINE STANDARD.
- 1.0 TO 2.0 µg/l, THERE IS A CHANCE THAT YOUR WATER SUPPLY EXCEEDS THE 3.0 µg/l TOTAL ATRAZINE STANDARD.
- GREATER THAN 2.0 µg/l, IT IS LIKELY THAT YOUR WATER SUPPLY EXCEEDS THE 3.0 µg/l TOTAL ATRAZINE STANDARD.
- GREATER THAN 3.0 µg/l, IT IS HIGHLY LIKELY THAT YOUR WATER SUPPLY EXCEEDS THE 3.0 µg/l TOTAL ATRAZINE STANDARD.

UW-Stevens Point "Interpreting your DACT Screening Result"





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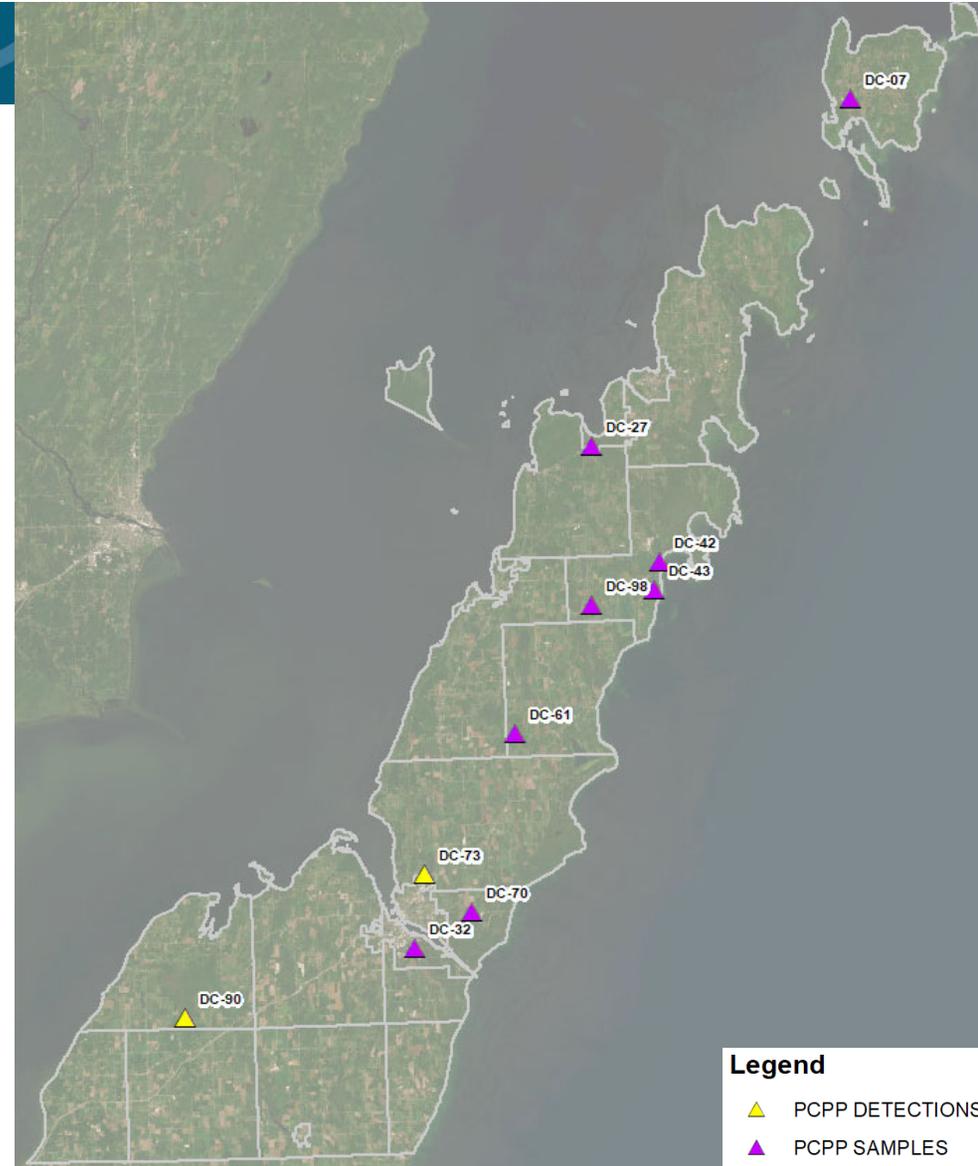
Results - PCPP

- 10 wells sampled
- 2 wells with detections

Spring 2024

Sample ID	Well Depth (ft)	Sucralose	Acesulfame	Sulfamethoxazole	Units
DC-90	-	3451.3	262.57	3.7	ng/L
DC-73	-	448.42	22.04	23.7	ng/L

ng/L = nanograms per liter





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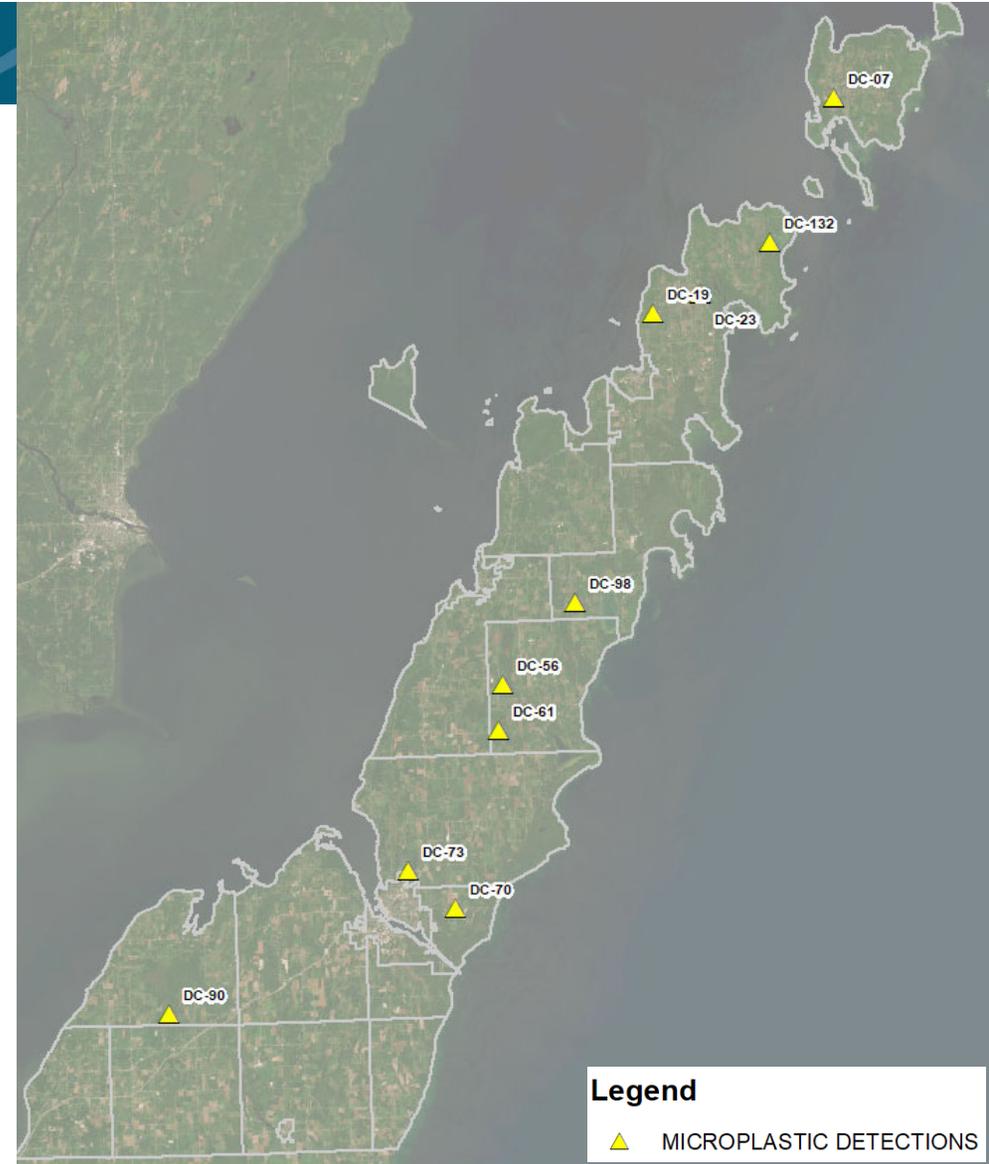
Results - Microplastics

- 10 wells sampled
- 10 wells with detections
- 36.12 – 4,548.12 MPP/L

Spring 2024

Sample ID	Well Depth (ft)	Total Microplastics	Units
DC-73	-	36.12	MPP/L
DC-61	-	48.16	MPP/L
DC-56	221	300.98	MPP/L
DC-98	241	254.16	MPP/L
DC-70	262	46.82	MPP/L
DC-90	-	535.07	MPP/L
DC-23	240	341.11	MPP/L
DC-19	242	157.85	MPP/L
DC-07	182	117.72	MPP/L
DC-132	260	4,548.12	MPP/L

MPP/L = Microplastic particles per liter





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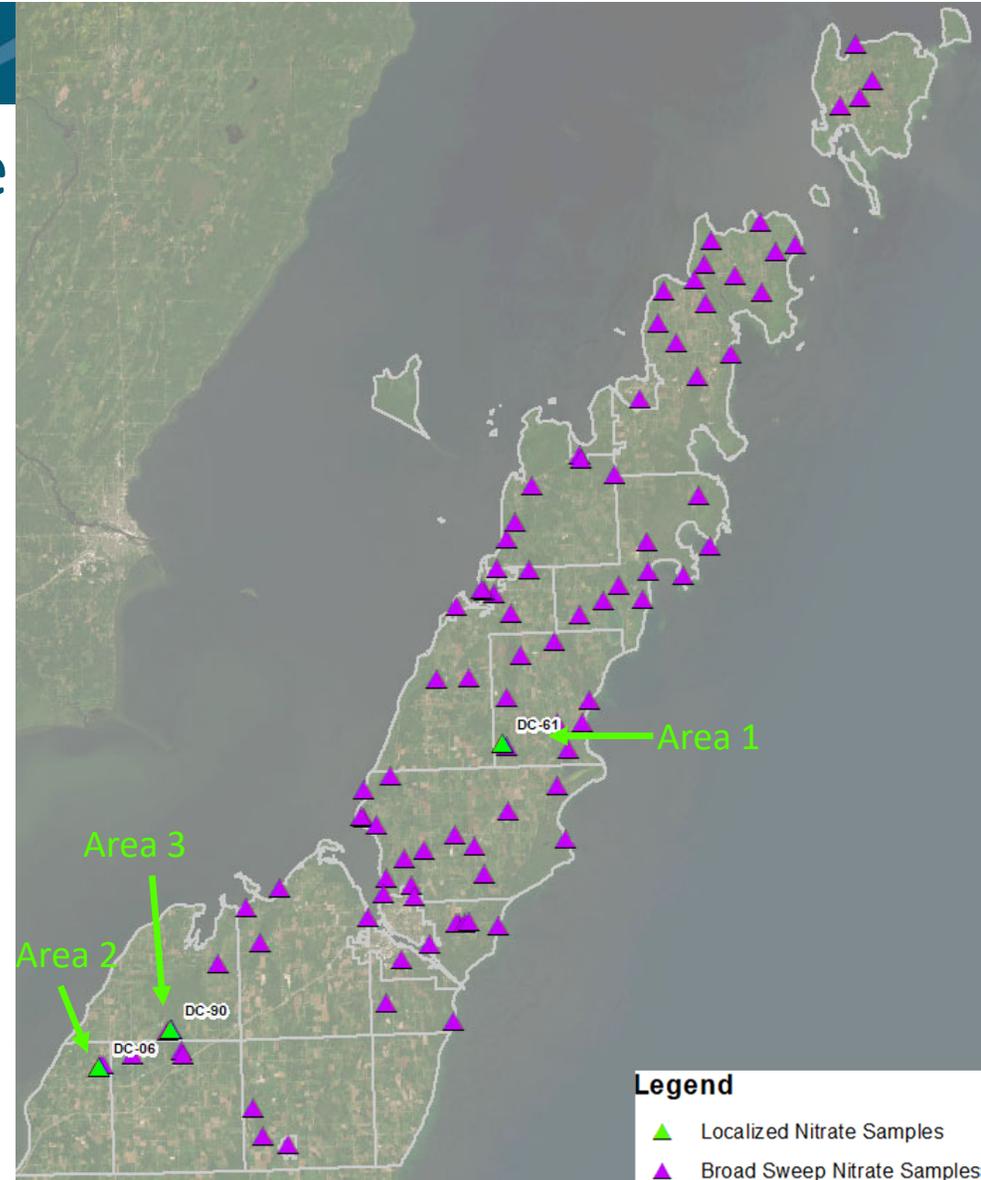
Localized Sampling Results - Nitrate

- 10/95 wells sampled for localized sampling in three areas

Fall 2023

Sample ID	Well Depth (ft)	Nitrate	NR140 PAL	NR140 ES	Units
DC-90	-	13.8	<i>2</i>	<i>10</i>	mg/l
DC-61	-	10.2	<i>2</i>	<i>10</i>	mg/l
DC-06	140	9	<i>2</i>	<i>10</i>	mg/l

Red bold text = ES exceedance
Black italicized text = PAL exceedance
Mg/L = milligrams per liter





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Localized Sampling Results - Nitrate

Area 1 (DC-61)

- 2 wells sampled
- 1 wells with detections > PAL

Fall 2023

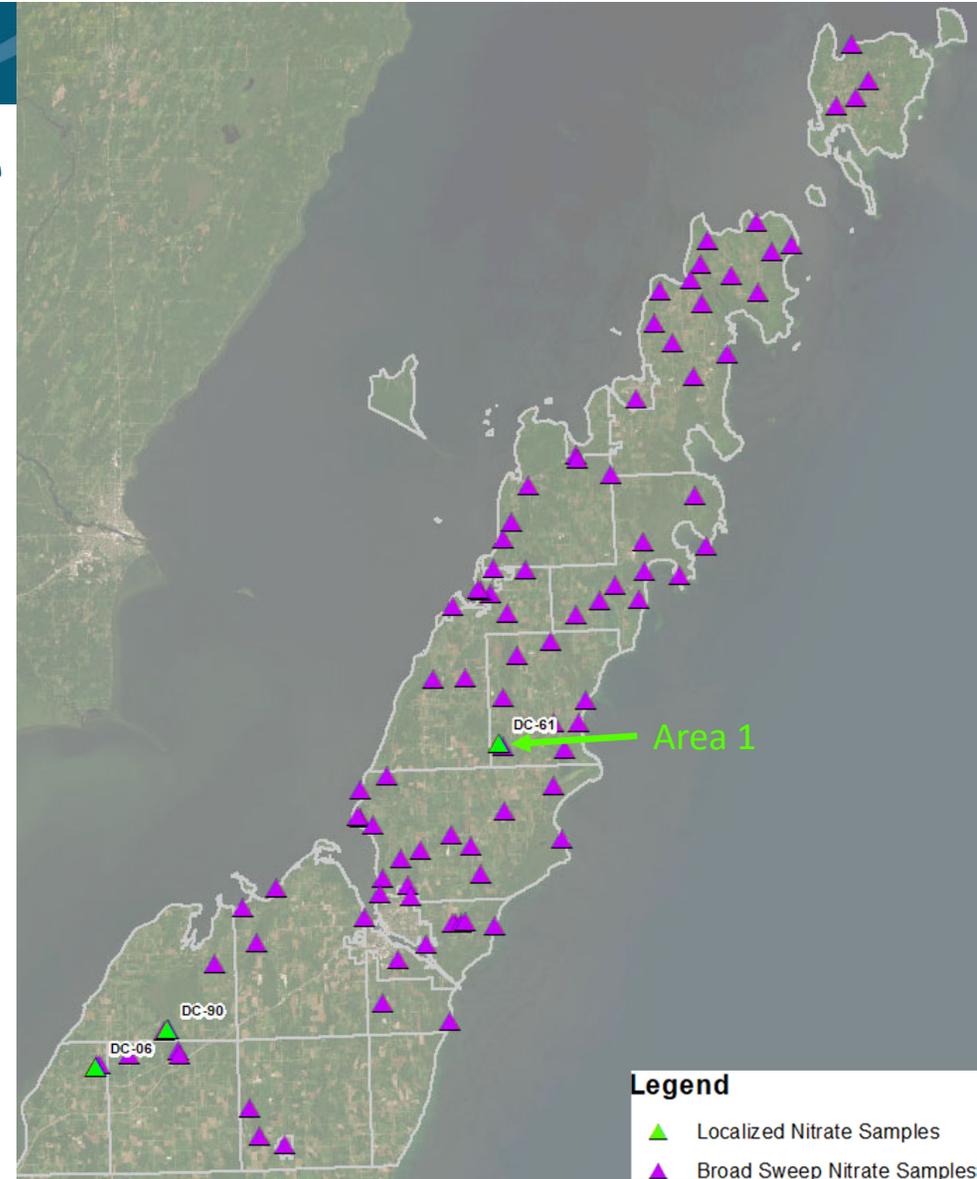
Sample ID	Well Depth (ft)	Nitrate	NR140 PAL	NR140 ES	Units
DC-61	-	10.2	2	10	mg/l

Spring 2024

Sample ID	Well Depth (ft)	Nitrate	NR140 PAL	NR140 ES	Units
DC-61	-	3.4	2	10	mg/l
DC-202	-	<i>0.53</i>	2	10	mg/l

Red bold text = ES exceedance
 Black italicized text = PAL exceedance
 Mg/L = milligrams per liter

- DC-202 is downgradient



Localized Sampling Results - Nitrate

Area 2 (DC-06)

- 3 wells sampled
- 1 well with detections > PAL

Fall 2023

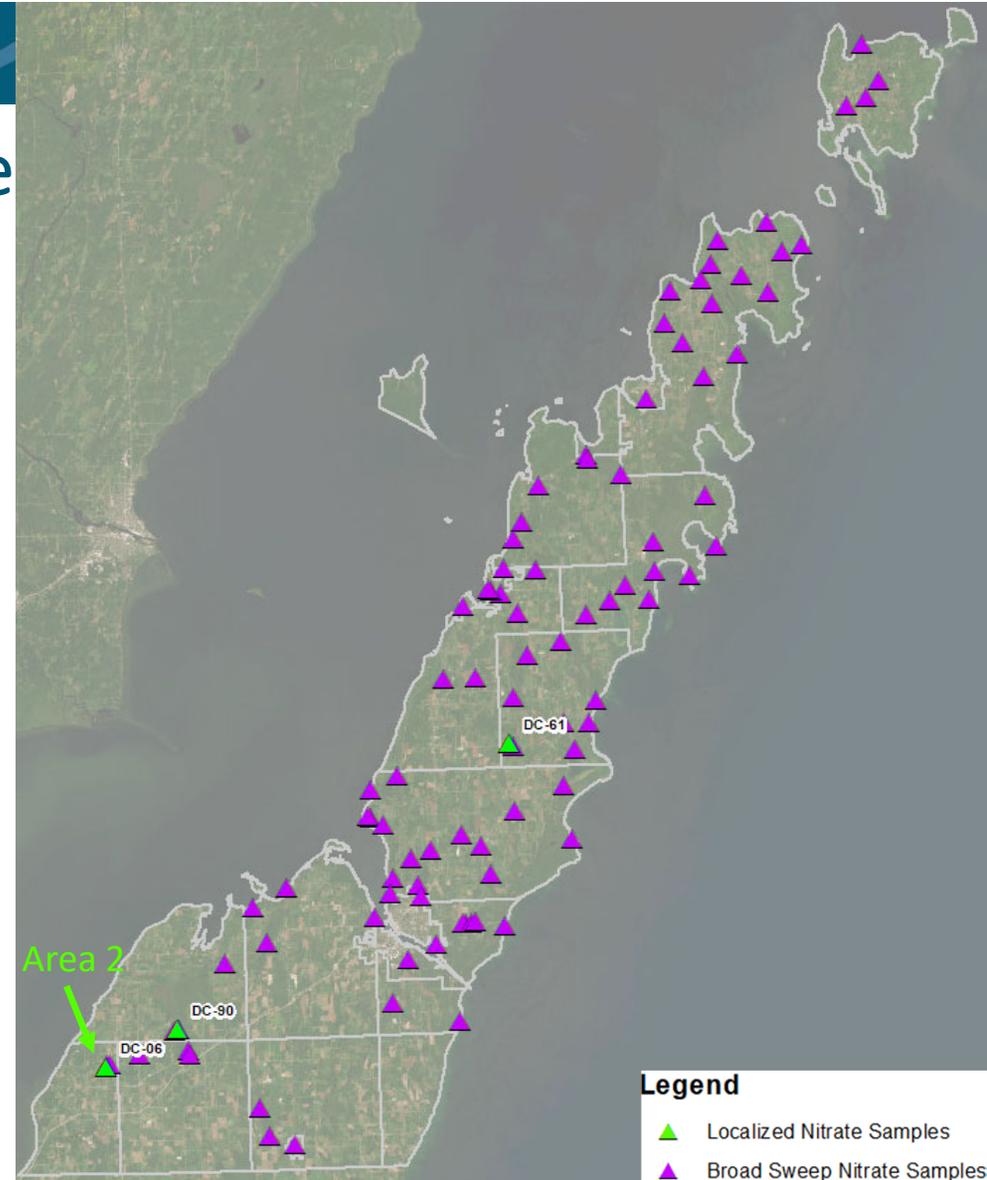
Sample ID	Well Depth (ft)	Nitrate	NR140 PAL	NR140 ES	Unit
DC-06	140	9	2	10	mg/l

Spring 2024

Sample ID	Well Depth (ft)	Nitrate	NR140 PAL	NR140 ES	Unit
DC-06	140	7.7	2	10	mg/l
DC-190	142	8.3	2	10	mg/l
DC-192	130	11.5	2	10	mg/l

Red bold text = ES exceedance
Mg/L = milligrams per liter

- All 3 wells are downgradient of large agricultural field
- DC-192 – previous elevated nitrate (UW-Oshkosh)





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Localized Sampling Results - Nitrate

Area 3 (DC-90)

- 5 wells sampled
- 1 well with detections > ES

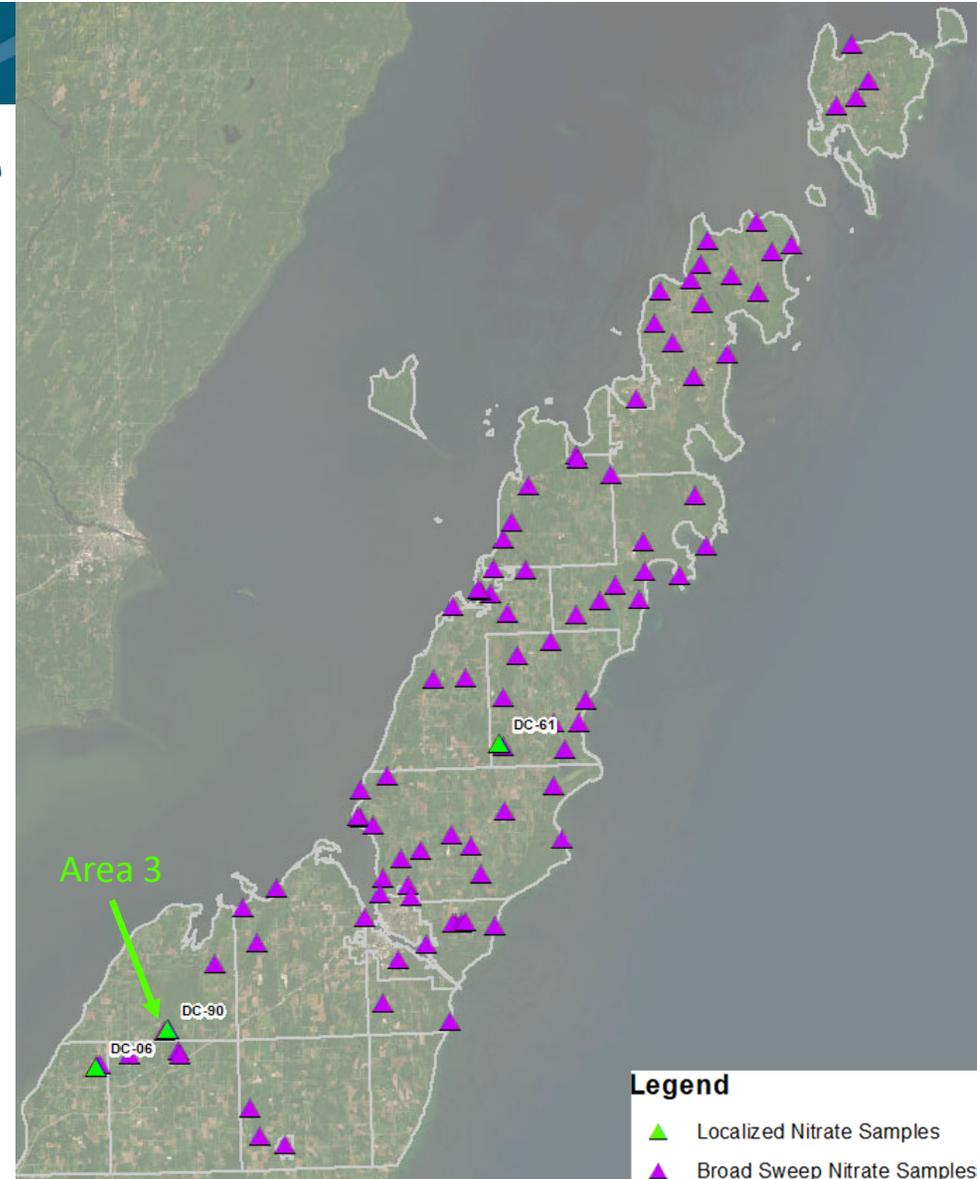
Fall 2023

Sample ID	Well Depth (ft)	Nitrate	NR140 PAL	NR140 ES	Unit
DC-90	-	13.1	2	10	mg/l

Spring 2024

Sample ID	Well Depth (ft)	Nitrate	NR140 PAL	NR140 ES	Unit
DC-90	-	12.5	2	10	mg/l
DC-196	220	1.9	2	10	mg/l
DC-195	203	1.7	2	10	mg/l
DC-194	-	0.98	2	10	mg/l
DC-193	-	ND	2	10	mg/l

Red bold text = ES exceedance
Mg/L = milligrams per liter



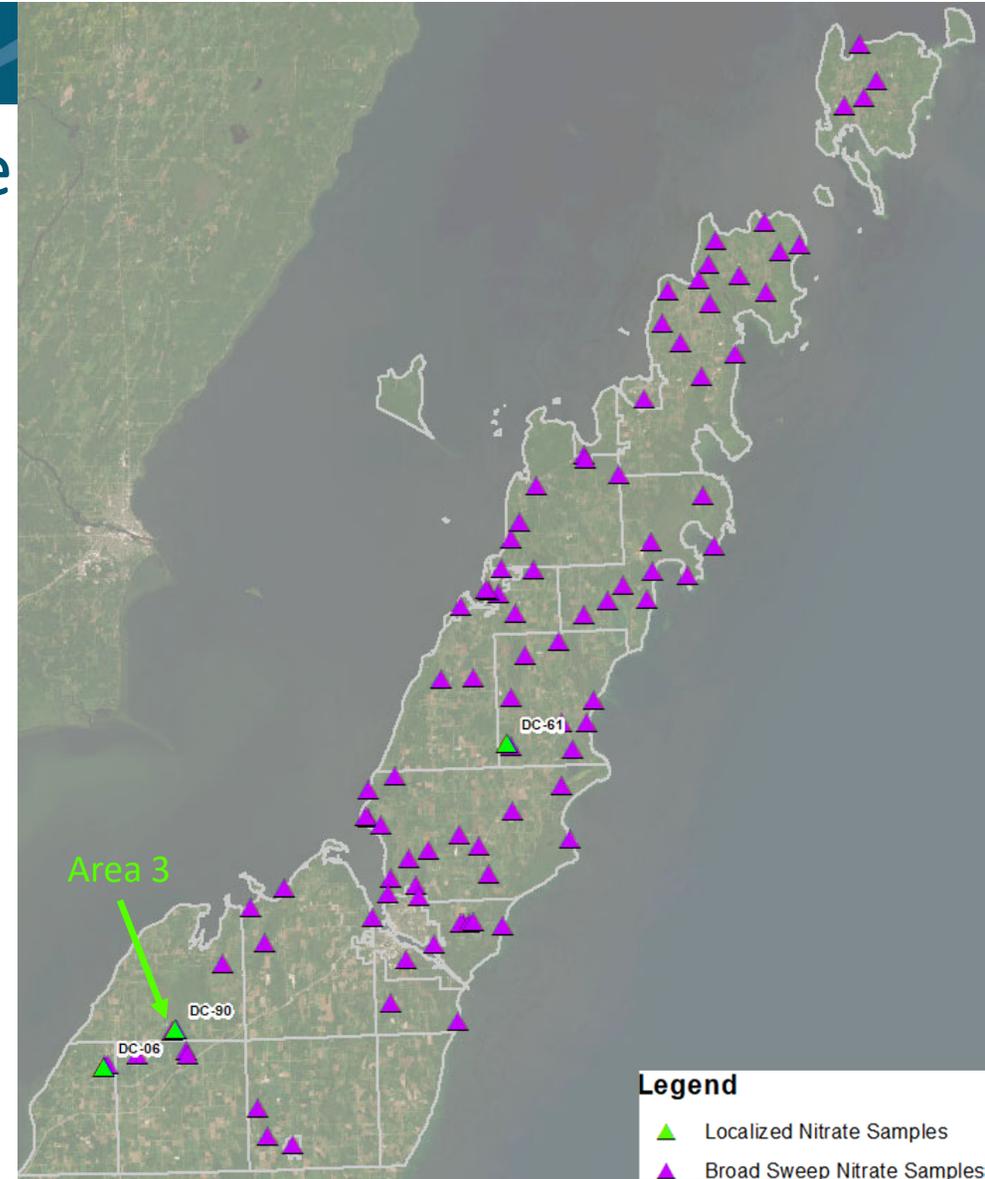


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Localized Sampling Results - Nitrate

Area 3 (DC-90)

- Localized elevated nitrate
- Presence of PCPP & PFAS
- Indicates human influence (e.g. septic)



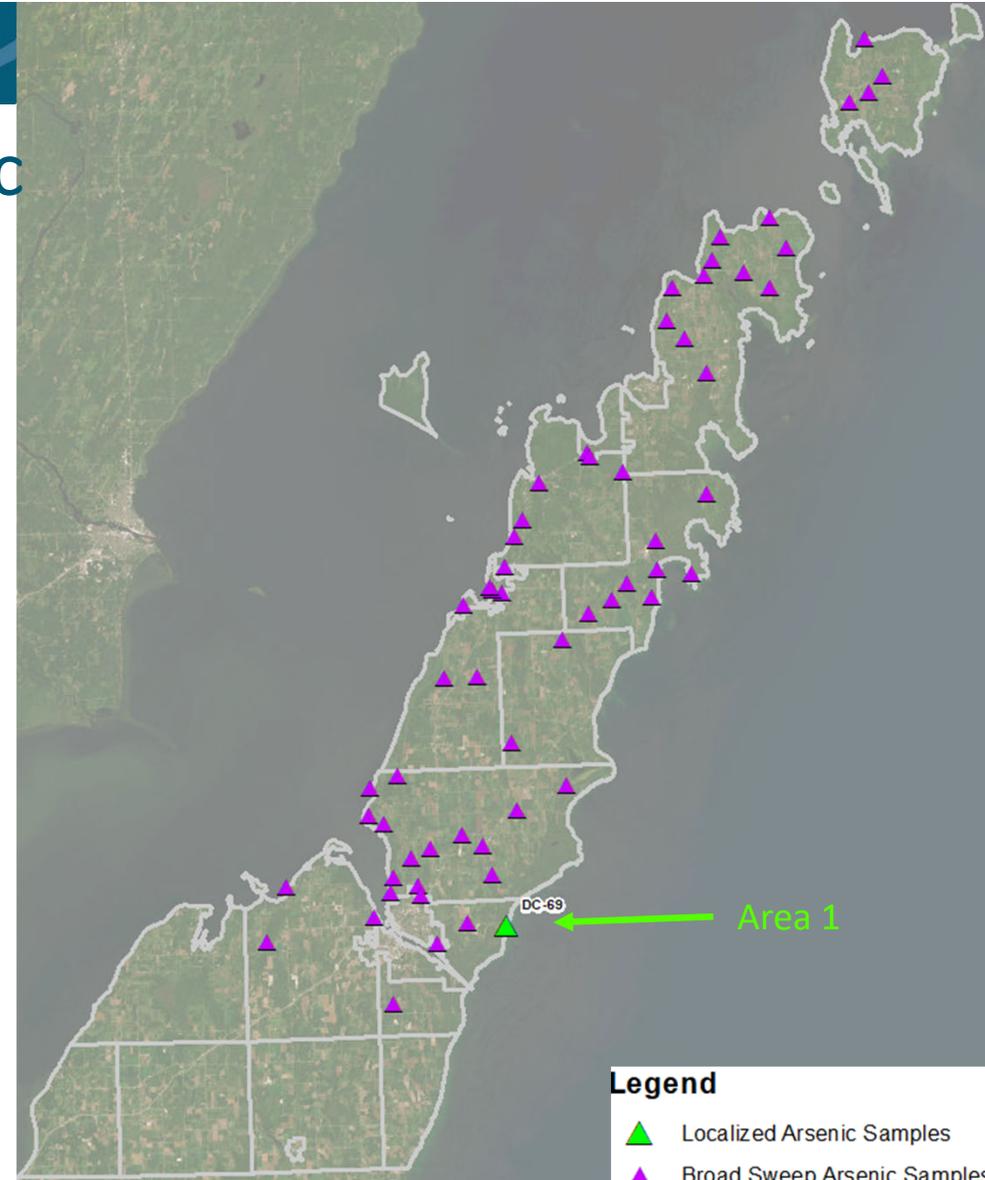
Localized Sampling Results - Arsenic

- 4/63 wells sampled for localized sampling in one area

Fall 2023

Sample ID	Well Depth (ft)	Arsenic	NR140 PAL	NR140 ES	Units
DC-69	-	27.4	1	10	ug/l

Red bold text = ES exceedance
 ug/L = micrograms per per liter





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Localized Sampling Results - Arsenic

Area 1 (DC-69)

- 3 wells sampled (4 samples)
- 1 wells (2 samples) with detections > ES

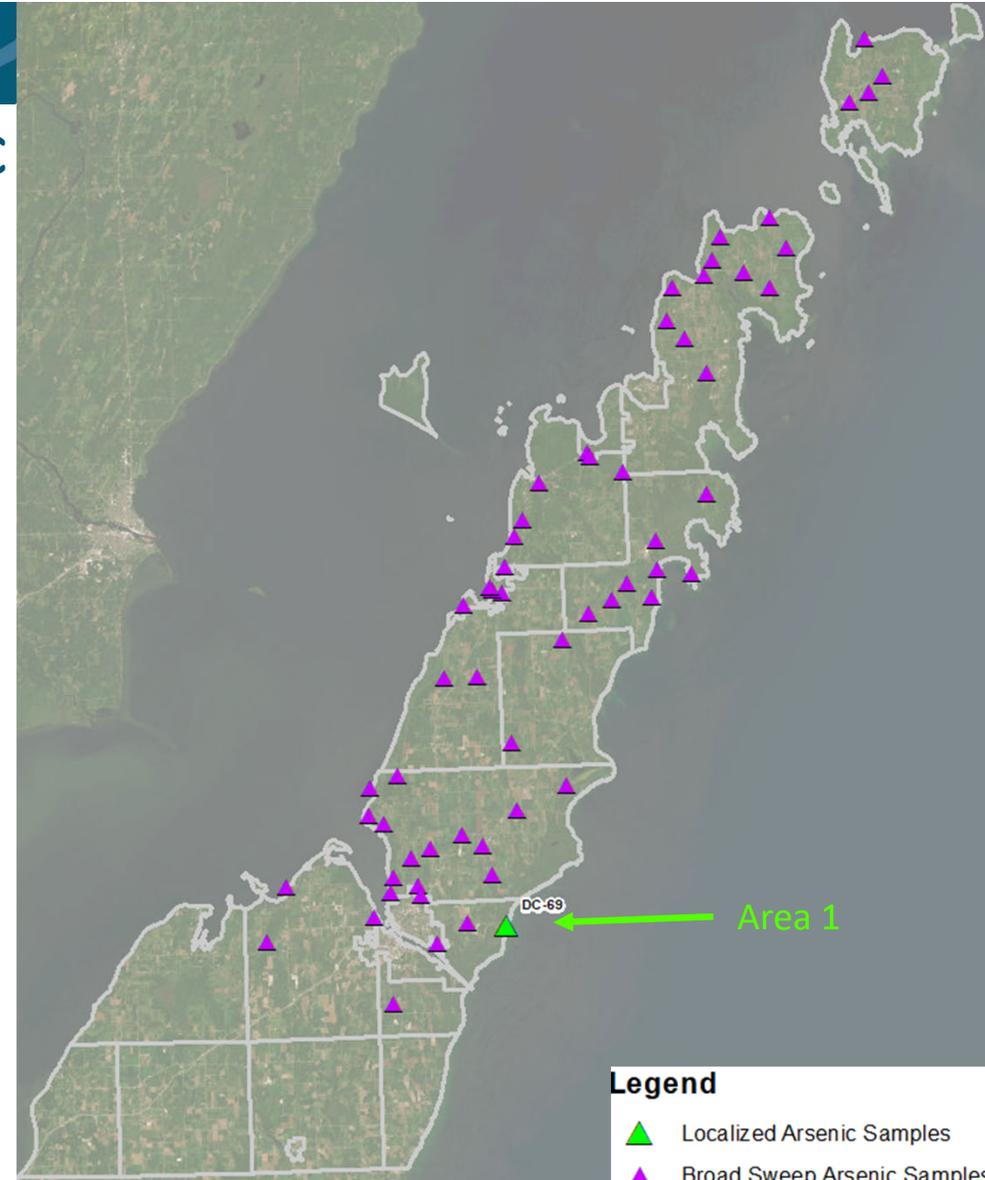
Fall 2023

Sample ID	Well Depth (ft)	Arsenic	NR140 PAL	NR140 ES	Units
DC-69	-	27.4	1	10	ug/l

Spring 2024

Sample ID	Well Depth (ft)	Arsenic	NR140 PAL	NR140 ES	Units
DC-69	-	25.1	1	10	ug/l
DC-206	-	27	1	10	ug/l
DC-208	-	6.9	1	10	ug/l
DC-205	-	ND	1	10	ug/l

Red bold text = ES exceedance
 ug/L = micrograms per per liter



Legend

- Localized Arsenic Samples
- Broad Sweep Arsenic Samples

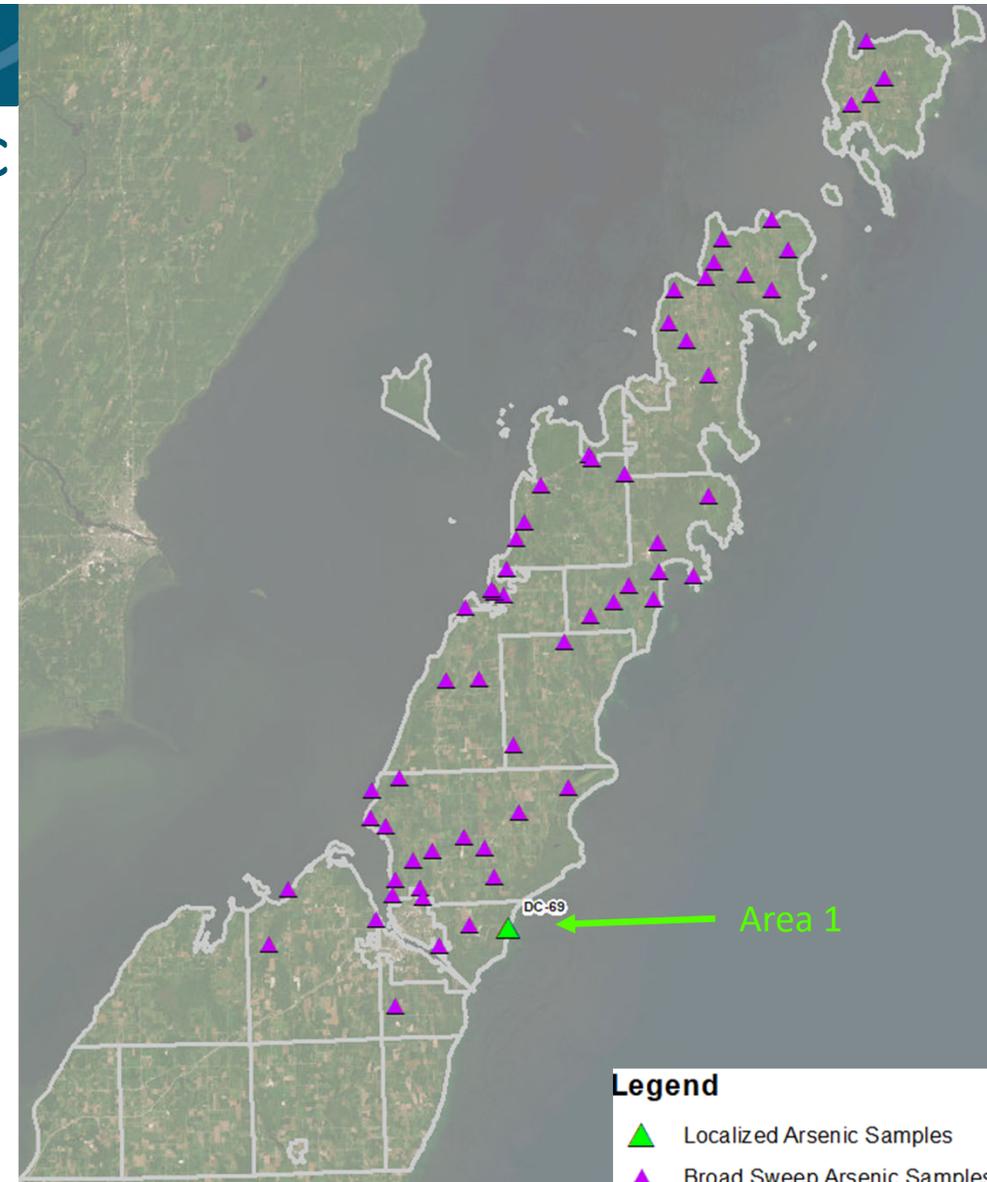


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Localized Sampling Results - Arsenic

Area 1 (DC-69)

- MVT mineralization – often see elevated cobalt and nickel (non-detect in samples)
- Lack of widespread issue, suggests anthropogenic





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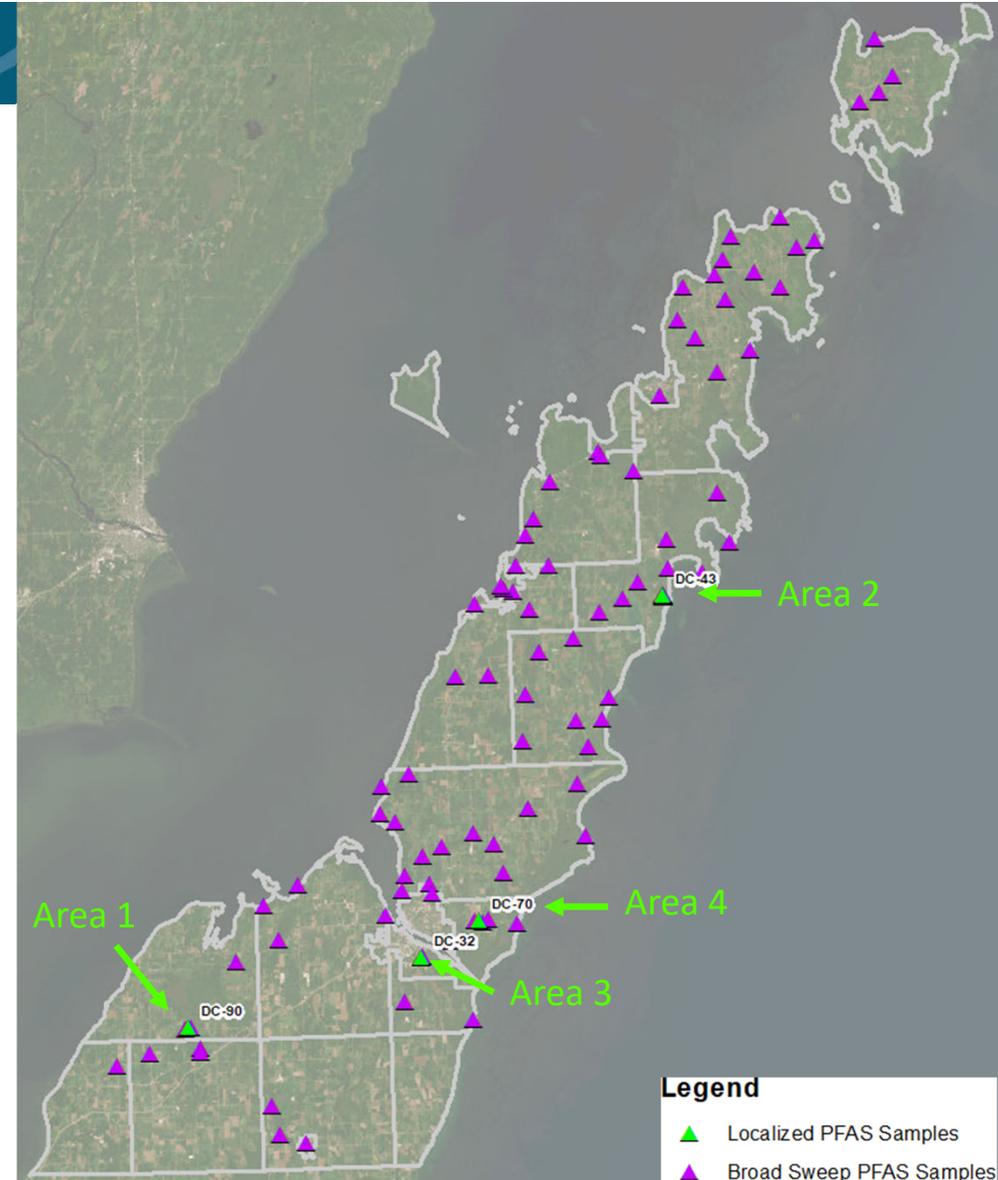
Localized Sampling Results - PFAS

- 16/96 wells sampled for localized sampling in four areas

Fall 2023

Sample ID	Well Depth (ft)	PFOA	PFOS	Units
		4	4	
DC-90	-	1.3	1.1	ng/L
DC-43	262	1.7	1.5	ng/L
DC-32	242	2.3	3.8	ng/L
DC-70	99	10.9	2.9	ng/L

Red= exceedance NPDWR
ng/L = nanograms per liter





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Localized Sampling Results - PFAS

Area 1 (DC-90)

- 5 wells sampled
- 4 wells with detections < NPDWR
- 1 wells non-detect

Fall 2023

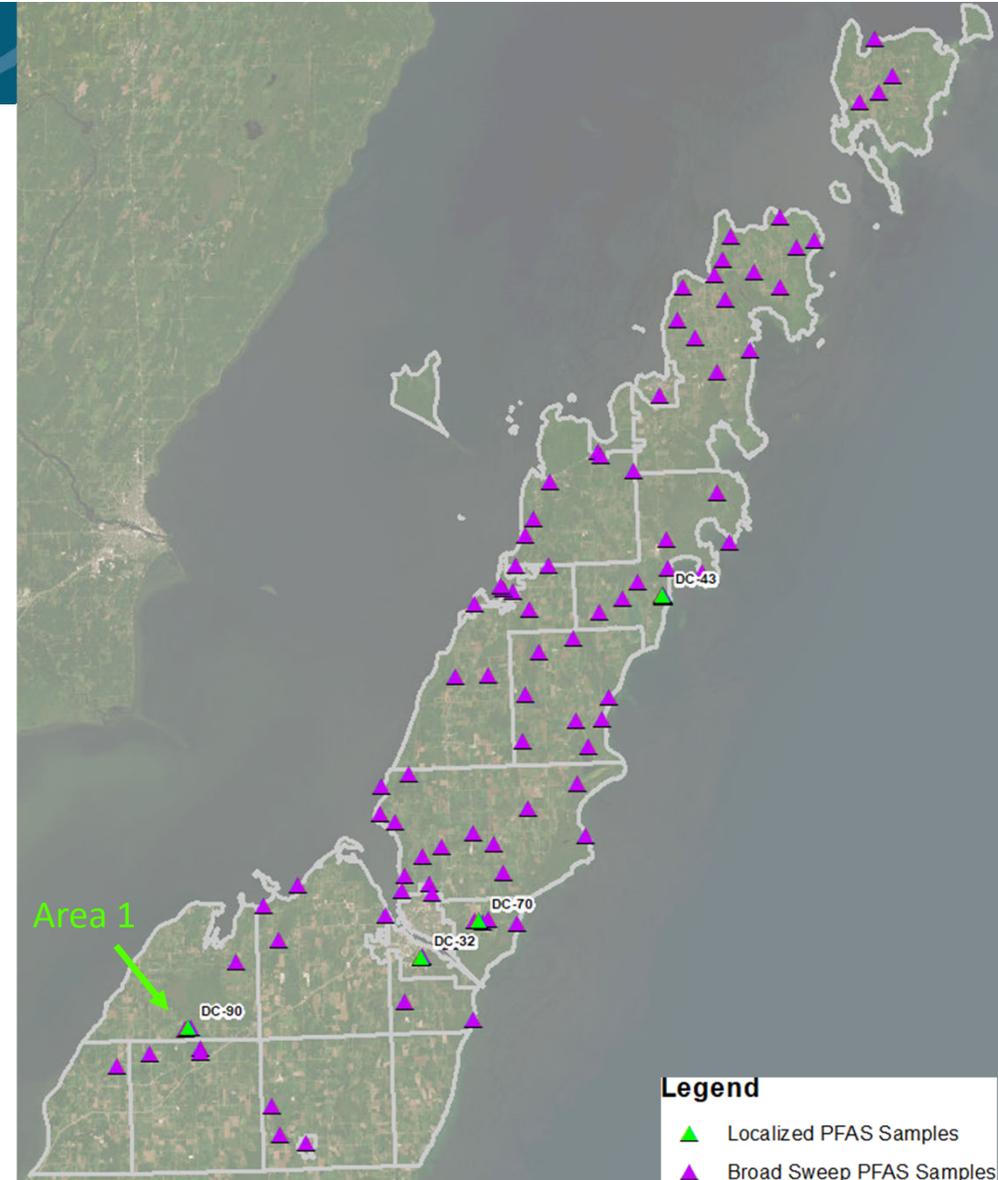
Sample ID	Well Depth (ft)	Nitrate	PFOA	PFOS
DC-90	-	13.1	1.3	1.1

Spring 2024

Sample ID	Well Depth (ft)	Nitrate	PFOA	PFOS	PFHxS	PFNA	Gen X
		10	4	4	10	10	10
DC-90	-	12.5	0.95	0.81	0.27	ND	ND
DC-196	220	1.9	ND	ND	ND	ND	ND
DC-195	203	1.7	ND	ND	0.49	ND	ND
DC-194	-	0.98	ND	ND	ND	ND	ND
DC-193	-	ND	ND	ND	ND	ND	ND

PFAS units = ng/l
Nitrate units = mg/l

Red bold text = ES exceedance
ND = non-detect





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Localized Sampling Results - PFAS

Area 2 (DC-43)

- 5 wells sampled
- 0 wells with detections

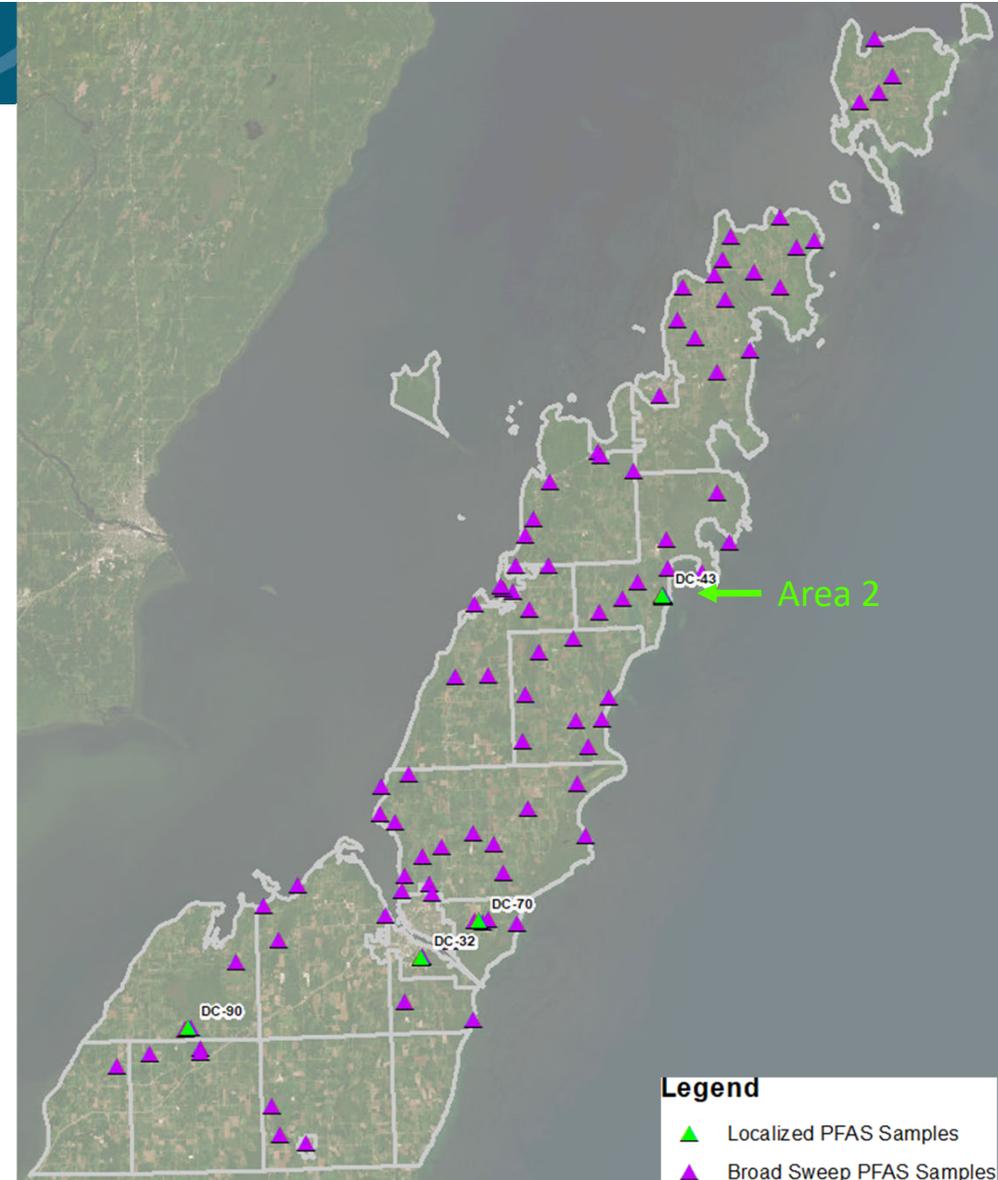
Fall 2023

Sample ID	Well Depth (ft)	PFOA	PFOS	Units
DC-43	242	1.7	1.5	ng/l

Spring 2024

Sample ID	Well Depth (ft)	PFOA	PFOS	PFHxS	PFNA	Gen X	Units
		4	4	10	10	10	
DC-43	242	ND	ND	ND	ND	ND	ng/l
DC-186	223	ND	ND	ND	ND	ND	ng/l
DC-185	201	ND	ND	0.49	ND	ND	ng/l
DC-184	198	ND	ND	ND	ND	ND	ng/l
DC-200	203	ND	ND	ND	ND	ND	ng/l

ND = non-detect
ng/L = nanograms per liter





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Localized Sampling Results - PFAS

Area 3 (DC-32)

- 2 wells sampled
- 1 well with detections > NPDWR
- 1 downgradient well with detections < NPDWR

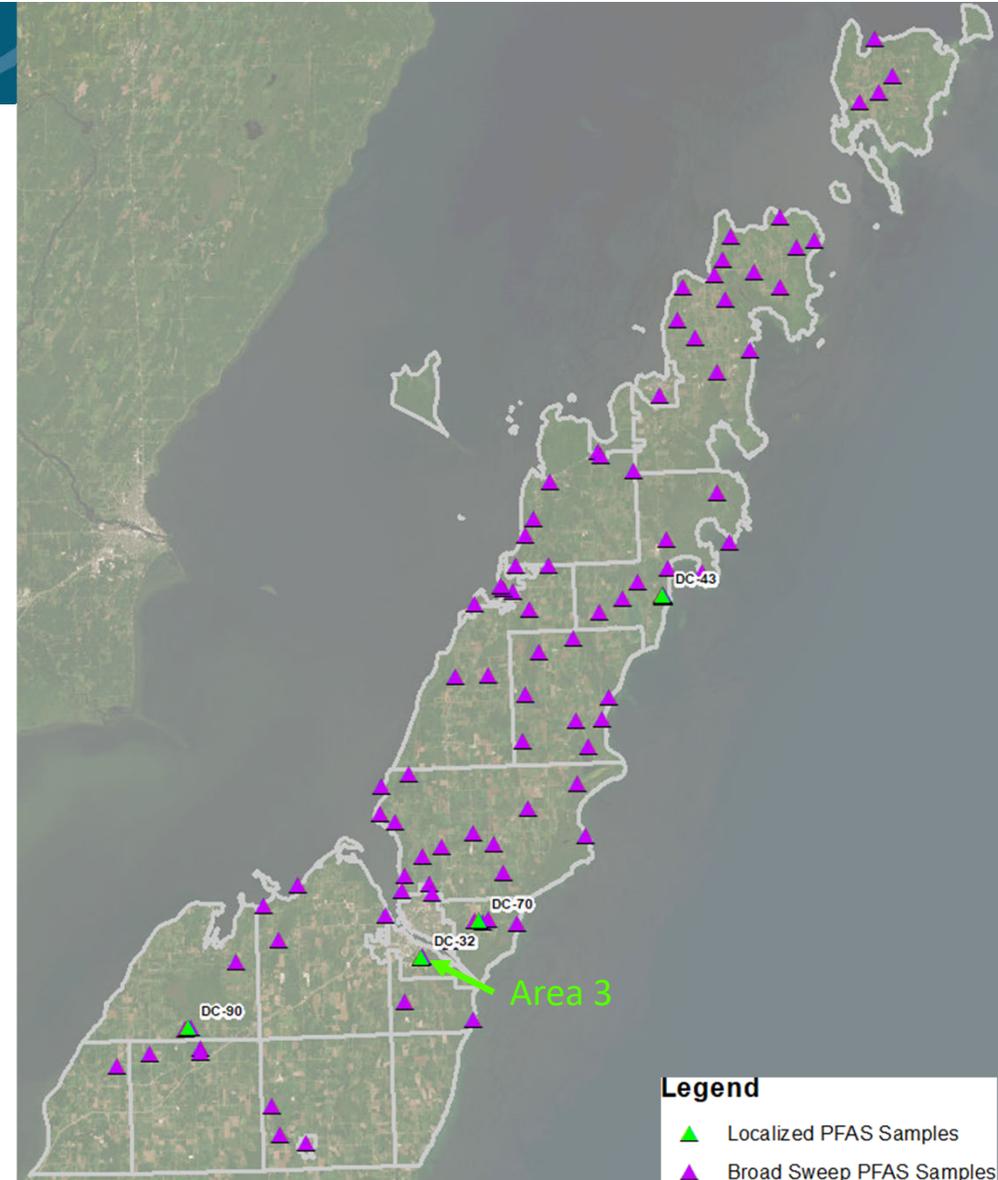
Fall 2023

Sample ID	Well Depth (ft)	PFOA	PFOS	Units
DC-32	-	2.3	3.8	ng/L

Spring 2024

Sample ID	Well Depth (ft)	PFOA	PFOS	PFHxS	PFNA	Gen X	Units
		4	4	10	10	10	
DC-32	-	2.4	4.7	13.5	ND	ND	ng/L
DC-198	-	ND	ND	0.34	ND	ND	ng/L

Red= exceedance of standard
ND = Non-detect



Legend

- ▲ Localized PFAS Samples
- ▲ Broad Sweep PFAS Samples



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Localized Sampling Results - PFAS

Area 4 (DC-70)

- 4 wells sampled
- 4 wells with detections > NPDWR

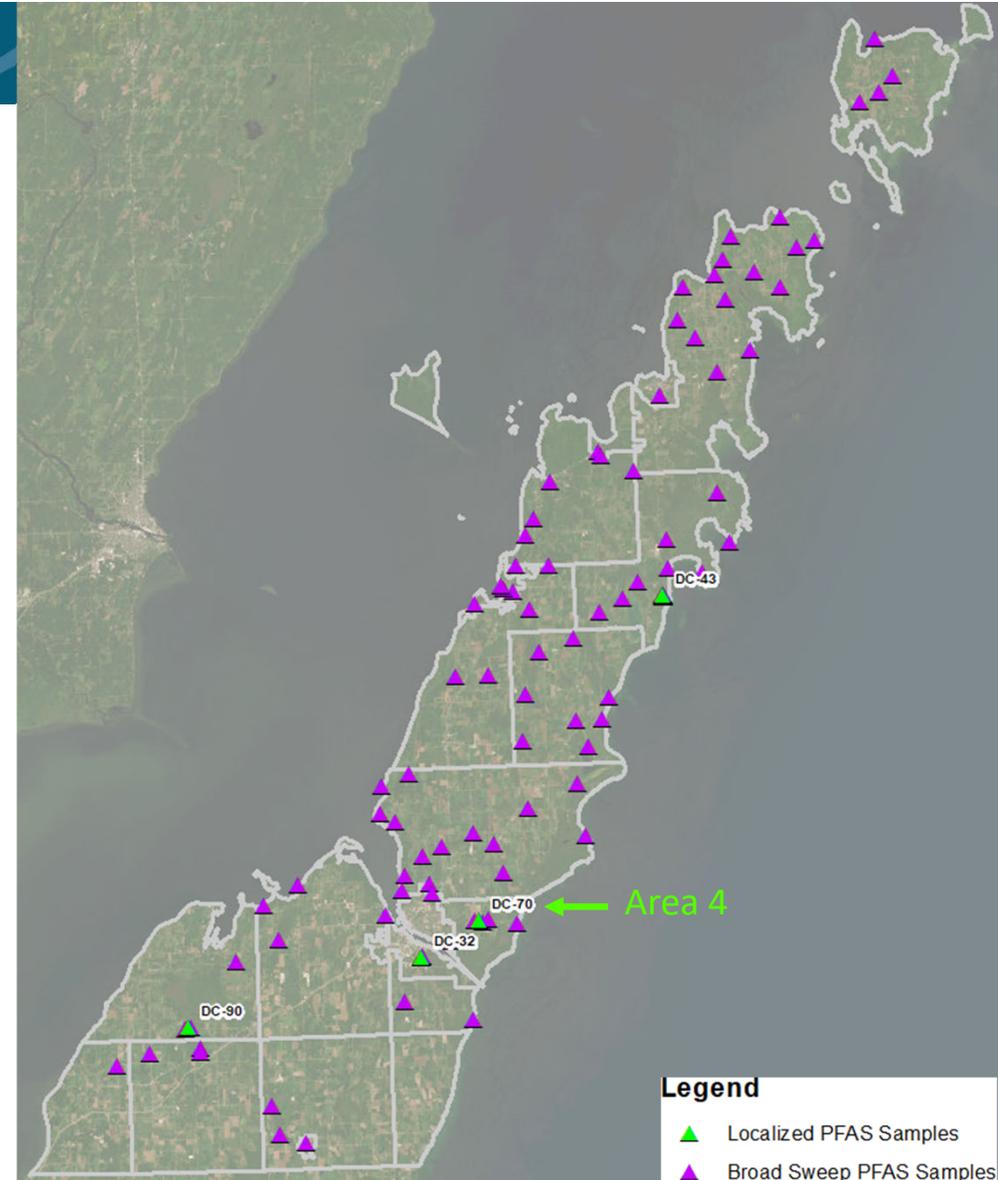
Fall 2023

Sample ID	Well Depth (ft)	Nitrate	PFOA	PFOS
DC-70	262	8.6	10.9	2.9

Spring 2024

Sample ID	Well Depth (ft)	Nitrate	PFOA	PFOS	PFHxS	PFNA	Gen X
		10	4	4	10	10	10
DC-70	262	7.3	14.5	4	31	ND	ND
DC-187	242	10.1	60.3	28.7	76.4	0.5	ND
DC-211	99	6.8	0.63	7.3	0.76	ND	ND
DC-212	300	8.2	9.2	2.8	20.6	ND	ND

Red= exceedance of standard
 PFAS units = ng/l
 Nitrate units = mg/l



Legend

- ▲ Localized PFAS Samples
- ▲ Broad Sweep PFAS Samples



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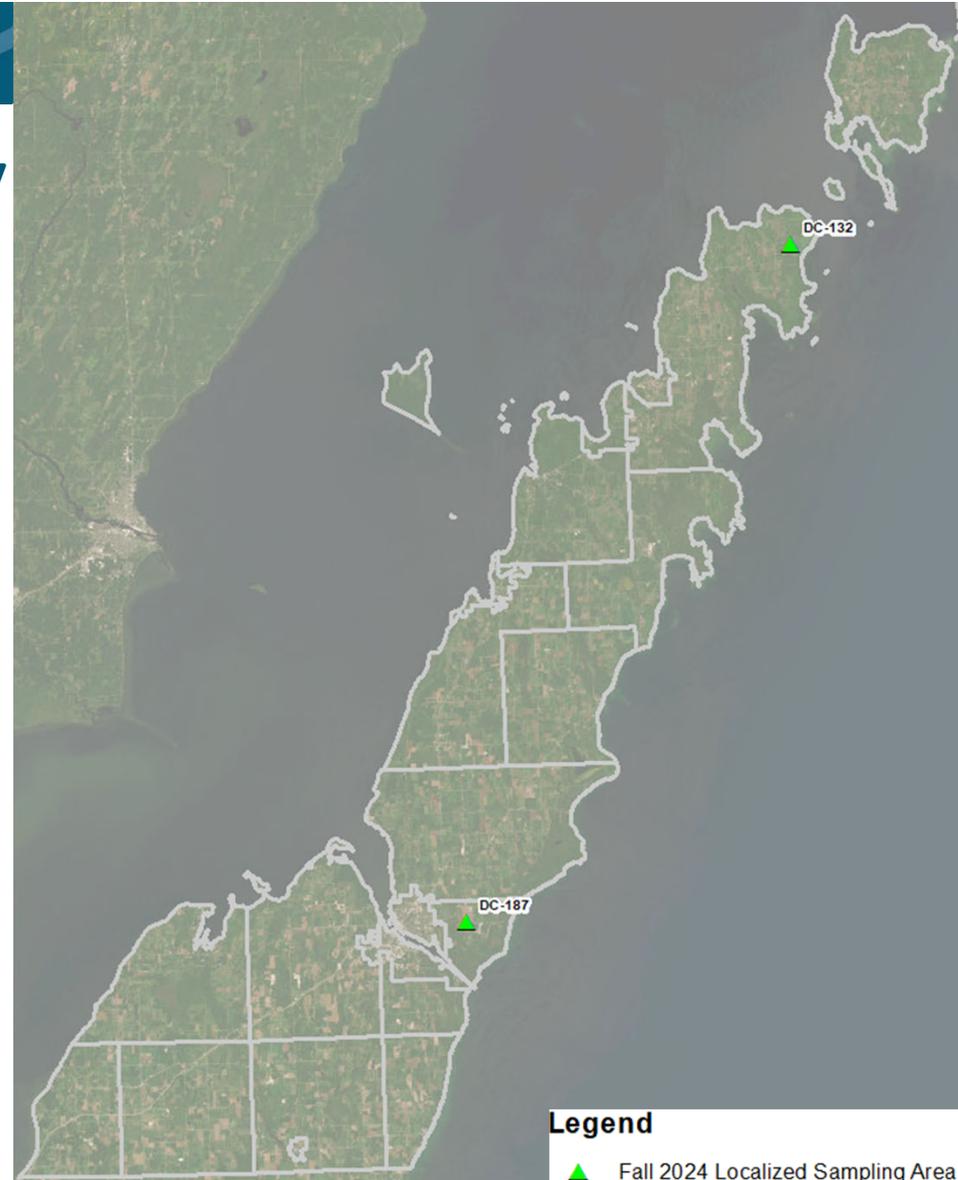
Fall 2024 Sampling Summary

Further Localized Sampling near DC-132

- 3 wells sampled for Microplastics
- DC-132 and 2 additional local wells
- DC-132 also sampled for PCPP

Further Localized Sampling near DC-187

- 15 wells sampled for PFAS
- 4 wells sampled in Spring 2024
- 11 additional local wells





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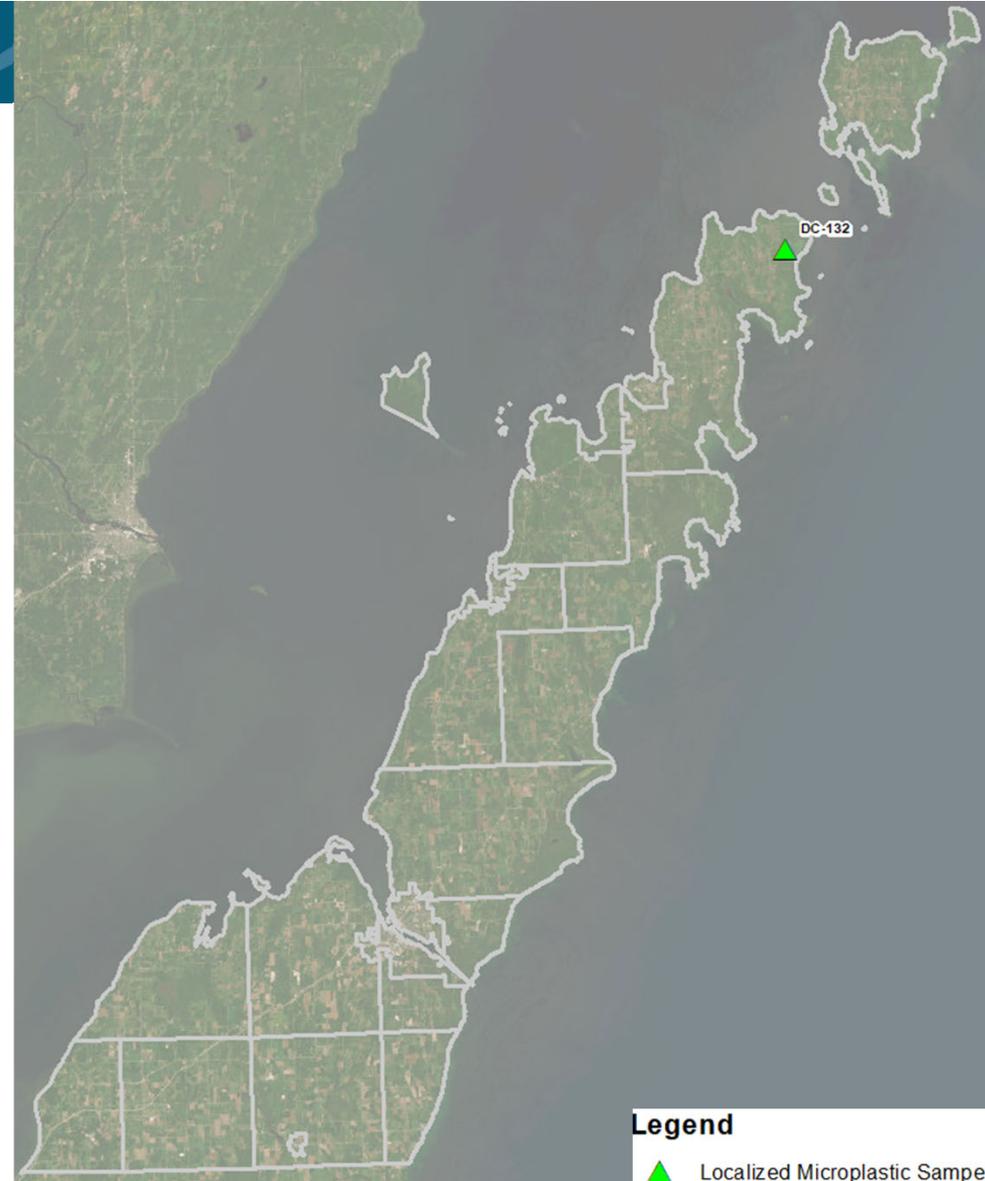
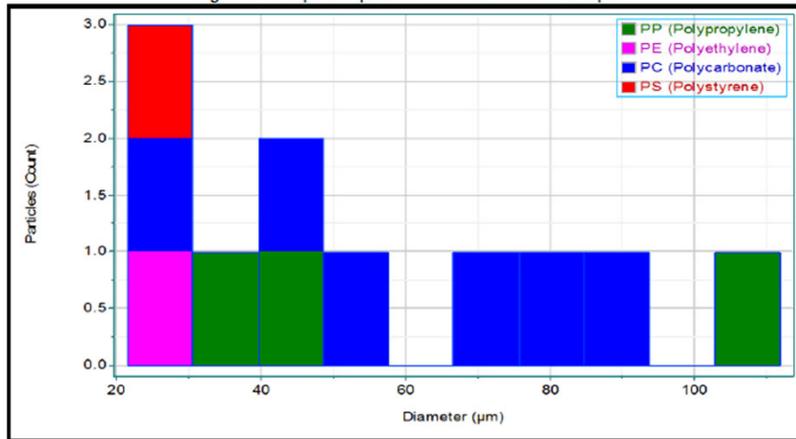
Results - Microplastics

- 3 wells sampled
- 3 wells with detections
- 5 - 21 MPP/L

Sample ID	Total Microplastics	Units
DC-132	11	MPP/L
DC-226	21	MPP/L
DC-227	5	MPP/L

MPP/L = Microplastic particles per liter

Figure 1: Microplastics particle size distribution in the sample





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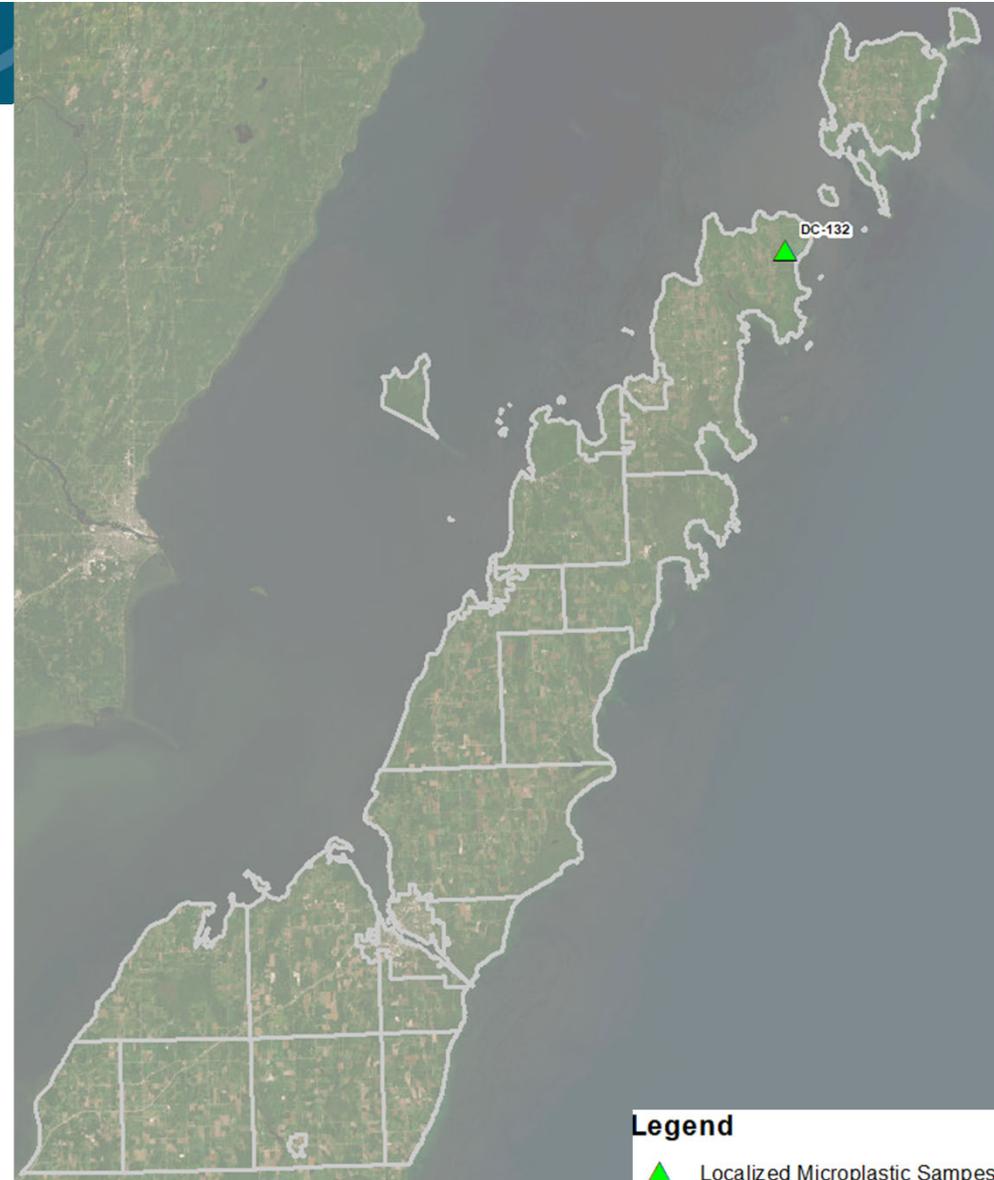
Results - Microplastics

- 3 wells sampled
- 3 wells with detections
- 5 - 21 MPP/L

Sample ID	Total Microplastics	Units
DC-132	11	MPP/L
DC-226	21	MPP/L
DC-227	5	MPP/L

MPP/L = Microplastic particles per liter

- Different labs
- Plastic (Spring 2024) vs glass (Fall 2024) bottles
- Minimum particle size detection differences





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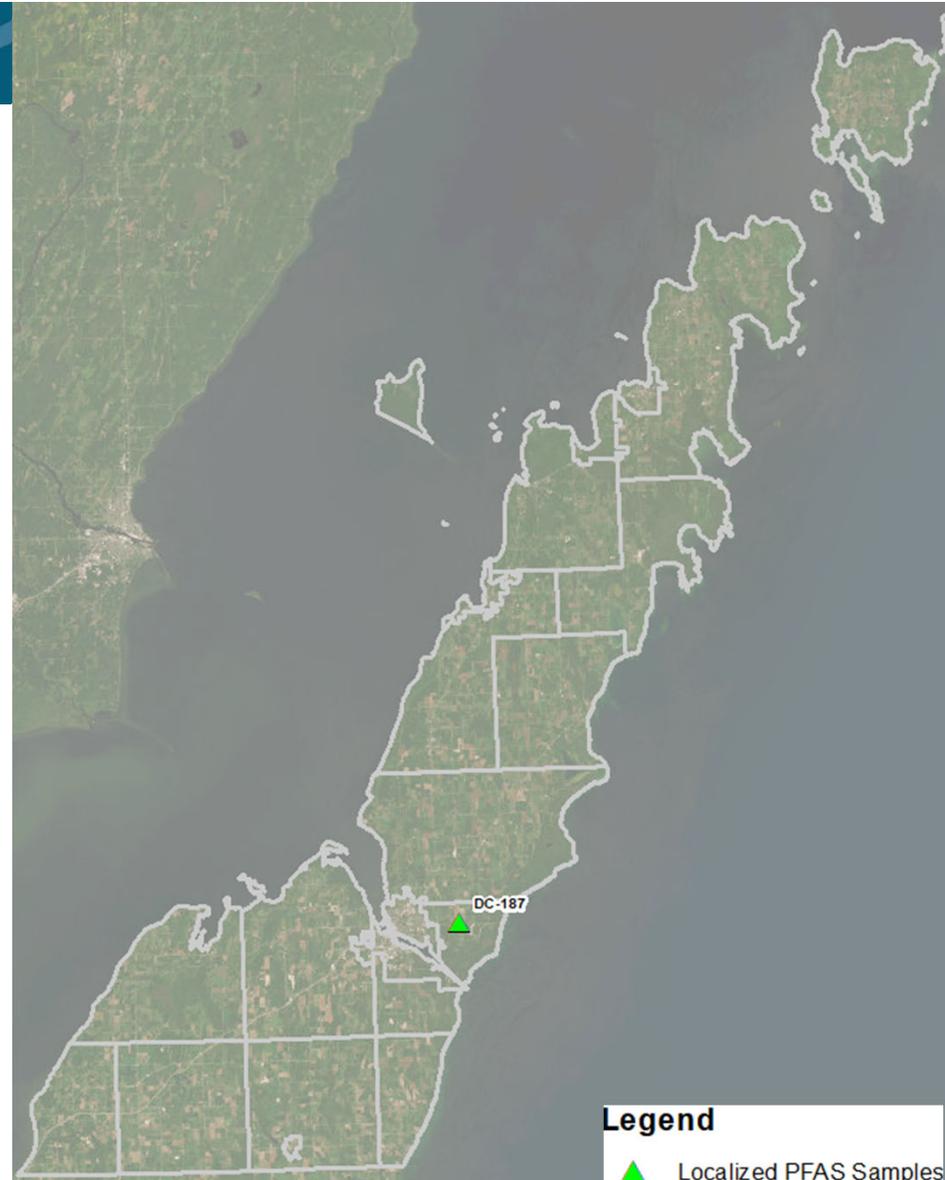
Results - PFAS

- 15 wells sampled
- 15 wells with at least one PFAS detection
- 7/15 detections > NPDWR

Spring 2024

Sample ID	Well Depth (ft)	PFOA	PFOS	PFHxS	PFNA	Gen X	Units
		4	4	10	10	10	
DC-187	242	48.5	21.9	63.7	0.5	ND	ng/l
DC-216	-	20	4.8	25.4	ND	ND	ng/l
DC-212	300	13.6	4.2	27.1	ND	ND	ng/l
DC-214	305	18.5	5.5	29.5	ND	ND	ng/l
DC-218	-	14.1	4.2	20.7	ND	ND	ng/l
DC-220	-	21.8	5.2	25.6	ND	ND	ng/l
DC-221	242	11.3	4.9	22.4	ND	ND	ng/l

Red= exceedance of NPDWR
 PFAS units = ng/l
 Nitrate units = mg/l





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Thank You