# Noland Law Firm

Arkansas Environmental Law and Litigation

May 18, 2022

Via Email

Meredith Hawkins
Pinnacle Mountain Community Coalition

Re: *NPDES Draft Permit No. AR005321 Public Comment*

Dear Meredith:

As you requested, the attached documents support your public comment today. As we previously commented, it is nearly impossible to meet water quality based effluent limits in a low or no flow stream. These issues are compounded here due to the fact pollutants, particularly endocrine disruptors, can and will make their way into the groundwater upstream and upgradient from the drinking water source for the Roland area. The supporting documentation includes:

- Attachment 1: Letter from Professional Engineer Rick Barger.
- Attachment 2: Letter from Professional Geologist Dr. Laura Ruhl.
- Attachment 3: Letter from Medical Doctor and Endocrinologist Brendan Stack.
- Attachment 4: Pennsylvania guidance for discharges to low or no flow streams.
- Attachment 5: Wastewater Treatment Plant Monitoring Study regarding endocrine disruptors, Minnesota Pollution Control Agency.

Taken together, this information demonstrates pollution, including endocrine disruptors, from the proposed discharge poses a threat to Roland's drinking water. Thank you for working with me on this matter.

Sincerely,

/s/ *Ross Noland*

Ross Noland

# ATTACHMENT 1

May 18, 2022

Meredith Hawkins
Pinnacle Mountain Community Coaliton

Subject: Review and Comments Concerning Proposed NPDES Permit
Draft AR0053210 Permit,

Dear Meredith:

As we have discussed on May 18th there will be an public hearling concerning potential approval of a Wastewater Permit now in draft for AR0053210.

I reviewed the draft permit AR0053219 and have several comments as follow:

1. Apparently, there are residence living in close proximity to the proposed WWTP discharge. They have sent in a comment concerning the fact that the new WWTP discharge might contaminate their home owners individual wells. The water table in this area has been noted in previous years as low as 21 feet below grade.The proposed permit allows NH3N level of 10 mg/L for the period of November through March. This is a high allowable NH3N concentration DEQ is proposing to allow.
2. Proposed permit monitoring of effluent shows monitoing only once per month. This does not protect water quality effectively with only monitoring 3% of the time. In the "Statement of Basics" the draft permit on page #7 states that the area down stream is considered a seconday contact stream that could be used by industries and effect the aquatic like and human health.
3. In the draft permit section discussing the Initial Trust Fund the fee projected amount needed to opeate the proposed plant for five years is based on a constrction cost $250,000.00. This projected cost is too low by at least a factor of two. Inflation in the wastewater construction field has recched at least 30% in the last six months. Therefore the amount of funds developed in calculating the five year reserve Trust Fund fee utilizes a cost of $250,000 for the 50,000 gpd plant. This number is far too low with current package plants costsing over $10.00 per gallon of wastewater treated for a cost of over $500,000.

4. The draft permit refers to 1000/2000 coliform which is not protective of potential usage of the water down stream. To avoid the potential spread of pathogens in the wastewater entering the receiving stream limit for must be adjusted.
5. The permit refers to the development being allowed to serve 300 new connections. At a lot size of 0.5 acres then 300 connections would need a delveope area of over 150 acres. Storm water discharge from the proposed area will increase significantly in pollutants flowing down sstream. The runoff coefficient from the 150 acres could be at least twice the rate as currnet undeveloped area.
6. There is no mention of the Class License of the needed plant operator. With a plant processes include secondary and tertiar treatment a Class III operator is in order.

Sincerely:

Rick Barger

Professional Engineer

# ATTACHMENT 2

# Memorandum

Subject: NPDES Permit Number AR0053210; AFIN 60-05010

My comments pertain to the proposed NPDES Permit No. AR0053210. I have serious concerns that the treated wastewater effluent to be discharged will degrade the water quality of Mill Bayou and potentially impact the health of the residents and wildlife (both aquatic and terrestrial) of the area. My comments are as follows:

1. **Contaminants of Concern:** The wastewater treatment process does not remove many of the pharmaceuticals and personal care products (PPCPs), nutrients, and metals from the wastewater (Glassmeyer et al. 2005; Blair, et al. 2015). **These PPCPs can be persistent, can bioaccumulate up the food chain, and can be toxic to aquatic wildlife with endocrine disrupting effects (Ebele et al, 2017).** This treated effluent could then impact aquatic wildlife in Mill Bayou.
    a. The EPA's aquatic wildlife limit (CCC- chronic and CMC-acute) for several constituents are listed in the table below, which have been measured in treated wastewater (Table 1; EPA, 2022a). There are several emerging contaminants (PFOS and PFOA), which do not break down and are an environmental health concern for humans and animals (EPA, 2022b).
    b. While not all PPCPs are persistent, some are considered "pseudo-persistent" because of their continuous use and release to the environment from wastewater discharges (Daughton and Ternes, 1999; Ebele et al., 2017). Pseudo-persistent pharmaceuticals are continually replenished, therefore even those that would degrade would effectively behave as persistent compounds in the environment (Houtman et al., 2004; Ebele et al. 2017). The PPCPs consistently released into Mill Bayou could become persistent and impact aquatic wildlife.
    c. A review of 147 studies of effluent-fed streams by Hamdhani et al. (2020), revealed that effluent generally impaired the water quality near the discharge points from elevated temperature, nutrients, and trace organic contaminants, in addition to lower dissolved oxygen levels (Hamdhani et al., 2020). Additionally, the review also revealed that basal resources, aquatic invertebrates, and fish were negatively affected in a number of ways, such as biodiversity loss.
    d. Excess nutrients (Nitrate- $NO_3$ and Phosphate- $PO_4$) will cause eutrophication in the surface water. Municial wastewater plays a main role in the acceleration of eutrophication in surface waters (Bhagowati & Ahamad, 2019). Eutrophication could lead to algal blooms and fish kills in Mill Bayou.

2. **Effluent entering a no to low flow bayou system:** In accordance the permit and with APC & EC Rule 2.409, the discharge of pollutants in amounts that are toxic are forbidden. Since the receiving stream has a 7Q10 of 0 cfs and little dilution potential, the EPA criteria must be met at the end-of-the pipe with no mixing zone.
    a. Ammonia is highly toxic to aquatic organisms (EPA, 2013). **The allowable ammonia ($NH_3$-N) concentration in the effluent Permit No. AR0053210 (5.0 mg/L from May-Oct; 10 mg/L from Nov-Mar; and 5.6 in April) would exceed**

**the EPA's ambient water quality criteria for Total Ammonia Nitrogen** (TAN) at pH of 7.0 and 20*C of 1.9 mg/L (chronic).

3. **Groundwater Infiltration and Drinking Water Source:** As water from the wastewater treatment plant is discharged into the Mill Bayou system, the stagnant water can infiltrate in to the subsurface. The subsurface geology of the area based on geologic maps and groundwater well logs (Table 2) is made up of alluvium deposited by the historic movements of the Arkansas River, consists of sand, silt, clay, and gravel. After reviewing the groundwater well logs of the three wells nearest to the proposed outfall and the Maumelle Water Corp Wells, the lithology consists of interbedded layers of sand, clay, and gravel (Figure 1-3). The each layer was deposited in a limited horizontal extent dependent on where the main channel of the Arkansas River (sand/gravel) was versus the floodplain (silt/clay). Therefore layers could discontinuous horizontally, and an impermeable unit in one area of the subsurface, can't be assumed to horizontally continuous throughout the entire area. **Therefore if the wastewater effluent infiltrates into the ground, it could make its way to the groundwater.** Then it would flow along the hydraulic gradient towards the towards the river and/or the pumping Maumelle Water Corp wells, which is a drinking water source for the Roland, AR area.
    a. The wastewater effluent is of grave concern reaching the drinking water source in the region. There have been several studies like Kreuzinger et al. (2004) and Sui et al. (2015) that revealed that some of these compounds are not adsorbed and removed from the water as it traveled through the ground, and therefore are mobile and could reach the drinking water source.

***Based on my review of the permit, local geology, local hydrology, and wastewater literature, I believe that NPDES Permit Number AR0053210 would place the local aquatic wildlife and human populations at risk, and therefore should be denied.***

Sincerely,

Laura S. Ruhl, Ph.D., P.G.
Associate Professor
Department of Earth Sciences
University of Arkansas at Little Rock
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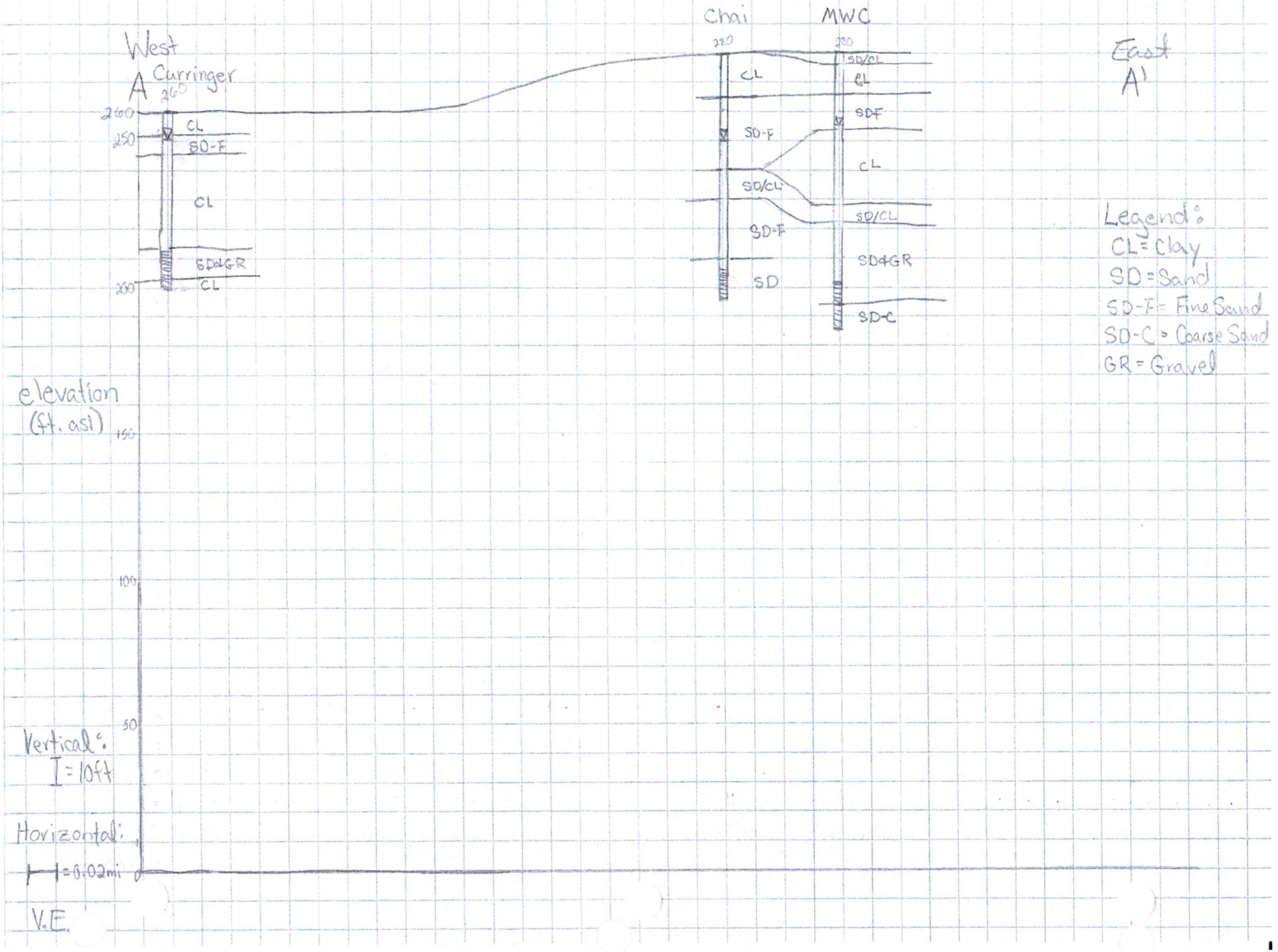
lsruhl@ualr.edu


West
A
Curringer
260
260
250
200
CL
SD-F
CL
SD&GR
CL
Chai
280
CL
SD-F
SD/CL
SD-F
SD
MWC
280
SD/CL
CL
SDF
CL
SD/CL
SD&GR
SD-C
East
A'
Legend:
CL = Clay
SD = Sand
SD-F = Fine Sand
SD-C = Coarse Sand
GR = Gravel
elevation
(ft. asl)
150
100
50
Vertical:
1 = 10ft
Horizontal:
1 = 0.02mi
V.E.

**References:**


Bhagowati, B. Ahamad, K. U. 2019. A review on lake eutrophication dynamics and recent developments in lake modeling. *Ecohydrology and Hydrobiology* 19 (1), 155-166. https://doi.org/10.1016/j.ecohyd.2018.03.002.

Blair, B., Nikolaus, A., Hedman, C., Klaper, R., Grundl, T. 2015. Evaluating the degradation, sorption, and negative mass balances of pharmaceuticals and personal care products during wastewater treatment. Chemosphere, 134, 395-401. http://dx.doi.org/10.1016/j.chemosphere.2015.04.078

Daughton, C.G. and Ternes, T.A. Pharmaceuticals and personal care prducts in the environment: agents of subtle change. Environmental Health Perspectives, 107, pgs 907-938.

Ebele, A.J., Abdallah, M.A., Harrad, S. 2017. Pharmaceuticals and personal care products (PPCPs) in the freshwater aquatic environment. Emerging Contaminants. 3, pgs. 1-16. https://doi.org/10.1016/j.emcon.2016.12.004

EPA, 2013. Final Aquatic Life Ambient Water Quality Criteria for Ammonia-Freshwater 2013. Notice; 78 FR 52192; pgs 52192-52194; EPA-HQ-OW-2009-0921; FRL-9810-4; Document #: 2013-20307. https://www.federalregister.gov/documents/2013/08/22/2013-20307/final-aquatic-life-ambient-water-quality-criteria-for-ammonia-freshwater-2013.

EPA, 2022a. Aquatic Life Criteria and Methods for Toxics https://www.epa.gov/wqc/aquatic-life-criteria-and-methods-toxics.

EPA, 2022b.PFAS Explained: What EPA has learned so far. https://www.epa.gov/pfas/pfas-explained

Glassmeyer, S.T., Furlong, E.T., Kolpin, D.W., et al., 2005. Transport of Chemical and microbial compounds from Known discharges: Potential for use as indicators of human fecal contamination. Environ. Sci. Technol., 39, 5157-5169. DOI: 10.1021/es048120k.

Hamdhani Hamdhani, Drew E. Eppehimer, and Michael T. Bogan. 2020. Release of treated effluent into streams: A global review of ecological impacts with a consideration of its potential use for environmental flows. Freshwater Biology. 65:1657–1670. DOI: 10.1111/fwb.13519.

Houtman,C.J. Van Oostveen, A.M., Brouwer, A., Lamoree, M.H., and Legler, J. 2004. Identification of Estrogenic compounds in fish bile using bioassay-directed fractionation. Environmental Science and Technology. 38. 6415

Kreuzinger, N. Clara, M., Strenn, B., and Vogel, B. 2004. Investigation on the behavior of selected pharmaceuticals in the groundwater after infiltration of treated wastewater. Water Science and Technology. Vol 50, No.2, pgs 221-228.

Sui, Q., Cao, X., Lu, S., Zhao, W., Qui, Z., and Yu, G. 2015. Occurrence, sources and fate of pharmaceuticals and personal care products in the groundwater: A Review. Emerging Contaminants. 1, pgs. 14-25. http://dx.doi.org/10.1016/j.emcon.2015.07.001

Table 1: List of EPA regulated chemicals in freshwater (CMC=acute and CCC=chronic), as well as its use and concentration found in treated wastewater (Glassmeyer, 2005).

| | CMC (ug/L)^ | CCC (ug/L)^ | Glassmeyer | Use |
|---|---|---|---|---|
| Carbaryl | 2.1 | 2.1 | 0.22 (max) | Pesticide |
| Chlorpyrifos | 0.083 | 0.041 | 0.032 | Domestic pest/termite |
| Pentachlorophenol | 19 | 15 | 0.086 | Wood preservative |
| Perfluorooctanoic Acid (PFOA) | | | | |
| Perfluorooctane Sulfonate (PFOS) | | | | |
| Tributyl phosphate | | | 0.47 (max) | DTXSID3021986. EPA Contaminant candidate list* |

^CMC and CCC (https://www.epa.gov/wqc/aquatic-life-criteria-and-methods-toxics)
* https://www.epa.gov/ccl/draft-ccl-5-chemicals

Table 2: List of wells used for geologic analysis of the watershed. All data publicly available from the Arkansas Natural Resource Commission (accessed April 2022).

| Well ID | Land Owner | Latitude | Longitude | Date Well Completed |
|---|---|---|---|---|
| 922958345406 | Maumelle Water corp. | 34.90166667 | -92.49944444 | 27-MAR-75 |
| 923001345418 | DENISE CHAI | 34.905 | -92.50027778 | 15-MAY-15 |
| 923026345412 | MIKE CURRINGER | 34.90333333 | -92.50722222 | 17-OCT-02 |

**Figures 1-3:** Well logs for the wells used in the geological analysis.



STATE OF ARKANSAS
REPORT ON WATER WELL CONSTRUCTION & PUMP INSTALLATION

MAIN MENU | RESET | SUBMIT

**A**

1. Contractor Name & Number: 1002 W. E. PENDER & SONS, INC. DBA
2. Driller Name & Number: 2389 SID D. MCILVEEN
3. Pump Installer Name & Number: 4600 JASON BRYANT
4. Date Well Completed: 10/17/2002 New Well
5. COUNTY: PULASKI (119)
6 FRACTION NW ¼ of NW ¼
7 SECTION: 16
8 TOWNSHIP T3N
9 RANGE R14W
11. LONGITUDE 92-30-26 12. LATITUDE 34-54-12

**B**

| DESCRIPTION OF FORMATION | DEPTHS IN FEET FROM | TO | WATER BEARING | IF YES.. DEPTH |
|---|---|---|---|---|
| CL | 0 | 8 | No | |
| SD FN. | 8 | 14 | No | |
| CL | 14 | 46 | No | |
| SD & PEA GR | 46 | 57 | No | |
| CL | 57 | 60 | No | |

2. TOTAL DEPTH OF WELL 58
3. STATIC WATER LEVEL 10 Ft. below land surface
4. YIELD 38 gallons per Y
5. DIAMETER OF BORE HOLE IN

**C** PUMP REPORT

1 TYPE PUMP
2 SETTING DEPTH FEET
3 BRAND NAME AND SERIAL NUMBERS:
4 RATED CAPACITY gallons per minute
5 TYPE LUBRICATION
6 DROP PIPE OR COLUMN PIPE SIZE
7 WIRE SIZE
8 PRESSURE TANK: SIZE: MAKE: MODEL:
9 DATE OF INSTALLATION OR REPAIR
10 Is there an abandoned water well on the property?

FT TO: FT

**D**

1 LAND OWNER OR OTHER CONTACT PERSON
NAME MIKE CURRINGER
STREET ADDRESS 21 NATURAL STEPS CV
CITY ROLAND, AR. 72155

CASING FROM 0 TO 48 W/ 4 Inner Diameter
CASING FROM TO W/ Inner Diameter
TYPE CASING PVC

3. SCREEN
TYPE: PVC DIA 4 SLOT/GA .010
SET FROM 48 FT TO 58 FT
TYPE: DIA SLOT/GA
SET FROM FT TO FT

4. GRAVEL PACK FROM: 24 FT TO: 58 FT
5. BACK FILLED WITH: FROM: FT TO: FT
6. SEALED WITH: BENTONITE & CEMENT
FROM: 0 FT TO: 12 FT
FROM: 12 FT TO: 24 FT
7. DISINFECTED WITH: SODIUM HYPOCHLORIDE
8. USE OF WELL:
OTHER
A/C HEATPUMP TYPE WELLS
(For A/C only)Will system also be used for purposes other than Heating and Air Conditioning? If yes, name use:
(For A/C open-loop only) Into what medium is water returned?
11. REMARKS
12. SIGNED DATE

# STATE OF ARKANSAS
# REPORT ON WATER WELL CONSTRUCTION & PUMP INSTALLATION

MAIN MENU | RESET | SUBMIT

**A**

1. Contractor Name & Number: 1290 LAYNE CHRISTENSEN COMPANY
2. Driller Name & Number: 9999 OLD DRILLER
3. Pump Installer Name & Number:
4. Date Well Completed: 03/27/1975 New Well

5. COUNTY : PULASKI ( 119 )
6 FRACTION ¼ of ¼
7 SECTION: 16
8 TOWNSHIP 3N
9 RANGE 14W

11. LONGITUDE 92-29-58 12. LATITUDE 34-54-06

**B**

| DESCRIPTION OF FORMATION | DEPTHS IN FEET FROM | TO | WATER BEARING | IF YES.. DEPTH |
|---|---|---|---|---|
| Topsoil | 0 | 1 | No | |
| Sand / Clay | 1 | 4 | No | |
| Clay | 4 | 14 | No | |
| Sand / Clay | 14 | 16 | No | |
| Fine Sand | 16 | 26 | No | |
| Clay | 26 | 51 | No | |
| Sand / Clay | 51 | 57 | No | |
| Yellow Sand / Gravel | 57 | 85 | No | |
| Coarse Sand | 85 | 93 | Yes | |
| | | | No | |

2. TOTAL DEPTH OF WELL 94.5
3. STATIC WATER LEVEL 24.2 Ft. below land surface
4. YIELD 200 gallons per
5. DIAMETER OF BORE HOLE 20 IN

**C** PUMP REPORT

1 TYPE PUMP
2 SETTING DEPTH FEET
3 BRAND NAME AND SERIAL NUMBERS:
4 RATED CAPACITY gallons per minute
5 TYPE LUBRICATION
6 DROP PIPE OR COLUMN PIPE SIZE
7 WIRE SIZE
8 PRESSURE TANK: SIZE: MAKE: MODEL:
9 DATE OF INSTALLATION OR REPAIR
10 Is there an abandoned water well on the property?

FT TO: FT

**D**

1 LAND OWNER OR OTHER CONTACT PERSON
NAME Maumelle Water corp.
STREET ADDRESS Maumelle, AR
CITY Maumelle, AR

CASING FROM 0 TO 74.2 W/ 20 Inner Diameter
CASING FROM TO W/ Inner Diameter
TYPE CASING STAINLESS STEEL

3. SCREEN
TYPE: STAINLESS STEEL DIA 10 SLOT/GA #8
SET FROM 79 FT TO 94 FT
TYPE: DIA SLOT/GA
SET FROM FT TO FT

4. GRAVEL PACK FROM: 79 FT TO: 94 FT

5. BACK FILLED WITH: CEMENT
FROM: 0 FT TO: 74.2 FT

6. SEALED WITH:
FROM: FT TO: FT

7. DISINFECTED WITH: HTH

8. USE OF WELL:
OTHER Municipal

A/C HEATPUMP TYPE WELLS

(For A/C only)Will system also be used for purposes other than Heating and Air Conditioning?
If yes, name use:

(For A/C open-loop only) Into what medium is water returned?

11. REMARKS
Contractor: Singer-Layne Arkansas Division Driller: Herbert C. Johnson School Yard

12. SIGNED DATE

# STATE OF ARKANSAS
# REPORT ON WATER WELL CONSTRUCTION & PUMP INSTALLATION

MAIN MENU | RESET | SUBMIT

**A**

1. Contractor Name & Number: 1251 CHARLIE WHITE WELL DRILLING &
2. Driller Name & Number: 2064 CHARLIE WHITE
3. Pump Installer Name & Number:
4. Date Well Completed: 05/15/2015 New Well

5. COUNTY : PULASKI ( 119 )
6 FRACTION ¼ of ¼
7 SECTION:
8 TOWNSHIP
9 RANGE

11. LONGITUDE 92-30-01 12. LATITUDE 34-54-18

**B**

| DESCRIPTION OF FORMATION | DEPTHS IN FEET FROM | TO | WATER BEARING | IF YES.. DEPTH |
|---|---|---|---|---|
| Clay | 0 | 15 | No | |
| Fine Sand | 15 | 40 | No | |
| Sand / Clay | 40 | 50 | No | |
| Fine Sand | 50 | 70 | No | |
| Sand | 70 | 83 | No | |
| | | | No | |
| | | | No | |

2. TOTAL DEPTH OF WELL 83
3. STATIC WATER LEVEL 30 Ft. below land surface
4. YIELD 25 gallons per
5. DIAMETER OF BORE HOLE 8 IN

**C** PUMP REPORT

1 TYPE PUMP
2 SETTING DEPTH FEET
3 BRAND NAME AND SERIAL NUMBERS:
4 RATED CAPACITY gallons per minute
5 TYPE LUBRICATION
6 DROP PIPE OR COLUMN PIPE SIZE
7 WIRE SIZE
8 PRESSURE TANK:
SIZE: MAKE: MODEL:
9 DATE OF INSTALLATION OR REPAIR
10 Is there an abandoned water well on the property?

FT TO: FT

**D**

1 LAND OWNER OR OTHER CONTACT PERSON
NAME DENISE CHAI
STREET ADDRESS 18 EDENFIELD COVE
CITY LITTLE ROCK AR

CASING FROM 0 TO 73 W/ 4 Inner Diameter
CASING FROM TO W/ Inner Diameter
TYPE CASING PVC

3. SCREEN
TYPE: PVC DIA 4 SLOT/GA .012
SET FROM 73 FT TO 83 FT
TYPE: DIA SLOT/GA
SET FROM FT TO FT

4 GRAVEL PACK FROM: 55 FT TO: 83 FT

5. BACK FILLED WITH: CUTTINGS
FROM: 10 FT TO: 55 FT

6. SEALED WITH: CEMENT
FROM: 0 FT TO: 10 FT
FROM: FT TO: FT

7. DISINFECTED WITH: BLEACH

8. USE OF WELL:
IRRIGATION
OTHER

A/C HEATPUMP TYPE WELLS

(For A/C only)Will system also be used for purposes other than Heating and Air Conditioning?
If yes, name use:

(For A/C open-loop only) Into what medium is water returned?

11. REMARKS

12. SIGNED DATE

# ATTACHMENT 3

May 2022

Arkansas Department of Environmental Quality (ADEQ)

Re: Proposed discharge of large volumes of under-treated sewage into Mill Bayou, AR

As a resident of Roland, AR since 2005, I make my formal petition to you that I consider the under-regulated discharge of lightly treated human sewage effluent into the essentially standing surface water of Mill Bayou to be both reckless and dangerous. I hope my concerns as outlined below will give the ADEQ pause with regards to this specific petitioner and other current or future proposed large scale, high-density developments in the Lake Maumelle Watershed, its adjacent areas, and the rural Roland community of west Pulaski County, AR. My comments are confined to this proposal's impact upon humans, my area of expertise, while acknowledging that this proposed activity has far reaching impacts upon terrestrial and aquatic wildlife as well as implications related to flooding in the Roland area from large precipitation events and fouling its quality of life.

As a university professor and endocrine focused surgeon for over 3 decades, I am widely recognized as an expert in my field with over 400 regional, national, and international presentations, 300 peer reviewed publications, and two medical textbooks I have edited. I have performed thousands of endocrine surgeries and have treated numerous patients suffering from conditions caused by exposure to endocrine disrupting contaminants/pollutants. These diseases are often insidious and challenging to diagnose. They can easily go overlooked or unrecognized by many medical practitioners. Modern medicine and science presently lack the analytics and data to appreciate the full ramifications of chronic exposure to known, and those yet to be described, ED compounds from home/household and personal care products (PCPs) which would be discharged from this proposed large scale residential development.

It is reckless to discharge large volumes of contaminated water into a relatively stagnant body of water such as Mill Bayou. Motion provided by a brisk moving current and dilution into a large volume of the recipient body of water are fundamental considerations for aeration and natural degradation/purification of sanitary system effluent. This WILL NOT happen in Mill Bayou. The discharge will foul the southeast entrance to the Roland, AR community where the bayou crosses under AR highway 300 and will in all likelihood diminish the quality of life of its residents. In addition, this effluent will lead to the deposition of known contaminants from human refuse (illicit drugs, pharmaceuticals, pathogenic bacteria and viruses, etc.) which will concentrate into the soil over time and create both a potential environmental "brown site" that will require future mitigation and leach into the ground water and contaminate wells from the Maumelle Water Corporation or others of private citizens.

Specific to the dangers that this proposal could cause, nominally treated human effluent contains compounds which can interfere with the human endocrine (hormone) system and are described as "endocrine disruptors" (EDs). EDs effect all genders and all ages of humans that are exposed. EDs often mimic normal hormonal elements and confuse the endocrine system which can result in lower or higher levels of hormone expression. This can result in a plethora of symptoms which adversely effect quality of life and health, cause permanent effects in children, are costly because of medical care, and are avoidable by maintaining a clean environment.

I have reviewed the attached publications and conclude that the "package" sewer treatment plant which has been proposed will not remove PCP/ED's and other contaminants from the effluent. They will, however, end up in our drinking water. The US Clean Water Act stipulates

that "best available control technology" should be utilized for waste water treatment. Reverse Osmosis (RO) would be the current technology which would best remove pharmaceuticals, heavy metals, and other known and unknown ED compounds from what will eventually become our drinking water. RO is not part of the sewer treatment proposed for this development.

It is my desire that AEDQ sees wisdom in being prudent stewards of our environment as regulators of our Roland, AR home and disapproves of this application with prejudice.

Brendan C. Stack, Jr, MD, FACS, FACE
Fellow, American College of Surgeons
Fellow, American College of Endocrinology
bcstackjr@gmail.com
https://scholar.google.com/citations?hl=en&user=rUPjPH4AAAAJ

# ATTACHMENT 4

**DEPARTMENT OF ENVIRONMENTAL PROTECTION**
**Bureau of Water Standards and Facility Regulation**

| | |
|---|---|
| **DOCUMENT NUMBER:** | 391-2000-014 |
| **TITLE:** | Policy and Procedure for Evaluating Wastewater Discharges to Intermittent and Ephemeral Streams, Drainage Channels and Swales, and Storm Sewers. |
| **EFFECTIVE DATE:** | April 12, 2008 |
| **AUTHORITY:** | Federal Safe Drinking Water Act of 1974, P.L. 93-523. Federal Water Pollution Control Act (33 U.S.C.A. §§ 1251 – 1376). Pennsylvania Sewage Facilities Act (35 P.S. §§ 750.1 – 750.20). Pennsylvania Clean Streams Law (35 P.S. §§ 691.1 – 691.801). Pennsylvania Code, Title 25, Environmental Protection, Chapters 71(Sewage Facilities Planning), 91 (General Provisions), 92 (NPDES Permitting, Monitoring and Compliance). |
| **POLICY:** | Whenever wastewater is discharged to an intermittent or ephemeral stream, a drainage channel or swale, or a storm sewer, the potential for public health effects, nuisance conditions, groundwater pollution, impact on designated uses in surface waters, and trespass must be considered. |
| **PURPOSE:** | To provide guidance for evaluating proposals involving wastewater discharges to intermittent and ephemeral streams, drainage channels and swales, and storm sewers. |
| **APPLICABILITY:** | This technical guidance applies to all wastewater dischargers in the Commonwealth of Pennsylvania required to obtain an NPDES permit. |
| **DISCLAIMER:** | The policies and procedures outlined in this guidance are intended to supplement existing requirements. Nothing in the policies or procedures shall affect regulatory requirements.<br><br>The policies and procedures herein are not an adjudication or a regulation. There is no intent on the part of DEP to give the rules in these policies that weight or deference. This document establishes the framework within which DEP will exercise its administrative discretion in the future. DEP reserves the discretion to deviate from this policy statement if circumstances warrant. |
| **PAGE LENGTH:** | 13 pages |
| **LOCATION:** | Volume 29, Tab 7 |

## I. Introduction

This document provides guidance on evaluating and permitting wastewater discharges to intermittent and ephemeral streams, drainage channels and swales, and storm sewers. The guidance also applies to man-made surface water drainage systems. Whenever wastewater is discharged to an intermittent or ephemeral stream, a drainage channel or swale, or a storm sewer, the potential for public health effects, nuisance conditions, groundwater pollution, impact on designated uses in surface waters, and trespass must be considered. This guidance supersedes all other policies and procedures, memoranda, letters, or guidance for evaluating discharges to drainage channels and swales, and other man-made conveyance systems described in the guidance.

This guidance applies to any proposed discharge from any new or expanded facility or activity, to a receiving watercourse with little or no natural surface water flow under most conditions. This includes proposed new or expanded discharges to intermittent and ephemeral streams, drainage channels and swales, and storm sewers. If successful, the end result of this process will be an NPDES permit for the discharge of treated wastewater. If the proposed discharge is for the purpose of wastewater treatment and reuse, a different guidance applies -- *Reuse of Treated Wastewater Guidance Manual*, DEP ID: 362-0300-009. If the proposed discharge is for the purpose of land application of treated wastewater, a different guidance applies -- *Manual for Land Application of Treated Sewage and Industrial Wastewater*, DEP ID: 362-2000-009. It is possible that an application may involve more than one of these programs, such as would be the case if the portions of the wastewater are to be treated or disposed under different programs. In this case, the requirements of all applicable programs must be satisfied.

A wastewater discharge to an intermittent or ephemeral stream, drainage channel or swale, storm sewer, or any other situation involving a dry or nearly dry channel, presents significant challenges to meeting surface water quality standards. There is little or no assimilative capacity available, and such discharges should be considered only as a last resort. If it is feasible to discharge to an existing treatment works which has adequate capacity, or if it is feasible to discharge the effluent from the proposed treatment works to a stream where assimilative capacity exists, a discharge of wastewater to a dry or nearly dry drainage channel should not be considered.

## II. Regulatory Requirements

The Pennsylvania Clean Streams Law prohibits the discharge of any substance to the waters of the Commonwealth if the discharge will or is likely to create a nuisance, or if it is detrimental to public health or livestock, wild animals, birds, fish, or other aquatic life. 25 Pa. Code Chapter 93 establishes general and specific water quality criteria, and defines protected and statewide water uses, that must be protected in surface water. Public water supply uses of groundwater must be maintained within the levels established in the Primary Drinking Water Standards of the Federal Safe Drinking Water Act unless specifically protected at more restrictive levels by DEP. Other requirements regarding the siting, design, and operation of wastewater discharges also apply.

## III. Definitions

The following words and terms, when used in this document, have the following meanings, unless the text indicates otherwise:

Drainage channel - A trench dug into the earth, for the purpose of conveying overland stormwater runoff away from a site or area. A drainage channel may be open or covered (i.e., a culvert).

Drainage swale - A natural topologic depression that collects overland stormwater runoff, and conveys it away from a site or area.

Ephemeral stream - A reach of stream that flows only during and for short periods following precipitation, and flows in low areas that may or may not have a well-defined channel. Ephemeral stream beds are located above the water table year-round. Groundwater is not a source of water for the stream. Some commonly used names for ephemeral streams include: stormwater channel, drain, swale, gully, hollow, saddle, and routinely and incorrectly as "dry streams." The term is often used interchangeably with intermittent stream but the difference is in length of time of continuous flow (less than one month per year for ephemeral streams).

Facility or activity - Any NPDES point source or any other facility or activity including land or appurtenances thereto that is subject to regulation under the NPDES Program.

Individual sewage system - A system of piping, tanks or other facilities serving a single lot and collecting and disposing of sewage in whole or in part into the soil or into waters of this Commonwealth or by means of conveyance to another site for final disposal.

Intermittent stream - A reach of stream that flows only during wet periods of the year (30% - 90% of the time) and flows in a continuous well-defined channel. During dry periods, especially in summer months, intermittent streams may be reduced to a trickle of water which makes it appear dry, when in fact there is water flowing through the stream bottom or "substrate". This is usually caused by the seasonal changes of the local soil water table or during periods of long-term drought.

MCL - Maximum contaminant level - The maximum permissible level of a contaminant in water which is delivered to a user of a public water system, and includes the primary and secondary MCLs established under the Federal Safe Drinking Water Act, and MCLs adopted under the Pennsylvania Safe Drinking Water Act. The term refers to the numerical value and the means of determining compliance with that value, and does not refer to EPA applications to specific types of public water systems or sources.

Onlot sewage system - A sewage system which uses a system of piping, tanks or other facilities for collecting, treating and disposing of sewage into a soil absorption area or spray field or by retention in a retaining tank.

Perennial stream - A body of water in a channel that flows throughout a majority of the year in a defined channel and is capable, in the absence of pollution, drought or man-made stream disturbances, of supporting a benthic macroinvertebrate community that is composed of two or more recognizable taxonomic groups of organisms, large enough to be seen by the unaided eye

and can be retained by a U.S. Standard No. 30 sieve (28 meshs per inch, 0.595 mm openings) and live at least part of their life cycles within or upon available substrates in a body of water or water transport system. A perennial stream can have $Q_{7-10}$ flow of zero. For the purposes of this document, a perennial stream includes lakes and ponds.

Point of first surface water use - The first downstream point where the stream is capable of supporting existing or designated uses as defined in Chapter 93.

SFTF - Small flow treatment facility - An individual or community sewerage system designed to adequately treat sewage flows not greater than 2,000 gpd for final disposal using a stream discharge or other disposal methods approved by the Department.

Surface waters - Perennial and intermittent streams, rivers, lakes, reservoirs, ponds, wetlands, springs, natural seeps and estuaries, excluding water at facilities approved for wastewater treatment such as wastewater treatment impoundments, cooling water ponds and constructed wetlands used as part of a wastewater treatment process.

WQBEL - Water quality-based effluent limit - An effluent limit produced based on the maximum capacity of the receiving water to assimilate pollutants while still meeting surface water quality criteria and protected uses.

## IV. Potential Effects of Wastewater Discharges to Intermittent and Ephemeral Streams, Drainage Channels and Swales, and Storm Sewers.

Discharges of wastewater to intermittent and ephemeral streams, drainage channels and swales, and storm sewers present significant challenges to meeting surface water quality criteria and designated uses in surface water for a number of reasons. There is little or no assimilative capacity available. Discharge flows that exceed the natural conveyance capacity of the channel or swale can result in progressive scour of the channel, unstable side slopes, and consequent degrading of the channel and transport of sediment downstream. High proportions of wastewater compared to natural stream flow may demand an impracticable level of wastewater treatment in order to meet Chapter 93 surface water quality criteria and protected uses, and typical methods used to produce WQBELs may not always be adequately protective under these conditions. It may be unclear where exactly surface water quality criteria should be applied, and where designated uses must be achieved, especially if the discharge will create a new, man-made watercourse. In order to satisfy all applicable regulatory requirements, all surface water quality standards (including those developed or applied under Chapter 16) that are designed to protect human health are applicable in all surface waters. All surface water quality standards that are designed to protect aquatic life are applicable at the point of first surface water use, and all points downstream.

Depending on the proximity of the discharge to the surface water, discharges of wastewater to intermittent and ephemeral streams, drainage channels and swales, and storm sewers also may present a significant threat to groundwater quality. As is the case with wastewater discharges to a surface stream, pollutants entering groundwater tend to become diluted down gradient due to dispersion. Unlike stream flow, which is largely turbulent, groundwater flow is nearly always laminar. Where stream dilution results from macroscopic dispersion, groundwater dilution results as contamination diffuses around individual grains of soil. Where stream flow velocities are measured in terms of feet per second, groundwater flow velocities are measured in terms of

feet per day or feet per year. The major difference in the dispersion and ultimate dilution of pollutants added to both systems is time. The average residence time for groundwater might be on the order of many years, whereas the comparable residence time for surface water can be measured in hours or days. Rapid assimilation of pollutants by groundwater is not feasible.

Since groundwater flow is laminar, pollutants in groundwater tend to move slowly down gradient in a plume with limited lateral and vertical dispersion. The existing groundwater flow path can be altered by groundwater withdrawals. A pumping well causes a cone of depression to form in the water table at the point of removal. The permeability of the aquifer controls the shape of the resultant cone of depression. For wells drilled in slowly permeable materials, the cone of depression that forms at the pumping well is deep and steep-sided but limited in area. Consequently, pollutants may not be drawn into the pumping well even when the source is relatively close. For wells drilled in highly permeable materials, the cone at the pumping well is shallow but may extend for extensive distances from the pumping center. Therefore, pollutants can be drawn from sources which are relatively far away. High permeability materials are often found in flood plain sediments, alluvial channel and outwash deposits, and other terrain having unconsolidated material.

Pollutants are not readily assimilated once a wastewater enters groundwater and can remain as a long term influence on water quality. Some ionic species (anions) move through the soils directly to the water table with little or no change in concentration. Considering the above and the fact that most drainage swales readily transmit wastewater to groundwater, all wastewater discharges to drainage swales should be considered as potential direct discharges to groundwater. When an existing or potential groundwater use is within the dispersion plume created by a wastewater discharge to groundwater, discharge limits must be sufficient to protect the groundwater use.

As previously noted, this guidance applies when the intended result of the process will be an NPDES permit for a surface water discharge. The basis for the permit effluent limit for any pollutant contained in the proposed discharge could be based on the need to protect groundwater, the need to protect surface water, or to fulfill a technology-based or advanced treatment requirement. The effluent limit issued in the NPDES permit will be the most stringent of those produced for these purposes.

Other issues that must be considered are those related to nuisance and trespass. A public nuisance is an unreasonable interference with a right common to the general public, and circumstances that constitute a public nuisance are, among other things, conduct that is forbidden by statute or ordinance, or conduct that interferes with public peace. A public nuisance claim could exist from the discharge itself. The Pennsylvania Supreme Court has held that it is a public nuisance to discharge sewage on to the property of others without permission and cause malodors and impair the value of that land, Freedman v. Borough of West Hazelton, 146 A. 564 (Pa. 1929). A private nuisance is an unreasonable invasion of another's interest in the private use and enjoyment of his or her land. Pennsylvania law requires both a physical presence and injury. Discharging treated wastewater to a dry swale and across others' properties could be an unreasonable interference with that property owner's use and enjoyment. While not the only demonstration of injury, odors, spoiling or scouring land, perpetual wetness, or prevention of use are possible injuries.

Trespass is any physical entry upon the surface of another's land. In order to prove trespass, one need only demonstrate that there is an unauthorized entry on the property. Flooding or just the overflowing of water alone can constitute trespass in some occasions. The entry of treated wastewater onto someone's property could reasonably constitute a trespass.

## V. Prerequisites

These prerequisites apply to any new or expanding facility or activity that involves a discharge to a receiving watercourse with little or no natural surface water flow under most conditions. This includes any proposed new or expanding discharge to an intermittent or ephemeral stream, drainage channel, swale, or storm sewer.

A. New wastewater discharges to intermittent and ephemeral streams, drainage channels and swales, and storm sewers where the first perennial stream that will be impacted by the discharge flow is designated as High Quality (HQ) or Exceptional Value (EV) under Chapter 93, must meet the requirements of § 93.4c to protect the existing quality of the HQ or EV Stream.

B. All water quality standards, including general and specific surface water quality criteria and protected uses in Chapter 93, and those developed or applied under Chapter 16, must be met for the full length of any natural or man-made watercourse. As an exception to this, surface water quality criteria and protected uses designed to protect aquatic life apply at the point of first surface water use, and all points downstream. Specific substances to be controlled in all surface waters include, but are not limited to, floating materials, oil, grease, scum and substances that produce color, tastes, odors, turbidity or settle to form deposits. These nuisance conditions must be controlled in any surface water, natural or man-made, as per Chapter 93.

C. Avoidance Criteria. Discharges to intermittent and ephemeral streams, drainage channels and swales, and storm sewers should not be permitted unless no other feasible options are available. Routing the discharge to an existing treatment works with sufficient capacity is the best option and should be required unless the applicant can demonstrate that this is cost prohibitive. The second best option is to move the discharge to a point on a perennial stream with significant assimilative capacity, using a discharge pipe or other enclosed conveyance. The regional permit engineer should determine if such an option is feasible and if there is a significant water quality benefit. As a guideline and subject to regional discretion, including the determination whether or not a significant water quality benefit will be attained, these criteria should be applied when determining whether it is feasible to move the point of discharge:

1. For proposed discharges of 2000 to10,000 gallons per day, the Department considers that moving the discharge point up to 250 feet at a minimum, is feasible. The feasibility of moving the discharge point greater distances should be evaluated by the applicant.

2. For proposed discharges of greater than 10,000 gallons per day, the Department considers that moving the discharge point up to 500 feet at a minimum, is feasible. The feasibility of moving the discharge point greater distances should be evaluated by the applicant.

SFTFs are exempt from any requirements related to these avoidance criteria.

D. Channel Conveyance Analysis. The permittee must demonstrate that expected velocities in the stream, channel, swale, or sewer will neither exceed the conveyance capacity of the channel, nor result in progressive scour of the channel bottom or sides. This will be accomplished using standard engineering principles and practices as they apply to open channel flow, and consider surface runoff as well as the facility discharge flow. In addition to this demonstration and as a guideline, velocities in the stream, channel, swale, or sewer should not exceed 2 feet per second unless the channel has been improved or stabilized to assure the stability of the channel. A Professional Engineer registered in Pennsylvania must seal the analysis report. Documentation of this analysis may be submitted with the application for a permit, with the NOI for coverage under a general permit, or by any other means approved by the responsible regional planner or permit engineer. SFTFs are exempt from the requirement for a channel conveyance analysis.

E. Equalization. New wastewater discharges to intermittent and ephemeral streams, drainage channels and swales, and storm sewers, should be equalized as required to avoid surges of flow through the channel. Equalization of the discharge flow should be required as an integral part of the design of Sequenced Batch Reactors (SBRs) or other batch-type facilities or operations. Equalization of other types of treatment facilities may be required in order to limit velocities in the channel to an acceptable range. SFTFs are exempt from the requirement for equalization.

F. Advanced Treatment Requirements. For discharges to intermittent and ephemeral streams, drainage channels and swales, and storm sewers, a high degree of treatment is required to compensate for the lack of available assimilative capacity and to minimize the potential for nuisance conditions. Effluent limits will be determined by the regional permit engineer on a case-by-case basis, but for discharges of treated sewage and similar oxygen-consuming wastes, effluent limits should include and be at least as stringent as these, or equivalent:

$CBOD_5$ - 10 mg/L as a monthly average;
TSS - 10 mg/L as a monthly average;
Total N - 5 mg/L as a monthly average;
Dissolved oxygen - minimum 6 mg/L at all times;
Phosphorus – 0.5 mg/L as a monthly average.

All discharges of treated sewage require effective disinfection sufficient to meet Chapter 93 bacteria criteria at the point of discharge. Seasonal adjustments should not be applied to effluent limits based on the advanced treatment requirements contained in this guidance. As an additional requirement for discharges of treated sewage, sand filters or equivalent are required in all cases. The Department will determine if alternative proposed treatment technologies are at least equivalent to sand filters.

SFTFs are exempt from the advanced treatment requirements listed in this guidance. However, the technology-based treatment requirements contained in the *Small Flow Treatment Facilities Manual,* DEP-ID 362-0300-002, are fully applicable for SFTFs.

For wastewater discharges other than discharges of treated sewage and similar oxygen-consuming wastes, no additional treatment requirements are applicable under this guidance. However, federal ELGs are still applicable, and other technology-based requirements may be applied consistent with regional requirements.

G. Easements Required. Applicants must acquire express easements from affected property owners, over whose property the proposed discharge could flow prior to the point where the discharge will intersect the first perennial stream, for the flow of wastewater across their property. These express easements must be filed in the county courthouse and attached to the property deeds for the properties. Copies of the registered, deeded easements should be submitted with the Planning Module for New Land Development for discharges of treated sewage, or with the Permit Application for discharges for industrial wastewater. The easements must cover all affected property between the proposed discharge point and the point where the discharge flow will intersect a perennial stream.

As an exception to this requirement, easements may not be required for a SFTF. The guidance contained in *Sewage Facilities Planning Module, Component 3s, Small Flow Treatment Facilities*, DEP-ID 3800-FM-WSFR0353s will apply for SFTFs. In general, easements will be required for projects proposing new construction of a SFTF. For projects proposing repair of existing onlot systems, documentation that potentially impacted property owners have received prior notification of the project usually will suffice.

H. Connection Provision. The NPDES permit that is issued should contain a provision that requires the permittee to connect to a municipal conveyance and treatment system, should this option become available during the term of the permit. Use of the existing facility should be terminated consistent with applicable public health and environmental standards.

## VI. Implementation

A. Planning

1. When a wastewater discharge requiring sewage facilities (Act 537) planning is proposed to an intermittent or ephemeral stream, a drainage channel or swale, or a storm sewer, the appropriate Sewage Facilities Planning Module will be used to assure that the proposed facility and documentation is consistent with applicable requirements.

2. As a minimum, the sewage facilities planning module will include:

   a) Documentation that the soils are not suitable for the installation of an individual or community onlot sewage disposal system.

   b) A copy of the most recent 7 ½" topographic map (or other map acceptable to the Department) with the location of the wastewater discharge accurately marked, and the exact latitude/longitude of the discharge point.

c) Identification on a map acceptable to the department, of all existing or potential groundwater uses within 200 feet of the proposed discharge point and for 200 feet on both sides of the dry channel downstream from the proposed discharge point to the point where perennial stream conditions exist.

d) Hydrogeologic studies, as required.

e) Documentation that easements have been obtained from all downstream property owners between the proposed discharge point and the point where perennial stream conditions exist.

f) Wastewater discharge rate and proposed effluent quality, including any seasonal variations.

g) The channel conveyance analysis.

3. Where a treated industrial wastewater (IW) discharge is proposed and sewage facilities' planning is not required, this same information should be submitted as part of the permit application package. For IW discharges, review of the planning documents must be coordinated by the responsible permit engineer or other regional staff.

B. Evaluation and Permitting

1. The responsible regional hydrogeologist will review the preliminary information considering, at a minimum, the variables shown in Appendix A. Based upon the review, the hydrogeologist will determine whether local groundwater uses may be adversely impacted by the proposed discharge. If the hydrogeologist determines that more information is necessary, he or she may request that the discharger perform a detailed hydrologic review. Additional information for the detailed review should include detailed definitions of the mixing zone, buffer zone, and existing and potential groundwater uses that may be affected. After reviewing these data, the hydrogeologist will make a determination whether groundwater uses will be adversely affected, and if necessary, the Department may require monitoring of existing uses.

2. If the hydrogeologist determines that the discharge may adversely impact groundwater use, applicable human health-related criteria should be imposed at the point of discharge. If an MCL has been promulgated for the pollutant of concern, the effluent limit should be set equal to the MCL value. If no MCL has been promulgated for the pollutant of concern, the effluent limit should be set equal to the human health-based criterion developed specifically for groundwater protection by the Bureau of Water Standards and Facility Regulation. These criteria will follow the guidelines for surface water criteria development, but with exposure conditions set to more accurately assess groundwater. Specifically, these include drinking water consumption of 2 L/d by a 70 kg person, and with an overall $10^{-6}$ lifetime risk management level (no fish consumption component will be applicable). If the hydrogeologist determines that groundwater uses will not be

adversely impacted by a wastewater discharge, final treatment requirements and effluent limits will not be governed by the requirement to protect groundwater.

3. The responsible water pollution biologist will evaluate the preliminary information and determine the point of first surface water use using the guidance provided in Appendix B.

4. Based on the determinations and input of the hydrogeologist and the biologist, the NPDES permit engineer will determine appropriate permit limits. For each pollutant and as applicable, the final permit limit will be the most stringent of those produced to protect groundwater, BDT, or the WQBEL evaluated at the point of first surface water use. WQBELs will be produced using PENTOXSD or equivalent for toxics and other substances, including disinfection byproducts; WQM 7.0 for $CBOD_5$, ammonia, and dissolved oxygen; and TRC_CALC for total residual chlorine, if applicable. If the design stream flow is zero or nearly zero, WQBELs for most pollutants, including toxics and ammonia, will be at or close to the criteria value. This is unavoidable under these unfavorable conditions.

**Appendix A**
**Variables Which Should Be Considered**
**When Evaluating Effects on Groundwater**

A. Type of Discharge

1. Drainage Swale
2. Artificially Constructed Drainage Ditch

B. Relationship of Channel to Groundwater Flow

C. Depth to Water Table (seasonal variations)

D. Physical Characteristics which Control Groundwater Flow

1. Fractures
2. Solution Channels
3. Bedding Features
4. Structure

E. Rock Characteristics

1. Physical (consolidated, unconsolidated, texture, etc.)
2. Chemical (mineralogy, weathering, etc.)

F. Background Groundwater Quality/Quantity

G. Groundwater Use Characteristics - Downgradient Users, Spring and Well Locations, Volumes of Groundwater Pumped, Estimated Cones of Depression, Influence of Pumping on Groundwater Flow Direction for Both Existing and Potential Users

H. Existing or Potential Dispersion Plume Characteristics

I. Site Runoff Characteristics - Expected Quality, Flow Characteristics, Volumes, Frequencies

J. Effluent

1. Volume
2. Quality (chemistry)
3. Location of Discharge

K. Distance to Perennial Receiving Stream

L. Downstream Characteristics - Flow Characteristics, Volume, Quality

M. Other Discharges to Channel and Receiving Stream Which Might Influence Quality

## Appendix B
## Point of First Surface Water Use Determination

The point of first surface water use establishes where Chapter 93 Water Quality Standards, including criteria developed and applied under Chapter 16, must be attained. It represents the location where continuous stream flow may be available for treated waste assimilation, and a determination usually should be limited to well defined stream channels in which flow usually occurs. The presence of flowing water, however, may not be sufficient evidence to conclude that an aquatic use occurs or is possible at a particular point. Intermittent flows may preclude the establishment of aquatic uses and additional analyses may be required to identify these situations and to determine the point at which a stream supports a use.

There are no published hard and fast rules for these types of determinations. The determination of the point of first stream use is subjective to some extent and based on the analyses of certain physical and chemical characteristics. The time to conduct stream channel surveys to determine the point of first surface water use should be left to the discretion of the biologist but, as a guideline, usually should be performed from November through April.

This appendix provides general guidance. It is not all inclusive and should not preclude evaluation of factors which are not listed. The intent is to distinguish between perennial streams, ephemeral streams, drainage channels, drainage swales, and "wet weather" types of flowing waters.

1. Biological Considerations

   a. Macroinvertebrate Community

      Indicators of Perennial Flow: Evidence of a diverse community which includes species which have relatively long aquatic life stages (Megaloptera, clams, and some Plecoptera and Ephemeroptera).

      Indicators of Intermittent Flows: Low diversities, absence of fall emergence forms, dominance of forms with short aquatic life states (Baetis, chironomids, Simulium).

      Cautions: Some invertebrates can compensate for intermittent dry periods (i.e. eggs which can withstand desiccation); some streams have interstitial flows which support diverse "subterranean type" macroinvertebrate communities.

   b. Fish

      Indicators of Perennial Flow: Diverse community composed of adults, juveniles in intermediate stages include forage and predator types.

      Indicators of Intermittent Flow: Low diversity or dominance by one age group, absence of predators.

      Caution: Fish are mobile and can move in and out of an area with relative ease as flow or other conditions become unsuitable.

c. Macrophytes

The presence of rooted aquatic plants is a possible indicator of perennial flows. However, due to the influence of other physical factors on macrophyte growth (i.e., substrate, canopy, stream velocities), the absence of macrophytes is not an indicator of intermittent conditions.

2. Physical Considerations

There are no generally applicable rules for consideration of physical factors, such as channel width and depth or substrate composition, that are relative to this subject other than the suitability of these to support an aquatic community. However, consultation with a geologist can yield valuable information on stream flow potentials based on geological factors in the region.

3. Other Factors

Existence of Ponds or Impoundments: Streams with a pond or an impoundment generally have flows throughout the year.

Topographical Maps: The depiction of a stream as intermittent (dashed line) or perennial (unbroken line) on a topographical map is generally based on some reliable historical data.

Knowledge of Area: This can be from personal experience or information from local residents or sportsmen who are familiar with the area.

4. Summary

It is best to consider all, or as many as possible, of the above factors in making a first use determination. Professional judgment tempered with experience is currently the best tool available for making a stream use determination.

# ATTACHMENT 5

# Wastewater Treatment Plant Endocrine Disrupting Chemical Monitoring Study

Minnesota Pollution Control Agency

February 2011

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# Contents



# Glossary of terms and abbreviations

| | |
|---|---|
| EAC | Endocrine active compound |
| Estrogenic chemical | A chemical that binds to estrogen receptors and elicits a response similar to natural estradiol hormones. |
| VTG | Vitellogenin; the protein normally found in female fish associated with egg development. |
| WWTP | Wastewater treatment plan |

| **Units** |
|---|
| One part per million: ppm, mg/Kg, mg/L, µg/g |
| One part per billion: ppb, µg/Kg, ng/g, µg/L |
| One part per trillion: ppt, ng/Kg, ng/L |

# Executive Summary

Some chemicals can mimic the effects of hormones in animals and cause adverse behavioral and physiologic effects, including impairment of the reproductive system or disruption of growth and development of an organism. These *endocrine active chemicals*, or EACs, do not usually exhibit acute toxicity at the levels normally found in the environment, but instead can alter the normal functioning and growth of the exposed organism at very low concentrations (Streets et al. 2008). (Scientists are increasingly adopting the term "endocrine active chemicals" over the term "endocrine disrupting chemicals" as a more accurate description for chemicals affecting the endocrine system).

Previous investigations have shown that EACs, including pharmaceuticals, are widespread at low concentrations in Minnesota's rivers and lakes. These studies show that fish in these waters show signs of endocrine disruption, such as the feminization of male fish.

The Minnesota Pollution Control Agency (MPCA) was directed by the 2009 Minnesota Legislature to monitor surface water for these chemicals at points upstream, at the point of discharge, and downstream from at least 20 wastewater treatment plants (WWTPs). (See Appendix A for statutory language). This report presents the results of this study.

WWTPs that were included in this study differed in capacity and treatment type. Results show that pharmaceuticals, triclosan, nonylphenol, nonylphenol ethoxylates, octylphenol, octylphenol ethoxylates, bisphenol A, phytoestrogens, and steroid hormones were detected in wastewater, surface water and sediment samples. Several of these compounds were detected at upstream locations as well as downstream from WWTPs, indicating that WWTPs are not the only source of these chemicals.

The most frequently detected contaminants include:

- Nonylphenol, a known EAC that is used in commercial products and is a breakdown product of commercial detergents. Nonylphenol was detected in 80 percent of the effluent samples, in 42 percent of the surface water samples, and in 63 percent of sediment samples. Nonylphenol was found in 33 percent of water samples collected upstream of WWTPs.
- Bisphenol A, which is used to make polycarbonate plastics and is considered an EAC, was detected in 56 percent of effluent samples, in 31 percent of surface water samples, and in 25 percent of upstream water samples.
- The contraceptive hormone 17α-ethinylestradiol, a known EAC, was detected in 40 percent of effluent samples and in 22 percent of all water samples. This hormone was detected both upstream and downstream of WWTPs at similar frequencies (13 percent).
- 17β-estradiol, a known EAC. This naturally occurring hormone was detected in 68 percent of effluent samples. It was detected in 13 percent of upstream water samples and in 92 percent of sediment samples.
- The pharmaceuticals carbamazepine (an anti-seizure medication used to treat attention deficit disorders) and sulfamethoxazole (a common antibiotic) were detected in 96 percent of effluent water samples. Sulfamethoxazole was found in 46 percent of upstream water samples and in 100 percent of the downstream samples, while carbamazepine was found in 21 percent of the upstream water samples and in 79 percent of the downstream water samples. Antidepressant medications also were frequently detected.

These and other contaminants were detected in the water and sediment at concentrations that ranged from the low ppt to ppb. Several contaminants, such as hormones, nonylphenol, or bisphenol A, were measured at concentrations that have been shown to impair endocrine function in fish and wildlife. Currently, there are no environmental regulatory standards that are based on the endocrine active properties of chemicals.

The results of this study are consistent with previous investigations that show that many pharmaceuticals and EACs are present at low concentrations in wastewater effluent, surface water, and sediment. The results add clarity to the types and amounts of compounds released from WWTPs, and indicate that several of these chemicals are present upstream of WWTP sources.

Fish studies were conducted at five WWTP locations. Fish were exposed to dilutions of WWTP effluent and to water upstream and downstream of the WWTP using a mobile laboratory that provided controlled conditions. Although the observed biological effects were subtle, vitellogenin concentrations in the male fathead minnows increased with the proportion of and time of exposure to WWTP effluent. Vitellogenin is a protein naturally found only in female fish, but is often found in male fish after they have been exposed to EACs. Changes in physical sex characteristics in male fish exposed to WWTP effluent were observed.

Water that contains a mixture of chemicals may have *estrogenic* properties, or, in other words, mimic the effects of hormones. The effluent from most of the 25 WWTPs tested had this hormone-like effect, although the degree of this estrogenicity varied from plant to plant. This also was observed in water collected upstream and downstream of the WWTPs.

At three WWTPs, effluent, upstream water, and downstream water were tested for the ability to turn on or turn off a wide variety of genes in fish using specific gene assays developed for this purpose. Water that contained effluent influenced the expression of several hundred genes in ways that upstream water did not.

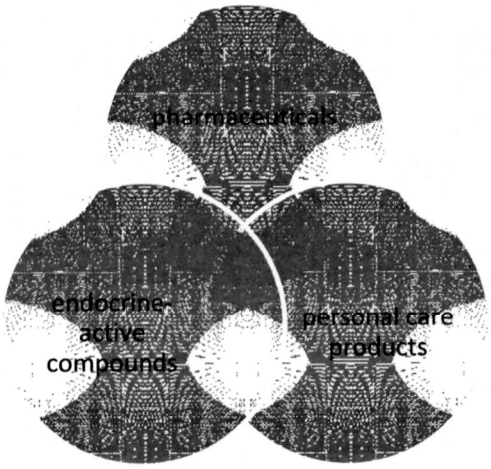
Although this study has advanced an understanding of the presence and concentration of EACs in WWTP effluent, surface water, and sediment, a number of questions remain unanswered. Ongoing research that is focused on monitoring EACs and assessing their effects on fish and wildlife will contribute important information that is needed by resource managers and the public to understand what impact these chemicals have on Minnesota's environment.

# Background

There are more than 500 WWTPs in Minnesota. Chemicals used in homes, industry, and agriculture are collected by the WWTP collection system and treated using a variety of engineering processes. However, compounds introduced into this system - including EACs and pharmaceuticals - are often observed in the effluent discharged to the surface water after treatment. In addition, some endocrine active compounds are produced by the degradation of parent compounds, and pharmaceuticals can be degraded into metabolites that still exhibit biologically active characteristics. EACs do not usually exhibit acute toxicity at concentrations typically found in the environment. Instead, EACs are hormonally active at very low, non-toxic concentrations, and may alter normal physiological functions in organisms that are exposed to them. An unknown number of the more than 87,000 chemicals that are manufactured worldwide may possess endocrine active properties.

Pharmaceuticals, personal care products, anthropogenic (or man-made) compounds, pesticides, or naturally occurring compounds also may be endocrine-active chemicals. Not every chemical found in wastewater, however, is an EAC. In other words, not all of these chemicals possess endocrine-active properties (Figure 1). In this report, the terms "EAC" or "chemical" are used for the sake of simplicity to refer to the broad group of pharmaceuticals, EACs, personal care products, and other chemicals that are detected in wastewater.

**Figure 1. Diagram showing the relationship between pharmaceuticals, personal care products, and endocrine-active compounds.**




Several previous monitoring studies over the last 15 years identified EACs in Minnesota rivers and lakes, as well as in WWTP effluent (Barber et al. 2007; Barber et al. 2000; Kolpin et al. 2002; Lee et al. 2010; Lee et al. 2004; Lee et al. 2008 (a); Lee et al. 2008(b); Writer et al. 2010). These investigations also have shown evidence of endocrine disruption in fish downstream of WWTP effluents. Available data suggest that concentrations of EACs in Minnesota WWTPs and receiving streams greatly vary, and that some WWTPs are discharging chemicals at concentrations that could have an effect on fish and wildlife. However, the number of WWTPs sampled among previous studies represents a small fraction of the WWTPs in Minnesota and thus may not be representative of all WWTPs in Minnesota.

The Minnesota Legislature directed the MPCA in 2009 to sample at least 20 WWTPs representing a variety of treatment types, capacities, and regions. The MPCA, after consulting the University of Minnesota, the Minnesota Department of Health, the Minnesota Department of Natural Resources, and the Metropolitan Council Environmental Services, collaborated with the U.S. Geological Survey (USGS), St. Cloud State University (SCSU), and the University of St. Thomas on the study.

A combination of chemical and biological analyses was used to measure the presence and effects of EACs in Minnesota WWTP effluents and receiving waters:

1. Analysis of EACs in water samples collected from the effluents from WWTPs and in the water upstream and downstream of the WWTPs.

   The testing included a total of 78 chemicals, including 20 pharmaceuticals, 19 steroid hormones, 6 alkylphenolmethoxycarboxylates,10 phytoestrogens and 23 alkylphenols and other natural and synthetic chemicals indicative of a variety of wastewaters. These chemicals have been tested in several prior EAC studies in Minnesota but are not routinely monitored at WWTPs. Several of these chemicals, such as nonylphenol and octylphenol (alkylphenols) and various hormones are known to be endocrine active. Other chemicals, though not possessing endocrine active properties, are natural or synthetic chemicals found in a variety of wastewaters including WWTP effluent, industrial effluent, and runoff from agricultural and urban land use. The effects of most of these chemicals, whether in surface water or sediment, on human health or the environment are unknown.

2. Analysis of EACs in sediments collected upstream and downstream of effluent discharges at a subset of sites.

   The testing included a total of 74 chemicals, including 19 steroid hormones and 55 natural and synthetic chemicals indicative of a variety of wastewaters.

3. Measurement of total estrogenicity of water samples using a gene assay.

   WWTP effluent can have hormone-like properties, although it is rarely clear what specific compounds in the effluent are directly responsible for those effects. In other words, effluent or water may be *estrogenic*. This estrogenicity can be measured by looking at certain genes that are activated, or expressed, when exposed to chemicals. This is a powerful method that allows scientists to look at the overall biological effect of a mixture of many chemicals in water (Martinovic et al. 2008).

4. Measurement of gene expression in fish that were exposed to surface water and WWTP effluent using a DNA microarray test.

   There are many thousands of genes in an organism that can be switched on or off when the animal is exposed to chemicals in the environment, each of which affect the health and behavior of the organism in some way. DNA microarray testing is an emerging technology that uses thousands of genes, allowing scientists to see whether specific genes are activated, or expressed, in response to a chemical or a mixture of chemicals in water. This powerful molecular test can reveal detailed information about the effects that chemicals in WWTP effluent have on fish metabolism.

5. Biological evaluation of fish that are exposed to WWTP effluent at a subset of locations.

   Observing how fish respond when exposed to actual mixtures of chemicals in wastewater demonstrates what effect those mixtures have on wild fish in the environment. A mobile exposure laboratory, which was funded through prior studies on EACs in Minnesota, was used in this study at a few of the 25 WWTPs to investigate how effluent from WWTPs affects fathead minnows, which is a test species recommended by the U.S. Environmental Protection Agency for studies of EACs. These studies reveal how wild fish populations may be affected near WWTPs.

This report presents the methods, results and discussion of the study. The tables and figures referenced in the text begin after page 18 of the report.

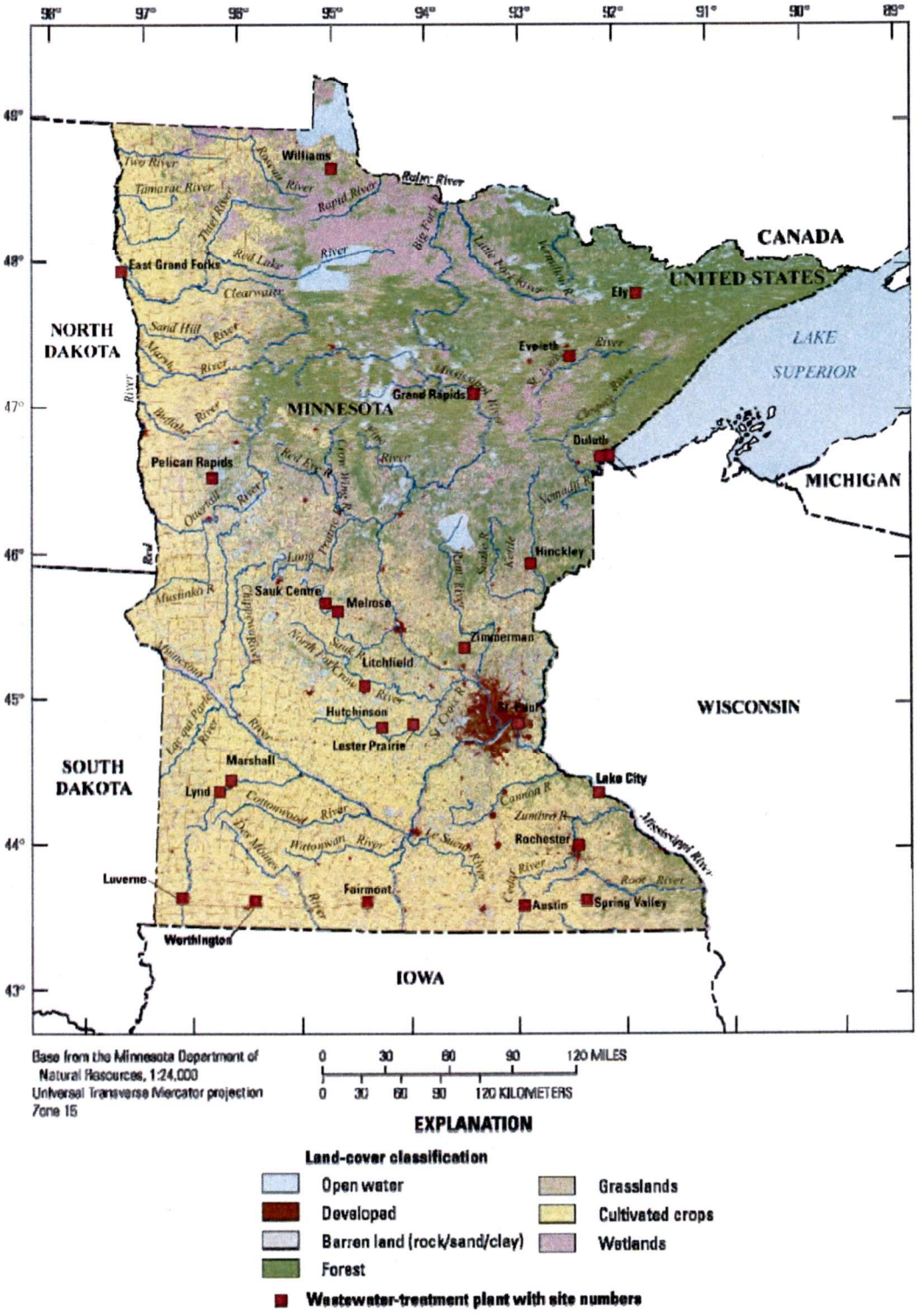
# Methods

## Sampling locations

A total of 25 WWTPs were selected for sampling based on size, geographical location, treatment type, and capacity (Figure 2). A diversity of WWTPs were selected to include those of differing treatment types and discharge (continuous flow vs. periodic releases), differing processing steps (activated sludge vs. trickling filters), and design flows ranging from 0.04 to 251 million gallons per day (Table 1). Locations were selected to gain an understanding of the effect that typical WWTPs have on surface waters in Minnesota. This study was not designed to focus attention on any particular WWTP. Streams that were selected for study ranged in drainage area from less than 5 to 48,000 square miles. Land use varies upstream of the sampling sites, ranging from forested land in the northern parts of Minnesota to dominantly agricultural land in the southern areas of the state.

Samples of effluent were collected from the discharge of each WWTP participating in the study. In addition, upstream and downstream locations from each WWTP plant were sampled to determine the occurrence of chemicals - including EACs and pharmaceuticals - in water and sediments.

**Figure 2. Site locations during 2009. Each square typically represents three sites (one upstream, one downstream, and one wastewater effluent sample).**



## Description of sampling procedures and analysis

Samples were collected between September 2, 2009, and November 23, 2009. Detailed USGS data collection methods have been described previously (Lee et al. 2011). Stream flow was measured at each stream site and WWTP daily discharge values were obtained from each facility at the time of sampling. Basic water quality properties (dissolved oxygen, pH, specific conductance, temperature, and turbidity) also were measured at each site. Dye tracer studies were performed at selected sites to determine water transit times to the downstream sampling sites.

Water and sediment samples were analyzed for steroid hormones, pharmaceuticals, alkylphenols and alkylphenol ethoxylates, and other chemicals associated with wastewaters as described elsewhere (Lee et al. 2011).

## Estrogenicity analysis

Total estrogenic activity of the water samples was measured using an estrogen receptor assay (Wilson et al. 2004). This test assesses the hormone-like properties of environmental samples compared to what a naturally occurring, known hormone would do in the same test. It is based on the tendency of chemicals in the water to bind to a specific steroid receptor on a cell. This binding to the receptor causes genetic responses in the cell that can be measured.

Data from these assays were used to estimate the *total estrogenic equivalents* (EEQs) in the water or effluent samples – in other words, how much of the naturally occurring hormone (17β-estradiol) would be needed to generate a similar response in the test. It is expressed as nanograms per liter, or ppt (Lee et al. 2011).

## Fish effects analysis

The effects of WWTP effluents on fish were studied at five WWTPs, selected to represent a variety of treatment technologies, population sizes and geographic distributions. At each site, a mobile exposure laboratory trailer was set up to conduct 12-day flow-through dilution series exposures of male fathead minnows. The goal of this work was to simulate likely exposures of native fish populations to WWTP effluent.

Following the 12-day flow-through exposures, male fish were examined for anatomical and physiological effects. Blood was collected from each fish to determine concentrations of vitellogenin in the blood.

Vitellogenin is a protein that is needed for egg production. It is therefore normally found only in female fish. However, it has been discovered that male fish will produce this protein when they are exposed to substances that are estrogenic. This makes vitellogenin a useful indicator of whether male fish have been exposed to EACs in the environment.

In addition, fish livers, testis size, and physical sexual characteristics were assessed in male fathead minnows to measure the effect of WWTP effluent on fish.

## Fish health assessment through gene expression

The effects that are observed and measured in caged fish (for example, the observation that vitellogenin is produced by male fish) are important because they relate to known stressors and impairments. These studies can be enhanced by looking at specific changes in the actual genes that are present and that are expressed in fish in response to chemical exposures. Gene expression data allows researchers to determine if other biochemical pathways – for example, the immune system, steroid synthesis, or other systems not otherwise observable - are affected by the exposure to the WWTP effluent.

WWTP effluents, upstream water, and downstream water were examined for effect on gene expression in male fathead minnows. Male fish (n=7) were exposed to water for 96 h at three locations. Fish were exposed to 100 percent effluent using the mobile exposure lab, or to the upstream or downstream water. These fish were used to investigate effects of exposure on the expression of roughly 15,000 genes in these fish using DNA microarray technology.

# Results

## WWTP effluent, surface water and sediment contaminant analysis

There was a broad range of natural and synthetic chemicals detected among water and bottom sediment samples including pharmaceuticals, alkylphenols, metal complexing agents, plastic components, and disinfectants, some of which are classified as EACs. Up to 58 percent of the 78 chemicals analyzed for this study were detected in effluent samples (Table 2), while 50 percent of the chemicals were detected at upstream locations and 68 percent of the chemicals were detected at downstream locations.

More chemicals were detected on average in WWTP effluent samples (an average of 26) than in surface water upstream (an average of 6) or downstream (an average of 14) samples (Table 2). Surface water downstream of the WWTPs contained from one to 10 pharmaceuticals, from one to seven hormones, and from two to 14 APEs and APECs (detergents), EDTA and NTA (metal complexing agents). However, many of the compounds identified downstream were detected upstream, implying that chemicals are being transported from other sources not identified in this study. Upstream water samples contained from zero and six pharmaceuticals, from one to nine chemicals of a group that included APEs, APECs, EDTA and NTA (Tables 3 and 4), and from zero to six hormones.

Results show that:

- At four of the 25 WWTP locations, upstream water samples had equal to or more total chemical detections than the corresponding downstream locations (Table 2).
- The number of pharmaceutical detections in upstream water samples was equal to or exceeded the number of detections in downstream samples at two out of the 25 WWTP locations (Table 3).
- There were a greater number of APEs, APECs, and other EAC detections in upstream samples than downstream water samples at eight out of 25 locations (Table 4).

## Pharmaceuticals

Figure 3 shows the individual pharmaceuticals that were detected in effluent, upstream water, and downstream water samples. Pharmaceuticals that were detected included carbamazepine (an anticonvulsant, detected up to a concentration of 1.5 ppb in WWTP effluent and 0.4 ppb in surface water), sulfamethoxazole (an antibiotic, found at 4.2 ppb in effluent and 2.4 ppb in surface water), and venlafaxine (an antidepressant, found at 5.5 ppb in effluent and at 1.8 ppb in surface water). These were the most commonly detected pharmaceuticals in 96 percent of effluent samples and in greater than 40 percent of surface water samples. Other pharmaceuticals found in water samples included trimethoprim (an antibiotic), fluoxetine (an antidepressant found in 80 percent of the effluent samples and 17 percent of downstream water samples); bupropion (an anti-depressant, detected in 80 percent of effluent samples and in 46 percent of downstream water samples); hydroxybupropion (a degradation product of bupropion), and diphenhydramine (an antihistamine) found in greater than 50 percent of the wastewater effluent samples.

The concentrations of pharmaceuticals detected were generally less than one microgram per liter, (one part per billion (ppb)) and most concentrations were estimated because they were detected in the samples below laboratory quality control reporting levels. Pharmaceuticals generally occurred as mixtures with the number detected ranging from zero to 15 among all samples (Figure 4). There were more pharmaceuticals detected in WWTP effluent samples (an average of eight pharmaceuticals) than in samples collected downstream of the effluent discharge (between one and 10 pharmaceuticals and an average of five) and samples collected upstream of the effluent discharge (between zero and six pharmaceuticals and an average of two). Some of the pharmaceuticals (carbamazepine, caffeine, sulfamethoxazole, and codeine) were present both upstream and downstream of WWTP discharges, although concentrations of pharmaceuticals were typically greater downstream from points of WWTP discharge.

## Steroid hormones

The number of steroid hormone detections in surface water downstream of WWTPs was generally greater than at the upstream locations and were found in the ppt concentrations.

- 17β-estradiol, estrone, estriol, and the synthetic contraceptive hormone 17α-ethinylestradiol were all detected at some upstream locations (Figure 5).
- 17β-estradiol, estrone, and estriol were detected in sediment upstream and downstream of WWTPs (Figure 6).
- 17β-estradiol was found in 13 percent of upstream water samples and in 42 percent of downstream surface water samples at a maximum concentration of 3 ppt; it was detected in 40 percent of upstream sediment samples and in 100 percent of downstream sediment samples.
- Estrone was detected in 13 percent of upstream water samples (maximum concentration of 32 ppt) and in 21 percent of downstream water samples (maximum concentration of 10 ppt). In WWTP effluent, it was detected in 52 percent of the samples up to concentrations of 38 ppt. This hormone also was detected in 92 percent of all sediment samples.
- 17α-ethinylestradiol, the synthetic contraceptive hormone, was detected in 13 percent of upstream water samples (1.5 ppt maximum concentration) and 13 percent of downstream water samples (0.5 ppt maximum). It was found in 40 percent of WWTP effluent samples, with a maximum concentration of 0.7 ppt.

## Alkylphenols

The alkylphenols nonylphenol and octylphenol (which are breakdown products of alkylphenol ethoxylate detergents and are EACs), were frequently detected in effluent, surface water, and in sediment (Figures 7, 8):

- Nonylphenol was found in 80 percent of the WWTP effluent samples with concentrations up to 10 ppb. Nonylphenol was detected in 33 percent of the upstream and 50 percent of the downstream surface water samples (Figure 7), and was present in 64 percent and 62 percent of the sediments that were collected upstream and downstream of WWTPs, respectively (Figure 8).
- Octylphenol was detected in 40 percent of WWTP effluent samples (up to 0.4 ppb). Octylphenol was not detected in upstream water samples, but was detected in 8 percent of the downstream water samples (Figure 7) and in 15 percent of the downstream sediment samples. (Figure 8).

## Additional chemicals

The insect repellant DEET was detected in 80 percent of the effluent samples (up to 0.8 ppb) and in 38 percent and 50 percent of the upstream and downstream water samples, respectively (up to 0.2 ppb). It was not detected in the sediments (Figures 7, 8).

HHCB and AHTN, chemicals used as fragrances and suspected EACs, were detected in 96 percent and 84 percent of effluent samples, respectively (Figure 7). HHCB and AHTN also were detected in upstream water samples (21 percent and 13 percent, respectively), indicating that there are upstream sources of these EACs to surface water. HHCB and AHTN were found up to 0.6 and 0.1 ppb, respectively, in effluent samples and up to 0.02 and 0.18 ppb, respectively, in water samples.

Triclosan (an antimicrobial) was detected in 76 percent of effluent samples, up to 0.4 ppb. This chemical was not detected in the surface water upstream of WWTPs, but was detected in 12 percent of downstream surface water (Figure 7) and in 31 percent of the downstream sediment samples (Figure 8). Triclocarban (an antimicrobial) was detected in 88 percent of the effluent samples, up to 0.4 ppb. This chemical was detected in 38 percent of the upstream samples (up to 0.07 ppb) and in 46 percent of the downstream samples (up to 0.4 ppb).

At some locations, the upstream concentrations of particular contaminants were greater than the concentrations measured at the corresponding downstream locations (Figure 9). For example, nonylphenol was found at higher or equal concentrations upstream (at 0.23 ppb) than downstream on the Grindstone River. This pattern was observed at the Pelican River, Red River, Jewitt's Creek, Zumbro River, and the Redwood River locations.

Similarly, some nonylphenol ethoxylates were found at higher concentration upstream of WWTPs (up to 4.3 ppb) on the Grindstone River, Redwood River, Sauk River, Zumbro River, and Center Creek than in the paired downstream samples.

Bisphenol A, the estrogenic chemical used in the manufacture of polycarbonate plastic, was present in 56 percent of WWTP effluent samples at concentrations up to 22 ppb (ppb). It was detected in 25 percent of water samples from upstream of WWTPs (up to 0.09 ppb), and in 33 percent of water samples downstream of the WWTPs (up to 6.2 ppb) (Figure 7). Bisphenol A was detected in the sediment at more locations upstream (55 percent) than at downstream locations (39 percent) (Figure 8).

## Comparison to previous studies

Table 5 shows a comparison of concentrations for several alkylphenols, alkylphenol ethoxylates, bisphenol A, triclosan, and DEET from this study and previous investigations in Minnesota, including the Mississippi River Study (Lee et al. 2008(a)), the Tributary Study (Lee et al. 2008(b)), and the Statewide EDC Study (Ferrey et al. 2008; Writer et al. 2010). The maximum concentrations of these chemicals measured in surface water downstream of WWTPs from this study are roughly similar to concentrations in water measured in previous studies, including the study of Minnesota lakes.

Of the four studies compared in Table 5, urban lakes with sewered development appear to have the lowest concentrations and detections of these compounds. Two exceptions are DEET, which was detected at greater concentration in urban lakes than in the rivers and streams associated with WWTPs, and bisphenol A, which was detected at much higher concentration downgradient of WWTPs.

Appendix C contains the complete analytical results of chemicals in WWTP effluent and surface water and sediment in upstream and downstream of WWTPs sampled during this study.

# Fish Exposure Analysis

The biological effects that were observed in the fish exposure studies were subtle and are based on the results of short (12 day) exposures of mature male fathead minnows to WWTP effluent.

While there were few changes in the gonadosomatic index (Table 6) suggesting that the relative size of the testis did not change across treatments and time intervals, the hepatosomatic index (HSI) (Table 7) trended higher in treatments containing effluent (especially at 75 percent and 100 percent). Higher HSI values suggest that the livers of these fish had to compensate for higher pollutant loads. Future analysis of these samples by SCSU will further evaluate changes to liver tissues.

The secondary sex characteristics of fathead minnows that were exposed to WWTP effluent (Table 8) declined with longer exposure periods and higher effluent exposure concentrations (especially at 75 percent and 100 percent effluent). Reduced secondary sex characteristics have been associated with reduced ability of fathead minnows to hold and defend nest sites, which is crucial to their reproductive success. Vitellogenin levels in the fish exposed to effluent in the mobile exposure lab showed induction of vitellogenin production in male fish at several sites and concentrations, although the observed effects were complex without a clear pattern (Table 9). In some cases, vitellogenin induction was observed even in control fish (i.e., fish not exposed to effluent), indicating that these fish may have been exposed to estrogenic compounds. This may be due to some of the chemicals in the tanks in which fish were exposed to effluent evaporating and migrating through the air to the control tanks as was suggested in a recently published study (Weinberg et al. 2011).

The effects in fish that were observed in these exposure studies were subtle and are based on the results of short (12 day) exposures of mature male fathead minnows. The effects observed in this study may not be severe enough to endanger populations in an ecosystem.

The results of this study should be followed by exposure studies of longer duration that use both sexes and include vulnerable life stages such as fish embryos and larvae.

# Estrogenicity and Gene Microarray Analysis

Total estrogenicity – the degree to which the water and effluent samples mimic the hormone estrogen – is reported in EEQs, and ranged from less than the detection limit to 63 ppt among all samples analyzed (Table 10).

For WWTP effluent, all of the effluent samples that were tested were estrogenic and ranged from 0.09 to 63.6 ppt. (Five WWTPs were not tested, and effluent from one appeared to be cytotoxic (thereby interfering with the cell-based assay)). Of the upstream waters, 78 percent were estrogenic, and upstream water EEQs ranged from non-detect to 12.8 ppt. Of the downstream water samples, 89 percent were estrogenic (16 of 18 samples tested), and downstream water ranged from non-detect to 23.2 ppt.

Gene expression analyses using DNA microarrays were done on samples from three sites (Rochester, Ely, and Hutchinson) to better understand the effect that WWTP effluent had on the expression of specific genes.

Microarray analyses did not find estrogenic activity at either the Rochester or Hutchinson WWTPs, but the Ely WWTP effluent activated expression of the gene responsible for the production of vitellogenin. Whether this source of estrogenicity has an effect on the broader population of fish in the lake is unknown.

One of the prominent observations made in the microarray study was that the Hutchinson WWTP effluent affected genes that regulate iron metabolism in fish. Iron is an important micronutrient for fish, and is an integral component of proteins involved in cellular respiration and oxygen transfer. Interestingly, the genes for immune response were affected only at upstream and downstream sites, and not by the Hutchinson WWTP effluent. These results suggest that the Crow River contained some chemicals that affect the immune system in fish that were not present in the Hutchinson WWTP effluent. The source(s) of these substances were not identified. Overall, downstream Crow River gene expression was more similar to the effluent (321 affected genes in common), than to the upstream site (179 affected genes in common) suggesting a detectable effluent signature at the downstream site (Figure 10).

The Rochester WWTP effluent and downstream water appeared to impact the genes for iron homeostasis, as well as the genes that regulate the synthesis of proteins important for oxygen transport. In addition, exposure to the Rochester effluent affected the genes in fish that are needed to break down proteins. Overall, the gene expression observed from exposure to downstream Zumbro River water was more similar to the effluent (350 genes in common), than the upstream site (271 genes in common) suggesting a detectable effluent signature at the downstream site (Figure 11).

The effluent from the Ely WWTP influenced the expression of multiple fish genes, including genes involved with immune response and the genes involved in the breakdown of proteins. As with the other two WWTP locations, effluent from the Ely WWTP had an effect on gene expression that was more similar to downstream sites (517 genes in common) than the upstream sites (314 genes in common), suggesting a detectable effluent signature at the downstream site (Figure 12).

# Discussion of Study Results

The results of this study are broadly consistent with previous studies, showing that WWTP effluents contain a wide variety of chemicals, including pharmaceuticals, alkylphenols, steroid hormones – many of which are EACs – that are discharged to surface water. It also confirms previous observations that fish exposed to WWTP effluent show signs of endocrine disruption. However, the scale of this study is unique, including 25 treatment plants that varied in capacity and treatment types located in various environmental settings throughout Minnesota. It provides a more detailed picture of the types of contaminants WWTPs contribute and the impact they are having on surface water.

It is clear from the results of this study that WWTPs commonly discharge several chemicals including pharmaceuticals, steroid hormones, detergents, and alkylphenols into surface water. Most of these compounds were detected in the sediment as well, demonstrating an accumulation of these contaminants in our environment over time. This was not unexpected, since incoming sewage contains a wide variety of these chemicals and treatment plants were not designed with the purpose of removing these compounds from sewage.

The size and location of a treatment plant does not appear to predict the number of contaminants detected in the effluent or the downstream surface water. For example, fewer pharmaceuticals and other chemicals were detected at the St. Paul Metro WWTP, with a capacity of 250 million gallons per day, than in the samples from several other treatment plants that are much smaller in size or capacity. However, it should be noted that this study was not designed to evaluate the effect of WWTP treatment processes on these contaminants.

At some of the study locations, upstream surface water contained as many or more contaminants than the samples that were collected downstream of the treatment plant. This indicates that there were significant upstream sources of nonylphenol, the ethoxylate detergents, and hormones to surface water. On some rivers, other WWTPs that are situated upstream may be contributing to detections at the upstream

locations that were sampled, while at other locations, there are no WWTPs located upstream. Where there are upstream WWTPs, several discharge to surface waters only intermittently. Other potential sources of these contaminants are individual sewage treatment systems (septic systems), urban storm water runoff, agricultural operations including feedlots and row cropping, application of biosolids, and atmospheric deposition.

This study, as well as previous studies of pharmaceuticals, organic wastewater compounds, and EACs in Minnesota, suggests that these chemicals are widespread in the aquatic environment at low concentrations. For example, a prior study on three rivers in Minnesota (Lee et al. 2008(a)) showed that alkylphenols and other contaminants were present in river water upstream of WWTPs. Similarly, the Statewide EDC Study (Ferrey et al. 2008; Writer et al. 2010) revealed that several pharmaceuticals, alkylphenols, and hormones were present in surface water and sediment of urban and rural lakes as well as in remote lakes with limited or no development. Table 5 shows that nonylphenol, some of the alkylphenol ethoxylates, and DEET were sometimes detected in urban and rural Minnesota lakes at roughly the same magnitude as were measured in this study downstream of WWTPs.

The data presented in this report represent only a "snapshot" of conditions that exist at a given WWTP, lake, or river location, since only one water or effluent sample was collected from each site at one point in time. Thus, chemical concentration data should be interpreted with caution. Concentrations of a chemical change temporally, so these results are not completely representative of the suite of contaminants at any given location over time.

Nonetheless, concern is growing over the possible effects of exposure to these contaminants in surface water, regardless of the source. Effect studies have shown that exposure to only 5 ppt of 17α-ethinylestradiol can result in the collapse of fathead minnow populations (Kidd et al. 2007); concentrations of 30 ppt of the antidepressant medication fluvoxamine has been observed to cause immediate spawning in freshwater mussels (Fong 1998). Although it is unknown what effects chemicals detected in this study are having on fish populations, it is clear that endocrine active compounds can be biologically active at the concentrations reported in this and prior investigations. In this study, male fathead minnows that were exposed to different concentrations of WWTP effluent under controlled conditions showed an increase in vitellogenin levels, indicating that the effluent had estrogenic effects. These fish also showed changes in secondary sex characteristics. In general, the fish exposure results were consistent with the cell-based estrogen assay that showed that the effluents from most of the WWTPs that were sampled were estrogenic. It is not known what particular chemicals in the effluent or mixtures of them induced these changes in fish, although alkylphenols have been demonstrated to cause similar responses under laboratory conditions (Barber et al. 2007; Lee et al. 2008; Schoenfuss et al. 2008).

The DNA microarray analysis employed in this study revealed that, in addition to estrogenic effects, hundreds of genes in fish can be affected when exposed to chemicals present in WWTP effluent. In future studies, this powerful emerging molecular technology may allow scientists to understand how particular EACs and chemicals found in wastewater cause physiological responses in fish and other organisms.

# Summary

- Alkylphenols, bisphenol A, pharmaceuticals, (including antibiotics, antidepressants, and steroid hormones), and other chemicals were present in the effluents of the 25 WWTPs included in this study. These chemicals were generally found more frequently downstream of the WWTP discharge. However at four locations, the number of chemical detections in upstream samples exceeded the number detected downstream.
- Several steroid hormones, including the synthetic hormone used in contraceptives, were found in WWTP effluent as well as at locations downstream of WWTPs. Some steroid hormones also were found at upstream sampling locations.
- Several pharmaceuticals were found in WWTP effluent and in downstream water samples. As a group, antidepressant medications were detected most frequently in WWTP effluent samples. Some pharmaceuticals were found at upstream locations.
- Several EACs, including bisphenol A, nonylphenol, nonylphenol ethoxylates, octylphenol ethoxylates, and musk fragrances were found in WWTP effluent. However, these chemicals were detected in water and sediment upstream of WWTPs, sometimes at higher concentrations than downstream of the plants, indicating that there were other upstream sources of these chemicals.
- The concentrations of nonylphenol, octylphenol, nonylphenol ethoxylates, and octylphenol ethoxylates found downstream of WWTPs in this study are similar to concentrations reported in previous studies of rivers as well as of lakes influenced by septic systems and other non-point sources.
- The effluents from most of the WWTPs that were tested were estrogenic. The impact of this on fish and wildlife populations is unknown.
- Male fathead minnows exposed to WWTP effluent under controlled conditions produced vitellogenin, a protein associated with egg production that is normally produced only by females. In addition, changes in secondary sex characteristics in these fish were observed.
- DNA microarray analysis showed that gene expression in fish was altered when they were exposed to WWTP effluents and to surface water collected either upstream or downstream of WWTPs. However, the gene expression patterns in fish exposed to downstream water bore similarity to the patterns observed in WWTP effluent-exposed fish.
- The gene expression patterns observed in fish exposed to WWTP effluent and to water downstream of WWTP sites were similar. These patterns were not observed upstream of WWTPs. While this suggests that WWTP effluents have an effect on fish downstream of their discharges, the effect on fish populations in general is not known.

This study demonstrates that several hormones, pharmaceuticals, and other wastewater chemicals are discharged by WWTPs. Many of these are EACs. However, it is clear that many of these contaminants are present upstream of WWTPs and at locations that are not influenced by WWTPs. Together with the results of other EAC studies in Minnesota and elsewhere, the results of this investigation indicate that these chemicals are widespread in our aquatic environment at low concentrations. The MPCA is currently sampling flowing waters in Minnesota at over 100 random locations for similar compounds, and the results of this study will increase our understanding of how widespread these contaminants are in surface water. The MPCA is continuing the collaboration with USGS, St. Cloud State University, and St. Thomas University to study the presence and effects of EACs on Minnesota lakes. The results of these studies will be available by June 30, 2011.

Although this study has advanced an understanding of the presence and concentration of EACs in WWTP effluent, surface water, and sediment, a number of questions remain unanswered:

- It is unclear to what degree other sources of contaminants – including private septic systems, agricultural feedlots, row cropping, biosolids application, and urban runoff – affect surface water.
- The degree to which they persist in sediment and surface water is not well understood. This study and others like it suggest that EACs and other chemicals appear to be accumulating in sediment, where they likely will persist for many years. The long-term ecological consequences of this accumulation in sediment are not known.
- Although it is clear that EACs can affect fish development and reproductive behavior, it is not known what impact EACs have on entire populations of fish and other organisms in the wild.
- The effect of different wastewater treatment processes on the fate of EACs is not well understood. Information about wastewater treatment technologies is needed to understand how variations in treatment might prevent EACs from reaching surface water.

Ongoing research that is focused on monitoring EACs and assessing their effects on fish and wildlife will contribute important information that is needed by resource managers and the public to understand what impact these chemicals have on Minnesota's environment.

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# Tables and Figures

**Table 1. Specifications for wastewater treatment plants included in this study.**

| Wastewater Treatment Plant | Design flow (Mgald) | Design flow (cms) | Type | Treatment processes | Number Trickling filters | Disinfection | Population Served | Percent Domestic | Percent Industrial |
|---|---|---|---|---|---|---|---|---|---|
| Williams WWTP Outflow at Williams, MN | 0.08 | 0.0035 | Continuous | Activated sludge – extended aeration | 0 | UV | 865 | 100 | 0 |
| Ely WWTP Outflow at Ely, MN | 1.5 | 0.0657 | Continuous | Activated Sludge - extended aeration; sand filters | 0 | Chl/DEChl | 3900 | 100 | 0 |
| Eveleth WWTP Outlflow at Eveleth, MN | 1 | 0.0438 | Continuous | Activated Sludge - extended aeration; Sand filters | 0 | Chl/DEChl | 3900 | 99.4 | 0.6 |
| Western Lake Superior Sanitary District - WWTP at Duluth, MN | 48.4 | 2.119 | Continuous | Activated Sludge – pure oxygen; Sand filters | 0 | Chl/DEChl | 111203 | 55 | 45 |
| Pelican Rapids WWTP Outflow at Pelican Rapids, MN | 0.91 | 0.0398 | Continuous | Trickling Filter; Rotating biological contactor (1 trickling filter; 3 RBC) | 1 | Chl/DEChl | 2476 | 67 | 33 |
| East Grand Forks WWTP Outflow at East Grand Forks, MN | 1.4 | 0.0613 | Controlled | Stabilization Ponds | 0 | | 8000 | 80 | 20 |
| Grand Rapids WWTP Outflow at Grand Rapids, MN | 15.2 | 0.6657 | Continuous | Activated Sludge - contact stabilization, conventional, step feed | 0 | Chl/DEChl | 12000 | 10 | 90 |
| Sauk Centre WWTP Outflow at Sauk Centre, MN | 0.88 | 0.0385 | Continuous | Activated Sludge - contact stabilization, conventional, step feed | 0 | Chl/DEChl | 4111 | 100 | 0 |
| Melrose WWTP Outflow at Melrose, MN | 3 | 0.1314 | Continuous | Trickling Filter; Activated Sludge - contact stabilization, conventional, step feed | 2 | Chl/DEChl | 3400 | 20 | 80 |
| Zimmerman WWTP outflow at Zimmerman, MN | 0.45 | 0.0197 | Continuous | Activated Sludge - conventional, sequencing batch reactors | 0 | UV | 5000 | 100 | 0 |
| Litchfield WWTP Outflow near Litchfield, MN | 2.4 | 0.1051 | Continuous | Trickling Filter; Activated Sludge – contact stabilization, convention, step feed | 2 | Chl/DEChl | 7500 | 50 | 50 |
| Hutchinson WWTP Outflow at Hutchinson, MN | 5.4 | 0.2365 | Continuous | Membrane Bioreactor | 0 | NA | 13900 | 68 | 32 |

**(Table 1 Continued)**

| Wastewater Treatment Plant | Design flow (Mgald) | Design flow (cms) | Type | Treatment processes | Number Trickling filters | Disinfection | Population Served | Percent Domestic | Percent Industrial |
|---|---|---|---|---|---|---|---|---|---|
| Lester Prairie WWTP Outflow at Lester Prairie, MN | 0.36 | 0.0157 | Continuous | Activated Sludge - extended aeration, oxidation ditch | 0 | UV | 1774 | 90 | 10 |
| Lynd WWTP Outflow near Lynd, MN | 0.045 | 0.0019 | Controlled | Stabilization Ponds | 0 | | 410 | 90 | 10 |
| Marshall WWTP outfall at Marshall, MN | 4.5 | 0.1971 | Continuous | Trickling Filter; Activated Sludge - contact stabilization, conventional, step fee; Sand filter | 2 | UV | 13000 | 40 | 60 |
| Fairmont WWTP Outflow at Fairmont, MN | 3.9 | 0.1708 | Continuous | Activated Sludge - contact stabilization, conventional, step feed | 0 | UV | 10889 | 81.7 | 18.3 |
| Metro Plant (WWTP) Outflow in St. Paul, MN | 251 | 10.99 | Continuous | Activated Sludge - contact stabilization, conventional, step feed | 0 | Chl/DEChl | 1800000 | na | na |
| Hinckley WWTP near Hinckley, MN | 0.5 | 0.0219 | Continuous | Activated Sludge - extended aeration | 0 | UV | 1438 | 100 | 0 |
| Lake City WWTP Outflow at Lake City, MN | 1.52 | 0.066576 | Continuous | Activated Sludge - contact stabilization, conventional, step feed | 0 | UV | 5300 | 75 | 25 |
| Rochester WWTP Outflow at Rochester, MN | 19.1 | 0.83658 | Continuous | Activated Sludge - Pure Oxygen | 0 | Chl/DEChl | 100000 | 50 | 50 |
| Spring Valley WWTP Outflow at Spring Valley, MN | 0.94 | 0.041172 | Continuous | Activated Sludge - extended aeration, oxidation ditch | 0 | Chl/DEChl | 2561 | 95 | 5 |
| Austin WWTP Outflow at Austin, MN | 8.5 | 0.3723 | Continuous | Trickling Filter (4 trickling filters + 2 nitrification trickling filters) | 6 | Chl/DEChl | 23000 | 67 | 33 |
| Worthington WWTP Outflow at Worthington, MN | 4 | 0.1752 | Continuous | Trickling Filter | 4 | Chl | 11283 | 97 | 3 |
| Worthington Industrial WWTP Outflow near Worthington, MN | 2.29 | 0.0876 | Continuous | Anaerobic Ponds; Activated sludge extended aeration; Sand Filters | 0 | Chl | 0 | 0 | 100 |
| Luverne WWTP Outlflow near Luverne, MN | 1.5 | 0.0657 | Continuous | Activated sludge; Trickling filter | 1 | Chl/DEChl | 4617 | 90 | 10 |

**Table 2. Total number of chemical detections in WWTP effluent and in surface water upstream and downstream of WWTPs.**

| Site number | Wastewater Treatment Plant | Upstream | Effluent | Downstream |
|---|---|---|---|---|
| 1 | Williams WWTP Outflow at Williams, MN | 5 | 13 | 9 |
| 2 | Ely WWTP Outflow at Ely, MN | 3 | 38 | 9 |
| 3 | Eveleth WWTP Outlflow at Eveleth, MN | 7 | 21 | 20 |
| 4 | Western Lake Superior Sanitary District - WWTP at Duluth, MN | 2 | 25 | 28 |
| 5 | Pelican Rapids WWTP Outflow at Pelican Rapids, MN | 2 | 40 | 7 |
| 6 | East Grand Forks WWTP Outflow at East Grand Forks, MN | 9 | 14 | 7 |
| 7 | Grand Rapids WWTP Outflow at Grand Rapids, MN | 2 | 17 | 3 |
| 8 | Sauk Centre WWTP Outflow at Sauk Centre, MN | 8 | 38 | 18 |
| 9 | Melrose WWTP Outflow at Melrose, MN | 14 | 36 | 14 |
| 10 | Zimmerman WWTP outflow at Zimmerman, MN | 4 | 28 | 28 |
| 11 | Litchfield WWTP Outflow near Litchfield, MN | 3 | 20 | 11 |
| 12 | Hutchinson WWTP Outflow at Hutchinson, MN | 10 | 23 | 16 |
| 13 | Lester Prairie WWTP Outflow at Lester Prairie, MN | 9 | 16 | 7 |
| 14 | Lynd WWTP Outflow near Lynd, MN | 4 | 24 | 8 |
| 15 | Marshall WWTP outfall at Marshall, MN | 5 | 29 | 12 |
| 16 | Fairmont WWTP Outflow at Fairmont, MN | 8 | 28 | 25 |
| 17 | Metro Plant (WWTP) Outflow in St. Paul, MN | 7 | 32 | 9 |
| 18 | Hinckley WWTP near Hinckley, MN | 6 | 25 | 8 |
| 19 | Lake City WWTP Outflow at Lake City, MN | 10 | 36 | 10 |
| 20 | Rochester WWTP Outflow at Rochester, MN | 11 | 26 | 14 |
| 21 | Spring Valley WWTP Outflow at Spring Valley, MN | 4 | 25 | 9 |
| 22 | Austin WWTP Outflow at Austin, MN | 7 | 38 | 28 |
| 23 | Worthington WWTP Outflow at Worthington, MN | 3 | 23 | 19 |
| 24 | Worthington Industrial WWTP Outflow near Worthington, MN | 3 | 10 | 19 |
| 25 | Luverne WWTP Outlflow near Luverne, MN | 1 | 36 | 8 |

**Table 3. Number of pharmaceuticals detected in WWTP effluent and in surface water upstream and downstream of WWTPs.**

| Site number | Wastewater Treatment Plant | Upstream | Effluent | Downstream |
|---|---|---|---|---|
| 1 | Williams WWTP Outflow at Williams, MN | 3 | 5 | 4 |
| 2 | Ely WWTP Outflow at Ely, MN | 1 | 15 | 3 |
| 3 | Eveleth WWTP Outlflow at Eveleth, MN | 6 | 8 | 9 |
| 4 | Western Lake Superior Sanitary District - WWTP at Duluth, MN | 1 | 9 | 8 |
| 5 | Pelican Rapids WWTP Outflow at Pelican Rapids, MN | 0 | 11 | 3 |
| 6 | East Grand Forks WWTP Outflow at East Grand Forks, MN | 3 | 3 | 4 |
| 7 | Grand Rapids WWTP Outflow at Grand Rapids, MN | 0 | 5 | 2 |
| 8 | Sauk Centre WWTP Outflow at Sauk Centre, MN | 0 | 11 | 5 |
| 9 | Melrose WWTP Outflow at Melrose, MN | 4 | 9 | 5 |
| 10 | Zimmerman WWTP outflow at Zimmerman, MN | 0 | 8 | 8 |
| 11 | Litchfield WWTP Outflow near Litchfield, MN | 0 | 7 | 4 |
| 12 | Hutchinson WWTP Outflow at Hutchinson, MN | 0 | 8 | 5 |
| 13 | Lester Prairie WWTP Outflow at Lester Prairie, MN | 4 | 8 | 4 |
| 14 | Lynd WWTP Outflow near Lynd, MN | 0 | 7 | 1 |
| 15 | Marshall WWTP outfall at Marshall, MN | 0 | 11 | 4 |
| 16 | Fairmont WWTP Outflow at Fairmont, MN | 0 | 10 | 8 |
| 17 | Metro Plant (WWTP) Outflow in St. Paul, MN | 5 | 11 | 5 |
| 18 | Hinckley WWTP near Hinckley, MN | 0 | 8 | 6 |
| 19 | Lake City WWTP Outflow at Lake City, MN | 5 | 12 | 6 |
| 20 | Rochester WWTP Outflow at Rochester, MN | 3 | 9 | 7 |
| 21 | Spring Valley WWTP Outflow at Spring Valley, MN | 1 | 7 | 4 |
| 22 | Austin WWTP Outflow at Austin, MN | 1 | 12 | 10 |
| 23 | Worthington WWTP Outflow at Worthington, MN | 1 | 7 | 5 |
| 24 | Worthington Industrial WWTP Outflow near Worthington, MN | 1 | 1 | 5 |
| 25 | Luverne WWTP Outlflow near Luverne, MN | 0 | 10 | 4 |

**Table 4. Number of detections of alkylphenol ethoxylates (APEs), alkylphenol ethoxylate carboxylates (APECs (which also include EDTA and NTA data)) in WWTP effluent and in surface water upstream and downstream of WWTPs.**

| | | Upstream | | | Effluent | | | Downstream | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Site | Wastewater Treatment Plant Location | APEs | APECs | sum | APEs | APECs | sum | APEs | APECs | sum |
| 1 | Williams WWTP Outflow at Williams, MN | 2 | 0 | 2 | 6 | 0 | 6 | 5 | 0 | 5 |
| 2 | Ely WWTP Outflow at Ely, MN | 2 | 0 | 2 | 10 | 5 | 15 | 1 | 1 | 2 |
| 3 | Eveleth WWTP Outlflow at Eveleth, MN | 1 | 0 | 1 | 5 | 4 | 9 | 5 | 2 | 7 |
| 4 | Western Lake Superior Sanitary District - WWTP at Duluth, MN | 0 | 0 | 0 | 11 | 5 | 16 | 11 | 3 | 14 |
| 5 | Pelican Rapids WWTP Outflow at Pelican Rapids, MN | 1 | 0 | 1 | 17 | 6 | 23 | 3 | 0 | 3 |
| 6 | East Grand Forks WWTP Outflow at East Grand Forks, MN | 4 | 0 | 4 | 5 | 1 | 6 | 2 | 0 | 2 |
| 7 | Grand Rapids WWTP Outflow at Grand Rapids, MN | 2 | 0 | 2 | 7 | 2 | 9 | 0 | 1 | 1 |
| 8 | Sauk Centre WWTP Outflow at Sauk Centre, MN | 5 | 0 | 5 | 16 | 4 | 20 | 7 | 2 | 9 |
| 9 | Melrose WWTP Outflow at Melrose, MN | 8 | 1 | 9 | 19 | 3 | 22 | 8 | 0 | 8 |
| 10 | Zimmerman WWTP outflow at Zimmerman, MN | 2 | 1 | 3 | 12 | 3 | 15 | 10 | 3 | 13 |
| 11 | Litchfield WWTP Outflow near Litchfield, MN | 2 | 0 | 2 | 9 | 3 | 12 | 3 | 1 | 4 |
| 12 | Hutchinson WWTP Outflow at Hutchinson, MN | 4 | 0 | 4 | 9 | 3 | 12 | 3 | 2 | 5 |
| 13 | Lester Prairie WWTP Outflow at Lester Prairie, MN | 2 | 2 | 4 | 4 | 3 | 7 | 1 | 1 | 2 |
| 14 | Lynd WWTP Outflow near Lynd, MN | 4 | 0 | 4 | 10 | 2 | 12 | 7 | 0 | 7 |
| 15 | Marshall WWTP outfall at Marshall, MN | 2 | 1 | 3 | 10 | 3 | 13 | 4 | 3 | 7 |
| 16 | Fairmont WWTP Outflow at Fairmont, MN | 6 | 0 | 6 | 9 | 4 | 13 | 9 | 3 | 12 |
| 17 | Metro Plant (WWTP) Outflow in St. Paul, MN | 1 | 0 | 1 | 13 | 3 | 16 | 2 | 2 | 4 |
| 18 | Hinckley WWTP near Hinckley, MN | 5 | 1 | 6 | 10 | 4 | 14 | 2 | 0 | 2 |
| 19 | Lake City WWTP Outflow at Lake City, MN | 3 | 0 | 3 | 14 | 4 | 18 | 1 | 1 | 2 |
| 20 | Rochester WWTP Outflow at Rochester, MN | 6 | 0 | 6 | 10 | 4 | 14 | 3 | 1 | 4 |
| 21 | Spring Valley WWTP Outflow at Spring Valley, MN | 3 | 0 | 3 | 13 | 2 | 15 | 5 | 0 | 5 |
| 22 | Austin WWTP Outflow at Austin, MN | 2 | 0 | 2 | 14 | 4 | 18 | 8 | 3 | 11 |
| 23 | Worthington WWTP Outflow at Worthington, MN | 1 | 1 | 2 | 10 | 4 | 14 | 8 | 4 | 12 |
| 24 | Worthington Industrial WWTP Outflow near Worthington, MN | 1 | 1 | 2 | 4 | 3 | 7 | 8 | 4 | 12 |
| 25 | Luverne WWTP Outlflow near Luverne, MN | 1 | 0 | 1 | 16 | 4 | 20 | 3 | 0 | 3 |

**Table 5. Comparison of maximum chemical concentrations in Minnesota lakes with maximum concentrations found downstream of WWTPs. Concentrations are in parts per trillion (ppt); nd = non detect.**

| | WWTP Study | Statewide Lake Study | | | |
|---|---|---|---|---|---|
| | Downstream of WWTP | Urban Lakes | Septic Influenced Lakes | Tributary Study | Mississippi River Study |
| 4-Nonylphenol (Grindstone) | 290 | nd | 111 | 880 | nd |
| NP monoethoxylate (Redwood) | 110 | 59 | 86 | 660 | nd |
| NP diethoxylate (Center Creek) | 120 | nd | 171 | 370 | nd |
| NP triethoxylate (Sauk) | 4900 | nd | 123 | 870 | |
| NP tetraethoxylate (Sauk) | 270 | nd | nd | 150 | |
| | | | | | |
| 4-t-Octylphenol (Mississippi) | 83 | nd | nd | 15 | nd |
| OP monoethoxylate (Grindstone) | 6 | nd | nd | 28 | 208 |
| OP diethoxylate (Center Creek) | 280 | 26 | 34 | 130 | 430 |
| OP triethoxylate | nd | nd | 14 | 110 | |
| OP tetraethoxylate (Sauk) | 78 | nd | nd | 15 | |
| | | | | | |
| Bisphenol A *(Cedar)* | 3200 | 38 | 20 | 137 | 2760 |
| Triclosan | 51 | nd | 10 | 150 | nd |
| DEET (Grindstone) | 150 | 90000 | 579 | 700 | 224 |

**Table 6. Gonadosomatic index (GSI) of male fathead minnows exposed in the mobile exposure laboratory trailer (the GSI is calculated by dividing the testis weight by the total weight of the fish and is a commonly used endpoint to judge the relative size of the reproductive organ of the fish).**

| MELT - Gonadosomatic Index | | Control | | | 25% Effluent | | | 50% Effluent | | | 75% Effluent | | | 100% Effluent | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | mean+/-stand. dev. | | (n) | mean+/-stand. dev. | | (n) | mean+/-stand. dev. | | (n) | mean+/-stand. ved. | | (n) | mean+/-stand. dev. | | (n) |
| Sauk Centre | Day 4 | 3.3367 | .0500 | 6 | 1.6526 | .0075 | 6 | 1.2299 | .0048 | 6 | . | . | | 1.6050 | .0045 | 3 |
| | Day 8 | 1.5303 | .0082 | 5 | 1.9002 | .0074 | 6 | 3.5974 | .0648 | 6 | . | . | | 1.7272 | .0089 | 5 |
| | Day 12 | 4.0158 | .0491 | 19 | 7.5795 | .0877 | 10 | 2.2101 | .0170 | 8 | . | . | | 8.9091 | .0889 | 10 |
| Hutchinson | Day 4 | 1.0335 | .0048 | 10 | 1.2184 | .0036 | 10 | 1.4430 | .0068 | 10 | 1.0690 | .0041 | 10 | 1.3958 | .0053 | 10 |
| | Day 8 | 1.2638 | .0070 | 8 | .8839 | .0044 | 9 | 1.6091 | .0042 | 6 | 1.3548 | .0081 | 10 | 1.2701 | .0026 | 10 |
| | Day 12 | 1.1921 | .0036 | 9 | 1.4477 | .0037 | 10 | 1.6403 | .0038 | 11 | 1.4343 | .0084 | 10 | 1.3887 | .0064 | 5 |
| Lester Prairie | Day 4 | 1.5389 | .0030 | 10 | 1.4413 | .0059 | 10 | 2.7099 | .0356 | 10 | 1.7196 | .0042 | 10 | 1.3278 | .0028 | 9 |
| | Day 8 | .0000 | | 0 | 1.9242 | .0062 | 5 | 1.6443 | .0044 | 10 | 1.6148 | .0037 | 10 | 1.5051 | .0041 | 11 |
| | Day 12 | .0000 | | 0 | 1.6202 | .0023 | 5 | 1.2040 | .0051 | 9 | 1.4860 | .0042 | 11 | 1.4710 | .0048 | 9 |
| Marshall | Day 4 | 1.5685 | .0046 | 9 | 1.0002 | .0053 | 11 | 1.2109 | .0030 | 10 | 1.3201 | .0070 | 10 | 1.1385 | .0066 | 10 |
| | Day 8 | 1.3839 | .0096 | 10 | 1.6410 | .0058 | 10 | 1.4376 | .0035 | 10 | 1.3636 | .0045 | 10 | 2.6012 | .0251 | 11 |
| | Day 12 | 1.3587 | .0048 | 12 | 1.9154 | .0045 | 11 | 1.8170 | .0096 | 15 | 1.2711 | .0051 | 17 | 1.4047 | .0057 | 17 |
| Rochester | Day 4 | | | 0 | | | | 1.7362 | .0072 | 10 | 2.1043 | .0060 | 10 | 1.7980 | .0073 | 10 |
| | Day 8 | | | 0 | 1.6147 | .0025 | 9 | 1.1437 | .0053 | 9 | 1.1918 | .0039 | 8 | 1.1199 | .0051 | 9 |
| | Day 12 | | | 0 | 1.5838 | .0073 | 8 | 1.9836 | .0072 | 12 | 1.6414 | .0043 | 12 | 3.2001 | .0323 | 16 |

**Table 7. Hepatosomatic Index (HSI) of male fathead minnows exposed in the mobile exposure laboratory trailer (the HSI is calculated by dividing the liver weight by the total weight of the fish and is a commonly used endpoint to judge the relative size of the liver of the fish).**

| MELT - Hepatosomatic Index | | Control | | | 25% Effluent | | | 50% Effluent | | | 75% Effluent | | | 100% Effluent | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | mean+/-stand. dev. | | (n) | mean+/-stand. dev. | | (n) | mean+/-stand. dev. | | (n) | mean+/-stand. ved. | | (n) | mean+/-stand. dev. | | (n) |
| Sauk Centre | Day 4 | 1.1552 | .0059 | 6 | 1.2849 | .0058 | 6 | 1.4266 | .0040 | 6 | . | . | | 1.5792 | .0087 | 3 |
| | Day 8 | 2.7357 | .0138 | 5 | 2.0306 | .0069 | 6 | 2.3320 | .0062 | 6 | | | | 2.4311 | .0107 | 5 |
| | Day 12 | 1.7035 | .0066 | 19 | 1.7462 | .0032 | 10 | 2.1191 | .0069 | 8 | . | . | | 2.5721 | .0101 | 10 |
| Hutchinson | Day 4 | 2.0567 | .0048 | 10 | 1.9812 | .0093 | 10 | 1.5309 | .0038 | 10 | 1.7464 | .0039 | 10 | 2.1630 | .0066 | 10 |
| | Day 8 | 1.8306 | .0068 | 8 | 1.5051 | .0058 | 9 | 1.8496 | .0072 | 6 | 1.6532 | .0060 | 10 | 1.7464 | .0043 | 10 |
| | Day 12 | 1.9018 | .0056 | 9 | 1.9448 | .0033 | 10 | 1.7254 | .0043 | 11 | 1.6635 | .0112 | 10 | 1.1470 | .0028 | 5 |
| Lester Prairie | Day 4 | 1.8254 | .0067 | 10 | 1.7471 | .0051 | 10 | 3.2476 | .0482 | 10 | 1.1680 | .0028 | 10 | 1.9451 | .0063 | 9 |
| | Day 8 | .0000 | | 0 | 1.5365 | .0029 | 5 | 1.9416 | .0083 | 10 | 1.4536 | .0046 | 10 | 1.8988 | .0062 | 11 |
| | Day 12 | .0000 | | 0 | 1.6806 | .0056 | 5 | 1.7710 | .0066 | 9 | 1.5025 | .0034 | 11 | 1.3779 | .0037 | 9 |
| Marshall | Day 4 | 1.4410 | .0052 | 9 | 1.5435 | .0077 | 11 | 1.6967 | .0075 | 10 | 1.2161 | .0068 | 10 | 1.6895 | .0107 | 10 |
| | Day 8 | 1.6398 | .0053 | 10 | 1.6700 | .0084 | 10 | 1.7121 | .0041 | 10 | 1.6148 | .0038 | 10 | 1.8959 | .0065 | 11 |
| | Day 12 | 1.9683 | .0088 | 12 | 1.8863 | .0045 | 11 | 2.0660 | .0105 | 15 | 1.9826 | .0061 | 17 | 1.9999 | .0066 | 17 |
| Rochester | Day 4 | | | 0 | | | | 1.4862 | .0050 | 10 | 1.4372 | .0041 | 10 | 1.2229 | .0033 | 10 |
| | Day 8 | | | 0 | 1.5806 | .0065 | 9 | 3.5963 | .0476 | 9 | 1.7144 | .0051 | 8 | 1.4370 | .0055 | 9 |
| | Day 12 | | | 0 | 1.5013 | .0055 | 8 | 1.8326 | .0084 | 12 | 1.6380 | .0038 | 12 | 3.1343 | .0363 | 16 |

**Table 8. Sum of Secondary Sex Characteristics (SSC) of male fathead minnows deployed in the mobile exposure laboratory trailer (the SSC is the sum of three individual scores describing the prominence of nuptial tubercles, dorsal pad and coloration of male fish).**

| MELT - Secondary Sex Characteristics | | Control | | | 25% Effluent | | | 50% Effluent | | | 75% Effluent | | | 100% Effluent | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | median +/-stand. dev. | | (n) | median +/-stand. dev. | | (n) | median +/-stand. dev. | | (n) | median +/-stand. dev. | | (n) | median +/-stand. dev. | | (n) |
| Sauk Centre | Day 4 | 6 | 2 | 6 | 5 | 3 | 6 | 5 | 3 | 6 | | | 0 | 5 | 2 | 3 |
| | Day 8 | 6 | 2 | 5 | 6 | 2 | 6 | 5 | 1 | 6 | | | 0 | 4 | 2 | 5 |
| | Day 12 | 5 | 3 | 19 | 2 | 3 | 10 | 6 | 3 | 8 | | | 0 | 2 | 4 | 10 |
| Hutchinson | Day 4 | 3 | 2 | 10 | 4 | 2 | 10 | 4 | 2 | 10 | 5 | 2 | 10 | 5 | 3 | 10 |
| | Day 8 | 5 | 2 | 8 | 4 | 2 | 9 | 6 | 3 | 6 | 4 | 2 | 10 | 4 | 2 | 10 |
| | Day 12 | 4 | 2 | 9 | 6 | 3 | 10 | 3 | 2 | 11 | 5 | 2 | 10 | 5 | 2 | 5 |
| Lester Prairie | Day 4 | 7 | 3 | 10 | 6 | 3 | 10 | 5 | 3 | 10 | 6 | 2 | 10 | 6 | 1 | 9 |
| | Day 8 | . | . | 0 | 3 | 2 | 5 | 6 | 2 | 10 | 6 | 3 | 10 | 5 | 2 | 11 |
| | Day 12 | . | . | 0 | 5 | 3 | 5 | 4 | 2 | 9 | 5 | 2 | 11 | 4 | 2 | 9 |
| Marshall | Day 4 | 6 | 2 | 9 | 5 | 3 | 11 | 6 | 1 | 10 | 5 | 2 | 10 | 6 | 2 | 10 |
| | Day 8 | 6 | 3 | 10 | 5 | 2 | 10 | 6 | 2 | 10 | 6 | 2 | 10 | 4 | 3 | 11 |
| | Day 12 | 7 | 1 | 12 | 7 | 3 | 11 | 6 | 2 | 15 | 5 | 2 | 17 | 4 | 2 | 17 |
| Rochester | Day 4 | | | | . | . | 0 | 6 | 1 | 10 | 5 | 3 | 10 | 4 | 2 | 10 |
| | Day 8 | | | | 6 | 2 | 9 | 7 | 3 | 9 | 7 | 2 | 8 | 6 | 2 | 9 |
| | Day 12 | | | | 6 | 2 | 8 | 5 | 3 | 12 | 6 | 3 | 12 | 3 | 3 | 16 |

**Table 9. Preliminary Plasma Vitellogenin (VTG, in mg/mL) concentrations in male fathead minnows exposed in the mobile exposure laboratory trailer. (VTG data will require additional quality assurance and quality control procedures before being finalized. The current data set does not yet include samples that fall above or below the detection limit of the standard curve.)**

| MELT - Vitellogenin Concentrations [µg/mL] (Males) | | 0% | | | 25% | | | 50% | | | 75% | | | 100% | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Mean | +/- Std. Dev. | (n) | Mean | +/- Std. Dev. | (n) | Mean | +/- Std. Dev. | (n) | Mean | +/- Std. Dev. | (n) | Mean | +/- Std. Dev. | (n) |
| Sauk Center | 4 | 217.44 | 144.42 | 6 | 161.94 | 135.43 | 6 | 123.72 | 174.60 | 6 | N/A | N/A | 0 | 563.38 | 523.48 | 3 |
| | 8 | 110.04 | 46.14 | 5 | 829.85 | 418.26 | 6 | 602.84 | 292.58 | 6 | N/A | N/A | 0 | 384.07 | 448.52 | 5 |
| | 12 | 1892.56 | 1898.40 | 13 | 2433.16 | 850.89 | 5 | 1523.55 | 1076.63 | 7 | N/A | N/A | 0 | 1664.56 | 1537.60 | 5 |
| Hutchinson | 4 | 32.71 | 10.50 | 10 | 100.40 | 131.40 | 10 | 66.79 | 68.21 | 10 | 198.28 | 199.72 | 10 | 207.13 | 430.29 | 10 |
| | 8 | 48.85 | 34.63 | 8 | 31.61 | 17.53 | 9 | 345.03 | 557.07 | 6 | 242.00 | 317.20 | 10 | 241.53 | 307.60 | 10 |
| | 12 | 812.54 | 670.71 | 9 | 552.69 | 718.82 | 10 | 815.12 | 1078.16 | 11 | 384.30 | 387.33 | 10 | 224.33 | 68.61 | 5 |
| Lester Prairie | 4 | 59.94 | 52.93 | 9 | 58.15 | 52.82 | 10 | 45.73 | 31.05 | 9 | 133.55 | 225.01 | 10 | 246.53 | 410.20 | 9 |
| | 8 | N/A | N/A | 0 | 226.70 | 288.30 | 5 | 394.26 | 235.51 | 10 | 351.10 | 238.75 | 10 | 71.38 | 52.37 | 10 |
| | 12 | N/A | N/A | 0 | 912.20 | 202.45 | 5 | 216.37 | 268.69 | 9 | 440.50 | 385.45 | 11 | 958.88 | 815.91 | 9 |
| Marshall | 4 | 447.47 | 591.84 | 9 | 117.75 | 141.73 | 11 | 447.70 | 583.98 | 10 | 456.80 | 543.44 | 10 | 835.26 | 1712.30 | 10 |
| | 8 | 885.33 | 1494.19 | 10 | 412.23 | 302.78 | 10 | 449.33 | 540.36 | 10 | 86.48 | 119.68 | 10 | 142.78 | 299.04 | 11 |
| | 12 | 413.54 | 315.75 | 12 | 658.83 | 830.88 | 11 | 312.07 | 395.85 | 15 | 394.80 | 576.75 | 17 | 545.67 | 901.93 | 17 |
| Rochester | 4 | N/A | N/A | 0 | 73.33 | 51.81 | 10 | 1070.55 | 731.18 | 10 | 956.75 | 215.12 | 10 | 132.63 | 135.13 | 10 |
| | 8 | N/A | N/A | 0 | 404.92 | 538.83 | 9 | 330.92 | 490.85 | 9 | 790.50 | 808.76 | 8 | 675.60 | 466.57 | 9 |
| | 12 | N/A | N/A | 0 | 186.84 | 128.67 | 8 | 142.20 | 196.34 | 12 | 460.93 | 392.36 | 12 | 167.62 | 245.75 | 10 |

**Table 10. Environmental sample results for total estrogenicity analyzed in water at the University of St. Thomas [US, upstream; DS, downstream; WWTP, wastewater treatment plant; ng/L, nanograms per liter; <, not detected above the detection limit of 0.21 ng/L; na, not available; E, estimated value].**

| Site Number | Position | USGS Station Name | Estradiol equivalents (ng /L) |
|---|---|---|---|
| 1 | US | Williams Creek above WWTP at Williams, MN | 0.40 |
| 2 | WWTP | Williams WWTP Outflow at Williams, MN | 0.88 |
| 3 | DS | Williams Creek below WWTP at Williams, MN | 23.20 |
| 4 | US | Shagawa Lake at Mouth of Burntside River near Ely, MN | 0.19 |
| 5 | WWTP | Ely WWTP Outflow at Ely, MN | 17.38 |
| 6 | DS | Shagawa Lake near Ely WWTP Outflow at Ely, MN | 0.58 |
| 7 | US | Elbow Creek above Eveleth WWTP at Eveleth, MN | < 0.21 |
| 8 | WWTP | Eveleth WWTP Outlflow at Eveleth, MN | 0.77 |
| 9 | DS | Elbow Creek below Eveleth WWTP at Eveleth, MN | 2.58 |
| 10 | US | St. Louis River at Hwy 23 above Fond Du Lac, MN | na |
| 11 | WWTP | Western Lake Superior Sanitary District - WWTP at Duluth, MN | 0.37 |
| 12 | DS | Lake Superior in St. Louis Bay at Duluth, MN | 0.66 |
| 13 | US | Pelican River above WWTP at Pelican Rapids, MN | E0.08 |
| 14 | WWTP | Pelican Rapids WWTP Outflow at Pelican Rapids, MN | 22.08 |
| 15 | DS | Pelican River below WWTP at Pelican Rapids, MN | 1.47 |
| 16 | US | Red R. of the North above WWTP at East Grand Forks, MN | 8.07 |
| 17 | WWTP | East Grand Forks WWTP Outflow at East Grand Forks, MN | 5.10 |
| 18 | DS | Red river of the North Below WWTP at East Grand Forks, MN | 5.16 |
| 19 | US | Mississippi River above WWTP at Grand Rapids, MN | E0.18 |
| 20 | WWTP | Grand Rapids WWTP Outflow at Grand Rapids, MN | 4.87 |
| 21 | DS | Mississippi River below WWTP at Grand Rapids, MN | na |
| 22 | US | Sauk River above Sauk Centre WWTP at Sauk Centre, MN | < 0.21 |
| 23 | WWTP | Sauk Centre WWTP Outflow at Sauk Centre, MN | 2.24 |
| 24 | DS | Sauk River below Sauk Centre WWTP at Sauk Centre, MN | < 0.21 |

**(Table 10 Continued)**

| Site Number | Position | USGS Station Name | Estradiol equivalents (ng /L) |
|---|---|---|---|
| 25 | US | Sauk River above Melrose WWTP at Melrose, MN | < 0.21 |
| 26 | WWTP | Melrose WWTP Outflow at Melrose, MN | 6.13 |
| 27 | DS | Sauk River below Melrose WWTP at Melrose, MN | 0.64 |
| 28 | US | South Fork Crow River above WWTP at Lester Prairie, MN | na |
| 29 | WWTP | Lester Prairie WWTP Outflow at Lester Prairie, MN | 1.57 |
| 30 | DS | South Fork Crow River below WWTP at Lester Prairie, MN | < 0.21 |
| 31 | US | Tibbets Brook above WWTP outflow at Zimmerman, MN | 1.07 |
| 32 | WWTP | Zimmerman WWTP outflow at Zimmerman, MN | 4.38 |
| 33 | DS | Tibbets Brook below WWTP outflow at Zimmerman, MN | 0.71 |
| 34 | US | Jewitts Creek at U.S. HWY. 12 in Litchfield, MN | 2.30 |
| 35 | WWTP | Litchfield WWTP Outflow near Litchfield, MN | 0.49 |
| 36 | DS | Jewitts Creek near Litchfield, MN | 1.93 |
| 37 | US | South Fork of the Crow River above WWTP at Hutchinson, MN | 0.59 |
| 38 | WWTP | Hutchinson WWTP Outflow at Hutchinson, MN | cytotoxic |
| 39 | DS | South Fork of the Crow River below Hutchinson, MN | E0.17 |
| 40 | US | Redwood River above Lynd WWTP near Lynd, MN | na |
| 41 | WWTP | Lynd WWTP Outflow near Lynd, MN | na |
| 42 | DS | Redwood River below Lynd WWTP near Lynd, MN | na |
| 43 | US | Redwood River above WWTP below Marshall, MN | 12.78 |
| 44 | WWTP | Marshall WWTP outfall at Marshall, MN | 1.24 |
| 45 | DS | Redwood River below WWTP near Marshall, MN | 0.53 |
| 46 | US | Center Creek on Co. Rd. 143, at Fairmont, MN | na |
| 47 | WWTP | Fairmont WWTP Outflow at Fairmont, MN | na |
| 48 | DS | Center Creek below WWTP at Fairmont, MN | na |
| 49 | US | Mississippi River at Industrial Mollasses St. Paul, MN | E0.08 |
| 50 | WWTP | Metro Plant (WWTP) Outflow in St. Paul, MN | 63.64 |
| 51 | DS | Mississippi River at South St. Paul, MN | 2.80 |
| 52 | US | Grindstone River above WWTP near Hinckley, MN | 0.27 |
| 53 | WWTP | Hinckley WWTP near Hinckley, MN | 23.98 |
| 54 | DS | Grindstone River below Hinckley, MN | 1.40 |
| 55 | US | Mississippi River (Lake Pepin) above Lake City, MN | E0.02 |
| 56 | WWTP | Lake City WWTP Outflow at Lake City, MN | 9.18 |
| 57 | DS | Mississippi River (Lake Pepin) at Mile 771 near Lake City, MN | 0.27 |
| 58 | US | South Fork Zumbro River at Rochester, MN | 11.28 |
| 59 | WWTP | Rochester WWTP Outflow at Rochester, MN | 1.99 |
| 60 | DS | South Fork Zumbro R. below WWTP near Rochester, MN | 0.22 |
| 61 | US | Spring Valley Creek above Spring Valley WWTP Outflow at Spring Valley, MN | 0.63 |
| 62 | WWTP | Spring Valley WWTP Outflow at Spring Valley, MN | 14.65 |
| 63 | DS | Spring Valley Creek below Spring Valley WWTP Outflow at Spring Valley, MN | na |
| 64 | US | Cedar River above Treatment Plant at Austin, MN | na |
| 65 | WWTP | Austin WWTP Outflow at Austin, MN | na |
| 66 | DS | Cedar River below Treatment Plant at Austin, MN | na |
| 67 | US | Okabena Creek above WWTP Outflow at Worthington, MN | na |

**(Table 10 Continued)**

| Site Number | Position | USGS Station Name | Estradiol equivalents (ng /L) |
|---|---|---|---|
| 68 | WWTP-Domestic | Worthington WWTP Outflow at Worthington, MN | na |
| 69 | WWTP-Industrial | Industrial WWTP Outflow near Worthington, MN | na |
| 70 | DS | Okabena Creek below WWTP Outflow at Worthington, MN | na |
| 71 | US | Rock River above WWTP near Luverne, MN | < 0.21 |
| 72 | WWTP | Luverne WWTP Outlflow near Luverne, MN | E0.09 |
| 73 | DS | Rock River below WWTP near Luverne, MN | 0.49 |

**Figure 3. Detection frequency of pharmaceuticals upstream and downstream of WWTPS and in WWTP effluent.**

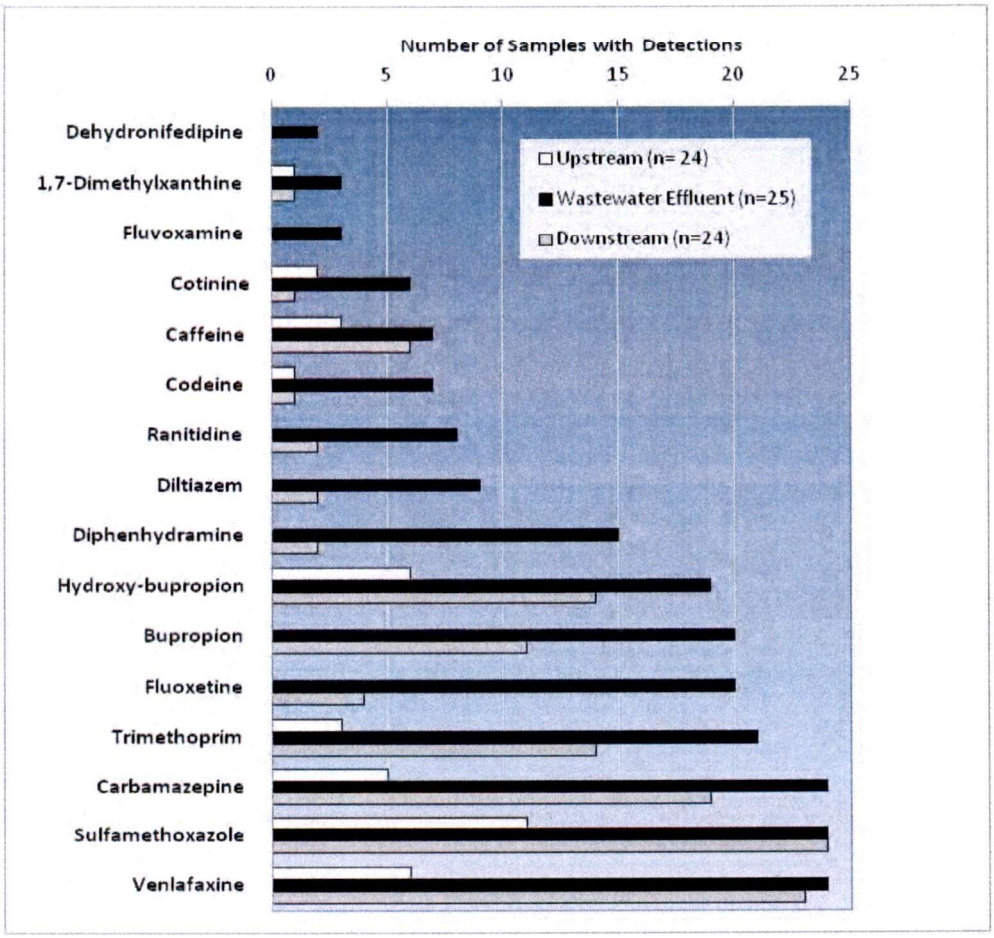


**Figure 4. Number of pharmaceuticals detected in the effluent of WWTPs selected for this study.**

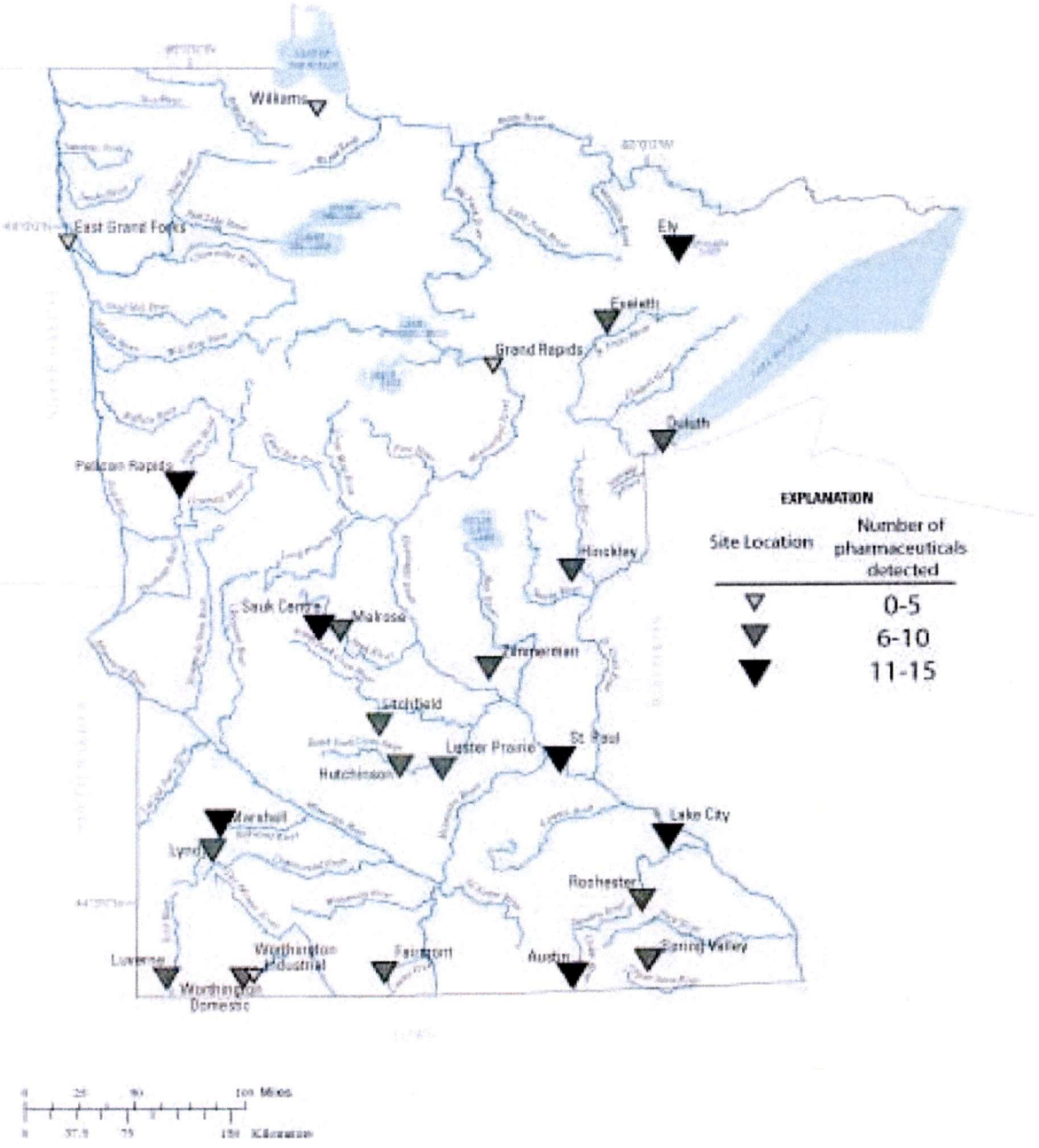


**Figure 5. Frequency of hormones detected in upstream water, downstream water, and in WWTP effluent.**

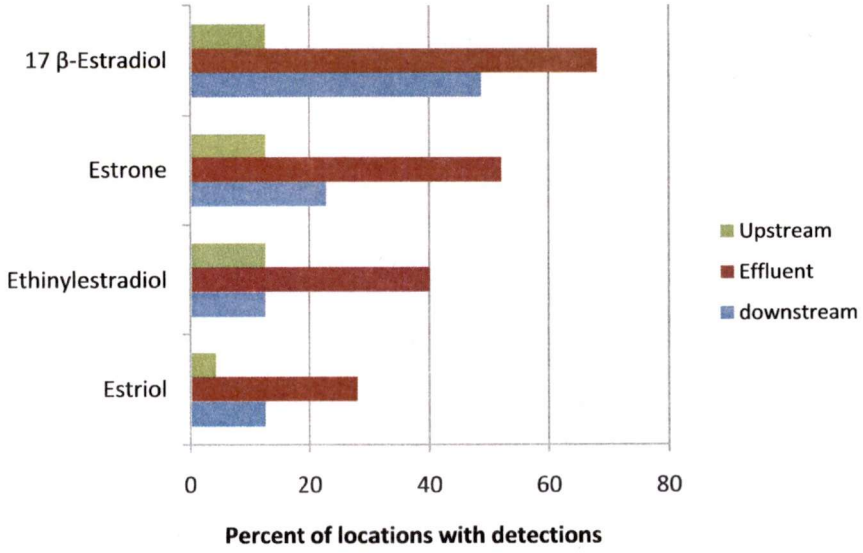



**Figure 6. Frequency of hormone detections in sediment collected upstream and downstream of WWTPs.**

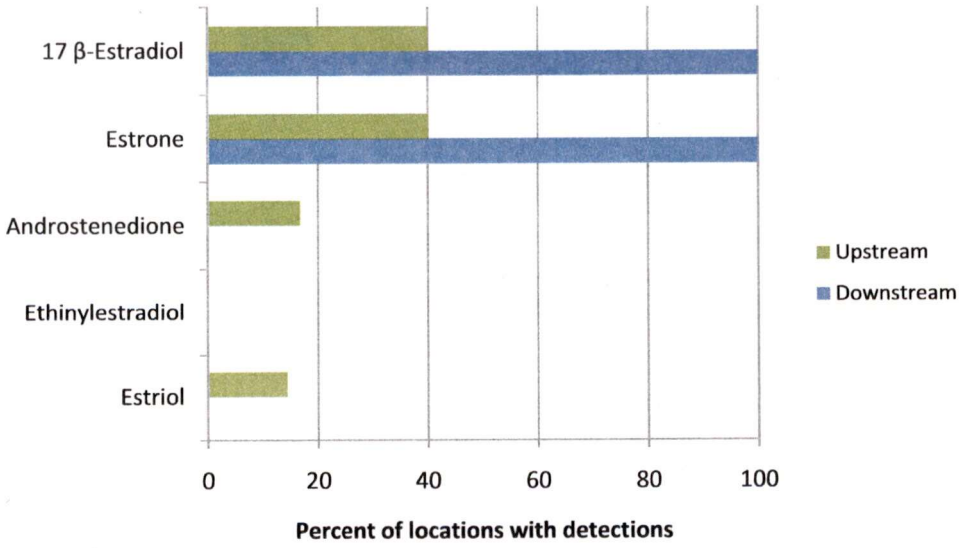


**Figure 7. Frequency of chemicals detected in upstream water, downstream water, and in WWTP effluent.**

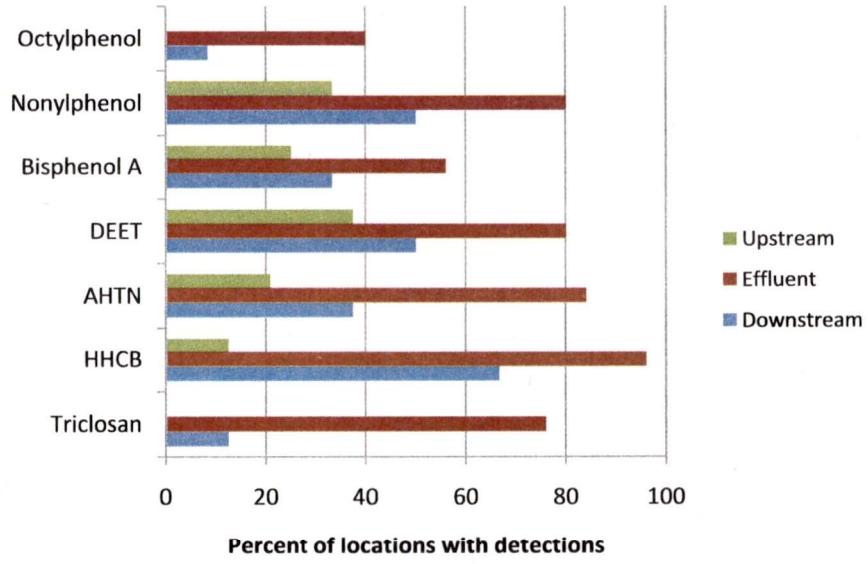



**Figure 8. Frequency of chemicals detected in sediment collected upstream and downstream of WWTPs.**

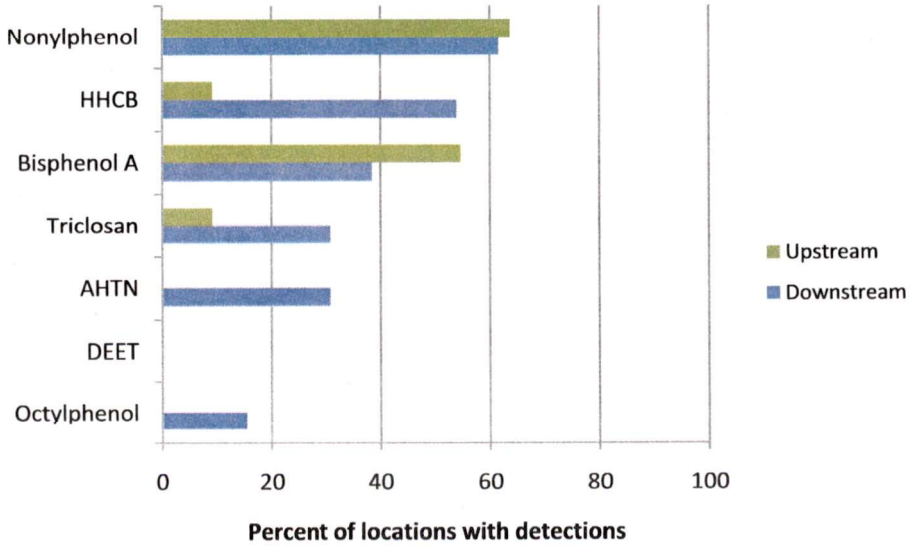


**Figure 9. EACs that were found at higher concentrations at locations upstream of WWTPs selected for this study.**

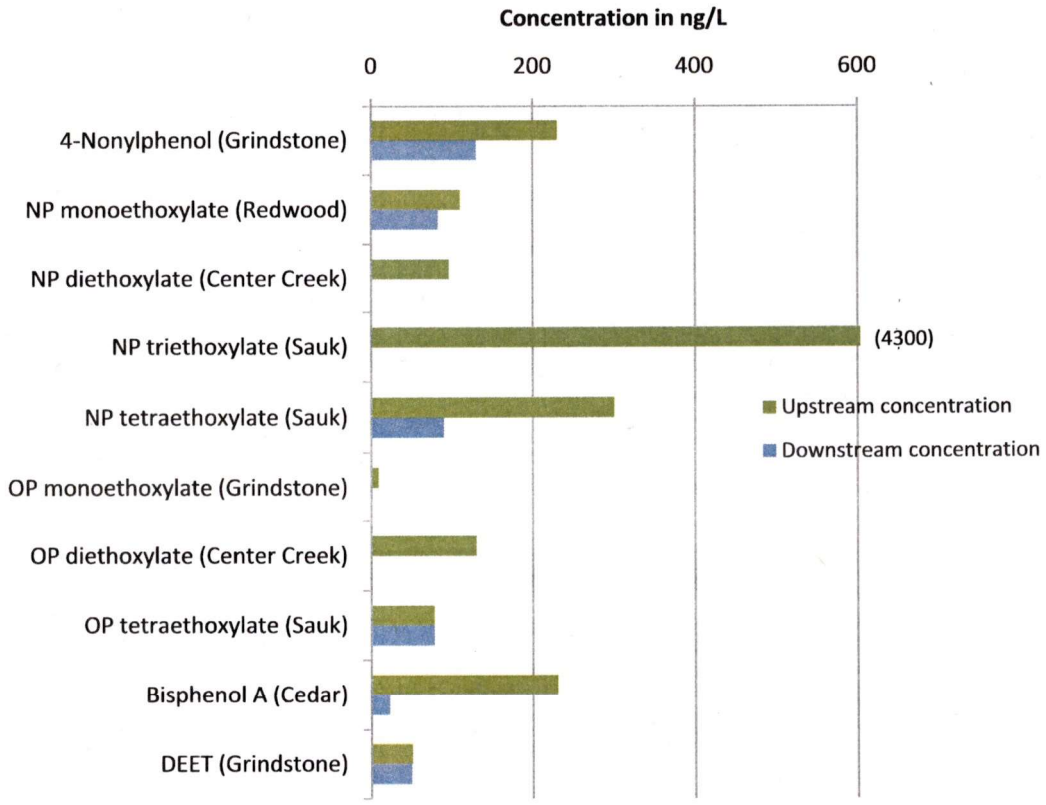


**Figure 10. Diagram showing the number of genes that were affected by exposure to the Hutchinson WWTP effluent as well as by exposure to upstream or downstream water. The values in the overlapping regions indicate the number of genes affected by both treatments. For example, 238 genes were affected by exposure to both effluent and downstream water, while there were 1336 genes affected only by effluent exposure.**

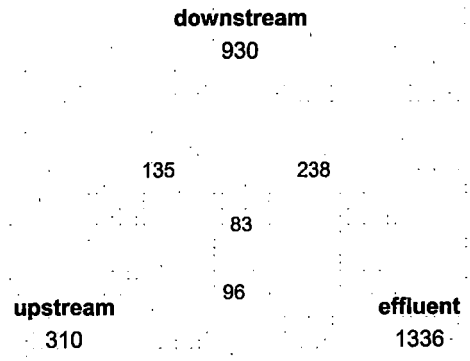



**Figure 11. Diagram showing the number of genes that were affected by exposure to the Rochester WWTP effluent as well as by exposure to upstream or downstream water. The values in the overlapping regions indicate the number of genes affected by both treatments. For example, 216 genes were affected by exposure to both WWTP effluent and downstream water, while 842 genes were affected only by effluent exposure.**

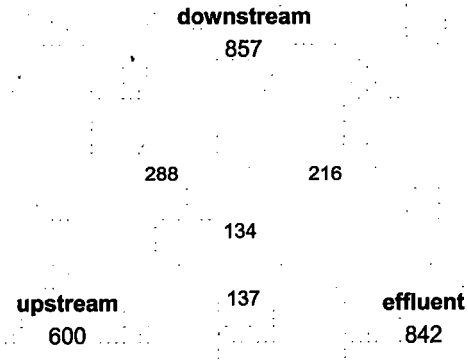
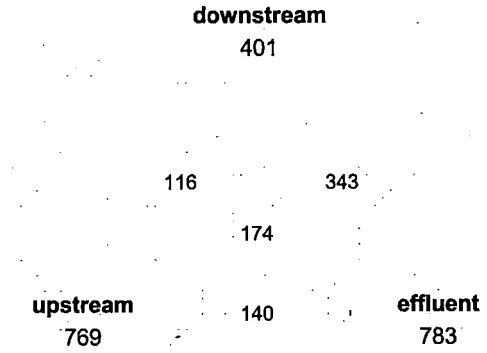


**Figure 12. Diagram showing the number of genes that were affected by exposure to the Ely WWTP effluent as well as by exposure to upstream or downstream water. The values in the overlapping regions indicate the number of genes affected by both treatments. For example, 343 genes were affected by exposure to both WWTP effluent and downstream water, while 783 genes were affected only by exposure to effluent.**



# Appendix A

## 2009 Statutory Language for Endocrine Disruptor Monitoring

From 2009 Session Law Chapter 172, Article 2, Sec. 4 (f) and Sec. 29 (f) $896,000 the first year is to establish a network of water monitoring sites, to include at least 20 additional sites, in public waters adjacent to wastewater treatment facilities across the state to assess levels of endocrine-disrupting compounds, antibiotic compounds, and pharmaceuticals as required in this article. The data must be placed on the agency's website.

## Sec. 29. Endocrine-Disruptor Monitoring

(a) The commissioner of the Pollution Control Agency shall establish a network of water monitoring sites in public waters adjacent to wastewater treatment facilities across the state to assess levels of endocrine disrupting compounds, antibiotic compounds, and pharmaceuticals.

(b) Each of the monitoring sites must provide enhanced monitoring of the effluent at the discharge point of the wastewater treatment facility and monitoring of the public waters above and below the discharge point.

(c) The monitoring sites must be located throughout the state, represent a variety of wastewater treatment facility sizes based on the number of gallons of water discharged per day, and represent a variety of waste treatment systems used for primary, secondary, and tertiary disinfecting treatment and management of biosolids.

(d) In establishing the monitoring network, the commissioner of the Pollution Control Agency must consult with the commissioners of health and natural resources, the United States Geological Survey, the Metropolitan Council, local wastewater treatment facility operators, and the Water Resources Center at the University of Minnesota. Consideration may be given to monitoring sites at facilities identified as part of a total maximum daily load study and facilities located on a water body identified for enhanced protection. The initial monitoring network must include at least ten sites.

(e) Monitoring must include, but is not limited to, endocrine-disrupting compounds from natural and synthetic hormones, pharmaceuticals, personal care products, and a range of industrial products and by-products. At a minimum, concentrations of estrone, nonylphenol, bisphenol-A, 17-beta-estradiol, 17-alpha-ethynylestradiol, estriol, and antibacterial triclosan must be monitored. Additional compounds, antibacterial compounds, and pharmaceuticals potentially impacting human health and aquatic communities may be considered for identification and monitoring including, but not limited to, nonylphenol ethoxylates, octylphenol, and octylphenol ethoxylates; the hormones androstenedione, trenbelone, and diethylphthalate; antidepressant medications, including fluoxetine and fluvoxamine; carbamazepine; and triclocarban.

(f) The commissioner of the Pollution Control Agency shall begin the monitoring and testing required under this section no later than November 1, 2009. Information about requirements under this section and the results from the monitoring and testing must be available on the agency's website by June 1, 2010. The commissioner shall submit a preliminary report on the results of the monitoring and testing to the chairs of the legislative committees with jurisdiction over environment and natural resources policy and finance by April 15, 2010, and a final report no later than January 15, 2011.

# Appendix B

## List of compounds, sources, and their uses

| Hormone | Description |
|---|---|
| 11-ketotestosterone | A male sex hormone |
| 17α-estradiol | A female estrogenic hormone |
| 17β-estradiol | One of three naturally occurring estrogens; a female hormone |
| Androstenedione | Precursor to testosterone and estrogen, the male and female sex hormones |
| Androsterone | Steroid hormone with weak androgenic activity |
| Equilenin | An estrogen used in hormone replacement therapy |
| Equilin | An estrogen used in hormone replacement therapy |
| Estriol | One of three naturally occurring estrogens; a female hormone |
| Estrone | One of three naturally occurring estrogens; a female hormone |
| 17α-ethinylestradiol | Synthetic oral contraceptive in birth control prescriptions |
| Mestranol | An estrogen used in oral contraceptives, converted to ethinylestradiol |
| Progesterone | A female steroid hormone |
| Testosterone | A male sex hormone and anabolic steroid |

| Organic Wastewater Compound | Application/description |
|---|---|
| 1,3-dichlorobenzene | Moth repellent, deodorant |
| 1,4-dichlorobenzene | Moth repellent, deodorant |
| 1-methylnaphthalene | A PAH, or polyaromatic hydrocarbon |
| 2,6-dimethylnaphthalene | A PAH, or polyaromatic hydrocarbon |
| 2,6-di-tert-butyl-1,4-benzoquinone | Chemical reagent in the synthesis of other chemicals |
| 2,6-di-tert-butyl-4-methylphenol | BHT. Antioxidant food additive, also used in fuels, cosmetics, pharmaceuticals. |
| 2,6-di-tert-butylphenol | One of many alkylphenols. Alkylphenols are used to synthesize detergents, fragrances, polymers, and other compounds |
| 2-methylnaphthalene | A PAH, or polyaromatic hydrocarbon |
| 3-beta coprostenol | Breakdown product of cholesterol; indicator of fecal matter |
| 3-methylindole | Skatole; naturally occurring chemical in feces |
| 3-t-butyl-4-hydroxyanisole | Precursor of synthetic chemicals |
| 4-(tert-octyl)phenol | Nonionic detergent or breakdown product of detergent |

| Organic Wastewater Compound | Application/description |
|---|---|
| 4-ethylphenol | One of many alkylphenols. Alkylphenols are used to synthesize detergents, fragrances, polymers, and other compounds |
| 4-methylphenol (cresol) | Wood preservative; can also be naturally occurring. |
| 4-*tert*-Octylphenol; 4-tert-OP | An alkylphenol, a breakdown product of octylphenol ethoxylate |
| 4-n-octylphenol; 4-OP | An alkylphenol; Nonionic detergent or breakdown product of detergent |
| 4-*tert*-Octylphenol monoethoxylate; 4-OP1EO | Nonionic detergent |
| 4-*tert*-Octylphenol diethoxylate; 4-OP2EO | Nonionic detergent |
| 4-*tert*-Octylphenol tetraethoxylate; 4-OP4EO | Nonionic detergent |
| 4-*tert*-Octylphenol pentaethoxylate; 4-OP5EO | Nonionic detergent |
| 4-*tert*-Pentylphenol | An alkylphenol |
| 4-nonylphenol | An alkylphenol; breakdown product of nonylphenol ethoxylate detergent |
| 4-Nonylphenol monoethoxylate; 4-NP1EO | Nonionic detergent; nonylphenol ethoxylate |
| 4-Nonylphenol diethoxylate 4-NP2EO | Nonionic detergent; nonylphenol ethoxylate |
| 4-Nonylphenol triethoxylate 4-NP3EO | Nonionic detergent; nonylphenol ethoxylate |
| 4-Nonylphenol tetraethoxylate 4-NP4EO | Nonionic detergent; nonylphenol ethoxylate |
| 4-propylphenol | One of many alkylphenols. Alkylphenols are used to synthesize detergents, fragrances, polymers, and other compounds |
| 4-tert-butylphenol | One of many alkylphenols. Alkylphenols are used to synthesize detergents, fragrances, polymers, and other compounds |
| 4-tert-pentylphenol | One of many alkylphenols. Alkylphenols are used to synthesize detergents, fragrances, polymers, and other compounds |
| 5-methyl-1H-benzotriazole | Anticorrosive; rust inhibitor |
| Acetophenone | Precursor to fragrances and resins |
| AHTN (Acetylhexamethyltetrahydronaphthalene) | Fragrance chemical |
| APECs (Alkylphenol ethoxycarboxylates) | Detergents |
| Anthracene | A PAH, or polyaromatic hydrocarbon |
| Anthraquinone | Precursor to dyes; used in wood pulp bleaching |
| Benzo-a-pyrene | A PAH; polyaromatic hydrocarbon |
| Benzophenone | UV inhibitor, sunscreen |
| Beta-sitosterol | Plant sterol, similar to cholesterol |

| Organic Wastewater Compound | Application/description |
|---|---|
| Beta-stigmasterol | Plant sterol |
| Bisphenol A | Monomer used to synthesize polycarbonate plastic |
| Bis(2-ethylhexyl)phthalate | Plasticizer |
| Bromacil | Pesticide |
| Camphor | Widely used medicinal and culinary additive |
| Carbazole | Chemical used in the production of pigments |
| Chlorpyrifos | Pesticide |
| Cresol | Naturally occurring and man-made chemical used as a disinfectant and a cleaner. |
| DEET (N,N-diethyl-*meta*-toluamide) | Insect repellant |
| Diazinon | Pesticide |
| Diethylhexylphthalate | Plasticizer |
| Diethylphthalate | Plasticizer |
| EDTA (Ethylenediaminetetraacetic acid) | Compound that binds metals in solution; widespread industrial and commercial application |
| Fluoranthene | A PAH; polyaromatic hydrocarbon |
| HHCB (hexahydrohexamethylcyclopentabenzopyran) | Fragrance chemical |
| Indole | Precursor to fragrances and pharmaceuticals |
| Isoborneol | Precursor to chemical synthesis |
| Isophorone | Solvent and precursor to chemical synthesis |
| Isoquinoline | Precursor to dyes, insecticides, paints |
| Limonene | Terpene used in detergent production |
| Methylnaphthalene | PAH; polyaromatic hydrocarbon |
| Metolachlor | Pesticide |
| Metribuzin | Pesticide |
| Naphthalene | PAH; polyaromatic hydrocarbon |
| NTA (Nitrilotriacetic acid) | Compound that binds metals in solution; widespread industrial and commercial application |

| Organic Wastewater Compound | Application/description |
|---|---|
| PBDE (Polybrominated diphenylether) | Flame retardant |
| Prometon | Herbicide |
| Triclosan | Antimicrobial |
| Triclocarban | Antimicrobial |

| Pharmaceutical | Description |
|---|---|
| Acetaminophen | Analgesic |
| Albuterol | Asthma medication |
| Bupropion | Antidepressant |
| Caffeine | Stimulant |
| Carbamazepine | Anticonvulsive used to treat epilepsy and attention-deficit hyperactivity disorder (ADHD) |
| Cimetidine | Antacid |
| Citalopram | Antidepressant |
| Codeine | Analgesic |
| Cotinine | Metabolite of nicotine |
| Dihydronifedipine | Metabolite of nifedipine, a blood pressure medication |
| Diltiazem | Heart medication |
| Dimethylxanthine | Metabolite of caffeine |
| Diphenhydramine | Antihistamine |
| Fluoxetine | Antidepressant |
| Fluvoxamine | Antidepressant |
| Hydroxybupropion | Metabolite of bupropion |
| Miconazole | Topical antifungal medication |
| Ranitidine | Antacid |
| Sertraline | Antidepressant |
| Sulfamethoxazole | Antibiotic |
| Thiabendazole | Fungicide |
| Trimethoprim | Antibiotic |
| Venlafaxine | Antidepressant |
| Warfarin | Blood thinner |
| Phytoestrogens (Biochanin A, coumestrol, daidzein, equol, formononetin, genistin, prunetin) | A diverse group of plant-derived, naturally occurring chemicals that have a structural similarity to 17β-estradiol, and can cause estrogenic or/and anti-estrogenic effects in humans and animals. |

# Appendix C

The following tables contain the analytical data for surface water, effluent, and sediment collected for the WWTP Endocrine Disrupting Chemical Study.

Data in this report were excerpted from the published USGS Report http://pubs.usgs.gov/ds/575/. See the report for details on site selection, data collection, laboratory analyses, and quality assurance associated with these data.

Red-shaded cells: wastewater treatment plant effluent

Blue-shaded cells: surface water downstream of wastewater treatment plant

Green-shaded cells: surface water upstream of wastewater treatment plant

nd: non-detect

## Alphabetical List of Analytes for Water

| | Chemical | Detected | Maximum Concentration |
|---|---|---|---|
| 1 | 1,3-Dichlorobenzene | Y | 30 ppt |
| 2 | 1,4-Dichlorobenzene | Y | 280 ppt |
| 3 | 1,7-Dimethylxanthine | Y | 4320 ppt |
| 4 | 11-*keto* -Testosterone | N | |
| 5 | 17-*alpha* -Estradiol | Y | 2.5 ppt |
| 6 | 17-*alpha* -Ethinylestradiol | Y | 1.5 ppt |
| 7 | 17-*beta* -Estradiol | Y | 10 ppt |
| 8 | 2,6-Di-*tert* -butyl-1,4-benzoquinone | Y | 2200 ppt |
| 9 | 4-Androstene-3,17-dione | N | |
| 10 | 4-Nonylphenol | Y | 10000 ppt |
| 11 | 4-Nonylphenol diethoxycarboxylate | Y | 130 ppb |
| 12 | 4-Nonylphenol diethoxylate | Y | 3400 ppt |
| 13 | 4-Nonylphenol monoethoxycarboxylate | Y | 110 ppb |
| 14 | 4-Nonylphenol monoethoxylate | Y | 2200 ppt |
| 15 | 4-Nonylphenol tetraethoxycarboxylate | Y | 7 ppb |
| 16 | 4-Nonylphenol tetraethoxylate | Y | 300 ppt |
| 17 | 4-Nonylphenol triethoxycarboxylate | Y | 19 ppb |
| 18 | 4-Nonylphenol triethoxylate | Y | 4900 ppt |
| 19 | 4-*tert* -Butylphenol | Y | 110 ppt |
| 20 | 4-*tert* -Octylphenol | Y | 430 ppt |
| 21 | 4-*tert* -Octylphenol diethoxylate | Y | 850 ppt |
| 22 | 4-*tert* -Octylphenol monoethoxylate | Y | 31 ppt |
| 23 | 4-*tert* -Octylphenol pentaethoxylate | Y | 4100 ppt |
| 24 | 4-*tert* -Octylphenol tetraethoxylate | Y | 78 ppt |
| 25 | 4-*tert* -Octylphenol triethoxylate | Y | 29 ppt |
| 26 | 4-*tert* -Pentylphenol | Y | 51 ppt |
| 27 | 5-Methyl-1H-benzotriazole | Y | 1000 ppt |
| 28 | Acetaminophen | N | |
| 29 | Acetylhexamethyltetrahydronaphthalene | Y | 110 ppt |
| 30 | Albuterol | N | |
| 31 | Biochanin A | N | |
| 32 | Bisphenol A | Y | 22000 ppt |
| 33 | Bupropion | Y | 4298 ppt |
| 34 | Caffeine | Y | 9900 ppt |
| 35 | Carbamazepine | Y | 11500 ppt |
| 36 | Cholesterol | Y | 92000 ppt |
| 37 | *cis* -Androsterone | Y | 5 ppt |
| 38 | Codeine | Y | 79 ppt |
| 39 | Coprostanol | Y | 14000 ppt |
| 40 | Cotinine | Y | 220 ppt |
| 41 | Coumestrol | Y | 6 ppt |
| 42 | Daidzein | Y | 4 ppt |

## Alphabetical List of Analytes for Water

| | Chemical | Detected | Maximum Concentration |
|---|---|---|---|
| 43 | Daidzin (sugar) | N | |
| 44 | Dehydronifedipine | Y | 4 ppt |
| 45 | Diethylstilbestrol | Y | 1 ppt |
| 46 | Dihydrotestosterone | N | |
| 47 | Diltiazem | Y | 46 ppt |
| 48 | Diphenhydramine | Y | 127 ppt |
| 49 | Epitestosterone | N | |
| 50 | Equilenin | Y | 8 ppt |
| 51 | Equilin | N | |
| 52 | Equol | N | |
| 53 | Estriol | Y | 11 ppt |
| 54 | Estrone | Y | 38 ppt |
| 55 | Ethylenediaminetetraacetic Acid | Y | 580 ppb |
| 56 | Fluoxetine | Y | 76 ppt |
| 57 | Fluvoxamine | Y | 21 ppt |
| 58 | Formononetin | Y | 5 ppt |
| 59 | Genistein | N | |
| 60 | Genistin (sugar) | N | |
| 61 | Glycitein | Y | 15 ppt |
| 62 | Hexahydrohexamethylcyclopentabenzopyran (HHCB) | Y | 640 ppb |
| 63 | Hydroxybupropion | Y | 1975 ppt |
| 64 | Mestranol | Y | 0.2 ppt |
| 65 | N,N-Diethyl-*meta* -toluamide (DEET) | Y | 780 ppb |
| 66 | Nitrilotriacetic acid | Y | 10 ppb |
| 67 | Norethindrone | N | |
| 68 | Progesterone | N | |
| 69 | Prunetin | N | |
| 70 | Ranitidine | Y | 130 ppt |
| 71 | Sulfamethoxazole | Y | 4166 ppt |
| 72 | Testosterone | Y | 0.6 ppt |
| 73 | Thiabendazole | N | |
| 74 | Triclocarban | Y | 416 ppt |
| 75 | Triclosan | Y | 410 ppb |
| 76 | Trimethoprim | Y | 1463 ppt |
| 77 | Venlafaxine | Y | 5451 ppt |
| 78 | Warfarin | N | |

## Alphabetical List of Analytes for Sediment

| | Chemical | Detected | Maximum Concentration |
|---|---|---|---|
| 1 | 1,4-Dichlorobenzene | Y | 240 ppb |
| 2 | 11-*keto*-Testosterone | N | |
| 3 | 17-*alpha*-Estradiol | Y | 4.3 ppb |
| 4 | 17-*alpha*-Ethinylestradiol | N | |
| 5 | 17-*beta*-Estradiol | Y | 12.2 ppb |
| 6 | 1-Methylnaphthalene | Y | 430 ppb |
| 7 | 2,2',4,4'-Tetrabromodiphenylether (PBDE 47) | N | |
| 8 | 2,6-Dimethylnaphthalene | Y | 340 ppb |
| 9 | 2-Methylnaphthalene | Y | 850 ppb |
| 10 | 3-*beta*-Coprostanol | Y | 3800 ppb |
| 11 | 3-Methyl(1H)indole | Y | 90 ppb |
| 12 | 3-*tert*-Butyl-4-hydroxyanisole | N | |
| 13 | 4-Androstene-3,17-dione | Y | 0.79 ppb |
| 14 | 4-Cumylphenol | Y | 400 ppb |
| 15 | 4-*n*-Octylphenol | N | |
| 16 | 4-Nonylphenol (all isomers) | Y | 6900 ppb |
| 17 | 4-Nonylphenol diethoxylate | Y | 2100 ppb |
| 18 | 4-Nonylphenol monoethoxylate | Y | 1300 ppb |
| 19 | 4-*tert*-Octylphenol | Y | 240 ppb |
| 20 | 4-*tert*-Octylphenol diethoxylate | N | |
| 21 | 4-*tert*-Octylphenol monoethoxylate | Y | 410 ppb |
| 22 | 9,10-Anthraquinone | Y | 640 ppb |
| 23 | Acetophenone | Y | 110 ppb |
| 24 | Acetylhexamethyltetrahydronaphthalene (AHTN) | Y | 190 ppb |
| 25 | Anthracene | Y | 1000 ppb |
| 26 | Atrazine | N | |
| 27 | Benzo[a]pyrene | Y | 3300 ppb |
| 28 | Benzophenone | Y | 120 ppb |
| 29 | *beta*-Sitosterol | Y | 15000 ppb |
| 30 | *beta*-Stigmastanol | Y | 10000 ppb |
| 31 | Bisphenol A | Y | 310 ppb |
| 32 | Bromacil | N | |
| 33 | Camphor | N | |
| 34 | Carbazole | Y | 320 ppb |
| 35 | Chlorpyrifos | N | |
| 36 | Cholesterol | Y | 6500 ppb |
| 37 | *cis*-Androsterone | Y | 1.2 ppb |
| 38 | Diazinon | N | |
| 39 | Diethylhexylphthalate | Y | 830 ppb |
| 40 | Diethylphthalate | N | |
| 41 | Dihydrotestosterone | N | |
| 42 | *d*-Limonene | Y | 280 ppb |
| 43 | Epitestosterone | Y | 3.14 ppb |

## Alphabetical List of Analytes for Sediment

| | Chemical | Detected | Maximum Concentration |
|---|---|---|---|
| 44 | Equilenin | Y | 1.6 ppb |
| 45 | Equilin | N | |
| 46 | Estriol | Y | 0.1 ppb |
| 47 | Estrone | Y | 9 ppb |
| 48 | Fluoranthene | Y | 6000 ppb |
| 49 | Hexahydrohexamethylcyclopentabenzopyran (HHCB) | Y | 1000 ppb |
| 50 | Indole | Y | 1300 ppb |
| 51 | Isoborneol | N | |
| 52 | Isophorone | Y | 20 ppb |
| 53 | Isopropylbenzene | Y | 50 ppb |
| 54 | Isoquinoline | N | |
| 55 | Menthol | N | |
| 56 | Mestranol | N | |
| 57 | Metolachlor | N | |
| 58 | N,N-Diethyl-*meta*-toluamide (DEET) | N | |
| 59 | Naphthalene | Y | 1900 ppb |
| 60 | Norethindrone | N | |
| 61 | *p*-Cresol | Y | 1800 ppb |
| 62 | Phenanthrene | Y | 3600 ppb |
| 63 | Phenol | N | |
| 64 | Progesterone | Y | 12.2 ppb |
| 65 | Prometon | N | |
| 66 | Pyrene | Y | 6400 ppb |
| 67 | Testosterone | N | |
| 68 | *trans*-Diethylstilbestrol | N | |
| 69 | Tributylphosphate | N | |
| 70 | Triclosan | Y | 352 ppb |
| 71 | Triphenylphosphate | N | |
| 72 | Tris(2-butoxyethyl)phosphate | N | |
| 73 | Tris(2-chloroethyl)phosphate | N | |
| 74 | Tris(dichloroisopropyl)phosphate | N | |

| Site Number | USGS Station Name | Date | Time | Site Type |
|---|---|---|---|---|
| 1 | Williams Creek above WWTP at Williams, Minn. | 10/20/2009 | 1112 | US |
| 2 | Williams WWTP outflow at Williams, Minn. | 10/20/2009 | 1039 | WWTP |
| 3 | Williams Creek below WWTP at Williams, Minn. | 10/20/2009 | 1054 | DS |
| 4 | Shagawa Lake at Mouth of Burntside River near Ely, Minn. | 09/28/2009 | 947 | US |
| 5 | Ely WWTP outflow at Ely, Minn. | 09/28/2009 | 1033 | WWTP |
| 6 | Shagawa Lake near Ely WWTP outflow at Ely, Minn. | 09/28/2009 | 1109 | DS |
| 7 | Elbow Creek above Eveleth WWTP at Eveleth, Minn. | 09/29/2009 | 1101 | US |
| 8 | Eveleth WWTP outlflow at Eveleth, Minn. | 09/29/2009 | 936 | WWTP |
| 9 | Elbow Creek below Eveleth WWTP at Eveleth, Minn. | 09/29/2009 | 1022 | DS |
| 10 | St. Louis River at Hwy. 23 above Fond Du Lac, Minn. | 10/01/2009 | 1308 | US |
| 11 | Western Lake Superior Sanitary District - WWTP at Duluth, Minn. | 10/01/2009 | 815 | WWTP |
| 12 | Lake Superior in St. Louis Bay at Duluth, Minn. | 10/01/2009 | 957 | DS |
| 13 | Pelican River above WWTP at Pelican Rapids, Minn. | 10/19/2009 | 1435 | US |
| 14 | Pelican Rapids WWTP outflow at Pelican Rapids, Minn. | 10/19/2009 | 1146 | WWTP |
| 15 | Pelican River below WWTP at Pelican Rapids, Minn. | 10/19/2009 | 1314 | DS |
| 16 | Red River of the North above WWTP at East Grand Forks, Minn. | 10/21/2009 | 1104 | US |
| 17 | East Grand Forks WWTP Outlow at East Grand Forks, MN | 10/21/2009 | 908 | WWTP |
| 18 | Red River of the North below WWTP at East Grand Forks, Minn. | 10/21/2009 | 1014 | DS |
| 19 | Mississippi River above WWTP at Grand Rapids, Minn. | 09/30/2009 | 1421 | US |
| 20 | Grand Rapids WWTP outflow at Grand Rapids, Minn. | 09/30/2009 | 932 | WWTP |
| 21 | Mississippi River below WWTP at Grand Rapids, Minn. | 09/30/2009 | 1241 | DS |
| 22 | Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | 09/16/2009 | 1036 | US |
| 23 | Sauk Centre WWTP outflow at Sauk Centre, Minn. | 09/16/2009 | 835 | WWTP |
| 24 | Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | 09/16/2009 | 933 | DS |
| 25 | Sauk River above Melrose WWTP at Melrose, Minn. | 09/17/2009 | 1007 | US |
| 26 | Melrose WWTP outflow at Melrose, Minn. | 09/17/2009 | 833 | WWTP |
| 27 | Sauk River below Melrose WWTP at Melrose, Minn. | 09/17/2009 | 915 | DS |
| 28 | Tibbets Brook above WWTP outflow at Zimmerman, Minn. | 09/03/2009 | 1046 | US |
| 29 | Zimmerman WWTP outflow at Zimmerman, Minn. | 09/03/2009 | 832 | WWTP |
| 30 | Tibbets Brook below WWTP outflow at Zimmerman, Minn. | 09/03/2009 | 850 | DS |
| 31 | Jewitts Creek at U.S. Hwy. 12 in Litchfield, Minn. | 10/08/2009 | 935 | US |
| 32 | Litchfield WWTP outflow near Litchfield, Minn. | 10/08/2009 | 808 | WWTP |
| 33 | Jewitts Creek near Litchfield, Minn. | 10/08/2009 | 850 | DS |
| 34 | South Fork of the Crow River above WWTP at Hutchinson, Minn. | 09/14/2009 | 1215 | US |
| 35 | Hutchinson WWTP outflow at Hutchinson, Minn. | 09/14/2009 | 1006 | WWTP |
| 36 | South Fork of the Crow River below Hutchinson, Minn. | 09/14/2009 | 1116 | DS |
| 37 | South Fork Crow River above WWTP at Lester Prairie, Minn. | 09/15/2009 | 1230 | US |
| 38 | Lester Prairie WWTP outflow at Lester Prairie, Minn. | 09/15/2009 | 849 | WWTP |
| 39 | South Fork Crow River below WWTP at Lester Prairie, Minn. | 09/15/2009 | 1045 | DS |
| 40 | Redwood River above Lynd WWTP near Lynd, Minn. | 11/23/2009 | 1429 | US |
| 41 | Lynd WWTP outflow near Lynd, Minn. | 11/23/2009 | 1230 | WWTP |
| 42 | Redwood River below Lynd WWTP near Lynd, Minn. | 11/23/2009 | 1323 | DS |
| 43 | Redwood River above WWTP below Marshall, Minn. | 10/07/2009 | 1108 | US |
| 44 | Marshall WWTP outfall at Marshall, Minn. | 10/07/2009 | 917 | WWTP |
| 45 | Redwood River below WWTP near Marshall, Minn. | 10/07/2009 | 1010 | DS |
| 46 | Center Creek on Co. Rd. 143, at Fairmont, Minn. | 09/09/2009 | 946 | US |

| Site Number | USGS Station Name | Date | Time | Site Type |
|---|---|---|---|---|
| 47 | Fairmont WWTP outflow at Fairmont, Minn. | 09/09/2009 | 755 | WWTP |
| 48 | Center Creek below WWTP at Fairmont, Minn. | 09/09/2009 | 843 | DS |
| 49 | Mississippi River at Industrial Mollasses, St. Paul, Minn. | 09/24/2009 | 1357 | US |
| 50 | Metro Plant (WWTP) outflow in St. Paul, Minn. | 09/24/2009 | 1046 | WWTP |
| 51 | Mississippi River at South St. Paul, Minn. | 09/24/2009 | 1244 | DS |
| 52 | Grindstone River above WWTP near Hinckley, Minn. | 09/02/2009 | 1157 | US |
| 53 | Hinckley WWTP near Hinckley, Minn. | 09/02/2009 | 850 | WWTP |
| 54 | Grindstone River below Hinckley, Minn. | 09/02/2009 | 1005 | DS |
| 55 | Mississippi River (Lake Pepin) above Lake City, Minn. | 09/23/2009 | 953 | US |
| 56 | Lake City WWTP outflow at Lake City, Minn. | 09/23/2009 | 749 | WWTP |
| 57 | Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | 09/23/2009 | 835 | DS |
| 58 | South Fork Zumbro River at Rochester, Minn. | 09/22/2009 | 1119 | US |
| 59 | Rochester WWTP outflow at Rochester, Minn. | 09/22/2009 | 843 | WWTP |
| 60 | South Fork Zumbro River below WWTP near Rochester, Minn. | 09/22/2009 | 949 | DS |
| 61 | Spring Valley Creek above Spring Valley WWTP outflow at Spring Valley, Minn. | 09/21/2009 | 1059 | US |
| 62 | Spring Valley WWTP outflow at Spring Valley, Minn. | 09/21/2009 | 944 | WWTP |
| 63 | Spring Valley Creek below Spring Valley WWTP outflow at Spring Valley, Minn. | 09/21/2009 | 1020 | DS |
| 64 | Cedar River above treatment plant at Austin, Minn. | 09/08/2009 | 946 | US |
| 65 | Austin WWTP outflow at Austin, Minn. | 09/08/2009 | 755 | WWTP |
| 66 | Cedar River below treatment plant at Austin, Minn. | 09/08/2009 | 846 | DS |
| 67 | Okabena Creek above WWTP outflow at Worthington, Minn. | 09/09/2009 | 1841 | US |
| 68 | Worthington WWTP outflow at Worthington, Minn. | 09/09/2009 | 1606 | WWTP |
| 69 | Industrial WWTP outflow near Worthington, Minn. | 09/09/2009 | 1711 | WWTP |
| 70 | Okabena Creek below WWTP outflow at Worthington, Minn. | 09/09/2009 | 1738 | DS |
| 71 | Rock River above WWTP near Luverne, Minn. | 10/06/2009 | 940 | US |
| 72 | Luverne WWTP outflow near Luverne, Minn. | 10/06/2009 | 725 | WWTP |
| 73 | Rock River below WWTP near Luverne, Minn. | 10/06/2009 | 827 | DS |

| USGS Station Name | Acetaminophen (ng/L) | Albuterol (ng/L) | Bupropion (ng/L) | Caffeine (ng/L) |
|---|---|---|---|---|
| Williams Creek above WWTP at Williams, Minn. | nd | nd | nd | 51 |
| Williams WWTP outflow at Williams, Minn. | nd | nd | nd | nd |
| Williams Creek below WWTP at Williams, Minn. | nd | nd | nd | 51 |
| Shagawa Lake at Mouth of Burntside River near Ely, Minn. | nd | nd | nd | nd |
| Ely WWTP outflow at Ely, Minn. | nd | nd | 395 | 11500 |
| Shagawa Lake near Ely WWTP outflow at Ely, Minn. | nd | nd | nd | 72 |
| Elbow Creek above Eveleth WWTP at Eveleth, Minn. | nd | nd | nd | 1080 |
| Eveleth WWTP outlflow at Eveleth, Minn. | nd | nd | 916 | nd |
| Elbow Creek below Eveleth WWTP at Eveleth, Minn. | nd | nd | 736 | 101 |
| St. Louis River at Hwy. 23 above Fond Du Lac, Minn. | nd | nd | nd | nd |
| Western Lake Superior Sanitary District - WWTP at Duluth, Minn. | nd | nd | nd | 9000 |
| Lake Superior in St. Louis Bay at Duluth, Minn. | nd | nd | nd | 769 |
| Pelican River above WWTP at Pelican Rapids, Minn. | nd | nd | nd | nd |
| Pelican Rapids WWTP outflow at Pelican Rapids, Minn. | nd | nd | 780 | 665 |
| Pelican River below WWTP at Pelican Rapids, Minn. | nd | nd | nd | nd |
| Red River of the North above WWTP at East Grand Forks, Minn. | nd | nd | nd | nd |
| East Grand Forks WWTP Outlow at East Grand Forks, MN | nd | nd | nd | nd |
| Red River of the North below WWTP at East Grand Forks, Minn. | nd | nd | nd | 58 |
| Mississippi River above WWTP at Grand Rapids, Minn. | nd | nd | nd | nd |
| Grand Rapids WWTP outflow at Grand Rapids, Minn. | nd | nd | nd | nd |
| Mississippi River below WWTP at Grand Rapids, Minn. | nd | nd | nd | nd |
| Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd | nd | nd |
| Sauk Centre WWTP outflow at Sauk Centre, Minn. | nd | nd | 550 | 261 |
| Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd | nd | nd |
| Sauk River above Melrose WWTP at Melrose, Minn. | nd | nd | nd | nd |
| Melrose WWTP outflow at Melrose, Minn. | nd | nd | 28 | nd |
| Sauk River below Melrose WWTP at Melrose, Minn. | nd | nd | nd | nd |
| Tibbets Brook above WWTP outflow at Zimmerman, Minn. | nd | nd | nd | nd |
| Zimmerman WWTP outflow at Zimmerman, Minn. | nd | nd | 701 | nd |
| Tibbets Brook below WWTP outflow at Zimmerman, Minn. | nd | nd | 236 | nd |
| Jewitts Creek at U.S. Hwy. 12 in Litchfield, Minn. | nd | nd | nd | nd |
| Litchfield WWTP outflow near Litchfield, Minn. | nd | nd | 77 | nd |
| Jewitts Creek near Litchfield, Minn. | nd | nd | 17 | nd |
| South Fork of the Crow River above WWTP at Hutchinson, Minn. | nd | nd | nd | nd |
| Hutchinson WWTP outflow at Hutchinson, Minn. | nd | nd | 68 | nd |
| South Fork of the Crow River below Hutchinson, Minn. | nd | nd | 12 | nd |
| South Fork Crow River above WWTP at Lester Prairie, Minn. | nd | nd | nd | nd |
| Lester Prairie WWTP outflow at Lester Prairie, Minn. | nd | nd | 515 | nd |
| South Fork Crow River below WWTP at Lester Prairie, Minn. | nd | nd | nd | nd |
| Redwood River above Lynd WWTP near Lynd, Minn. | nd | nd | nd | nd |
| Lynd WWTP outflow near Lynd, Minn. | nd | nd | 10.4 | 81 |
| Redwood River below Lynd WWTP near Lynd, Minn. | nd | nd | nd | nd |
| Redwood River above WWTP below Marshall, Minn. | nd | nd | nd | nd |
| Marshall WWTP outfall at Marshall, Minn. | nd | nd | 206 | nd |
| Redwood River below WWTP near Marshall, Minn. | nd | nd | nd | nd |
| Center Creek on Co. Rd. 143, at Fairmont, Minn. | nd | nd | nd | nd |

| USGS Station Name | Acetaminophen (ng/L) | Albuterol (ng/L) | Bupropion (ng/L) | Caffeine (ng/L) |
|---|---|---|---|---|
| Fairmont WWTP outflow at Fairmont, Minn. | nd | nd | 971 | nd |
| Center Creek below WWTP at Fairmont, Minn. | nd | nd | 273 | nd |
| Mississippi River at Industrial Mollasses, St. Paul, Minn. | nd | nd | nd | nd |
| Metro Plant (WWTP) outflow in St. Paul, Minn. | nd | nd | 1,138 | nd |
| Mississippi River at South St. Paul, Minn. | nd | nd | nd | nd |
| Grindstone River above WWTP near Hinckley, Minn. | nd | nd | nd | nd |
| Hinckley WWTP near Hinckley, Minn. | nd | nd | 255 | nd |
| Grindstone River below Hinckley, Minn. | nd | nd | 10.8 | nd |
| Mississippi River (Lake Pepin) above Lake City, Minn. | nd | nd | nd | nd |
| Lake City WWTP outflow at Lake City, Minn. | nd | nd | 1,056 | nd |
| Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | nd | nd | 15 | nd |
| South Fork Zumbro River at Rochester, Minn. | nd | nd | nd | 126 |
| Rochester WWTP outflow at Rochester, Minn. | nd | nd | 1,556 | nd |
| South Fork Zumbro River below WWTP near Rochester, Minn. | nd | nd | 164 | nd |
| Spring Valley Creek above Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | nd | nd |
| Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | 185 | nd |
| Spring Valley Creek below Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | 24 | nd |
| Cedar River above treatment plant at Austin, Minn. | nd | nd | nd | nd |
| Austin WWTP outflow at Austin, Minn. | nd | nd | 4,298 | 332 |
| Cedar River below treatment plant at Austin, Minn. | nd | nd | 98 | 79 |
| Okabena Creek above WWTP outflow at Worthington, Minn. | nd | nd | nd | nd |
| Worthington WWTP outflow at Worthington, Minn. | nd | nd | 260 | nd |
| Industrial WWTP outflow near Worthington, Minn. | nd | nd | nd | nd |
| Okabena Creek below WWTP outflow at Worthington, Minn. | nd | nd | 36 | nd |
| Rock River above WWTP near Luverne, Minn. | nd | nd | nd | nd |
| Luverne WWTP outflow near Luverne, Minn. | nd | nd | 245 | 338 |
| Rock River below WWTP near Luverne, Minn. | nd | nd | nd | nd |

| USGS Station Name | Carbamaze-pine (ng/L) | Codeine (ng/L) | Cotinine (ng/L) |
|---|---|---|---|
| Williams Creek above WWTP at Williams, Minn. | 211 | nd | nd |
| Williams WWTP outflow at Williams, Minn. | 1,475 | nd | nd |
| Williams Creek below WWTP at Williams, Minn. | 274 | nd | nd |
| Shagawa Lake at Mouth of Burntside River near Ely, Minn. | nd | nd | nd |
| Ely WWTP outflow at Ely, Minn. | 355 | 51 | nd |
| Shagawa Lake near Ely WWTP outflow at Ely, Minn. | nd | nd | nd |
| Elbow Creek above Eveleth WWTP at Eveleth, Minn. | nd | 6 | 17 |
| Eveleth WWTP outlflow at Eveleth, Minn. | 372 | nd | nd |
| Elbow Creek below Eveleth WWTP at Eveleth, Minn. | 358 | nd | nd |
| St. Louis River at Hwy. 23 above Fond Du Lac, Minn. | nd | nd | nd |
| Western Lake Superior Sanitary District - WWTP at Duluth, Minn. | 301 | nd | 220 |
| Lake Superior in St. Louis Bay at Duluth, Minn. | 43 | nd | 70 |
| Pelican River above WWTP at Pelican Rapids, Minn. | nd | nd | nd |
| Pelican Rapids WWTP outflow at Pelican Rapids, Minn. | 197 | 16 | 48 |
| Pelican River below WWTP at Pelican Rapids, Minn. | nd | nd | nd |
| Red River of the North above WWTP at East Grand Forks, Minn. | nd | nd | nd |
| East Grand Forks WWTP Outlow at East Grand Forks, MN | 38 | nd | nd |
| Red River of the North below WWTP at East Grand Forks, Minn. | nd | nd | nd |
| Mississippi River above WWTP at Grand Rapids, Minn. | nd | nd | nd |
| Grand Rapids WWTP outflow at Grand Rapids, Minn. | 126 | nd | 9 |
| Mississippi River below WWTP at Grand Rapids, Minn. | nd | nd | nd |
| Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd | nd |
| Sauk Centre WWTP outflow at Sauk Centre, Minn. | 1,295 | nd | 42 |
| Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | 22 | nd | nd |
| Sauk River above Melrose WWTP at Melrose, Minn. | 14 | nd | nd |
| Melrose WWTP outflow at Melrose, Minn. | 84 | nd | nd |
| Sauk River below Melrose WWTP at Melrose, Minn. | 23 | nd | nd |
| Tibbets Brook above WWTP outflow at Zimmerman, Minn. | nd | nd | nd |
| Zimmerman WWTP outflow at Zimmerman, Minn. | 71 | nd | nd |
| Tibbets Brook below WWTP outflow at Zimmerman, Minn. | 45 | nd | nd |
| Jewitts Creek at U.S. Hwy. 12 in Litchfield, Minn. | nd | nd | nd |
| Litchfield WWTP outflow near Litchfield, Minn. | 492 | nd | nd |
| Jewitts Creek near Litchfield, Minn. | 51 | nd | nd |
| South Fork of the Crow River above WWTP at Hutchinson, Minn. | nd | nd | nd |
| Hutchinson WWTP outflow at Hutchinson, Minn. | 415 | nd | nd |
| South Fork of the Crow River below Hutchinson, Minn. | 58 | nd | nd |
| South Fork Crow River above WWTP at Lester Prairie, Minn. | 21 | nd | nd |
| Lester Prairie WWTP outflow at Lester Prairie, Minn. | 1,146 | nd | nd |
| South Fork Crow River below WWTP at Lester Prairie, Minn. | 26 | nd | nd |
| Redwood River above Lynd WWTP near Lynd, Minn. | nd | nd | nd |
| Lynd WWTP outflow near Lynd, Minn. | 87 | nd | nd |
| Redwood River below Lynd WWTP near Lynd, Minn. | nd | nd | nd |
| Redwood River above WWTP below Marshall, Minn. | nd | nd | nd |
| Marshall WWTP outfall at Marshall, Minn. | 376 | 22 | nd |
| Redwood River below WWTP near Marshall, Minn. | 29 | nd | nd |
| Center Creek on Co. Rd. 143, at Fairmont, Minn. | nd | nd | nd |

| USGS Station Name | Carbamaze-pine (ng/L) | Codeine (ng/L) | Cotinine (ng/L) |
|---|---|---|---|
| Fairmont WWTP outflow at Fairmont, Minn. | 531 | nd | nd |
| Center Creek below WWTP at Fairmont, Minn. | 398 | nd | nd |
| Mississippi River at Industrial Mollasses, St. Paul, Minn. | 16 | nd | nd |
| Metro Plant (WWTP) outflow in St. Paul, Minn. | 597 | 71 | nd |
| Mississippi River at South St. Paul, Minn. | 47 | nd | nd |
| Grindstone River above WWTP near Hinckley, Minn. | nd | nd | nd |
| Hinckley WWTP near Hinckley, Minn. | 526 | nd | nd |
| Grindstone River below Hinckley, Minn. | 5.7 | nd | nd |
| Mississippi River (Lake Pepin) above Lake City, Minn. | 20 | nd | nd |
| Lake City WWTP outflow at Lake City, Minn. | 252 | 79 | 36 |
| Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | 35 | nd | nd |
| South Fork Zumbro River at Rochester, Minn. | nd | nd | 19 |
| Rochester WWTP outflow at Rochester, Minn. | 535 | nd | nd |
| South Fork Zumbro River below WWTP near Rochester, Minn. | 185 | nd | nd |
| Spring Valley Creek above Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | nd |
| Spring Valley WWTP outflow at Spring Valley, Minn. | 965 | nd | nd |
| Spring Valley Creek below Spring Valley WWTP outflow at Spring Valley, Minn. | 152 | nd | nd |
| Cedar River above treatment plant at Austin, Minn. | nd | nd | nd |
| Austin WWTP outflow at Austin, Minn. | 375 | 56 | nd |
| Cedar River below treatment plant at Austin, Minn. | 64 | 13 | nd |
| Okabena Creek above WWTP outflow at Worthington, Minn. | nd | nd | nd |
| Worthington WWTP outflow at Worthington, Minn. | 430 | nd | nd |
| Industrial WWTP outflow near Worthington, Minn. | nd | nd | nd |
| Okabena Creek below WWTP outflow at Worthington, Minn. | 172 | nd | nd |
| Rock River above WWTP near Luverne, Minn. | nd | nd | nd |
| Luverne WWTP outflow near Luverne, Minn. | 344 | 56 | 56 |
| Rock River below WWTP near Luverne, Minn. | 8 | nd | nd |

| USGS Station Name | Dehydronifedipine (ng/L) | Diltiazem (ng/L) | 1,7-Dimethylxanthine (ng/L) |
|---|---|---|---|
| Williams Creek above WWTP at Williams, Minn. | nd | nd | nd |
| Williams WWTP outflow at Williams, Minn. | nd | nd | nd |
| Williams Creek below WWTP at Williams, Minn. | nd | nd | nd |
| Shagawa Lake at Mouth of Burntside River near Ely, Minn. | nd | nd | nd |
| Ely WWTP outflow at Ely, Minn. | 4 | 40 | 4320 |
| Shagawa Lake near Ely WWTP outflow at Ely, Minn. | nd | nd | nd |
| Elbow Creek above Eveleth WWTP at Eveleth, Minn. | nd | nd | 73 |
| Eveleth WWTP outlflow at Eveleth, Minn. | nd | 28 | nd |
| Elbow Creek below Eveleth WWTP at Eveleth, Minn. | nd | 25 | nd |
| St. Louis River at Hwy. 23 above Fond Du Lac, Minn. | nd | nd | nd |
| Western Lake Superior Sanitary District - WWTP at Duluth, Minn. | nd | nd | 464 |
| Lake Superior in St. Louis Bay at Duluth, Minn. | nd | nd | 137 |
| Pelican River above WWTP at Pelican Rapids, Minn. | nd | nd | nd |
| Pelican Rapids WWTP outflow at Pelican Rapids, Minn. | nd | nd | 82 |
| Pelican River below WWTP at Pelican Rapids, Minn. | nd | nd | nd |
| Red River of the North above WWTP at East Grand Forks, Minn. | nd | nd | nd |
| East Grand Forks WWTP Outlow at East Grand Forks, MN | nd | nd | nd |
| Red River of the North below WWTP at East Grand Forks, Minn. | nd | nd | nd |
| Mississippi River above WWTP at Grand Rapids, Minn. | nd | nd | nd |
| Grand Rapids WWTP outflow at Grand Rapids, Minn. | nd | nd | nd |
| Mississippi River below WWTP at Grand Rapids, Minn. | nd | nd | nd |
| Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd | nd |
| Sauk Centre WWTP outflow at Sauk Centre, Minn. | nd | 46 | nd |
| Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd | nd |
| Sauk River above Melrose WWTP at Melrose, Minn. | nd | nd | nd |
| Melrose WWTP outflow at Melrose, Minn. | nd | 13 | nd |
| Sauk River below Melrose WWTP at Melrose, Minn. | nd | nd | nd |
| Tibbets Brook above WWTP outflow at Zimmerman, Minn. | nd | nd | nd |
| Zimmerman WWTP outflow at Zimmerman, Minn. | nd | nd | nd |
| Tibbets Brook below WWTP outflow at Zimmerman, Minn. | nd | nd | nd |
| Jewitts Creek at U.S. Hwy. 12 in Litchfield, Minn. | nd | nd | nd |
| Litchfield WWTP outflow near Litchfield, Minn. | nd | nd | nd |
| Jewitts Creek near Litchfield, Minn. | nd | nd | nd |
| South Fork of the Crow River above WWTP at Hutchinson, Minn. | nd | nd | nd |
| Hutchinson WWTP outflow at Hutchinson, Minn. | nd | nd | nd |
| South Fork of the Crow River below Hutchinson, Minn. | nd | nd | nd |
| South Fork Crow River above WWTP at Lester Prairie, Minn. | nd | nd | nd |
| Lester Prairie WWTP outflow at Lester Prairie, Minn. | nd | nd | nd |
| South Fork Crow River below WWTP at Lester Prairie, Minn. | nd | nd | nd |
| Redwood River above Lynd WWTP near Lynd, Minn. | nd | nd | nd |
| Lynd WWTP outflow near Lynd, Minn. | nd | nd | nd |
| Redwood River below Lynd WWTP near Lynd, Minn. | nd | nd | nd |
| Redwood River above WWTP below Marshall, Minn. | nd | nd | nd |
| Marshall WWTP outfall at Marshall, Minn. | nd | 11 | nd |
| Redwood River below WWTP near Marshall, Minn. | nd | nd | nd |
| Center Creek on Co. Rd. 143, at Fairmont, Minn. | nd | nd | nd |

| USGS Station Name | Dehydronifedipine (ng/L) | Diltiazem (ng/L) | 1,7-Dimethylxanthine (ng/L) |
|---|---|---|---|
| Fairmont WWTP outflow at Fairmont, Minn. | nd | 41 | nd |
| Center Creek below WWTP at Fairmont, Minn. | nd | 29 | nd |
| Mississippi River at Industrial Mollasses, St. Paul, Minn. | nd | nd | nd |
| Metro Plant (WWTP) outflow in St. Paul, Minn. | 4 | 26 | nd |
| Mississippi River at South St. Paul, Minn. | nd | nd | nd |
| Grindstone River above WWTP near Hinckley, Minn. | nd | nd | nd |
| Hinckley WWTP near Hinckley, Minn. | nd | nd | nd |
| Grindstone River below Hinckley, Minn. | nd | nd | nd |
| Mississippi River (Lake Pepin) above Lake City, Minn. | nd | nd | nd |
| Lake City WWTP outflow at Lake City, Minn. | nd | 21 | nd |
| Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | nd | nd | nd |
| South Fork Zumbro River at Rochester, Minn. | nd | nd | nd |
| Rochester WWTP outflow at Rochester, Minn. | nd | nd | nd |
| South Fork Zumbro River below WWTP near Rochester, Minn. | nd | nd | nd |
| Spring Valley Creek above Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | nd |
| Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | nd |
| Spring Valley Creek below Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | nd |
| Cedar River above treatment plant at Austin, Minn. | nd | nd | nd |
| Austin WWTP outflow at Austin, Minn. | nd | 19 | nd |
| Cedar River below treatment plant at Austin, Minn. | nd | nd | nd |
| Okabena Creek above WWTP outflow at Worthington, Minn. | nd | nd | nd |
| Worthington WWTP outflow at Worthington, Minn. | nd | nd | nd |
| Industrial WWTP outflow near Worthington, Minn. | nd | nd | nd |
| Okabena Creek below WWTP outflow at Worthington, Minn. | nd | nd | nd |
| Rock River above WWTP near Luverne, Minn. | nd | nd | nd |
| Luverne WWTP outflow near Luverne, Minn. | nd | nd | nd |
| Rock River below WWTP near Luverne, Minn. | nd | nd | nd |

| USGS Station Name | Diphenhydramine (ng/L) | Fluoxetine (ng/L) | Fluvoxamine (ng/L) |
|---|---|---|---|
| Williams Creek above WWTP at Williams, Minn. | nd | nd | nd |
| Williams WWTP outflow at Williams, Minn. | 47 | nd | nd |
| Williams Creek below WWTP at Williams, Minn. | nd | nd | nd |
| Shagawa Lake at Mouth of Burntside River near Ely, Minn. | nd | nd | nd |
| Ely WWTP outflow at Ely, Minn. | 127 | 63 | 21 |
| Shagawa Lake near Ely WWTP outflow at Ely, Minn. | nd | nd | nd |
| Elbow Creek above Eveleth WWTP at Eveleth, Minn. | nd | nd | nd |
| Eveleth WWTP outlflow at Eveleth, Minn. | 43 | 52 | nd |
| Elbow Creek below Eveleth WWTP at Eveleth, Minn. | 30 | 44 | nd |
| St. Louis River at Hwy. 23 above Fond Du Lac, Minn. | nd | nd | nd |
| Western Lake Superior Sanitary District - WWTP at Duluth, Minn. | nd | 19 | nd |
| Lake Superior in St. Louis Bay at Duluth, Minn. | nd | nd | nd |
| Pelican River above WWTP at Pelican Rapids, Minn. | nd | nd | nd |
| Pelican Rapids WWTP outflow at Pelican Rapids, Minn. | nd | 11 | nd |
| Pelican River below WWTP at Pelican Rapids, Minn. | nd | nd | nd |
| Red River of the North above WWTP at East Grand Forks, Minn. | nd | nd | nd |
| East Grand Forks WWTP Outlow at East Grand Forks, MN | nd | nd | nd |
| Red River of the North below WWTP at East Grand Forks, Minn. | nd | nd | nd |
| Mississippi River above WWTP at Grand Rapids, Minn. | nd | nd | nd |
| Grand Rapids WWTP outflow at Grand Rapids, Minn. | nd | nd | nd |
| Mississippi River below WWTP at Grand Rapids, Minn. | nd | nd | nd |
| Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd | nd |
| Sauk Centre WWTP outflow at Sauk Centre, Minn. | 88 | 36 | nd |
| Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd | nd |
| Sauk River above Melrose WWTP at Melrose, Minn. | nd | nd | nd |
| Melrose WWTP outflow at Melrose, Minn. | 29 | 16 | nd |
| Sauk River below Melrose WWTP at Melrose, Minn. | nd | nd | nd |
| Tibbets Brook above WWTP outflow at Zimmerman, Minn. | nd | nd | nd |
| Zimmerman WWTP outflow at Zimmerman, Minn. | nd | 27 | nd |
| Tibbets Brook below WWTP outflow at Zimmerman, Minn. | nd | 17 | nd |
| Jewitts Creek at U.S. Hwy. 12 in Litchfield, Minn. | nd | nd | nd |
| Litchfield WWTP outflow near Litchfield, Minn. | 36 | 15 | nd |
| Jewitts Creek near Litchfield, Minn. | nd | nd | nd |
| South Fork of the Crow River above WWTP at Hutchinson, Minn. | nd | nd | nd |
| Hutchinson WWTP outflow at Hutchinson, Minn. | nd | 15 | nd |
| South Fork of the Crow River below Hutchinson, Minn. | nd | nd | nd |
| South Fork Crow River above WWTP at Lester Prairie, Minn. | nd | nd | nd |
| Lester Prairie WWTP outflow at Lester Prairie, Minn. | nd | 21 | nd |
| South Fork Crow River below WWTP at Lester Prairie, Minn. | nd | nd | nd |
| Redwood River above Lynd WWTP near Lynd, Minn. | nd | nd | nd |
| Lynd WWTP outflow near Lynd, Minn. | nd | nd | nd |
| Redwood River below Lynd WWTP near Lynd, Minn. | nd | nd | nd |
| Redwood River above WWTP below Marshall, Minn. | nd | nd | nd |
| Marshall WWTP outfall at Marshall, Minn. | 40 | 18 | nd |
| Redwood River below WWTP near Marshall, Minn. | nd | nd | nd |
| Center Creek on Co. Rd. 143, at Fairmont, Minn. | nd | nd | nd |

| USGS Station Name | Diphenhydramine (ng/L) | Fluoxetine (ng/L) | Fluvoxamine (ng/L) |
|---|---|---|---|
| Fairmont WWTP outflow at Fairmont, Minn. | 35 | 30 | nd |
| Center Creek below WWTP at Fairmont, Minn. | nd | nd | nd |
| Mississippi River at Industrial Mollasses, St. Paul, Minn. | nd | nd | nd |
| Metro Plant (WWTP) outflow in St. Paul, Minn. | 38 | 47 | nd |
| Mississippi River at South St. Paul, Minn. | nd | nd | nd |
| Grindstone River above WWTP near Hinckley, Minn. | nd | nd | nd |
| Hinckley WWTP near Hinckley, Minn. | nd | 31 | nd |
| Grindstone River below Hinckley, Minn. | nd | nd | nd |
| Mississippi River (Lake Pepin) above Lake City, Minn. | nd | nd | nd |
| Lake City WWTP outflow at Lake City, Minn. | 47 | 46 | nd |
| Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | nd | nd | nd |
| South Fork Zumbro River at Rochester, Minn. | nd | nd | nd |
| Rochester WWTP outflow at Rochester, Minn. | 18 | 76 | 17 |
| South Fork Zumbro River below WWTP near Rochester, Minn. | nd | 13 | nd |
| Spring Valley Creek above Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | nd |
| Spring Valley WWTP outflow at Spring Valley, Minn. | 38 | 30 | nd |
| Spring Valley Creek below Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | nd |
| Cedar River above treatment plant at Austin, Minn. | nd | nd | nd |
| Austin WWTP outflow at Austin, Minn. | 29 | 28 | 16 |
| Cedar River below treatment plant at Austin, Minn. | 9 | 10 | nd |
| Okabena Creek above WWTP outflow at Worthington, Minn. | nd | nd | nd |
| Worthington WWTP outflow at Worthington, Minn. | 12 | 23 | nd |
| Industrial WWTP outflow near Worthington, Minn. | nd | nd | nd |
| Okabena Creek below WWTP outflow at Worthington, Minn. | nd | nd | nd |
| Rock River above WWTP near Luverne, Minn. | nd | nd | nd |
| Luverne WWTP outflow near Luverne, Minn. | 24 | 31 | nd |
| Rock River below WWTP near Luverne, Minn. | nd | nd | nd |

| USGS Station Name | Hydroxy-bupropion (ng/L) | Ranitidine (ng/L) | Sulfamethoxa-zole (ng/L) | Thiabendazole (ng/L) |
|---|---|---|---|---|
| Williams Creek above WWTP at Williams, Minn. | nd | nd | 5 | nd |
| Williams WWTP outflow at Williams, Minn. | 6 | nd | 65 | nd |
| Williams Creek below WWTP at Williams, Minn. | nd | nd | 5 | nd |
| Shagawa Lake at Mouth of Burntside River near Ely, Minn. | nd | nd | 9 | nd |
| Ely WWTP outflow at Ely, Minn. | 404 | 130 | 235 | nd |
| Shagawa Lake near Ely WWTP outflow at Ely, Minn. | nd | nd | 9 | nd |
| Elbow Creek above Eveleth WWTP at Eveleth, Minn. | 1.3 | nd | nd | nd |
| Eveleth WWTP outlflow at Eveleth, Minn. | nd | nd | 871 | nd |
| Elbow Creek below Eveleth WWTP at Eveleth, Minn. | nd | nd | 645 | nd |
| St. Louis River at Hwy. 23 above Fond Du Lac, Minn. | nd | nd | 6 | nd |
| Western Lake Superior Sanitary District - WWTP at Duluth, Minn. | 128 | nd | 233 | nd |
| Lake Superior in St. Louis Bay at Duluth, Minn. | 20 | nd | 73 | nd |
| Pelican River above WWTP at Pelican Rapids, Minn. | nd | nd | nd | nd |
| Pelican Rapids WWTP outflow at Pelican Rapids, Minn. | 255 | nd | 2,324 | nd |
| Pelican River below WWTP at Pelican Rapids, Minn. | nd | nd | 29 | nd |
| Red River of the North above WWTP at East Grand Forks, Minn. | 2.4 | nd | 38 | nd |
| East Grand Forks WWTP Outlow at East Grand Forks, MN | 14 | nd | 15 | nd |
| Red River of the North below WWTP at East Grand Forks, Minn. | 1.9 | nd | 36 | nd |
| Mississippi River above WWTP at Grand Rapids, Minn. | nd | nd | nd | nd |
| Grand Rapids WWTP outflow at Grand Rapids, Minn. | 3.7 | nd | 200 | nd |
| Mississippi River below WWTP at Grand Rapids, Minn. | nd | nd | 19 | nd |
| Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd | nd | nd |
| Sauk Centre WWTP outflow at Sauk Centre, Minn. | 303 | nd | 4,166 | nd |
| Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | 1 | nd | 58 | nd |
| Sauk River above Melrose WWTP at Melrose, Minn. | nd | nd | 48 | nd |
| Melrose WWTP outflow at Melrose, Minn. | 2.4 | nd | 220 | nd |
| Sauk River below Melrose WWTP at Melrose, Minn. | 1.4 | nd | 66 | nd |
| Tibbets Brook above WWTP outflow at Zimmerman, Minn. | nd | nd | nd | nd |
| Zimmerman WWTP outflow at Zimmerman, Minn. | 1,975 | 56 | 1,066 | nd |
| Tibbets Brook below WWTP outflow at Zimmerman, Minn. | 592 | 62 | 1,107 | nd |
| Jewitts Creek at U.S. Hwy. 12 in Litchfield, Minn. | nd | nd | nd | nd |
| Litchfield WWTP outflow near Litchfield, Minn. | nd | nd | 339 | nd |
| Jewitts Creek near Litchfield, Minn. | nd | nd | 46 | nd |
| South Fork of the Crow River above WWTP at Hutchinson, Minn. | nd | nd | nd | nd |
| Hutchinson WWTP outflow at Hutchinson, Minn. | 377 | 15 | 1,667 | nd |
| South Fork of the Crow River below Hutchinson, Minn. | 34 | nd | 207 | nd |
| South Fork Crow River above WWTP at Lester Prairie, Minn. | 10 | nd | 97 | nd |
| Lester Prairie WWTP outflow at Lester Prairie, Minn. | 1,970 | 46 | 2,282 | nd |
| South Fork Crow River below WWTP at Lester Prairie, Minn. | 10 | nd | 91 | nd |
| Redwood River above Lynd WWTP near Lynd, Minn. | nd | nd | nd | nd |
| Lynd WWTP outflow near Lynd, Minn. | 85 | nd | 72 | nd |
| Redwood River below Lynd WWTP near Lynd, Minn. | nd | nd | 5 | nd |
| Redwood River above WWTP below Marshall, Minn. | nd | nd | nd | nd |
| Marshall WWTP outfall at Marshall, Minn. | 369 | 20 | 1,244 | nd |
| Redwood River below WWTP near Marshall, Minn. | 29 | nd | 98 | nd |
| Center Creek on Co. Rd. 143, at Fairmont, Minn. | nd | nd | nd | nd |

| USGS Station Name | Hydroxy-bupropion (ng/L) | Ranitidine (ng/L) | Sulfamethoxa-zole (ng/L) | Thiabendazole (ng/L) |
|---|---|---|---|---|
| Fairmont WWTP outflow at Fairmont, Minn. | 1,023 | 110 | 3,031 | nd |
| Center Creek below WWTP at Fairmont, Minn. | 330 | 86 | 2,417 | nd |
| Mississippi River at Industrial Mollasses, St. Paul, Minn. | 1.3 | nd | 64 | nd |
| Metro Plant (WWTP) outflow in St. Paul, Minn. | 705 | nd | 2,980 | nd |
| Mississippi River at South St. Paul, Minn. | 26 | nd | 221 | nd |
| Grindstone River above WWTP near Hinckley, Minn. | nd | nd | nd | nd |
| Hinckley WWTP near Hinckley, Minn. | 523 | 19 | 901 | nd |
| Grindstone River below Hinckley, Minn. | 12.5 | nd | 21 | nd |
| Mississippi River (Lake Pepin) above Lake City, Minn. | 3 | nd | 73 | nd |
| Lake City WWTP outflow at Lake City, Minn. | 786 | 48 | 981 | nd |
| Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | 27 | nd | 118 | nd |
| South Fork Zumbro River at Rochester, Minn. | nd | nd | 6 | nd |
| Rochester WWTP outflow at Rochester, Minn. | 48 | nd | 1,474 | nd |
| South Fork Zumbro River below WWTP near Rochester, Minn. | 4 | nd | 435 | nd |
| Spring Valley Creek above Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | 5 | nd |
| Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | 1,508 | nd |
| Spring Valley Creek below Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | 146 | nd |
| Cedar River above treatment plant at Austin, Minn. | nd | nd | 11 | nd |
| Austin WWTP outflow at Austin, Minn. | 53 | nd | 2,021 | nd |
| Cedar River below treatment plant at Austin, Minn. | 1 | nd | 275 | nd |
| Okabena Creek above WWTP outflow at Worthington, Minn. | 7 | nd | nd | nd |
| Worthington WWTP outflow at Worthington, Minn. | nd | nd | 841 | nd |
| Industrial WWTP outflow near Worthington, Minn. | nd | nd | nd | nd |
| Okabena Creek below WWTP outflow at Worthington, Minn. | nd | nd | 450 | nd |
| Rock River above WWTP near Luverne, Minn. | nd | nd | nd | nd |
| Luverne WWTP outflow near Luverne, Minn. | nd | nd | 834 | nd |
| Rock River below WWTP near Luverne, Minn. | nd | nd | 37 | nd |

| USGS Station Name | Trimethoprim (ng/L) | Warfarin (ng/L) | Venlafaxine (ng/L) |
|---|---|---|---|
| Williams Creek above WWTP at Williams, Minn. | nd | nd | nd |
| Williams WWTP outflow at Williams, Minn. | nd | nd | 748 |
| Williams Creek below WWTP at Williams, Minn. | nd | nd | 15 |
| Shagawa Lake at Mouth of Burntside River near Ely, Minn. | nd | nd | nd |
| Ely WWTP outflow at Ely, Minn. | 571 | nd | 3,018 |
| Shagawa Lake near Ely WWTP outflow at Ely, Minn. | nd | nd | 11 |
| Elbow Creek above Eveleth WWTP at Eveleth, Minn. | nd | nd | 57 |
| Eveleth WWTP outlflow at Eveleth, Minn. | 779 | nd | 2,238 |
| Elbow Creek below Eveleth WWTP at Eveleth, Minn. | 632 | nd | 1,840 |
| St. Louis River at Hwy. 23 above Fond Du Lac, Minn. | nd | nd | nd |
| Western Lake Superior Sanitary District - WWTP at Duluth, Minn. | 80 | nd | 230 |
| Lake Superior in St. Louis Bay at Duluth, Minn. | 15 | nd | 92 |
| Pelican River above WWTP at Pelican Rapids, Minn. | nd | nd | nd |
| Pelican Rapids WWTP outflow at Pelican Rapids, Minn. | 242 | nd | 520 |
| Pelican River below WWTP at Pelican Rapids, Minn. | 8 | nd | 7 |
| Red River of the North above WWTP at East Grand Forks, Minn. | nd | nd | 6 |
| East Grand Forks WWTP Outlow at East Grand Forks, MN | nd | nd | nd |
| Red River of the North below WWTP at East Grand Forks, Minn. | nd | nd | 5 |
| Mississippi River above WWTP at Grand Rapids, Minn. | nd | nd | nd |
| Grand Rapids WWTP outflow at Grand Rapids, Minn. | nd | nd | 80 |
| Mississippi River below WWTP at Grand Rapids, Minn. | nd | nd | 11 |
| Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd | nd |
| Sauk Centre WWTP outflow at Sauk Centre, Minn. | 1,191 | nd | 2,323 |
| Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | 20 | nd | 18 |
| Sauk River above Melrose WWTP at Melrose, Minn. | 6 | nd | 6 |
| Melrose WWTP outflow at Melrose, Minn. | 10 | nd | 118 |
| Sauk River below Melrose WWTP at Melrose, Minn. | 6 | nd | 15 |
| Tibbets Brook above WWTP outflow at Zimmerman, Minn. | nd | nd | nd |
| Zimmerman WWTP outflow at Zimmerman, Minn. | 1,463 | nd | 2,532 |
| Tibbets Brook below WWTP outflow at Zimmerman, Minn. | 635 | nd | 945 |
| Jewitts Creek at U.S. Hwy. 12 in Litchfield, Minn. | nd | nd | nd |
| Litchfield WWTP outflow near Litchfield, Minn. | 15 | nd | 680 |
| Jewitts Creek near Litchfield, Minn. | nd | nd | 62 |
| South Fork of the Crow River above WWTP at Hutchinson, Minn. | nd | nd | nd |
| Hutchinson WWTP outflow at Hutchinson, Minn. | 31 | nd | 1,060 |
| South Fork of the Crow River below Hutchinson, Minn. | nd | nd | 63 |
| South Fork Crow River above WWTP at Lester Prairie, Minn. | nd | nd | 9 |
| Lester Prairie WWTP outflow at Lester Prairie, Minn. | 17 | nd | 5,451 |
| South Fork Crow River below WWTP at Lester Prairie, Minn. | nd | nd | 11 |
| Redwood River above Lynd WWTP near Lynd, Minn. | nd | nd | nd |
| Lynd WWTP outflow near Lynd, Minn. | 18 | nd | 12 |
| Redwood River below Lynd WWTP near Lynd, Minn. | nd | nd | nd |
| Redwood River above WWTP below Marshall, Minn. | nd | nd | nd |
| Marshall WWTP outfall at Marshall, Minn. | 23 | nd | 524 |
| Redwood River below WWTP near Marshall, Minn. | nd | nd | 41 |
| Center Creek on Co. Rd. 143, at Fairmont, Minn. | nd | nd | nd |

| USGS Station Name | Trimethoprim (ng/L) | Warfarin (ng/L) | Venlafaxine (ng/L) |
|---|---|---|---|
| Fairmont WWTP outflow at Fairmont, Minn. | 305 | nd | 2,789 |
| Center Creek below WWTP at Fairmont, Minn. | 146 | nd | 799 |
| Mississippi River at Industrial Mollasses, St. Paul, Minn. | 10 | nd | 12 |
| Metro Plant (WWTP) outflow in St. Paul, Minn. | 642 | nd | 2,392 |
| Mississippi River at South St. Paul, Minn. | 37 | nd | 52 |
| Grindstone River above WWTP near Hinckley, Minn. | nd | nd | nd |
| Hinckley WWTP near Hinckley, Minn. | 572 | nd | 1,319 |
| Grindstone River below Hinckley, Minn. | 9 | nd | 28 |
| Mississippi River (Lake Pepin) above Lake City, Minn. | 9 | nd | 6 |
| Lake City WWTP outflow at Lake City, Minn. | 558 | nd | 2,023 |
| Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | 40 | nd | 60 |
| South Fork Zumbro River at Rochester, Minn. | nd | nd | nd |
| Rochester WWTP outflow at Rochester, Minn. | 46 | nd | 1,885 |
| South Fork Zumbro River below WWTP near Rochester, Minn. | 13 | nd | 334 |
| Spring Valley Creek above Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | nd |
| Spring Valley WWTP outflow at Spring Valley, Minn. | 23 | nd | 930 |
| Spring Valley Creek below Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | 74 |
| Cedar River above treatment plant at Austin, Minn. | nd | nd | nd |
| Austin WWTP outflow at Austin, Minn. | 376 | nd | 1,330 |
| Cedar River below treatment plant at Austin, Minn. | 41 | nd | 95 |
| Okabena Creek above WWTP outflow at Worthington, Minn. | nd | nd | nd |
| Worthington WWTP outflow at Worthington, Minn. | 65 | nd | 603 |
| Industrial WWTP outflow near Worthington, Minn. | nd | nd | 5 |
| Okabena Creek below WWTP outflow at Worthington, Minn. | 18 | nd | 204 |
| Rock River above WWTP near Luverne, Minn. | nd | nd | nd |
| Luverne WWTP outflow near Luverne, Minn. | 357 | nd | 610 |
| Rock River below WWTP near Luverne, Minn. | 6 | nd | 15 |

| Site Number | USGS Station Name | Date | Time | Site Type |
|---|---|---|---|---|
| 1 | Williams Creek above WWTP at Williams, Minn. | 10/20/2009 | 1112 | US |
| 2 | Williams WWTP outflow at Williams, Minn. | 10/20/2009 | 1039 | WWTP |
| 3 | Williams Creek below WWTP at Williams, Minn. | 10/20/2009 | 1054 | DS |
| 4 | Shagawa Lake at Mouth of Burntside River near Ely, Minn. | 09/28/2009 | 947 | US |
| 5 | Ely WWTP outflow at Ely, Minn. | 09/28/2009 | 1033 | WWTP |
| 6 | Shagawa Lake near Ely WWTP outflow at Ely, Minn. | 09/28/2009 | 1109 | DS |
| 7 | Elbow Creek above Eveleth WWTP at Eveleth, Minn. | 09/29/2009 | 1101 | US |
| 8 | Eveleth WWTP outlflow at Eveleth, Minn. | 09/29/2009 | 936 | WWTP |
| 9 | Elbow Creek below Eveleth WWTP at Eveleth, Minn. | 09/29/2009 | 1022 | DS |
| 10 | St. Louis River at Hwy. 23 above Fond Du Lac, Minn. | 10/01/2009 | 1308 | US |
| 11 | Western Lake Superior Sanitary District - WWTP at Duluth, Minn. | 10/01/2009 | 815 | WWTP |
| 12 | Lake Superior in St. Louis Bay at Duluth, Minn. | 10/01/2009 | 957 | DS |
| 13 | Pelican River above WWTP at Pelican Rapids, Minn. | 10/19/2009 | 1435 | US |
| 14 | Pelican Rapids WWTP outflow at Pelican Rapids, Minn. | 10/19/2009 | 1146 | WWTP |
| 15 | Pelican River below WWTP at Pelican Rapids, Minn. | 10/19/2009 | 1314 | DS |
| 16 | Red River of the North above WWTP at East Grand Forks, Minn. | 10/21/2009 | 1104 | US |
| 17 | East Grand Forks WWTP Outlow at East Grand Forks, MN | 10/21/2009 | 908 | WWTP |
| 18 | Red River of the North below WWTP at East Grand Forks, Minn. | 10/21/2009 | 1014 | DS |
| 19 | Mississippi River above WWTP at Grand Rapids, Minn. | 09/30/2009 | 1421 | US |
| 20 | Grand Rapids WWTP outflow at Grand Rapids, Minn. | 09/30/2009 | 932 | WWTP |
| 21 | Mississippi River below WWTP at Grand Rapids, Minn. | 09/30/2009 | 1241 | DS |
| 22 | Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | 09/16/2009 | 1036 | US |
| 23 | Sauk Centre WWTP outflow at Sauk Centre, Minn. | 09/16/2009 | 835 | WWTP |
| 24 | Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | 09/16/2009 | 933 | DS |
| 25 | Sauk River above Melrose WWTP at Melrose, Minn. | 09/17/2009 | 1007 | US |
| 26 | Melrose WWTP outflow at Melrose, Minn. | 09/17/2009 | 833 | WWTP |
| 27 | Sauk River below Melrose WWTP at Melrose, Minn. | 09/17/2009 | 915 | DS |
| 28 | Tibbets Brook above WWTP outflow at Zimmerman, Minn. | 09/03/2009 | 1046 | US |
| 29 | Zimmerman WWTP outflow at Zimmerman, Minn. | 09/03/2009 | 832 | WWTP |
| 30 | Tibbets Brook below WWTP outflow at Zimmerman, Minn. | 09/03/2009 | 850 | DS |
| 31 | Jewitts Creek at U.S. Hwy. 12 in Litchfield, Minn. | 10/08/2009 | 935 | US |
| 32 | Litchfield WWTP outflow near Litchfield, Minn. | 10/08/2009 | 808 | WWTP |
| 33 | Jewitts Creek near Litchfield, Minn. | 10/08/2009 | 850 | DS |
| 34 | South Fork of the Crow River above WWTP at Hutchinson, Minn. | 09/14/2009 | 1215 | US |
| 35 | Hutchinson WWTP outflow at Hutchinson, Minn. | 09/14/2009 | 1006 | WWTP |
| 36 | South Fork of the Crow River below Hutchinson, Minn. | 09/14/2009 | 1116 | DS |
| 37 | South Fork Crow River above WWTP at Lester Prairie, Minn. | 09/15/2009 | 1230 | US |
| 38 | Lester Prairie WWTP outflow at Lester Prairie, Minn. | 09/15/2009 | 849 | WWTP |
| 39 | South Fork Crow River below WWTP at Lester Prairie, Minn. | 09/15/2009 | 1045 | DS |
| 40 | Redwood River above Lynd WWTP near Lynd, Minn. | 11/23/2009 | 1429 | US |
| 41 | Lynd WWTP outflow near Lynd, Minn. | 11/23/2009 | 1230 | WWTP |
| 42 | Redwood River below Lynd WWTP near Lynd, Minn. | 11/23/2009 | 1323 | DS |
| 43 | Redwood River above WWTP below Marshall, Minn. | 10/07/2009 | 1108 | US |
| 44 | Marshall WWTP outfall at Marshall, Minn. | 10/07/2009 | 917 | WWTP |
| 45 | Redwood River below WWTP near Marshall, Minn. | 10/07/2009 | 1010 | DS |
| 46 | Center Creek on Co. Rd. 143, at Fairmont, Minn. | 09/09/2009 | 946 | US |
| 47 | Fairmont WWTP outflow at Fairmont, Minn. | 09/09/2009 | 755 | WWTP |
| 48 | Center Creek below WWTP at Fairmont, Minn. | 09/09/2009 | 843 | DS |
| 49 | Mississippi River at Industrial Mollasses, St. Paul, Minn. | 09/24/2009 | 1357 | US |
| 50 | Metro Plant (WWTP) outflow in St. Paul, Minn. | 09/24/2009 | 1046 | WWTP |
| 51 | Mississippi River at South St. Paul, Minn. | 09/24/2009 | 1244 | DS |
| 52 | Grindstone River above WWTP near Hinckley, Minn. | 09/02/2009 | 1157 | US |
| 53 | Hinckley WWTP near Hinckley, Minn. | 09/02/2009 | 850 | WWTP |
| 54 | Grindstone River below Hinckley, Minn. | 09/02/2009 | 1005 | DS |
| 55 | Mississippi River (Lake Pepin) above Lake City, Minn. | 09/23/2009 | 953 | US |
| 56 | Lake City WWTP outflow at Lake City, Minn. | 09/23/2009 | 749 | WWTP |

| Site Number | USGS Station Name | Date | Time | Site Type |
|---|---|---|---|---|
| 57 | Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | 09/23/2009 | 835 | DS |
| 58 | South Fork Zumbro River at Rochester, Minn. | 09/22/2009 | 1119 | US |
| 59 | Rochester WWTP outflow at Rochester, Minn. | 09/22/2009 | 843 | WWTP |
| 60 | South Fork Zumbro River below WWTP near Rochester, Minn. | 09/22/2009 | 949 | DS |
| 61 | Spring Valley Creek above Spring Valley WWTP outflow at Spring Valley, Minn. | 09/21/2009 | 1059 | US |
| 62 | Spring Valley WWTP outflow at Spring Valley, Minn. | 09/21/2009 | 944 | WWTP |
| 63 | Spring Valley Creek below Spring Valley WWTP outflow at Spring Valley, Minn. | 09/21/2009 | 1020 | DS |
| 64 | Cedar River above treatment plant at Austin, Minn. | 09/08/2009 | 946 | US |
| 65 | Austin WWTP outflow at Austin, Minn. | 09/08/2009 | 755 | WWTP |
| 66 | Cedar River below treatment plant at Austin, Minn. | 09/08/2009 | 846 | DS |
| 67 | Okabena Creek above WWTP outflow at Worthington, Minn. | 09/09/2009 | 1841 | US |
| 68 | Worthington WWTP outflow at Worthington, Minn. | 09/09/2009 | 1606 | WWTP |
| 69 | Industrial WWTP outflow near Worthington, Minn. | 09/09/2009 | 1711 | WWTP |
| 70 | Okabena Creek below WWTP outflow at Worthington, Minn. | 09/09/2009 | 1738 | DS |
| 71 | Rock River above WWTP near Luverne, Minn. | 10/06/2009 | 940 | US |
| 72 | Luverne WWTP outflow near Luverne, Minn. | 10/06/2009 | 725 | WWTP |
| 73 | Rock River below WWTP near Luverne, Minn. | 10/06/2009 | 827 | DS |

| USGS Station Name | Triclocarban (ng/L) | Biochanin A (ng/L) | Coumestrol (ng/L) | Daidzein (ng/L) |
|---|---|---|---|---|
| Williams Creek above WWTP at Williams, Minn. | nd | nd | nd | nd |
| Williams WWTP outflow at Williams, Minn. | 121 | nd | nd | nd |
| Williams Creek below WWTP at Williams, Minn. | nd | nd | nd | nd |
| Shagawa Lake at Mouth of Burntside River near Ely, Minn. | nd | nd | nd | nd |
| Ely WWTP outflow at Ely, Minn. | 201 | nd | nd | nd |
| Shagawa Lake near Ely WWTP outflow at Ely, Minn. | 23 | nd | nd | nd |
| Elbow Creek above Eveleth WWTP at Eveleth, Minn. | nd | nd | nd | nd |
| Eveleth WWTP outlflow at Eveleth, Minn. | 416 | nd | nd | nd |
| Elbow Creek below Eveleth WWTP at Eveleth, Minn. | 370 | nd | nd | nd |
| St. Louis River at Hwy. 23 above Fond Du Lac, Minn. | nd | nd | nd | nd |
| Western Lake Superior Sanitary District - WWTP at Duluth, Minn. | 175 | nd | nd | nd |
| Lake Superior in St. Louis Bay at Duluth, Minn. | 20 | nd | nd | nd |
| Pelican River above WWTP at Pelican Rapids, Minn. | nd | nd | nd | nd |
| Pelican Rapids WWTP outflow at Pelican Rapids, Minn. | 43 | nd | nd | nd |
| Pelican River below WWTP at Pelican Rapids, Minn. | nd | nd | nd | nd |
| Red River of the North above WWTP at East Grand Forks, Minn. | 31 | nd | nd | nd |
| East Grand Forks WWTP Outlow at East Grand Forks, MN | nd | nd | nd | nd |
| Red River of the North below WWTP at East Grand Forks, Minn. | nd | nd | nd | nd |
| Mississippi River above WWTP at Grand Rapids, Minn. | 70 | nd | nd | nd |
| Grand Rapids WWTP outflow at Grand Rapids, Minn. | 31 | nd | nd | nd |
| Mississippi River below WWTP at Grand Rapids, Minn. | 33 | nd | nd | nd |
| Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd | nd | nd |
| Sauk Centre WWTP outflow at Sauk Centre, Minn. | 123 | nd | nd | nd |
| Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd | nd | nd |
| Sauk River above Melrose WWTP at Melrose, Minn. | 31 | nd | nd | nd |
| Melrose WWTP outflow at Melrose, Minn. | 33 | nd | nd | nd |
| Sauk River below Melrose WWTP at Melrose, Minn. | nd | nd | nd | nd |
| Tibbets Brook above WWTP outflow at Zimmerman, Minn. | nd | nd | nd | nd |
| Zimmerman WWTP outflow at Zimmerman, Minn. | 168 | nd | nd | nd |
| Tibbets Brook below WWTP outflow at Zimmerman, Minn. | 64 | nd | nd | nd |
| Jewitts Creek at U.S. Hwy. 12 in Litchfield, Minn. | nd | nd | nd | nd |
| Litchfield WWTP outflow near Litchfield, Minn. | 33 | nd | nd | nd |
| Jewitts Creek near Litchfield, Minn. | nd | nd | nd | nd |
| South Fork of the Crow River above WWTP at Hutchinson, Minn. | nd | nd | nd | nd |
| Hutchinson WWTP outflow at Hutchinson, Minn. | 72 | nd | nd | nd |
| South Fork of the Crow River below Hutchinson, Minn. | nd | nd | 6 | nd |
| South Fork Crow River above WWTP at Lester Prairie, Minn. | nd | nd | nd | nd |
| Lester Prairie WWTP outflow at Lester Prairie, Minn. | 116 | nd | nd | nd |
| South Fork Crow River below WWTP at Lester Prairie, Minn. | nd | nd | nd | nd |
| Redwood River above Lynd WWTP near Lynd, Minn. | nd | nd | 2 | 4 |
| Lynd WWTP outflow near Lynd, Minn. | 28 | nd | nd | nd |
| Redwood River below Lynd WWTP near Lynd, Minn. | nd | nd | 2 | 4 |
| Redwood River above WWTP below Marshall, Minn. | 52 | nd | nd | nd |
| Marshall WWTP outfall at Marshall, Minn. | nd | nd | nd | nd |
| Redwood River below WWTP near Marshall, Minn. | 21 | nd | nd | nd |
| Center Creek on Co. Rd. 143, at Fairmont, Minn. | 20 | nd | nd | nd |
| Fairmont WWTP outflow at Fairmont, Minn. | 96 | nd | nd | nd |
| Center Creek below WWTP at Fairmont, Minn. | 52 | nd | nd | nd |
| Mississippi River at Industrial Mollasses, St. Paul, Minn. | nd | nd | 2 | nd |
| Metro Plant (WWTP) outflow in St. Paul, Minn. | 136 | nd | nd | nd |
| Mississippi River at South St. Paul, Minn. | nd | nd | nd | nd |
| Grindstone River above WWTP near Hinckley, Minn. | nd | nd | nd | nd |
| Hinckley WWTP near Hinckley, Minn. | nd | nd | nd | nd |
| Grindstone River below Hinckley, Minn. | nd | nd | nd | nd |
| Mississippi River (Lake Pepin) above Lake City, Minn. | nd | nd | nd | nd |
| Lake City WWTP outflow at Lake City, Minn. | 53 | nd | nd | nd |

| USGS Station Name | Triclocarban (ng/L) | Biochanin A (ng/L) | Coumestrol (ng/L) | Daidzein (ng/L) |
|---|---|---|---|---|
| Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | nd | nd | nd | nd |
| South Fork Zumbro River at Rochester, Minn. | 32 | nd | nd | nd |
| Rochester WWTP outflow at Rochester, Minn. | 92 | nd | nd | nd |
| South Fork Zumbro River below WWTP near Rochester, Minn. | 26 | nd | nd | nd |
| Spring Valley Creek above Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | nd | nd |
| Spring Valley WWTP outflow at Spring Valley, Minn. | 173 | nd | nd | nd |
| Spring Valley Creek below Spring Valley WWTP outflow at Spring Valley, Minn. | 21 | nd | nd | nd |
| Cedar River above treatment plant at Austin, Minn. | 40 | nd | 1 | nd |
| Austin WWTP outflow at Austin, Minn. | 257 | nd | nd | nd |
| Cedar River below treatment plant at Austin, Minn. | 32 | nd | 4 | nd |
| Okabena Creek above WWTP outflow at Worthington, Minn. | 63 | nd | nd | nd |
| Worthington WWTP outflow at Worthington, Minn. | 172 | nd | nd | nd |
| Industrial WWTP outflow near Worthington, Minn. | 45 | nd | nd | nd |
| Okabena Creek below WWTP outflow at Worthington, Minn. | 35 | nd | nd | nd |
| Rock River above WWTP near Luverne, Minn. | 31 | nd | nd | nd |
| Luverne WWTP outflow near Luverne, Minn. | 296 | nd | nd | nd |
| Rock River below WWTP near Luverne, Minn. | nd | nd | nd | nd |

| USGS Station Name | Daidzin (ng/L) | Equol (ng/L) | Formononetin (ng/L) | Genistein (ng/L) |
|---|---|---|---|---|
| Williams Creek above WWTP at Williams, Minn. | nd | nd | nd | nd |
| Williams WWTP outflow at Williams, Minn. | nd | nd | nd | nd |
| Williams Creek below WWTP at Williams, Minn. | nd | nd | nd | nd |
| Shagawa Lake at Mouth of Burntside River near Ely, Minn. | nd | nd | nd | nd |
| Ely WWTP outflow at Ely, Minn. | nd | nd | nd | nd |
| Shagawa Lake near Ely WWTP outflow at Ely, Minn. | nd | nd | nd | nd |
| Elbow Creek above Eveleth WWTP at Eveleth, Minn. | nd | nd | nd | nd |
| Eveleth WWTP outlflow at Eveleth, Minn. | nd | nd | nd | nd |
| Elbow Creek below Eveleth WWTP at Eveleth, Minn. | nd | nd | nd | nd |
| St. Louis River at Hwy. 23 above Fond Du Lac, Minn. | nd | nd | 4 | nd |
| Western Lake Superior Sanitary District - WWTP at Duluth, Minn. | nd | nd | nd | nd |
| Lake Superior in St. Louis Bay at Duluth, Minn. | nd | nd | nd | nd |
| Pelican River above WWTP at Pelican Rapids, Minn. | nd | nd | nd | nd |
| Pelican Rapids WWTP outflow at Pelican Rapids, Minn. | nd | nd | nd | nd |
| Pelican River below WWTP at Pelican Rapids, Minn. | nd | nd | nd | nd |
| Red River of the North above WWTP at East Grand Forks, Minn. | nd | nd | nd | nd |
| East Grand Forks WWTP Outlow at East Grand Forks, MN | nd | nd | nd | nd |
| Red River of the North below WWTP at East Grand Forks, Minn. | nd | nd | nd | nd |
| Mississippi River above WWTP at Grand Rapids, Minn. | nd | nd | nd | nd |
| Grand Rapids WWTP outflow at Grand Rapids, Minn. | nd | nd | nd | nd |
| Mississippi River below WWTP at Grand Rapids, Minn. | nd | nd | nd | nd |
| Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd | nd | nd |
| Sauk Centre WWTP outflow at Sauk Centre, Minn. | nd | nd | nd | nd |
| Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd | 1 | nd |
| Sauk River above Melrose WWTP at Melrose, Minn. | nd | nd | nd | nd |
| Melrose WWTP outflow at Melrose, Minn. | nd | nd | nd | nd |
| Sauk River below Melrose WWTP at Melrose, Minn. | nd | nd | nd | nd |
| Tibbets Brook above WWTP outflow at Zimmerman, Minn. | nd | nd | nd | nd |
| Zimmerman WWTP outflow at Zimmerman, Minn. | nd | nd | nd | nd |
| Tibbets Brook below WWTP outflow at Zimmerman, Minn. | nd | nd | nd | nd |
| Jewitts Creek at U.S. Hwy. 12 in Litchfield, Minn. | nd | nd | nd | nd |
| Litchfield WWTP outflow near Litchfield, Minn. | nd | nd | nd | nd |
| Jewitts Creek near Litchfield, Minn. | nd | nd | nd | nd |
| South Fork of the Crow River above WWTP at Hutchinson, Minn. | nd | nd | 2 | nd |
| Hutchinson WWTP outflow at Hutchinson, Minn. | nd | nd | nd | nd |
| South Fork of the Crow River below Hutchinson, Minn. | nd | nd | 5 | nd |
| South Fork Crow River above WWTP at Lester Prairie, Minn. | nd | nd | 2 | nd |
| Lester Prairie WWTP outflow at Lester Prairie, Minn. | nd | nd | nd | nd |
| South Fork Crow River below WWTP at Lester Prairie, Minn. | nd | nd | 2 | nd |
| Redwood River above Lynd WWTP near Lynd, Minn. | nd | nd | 3 | nd |
| Lynd WWTP outflow near Lynd, Minn. | nd | nd | nd | nd |
| Redwood River below Lynd WWTP near Lynd, Minn. | nd | nd | 3 | nd |
| Redwood River above WWTP below Marshall, Minn. | nd | nd | 1 | nd |
| Marshall WWTP outfall at Marshall, Minn. | nd | nd | nd | nd |
| Redwood River below WWTP near Marshall, Minn. | nd | nd | 2 | nd |
| Center Creek on Co. Rd. 143, at Fairmont, Minn. | nd | nd | 2 | nd |
| Fairmont WWTP outflow at Fairmont, Minn. | nd | nd | nd | nd |
| Center Creek below WWTP at Fairmont, Minn. | nd | nd | nd | nd |
| Mississippi River at Industrial Mollasses, St. Paul, Minn. | nd | nd | 1 | nd |
| Metro Plant (WWTP) outflow in St. Paul, Minn. | nd | nd | nd | nd |
| Mississippi River at South St. Paul, Minn. | nd | nd | 3 | nd |
| Grindstone River above WWTP near Hinckley, Minn. | nd | nd | 2 | nd |
| Hinckley WWTP near Hinckley, Minn. | nd | nd | nd | nd |
| Grindstone River below Hinckley, Minn. | nd | nd | 2 | nd |
| Mississippi River (Lake Pepin) above Lake City, Minn. | nd | nd | nd | nd |
| Lake City WWTP outflow at Lake City, Minn. | nd | nd | nd | nd |

| USGS Station Name | Daidzin (ng/L) | Equol (ng/L) | Formononetin (ng/L) | Genistein (ng/L) |
|---|---|---|---|---|
| Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | nd | nd | nd | nd |
| South Fork Zumbro River at Rochester, Minn. | nd | nd | nd | nd |
| Rochester WWTP outflow at Rochester, Minn. | nd | nd | nd | nd |
| South Fork Zumbro River below WWTP near Rochester, Minn. | nd | nd | 2 | nd |
| Spring Valley Creek above Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | nd | nd |
| Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | nd | nd |
| Spring Valley Creek below Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | nd | nd |
| Cedar River above treatment plant at Austin, Minn. | nd | nd | 2 | nd |
| Austin WWTP outflow at Austin, Minn. | nd | nd | nd | nd |
| Cedar River below treatment plant at Austin, Minn. | nd | nd | 4 | nd |
| Okabena Creek above WWTP outflow at Worthington, Minn. | nd | nd | nd | nd |
| Worthington WWTP outflow at Worthington, Minn. | nd | nd | nd | nd |
| Industrial WWTP outflow near Worthington, Minn. | nd | nd | nd | nd |
| Okabena Creek below WWTP outflow at Worthington, Minn. | nd | nd | nd | nd |
| Rock River above WWTP near Luverne, Minn. | nd | nd | nd | nd |
| Luverne WWTP outflow near Luverne, Minn. | nd | nd | nd | nd |
| Rock River below WWTP near Luverne, Minn. | nd | nd | nd | nd |

| USGS Station Name | Genistin (ng/L) | Glycitein (ng/L) | Prunetin (ng/L) |
|---|---|---|---|
| Williams Creek above WWTP at Williams, Minn. | nd | nd | nd |
| Williams WWTP outflow at Williams, Minn. | nd | nd | nd |
| Williams Creek below WWTP at Williams, Minn. | nd | nd | nd |
| Shagawa Lake at Mouth of Burntside River near Ely, Minn. | nd | nd | nd |
| Ely WWTP outflow at Ely, Minn. | nd | 15 | nd |
| Shagawa Lake near Ely WWTP outflow at Ely, Minn. | nd | nd | nd |
| Elbow Creek above Eveleth WWTP at Eveleth, Minn. | nd | nd | nd |
| Eveleth WWTP outlflow at Eveleth, Minn. | nd | nd | nd |
| Elbow Creek below Eveleth WWTP at Eveleth, Minn. | nd | nd | nd |
| St. Louis River at Hwy. 23 above Fond Du Lac, Minn. | nd | nd | nd |
| Western Lake Superior Sanitary District - WWTP at Duluth, Minn. | nd | nd | nd |
| Lake Superior in St. Louis Bay at Duluth, Minn. | nd | nd | nd |
| Pelican River above WWTP at Pelican Rapids, Minn. | nd | nd | nd |
| Pelican Rapids WWTP outflow at Pelican Rapids, Minn. | nd | nd | nd |
| Pelican River below WWTP at Pelican Rapids, Minn. | nd | nd | nd |
| Red River of the North above WWTP at East Grand Forks, Minn. | nd | nd | nd |
| East Grand Forks WWTP Outlow at East Grand Forks, MN | nd | nd | nd |
| Red River of the North below WWTP at East Grand Forks, Minn. | nd | nd | nd |
| Mississippi River above WWTP at Grand Rapids, Minn. | nd | nd | nd |
| Grand Rapids WWTP outflow at Grand Rapids, Minn. | nd | nd | nd |
| Mississippi River below WWTP at Grand Rapids, Minn. | nd | nd | nd |
| Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd | nd |
| Sauk Centre WWTP outflow at Sauk Centre, Minn. | nd | 11 | nd |
| Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd | nd |
| Sauk River above Melrose WWTP at Melrose, Minn. | nd | nd | nd |
| Melrose WWTP outflow at Melrose, Minn. | nd | nd | nd |
| Sauk River below Melrose WWTP at Melrose, Minn. | nd | nd | nd |
| Tibbets Brook above WWTP outflow at Zimmerman, Minn. | nd | nd | nd |
| Zimmerman WWTP outflow at Zimmerman, Minn. | nd | nd | nd |
| Tibbets Brook below WWTP outflow at Zimmerman, Minn. | nd | nd | nd |
| Jewitts Creek at U.S. Hwy. 12 in Litchfield, Minn. | nd | nd | nd |
| Litchfield WWTP outflow near Litchfield, Minn. | nd | nd | nd |
| Jewitts Creek near Litchfield, Minn. | nd | nd | nd |
| South Fork of the Crow River above WWTP at Hutchinson, Minn. | nd | nd | nd |
| Hutchinson WWTP outflow at Hutchinson, Minn. | nd | nd | nd |
| South Fork of the Crow River below Hutchinson, Minn. | nd | nd | nd |
| South Fork Crow River above WWTP at Lester Prairie, Minn. | nd | nd | nd |
| Lester Prairie WWTP outflow at Lester Prairie, Minn. | nd | nd | nd |
| South Fork Crow River below WWTP at Lester Prairie, Minn. | nd | nd | nd |
| Redwood River above Lynd WWTP near Lynd, Minn. | nd | nd | nd |
| Lynd WWTP outflow near Lynd, Minn. | nd | nd | nd |
| Redwood River below Lynd WWTP near Lynd, Minn. | nd | nd | nd |
| Redwood River above WWTP below Marshall, Minn. | nd | nd | nd |
| Marshall WWTP outfall at Marshall, Minn. | nd | nd | nd |
| Redwood River below WWTP near Marshall, Minn. | nd | nd | nd |
| Center Creek on Co. Rd. 143, at Fairmont, Minn. | nd | nd | nd |
| Fairmont WWTP outflow at Fairmont, Minn. | nd | nd | nd |
| Center Creek below WWTP at Fairmont, Minn. | nd | nd | nd |
| Mississippi River at Industrial Mollasses, St. Paul, Minn. | nd | nd | nd |
| Metro Plant (WWTP) outflow in St. Paul, Minn. | nd | nd | nd |
| Mississippi River at South St. Paul, Minn. | nd | nd | nd |
| Grindstone River above WWTP near Hinckley, Minn. | nd | nd | nd |
| Hinckley WWTP near Hinckley, Minn. | nd | nd | nd |
| Grindstone River below Hinckley, Minn. | nd | nd | nd |
| Mississippi River (Lake Pepin) above Lake City, Minn. | nd | nd | nd |
| Lake City WWTP outflow at Lake City, Minn. | nd | nd | nd |

| USGS Station Name | Genistin (ng/L) | Glycitein (ng/L) | Prunetin (ng/L) |
|---|---|---|---|
| Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | nd | nd | nd |
| South Fork Zumbro River at Rochester, Minn. | nd | nd | nd |
| Rochester WWTP outflow at Rochester, Minn. | nd | nd | nd |
| South Fork Zumbro River below WWTP near Rochester, Minn. | nd | nd | nd |
| Spring Valley Creek above Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | nd |
| Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | nd |
| Spring Valley Creek below Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | nd |
| Cedar River above treatment plant at Austin, Minn. | nd | nd | nd |
| Austin WWTP outflow at Austin, Minn. | nd | nd | nd |
| Cedar River below treatment plant at Austin, Minn. | nd | nd | nd |
| Okabena Creek above WWTP outflow at Worthington, Minn. | nd | nd | nd |
| Worthington WWTP outflow at Worthington, Minn. | nd | nd | nd |
| Industrial WWTP outflow near Worthington, Minn. | nd | nd | nd |
| Okabena Creek below WWTP outflow at Worthington, Minn. | nd | nd | nd |
| Rock River above WWTP near Luverne, Minn. | nd | nd | nd |
| Luverne WWTP outflow near Luverne, Minn. | nd | nd | nd |
| Rock River below WWTP near Luverne, Minn. | nd | nd | nd |

| Site Number | USGS Station Name | Date | Time | Site Type | Acetyl hexamethyl tetrahydro-naphthalene (AHTN) (ng/L) |
|---|---|---|---|---|---|
| 1 | Williams Creek above WWTP at Williams, Minn. | 10/20/2009 | 1112 | US | nd |
| 2 | Williams WWTP outflow at Williams, Minn. | 10/20/2009 | 1039 | WWTP | 11 |
| 3 | Williams Creek below WWTP at Williams, Minn. | 10/20/2009 | 1054 | DS | nd |
| 4 | Shagawa Lake at Mouth of Burntside River near Ely, Minn. | 09/28/2009 | 947 | US | nd |
| 5 | Ely WWTP outflow at Ely, Minn. | 09/28/2009 | 1033 | WWTP | 10 |
| 6 | Shagawa Lake near Ely WWTP outflow at Ely, Minn. | 09/28/2009 | 1109 | DS | nd |
| 7 | Elbow Creek above Eveleth WWTP at Eveleth, Minn. | 09/29/2009 | 1101 | US | nd |
| 8 | Eveleth WWTP outlflow at Eveleth, Minn. | 09/29/2009 | 936 | WWTP | 22 |
| 9 | Elbow Creek below Eveleth WWTP at Eveleth, Minn. | 09/29/2009 | 1022 | DS | 17 |
| 10 | St. Louis River at Hwy. 23 above Fond Du Lac, Minn. | 10/01/2009 | 1308 | US | nd |
| 11 | Western Lake Superior Sanitary District - WWTP at Duluth, Minn. | 10/01/2009 | 815 | WWTP | nd |
| 12 | Lake Superior in St. Louis Bay at Duluth, Minn. | 10/01/2009 | 957 | DS | 13 |
| 13 | Pelican River above WWTP at Pelican Rapids, Minn. | 10/19/2009 | 1435 | US | nd |
| 14 | Pelican Rapids WWTP outflow at Pelican Rapids, Minn. | 10/19/2009 | 1146 | WWTP | 16 |
| 15 | Pelican River below WWTP at Pelican Rapids, Minn. | 10/19/2009 | 1314 | DS | nd |
| 16 | Red River of the North above WWTP at East Grand Forks, Minn. | 10/21/2009 | 1104 | US | nd |
| 17 | East Grand Forks WWTP Outlow at East Grand Forks, MN | 10/21/2009 | 908 | WWTP | nd |
| 18 | Red River of the North below WWTP at East Grand Forks, Minn. | 10/21/2009 | 1014 | DS | nd |
| 19 | Mississippi River above WWTP at Grand Rapids, Minn. | 09/30/2009 | 1421 | US | nd |
| 20 | Grand Rapids WWTP outflow at Grand Rapids, Minn. | 09/30/2009 | 932 | WWTP | nd |
| 21 | Mississippi River below WWTP at Grand Rapids, Minn. | 09/30/2009 | 1241 | DS | nd |
| 22 | Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | 09/16/2009 | 1036 | US | nd |
| 23 | Sauk Centre WWTP outflow at Sauk Centre, Minn. | 09/16/2009 | 835 | WWTP | 37 |
| 24 | Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | 09/16/2009 | 933 | DS | nd |
| 25 | Sauk River above Melrose WWTP at Melrose, Minn. | 09/17/2009 | 1007 | US | 1 |
| 26 | Melrose WWTP outflow at Melrose, Minn. | 09/17/2009 | 833 | WWTP | 2 |
| 27 | Sauk River below Melrose WWTP at Melrose, Minn. | 09/17/2009 | 915 | DS | 3 |
| 28 | Tibbets Brook above WWTP outflow at Zimmerman, Minn. | 09/03/2009 | 1046 | US | nd |
| 29 | Zimmerman WWTP outflow at Zimmerman, Minn. | 09/03/2009 | 832 | WWTP | 41 |
| 30 | Tibbets Brook below WWTP outflow at Zimmerman, Minn. | 09/03/2009 | 850 | DS | 16 |
| 31 | Jewitts Creek at U.S. Hwy. 12 in Litchfield, Minn. | 10/08/2009 | 935 | US | 1 |
| 32 | Litchfield WWTP outflow near Litchfield, Minn. | 10/08/2009 | 808 | WWTP | 2 |
| 33 | Jewitts Creek near Litchfield, Minn. | 10/08/2009 | 850 | DS | 3 |
| 34 | South Fork of the Crow River above WWTP at Hutchinson, Minn. | 09/14/2009 | 1215 | US | nd |
| 35 | Hutchinson WWTP outflow at Hutchinson, Minn. | 09/14/2009 | 1006 | WWTP | 9 |
| 36 | South Fork of the Crow River below Hutchinson, Minn. | 09/14/2009 | 1116 | DS | nd |
| 37 | South Fork Crow River above WWTP at Lester Prairie, Minn. | 09/15/2009 | 1230 | US | nd |

| Site Number | USGS Station Name | Date | Time | Site Type | Acetyl hexamethyl tetrahydro-naphthalene (AHTN) (ng/L) |
|---|---|---|---|---|---|
| 38 | Lester Prairie WWTP outflow at Lester Prairie, Minn. | 09/15/2009 | 849 | WWTP | 17 |
| 39 | South Fork Crow River below WWTP at Lester Prairie, Minn. | 09/15/2009 | 1045 | DS | nd |
| 40 | Redwood River above Lynd WWTP near Lynd, Minn. | 11/23/2009 | 1429 | US | nd |
| 41 | Lynd WWTP outflow near Lynd, Minn. | 11/23/2009 | 1230 | WWTP | nd |
| 42 | Redwood River below Lynd WWTP near Lynd, Minn. | 11/23/2009 | 1323 | DS | nd |
| 43 | Redwood River above WWTP below Marshall, Minn. | 10/07/2009 | 1108 | US | nd |
| 44 | Marshall WWTP outfall at Marshall, Minn. | 10/07/2009 | 917 | WWTP | 9 |
| 45 | Redwood River below WWTP near Marshall, Minn. | 10/07/2009 | 1010 | DS | nd |
| 46 | Center Creek on Co. Rd. 143, at Fairmont, Minn. | 09/09/2009 | 946 | US | 1 |
| 47 | Fairmont WWTP outflow at Fairmont, Minn. | 09/09/2009 | 755 | WWTP | 2 |
| 48 | Center Creek below WWTP at Fairmont, Minn. | 09/09/2009 | 843 | DS | 3 |
| 49 | Mississippi River at Industrial Mollasses, St. Paul, Minn. | 09/24/2009 | 1357 | US | nd |
| 50 | Metro Plant (WWTP) outflow in St. Paul, Minn. | 09/24/2009 | 1046 | WWTP | 42 |
| 51 | Mississippi River at South St. Paul, Minn. | 09/24/2009 | 1244 | DS | nd |
| 52 | Grindstone River above WWTP near Hinckley, Minn. | 09/02/2009 | 1157 | US | nd |
| 53 | Hinckley WWTP near Hinckley, Minn. | 09/02/2009 | 850 | WWTP | 9 |
| 54 | Grindstone River below Hinckley, Minn. | 09/02/2009 | 1005 | DS | nd |
| 55 | Mississippi River (Lake Pepin) above Lake City, Minn. | 09/23/2009 | 953 | US | 1 |
| 56 | Lake City WWTP outflow at Lake City, Minn. | 09/23/2009 | 749 | WWTP | 2 |
| 57 | Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | 09/23/2009 | 835 | DS | 3 |
| 58 | South Fork Zumbro River at Rochester, Minn. | 09/22/2009 | 1119 | US | nd |
| 59 | Rochester WWTP outflow at Rochester, Minn. | 09/22/2009 | 843 | WWTP | 110 |
| 60 | South Fork Zumbro River below WWTP near Rochester, Minn. | 09/22/2009 | 949 | DS | nd |
| 61 | Spring Valley Creek above Spring Valley WWTP outflow at Spring Valley, Minn. | 09/21/2009 | 1059 | US | nd |
| 62 | Spring Valley WWTP outflow at Spring Valley, Minn. | 09/21/2009 | 944 | WWTP | 52 |
| 63 | Spring Valley Creek below Spring Valley WWTP outflow at Spring Valley, Minn. | 09/21/2009 | 1020 | DS | 17 |
| 64 | Cedar River above treatment plant at Austin, Minn. | 09/08/2009 | 946 | US | nd |
| 65 | Austin WWTP outflow at Austin, Minn. | 09/08/2009 | 755 | WWTP | 9 |
| 66 | Cedar River below treatment plant at Austin, Minn. | 09/08/2009 | 846 | DS | nd |
| 67 | Okabena Creek above WWTP outflow at Worthington, Minn. | 09/09/2009 | 1841 | US | 1 |
| 68 | Worthington WWTP outflow at Worthington, Minn. | 09/09/2009 | 1606 | WWTP | 2 |
| 69 | Industrial WWTP outflow near Worthington, Minn. | 09/09/2009 | 1711 | WWTP | 1 |
| 70 | Okabena Creek below WWTP outflow at Worthington, Minn. | 09/09/2009 | 1738 | DS | 3 |
| 71 | Rock River above WWTP near Luverne, Minn. | 10/06/2009 | 940 | US | nd |
| 72 | Luverne WWTP outflow near Luverne, Minn. | 10/06/2009 | 725 | WWTP | 27 |
| 73 | Rock River below WWTP near Luverne, Minn. | 10/06/2009 | 827 | DS | nd |

| USGS Station Name | Bisphenol A (ng/L) | 4-*tert*-Butylphenol (ng/L) | Caffeine (ng/L) | 2,6-Di-*tert*-butyl-1,4-benzo-quinone (ng/L) | 1,3-Dichloro-benzene (ng/L) | 1,4-Dichloro-benzene (ng/L) |
|---|---|---|---|---|---|---|
| Williams Creek above WWTP at Williams, Minn. | nd | nd | 71 | nd | nd | nd |
| Williams WWTP outflow at Williams, Minn. | nd | nd | 33 | nd | nd | 13 |
| Williams Creek below WWTP at Williams, Minn. | 25 | nd | 100 | nd | nd | nd |
| Shagawa Lake at Mouth of Burntside River near Ely, Minn. | nd | nd | 30 | nd | nd | nd |
| Ely WWTP outflow at Ely, Minn. | 84 | 86 | 9,900 | nd | nd | 27 |
| Shagawa Lake near Ely WWTP outflow at Ely, Minn. | nd | nd | 40 | nd | nd | nd |
| Elbow Creek above Eveleth WWTP at Eveleth, Minn. | nd | nd | 840 | nd | nd | nd |
| Eveleth WWTP outlflow at Eveleth, Minn. | nd | 56 | 26 | nd | nd | nd |
| Elbow Creek below Eveleth WWTP at Eveleth, Minn. | nd | 46 | 150 | nd | nd | nd |
| St. Louis River at Hwy. 23 above Fond Du Lac, Minn. | nd | nd | nd | nd | nd | nd |
| Western Lake Superior Sanitary District - WWTP at Duluth, Minn. | 22,000 | nd | 9,400 | nd | nd | 97 |
| Lake Superior in St. Louis Bay at Duluth, Minn. | 3,200 | 11 | 1,700 | nd | nd | 8 |
| Pelican River above WWTP at Pelican Rapids, Minn. | nd | nd | nd | nd | nd | nd |
| Pelican Rapids WWTP outflow at Pelican Rapids, Minn. | 47 | 73 | 2,100 | 500 | nd | 280 |
| Pelican River below WWTP at Pelican Rapids, Minn. | nd | nd | 39 | nd | nd | nd |
| Red River of the North above WWTP at East Grand Forks, Minn. | 28 | nd | nd | 400 | nd | nd |
| East Grand Forks WWTP Outlow at East Grand Forks, MN | nd | nd | nd | nd | nd | nd |
| Red River of the North below WWTP at East Grand Forks, Minn. | nd | nd | nd | nd | nd | nd |
| Mississippi River above WWTP at Grand Rapids, Minn. | nd | nd | nd | nd | nd | nd |
| Grand Rapids WWTP outflow at Grand Rapids, Minn. | 38 | nd | 21 | nd | nd | nd |
| Mississippi River below WWTP at Grand Rapids, Minn. | nd | nd | nd | nd | nd | nd |
| Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd | nd | nd | nd | nd |
| Sauk Centre WWTP outflow at Sauk Centre, Minn. | nd | 62 | 630 | 2,200 | nd | 64 |
| Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd | 29 | nd | nd | nd |
| Sauk River above Melrose WWTP at Melrose, Minn. | 62 | nd | 35 | nd | nd | nd |
| Melrose WWTP outflow at Melrose, Minn. | 31 | 31 | 27 | 600 | 26 | 25 |
| Sauk River below Melrose WWTP at Melrose, Minn. | nd | nd | 28 | nd | nd | nd |
| Tibbets Brook above WWTP outflow at Zimmerman, Minn. | nd | nd | nd | 400 | nd | nd |
| Zimmerman WWTP outflow at Zimmerman, Minn. | 170 | 110 | 62 | nd | nd | 85 |
| Tibbets Brook below WWTP outflow at Zimmerman, Minn. | 91 | 46 | nd | nd | nd | 33 |
| Jewitts Creek at U.S. Hwy. 12 in Litchfield, Minn. | nd | nd | nd | nd | nd | nd |
| Litchfield WWTP outflow near Litchfield, Minn. | nd | nd | 55 | 1,200 | nd | nd |
| Jewitts Creek near Litchfield, Minn. | nd | 6 | nd | nd | nd | nd |
| South Fork of the Crow River above WWTP at Hutchinson, Minn. | 27 | 9 | 25 | nd | nd | nd |
| Hutchinson WWTP outflow at Hutchinson, Minn. | 65 | 27 | 28 | 500 | nd | 15 |
| South Fork of the Crow River below Hutchinson, Minn. | nd | 12 | nd | nd | nd | nd |
| South Fork Crow River above WWTP at Lester Prairie, Minn. | nd | nd | 33 | nd | nd | nd |

| USGS Station Name | Bisphenol A (ng/L) | 4-*tert*-Butylphenol (ng/L) | Caffeine (ng/L) | 2,6-Di-*tert*-butyl-1,4-benzo-quinone (ng/L) | 1,3-Dichloro-benzene (ng/L) | 1,4-Dichloro-benzene (ng/L) |
|---|---|---|---|---|---|---|
| Lester Prairie WWTP outflow at Lester Prairie, Minn. | nd | 12 | nd | nd | nd | 30 |
| South Fork Crow River below WWTP at Lester Prairie, Minn. | nd | nd | 31 | nd | nd | nd |
| Redwood River above Lynd WWTP near Lynd, Minn. | nd | nd | 70 | nd | nd | nd |
| Lynd WWTP outflow near Lynd, Minn. | 33 | 9 | 190 | nd | nd | nd |
| Redwood River below Lynd WWTP near Lynd, Minn. | nd | nd | 65 | 400 | nd | nd |
| Redwood River above WWTP below Marshall, Minn. | nd | nd | nd | nd | nd | nd |
| Marshall WWTP outfall at Marshall, Minn. | nd | 38 | 47 | 400 | nd | 14 |
| Redwood River below WWTP near Marshall, Minn. | 25 | nd | 46 | nd | nd | nd |
| Center Creek on Co. Rd. 143, at Fairmont, Minn. | 58 | nd | nd | nd | nd | nd |
| Fairmont WWTP outflow at Fairmont, Minn. | 150 | 22 | 28 | 600 | nd | 28 |
| Center Creek below WWTP at Fairmont, Minn. | 180 | 27 | 26 | 500 | nd | 22 |
| Mississippi River at Industrial Mollasses, St. Paul, Minn. | nd | nd | nd | nd | nd | nd |
| Metro Plant (WWTP) outflow in St. Paul, Minn. | 80 | 58 | 70 | 800 | nd | 140 |
| Mississippi River at South St. Paul, Minn. | nd | nd | nd | nd | nd | 11 |
| Grindstone River above WWTP near Hinckley, Minn. | nd | nd | nd | nd | nd | nd |
| Hinckley WWTP near Hinckley, Minn. | nd | 16 | 53 | 600 | nd | 39 |
| Grindstone River below Hinckley, Minn. | nd | nd | nd | nd | nd | nd |
| Mississippi River (Lake Pepin) above Lake City, Minn. | nd | nd | nd | 1,300 | nd | nd |
| Lake City WWTP outflow at Lake City, Minn. | 50 | 30 | 66 | 1,900 | nd | 110 |
| Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | nd | nd | nd | nd | nd | nd |
| South Fork Zumbro River at Rochester, Minn. | 37 | nd | 230 | 1,300 | nd | nd |
| Rochester WWTP outflow at Rochester, Minn. | 30 | 16 | nd | nd | 30 | 30 |
| South Fork Zumbro River below WWTP near Rochester, Minn. | nd | nd | nd | 1,200 | nd | nd |
| Spring Valley Creek above Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | nd | nd | nd | nd |
| Spring Valley WWTP outflow at Spring Valley, Minn. | nd | 33 | 51 | 1,200 | nd | 40 |
| Spring Valley Creek below Spring Valley WWTP outflow at Spring Valley, Minn. | 27 | nd | nd | nd | nd | nd |
| Cedar River above treatment plant at Austin, Minn. | 230 | nd | 29 | nd | nd | nd |
| Austin WWTP outflow at Austin, Minn. | 62 | 34 | 790 | 500 | nd | nd |
| Cedar River below treatment plant at Austin, Minn. | 23 | 9 | 170 | nd | nd | nd |
| Okabena Creek above WWTP outflow at Worthington, Minn. | nd | nd | nd | nd | nd | nd |
| Worthington WWTP outflow at Worthington, Minn. | nd | 20 | 150 | 700 | nd | 11 |
| Industrial WWTP outflow near Worthington, Minn. | nd | nd | 67 | 900 | nd | nd |
| Okabena Creek below WWTP outflow at Worthington, Minn. | 34 | 11 | 110 | 500 | nd | nd |
| Rock River above WWTP near Luverne, Minn. | nd | nd | nd | nd | nd | nd |
| Luverne WWTP outflow near Luverne, Minn. | 30 | 63 | 610 | 1,000 | nd | 28 |
| Rock River below WWTP near Luverne, Minn. | nd | nd | 28 | nd | nd | nd |

| USGS Station Name | N,N-diethyl-*meta*-toluamide (DEET) (ng/L) | Hexahydrohexa-methyl-cyclopenta-benzopyran (HHCB) (ng/L) | 5-Methyl-1H-benzotriazole (ng/L) | 4-Nonylphenol (ng/L) | 4-Nonylphenol-monoethoxylate (ng/L) |
|---|---|---|---|---|---|
| Williams Creek above WWTP at Williams, Minn. | nd | 6 | nd | nd | nd |
| Williams WWTP outflow at Williams, Minn. | nd | 300 | nd | 160 | nd |
| Williams Creek below WWTP at Williams, Minn. | nd | 15 | nd | 200 | 52 |
| Shagawa Lake at Mouth of Burntside River near Ely, Minn. | 20 | nd | nd | nd | nd |
| Ely WWTP outflow at Ely, Minn. | nd | 75 | nd | 440 | 130 |
| Shagawa Lake near Ely WWTP outflow at Ely, Minn. | nd | nd | nd | nd | nd |
| Elbow Creek above Eveleth WWTP at Eveleth, Minn. | nd | nd | nd | nd | nd |
| Eveleth WWTP outlflow at Eveleth, Minn. | 27 | 100 | nd | nd | nd |
| Elbow Creek below Eveleth WWTP at Eveleth, Minn. | 19 | 85 | nd | nd | nd |
| St. Louis River at Hwy. 23 above Fond Du Lac, Minn. | nd | nd | nd | nd | nd |
| Western Lake Superior Sanitary District - WWTP at Duluth, Minn. | 780 | 230 | nd | 910 | 600 |
| Lake Superior in St. Louis Bay at Duluth, Minn. | 150 | 46 | nd | 270 | 110 |
| Pelican River above WWTP at Pelican Rapids, Minn. | nd | nd | nd | 190 | nd |
| Pelican Rapids WWTP outflow at Pelican Rapids, Minn. | 150 | 330 | 340 | 10,000 | 2,200 |
| Pelican River below WWTP at Pelican Rapids, Minn. | nd | 9 | nd | 160 | nd |
| Red River of the North above WWTP at East Grand Forks, Minn. | nd | 9 | nd | 150 | nd |
| East Grand Forks WWTP Outlow at East Grand Forks, MN | 120 | 10 | nd | 230 | 74 |
| Red River of the North below WWTP at East Grand Forks, Minn. | nd | 8 | nd | 150 | nd |
| Mississippi River above WWTP at Grand Rapids, Minn. | nd | nd | 46 | nd | 67 |
| Grand Rapids WWTP outflow at Grand Rapids, Minn. | 48 | 13 | 120 | nd | 90 |
| Mississippi River below WWTP at Grand Rapids, Minn. | nd | nd | nd | nd | nd |
| Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd | nd | nd | nd |
| Sauk Centre WWTP outflow at Sauk Centre, Minn. | 320 | 180 | 129 | 330 | 350 |
| Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | 24 | nd | 24 | nd | nd |
| Sauk River above Melrose WWTP at Melrose, Minn. | 35 | nd | nd | nd | 63 |
| Melrose WWTP outflow at Melrose, Minn. | 55 | 36 | 160 | 220 | 220 |
| Sauk River below Melrose WWTP at Melrose, Minn. | 24 | nd | nd | nd | nd |
| Tibbets Brook above WWTP outflow at Zimmerman, Minn. | 36 | nd | nd | nd | nd |
| Zimmerman WWTP outflow at Zimmerman, Minn. | nd | 450 | nd | 560 | 80 |
| Tibbets Brook below WWTP outflow at Zimmerman, Minn. | 18 | 180 | nd | 190 | nd |
| Jewitts Creek at U.S. Hwy. 12 in Litchfield, Minn. | nd | nd | nd | 110 | nd |
| Litchfield WWTP outflow near Litchfield, Minn. | 72 | 65 | 28 | 130 | 75 |
| Jewitts Creek near Litchfield, Minn. | nd | 8 | nd | nd | nd |
| South Fork of the Crow River above WWTP at Hutchinson, Minn. | 23 | nd | nd | nd | nd |
| Hutchinson WWTP outflow at Hutchinson, Minn. | 16 | 93 | nd | nd | nd |
| South Fork of the Crow River below Hutchinson, Minn. | 20 | 9 | nd | nd | nd |
| South Fork Crow River above WWTP at Lester Prairie, Minn. | 21 | nd | nd | nd | nd |

| USGS Station Name | N,N-diethyl-*meta*-toluamide (DEET) (ng/L) | Hexahydrohexa-methyl-cyclopenta-benzopyran (HHCB) (ng/L) | 5-Methyl-1H-benzotriazole (ng/L) | 4-Nonylphenol (ng/L) | 4-Nonylphenol-monoethoxylate (ng/L) |
|---|---|---|---|---|---|
| Lester Prairie WWTP outflow at Lester Prairie, Minn. | nd | 130 | nd | nd | nd |
| South Fork Crow River below WWTP at Lester Prairie, Minn. | nd | nd | nd | nd | nd |
| Redwood River above Lynd WWTP near Lynd, Minn. | 28 | nd | nd | 170 | 110 |
| Lynd WWTP outflow near Lynd, Minn. | 85 | 19 | nd | 280 | 210 |
| Redwood River below Lynd WWTP near Lynd, Minn. | 29 | 7 | nd | 160 | 83 |
| Redwood River above WWTP below Marshall, Minn. | nd | 6 | nd | 160 | nd |
| Marshall WWTP outfall at Marshall, Minn. | 25 | 180 | nd | 120 | 80 |
| Redwood River below WWTP near Marshall, Minn. | nd | 14 | nd | 290 | nd |
| Center Creek on Co. Rd. 143, at Fairmont, Minn. | 27 | nd | 160 | nd | nd |
| Fairmont WWTP outflow at Fairmont, Minn. | 100 | 150 | nd | 140 | nd |
| Center Creek below WWTP at Fairmont, Minn. | 91 | 120 | nd | 100 | nd |
| Mississippi River at Industrial Mollasses, St. Paul, Minn. | 16 | nd | nd | nd | nd |
| Metro Plant (WWTP) outflow in St. Paul, Minn. | 24 | 200 | 390 | 240 | 280 |
| Mississippi River at South St. Paul, Minn. | nd | 20 | nd | nd | nd |
| Grindstone River above WWTP near Hinckley, Minn. | 51 | nd | nd | 230 | 90 |
| Hinckley WWTP near Hinckley, Minn. | 54 | 82 | nd | 190 | 80 |
| Grindstone River below Hinckley, Minn. | 50 | nd | nd | 130 | nd |
| Mississippi River (Lake Pepin) above Lake City, Minn. | nd | nd | nd | nd | nd |
| Lake City WWTP outflow at Lake City, Minn. | 99 | 190 | 1,000 | 380 | 410 |
| Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | nd | nd | nd | nd | nd |
| South Fork Zumbro River at Rochester, Minn. | nd | nd | nd | 120 | 77 |
| Rochester WWTP outflow at Rochester, Minn. | 59 | 99 | 190 | nd | nd |
| South Fork Zumbro River below WWTP near Rochester, Minn. | 27 | nd | 57 | nd | nd |
| Spring Valley Creek above Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | nd | nd | nd |
| Spring Valley WWTP outflow at Spring Valley, Minn. | 63 | 200 | nd | 190 | 63 |
| Spring Valley Creek below Spring Valley WWTP outflow at Spring Valley, Minn. | nd | 14 | nd | nd | nd |
| Cedar River above treatment plant at Austin, Minn. | nd | nd | nd | nd | nd |
| Austin WWTP outflow at Austin, Minn. | 430 | 69 | nd | 330 | 180 |
| Cedar River below treatment plant at Austin, Minn. | 94 | 15 | nd | 170 | nd |
| Okabena Creek above WWTP outflow at Worthington, Minn. | nd | nd | nd | nd | nd |
| Worthington WWTP outflow at Worthington, Minn. | 130 | 160 | nd | 120 | 67 |
| Industrial WWTP outflow near Worthington, Minn. | nd | nd | nd | 110 | nd |
| Okabena Creek below WWTP outflow at Worthington, Minn. | 78 | 30 | nd | 110 | nd |
| Rock River above WWTP near Luverne, Minn. | nd | nd | nd | 100 | nd |
| Luverne WWTP outflow near Luverne, Minn. | 55 | 640 | 72 | 350 | 350 |
| Rock River below WWTP near Luverne, Minn. | nd | 19 | nd | 140 | nd |

| USGS Station Name | 4-Nonylphenol-diethoxylate (ng/L) | 4-Nonylphenol-triethoxylate (ng/L) | 4-Nonylphenol-tetraethoxylate (ng/L) | 4-*tert*-Octylphenol (ng/L) |
|---|---|---|---|---|
| Williams Creek above WWTP at Williams, Minn. | nd | nd | nd | nd |
| Williams WWTP outflow at Williams, Minn. | nd | nd | nd | nd |
| Williams Creek below WWTP at Williams, Minn. | nd | nd | nd | nd |
| Shagawa Lake at Mouth of Burntside River near Ely, Minn. | nd | nd | nd | nd |
| Ely WWTP outflow at Ely, Minn. | nd | nd | nd | 68 |
| Shagawa Lake near Ely WWTP outflow at Ely, Minn. | nd | nd | nd | nd |
| Elbow Creek above Eveleth WWTP at Eveleth, Minn. | nd | nd | nd | nd |
| Eveleth WWTP outlflow at Eveleth, Minn. | nd | nd | nd | nd |
| Elbow Creek below Eveleth WWTP at Eveleth, Minn. | nd | nd | nd | nd |
| St. Louis River at Hwy. 23 above Fond Du Lac, Minn. | nd | nd | nd | nd |
| Western Lake Superior Sanitary District - WWTP at Duluth, Minn. | nd | nd | nd | 430 |
| Lake Superior in St. Louis Bay at Duluth, Minn. | nd | nd | nd | 83 |
| Pelican River above WWTP at Pelican Rapids, Minn. | nd | nd | nd | nd |
| Pelican Rapids WWTP outflow at Pelican Rapids, Minn. | 3,400 | nd | 220 | 99 |
| Pelican River below WWTP at Pelican Rapids, Minn. | nd | nd | nd | nd |
| Red River of the North above WWTP at East Grand Forks, Minn. | nd | nd | nd | nd |
| East Grand Forks WWTP Outlow at East Grand Forks, MN | nd | nd | nd | nd |
| Red River of the North below WWTP at East Grand Forks, Minn. | nd | nd | nd | nd |
| Mississippi River above WWTP at Grand Rapids, Minn. | nd | nd | nd | nd |
| Grand Rapids WWTP outflow at Grand Rapids, Minn. | nd | nd | nd | nd |
| Mississippi River below WWTP at Grand Rapids, Minn. | nd | nd | nd | nd |
| Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | nd | 4,300 | 300 | nd |
| Sauk Centre WWTP outflow at Sauk Centre, Minn. | 390 | nd | 230 | nd |
| Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd | 90 | nd |
| Sauk River above Melrose WWTP at Melrose, Minn. | nd | nd | 180 | nd |
| Melrose WWTP outflow at Melrose, Minn. | 140 | nd | 250 | nd |
| Sauk River below Melrose WWTP at Melrose, Minn. | nd | 4,900 | 270 | nd |
| Tibbets Brook above WWTP outflow at Zimmerman, Minn. | nd | nd | nd | nd |
| Zimmerman WWTP outflow at Zimmerman, Minn. | nd | nd | nd | 100 |
| Tibbets Brook below WWTP outflow at Zimmerman, Minn. | nd | nd | nd | 30 |
| Jewitts Creek at U.S. Hwy. 12 in Litchfield, Minn. | nd | nd | nd | nd |
| Litchfield WWTP outflow near Litchfield, Minn. | nd | nd | nd | nd |
| Jewitts Creek near Litchfield, Minn. | nd | nd | nd | nd |
| South Fork of the Crow River above WWTP at Hutchinson, Minn. | nd | nd | nd | nd |
| Hutchinson WWTP outflow at Hutchinson, Minn. | nd | nd | nd | 24 |
| South Fork of the Crow River below Hutchinson, Minn. | nd | nd | nd | nd |
| South Fork Crow River above WWTP at Lester Prairie, Minn. | nd | nd | nd | nd |

| USGS Station Name | 4-Nonylphenol-diethoxylate (ng/L) | 4-Nonylphenol-triethoxylate (ng/L) | 4-Nonylphenol-tetraethoxylate (ng/L) | 4-*tert*-Octylphenol (ng/L) |
|---|---|---|---|---|
| Lester Prairie WWTP outflow at Lester Prairie, Minn. | nd | nd | nd | nd |
| South Fork Crow River below WWTP at Lester Prairie, Minn. | nd | nd | nd | nd |
| Redwood River above Lynd WWTP near Lynd, Minn. | nd | nd | nd | nd |
| Lynd WWTP outflow near Lynd, Minn. | nd | nd | nd | 17 |
| Redwood River below Lynd WWTP near Lynd, Minn. | nd | nd | nd | nd |
| Redwood River above WWTP below Marshall, Minn. | nd | nd | nd | nd |
| Marshall WWTP outfall at Marshall, Minn. | nd | nd | nd | nd |
| Redwood River below WWTP near Marshall, Minn. | nd | nd | nd | nd |
| Center Creek on Co. Rd. 143, at Fairmont, Minn. | 96 | nd | nd | nd |
| Fairmont WWTP outflow at Fairmont, Minn. | nd | nd | nd | nd |
| Center Creek below WWTP at Fairmont, Minn. | nd | nd | nd | nd |
| Mississippi River at Industrial Mollasses, St. Paul, Minn. | nd | nd | nd | nd |
| Metro Plant (WWTP) outflow in St. Paul, Minn. | nd | nd | nd | 43 |
| Mississippi River at South St. Paul, Minn. | nd | nd | nd | nd |
| Grindstone River above WWTP near Hinckley, Minn. | nd | nd | 73 | nd |
| Hinckley WWTP near Hinckley, Minn. | nd | nd | nd | nd |
| Grindstone River below Hinckley, Minn. | nd | nd | nd | nd |
| Mississippi River (Lake Pepin) above Lake City, Minn. | nd | nd | 95 | nd |
| Lake City WWTP outflow at Lake City, Minn. | nd | nd | nd | 62 |
| Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | nd | nd | nd | nd |
| South Fork Zumbro River at Rochester, Minn. | nd | nd | 95 | nd |
| Rochester WWTP outflow at Rochester, Minn. | nd | nd | 100 | 14 |
| South Fork Zumbro River below WWTP near Rochester, Minn. | nd | nd | nd | nd |
| Spring Valley Creek above Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | 190 | nd |
| Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | 88 | nd |
| Spring Valley Creek below Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | nd | nd |
| Cedar River above treatment plant at Austin, Minn. | nd | nd | nd | nd |
| Austin WWTP outflow at Austin, Minn. | 390 | nd | 94 | nd |
| Cedar River below treatment plant at Austin, Minn. | 120 | nd | nd | nd |
| Okabena Creek above WWTP outflow at Worthington, Minn. | nd | nd | nd | nd |
| Worthington WWTP outflow at Worthington, Minn. | nd | nd | nd | nd |
| Industrial WWTP outflow near Worthington, Minn. | nd | nd | nd | nd |
| Okabena Creek below WWTP outflow at Worthington, Minn. | nd | nd | nd | nd |
| Rock River above WWTP near Luverne, Minn. | nd | nd | nd | nd |
| Luverne WWTP outflow near Luverne, Minn. | 570 | nd | 46 | 21 |
| Rock River below WWTP near Luverne, Minn. | nd | nd | nd | nd |

## Alkylphenols in Water (continued)

| USGS Station Name | 4-*tert*-Octylphenol-monoethoxylate (ng/L) | 4-*tert*-Octylphenol-diethoxylate (ng/L) | 4-*tert*-Octylphenol-triethoxylate (ng/L) | 4-*tert*-Octylphenol-tetraethoxylate (ng/L) |
|---|---|---|---|---|
| Williams Creek above WWTP at Williams, Minn. | nd | nd | nd | nd |
| Williams WWTP outflow at Williams, Minn. | nd | nd | nd | nd |
| Williams Creek below WWTP at Williams, Minn. | nd | nd | nd | nd |
| Shagawa Lake at Mouth of Burntside River near Ely, Minn. | nd | nd | nd | nd |
| Ely WWTP outflow at Ely, Minn. | nd | nd | nd | nd |
| Shagawa Lake near Ely WWTP outflow at Ely, Minn. | nd | nd | nd | nd |
| Elbow Creek above Eveleth WWTP at Eveleth, Minn. | nd | nd | nd | nd |
| Eveleth WWTP outlflow at Eveleth, Minn. | nd | nd | nd | nd |
| Elbow Creek below Eveleth WWTP at Eveleth, Minn. | nd | nd | nd | nd |
| St. Louis River at Hwy. 23 above Fond Du Lac, Minn. | nd | nd | nd | nd |
| Western Lake Superior Sanitary District - WWTP at Duluth, Minn. | 24 | nd | nd | nd |
| Lake Superior in St. Louis Bay at Duluth, Minn. | nd | nd | nd | nd |
| Pelican River above WWTP at Pelican Rapids, Minn. | nd | nd | nd | nd |
| Pelican Rapids WWTP outflow at Pelican Rapids, Minn. | 31 | nd | nd | nd |
| Pelican River below WWTP at Pelican Rapids, Minn. | nd | nd | nd | nd |
| Red River of the North above WWTP at East Grand Forks, Minn. | nd | nd | nd | nd |
| East Grand Forks WWTP Outlow at East Grand Forks, MN | nd | nd | nd | nd |
| Red River of the North below WWTP at East Grand Forks, Minn. | nd | nd | nd | nd |
| Mississippi River above WWTP at Grand Rapids, Minn. | nd | nd | nd | nd |
| Grand Rapids WWTP outflow at Grand Rapids, Minn. | nd | nd | nd | nd |
| Mississippi River below WWTP at Grand Rapids, Minn. | nd | nd | nd | nd |
| Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | nd | 46 | nd | 78 |
| Sauk Centre WWTP outflow at Sauk Centre, Minn. | 13 | 850 | nd | nd |
| Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | nd | 280 | nd | 78 |
| Sauk River above Melrose WWTP at Melrose, Minn. | nd | 74 | nd | 69 |
| Melrose WWTP outflow at Melrose, Minn. | 10 | 150 | nd | nd |
| Sauk River below Melrose WWTP at Melrose, Minn. | nd | 33 | nd | 50 |
| Tibbets Brook above WWTP outflow at Zimmerman, Minn. | nd | nd | nd | nd |
| Zimmerman WWTP outflow at Zimmerman, Minn. | 8 | nd | nd | nd |
| Tibbets Brook below WWTP outflow at Zimmerman, Minn. | nd | nd | nd | nd |
| Jewitts Creek at U.S. Hwy. 12 in Litchfield, Minn. | nd | nd | nd | nd |
| Litchfield WWTP outflow near Litchfield, Minn. | nd | nd | nd | nd |
| Jewitts Creek near Litchfield, Minn. | nd | nd | nd | nd |
| South Fork of the Crow River above WWTP at Hutchinson, Minn. | nd | nd | nd | nd |
| Hutchinson WWTP outflow at Hutchinson, Minn. | nd | nd | nd | nd |
| South Fork of the Crow River below Hutchinson, Minn. | nd | nd | nd | nd |
| South Fork Crow River above WWTP at Lester Prairie, Minn. | nd | nd | nd | nd |

| USGS Station Name | 4-*tert*-Octylphenol-monoethoxylate (ng/L) | 4-*tert*-Octylphenol-diethoxylate (ng/L) | 4-*tert*-Octylphenol-triethoxylate (ng/L) | 4-*tert*-Octylphenol-tetraethoxylate (ng/L) |
|---|---|---|---|---|
| Lester Prairie WWTP outflow at Lester Prairie, Minn. | nd | nd | nd | nd |
| South Fork Crow River below WWTP at Lester Prairie, Minn. | nd | nd | nd | nd |
| Redwood River above Lynd WWTP near Lynd, Minn. | nd | nd | nd | nd |
| Lynd WWTP outflow near Lynd, Minn. | 10 | nd | nd | nd |
| Redwood River below Lynd WWTP near Lynd, Minn. | 6 | nd | nd | nd |
| Redwood River above WWTP below Marshall, Minn. | nd | nd | nd | nd |
| Marshall WWTP outfall at Marshall, Minn. | nd | nd | nd | nd |
| Redwood River below WWTP near Marshall, Minn. | nd | nd | nd | nd |
| Center Creek on Co. Rd. 143, at Fairmont, Minn. | nd | 130 | nd | nd |
| Fairmont WWTP outflow at Fairmont, Minn. | nd | nd | nd | nd |
| Center Creek below WWTP at Fairmont, Minn. | nd | nd | nd | nd |
| Mississippi River at Industrial Mollasses, St. Paul, Minn. | nd | nd | nd | nd |
| Metro Plant (WWTP) outflow in St. Paul, Minn. | nd | nd | nd | nd |
| Mississippi River at South St. Paul, Minn. | nd | nd | nd | nd |
| Grindstone River above WWTP near Hinckley, Minn. | 9 | nd | nd | nd |
| Hinckley WWTP near Hinckley, Minn. | nd | nd | nd | nd |
| Grindstone River below Hinckley, Minn. | nd | nd | nd | nd |
| Mississippi River (Lake Pepin) above Lake City, Minn. | nd | nd | nd | nd |
| Lake City WWTP outflow at Lake City, Minn. | 26 | nd | nd | nd |
| Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | nd | nd | nd | nd |
| South Fork Zumbro River at Rochester, Minn. | nd | nd | nd | nd |
| Rochester WWTP outflow at Rochester, Minn. | nd | nd | nd | nd |
| South Fork Zumbro River below WWTP near Rochester, Minn. | nd | nd | nd | nd |
| Spring Valley Creek above Spring Valley WWTP outflow at Spring Valley, Minn. | nd | 66 | nd | nd |
| Spring Valley WWTP outflow at Spring Valley, Minn. | nd | 230 | nd | nd |
| Spring Valley Creek below Spring Valley WWTP outflow at Spring Valley, Minn. | nd | 24 | nd | nd |
| Cedar River above treatment plant at Austin, Minn. | nd | nd | nd | nd |
| Austin WWTP outflow at Austin, Minn. | 8 | nd | 29 | nd |
| Cedar River below treatment plant at Austin, Minn. | nd | nd | nd | nd |
| Okabena Creek above WWTP outflow at Worthington, Minn. | nd | nd | nd | nd |
| Worthington WWTP outflow at Worthington, Minn. | nd | nd | nd | nd |
| Industrial WWTP outflow near Worthington, Minn. | nd | nd | nd | nd |
| Okabena Creek below WWTP outflow at Worthington, Minn. | nd | nd | nd | nd |
| Rock River above WWTP near Luverne, Minn. | nd | nd | nd | nd |
| Luverne WWTP outflow near Luverne, Minn. | 10 | nd | nd | nd |
| Rock River below WWTP near Luverne, Minn. | nd | nd | nd | nd |

| USGS Station Name | 4-*tert*-Octylphenol-pentaethoxylate (ng/L) | 4-*tert*-Pentylphenol (ng/L) | Triclosan (ng/L) |
|---|---|---|---|
| Williams Creek above WWTP at Williams, Minn. | nd | nd | nd |
| Williams WWTP outflow at Williams, Minn. | nd | nd | 17 |
| Williams Creek below WWTP at Williams, Minn. | nd | nd | nd |
| Shagawa Lake at Mouth of Burntside River near Ely, Minn. | nd | nd | nd |
| Ely WWTP outflow at Ely, Minn. | nd | nd | 69 |
| Shagawa Lake near Ely WWTP outflow at Ely, Minn. | nd | nd | nd |
| Elbow Creek above Eveleth WWTP at Eveleth, Minn. | nd | nd | nd |
| Eveleth WWTP outlflow at Eveleth, Minn. | nd | nd | nd |
| Elbow Creek below Eveleth WWTP at Eveleth, Minn. | nd | nd | nd |
| St. Louis River at Hwy. 23 above Fond Du Lac, Minn. | nd | nd | nd |
| Western Lake Superior Sanitary District - WWTP at Duluth, Minn. | nd | 51 | 410 |
| Lake Superior in St. Louis Bay at Duluth, Minn. | nd | nd | 51 |
| Pelican River above WWTP at Pelican Rapids, Minn. | nd | nd | nd |
| Pelican Rapids WWTP outflow at Pelican Rapids, Minn. | nd | 9 | 340 |
| Pelican River below WWTP at Pelican Rapids, Minn. | nd | nd | nd |
| Red River of the North above WWTP at East Grand Forks, Minn. | nd | nd | nd |
| East Grand Forks WWTP Outlow at East Grand Forks, MN | nd | nd | 11 |
| Red River of the North below WWTP at East Grand Forks, Minn. | nd | nd | nd |
| Mississippi River above WWTP at Grand Rapids, Minn. | nd | nd | nd |
| Grand Rapids WWTP outflow at Grand Rapids, Minn. | nd | nd | 51 |
| Mississippi River below WWTP at Grand Rapids, Minn. | nd | nd | nd |
| Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | 4,100 | nd | nd |
| Sauk Centre WWTP outflow at Sauk Centre, Minn. | nd | 18 | 40 |
| Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | 260 | nd | nd |
| Sauk River above Melrose WWTP at Melrose, Minn. | nd | nd | nd |
| Melrose WWTP outflow at Melrose, Minn. | 1,400 | 34 | 52 |
| Sauk River below Melrose WWTP at Melrose, Minn. | 4,000 | nd | nd |
| Tibbets Brook above WWTP outflow at Zimmerman, Minn. | nd | nd | nd |
| Zimmerman WWTP outflow at Zimmerman, Minn. | nd | 39 | 41 |
| Tibbets Brook below WWTP outflow at Zimmerman, Minn. | nd | 15 | 21 |
| Jewitts Creek at U.S. Hwy. 12 in Litchfield, Minn. | nd | nd | nd |
| Litchfield WWTP outflow near Litchfield, Minn. | nd | nd | 24 |
| Jewitts Creek near Litchfield, Minn. | nd | nd | nd |
| South Fork of the Crow River above WWTP at Hutchinson, Minn. | nd | nd | nd |
| Hutchinson WWTP outflow at Hutchinson, Minn. | nd | nd | nd |
| South Fork of the Crow River below Hutchinson, Minn. | nd | nd | nd |
| South Fork Crow River above WWTP at Lester Prairie, Minn. | nd | nd | nd |

| USGS Station Name | 4-*tert*-Octylphenol-pentaethoxylate (ng/L) | 4-*tert*-Pentylphenol (ng/L) | Triclosan (ng/L) |
|---|---|---|---|
| Lester Prairie WWTP outflow at Lester Prairie, Minn. | nd | nd | nd |
| South Fork Crow River below WWTP at Lester Prairie, Minn. | nd | nd | nd |
| Redwood River above Lynd WWTP near Lynd, Minn. | nd | nd | nd |
| Lynd WWTP outflow near Lynd, Minn. | nd | nd | 29 |
| Redwood River below Lynd WWTP near Lynd, Minn. | nd | nd | nd |
| Redwood River above WWTP below Marshall, Minn. | nd | nd | nd |
| Marshall WWTP outfall at Marshall, Minn. | nd | nd | 67 |
| Redwood River below WWTP near Marshall, Minn. | nd | nd | nd |
| Center Creek on Co. Rd. 143, at Fairmont, Minn. | nd | nd | nd |
| Fairmont WWTP outflow at Fairmont, Minn. | nd | nd | nd |
| Center Creek below WWTP at Fairmont, Minn. | nd | nd | nd |
| Mississippi River at Industrial Mollasses, St. Paul, Minn. | nd | nd | nd |
| Metro Plant (WWTP) outflow in St. Paul, Minn. | nd | nd | 120 |
| Mississippi River at South St. Paul, Minn. | nd | nd | nd |
| Grindstone River above WWTP near Hinckley, Minn. | nd | nd | nd |
| Hinckley WWTP near Hinckley, Minn. | nd | nd | 40 |
| Grindstone River below Hinckley, Minn. | nd | nd | nd |
| Mississippi River (Lake Pepin) above Lake City, Minn. | nd | nd | nd |
| Lake City WWTP outflow at Lake City, Minn. | nd | nd | 180 |
| Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | nd | nd | nd |
| South Fork Zumbro River at Rochester, Minn. | nd | nd | nd |
| Rochester WWTP outflow at Rochester, Minn. | nd | nd | nd |
| South Fork Zumbro River below WWTP near Rochester, Minn. | nd | nd | nd |
| Spring Valley Creek above Spring Valley WWTP outflow at Spring Valley, Minn. | 1,300 | nd | nd |
| Spring Valley WWTP outflow at Spring Valley, Minn. | 220 | nd | 32 |
| Spring Valley Creek below Spring Valley WWTP outflow at Spring Valley, Minn. | 290 | nd | nd |
| Cedar River above treatment plant at Austin, Minn. | nd | nd | nd |
| Austin WWTP outflow at Austin, Minn. | nd | nd | 150 |
| Cedar River below treatment plant at Austin, Minn. | nd | nd | 28 |
| Okabena Creek above WWTP outflow at Worthington, Minn. | nd | nd | nd |
| Worthington WWTP outflow at Worthington, Minn. | nd | nd | 18 |
| Industrial WWTP outflow near Worthington, Minn. | nd | nd | nd |
| Okabena Creek below WWTP outflow at Worthington, Minn. | nd | nd | nd |
| Rock River above WWTP near Luverne, Minn. | nd | nd | nd |
| Luverne WWTP outflow near Luverne, Minn. | nd | nd | 95 |
| Rock River below WWTP near Luverne, Minn. | nd | nd | nd |

| Site Number | USGS Station Name | Date | Site Type |
|---|---|---|---|
| 1 | Williams Creek above WWTP at Williams, Minn. | 10/20/2009 | US |
| 2 | Williams WWTP outflow at Williams, Minn. | 10/20/2009 | WWTP |
| 3 | Williams Creek below WWTP at Williams, Minn. | 10/20/2009 | DS |
| 4 | Shagawa Lake at Mouth of Burntside River near Ely, Minn. | 9/28/2009 | US |
| 5 | Ely WWTP outflow at Ely, Minn. | 9/28/2009 | WWTP |
| 6 | Shagawa Lake near Ely WWTP outflow at Ely, Minn. | 9/28/2009 | DS |
| 7 | Elbow Creek above Eveleth WWTP at Eveleth, Minn. | 9/29/2009 | US |
| 8 | Eveleth WWTP outlflow at Eveleth, Minn. | 9/29/2009 | WWTP |
| 9 | Elbow Creek below Eveleth WWTP at Eveleth, Minn. | 9/29/2009 | DS |
| 10 | St. Louis River at Hwy. 23 above Fond Du Lac, Minn. | 10/1/2009 | US |
| 11 | Western Lake Superior Sanitary District - WWTP at Duluth, Minn. | 10/1/2009 | WWTP |
| 12 | Lake Superior in St. Louis Bay at Duluth, Minn. | 10/1/2009 | DS |
| 13 | Pelican River above WWTP at Pelican Rapids, Minn. | 10/19/2009 | US |
| 14 | Pelican Rapids WWTP outflow at Pelican Rapids, Minn. | 10/19/2009 | WWTP |
| 15 | Pelican River below WWTP at Pelican Rapids, Minn. | 10/19/2009 | DS |
| 16 | Red River of the North above WWTP at East Grand Forks, Minn. | 10/21/2009 | US |
| 17 | East Grand Forks WWTP Outlow at East Grand Forks, MN | 10/21/2009 | WWTP |
| 18 | Red River of the North below WWTP at East Grand Forks, Minn. | 10/21/2009 | DS |
| 19 | Mississippi River above WWTP at Grand Rapids, Minn. | 9/30/2009 | US |
| 20 | Grand Rapids WWTP outflow at Grand Rapids, Minn. | 9/30/2009 | WWTP |
| 21 | Mississippi River below WWTP at Grand Rapids, Minn. | 9/30/2009 | DS |
| 22 | Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | 9/16/2009 | US |
| 23 | Sauk Centre WWTP outflow at Sauk Centre, Minn. | 9/16/2009 | WWTP |
| 24 | Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | 9/16/2009 | DS |
| 25 | Sauk River above Melrose WWTP at Melrose, Minn. | 9/17/2009 | US |
| 26 | Melrose WWTP outflow at Melrose, Minn. | 9/17/2009 | WWTP |
| 27 | Sauk River below Melrose WWTP at Melrose, Minn. | 9/17/2009 | DS |
| 28 | Tibbets Brook above WWTP outflow at Zimmerman, Minn. | 9/3/2009 | US |
| 29 | Zimmerman WWTP outflow at Zimmerman, Minn. | 9/3/2009 | WWTP |
| 30 | Tibbets Brook below WWTP outflow at Zimmerman, Minn. | 9/3/2009 | DS |
| 31 | Jewitts Creek at U.S. Hwy. 12 in Litchfield, Minn. | 10/8/2009 | US |
| 32 | Litchfield WWTP outflow near Litchfield, Minn. | 10/8/2009 | WWTP |
| 33 | Jewitts Creek near Litchfield, Minn. | 10/8/2009 | DS |
| 34 | South Fork of the Crow River above WWTP at Hutchinson, Minn. | 9/14/2009 | US |
| 35 | Hutchinson WWTP outflow at Hutchinson, Minn. | 9/14/2009 | WWTP |
| 36 | South Fork of the Crow River below Hutchinson, Minn. | 9/14/2009 | DS |
| 37 | South Fork Crow River above WWTP at Lester Prairie, Minn. | 9/15/2009 | US |
| 38 | Lester Prairie WWTP outflow at Lester Prairie, Minn. | 9/15/2009 | WWTP |
| 39 | South Fork Crow River below WWTP at Lester Prairie, Minn. | 9/15/2009 | DS |
| 40 | Redwood River above Lynd WWTP near Lynd, Minn. | 11/23/2009 | US |
| 41 | Lynd WWTP outflow near Lynd, Minn. | 11/23/2009 | WWTP |
| 42 | Redwood River below Lynd WWTP near Lynd, Minn. | 11/23/2009 | DS |

| Site Number | USGS Station Name | Date | Site Type |
|---|---|---|---|
| 43 | Redwood River above WWTP below Marshall, Minn. | 10/7/2009 | US |
| 44 | Marshall WWTP outfall at Marshall, Minn. | 10/7/2009 | WWTP |
| 45 | Redwood River below WWTP near Marshall, Minn. | 10/7/2009 | DS |
| 46 | Center Creek on Co. Rd. 143, at Fairmont, Minn. | 9/9/2009 | US |
| 47 | Fairmont WWTP outflow at Fairmont, Minn. | 9/9/2009 | WWTP |
| 48 | Center Creek below WWTP at Fairmont, Minn. | 9/9/2009 | DS |
| 49 | Mississippi River at Industrial Mollasses, St. Paul, Minn. | 9/24/2009 | US |
| 50 | Metro Plant (WWTP) outflow in St. Paul, Minn. | 9/24/2009 | WWTP |
| 51 | Mississippi River at South St. Paul, Minn. | 9/24/2009 | DS |
| 52 | Grindstone River above WWTP near Hinckley, Minn. | 9/2/2009 | US |
| 53 | Hinckley WWTP near Hinckley, Minn. | 9/2/2009 | WWTP |
| 54 | Grindstone River below Hinckley, Minn. | 9/2/2009 | DS |
| 55 | Mississippi River (Lake Pepin) above Lake City, Minn. | 9/23/2009 | US |
| 56 | Lake City WWTP outflow at Lake City, Minn. | 9/23/2009 | WWTP |
| 57 | Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | 9/23/2009 | DS |
| 58 | South Fork Zumbro River at Rochester, Minn. | 9/22/2009 | US |
| 59 | Rochester WWTP outflow at Rochester, Minn. | 9/22/2009 | WWTP |
| 60 | South Fork Zumbro River below WWTP near Rochester, Minn. | 9/22/2009 | DS |
| 61 | Spring Valley Creek above Spring Valley WWTP outflow at Spring Valley, Minn. | 9/21/2009 | US |
| 62 | Spring Valley WWTP outflow at Spring Valley, Minn. | 9/21/2009 | WWTP |
| 63 | Spring Valley Creek below Spring Valley WWTP outflow at Spring Valley, Minn. | 9/21/2009 | DS |
| 64 | Cedar River above treatment plant at Austin, Minn. | 9/8/2009 | US |
| 65 | Austin WWTP outflow at Austin, Minn. | 9/8/2009 | WWTP |
| 66 | Cedar River below treatment plant at Austin, Minn. | 9/8/2009 | DS |
| 67 | Okabena Creek above WWTP outflow at Worthington, Minn. | 9/9/2009 | US |
| 68 | Worthington WWTP outflow at Worthington, Minn. | 9/9/2009 | WWTP |
| 69 | Industrial WWTP outflow near Worthington, Minn. | 9/9/2009 | WWTP |
| 70 | Okabena Creek below WWTP outflow at Worthington, Minn. | 9/9/2009 | DS |
| 71 | Rock River above WWTP near Luverne, Minn. | 10/6/2009 | US |
| 72 | Luverne WWTP outflow near Luverne, Minn. | 10/6/2009 | WWTP |
| 73 | Rock River below WWTP near Luverne, Minn. | 10/6/2009 | DS |

| USGS Station Name | Ethylenediamine-tetraacetic acid (µg/L) | Nitrilotriacetic acid (µg/L) |
|---|---|---|
| Williams Creek above WWTP at Williams, Minn. | nd | nd |
| Williams WWTP outflow at Williams, Minn. | nd | nd |
| Williams Creek below WWTP at Williams, Minn. | nd | nd |
| Shagawa Lake at Mouth of Burntside River near Ely, Minn. | nd | nd |
| Ely WWTP outflow at Ely, Minn. | 60 | 9 |
| Shagawa Lake near Ely WWTP outflow at Ely, Minn. | nd | nd |
| Elbow Creek above Eveleth WWTP at Eveleth, Minn. | nd | nd |
| Eveleth WWTP outlflow at Eveleth, Minn. | 83 | 9 |
| Elbow Creek below Eveleth WWTP at Eveleth, Minn. | nd | nd |
| St. Louis River at Hwy. 23 above Fond Du Lac, Minn. | nd | nd |
| Western Lake Superior Sanitary District - WWTP at Duluth, Minn. | 110 | 10 |
| Lake Superior in St. Louis Bay at Duluth, Minn. | nd | 2 |
| Pelican River above WWTP at Pelican Rapids, Minn. | nd | nd |
| Pelican Rapids WWTP outflow at Pelican Rapids, Minn. | 160 | 4 |
| Pelican River below WWTP at Pelican Rapids, Minn. | nd | nd |
| Red River of the North above WWTP at East Grand Forks, Minn. | nd | nd |
| East Grand Forks WWTP Outlow at East Grand Forks, MN | nd | nd |
| Red River of the North below WWTP at East Grand Forks, Minn. | nd | nd |
| Mississippi River above WWTP at Grand Rapids, Minn. | nd | nd |
| Grand Rapids WWTP outflow at Grand Rapids, Minn. | 340 | nd |
| Mississippi River below WWTP at Grand Rapids, Minn. | 38 | nd |
| Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd |
| Sauk Centre WWTP outflow at Sauk Centre, Minn. | 280 | 2 |
| Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd |
| Sauk River above Melrose WWTP at Melrose, Minn. | nd | nd |
| Melrose WWTP outflow at Melrose, Minn. | 140 | nd |
| Sauk River below Melrose WWTP at Melrose, Minn. | nd | nd |
| Tibbets Brook above WWTP outflow at Zimmerman, Minn. | nd | nd |
| Zimmerman WWTP outflow at Zimmerman, Minn. | 160 | nd |
| Tibbets Brook below WWTP outflow at Zimmerman, Minn. | 86 | nd |
| Jewitts Creek at U.S. Hwy. 12 in Litchfield, Minn. | nd | nd |
| Litchfield WWTP outflow near Litchfield, Minn. | 320 | nd |
| Jewitts Creek near Litchfield, Minn. | 45 | nd |
| South Fork of the Crow River above WWTP at Hutchinson, Minn. | nd | nd |
| Hutchinson WWTP outflow at Hutchinson, Minn. | 580 | nd |
| South Fork of the Crow River below Hutchinson, Minn. | 40 | nd |
| South Fork Crow River above WWTP at Lester Prairie, Minn. | 48 | nd |
| Lester Prairie WWTP outflow at Lester Prairie, Minn. | 61 | nd |
| South Fork Crow River below WWTP at Lester Prairie, Minn. | 36 | nd |
| Redwood River above Lynd WWTP near Lynd, Minn. | nd | nd |
| Lynd WWTP outflow near Lynd, Minn. | nd | nd |
| Redwood River below Lynd WWTP near Lynd, Minn. | nd | nd |

| USGS Station Name | Ethylenediamine-tetraacetic acid (µg/L) | Nitrilotriacetic acid (µg/L) |
|---|---|---|
| Redwood River above WWTP below Marshall, Minn. | 110 | nd |
| Marshall WWTP outfall at Marshall, Minn. | 180 | nd |
| Redwood River below WWTP near Marshall, Minn. | 40 | nd |
| Center Creek on Co. Rd. 143, at Fairmont, Minn. | nd | nd |
| Fairmont WWTP outflow at Fairmont, Minn. | 180 | 2 |
| Center Creek below WWTP at Fairmont, Minn. | 150 | nd |
| Mississippi River at Industrial Mollasses, St. Paul, Minn. | nd | nd |
| Metro Plant (WWTP) outflow in St. Paul, Minn. | 210 | nd |
| Mississippi River at South St. Paul, Minn. | 30 | nd |
| Grindstone River above WWTP near Hinckley, Minn. | nd | nd |
| Hinckley WWTP near Hinckley, Minn. | 180 | 3 |
| Grindstone River below Hinckley, Minn. | nd | nd |
| Mississippi River (Lake Pepin) above Lake City, Minn. | nd | nd |
| Lake City WWTP outflow at Lake City, Minn. | 56 | 2 |
| Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | nd | nd |
| South Fork Zumbro River at Rochester, Minn. | nd | nd |
| Rochester WWTP outflow at Rochester, Minn. | 250 | 3 |
| South Fork Zumbro River below WWTP near Rochester, Minn. | 100 | nd |
| Spring Valley Creek above Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd |
| Spring Valley WWTP outflow at Spring Valley, Minn. | 230 | nd |
| Spring Valley Creek below Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd |
| Cedar River above treatment plant at Austin, Minn. | nd | nd |
| Austin WWTP outflow at Austin, Minn. | 230 | 3 |
| Cedar River below treatment plant at Austin, Minn. | 37 | nd |
| Okabena Creek above WWTP outflow at Worthington, Minn. | nd | 2 |
| Worthington WWTP outflow at Worthington, Minn. | 230 | 2 |
| Industrial WWTP outflow near Worthington, Minn. | 28 | nd |
| Okabena Creek below WWTP outflow at Worthington, Minn. | 53 | 2 |
| Rock River above WWTP near Luverne, Minn. | nd | nd |
| Luverne WWTP outflow near Luverne, Minn. | 220 | 2 |
| Rock River below WWTP near Luverne, Minn. | nd | nd |

| USGS Station Name | 4-Nonylphenol-monoethoxy-carboxylate (µg/L) | 4-Nonylphenol-diethoxy-carboxylate (µg/L) |
|---|---|---|
| Williams Creek above WWTP at Williams, Minn. | nd | nd |
| Williams WWTP outflow at Williams, Minn. | nd | nd |
| Williams Creek below WWTP at Williams, Minn. | nd | nd |
| Shagawa Lake at Mouth of Burntside River near Ely, Minn. | nd | nd |
| Ely WWTP outflow at Ely, Minn. | 16 | 20 |
| Shagawa Lake near Ely WWTP outflow at Ely, Minn. | nd | 2 |
| Elbow Creek above Eveleth WWTP at Eveleth, Minn. | nd | nd |
| Eveleth WWTP outlflow at Eveleth, Minn. | 8 | 3 |
| Elbow Creek below Eveleth WWTP at Eveleth, Minn. | 4 | 4 |
| St. Louis River at Hwy. 23 above Fond Du Lac, Minn. | nd | nd |
| Western Lake Superior Sanitary District - WWTP at Duluth, Minn. | 8 | 5 |
| Lake Superior in St. Louis Bay at Duluth, Minn. | 2 | nd |
| Pelican River above WWTP at Pelican Rapids, Minn. | nd | nd |
| Pelican Rapids WWTP outflow at Pelican Rapids, Minn. | 110 | 130 |
| Pelican River below WWTP at Pelican Rapids, Minn. | nd | nd |
| Red River of the North above WWTP at East Grand Forks, Minn. | nd | nd |
| East Grand Forks WWTP Outlow at East Grand Forks, MN | 2 | nd |
| Red River of the North below WWTP at East Grand Forks, Minn. | nd | nd |
| Mississippi River above WWTP at Grand Rapids, Minn. | nd | nd |
| Grand Rapids WWTP outflow at Grand Rapids, Minn. | 2 | nd |
| Mississippi River below WWTP at Grand Rapids, Minn. | nd | nd |
| Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd |
| Sauk Centre WWTP outflow at Sauk Centre, Minn. | 9 | 8 |
| Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | 2 | 3 |
| Sauk River above Melrose WWTP at Melrose, Minn. | 3 | nd |
| Melrose WWTP outflow at Melrose, Minn. | 22 | 15 |
| Sauk River below Melrose WWTP at Melrose, Minn. | nd | nd |
| Tibbets Brook above WWTP outflow at Zimmerman, Minn. | 2 | nd |
| Zimmerman WWTP outflow at Zimmerman, Minn. | 15 | 10 |
| Tibbets Brook below WWTP outflow at Zimmerman, Minn. | 15 | 9 |
| Jewitts Creek at U.S. Hwy. 12 in Litchfield, Minn. | nd | nd |
| Litchfield WWTP outflow near Litchfield, Minn. | 5 | 4 |
| Jewitts Creek near Litchfield, Minn. | nd | nd |
| South Fork of the Crow River above WWTP at Hutchinson, Minn. | nd | nd |
| Hutchinson WWTP outflow at Hutchinson, Minn. | 3 | 3 |
| South Fork of the Crow River below Hutchinson, Minn. | 3 | nd |
| South Fork Crow River above WWTP at Lester Prairie, Minn. | 2 | nd |
| Lester Prairie WWTP outflow at Lester Prairie, Minn. | 9 | 3 |
| South Fork Crow River below WWTP at Lester Prairie, Minn. | nd | nd |
| Redwood River above Lynd WWTP near Lynd, Minn. | nd | nd |
| Lynd WWTP outflow near Lynd, Minn. | 5 | 2 |
| Redwood River below Lynd WWTP near Lynd, Minn. | nd | nd |

| USGS Station Name | 4-Nonylphenol-monoethoxy-carboxylate (µg/L) | 4-Nonylphenol-diethoxy-carboxylate (µg/L) |
|---|---|---|
| Redwood River above WWTP below Marshall, Minn. | nd | nd |
| Marshall WWTP outfall at Marshall, Minn. | 6 | 5 |
| Redwood River below WWTP near Marshall, Minn. | 5 | 5 |
| Center Creek on Co. Rd. 143, at Fairmont, Minn. | nd | nd |
| Fairmont WWTP outflow at Fairmont, Minn. | 3 | 2 |
| Center Creek below WWTP at Fairmont, Minn. | 4 | 2 |
| Mississippi River at Industrial Mollasses, St. Paul, Minn. | nd | nd |
| Metro Plant (WWTP) outflow in St. Paul, Minn. | 9 | 5 |
| Mississippi River at South St. Paul, Minn. | 3 | nd |
| Grindstone River above WWTP near Hinckley, Minn. | 3 | nd |
| Hinckley WWTP near Hinckley, Minn. | 6 | 3 |
| Grindstone River below Hinckley, Minn. | nd | nd |
| Mississippi River (Lake Pepin) above Lake City, Minn. | nd | nd |
| Lake City WWTP outflow at Lake City, Minn. | 33 | 9 |
| Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | 5 | nd |
| South Fork Zumbro River at Rochester, Minn. | nd | nd |
| Rochester WWTP outflow at Rochester, Minn. | 2 | 2 |
| South Fork Zumbro River below WWTP near Rochester, Minn. | nd | nd |
| Spring Valley Creek above Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd |
| Spring Valley WWTP outflow at Spring Valley, Minn. | 3 | nd |
| Spring Valley Creek below Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd |
| Cedar River above treatment plant at Austin, Minn. | nd | nd |
| Austin WWTP outflow at Austin, Minn. | 5 | 4 |
| Cedar River below treatment plant at Austin, Minn. | 2 | 3 |
| Okabena Creek above WWTP outflow at Worthington, Minn. | nd | nd |
| Worthington WWTP outflow at Worthington, Minn. | 7 | 6 |
| Industrial WWTP outflow near Worthington, Minn. | 3 | 2 |
| Okabena Creek below WWTP outflow at Worthington, Minn. | 7 | 3 |
| Rock River above WWTP near Luverne, Minn. | nd | nd |
| Luverne WWTP outflow near Luverne, Minn. | 8 | 8 |
| Rock River below WWTP near Luverne, Minn. | nd | nd |

| USGS Station Name | 4-Nonylphenol-triethoxy-carboxylate (µg/L) | 4-Nonylphenol-tetraethoxy-carboxylate (µg/L) |
|---|---|---|
| Williams Creek above WWTP at Williams, Minn. | nd | nd |
| Williams WWTP outflow at Williams, Minn. | nd | nd |
| Williams Creek below WWTP at Williams, Minn. | nd | nd |
| Shagawa Lake at Mouth of Burntside River near Ely, Minn. | nd | nd |
| Ely WWTP outflow at Ely, Minn. | 2 | nd |
| Shagawa Lake near Ely WWTP outflow at Ely, Minn. | nd | nd |
| Elbow Creek above Eveleth WWTP at Eveleth, Minn. | nd | nd |
| Eveleth WWTP outlflow at Eveleth, Minn. | nd | nd |
| Elbow Creek below Eveleth WWTP at Eveleth, Minn. | nd | nd |
| St. Louis River at Hwy. 23 above Fond Du Lac, Minn. | nd | nd |
| Western Lake Superior Sanitary District - WWTP at Duluth, Minn. | nd | 6 |
| Lake Superior in St. Louis Bay at Duluth, Minn. | nd | 2 |
| Pelican River above WWTP at Pelican Rapids, Minn. | nd | nd |
| Pelican Rapids WWTP outflow at Pelican Rapids, Minn. | 19 | 7 |
| Pelican River below WWTP at Pelican Rapids, Minn. | nd | nd |
| Red River of the North above WWTP at East Grand Forks, Minn. | nd | nd |
| East Grand Forks WWTP Outlow at East Grand Forks, MN | nd | nd |
| Red River of the North below WWTP at East Grand Forks, Minn. | nd | nd |
| Mississippi River above WWTP at Grand Rapids, Minn. | nd | nd |
| Grand Rapids WWTP outflow at Grand Rapids, Minn. | nd | nd |
| Mississippi River below WWTP at Grand Rapids, Minn. | nd | nd |
| Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd |
| Sauk Centre WWTP outflow at Sauk Centre, Minn. | nd | nd |
| Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd |
| Sauk River above Melrose WWTP at Melrose, Minn. | nd | nd |
| Melrose WWTP outflow at Melrose, Minn. | nd | nd |
| Sauk River below Melrose WWTP at Melrose, Minn. | nd | nd |
| Tibbets Brook above WWTP outflow at Zimmerman, Minn. | nd | nd |
| Zimmerman WWTP outflow at Zimmerman, Minn. | nd | nd |
| Tibbets Brook below WWTP outflow at Zimmerman, Minn. | nd | nd |
| Jewitts Creek at U.S. Hwy. 12 in Litchfield, Minn. | nd | nd |
| Litchfield WWTP outflow near Litchfield, Minn. | nd | nd |
| Jewitts Creek near Litchfield, Minn. | nd | nd |
| South Fork of the Crow River above WWTP at Hutchinson, Minn. | nd | nd |
| Hutchinson WWTP outflow at Hutchinson, Minn. | nd | nd |
| South Fork of the Crow River below Hutchinson, Minn. | nd | nd |
| South Fork Crow River above WWTP at Lester Prairie, Minn. | nd | nd |
| Lester Prairie WWTP outflow at Lester Prairie, Minn. | nd | nd |
| South Fork Crow River below WWTP at Lester Prairie, Minn. | nd | nd |
| Redwood River above Lynd WWTP near Lynd, Minn. | nd | nd |
| Lynd WWTP outflow near Lynd, Minn. | nd | nd |
| Redwood River below Lynd WWTP near Lynd, Minn. | nd | nd |

| USGS Station Name | 4-Nonylphenol-triethoxy-carboxylate (µg/L) | 4-Nonylphenol-tetraethoxy-carboxylate (µg/L) |
|---|---|---|
| Redwood River above WWTP below Marshall, Minn. | nd | nd |
| Marshall WWTP outfall at Marshall, Minn. | nd | nd |
| Redwood River below WWTP near Marshall, Minn. | nd | nd |
| Center Creek on Co. Rd. 143, at Fairmont, Minn. | nd | nd |
| Fairmont WWTP outflow at Fairmont, Minn. | nd | nd |
| Center Creek below WWTP at Fairmont, Minn. | nd | nd |
| Mississippi River at Industrial Mollasses, St. Paul, Minn. | nd | nd |
| Metro Plant (WWTP) outflow in St. Paul, Minn. | nd | nd |
| Mississippi River at South St. Paul, Minn. | nd | nd |
| Grindstone River above WWTP near Hinckley, Minn. | nd | nd |
| Hinckley WWTP near Hinckley, Minn. | nd | nd |
| Grindstone River below Hinckley, Minn. | nd | nd |
| Mississippi River (Lake Pepin) above Lake City, Minn. | nd | nd |
| Lake City WWTP outflow at Lake City, Minn. | nd | nd |
| Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | nd | nd |
| South Fork Zumbro River at Rochester, Minn. | nd | nd |
| Rochester WWTP outflow at Rochester, Minn. | nd | nd |
| South Fork Zumbro River below WWTP near Rochester, Minn. | nd | nd |
| Spring Valley Creek above Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd |
| Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd |
| Spring Valley Creek below Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd |
| Cedar River above treatment plant at Austin, Minn. | nd | nd |
| Austin WWTP outflow at Austin, Minn. | nd | nd |
| Cedar River below treatment plant at Austin, Minn. | nd | nd |
| Okabena Creek above WWTP outflow at Worthington, Minn. | nd | nd |
| Worthington WWTP outflow at Worthington, Minn. | nd | nd |
| Industrial WWTP outflow near Worthington, Minn. | nd | nd |
| Okabena Creek below WWTP outflow at Worthington, Minn. | nd | nd |
| Rock River above WWTP near Luverne, Minn. | nd | nd |
| Luverne WWTP outflow near Luverne, Minn. | nd | nd |
| Rock River below WWTP near Luverne, Minn. | nd | nd |

| Site number | USGS station name | Date | Site type | 4-Androstene-3,17-dione (ng/L) |
|---|---|---|---|---|
| 1 | Williams Creek above WWTP at Williams, Minn. | 10/20/2009 | US | nd |
| 2 | Williams WWTP outflow at Williams, Minn. | 10/20/2009 | WWTP | nd |
| 3 | Williams Creek below WWTP at Williams, Minn. | 10/20/2009 | DS | nd |
| 4 | Shagawa Lake at Mouth of Burntside River near Ely, Minn. | 9/28/2009 | US | nd |
| 5 | Ely WWTP outflow at Ely, Minn. | 9/28/2009 | WWTP | nd |
| 6 | Shagawa Lake near Ely WWTP outflow at Ely, Minn. | 9/28/2009 | DS | nd |
| 7 | Elbow Creek above Eveleth WWTP at Eveleth, Minn. | 9/29/2009 | US | nd |
| 8 | Eveleth WWTP outlflow at Eveleth, Minn. | 9/29/2009 | WWTP | nd |
| 9 | Elbow Creek below Eveleth WWTP at Eveleth, Minn. | 9/29/2009 | US | nd |
| 10 | St. Louis River at Hwy. 23 above Fond Du Lac, Minn. | 10/1/2009 | US | nd |
| 11 | Western Lake Superior Sanitary District - WWTP at Duluth, Minn. | 10/1/2009 | WWTP | nd |
| 12 | Lake Superior in St. Louis Bay at Duluth, Minn. | 10/1/2009 | DS | nd |
| 13 | Pelican River above WWTP at Pelican Rapids, Minn. | 10/19/2009 | US | nd |
| 14 | Pelican Rapids WWTP outflow at Pelican Rapids, Minn. | 10/19/2009 | WWTP | nd |
| 15 | Pelican River below WWTP at Pelican Rapids, Minn. | 10/19/2009 | DS | nd |
| 16 | Red River of the North above WWTP at East Grand Forks, Minn. | 10/21/2009 | US | nd |
| 17 | East Grand Forks WWTP Outlow at East Grand Forks, MN | 10/21/2009 | WWTP | nd |
| 18 | Red River of the North below WWTP at East Grand Forks, Minn. | 10/21/2009 | DS | nd |
| 19 | Mississippi River above WWTP at Grand Rapids, Minn. | 9/30/2009 | US | nd |
| 20 | Grand Rapids WWTP outflow at Grand Rapids, Minn. | 9/30/2009 | WWTP | nd |
| 21 | Mississippi River below WWTP at Grand Rapids, Minn. | 9/30/2009 | DS | nd |
| 22 | Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | 9/16/2009 | US | nd |
| 23 | Sauk Centre WWTP outflow at Sauk Centre, Minn. | 9/16/2009 | WWTP | nd |
| 24 | Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | 9/16/2009 | DS | nd |
| 25 | Sauk River above Melrose WWTP at Melrose, Minn. | 9/17/2009 | US | nd |
| 26 | Melrose WWTP outflow at Melrose, Minn. | 9/17/2009 | WWTP | nd |
| 27 | Sauk River below Melrose WWTP at Melrose, Minn. | 9/17/2009 | DS | nd |
| 28 | Tibbets Brook above WWTP outflow at Zimmerman, Minn. | 9/3/2009 | US | nd |
| 29 | Zimmerman WWTP outflow at Zimmerman, Minn. | 9/3/2009 | WWTP | nd |
| 30 | Tibbets Brook below WWTP outflow at Zimmerman, Minn. | 9/3/2009 | DS | nd |
| 31 | Jewitts Creek at U.S. Hwy. 12 in Litchfield, Minn. | 10/8/2009 | US | nd |
| 32 | Litchfield WWTP outflow near Litchfield, Minn. | 10/8/2009 | WWTP | nd |
| 33 | Jewitts Creek near Litchfield, Minn. | 10/8/2009 | DS | nd |
| 34 | South Fork of the Crow River above WWTP at Hutchinson, Minn. | 9/14/2009 | US | nd |
| 35 | Hutchinson WWTP outflow at Hutchinson, Minn. | 9/14/2009 | WWTP | nd |
| 36 | South Fork of the Crow River below Hutchinson, Minn. | 9/14/2009 | DS | nd |
| 37 | South Fork Crow River above WWTP at Lester Prairie, Minn. | 9/15/2009 | US | nd |
| 38 | Lester Prairie WWTP outflow at Lester Prairie, Minn. | 9/15/2009 | WWTP | nd |
| 39 | South Fork Crow River below WWTP at Lester Prairie, Minn. | 9/15/2009 | DS | nd |
| 40 | Redwood River above Lynd WWTP near Lynd, Minn. | 11/23/2009 | US | nd |

| Site number | USGS station name | Date | Site type | 4-Androstene-3,17-dione (ng/L) |
|---|---|---|---|---|
| 41 | Lynd WWTP outflow near Lynd, Minn. | 11/23/2009 | WWTP | nd |
| 42 | Redwood River below Lynd WWTP near Lynd, Minn. | 11/23/2009 | DS | nd |
| 43 | Redwood River above WWTP below Marshall, Minn. | 10/7/2009 | US | nd |
| 44 | Marshall WWTP outfall at Marshall, Minn. | 10/7/2009 | WWTP | nd |
| 45 | Redwood River below WWTP near Marshall, Minn. | 10/7/2009 | DS | nd |
| 46 | Center Creek on Co. Rd. 143, at Fairmont, Minn. | 9/9/2009 | US | nd |
| 47 | Fairmont WWTP outflow at Fairmont, Minn. | 9/9/2009 | WWTP | nd |
| 48 | Center Creek below WWTP at Fairmont, Minn. | 9/9/2009 | DS | nd |
| 49 | Mississippi River at Industrial Mollasses, St. Paul, Minn. | 9/24/2009 | US | nd |
| 50 | Metro Plant (WWTP) outflow in St. Paul, Minn. | 9/24/2009 | WWTP | nd |
| 51 | Mississippi River at South St. Paul, Minn. | 9/24/2009 | DS | nd |
| 52 | Grindstone River above WWTP near Hinckley, Minn. | 9/2/2009 | US | nd |
| 53 | Hinckley WWTP near Hinckley, Minn. | 9/2/2009 | WWTP | nd |
| 54 | Grindstone River below Hinckley, Minn. | 9/2/2009 | DS | nd |
| 55 | Mississippi River (Lake Pepin) above Lake City, Minn. | 9/23/2009 | US | nd |
| 56 | Lake City WWTP outflow at Lake City, Minn. | 9/23/2009 | WWTP | nd |
| 57 | Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | 9/23/2009 | DS | nd |
| 58 | South Fork Zumbro River at Rochester, Minn. | 9/22/2009 | US | nd |
| 59 | Rochester WWTP outflow at Rochester, Minn. | 9/22/2009 | WWTP | nd |
| 60 | South Fork Zumbro River below WWTP near Rochester, Minn. | 9/22/2009 | DS | nd |
| 61 | Spring Valley Creek above Spring Valley WWTP outflow at Spring Valley, Minn. | 9/21/2009 | US | nd |
| 62 | Spring Valley WWTP outflow at Spring Valley, Minn. | 9/21/2009 | WWTP | nd |
| 63 | Spring Valley Creek below Spring Valley WWTP outflow at Spring Valley, Minn. | 9/21/2009 | DS | nd |
| 64 | Cedar River above treatment plant at Austin, Minn. | 9/8/2009 | US | nd |
| 65 | Austin WWTP outflow at Austin, Minn. | 9/8/2009 | WWTP | nd |
| 66 | Cedar River below treatment plant at Austin, Minn. | 9/8/2009 | DS | nd |
| 67 | Okabena Creek above WWTP outflow at Worthington, Minn. | 9/9/2009 | US | nd |
| 68 | Worthington WWTP outflow at Worthington, Minn. | 9/9/2009 | WWTP | nd |
| 69 | Industrial WWTP outflow near Worthington, Minn. | 9/9/2009 | WWTP | nd |
| 70 | Okabena Creek below WWTP outflow at Worthington, Minn. | 9/9/2009 | DS | nd |
| 71 | Rock River above WWTP near Luverne, Minn. | 10/6/2009 | US | nd |
| 72 | Luverne WWTP outflow near Luverne, Minn. | 10/6/2009 | WWTP | nd |
| 73 | Rock River below WWTP near Luverne, Minn. | 10/6/2009 | DS | nd |

| USGS station name | *cis* - Androsterone (ng/L) | Bisphenol A (ng/L) | Cholesterol (ng/L) |
|---|---|---|---|
| Williams Creek above WWTP at Williams, Minn. | nd | nd | nd |
| Williams WWTP outflow at Williams, Minn. | nd | nd | 11000.00 |
| Williams Creek below WWTP at Williams, Minn. | nd | nd | nd |
| Shagawa Lake at Mouth of Burntside River near Ely, Minn. | nd | nd | nd |
| Ely WWTP outflow at Ely, Minn. | nd | 220.00 | 5900.00 |
| Shagawa Lake near Ely WWTP outflow at Ely, Minn. | nd | nd | 9800.00 |
| Elbow Creek above Eveleth WWTP at Eveleth, Minn. | nd | nd | nd |
| Eveleth WWTP outlflow at Eveleth, Minn. | nd | nd | 23000.00 |
| Elbow Creek below Eveleth WWTP at Eveleth, Minn. | nd | nd | 20000.00 |
| St. Louis River at Hwy. 23 above Fond Du Lac, Minn. | nd | nd | nd |
| Western Lake Superior Sanitary District - WWTP at Duluth, Minn. | nd | 1200.00 | nd |
| Lake Superior in St. Louis Bay at Duluth, Minn. | nd | 5000.00 | 6100.00 |
| Pelican River above WWTP at Pelican Rapids, Minn. | nd | nd | 2500.00 |
| Pelican Rapids WWTP outflow at Pelican Rapids, Minn. | nd | 45.52 | 4900.00 |
| Pelican River below WWTP at Pelican Rapids, Minn. | nd | nd | nd |
| Red River of the North above WWTP at East Grand Forks, Minn. | nd | nd | 6700.00 |
| East Grand Forks WWTP Outlow at East Grand Forks, MN | nd | nd | 20000.00 |
| Red River of the North below WWTP at East Grand Forks, Minn. | nd | nd | 3100.00 |
| Mississippi River above WWTP at Grand Rapids, Minn. | nd | nd | nd |
| Grand Rapids WWTP outflow at Grand Rapids, Minn. | nd | nd | nd |
| Mississippi River below WWTP at Grand Rapids, Minn. | nd | nd | nd |
| Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd | 8700.00 |
| Sauk Centre WWTP outflow at Sauk Centre, Minn. | nd | nd | 9900.00 |
| Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd | 8600.00 |
| Sauk River above Melrose WWTP at Melrose, Minn. | nd | nd | 5100.00 |
| Melrose WWTP outflow at Melrose, Minn. | nd | nd | 8300.00 |
| Sauk River below Melrose WWTP at Melrose, Minn. | nd | nd | 5100.00 |
| Tibbets Brook above WWTP outflow at Zimmerman, Minn. | nd | nd | nd |
| Zimmerman WWTP outflow at Zimmerman, Minn. | nd | 470.00 | nd |
| Tibbets Brook below WWTP outflow at Zimmerman, Minn. | nd | 200.00 | 3200.00 |
| Jewitts Creek at U.S. Hwy. 12 in Litchfield, Minn. | nd | nd | 4400.00 |
| Litchfield WWTP outflow near Litchfield, Minn. | nd | nd | nd |
| Jewitts Creek near Litchfield, Minn. | nd | nd | 3800.00 |
| South Fork of the Crow River above WWTP at Hutchinson, Minn. | nd | nd | 14000.00 |
| Hutchinson WWTP outflow at Hutchinson, Minn. | nd | nd | nd |
| South Fork of the Crow River below Hutchinson, Minn. | nd | nd | 14000.00 |
| South Fork Crow River above WWTP at Lester Prairie, Minn. | nd | nd | 5300.00 |
| Lester Prairie WWTP outflow at Lester Prairie, Minn. | nd | nd | nd |
| South Fork Crow River below WWTP at Lester Prairie, Minn. | nd | nd | 4300.00 |
| Redwood River above Lynd WWTP near Lynd, Minn. | nd | nd | nd |

| USGS station name | *cis* - Androsterone (ng/L) | Bisphenol A (ng/L) | Cholesterol (ng/L) |
|---|---|---|---|
| Lynd WWTP outflow near Lynd, Minn. | nd | nd | 44000.00 |
| Redwood River below Lynd WWTP near Lynd, Minn. | nd | nd | nd |
| Redwood River above WWTP below Marshall, Minn. | nd | 89.68 | 4900.00 |
| Marshall WWTP outfall at Marshall, Minn. | nd | nd | 9200.00 |
| Redwood River below WWTP near Marshall, Minn. | nd | nd | 9600.00 |
| Center Creek on Co. Rd. 143, at Fairmont, Minn. | nd | nd | nd |
| Fairmont WWTP outflow at Fairmont, Minn. | nd | 47.50 | 3100.00 |
| Center Creek below WWTP at Fairmont, Minn. | nd | nd | 5500.00 |
| Mississippi River at Industrial Mollasses, St. Paul, Minn. | nd | nd | 7600.00 |
| Metro Plant (WWTP) outflow in St. Paul, Minn. | nd | 130.00 | 3800.00 |
| Mississippi River at South St. Paul, Minn. | nd | nd | nd |
| Grindstone River above WWTP near Hinckley, Minn. | nd | nd | nd |
| Hinckley WWTP near Hinckley, Minn. | nd | nd | 4200.00 |
| Grindstone River below Hinckley, Minn. | nd | nd | nd |
| Mississippi River (Lake Pepin) above Lake City, Minn. | nd | nd | 4900.00 |
| Lake City WWTP outflow at Lake City, Minn. | nd | nd | 13000.00 |
| Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | nd | nd | 6400.00 |
| South Fork Zumbro River at Rochester, Minn. | nd | 48.78 | 5000.00 |
| Rochester WWTP outflow at Rochester, Minn. | nd | 49.70 | 4300.00 |
| South Fork Zumbro River below WWTP near Rochester, Minn. | nd | nd | 4400.00 |
| Spring Valley Creek above Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | nd |
| Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | 3200.00 |
| Spring Valley Creek below Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | nd |
| Cedar River above treatment plant at Austin, Minn. | nd | nd | 13000.00 |
| Austin WWTP outflow at Austin, Minn. | 4.62 | nd | 92000.00 |
| Cedar River below treatment plant at Austin, Minn. | nd | 6200.00 | 30000.00 |
| Okabena Creek above WWTP outflow at Worthington, Minn. | nd | nd | nd |
| Worthington WWTP outflow at Worthington, Minn. | nd | nd | 5800.00 |
| Industrial WWTP outflow near Worthington, Minn. | nd | nd | 5200.00 |
| Okabena Creek below WWTP outflow at Worthington, Minn. | nd | nd | 5300.00 |
| Rock River above WWTP near Luverne, Minn. | nd | nd | nd |
| Luverne WWTP outflow near Luverne, Minn. | 3.00 | nd | 49000.00 |
| Rock River below WWTP near Luverne, Minn. | nd | nd | nd |

| USGS station name | Coprostanol (ng/L) | Diethylstilbestrol (ng/L) | Equilenin (ng/L) |
|---|---|---|---|
| Williams Creek above WWTP at Williams, Minn. | nd | nd | nd |
| Williams WWTP outflow at Williams, Minn. | 660.00 | nd | nd |
| Williams Creek below WWTP at Williams, Minn. | nd | nd | nd |
| Shagawa Lake at Mouth of Burntside River near Ely, Minn. | nd | nd | nd |
| Ely WWTP outflow at Ely, Minn. | 2000.00 | nd | 2.00 |
| Shagawa Lake near Ely WWTP outflow at Ely, Minn. | 4400.00 | nd | nd |
| Elbow Creek above Eveleth WWTP at Eveleth, Minn. | nd | nd | nd |
| Eveleth WWTP outlflow at Eveleth, Minn. | 13000.00 | nd | 0.34 |
| Elbow Creek below Eveleth WWTP at Eveleth, Minn. | 10000.00 | nd | 0.31 |
| St. Louis River at Hwy. 23 above Fond Du Lac, Minn. | nd | nd | nd |
| Western Lake Superior Sanitary District - WWTP at Duluth, Minn. | nd | nd | nd |
| Lake Superior in St. Louis Bay at Duluth, Minn. | 5500.00 | nd | 8.16 |
| Pelican River above WWTP at Pelican Rapids, Minn. | nd | nd | nd |
| Pelican Rapids WWTP outflow at Pelican Rapids, Minn. | 3600.00 | nd | nd |
| Pelican River below WWTP at Pelican Rapids, Minn. | nd | nd | nd |
| Red River of the North above WWTP at East Grand Forks, Minn. | 250.00 | nd | nd |
| East Grand Forks WWTP Outlow at East Grand Forks, MN | 250.00 | nd | 1.84 |
| Red River of the North below WWTP at East Grand Forks, Minn. | nd | nd | nd |
| Mississippi River above WWTP at Grand Rapids, Minn. | nd | nd | nd |
| Grand Rapids WWTP outflow at Grand Rapids, Minn. | nd | nd | nd |
| Mississippi River below WWTP at Grand Rapids, Minn. | nd | nd | nd |
| Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd | nd |
| Sauk Centre WWTP outflow at Sauk Centre, Minn. | 4000.00 | nd | 0.98 |
| Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | 230.00 | nd | nd |
| Sauk River above Melrose WWTP at Melrose, Minn. | nd | nd | nd |
| Melrose WWTP outflow at Melrose, Minn. | 1200.00 | nd | nd |
| Sauk River below Melrose WWTP at Melrose, Minn. | nd | nd | nd |
| Tibbets Brook above WWTP outflow at Zimmerman, Minn. | nd | nd | nd |
| Zimmerman WWTP outflow at Zimmerman, Minn. | 360.00 | nd | nd |
| Tibbets Brook below WWTP outflow at Zimmerman, Minn. | 790.00 | nd | 1.40 |
| Jewitts Creek at U.S. Hwy. 12 in Litchfield, Minn. | nd | nd | nd |
| Litchfield WWTP outflow near Litchfield, Minn. | 310.00 | nd | nd |
| Jewitts Creek near Litchfield, Minn. | nd | nd | 0.97 |
| South Fork of the Crow River above WWTP at Hutchinson, Minn. | nd | nd | 2.09 |
| Hutchinson WWTP outflow at Hutchinson, Minn. | 230.00 | nd | nd |
| South Fork of the Crow River below Hutchinson, Minn. | nd | 1.03 | nd |
| South Fork Crow River above WWTP at Lester Prairie, Minn. | nd | nd | nd |
| Lester Prairie WWTP outflow at Lester Prairie, Minn. | 450.00 | nd | nd |
| South Fork Crow River below WWTP at Lester Prairie, Minn. | nd | nd | nd |
| Redwood River above Lynd WWTP near Lynd, Minn. | nd | nd | nd |

| USGS station name | Coprostanol (ng/L) | Diethylstilbestrol (ng/L) | Equilenin (ng/L) |
|---|---|---|---|
| Lynd WWTP outflow near Lynd, Minn. | 1800.00 | nd | nd |
| Redwood River below Lynd WWTP near Lynd, Minn. | nd | nd | nd |
| Redwood River above WWTP below Marshall, Minn. | nd | nd | nd |
| Marshall WWTP outfall at Marshall, Minn. | 2500.00 | nd | nd |
| Redwood River below WWTP near Marshall, Minn. | nd | nd | nd |
| Center Creek on Co. Rd. 143, at Fairmont, Minn. | nd | nd | 1.60 |
| Fairmont WWTP outflow at Fairmont, Minn. | 750.00 | nd | 2.90 |
| Center Creek below WWTP at Fairmont, Minn. | 450.00 | nd | 7.14 |
| Mississippi River at Industrial Mollasses, St. Paul, Minn. | nd | nd | nd |
| Metro Plant (WWTP) outflow in St. Paul, Minn. | 1700.00 | nd | nd |
| Mississippi River at South St. Paul, Minn. | nd | nd | nd |
| Grindstone River above WWTP near Hinckley, Minn. | nd | nd | nd |
| Hinckley WWTP near Hinckley, Minn. | 920.00 | nd | nd |
| Grindstone River below Hinckley, Minn. | nd | nd | nd |
| Mississippi River (Lake Pepin) above Lake City, Minn. | nd | 0.10 | nd |
| Lake City WWTP outflow at Lake City, Minn. | 9400.00 | nd | nd |
| Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | nd | nd | nd |
| South Fork Zumbro River at Rochester, Minn. | nd | nd | nd |
| Rochester WWTP outflow at Rochester, Minn. | 2400.00 | nd | nd |
| South Fork Zumbro River below WWTP near Rochester, Minn. | 650.00 | nd | 0.46 |
| Spring Valley Creek above Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | nd |
| Spring Valley WWTP outflow at Spring Valley, Minn. | 980.00 | nd | 0.29 |
| Spring Valley Creek below Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | nd |
| Cedar River above treatment plant at Austin, Minn. | nd | nd | nd |
| Austin WWTP outflow at Austin, Minn. | nd | nd | 2.46 |
| Cedar River below treatment plant at Austin, Minn. | 12000.00 | nd | 1.12 |
| Okabena Creek above WWTP outflow at Worthington, Minn. | nd | nd | nd |
| Worthington WWTP outflow at Worthington, Minn. | 4600.00 | nd | nd |
| Industrial WWTP outflow near Worthington, Minn. | 750.00 | nd | nd |
| Okabena Creek below WWTP outflow at Worthington, Minn. | 790.00 | nd | nd |
| Rock River above WWTP near Luverne, Minn. | nd | nd | nd |
| Luverne WWTP outflow near Luverne, Minn. | 14000.00 | nd | nd |
| Rock River below WWTP near Luverne, Minn. | nd | nd | nd |

| USGS station name | Equilin (ng/L) | 17-*alpha*-estradiol (ng/L) | 17-*beta*-estradiol (ng/L) | Estriol (ng/L) |
|---|---|---|---|---|
| Williams Creek above WWTP at Williams, Minn. | nd | nd | nd | nd |
| Williams WWTP outflow at Williams, Minn. | nd | nd | nd | nd |
| Williams Creek below WWTP at Williams, Minn. | nd | nd | nd | nd |
| Shagawa Lake at Mouth of Burntside River near Ely, Minn. | nd | nd | nd | nd |
| Ely WWTP outflow at Ely, Minn. | nd | 2.50 | 0.50 | 4.00 |
| Shagawa Lake near Ely WWTP outflow at Ely, Minn. | nd | nd | 0.50 | nd |
| Elbow Creek above Eveleth WWTP at Eveleth, Minn. | nd | nd | nd | nd |
| Eveleth WWTP outlflow at Eveleth, Minn. | nd | nd | 0.82 | nd |
| Elbow Creek below Eveleth WWTP at Eveleth, Minn. | nd | nd | 1.20 | nd |
| St. Louis River at Hwy. 23 above Fond Du Lac, Minn. | nd | nd | nd | nd |
| Western Lake Superior Sanitary District - WWTP at Duluth, Minn. | nd | nd | nd | nd |
| Lake Superior in St. Louis Bay at Duluth, Minn. | nd | nd | 1.93 | nd |
| Pelican River above WWTP at Pelican Rapids, Minn. | nd | nd | nd | nd |
| Pelican Rapids WWTP outflow at Pelican Rapids, Minn. | nd | 1.17 | 10.23 | 11.00 |
| Pelican River below WWTP at Pelican Rapids, Minn. | nd | nd | 0.57 | nd |
| Red River of the North above WWTP at East Grand Forks, Minn. | nd | nd | nd | nd |
| East Grand Forks WWTP Outlow at East Grand Forks, MN | nd | nd | 1.40 | nd |
| Red River of the North below WWTP at East Grand Forks, Minn. | nd | nd | nd | nd |
| Mississippi River above WWTP at Grand Rapids, Minn. | nd | nd | nd | nd |
| Grand Rapids WWTP outflow at Grand Rapids, Minn. | nd | 0.48 | 1.13 | nd |
| Mississippi River below WWTP at Grand Rapids, Minn. | nd | nd | nd | nd |
| Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd | 1.38 | nd |
| Sauk Centre WWTP outflow at Sauk Centre, Minn. | nd | nd | 0.43 | 0.66 |
| Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd | 0.67 | nd |
| Sauk River above Melrose WWTP at Melrose, Minn. | nd | nd | nd | nd |
| Melrose WWTP outflow at Melrose, Minn. | nd | nd | 1.74 | nd |
| Sauk River below Melrose WWTP at Melrose, Minn. | nd | nd | nd | nd |
| Tibbets Brook above WWTP outflow at Zimmerman, Minn. | nd | 0.61 | nd | nd |
| Zimmerman WWTP outflow at Zimmerman, Minn. | nd | nd | 0.74 | 0.50 |
| Tibbets Brook below WWTP outflow at Zimmerman, Minn. | nd | 0.40 | nd | 0.50 |
| Jewitts Creek at U.S. Hwy. 12 in Litchfield, Minn. | nd | nd | nd | nd |
| Litchfield WWTP outflow near Litchfield, Minn. | nd | nd | nd | nd |
| Jewitts Creek near Litchfield, Minn. | nd | nd | 0.44 | nd |
| South Fork of the Crow River above WWTP at Hutchinson, Minn. | nd | nd | 3.25 | 1.42 |
| Hutchinson WWTP outflow at Hutchinson, Minn. | nd | nd | 1.13 | nd |
| South Fork of the Crow River below Hutchinson, Minn. | nd | nd | 0.61 | 0.35 |
| South Fork Crow River above WWTP at Lester Prairie, Minn. | nd | nd | nd | nd |
| Lester Prairie WWTP outflow at Lester Prairie, Minn. | nd | nd | nd | nd |
| South Fork Crow River below WWTP at Lester Prairie, Minn. | nd | nd | nd | nd |
| Redwood River above Lynd WWTP near Lynd, Minn. | nd | nd | nd | nd |

| USGS station name | Equilin (ng/L) | 17-*alpha*-estradiol (ng/L) | 17-*beta*-estradiol (ng/L) | Estriol (ng/L) |
|---|---|---|---|---|
| Lynd WWTP outflow near Lynd, Minn. | nd | 1.03 | 6.80 | nd |
| Redwood River below Lynd WWTP near Lynd, Minn. | nd | nd | nd | nd |
| Redwood River above WWTP below Marshall, Minn. | nd | nd | nd | nd |
| Marshall WWTP outfall at Marshall, Minn. | nd | nd | 0.91 | nd |
| Redwood River below WWTP near Marshall, Minn. | nd | nd | nd | nd |
| Center Creek on Co. Rd. 143, at Fairmont, Minn. | nd | nd | nd | nd |
| Fairmont WWTP outflow at Fairmont, Minn. | nd | nd | 1.48 | nd |
| Center Creek below WWTP at Fairmont, Minn. | nd | nd | 2.45 | nd |
| Mississippi River at Industrial Mollasses, St. Paul, Minn. | nd | nd | nd | nd |
| Metro Plant (WWTP) outflow in St. Paul, Minn. | nd | nd | 4.35 | nd |
| Mississippi River at South St. Paul, Minn. | nd | nd | nd | nd |
| Grindstone River above WWTP near Hinckley, Minn. | nd | nd | nd | nd |
| Hinckley WWTP near Hinckley, Minn. | nd | nd | 1.05 | nd |
| Grindstone River below Hinckley, Minn. | nd | nd | nd | nd |
| Mississippi River (Lake Pepin) above Lake City, Minn. | nd | nd | nd | nd |
| Lake City WWTP outflow at Lake City, Minn. | nd | nd | 2.85 | 0.90 |
| Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | nd | nd | nd | nd |
| South Fork Zumbro River at Rochester, Minn. | nd | nd | nd | nd |
| Rochester WWTP outflow at Rochester, Minn. | nd | nd | nd | nd |
| South Fork Zumbro River below WWTP near Rochester, Minn. | nd | nd | nd | nd |
| Spring Valley Creek above Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | nd | nd |
| Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | nd | nd |
| Spring Valley Creek below Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | nd | nd |
| Cedar River above treatment plant at Austin, Minn. | nd | 0.39 | 2.23 | nd |
| Austin WWTP outflow at Austin, Minn. | nd | 0.62 | 1.95 | 2.70 |
| Cedar River below treatment plant at Austin, Minn. | nd | nd | 3.27 | 0.50 |
| Okabena Creek above WWTP outflow at Worthington, Minn. | nd | nd | nd | nd |
| Worthington WWTP outflow at Worthington, Minn. | nd | nd | nd | nd |
| Industrial WWTP outflow near Worthington, Minn. | nd | nd | nd | nd |
| Okabena Creek below WWTP outflow at Worthington, Minn. | nd | nd | nd | nd |
| Rock River above WWTP near Luverne, Minn. | nd | nd | nd | nd |
| Luverne WWTP outflow near Luverne, Minn. | nd | nd | 1.24 | 1.40 |
| Rock River below WWTP near Luverne, Minn. | nd | nd | 0.48 | nd |

| USGS station name | Estrone (ng/L) | 17-*alpha*-Ethinylestradiol (ng/L) | Mestranol (ng/L) | Norethindrone (ng/L) |
|---|---|---|---|---|
| Williams Creek above WWTP at Williams, Minn. | nd | nd | nd | nd |
| Williams WWTP outflow at Williams, Minn. | nd | nd | nd | nd |
| Williams Creek below WWTP at Williams, Minn. | nd | nd | nd | nd |
| Shagawa Lake at Mouth of Burntside River near Ely, Minn. | nd | nd | nd | nd |
| Ely WWTP outflow at Ely, Minn. | 14.43 | 0.54 | nd | nd |
| Shagawa Lake near Ely WWTP outflow at Ely, Minn. | 9.25 | nd | nd | nd |
| Elbow Creek above Eveleth WWTP at Eveleth, Minn. | nd | nd | nd | nd |
| Eveleth WWTP outlflow at Eveleth, Minn. | nd | nd | nd | nd |
| Elbow Creek below Eveleth WWTP at Eveleth, Minn. | nd | nd | nd | nd |
| St. Louis River at Hwy. 23 above Fond Du Lac, Minn. | nd | 0.10 | nd | nd |
| Western Lake Superior Sanitary District - WWTP at Duluth, Minn. | nd | nd | nd | nd |
| Lake Superior in St. Louis Bay at Duluth, Minn. | 10.00 | nd | nd | nd |
| Pelican River above WWTP at Pelican Rapids, Minn. | nd | nd | nd | nd |
| Pelican Rapids WWTP outflow at Pelican Rapids, Minn. | 18.34 | nd | nd | nd |
| Pelican River below WWTP at Pelican Rapids, Minn. | nd | nd | nd | nd |
| Red River of the North above WWTP at East Grand Forks, Minn. | nd | nd | nd | nd |
| East Grand Forks WWTP Outlow at East Grand Forks, MN | 4.47 | nd | nd | nd |
| Red River of the North below WWTP at East Grand Forks, Minn. | nd | nd | nd | nd |
| Mississippi River above WWTP at Grand Rapids, Minn. | nd | nd | nd | nd |
| Grand Rapids WWTP outflow at Grand Rapids, Minn. | 5.52 | nd | nd | nd |
| Mississippi River below WWTP at Grand Rapids, Minn. | nd | nd | nd | nd |
| Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | nd | 0.33 | nd | nd |
| Sauk Centre WWTP outflow at Sauk Centre, Minn. | 2.11 | 0.21 | nd | nd |
| Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | nd | 0.30 | nd | nd |
| Sauk River above Melrose WWTP at Melrose, Minn. | nd | nd | nd | nd |
| Melrose WWTP outflow at Melrose, Minn. | 9.40 | 0.18 | nd | nd |
| Sauk River below Melrose WWTP at Melrose, Minn. | nd | nd | nd | nd |
| Tibbets Brook above WWTP outflow at Zimmerman, Minn. | nd | nd | nd | nd |
| Zimmerman WWTP outflow at Zimmerman, Minn. | nd | 0.48 | nd | nd |
| Tibbets Brook below WWTP outflow at Zimmerman, Minn. | nd | nd | 0.18 | nd |
| Jewitts Creek at U.S. Hwy. 12 in Litchfield, Minn. | nd | nd | nd | nd |
| Litchfield WWTP outflow near Litchfield, Minn. | nd | nd | nd | nd |
| Jewitts Creek near Litchfield, Minn. | nd | nd | nd | nd |
| South Fork of the Crow River above WWTP at Hutchinson, Minn. | 32.49 | 1.46 | nd | nd |
| Hutchinson WWTP outflow at Hutchinson, Minn. | nd | 0.71 | nd | nd |
| South Fork of the Crow River below Hutchinson, Minn. | 8.14 | 0.49 | nd | nd |
| South Fork Crow River above WWTP at Lester Prairie, Minn. | nd | nd | nd | nd |
| Lester Prairie WWTP outflow at Lester Prairie, Minn. | nd | nd | nd | nd |
| South Fork Crow River below WWTP at Lester Prairie, Minn. | nd | nd | nd | nd |
| Redwood River above Lynd WWTP near Lynd, Minn. | nd | nd | nd | nd |

| USGS station name | Estrone (ng/L) | 17-*alpha*-Ethinylestradiol (ng/L) | Mestranol (ng/L) | Norethindrone (ng/L) |
|---|---|---|---|---|
| Lynd WWTP outflow near Lynd, Minn. | 18.00 | nd | nd | nd |
| Redwood River below Lynd WWTP near Lynd, Minn. | nd | nd | nd | nd |
| Redwood River above WWTP below Marshall, Minn. | nd | nd | nd | nd |
| Marshall WWTP outfall at Marshall, Minn. | 3.04 | 0.11 | nd | nd |
| Redwood River below WWTP near Marshall, Minn. | nd | nd | nd | nd |
| Center Creek on Co. Rd. 143, at Fairmont, Minn. | 2.68 | nd | nd | nd |
| Fairmont WWTP outflow at Fairmont, Minn. | 9.62 | nd | nd | nd |
| Center Creek below WWTP at Fairmont, Minn. | 5.55 | nd | nd | nd |
| Mississippi River at Industrial Mollasses, St. Paul, Minn. | nd | nd | nd | nd |
| Metro Plant (WWTP) outflow in St. Paul, Minn. | 38.00 | 0.24 | nd | nd |
| Mississippi River at South St. Paul, Minn. | nd | nd | nd | nd |
| Grindstone River above WWTP near Hinckley, Minn. | nd | nd | nd | nd |
| Hinckley WWTP near Hinckley, Minn. | nd | nd | nd | nd |
| Grindstone River below Hinckley, Minn. | nd | nd | nd | nd |
| Mississippi River (Lake Pepin) above Lake City, Minn. | nd | nd | nd | nd |
| Lake City WWTP outflow at Lake City, Minn. | 18.09 | 0.29 | nd | nd |
| Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | nd | 0.18 | nd | nd |
| South Fork Zumbro River at Rochester, Minn. | nd | nd | nd | nd |
| Rochester WWTP outflow at Rochester, Minn. | nd | 0.31 | nd | nd |
| South Fork Zumbro River below WWTP near Rochester, Minn. | nd | nd | nd | nd |
| Spring Valley Creek above Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | nd | nd |
| Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | nd | nd |
| Spring Valley Creek below Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | nd | nd |
| Cedar River above treatment plant at Austin, Minn. | 2.68 | nd | nd | nd |
| Austin WWTP outflow at Austin, Minn. | 22.02 | 0.26 | nd | nd |
| Cedar River below treatment plant at Austin, Minn. | 6.23 | nd | nd | nd |
| Okabena Creek above WWTP outflow at Worthington, Minn. | nd | nd | nd | nd |
| Worthington WWTP outflow at Worthington, Minn. | nd | nd | nd | nd |
| Industrial WWTP outflow near Worthington, Minn. | nd | nd | nd | nd |
| Okabena Creek below WWTP outflow at Worthington, Minn. | nd | nd | nd | nd |
| Rock River above WWTP near Luverne, Minn. | nd | nd | nd | nd |
| Luverne WWTP outflow near Luverne, Minn. | 5.69 | nd | nd | nd |
| Rock River below WWTP near Luverne, Minn. | nd | nd | nd | nd |

| USGS station name | Progesterone (ng/L) | Testosterone (ng/L) | Dihydro-Testosterone (ng/L) |
|---|---|---|---|
| Williams Creek above WWTP at Williams, Minn. | nd | nd | nd |
| Williams WWTP outflow at Williams, Minn. | nd | nd | nd |
| Williams Creek below WWTP at Williams, Minn. | nd | nd | nd |
| Shagawa Lake at Mouth of Burntside River near Ely, Minn. | nd | nd | nd |
| Ely WWTP outflow at Ely, Minn. | nd | nd | nd |
| Shagawa Lake near Ely WWTP outflow at Ely, Minn. | nd | nd | nd |
| Elbow Creek above Eveleth WWTP at Eveleth, Minn. | nd | nd | nd |
| Eveleth WWTP outlflow at Eveleth, Minn. | nd | nd | nd |
| Elbow Creek below Eveleth WWTP at Eveleth, Minn. | nd | nd | nd |
| St. Louis River at Hwy. 23 above Fond Du Lac, Minn. | nd | nd | nd |
| Western Lake Superior Sanitary District - WWTP at Duluth, Minn. | nd | nd | nd |
| Lake Superior in St. Louis Bay at Duluth, Minn. | nd | nd | nd |
| Pelican River above WWTP at Pelican Rapids, Minn. | nd | nd | nd |
| Pelican Rapids WWTP outflow at Pelican Rapids, Minn. | nd | nd | nd |
| Pelican River below WWTP at Pelican Rapids, Minn. | nd | nd | nd |
| Red River of the North above WWTP at East Grand Forks, Minn. | nd | nd | nd |
| East Grand Forks WWTP Outlow at East Grand Forks, MN | nd | nd | nd |
| Red River of the North below WWTP at East Grand Forks, Minn. | nd | nd | nd |
| Mississippi River above WWTP at Grand Rapids, Minn. | nd | nd | nd |
| Grand Rapids WWTP outflow at Grand Rapids, Minn. | nd | nd | nd |
| Mississippi River below WWTP at Grand Rapids, Minn. | nd | nd | nd |
| Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd | nd |
| Sauk Centre WWTP outflow at Sauk Centre, Minn. | nd | nd | nd |
| Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd | nd |
| Sauk River above Melrose WWTP at Melrose, Minn. | nd | nd | nd |
| Melrose WWTP outflow at Melrose, Minn. | nd | nd | nd |
| Sauk River below Melrose WWTP at Melrose, Minn. | nd | nd | nd |
| Tibbets Brook above WWTP outflow at Zimmerman, Minn. | nd | nd | nd |
| Zimmerman WWTP outflow at Zimmerman, Minn. | nd | 0.60 | nd |
| Tibbets Brook below WWTP outflow at Zimmerman, Minn. | nd | nd | nd |
| Jewitts Creek at U.S. Hwy. 12 in Litchfield, Minn. | nd | nd | nd |
| Litchfield WWTP outflow near Litchfield, Minn. | nd | nd | nd |
| Jewitts Creek near Litchfield, Minn. | nd | nd | nd |
| South Fork of the Crow River above WWTP at Hutchinson, Minn. | nd | nd | nd |
| Hutchinson WWTP outflow at Hutchinson, Minn. | nd | nd | nd |
| South Fork of the Crow River below Hutchinson, Minn. | nd | nd | nd |
| South Fork Crow River above WWTP at Lester Prairie, Minn. | nd | nd | nd |
| Lester Prairie WWTP outflow at Lester Prairie, Minn. | nd | nd | nd |
| South Fork Crow River below WWTP at Lester Prairie, Minn. | nd | nd | nd |
| Redwood River above Lynd WWTP near Lynd, Minn. | nd | nd | nd |

| USGS station name | Progesterone (ng/L) | Testosterone (ng/L) | Dihydro-Testosterone (ng/L) |
|---|---|---|---|
| Lynd WWTP outflow near Lynd, Minn. | nd | nd | nd |
| Redwood River below Lynd WWTP near Lynd, Minn. | nd | nd | nd |
| Redwood River above WWTP below Marshall, Minn. | nd | nd | nd |
| Marshall WWTP outfall at Marshall, Minn. | nd | nd | nd |
| Redwood River below WWTP near Marshall, Minn. | nd | nd | nd |
| Center Creek on Co. Rd. 143, at Fairmont, Minn. | nd | nd | nd |
| Fairmont WWTP outflow at Fairmont, Minn. | nd | nd | nd |
| Center Creek below WWTP at Fairmont, Minn. | nd | nd | nd |
| Mississippi River at Industrial Mollasses, St. Paul, Minn. | nd | nd | nd |
| Metro Plant (WWTP) outflow in St. Paul, Minn. | nd | nd | nd |
| Mississippi River at South St. Paul, Minn. | nd | nd | nd |
| Grindstone River above WWTP near Hinckley, Minn. | nd | nd | nd |
| Hinckley WWTP near Hinckley, Minn. | nd | nd | nd |
| Grindstone River below Hinckley, Minn. | nd | nd | nd |
| Mississippi River (Lake Pepin) above Lake City, Minn. | nd | nd | nd |
| Lake City WWTP outflow at Lake City, Minn. | nd | nd | nd |
| Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | nd | nd | nd |
| South Fork Zumbro River at Rochester, Minn. | nd | nd | nd |
| Rochester WWTP outflow at Rochester, Minn. | nd | nd | nd |
| South Fork Zumbro River below WWTP near Rochester, Minn. | nd | nd | nd |
| Spring Valley Creek above Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | nd |
| Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | nd |
| Spring Valley Creek below Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd | nd |
| Cedar River above treatment plant at Austin, Minn. | nd | nd | nd |
| Austin WWTP outflow at Austin, Minn. | nd | nd | nd |
| Cedar River below treatment plant at Austin, Minn. | nd | nd | nd |
| Okabena Creek above WWTP outflow at Worthington, Minn. | nd | nd | nd |
| Worthington WWTP outflow at Worthington, Minn. | nd | nd | nd |
| Industrial WWTP outflow near Worthington, Minn. | nd | nd | nd |
| Okabena Creek below WWTP outflow at Worthington, Minn. | nd | nd | nd |
| Rock River above WWTP near Luverne, Minn. | nd | nd | nd |
| Luverne WWTP outflow near Luverne, Minn. | nd | nd | nd |
| Rock River below WWTP near Luverne, Minn. | nd | nd | nd |

| USGS station name | Epi-testosterone (ng/L) | 11-*keto*-Testosterone (ng/L) |
|---|---|---|
| Williams Creek above WWTP at Williams, Minn. | nd | nd |
| Williams WWTP outflow at Williams, Minn. | nd | nd |
| Williams Creek below WWTP at Williams, Minn. | nd | nd |
| Shagawa Lake at Mouth of Burntside River near Ely, Minn. | nd | nd |
| Ely WWTP outflow at Ely, Minn. | nd | nd |
| Shagawa Lake near Ely WWTP outflow at Ely, Minn. | nd | nd |
| Elbow Creek above Eveleth WWTP at Eveleth, Minn. | nd | nd |
| Eveleth WWTP outlflow at Eveleth, Minn. | nd | nd |
| Elbow Creek below Eveleth WWTP at Eveleth, Minn. | nd | nd |
| St. Louis River at Hwy. 23 above Fond Du Lac, Minn. | nd | nd |
| Western Lake Superior Sanitary District - WWTP at Duluth, Minn. | nd | nd |
| Lake Superior in St. Louis Bay at Duluth, Minn. | nd | nd |
| Pelican River above WWTP at Pelican Rapids, Minn. | nd | nd |
| Pelican Rapids WWTP outflow at Pelican Rapids, Minn. | nd | nd |
| Pelican River below WWTP at Pelican Rapids, Minn. | nd | nd |
| Red River of the North above WWTP at East Grand Forks, Minn. | nd | nd |
| East Grand Forks WWTP Outlow at East Grand Forks, MN | nd | nd |
| Red River of the North below WWTP at East Grand Forks, Minn. | nd | nd |
| Mississippi River above WWTP at Grand Rapids, Minn. | nd | nd |
| Grand Rapids WWTP outflow at Grand Rapids, Minn. | nd | nd |
| Mississippi River below WWTP at Grand Rapids, Minn. | nd | nd |
| Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd |
| Sauk Centre WWTP outflow at Sauk Centre, Minn. | nd | nd |
| Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd |
| Sauk River above Melrose WWTP at Melrose, Minn. | nd | nd |
| Melrose WWTP outflow at Melrose, Minn. | nd | nd |
| Sauk River below Melrose WWTP at Melrose, Minn. | nd | nd |
| Tibbets Brook above WWTP outflow at Zimmerman, Minn. | nd | nd |
| Zimmerman WWTP outflow at Zimmerman, Minn. | nd | nd |
| Tibbets Brook below WWTP outflow at Zimmerman, Minn. | nd | nd |
| Jewitts Creek at U.S. Hwy. 12 in Litchfield, Minn. | nd | nd |
| Litchfield WWTP outflow near Litchfield, Minn. | nd | nd |
| Jewitts Creek near Litchfield, Minn. | nd | nd |
| South Fork of the Crow River above WWTP at Hutchinson, Minn. | nd | nd |
| Hutchinson WWTP outflow at Hutchinson, Minn. | nd | nd |
| South Fork of the Crow River below Hutchinson, Minn. | nd | nd |
| South Fork Crow River above WWTP at Lester Prairie, Minn. | nd | nd |
| Lester Prairie WWTP outflow at Lester Prairie, Minn. | nd | nd |
| South Fork Crow River below WWTP at Lester Prairie, Minn. | nd | nd |
| Redwood River above Lynd WWTP near Lynd, Minn. | nd | nd |

| USGS station name | Epi-testosterone (ng/L) | 11-*keto*-Testosterone (ng/L) |
|---|---|---|
| Lynd WWTP outflow near Lynd, Minn. | nd | nd |
| Redwood River below Lynd WWTP near Lynd, Minn. | nd | nd |
| Redwood River above WWTP below Marshall, Minn. | nd | nd |
| Marshall WWTP outfall at Marshall, Minn. | nd | nd |
| Redwood River below WWTP near Marshall, Minn. | nd | nd |
| Center Creek on Co. Rd. 143, at Fairmont, Minn. | nd | nd |
| Fairmont WWTP outflow at Fairmont, Minn. | nd | nd |
| Center Creek below WWTP at Fairmont, Minn. | nd | nd |
| Mississippi River at Industrial Mollasses, St. Paul, Minn. | nd | nd |
| Metro Plant (WWTP) outflow in St. Paul, Minn. | nd | nd |
| Mississippi River at South St. Paul, Minn. | nd | nd |
| Grindstone River above WWTP near Hinckley, Minn. | nd | nd |
| Hinckley WWTP near Hinckley, Minn. | nd | nd |
| Grindstone River below Hinckley, Minn. | nd | nd |
| Mississippi River (Lake Pepin) above Lake City, Minn. | nd | nd |
| Lake City WWTP outflow at Lake City, Minn. | nd | nd |
| Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | nd | nd |
| South Fork Zumbro River at Rochester, Minn. | nd | nd |
| Rochester WWTP outflow at Rochester, Minn. | nd | nd |
| South Fork Zumbro River below WWTP near Rochester, Minn. | nd | nd |
| Spring Valley Creek above Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd |
| Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd |
| Spring Valley Creek below Spring Valley WWTP outflow at Spring Valley, Minn. | nd | nd |
| Cedar River above treatment plant at Austin, Minn. | nd | nd |
| Austin WWTP outflow at Austin, Minn. | nd | nd |
| Cedar River below treatment plant at Austin, Minn. | nd | nd |
| Okabena Creek above WWTP outflow at Worthington, Minn. | nd | nd |
| Worthington WWTP outflow at Worthington, Minn. | nd | nd |
| Industrial WWTP outflow near Worthington, Minn. | nd | nd |
| Okabena Creek below WWTP outflow at Worthington, Minn. | nd | nd |
| Rock River above WWTP near Luverne, Minn. | nd | nd |
| Luverne WWTP outflow near Luverne, Minn. | nd | nd |
| Rock River below WWTP near Luverne, Minn. | nd | nd |

| Site number | USGS station name | Date | Time | Site type | Aceto-phenone (ng/g) | Acetyl hexamethyl-tetrahydro-naphthalene (ng/g) | Anthracene (ng/g) |
|---|---|---|---|---|---|---|---|
| 4 | Shagawa Lake at mouth of Burntside River near Ely, Minn. | 09/28/2009 | 1000 | US | nd | nd | nd |
| 6 | Shagawa Lake near Ely WWTP outflow at Ely, Minn. | 09/28/2009 | 1100 | DS | nd | 20 | 520 |
| 10 | St. Louis River at Hwy 23 above Fond Du Lac, Minn. | 10/01/2009 | 1300 | US | nd | nd | 20 |
| 12 | Lake Superior in St. Louis Bay at Duluth, Minn. | 10/01/2009 | 1000 | DS | nd | 80 | 370 |
| 19 | Mississippi River above WWTP at Grand Rapids, Minn. | 09/30/2009 | 1300 | US | nd | nd | 310 |
| 21 | Mississippi River below WWTP at Grand Rapids, Minn. | 09/30/2009 | 1000 | DS | nd | nd | 30 |
| 22 | Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | 09/16/2009 | 1100 | US | 60 | nd | 30 |
| 24 | Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | 09/16/2009 | 900 | DS | 110 | nd | 30 |
| 27 | Sauk River below Melrose WWTP at Melrose, Minn. | 09/17/2009 | 900 | DS | nd | nd | 40 |
| 34 | South Fork of the Crow River above WWTP at Hutchinson, Minn. | 09/14/2009 | 1400 | US | 20 | nd | 10 |
| 36 | South Fork of the Crow River below Hutchinson, Minn. | 09/14/2009 | 1100 | DS | nd | nd | nd |
| 37 | South Fork Crow River above WWTP at Lester Prairie, Minn. | 09/15/2009 | 1300 | US | nd | nd | nd |
| 39 | South Fork Crow River below WWTP at Lester Prairie, Minn. | 09/15/2009 | 1100 | DS | nd | nd | nd |
| 46 | Center Creek on Co. Rd. 143, at Fairmont, Minn. | 09/08/2009 | 1308 | US | nd | nd | 50 |
| 48 | Center Creek below WWTP at Fairmont, Minn. | 09/08/2009 | 900 | DS | nd | nd | nd |
| 49 | Mississippi River at Industrial Mollasses St. Paul, Minn. | 09/24/2009 | 1500 | US | nd | nd | 30 |
| 50 | Metro Plant (WWTP) outflow in St. Paul, Minn. | 09/24/2009 | 1000 | DS | 70 | 190 | 1000 |
| 51 | Mississippi River at South St. Paul, Minn. | 09/24/2009 | 1300 | DS | nd | nd | 60 |
| 52 | Grindstone River above WWTP near Hinckley, Minn. | 09/01/2009 | 1700 | US | nd | nd | nd |
| 54 | Grindstone River below Hinckley, Minn. | 09/01/2009 | 1400 | DS | nd | nd | nd |
| 55 | Mississippi River (Lake Pepin) above Lake City, Minn. | 09/23/2009 | 1100 | US | nd | nd | 20 |
| 57 | Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | 09/23/2009 | 1300 | DS | nd | nd | nd |
| 67 | Okabena Creek above WWTP outflow at Worthington, Minn. | 09/09/2009 | 1430 | US | nd | nd | 10 |
| 70 | Okabena Creek below WWTP outflow at Worthington, Minn. | 09/09/2009 | 1100 | DS | nd | 20 | 10 |

| USGS station name | 9,10-Anthraquinone (ng/g) | Atrazine (ng/g) | Benzo[a]-pyrene (ng/g) | Benzo-phenone (ng/g) | Bisphenol A (ng/g) | Bromacil (ng/g) | 3-*tert*-Butyl-4-hydroxy-anisole (ng/g) |
|---|---|---|---|---|---|---|---|
| Shagawa Lake at mouth of Burntside River near Ely, Minn. | nd | nd | nd | nd | nd | nd | nd |
| Shagawa Lake near Ely WWTP outflow at Ely, Minn. | 580 | nd | 1500 | nd | nd | nd | nd |
| St. Louis River at Hwy 23 above Fond Du Lac, Minn. | nd | nd | 30 | nd | 100 | nd | nd |
| Lake Superior in St. Louis Bay at Duluth, Minn. | 340 | nd | 560 | 120 | 310 | nd | nd |
| Mississippi River above WWTP at Grand Rapids, Minn. | 640 | nd | 960 | nd | 190 | nd | nd |
| Mississippi River below WWTP at Grand Rapids, Minn. | nd | nd | 90 | nd | 40 | nd | nd |
| Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | 64 | nd | 60 | nd | 80 | nd | nd |
| Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | 70 | nd | 80 | nd | nd | nd | nd |
| Sauk River below Melrose WWTP at Melrose, Minn. | 55 | nd | 120 | nd | nd | nd | nd |
| South Fork of the Crow River above WWTP at Hutchinson, Minn. | 18 | nd | 30 | nd | 70 | nd | nd |
| South Fork of the Crow River below Hutchinson, Minn. | 14 | nd | 20 | nd | 40 | nd | nd |
| South Fork Crow River above WWTP at Lester Prairie, Minn. | nd | nd | nd | nd | nd | nd | nd |
| South Fork Crow River below WWTP at Lester Prairie, Minn. | nd | nd | nd | nd | 110 | nd | nd |
| Center Creek on Co. Rd. 143, at Fairmont, Minn. | 100 | nd | 180 | nd | nd | nd | nd |
| Center Creek below WWTP at Fairmont, Minn. | nd | nd | nd | nd | nd | nd | nd |
| Mississippi River at Industrial Mollasses St. Paul, Minn. | nd | nd | 80 | nd | 60 | nd | nd |
| Metro Plant (WWTP) outflow in St. Paul, Minn. | 540 | nd | 3300 | nd | 90 | nd | nd |
| Mississippi River at South St. Paul, Minn. | 58 | nd | 180 | nd | nd | nd | nd |
| Grindstone River above WWTP near Hinckley, Minn. | nd | nd | 30 | nd | 70 | nd | nd |
| Grindstone River below Hinckley, Minn. | nd | nd | 10 | nd | nd | nd | nd |
| Mississippi River (Lake Pepin) above Lake City, Minn. | 33 | nd | 50 | nd | nd | nd | nd |
| Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | nd | nd | 20 | nd | nd | nd | nd |
| Okabena Creek above WWTP outflow at Worthington, Minn. | 28 | nd | 50 | nd | nd | nd | nd |
| Okabena Creek below WWTP outflow at Worthington, Minn. | 21 | nd | 20 | nd | nd | nd | nd |

| USGS station name | Camphor (ng/g) | Carbazole (ng/g) | Chlorpyrifos (ng/g) | Cholesterol (ng/g) | 3-*beta*-Coprostanol (ng/g) | *p*-Cresol (ng/g) | 4-Cumyl-phenol (ng/g) |
|---|---|---|---|---|---|---|---|
| Shagawa Lake at mouth of Burntside River near Ely, Minn. | nd | nd | nd | nd | nd | 360 | nd |
| Shagawa Lake near Ely WWTP outflow at Ely, Minn. | nd | 280 | nd | 4900 | 3800 | 340 | nd |
| St. Louis River at Hwy 23 above Fond Du Lac, Minn. | nd | nd | nd | nd | 230 | 110 | nd |
| Lake Superior in St. Louis Bay at Duluth, Minn. | nd | 170 | nd | 3500 | 3700 | 1000 | nd |
| Mississippi River above WWTP at Grand Rapids, Minn. | nd | 320 | nd | 4500 | 650 | 600 | 400 |
| Mississippi River below WWTP at Grand Rapids, Minn. | nd | 30 | nd | 6500 | 440 | 1800 | nd |
| Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | nd | 20 | nd | 3300 | nd | 360 | nd |
| Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | nd | 30 | nd | 4400 | 560 | 170 | nd |
| Sauk River below Melrose WWTP at Melrose, Minn. | nd | 20 | nd | 6200 | 420 | 60 | nd |
| South Fork of the Crow River above WWTP at Hutchinson, Minn. | nd | 10 | nd | 700 | 180 | 60 | 10 |
| South Fork of the Crow River below Hutchinson, Minn. | nd | nd | nd | 1900 | 290 | 60 | nd |
| South Fork Crow River above WWTP at Lester Prairie, Minn. | nd | nd | nd | 2100 | 260 | 160 | nd |
| South Fork Crow River below WWTP at Lester Prairie, Minn. | nd | nd | nd | 2000 | 290 | 150 | nd |
| Center Creek on Co. Rd. 143, at Fairmont, Minn. | nd | 70 | nd | 3400 | 380 | 170 | nd |
| Center Creek below WWTP at Fairmont, Minn. | nd | nd | nd | 4300 | 560 | 680 | nd |
| Mississippi River at Industrial Mollasses St. Paul, Minn. | nd | 10 | nd | 1600 | 370 | 410 | nd |
| Metro Plant (WWTP) outflow in St. Paul, Minn. | nd | 130 | nd | 1800 | 1900 | 270 | nd |
| Mississippi River at South St. Paul, Minn. | nd | 10 | nd | 1800 | 620 | 50 | nd |
| Grindstone River above WWTP near Hinckley, Minn. | nd | 20 | nd | 2900 | 620 | 130 | nd |
| Grindstone River below Hinckley, Minn. | nd | nd | nd | 1200 | 330 | 30 | nd |
| Mississippi River (Lake Pepin) above Lake City, Minn. | nd | nd | nd | 2800 | 630 | 90 | nd |
| Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | nd | nd | nd | 1500 | 260 | 60 | nd |
| Okabena Creek above WWTP outflow at Worthington, Minn. | nd | 10 | nd | 2200 | 500 | 30 | nd |
| Okabena Creek below WWTP outflow at Worthington, Minn. | nd | nd | nd | 1300 | 570 | 30 | nd |

| USGS station name | Diazinon (ng/g) | 1,4-Dichloro-benzene (ng/g) | Diethyl-hexyl phthalate (ng/g) | Diethyl phthalate (ng/g) | 2,6-Dimethyl-naphthalene (ng/g) | Fluoranthene (ng/g) | Hexahydro-hexamethyl-cyclopenta-benzopyran (HHCB) (ng/g) |
|---|---|---|---|---|---|---|---|
| Shagawa Lake at mouth of Burntside River near Ely, Minn. | nd | nd | nd | nd | 20 | 70 | nd |
| Shagawa Lake near Ely WWTP outflow at Ely, Minn. | nd | 94 | 610 | nd | 100 | 6000 | 60 |
| St. Louis River at Hwy 23 above Fond Du Lac, Minn. | nd | nd | nd | nd | 30 | 80 | nd |
| Lake Superior in St. Louis Bay at Duluth, Minn. | nd | 240 | 830 | nd | 340 | 2800 | 400 |
| Mississippi River above WWTP at Grand Rapids, Minn. | nd | nd | 590 | nd | 70 | 4700 | nd |
| Mississippi River below WWTP at Grand Rapids, Minn. | nd | nd | nd | nd | 230 | 350 | nd |
| Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd | nd | nd | 80 | 300 | nd |
| Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd | nd | nd | 80 | 300 | 10 |
| Sauk River below Melrose WWTP at Melrose, Minn. | nd | nd | nd | nd | 60 | 330 | nd |
| South Fork of the Crow River above WWTP at Hutchinson, Minn. | nd | nd | nd | nd | 30 | 130 | nd |
| South Fork of the Crow River below Hutchinson, Minn. | nd | nd | nd | nd | 30 | 70 | nd |
| South Fork Crow River above WWTP at Lester Prairie, Minn. | nd | nd | nd | nd | 50 | 10 | nd |
| South Fork Crow River below WWTP at Lester Prairie, Minn. | nd | nd | nd | nd | 70 | 20 | nd |
| Center Creek on Co. Rd. 143, at Fairmont, Minn. | nd | nd | nd | nd | 50 | 830 | nd |
| Center Creek below WWTP at Fairmont, Minn. | nd | nd | nd | nd | 70 | 40 | 90 |
| Mississippi River at Industrial Mollasses St. Paul, Minn. | nd | nd | 170 | nd | 50 | 200 | nd |
| Metro Plant (WWTP) outflow in St. Paul, Minn. | nd | 53 | 560 | nd | 140 | 5600 | 1000 |
| Mississippi River at South St. Paul, Minn. | nd | nd | nd | nd | 50 | 480 | 30 |
| Grindstone River above WWTP near Hinckley, Minn. | nd | nd | nd | nd | 40 | 90 | nd |
| Grindstone River below Hinckley, Minn. | nd | nd | nd | nd | 20 | 30 | nd |
| Mississippi River (Lake Pepin) above Lake City, Minn. | nd | nd | nd | nd | 300 | 150 | nd |
| Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | nd | nd | nd | nd | 70 | 60 | nd |
| Okabena Creek above WWTP outflow at Worthington, Minn. | nd | nd | nd | nd | 30 | 130 | 30 |
| Okabena Creek below WWTP outflow at Worthington, Minn. | nd | nd | nd | nd | 20 | 80 | 40 |

| USGS station name | Indole (ng/g) | Isoborneol (ng/g) | Isophorone (ng/g) | Isopropyl-benzene (ng/g) | Isoquinoline (ng/g) | *d*-Limonene (ng/g) | Menthol (ng/g) |
|---|---|---|---|---|---|---|---|
| Shagawa Lake at mouth of Burntside River near Ely, Minn. | 1300 | nd | nd | nd | nd | nd | nd |
| Shagawa Lake near Ely WWTP outflow at Ely, Minn. | 1000 | nd | 20 | nd | nd | 80 | nd |
| St. Louis River at Hwy 23 above Fond Du Lac, Minn. | 310 | nd | nd | nd | nd | 60 | nd |
| Lake Superior in St. Louis Bay at Duluth, Minn. | 670 | nd | nd | 50 | nd | nd | nd |
| Mississippi River above WWTP at Grand Rapids, Minn. | 830 | nd | nd | nd | nd | 280 | nd |
| Mississippi River below WWTP at Grand Rapids, Minn. | 360 | nd | nd | nd | nd | nd | nd |
| Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | 720 | nd | 10 | nd | nd | nd | nd |
| Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | 1200 | nd | 10 | nd | nd | nd | nd |
| Sauk River below Melrose WWTP at Melrose, Minn. | 1100 | nd | 10 | nd | nd | nd | nd |
| South Fork of the Crow River above WWTP at Hutchinson, Minn. | 150 | nd | nd | nd | nd | nd | nd |
| South Fork of the Crow River below Hutchinson, Minn. | 150 | nd | nd | nd | nd | nd | nd |
| South Fork Crow River above WWTP at Lester Prairie, Minn. | 540 | nd | nd | nd | nd | nd | nd |
| South Fork Crow River below WWTP at Lester Prairie, Minn. | 650 | nd | nd | nd | nd | nd | nd |
| Center Creek on Co. Rd. 143, at Fairmont, Minn. | 480 | nd | nd | nd | nd | nd | nd |
| Center Creek below WWTP at Fairmont, Minn. | 730 | nd | nd | nd | nd | nd | nd |
| Mississippi River at Industrial Mollasses St. Paul, Minn. | 260 | nd | nd | nd | nd | nd | nd |
| Metro Plant (WWTP) outflow in St. Paul, Minn. | 410 | nd | nd | nd | nd | nd | nd |
| Mississippi River at South St. Paul, Minn. | 210 | nd | nd | nd | nd | nd | nd |
| Grindstone River above WWTP near Hinckley, Minn. | 740 | nd | 10 | nd | nd | nd | nd |
| Grindstone River below Hinckley, Minn. | 380 | nd | nd | nd | nd | 50 | nd |
| Mississippi River (Lake Pepin) above Lake City, Minn. | 590 | nd | 20 | nd | nd | nd | nd |
| Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | 230 | nd | 10 | nd | nd | nd | nd |
| Okabena Creek above WWTP outflow at Worthington, Minn. | 220 | nd | nd | nd | nd | nd | nd |
| Okabena Creek below WWTP outflow at Worthington, Minn. | 150 | nd | nd | nd | nd | nd | nd |

| USGS station name | 3-Methyl-1H-indole (ng/g) | 1-Methyl-naphthalene (ng/g) | 2-Methyl-naphthalene (ng/g) | Metolachlor (ng/g) | Naphthalene (ng/g) | N,N-diethyl-*meta*-toluamide (DEET) (ng/g) |
|---|---|---|---|---|---|---|
| Shagawa Lake at mouth of Burntside River near Ely, Minn. | 70 | nd | nd | nd | nd | nd |
| Shagawa Lake near Ely WWTP outflow at Ely, Minn. | 90 | 100 | 190 | nd | 240 | nd |
| St. Louis River at Hwy 23 above Fond Du Lac, Minn. | 10 | nd | nd | nd | nd | nd |
| Lake Superior in St. Louis Bay at Duluth, Minn. | 80 | 430 | 850 | nd | 1900 | nd |
| Mississippi River above WWTP at Grand Rapids, Minn. | 70 | 30 | 40 | nd | 90 | nd |
| Mississippi River below WWTP at Grand Rapids, Minn. | 60 | nd | nd | nd | nd | nd |
| Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | 80 | nd | nd | nd | nd | nd |
| Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | 50 | nd | nd | nd | nd | nd |
| Sauk River below Melrose WWTP at Melrose, Minn. | 40 | nd | nd | nd | nd | nd |
| South Fork of the Crow River above WWTP at Hutchinson, Minn. | 10 | nd | nd | nd | nd | nd |
| South Fork of the Crow River below Hutchinson, Minn. | nd | nd | nd | nd | nd | nd |
| South Fork Crow River above WWTP at Lester Prairie, Minn. | 30 | nd | nd | nd | nd | nd |
| South Fork Crow River below WWTP at Lester Prairie, Minn. | 40 | nd | nd | nd | nd | nd |
| Center Creek on Co. Rd. 143, at Fairmont, Minn. | 30 | nd | nd | nd | nd | nd |
| Center Creek below WWTP at Fairmont, Minn. | 80 | nd | nd | nd | nd | nd |
| Mississippi River at Industrial Mollasses St. Paul, Minn. | 30 | 10 | 20 | nd | 40 | nd |
| Metro Plant (WWTP) outflow in St. Paul, Minn. | 30 | 180 | 380 | nd | 790 | nd |
| Mississippi River at South St. Paul, Minn. | 10 | nd | nd | nd | nd | nd |
| Grindstone River above WWTP near Hinckley, Minn. | 30 | nd | nd | nd | nd | nd |
| Grindstone River below Hinckley, Minn. | 20 | nd | nd | nd | nd | nd |
| Mississippi River (Lake Pepin) above Lake City, Minn. | 50 | nd | nd | nd | nd | nd |
| Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | 10 | nd | nd | nd | nd | nd |
| Okabena Creek above WWTP outflow at Worthington, Minn. | 10 | nd | nd | nd | nd | nd |
| Okabena Creek below WWTP outflow at Worthington, Minn. | nd | nd | nd | nd | nd | nd |

| USGS station name | 4-Nonylphenol (all isomers) (ng/g) | 4-Nonylphenol-diethoxylate (ng/g) | 4-Nonylphenol-mono-ethoxylate (ng/g) | 4-*n*-Octylphenol (ng/g) | 4-*tert*-Octylphenol (ng/g) | 4-*tert*-Octylphenol-diethoxylate (ng/g) |
|---|---|---|---|---|---|---|
| Shagawa Lake at mouth of Burntside River near Ely, Minn. | nd | nd | nd | nd | nd | nd |
| Shagawa Lake near Ely WWTP outflow at Ely, Minn. | 760 | nd | nd | nd | nd | nd |
| St. Louis River at Hwy 23 above Fond Du Lac, Minn. | 1300 | nd | nd | nd | nd | nd |
| Lake Superior in St. Louis Bay at Duluth, Minn. | 6900 | 2100 | 1300 | nd | 240 | nd |
| Mississippi River above WWTP at Grand Rapids, Minn. | 2200 | nd | nd | nd | nd | nd |
| Mississippi River below WWTP at Grand Rapids, Minn. | 560 | nd | nd | nd | nd | nd |
| Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | 250 | nd | nd | nd | nd | nd |
| Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd | nd | nd | nd | nd |
| Sauk River below Melrose WWTP at Melrose, Minn. | nd | nd | nd | nd | nd | nd |
| South Fork of the Crow River above WWTP at Hutchinson, Minn. | 240 | nd | nd | nd | nd | nd |
| South Fork of the Crow River below Hutchinson, Minn. | 160 | nd | nd | nd | nd | nd |
| South Fork Crow River above WWTP at Lester Prairie, Minn. | nd | nd | nd | nd | nd | nd |
| South Fork Crow River below WWTP at Lester Prairie, Minn. | nd | nd | nd | nd | nd | nd |
| Center Creek on Co. Rd. 143, at Fairmont, Minn. | 250 | nd | nd | nd | nd | nd |
| Center Creek below WWTP at Fairmont, Minn. | 280 | nd | nd | nd | nd | nd |
| Mississippi River at Industrial Mollasses St. Paul, Minn. | 380 | 1100 | nd | nd | nd | nd |
| Metro Plant (WWTP) outflow in St. Paul, Minn. | 2500 | 1200 | 750 | nd | 90 | nd |
| Mississippi River at South St. Paul, Minn. | 330 | nd | nd | nd | nd | nd |
| Grindstone River above WWTP near Hinckley, Minn. | nd | nd | nd | nd | nd | nd |
| Grindstone River below Hinckley, Minn. | nd | nd | nd | nd | nd | nd |
| Mississippi River (Lake Pepin) above Lake City, Minn. | nd | nd | nd | nd | nd | nd |
| Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | nd | nd | nd | nd | nd | nd |
| Okabena Creek above WWTP outflow at Worthington, Minn. | nd | 470 | nd | nd | nd | nd |
| Okabena Creek below WWTP outflow at Worthington, Minn. | 170 | 380 | nd | nd | nd | nd |

| USGS station name | 4- *tert* - Octylphenol-mono-ethoxylate (ng/g) | Phenanthrene (ng/g) | Phenol (ng/g) | Prometon (ng/g) | Pyrene (ng/g) | *beta* - Sitosterol (ng/g) | *beta* - Stigmastanol (ng/g) |
|---|---|---|---|---|---|---|---|
| Shagawa Lake at mouth of Burntside River near Ely, Minn. | nd | nd | nd | nd | 40 | 12000 | 10000 |
| Shagawa Lake near Ely WWTP outflow at Ely, Minn. | nd | 3000 | nd | nd | 4900 | 5400 | 2300 |
| St. Louis River at Hwy 23 above Fond Du Lac, Minn. | nd | 50 | nd | nd | 60 | 5000 | 1400 |
| Lake Superior in St. Louis Bay at Duluth, Minn. | 410 | 1900 | nd | nd | 2400 | 7700 | 3500 |
| Mississippi River above WWTP at Grand Rapids, Minn. | nd | 2300 | nd | nd | 3800 | 15000 | 3700 |
| Mississippi River below WWTP at Grand Rapids, Minn. | nd | 130 | nd | nd | 240 | 4000 | 750 |
| Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | nd | 140 | nd | nd | 240 | 2700 | 810 |
| Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | nd | 130 | nd | nd | 240 | 3900 | 1200 |
| Sauk River below Melrose WWTP at Melrose, Minn. | nd | 100 | nd | nd | 280 | 4700 | 1100 |
| South Fork of the Crow River above WWTP at Hutchinson, Minn. | nd | 70 | nd | nd | 100 | 1600 | 510 |
| South Fork of the Crow River below Hutchinson, Minn. | nd | 30 | nd | nd | 60 | 2100 | 570 |
| South Fork Crow River above WWTP at Lester Prairie, Minn. | nd | nd | nd | nd | nd | 4600 | 1100 |
| South Fork Crow River below WWTP at Lester Prairie, Minn. | nd | nd | nd | nd | 20 | 3600 | 970 |
| Center Creek on Co. Rd. 143, at Fairmont, Minn. | nd | 440 | nd | nd | 610 | 4000 | 1100 |
| Center Creek below WWTP at Fairmont, Minn. | nd | nd | nd | nd | 30 | 4300 | 1600 |
| Mississippi River at Industrial Mollasses St. Paul, Minn. | 50 | 80 | nd | nd | 180 | 3000 | 1400 |
| Metro Plant (WWTP) outflow in St. Paul, Minn. | nd | 3600 | nd | nd | 6400 | 3600 | 2200 |
| Mississippi River at South St. Paul, Minn. | nd | 290 | nd | nd | 540 | 3500 | 1500 |
| Grindstone River above WWTP near Hinckley, Minn. | nd | nd | nd | nd | 60 | 13000 | 3600 |
| Grindstone River below Hinckley, Minn. | nd | nd | nd | nd | 20 | 3400 | 1200 |
| Mississippi River (Lake Pepin) above Lake City, Minn. | nd | 50 | nd | nd | 140 | 3600 | 1800 |
| Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | nd | 30 | nd | nd | 50 | 2000 | 820 |
| Okabena Creek above WWTP outflow at Worthington, Minn. | nd | 60 | nd | nd | 110 | 1800 | 420 |
| Okabena Creek below WWTP outflow at Worthington, Minn. | nd | 40 | nd | nd | 60 | 1200 | 400 |

| USGS station name | 2,2',4,4'-Tetrabromo-diphenyl-ether (PBDE 47) (ng/g) | Tributyl phosphate (ng/g) | Triclosan (ng/g) | Triphenyl phosphate (ng/g) | Tris(2-butoxyethyl)-phosphate (ng/g) | Tris (2-chloroethyl)-phosphate (ng/g) | Tris(dichloro-isopropyl) phosphate (ng/g) |
|---|---|---|---|---|---|---|---|
| Shagawa Lake at mouth of Burntside River near Ely, Minn. | nd | nd | nd | nd | nd | nd | nd |
| Shagawa Lake near Ely WWTP outflow at Ely, Minn. | nd | nd | 106 | nd | nd | nd | nd |
| St. Louis River at Hwy 23 above Fond Du Lac, Minn. | nd | nd | nd | nd | nd | nd | nd |
| Lake Superior in St. Louis Bay at Duluth, Minn. | nd | nd | 352 | nd | nd | nd | nd |
| Mississippi River above WWTP at Grand Rapids, Minn. | nd | nd | nd | nd | nd | nd | nd |
| Mississippi River below WWTP at Grand Rapids, Minn. | nd | nd | nd | nd | nd | nd | nd |
| Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd | nd | nd | nd | nd | nd |
| Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd | nd | nd | nd | nd | nd |
| Sauk River below Melrose WWTP at Melrose, Minn. | nd | nd | nd | nd | nd | nd | nd |
| South Fork of the Crow River above WWTP at Hutchinson, Minn. | nd | nd | nd | nd | nd | nd | nd |
| South Fork of the Crow River below Hutchinson, Minn. | nd | nd | 10.8 | nd | nd | nd | nd |
| South Fork Crow River above WWTP at Lester Prairie, Minn. | nd | nd | nd | nd | nd | nd | nd |
| South Fork Crow River below WWTP at Lester Prairie, Minn. | nd | nd | nd | nd | nd | nd | nd |
| Center Creek on Co. Rd. 143, at Fairmont, Minn. | nd | nd | nd | nd | nd | nd | nd |
| Center Creek below WWTP at Fairmont, Minn. | nd | nd | nd | nd | nd | nd | nd |
| Mississippi River at Industrial Mollasses St. Paul, Minn. | nd | nd | 23.9 | nd | nd | nd | nd |
| Metro Plant (WWTP) outflow in St. Paul, Minn. | nd | nd | 186 | nd | nd | nd | nd |
| Mississippi River at South St. Paul, Minn. | nd | nd | nd | nd | nd | nd | nd |
| Grindstone River above WWTP near Hinckley, Minn. | nd | nd | nd | nd | nd | nd | nd |
| Grindstone River below Hinckley, Minn. | nd | nd | nd | nd | nd | nd | nd |
| Mississippi River (Lake Pepin) above Lake City, Minn. | nd | nd | nd | nd | nd | nd | nd |
| Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | nd | nd | nd | nd | nd | nd | nd |
| Okabena Creek above WWTP outflow at Worthington, Minn. | nd | nd | nd | nd | nd | nd | nd |
| Okabena Creek below WWTP outflow at Worthington, Minn. | nd | nd | nd | nd | nd | nd | nd |

| Site number | USGS station name | Date | Time | Site type | 4-Androstene-3,17-dione (ng/g) | *cis*-Androsterone (ng/g) | Bisphenol A (ng/g) | Cholesterol (ng/g) | 3-*beta*-Coprostanol (ng/g) | *trans*-Diethylstilbestrol (ng/g) |
|---|---|---|---|---|---|---|---|---|---|---|
| 4 | Shagawa Lake at mouth of Burntside River near Ely, Minn. | 09/28/2009 | 1100 | US | nd | 0.64 | nd | 10880 | 22010 | nd |
| 6 | Shagawa Lake near Ely WWTP outflow at Ely, Minn. | 09/28/2009 | 1000 | DS | nd | nd | nd | 8163 | 3388 | nd |
| 10 | St. Louis River at Hwy 23 above Fond Du Lac, Minn. | 10/01/2009 | 1300 | US | nd | 0.08 | 158 | 3898 | 5920 | nd |
| 12 | Lake Superior in St. Louis Bay at Duluth, Minn. | 10/01/2009 | 1000 | DS | nd | 1.21 | 213 | 7311 | 21260 | nd |
| 19 | Mississippi River above WWTP at Grand Rapids, Minn. | 09/30/2009 | 1300 | US | nd | 0.29 | 170 | 8540 | 3860 | nd |
| 21 | Mississippi River below WWTP at Grand Rapids, Minn. | 09/30/2009 | 1000 | DS | nd | 0.18 | 50.9 | 12470 | 2529 | nd |
| 22 | Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | 09/16/2009 | 1100 | US | nd | nd | 73.9 | 35360 | 610 | nd |
| 24 | Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | 09/16/2009 | 900 | DS | nd | 0.48 | 25.4 | 34540 | 1221 | nd |
| 25 | Sauk River above Melrose WWTP at Melrose, Minn. | 09/17/2009 | 1130 | US | nd | nd | nd | 64030 | 1524 | nd |
| 27 | Sauk River below Melrose WWTP at Melrose, Minn. | 09/17/2009 | 900 | DS | nd | nd | nd | 28020 | 623 | nd |
| 37 | South Fork Crow River above WWTP at Lester Prairie, Minn. | 09/14/2009 | 1300 | US | nd | 0.15 | nd | 5360 | 1075 | nd |
| 37 | South Fork of the Crow River above WWTP at Hutchinson, Minn. | 09/14/2009 | 1400 | DS | nd | 0.29 | 154 | 4985 | 710 | nd |
| 39 | South Fork Crow River below WWTP at Lester Prairie, Minn. | 09/15/2009 | 1100 | US | 0.79 | nd | 17.4 | 7687 | nd | nd |
| 39 | South Fork of the Crow River below Hutchinson, Minn. | 09/15/2009 | 1100 | DS | nd | 0.15 | 67.9 | 9484 | 392 | nd |
| 46 | Center Creek on Co. Rd. 143, at Fairmont, Minn. | 09/08/2009 | 1308 | US | nd | 0.15 | nd | 8395 | 1622 | nd |
| 48 | Center Creek below WWTP at Fairmont, Minn. | 09/08/2009 | 900 | DS | nd | 0.17 | nd | 7658 | 2590 | nd |
| 49 | Mississippi River at Industrial Mollasses St. Paul, Minn. | 09/24/2009 | 1500 | US | nd | 0.2 | 14 | 3444 | 1684 | nd |
| 50 | Metro Plant (WWTP) outflow in St. Paul, Minn. | 09/24/2009 | 1000 | DS | nd | 0.72 | 54.3 | 5410 | 9438 | nd |
| 51 | Mississippi River at South St. Paul, Minn. | 09/24/2009 | 1300 | DS | nd | 0.17 | 14.1 | 3185 | 2564 | nd |
| 52 | Grindstone River above WWTP near Hinckley, Minn. | 09/01/2009 | 1700 | US | nd | nd | 34.9 | 4226 | 409 | nd |
| 54 | Grindstone River below Hinckley, Minn. | 09/01/2009 | 1400 | DS | nd | 0.22 | nd | 3437 | 319 | nd |
| 55 | Mississippi River (Lake Pepin) above Lake City, Minn. | 09/23/2009 | 1100 | US | nd | 0.2 | nd | 8140 | 3598 | nd |
| 57 | Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | 09/23/2009 | 1300 | DS | nd | 0.09 | nd | 3446 | 961 | nd |
| 67 | Okabena Creek above WWTP outflow at Worthington, Minn. | 09/09/2009 | 1430 | US | 0.17 | 0.13 | 11.8 | 3513 | 410 | nd |
| 70 | Okabena Creek below WWTP outflow at Worthington, Minn. | 09/09/2009 | 1100 | DS | nd | nd | nd | 3998 | 724 | nd |

| USGS station name | Dihydro-testosterone (ng/g) | Equilenin (ng/g) | Equilin (ng/g) | Estriol (ng/g) | 17-*alpha*-Estradiol (ng/g) | 17-*beta*-Estradiol (ng/g) | Estrone (ng/g) | 17-*alpha*-Ethinyl-estradiol (ng/g) | Mestranol (ng/g) | Norethindrone (ng/g) |
|---|---|---|---|---|---|---|---|---|---|---|
| Shagawa Lake at mouth of Burntside River near Ely, Minn. | nd | nd | nd | nd | nd | 0.23 | nd | nd | nd | nd |
| Shagawa Lake near Ely WWTP outflow at Ely, Minn. | nd | nd | nd | nd | nd | 0.73 | 3.81 | nd | nd | nd |
| St. Louis River at Hwy 23 above Fond Du Lac, Minn. | nd | nd | nd | 0.14 | nd | 0.26 | 1.21 | nd | nd | nd |
| Lake Superior in St. Louis Bay at Duluth, Minn. | nd | nd | nd | nd | nd | 0.75 | 5.14 | nd | nd | nd |
| Mississippi River above WWTP at Grand Rapids, Minn. | nd | nd | nd | nd | nd | nd | 0.61 | nd | nd | nd |
| Mississippi River below WWTP at Grand Rapids, Minn. | nd | nd | nd | nd | nd | 0.22 | 0.66 | nd | nd | nd |
| Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd | nd | na | 1.01 | 2.86 | 2.41 | nd | nd | nd |
| Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | nd | 1.25 | nd | na | nd | 2.26 | 1.99 | nd | nd | nd |
| Sauk River above Melrose WWTP at Melrose, Minn. | nd | nd | nd | na | 4.28 | 12.2 | 9.2 | nd | nd | nd |
| Sauk River below Melrose WWTP at Melrose, Minn. | nd | 1.57 | nd | na | nd | 2.24 | 2.14 | nd | nd | nd |
| South Fork Crow River above WWTP at Lester Prairie, Minn. | nd | nd | nd | nd | nd | 0.36 | 1.23 | nd | nd | nd |
| South Fork of the Crow River above WWTP at Hutchinson, Minn. | nd | nd | nd | na | 0.14 | 0.41 | 1.11 | nd | nd | nd |
| South Fork Crow River below WWTP at Lester Prairie, Minn. | nd | nd | nd | na | nd | 1.47 | nd | nd | nd | nd |
| South Fork of the Crow River below Hutchinson, Minn. | nd | nd | nd | na | nd | 0.24 | 0.78 | nd | nd | nd |
| Center Creek on Co. Rd. 143, at Fairmont, Minn. | nd | nd | nd | nd | nd | 0.18 | 1.86 | nd | nd | nd |
| Center Creek below WWTP at Fairmont, Minn. | nd | nd | nd | nd | nd | 0.49 | 3.57 | nd | nd | nd |
| Mississippi River at Industrial Mollasses St. Paul, Minn. | nd | nd | nd | nd | nd | 0.44 | 2.41 | nd | nd | nd |
| Metro Plant (WWTP) outflow in St. Paul, Minn. | nd | nd | nd | nd | 0.14 | 0.51 | 5.55 | nd | nd | nd |
| Mississippi River at South St. Paul, Minn. | nd | nd | nd | nd | nd | 0.38 | 2.2 | nd | nd | nd |
| Grindstone River above WWTP near Hinckley, Minn. | nd | nd | nd | nd | nd | 0.51 | 0.78 | nd | nd | nd |
| Grindstone River below Hinckley, Minn. | nd | nd | nd | na | 0.27 | 0.38 | 0.27 | nd | nd | nd |
| Mississippi River (Lake Pepin) above Lake City, Minn. | nd | nd | nd | nd | nd | 0.42 | 2.51 | nd | nd | nd |
| Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | nd | nd | nd | nd | nd | 0.12 | 0.61 | nd | nd | nd |
| Okabena Creek above WWTP outflow at Worthington, Minn. | nd | nd | nd | na | nd | nd | 0.14 | nd | nd | nd |
| Okabena Creek below WWTP outflow at Worthington, Minn. | nd | 0.33 | nd | na | nd | 0.29 | 0.39 | nd | nd | nd |

| USGS station name | Progesterone (ng/g) | Testosterone (ng/g) | epi-Testosterone (ng/g) | 11-*keto*-Testosterone (ng/g) |
|---|---|---|---|---|
| Shagawa Lake at mouth of Burntside River near Ely, Minn. | nd | nd | nd | nd |
| Shagawa Lake near Ely WWTP outflow at Ely, Minn. | 12.2 | nd | nd | nd |
| St. Louis River at Hwy 23 above Fond Du Lac, Minn. | nd | nd | nd | nd |
| Lake Superior in St. Louis Bay at Duluth, Minn. | nd | nd | nd | nd |
| Mississippi River above WWTP at Grand Rapids, Minn. | nd | nd | nd | nd |
| Mississippi River below WWTP at Grand Rapids, Minn. | nd | nd | nd | nd |
| Sauk River above Sauk Centre WWTP at Sauk Centre, Minn. | nd | nd | nd | nd |
| Sauk River below Sauk Centre WWTP at Sauk Centre, Minn. | na | nd | nd | nd |
| Sauk River above Melrose WWTP at Melrose, Minn. | nd | nd | nd | nd |
| Sauk River below Melrose WWTP at Melrose, Minn. | nd | nd | 0.79 | nd |
| South Fork Crow River above WWTP at Lester Prairie, Minn. | nd | nd | nd | nd |
| South Fork of the Crow River above WWTP at Hutchinson, Minn. | nd | nd | nd | nd |
| South Fork Crow River below WWTP at Lester Prairie, Minn. | nd | nd | nd | nd |
| South Fork of the Crow River below Hutchinson, Minn. | na | nd | nd | nd |
| Center Creek on Co. Rd. 143, at Fairmont, Minn. | nd | nd | nd | nd |
| Center Creek below WWTP at Fairmont, Minn. | nd | nd | nd | nd |
| Mississippi River at Industrial Mollasses St. Paul, Minn. | nd | nd | 0.12 | nd |
| Metro Plant (WWTP) outflow in St. Paul, Minn. | nd | nd | nd | nd |
| Mississippi River at South St. Paul, Minn. | nd | nd | 0.08 | nd |
| Grindstone River above WWTP near Hinckley, Minn. | nd | nd | 3.14 | nd |
| Grindstone River below Hinckley, Minn. | nd | nd | 0.53 | nd |
| Mississippi River (Lake Pepin) above Lake City, Minn. | nd | nd | 0.12 | nd |
| Mississippi River (Lake Pepin) at Mile 771 near Lake City, Minn. | nd | nd | nd | nd |
| Okabena Creek above WWTP outflow at Worthington, Minn. | nd | nd | nd | nd |
| Okabena Creek below WWTP outflow at Worthington, Minn. | nd | nd | nd | nd |