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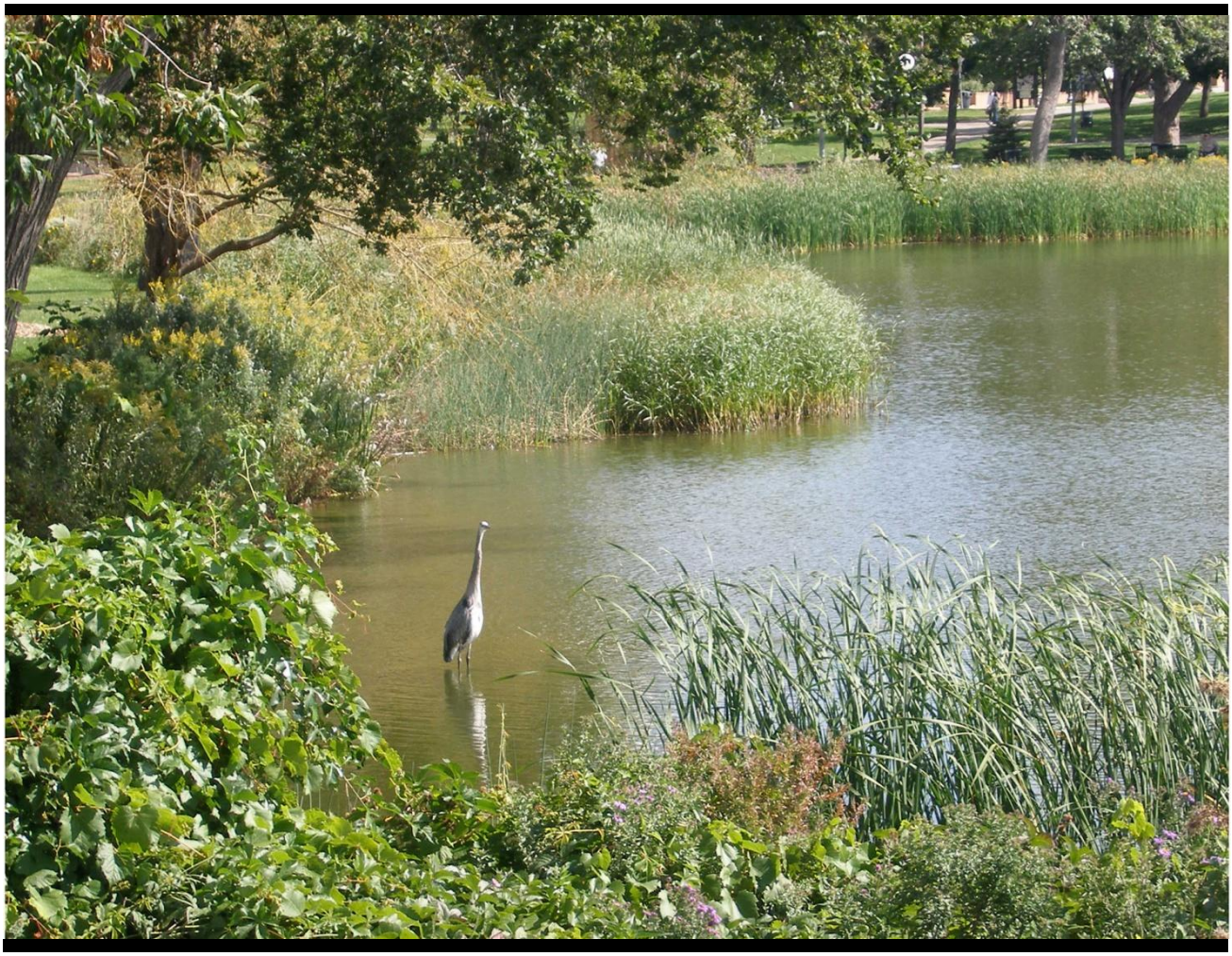
MISSISSIPPI WATERSHED MANAGEMENT ORGANIZATION

Annual Monitoring Report 2009



MWMO Watershed Bulletin: 2010-4

Annual Monitoring Report 2009

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A Great Blue Heron in Loring Pond in Minneapolis. *Photograph by B. Jastram, Mississippi Watershed Management Organization.*

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Annual Monitoring Report 2009

MWMO Watershed Bulletin: 2010-4

Abstract

In 2009, The Mississippi Watershed Management Organization (MWMO) continued monitoring in the Mississippi River, Loring Pond, stormwater outfalls to the Mississippi River, and Kasota Ponds wetlands.

Under Section 303(d) of the Federal Clean Water Act, the 12-mile reach of the Mississippi River in the MWMO is listed on the 303(d) Total Maximum Daily Load (TMDL) list as impaired for fecal coliform. The Minnesota Pollution Control Agency has moved from a fecal coliform standard to an *E. coli* standard, therefore all fecal coliform impairments are now evaluated with *E. coli* data. *E. coli* concentrations in the Mississippi River exceeded Minnesota water quality standards during the months of July, August, September, and October in 2009. Long-term monitoring of the river and stormwater outfalls to the river is necessary to evaluate bacteria inputs from within the watershed compared to inputs from upstream sources.

In Loring Pond, *E. coli* concentrations exceeded Minnesota water quality standards May through October of 2009. Loring Pond is not listed on the 303(d) TMDL list due to a lack of data. Data are submitted to the MPCA on an annual basis and included in assessments conducted biannually to add waterbodies to the 303(d) TMDL list.

The MWMO continued monitoring stormwater and wetlands in 2009. There are no water quality standards for stormwater so, rather than comparing to standards, stormwater drainage results are presented in the report. The MPCA wetlands' water quality criteria indicate that wetland water quality should maintain background. Background water quality has not yet been determined for MWMO wetlands.

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Executive Summary

This report details the results of the Mississippi Watershed Management Organization's (MWMO) 2009 monitoring season. MWMO staff will complete an annual monitoring report summarizing the year's results and outlining the next year's work plan each year. The report is available on the MWMO website at **www.mwmo.org**.

The MWMO monitors water quality in the watershed's stormwater drainage system and in the Mississippi River, Loring Pond, and Kasota Ponds (wetlands). Within these systems, major factors influencing water quality include the amount of precipitation, timing of precipitation events, and land use practices in the watershed. Long-term monitoring is necessary to characterize the impact of various land use practices on surface water runoff within the MWMO and, ultimately, the Mississippi River. Water quality in the Mississippi River is also influenced by precipitation and land use practices in the entire Mississippi River basin upstream of the MWMO. Long-term monitoring of the river will aid the understanding of upstream weather patterns and land use impact on the MWMO watershed.

The 2009 monitoring season included collection of water quality samples from six locations in the Mississippi River, one in Loring Pond, five stormwater outfalls to the Mississippi River, one stormwater pipe at the jurisdictional boundary of Saint Anthony Village and Minneapolis, and seven locations in the three wetlands known as Kasota Ponds. The MWMO had a total of six automated stormwater monitoring sites in 2009.

The 12-mile reach of the Mississippi River in the MWMO is listed on the Federal Clean Water Act Section 303(d) Total Maximum Daily Load (TMDL) list as impaired for fecal coliform. The Minnesota Pollution Control Agency has moved from a fecal coliform standard to an *E. coli* standard, therefore all fecal coliform impairments are now evaluated with *E. coli* data. *E. coli* concentrations exceeded Minnesota water quality standards in 2009 during the months of July, August, September, and October. Long-term monitoring of both the river and the stormwater outfalls to the river is necessary to evaluate *E. coli* inputs from within the watershed compared to those inputs from upstream sources.

E. coli concentrations in Loring Pond exceeded Minnesota water quality standards in May through October of 2009. Loring Pond is not listed on the 303(d) TMDL list due to a lack of data. Data are submitted to the MPCA on an annual basis and included in assessments conducted biannually to add waterbodies to the 303(d) TMDL list.

The MWMO continued monitoring stormwater in 2009. Water quality standards do not exist for stormwater, therefore data were not compared to standards but are presented in subsequent sections. The MWMO will continue to monitor stormwater drainage systems to develop a record of baseline data to characterize stormwater quality within the watershed.

The MWMO continued monitoring the Kasota Ponds wetlands in 2009. Samples were collected for nutrients, sediment, inorganics, and metals analyses. The MPCA water quality criteria indicate that wetland water quality should maintain background. Background water quality has not yet been determined for MWMO wetlands.

Introduction

This report details the results of the Mississippi Watershed Management Organization's (MWMO) 2009 monitoring season. MWMO staff will complete an annual monitoring report summarizing the year's results and outlining the next year's work plan each year. The report is available on the MWMO website at **www.mwmo.org**.

The MWMO established the monitoring program to provide a scientific basis for identifying and evaluating water quality and quantity issues and implementing solutions to improve water quality and reestablish natural water regimes in the watershed. The objectives of the program are to:

- Monitor biological, chemical, and physical parameters of water resources in the watershed
- Monitor water quality within the watershed
  - Develop a record of baseline data to characterize water quality and identify pollutants that exceed water quality standards
  - Assess pollutants listed on the 303(d) Total Maximum Daily Load list
- Assess the volume and rate of water movement in the watershed
- Develop and agree with organizations in the watershed upon a standardized set of parameters and sample collection, data analysis, and reporting standards
- Develop partnerships and collaborate with other organizations and/or agencies, both inside and outside the watershed boundaries, to improve water quality in the Mississippi River
- Assess land use impact on water quality

The 2009 monitoring season included collection of water quality samples from six locations in the Mississippi River, one in Loring Pond, six stormwater sites, and seven wetland sites in the Kasota Ponds. Refer to Figures A.1 and A.2. in Appendix A for the monitoring locations. Descriptions of the sampling sites are found in the MWMO 2005 Annual Monitoring Report (2006), Annual Monitoring Report 2007 (2009), and the Annual Monitoring Report 2008 (2010) at **www.mwmo.org**.

Background

The MWMO was established in 1985 by a Joint Powers Agreement among member organizations. (The MWMO watershed boundaries are shown in Figure A.1 in Appendix A.) The MWMO is a unique organization in that it includes a reach of the Mississippi River. Other local watershed districts and organizations include land and water resources up to the river's shore, but not extending into the river itself. The reach of the Mississippi River included in the MWMO extends from 53rd Avenue in north Minneapolis downstream to Lock and Dam 1 (Ford Dam) in south Minneapolis. Another unique feature of the MWMO is that its boundaries include only one lake, Loring Pond.

Minnesota regulations require that the MWMO protect water quality in the watershed. Minnesota Rules Chapter 7050 requires that all waterbodies comply with state water quality standards. Furthermore, section 303(d) of the Federal Water Pollution Control Act (commonly known as the Clean Water Act) requires states to develop TMDLs for waters with impaired uses. Impaired waters are those waters that exceed water quality standards for their classified use. Some typical classifications include drinking water and aquatic life and recreation (swimming and fishing). According to Minnesota Rules Chapter 7050, the reach of the Mississippi River within the MWMO watershed is divided into two sections for classification. Table 1 highlights the most restrictive classifications.

Table 1. Water use classifications for waterbodies in the MWMO

Waterbody	Water Use Classification
Mississippi River, MWMO upstream boundary to Upper Saint Anthony Falls	1C, 2Bd Domestic consumption (drinking water)
Mississippi River, Upper Saint Anthony Falls to Lock & Dam 1 (Ford Dam)	2B Aquatic life and recreation
Loring Pond	2B Aquatic life and recreation

Table 2. Pollutants in impaired waters

Impaired Mississippi River Reach	Pollutant
MWMO upstream boundary to Upper Saint Anthony Falls	Fecal coliform, Mercury in fish tissue, Polychlorinated biphenyls (PCBs) in fish tissue
Upper Saint Anthony Falls to Lower Saint Anthony Falls	Mercury in fish tissue, PCBs in fish tissue
Lower Saint Anthony Falls to Lock & Dam 1 (Ford Dam)	Fecal coliform, Mercury in fish tissue

The MWMO's reach of the Mississippi River is listed on Minnesota's 303(d) TMDL list. The Minnesota Pollution Control Agency divided the reach of the Mississippi River flowing through the MWMO into three sections. Table 2 lists the impaired reaches of the river and the corresponding pollutants of concern. The Minnesota Pollution Control Agency has written a statewide TMDL for mercury (MPCA, 2007).

Mercury and Polychlorinated biphenyls (PCBs) are listed on the 303(d) TMDL list for aquatic consumption advisories; therefore, this report will address fecal coliform only.

Protecting water quality in the Mississippi River is a complicated task. The reach of the Mississippi River flowing through the MWMO is densely urbanized with commercial, industrial, residential, park lands, and downtown Minneapolis land uses contributing to the volume and quality of the water entering the river through the stormwater drainage system. The MWMO monitors stormwater outfalls to determine the contributions of surface runoff from the watershed to water quality in the river.

That being said, the entire Mississippi River basin upstream of the MWMO watershed contributes to water quality in the MWMO's reach of the river.

The upper Mississippi River is a large, dynamic river system that includes runoff from forested areas near the source at Lake Itasca, agricultural runoff from the central region of Minnesota, and the urbanized areas of Saint Cloud and the north Twin Cities Metro area. As precipitation produces surface runoff, precipitation differences throughout the upper Mississippi River basin can affect water flow and water quality in the MWMO's reach of the Mississippi River.

Thus, if large amounts of rainfall have washed pollutants from the land upstream into the river, it is possible that flows could increase and water quality could decline, even though it has not rained in the watershed. In cooperation with other watershed organizations and districts, the MWMO plans to investigate upstream impact on water quality to discern the effect precipitation in other portions of the state has on water quality in the MWMO's reach of the Mississippi River.

Further complicating the investigation of water volume and quality in the river are the inputs of groundwater, and the recharge to groundwater from the river. Groundwater may carry pollutants from upstream in the Mississippi River basin to the MWMO's reach of the river. Pollutants may also leach from the river into the groundwater system. It is quite difficult to track potential groundwater inputs from an area as large as the Mississippi River basin to the MWMO's reach of the river. The MWMO has long-term plans to coordinate with organizations and agencies in the upper portion of the basin to improve water quality in the Mississippi River.

Methodology

In 2009, the MWMO examined water quality from four types of locations: rivers, lakes, stormwater, and wetlands. River and lake samples were collected in the Mississippi River and Loring Pond. Stormwater outfall samples were collected from stormwater pipes at the point of discharge to the river and at the boundary of the cities of Saint Anthony Village and Minneapolis. Wetland samples were collected from the Kasota Ponds in St. Paul. Mississippi River and Loring Pond samples were collected between April and October, while stormwater samples were collected between March and October. Wetland samples were collected between March and November. Snowmelt samples were also collected at the stormwater sampling sites.

Sample Collection, Handling, and Preservation

Mississippi River and Loring Pond

Grab samples were collected from six locations in the Mississippi River and one location in Loring Pond. Samples were collected in lab-sterilized 250mL plastic bottles. Collection occurred away from shore, in approximately three feet of water. For the river water collection, samples were taken in positive flow (no back eddies or stagnant water) and upstream of the monitoring technician to prevent contamination by the disturbed river bottom. To collect samples, the monitoring technician plunged an opened, inverted bottle one foot below the water surface, turned it upward to fill, and brought it out of the water (Figure 1). The technician then poured some of the sample out to provide headspace for the laboratory.

Samples were labeled, stored on ice in a cooler, and delivered to the laboratory by the monitoring technician after the final sample was collected. Analyses conducted on these samples did not require preservation.

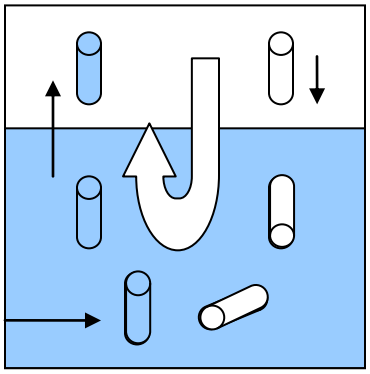

Figure 1. Diagram of sample collection method

Dissolved oxygen, conductivity, salinity, and temperature were collected using a YSI85 meter (YSI Inc., Yellow Springs, OH). The meter probe was placed in the water approximately one foot below the surface. Data were recorded when the values stabilized. Data for pH were collected using an ISFET pH meter (Hach Company, Loveland, CO). These data were collected by placing the pH meter in the surface of the water.

Samples were collected weekly for baseflow and up to three times per month during storm events.

Stormwater

Grab samples were collected from six stormwater sites in the MWMO watershed. Samples were collected in laboratory cleansed (non-sterile) two gallon plastic bottles. Samples were collected with the two gallon sample bottle mounted on the end of a telescoping pole or with the automatic sampler described below. The bottle was capped after it was filled, with headspace included.

An ISCO 6712 automatic sampler (Teledyne Isco, Inc., Lincoln, NE) was used at sites 1NE, 6UMN, and 10SA. An automatic sampler was also used occasionally at 7LSTU. An automatic sampler was also installed at 4PP in August. The samplers housed twenty-four one liter plastic bottles for sample collection. Velocity, water level, and flow data were collected with an ISCO 750 Area Velocity Meter (Teledyne Isco, Inc., Lincoln, NE) that attached to the automatic sampler. When the meter detected water level above baseflow, it triggered the sampler to begin sampling.

Once triggered, the sampler rinsed the sample tubing twice before drawing the sample into the containers. Samples were collected on a flow-paced basis. The bottles were rinsed three times with deionized (DI) water free of pollutants between storm events. Once collected, the bottles were composited as one sample into a two gallon plastic bottle by the monitoring technician. Automated precipitation gauges were used at 1NE and 10SA to gather precipitation data in the watershed.

Stormwater samples were labeled and placed in a cooler for transport to the laboratory by the monitoring technician. Samples were dropped off at the laboratory after collection of the last sample. Laboratory personnel split the sample and preserved it as needed for the various analyses.

Dissolved oxygen, conductivity, salinity, temperature, and pH were collected using the same equipment listed in the previous section, but the data were collected in the two gallon bottle rather than directly in the stormwater drainage system.

Stormwater samples were collected for a maximum of three precipitation events per month. If baseflow conditions were present, samples were collected twice per month during baseflow.

The MWMO collected real-time monitoring data at the stormwater sites. The network was designed to provide instantaneous data about stormwater level, velocity and flow, precipitation, and automated sample collection. The data were available instantaneously

from any computer, allowing MWMO staff to respond more quickly to sample collection and equipment failures. The network used radios to link six automatic water samplers to the internet, enabling the MWMO staff to view stormwater data, automated sample collection, and rainfall from the office. Radios were located at two additional locations, the SAFL roof and the Moos Tower roof on the University of Minnesota East Bank campus, to provide line-of-sight communication between all of the monitoring sites. Refer to Figure A.3 in Appendix A for the real-time monitoring network.

Equipment for the real-time monitoring network included the area velocity meters and automatic samplers described previously, dataloggers, antennas, and radios to send data to a central location. All data was stored at SAFL. As previously described, the area velocity meters provided stormwater level and velocity readings to the automatic samplers. The automatic samplers stored these readings and calculated the volume of water that flowed past the sensors.

MWMO staff installed a CR800 Measurement and Control Datalogger (Campbell Scientific, Inc., Logan, UT) at each stormwater monitoring location. The datalogger retrieved data from the automatic sampler. Data were then transmitted via RF450 Spread Spectrum Radios (Campbell Scientific, Inc., Logan, UT) and Yagi or Omnidirectional antennas (Campbell Scientific, Inc., Logan, UT) to an NL100 Network Link Interface (Campbell Scientific, Inc., Logan, UT). The NL100 allowed communication between the dataloggers and a network-linked computer in order to store the logged data in a useable data file. Vista Data Vision software (Vista Engineering, Reykjavik, Iceland) displayed the data on webpages in graphical and tabular form so it could be viewed in real time.

Kasota Ponds

Grab samples were collected from seven locations in the Kasota Ponds wetlands. Samples were collected in lab-sterilized 250mL plastic bottles. Collection occurred away from shore, in approximately three feet of water. Samples were collected in laboratory cleansed (non-sterile) two gallon plastic bottles. To collect samples, the monitoring technician plunged an opened, inverted bottle one foot below the water surface, turned it upward to fill, and brought it out of the water. The technician then poured some of the sample out to provide headspace for the laboratory.

Samples were labeled and placed in a cooler for transport to the laboratory by the monitoring technician. Samples were dropped off at the laboratory after collection of the last sample. Laboratory personnel split the sample and preserved it as needed for the various analyses.

Dissolved oxygen, conductivity, salinity, temperature, and pH were collected using the same methodology as stormwater samples.

Kasota Ponds samples were collected once a month from March through November.

Sampling Quality Control

The MWMO staff followed the quality control protocol outlined in the MWMO Ambient Surface Water Monitoring Quality Assurance Project Plan. Blank samples of DI water were submitted to laboratories periodically to verify that sample containers were clean and samples were not contaminated during travel. Duplicate samples were submitted periodically to verify that sampling and laboratory procedures did not jeopardize the data.

Laboratory Analyses

The MWMO used two laboratories for analyses. Bacteria samples were analyzed at the Minneapolis

Department of Health Laboratory. All other samples were analyzed at the Metropolitan Council Environmental Services Laboratory. Refer to Table B.1 in Appendix B for a list of sample parameters the laboratories analyzed, the analysis methods, and information regarding certification.

Each laboratory followed strict protocol for quality assurance and quality control. Information regarding laboratory protocol is available from MWMO staff.

Parameters Information

The MWMO has conducted extensive research regarding the parameters of concern. Parameter information includes definitions, sources, impact on various organisms, and water quality standards, as well as others. Refer to the MWMO 2006 Annual Monitoring Report (2007) for the comprehensive list of parameters information.

Data Analysis

The following data cleaning techniques were used to ensure quality data:

- Duplicates were omitted from analysis
- Suspect data were flagged and verified with the laboratory
- For values greater than the maximum detection level, the maximum detection level + 1 was used for analysis
- Values less than the minimum detection level were changed to half the minimum detection level for analysis
- For approximate values that were less than the minimum detection level, the approximate value was used for analysis
- Statistical regression techniques were used to interpolate automated flow data that were missing due to equipment malfunctions

For the Mississippi River and Loring Pond, grab sample data were compared to the Minnesota water quality standards for their most restricted water use classification. Water quality standards do not exist for stormwater. Data were therefore not compared to standards, but are presented in subsequent sections.

Cold Climate Considerations

Minnesota is considered a cold climate state, requiring special consideration in runoff management. MWMO staff takes this into consideration when writing the annual work plan for the program. The Minnesota Stormwater Manual (Minnesota Stormwater Steering Committee, 2008) outlines the cold climate considerations in Chapter 9.

Precipitation

Precipitation determines surface runoff and is arguably the greatest factor controlling surface water quality. As stated in Background, water quality in the MWMO's reach of the Mississippi River is affected by precipitation in the entire Mississippi River basin upstream of the MWMO, including tributary watersheds to the river.

Figure 2 shows precipitation for six locations along the Mississippi River: two in the watershed (Lower Saint Anthony Falls and Lock and Dam 1) and four between Saint Cloud and the MWMO northern boundary. Precipitation for the watershed only is shown in Figure 3. The MWMO acknowledges a link between precipitation and the water quality data shown in the following sections. However, the MWMO does not support quantitative analysis of this relationship because the precipitation data are not representative of the entire Mississippi River basin contributing to the MWMO watershed.

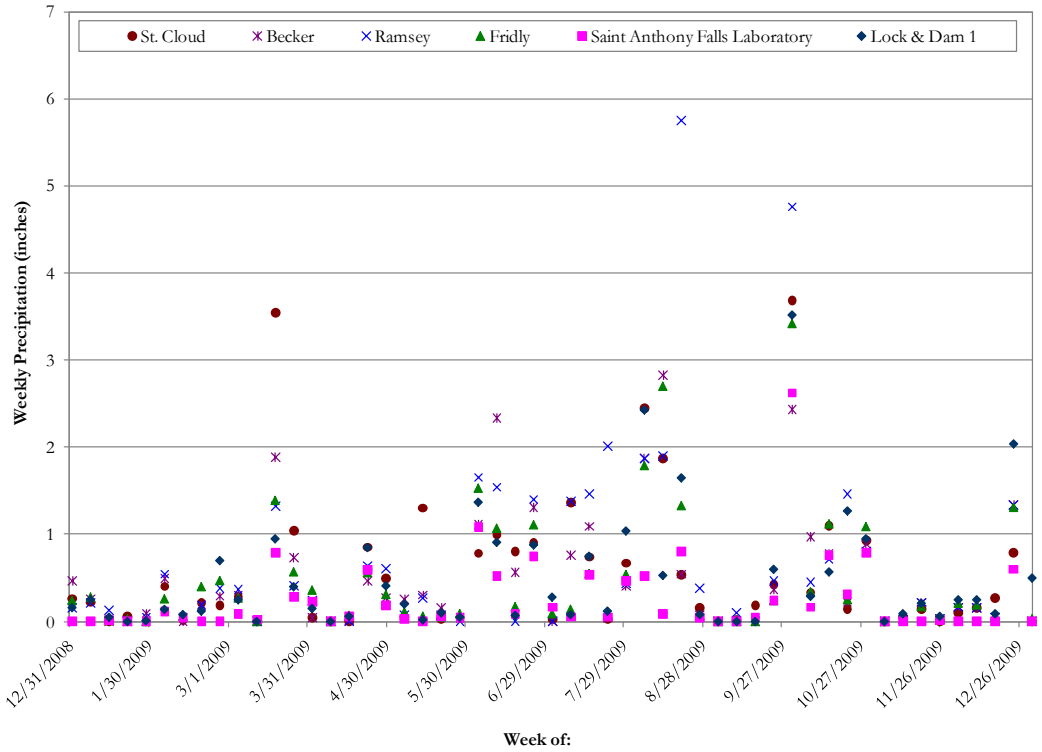

Figure 2. Precipitation for six locations along the Mississippi River

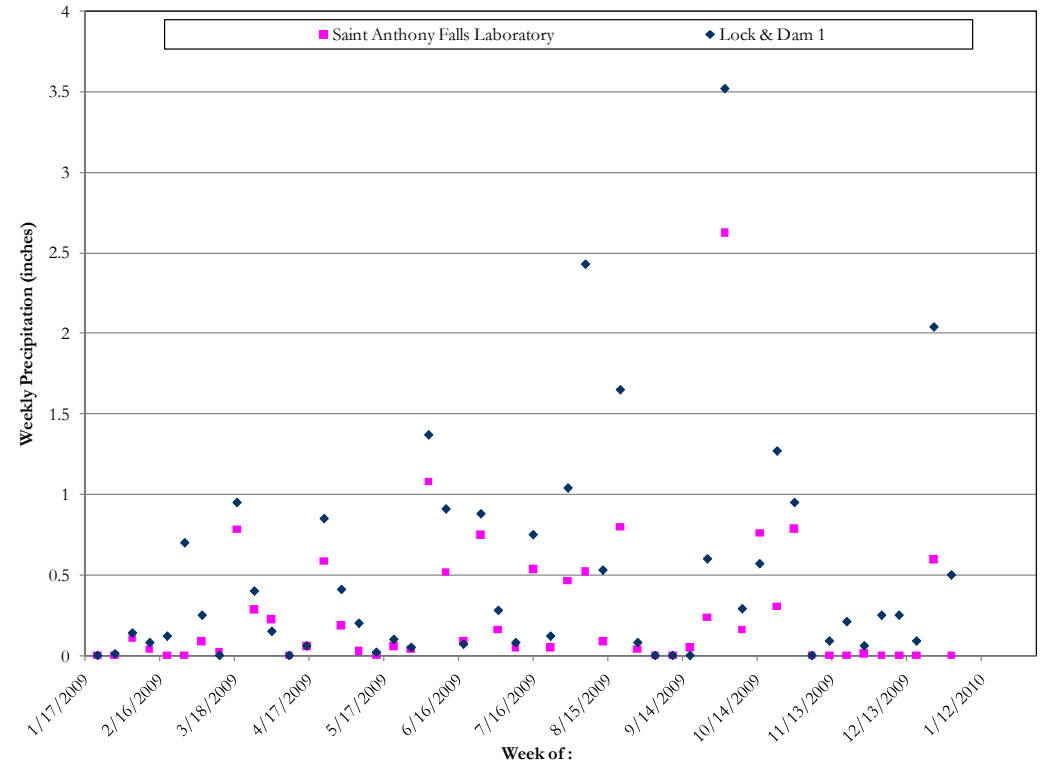

Figure 3. Precipitation for two locations in the MWMO watershed

Mississippi River

The MWMO monitors six locations in the Mississippi River. Refer to the 2005 Annual Monitoring Report (MWMO, 2006) for site-specific details and information regarding site selection.

Water Elevation

Water level data (typically referred to as stage data) show the rise and fall of the river in response to precipitation. These data are complicated by the dams at Saint Anthony Falls and Lock and Dam 1.

The river pools behind the dams, therefore control activities at the dam cause changes in river elevation even in the absence of precipitation. River elevations for the six MWMO monitoring locations on the Mississippi River are shown in Figures 4 and 5.

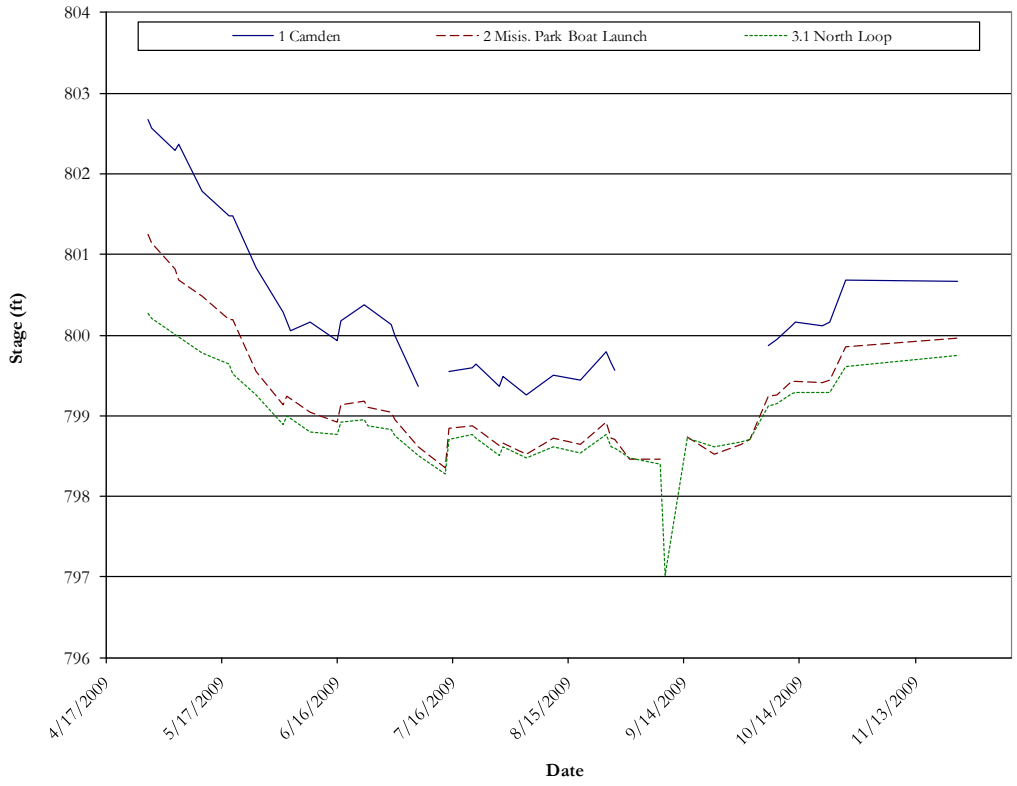

Figure 4. Mississippi River water level upstream of Saint Anthony Falls

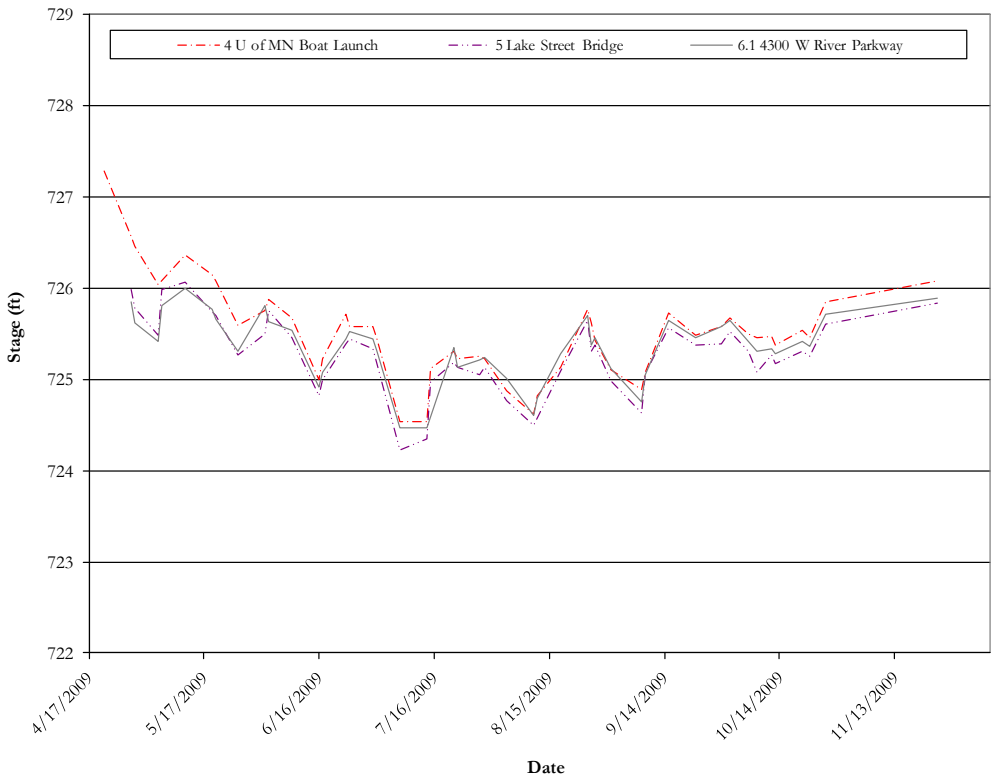

Figure 5. Mississippi River water level downstream of Saint Anthony Falls

Time periods with missing data are the result of either high water levels (the staff gauges were submerged underwater) or low water levels (the staff gauges were located in the dry riverbed). The sharp decline in water elevation at site 3.1 on September 9 was caused by a planned drawdown of water level above the Upper Saint Anthony Falls dam to perform maintenance on bridge abutments.

Monitoring Results

E. coli

As noted under Background, the MWMO's reach of the Mississippi River is listed as an impaired water for fecal coliform pollution. In 2008, the MPCA changed the bacteria water quality standard from fecal coliform to *E. coli* for bacteria monitoring in Minnesota. The standard for *E. coli* in 2B and 2Bd waters is 126 CFU/100mL for a monthly geomean of at least five samples. The geomean is equal to the nth root of the product of the n terms:

$$Geomean_{\bar{y}} = \sqrt[n]{y_1 y_2 y_3 .... y_n}$$

Site 3.1 exceeded the *E. coli* standard in August, Sites 1 and 2 exceeded the standard in September and Sites 1, 2, 4, 5, and 6 exceeded the standard in October (Figure 6). The *E. coli* concentrations are shown in Appendix D.

The MPCA *E. coli* standard also states that *E. coli* cannot exceed 1260 CFU/100mL in more than 10% of the samples taken in one month. Sites 1, 2, 3, 4, and 5 exceeded this standard in various months. Table 3 presents a summary of *E. coli* exceedances. The *E. coli* concentrations for each sample collected are shown in Appendix C.

As these results are highly dependent on precipitation—both in the watershed and upstream—results may differ drastically from year to year. The MWMO does not support interpretation or assumptions based solely on one year of data. The MWMO will continue to collect data on the Mississippi River to provide baseline data for development of TMDLs in the watershed.

Two additional factors should be considered when evaluating these results. First, these results are based on a maximum of nine samples collected per month. Had more samples been collected, the data may have exhibited different results. Second, two unique features of the MWMO watershed are the Upper and Lower Saint Anthony Falls. The Mississippi River water mixes as it flows over the falls, likely affecting water quality.

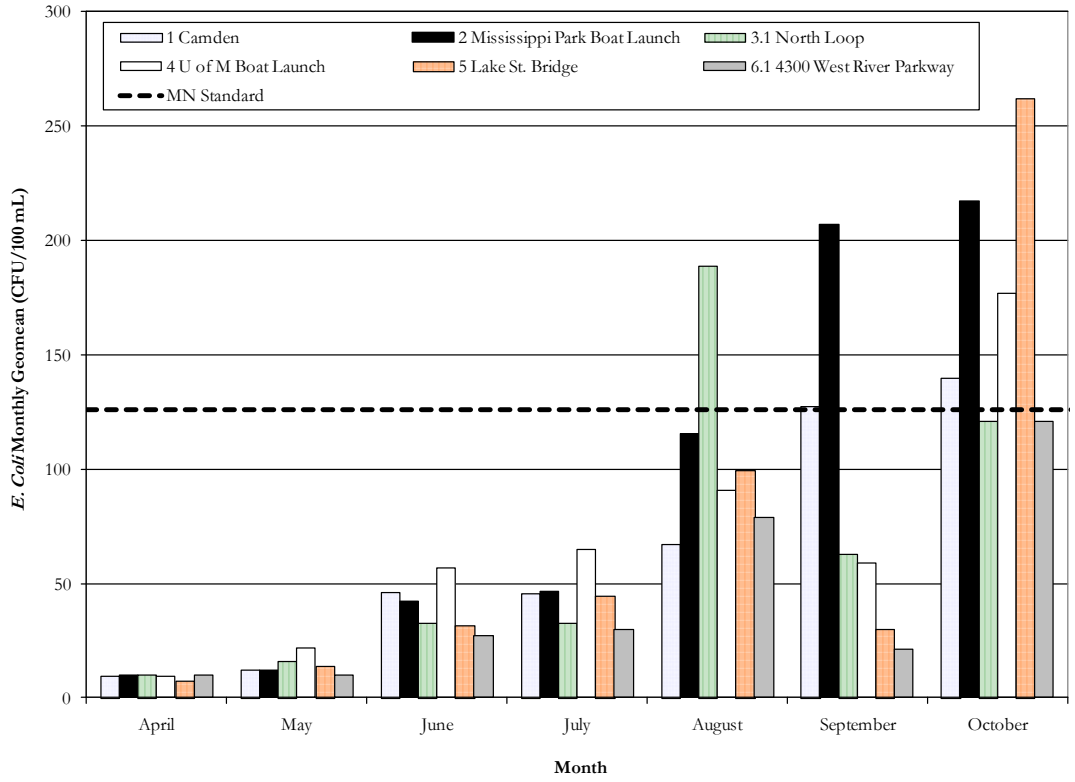

Figure 6. E. coli monthly geomeans for the Mississippi River monitoring sites

Table 3. Sites that exceeded the monthly e. coli geomean for the Mississippi River

Month	Sites that exceed monthly geomean	Sites that exceed 1260 CFU/100 mL in > 10% of samples	Sites that do not exceed the standards
April	None	None	All
May	None	None	All
June	None	None	All
July	None	2	1, 3.1, 4, 5, 6.1
August	3.1	3.1, 5	1, 2, 4, 6.1
September	1, 2	2	3.1, 4, 5, 6.1
October	1, 2, 4, 5	1, 2, 4, 5	3.1, 6.1

Dissolved Oxygen, pH, Transparency, and Specific Conductivity

The MWMO monitored dissolved oxygen, pH, transparency, and specific conductivity on a weekly basis throughout the 2009 sampling season. These parameters are basic measures that indicate the health of a waterbody, as they contribute to survival of fish and other aquatic organisms and plants. Refer to Appendix C for the monitoring data.

Loring Pond

Loring Pond is the only lake in the MWMO watershed. It is not listed on the impaired waters list. Refer to the 2005 Annual Monitoring Report (MWMO, 2006) for an overview and history of Loring Pond. Refer to Figure A.1 in Appendix A for the location of Loring Pond.

Water Level

The MWMO monitored stage in Loring Pond with the MPRB staff gauge installed on the large pond outlet. Water level fluctuations throughout the 2009 sampling season are shown in Figure 7. Water levels were based upon a selected benchmark of 100 feet.

Monitoring Results

E. coli

Loring Pond is classified for 2B water use, therefore the same water quality standards apply as for the Mississippi River monitoring sites. Loring Pond exceeded the MPCA standard May through October (Figure 8). The *E. coli* results are highly dependent on precipitation, therefore results may differ drastically from year to year.

Dissolved Oxygen, pH, Transparency, and Specific Conductivity

Due to the closed nature of a lake system, their dissolved oxygen, pH, and specific conductivity will often differ greatly from rivers. While rivers are always receiving "new" water from upstream, lakes contain the same water throughout the sampling season. Precipitation, stormwater, and occasional pumping of water from the recharge well are the major water inputs to Loring Pond. Figure 9 exhibits the dissolved oxygen, pH, transparency, and specific conductivity data for Loring Pond.

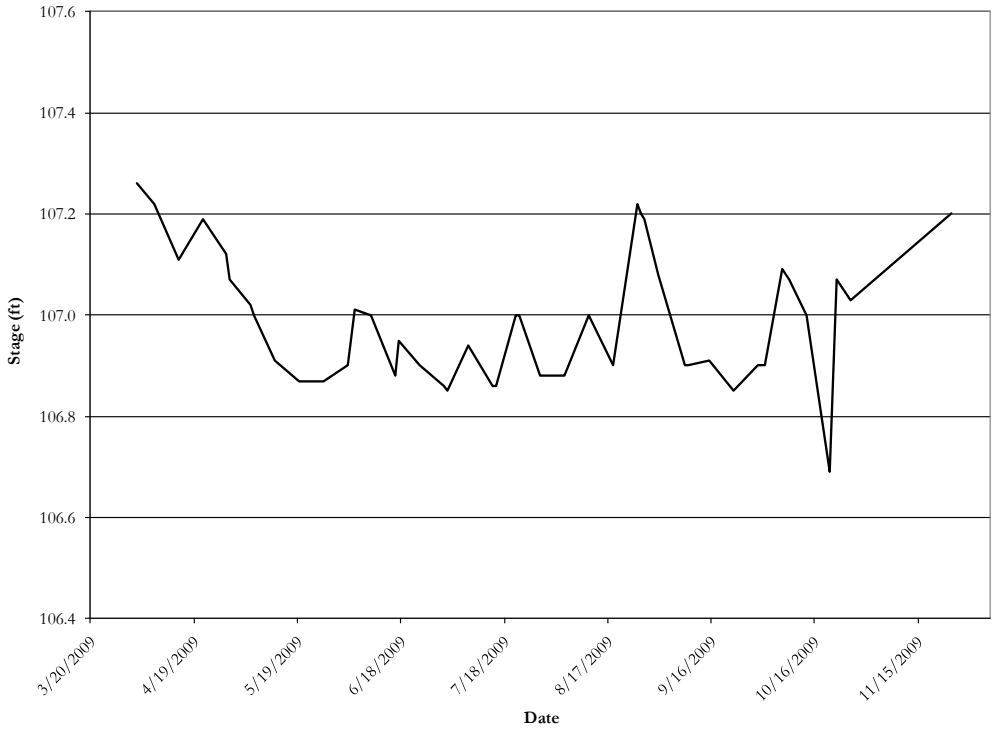

Figure 7. Loring Pond water level data based on a 100-foot benchmark

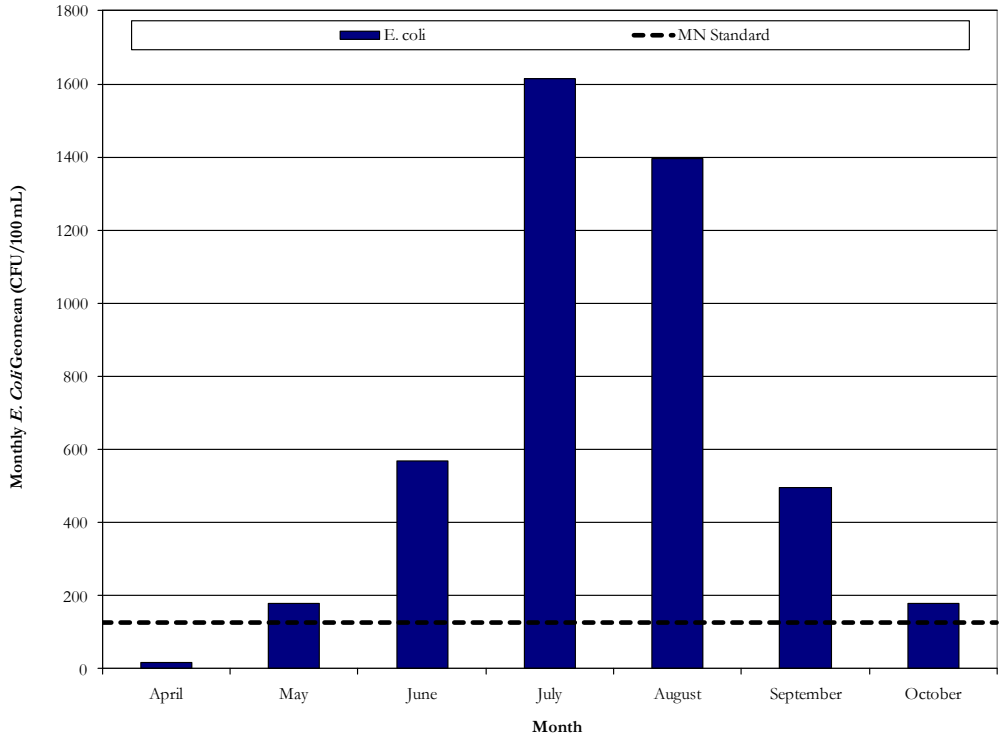

Figure 8. E. coli monthly geomeans for Loring Pond

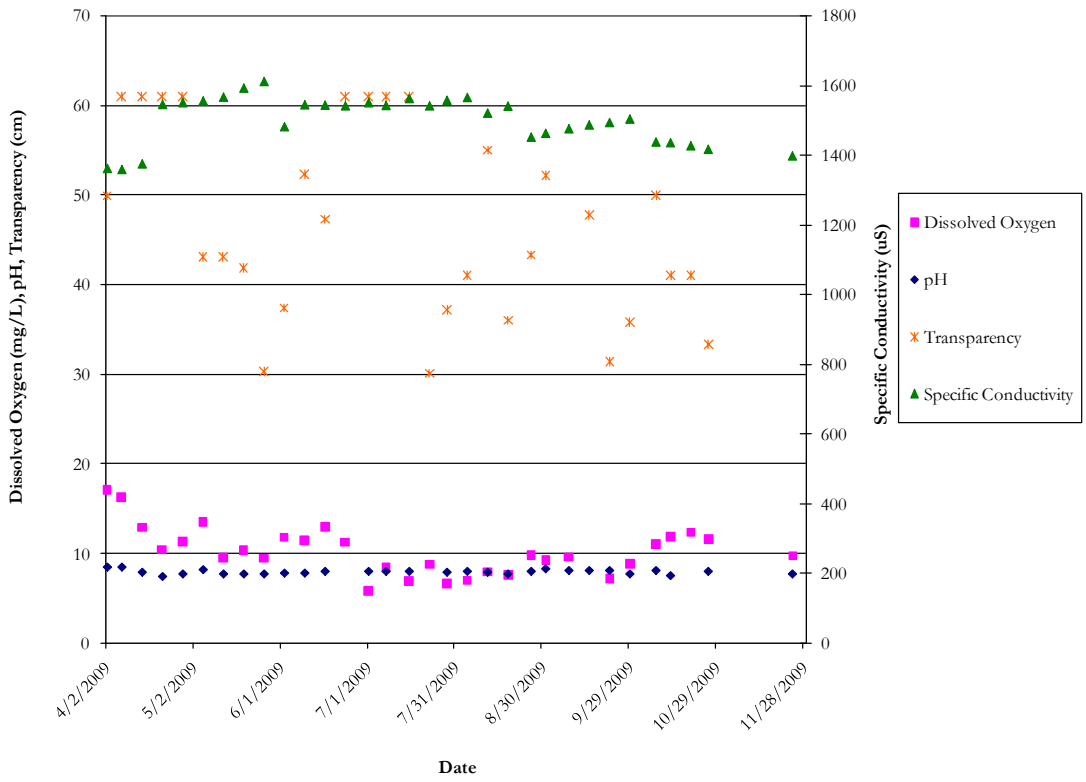

Figure 9. Dissolved oxygen, pH, transparency, and specific conductivity for Loring Pond

Stormwater

The MWMO monitored five stormwater outfalls into the Mississippi River and one stormwater pipe at the jurisdictional boundary of Saint Anthony Village and Minneapolis. The monitored outfalls were chosen because they are the most extensive drainage systems within the watershed, and they are accessible. (Refer to Figure A.1 in Appendix A for the outfall locations.) Refer to the 2005 Annual Monitoring Report (MWMO, 2006) and the Annual Monitoring Report 2007 (MWMO, 2009) for site descriptions for the stormwater monitoring sites. Water quality data for each stormwater outfall are provided in this section.

A stormwater drainage system refers to the area that drains to one stormwater outfall. Land uses in the stormwater drainage systems affect water quality. The amount of impervious surfaces and potential pollutants differs between industrial and residential land uses. A future objective of the monitoring program is to investigate the impact of specific land uses on water quality. Refer to the Annual Monitoring Report 2007 (MWMO, 2009) for land uses in the watershed.

Water Level

Water level in a stormwater pipe is very different from water levels in the Mississippi River and Loring Pond. Stormwater pipes respond quickly to rainfall, so water levels may rise many feet within a few minutes, depending on the size and intensity of the storm event. Some stormwater pipes only contain water during precipitation events, while others have baseflow throughout the year. Stormwater monitoring sites 1NE, 4PP, 6UMN, and 10SA have baseflow throughout the year.

Water levels (stage) for each stormwater outfall are listed in Tables D.1 – D.6 in Appendix D. Water level data collected with the automated equipment are presented in Figures 10-13. Automated data for 7LSTU are not included, as the data were not accurate due to Mississippi River tailwater in the stormwater tunnel.

It should be noted that, as the Mississippi River water level rises above the base of the stormwater outfalls, river tailwater may affect the water level in the stormwater pipes

Monitoring Results

The MPCA does not have water quality criteria for stormwater drainage systems, therefore data are not compared with standards. The MWMO monitors stormwater to characterize surface runoff in the watershed and determine land contributions to water quality in the Mississippi River. Samples are collected for bacteria, nutrients, sediment, inorganic, organic, and metals analyses. The MWMO will not draw conclusions or make assumptions based on this data until 3 - 5 years of accurate flow-weighted composite data are available. The data are presented in Tables D.1 – D.6 in Appendix D.

Discharge data collected with the automated equipment are presented in Figures 14-17.

Discharge data for 7LSTU were not available due to Mississippi River tailwater in the stormwater tunnel.

Kasota Ponds

The MWMO monitors seven locations in the Kasota Ponds. Refer to the 2008 Annual Monitoring Report (MWMO, 2010) for site-specific details.

Monitoring Results

The MWMO monitors Kasota Ponds to characterize water quality in its wetlands. Samples are collected for nutrients, sediment, inorganic, and metals analyses. The MPCA water quality criteria indicate that wetland water quality should maintain background. Background water quality has not yet been determined for MWMO wetlands. The data are presented in Tables E.1 – E.7 in Appendix E.

Work Plan

Assessment of 2009

The MWMO completed all of its monitoring objectives for 2009. Staff installed automated monitoring equipment in the 4PP stormwater pipe and at the outlet of the 2NNBC stormwater pipe. The MWMO provided all of its stormwater data to the MPCA for use in the Upper Mississppi River Bacteria TMDL development. In cooperation with staff from SAFL, the MWMO completed installation of the real-time stormwater monitoring network.

Additional work completed by the MWMO included submitting all of the MWMO's Mississippi River and Loring Pond data to the MPCA's data storage and retrieval (STORET) database and assisting Minneapolis with its illicit discharge detection program.

2010 Work Plan

The MWMO will continue to monitor all the sites listed in this report. Goals for 2010 include:

- Add a Mississippi River monitoring site between the Upper and Lower Saint Anthony Falls to assist the MPCA with assessment of *E. coli* impairments in the river
- Begin discussions with other agencies that monitor water quality on the Mississippi River to determine if their monitoring methodologies are

appropriate for a large river system with dense, urban land uses

- Improve stormwater monitoring methods to reduce time periods with erroneous data or no data
- Update and finalize standard operating procedures for MWMO monitoring protocols
- Conduct data cleaning for 2010 monitoring data
- Share MWMO data through the MPCA STORET database and the Annual Monitoring Report
- Continue working with the MPCA on the Upper Mississippi River Bacteria TMDL
- Coordinate with the City of Minneapolis to assist with their illicit discharge monitoring program

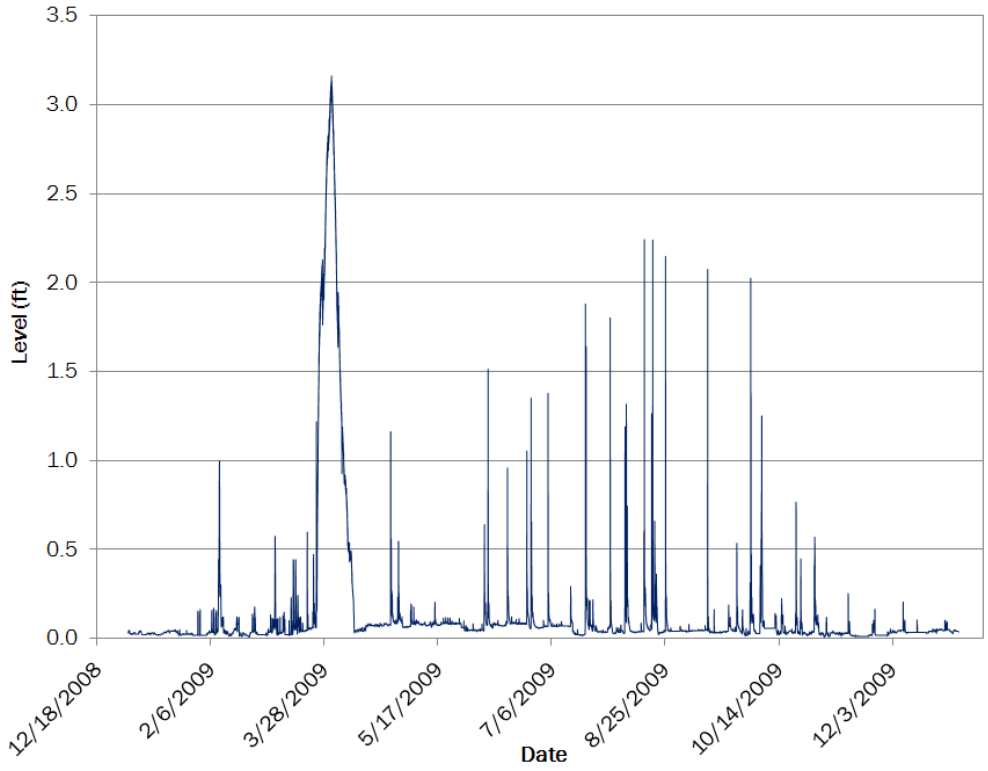

Figure 10. Water level for 1NE

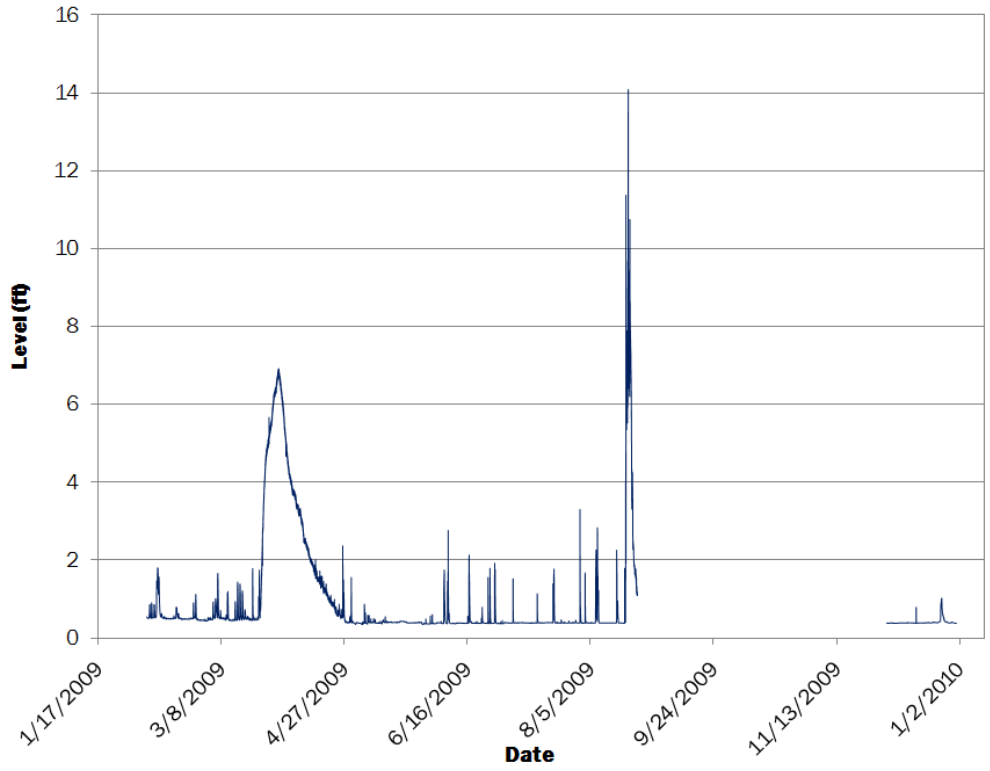

Figure 11. Water level for 4PP

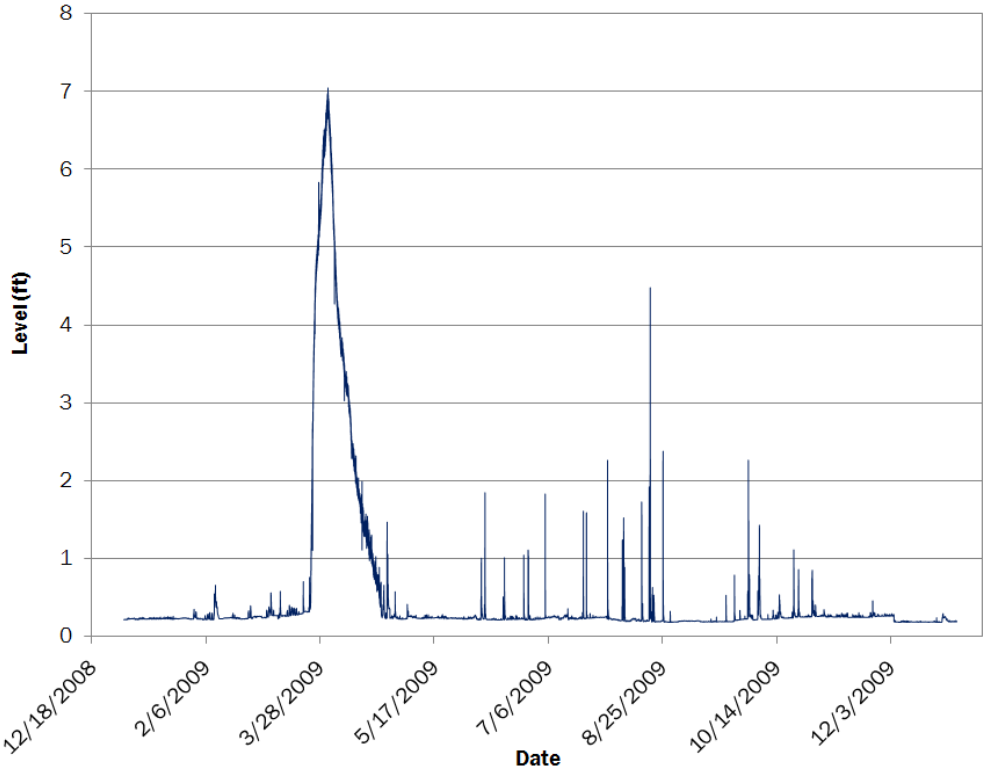

Figure 12. Water level for 6UMN

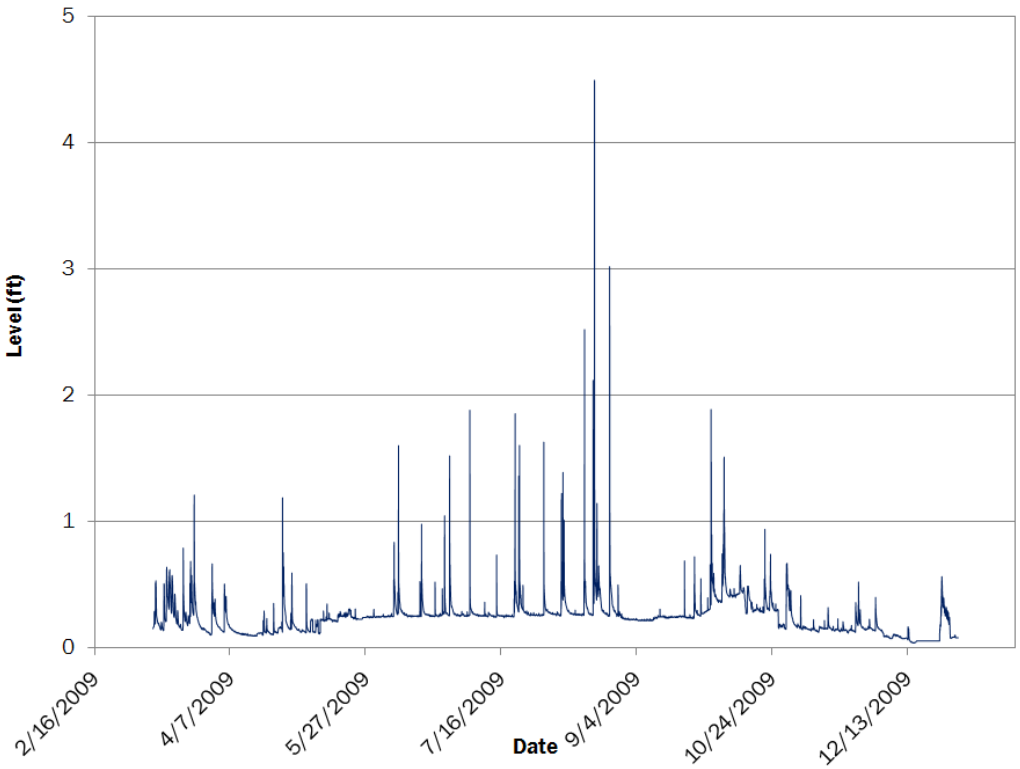

Figure 13. Water level for 10SA

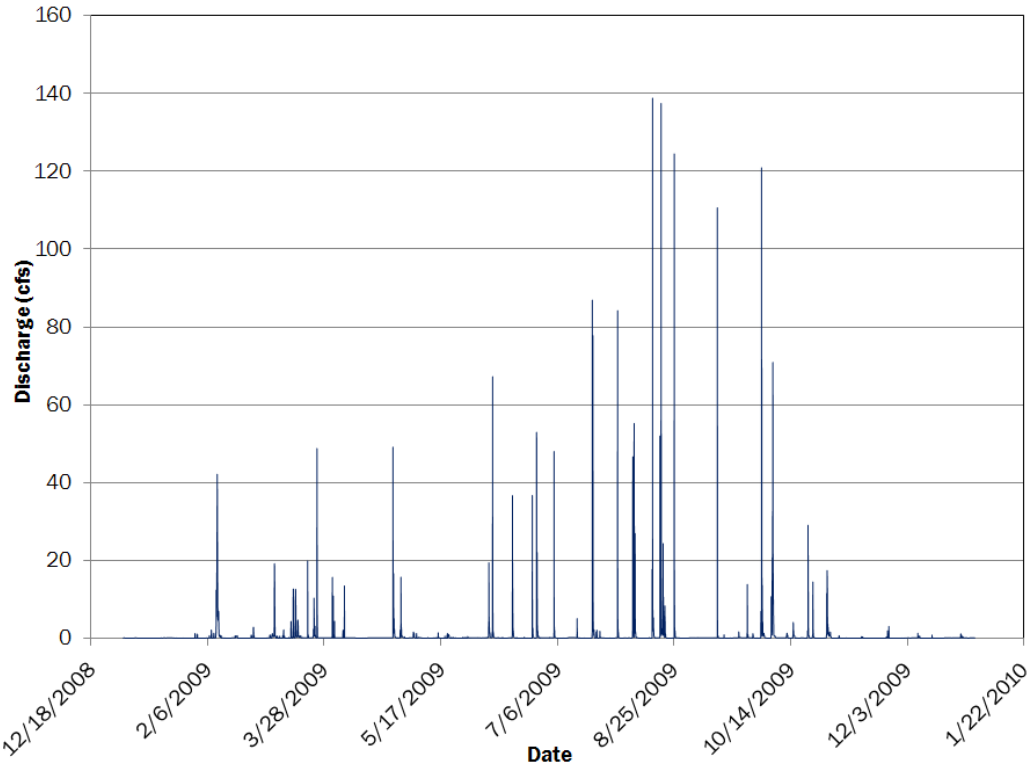

Figure 14. Discharge for 1NE

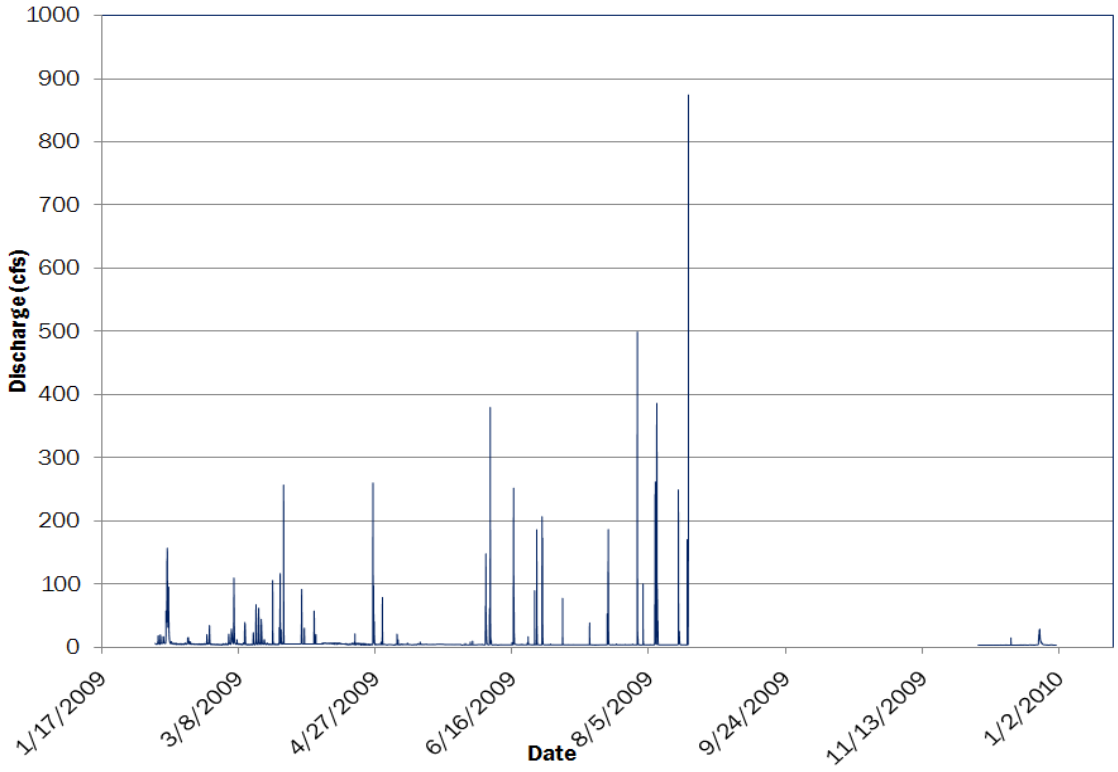

Figure 15. Discharge for 4PP

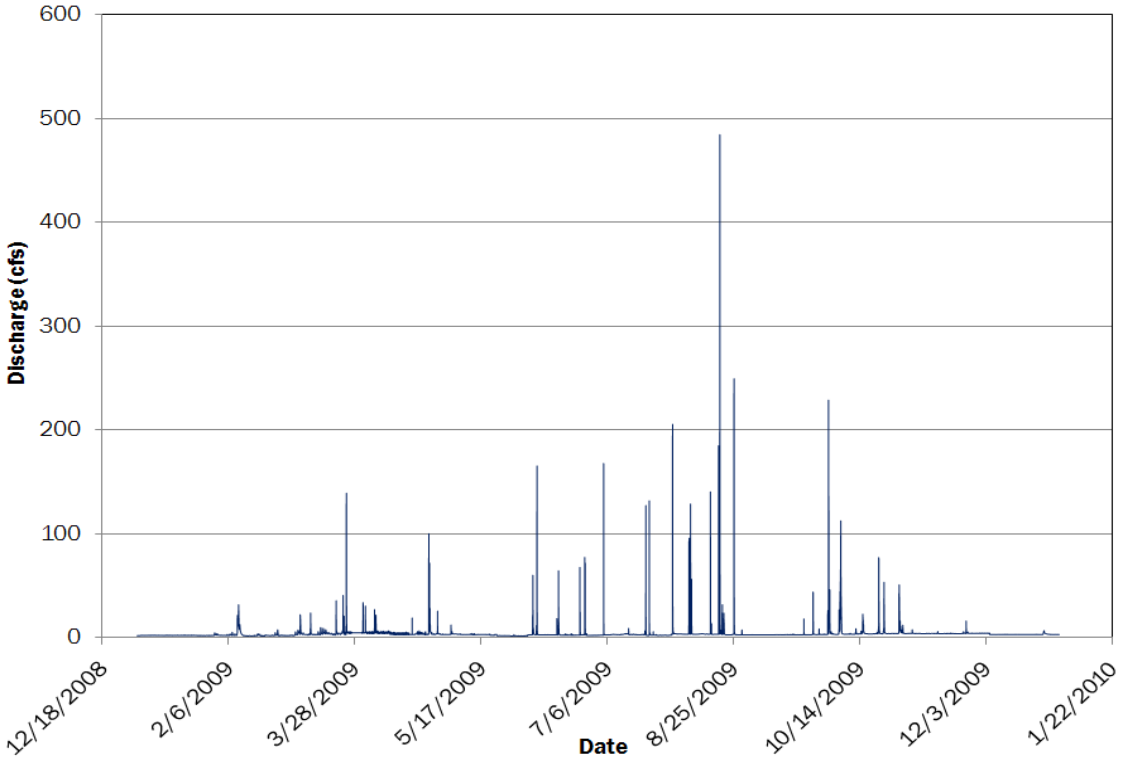

Figure 16. Discharge for 6UMN

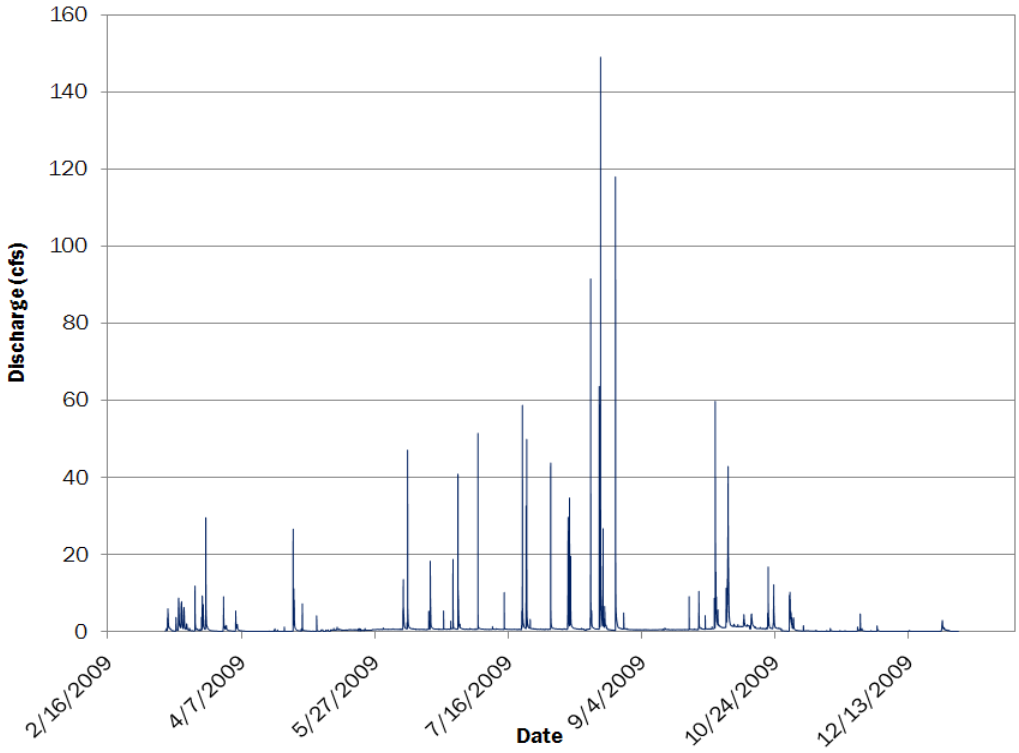

Figure 17. Discharge for 10SA

Future Recommendations

Future needs of the MWMO include (1) knowledge of the contribution of *E. coli* to the Mississippi River from within the MWMO boundaries relative to the remainder of the upper Mississippi River watershed for development of TMDLs for the current impairment and (2) development of big river monitoring methodology to collect accurate, representative data from the Mississippi River in a dense, urban watershed with over 70 outfalls and two streams discharging to the river.

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Appendix A – Watershed Maps

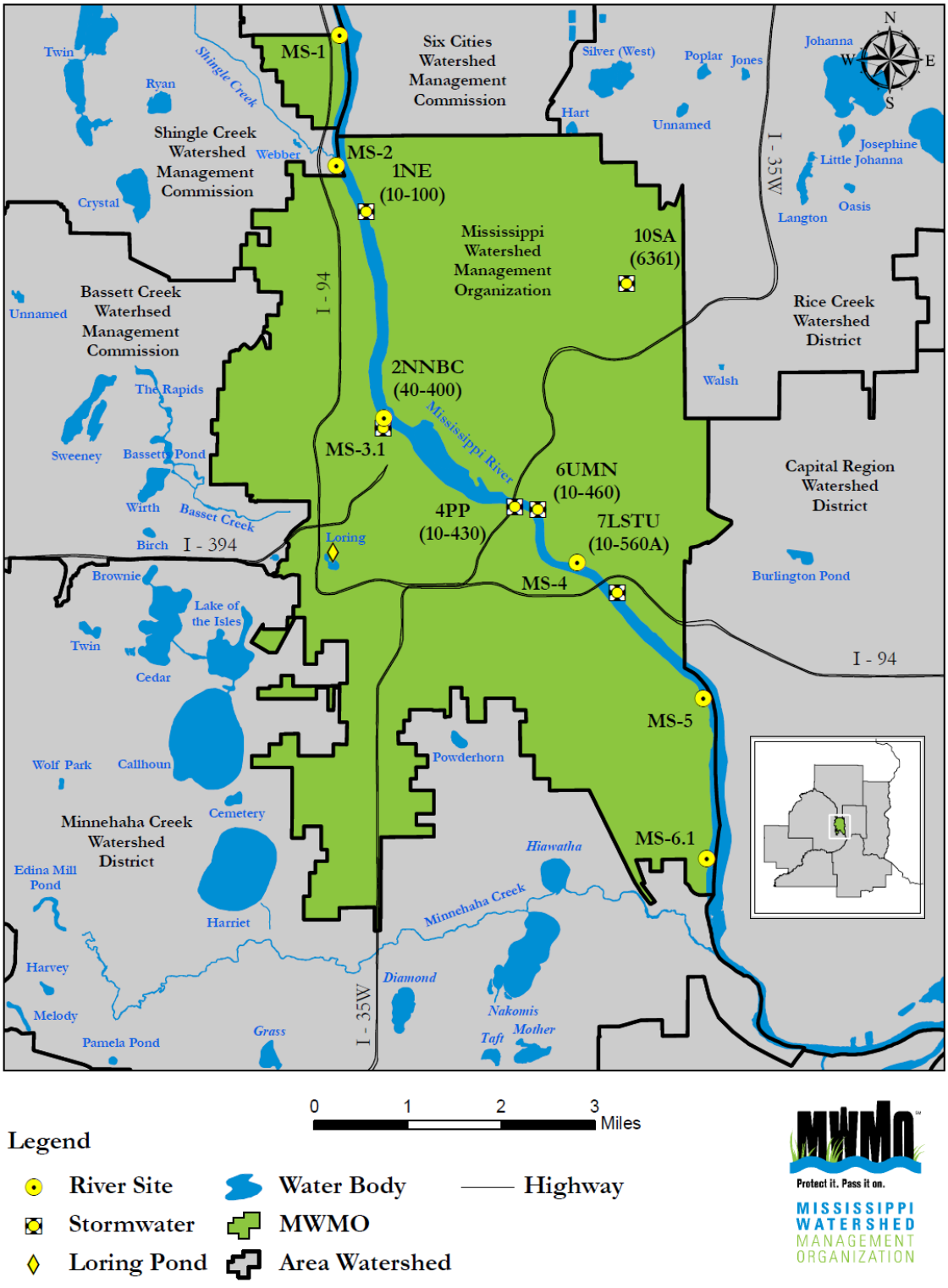

Figure A.1. MWMO watershed boundary and monitoring sites

Figure A.2. Kasota Ponds monitoring sites

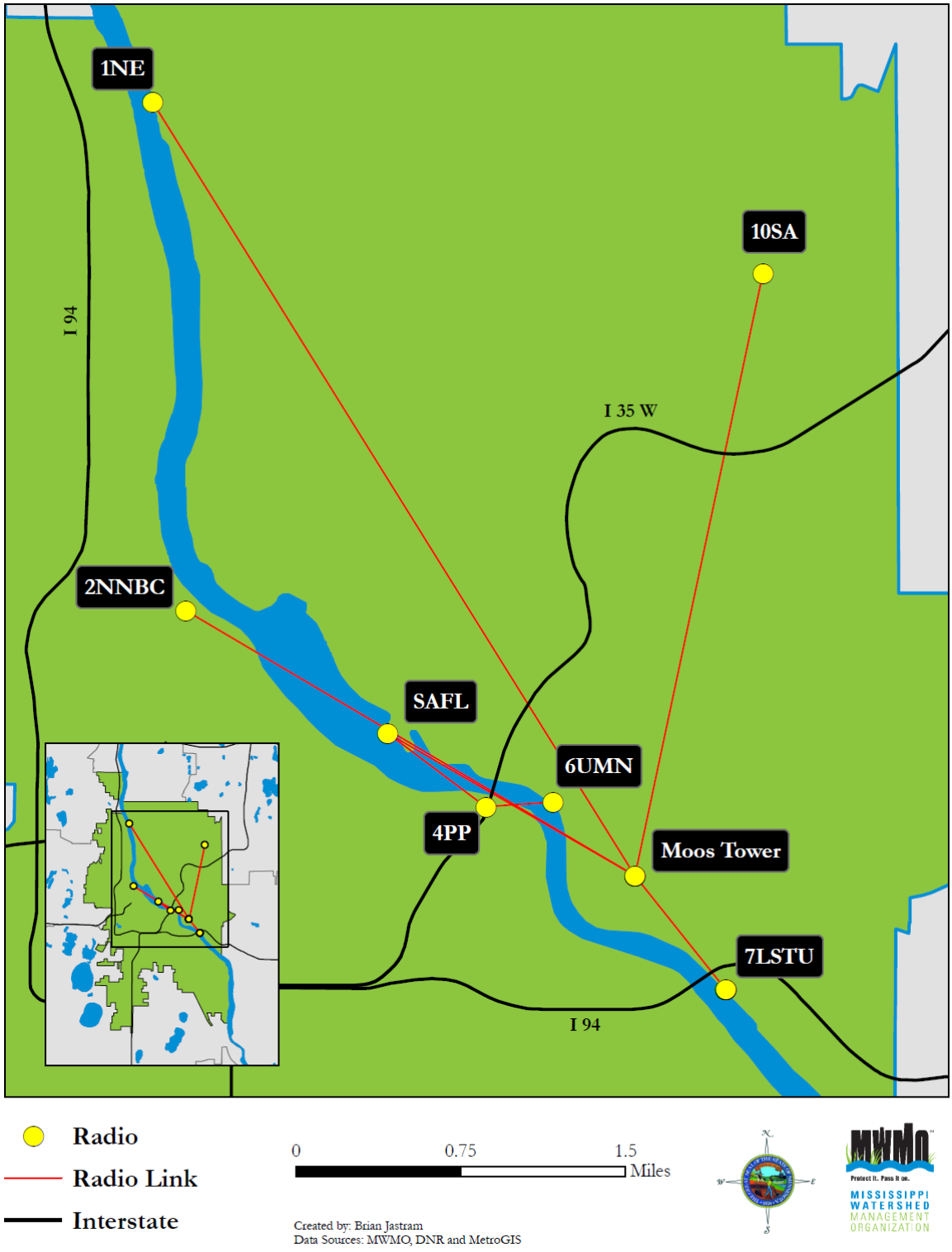

Figure A.3. Real-time monitoring network

Appendix B – Laboratory Methods and Certification

Table B.1. Laboratory methods and certification for each analyte

Analyte	Lab	Method	Certified
Total Metals (Copper, Nickel, Lead, Zinc, Cadmium, Chromium, Mercury)	Metropolitan Council	EPA 200.8 with ATP (Mercury) EPA 245.7	Yes
Total Soluble Metals	Metropolitan Council	EPA 200.8 with ATP (Mercury) EPA 245.7	Yes
Total Chemical Oxygen Demand	Metropolitan Council	EPA 410.4	Yes
Carbonaceous Biological Oxygen Demand (CBOD) 5-Day	Metropolitan Council	Standard Methods 5210B 18th Edition	Yes
Total 5-day BOD	Metropolitan Council	Standard Methods 5210B 18th Edition	No*
Total Organic Carbon	Metropolitan Council	EPA 415.1 wet oxidation; auto sampler; settled sample; NDIR detection	NA
Total & Volatile Suspended Solids	Metropolitan Council	EPA 160.2 ATP	Yes
Total Dissolved Solids	Metropolitan Council	Standard Methods 2540C 18th Edition	No
Total Alkalinity	Metropolitan Council	EPA 310.2	Yes
Total Hardness	Metropolitan Council	Standard Methods 314B 15th Edition	NA
Total Chlorides	Metropolitan Council	EPA 325.2	No
Total Sulfates	Metropolitan Council	Standard Methods 425C 15th Edition	No

*No = Indicates that the lab follows standard certification test methods but has not sought certification from the Minnesota Department of Health.

NA = The Minnesota Department of Health does not have certification for the analyte.

Table B.1 continued. Laboratory methods and certification for each analyte

Analyte	Lab	Method	Certified
Fluoride	Minneapolis Department of Health	Standard Methods 20th Edition 4500-F^- D. SPADNS Method, Ref SM 20th ed.P 4-82	No
Total Phosphorus plus Total Kjeldahl Nitrogen	Metropolitan Council	EPA 351.2 & 365.4 ATP	Yes
Dissolved Phosphorus	Metropolitan Council	EPA 351.2 & 365.4 ATP	Yes
Orthophosphorus	Metropolitan Council	EPA 365.2	Yes
Total Ammonia Nitrogen	Metropolitan Council	EPA 350.1	Yes
Nitrate & Nitrite Nitrogen	Metropolitan Council	EPA 353.1 Chloroform preservation	Yes
Total Volatile Organic Compounds	Metropolitan Council	EPA 624/625	Yes
Oil and Grease	Metropolitan Council	Soxhlet extraction using Freon, dry at 130C and weigh Standard Methods 503C 15th Ed.	NA
E. coli	Minneapolis Department of Health	EPA method 1603	Yes

*No = Indicates that the lab follows standard certification test methods but has not sought certification from the Minnesota Department of Health.

NA = The Minnesota Department of Health does not have certification for the analyte.

Appendix C – *E. coli* Data

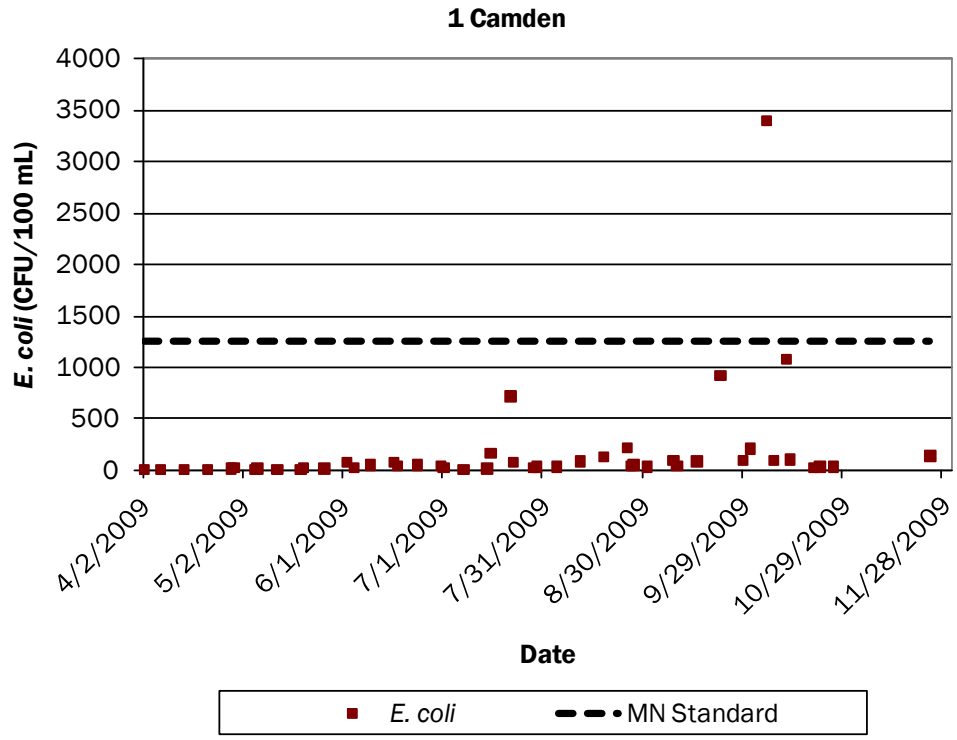

Figure C.1. *E. coli* data for Mississippi River Site 1

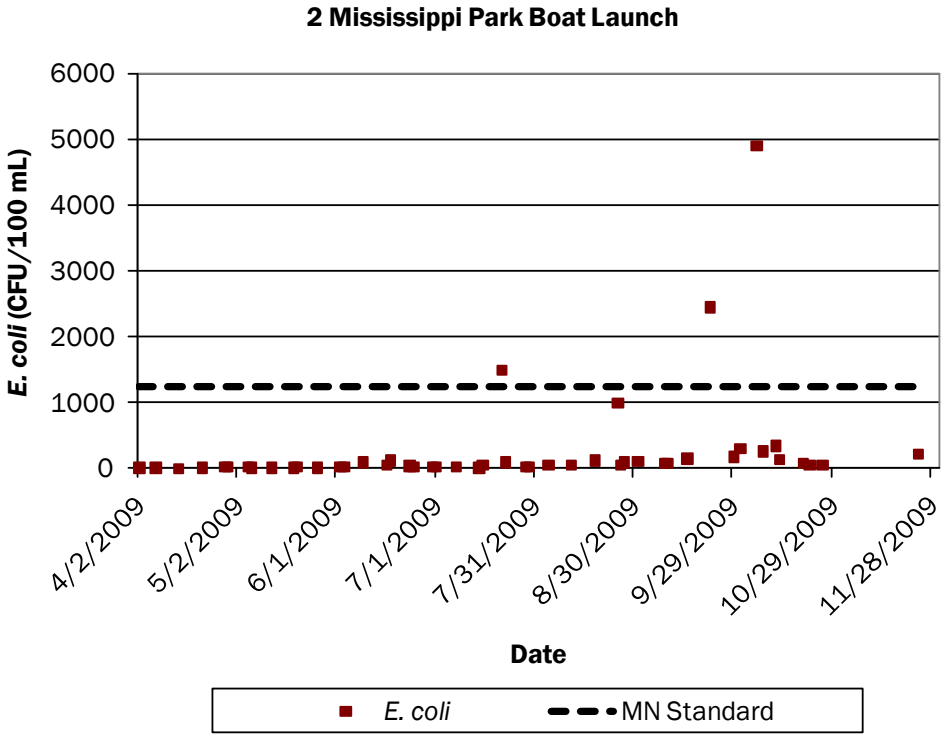

Figure C.2. *E. coli* data for Mississippi River Site 2

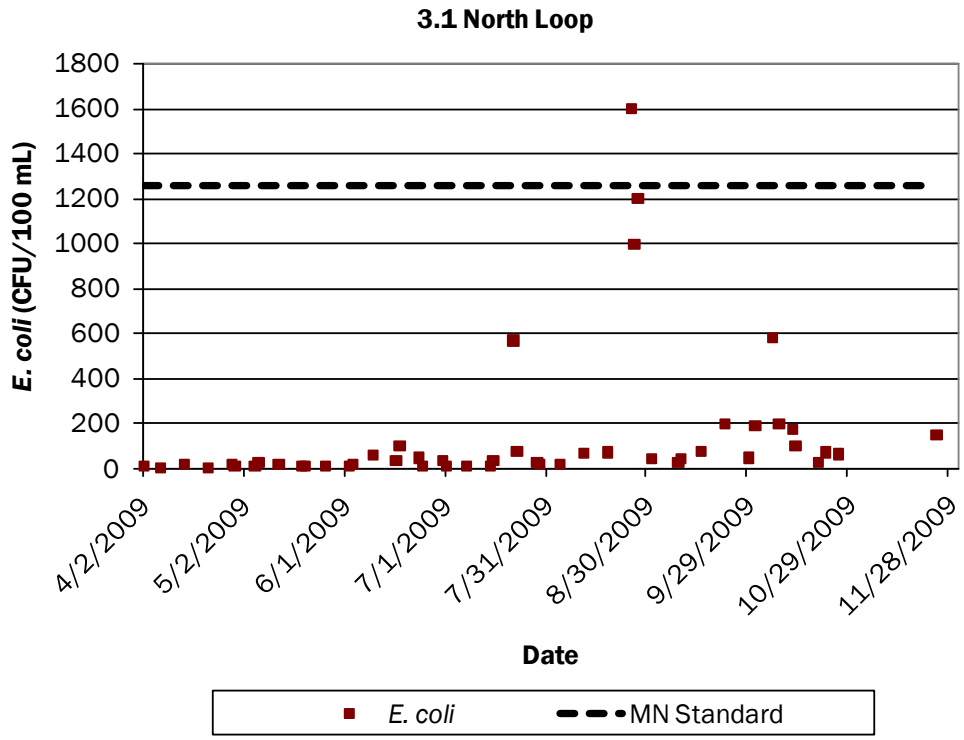

Figure C.3. *E. coli* data for Mississippi River Site 3.1

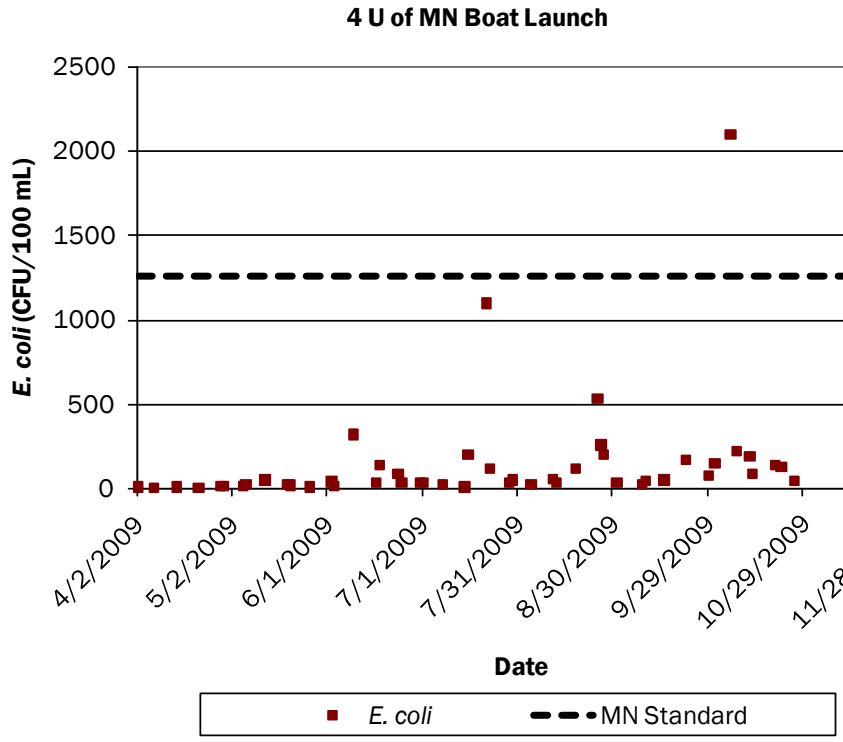

Figure C.4. *E. coli* data for Mississippi River Site 4

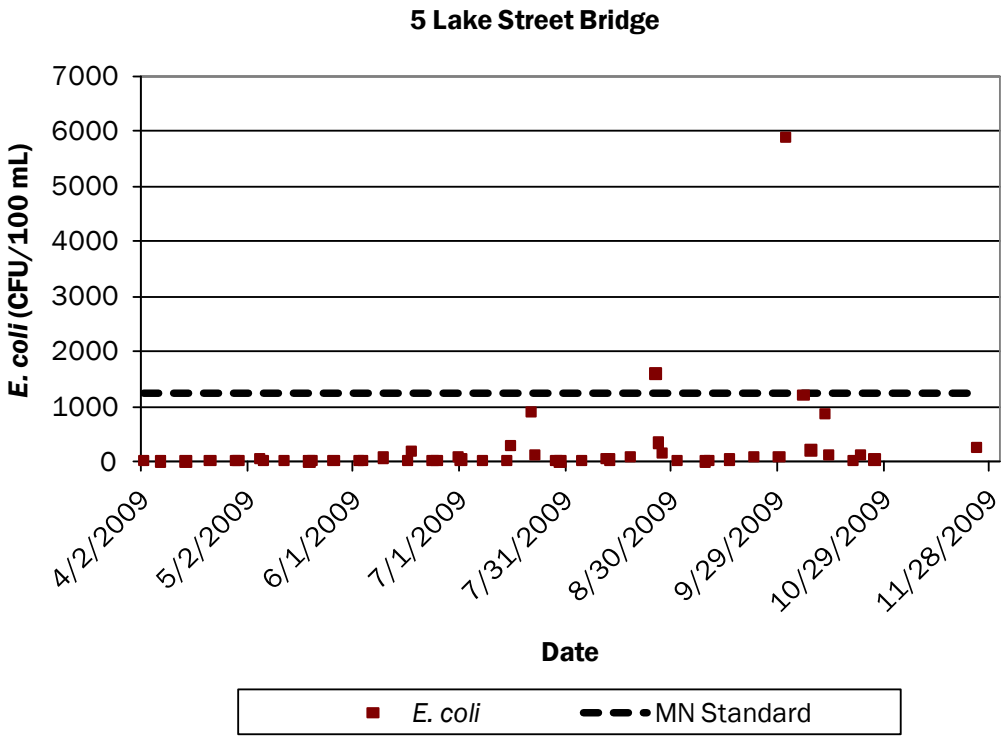

Figure C.5. *E. coli* data for Mississippi River Site 5

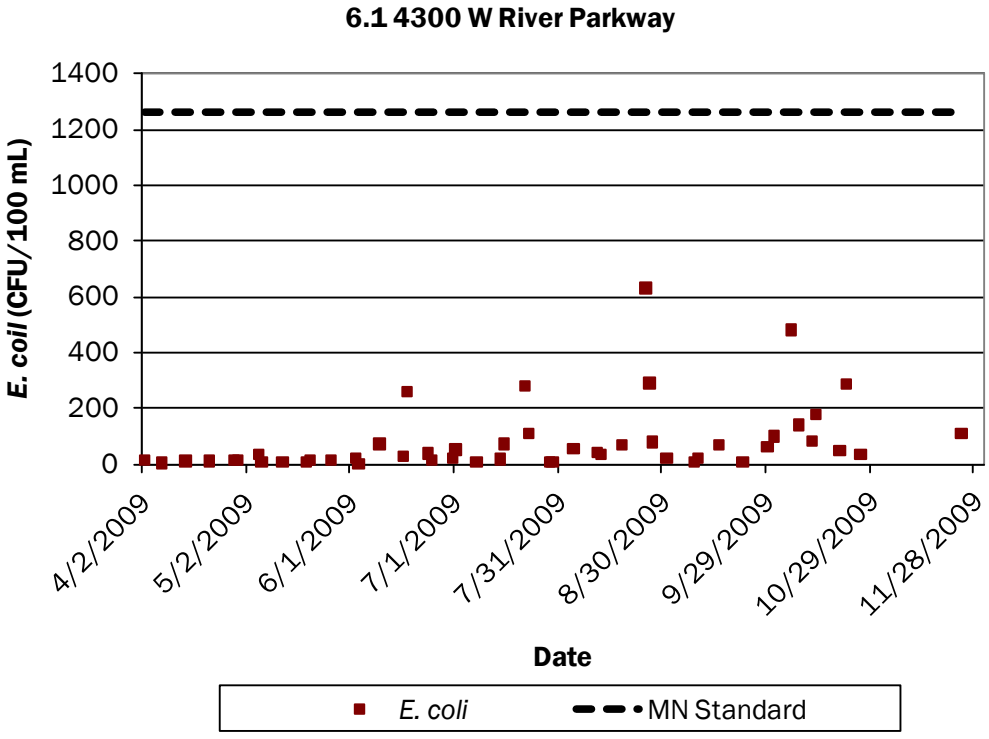

Figure C.6. *E. coli* data for Mississippi River Site 6.1

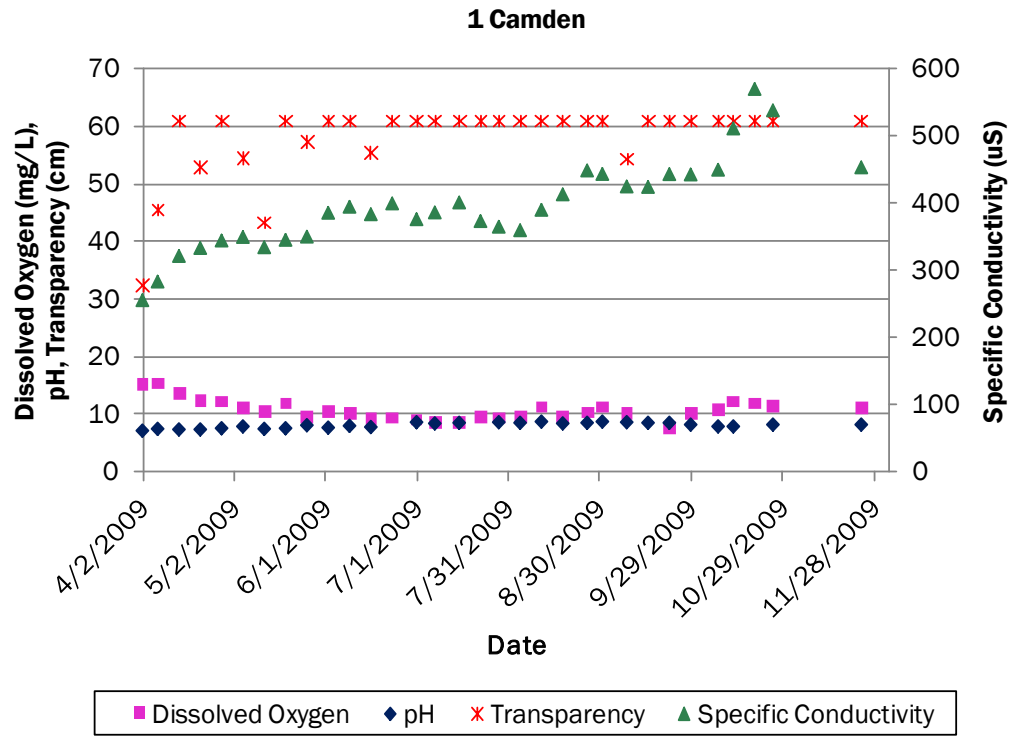

Figure C.7. Dissolved oxygen, pH, transparency, and specific conductivity for Mississippi River Site 1

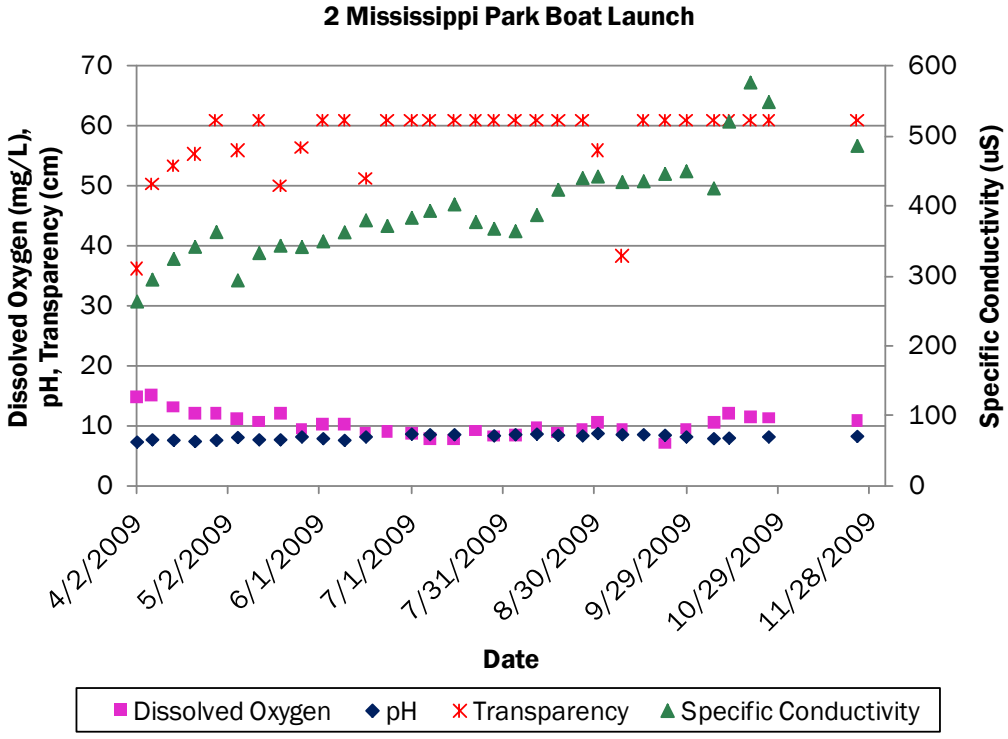

Figure C.8. Dissolved oxygen, pH, transparency, and specific conductivity for Mississippi River Site 2

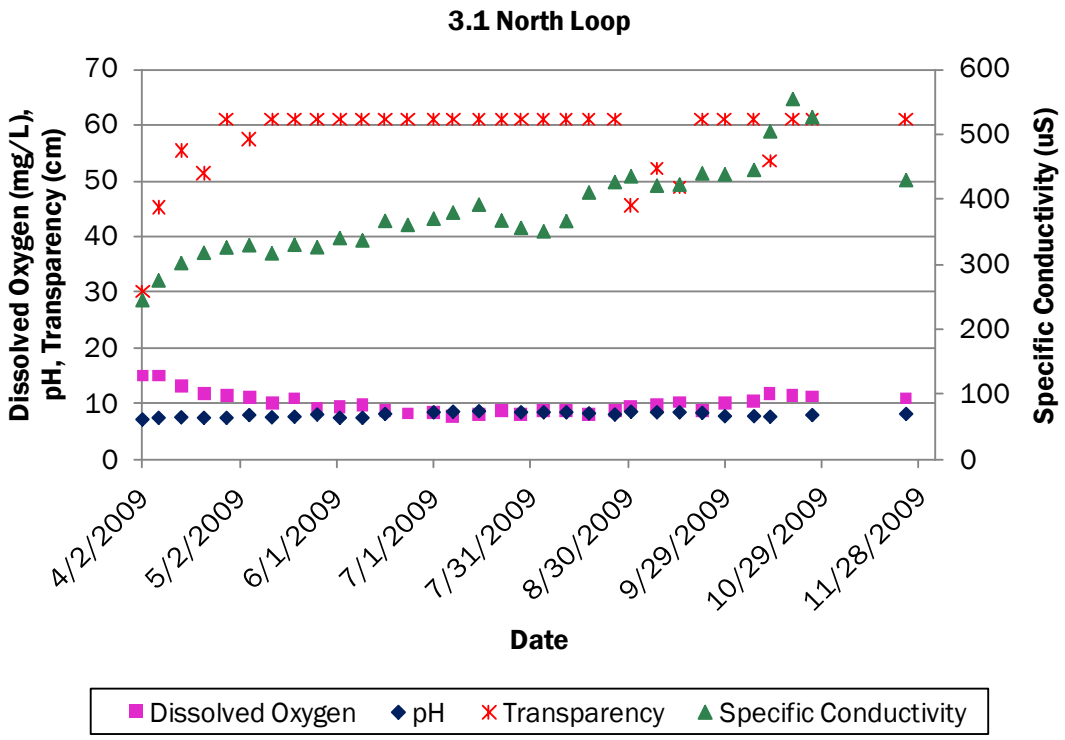

Figure C.9. Dissolved oxygen, pH, transparency, and specific conductivity for Mississippi River Site 3.1

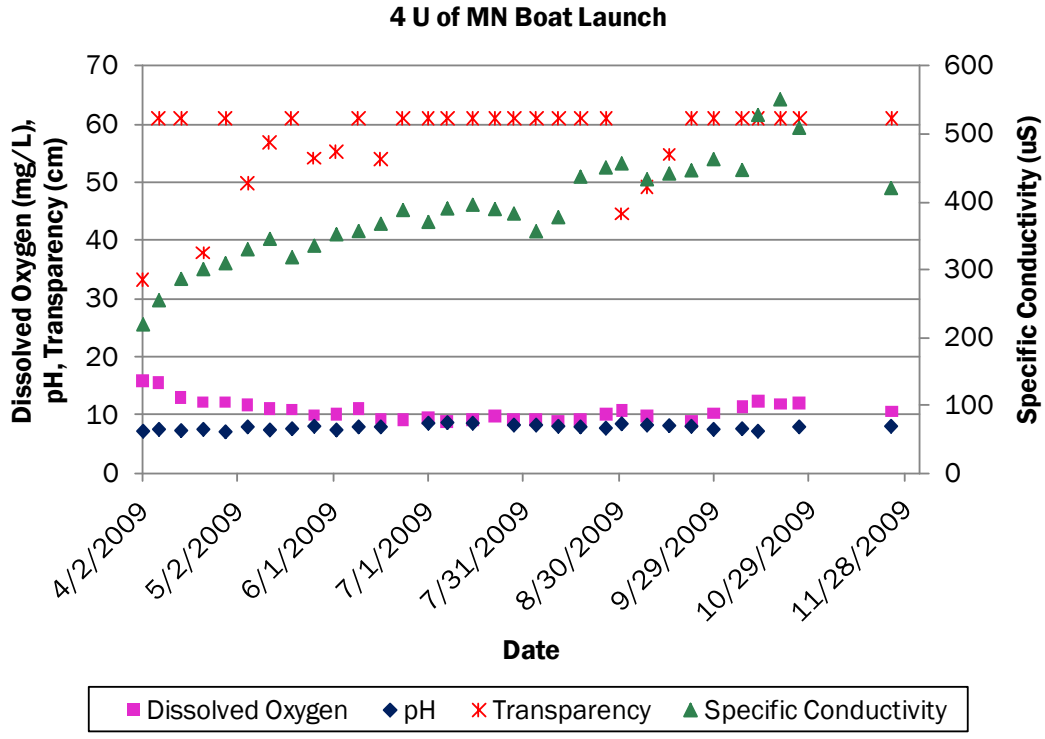

Figure C.10. Dissolved oxygen, pH, transparency, and specific conductivity for Mississippi River Site 4

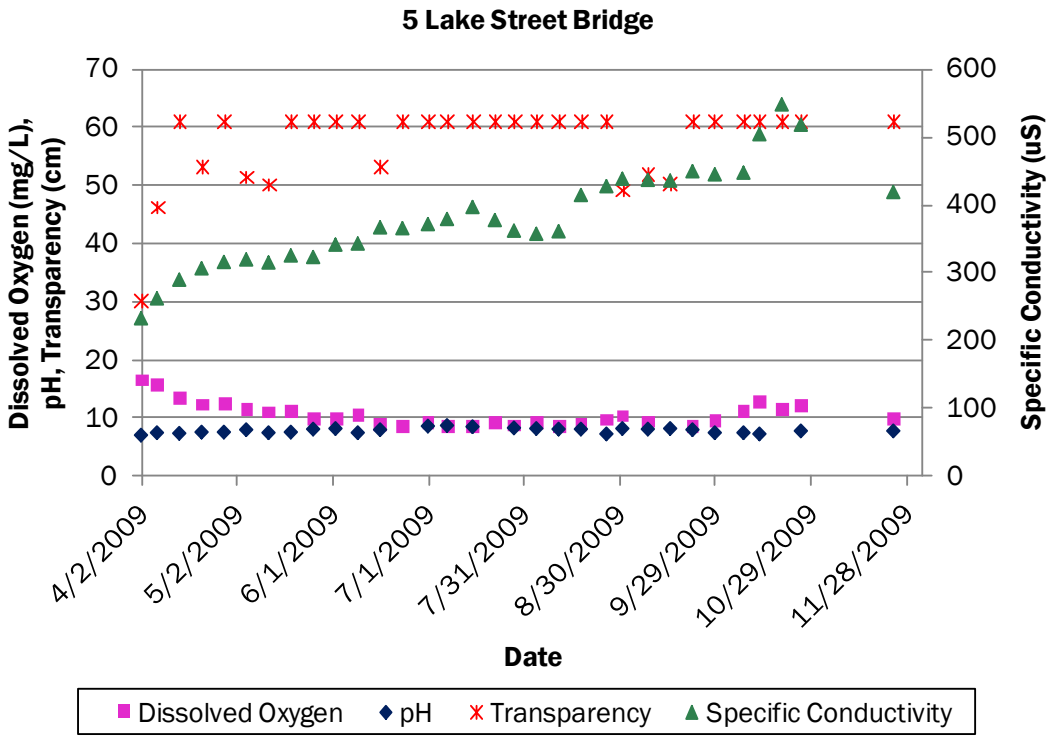

Figure C.11. Dissolved oxygen, pH, transparency, and specific conductivity for Mississippi River Site 5

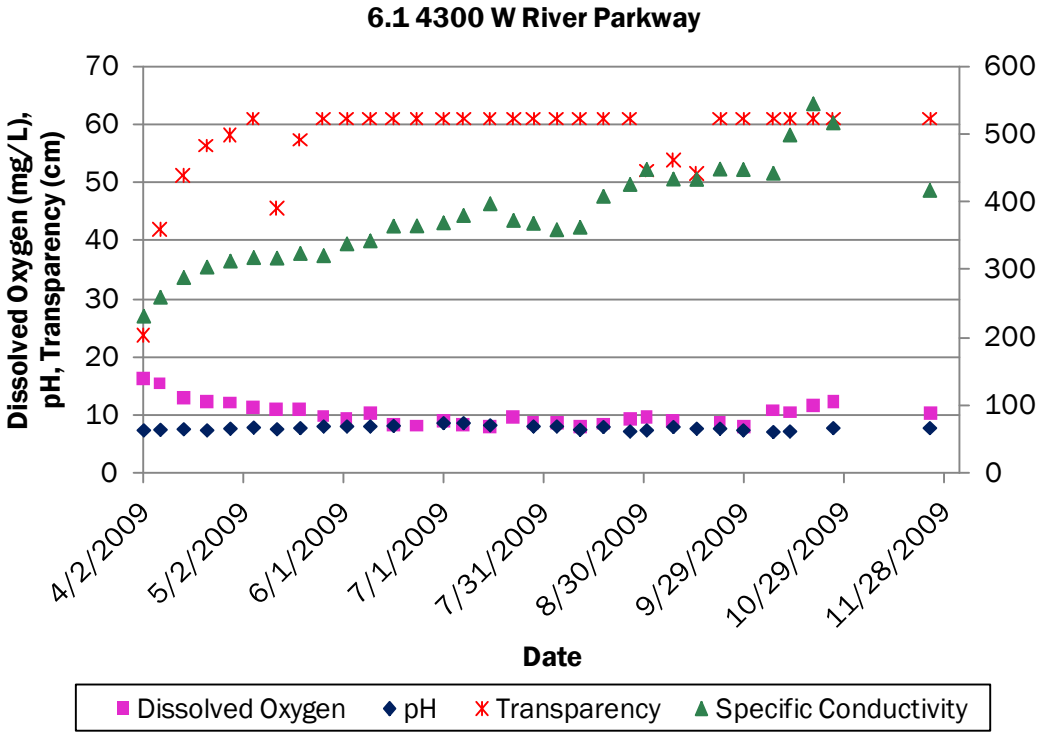

Figure C.12. Dissolved oxygen, pH, transparency, and specific conductivity for Mississippi River Site 6.1

Appendix D – Stormwater Monitoring Results

Table D.1. Monitoring results for 1NE outfall

Start Date Start Time	End Date End Time	Sample Type	Air Temp (F)	Water Temp (F)	Dissolved Oxygen (mg/L)	Conductivity (uS)	Specific Conductivity (uS)	pH	Transparency (cm)	Salinity (ppt)	E. coli (counts/ 100 mL)	Fluoride (mg/L)	Total Suspended Solids (mg/L)	Volatile Suspended Solids (mg/L)	Total Dissolved Solids (mg/L)	Sulfate (mg/L)	Dissolved Phosphorus (mg/L)	Total Phosphorus (mg/L)	Ortho Phosphate (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia Nitrogen (mg/L)	Nitrite N (mg/L)	Nitrate N (mg/L)
1/5/2009	1/5/2009 15:31	Base Grab	24	42.1	11.86	1,529.0	2,432.0		61.0	1.3								0.005		0.8			
2/9/2009	2/10/2009 2:53	Melt Composite	40	40.6	13.10	1,457.0	2,371.0	7.3	7.0	1.2			165	57	1,320	13.6	0.588	0.856	0.542	7.6	1.84	0.13	0.88
3/4/2009	3/4/2009 11:21	Base Grab	29	43.5		1,057.0	1,638.0	7.7	61.0	0.8			3	1	1,030	123.0	0.005	0.014	0.009	1.4	0.09	0.02	0.50
3/6/2009	3/6/2009 11:31	Melt Grab	41	39.6	12.08	1,480.0	2,456.0	7.4	5.8	1.3			148	44	1,380	15.4	0.490	1.490	0.487	7.1	1.67	0.14	0.50
3/6/2009	3/6/2009 17:16	Melt Composite	35	42.4	7.31	741.0	1,171.0	6.8	8.8	0.6					660	7.8	0.535	0.746		6.4	2.06	0.06	0.09
3/14/2009	3/14/2009 18:54	Melt Composite	45	57.0	4.87			7.0	15.1	0.5			80	32	493	8.5	0.542	0.847	0.516	6.2	1.22	0.11	0.27
3/15/2009	3/15/2009 18:42	Melt Composite	45	55.9	6.40			6.6	18.2	0.3			61	29	332	8.7	0.597	0.827	0.298	4.9	1.04	0.14	0.16
3/16/2009	3/16/2009 16:32	Melt Composite	45	49.8	7.92			7.3		0.3			60	26	336	8.4	0.575	1.000	0.548	5.1	0.66	0.04	0.05
3/23/2009	3/23/2009 13:26	Storm Grab	45	42.6	11.76			7.6	8.7	0.2			121	30	282	7.6	0.132	0.522	0.121	2.1	0.28	0.07	0.35
4/13/2009	4/13/2009 12:35	Base Grab	40	56.7	9.34	978.0	1,248.0	8.0	23.1	0.6			16	13	743	95.2	1.140	1.540	1.040	17.0	11.60	0.02	0.13
4/15/2009	4/15/2009 11:40	Base Grab	50	46.2							5,500												
4/26/2009	4/26/2009 21:52	Storm Composite	48	49.6	9.23	195.8	275.5	6.6	7.8	0.1					188	7.4	0.171	1.020	0.146	5.2	0.40	0.03	0.40
4/27/2009	4/27/2009 12:01	Base Grab	48	47.7	10.80	672.0	975.0	6.9	57.6	0.5			5	4	553	41.6	0.027	0.072	0.019	2.1	0.16	0.06	0.59
4/29/2009	4/29/2009 11:50	Storm Grab	50	50.2							5	0.54											
4/29/2009	4/29/2009 23:23	Storm Composite	55	55.6	9.13	203.7	263.6	6.4	11.7	0.1					153	7.0	0.079	0.415	0.072	2.6	0.29	0.04	0.41
5/6/2009	5/6/2009 12:35	Base Grab	70	50.0							14	0.55											
5/11/2009	5/11/2009 12:04	Base Grab	70	48.6	10.63	798.0	1,144.0	7.5	61.0	0.6			9	5	700	75.3	0.062	0.182	0.056	2.0	0.13	0.04	2.20
5/20/2009	5/20/2009 12:15	Base Grab	87	50.7							670	0.47											
5/27/2009	5/27/2009 11:56	Base Grab	60	49.1	11.02	1,019.0	1,448.0	7.4	61.0	0.7			3	2	922	146.0	0.005	0.012	0.006	1.9	0.23	0.02	0.77
6/4/2009	6/4/2009 9:30	Base Grab	70	50.9							1	0.41											
6/8/2009	6/8/2009 8:44	Storm Composite	57	55.0	9.47	121.3	158.1	6.5	18.0	0.1					84	4.2	0.107	0.636	0.086	3.2	0.08	0.02	0.32
6/11/2009	6/11/2009 13:56	Base Grab	70	52.3	10.19	785.0	1,062.0	7.2	61.0	0.5			3	2	625	62.7	0.041	0.088	0.036	2.0	0.09	0.04	1.16
6/16/2009	6/16/2009 22:24	Storm Composite	70	68.0	6.20	186.2	205.3	6.4	17.7	0.1					129	8.2	0.073	0.376	0.063	2.9	0.42	0.08	0.71
6/17/2009	6/17/2009 11:45	Base Grab	72	63.3							7,300	0.31											
6/24/2009	6/24/2009 12:40	Storm Grab	8	53.6							16	0.45											
6/26/2009	6/26/2009 10:13	Base Grab	79	59.2	9.85	1,123.0	1,384.0	7.9	61.0	0.7			987	433	863	133.0	0.005	0.014	0.003	2.1	0.04	0.02	0.38
6/27/2009	6/27/2009 6:20	Storm Composite	65	70.5	4.13	153.1	164.3	7.6	9.1	0.1					100	5.4	0.092	0.531		3.7	0.42	0.05	0.21
6/30/2009	6/30/2009 11:45	Base Grab	62	54.5							300	0.44											

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Table D.1 continued. Monitoring results for 1NE outfall

Start Date Start Time	End Date End Time	Sample Type	Air Temp (F)	Water Temp (F)	Dissolved Oxygen (mg/L)	Conductivity (uS)	Specific Conductivity (uS)	pH	Transparency (cm)	Salinity (ppt)	E. coli (counts/ 100 mL)	Fluoride (mg/L)	Total Suspended Solids (mg/L)	Volatile Suspended Solids (mg/L)	Total Dissolved Solids (mg/L)	Sulfate (mg/L)	Dissolved Phosphorus (mg/L)	Total Phosphorus (mg/L)	Ortho Phosphate (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia Nitrogen (mg/L)	Nitrite N (mg/L)	Nitrate N (mg/L)
7/4/2009 15:14	7/4/2009 19:01	Storm Composite	77	76.5	3.63	183.3	184.4	7.6	15.5	0.1					125	7.00	0.105	0.580		3.4	0.03	0.02	0.17
7/8/2009 12:10	7/8/2009 12:11	Base Grab	77	55.6	10.36	1,082.0	1,400.0	8.0	26.5	0.7			33.0	32.0	863	141.00	0.005	0.060	0.003	2.2	0.07	0.02	0.81
7/14/2009 11:45	7/14/2009 11:45	Base Grab	71	57.2							62	0.95											
7/20/2009 12:15	7/20/2009 12:16	Base Grab	75	56.8	10.21	1,114.0	1,416.0	8.3	17.1	0.7			52.0	44.0	912	14.90	0.005	0.005	0.003	1.6	0.04	0.02	0.65
7/21/2009 1:04	7/21/2009 2:54	Storm Composite	75	72.9	4.21	143.2	149.8	7.5	9.0	0.1					90	5.37	0.053	0.959	0.026	6.5	0.13	0.06	0.35
7/21/2009 11:45	7/21/2009 11:46	Storm Grab	70	45.7	8.12	249.5	373.8	7.4	27.0	0.2					196	7.88	0.058	0.158	0.058	1.8	0.42	0.04	0.32
7/21/2009 11:38	7/21/2009 11:38	Storm Grab	70	67.64							9,500	0.18											
7/29/2009 11:47	7/29/2009 11:47	Base Grab	76	57.56							80	0.36											
8/5/2009 11:20	8/5/2009 11:21	Base Grab	80	58.8	9.37	865.0	1,072.0	7.6	0.1	0.5			1260.0	1080.0	712	137.00	0.005	1.000	0.003	27.0	0.01	0.02	0.44
8/7/2009 9:59	8/7/2009 10:00	Storm Grab	70	66.0	7.41	154.8	175.0	7.8	7.3	0.1					121	10.20	0.146	0.491	0.122	2.0	0.18	0.07	0.52
8/12/2009 12:20	8/12/2009 12:20	Base Grab	83	63.14							210	0.33											
8/18/2009 15:10	8/18/2009 15:11	Base Grab	78	60.4	9.61	850.0	1,031.0	8.1	61.0	0.5			1.0	1.0	631	90.80	0.022	0.055	0.014	1.3	0.04	0.02	0.96
8/19/2009 14:20	8/19/2009 14:21	Storm Grab	70	69.1	8.64	490.0	534.0	8.3	7.5	0.0			92.0	24.0	81	5.88	0.067	0.223	0.045	1.1	0.15	0.02	0.42
8/25/2009 8:23	8/25/2009 8:23	Storm Grab	70	70.88							5,100	0.06											
8/27/2009 8:40	8/27/2009 8:40	Base Grab	67	59.72							700	0.40											
9/2/2009 10:35	9/2/2009 10:36	Base Grab	70	59.4	9.67	1,137.0	1,400.0		61.0	0.7			3.0	1.0	891	145.00	0.005	0.012	0.005	1.4	0.06	0.02	0.85
9/9/2009 8:56	9/9/2009 8:56	Base Grab	69	59.36							10	0.38											
9/12/2009 18:05	9/12/2009 19:08	Storm Composite	81	74.84	4.23	141.0	144.2	7.5	9.8	0.1					75	7.68	0.118	0.433	0.084	1.7	0.42	0.07	0.21
9/17/2009 10:33	9/17/2009 10:34	Base Grab	67	61.0	9.46	1,139.0	1,372.0	7.3	61.0	0.7			2.0	0.5	895	152.00	0.005	0.025	0.009	0.8	0.06	0.02	0.66
9/23/2009 9:10	9/23/2009 9:10	Base Grab	65	61.2							280,000	0.39											
10/1/2009 8:40	10/1/2009 8:40	Storm Grab	50	59.7							1,600	0.38											
10/1/2009 15:47	10/1/2009 22:43	Storm Composite	53	52.5	10.21	57.8	78.1	7.3	14.3	0.0					54		0.070	0.248	0.087	0.9	0.03	0.03	0.23
10/6/2009 8:45	10/6/2009 8:45	Storm Grab	46	50.4							6,400	0.05											
10/6/2009 8:46	10/6/2009 8:46	Storm Grab	46	50.4							7,400	0.05											
10/5/2009 19:29	10/6/2009 12:29	Storm Composite	40	47.1	11.32	57.9	84.9	7.5	15.1	0.0					55	3.27	0.076	0.205	0.057	0.6	0.04	0.02	0.20
10/12/2009 12:06	10/12/2009 12:06	Snow Grab	32	43.5							2,421												
10/13/2009 8:10	10/13/2009 8:10	Base Grab	29	41.2							2,000	0.24											
10/14/2009 13:20	10/14/2009 13:21	Base Grab	30	50.0	9.93	725.0	1,016.0	7.9	61.0	0.5			3.0	1.0	606	84.00	0.005	0.025	0.008	1.2	0.03	0.02	0.76
10/22/2009 11:30	10/22/2009 11:30	Base Grab	40	51.6							1,200	0.04											
10/27/2009 11:55	10/27/2009 11:56	Base Grab	45	54.0	8.94	1,021.0	1,350.0	7.3	28.2	0.7			180.0	8.0	862	166.00	0.017	0.058	0.011	1.3	0.08	0.02	1.05
10/29/2009 12:33	10/30/2009 1:45	Storm Composite	50	51.8	9.01	127.5	174.1			0.1					152	6.13	0.245	0.611		1.6	0.04	0.02	0.03
11/18/2009 12:20	11/18/2009 12:21	Base Grab	45	51.3	10.03	1,061.0	1,458.0	7.4	61.0	0.7			1.0	0.5	902	137.00	0.017	0.005	0.007	1.1	0.09	0.02	1.17
11/24/2009 8:25	11/24/2009 8:25	Storm Grab	48	53.8							8,300	0.39											
12/18/2009 9:27	12/18/2009 9:28	Base Grab	10	43.7	11.00	966.0	1,494.0	7.0	61.0	0.8			0.5	0.5	905		0.005			0.5			

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Table D.1 continued. Monitoring results for 1NE outfall

Start Date Start Time	End Date End Time	Sample Type	Alkalinity (mg/L CaCO3)	Chloride Ion (mg/L)	Hardness (mg/L CaCO3)	COD (mg/L)	Total Organic Carbon (mg/L)	Carbonaceous Biological Oxygen Demand 5-day (mg/L)	Total Biological Oxygen Demand 5-day (mg/L)	Soluble Copper (mg/L)	Total Copper (mg/L)	Soluble Nickel (mg/L)	Total Nickel (mg/L)	Soluble Lead (mg/L)	Total Lead (mg/L)	Soluble Zinc (mg/L)	Total Zinc (mg/L)	Soluble Cadmium (mg/L)	Total Cadmium (mg/L)	Soluble Chromium (mg/L)	Total Chromium (mg/L)	Mercury (ug/L)	Oil and Grease (mg/L)
1/5/2009 15:30	1/5/2009 15:31	Base Grab		460																			
2/9/2009 16:25	2/10/2009 2:53	Melt Composite	62	706	108	191	27.2	24.0	32.0	0.0206	0.0376	0.0032	0.0085	0.0014	0.0202	0.0425	0.188	0.00025	0.00025	0.0025	0.0112		7
3/4/2009 11:20	3/4/2009 11:21	Base Grab	366	238	536	9	3.2	0.5	0.5														3
3/6/2009 11:30	3/6/2009 11:31	Melt Grab	60	752	116	192	27.5	17.6	22.0														6
3/6/2009 11:49	3/6/2009 17:16	Melt Composite	53	357	68	141	19.0																6
3/14/2009 13:41	3/14/2009 18:54	Melt Composite	47	254	60	109	16.6	11.0	22.0														3
3/15/2009 13:02	3/15/2009 18:42	Melt Composite	53	131	68	112	19.5	16.0	23.0														3
3/16/2009 13:07	3/16/2009 16:32	Melt Composite	67	130	56	100	14.4																
3/23/2009 13:25	3/23/2009 13:26	Storm Grab	16	98	60	122	10.3	6.2	7.0														6
4/13/2009 12:30	4/13/2009 12:35	Base Grab	336	134	406	107	19.2	24.0	24.0														3
4/15/2009 11:40	4/15/2009 11:40	Base Grab																					
4/26/2009 10:24	4/26/2009 21:52	Storm Composite	35	54	84	275	17.3	22.0	38.0														22
4/27/2009 12:00	4/27/2009 12:01	Base Grab	123	195	220	36	8.6	3.6	5.4														3
4/29/2009 11:50	4/29/2009 11:50	Storm Grab																					
4/29/2009 20:47	4/29/2009 23:23	Storm Composite	38	49	84	116	13.5	11.0	17.0														
5/6/2009 12:35	5/6/2009 12:35	Base Grab																					
5/11/2009 12:03	5/11/2009 12:04	Base Grab	272	168	384	26	5.2	2.5	3.2														3
5/20/2009 12:15	5/20/2009 12:15	Base Grab																					
5/27/2009 11:55	5/27/2009 11:56	Base Grab	387	209	576	15	3.2	0.5	0.5														3
6/4/2009 9:30	6/4/2009 9:30	Base Grab																					
6/8/2009 5:18	6/8/2009 8:44	Storm Composite	23	29	52	129	7.2	14.0	23.0														29
6/11/2009 13:55	6/11/2009 13:56	Base Grab	209	170	356	27	7.1	1.1	1.6														3
6/16/2009 17:47	6/16/2009 22:24	Storm Composite	50	31	60	80	13.5	5.6	7.7														6
6/17/2009 11:45	6/17/2009 11:45	Base Grab																					
6/24/2009 12:40	6/24/2009 12:40	Storm Grab																					
6/26/2009 10:12	6/26/2009 10:13	Base Grab	333	192	524	22	5.4	1.0	1.5														3
6/27/2009 3:17	6/27/2009 6:20	Storm Composite	38	23	64	104	10.3																3
6/30/2009 11:45	6/30/2009 11:45	Base Grab																					

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Table D.1 continued. Monitoring results for 1NE outfall

Start Date Start Time	End Date End Time	Sample Type	Alkalinity (mg/L CaCO3)	Chloride Ion (mg/L)	Hardness (mg/L CaCO3)	COD (mg/L)	Total Organic Carbon (mg/L)	Carbonaceous Biological Oxygen Demand 5-day (mg/L)	Total Biological Oxygen Demand 5-day (mg/L)	Soluble Copper (mg/L)	Total Copper (mg/L)	Soluble Nickel (mg/L)	Total Nickel (mg/L)	Soluble Lead (mg/L)	Total Lead (mg/L)	Soluble Zinc (mg/L)	Total Zinc (mg/L)	Soluble Cadmium (mg/L)	Total Cadmium (mg/L)	Soluble Chromium (mg/L)	Total Chromium (mg/L)	Mercury (ug/L)	Oil and Grease (mg/L)
7/4/2009 15:14	7/4/2009 19:01	Storm Composite	41	21	64	144	14.5				0.0271		0.0075		0.0251		0.1840		0.00025		0.0119	0.041	17
7/8/2009 12:10	7/8/2009 12:11	Base Grab	364	165	540	70	6.8	1.0	0.5														3
7/14/2009 11:45	7/14/2009 11:45	Base Grab																					
7/20/2009 12:15	7/20/2009 12:16	Base Grab	262	183	528	92	4.1	1.5	1.5														3
7/21/2009 1:04	7/21/2009 2:54	Storm Composite	31	21	68	193	12.3		18.0														11
7/21/2009 11:45	7/21/2009 11:46	Storm Grab	39	85	56	45	9.4	4.2	6.3														9
7/21/2009 11:38	7/21/2009 11:38	Storm Grab																					
7/29/2009 11:47	7/29/2009 11:47	Base Grab																					
8/5/2009 11:20	8/5/2009 11:21	Base Grab	249	134	500	8,600	9.6	6.0	6.0	0.0020	0.0492	0.0038	0.0250	0.00020	0.0550	0.0374	0.1340	0.00025	0.00025	0.0025	0.0199	0.508	50
8/7/2009 9:59	8/7/2009 10:00	Storm Grab	31	19	72	180	23.6	23.0	34.0														3
8/12/2009 12:20	8/12/2009 12:20	Base Grab																					
8/18/2009 15:10	8/18/2009 15:11	Base Grab	265	136	400	15	5.3	0.5	0.5														3
8/19/2009 14:20	8/19/2009 14:21	Storm Grab	23	11	68	59	10.5	4.7	7.2														3
8/25/2009 8:23	8/25/2009 8:23	Storm Grab																					
8/27/2009 8:40	8/27/2009 8:40	Base Grab																					
9/2/2009 10:35	9/2/2009 10:36	Base Grab	379	169	492	18	2.8	0.5	0.5														3
9/9/2009 8:56	9/9/2009 8:56	Base Grab																					
9/12/2009 18:05	9/12/2009 19:08	Storm Composite	34	10	56	119	10.1																7
9/17/2009 10:33	9/17/2009 10:34	Base Grab	341	162	516	12	3.7	0.5	0.5	0.0020	0.0021	0.0081	0.0082	0.00005	0.0001	0.0025	0.0025	0.00025	0.00025	0.0025	0.0025	0.012	3
9/23/2009 9:10	9/23/2009 9:10	Base Grab																					
10/1/2009 8:40	10/1/2009 8:40	Storm Grab																					
10/1/2009 15:47	10/1/2009 22:43	Storm Composite	5	6	20	61	7.1	5.2	6.1	0.0029	0.0124	0.0008	0.0039	0.00050	0.0154	0.0075	0.0682	0.00025	0.00025	0.0063	0.0069	0.024	3
10/6/2009 8:45	10/6/2009 8:45	Storm Grab																					
10/6/2009 8:46	10/6/2009 8:46	Storm Grab																					
10/5/2009 19:29	10/6/2009 12:29	Storm Composite	22	6	48	31	4.8		3.8														3
10/12/2009 12:06	10/12/2009 12:06	Snow Grab																					
10/13/2009 8:10	10/13/2009 8:10	Base Grab																					
10/14/2009 13:20	10/14/2009 13:21	Base Grab	264	108	392	16	3.8	0.5	1.1														3
10/22/2009 11:30	10/22/2009 11:30	Base Grab																					
10/27/2009 11:55	10/27/2009 11:56	Base Grab	241	16	472	27	4.2	1.5	2.0														6
10/29/2009 12:33	10/30/2009 1:45	Storm Composite	40	14	112	144	21.5																6
11/18/2009 12:20	11/18/2009 12:21	Base Grab	364	175	528	21	3.1	0.5	0.5														3
11/24/2009 8:25	11/24/2009 8:25	Storm Grab																					
12/18/2009 9:27	12/18/2009 9:28	Base Grab		190																			

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Table D.2. Monitoring results for 2NNBC outfall

Start Date Start Time	End Date End Time	Sample Type	Air Temp (F)	Water Temp (F)	Dissolved Oxygen (mg/L)	Conductivity (uS)	Specific Conductivity (uS)	pH	Transparency (cm)	Salinity (ppt)	E. coli (counts/ 100 mL)	Fluoride (mg/L)	Total Suspended Solids (mg/L)	Volatile Suspended Solids (mg/L)	Total Dissolved Solids (mg/L)	Sulfate (mg/L)	Dissolved Phosphorus (mg/L)	Total Phosphorus (mg/L)	Ortho Phosphate (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia Nitrogen (mg/L)	Nitrite N (mg/L)	Nitrate N (mg/L)
3/6/2009 12:30	3/6/2009 12:31	Melt Grab	41	43.7	10.38	1,798.0	2,778.0	7.3	18.9	1.4			30	13	1,530	35.0	0.535	0.516	0.443	5.5	1.25	0.09	1.25
3/23/2009 12:45	3/23/2009 12:46	Storm Grab	45	45.1	10.81			7.6	7.2	0.4			116	34	458	15.9	0.218	0.410	0.157	2.0	0.43	0.07	0.74
5/6/2009 11:45	5/6/2009 11:45	Base Grab	67	64.0							750	0.96											
5/11/2009 13:50	5/11/2009 13:51	Base Grab	70	64.8	5.50	830.0	954.0	7.4	61.0	0.5			7	3	613	81.0	0.277	0.327	0.221	1.2	0.25	0.05	0.72
5/20/2009 11:52	5/20/2009 11:52	Base Grab	85	71.8							38	1.17											
6/11/2009 15:35	6/11/2009 15:36	Base Grab	73	72.5	5.12	881.0	925.0	7.1	61.0	0.5			6	2	547	72.8	0.078	0.189	0.066	1.1	0.30	0.02	0.33
6/30/2009 11:00	6/30/2009 11:00	Base Grab	62	67.3							10,000	1.34											
7/20/2009 11:26	7/20/2009 11:27	Base Grab	75	67.5	7.11	866.0	962.0	8.0	61.0	0.5			1	1	623	91.9	0.276	0.214	0.179	1.2	0.23	0.02	0.79
7/21/2009 10:51	7/21/2009 10:51	Storm Grab	69	69.6							17,000	0.23											
7/29/2009 11:02	7/29/2009 11:02	Base Grab	73	68.7							70	1.02											
8/7/2009 10:30	8/7/2009 10:31	Storm Grab	70	67.1	7.95	154.0	172.1	7.7	11.1	0.1					104	9.8	0.133	0.441	0.112	1.6	0.17	0.04	0.44
8/18/2009 11:25	8/18/2009 11:26	Base Grab	69	66.2	6.74	841.0	949.0	7.9	61.0	0.5			4	2	588	92.7	0.254	0.268	0.194	1.2	0.22	0.02	1.03
8/19/2009 13:50	8/19/2009 13:51	Storm Grab	70	70.3	7.98	101.6	109.3	8.1	20.2	0.1			512	78	62	2.1	0.061	0.394	0.039	1.8	0.07	0.02	0.18
8/25/2009 11:10	8/25/2009 11:10	Storm Grab	71	72.1							3,800	0.27											
9/9/2009 11:55	9/9/2009 11:55	Base Grab	74	75.0							20	0.90											
10/6/2009 11:48	10/6/2009 11:48	Storm Grab	46	50.5							8,700	0.05											
10/6/2009 7:32	10/6/2009 7:44	Storm Composite	45	44.6	11.05	67.3	102.3	7.6	36.2	0.0					50	3.8	0.091	0.124	0.057	0.5	0.15	0.02	0.21
10/12/2009 11:20	10/12/2009 11:20	Snow Grab	31	45.0							53												
11/24/2009 10:59	11/24/2009 10:59	Storm Grab	45	56.3							230	3.90											

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Maroon font equals values was ~. Value used for analysis was the ~value.

Table D.2 continued. Monitoring results for 2NNBC outfall

Start Date Start Time	End Date End Time	Sample Type	Alkalinity (mg/L CaCO3)	Chloride Ion (mg/L)	Hardness (mg/L CaCO3)	COD (mg/L)	Total Organic Carbon (mg/L)	Carbonaceous Biological Oxygen Demand 5-day (mg/L)	Total Biological Oxygen Demand 5-day (mg/L)	Soluble Copper (mg/L)	Total Copper (mg/L)	Soluble Nickel (mg/L)	Total Nickel (mg/L)	Soluble Lead (mg/L)	Total Lead (mg/L)	Soluble Zinc (mg/L)	Total Zinc (mg/L)	Soluble Cadmium (mg/L)	Total Cadmium (mg/L)	Soluble Chromium (mg/L)	Total Chromium (mg/L)	Mercury (ug/L)	Oil and Grease (mg/L)
3/6/2009 12:30	3/6/2009 12:31	Melt Grab	102	850	176	103	17.0	12.4	15.0														3
3/23/2009 12:45	3/23/2009 12:46	Storm Grab	42	183	82	131	12.2	13.0	18.0														10
5/6/2009 11:45	5/6/2009 11:45	Base Grab																					
5/11/2009 13:50	5/11/2009 13:51	Base Grab	290	84	418	30	7.7	1.2	2.9														10
5/20/2009 11:52	5/20/2009 11:52	Base Grab																					
6/11/2009 15:35	6/11/2009 15:36	Base Grab	312	84	420	13	5.4	0.5	0.5														3
6/30/2009 11:00	6/30/2009 11:00	Base Grab																					
7/20/2009 11:26	7/20/2009 11:27	Base Grab	310	95	428	18	4.8	0.5	0.5														3
7/21/2009 10:51	7/21/2009 10:51	Storm Grab																					
7/29/2009 11:02	7/29/2009 11:02	Base Grab																					
8/7/2009 10:30	8/7/2009 10:31	Storm Grab	45	19	56	87	16.5	19.0	23.0	0.0057	0.0315	0.0017	0.0046	0.001	0.0324	0.115	0.154	0.00025	0.0006	0.0025	0.0093	0.07	8
8/18/2009 11:25	8/18/2009 11:26	Base Grab	284	93	420	19	5.6	0.5	0.5														3
8/19/2009 13:50	8/19/2009 13:51	Storm Grab	14	5	40	96	4.5	4.9	9.7														6
8/25/2009 11:10	8/25/2009 11:10	Storm Grab																					
9/9/2009 11:55	9/9/2009 11:55	Base Grab																					
10/6/2009 11:48	10/6/2009 11:48	Storm Grab																					
10/6/2009 7:32	10/6/2009 7:44	Storm Composite	26	7	44	25	4.1		3.2														3
10/12/2009 11:20	10/12/2009 11:20	Snow Grab																					
11/24/2009 10:59	11/24/2009 10:59	Storm Grab																					

All duplicates are omitted from analysis.

Green font indicates value was greater than the maximum detection limit. MDL+1 was the value used for analysis.

Blue font indicates the value was below the minimum detection limit and 1/2 the MDL was used as the value for analysis.

Maroon font equals values was ~. Value used for analysis was the ~value.

Table D.3. Monitoring results for 4PP outfall

Start Date Start Time	End Date End Time	Sample Type	Air Temp (F)	Water Temp (F)	Dissolved Oxygen (mg/L)	Conductivity (uS)	Specific Conductivity (uS)	pH	Transparency (cm)	Salinity (ppt)	E. coli (counts/100 mL)	Fluoride (mg/L)	Total Suspended Solids (mg/L)	Volatile Suspended Solids (mg/L)	Total Dissolved Solids (mg/L)	Sulfate (mg/L)	Dissolved Phosphorus (mg/L)	Total Phosphorus (mg/L)	Ortho Phosphate (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia Nitrogen (mg/L)	Nitrite N (mg/L)	Nitrate N (mg/L)
1/5/2009 14:37	1/5/2009 14:38	Base Grab	24	48.7	10.88	1,112.0	1,587.0		61.0	0.8								0.005		0.5			
2/5/2009 9:19	2/5/2009 9:20	Base Grab	15	48.9	11.85	910.0	1,297.0	7.6	61.0	0.7			48.0	1.0	781			0.039		0.4			
3/3/2009 10:32	3/3/2009 10:33	Base Grab	26	47.5	13.00	741.0	1,078.0	7.8	61.0	0.5			1.0	0.5	535	77.3	0.005	0.005	0.021	0.8	0.04	0.02	1.59
3/6/2009 13:05	3/6/2009 13:06	Melt Grab	41	41.4	13.69	1,326.0	2,132.0	7.5	5.0	1.1			322.0	80.0	1,190	15.8	0.409	1.140	0.378	5.9	1.19	0.13	0.44
3/23/2009 10:49	3/23/2009 10:50	Storm Grab	45	46.8	11.85			7.1	6.8	0.6			96.0	36.0	676	42.3	0.098	0.191	0.078	2.1	0.32	0.09	0.76
3/31/2009 13:33	3/31/2009 13:34	Storm Grab	35	38.1		160.0	272.3	7.3	11.4	0.1			49.0	18.0	166	9.2	0.072	0.205	0.069	1.4	0.47	0.05	0.60
4/29/2009 10:45	4/29/2009 10:45	Storm Grab	50	53.4							10	0.35											
5/8/2009 10:09	5/8/2009 10:10	Base Grab	65	52.5	10.44	984.0	1,330.0	7.7	61.0	0.7			2.0	1.0	797	85.9	0.005	0.036	0.017	1.3	0.04	0.02	1.64
5/20/2009 11:16	5/20/2009 11:16	Base Grab	80	55.2							1	0.35											
5/27/2009 10:45	5/27/2009 10:46	Base Grab	60	53.2	10.33	863.0	1,155.0	7.5	61.0	0.6			6.0	2.0	690	84.5	0.033	0.071	0.038	1.5	0.13	0.02	1.20
6/3/2009 12:00	6/3/2009 12:01	Base Grab	56	54.3							10	0.26											
6/11/2009 12:18	6/11/2009 12:19	Base Grab	70	53.6	10.23	935.0	1,245.0	7.6	61.0	0.6			1.0	1.0	754	88.3	0.031	0.035	0.019	1.6	0.09	0.02	1.09
6/17/2009 10:30	6/17/2009 10:30	Storm Grab	66	57.9							600	0.34											
6/24/2009 11:30	6/24/2009 11:30	Storm Grab	78	68.0							8,200	0.25											
6/26/2009 11:10	6/26/2009 11:11	Base Grab	79	58.5	9.27	981.0	1,221.0	7.8	61.0	0.6			4.0	2.0	722	89.5	0.027	0.111	0.027	1.5	0.04	0.02	1.04
6/25/2009 10:32	6/25/2009 10:32	Base Grab	61	56.1							9,500	0.32											
7/8/2009 11:18	7/8/2009 11:19	Base Grab	70	54.9	10.25	929.0	1,214.0	8.0	61.0	0.6			1.0	1.0	708	85.0	0.027	0.060	0.025	1.5	0.06	0.02	1.18
7/14/2009 10:30	7/14/2009 10:30	Base Grab	71	56.5							140	0.33											
7/20/2009 10:50	7/20/2009 10:51	Base Grab	70	54.7	10.13	933.0	1,223.0	7.9	61.0	0.6			1.0	0.5	751	88.8	0.063	0.046	0.033	1.6	0.07	0.02	1.26
7/21/2009 10:35	7/21/2009 10:36	Storm Grab	65	46.0	6.08	144.8	215.5	7.5	10.2	0.1					142	10.7	0.005	0.379	0.003	1.9	0.03	0.02	0.18
7/21/2009 10:30	7/21/2009 10:30	Storm Grab	65	67.1							19,000	0.05											
7/29/2009 10:34	7/29/2009 10:34	Base Grab	70	56.8							10	0.35											
8/5/2009 13:50	8/5/2009 13:51	Base Grab	80	56.3	9.77	909.0	1,163.0	8.2	61.0	0.6			2.0	1.0	708	86.6	0.023	0.055	0.024	0.8	0.04	0.02	1.11
8/7/2009 10:56	8/7/2009 10:57	Storm Grab	70	59.4	8.81	105.4	118.5	7.9	10.0	0.1					73	5.1	0.087	0.286	0.063	1.2	0.08	0.04	0.30
8/12/2009 11:35	8/12/2009 11:35	Base Grab	85	63.5							3,000	0.31											
8/18/2009 13:12	8/18/2009 13:13	Base Grab	75	56.5	9.79	963.0	1,231.0	8.2	61.0	0.6			1.0	1.0	729	89.8	0.036	0.043	0.019	1.4	0.05	0.02	1.22
8/19/2009 11:58	8/19/2009 11:59	Storm Grab	70	62.6	8.98	473.0	559.0	7.2	25.3	0.3			19.0	9.0	366	43.2	0.067	0.167	0.052	1.2	0.01	0.07	0.94
8/25/2009 10:41	8/25/2009 10:41	Storm Grab	70	68.4							11,000	0.15											
8/27/2009 11:02	8/27/2009 11:02	Base Grab	74	60.6							30	0.40											
9/2/2009 11:20	9/2/2009 11:21	Base Grab	75	56.3	10.16	886.0	1,134.0		61.0	0.6			1.0	1.0	717	90.5	0.036	0.045	0.030	1.4	0.08	0.03	1.20
9/9/2009 11:30	9/9/2009 11:30	Base Grab	73	57.6							5	0.40											
9/17/2009 11:27	9/17/2009 11:28	Base Grab	70	55.8	10.33	975.0	1,257.0	7.9	61.0	0.6			4.0	0.5	771	96.5	0.032	0.044	0.029	0.9	0.06	0.02	1.32
9/23/2009 10:55	9/23/2009 10:55	Base Grab	65	57.6							1,900	0.31											
10/1/2009 10:58	10/1/2009 10:58	Storm Grab	50	54.1							15,000	0.22											
10/6/2009 11:30	10/6/2009 11:31	Storm Grab	46	54.1	9.01	72.4	95.7	7.4	30.1	0.0					48	4.0	0.028	0.095	0.030	0.5	0.14	0.02	0.08
10/6/2009 11:25	10/6/2009 11:25	Storm Grab	46	51.1							6,200	0.05											
10/13/2009 10:42	10/13/2009 10:42	Base Grab	32	49.3							160	0.22											
10/14/2009 14:10	10/14/2009 14:11	Base Grab	32	52.5	10.15	982.0	1,327.0	8.0	61.0	0.7			1.0	0.5	766	80.4	0.037	0.023	0.018	1.1	0.05	0.02	1.15
10/27/2009 10:56	10/27/2009 10:57	Base Grab	45	52.7	10.08	837.0	1,127.0	7.2	61.0	0.6			1.0	1.0	645	71.3	0.053	0.087	0.042	1.4	0.16	0.03	1.43
11/18/2009 14:30	11/18/2009 14:31	Base Grab	50	52.0	9.51	982.0	1,335.0	7.9	61.0	0.7			0.5	1.0	768	69.4	0.025	0.021	0.022	0.9	0.07	0.02	1.24
11/24/2009 10:38	11/24/2009 10:38	Base Grab	40	53.8							2,100	0.35											
12/18/2009 11:05	12/18/2009 11:06	Base Grab	12	48.6	10.07	944.0	1,350.0	7.9	61.0	0.7			0.5	0.5	772		0.030			0.4			

All duplicates are omitted from analysis.

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Blue font indicates the value was below the minimum detection limit and 1/2 the MDL was used as the value for analysis.

Maroon font equals values was ~. Value used for analysis was the ~value.

Table D.3 continued. Monitoring results for 4PP outfall

Start Date Start Time	End Date End Time	Sample Type	Alkalinity (mg/L CaCO3)	Chloride Ion (mg/L)	Hardness (mg/L CaCO3)	COD (mg/L)	Total Organic Carbon (mg/L)	Carbonaceous Biological Oxygen Demand 5-day (mg/L)	Total Biological Oxygen Demand 5-day (mg/L)	Soluble Copper (mg/L)	Total Copper (mg/L)	Soluble Nickel (mg/L)	Total Nickel (mg/L)	Soluble Lead (mg/L)	Total Lead (mg/L)	Soluble Zinc (mg/L)	Total Zinc (mg/L)	Soluble Cadmium (mg/L)	Total Cadmium (mg/L)	Soluble Chromium (mg/L)	Total Chromium (mg/L)	Mercury (ug/L)	Oil and Grease (mg/L)
1/5/2009 14:37	1/5/2009 14:38	Base Grab		281																			
2/5/2009 9:19	2/5/2009 9:20	Base Grab		205																			
3/3/2009 10:32	3/3/2009 10:33	Base Grab	285	206	452	8	1.7	0.5	0.5														3
3/6/2009 13:05	3/6/2009 13:06	Melt Grab	65	650	120	237	24.2	24.3	34.0														18
3/23/2009 10:49	3/23/2009 10:50	Storm Grab	106	241	196	138	12.5	12.0	15.0														14
3/31/2009 13:33	3/31/2009 13:34	Storm Grab	22	49	64	70	7.9	9.5	11.0														3
4/29/2009 10:45	4/29/2009 10:45	Storm Grab																					
5/8/2009 10:09	5/8/2009 10:10	Base Grab	301	212	484	15	2.3	0.5	0.5														3
5/20/2009 11:16	5/20/2009 11:16	Base Grab																					
5/27/2009 10:45	5/27/2009 10:46	Base Grab	269	175	488	11	2.5	0.5	0.5														3
6/3/2009 12:00	6/3/2009 12:01	Base Grab																					
6/11/2009 12:18	6/11/2009 12:19	Base Grab	280	192	492	7	2.5	0.5	0.5														3
6/17/2009 10:30	6/17/2009 10:30	Storm Grab																					
6/24/2009 11:30	6/24/2009 11:30	Storm Grab																					
6/26/2009 11:10	6/26/2009 11:11	Base Grab	285	181	488	12	2.7	1.2	1.0														3
6/25/2009 10:32	6/25/2009 10:32	Base Grab																					
7/8/2009 11:18	7/8/2009 11:19	Base Grab	292	168	484	8	4.3	0.5	0.5														3
7/14/2009 10:30	7/14/2009 10:30	Base Grab																					
7/20/2009 10:50	7/20/2009 10:51	Base Grab	256	189	480	13	2.2	0.5	0.5														3
7/21/2009 10:35	7/21/2009 10:36	Storm Grab	43	28	80	92	9.7	6.2	7.5														3
7/21/2009 10:30	7/21/2009 10:30	Storm Grab																					
7/29/2009 10:34	7/29/2009 10:34	Base Grab																					
8/5/2009 13:50	8/5/2009 13:51	Base Grab	272	172	460	9	3.4	0.5	0.5														31
8/7/2009 10:56	8/7/2009 10:57	Storm Grab	37	12	48	74	13.0	15.0	19.0	0.0062	0.0197	0.0013	0.0055	0.00070	0.0265	0.0237	0.0824	0.00025	0.00025	0.0088	0.0123	0.046	3
8/12/2009 11:35	8/12/2009 11:35	Base Grab																					
8/18/2009 13:12	8/18/2009 13:13	Base Grab	270	191	484	9	2.5	0.5	0.5														3
8/19/2009 11:58	8/19/2009 11:59	Storm Grab	128	87	236	52	9.7	6.6	9.2														3
8/25/2009 10:41	8/25/2009 10:41	Storm Grab																					
8/27/2009 11:02	8/27/2009 11:02	Base Grab																					
9/2/2009 11:20	9/2/2009 11:21	Base Grab	274	186	472	11	3.3	0.5	0.5														3
9/9/2009 11:30	9/9/2009 11:30	Base Grab																					
9/17/2009 11:27	9/17/2009 11:28	Base Grab	253	193	500	11	2.6	0.5	0.5	0.0016	0.0020	0.0047	0.0048	0.00005	0.0001	0.0025	0.0025	0.00025	0.00025	0.0025	0.0025	0.012	3
9/23/2009 10:55	9/23/2009 10:55	Base Grab																					
10/1/2009 10:58	10/1/2009 10:58	Storm Grab																					
10/6/2009 11:30	10/6/2009 11:31	Storm Grab	20	9	48	31	3.5		4.1														3
10/6/2009 11:25	10/6/2009 11:25	Storm Grab																					
10/13/2009 10:42	10/13/2009 10:42	Base Grab																					
10/14/2009 14:10	10/14/2009 14:11	Base Grab	300	197	516	10	2.2	0.5	0.5														3
10/27/2009 10:56	10/27/2009 10:57	Base Grab	228	163	440	22	2.4	0.5	0.5														3
11/18/2009 14:30	11/18/2009 14:31	Base Grab	298	196	524	14	2.0	0.5	0.5														3
11/24/2009 10:38	11/24/2009 10:38	Base Grab																					
12/18/2009 11:05	12/18/2009 11:06	Base Grab		215																			

All duplicates are omitted from analysis.

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Blue font indicates the value was below the minimum detection limit and 1/2 the MDL was used as the value for analysis.

Maroon font equals values was ~. Value used for analysis was the ~value.

Table D.4. Monitoring results for 6UMN outfall

Start Date Start Time	End Date End Time	Sample Type	Air Temp (F)	Water Temp (F)	Dissolved Oxygen (mg/L)	Conductivity (uS)	Specific Conductivity (uS)	pH	Transparency (cm)	Salinity (ppt)	E. coli (counts/ 100 mL)	Fluoride (mg/L)	Total Suspended Solids (mg/L)	Volatile Suspended Solids (mg/L)	Total Dissolved Solids (mg/L)	Sulfate (mg/L)	Dissolved Phosphorus (mg/L)	Total Phosphorus (mg/L)	Ortho Phosphate (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia Nitrogen (mg/L)	Nitrite N (mg/L)	Nitrate N (mg/L)
1/5/2009 12:30	1/5/2009 12:31	Base Grab	15	49.8	11.04	1,113.0	1,565.0		61.0	0.8			1.0	1.0	938			0.005		0.6			
2/4/2009 14:45	2/4/2009 14:46	Base Grab	10	49.1	10.74	1,005.0	1,428.0	8.0	61.0	0.7			3.0	0.5	833			0.005		0.5			
3/3/2009 9:51	3/3/2009 9:52	Base Grab	20	40.5	16.71	596.0	975.0	7.5	61.0	0.5			2.0	1.0	523	43.1	0.093	0.121	0.021	1.6	0.05	0.02	2.70
3/3/2009 9:52	3/3/2009 9:53	Base Grab	20	40.5	16.71	596.0	975.0	7.5	61.0	0.5			2.0	1.0	761	48.2	0.014	0.031	0.021	0.9	0.04	0.02	2.94
3/6/2009 13:41	3/6/2009 13:42	Melt Grab	41	43.2	13.05	777.0	1,212.0	7.6	4.2	0.6			312.0	80.0	692	17.6	0.454	0.620	0.434	3.2	0.83	0.10	0.64
3/23/2009 11:35	3/23/2009 11:36	Storm Grab	45	43.2	14.18			7.4	5.5	0.1			131.0	40.0	414	24.5	0.085	0.339	0.067	2.1	0.26	0.06	0.86
5/7/2009 14:38	5/7/2009 14:39	Base Grab	75	54.0	10.71	1,053.0	1,395.0	7.6	61.0	0.7			0.5	1.0	864	89.5	0.005	0.032	0.009	1.5	0.01	0.02	4.34
5/27/2009 13:40	5/27/2009 13:41	Base Grab	60	54.5	10.22	1,058.0	1,391.0	7.6	61.0	0.7			2.0	1.0	862	99.2	0.005	0.026	0.008	1.4	0.03	0.02	4.84
6/3/2009 11:20	6/3/2009 11:21	Base Grab	57	57.9							1	0.42											
6/11/2009 10:51	6/11/2009 10:52	Base Grab	70	54.3	10.76	1,056.0	1,391.0	7.7	61.0	0.7			1.0	1.0	847	93.9	0.005	0.032	0.013	1.4	0.03	0.02	4.43
6/16/09 18:13	6/16/09 22:03	Storm Composite	70	64.6	7.65	156.1	181.0	6.4	23.4	0.1					114	12.0	0.071	0.200	0.069	1.2	0.43	0.06	0.88
6/17/2009 10:05	6/17/2009 10:05	Storm Grab	64	59.7							160	0.30											
6/24/2009 11:05	6/24/2009 11:05	Storm Grab	70	61.2							110	0.42											
6/25/2009 5:28	6/25/2009 6:21	Storm Composite	83	71.8	7.32	272.4	288.4	7.7	6.8	0.1					196	17.2	0.173	0.834	0.120	5.2	0.62	0.05	1.27
6/26/2009 11:55	6/26/2009 11:56	Base Grab	80	64.2	9.25	1,131.0	1,309.0	8.0	61.0	0.7			5.0	1.0	849	100.0	0.005	0.047	0.015	1.3	0.01	0.02	4.76
6/27/2009 3:18	6/27/2009 5:26	Storm Composite	65	68.5	5.94	199.0	218.8	8.0	23.4	0.1					104	9.6	0.093	0.251		1.8	0.49	0.11	0.76
6/30/2009 10:10	6/30/2009 10:10	Base Grab	61	58.1							30	0.35											
7/4/2009 15:12	7/7/2009 16:30	Storm Composite	80	71.2	4.98	171.5	182.6	8.0	18.5	0.1					114	10.4	0.110	0.356		1.5	0.08	0.03	0.55
7/8/2009 10:47	7/8/2009 10:48	Base Grab	70	56.7	10.31	1,103.0	1,407.0	7.3	61.0	0.7			2.0	1.0	890	97.4	0.010	0.005	0.010	1.7	0.01	0.02	4.82
7/14/2009 10:06	7/14/2009 10:06	Base Grab	71	61.5							100	0.35											
7/20/2009 10:20	7/20/2009 10:21	Base Grab	70	59.0	9.65	1,125.0	1,392.0	7.7	61.0	0.7			2.0	0.5	894	98.2	0.015	0.019	0.011	0.9	0.01	0.02	4.70
7/21/2009 9:57	7/21/2009 9:57	Storm Grab	65	64.4							5,200	0.11											
7/29/2009 10:10	7/29/2009 10:10	Base Grab	70	57.2							20	0.31											
7/31/2009 22:22	7/31/2009 22:51	Storm Composite	76	69.3	4.87	177.2	193.1	8.2	10.1	0.1					112	10.3	0.033	0.302	0.025	1.6	0.11	0.12	0.21
8/5/2009 14:20	8/5/2009 14:21	Base Grab	80	60.6	9.70	1,160.0	1,404.0	8.4	61.0	0.7			4.0	1.0	831	99.1	0.005	0.018	0.005	0.4	0.01	0.02	4.63
8/7/2009 9:43	8/7/2009 11:01	Storm Composite	80	73.0	5.52	216.5	225.9	7.5	20.9	0.1					112	11.7	0.078	0.231		1.0	0.12	0.03	0.31
8/12/2009 10:30	8/12/2009 10:30	Base Grab	85	59.0							20	0.27											
8/19/2009 12:25	8/19/2009 12:26	Storm Grab	70	68.0	9.01	431.7	476.8	7.4	23.0	0.2			28.0	11.0	290	28.4	0.054	0.127	0.042	1.2	0.09	0.03	1.00
8/25/2009 14:50	8/25/2009 14:51	Base Grab	76	66.7	8.78			7.0	61.0	0.4			2.0	1.0	676	73.2	0.058	0.059	0.043	1.4	0.01	0.02	3.45
8/25/2009 10:27	8/25/2009 10:27	Storm Grab	72	66.4							2,000	0.23											
8/27/2009 10:37	8/27/2009 10:37	Base Grab	74	62.2							5	0.34											
9/2/2009 12:27	9/2/2009 12:28	Base Grab	75	61.2	9.20	1,158.0	1,393.0		61.0	0.7			1.0	1.0	891	99.8	0.005	0.005	0.037	1.5	0.02	0.02	4.09
9/9/2009 9:30	9/9/2009 9:30	Base Grab	69	62.8							10	0.33											
9/23/2009 10:10	9/23/2009 10:10	Base Grab	65	61.3							210	0.38											
9/17/2009 12:35	9/17/2009 12:36	Base Grab	70	62.1	9.29	1,156.0	1,374.0	8.1	61.0	0.7			1.0	0.5	899	102.0	0.014	0.005	0.014	0.7	0.04	0.02	4.29
9/25/2009 13:12	9/25/2009 15:58	Storm Composite	60	60.8	5.66	292.6	353.0	7.6	17.6	0.2					204	23.7	0.183	0.100		0.6	0.13	0.09	0.87
10/1/2009 10:40	10/1/2009 10:40	Storm Grab	50	55.9							5,500	0.23											
10/1/2009 15:37	10/1/2009 17:04	Storm Composite	53	54.5	9.97	84.4	110.8	7.5	14.4	0.1					79		0.066	0.284	0.066	1.2	0.04	0.02	0.41
10/6/2009 11:00	10/6/2009 11:00	Storm Grab	46	52.3							1,500	0.05											
10/5/2009 19:23	10/6/2009 4:16	Storm Composite	48	51.3	10.30	211.8	291.5	7.1	45.6	0.1					165	13.7	0.069	0.082	0.038	0.3	0.07	0.02	0.86
10/12/2009 10:52	10/12/2009 10:52	Snow Grab	31	47.3							104												
10/13/2009 10:20	10/13/2009 10:20	Base Grab	31	48.6							190	0.32											
10/14/2009 11:58	10/14/2009 11:59	Base Grab	30	53.1	10.30	564.0	756.0	8.0	61.0	0.4			4.0	2.0	448	42.5	0.043	0.108	0.049	0.9	0.08	0.02	2.34
10/15/2009 4:30	10/15/2009 11:52	Storm Composite	35	46.6	9.96	191.2	282.2	7.2	22.4	0.1					157	12.5	0.315	0.407	0.347	0.8	0.05	0.02	0.87
10/22/2009 10:24	10/22/2009 10:24	Base Grab	40	52.5							70	0.28											
10/21/2009 13:02	10/21/2009 16:17	Storm Composite	35	47.5	9.21	135.2	196.9		9.0	0.1					111						0.01		
10/27/2009 10:25	10/27/2009 10:26	Base Grab	45	50.2	9.55	885.0	1,238.0	7.0	61.0	0.6			2.0	1.0	888	90.8	0.019	0.011	0.018	1.2	0.01	0.02	4.02
10/29/2009 12:00	10/29/2009 17:21	Storm Composite	50	54.0	8.65	179.8	238.2			0.1					255	11.6	0.005	0.233		1.1	0.03	0.02	0.30
11/18/2009 14:02	11/18/2009 14:03	Base Grab	50	54.0	9.02	946.0	1,251.0	7.9	61.0	0.6			1.0	1.0	804	70.2	0.025	0.005	0.017	1.0	0.01	0.02	3.15
11/24/2009 10:16	11/24/2009 10:16	Storm Grab	45	53.1							1,400	0.39											
12/18/2009 11:55	12/18/2009 11:56	Base Grab	15	50.5	10.12	1,055.0	1,465.0	7.9	61.0	0.7			2.0	0.5	821		0.016			1.0			

All duplicates are omitted from analysis.

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Blue font indicates the value was below the minimum detection limit and 1/2 the MDL was used as the value for analysis.

Maroon font equals values was ~. Value used for analysis was the ~value.

Table D.4 continued. Monitoring results for 6UMN outfall

Start Date Start Time	End Date End Time	Sample Type	Alkalinity (mg/L CaCO3)	Chloride Ion (mg/L)	Hardness (mg/L CaCO3)	COD (mg/L)	Total Organic Carbon (mg/L)	Carbonaceous Biological Oxygen Demand 5-day (mg/L)	Total Biological Oxygen Demand 5-day (mg/L)	Soluble Copper (mg/L)	Total Copper (mg/L)	Soluble Nickel (mg/L)	Total Nickel (mg/L)	Soluble Lead (mg/L)	Total Lead (mg/L)	Soluble Zinc (mg/L)	Total Zinc (mg/L)	Soluble Cadmium (mg/L)	Total Cadmium (mg/L)	Soluble Chromium (mg/L)	Total Chromium (mg/L)	Mercury (ug/L)	Oil and Grease (mg/L)
1/5/2009 12:30	1/5/2009 12:31	Base Grab		231																			
2/4/2009 14:45	2/4/2009 14:46	Base Grab		190																			
3/3/2009 9:51	3/3/2009 9:52	Base Grab	251	82	352	18	5.1	0.5	0.5														3
3/3/2009 9:52	3/3/2009 9:53	Base Grab	268	86	376	14	5.1	0.5	0.5														3
3/6/2009 13:41	3/6/2009 13:42	Melt Grab	70	340	144	194	23.1	20.1	28.0														12
3/23/2009 11:35	3/23/2009 11:36	Storm Grab	91	128	164	137	9.9	6.3	14.0														3
5/7/2009 14:38	5/7/2009 14:39	Base Grab	341	199	610	34	9.2	9.0	9.0														3
5/27/2009 13:40	5/27/2009 13:41	Base Grab	325	197	540	9	2.6	0.5	0.5														3
6/3/2009 11:20	6/3/2009 11:21	Base Grab																					
6/11/2009 10:51	6/11/2009 10:52	Base Grab	325	197	504	7	3.0	0.5	0.5														3
6/16/09 18:13	6/16/09 22:03	Storm Composite	48	20	72	60	10.1	5.1	7.2														7
6/17/2009 10:05	6/17/2009 10:05	Storm Grab																					
6/24/2009 11:05	6/24/2009 11:05	Storm Grab																					
6/25/2009 5:28	6/25/2009 6:21	Storm Composite	57	48	104	242	19.9	17.2	29.0														16
6/26/2009 11:55	6/26/2009 11:56	Base Grab	332	198	536	12	4.3	0.5	0.5														3
6/27/2009 3:18	6/27/2009 5:26	Storm Composite	40	18	84	71	8.0																3
6/30/2009 10:10	6/30/2009 10:10	Base Grab																					
7/4/2009 15:12	7/7/2009 16:30	Storm Composite	40	21	108	89	9.4				0.0243		0.0073		0.02450		0.1410		0.00025		0.0082	0.012	3
7/8/2009 10:47	7/8/2009 10:48	Base Grab	331	187	556	8	4.2	0.5	0.5														3
7/14/2009 10:06	7/14/2009 10:06	Base Grab																					
7/20/2009 10:20	7/20/2009 10:21	Base Grab	286	209	544	17	2.2	0.5	0.5														3
7/21/2009 9:57	7/21/2009 9:57	Storm Grab																					
7/29/2009 10:10	7/29/2009 10:10	Base Grab																					
7/31/2009 22:22	7/31/2009 22:51	Storm Composite	51	23	84	84	6.6			0.0058	0.0254	0.0267	0.0267	0.00030	0.02740	0.0100	0.1630	0.00025	0.00025	0.0025	0.0113		3
8/5/2009 14:20	8/5/2009 14:21	Base Grab	315	211	528	8	3.2	0.5	0.5														3
8/7/2009 9:43	8/7/2009 11:01	Storm Composite	48	26	84	52	7.5																3
8/12/2009 10:30	8/12/2009 10:30	Base Grab																					
8/19/2009 12:25	8/19/2009 12:26	Storm Grab	126	52	204	43	8.8	4.3	5.4														3
8/25/2009 14:50	8/25/2009 14:51	Base Grab	270	161	448	14	3.2	0.5	0.5														3
8/25/2009 10:27	8/25/2009 10:27	Storm Grab																					
8/27/2009 10:37	8/27/2009 10:37	Base Grab																					
9/2/2009 12:27	9/2/2009 12:28	Base Grab	342	187	524	12	3.0	0.5	0.5														3
9/9/2009 9:30	9/9/2009 9:30	Base Grab																					
9/23/2009 10:10	9/23/2009 10:10	Base Grab																					
9/17/2009 12:35	9/17/2009 12:36	Base Grab	306	192	552	11	2.9	0.5	0.5	0.0021	0.0021	0.0074	0.0074	0.00005	0.00005	0.0025	0.0025	0.00025	0.00025	0.0076	0.0077	0.012	3
9/25/2009 13:12	9/25/2009 15:58	Storm Composite	70	43	160	84	13.2																3
10/1/2009 10:40	10/1/2009 10:40	Storm Grab																					
10/1/2009 15:37	10/1/2009 17:04	Storm Composite	23	9	68	62	5.7	4.2	5.1	0.0029	0.0214	0.0015	0.0069	0.00040	0.02490	0.0067	0.1060	0.00025	0.00025	0.0061	0.0097	0.025	3
10/6/2009 11:00	10/6/2009 11:00	Storm Grab																					
10/5/2009 19:23	10/6/2009 4:16	Storm Composite	68	33	124	21	4.8		3.0														3
10/12/2009 10:52	10/12/2009 10:52	Snow Grab																					
10/13/2009 10:20	10/13/2009 10:20	Base Grab																					
10/14/2009 11:58	10/14/2009 11:59	Base Grab	180	79	316	16	3.5	0.5	1.1														3
10/15/2009 4:30	10/15/2009 11:52	Storm Composite	61	34	140	35	6.6																3
10/22/2009 10:24	10/22/2009 10:24	Base Grab																					
10/21/2009 13:02	10/21/2009 16:17	Storm Composite	43	17		91	9.1																
10/27/2009 10:25	10/27/2009 10:26	Base Grab	178	195	544	16	2.3	0.5	0.5														3
10/29/2009 12:00	10/29/2009 17:21	Storm Composite	65	26	128	76	6.7																11
11/18/2009 14:02	11/18/2009 14:03	Base Grab	324	184	508	15	2.3	0.5	0.5														3
11/24/2009 10:16	11/24/2009 10:16	Storm Grab																					
12/18/2009 11:55	12/18/2009 11:56	Base Grab		99																			

All duplicates are omitted from analysis.

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Maroon font equals values was ~. Value used for analysis was the ~value.

Table D.5. Monitoring results for 7LSTU outfall

Start Date Start Time	End Date End Time	Sample Type	Air Temp (F)	Water Temp (F)	Dissolved Oxygen (mg/L)	Conductivity (uS)	Specific Conductivity (uS)	pH	Transparency (cm)	Salinity (ppt)	E. coli (counts/ 100 mL)	Fluoride (mg/L)	Total Suspended Solids (mg/L)	Volatile Suspended Solids (mg/L)	Total Dissolved Solids (mg/L)	Sulfate (mg/L)	Dissolved Phosphorus (mg/L)	Total Phosphorus (mg/L)	Ortho Phosphate (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia Nitrogen (mg/L)	Nitrite N (mg/L)	Nitrate N (mg/L)
1/5/2009 13:50	1/5/2009 13:51	Base Grab	20	31.3	13.40	16,780.0	9,800.0		15.0	19.5								0.045		1.7			
3/16/2009 13:30	3/16/2009 13:31	Melt Grab	50	39.2	14.40			7.6	4.9	0.5			31	122	558	12.9	0.442	0.871	0.431	3.7	1.02	0.07	0.24
3/23/2009 12:25	3/23/2009 12:26	Storm Grab	45	44.1	13.42			7.5	4.1	0.1			86	322	388	11.0	0.167	0.741	0.137	2.9	0.33	0.11	0.35
7/21/2009 9:20	7/21/2009 9:20	Storm Grab	65	67.5							13,000	0.10											
7/21/2009 4:04	7/21/2009 9:49	Storm Composite	80	74.5	6.75	380.2	390.7	7.5	6.2	0.2					213	11.1	0.005	0.504	0.003	1.2	0.03	0.02	0.56
7/31/2009 22:07	8/1/2009 5:33	Storm Composite	80	74.3	5.87	263.8	271.5	8.0	8.8	0.1					167	9.7	0.058	0.352	0.058	1.6	0.12	0.02	0.44
8/7/2009 9:48	8/7/2009 11:51	Storm Composite	80	75.6	5.67	471.5	478.6	7.3	8.5	0.2					274	22.7	0.079	0.369		2.1	0.09	0.04	0.35
8/19/2009 13:02	8/19/2009 13:03	Storm Grab	70	69.4	8.84	485.0	527.0	7.5	7.9	0.3			56	294	323	17.1	0.065	0.525	0.050	2.1	0.18	0.04	0.68
8/25/2009 9:50	8/26/2009 9:50	Storm Grab	71	70.9							9,100	0.12											
10/1/2009 10:05	10/1/2009 10:05	Storm Grab	50	52.7							3,500	0.24											
10/6/2009 10:25	10/6/2009 10:25	Storm Grab	46	50.7							3,200	0.05											
10/6/2009 9:22	10/6/2009 11:31	Storm Composite	50	51.8	10.08	198.8	271.1	7.1	5.2	0.1					152	14.0	0.047	0.212	0.040	0.3	0.04	0.02	0.12
10/12/2009 10:08	10/12/2009 10:08	Storm Grab	31	46.0							2,421												
10/14/2009 10:30	10/14/2009 10:31	Base Grab	30	52.2	10.76	798.0	1,085.0	7.8	61.0	0.5			1	11	623	88.2	0.016	0.016	1.300	0.9	0.08	0.02	0.18
10/22/2009 9:50	10/22/2009 9:50	Base Grab	39	50.2							200	0.19											
10/21/2009 14:53	10/22/2009 1:19	Storm Composite	35	40.8	11.81	423.2	686.0		17.0	0.3					305	40.1	0.021	0.182		0.8	0.01	0.02	0.10
10/29/2009 13:06	10/30/2009 5:16	Storm Composite	40	45.9	9.01	263.9	394.3	7.9	9.0	0.2					143	22.0	0.011	0.196		0.8	0.01	0.02	0.19

All duplicates are omitted from analysis.

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Table D.5 continued. Monitoring results for 7LSTU outfall

Start Date Start Time	End Date End Time	Sample Type	Alkalinity (mg/L CaCO3)	Chloride Ion (mg/L)	Hardness (mg/L CaCO3)	COD (mg/L)	Total Organic Carbon (mg/L)	Carbonaceous Biological Oxygen Demand 5-day (mg/L)	Total Biological Oxygen Demand 5-day (mg/L)	Soluble Copper (mg/L)	Total Copper (mg/L)	Soluble Nickel (mg/L)	Total Nickel (mg/L)	Soluble Lead (mg/L)	Total Lead (mg/L)	Soluble Zinc (mg/L)	Total Zinc (mg/L)	Soluble Cadmium (mg/L)	Total Cadmium (mg/L)	Soluble Chromium (mg/L)	Total Chromium (mg/L)	Mercury (ug/L)	Oil and Grease (mg/L)
1/5/2009 13:50	1/5/2009 13:51	Base Grab		3,928																			
3/16/2009 13:30	3/16/2009 13:31	Melt Grab	83	266	152	126	15.8	13.0	24.0		0.0206		0.0073		0.0255		0.1130		0.00025		0.0068		9
3/23/2009 12:25	3/23/2009 12:26	Storm Grab	30	132	102	217	8.9	6.6	7.2														19
7/21/2009 9:20	7/21/2009 9:20	Storm Grab																					
7/21/2009 4:04	7/21/2009 9:49	Storm Composite	59	71	128	134	11.4		6.4														12
7/31/2009 22:07	8/1/2009 5:33	Storm Composite	51	45	84	68	7.0			0.0039	0.0190	0.0018	0.0062	0.0002	0.0282	0.0078	0.1030	0.00025	0.00025	0.0025	0.0080		3
8/7/2009 9:48	8/7/2009 11:51	Storm Composite	60	88	170	80	6.2																7
8/19/2009 13:02	8/19/2009 13:03	Storm Grab	37	117	192	144	8.4	6.9	12.0														9
8/25/2009 9:50	8/26/2009 9:50	Storm Grab																					
10/1/2009 10:05	10/1/2009 10:05	Storm Grab																					
10/6/2009 10:25	10/6/2009 10:25	Storm Grab																					
10/6/2009 9:22	10/6/2009 11:31	Storm Composite	68	30	126	69	5.3	3.7															3
10/12/2009 10:08	10/12/2009 10:08	Storm Grab																					
10/14/2009 10:30	10/14/2009 10:31	Base Grab	279	120	476	10	2.7	0.5	0.5														3
10/22/2009 9:50	10/22/2009 9:50	Base Grab																					
10/21/2009 14:53	10/22/2009 1:19	Storm Composite	150	63	272	57	6.8			0.0044	0.0138	0.0021	0.0055	0.0002	0.0184	0.0090	0.0734	0.00025	0.00025	0.0025	0.0060		9
10/29/2009 13:06	10/30/2009 5:16	Storm Composite	106	42	178	70	5.6																9

All duplicates are omitted from analysis.

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Maroon font equals values was ~. Value used for analysis was the ~value.

Table D.6. Monitoring results for 10SA outfall

Start Date Start Time	End Date End Time	Sample Type	Air Temp (F)	Water Temp (F)	Dissolved Oxygen (mg/L)	Conductivity (uS)	Specific Conductivity (uS)	pH	Transparency (cm)	Salinity (ppt)	E. coli (counts/ 100 mL)	Fluoride (mg/L)	Total Suspended Solids (mg/L)	Volatile Suspended Solids (mg/L)	Total Dissolved Solids (mg/L)	Sulfate (mg/L)	Dissolved Phosphorus (mg/L)	Total Phosphorus (mg/L)	Ortho Phosphate (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia Nitrogen (mg/L)	Nitrite N (mg/L)	Nitrate N (mg/L)
1/5/2009 11:35	1/5/2009 11:36	Base Grab	5	43.3	11.48	604.0	938.0		61.0	0.5			2	1	537			0.209		0.3			
1/31/2009 12:40	1/31/2009 17:09	Melt Composite	5	44.8	9.00	8,770.0	13,340.0		5.8	7.7			212	81	12,600			0.374		7.7			
2/4/2009 13:20	2/4/2009 13:21	Base Grab	10	37.9	12.08	1,798.0	3,073.0	7.9		1.6			10	5	1,720			0.306		5.6			
2/7/2009 13:26	2/7/2009 19:47	Melt Composite	35	43.2	9.31	5,520.0	8,620.0	7.5	3.2	4.8			74	31	4,900			0.362		8.0			
2/9/2009 12:33	2/9/2009 6:57	Melt Composite	40	41.4	12.24	2,934.0	4,723.0	7.0	4.2	2.5			232	84	2,700	28.7	0.263	0.578	0.247	6.1	1.74	0.22	0.95
2/25/2009 10:47	2/25/2009 3:07	Melt Composite	23	39.2	13.20	1,480.0	2,469.0	7.2	8.0	1.3			58	21	1,350			0.515		5.8			
3/4/2009 10:45	3/4/2009 10:46	Base Grab	29	36.3		1,654.0	2,907.0	7.9	61.0	1.5			2	1	1,980	28.5	0.180	0.189	0.170	2.2	0.21	0.06	0.49
3/4/2009 12:07	3/4/2009 3:36	Melt Composite	39	41.9	12.60	2,401.0	3,830.0	7.3	6.0	2.0			78	25	2,140	16.6	0.166	0.341	0.147	4.5	0.78	0.09	0.38
3/14/2009 12:37	3/14/2009 5:49	Melt Composite	45	40.3	11.59			7.5	23.0	0.3			46	20	344	7.5	0.526	0.687	0.560	3.3	1.04	0.06	0.38
3/16/2009 11:12	3/16/2009 21:09	Melt Composite	45	42.6	8.67			7.2	20.1	0.3			54	18	362	7.6	0.410	0.490	0.388	2.7	0.50	0.04	0.25
3/20/2009 17:11	3/20/2009 0:24	Storm Composite	45	41.4	9.92	1,007.0	1,618.0	6.8	5.4	0.8			256	74	909	15.8	0.110	0.552	0.009	5.1	0.49	0.08	0.61
3/23/2009 9:20	3/23/2009 13:39	Storm Composite	45	40.6	12.41			7.3	8.2	0.3			110	34	361	9.7	0.090	0.165	0.077	1.7	0.23	0.05	0.38
3/30/2009 13:30	3/30/2009 13:31	Base Grab	35	40.3		1,016.0	1,663.0	7.6	61.0	0.8			3	1	949	36.0	0.072	0.134	0.006	2.2	0.24	0.05	1.02
3/31/2009 8:27	3/31/2009 13:10	Storm Composite	32	45.1		254.2	384.5	7.6	9.1	0.2			52	18	224	6.7	0.048	0.119	0.045	1.4	0.35	0.02	0.62
4/4/2009 21:32	4/5/2009 18:33	Storm Composite	38	49.3	11.75	441.8	626.0	7.5	25.3	0.3			24	7	356	10.4	0.043	0.074	0.033	1.5	0.24	0.02	0.35
4/8/2009 10:41	4/8/2009 10:42	Base Grab	33	43.7							100												
4/13/2009 11:31	4/13/2009 11:39	Base Grab	40	47.1	11.81	1,145.0	1,676.0	8.0	61.0	0.8			2	1	982	44.0	0.107	0.104	0.086	1.8	0.12	0.04	1.31
4/26/2009 9:51	4/27/2009 2:05	Storm Composite	47	50.4	10.29	264.3	368.4	7.3	9.5	0.2					214	6.5	0.075	0.363	0.068	2.0	0.27	0.02	0.33
4/27/2009 11:05	4/27/2009 11:06	Base Grab	47	49.5	10.90	923.0	1,304.0	7.4	45.0	0.7			8	5	712	16.1	0.050	0.147	0.016	2.6	0.04	0.02	0.19
4/29/2009 8:50	4/29/2009 8:50	Base Grab	49	50.1							170	0.26											
4/29/2009 19:04	4/29/2009 21:51	Storm Composite	55	61.3	8.95	257.9	309.0	7.5	14.4	0.1					176	6.8	0.036	0.172	0.031	1.9	0.35	0.03	0.45
5/6/2009 12:10	5/6/2009 12:10	Base Grab	70	61.9							60	0.33											
5/11/2009 10:48	5/11/2009 10:49	Base Grab	70	48.7	11.43	687.0	982.0	7.7	61.0	0.5			1	1	611	62.1	0.005	0.016	0.018	0.5	0.01	0.02	1.68
5/20/2009 9:00	5/20/2009 9:00	Base Grab	75	55.8							4	0.31											
5/27/2009 10:00	5/27/2009 10:01	Base Grab	60	51.1	10.85	642.0	887.0	7.4	61.0	0.4			1	1	549	66.4	0.005	0.005	0.011	0.5	0.04	0.02	1.31
6/4/2009 9:00	6/4/2009 9:00	Base Grab	71	56.5							1	0.38											
6/6/2009 11:21	6/7/2009 12:59	Storm Composite	55	56.3	7.04	269.3	345.3	7.0	25.6	0.2					194	13.2	0.074	0.286		1.7	0.01	0.06	0.44
6/11/2009 9:40	6/11/2009 9:41	Base Grab	70	52.0	10.48	620.0	845.0	7.3	61.0	0.4			1	1	510	58.2	0.013	0.026	0.012	0.5	0.01	0.02	0.90
6/16/2009 16:26	6/16/2009 23:03	Storm Composite	70	67.3	7.47	202.3	225.6	7.8	18.1	0.1					140	11.2	0.049	0.204	0.049	1.6	0.47	0.05	0.68
6/17/2009 11:18	6/17/2009 11:18	Base Grab	70	60.4							600	0.31											
6/24/2009 12:16	6/24/2009 12:16	Storm Grab	77	61.2							1,600	0.36											
6/25/2009 5:18	6/25/2009 7:52	Storm Composite	82	78.3	7.08	212.8	209.9	7.9	12.1	0.1						11.1	0.426	0.416	0.086	2.6	0.53	0.05	0.86
6/26/2009 9:20	6/26/2009 9:21	Base Grab	80	65.5	9.05	708.0	806.0	8.1	61.0	0.4			1	1	492	49.7	0.005	0.034	0.013	0.5	0.01	0.02	0.78
6/27/2009 2:47	6/27/2009 16:50	Storm Composite	65	73.9	5.70	286.1	295.8	7.6	31.3	0.1					149	10.5	0.085	0.245		1.7	0.38	0.07	0.56
6/30/2009 11:25	6/30/2009 11:25	Base Grab	66	58.5							5	0.27											

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Blue font indicates the value was below the minimum detection limit and 1/2 the MDL was used as the value for analysis.

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Table D.6 continued. Monitoring results for 10SA outfall

Start Date Start Time	End Date End Time	Sample Type	Air Temp (F)	Water Temp (F)	Dissolved Oxygen (mg/L)	Conductivity (uS)	Specific Conductivity (uS)	pH	Transparency (cm)	Salinity (ppt)	E. coli (counts/ 100 mL)	Fluoride (mg/L)	Total Suspended Solids (mg/L)	Volatile Suspended Solids (mg/L)	Total Dissolved Solids (mg/L)	Sulfate (mg/L)	Dissolved Phosphorus (mg/L)	Total Phosphorus (mg/L)	Ortho Phosphate (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia Nitrogen (mg/L)	Nitrite N (mg/L)	Nitrate N (mg/L)
7/4/2009 14:51	7/4/2009 20:15	Storm Composite	77	77.7	5.34	242.6	240.8	8.1	13.7	0.1					159	11.7	0.049	0.224		1.2	0.08	0.02	0.42
7/8/2009 12:36	7/8/2009 12:37	Base Grab	77	53.6	10.30	595.0	792.0	8.0	61.0	0.4			0.5	0.5	415	53.4	0.013	0.015	0.018	0.2	0.01	0.02	0.81
7/14/2009 11:24	7/14/2009 11:24	Base Grab	71	60.6							420	0.27											
7/20/2009 12:45	7/20/2009 12:46	Base Grab	76	61.5	9.70	673.0	806.0	8.3	61.0	0.4			0.5	0.5	478	55.3	0.029	0.031	0.014	0.3	0.01	0.02	0.89
7/21/2009 5:46	7/21/2009 9:23	Storm Composite	78	72.0	7.93	122.1	128.9	8.2	18.1	0.1					83	4.4	0.034	0.267	0.025	1.1	0.08	0.02	0.24
7/21/2009 11:15	7/21/2009 11:15	Storm Grab	69	70.2							9,800	0.11											
7/22/2009 22:53	7/23/2009 0:32	Storm Composite	76	72.5	7.46	107.1	112.5	8.3	12.9	0.1					92	4.8	0.034	0.304	0.041	1.5	0.24	0.02	0.34
7/29/2009 11:27	7/29/2009 11:27	Base Grab	76	63.7							20	0.29											
7/31/2009 21:58	7/31/2009 23:47	Storm Composite	75	76.3	5.86	113.1	113.9	8.0	19.0	0.1					59	4.6	0.051	0.223	0.036	1.1	0.11	0.02	0.25
8/5/2009 9:45	8/5/2009 9:46	Base Grab	78	54.1	10.24	573.0	756.0	7.7	61.0	0.4			0.5	0.5	476	51.3	0.013	0.027	0.016	0.2	0.01	0.02	0.78
8/7/2009 9:42	8/7/2009 14:18	Storm Composite	80	79.0	6.53	129.5	126.7	7.8	39.5	0.1					59	2.6	0.045	0.129	0.037	0.6	0.06	0.02	0.21
8/12/2009 12:00	8/12/2009 12:00	Base Grab	87	65.8							10	0.23											
8/15/2009 20:30	8/16/2009 0:49	Storm Composite	75	77.5	5.63	170.2	169.3	8.5	28.5	0.1					100	7.3	0.043	0.267		1.5	0.14	0.05	0.31
8/18/2009 14:50	8/18/2009 14:51	Base Grab	75	61.3	9.59	600.0	720.0	8.2	61.0	0.4			0.5	1.0	451	49.1	0.017	0.029	0.013	0.1	0.01	0.02	0.70
8/19/2009 3:13	8/19/2009 5:06	Storm Composite	65	66.7	7.05	86.4	97.0	7.4	24.1	0.0					73	4.8	0.044	0.251	0.019	1.7	0.25	0.02	0.36
8/25/2009 5:26	8/25/2009 6:40	Storm Composite	76	74.5	7.71			7.3	24.2	0.0					38	3.2	0.047	0.176	0.040	1.1	0.43	0.02	0.38
8/25/2009 8:45	8/25/2009 8:45	Storm Grab	70	71.2							9,200	0.19											
8/27/2009 9:02	8/27/2009 9:02	Base Grab	67	64.4							110	0.30											
9/2/2009 9:45	9/2/2009 9:46	Base Grab	70	60.4	9.86	645.0	783.0		61.0	0.4			0.5	0.5	476	52.8	0.019	0.005	0.020	0.2	0.01	0.02	0.80
9/9/2009 8:34	9/9/2009 8:34	Base Grab	69	57.9							60	0.26											
9/17/2009 9:50	9/17/2009 9:51	Base Grab	65	62.6	9.41	662.0	782.0	7.0	61.0	0.4			0.5	0.5	478	54.6	0.020	0.010	0.017	0.1	0.01	0.02	0.03
9/23/2009 9:35	9/23/2009 9:35	Base Grab	65	59.5							4,500	0.25											
9/25/2009 12:58	9/26/2009 3:30	Storm Composite	60	60.3	7.87	272.6	331.7	7.2	38.0	0.2					187	18.3	0.038	0.138		0.7	0.05	0.02	0.44
10/1/2009 8:57	10/1/2009 8:57	Storm Grab	50	54.0							12,000	0.14											
10/1/2009 15:08	10/1/2009 17:53	Storm Composite	53	52.9	10.01	89.1	119.6	7.3	31.2	0.1					82		0.047	0.161	0.053	0.6	0.06	0.02	0.25
10/6/2009 9:15	10/6/2009 9:15	Storm Grab	46	51.4							1,100	0.05											
10/12/2009 11:50	10/12/2009 11:50	Snow Grab	31	45.3							2,420												
10/12/2009 6:22	10/12/2009 14:33	Snow Composite	35	41.4	11.56	308.3	495.3	8.4	40.6	0.2					300	31.1	0.096	0.092	0.071	0.9	0.12	0.02	0.43
10/13/2009 8:35	10/13/2009 8:35	Base Grab	29	48.2							110	0.21											
10/14/2009 12:42	10/14/2009 12:43	Base Grab	30	52.5	10.10	514.0	695.0	7.9	61.0	0.3			0.5	0.5	408	40.6	0.005	0.005	0.010	0.4	0.01	0.02	0.67
10/15/2009 4:01	10/15/2009 14:38	Storm Composite	35	45.7	10.82	163.2	244.2	7.1	46.9	0.1					130	9.0	0.101	0.094	0.062	0.5	0.05	0.02	0.31
10/22/2009 11:10	10/22/2009 11:10	Base Grab	40	51.3							200	0.15							0.880				
10/21/2009 7:38	10/22/2009 7:58	Storm Composite	35	45.5	9.81	216.7	325.2		27.1	0.2					178	14.8	0.027	0.174			0.01	0.02	0.29
10/27/2009 12:30	10/27/2009 12:31	Base Grab	45	51.4	10.29	512.0	702.0	7.5	61.0	0.3			2.0	1.0	424	38.1	0.049	0.045	0.025	0.9	0.05	0.02	0.68
10/29/2009 11:55	10/30/2009 4:05	Storm Composite	50	53.1	9.43	122.6	164.1			0.1					104	5.4	0.058	0.192		0.8	0.01	0.02	0.03
11/18/2009 12:50	11/18/2009 12:51	Base Grab	45	50.7	9.92	793.0	1,100.0	8.0	61.0	0.5			1.0	1.0	668	51.8	0.071	0.073	0.056	1.4	0.02	0.04	1.04
11/24/2009 8:40	11/24/2009 8:40	Storm Grab	45	51.6							5,200	0.17											
12/18/2009 10:09	12/18/2009 10:10	Base Grab	10	43.9	10.96	957.0	1,476.0	7.8	61.0	0.7			10.0	2.0	907		0.059			1.1			
12/25/2009 18:37	12/26/2009 22:43	Storm Composite	9	33.8	10.87	2,464.0	4,435.0	6.9	31.5	2.4			21.0	15.0	2,370		0.143			2.0			

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Table D.6 continued. Monitoring results for 10SA outfall

Start Date Start Time	End Date End Time	Sample Type	Alkalinity (mg/L CaCO3)	Chloride Ion (mg/L)	Hardness (mg/L CaCO3)	COD (mg/L)	Total Organic Carbon (mg/L)	Carbonaceous Biological Oxygen Demand 5-day (mg/L)	Total Biological Oxygen Demand 5-day (mg/L)	Soluble Copper (mg/L)	Total Copper (mg/L)	Soluble Nickel (mg/L)	Total Nickel (mg/L)	Soluble Lead (mg/L)	Total Lead (mg/L)	Soluble Zinc (mg/L)	Total Zinc (mg/L)	Soluble Cadmium (mg/L)	Total Cadmium (mg/L)	Soluble Chromium (mg/L)	Total Chromium (mg/L)	Mercury (ug/L)	Oil and Grease (mg/L)
1/5/2009 11:35	1/5/2009 11:36	Base Grab		149																			
1/31/2009 12:40	1/31/2009 17:09	Melt Composite		6,871	308						0.2230		0.0204		0.0307		0.311		0.0025		0.0466		
2/4/2009 13:20	2/4/2009 13:21	Base Grab		897																			
2/7/2009 13:26	2/7/2009 19:47	Melt Composite		2,629																			
2/9/2009 12:33	2/9/2009 6:57	Melt Composite	82	1,385	160	296	24.3	23.0	33.0	0.0436	0.0651	0.0045	0.0142	0.0005	0.0237	0.0198	0.231	0.00025	0.00025	0.008	0.0249		17
2/25/2009 10:47	2/25/2009 3:07	Melt Composite		738																			
3/4/2009 10:45	3/4/2009 10:46	Base Grab	297	1,027	392	39	7.2	1.1	1.5														3
3/4/2009 12:07	3/4/2009 3:36	Melt Composite	59	1,148	124	141	18.4	9.5	13.0														7
3/14/2009 12:37	3/14/2009 5:49	Melt Composite	39	137	54	94	15.9	11.0	17.0		0.0131		0.0038		0.0036		0.036		0.00025		0.0025		3
3/16/2009 11:12	3/16/2009 21:09	Melt Composite	56	126	72	76	11.6	7.3	12.0														3
3/20/2009 17:11	3/20/2009 0:24	Storm Composite	47	476	86	221	13.5	6.5	13.0														11
3/23/2009 9:20	3/23/2009 13:39	Storm Composite	44	129	48	99	8.6	4.2	6.0														9
3/30/2009 13:30	3/30/2009 13:31	Base Grab	184	387	292	26	6.3	0.5	1.3														3
3/31/2009 8:27	3/31/2009 13:10	Storm Composite	20	74	64	74	7.4	4.8	8.1														3
4/4/2009 21:32	4/5/2009 18:33	Storm Composite	53	140	80	37	6.7	2.6	3.9														3
4/8/2009 10:41	4/8/2009 10:42	Base Grab																					
4/13/2009 11:31	4/13/2009 11:39	Base Grab	260	372	372	31	6.8	0.5	0.5														3
4/26/2009 9:51	4/27/2009 2:05	Storm Composite	27	89	68	105	10.1	5.8	13.0														3
4/27/2009 11:05	4/27/2009 11:06	Base Grab	80	338	168	42	9.0	4.1	6.1														3
4/29/2009 8:50	4/29/2009 8:50	Base Grab																					
4/29/2009 19:04	4/29/2009 21:51	Storm Composite	33	69	48	79	11.7	6.1	7.2														
5/6/2009 12:10	5/6/2009 12:10	Base Grab																					
5/11/2009 10:48	5/11/2009 10:49	Base Grab	343	95	450	13	2.0	0.5	0.5														3
5/20/2009 9:00	5/20/2009 9:00	Base Grab																					
5/27/2009 10:00	5/27/2009 10:01	Base Grab	356	63	488	3	1.4	0.5	0.5														3
6/4/2009 9:00	6/4/2009 9:00	Base Grab																					
6/6/2009 11:21	6/7/2009 12:59	Storm Composite	77	50	116	82	11.3																3
6/11/2009 9:40	6/11/2009 9:41	Base Grab	314	67	388	7	2.5	0.5	0.5														3
6/16/2009 16:26	6/16/2009 23:03	Storm Composite	63	24	92	69	9.9	4.8	6.3														3
6/17/2009 11:18	6/17/2009 11:18	Base Grab																					
6/24/2009 12:16	6/24/2009 12:16	Storm Grab																					
6/25/2009 5:18	6/25/2009 7:52	Storm Composite	68	22	100	117	11.9	9.3	16.0														6
6/26/2009 9:20	6/26/2009 9:21	Base Grab	307	68	400	13	3.2	0.5	1.2														3
6/27/2009 2:47	6/27/2009 16:50	Storm Composite	70	39	96	51	7.6																3
6/30/2009 11:25	6/30/2009 11:25	Base Grab																					

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Table D.6 continued. Monitoring results for 10SA outfall

Start Date Start Time	End Date End Time	Sample Type	Alkalinity (mg/L CaCO3)	Chloride Ion (mg/L)	Hardness (mg/L CaCO3)	COD (mg/L)	Total Organic Carbon (mg/L)	Carbonaceous Biological Oxygen Demand 5-day (mg/L)	Total Biological Oxygen Demand 5-day (mg/L)	Soluble Copper (mg/L)	Total Copper (mg/L)	Soluble Nickel (mg/L)	Total Nickel (mg/L)	Soluble Lead (mg/L)	Total Lead (mg/L)	Soluble Zinc (mg/L)	Total Zinc (mg/L)	Soluble Cadmium (mg/L)	Total Cadmium (mg/L)	Soluble Chromium (mg/L)	Total Chromium (mg/L)	Mercury (ug/L)	Oil and Grease (mg/L)
7/4/2009 14:51	7/4/2009 20:15	Storm Composite	69	22	116	66	9.2				0.0172		0.0062		0.0113		0.0800		0.00025		0.0077	0.030	3
7/8/2009 12:36	7/8/2009 12:37	Base Grab	342	52	420	5	3.7	0.5	0.5														3
7/14/2009 11:24	7/14/2009 11:24	Base Grab																					
7/20/2009 12:45	7/20/2009 12:46	Base Grab	317	50	432	10	1.3	0.5	0.5														3
7/21/2009 5:46	7/21/2009 9:23	Storm Composite	25	14	56	66	7.1		6.2														3
7/21/2009 11:15	7/21/2009 11:15	Storm Grab																					
7/22/2009 22:53	7/23/2009 0:32	Storm Composite	23	12	52	67	7.5	4.7	5.6														3
7/29/2009 11:27	7/29/2009 11:27	Base Grab																					
7/31/2009 21:58	7/31/2009 23:47	Storm Composite	41	8	44	60	6.2			0.0036	0.0129	0.0024	0.0044	0.0001	0.0070	0.0096	0.0631	0.00025	0.00025	0.0025	0.0066		3
8/5/2009 9:45	8/5/2009 9:46	Base Grab	315	48	392	2.5	2.2	0.5	0.5														3
8/7/2009 9:42	8/7/2009 14:18	Storm Composite	26	10	44	30	5.3																3
8/12/2009 12:00	8/12/2009 12:00	Base Grab																					
8/15/2009 20:30	8/16/2009 0:49	Storm Composite	53	14	64	60	7.9																3
8/18/2009 14:50	8/18/2009 14:51	Base Grab	306	43	392	6	1.9	0.5	0.5														3
8/19/2009 3:13	8/19/2009 5:06	Storm Composite	24	8	40	76	6.0																3
8/25/2009 5:26	8/25/2009 6:40	Storm Composite	17	4	48	39	4.6		4.7														3
8/25/2009 8:45	8/25/2009 8:45	Storm Grab																					
8/27/2009 9:02	8/27/2009 9:02	Base Grab																					
9/2/2009 9:45	9/2/2009 9:46	Base Grab	337	44	404	5	1.5	0.5	0.5														3
9/9/2009 8:34	9/9/2009 8:34	Base Grab																					
9/17/2009 9:50	9/17/2009 9:51	Base Grab	288	43	432	2.5	1.7	0.5	0.5	0.0033	0.0035	0.0037	0.0040	0.0005	0.0014	0.0025	0.0025	0.00025	0.00025	0.0025	0.0025	0.012	3
9/23/2009 9:35	9/23/2009 9:35	Base Grab																					
9/25/2009 12:58	9/26/2009 3:30	Storm Composite	112	19	160	35	6.9																3
10/1/2009 8:57	10/1/2009 8:57	Storm Grab																					
10/1/2009 15:08	10/1/2009 17:53	Storm Composite	38	7	72	33	4.4	3.0	4.5	0.0028	0.0091	0.0013	0.0031	0.0002	0.0052	0.1830	0.0408	0.00025	0.00025	0.0066	0.0071	0.012	3
10/6/2009 9:15	10/6/2009 9:15	Storm Grab																					
10/12/2009 11:50	10/12/2009 11:50	Snow Grab																					
10/12/2009 6:22	10/12/2009 14:33	Snow Composite	118	74	170	21	8.1																3
10/13/2009 8:35	10/13/2009 8:35	Base Grab																					
10/14/2009 12:42	10/14/2009 12:43	Base Grab	283	40	384	11	2.4	0.5	0.5														3
10/15/2009 4:01	10/15/2009 14:38	Storm Composite	69	22	112	25	6.1																3
10/22/2009 11:10	10/22/2009 11:10	Base Grab																					
10/21/2009 7:38	10/22/2009 7:58	Storm Composite	93	27	154	41	6.6																80
10/27/2009 12:30	10/27/2009 12:31	Base Grab	147	94	244	21	5.4	1.0	1.3														3
10/29/2009 11:55	10/30/2009 4:05	Storm Composite	39	16	58	46	7.5																3
11/18/2009 12:50	11/18/2009 12:51	Base Grab	303	131	432	26	7.0	0.5	1.2														3
11/24/2009 8:40	11/24/2009 8:40	Storm Grab																					
12/18/2009 10:09	12/18/2009 10:10	Base Grab		204																			
12/25/2009 18:37	12/26/2009 22:43	Storm Composite		1,416																			

All duplicates are omitted from analysis.

Green font indicates value was greater than the maximum detection limit. MDL+1 was the value used for analysis.

Blue font indicates the value was below the minimum detection limit and 1/2 the MDL was used as the value for analysis.

Maroon font equals values was ~. Value used for analysis was the ~value.

Appendix E – Kasota Ponds Monitoring Results

Table E.1. Monitoring results for KPEE

Date	Sample Time	Air Temp (F)	Water Temp (F)	Dissolved Oxygen (mg/L)	Conductivity (uS)	Specific Conductivity (uS)	pH	Salinity (ppt)	Total Suspended Solids (mg/L)	Volatile Suspended Solids (mg/L)	Total Dissolved Solids (mg/L)	Dissolved Phosphorus (mg/L)	Total Phosphorus (mg/L)	Ortho Phosphate (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia Nitrogen (mg/L)	Nitrite N (mg/L)	Nitrate N (mg/L)	Chloride Ion (mg/L)	Hardness (mg/L CaCO3)	Soluble Copper (mg/L)	Total Copper (mg/L)	Soluble Nickel (mg/L)	Total Nickel (mg/L)	Soluble Lead (mg/L)	Total Lead (mg/L)	Soluble Zinc (mg/L)	Total Zinc (mg/L)	Soluble Cadmium (mg/L)	Total Cadmium (mg/L)	Soluble Chromium (mg/L)	Total Chromium (mg/L)
3/25/2009	10:05	32	39.2		926.0	1,546.0	7.1	0.8	68	41	806	0.058	0.312	0.0025	4.9	0.11	0.02	0.06	385	276	0.0030	0.0075	0.0028	0.0040	0.00010	0.0074	0.0045	0.0294	0.00025	0.00025	0.0030	0.0030
4/20/2009	13:20	43	52.7	7.73	1,412.0	1,902.0	7.3	1.0	5	3	1,070	0.005	0.073	0.0025	1.8	0.01	0.02	0.03	532	384	0.0054	0.0063	0.0043	0.0043	0.00005	0.0003	0.0021	0.0021	0.00025	0.00025	0.0035	0.0035
5/14/2009	10:50	60	57.6	10.08	1,570.0	1,977.0	7.6	1.2	12	5	1,170	0.015	0.100	0.0050	2.7	0.01	0.02	0.06	539	384	0.0043	0.0047	0.0037	0.0037	0.00005	0.0006	0.0146	0.0146	0.00025	0.00025	0.0025	0.0025
6/5/2009	11:25	70	67.8	7.15	2,127.0	2,361.0	7.7	1.2	5	4	1,340		0.113	0.0070	2.7	0.04	0.02	0.03	685	368	0.0048	0.0049	0.0034	0.0034	0.00005	0.0004	0.0025	0.0025	0.00025	0.00025	0.0025	0.0025
7/9/2009	12:05	65	73.4	4.94	2,247.0	2,335.0	9.0	1.2	90	56	1,260		0.984	0.0260	8.1	0.05	0.02	0.03	627	700	0.0046	0.0080	0.0034	0.0041	0.00005	0.0048	0.0025	0.0202	0.00025	0.00025	0.0025	0.0025
8/21/2009	11:05	60	65.7	6.13	1,145.0	1,301.0	7.4	0.7	7	5	783		0.151	0.0290	2.6	0.06	0.02	0.03	362	264	0.0033	0.0036	0.0030	0.0030	0.00010	0.0004	0.0025	0.0025	0.00025	0.00025	0.0025	0.0025
9/4/2009	10:55	65	64.8	4.78	1,455.0	1,672.0	7.7	0.8	49	26	826		0.192	0.0230	2.2	0.04	0.02	0.03	455	292	0.0056	0.0100	0.0032	0.0042	0.00010	0.0059	0.0025	0.0198	0.00025	0.00025	0.0025	0.0025
10/21/2009	10:30	50	49.1	8.35	999.0	1,420.0		0.7	2	1	772		0.056	0.0025	1.7	0.11	0.02	0.03	357	280	0.0033	0.0033	0.0032	0.0032	0.00010	0.0006	0.0025	0.0025	0.00025	0.00025	0.0025	0.0025
12/1/2009	10:30	35	37.2	12.29	900.0	1,553.0	7.2	0.8	8	6	832		0.082	0.0070	3.0	0.77	0.02	0.08	417	320	0.0023	0.0025	0.0037	0.0038	0.00005	0.0010	0.0051	0.0055	0.00025	0.00025	0.0025	0.0025

All duplicates are omitted from analysis.

Green font indicates value was greater than the maximum detection limit. MDL+1 was the value used for analysis.

Blue font indicates the value was below the minimum detection limit and 1/2 the MDL was used as the value for analysis.

Maroon font equals values was ~. Value used for analysis was the ~value.

Table E.2. Monitoring results for KPEN

Date	Sample Time	Air Temp (F)	Water Temp (F)	Dissolved Oxygen (mg/L)	Conductivity (uS)	Specific Conductivity (uS)	pH	Salinity (ppt)	Total Suspended Solids (mg/L)	Volatile Suspended Solids (mg/L)	Total Dissolved Solids (mg/L)	Dissolved Phosphorus (mg/L)	Total Phosphorus (mg/L)	Ortho Phosphate (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia Nitrogen (mg/L)	Nitrite N (mg/L)	Nitrate N (mg/L)	Chloride Ion (mg/L)	Hardness (mg/L CaCO3)	Soluble Copper (mg/L)	Total Copper (mg/L)	Soluble Nickel (mg/L)	Total Nickel (mg/L)	Soluble Lead (mg/L)	Total Lead (mg/L)	Soluble Zinc (mg/L)	Total Zinc (mg/L)	Soluble Cadmium (mg/L)	Total Cadmium (mg/L)	Soluble Chromium (mg/L)	Total Chromium (mg/L)
3/25/2009	10:00	32	39.4		852.0	1,419.0	7.2	0.7	29	23	780	0.011	0.208	0.0050	3.7	0.09	0.02	0.05	390	284	0.0032	0.0044	0.0028	0.0030	0.00010	0.0010	0.0047	0.0135	0.00025	0.00025	0.0030	0.0030
4/20/2009	13:10	43	53.1	6.51	1,410.0	1,890.0	7.3	1.0	6	4	1,070	0.005	0.094	0.0025	2.0	0.01	0.02	0.03	543	336	0.0051	0.0051	0.0044	0.0044	0.00005	0.0003	0.0016	0.0034	0.00025	0.00025	0.0035	0.0035
5/14/2009	10:40	60	59.7	9.07	1,599.0	1,959.0	7.6	1.0	6	4	1,140	0.022	0.064	0.0080	2.1	0.01	0.02	0.03	536	348	0.0037	0.0049	0.0035	0.0034	0.00005	0.0003	0.0178	0.0178	0.00025	0.00025	0.0025	0.0025
6/5/2009	11:20	70	70.2	7.36	2,120.0	2,279.0	7.5	1.2	4	3	1,320		0.062	0.0025	2.8	0.01	0.02	0.03	654	360	0.0042	0.0046	0.0052	0.0052	0.00005	0.0003	0.0025	0.0025	0.00025	0.00025	0.0025	0.0025
7/9/2009	11:55	65	73.4	8.86	2,110.0	2,195.0	7.6	1.1	46	24	1,080		0.207	0.0050	4.2	0.03	0.02	0.03	572	304	0.0043	0.0054	0.0027	0.0031	0.00005	0.0012	0.0025	0.0090	0.00025	0.00025	0.0025	0.0025
8/21/2009	10:55	60	65.7	2.78	1,193.0	1,356.0	7.4	0.7	6	5	760		0.071	0.0150	2.2	0.04	0.02	0.03	338	256	0.0033	0.0038	0.0029	0.0032	0.00030	0.0005	0.0076	0.0076	0.00025	0.00025	0.0025	0.0025
9/4/2009	10:40	65	67.6	6.00	1,493.0	1,652.0	7.4	0.8	13	8	966		0.099	0.0060	1.9	0.05	0.02	0.03	446	300	0.0061	0.0062	0.0035	0.0037	0.00005	0.0007	0.0025	0.0025	0.00025	0.00025	0.0025	0.0025
10/21/2009	10:15	50	49.1	8.03	1,002.0	1,424.0		0.7	1	1	757		0.089	0.0025	2.2	0.13	0.02	0.03	377	280	0.0031	0.0031	0.0033	0.0035	0.00010	0.0005	0.0025	0.0597	0.00025	0.00025	0.0025	0.0025
12/1/2009	11:20	35	37.4	11.75	901.0	1,552.0	7.0	0.8	13	11	837		0.141	0.0090	3.8	0.82	0.02	0.08	384	332	0.0021	0.0025	0.0035	0.0038	0.00005	0.0011	0.0025	0.0025	0.00025	0.00025	0.0025	0.0025

All duplicates are omitted from analysis.

Green font indicates value was greater than the maximum detection limit. MDL+1 was the value used for analysis.

Blue font indicates the value was below the minimum detection limit and 1/2 the MDL was used as the value for analysis.

Maroon font equals values was ~. Value used for analysis was the ~value.

Table E.3. Monitoring results for KPEW

Date	Sample Time	Air Temp (F)	Water Temp (F)	Dissolved Oxygen (mg/L)	Conductivity (uS)	Specific Conductivity (uS)	pH	Salinity (ppt)	Total Suspended Solids (mg/L)	Volatile Suspended Solids (mg/L)	Total Dissolved Solids (mg/L)	Dissolved Phosphorus (mg/L)	Total Phosphorus (mg/L)	Ortho Phosphate (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia Nitrogen (mg/L)	Nitrite N (mg/L)	Nitrate N (mg/L)	Chloride Ion (mg/L)	Hardness (mg/L CaCO3)	Soluble Copper (mg/L)	Total Copper (mg/L)	Soluble Nickel (mg/L)	Total Nickel (mg/L)	Soluble Lead (mg/L)	Total Lead (mg/L)	Soluble Zinc (mg/L)	Total Zinc (mg/L)	Soluble Cadmium (mg/L)	Total Cadmium (mg/L)	Soluble Chromium (mg/L)	Total Chromium (mg/L)
3/25/2009	9:55	32	40.3		872.0	1,429.0	7.1	0.7	26	21	800	0.011	0.222	0.0025	3.7	0.09	0.02	0.07	348	284	0.0034	0.0046	0.0035	0.0035	0.00020	0.0010	0.0130	0.0158	0.00025	0.00025	0.0030	0.0030
4/20/2009	12:55	43	52.5	7.20	1,397.0	1,890.0	7.3	1.0	10	5	1,020	0.005	0.084	0.0090	2.0	0.01	0.02	0.03	499	352	0.0052	0.0062	0.0043	0.0043	0.00005	0.0007	0.0037	0.0046	0.00025	0.00025	0.0035	0.0035
5/14/2009	10:30	60	57.7	8.98	1,562.0	1,963.0	7.6	1.0	4	3	1,140	0.005	0.048	0.0080	1.8	0.01	0.02	0.03	535	344	0.0055	0.0058	0.0035	0.0035	0.00005	0.0001	0.0147	0.0147	0.00025	0.00025	0.0025	0.0025
6/5/2009	12:50	70	70.0	8.12	1,844.0	2,101.0	7.9	1.1	2	3	1,210		0.091	0.0230	2.4	0.03	0.02	0.03	604	344	0.0039	0.0041	0.0029	0.0031	0.00005	0.0001	0.0025	0.0025	0.00025	0.00025	0.0025	0.0025
7/9/2009	11:45	65	69.3	2.11	1,872.0	3,038.0	7.5	1.0	27	21	1,130		0.147	0.0380	2.7	0.04	0.02	0.03	545	316	0.0040	0.0052	0.0029	0.0033	0.00005	0.0024	0.0188	0.0188	0.00025	0.00025	0.0025	0.0025
8/21/2009	10:45	60	65.8	2.38	1,394.0	1,582.0	7.3	0.8	43	36	927		0.222	0.0310	2.9	0.06	0.02	0.03	450	320	0.0030	0.0037	0.0028	0.0032	0.00005	0.0002	0.0051	0.0113	0.00025	0.00025	0.0025	0.0025
9/4/2009	10:30	65	66.0	4.52	1,399.0	1,585.0	7.3	0.8	9	6	912		0.088	0.0230	1.0	0.05	0.02	0.03	410	284	0.0039	0.0044	0.0028	0.0030	0.00005	0.0007	0.0025	0.0025	0.00025	0.00025	0.0025	0.0025
10/21/2009	9:55	50	49.1	7.63	1,001.0	1,423.0		0.7	26	19	787		0.165	0.0025	2.5	0.12	0.02	0.03	356	268	0.0032	0.0036	0.0034	0.0035	0.00010	0.0013	0.0181	0.0181	0.00025	0.00025	0.0025	0.0025
12/1/2009	11:10	35	37.9	11.32	896.0	1,531.0	7.0	0.8	8	7	814		0.093	0.0090	3.3	0.78	0.02	0.12	425	324	0.0021	0.0022	0.0035	0.0037	0.00005	0.0006	0.0025	0.0120	0.00025	0.00025	0.0025	0.0025

All duplicates are omitted from analysis.

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Table E.4. Monitoring results for KPNS

Date	Sample Time	Air Temp (F)	Water Temp (F)	Dissolved Oxygen (mg/L)	Conductivity (uS)	Specific Conductivity (uS)	pH	Salinity (ppt)	Total Suspended Solids (mg/L)	Volatile Suspended Solids (mg/L)	Total Dissolved Solids (mg/L)	Dissolved Phosphorus (mg/L)	Total Phosphorus (mg/L)	Ortho Phosphate (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia Nitrogen (mg/L)	Nitrite N (mg/L)	Nitrate N (mg/L)	Chloride Ion (mg/L)	Hardness (mg/L CaCO3)	Soluble Copper (mg/L)	Total Copper (mg/L)	Soluble Nickel (mg/L)	Total Nickel (mg/L)	Soluble Lead (mg/L)	Total Lead (mg/L)	Soluble Zinc (mg/L)	Total Zinc (mg/L)	Soluble Cadmium (mg/L)	Total Cadmium (mg/L)	Soluble Chromium (mg/L)	Total Chromium (mg/L)
3/25/2009	9:30	32	40.5		919.0	1,501.0	7.4	0.8	20	15	829	0.005	0.031	0.0120	2.2	0.11	0.02	0.17	376	268	0.0054	0.0067	0.0033	0.0034	0.00060	0.0016	0.0223	0.0279	0.00025	0.00025	0.0030	0.0030
4/20/2009	12:25	43	52.7	9.98	1,464.0	1,973.0	7.4	1.0	6	4	1,130	0.005	0.027	0.0025	2.0	0.01	0.02	0.03	561	356	0.0070	0.0070	0.0044	0.0046	0.00005	0.0006	0.0063	0.0063	0.00025	0.00025	0.0035	0.0035
5/14/2009	10:05	60	58.3	7.21	1,752.0	2,188.0	7.1	1.1	13	4	1,320	0.005	0.176	0.0025	3.4	0.01	0.02	0.03	592	408	0.0060	0.0129	0.0051	0.0064	0.00020	0.0223	0.3020	0.3020	0.00025	0.00025	0.0025	0.0025
6/5/2009	10:40	70	68.9	6.32	2,370.0	2,594.0	7.4	1.3	9	7	1,510		0.073	0.0025	2.7	0.01	0.02	0.03	716	512	0.0045	0.0045	0.0051	0.0051	0.00020	0.0010	0.0025	0.0025	0.00025	0.00025	0.0025	0.0025
7/9/2009	10:10	65	70.3	4.88	2,420.0	2,604.0	7.6	1.3	18	15	1,460		0.160	0.0025	3.6	0.01	0.02	0.03	681	516	0.0046	0.0046	0.0051	0.0051	0.00005	0.0013	0.0025	0.0069	0.00025	0.00025	0.0025	0.0025
8/21/2009	10:25	60	66.0	5.28	1,336.0	1,514.0	7.2	0.8	13	9	909		0.135	0.0025	3.3	0.01	0.02	0.03	387	300	0.0033	0.0034	0.0038	0.0040	0.00005	0.0011	0.0025	0.0143	0.00025	0.00025	0.0025	0.0025
9/4/2009	10:05	65	65.8	7.80	1,374.0	1,557.0	7.3	0.8	8	6	855		0.061	0.0080	1.3	0.01	0.02	0.03	364	328	0.0031	0.0033	0.0040	0.0040	0.00005	0.0003	0.0086	0.0086	0.00025	0.00025	0.0025	0.0025
10/21/2009	11:30	50	48.6	7.59	706.0	1,013.0		0.5	3	3	568		0.084	0.0025	1.7	0.01	0.02	0.03	212	248	0.0029	0.0029	0.0034	0.0034	0.00010	0.0006	0.0025	0.0352	0.00025	0.00025	0.0025	0.0025
12/1/2009	12:30	35	38.8	10.78	643.0	1,080.0	7.3	0.5	2	2	570		0.023	0.0025	0.6	0.01	0.02	0.03	252	240	0.0022	0.0022	0.0030	0.0032	0.00005	0.0002	0.0153	0.0153	0.00025	0.00025	0.0025	0.0025

All duplicates are omitted from analysis.

Green font indicates value was greater than the maximum detection limit. MDL+1 was the value used for analysis.

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Maroon font equals values was ~. Value used for analysis was the ~value.

Table E.5. Monitoring results for KPNW

Date	Sample Time	Air Temp (F)	Water Temp (F)	Dissolved Oxygen (mg/L)	Conductivity (uS)	Specific Conductivity (uS)	pH	Salinity (ppt)	Total Suspended Solids (mg/L)	Volatile Suspended Solids (mg/L)	Total Dissolved Solids (mg/L)	Dissolved Phosphorus (mg/L)	Total Phosphorus (mg/L)	Ortho Phosphate (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia Nitrogen (mg/L)	Nitrite N (mg/L)	Nitrate N (mg/L)	Chloride Ion (mg/L)	Hardness (mg/L CaCO3)	Soluble Copper (mg/L)	Total Copper (mg/L)	Soluble Nickel (mg/L)	Total Nickel (mg/L)	Soluble Lead (mg/L)	Total Lead (mg/L)	Soluble Zinc (mg/L)	Total Zinc (mg/L)	Soluble Cadmium (mg/L)	Total Cadmium (mg/L)	Soluble Chromium (mg/L)	Total Chromium (mg/L)
3/25/2009	9:20	32	41.4		942.0	1,514.0	7.4	0.8	17	13	870	0.023	0.036	0.0110	2.4	0.12	0.02	0.16	473	264	0.0056	0.0063	0.0068	0.0068	0.00050	0.0015	0.0236	0.0333	0.00025	0.00025	0.0030	0.0030
4/20/2009	12:20	43	53.2	9.37	1,474.0	1,970.0	7.4	1.0	9	5	1,120	0.005	0.029	0.0025	1.6	0.01	0.02	0.03	534	352	0.0069	0.0069	0.0048	0.0048	0.00030	0.0008	0.0107	0.0107	0.00025	0.00025	0.0035	0.0035
5/14/2009	9:55	60	58.5	6.92	1,754.0	2,182.0	7.1	1.1	85	50	1,310	0.005	0.049	0.0025	2.2	0.01	0.02	0.03	589	392	0.0044	0.0044	0.0045	0.0048	0.00005	0.0009	0.0025	0.0050	0.00025	0.00025	0.0025	0.0025
6/5/2009	10:30	70	69.1	4.55	2,374.0	2,591.0	7.4	1.3	9	7	1,530		0.066	0.0025	2.9	0.01	0.02	0.03	711	512	0.0043	0.0044	0.0052	0.0052	0.00005	0.0010	0.0245	0.0245	0.00025	0.00025	0.0025	0.0025
7/9/2009	9:55	65	70.3	4.97	2,421.0	2,603.0	7.4	1.3	31	18	1,500		0.138	0.0025	3.8	0.01	0.02	0.03	685	492	0.0047	0.0051	0.0050	0.0052	0.00005	0.0026	0.0065	0.0073	0.00025	0.00025	0.0025	0.0025
8/21/2009	10:15	60	66.0	5.12	1,317.0	1,492.0	7.0	0.8	12	10	898		0.143	0.0025	3.0	0.01	0.02	0.03	423	300	0.0033	0.0033	0.0036	0.0036	0.00005	0.0009	0.0025	0.0025	0.00025	0.00025	0.0025	0.0025
9/4/2009	9:50	65	65.7	6.02	1,368.0	1,556.0	6.8	0.8	12	8	911		0.102	0.3770	1.7	0.01	0.02	0.03	377	360	0.0037	0.0037	0.0047	0.0047	0.00010	0.0008	0.0080	0.0080	0.00025	0.00025	0.0025	0.0025
10/21/2009	11:15	50	48.4	7.69	703.0	1,009.0		0.5	5	5	573		0.071	0.0025	1.8	0.01	0.02	0.03	215	248	0.0026	0.0028	0.0033	0.0033	0.00010	0.0006	0.0097	0.0097	0.00025	0.00025	0.0025	0.0025
12/1/2009	12:15	35	36.9	11.23	618.0	1,081.0	7.3	0.5	5	5	570		0.042	0.0025	0.8	0.01	0.02	0.03	25	260	0.0022	0.0129	0.0032	0.0032	0.00005	0.0005	0.0055	0.0115	0.00025	0.00025	0.0025	0.0025

All duplicates are omitted from analysis.

Green font indicates value was greater than the maximum detection limit. MDL+1 was the value used for analysis.

Blue font indicates the value was below the minimum detection limit and 1/2 the MDL was used as the value for analysis.

Maroon font equals values was ~. Value used for analysis was the ~value.

Table E.6. Monitoring results for KPWE

Date	Sample Time	Air Temp (F)	Water Temp (F)	Dissolved Oxygen (mg/L)	Conductivity (uS)	Specific Conductivity (uS)	pH	Salinity (ppt)	Total Suspended Solids (mg/L)	Volatile Suspended Solids (mg/L)	Total Dissolved Solids (mg/L)	Dissolved Phosphorus (mg/L)	Total Phosphorus (mg/L)	Ortho Phosphate (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia Nitrogen (mg/L)	Nitrite N (mg/L)	Nitrate N (mg/L)	Chloride Ion (mg/L)	Hardness (mg/L CaCO3)	Soluble Copper (mg/L)	Total Copper (mg/L)	Soluble Nickel (mg/L)	Total Nickel (mg/L)	Soluble Lead (mg/L)	Total Lead (mg/L)	Soluble Zinc (mg/L)	Total Zinc (mg/L)	Soluble Cadmium (mg/L)	Total Cadmium (mg/L)	Soluble Chromium (mg/L)	Total Chromium (mg/L)
3/25/2009	10:35	32	39.7		657	1,088	7.2	0.5	14	8	597	0.015	0.050	0.0025	2.9	0.65	0.02	0.14	306	200	0.0034	0.0047	0.0022	0.0026	0.00020	0.0023	0.0075	0.0113	0.00025	0.00025	0.0030	0.0030
4/20/2009	13:35	43	54.9	13.89	1,291	1,687	8.6	0.9	6	5	908	0.005	0.033	0.0025	2.0	0.01	0.02	0.03	451	308	0.0039	0.0041	0.0037	0.0039	0.00005	0.0002	0.0011	0.0067	0.00025	0.00025	0.0035	0.0035
5/14/2009	11:20	60	59.7	4.49	1,445	1,768	7.4	0.9	3	2	1,040	0.005	0.051	0.0025	3.7	0.99	0.02	0.06	474	332	0.0040	0.0042	0.0038	0.0038	0.00020	0.0016	0.0025	0.0081	0.00025	0.00025	0.0025	0.0025
6/5/2009	12:00	70	70.2	3.16	1,782	1,921	7.5	1.0	2	1	1,120		0.047	0.0050	2.8	2.04	0.08	0.03	514	348	0.0031	0.0035	0.0036	0.0038	0.00005	0.0004	0.0025	0.0025	0.00025	0.00025	0.0025	0.0025
7/9/2009	12:30	65	77.2	4.73	1,810	1,807	7.7	0.9	2	2	1,040		0.065	0.0025	4.9	1.52	0.17	0.10	443	356	0.0038	0.0038	0.0043	0.0043	0.00010	0.0004	0.2090	0.2090	0.00025	0.00025	0.0025	0.0025
8/21/2009	11:35	60	68.9	5.14	1,212	1,327	7.6	0.7	18	17	789		0.113	0.0025	4.0	0.03	0.02	0.03	361	240	0.0028	0.0032	0.0026	0.0029	0.00005	0.0005	0.0025	0.0025	0.00025	0.00025	0.0025	0.0025
9/4/2009	11:50	65	69.3	14.10	1,241	1,349	8.5	0.7	76	57	763		0.545	0.0290	7.5	0.07	0.02	0.03	350	232	0.0041	0.0045	0.0026	0.0032	0.00005	0.0020	0.0062	0.0088	0.00025	0.00025	0.0025	0.0025
10/21/2009	9:40	50	48.2	5.15	842	1,213		0.6	2	2	684		0.070	0.0025	2.8	0.44	0.02	0.03	304	256	0.0031	0.0031	0.0035	0.0035	0.00030	0.0006	0.0165	0.0165	0.00025	0.00025	0.0025	0.0025
12/1/2009	10:55	35	39.0	7.33	775	1,289	6.7	0.6	2	1	710		0.071	0.0120	3.0	1.43	0.02	0.07	344	308	0.0023	0.0026	0.0030	0.0031	0.00020	0.0009	0.0025	0.0061	0.00025	0.00025	0.0025	0.0025

All duplicates are omitted from analysis.

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Table E.7. Monitoring results for KPWN

Date	Sample Time	Air Temp (F)	Water Temp (F)	Dissolved Oxygen (mg/L)	Conductivity (uS)	Specific Conductivity (uS)	pH	Salinity (ppt)	Total Suspended Solids (mg/L)	Volatile Suspended Solids (mg/L)	Total Dissolved Solids (mg/L)	Dissolved Phosphorus (mg/L)	Total Phosphorus (mg/L)	Ortho Phosphate (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia Nitrogen (mg/L)	Nitrite N (mg/L)	Nitrate N (mg/L)	Chloride Ion (mg/L)	Hardness (mg/L CaCO3)	Soluble Copper (mg/L)	Total Copper (mg/L)	Soluble Nickel (mg/L)	Total Nickel (mg/L)	Soluble Lead (mg/L)	Total Lead (mg/L)	Soluble Zinc (mg/L)	Total Zinc (mg/L)	Soluble Cadmium (mg/L)	Total Cadmium (mg/L)	Soluble Chromium (mg/L)	Total Chromium (mg/L)
3/25/2009	10:28	32	39.9		672.0	1,107.0	7.2	0.5	14	8	596	0.010	0.005	0.0025	2.2	0.64	0.02	0.13	238	288	0.0034	0.0051	0.0022	0.0028	0.00020	0.0023	0.0052	0.0130	0.00025	0.00025	0.0030	0.0030
4/20/2009	13:28	43	54.7	14.02	1,293.0	1,695.0	8.3	0.9	5	4	954	0.012	0.044	0.0050	2.5	0.01	0.02	0.03	463	308	0.0039	0.0044	0.0037	0.0037	0.00005	0.0001	0.0048	0.0048	0.00025	0.00025	0.0035	0.0035
5/14/2009	11:10	60	58.8	4.08	1,429.0	1,769.0	7.3	0.9	4	2	1,050	0.005	0.050	0.0025	3.8	0.99	0.02	0.07	476	340	0.0039	0.0044	0.0036	0.0038	0.00010	0.0018	0.0025	0.0062	0.00025	0.00025	0.0025	0.0025
6/5/2009	11:50	70	69.4	2.75	1,754.0	1,908.0	7.5	1.0	2	2	1,090		0.065	0.0100	4.4	1.90	0.08	0.03	511	368	0.0034	0.0036	0.0038	0.0038	0.00005	0.0005	0.0025	0.0025	0.00025	0.00025	0.0025	0.0025
7/9/2009	12:25	65	74.7	4.05	1,753.0	1,797.0	7.6	0.9	2	1	1,040		0.046	0.0025	4.4	1.48	0.18	0.11	454	336	0.0037	0.0037	0.0038	0.0039	0.00005	0.0005	0.0213	0.0213	0.00025	0.00025	0.0025	0.0025
8/21/2009	11:30	60	68.5	4.35	1,204.0	1,323.0	7.6	0.7	5	4	759		0.067	0.0025	2.7	0.10	0.02	0.03	357	236	0.0029	0.0031	0.0028	0.0028	0.00010	0.0005	0.0610	0.0610	0.00025	0.00025	0.0025	0.0025
9/4/2009	11:40	65	72.7	8.82	1,286.0	1,345.0	8.2	0.7	8	5	794		0.104	0.0360	2.1	0.15	0.02	0.03	344	244	0.0032	0.0040	0.0025	0.0028	0.00010	0.0010	0.0025	0.0025	0.00025	0.00025	0.0025	0.0025
10/21/2009	9:30	50	48.2	5.00	837.0	1,207.0		0.6	1	2	689		0.066	0.0025	2.9	0.45	0.02	0.06	296	244	0.0035	0.0032	0.0038	0.0038	0.00030	0.0006	0.0107	0.2000	0.00025	0.00025	0.0025	0.0025
12/1/2009	10:30	35	37.4	7.82	759.0	1,306.0	6.7	0.6	1	1	703		0.078	0.0130	3.3	1.57	0.02	0.06	324	272	0.0024	0.0024	0.0029	0.0032	0.00030	0.0008	0.0088	0.0088	0.00025	0.00025	0.0025	0.0025

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