# Pima County
# 2017 Annual Stormwater Report

**July 2016 – June 2017**
**AZPDES Permit No. AZS000002**

PIMA COUNTY

**September 29, 2017**

# Stormwater Management Plan

*Prepared in cooperation with:*
Regional Wastewater Reclamation Department
Department of Transportation
Regional Flood Control District
Development Services Department
Pima Association of Governments

**Stormwater Management Program**
**Pima County Department of Environmental Quality**
**33 N. Stone Avenue, Suite 700**
**Tucson, Arizona 85701-1429**

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# EXECUTIVE SUMMARY

## Introduction

This report describes activities performed and data collected for Pima County's Arizona Pollutant Discharge System (AZPDES) Permit No. AZS000002 between July 1, 2016 and June 30, 2017. This permit authorizes Pima County to discharge stormwater from a municipal separate storm sewer system (MS4) to waters of the United States.

This report is the sixth annual report prepared under the new state permit issued on June 16, 2011 and effective on July 18, 2011, herein referred to as the 2011 MS4 permit. Under the previous EPA MS4 permit issued on February 14, 1997, 14 annual reports were prepared.

## Certification

Pima County's principal executive officer signs and certifies this annual report was prepared by qualified personnel to properly gather and evaluate the information submitted (Part 2).

## Stormwater Management Program (SWMP)

Best management practices (BMPs) were implemented in accordance with the SWMP during the reporting period. Information for the SWMP is found in the following parts: Narrative summary of SWMP activities (Part 3 and Appendices), Numeric summary of SWMP activities (Part 4), Evaluation of SWMP (Part 5), and Modifications to SWMP (Part 6).

## Wet Weather Monitoring

Water quality samples were collected from the five Monitoring Sites (Part 7). Storm event records were automatically recorded and summarized (Part 8). Analytical results for the water quality samples (Part 9), the water quality assessment (Part 10) and the estimate of annual pollutant loadings (Part 11) document the quality of surface water flows.

## Expenditures and Proposed Budget

A summary of the annual expenditures and the proposed budget are summarized (Part 12).

## Conclusions

Pima County implemented the SWMP and Wet Weather Monitoring Program. Activities included maintenance of the roadways and drainage systems. Inspections were performed at 40 outfalls, 115 construction sites, 84 post construction sites, and 10 private industrial facilities. The public reported 1,097 environmental complaints. All were inspected or referred to another jurisdiction. These inspections resulted in 265 Notices of Violation and 230 remediated sites. Seven stormwater samples were collected at five monitor sites. Analysis of the water quality results for 133 parameters shows copper, silver and *E. Coli* were the three pollutants detected above Arizona's Surface Water Quality Standards (SWQS). These activities and increasingly effective stormwater stewardship practices by the public contribute to stormwater quality with three parameters outside of standards and meeting the other 102 parameters with established SWQS.

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**1. General Information**

A. Name of Permittee: Pima County

B. Permit Number: AZS000002

C. Reporting Period: July 1, 2016 - June 30, 2017

D. Name of Stormwater Management Program Contact: Marie Light

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E. Name of Certifying Official: Carmine DeBonis

Title: Deputy County Administrator for Public Works

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F. Scope of Permit

The physical components within the permit area include 2,087 miles of roadway, 39 miles of storm drains and appurtenances that collect and convey runoff from precipitation events, with lengths reported by Pima County Department of Transportation (PDOT) and Regional Flood Control District (RFCD), respectively. The permit area is unincorporated Pima County within the Santa Cruz River watershed (Figure 1-1, blue area). In both rural areas and metropolitan areas, runoff collects in ephemeral stream channels and infiltrates into alluvial deposit in the valley (USGS, 1973). Flows in ephemeral stream channels occur in response to rainfall events that are larger than 0.2 inches. Most runoff infiltrates within Pima County.

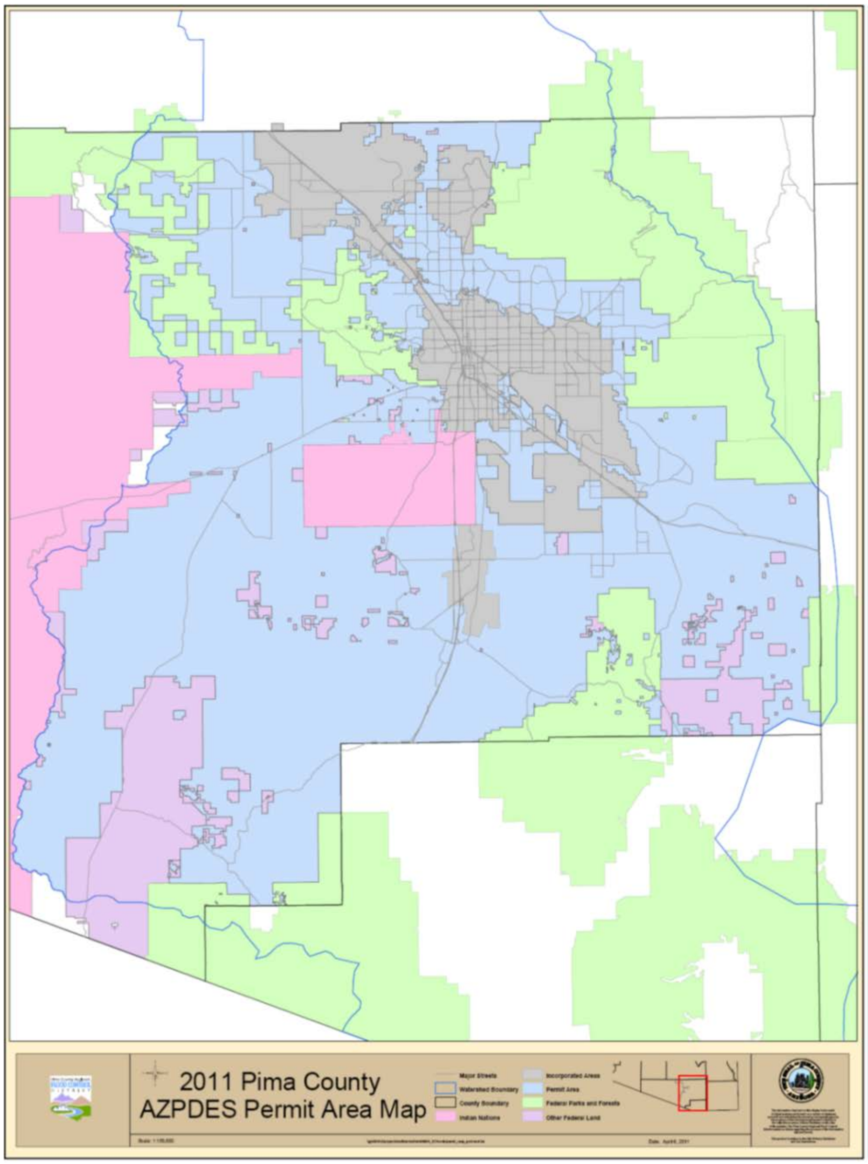


**Figure 1. 2011 AZPDES Permit Area Map**

Managements Activities

Management of the program includes coordinating with Pima County departments that maintain roadways and drainageways, purchasing open space to conserve land and managing stormwater operations between five county departments. Pima County collaborates with local jurisdictions, businesses, educational institutions, and interested members of the public to engage the public in restoring and maintaining the integrity of surface waters in the county. Education and training include teaching techniques to keep water clean and using stormwater as a resource for landscape irrigation and other beneficial uses. Staff works with novices to professionals as well as kids to great grandparents.

Field Activities

Pima County inspects outfalls, construction sites, industrial facilities, and reported environmental complaints that could lead to illicit discharge detection and elimination. To characterize water quality, Pima County collects water samples at five monitor sites representing low density residences, medium density residences, high density residences, commercial and industrial land uses.

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## 2. ANNUAL REPORT CERTIFICATION AND LEGAL AUTHORITY

**Written by:** **Date:**

Marie Light
Principal Hydrologist

**Reviewed by:** **Date:**

Larry Hawke
Intergovernmental Relations Manager

Richard Grimaldi
Deputy Director, Department of Environmental Quality

Ursula Nelson
Director, Department of Environmental Quality

**Approved by:**

*I certify under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.*

Carmine DeBonis — September 29, 2017
Deputy County Administrator for Public Works

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## 3. Narrative Summary of Stormwater Management Program

Pima County's municipal separate storm sewer storm drain system consists of 2,087 miles of roadways, 39 miles of storm drains, and infrastructure collecting runoff into drainageways or discharging runoff to ephemeral stream channels. Pima County utilizes a Public Awareness Program and a Public Participation Program to invest in behaviors protecting the quality of stormwater as it flows through the county. The public is encouraged to report illegal dumping and unusual environmental conditions and to remove materials in washes or upon land that could be transported into a wash during rainfall events. Management of Pima County Facilities includes maintenance of infrastructure and acquisition of property to prevent stormwater pollution. Inspections of Industrial Facilities and Construction Sites also reduce stormwater pollution. Post Construction activities include inspections once construction is completed at a site as well as implementation of Green Infrastructure and Low Impact Development (GI/LID) to prevent flooding and stormwater pollution.

### A. Public Awareness

The public awareness program involves on-going education of the public and businesses, and contributes to environmental and stormwater educational events. Pima County DEQ staff delivered the keep-stormwater-clean message using literature, promotional materials, presentations, and assistance to business. A wide range of literature provided to the public includes 48 types ranging from bookmarks, booklets, brochures, posters, stickers, bags and fact sheets (Appendix A). Literature is being prepared in both Spanish and English as the demographic population is 35% Hispanic or Latino.

<u>Conferences, Seminars and Presentations</u>
Pima Community College requests PDEQ staff to provide a three-hour presentation for students in the class *Building/Construction Technology 265 Sustainability.* The presentation provided on September 9, 2016 addressed the application of Low Impact Development and Green Infrastructure to achieve sustainable water use. Pima County presents requested information once each year to classes ranging between 5 and 30 registered students.

Presentations to professionals include the importance of LID to preventing flooding to the Community Association Institute, an organization dedicated to building better communities, on June 14, 2017. The principles of Green Infrastructure and Low Impact Development were presented to the Orange Grove Park Homeowners Association on July 21, 2016.

The topics presented to the general public include wash protection, illicit discharges, illegal dumping and Low Impact Development. Special outreach was developed for Basis grade school children using a the *Desert Dwellers Know* coloring book and poster. Teaching sessions for first graders were geared to identify desert plants, animals and landforms. Teaching sessions for 120 fifth graders were geared to adaptive strategies used by plants and animals. The example of the plants and animals illustrated how humans have adapted historically and how we can adapt today.

MS4s within Pima County, ADEQ and the construction industry meet regularly at the Stormwater Management Working Group (SWMWG) hosted by Pima Association of Governments (PAG) to develop a stormwater message for the area. PDEQ helped define messages for residents, homeowners, schools and the development community. The group developed a multi-media outreach campaign designed to educate residents about stormwater pollution, watershed awareness, wash protection, illicit discharges and illegal dumping. Public events, media interviews, magazine ads, articles, signage, website and social media communication, promotional materials and educational literature formed the multi-media campaign.

The slogan “Clean Water Starts with Me” was used for the ninth consecutive year to increase familiarity with the successful message. Artwork and style matches the imagery used by the local jurisdictions in school programs. SWMWG formed a key partnership in fiscal year 2015-16 with the University of Arizona’s Project Water Education for Teachers (WET) to expand outreach to youth audiences and continued through fiscal year 2016-17. Project WET is based in Science, Technology, Engineering & Math (STEM) standards and meets Arizona State Science Standards. Students address real world problems through a variety of experiments using watershed models and observing relative effectiveness of stormwater management systems. SWMWG collaborated with Project WET staff to further enhance development of the stormwater curriculum for the local desert environment.

A phone survey was conducted in May 2017 to assess the public’s attitudes towards stormwater and their trash disposal behaviors. The results were finalized in a report (FMR Associates, 2017) and the results were presented to Pima County, Town of Oro Valley, City of Tucson, Town of Marana and PAG staff working on air and water quality public outreach in early June 2017. The results guide outreach strategies to minimize pollutants released by the public and to report illicit discharges to PDEQ.

EcoNook for Desert Dwellers and Eco Kids Corner

This community outreach project continues to provide a significant source of stormwater literature to the public at 27 Pima County Public Libraries and 6 community centers. Librarians and program staff are invited to create special areas within each library where free environmental literature is available for patrons. “EcoNook for Desert Dwellers” targets teenagers and adults while “Eco Kids Corner” serves children 12 years and under. Educational materials cover stormwater quality topics including stormwater pollution prevention, water harvesting, desert gardening, and Green Infrastructure/Low Impact Development. Other organizations that provide environmental literature are now taking their literature to the libraries as well.

Business Assistance Program

Activities in the Business Assistance Program help local businesses comply with applicable environmental requirements (Table 2). Pima County DEQ staff assists businesses in the completion of permit applications, clarifies the complex regulations, identifies potential violations, informs businesses about pollution prevention methods and makes suggestion to reducing stormwater discharges to stay in compliance. Free literature is provided upon request.

| **Table 1. Summary of Business Assistance Program** | |
|---|---|
| Type of Assistance | Number |
| Telephone/E-mail inquiries | 150 |
| DEQ office assistance visits | 25 |
| Letters/information mailed | 20 |
| Educational literature distributed | 10,420 |
| Seminars/presentations given | 7 |
| Number of times stormwater website or LID website was visited | 1,377 |
| Number of times website for Water & Wastewater Infrastructure, Supply & Planning Study | 655 |
| Number of times Pima County's Comprehensive Plan Pima Prospers website was visited (chapters containing stormwater management, rainwater harvesting or LID) | 962 |

### B. Public Participation

Engaging the public in substantive actions to reduce pollutants entering stormwater is key to long-term success. Members of the public clean trash from roadways and drainageways, recycle or dispose of hazardous materials at the Household Hazardous Waste Facility and report environmental issues to Pima County DEQ.

Adopt-a-Roadway Program
Volunteers in Pima County's Adopt-a-Roadway program clean up roadways and public lands. The program had 352 clean-up events over a total length of 567 miles. Volunteers removed 6,691 bags of trash from the adopted roads (Appendix B).

Environmental Complaints
The public and businesses are encouraged to fax, phone or e-mail information about environmental complaints to Pima County DEQ. Each complaint is inspected or, if the location of the complaint places it within another jurisdiction, the complaint is referred to the responsible jurisdiction. Additional information about the inspection and potential enforcement process is described in the next section on illicit discharge detection and elimination activities.

ABOP Program
Pima County contracted Tucson Recycling & Waste Services on June 1, 2013 to operate the County's landfills and transfer stations. Recycling of antifreeze, batteries, oil and paint (ABOP) occurs at Catalina Transfer Station, Ryan Field Transfer Station and Sahuarita Transfer Station. Additionally, used oil is recycled at the Ajo Landfill. Recycling is free and participants are encouraged to be careful with their containers during transport. Tucson Recycling & Waste Services tracks the number or batteries and gallons of paint while they recycle the oil and antifreeze with Arizona Waste Oil Services Inc. who provides an annual estimate of the amounts (Appendix C).

### C. Illicit Discharge Detection and Elimination Activities

Pima County DEQ receives complaints from the general public, elected officials, regulators, and local governments identifying potential sources of pollutants that could endanger public health or the environment. Each complaint within Pima County's jurisdiction is inspected to determine if a pollutant has entered the environment and if so, the severity of the problem. The complaint is tracked until it is closed (Appendix D) or is escalated to the enforcement action of a Notice of Violation (NOV). NOVs are closed when the pollutant has been abated (Appendix E).

The number of complaints filed within Pima County's jurisdiction during this fiscal year was 1,097. Each complaint was inspected and the average time between filing the complaint and the inspection was 5.8 days. The number of inspections performed within three days was 625 or 57% of all Pima County responses, missing the goal of initiating investigation of 80% of potential illicit discharges within three business days. During fiscal year 2016-17 Pima County hired and trained new staff resulting in delays in initiating inspections for wildcat dumping and improper disposal of solid wastes. Additional staff were hired in July 2017 and the turnaround time has improved significantly.

These inspections led to 265 NOVs. During the fiscal year 230 cases were closed or rescinded, 30 remained open. The open cases are either in the process of closing or have entered an escalated enforcement process such as assessment of penalties, referral to Pima County Attorney's Office, an order to show cause with the court, or contempt of court. The enforcement phase has a closure rate of 86% and average closure time is 69 days. Illicit discharges of solid wastes, such as wildcat dumping and improper disposal of solid wastes, comprise 78% of complaints received by Pima County DEQ and 90% of issued NOVs.

Illicit discharges of liquids to the MS4 are relatively rare due to the high visibility of the ephemeral stream system and the high likelihood that a liquid illicit discharge will be seen and tracked to the source. The most common illicit discharges are dumping solid waste in a remote location. These types of events are reported by the public as an environmental complaint. Pima County takes the extra step of inspecting 100% of the 40 identified outfalls within the permit area to assess if liquid illicit discharges are taking place (Appendix F-1). This is over and above the permit requirement of inspecting 20% each year. While 23 are rated major outfalls based on size, none have a high priority due to the lack of illicit liquid discharges. In addition, both the Pima County Department of Transportation (PDOT) and Regional Wastewater Reclamation Department (RWRD) document when the public spills hazardous materials within the right-of-way or county, respectively (Table 2).

### D. County Facilities

Management of County Facilities includes preparing an inventory of county facilities, GIS mapping of the MS4 features, maintaining roadway and drainageway infrastructure, drainageways, acquiring land to conserve open spaces, inspecting facilities for implementation of Pollution

Prevention Plans and training staff directly involved in stormwater activities. All activities are preventive measures to keep stormwater clean.

**Table 2. Spills within Permit Area**

| **Date** | **Depart-ment** | **Location** | **Town-ship-Range-Section** | **Description** | **Response** |
|---|---|---|---|---|---|
| 09/26/16 | PDOT | 1313 S Mission Rd, Bldg 14, Paint Deck | 14-13-23NW | About 150 gal of yellow pain spilled *within secondary containment* when a shut-off valve popped off while loading a paint striper | Paint was shoveled into 55 gal drums, absorbent noodles limited the extent of spill, and the remaining thin layer of paint was scraped off. |
| 11/06/16 | RWRD | 5975 W Arizona Pavilions Dr | 12-12-26 SW | Combo truck was preparing to clean out manhole when hydraulic hose from under hose reel broke. Leaked onto asphalt. | Oil Absorbent was applied onto spill, swept into piles and put into trash bags. |
| 12/27/16 | RWRD | 442 W Esperanza Blvd | 18-13-10 SE | Coolant leaked from truck onto street. Flowed 5’ and then pooled. | Absorbent was applied onto spill area, swept and placed into trash bags. |
| 04/04/17 | RWRD | 3753 E Flower St | 13-14-33 SE | Coolant hose broke and released coolant onto asphalt street. | Crew used dirt to soak up coolant; swept and bagged dirt. Spill area washed down on following day. |

PDOT = Pima County Department of Transportation
RWRD = Pima County Regional Wastewater Reclamation Department

<u>County Facility Inventory and Spill Prevention</u>

Pima County owns or operates 34 facilities with the potential to discharge pollutants to receiving waters (Appendix G). Twenty-three facilities are permitted with Arizona Department of Environmental Quality water permits such as Aquifer Protection Permits (APP) and Arizona Pollutant Discharge Elimination System (AZPDES). Nine unpermitted county facilities have a site specific Pollution Prevention Plan and have been inspected to verify the plans are being implemented. One project is pending as the land will be donated to Pima County through the current owner's will. The project will remain on the inventory until the area has been inspected to determine if there is a potential for a discharge of pollutants.

Proper use and storage of chemicals is regulated within Pima County through enforcement of local requirements (environmental nuisance, solid waste, and liquid waste requirements) established in Title 7 of the Pima County Code (Pima County, 2011b). Contractors hired to maintain Pima County landscaped areas and public rights-of-way are required to follow spraying protocols established by State of Arizona rules and manufacturer's recommendations.

<u>GIS Mapping</u>
The layers of Pima County's Geographic Information System (GIS) facilitate the management of stormwater (Appendix H).

<u>Infrastructure Maintenance</u>
*Roadways*
Pima County Department of Transportation (PDOT) maintains 2,087 miles of roads and the drainageways in the road right-of-ways. The types of roadway maintenance include sweeping, shoulder repairs, pothole repairs, grading and blading, sidewalk and curb repair, street surface repairs and litter and debris removal (Appendix I).

*Drainageways*
Pima County RFCD maintains 450 miles of drainage, excluding the major water courses of the Santa Cruz River, Rillito River, Pantano Wash and Cañada Del Oro Wash. RFCD prioritizes 150 miles for inspection, and inspects the identified outfalls (Appendix F) and drainage reaches. They then follow up with grading; spot litter, debris, weed control; sediment removal; mowing; and spraying vegetation where needed (Appendix J).

<u>Land Conservation</u>
Land has been purchased under the 1997 Open Space Bond Program (OSBP), the 2004 Conservation Acquisition Bond Program (CABP) and the Flood Prone Land Acquisition Program (FLAP) to conserve land (Appendix K). The 1997 OSBP and 2004 CABP protect the region's most prized natural and cultural resources (Pima County, 2011d). The FLAP preserves land in floodways (Appendix N).

<u>Training staff directly working on stormwater control measures</u>
Pima County DOT conducts weekly training for staff in the field that addresses technical as well as safety and stormwater topics. Fiscal year 16/17 is between the two-year requirement for stormwater training so training this year was smaller than last year.

### E. Industrial and Commercial Facilities

The Industrial Facilities Inventory is based on ADEQ's list of facilities that filed for the 2010 Multi-Sector General Permit (2010 MSGP) and facilities which need to file a Notice of Intent for the 2010 MSGP. Facilities located within the permit area and which have the potential to discharge to a Pima County roadway or drainageway were added to the inventory (Appendix L-1). Stormwater inspections are designed to evaluate consistency with the ADEQ's 2010 MSGP and compliance with Pima County ordinances. The Site Inspection Report form was modified to incorporate the 2010 MSGP and Pima County 2011 MS4 permit. Of the 52 industrial facilities, ten were inspected during this fiscal year (Appendix L-2). All industrial facilities permitted during the last five years were inspected.

## F. Construction Sites

Activities reducing pollutants to stream channels include plan reviews, issuance of air quality permits and Floodplain Use Permits, construction site inspections, and staff training.

Plan Reviews

Pima County Development Services Department (DSD) reviews plans before issuing construction permits or building permits. These plans must conform to requirements for Pima County Buffer Overlay Zone (BOZO), grading standards (GS), setback requirements for BOZO and GS, hydro seeding and revegetation, Hillside Development Overlay Zone and surface stabilization (Appendix M). Pima County DSD staff inspects the sites to verify the construction is proceeding according to approved plans.

Pima County Permits

*Septic Systems*

All new septic systems within Pima County undergo pre-construction design approval, percolation testing, and post-construction installation approval. Septic system failure or exfiltration of water from these systems into the Pima County MS4 rarely occurs. Potential surface discharges from a septic system are regulated under Pima County Code 7 §7.21.025.A.

*Floodplain Use Permit (FPUP)*

Pima County RFCD issues FPUPs for specific improvements within the regulatory floodplain or erosion hazard area (Appendix N). The permits are required prior to beginning construction in areas were flows exceed 100 cubic feet per second or where sheet flooding occurs.

*Pima County Air Quality Activity Permits*

Pima County requires air quality activity permits, called fugitive dust activity permits, for trenching operations, road construction, and land stripping or earthmoving activities that disturb one acre or more. Each permit requires the construction site operator to take reasonable precautions to control fugitive dust emissions from the site. Proper dust suppression techniques prevent the deposition of windblown dust that may later become entrained in stormwater and reduces tracking from construction sites.

<u>Construction Site Inventory and Inspections</u>
Pima County DEQ prepares a construction site inventory based on ADEQ's list of operators filing for the 2013 Construction General Permit (CGP) as well as identification of sites that need to file an NOI for the 2013 CGP. A total of 115 Notices of Intent (NOI) were inspected during the fiscal year out of a total of 167 active NOIs (Appendix O-1). A large number of construction sites closed during the last fiscal year and 47 sites were inspected under the Post Construction program

The average number of days for a construction site to return to compliance was 7 days, if it was out of compliance in a quarter. Two sites took longer than one month and were in compliance within the next month.

### G. Post Construction

After construction has been completed, an inspection is performed to track the effectiveness of the new construction and if the site has been properly cleaned of temporary sediment and erosion control measures. The post-construction site inventory (Appendix P-1) identifies which sites have been inspected and copies of the site inspection reports show how well the projects are functioning (Appendix P-2). Post-construction inspections are typically conducted within one year after the completion of the project; however, some inspections were delayed during the first quarter. Some post-construction inspections were not completed yet because there was active construction under a different NOI at the same site where the notice of termination (NOT) had been filed. The completion of the project is determined by the date the NOT is submitted to the Arizona Department of Environmental Quality (ADEQ). Post-construction inspections ensure that post-construction stormwater controls are adequate, complete and maintainable. Post-construction inspections also encompass the verification of compliance with specific Pima County ordinances. These ordinances confirm that retention/detention basins do not cause an environmental nuisance, proper disposal of used oil and the removal of construction debris and temporary stormwater controls.

### H. Non-filer Reporting

Pima County requests entities provide a copy of the NOI Certificate for activities appearing to qualify for a Construction General Permit or a Multi-Sector General Permit. If an NOI has not been obtained, the name, address and contact information are submitted to ADEQ's Southern Regional Office or Phoenix main office. Sometimes in the process of making a request a construction site manager will obtain an NOI thereby shifting from being a non-filer to a filer. Between July 1, 2016 and June 30, 2017, Pima County did not encounter non-filers.

## 4. Numeric Summary of Stormwater Management Program Activities

### Table 3. Numeric Summary of Stormwater Management Program Activities

| **Control Measures** (number, unless specified otherwise) | 11/12 | 12/13 | 13/14 | 14/15 | 15/16 | 16/17 |
|---|---|---|---|---|---|---|
| **Illicit Discharge Detection and Elimination Program (See Appendix D, E & F for details)** | | | | | | |
| *1. County Employee Training* | | | | | | |
| Training sessions (non-stormwater discharges, IDDE program) | 1 | 1 | 1 | 9 | 2 | 0 |
| Employees attending training | 15 | 14 | 15 | 14 | 7 | 0 |
| *2. Spill Prevention (Appendix D & E)* | | | | | | |
| County facilities identified with hazardous materials | 9 | 9 | 9 | 11 | 34 | 34 |
| Spills in outside areas @ county facilities w/ hazardous materials | 0 | 0 | 7 | 0 | 3 | 4 |
| Facility assessments completed | NA | 10/28/13 | 4 | 17 | 17 | 17 |
| Date of last review of Site Specific Pollution Prevention Plan (materials handling and spill response procedures) | 11/12/11 | 11/12/11 | 12/01/13 | 06/30/15 | 05/23/16 | 05/23/16 |
| *3. Outfall Inspections (Appendix F)* | | | | | | |
| Outfalls inspected[2] | 9 | 39 | 39 | 40 | 40 | 40 |
| Priority Outfalls identified to date | 20 | 39 | 39 | 40 | 40 | 40 |
| Priority Outfalls inspected | 9 | 39 | 39 | 40 | 40 | 40 |
| Dry weather flows detected | 0 | 0 | 0 | 0 | 1 | 0 |
| Dry weather flows investigated | NA | NA | NA | NA | 1 | NA |
| Major outfalls sampled during dry weather flows | 0 | 0 | 0 | 0 | 0 | 0 |
| Illicit discharges identified | 0 | 0 | 0 | 0 | 0 | 0 |
| Illicit discharges eliminated | NA | NA | NA | NA | NA | NA |
| Amount of stormwater drainage system inspected | 53% | 100% | 100% | 100% | 100% | 100% |
| Storm drain cross-connection investigations | 0 | 0 | 0 | 0 | 0 | 0 |
| Illicit connections detected | 0 | 0 | 0 | 0 | 0 | 0 |
| Illicit connections eliminated | NA | NA | NA | NA | NA | NA |
| Corrective/enforcement actions* initiated w/ 60 days of identification | 511 | 523 | 459 | 395 | 355 | 265 |
| Cases* resolved w/ 1 year of original enforcement action (%) | 477 | 502 | 423 | 374 | 314 | 230 |
| Illicit discharge reports received from public | 1,220 | 1,366 | 1,185 | 1,330 | 1,162 | 1,097 |
| Illicit discharge reports responded to (%) | 100% | 98% | 100% | 100% | 100% | 100% |
| Responses initiated within three (3) business days of receipt | 1,075 | 1,101 | 1,276 | 1,260 | 867 | 625 |
| **County Facilities (See Appendix G, I & J for details)** | | | | | | |
| *1. Employee Training* | | | | | | |
| Training events (Part 3 for dates & topics) | 1 | 1 | 1 | 1 | 2 | 2 |
| Staff trained | 15 | 14 | 15 | 8 | 7 | 6 |
| *2. Inventory, Map, or Database of County Owned/Operated Facilities* | | | | | | |
| Facilities on inventory | 46 | 39 | 39 | 43 | 43 | 34 |
| Date identification of Higher Risk facilities completed | NA | 10/18/13 | - | - | - | - |
| Date prioritization of county facilities completed | NA | NA | 09/30/13 | - | - | - |

| **Control Measures** (number, unless specified otherwise) | **11/12** | **12/13** | **13/14** | **14/15** | **15/16** | **16/17** |
|---|---|---|---|---|---|---|
| *3. Inspections* | | | | | | |
| Miles of MS4 drainage system prioritized for inspection | 150 | 150 | 150 | 150 | 150 | 150 |
| Miles of MS4 drainage system visually inspected | 238 | 238 | 238 | 238 | 238 | 238 |
| Higher Risk county facilities** inspected [no high risk] | NA | 0 | 0 | 0 | 0 | 0 |
| Higher Risk county facilities** needing improved stormwater controls | NA | NA | NA | NA | NA | NA |
| *4. Infrastructure Maintenance* | | | | | | |
| Linear miles of MS4 drainage system cleaned each year | 175 | 175 | 175 | 175 | 175 | 175 |
| Street and intersection sweeping (miles) | 4,208 | 2,180 | 2,720 | 2,740 | 5,317 | 2,854 |
| Catch basins identified to date [begins FY12/13] | NA | 0 | 953 | 996 | 1092 | 1,121 |
| Number of retention/detention basins cleaned | 50 | 52 | 53 | 55 | 54 | 56 |
| Catch basins cleaned | 0 | 0 | 0 | 0 | 0 | 0 |
| Amount of waste collected from catch basin cleaning (tons) | 0 | 0 | 0 | 0 | 0 | 0 |
| **Industrial & Commercial Sites Not Owned by the County (See Appendix L for details)** | | | | | | |
| Training events for county staff | 1 | 1 | 1 | 12 | 1 | 1 |
| County staff trained | 15 | 14 | 15 | 183 | 4 | 1 |
| Facilities on priority list | 49 | 51 | 52 | 51 | 50 | 52 |
| Industrial facilities inspected | 10 | 10 | 10 | 12 | 9 | 10 |
| Corrective/enforcement actions initiated on industrial facilities | 8 | 9 | 9 | 12 | 9 | 8 |
| Cases resolved w/ 1 year of original enforcement action (%) | 1 | 8 | 7 | 0 | 1 | 2 |
| **Construction Program Activities (See Appendix M & O for details)** | | | | | | |
| Training events for county staff (Part 3.A for topics) | 1 | 1 | 1 | 5 | 3 | 1 |
| County staff trained | 80 | 14 | 15 | 34 | 27 | 2 |
| Construction/grading plans submitted for review | 62 | 53 | 72 | 50 | 62 | 92 |
| Construction/grading plans reviewed | 27 | 47 | 70 | 50 | 62 | 92 |
| Construction sites inspected | 75 | 123 | 75 | 39 | 129 | 115 |
| Corrective/enforcement actions initiated on Construction Sites | 16 | 25 | 21 | 29 | 89 | 85 |
| Corrective/enforcement actions resolved on Construction Sites | 15 | 23 | 15 | 23 | 89 | 85 |
| **Post Construction Program Activities (Appendix P)** | | | | | | |
| Post-construction inspections completed for Post Construction | 32 | 52 | 35 | 56 | 89 | 84 |
| Corrective/enforcement actions initiated for Post Construction | 0 | 2 | 1 | 4 | 16 | 7 |

* Enforcement actions and cases resolved are all environmental complaints where the property owner was initially unresponsive.

** High risk facilities have been permitted with an MSGP. All reporting, including inspections and improvements are reported pursuant to the facility MSGP.

NA Not applicable

## 5. EVALUATION OF STORMWATER MANAGEMENT PROGRAM

Activities of the Stormwater Management Program (SWMP) include control measures to reduce discharges in stormwater through public awareness and public involvement programs, maintenance of roadways and drainage ways, and investigation of illicit connection and illegal dumping, new development and significant redevelopment programs, industrial facility inspections, construction site inspections, and enforcement actions. Water quality data from five monitor points documents runoff quality. Inspections at construction sites and industrial facilities maintain awareness of the importance of following Stormwater Pollution Prevention Plans. Regular inspections and business assistance is needed to maintain surface water quality consistent with state SWQS and AZPDES permits.

**Update of Recommendations**

Recommendations from previous annual reports have been continued. Completed recommendations are no longer reported on and additional analyses were implemented this year to improve the program. A summary is described below.

1. **Assess Effectiveness of Environmental Complaint Enforcement.**
PDEQ frequently issues NOVs for solid waste on private property and wildcat dumping on public land in the Upper Santa Cruz watershed and the Brawley watershed. The average annual number of enforcement cases is declining by about 23 cases each year. The general trend is significant as the annual number of NOVs in 1996 reached nearly 900 and fell in 2017 to nearly 300.

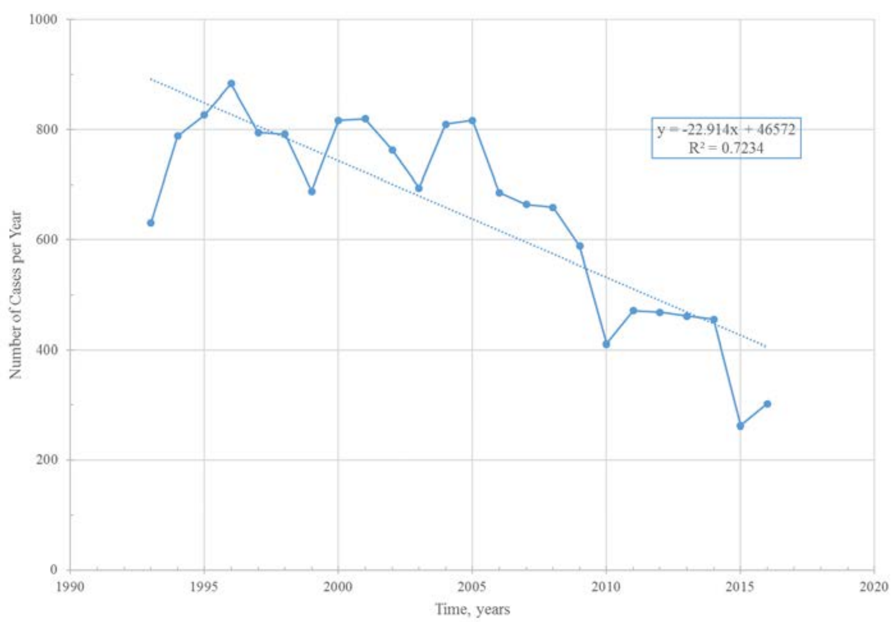


**Figure 2. Number of Enforcement Cases related to Pollutants Exposed to Rain of Runoff**

**2. Evaluate water quality and pollutant loadings by season**

Six years of water quality data have been collected under the new permit. Full sets of analytes are collected in both seasons, when water is available. The monitor points have four to six summer samples, and four to six winter samples. The data do not show a seasonal difference, with the exception that hardness can be lower in summer at Site #2. Seasonal differences have not been evident in the water quality data collected between 2011 and 2017.

**3. Calculate acres of five land uses within new permit area to facilitate evaluation of pollutant loading estimates by land use.**

The areas of the five land uses within the new permit area have been calculated. The MS4 is dominantly Low Density Residential. This trend has not changed in 2017.

**Table 4. Land Use Area within Unincorporated Pima County**

| Land Use | Area (square miles) | Percent |
|---|---|---|
| High Density Residential | 5.7 | 0% |
| Commercial | 5.9 | 0% |
| Industrial | 21.2 | 1% |
| Medium Density Residential | 160.0 | 8% |
| Low Density Residential | 1,766.7 | 90% |

**4. Develop outreach program to address elevated copper and E. coli at selected monitor site watersheds.**

Due to legislation enacted in California and Washington in 2010 mandating the reduction of copper in brakes, the brake manufacturing industry agreed to phase out copper in brakes over fifteen years (Copper Development Industry, 2013). As a nationwide program has been implemented to address this issue, an outreach program for copper will not be implemented, though relevant information will be provided to interested parties.

**5. Improve compliance activities for construction projects.**

Construction managers for non-compliant construction projects averaged about 6 days to return to compliance. Only two facilities took longer than one month to return to compliance.

**6. Improve compliance at post-construction projects.**

Compliance for post-construction inspections increased significantly from 82% last year to 91% this year.

## A. Evaluation of 2017 Stormwater Management Program

The Stormwater Management Program has made significant progress and has a high level of success in restoring and maintaining the chemical, biological and physical integrity of the surface waters flowing in Pima County's permit area. The written summary evaluates public education and outreach, public involvement and participation, IDDE, county facility pollution prevention and good housekeeping practices, residential and commercial control measures, industrial facilities and construction sites.

1. *Program Progress*

Pima County developed a series of documents describing the procedures to be used in various activities impacting stormwater quality and identified in the 2011 MS4 Permit. The current date for the Standard Operation Procedure (SOP) is included.

- STW-001 SOP for Stormwater Inspection at a Construction Site (December, 2014)
- STW-002 SOP for Stormwater Post Construction Inspection (June, 2017)
- STW-003 SOP for Industrial Facility Inspection (December, 2014)
- STW-004 SOP for Illicit Discharge Detection and Elimination Inspection (June, 2017)
- Sampling and Analysis Plan for Stormwater Management Program (September, 2015)
- Pima County Stormwater Management Program (September, 2015)
- Stormwater Control Measure Field Manual (December, 2014)
- Stormwater Training Program (December, 2014)
- Template for Pollution Prevention Plan for Pima County Facilities (June 2016)

2. *Program Successes*

During the permit cycle, the following successes are attributed to Pima County's Stormwater Management Program and Regional Flood Control District.

- Organized Celebrate World Water Day by Keeping Washes Clean that included a day where citizens were invited to clean up a wash, a TV interview, two fact sheets and a website article.
- EPA Factsheet for Improving Community Resiliency with Green Infrastructure credited Pima County for using GI for flood control and drought management.
- Referral of 254 stormwater-related complaints to other jurisdictions functioning to clean up citizen reported environmental contamination.
- Partnered with University of Arizona's Wet Water Education for Teachers to expand outreach to youth audiences.
- Trained 45 children at Littletown Community Center how to properly dispose of trash.
- Water conservation radio program to encourage the public to use stormwater to irrigate native plants to save on water utility bills, and potentially electricity bills if the native trees are planted to shade buildings.
- Pima County published the *Low Impact Development and Green Infrastructure Guidance Manual* in March 2015 describing how stormwater harvesting features, effective in the semi-arid climate of Pima County, can be implemented at the neighborhood scale.
- The Pima County Board of Supervisors amended Title 18 (Zoning) to include Stormwater Harvesting Systems on March 17, 2015.
- The Pima County Comprehensive Plan *Pima Prospers* was adopted on May 19, 2015 and includes LID in land management and water resource management (Appendix R).
- Pima County Regional Flood Control District published the *Design Standards for Stormwater Detention and Retention Basins* in June, 2014 and was approved by Pima County Board of Supervisors on December 15, 2015. The manual represents a fundamental

shift away from conveying runoff to a small number of downstream points through hydraulically efficient infrastructure toward retaining and using the runoff as close as possible to the source of the runoff for beneficial use.

- The Pima County Subdivision and Development Standards (May, 2016) encourages stormwater harvesting within the right-of-way using the Design Standards for Stormwater Detention and Retention as well as the *Low-Impact Development and Green Infrastructure Guidance Manual*.
- The Arizona American Society of Landscape Architecture (AZ ASLA) awarded Pima County and the other co-authors the "Honor Award" for the *Low-Impact Development and Green Infrastructure Guidance Manual* and associated *Case Studies*.

*3. Reduction of pollutants to and from the MS4*

The control measures implemented in the stormwater management program include Public Awareness and Public Participation; Anti-freeze, Batteries, Oil and Paint Program; Public Reporting and Response; Infrastructure Maintenance; Land Conservation and Enforcement actions.

a. Public Awareness and Public Participation

Outreach activities provide environmental literature and 10,420 pieces were collected by members of the public at libraries, public events and private events reaching a wide range of people with information specific to their interest. A phone survey conducted in May 2016 assessed the public's attitudes toward Low Impact Development. The information will be used to refine the outreach message to implement the LID Guidance Manual at the neighborhood scale.

Public participation included volunteers in Pima County's Adopt-a-Roadway program clean up roadways and public lands. The program had 352 clean-up events over a total length of 567 miles. Outreach activities reduce the amount pollutants entering the MS4.

b. Anti-freeze, Batteries, Oil and Paint Program

The Pima County ABOP program collected 28,970 gallons of anti-freeze, oil and paint as well as 340 batteries. This recycling prevents the disposal in a landfill or dumping in the desert.

c. Public Reporting and Responses

Pima County received 1,097 complaints from the public and responded to them within an average of 5.8 days. Inspections effectively addressed most of the complaints and 265 resulted in an enforcement action of Notice of Violation (NOV). The NOV closure rate of 86%, with an average closure period of 69 days, which reduces the amount of pollutants entering stormwater.

d. Infrastructure Maintenance

Roadway maintenance at 15,326 locations removed sediment from streets and repaired roads which stabilized the surface reducing erosion (Appendix I). Drainageway maintenance includes clearing vegetation, mowing, removal of trash, and channel maintenance at 2,465 locations. The infrastructure maintenance reduces the amount of pollutants leaving the permit area.

e. Land Conservation

Pima County has invested over $211 million to conserve 58,301 acres, thereby preserving the natural landscape and reducing erosion that would contribute a pollutant to stormwater.

f. The number of environmental complaints that require enforcement has declined from nearly 900 in 1996 to about 300 in 2017. The consistent effort to teach proper contaminant handling methods or recycling strategies and firm enforcement for those who do not comply has resulted in a cleaner environment.

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## 6. Stormwater Management Program Modifications

ADEQ issued the new 2011 MS4 permit on June 16, 2011. A new Stormwater Management Program was developed to meet the provisions of the 2011 MS4 permit. Below are the identified changes to the stormwater management program.

1. **Addition of New Control Measures**
   No new control measures were added during the last year.

2. **Addition of Temporary Control Measures**
   No temporary control measures were proposed.

3. **Increase of Existing Control Measures**
   Existing control measures were maintained.

4. **Replacement of Existing Control Measures**
   Existing Control Measures were not replaced.

5. **Modifications to SWMP**
   The numeric summary of Stormwater Management Program activities (Table 3) has been modified to match the permit requirements. A few line items in Table 3 are a holdover from reporting requirements from the original MS4 permit issued in 1997 and are no longer required. The following line items have been removed from Table 3:
   - Five line items for Public Awareness and Public participation,
   - Nine line items under Infrastructure Maintenance that are details of roadway maintenance, and
   - Nine line items under Construction Program Activities related to stormwater ordinances.

   The information from these line items are described in Chapter 3 in detail or are itemized in Appendices A, B, I, M and N as these are on-going activities. Note that the “Environmental complaints” and “Environmental complaints inspected within 3 days” are already reported under “Illicit discharge reports from public” and “responses initiated within three (3) business days of receipt”, respectively. The information for Notices of Violation are reported under “Corrective/enforcement actions initiated w/ 1 year of original enforcement action (%)”. These modifications in Table 3 do not change control measures or infrastructure maintenance activities within Pima County’s jurisdiction.

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## 7. Monitoring Locations

Five monitor sites are sampled each summer and winter season for field parameters, microbiology, metals, nutrients, toxic organic pollutants, volatile organic compounds (VOCs), semi-VOCs, PCBs and pesticides, as identified in the permit. Water quality data from each site is intended to characterize the water chemistry of runoff from five land uses, namely low density residential, medium density residential, high density residential, commercial and industrial. Results may also be used to identify and eliminate illicit discharges. The data is evaluated to assess the effectiveness of control measures to reduce the discharge of pollutants.

**Table 5. Monitoring Site Locations**

| Site No. | Receiving Water | Monitoring Site Location Information | | | | |
|---|---|---|---|---|---|---|
| | | Location | Latitude Longitude | Elevation (famsl*) | Drainage Area (acres) | Dominant Land Use |
| 1 | Unnamed wash, tributary to Rillito River | Calle Esplendor/ Calle Barril | 32°17'46.1" -110°54'30.6" | 2642 | 2.8 | Residential Low Density |
| 2 | Unnamed wash, tributary to Rillito River | Ruthrauff Road/La Cholla Blvd. | 32°17'32.6" -111°00'42.6" | 2275 | 56.8 | Residential Medium Density |
| 3 | Valley View Wash | Valley View Rd/ Sunrise Drive | 32°18'22.9" -110°54'38.8" | 2709 | 7.3 | Residential High Density |
| 4 | Valley View Wash | Valley View Rd/ Sunrise Drive | 32°18'23.0" -110°54'38.8" | 2710 | 41.6 | Commercial |
| 5 | Unnamed wash, tributary to Tucson Diversion Channel | 4101 S. Country Club Rd | 32°10'27.5" -110°55'34.1" | 2542 | 52.2 | Industrial |

* famsl – feet above mean sea level

All sites have an adjacent weather station with a tipping bucket rain gage and remote data collection equipment using Pima County's Automated Local Evaluation in Real Time (ALERT) system. Flow is measured using a depth gage and channel characteristics or the bucket method. When sampling the stormwater, a pH meter with a temperature sensor is used to collect pH. For deep sampling locations, a dipping pole is used to collect the water samples.

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## 8. Storm Event Records

Summer storms in Pima County typically have a short duration and high intensity. Winter storms are generally longer in duration and less intense. The extended event duration in the winter may result in a delay from the time rainfall begins and runoff begins that is greater than one hour. Although permit and guidance documentation indicates the first sample is to be collected within an hour of the start of rainfall, storm runoff may not begin until several minutes or hours after the initial rainfall. In this case, first flush is collected when runoff begins.

During the reporting period there were 52 rainfall events, of which 18 qualified for stormwater sampling (Table 6). The annual rainfall at the monitor sites ranged from 11.26 to 12.67 inches. One of the monitor sites received less rainfall than the annual normal rainfall of 11.59 inches. (National Weather Service Forecast Office, Tucson, AZ, 2011).

Seven of the ten wet weather samples were collected during the fiscal year. While there were two qualifying rainfall events for sites No 1, 3 and 4 during the winter, samples were not collected due to technical difficulty receiving an alert to the rain event in one case and inadequate staff in the other case.

**Table 6. Storm Event Records for Monitoring Sites**

| Season | Date | Site #1 | Rainfall (in) | Site #2 | Rainfall (in) | Site #3 | Rainfall (in) | Site #4 | Rainfall (in) | Site #5 | Rainfall (in) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S | 06/11/16 | NR | 0.04 | | | NR | 0.04 | NR | 0.04 | | |
| S | 06/25/16 | TD | 0.24 | | | TD | 0.24 | TD | 0.24 | NR | 0.04 |
| S | 06/26/16 | NR | 0.12 | TD | 0.32 | NR | 0.12 | NR | 0.12 | TD | 0.24 |
| S | 06/28/16 | NR | 0.04 | NR | 0.16 | NR | 0.04 | NR | 0.04 | | |
| S | 06/29/16 | AOS | 0.32 | AOS | 1.04 | **SC** | **0.32** | AOS | 0.32 | AOS | 1.20 |
| S | 06/30/16 | NR | 0.44 | NR | 0.56 | NR | 0.44 | NR | 0.44 | NR | 0.20 |
| S | 07/01/16 | NR | 0.04 | NR | 0.16 | NR | 0.04 | NR | 0.04 | NR | 0.52 |
| S | 07/20/16 | | | | | | | | | NR | 0.04 |
| S | 07/26/16 | NR | 0.08 | | | NR | 0.08 | NR | 0.08 | NR | 0.16 |
| S | 07/27/16 | TD | 0.24 | NR | 0.08 | - | 0.24 | TD | 0.24 | NR | 0.12 |
| S | 07/28/16 | NR | 0.35 | **SC** | **0.82** | NR | 0.35 | NR | 0.35 | AOS | 0.39 |
| S | 07/29/16 | NR | 0.24 | NR | 0.71 | NR | 0.24 | NR | 0.24 | NR | 0.31 |
| S | 07/30/16 | NR | 0.08 | | | NR | 0.08 | NR | 0.08 | NR | 0.08 |
| S | 07/31/16 | NR | 0.51 | NR | 1.10 | NR | 0.51 | NR | 0.51 | NR | 0.83 |
| S | 08/01/16 | NR | 0.08 | NR | 0.20 | NR | 0.08 | NR | 0.08 | NR | 0.08 |
| S | 08/02/16 | NR | 0.27 | NR | 0.32 | NR | 0.27 | NR | 0.27 | NR | 0.23 |
| S | 08/06/16 | TD | 1.50 | | | TD | 1.50 | TD | 1.50 | | |
| S | 08/09/16 | NR | 1.46 | - | 1.33 | NR | 1.46 | NR | 1.46 | **SC** | **2.09** |
| S | 08/11/16 | NR | 0.23 | | | NR | 0.23 | NR | 0.23 | | |
| S | 08/13/16 | NR | 0.04 | NR | 0.04 | NR | 0.04 | NR | 0.04 | NR | 0.08 |

| Season | Date | Site #1 | Rainfall (in) | Site #2 | Rainfall (in) | Site #3 | Rainfall (in) | Site #4 | Rainfall (in) | Site #5 | Rainfall (in) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S | 08/16/16 | TD | 0.20 | - | 0.24 | TD | 0.20 | TD | 0.20 | NR | 0.08 |
| | | | | | | | | | | | |
| S | 08/21/16 | | | NR | 0.08 | | | | | | |
| S | 08/26/16 | NR | 0.07 | | | NR | 0.07 | NR | 0.07 | | |
| S | 09/07/16 | **SC** | **0.83** | - | 1.38 | - | 0.83 | **SC** | **0.83** | - | 1.02 |
| S | 09/08/16 | | | | | | | | | NR | 0.04 |
| S | 09/12/16 | - | 0.28 | - | 0.27 | - | 0.28 | - | 0.28 | - | 0.20 |
| S | 09/27/16 | NR | 0.08 | NR | 0.12 | NR | 0.08 | NR | 0.08 | NR | 0.04 |
| S | 09/28/16 | NR | 0.07 | - | 0.55 | NR | 0.07 | NR | 0.07 | NR | 0.12 |
| S | 09/29/16 | NR | 0.12 | | | NR | 0.12 | NR | 0.12 | NR | 0.12 |
| S | 09/30/16 | NR | 0.12 | | | NR | 0.12 | NR | 0.12 | | |
| S | 10/02/16 | | | | | | | | | NR | 0.11 |
| W | 11/03/16 | NR | 0.16 | IF | 0.20 | NR | 0.16 | NR | 0.16 | NR | 0.12 |
| W | 11/21/16 | | | NR | 0.04 | | | | | | |
| W | 11/27/16 | NR | 0.08 | NR | 0.08 | NR | 0.08 | NR | 0.08 | NR | 0.08 |
| W | 11/28/16 | NR | 0.04 | | | NR | 0.04 | NR | 0.04 | | |
| W | 12/17/16 | AOS | 0.31 | **SC** | **0.27** | AOS | 0.31 | AOS | 0.31 | NR | 0.16 |
| W | 12/22/16 | AOS | 0.24 | - | 0.47 | AOS | 0.24 | AOS | 0.24 | **SC** | **0.31** |
| W | 12/24/16 | NR | 0.31 | NR | 0.16 | NR | 0.31 | NR | 0.31 | NR | 0.32 |
| W | 12/30/16 | NR | 0.08 | NR | 0.04 | NR | 0.08 | NR | 0.08 | NR | 0.12 |
| W | 12/31/16 | IF | 0.24 | NR | 0.08 | IF | 0.24 | IF | 0.24 | - | 0.23 |
| W | 01/01/17 | NR | 0.19 | NR | 0.08 | NR | 0.19 | NR | 0.19 | - | 0.24 |
| W | 01/14/17 | TD | 0.32 | NR | 0.12 | TD | 0.32 | TD | 0.32 | NR | 0.19 |
| W | 01/16/17 | NR | 0.63 | - | 0.35 | NR | 0.63 | NR | 0.63 | NR | 0.48 |
| W | 01/20/17 | IF | 0.27 | IF | 0.20 | IF | 0.27 | IF | 0.27 | | |
| W | 01/21/17 | NR | 0.40 | NR | 0.43 | NR | 0.40 | NR | 0.40 | - | 0.31 |
| W | 01/24/17 | NR | 0.19 | NR | 0.04 | NR | 0.19 | NR | 0.19 | - | 0.20 |
| W | 02/18/17 | IS | 0.40 | NR | 0.12 | IS | 0.40 | IS | 0.40 | NR | 0.04 |
| W | 02/20/17 | | | NR | 0.12 | | | | | NR | 0.04 |
| W | 02/21/17 | NR | 0.12 | | | NR | 0.12 | NR | 0.12 | | |
| W | 02/28/17 | | | | | | | | | NR | 0.04 |
| W | 03/28/17 | NR | 0.04 | | | NR | 0.04 | NR | 0.04 | NR | 0.04 |
| S | 05/09/17 | NR | 0.11 | - | 0.31 | NR | 0.11 | NR | 0.11 | | |
| Winter total | | | 6.52 | | 7.16 | | 6.52 | | 6.52 | | 6.69 |
| Summer Total | | | 5.70 | | 5.51 | | 5.70 | | 5.70 | | 4.57 |
| Annual total | | | 12.22 | | 12.67 | | 12.22 | | 12.22 | | 11.26 |

Seasons: Summer June 1 - October 31 Winter November 1 - May 31

NR - Not Representative (storm event < 0.2 inches or within 72 hours of last rain)
SC - Sample collected
IS - Insufficient Sample for analytical method
IF - Insufficient Flow for sample collection
NF - No flow
DC - Dangerous Conditions
TD - Technical Difficulty (Refer to Part 3H for details)
midN - rainfall during midnight hours
AOS - Staff monitoring/collecting data at other site
- Sample already collected
* - Sample for FY2017

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## 9. Water Quality Data from Monitor Sites

The permit requires a full suite of water quality parameters on the first, third, and fifth years of the permit. In the other years a smaller set of analytes are defined. Due to drought conditions and missing samples from a monitor site, the pattern of collecting full suites every other year was difficult to track. To maintain a good data set, a full suite is now collected for every event (Table 7).

**Table 7. Monitor Site Sample Dates and Type of Sample Set**

| Site | Summer | Type | Winter | Type |
|---|---|---|---|---|
| 1 | 09/19/16 | Full suite | | |
| 2 | 07/08/16 | Full suite | 02/07/17 | Full suite |
| 3 | 06/29/16 | Full suite | | |
| 4 | 09/17/16 | Full suite | | |
| 5 | 08/09/16 | Full suite | 12/22/16 | Full suite |

Analytical Methods in Full Suite:

- SM 9233B — E. Coli
- SM4500-CN-BCE — Total Cyanide
- EPA 1664A — Oil & Grease, Total Petroleum Hydrocarbons
- EPA 624 — Acrolein, Acrylonitrile
- EPA 8260 — Volatile Organic Compounds (VOCs)
- EPA 625-BNA — Semi-volatile Organic Compounds (SVOCs)
- EPA 625-P&PCBS — Pesticides and PCBs
- SM 4500-NH3D — Ammonia
- EPA 351.2 — Total Kjeldahl Nitrogen
- EPA 365.1 — Total Phosphorus, Ortho Phosphate
- EPA 353.2 — Nitrate-Nitrite
- Hach 8000 — Chemical Oxygen Demand
- EPA 200.8 — Total Metals, Dissolved Metals
- EPA 245.1 — Mercury
- SM 2540C — Total Dissolved Solids
- SM 2450D — Total Suspended Solids
- SM 5210B — Biological Oxygen Demand

Analytical Methods in Small Set: Same as above without VOCs, SVOCs, P&PCBs

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**Table 8. Water Quality Data Monitor Site #1**

| PARAMETERS | SWQS[2] | Hardness SWQS | Summer 2012 | Hardness SWQS | Winter 2012-13 | Hardness SWQS | Summer 2013 | Hardness SWQS | Winter 2013-14 | Hardness SWQS | Summer 2014 | Hardness SWQS | Winter 2014-15 | Hardness SWQS | Summer 2015 | Hardness SWQS | Winter 2015-16 | Hardness SWQS | Summer 2016 | Hardness SWQS | Winter 2016-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | | 07/15/12 | | 12/14/12 | | | | 11/22/13 | | 08/12/14 | | 12/17/14 | | 09/21/15 | | | | 09/07/16 | | | |
| Conventional Parameters | | | 0.423076 | | | 1 | | | | | | | | | 0.725274 | | | | 1 | | |
| Average Flow Rate3 (m3/s) | - | | 0.00044 | | 0.0006 | | 0 | | 0.0004 | | 0.00155 | | 0.000269 | | 0.00198 | | | | 0.00075 | | |
| pH | 6.5-9.0 | 7.6 | 7.6 | 8.1 | 8.1 | | | 6.9 | 6.9 | 8 | 8 | 7 | 7 | 8.6 | 8.6 | | | 7 | 7.0 | | |
| Temperature (°Celsius) | - | | 27.5 | | 12.1 | | | | 15.1 | | ND | | 16.1 | | 23.6 | | | | 22.9 | | |
| Hardness4 (mg/L)5 | - | 30.7 | 30.7 | 37.4 | 37.4 | | | 26 | 26 | 54.5 | 54.5 | 88.9 | 88.9 | 58 | 58 | | | 105 | 105 | | |
| Total Dissolved Solids (TDS) (mg/L) | - | | 71.4 | | 34.0 | | | | 72 | | 150 | | 292 | | 94.3 | | | | 326 | | |
| Total Suspended Solids (TSS) (mg/L) | - | | 35.0 | | 50.0 | | | | 62 | | 195 | | 334 | | 331 | | | | 286 | | |
| Biological Oxygen Demand (BOD) (mg/L) | - | | 10.5 | | 5.00 | | | | 4.9 | | 9.8 | | 3.8 | | ND | | | | 3.5 | | |
| Chemical Oxygen Demand (COD) (mg/L) | - | | 62 | | 40.0 | | | | 57 | | 67 | | 88 | | 50 | | | | 84 | | |
| Inorganics | | | | | | | | | | | | | | | | | | | | | |
| Cyanide, total (ug/L)6 | 84 | | ND | | 2.98 | | | | 3.78 | | 2.14 | | ND | | ND | | | | ND | | |
| Nutrients | | | | | | | | | | | | | | | | | | | | | |
| Nitrate + Nitrite as N (mg/L) | | | 0.40 | | 0.20 | | | | 0.17 | | 0.98 | | 0.36 | | 0.1 | | | | 0.14 | | |
| Ammonia as N (mg/L) | | | 0.58 | | 0.53 | | | | 0.53 | | 0.66 | | 0.33 | | 0.19 | | | | 0.21 | | |
| TKN (mg/L) | | | 2.12 | | 1.63 | | | | 1.41 | | 1.98 | | 0.82 | | ND | | | | 1.33 | | |
| Total Nitrogen | | | 2.52 | | 1.83 | | | | 1.58 | | 2.96 | | 1.18 | | 0.10 | | | | 1.68 | | |
| Total Phosphorus (mg/L) | | | 0.25 | | 0.22 | | | | 0.15 | | 0.52 | | 0.44 | | 0.33 | | | | 0.46 | | |
| Total Orthophosphate (mg/L) | | | 0.09 | | 0.07 | | | | ND0.50 | | 0.19 | | 0.08 | | 0.04 | | | | ND | | |
| Microbiological | | | | | | | | | | | | | | | | | | | | | |
| Escherichia coli (E. coli) (CFU/100 mg or | 575 | | 10 | | | | | | 10 | | 487 | | 15500 | | 1300 | | | | 200 | | |
| Total Metals8 | | | | | | | | | | | | | | | | | | | | | |
| AntimonyT (µg/L) | 747 | | 0.25 | | 0.21 | | | | 0.53 | | 0.43 | | 0.55 | | ND | | | | 0.19 | | |
| ArsenicT (µg/L) | 200 | | 1.19 | | 1.87 | | | | 1.46 | | 2.91 | | 4.49 | | 1.23 | | | | 4.35 | | |
| BariumT (µg/L) | 98,000 | | 30 | | 67.2 | | | | 57.6 | | 93.3 | | 189 | | 84.2 | | | | 175 | | |
| BerylliumT (µg/L) | 1,867 | | ND | | 0.26 | | | | 0.23 | | 0.53 | | 1.32 | | 0.52 | | | | 1.41 | | |
| CadmiumD (µg/L) | | 7 | ND | 9 | ND | | | 6 | ND | 13 | ND | 20 | ND | 13 | ND | | | 24 | ND | | |
| ChromiumT (µg/L) | 1,000 | | ND | | 1.18 | | | | ND | | 7.2 | | 15.5 | | 2.02 | | | | 5.29 | | |
| CopperD (µg/L) | | 7.65 | 5.77 | 9.21 | 3.26 | | | 6.54 | 4.20 | 13.13 | 5.30 | 20.82 | 1.91 | 13.92 | 1.45 | | | 24.36 | 2.80 | | |
| LeadD (µg/L) | | 36.91 | 0.24 | 46.03 | 0.12 | | | 30.62 | ND | 69.98 | ND | 119.88 | ND | 74.96 | ND | | | 143.73 | 0.08 | | |
| MercuryT (µg/L) | 10.00 | | ND | | ND | | | | 0.32 | | - | | 0.082 | | ND | | | | ND | | |
| NickelD (µg/L) | | 1531.23 | 1.72 | 1809.55 | 0.72 | | | 1330.42 | 1.01 | 2488.35 | 1.03 | 3764.36 | 0.58 | 2622.89 | 0.21 | | | 4333.58 | 0.52 | | |
| SeleniumT (µg/L) | 33 | | ND | | ND | | | | ND | | 0.79 | | 0.88 | | ND | | | | ND | | |
| SilverD (µg/L) | | 0.42 | ND | 0.59 | 2.66 | | | 0.32 | ND | 1.13 | ND | 2.63 | ND | 1.26 | ND | | | 3.50 | 42.90 | | |
| ThalliumT (µg/L) | 75 | | ND | | ND | | | | ND | | ND | | 0.41 | | ND | | | | 0.14 | | |
| ZincD (µg/L) | | 408.84 | 6.61 | 483.28 | 3.74 | | | 355.15 | 4.68 | 664.90 | 48.30 | 1006.49 | ND | 700.90 | 1.42 | | | 1158.93 | 0.88 | | |
| Organic Toxic Pollutants (mg/L) | | | | | | | | | | | | | | | | | | | | | |
| Total Petroleum Hydrocarbons (TPH) | - | | 2.59 | | 10 | | | | 9.39 | | 7.65 | | 8.35 | | 10.6 | | | | 2.64 | | |
| Total Oil & Grease | - | | 3.78 | | 4.89 | | | | 10.1 | | 11.06 | | 12.59 | | 11.88 | | | | 3.3 | | |
| VOCs9, Semi-VOCs, and Pesticides | | | | | | | | | | | | | | | | | | | | | |
| Acrolein (µg/L) | 467 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |

| PARAMETERS | SWQS[2] | Hardness SWQS | Summer 2012 | Hardness SWQS | Winter 2012-13 | Hardness SWQS | Summer 2013 | Hardness SWQS | Winter 2013-14 | Hardness SWQS | Summer 2014 | Hardness SWQS | Winter 2014-15 | Hardness SWQS | Summer 2015 | Hardness SWQS | Winter 2015-16 | Hardness SWQS | Summer 2016 | Hardness SWQS | Winter 2016-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | | **07/15/12** | | **12/14/12** | | | | **11/22/13** | | **08/12/14** | | **12/17/14** | | **09/21/15** | | | | **09/07/16** | | | |
| Acrylonitrile (µg/L) | 37,333 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Benzene (µg/L) | 3,733 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Bromoform (µg/L) | 18,667 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Carbon tetrachloride (µg/L) | 1,307 | | ND | | | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Chlorobenzene (µg/L) | 18,667 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Chlorodibromomethane (µg/L) | 18,667 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Chloroethane (µg/L) | - | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| 2-chloroethylvinyl ether (µg/L) | - | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Chloroform (µg/L) | 9,333 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Dichlorobromomethane (µg/L) | 18,667 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| 1,2-dichlorobenzene (µg/L) | 5,900 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| 1,3-dichlorobenzene (µg/L) | - | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| 1,4-dichlorobenzene (µg/L) | 6,500 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| 1,1-dichloroethane (µg/L) | - | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| 1,2-dichloroethane (µg/L) | 186,667 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| 1,1-dichloroethylene (µg/L) | 46,667 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| 1,2-dichloropropane (µg/L) | 84,000 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| 1,3-dichloropropylene (µg/L) | 28,000 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Ethylbenzene (µg/L) | 93,333 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Methyl bromide (µg/L) | 1,307 | | ND | | - | | | | ND | | ND | | 0.39 | | 0.32 | | | | ND | | |
| Methyl chloride (µg/L) | - | | ND | | | | | | ND | | ND | | 0.3 | | ND | | | | ND | | |
| Methylene chloride (µg/L) | 56,000 | | - | | - | | | | - | | ND | | ND | | ND | | | | ND | | |
| 1,1,2,2-tetrachloroethane (µg/L) | 93,333 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Tetrachloroethylene (µg/L) | 9,333 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Toluene (µg/L) | 373,333 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| 1,2-trans-dichloroethylene (µg/L) | 18,667 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| 1,1,1-trichloroethane (µg/L) | 1,866,667 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| 1,1,2-trichloroethane (µg/L) | 3,733 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Trichloroethylene (µg/L) | 280 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Trimethylbenzene (µg/L) | - | | - | | - | | | | - | | - | | - | | - | | | | - | | |
| Vinyl chloride (µg/L) | 2,800 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Xylene (µg/L) | 186,667 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| SVOCs - Acid Extractables | | | | | | | | | | | | | | | | | | | | | |
| 2-chlorophenol (µg/L) | 4,667 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| 2,4-dichlorophenol (µg/L) | 2,800 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| 2,4-dimethylphenol (µg/L) | 18,667 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| 4,6-dinitro-o-cresol (µg/L) | 3,733 | | - | | - | | | | - | | ND | | ND | | ND | | | | ND | | |
| 2,4-dinitrophenol (µg/L) | 1,867 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| 2-nitrophenol (µg/L) | - | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| 4-nitrophenol (µg/L) | - | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| p-chloro-m-cresol (µg/L) | 48,000 | | - | | - | | | | - | | ND | | ND | | ND | | | | ND | | |

| PARAMETERS | SWQS[2] | Hardness SWQS | Summer 2012 | Hardness SWQS | Winter 2012-13 | Hardness SWQS | Summer 2013 | Hardness SWQS | Winter 2013-14 | Hardness SWQS | Summer 2014 | Hardness SWQS | Winter 2014-15 | Hardness SWQS | Summer 2015 | Hardness SWQS | Winter 2015-16 | Hardness SWQS | Summer 2016 | Hardness SWQS | Winter 2016-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | | **07/15/12** | | **12/14/12** | | | | **11/22/13** | | **08/12/14** | | **12/17/14** | | **09/21/15** | | | | **09/07/16** | | | |
| Pentachlorophenol (µg/L) | | 67.2 | ND | 111.0 | - | | | 33.2 | ND | 100.4 | ND | 36.8 | ND | 183.5 | ND | | | 36.8 | ND | | |
| Phenol (µg/L) | 180,000 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| 2,4,6-trichlorophenol (µg/L) | 130 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| SVOCs - Bases/Neutrals | | | | | | | | | | | | | | | | | | | | | |
| Acenaphthene (µg/L) | 56,000 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Acenaphthylene (µg/L) | - | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Anthracene (µg/L) | 280,000 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Benzo(a)anthracene (µg/L) | 0.20 | | ND1.44 | | - | | | | ND1.44 | | ND1.44 | | ND1.44 | | ND | | | | ND | | |
| Benzo(a)pyrene (µg/L) | 0.20 | | ND1.55 | | - | | | | ND1.55 | | ND1.55 | | ND1.55 | | ND | | | | ND | | |
| Benzo(b)fluoranthene (µg/L) | - | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Benzo(g,h,i)perylene (µg/L) | - | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Benzo(k)fluoranthene (µg/L) | 1.9 | | ND2.28 | | - | | | | ND2.28 | | ND2.28 | | ND2.28 | | ND | | | | ND | | |
| Chrysene (µg/L) | 19 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Dibenzo(a,h)anthracene (µg/L) | 1.9 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| 3,3-dichlorobenzidine (µg/L) | 3 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Diethyl phthalate (µg/L) | 746,667 | | ND | | - | | | | 6.68 | | ND | | ND | | ND | | | | ND | | |
| Dimethyl phthalate (µg/L) | - | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Di-n-butyl phthalate (µg/L) | 1,100 | | ND | | - | | | | 26.6 | | 9.31 | | ND | | ND | | | | 6.9 | | |
| 2,4-dinitrotoluene (µg/L) | 1,867 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| 2,6-dinitrotoluene (µg/L) | 3,733 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Di-n-octyl phthalate (µg/L) | 373,333 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| 1,2-diphenylhydrazine (as azobenzene) | 1.8 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Fluroranthene (µg/L) | 37,333 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Fluorene (µg/L) | 37,333 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Hexachlorobenzene (µg/L) | 747 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Hexachlorobutadiene (µg/L) | 187 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Hexachlorocyclopentadiene (µg/L) | 11,200 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Hexachloroethane (µg/L) | 850 | | ND2.25 | | - | | | | ND2.25 | | ND | | ND | | ND | | | | ND | | |
| Indeno(1,2,3-cd)pyrene (µg/L) | 1.90 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Isophorone (µg/L) | 186,667 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Naphthalene (µg/L) | 18,667 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Nitrobenzene (µg/L) | 467 | | ND4.23 | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| N-nitrosodimethylamine (µg/L) | 0.03 | | ND | | - | | | | ND4.23 | | ND4.23 | | ND4.23 | | ND | | | | ND | | |
| N-nitrosodi-n-propylamine (µg/L) | 88,667 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| N-nitrosodiphenylamine (µg/L) | 290 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Phenanthrene (µg/L) | - | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Pyrene (µg/L) | 28,000 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| 1,2,4-trichlorobenzene (µg/L) | 9,333 | | ND | | - | | | | ND | | ND | | 0.1 | | ND | | | | ND | | |
| PCB/Pesticides | | | | | | | | | | | | | | | | | | | ND | | |
| Aldrin (µg/L) | 0.00 | | ND0.10 | | - | | | | ND0.10 | | ND0.09 | | ND0.09 | | ND | | | | ND | | |
| Alpha-BHC (µg/L) | 1,600 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |

| **PARAMETERS** | **SWQS[2]** | **Hardness SWQS** | **Summer 2012** | **Hardness SWQS** | **Winter 2012-13** | **Hardness SWQS** | **Summer 2013** | **Hardness SWQS** | **Winter 2013-14** | **Hardness SWQS** | **Summer 2014** | **Hardness SWQS** | **Winter 2014-15** | **Hardness SWQS** | **Summer 2015** | **Hardness SWQS** | **Winter 2015-16** | **Hardness SWQS** | **Summer 2016** | **Hardness SWQS** | **Winter 2016-17** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | | **07/15/12** | | **12/14/12** | | | | **11/22/13** | | **08/12/14** | | **12/17/14** | | **09/21/15** | | | | **09/07/16** | | | |
| Beta-BHC (µg/L) | 560 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Gamma-BHC (µg/L) | 11 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Delta-BHC (µg/L) | 1,600 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Chlordane (µg/L) | 3.2 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| 4,4'-DDT (µg/L) | 1.1 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| 4,4'-DDE (µg/L) | 1.1 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| 4,4'-DDD (µg/L) | 1.1 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Dieldrin (µg/L) | 0.00 | | ND0.07 | | - | | | | ND0.07 | | ND0.05 | | ND0.05 | | ND | | | | ND | | |
| Alpha-endosulfan (µg/L) | 3 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Beta-endosulfan (µg/L) | 3 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Endosulfan sulfate (µg/L) | 3 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Endrin (µg/L) | 0.004 | | ND0.10 | | - | | | | ND0.10 | | ND0.09 | | ND0.09 | | ND | | | | ND | | |
| Endrin aldehyde (µg/L) | 0.7 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Heptachlor (µg/L) | 0.9 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| Heptachlor epoxide (µg/L) | 0.9 | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND | | |
| PCB-1242 (AROCLOR-1242) (µg/L) | 0.001 | | ND0.10 | | - | | | | ND0.10 | | ND0.23 | | ND0.23 | | ND | | | | ND | | |
| PCB-1254 (AROCLOR-1254) (µg/L) | 0.001 | | ND0.07 | | - | | | | ND0.07 | | ND0.07 | | ND0.07 | | ND | | | | ND | | |
| PCB-1221 (AROCLOR-1221) (µg/L) | 0.001 | | ND0.09 | | - | | | | ND0.09 | | ND0.09 | | ND0.09 | | ND | | | | ND | | |
| PCB-1232 (AROCLOR-1232) (µg/L) | 0.001 | | ND0.16 | | - | | | | ND0.16 | | ND0.11 | | ND0.11 | | ND | | | | ND | | |
| PCB-1248 (AROCLOR-1248) (µg/L) | 0.001 | | ND0.16 | | - | | | | ND0.16 | | ND0.19 | | ND0.19 | | ND | | | | ND | | |
| PCB-1260 (AROCLOR-1260) (µg/L) | 0.001 | | ND0.25 | | - | | | | ND0.25 | | ND0.10 | | ND0.10 | | ND | | | | ND | | |
| PCB-1016 (AROCLOR-1016) (µg/L) | 0.001 | | ND0.10 | | - | | | | ND0.10 | | ND0.05 | | ND0.05 | | ND | | | | ND | | |
| Toxaphene (µg/L) | 0.005 | | ND5.08 | | - | | | | ND5.08 | | ND0.71 | | ND0.71 | | ND | | | | ND | | |

Note: Results higher than SWQ are shown in red font. Non-detectable results with the Method Detection Limit (MDL) above the SWQS are shown as ND with the MDL in parentheses.

1 - Partial Body Contact (PBC), Aquatic & Wildlife ephemeral (A&We) or Agricultural Livestock watering (AgL).

2 - Surface Water Quality Standards (A.A.C R18-11-101 through Appendix B) selected from lowest of PBC, A&We or AgL.

3 - Average flow rate during the sampling event. $m^3/s$ = meters cubed per second.

4 - Hardness of sample event is used to calculate SWQS for Cadmium, Chromium, Copper, Lead, Nickel, Sliver, and Zinc.

5 - mg/l = milligram per liter

6 - µg/L = micrograms per liter

7 - CFU/100 ml = colony forming unit per 100 milliliters, MPN = Most probable number per 100 ml

8 - SWQS for Total Metals are denoted with "T". SWQS for Dissolved Metal for A&We are denoted with a "D".

9 - Volatile Organic Compounds

10 - Dash means information unavailable (ie. SWQS was not established or sample was not collected).

11 - Total of α-BHC, β-BHC, γ-BHC, δ-

12 - Refer to Appendix Part 13O for Analytical Laboratory Reports

**Table 9. Water Quality Data Monitor Site #2**

| PARAMETERS | SWQS[2] | Hardness SWQS | Summer 2012 | Hardness SWQS | Winter 2012-13 | Hardness SWQS | Summer 2013 | Hardness SWQS | Winter 2013-14 | Hardness SWQS | Summer 2014 | Hardness SWQS | Winter 2014-15 | Hardness SWQS | Summer 2015 | Hardness SWQS | Winter 2015-16 | Hardness SWQS | Summer 2016 | Hardness SWQS | Winter 2016-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | | - | | 01/26/13 | | 08/22/13 | | 11/22/13 | | 07/05/14 | | 12/13/14 | | 07/05/15 | | 01/04/16 | | 07/28/16 | | 12/17/16 | |
| Conventional Parameters | | | | | | | | | | | | | | | 0.63 | | | | 0.70212 | | 0.29787 |
| Average Flow Rate3 (m3/s) | - | | | | 0.013 | | 0.040 | | 0.016 | | 0.0065 | | 0.029 | | 0.027 | | 0.016 | | 0.033 | | 0.014 |
| pH | 6.5-9.0 | | | 8.73 | 8.73 | | | 6.7 | 6.7 | 6.4 | 6.4 | 6.4 | 6.4 | 8.4 | 8.4 | 8 | 8 | 7.7 | 7.7 | | 6.7 |
| Temperature (°Celcius) | - | | | | 15.1 | | | | 13.9 | | 26.9 | | 14.5 | | 26.6 | | 11.8 | | 26.6 | | 11.6 |
| Hardness4 (mg/L)5 | | | | 48.9 | 48.9 | 147 | 147 | 62.5 | 62.5 | 154 | 154 | 57.7 | 57.7 | 87.2 | 87.2 | 82.2 | 82.2 | 64.3 | 64.3 | | 53.5 |
| Total Dissolved Solids (TDS) (mg/L) | - | | | | 109 | | 126 | | 114 | | 243 | | 127 | | 150 | | 153 | | 150 | | 122 |
| Total Suspended Solids (TSS) (mg/L) | - | | | | 45 | | 426 | | 88 | | 316 | | 42 | | 124 | | 100 | | 77 | | 36.7 |
| Biological Oxygen Demand (BOD) (mg/L) | - | | | | 12.6 | | 12.2 | | 9.3 | | 19 | | 7.6 | | 12.9 | | 14.5 | | 10.1 | | 16.4 |
| Chemical Oxygen Demand (COD) (mg/L) | - | | | | 53.0 | | 124 | | 107 | | 132 | | 84 | | 132 | | 93.0 | | 87.0 | | 112.0 |
| Inorganics | | | | | | | | | | | | | | | | | | | | | |
| Cyanide, total (ug/L)6 | 84T | | | | 1.31 | | 1.31 | | ND1.40 | | 1.73 | | ND | | ND | | 1.42 | | | | ND |
| Nutrients | | | | | | | | | | | | | | | | | | | | | |
| Nitrate + Nitrite as N (mg/L) | | | | | 1.6 | | 2.52 | | 0.96 | | 2.08 | | 3.44 | | 1.64 | | 4.54 | | 1.8 | | 2.23 |
| Ammonia as N (mg/L) | | | | | 0.63 | | 0.98 | | 0.53 | | 1.58 | | 0.39 | | 0.61 | | 0.63 | | 0.94 | | 0.66 |
| TKN (mg/L) | | | | | 1.88 | | 2.83 | | 1.97 | | 4.24 | | 1.56 | | 1.69 | | 1.90 | | 2.52 | | 2.55 |
| Total Nitrogen | | | | | 3.48 | | 5.35 | | 2.93 | | 6.32 | | 5 | | 3.33 | | 6.44 | | 4.32 | | 5.44 |
| Total Phosphorus (mg/L) | | | | | 0.30 | | 0.23 | | 0.49 | | 1.21 | | 0.3 | | 0.67 | | 0.5 | | 0.5 | | 0.38 |
| Total Orthophosphate (mg/L) | | | | | 0.16 | | 0.98 | | 0.22 | | 0.34 | | 0.11 | | 0.27 | | 0.2 | | 0.21 | | 0.22 |
| Microbiological | | | | | | | | | | | | | | | | | | | | | |
| Escherichia coli (E. coli) (CFU/100 mg or | 575 | | | | 4884 | | 19863 | | 4884 | | 24810 | | 14400 | | 14100 | | 12000 | | 582 | | 19900 |
| Total Metals8 | | | | | | | | | | | | | | | | | | | | | |
| AntimonyT (µg/L) | 747 | | | | 0.72 | | 1.08 | | 0.85 | | 0.96 | | 0.81 | | 0.57 | | 0.56 | | 0.46 | | 0.43 |
| ArsenicT (µg/L) | 200 | | | | 1.48 | | 4.1 | | 2.11 | | 4.57 | | 1.74 | | 2.05 | | 1.16 | | 1.81 | | 0.99 |
| BariumT (µg/L) | 98,000 | | | | 38.4 | | 163 | | 83.6 | | 157 | | 58.2 | | 61 | | 53 | | 47.6 | | 28.7 |
| BerylliumT (µg/L) | 1,867 | | | | ND | | 0.64 | | 0.28 | | 0.88 | | ND | | ND | | ND | | ND | | ND |
| CadmiumD (µg/L) | | | | 11 | ND | 33 | ND | 14 | ND | 35 | ND | 13 | ND | 20 | 15.8 | 19 | ND | 15 | ND | | ND |
| ChromiumT (µg/L) | 1,000 | | | | 0.51 | | 1.28 | | 0.67 | | 11.8 | | 3.23 | | 2.21 | | 1.45 | | 2.18 | | 1.11 |
| CopperD (µg/L) | | | | 11.85 | 6.37 | 33.44 | 8.18 | 14.94 | 7.45 | 34.94 | 14.40 | 13.85 | 11.80 | 20.44 | 13.00 | 19.34 | 8.98 | 15.34 | 19.70 | 12.90 | 11.50 |
| LeadD (µg/L) | | | | 62.05 | 0.53 | 206.78 | 0.62 | 81.41 | 0.50 | 217.37 | 1.24 | 74.54 | 0.37 | 117.38 | 0.73 | 110.03 | 0.37 | 84.00 | 0.28 | | 3.77 |
| MercuryT (µg/L) | 10.00 | | | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| NickelD (µg/L) | | | | 2270.26 | 0.87 | 5760.64 | 0.76 | 2794.05 | 0.72 | 5991.88 | 1.64 | 2611.41 | 0.59 | 3703.37 | 0.97 | 3522.91 | 0.82 | 2861.98 | 0.79 | | 1.84 |
| SeleniumT (µg/L) | 33 | | | | ND | | 0.94 | | ND | | 1.36 | | ND | | ND | | ND | | 0.73 | | ND |
| SilverD (µg/L) | | | | 0.94 | ND | 6.24 | ND | 1.43 | ND | 6.76 | 1.14 | 1.25 | ND | 2.54 | ND | 2.30 | ND | 1.51 | 0.36 | 1.10 | 0.54 |
| ThalliumT (µg/L) | 75 | | | | ND | | 0.2 | | ND | | 0.51 | | ND | | ND | | ND | | ND | | ND |
| ZincD (µg/L) | | | | 606.54 | 9.51 | 1541.25 | 7.46 | 746.71 | 10.70 | 1603.21 | 15.50 | 697.83 | 13.27 | 990.16 | 8.91 | 941.84 | 9.09 | 764.89 | 4.19 | | 54.70 |
| Organic Toxic Pollutants | | | | | | | | | | | | | | | | | | | | | |
| Total Petroleum Hydrocarbons (TPH) (mg/L) | - | | | | 1.12 | | 2.09 | | 8.38 | | 6.98 | | 8 | | 6.24 | | 6.56 | | ND | | 2.8 |
| Total Oil & Grease (mg/L) | - | | | | 11.2 | | 3.72 | | 8.08 | | 20.93 | | 13.25 | | 9.06 | | 25.89 | | ND | | 4.8 |
| VOCs9, Semi-VOCs, and Pesticides | | | | | | | | | | | | | | | | | | | | | |
| Acrolein (µg/L) | 467 | | | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Acrylonitrile (µg/L) | 37333 | | | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |

| PARAMETERS | SWQS[2] | Hardness SWQS | Summer 2012 | Hardness SWQS | Winter 2012-13 | Hardness SWQS | Summer 2013 | Hardness SWQS | Winter 2013-14 | Hardness SWQS | Summer 2014 | Hardness SWQS | Winter 2014-15 | Hardness SWQS | Summer 2015 | Hardness SWQS | Winter 2015-16 | Hardness SWQS | Summer 2016 | Hardness SWQS | Winter 2016-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | | - | | 01/26/13 | | 08/22/13 | | 11/22/13 | | 07/05/14 | | 12/13/14 | | 07/05/15 | | 01/04/16 | | 07/28/16 | | 12/17/16 | |
| Benzene (µg/L) | 3733 | | | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Bromoform (µg/L) | 18667 | | | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Carbon tetrachloride (µg/L) | 1307 | | | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Chlorobenzene (µg/L) | 18667 | | | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Chlorodibromomethane (µg/L) | 18667 | | | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Chloroethane (µg/L) | - | | | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| 2-chloroethylvinyl ether (µg/L) | - | | | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Chloroform (µg/L) | 9333 | | | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Dichlorobromomethane (µg/L) | 18667 | | | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| 1,2-dichlorobenzene (µg/L) | 5,900 | | | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| 1,3-dichlorobenzene (µg/L) | - | | | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| 1,4-dichlorobenzene (µg/L) | 6,500 | | | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| 1,1-dichloroethane (µg/L) | - | | | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| 1,2-dichloroethane (µg/L) | 186,667 | | | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| 1,1-dichloroethylene (µg/L) | 46,667 | | | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| 1,2-dichloropropane (µg/L) | 84,000 | | | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| 1,3-dichloropropylene (µg/L) | 28,000 | | | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Ethylbenzene (µg/L) | 93,333 | | | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Methyl bromide (µg/L) | 1,307 | | | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Methyl chloride (µg/L) | - | | | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Methylene chloride (µg/L) | 56,000 | | | | - | | - | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| 1,1,2,2-tetrachloroethane (µg/L) | 93,333 | | | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Tetrachloroethylene (µg/L) | 9,333 | | | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Toluene (µg/L) | 373,333 | | | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| 1,2-trans-dichloroethylene (µg/L) | - | | | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | N D | | ND |
| 1,1,1-trichloroethane (µg/L) | 1,866,667 | | | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| 1,1,2-trichloroethane (µg/L) | 3,733 | | | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Trichloroethylene (µg/L) | 280 | | | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Trimethylbenzene (µg/L) | - | | | | - | | - | | - | | - | | - | | - | | - | | - | | ND |
| Vinyl chloride (µg/L) | 2,800 | | | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Xylene (µg/L) | 186,667 | | | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| SVOCs - Acid Extractables | | | | | | | | | | | | | | | | | | | | | |
| 2-chlorophenol (µg/L) | 4,667 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| 2,4-dichlorophenol (µg/L) | 2,800 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| 2,4-dimethylphenol (µg/L) | 18,667 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| 4,6-dinitro-o-cresol (µg/L) | 3,733 | | | | - | | - | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| 2,4-dinitrophenol (µg/L) | 1,867 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| 2-nitrophenol (µg/L) | - | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| 4-nitrophenol (µg/L) | - | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| p-chloro-m-cresol (µg/L) | 48,000 | | | | - | | - | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| Pentachlorophenol (µg/L) | | | | 209.1 | ND | NA | ND | 27.2 | - | 20.1 | ND | 20.1 | ND | 150.1 | ND | 100.4 | ND | 74.3 | ND | | ND |
| Phenol (µg/L) | 180,000 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |

| PARAMETERS | SWQS[2] | Hardness SWQS | Summer 2012 | Hardness SWQS | Winter 2012-13 | Hardness SWQS | Summer 2013 | Hardness SWQS | Winter 2013-14 | Hardness SWQS | Summer 2014 | Hardness SWQS | Winter 2014-15 | Hardness SWQS | Summer 2015 | Hardness SWQS | Winter 2015-16 | Hardness SWQS | Summer 2016 | Hardness SWQS | Winter 2016-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | | - | | 01/26/13 | | 08/22/13 | | 11/22/13 | | 07/05/14 | | 12/13/14 | | 07/05/15 | | 01/04/16 | | 07/28/16 | | 12/17/16 | |
| 2,4,6-trichlorophenol (µg/L) | 130 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| SVOCs - Bases/Neutrals | | | | | | | | | | | | | | | | | | | | | |
| Acenaphthene (µg/L) | 56,000 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| Acenaphthylene (µg/L) | - | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| Anthracene (µg/L) | 280,000 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| Benzo(a)anthracene (µg/L) | 0.2 | | | | ND1.44 | | ND1.44 | | - | | ND1.44 | | ND1.44 | | ND1.44 | | ND1.25 | | ND1.25 | | ND1.25 |
| Benzo(a)pyrene (µg/L) | 0.2 | | | | ND1.55 | | ND1.55 | | - | | ND1.55 | | ND1.55 | | ND1.55 | | ND1.96 | | ND1.96 | | ND1.96 |
| Benzo(b)fluoranthene (µg/L) | - | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| Benzo(g,h,i)perylene (µg/L) | - | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| Benzo(k)fluoranthene (µg/L) | 1.9 | | | | ND2.28 | | ND2.28 | | - | | ND2.28 | | ND2.28 | | ND2.28 | | ND2.29 | | ND2.29 | | ND2.29 |
| Chrysene (µg/L) | 19 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| Dibenzo(a,h)anthracene (µg/L) | 1.9 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| 3,3-dichlorobenzidine (µg/L) | 3 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| Diethyl phthalate (µg/L) | 746,667 | | | | ND | | ND | | - | | ND | | 13.8 | | ND | | ND | | ND | | ND |
| Dimethyl phthalate (µg/L) | - | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| Di-n-butyl phthalate (µg/L) | 1,100 | | | | ND | | 4.94 | | - | | ND | | 4.02 | | ND | | ND | | ND | | ND |
| 2,4-dinitrotoluene (µg/L) | 1,867 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| 2,6-dinitrotoluene (µg/L) | 3,733 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| Di-n-octyl phthalate (µg/L) | 373,333 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| 1,2-diphenylhydrazine (as azobenzene) | 1.8 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| Fluroranthene (µg/L) | 37,333 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| Fluorene (µg/L) | 37,333 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| Hexachlorobenzene (µg/L) | 747 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| Hexachlorobutadiene (µg/L) | 187 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| Hexachlorocyclopentadiene (µg/L) | 11,200 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| Hexachloroethane (µg/L) | 850 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| Indeno(1,2,3-cd)pyrene (µg/L) | 1.9 | | | | ND | | ND | | - | | ND2.25 | | ND2.25 | | ND2.25 | | ND2.83 | | ND2.83 | | ND2.83 |
| Isophorone (µg/L) | 186,667 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| Naphthalene (µg/L) | 18,667 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| Nitrobenzene (µg/L) | 467 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| N-nitrosodimethylamine (µg/L) | 0.03 | | | | ND | | ND | | - | | ND4.23 | | ND4.23 | | ND4.23 | | ND2.09 | | ND2.09 | | ND2.09 |
| N-nitrosodi-n-propylamine (µg/L) | 88,667 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| N-nitrosodiphenylamine (µg/L) | 290 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| Phenanthrene (µg/L) | - | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| Pyrene (µg/L) | 28,000 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| 1,2,4-trichlorobenzene (µg/L) | 9,333 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| PCB/Pesticides | | | | | | | | | | | | | | | | | | | | | |
| Aldrin (µg/L) | 0.003 | | | | ND0.10 | | ND0.10 | | - | | ND0.09 | | ND0.09 | | ND0.09 | | ND0.09 | | ND0.09 | | ND |
| Alpha-BHC (µg/L) | 1,600 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| Beta-BHC (µg/L) | 560 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| Gamma-BHC (µg/L) | 11 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| Delta-BHC (µg/L) | 1600 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |

| PARAMETERS | SWQS[2] | Hardness SWQS | Summer 2012 | Hardness SWQS | Winter 2012-13 | Hardness SWQS | Summer 2013 | Hardness SWQS | Winter 2013-14 | Hardness SWQS | Summer 2014 | Hardness SWQS | Winter 2014-15 | Hardness SWQS | Summer 2015 | Hardness SWQS | Winter 2015-16 | Hardness SWQS | Summer 2016 | Hardness SWQS | Winter 2016-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | | **-** | | **01/26/13** | | **08/22/13** | | **11/22/13** | | **07/05/14** | | **12/13/14** | | **07/05/15** | | **01/04/16** | | **07/28/16** | | **12/17/16** | |
| Chlordane (µg/L) | 3.2 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| 4,4'-DDT (µg/L) | 1.1 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| 4,4'-DDE (µg/L) | 1.1 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| 4,4'-DDD (µg/L) | 1.1 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| Dieldrin (µg/L) | 0.003 | | | | ND0.07 | | ND0.07 | | - | | ND0.05 | | ND0.05 | | ND0.05 | | ND0.05 | | ND0.05 | | ND0.05 |
| Alpha-endosulfan (µg/L) | 3 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| Beta-endosulfan (µg/L) | 3 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| Endosulfan sulfate (µg/L) | 3 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| Endrin (µg/L) | 0.004 | | | | ND0.10 | | ND0.10 | | - | | ND0.09 | | ND0.09 | | ND0.09 | | ND0.09 | | ND0.09 | | ND0.09 |
| Endrin aldehyde (µg/L) | 0.7 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| Heptachlor (µg/L) | 0.9 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| Heptachlor epoxide (µg/L) | 0.9 | | | | ND | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| PCB-1242 (AROCLOR-1242) (µg/L) | 0.001 | | | | ND0.10 | | ND0.10 | | - | | ND0.10 | | ND0.23 | | ND0.23 | | ND0.23 | | ND0.23 | | ND0.23 |
| PCB-1254 (AROCLOR-1254) (µg/L) | 0.001 | | | | ND0.07 | | ND0.07 | | - | | ND0.07 | | ND0.07 | | ND0.07 | | ND0.07 | | ND0.07 | | ND0.07 |
| PCB-1221 (AROCLOR-1221) (µg/L) | 0.001 | | | | ND0.09 | | ND0.09 | | - | | ND0.09 | | ND0.09 | | ND0.09 | | ND0.09 | | ND0.09 | | ND0.09 |
| PCB-1232 (AROCLOR-1232) (µg/L) | 0.001 | | | | ND0.16 | | ND0.16 | | - | | ND0.11 | | ND0.11 | | ND0.11 | | ND0.11 | | ND0.11 | | ND0.11 |
| PCB-1248 (AROCLOR-1248) (µg/L) | 0.001 | | | | ND0.16 | | ND0.16 | | - | | ND0.19 | | ND0.19 | | ND0.19 | | ND0.19 | | ND0.19 | | ND0.19 |
| PCB-1260 (AROCLOR-1260) (µg/L) | 0.001 | | | | ND0.25 | | ND0.25 | | - | | ND0.10 | | ND0.10 | | ND0.10 | | ND0.10 | | ND0.10 | | ND0.10 |
| PCB-1016 (AROCLOR-1016) (µg/L) | 0.001 | | | | ND0.10 | | ND0.10 | | - | | ND0.05 | | ND0.05 | | ND0.05 | | ND0.05 | | ND0.05 | | ND0.05 |
| Toxaphene (µg/L) | 0.005 | | | | ND5.08 | | ND5.08 | | - | | ND0.71 | | ND0.71 | | ND0.71 | | ND0.71 | | ND0.71 | | ND0.71 |

Note: Results higher than SWQ are shown in red font. Non-detectable results with the Method Detection Limit (MDL) above the SWQS are shown as ND with the MDL in parentheses.

1 - Partial Body Contact (PBC),  Aquatic & Wildlife ephemeral (A&We) or Agricultural Livestock watering (AgL).

2 - Surface Water Quality Standards (A.A.C R18-11-101 through Appendix B) selected from lowest of PBC, A&We or AgL.

3 - Average flow rate during the sampling event. m3/s = meters cubed per second.

4 - Hardness of sample event is used to calculate SWQS for Cadmium, Chromium, Copper, Lead, Nickel, Sliver, and Zinc.

5 - mg/l = milligram per liter

6 - µg/L = micrograms per liter

7 - CFU/100 ml = colony forming unit per 100 milliliters, MPN = Most probable number per 100 ml

8 - SWQS for Total Metals are denoted with "T". SWQS for Dissolved Metal for A&We are denoted with a "D".

9 - Volatile Organic Compounds

10 - Dash means information unavailable (ie. SWQS was not established or sample was not collected).

11 - Total of α-BHC, β-BHC, γ-BHC, δ-BHC.

12 - Refer to Appendix Part 13O for Analytical Laboratory Reports

## Table 10. Water Quality Data Monitor Site #3

| PARAMETERS | Standard SWQS[2] | Hardness SWQS | Winter 2011-12 | Hardness SWQS | Summer 2012 | Hardness SWQS | Winter 2012-13 | Hardness SWQS | Summer 2013 | Hardness SWQS | Winter 2013-14 | Hardness SWQS | Summer 2014 | Hardness SWQS | Winter 2014-15 | Hardness SWQS | Summer 2015 | Hardness SWQS | Winter 2015-16 | Hardness SWQS | Summer 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | | 03/18/12 | | 07/20/12 | | 12/14/12 | | | | 11/22/13 | | 08/26/14 | | 01/30/15 | | 07/05/15 | | | | 6/29/16 | |
| Conventional Parameters | | | | | 0.594 | | | | | | | | | | | | 1.00 | | | | 1 |
| Average Flow Rate3 (m3/s) | - | | 0.2280 | | 0.27 | | 0.185 | | | | 0.200 | | 0.236 | | 0.178 | | 0.182 | | | | 0.181 |
| pH | 6.5-9.0 | 7.4 | 7.4 | 7.2 | 7.2 | 7.5 | 7.5 | | | 7.1 | 7.1 | - | - | 6.2 | 6.2 | 8.5 | 8.5 | | | 6.8 | 6.8 |
| Temperature (°Celcius) | - | | 12.4°C | | 28.7 | | 13.6 | | | | 18.7 | | - | | 16.5 | | 27.4 | | | | 26.5 |
| Hardness4 (mg/L)5 | - | 50 | Trace 50 | 27.4 | 27.4 | 13.4 | 13.4 | | | 23.5 | 23.5 | 35.9 | 35.9 | 27.1 | 27.1 | 28.3 | 28.3 | | | 30.9 | 30.9 |
| Total Dissolved Solids (TDS) (mg/L) | - | | 57 | | 66.0 | | 38 | | | | 44 | | 42.9 | | 24.3 | | 48 | | | | 60 |
| Total Suspended Solids (TSS) (mg/L) | - | | 55 | | 30.0 | | 4.50 | | | | 18 | | 28 | | 5.5 | | 7.6 | | | | 9 |
| Biological Oxygen Demand (BOD) (mg/L) | - | | 10 | | 8.00 | | 3.00 | | | | 5.5 | | 12.4 | | 3.4 | | 9.5 | | | | 10.3 |
| Chemical Oxygen Demand (COD) (mg/L) | - | | 140 | | 72.0 | | 28.0 | | | | 42 | | 107 | | 35 | | 63 | | | | 83 |
| Inorganics | | | | | | | | | | | | | | | | | | | | | |
| Cyanide, total (ug/L)6 | 84T | | ND | | ND | | ND | | | | ND | | ND | | ND | | ND | | | | ND |
| Nutrients | | | | | | | | | | | | | | | | | | | | | |
| Nitrate + Nitrite as N (mg/L) | | | 0.3 | | 0.75 | | 0.2 | | | | 0.22 | | 0.85 | | 0.2 | | 0.33 | | | | 0.38 |
| Ammonia as N (mg/L) | | | 0.5 | | 0.91 | | 0.400 | | | | 0.49 | | 0.57 | | 0.54 | | 0.66 | | | | 0.68 |
| TKN (mg/L) | | | 1.1 | | 1.61 | | 0.68 | | | | 1.03 | | 1.52 | | 0.82 | | 0.75 | | | | 1.31 |
| Total Nitrogen | | | 1.4 | | 2.36 | | 0.88 | | | | 1.25 | | 2.37 | | 1.02 | | 1.08 | | | | 1.69 |
| Total Phosphorus (mg/L) | | | T0.06 | | 0.14 | | ND | | | | 0.16 | | 0.17 | | ND | | 0.18 | | | | 0.18 |
| Total Orthophosphate (mg/L) | | | T0.02 | | 0.03 | | 0.04 | | | | 0.1 | | 0.08 | | ND | | 0.09 | | | | ND |
| Microbiological | | | | | | | | | | | | | | | | | | | | | |
| Escherichia coli (E. coli) (CFU/100 mg or | 575 | | 10 | | 20 | | 63 | | | | 100 | | 10 | | 59 | | 78.6 | | | | 43.6 |
| Total Metals8 | | | | | | | | | | | | | | | | | | | | | |
| AntimonyT (µg/L) | 747 | | ND | | 1.23 | | 0.45 | | | | 0.79 | | 0.83 | | 0.34 | | 0.52 | | | | 0.46 |
| ArsenicT (µg/L) | 200 | | 1.3 | | 1.19 | | 0.69 | | | | 0.42 | | 1.07 | | 0.32 | | 0.57 | | | | 0.65 |
| BariumT (µg/L) | 98,000 | | 38 | | 29.2 | | 9.33 | | | | 14 | | 24.2 | | 8.77 | | 13.2 | | | | 12.9 |
| BerylliumT (µg/L) | 1,867 | | ND | | ND | | ND | | | | ND | | ND | | ND | | ND | | | | ND |
| CadmiumD (µg/L) | | 12 | ND | 6 | ND | 3 | ND | | | 6 | ND | 8 | ND | 6 | ND | 7 | ND | | | 7 | ND |
| ChromiumT (µg/L) | 1,000 | | 2.0 | | ND | | 1.32 | | | | 0.49 | | 1.24 | | 0.32 | | 0.81 | | | | 0.56 |
| CopperD (µg/L) | | 12.11 | 21.00 | 6.87 | 10.90 | 3.50 | 4.66 | | | 5.94 | 8.70 | 8.86 | 13.30 | 6.80 | 3.90 | 7.08 | 8.46 | | | 7.69 | 8.08 |
| LeadD (µg/L) | | 63.60 | 3.10 | 32.48 | 0.12 | 14.46 | ND | | | 27.32 | ND | 43.97 | ND | 32.08 | ND | 33.68 | ND | | | 37.18 | 0.09 |
| MercuryT (µg/L) | 10.00 | | ND | | ND | | ND | | | | 0.287 | | ND | | 0.044 | | ND | | | | ND |
| NickelD (µg/L) | | 2313.39 | 3.10 | 1390.78 | 1.26 | 759.37 | 0.49 | | | 1221.36 | 0.98 | 1747.95 | ND | 1377.88 | 0.31 | 1429.33 | 0.77 | | | 1539.66 | 0.87 |
| SeleniumT (µg/L) | 33 | | ND | | ND | | ND | | | | ND | | ND | | ND | | ND | | | | ND |
| SilverD (µg/L) | | 0.98 | ND | 0.35 | ND | 0.10 | 2.25 | | | 0.27 | ND1 | 0.55 | ND | 0.34 | ND | 0.37 | ND | | | 0.43 | ND |
| ThalliumT (µg/L) | 75 | | ND | | ND | | ND | | | | ND | | ND | | ND | | ND | | | | ND |
| ZincD (µg/L) | | 618.08 | 110.00 | 371.29 | 42.60 | 202.54 | 38.50 | | | 325.99 | 70.00 | 466.81 | 50.80 | 367.84 | 40.70 | 381.60 | 69.30 | | | 411.10 | 63.80 |
| Organic Toxic Pollutants | | | | | | | | | | | | | | | | | | | | | |
| Total Petroleum Hydrocarbons (TPH) (mg/L) | - | | 3.02 | | 18.0 | | ND | | | | 7.37 | | 9.29 | | 10.8 | | 8.12 | | | | 1.90 |
| Total Oil & Grease (mg/L) | - | | 86.63 | | 11.60 | | 3.12 | | | | 9.29 | | 19.88 | | 15.41 | | 14.59 | | | | 2.74 |
| VOCs9, Semi-VOCs, and Pesticides | | | | | | | | | | | | | | | | | | | | | |
| Acrolein (µg/L) | 467 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Acrylonitrile (µg/L) | 37333 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |

| PARAMETERS | Standard SWQS[2] | Hardness SWQS | Winter 2011-12 | Hardness SWQS | Summer 2012 | Hardness SWQS | Winter 2012-13 | Hardness SWQS | Summer 2013 | Hardness SWQS | Winter 2013-14 | Hardness SWQS | Summer 2014 | Hardness SWQS | Winter 2014-15 | Hardness SWQS | Summer 2015 | Hardness SWQS | Winter 2015-16 | Hardness SWQS | Summer 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | | 03/18/12 | | 07/20/12 | | 12/14/12 | | | | 11/22/13 | | 08/26/14 | | 01/30/15 | | 07/05/15 | | | | 6/29/16 | |
| Benzene (µg/L) | 3733 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Bromoform (µg/L) | 18667 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Carbon tetrachloride (µg/L) | 1307 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Chlorobenzene (µg/L) | 18667 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Chlorodibromomethane (µg/L) | 18667 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Chloroethane (µg/L) | - | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| 2-chloroethylvinyl ether (µg/L) | - | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Chloroform (µg/L) | 9333 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Dichlorobromomethane (µg/L) | 18667 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| 1,2-dichlorobenzene (µg/L) | 5,900 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| 1,3-dichlorobenzene (µg/L) | - | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| 1,4-dichlorobenzene (µg/L) | 6,500 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| 1,1-dichloroethane (µg/L) | - | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| 1,2-dichloroethane (µg/L) | 186,667 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| 1,1-dichloroethylene (µg/L) | 46,667 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| 1,2-dichloropropane (µg/L) | 84,000 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| 1,3-dichloropropylene (µg/L) | 28,000 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Ethylbenzene (µg/L) | 93,333 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Methyl bromide (µg/L) | 1,307 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Methyl chloride (µg/L) | - | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Methylene chloride (µg/L) | 56,000 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| 1,1,2,2-tetrachloroethane (µg/L) | 93,333 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Tetrachloroethylene (µg/L) | 9,333 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Toluene (µg/L) | 373,333 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| 1,2-trans-dichloroethylene (µg/L) | - | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| 1,1,1-trichloroethane (µg/L) | 1,866,667 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| 1,1,2-trichloroethane (µg/L) | 3,733 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Trichloroethylene (µg/L) | 280 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Trimethylbenzene (µg/L) | - | | - | | - | | - | | | | - | | - | | - | | - | | | | - |
| Vinyl chloride (µg/L) | 2,800 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Xylene (µg/L) | 186,667 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| SVOCs - Acid Extractables | | | | | | | | | | | | | | | | | | | | | |
| 2-chlorophenol (µg/L) | 4,667 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| 2,4-dichlorophenol (µg/L) | 2,800 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| 2,4-dimethylphenol (µg/L) | 18,667 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| 4,6-dinitro-o-cresol (µg/L) | 3,733 | | - | | - | | - | | | | - | | ND | | ND | | ND | | | | ND |
| 2,4-dinitrophenol (µg/L) | 1,867 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| 2-nitrophenol (µg/L) | - | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| 4-nitrophenol (µg/L) | - | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| p-chloro-m-cresol (µg/L) | 48,000 | | - | | - | | - | | | | - | | ND | | ND | | ND | | | | ND |
| Pentachlorophenol (µg/L) | | 54.9 | ND | 44.9 | ND | | - | | | 40.6 | ND | - | ND | 16.5 | ND | 166.0 | ND | | | | ND |
| Phenol (µg/L) | 180,000 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |

| PARAMETERS | Standard SWQS[2] | Hardness SWQS | Winter 2011-12 | Hardness SWQS | Summer 2012 | Hardness SWQS | Winter 2012-13 | Hardness SWQS | Summer 2013 | Hardness SWQS | Winter 2013-14 | Hardness SWQS | Summer 2014 | Hardness SWQS | Winter 2014-15 | Hardness SWQS | Summer 2015 | Hardness SWQS | Winter 2015-16 | Hardness SWQS | Summer 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | | 03/18/12 | | 07/20/12 | | 12/14/12 | | | | 11/22/13 | | 08/26/14 | | 01/30/15 | | 07/05/15 | | | | 6/29/16 | |
| 2,4,6-trichlorophenol (µg/L) | 130 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| SVOCs - Bases/Neutrals | | | | | | | | | | | | | | | | | | | | | |
| Acenaphthene (µg/L) | 56,000 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Acenaphthylene (µg/L) | - | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Anthracene (µg/L) | 280,000 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Benzo(a)anthracene (µg/L) | 0.2 | | ND1.44 | | ND1.44 | | - | | | | ND1.44 | | ND1.44 | | ND1.44 | | ND | | | | ND |
| Benzo(a)pyrene (µg/L) | 0.2 | | ND1.55 | | ND1.55 | | - | | | | ND1.55 | | ND1.55 | | ND1.55 | | ND | | | | ND |
| Benzo(b)fluoranthene (µg/L) | - | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Benzo(g,h,i)perylene (µg/L) | - | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Benzo(k)fluoranthene (µg/L) | 1.9 | | ND2.28 | | ND2.28 | | - | | | | ND2.28 | | ND2.28 | | ND2.28 | | ND | | | | ND |
| Chrysene (µg/L) | 19 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Dibenzo(a,h)anthracene (µg/L) | 1.9 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| 3,3-dichlorobenzidine (µg/L) | 3 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Diethyl phthalate (µg/L) | 746,667 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Dimethyl phthalate (µg/L) | - | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Di-n-butyl phthalate (µg/L) | 1,100 | | 65.86 | | 10.1 | | - | | | | 21.6 | | ND | | ND | | ND | | | | ND |
| 2,4-dinitrotoluene (µg/L) | 1,867 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| 2,6-dinitrotoluene (µg/L) | 3,733 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Di-n-octyl phthalate (µg/L) | 373,333 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| 1,2-diphenylhydrazine (as azobenzene) | 1.8 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Fluroranthene (µg/L) | 37,333 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Fluorene (µg/L) | 37,333 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Hexachlorobenzene (µg/L) | 747 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Hexachlorobutadiene (µg/L) | 187 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Hexachlorocyclopentadiene (µg/L) | 11,200 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Hexachloroethane (µg/L) | 850 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Indeno(1,2,3-cd)pyrene (µg/L) | 1.9 | | ND2.25 | | ND2.25 | | - | | | | ND2.25 | | ND2.25 | | ND2.25 | | ND | | | | ND |
| Isophorone (µg/L) | 186,667 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Naphthalene (µg/L) | 18,667 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Nitrobenzene (µg/L) | 467 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| N-nitrosodimethylamine (µg/L) | 0.03 | | ND1.06 | | ND4.23 | | - | | | | ND4.23 | | ND4.23 | | ND | | ND | | | | ND |
| N-nitrosodi-n-propylamine (µg/L) | 88,667 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| N-nitrosodiphenylamine (µg/L) | 290 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Phenanthrene (µg/L) | - | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Pyrene (µg/L) | 28,000 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| 1,2,4-trichlorobenzene (µg/L) | 9,333 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| PCB/Pesticides | | | | | | | | | | | | | | | | | | | | | |
| Aldrin (µg/L) | 0.003 | | ND0.1 | | ND0.10 | | - | | | | ND0.10 | | ND0.09 | | ND0.09 | | ND | | | | ND |
| Alpha-BHC (µg/L) | 1,600 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Beta-BHC (µg/L) | 560 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Gamma-BHC (µg/L) | 11 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Delta-BHC (µg/L) | 1600 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |

| PARAMETERS | Standard SWQS[2] | Hardness SWQS | Winter 2011-12 | Hardness SWQS | Summer 2012 | Hardness SWQS | Winter 2012-13 | Hardness SWQS | Summer 2013 | Hardness SWQS | Winter 2013-14 | Hardness SWQS | Summer 2014 | Hardness SWQS | Winter 2014-15 | Hardness SWQS | Summer 2015 | Hardness SWQS | Winter 2015-16 | Hardness SWQS | Summer 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | | **03/18/12** | | **07/20/12** | | **12/14/12** | | | | **11/22/13** | | **08/26/14** | | **01/30/15** | | **07/05/15** | | | | **6/29/16** | |
| Chlordane (µg/L) | 3.2 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| 4,4'-DDT (µg/L) | 1.1 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| 4,4'-DDE (µg/L) | 1.1 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| 4,4'-DDD (µg/L) | 1.1 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Dieldrin (µg/L) | 0.003 | | ND0.07 | | ND0.07 | | - | | | | ND0.07 | | ND0.05 | | ND0.05 | | ND | | | | ND |
| Alpha-endosulfan (µg/L) | 3 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Beta-endosulfan (µg/L) | 3 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Endosulfan sulfate (µg/L) | 3 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Endrin (µg/L) | 0.004 | | ND0.10 | | ND0.10 | | - | | | | ND0.10 | | ND0.09 | | ND0.09 | | ND | | | | ND |
| Endrin aldehyde (µg/L) | 0.7 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Heptachlor (µg/L) | 0.9 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Heptachlor epoxide (µg/L) | 0.9 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| PCB-1242 (AROCLOR-1242) (µg/L) | 0.001 | | ND0.10 | | ND0.10 | | - | | | | ND0.10 | | ND0.23 | | ND0.23 | | ND | | | | ND |
| PCB-1254 (AROCLOR-1254) (µg/L) | 0.001 | | ND0.07 | | ND0.07 | | - | | | | ND0.07 | | ND0.07 | | ND0.07 | | ND | | | | ND |
| PCB-1221 (AROCLOR-1221) (µg/L) | 0.001 | | ND0.09 | | ND0.09 | | - | | | | ND0.09 | | ND0.09 | | ND0.09 | | ND | | | | ND |
| PCB-1232 (AROCLOR-1232) (µg/L) | 0.001 | | ND0.16 | | ND0.16 | | - | | | | ND0.16 | | ND0.11 | | ND0.11 | | ND | | | | ND |
| PCB-1248 (AROCLOR-1248) (µg/L) | 0.001 | | ND0.16 | | ND0.16 | | - | | | | ND0.16 | | ND0.19 | | ND0.19 | | ND | | | | ND |
| PCB-1260 (AROCLOR-1260) (µg/L) | 0.001 | | ND0.25 | | ND0.25 | | - | | | | ND0.25 | | ND0.10 | | ND0.10 | | ND | | | | ND |
| PCB-1016 (AROCLOR-1016) (µg/L) | 0.001 | | ND0.10 | | ND0.10 | | - | | | | ND0.10 | | ND0.05 | | ND0.05 | | ND | | | | ND |
| Toxaphene (µg/L) | 0.005 | | ND5.08 | | ND5.08 | | - | | | | ND5.08 | | ND0.71 | | ND0.71 | | ND | | | | ND |

Note:Results higher than SWQ are shown in red font. Non-detectable results with the Method Detection Limit (MDL) above the SWQS are shown as ND with the MDL in parentheses.

1 - Partial Body Contact (PBC), Aquatic & Wildlife ephemeral (A&We) or Agricultural Livestock watering (AgL).
2 - Surface Water Quality Standards (A.A.C R18-11-101 through Appendix B) selected from lowest of PBC, A&We or AgL.
3 - Average flow rate during the sampling event. m3/s = meters cubed per second.
4 - Hardness of sample event is used to calculate SWQS for Cadmium, Chromium, Copper, Lead, Nickel, Sliver, and Zinc.
5 - mg/l = milligram per liter
6 - µg/L = micrograms per liter
7 - CFU/100 ml = colony forming unit per 100 milliliters, MPN = Most probable number per 100 ml
8 - SWQS for Total Metals are denoted with "T". SWQS for Dissolved Metal for A&We are denoted with a "D".
9 - Volatile Organic Compounds
10 - Dash means information unavailable (ie. SWQS was not established or sample was not collected).
11 - Total of α-BHC, β-BHC, γ-BHC, δ-BHC.
12 - Refer to Appendix Part 13O for Analytical Laboratory Reports

## Table 11. Water Quality Data Monitor Site #4

| PARAMETERS | SWQS2 | Hardness SWQS | Winter 2011-12 | Hardness SWQS | Summer 2012 | Hardness SWQS | Winter 2012-13 | Hardness SWQS | Summer 2013 | Hardness SWQS | Winter 2013-14 | Hardness SWQS | Summer 2014 | Hardness SWQS | Winter 2014-15 | Hardness SWQS | Summer 2015 | Hardness SWQS | Winter 2015-16 | Hardness SWQS | Summer 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | | 03/18/12 | | 07/15/12 | | 12/14/12 | | | | 11/22/13 | | 08/12/14 | | 01/08/15- | | 09/13/15 | | | | 09/07/16 | |
| Conventional Parameters | | | | | 0.470 | | | | | | | | | | | | | 0.35 | | | |
| Average Flow Rate3 (m3/s) | - | | 0.46 | | 0.202 | | 0.228 | | 0 | | 0.39 | | 0.97 | | 0.3365 | | 0.505 | | | | 0.945 |
| pH | 6.5-9.0 | 7.4 | 7.4 | 7.7 | 7.70 | 7.75 | 7.75 | | | 6.7 | 6.7 | 7.5 | 7.5 | 8.5 | 8.5 | 7.9 | 7.9 | | | 7.6 | 7.6 |
| Temperature (°Celcius) | - | | 11.8°C | | 27.1 | | 13.9 | | | | 17 | | 27.4 | | 13.6 | | 28.4 | | | | 24.5 |
| Hardness4 (mg/L)5 | | 50 | Trace 50 | 42.3 | 42.3 | 90.9 | 90.9 | | | 50 | 50 | 35.4 | 35.4 | 38.2 | 38.2 | 38.2 | 38.2 | | | 29.8 | 29.8 |
| Total Dissolved Solids (TDS) (mg/L) | - | | 51 | | 98.6 | | 24.0 | | | | 114 | | 98 | | 81.4 | | 97.1 | | | | 80.0 |
| Total Suspended Solids (TSS) (mg/L) | - | | 37.3 | | 12.5 | | 4.50 | | | | 12 | | 27 | | 33 | | 20 | | | | 25.0 |
| Biological Oxygen Demand (BOD) (mg/L) | - | | 15 | | 7.6 | | 4.00 | | | | 7.3 | | | | 8.9 | | 8.8 | | | | 46.8 |
| Chemical Oxygen Demand (COD) (mg/L) | - | | 100 | | 35.0 | | 25.0 | | | | 50 | | | | 78 | | 81 | | | | 239 |
| Inorganics | | | | | | | | | | | | | | | | | | | | | |
| Cyanide, total (ug/L)6 | 84T | | ND | | ND | | ND | | | | ND | | ND | | ND | | ND | | | | ND |
| Nutrients | | | | | | | | | | | | | | | | | | | | | |
| Nitrate + Nitrite as N (mg/L) | | | 0.3 | | 0.68 | | 0.7 | | | | 0.39 | | 0.62 | | 0.34 | | 1.01 | | | | 0.18 |
| Ammonia as N (mg/L) | | | 0.7 | | 0.59 | | 0.35 | | | | 0.46 | | 0.64 | | 0.67 | | 0.97 | | | | 0.28 |
| TKN (mg/L) | | | 1.4 | | 1.39 | | 0.94 | | | | 1.43 | | 1.34 | | 1.1 | | ND | | | | 1.07 |
| Total Nitrogen (mg/L) | | | 1.7 | | 2.07 | | 1.64 | | | | 1.82 | | 1.96 | | 1.44 | | 1.01 | | | | 1.25 |
| Total Phosphorus (mg/L) | | | T0.06 | | 0.19 | | 0.11 | | | | 0.1 | | 0.19 | | 0.13 | | 0.13 | | | | 0.14 |
| Total Orthophosphate (mg/L) | | | T0.02 | | 0.07 | | 0.07 | | | | 0.09 | | 0.09 | | 0.06 | | 0.04 | | | | ND |
| Microbiological | | | | | | | | | | | | | | | | | | | | | |
| Escherichia coli (E. coli) (CFU/100 mg or | 575 | | 697 | | 1789 | | 1850 | | | | 1178 | | 1850 | | 249 | | 384 | | | | 3100 |
| Total Metals8 | | | | | | | | | | | | | | | | | | | | | |
| AntimonyT (µg/L) | 747 | | ND | | 1.70 | | 0.51 | | | | 1.46 | | 1.33 | | 1.82 | | 1.48 | | | | 0.98 |
| ArsenicT (µg/L) | 200 | | 1.9 | | 1.41 | | 1.68 | | | | 1.13 | | 1.35 | | 120 | | 0.95 | | | | 0.67 |
| BariumT (µg/L) | 98,000 | | 29 | | 112 | | 44.9 | | | | 33.7 | | 32.1 | | 40.3 | | 25.9 | | | | 25.5 |
| BerylliumT (µg/L) | 1,867 | | ND | | ND | | ND | | | | ND | | ND | | ND | | ND | | | | ND |
| CadmiumD (µg/L) | | 12 | ND | 10 | ND | 21 | ND | | | 12 | ND | 8 | ND | 9 | ND | 9 | ND | | | 7 | 0.22 |
| ChromiumT (µg/L) | 1000 | | 1.3 | | 0.65 | | 1.14 | | | | 0.79 | | 1.58 | | 1.9 | | 1.9 | | | | 1 |
| CopperD (µg/L) | | 12.11 | 29.00 | 10.34 | 12.90 | 21.26 | 12.70 | | | 12.11 | 16.00 | 8.74 | 23.10 | 9.39 | 9.51 | 9.39 | 12.60 | | | 7.43 | 6.98 |
| LeadD (µg/L) | | 63.60 | ND | 52.81 | 0.27 | 122.83 | 0.15 | | | 63.60 | 0.47 | 43.29 | ND | 47.13 | 0.41 | 47.13 | 0.32 | | | 35.69 | 6.29 |
| MercuryT (µg/L) | 10 | | ND | | ND | | ND | | | | 0.185 | | - | | ND | | ND | | | | ND |
| NickelD (µg/L) | | 2313.39 | 1.50 | 2008.19 | 0.78 | 3835.88 | 0.78 | | | 2313.39 | 2.20 | 1727.34 | 1.10 | 1842.24 | 1.36 | 1842.24 | 0.92 | | | 1493.16 | 0.54 |
| SeleniumT (µg/L) | 33 | | ND | | ND | | ND | | | | ND | | ND | | ND | | ND | | | | ND |
| SilverD (µg/L) | | 0.98 | ND | 0.73 | 0.24 | 2.73 | 0.96 | | | 0.98 | ND1.0 | 0.54 | ND | 0.61 | ND | 0.61 | ND | | | 0.40 | 0.63 |
| ThalliumT (µg/L) | 75 | | ND | | ND | | ND | | | | ND | | ND | | ND | | ND | | | | ND |
| ZincD (µg/L) | | 618.08 | 290.00 | 536.42 | 217.00 | 1025.64 | 66.50 | | | 618.08 | 67.60 | 461.29 | 73.10 | 492.02 | 58.10 | 492.02 | 62.00 | | | 398.66 | 26.90 |
| Organic Toxic Pollutants | | | | | | | | | | | | | | | | | | | | | |
| Total Petroleum Hydrocarbons (TPH) (mg/L) | - | | 3.02 | | 1.40 | | 5.57 | | | | 6.67 | | 7.53 | | 9.76 | | 7.06 | | | | 3.78 |
| Total Oil & Grease (mg/L) | - | | 5.47 | | 1.40 | | 8.07 | | | | 7.07 | | 13.65 | | 14.88 | | 10.12 | | | | 5.00 |
| VOCs9, Semi-VOCs, and Pesticides | | | | | | | | | | | | | | | | | | | | | |
| Acrolein (µg/L) | 467 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |
| Acrylonitrile (µg/L) | 37333 | | ND | | ND | | - | | | | ND | | ND | | ND | | ND | | | | ND |

| PARAMETERS | SWQS2 | Hardness SWQS | Winter 2011-12 | Hardness SWQS | Summer 2012 | Hardness SWQS | Winter 2012-13 | Hardness SWQS | Summer 2013 | Hardness SWQS | Winter 2013-14 | Hardness SWQS | Summer 2014 | Hardness SWQS | Winter 2014-15 | Hardness SWQS | Summer 2015 | Hardness SWQS | Winter 2015-16 | Hardness SWQS | Summer 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | | **03/18/12** | | **07/15/12** | | **12/14/12** | | | | **11/22/13** | | **08/12/14** | | **01/08/15-** | | **09/13/15** | | | | **09/07/16** | |
| Benzene (µg/L) | 3733 | | Trace | | ND | | - | | | | *ND* | | 0.03 | | ND | | ND | | | | ND |
| Bromoform (µg/L) | 18667 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Carbon tetrachloride (µg/L) | 1307 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Chlorobenzene (µg/L) | 18667 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Chlorodibromomethane (µg/L) | 18667 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Chloroethane (µg/L) | - | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| 2-chloroethylvinyl ether (µg/L) | - | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Chloroform (µg/L) | 9333 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Dichlorobromomethane (µg/L) | 18667 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| 1,2-dichlorobenzene (µg/L) | 5,900 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| 1,3-dichlorobenzene (µg/L) | - | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| 1,4-dichlorobenzene (µg/L) | 6,500 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| 1,1-dichloroethane (µg/L) | - | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| 1,2-dichloroethane (µg/L) | 186,667 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| 1,1-dichloroethylene (µg/L) | 46,667 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| 1,2-dichloropropane (µg/L) | 84,000 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| 1,3-dichloropropylene (µg/L) | 28,000 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Ethylbenzene (µg/L) | 93,333 | | Trace | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Methyl bromide (µg/L) | 1,307 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | 0.21 | | | | ND |
| Methyl chloride (µg/L) | - | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Methylene chloride (µg/L) | 56,000 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| 1,1,2,2-tetrachloroethane (µg/L) | 93,333 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Tetrachloroethylene (µg/L) | 9,333 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Toluene (µg/L) | 373,333 | | 1.06 | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| 1,2-trans-dichloroethylene (µg/L) | - | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| 1,1,1-trichloroethane (µg/L) | 1,866,667 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| 1,1,2-trichloroethane (µg/L) | 3,733 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Trichloroethylene (µg/L) | 280 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Trimethylbenzene (µg/L) | - | | ND | | - | | - | | | | - | | - | | - | | - | | | | ND |
| Vinyl chloride (µg/L) | 2,800 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Xylene (µg/L) | 186,667 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| SVOCs - Acid Extractables | | | | | | | | | | | | | | | | | | | | | |
| 2-chlorophenol (µg/L) | 4,667 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| 2,4-dichlorophenol (µg/L) | 2,800 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| 2,4-dimethylphenol (µg/L) | 18,667 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| 4,6-dinitro-o-cresol (µg/L) | 3,733 | | - | | - | | - | | | | - | | ND | | ND | | ND | | | | ND |
| 2,4-dinitrophenol (µg/L) | 1,867 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| 2-nitrophenol (µg/L) | - | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| 4-nitrophenol (µg/L) | - | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| p-chloro-m-cresol (µg/L) | 48,000 | | - | | - | | - | | | | - | | ND | | ND | | ND | | | | ND |
| Pentachlorophenol (µg/L) | | 54.9 | ND | 74.3 | ND | | - | | | 27.2 | *ND* | 60.8 | ND | 166.0 | ND | 90.8 | ND | | | 67.2 | ND |
| Phenol (µg/L) | 180,000 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | | **03/18/12** | | **07/15/12** | | **12/14/12** | | | | **11/22/13** | | **08/12/14** | | **01/08/15-** | | **09/13/15** | | | | **09/07/16** | |
| 2,4,6-trichlorophenol (µg/L) | 130 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| SVOCs - Bases/Neutrals | | | | | | | | | | | | | | | | | | | | | |
| Acenaphthene (µg/L) | 56,000 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Acenaphthylene (µg/L) | - | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Anthracene (µg/L) | 280,000 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Benzo(a)anthracene (µg/L) | 0.2 | | ND1.44 | | ND1.44 | | - | | | | *ND1.44* | | ND1.44 | | ND1.44 | | ND | | | | ND |
| Benzo(a)pyrene (µg/L) | 0.2 | | ND1.55 | | ND1.55 | | - | | | | *ND1.55* | | ND1.55 | | ND1.55 | | ND | | | | ND |
| Benzo(b)fluoranthene (µg/L) | - | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Benzo(g,h,i)perylene (µg/L) | - | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Benzo(k)fluoranthene (µg/L) | 1.9 | | ND2.28 | | ND2.28 | | - | | | | *ND2.28* | | ND2.28 | | ND2.28 | | ND | | | | ND |
| Chrysene (µg/L) | 19 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Dibenzo(a,h)anthracene (µg/L) | 1.9 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| 3,3-dichlorobenzidine (µg/L) | 3 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Diethyl phthalate (µg/L) | 746,667 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Dimethyl phthalate (µg/L) | - | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Di-n-butyl phthalate (µg/L) | 1,100 | | 88.44 | | 17.5 | | - | | | | *25* | | 10.7 | | 2.03 | | ND | | | | 8.72 |
| 2,4-dinitrotoluene (µg/L) | 1,867 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| 2,6-dinitrotoluene (µg/L) | 3,733 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Di-n-octyl phthalate (µg/L) | 373,333 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| 1,2-diphenylhydrazine (as azobenzene) | 1.8 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Fluroranthene (µg/L) | 37,333 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Fluorene (µg/L) | 37,333 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Hexachlorobenzene (µg/L) | 747 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Hexachlorobutadiene (µg/L) | 187 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Hexachlorocyclopentadiene (µg/L) | 11,200 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Hexachloroethane (µg/L) | 850 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Indeno(1,2,3-cd)pyrene (µg/L) | 1.9 | | ND2.25 | | ND2.25 | | - | | | | *ND2.25* | | ND2.25 | | ND2.25 | | ND | | | | ND |
| Isophorone (µg/L) | 186,667 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Naphthalene (µg/L) | 18,667 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Nitrobenzene (µg/L) | 467 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| N-nitrosodimethylamine (µg/L) | 0.03 | | ND | | ND | | - | | | | *ND4.23* | | ND4.23 | | ND4.23 | | ND | | | | ND |
| N-nitrosodi-n-propylamine (µg/L) | 88,667 | | ND1.06 | | ND4.23 | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| N-nitrosodiphenylamine (µg/L) | 290 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Phenanthrene (µg/L) | - | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Pyrene (µg/L) | 28,000 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| 1,2,4-trichlorobenzene (µg/L) | 9,333 | | 0.00 | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| PCB/Pesticides | | | | | | | | | | | | | | | | | | | | | |
| Aldrin (µg/L) | 0.003 | | ND0.1 | | ND0.1 | | - | | | | *ND0.1* | | ND0.09 | | ND0.09 | | ND | | | | ND |
| Alpha-BHC (µg/L) | 1,600 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Beta-BHC (µg/L) | 560 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Gamma-BHC (µg/L) | 11 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Delta-BHC (µg/L) | 1600 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | | **03/18/12** | | **07/15/12** | | **12/14/12** | | | | **11/22/13** | | **08/12/14** | | **01/08/15-** | | **09/13/15** | | | | **09/07/16** | |
| Chlordane (µg/L) | 3.2 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| 4,4'-DDT (µg/L) | 1.1 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| 4,4'-DDE (µg/L) | 1.1 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| 4,4'-DDD (µg/L) | 1.1 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Dieldrin (µg/L) | 0.003 | | ND0.07 | | ND0.07 | | - | | | | *ND0.07* | | ND0.05 | | ND0.05 | | ND | | | | ND |
| Alpha-endosulfan (µg/L) | 3 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Beta-endosulfan (µg/L) | 3 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Endosulfan sulfate (µg/L) | 3 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Endrin (µg/L) | 0.004 | | ND | | ND | | - | | | | *ND* | | ND | | ND0.09 | | ND | | | | ND |
| Endrin aldehyde (µg/L) | 0.7 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Heptachlor (µg/L) | 0.9 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| Heptachlor epoxide (µg/L) | 0.9 | | ND | | ND | | - | | | | *ND* | | ND | | ND | | ND | | | | ND |
| PCB-1242 (AROCLOR-1242) (µg/L) | 0.001 | | ND0.10 | | ND0.10 | | - | | | | *ND0.10* | | ND0.23 | | ND0.23 | | ND | | | | ND |
| PCB-1254 (AROCLOR-1254) (µg/L) | 0.001 | | ND0.07 | | ND0.07 | | - | | | | *ND0.07* | | ND0.07 | | ND0.07 | | ND | | | | ND |
| PCB-1221 (AROCLOR-1221) (µg/L) | 0.001 | | ND0.09 | | ND0.09 | | - | | | | *ND0.09* | | ND0.09 | | ND0.09 | | ND | | | | ND |
| PCB-1232 (AROCLOR-1232) (µg/L) | 0.001 | | ND0.16 | | ND0.16 | | - | | | | *ND0.16* | | ND0.11 | | ND0.11 | | ND | | | | ND |
| PCB-1248 (AROCLOR-1248) (µg/L) | 0.001 | | ND0.16 | | ND0.16 | | - | | | | *ND0.16* | | ND0.19 | | ND0.19 | | ND | | | | ND |
| PCB-1260 (AROCLOR-1260) (µg/L) | 0.001 | | ND0.25 | | ND0.25 | | - | | | | *ND0.25* | | ND0.10 | | ND0.10 | | ND | | | | ND |
| PCB-1016 (AROCLOR-1016) (µg/L) | 0.001 | | ND0.10 | | ND0.10 | | - | | | | *ND0.10* | | ND0.05 | | ND0.05 | | ND | | | | ND |
| Toxaphene (µg/L) | 0.005 | | ND5.08 | | ND5.08 | | - | | | | *ND5.08* | | ND0.71 | | ND0.71 | | ND | | | | ND |

Note:Results higher than SWQ are shown in red font. Non-detectable results with the Method Detection Limit (MDL) above the SWQS are shown as ND with the MDL in parentheses.

1 - Partial Body Contact (PBC), Aquatic & Wildlife ephemeral (A&We) or Agricultural Livestock watering (AgL).

2 - Surface Water Quality Standards (A.A.C R18-11-101 through Appendix B) selected from lowest of PBC, A&We or AgL.

3 - Average flow rate during the sampling event. m3/s = meters cubed per second.

4 - Hardness of sample event is used to calculate SWQS for Cadmium, Chromium, Copper, Lead, Nickel, Sliver, and Zinc.

5 - mg/l = milligram per liter

6 - µg/L = micrograms per liter

7 - CFU/100 ml = colony forming unit per 100 milliliters, MPN = Most probable number per 100 ml

8 - SWQS for Total Metals are denoted with "T". SWQS for Dissolved Metal for A&We are denoted with a "D".

9 - Volatile Organic Compounds

10 - Dash means information unavailable (ie. SWQS was not established or sample was not collected).

11 - Total of α-BHC, β-BHC, γ-BHC, δ-BHC.

12 - Refer to Appendix Part 13O for Analytical Laboratory Reports

**Table 12. Water Quality Data Monitor Site #5**

| PARAMETERS | SWQS[2] | Hardness SWQS | Summer 2012 | Hardness SWQS | Winter 2012-13 | Hardness SWQS | Summer 2013 | Hardness SWQS | Winter 2013-14 | Hardness SWQS | Summer 2014 | Hardness SWQS | Winter 2014-15 | Hardness SWQS | Summer 2015 | Hardness SWQS | Winter 2015-16 | Hardness SWQS | Summer 2016 | Hardness SWQS | Winter 2016-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | | **07/04/12** | | **01/26/13** | | **07/05/13** | | **11/22/13** | | **07/05/14** | | **12/13/14** | | **07/13/15** | | **01/04/16** | | **08/09/16** | | **12/22/16** | |
| Conventional Parameters | | | 0.85 | | | 0.5 | | | | | | | | | 0.04213179 | | | | 0.9917 | | 0.0083 |
| Average Flow Rate3 (m3/s) | - | | 0.012 | | 0.0021 | | 0.0206 | | 0.0206 | | 0.0403 | | 0.00508 | | 0.00117 | | 0.0266 | | 1.0915 | | 0.00911 |
| pH | 6.5-9.0 | 7.8 | 7.8 | 8 | 8.0 | 7.6 | 7.6 | 6.8 | 6.8 | 7.5 | 7.5 | 6.8 | 6.8 | 8.5 | 8.5 | 6.4 | 6.4 | 8.7 | 8.7 | | 7.9 |
| Temperature (°Celcius) | - | | 26.4 | | 16.3 | | 27.5 | | 15.4 | | 27.4 | | 14.1 | | 31.7 | | 10.3 | | 26.3 | | 14.5 |
| Hardness4 (mg/L)5 | | 143 | 143 | 68.7 | 68.7 | 185 | 185 | 86.7 | 86.7 | 466 | 466 | 55.6 | 55.6 | 101 | 101 | 112 | 112 | 175 | 175 | | 55.1 |
| Total Dissolved Solids (TDS) (mg/L) | - | | 270 | | 139 | | 269 | | 162 | | 620 | | 104 | | 166 | | 121 | | 100 | | 154 |
| Total Suspended Solids (TSS) (mg/L) | - | | 214 | | 40.0 | | 336 | | 68 | | 1020 | | 35.5 | | 202 | | 203 | | 468 | | 40 |
| Biological Oxygen Demand (BOD) | - | | ND | | 9.60 | | 37.4 | | 11.7 | | 81.7 | | 5.8 | | 28.9 | | 10.7 | | 5.2 | | 15.8 |
| Chemical Oxygen Demand (COD) | - | | 192 | | 46.0 | | 244 | | 65 | | 450 | | 52 | | 205 | | 101 | | 91 | | 99 |
| Inorganics | | | | | | | | | | | | | | | | | | | | | |
| Cyanide, total (ug/L)6 | 84T | | ND | | 1.10 | | 2.43 | | ND | | 2.62 | | ND | | 2.37 | | ND | | | | ND |
| Nutrients | | | | | | | | | | | | | | | | | | | | | |
| Nitrate + Nitrite as N (mg/L) | | | 2.75 | | 2.3 | | 4.35 | | 1.47 | | 8.31 | | 1.68 | | 1.21 | | 3.25 | | 0.85 | | 2.92 |
| Ammonia as N (mg/L) | | | 0.68 | | 0.36 | | 1.28 | | 0.36 | | 2.04 | | 0.19 | | 1.01 | | 0.22 | | 0.35 | | 0.29 |
| TKN (mg/L) | | | 3.77 | | 2.45 | | 5.75 | | 1.83 | | 10.9 | | 0.67 | | 3.22 | | 1.81 | | 2.33 | | 2.27 |
| Total Nitrogen (mg/L) | | | 6.52 | | 4.75 | | 10.10 | | 3.30 | | 19.21 | | 2.35 | | 4.43 | | 5.06 | | 3.18 | | 5.48 |
| Total Phosphorus (mg/L) | | | 0.75 | | 0.29 | | 1.02 | | 0.48 | | 2.01 | | 0.19 | | 0.78 | | 0.54 | | 0.6 | | 0.55 |
| Total Orthophosphate (mg/L) | | | 0.34 | | 0.17 | | 0.45 | | 0.29 | | 0.6 | | 0.1 | | 0.43 | | 0.22 | | ND | | 0.38 |
| Microbiological | | | | | | | | | | | | | | | | | | | | | |
| Escherichia coli (E. coli) (CFU/100 | 575 | | 52 | | 4106 | | 11199 | | 3873 | | 181 | | 7270 | | 450 | | 551 | | 6130 | | 3080 |
| Total Metals8 | | | | | | | | | | | | | | | | | | | | | |
| AntimonyT (µg/L) | 747 | | 1.73 | | 8.22 | | 2.28 | | 4.5 | | 2.85 | | 0.78 | | 1.66 | | 0.85 | | 0.64 | | 0.95 |
| ArsenicT (µg/L) | 200 | | 3.36 | | 2.15 | | 5.6 | | 3.21 | | 12 | | 1.69 | | 2.82 | | 2.2 | | 5.38 | | 2.15 |
| BariumT (µg/L) | 98,000 | | 152 | | 57.9 | | 19.3 | | 81.2 | | 519 | | 53.6 | | 90.2 | | 92.1 | | 165 | | 53.5 |
| BerylliumT (µg/L) | 1,867 | | 0.36 | | ND | | 0.39 | | ND | | 1.05 | | ND | | ND | | ND | | 0.29 | | ND |
| CadmiumD (µg/L) | | 32 | 0.53 | 16 | ND | 20 | ND | 20 | ND | 88 | ND | 13 | ND | 23 | ND | 25 | ND | 39 | ND | | 0.23 |
| ChromiumT (µg/L) | 1000 | | 1.66 | | 0.62 | | 1.41 | | 1.38 | | 31 | | 2.92 | | 4.9 | | 2.79 | | 6.96 | | 3.65 |
| CopperD (µg/L) | | 32.58 | 41.20 | 16.33 | 19.80 | 41.53 | 60.20 | 20.33 | 28.90 | 85.88 | 132.00 | 13.38 | 17.10 | 23.48 | 32.90 | 25.88 | 23.40 | 39.41 | 12.00 | 13.27 | 35.20 |
| LeadD (µg/L) | | 200.74 | 1.58 | 90.36 | 0.88 | 264.46 | 1.94 | 116.64 | 1.03 | 592.71 | 2.56 | 71.54 | 0.59 | 137.78 | 1.78 | 154.16 | 0.61 | 249.24 | 0.40 | | 10.30 |
| MercuryT (µg/L) | 10 | | ND | | ND | | ND0.2 | | 0.136 | | 0.272 | | ND | | ND | | 0.08 | | ND | | ND |
| NickelD (µg/L) | | 5627.75 | 2.84 | 3026.81 | 0.95 | 6997.58 | 3.29 | 3685.40 | 1.28 | 13435.79 | 6.32 | 2530.78 | 1.00 | 4193.50 | 2.17 | 4576.77 | 1.04 | 6676.22 | 0.63 | | 3.03 |
| SeleniumT (µg/L) | 33 | | 0.89 | | ND | | 0.34 | | 0.82 | | 4.23 | | ND | | 2.28 | | 0.85 | | 3.48 | | 1.04 |
| SilverD (µg/L) | | 5.95 | 0.79 | 1.69 | ND | 9.27 | ND1.0 | 2.52 | ND | 34.91 | ND | 1.17 | ND | 3.27 | ND | 3.91 | ND | 8.42 | 0.17 | 1.15 | 0.15 |
| ThalliumT (µg/L) | 75 | | 0.22 | | ND | | 0.18 | | ND | | 0.4 | | ND | | ND | | ND | | ND | | ND |
| ZincD (µg/L) | | 1505.64 | 23.90 | 809.02 | 9.48 | 1872.75 | 34.70 | 985.34 | 12.50 | 3599.40 | 59.30 | 676.25 | 6.65 | 1121.41 | 36.20 | 1224.07 | 6.52 | 1786.61 | 2.86 | | 65.50 |
| Organic Toxic Pollutants | | | | | | | | | | | | | | | | | | | | | |
| Total Petroleum Hydrocarbons (TPH) | - | | 5.56 | | 1.76 | | 2.00 | | 7.88 | | 7.3 | | 11.06 | | 8.59 | | 9.00 | | 2.33 | | 5.06 |
| Total Oil & Grease (mg/L) | - | | 7.11 | | 1.76 | | 2.89 | | 10.61 | | 25.23 | | 6.24 | | 11.88 | | 29.56 | | 3.49 | | 5.84 |
| VOCs9, Semi-VOCs, and Pesticides | | | | | | | | | | | | | | | | | | | | | |
| Acrolein (µg/L) | 467 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Acrylonitrile (µg/L) | 37333 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |

| PARAMETERS | SWQS[2] | Hardness SWQS | Summer 2012 | Hardness SWQS | Winter 2012-13 | Hardness SWQS | Summer 2013 | Hardness SWQS | Winter 2013-14 | Hardness SWQS | Summer 2014 | Hardness SWQS | Winter 2014-15 | Hardness SWQS | Summer 2015 | Hardness SWQS | Winter 2015-16 | Hardness SWQS | Summer 2016 | Hardness SWQS | Winter 2016-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | | **07/04/12** | | **01/26/13** | | **07/05/13** | | **11/22/13** | | **07/05/14** | | **12/13/14** | | **07/13/15** | | **01/04/16** | | **08/09/16** | | **12/22/16** | |
| Benzene (µg/L) | 3733 | | ND | | - | | ND | | ND | | 0.05 | | ND | | ND | | ND | | ND | | ND |
| Bromoform (µg/L) | 18667 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Carbon tetrachloride (µg/L) | 1307 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Chlorobenzene (µg/L) | 18667 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Chlorodibromomethane (µg/L) | 18667 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Chloroethane (µg/L) | - | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| 2-chloroethylvinyl ether (µg/L) | - | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Chloroform (µg/L) | 9333 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Dichlorobromomethane (µg/L) | 18667 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| 1,2-dichlorobenzene (µg/L) | 5,900 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| 1,3-dichlorobenzene (µg/L) | - | | ND | | - | | ND | | ND | | ND | | ND | | 0.11 | | ND | | 0.11 | | ND |
| 1,4-dichlorobenzene (µg/L) | 6,500 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| 1,1-dichloroethane (µg/L) | - | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| 1,2-dichloroethane (µg/L) | 186,667 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| 1,1-dichloroethylene (µg/L) | 46,667 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| 1,2-dichloropropane (µg/L) | 84,000 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| 1,3-dichloropropylene (µg/L) | 28,000 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Ethylbenzene (µg/L) | 93,333 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Methyl bromide (µg/L) | 1,307 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Methyl chloride (µg/L) | - | | ND | | - | | ND | | 0.11 | | ND | | ND | | ND | | ND | | ND | | ND |
| Methylene chloride (µg/L) | 56,000 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| 1,1,2,2-tetrachloroethane (µg/L) | 93,333 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Tetrachloroethylene (µg/L) | 9,333 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Toluene (µg/L) | 373,333 | | ND | | - | | ND | | 0.06 | | 0.09 | | ND | | ND | | ND | | ND | | ND |
| 1,2-trans-dichloroethylene (µg/L) | - | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| 1,1,1-trichloroethane (µg/L) | 1,866,667 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| 1,1,2-trichloroethane (µg/L) | 3,733 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Trichloroethylene (µg/L) | 280 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Trimethylbenzene (µg/L) | - | | - | | - | | - | | - | | - | | - | | - | | - | | - | | - |
| Vinyl chloride (µg/L) | 2,800 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Xylene (µg/L) | 186,667 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| SVOCs - Acid Extractables | | | | | | | | | | | | | | | | | | | | | |
| 2-chlorophenol (µg/L) | 4,667 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| 2,4-dichlorophenol (µg/L) | 2,800 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| 2,4-dimethylphenol (µg/L) | 18,667 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| 4,6-dinitro-o-cresol (µg/L) | 3,733 | | - | | - | | - | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| 2,4-dinitrophenol (µg/L) | 1,867 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| 2-nitrophenol (µg/L) | - | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| 4-nitrophenol (µg/L) | - | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| p-chloro-m-cresol (µg/L) | 48,000 | | - | | - | | - | | - | | ND | | ND | | ND | | ND | | ND | | ND |
| Pentachlorophenol (µg/L) | | 82.1 | ND | | - | 67.2 | ND | 30.1 | ND | 60.8 | ND | 30.1 | ND | 166.0 | ND | 20.1 | ND | 202.9 | ND | | ND |
| Phenol (µg/L) | 180,000 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |

| PARAMETERS | SWQS[2] | Hardness SWQS | Summer 2012 | Hardness SWQS | Winter 2012-13 | Hardness SWQS | Summer 2013 | Hardness SWQS | Winter 2013-14 | Hardness SWQS | Summer 2014 | Hardness SWQS | Winter 2014-15 | Hardness SWQS | Summer 2015 | Hardness SWQS | Winter 2015-16 | Hardness SWQS | Summer 2016 | Hardness SWQS | Winter 2016-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | | 07/04/12 | | 01/26/13 | | 07/05/13 | | 11/22/13 | | 07/05/14 | | 12/13/14 | | 07/13/15 | | 01/04/16 | | 08/09/16 | | 12/22/16 | |
| 2,4,6-trichlorophenol (µg/L) | 130 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| SVOCs - Bases/Neutrals | | | | | | | | | | | | | | | | | | | | | |
| Acenaphthene (µg/L) | 56,000 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Acenaphthylene (µg/L) | - | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Anthracene (µg/L) | 280,000 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Benzo(a)anthracene (µg/L) | 0.2 | | ND1.44 | | - | | ND1.44 | | ND1.44 | | ND1.44 | | ND1.44 | | ND1.44 | | ND1.25 | | ND1.44 | | ND1.25 |
| Benzo(a)pyrene (µg/L) | 0.2 | | ND1.55 | | - | | ND1.55 | | ND1.55 | | ND1.55 | | ND1.55 | | ND1.55 | | ND1.96 | | ND1.55 | | ND1.96 |
| Benzo(b)fluoranthene (µg/L) | - | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Benzo(g,h,i)perylene (µg/L) | - | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Benzo(k)fluoranthene (µg/L) | 1.9 | | ND2.28 | | - | | ND2.28 | | ND2.28 | | ND2.28 | | ND2.28 | | ND2.28 | | ND2.29 | | ND2.28 | | ND2.29 |
| Chrysene (µg/L) | 19 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Dibenzo(a,h)anthracene (µg/L) | 1.9 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| 3,3-dichlorobenzidine (µg/L) | 3 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Diethyl phthalate (µg/L) | 746,667 | | ND | | - | | ND | | ND | | ND | | ND | | 7.09 | | ND | | 7.09 | | ND |
| Dimethyl phthalate (µg/L) | - | | ND | | - | | ND | | 8.7 | | ND | | ND | | ND | | ND | | ND | | ND |
| Di-n-butyl phthalate (µg/L) | 1,100 | | 14.8 | | - | | ND | | ND | | ND | | 1.69 | | ND | | ND | | ND | | ND |
| 2,4-dinitrotoluene (µg/L) | 1,867 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| 2,6-dinitrotoluene (µg/L) | 3,733 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Di-n-octyl phthalate (µg/L) | 373,333 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| 1,2-diphenylhydrazine (as azobenzene) | 1.8 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Fluroranthene (µg/L) | 37,333 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Fluorene (µg/L) | 37,333 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Hexachlorobenzene (µg/L) | 747 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Hexachlorobutadiene (µg/L) | 187 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Hexachlorocyclopentadiene (µg/L) | 11,200 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Hexachloroethane (µg/L) | 850 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Indeno(1,2,3-cd)pyrene (µg/L) | 1.9 | | ND2.25 | | - | | ND2.25 | | ND2.25 | | ND2.25 | | ND2.25 | | ND2.25 | | ND2.83 | | ND2.25 | | ND2.83 |
| Isophorone (µg/L) | 186,667 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Naphthalene (µg/L) | 18,667 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Nitrobenzene (µg/L) | 467 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| N-nitrosodimethylamine (µg/L) | 0.03 | | ND4.23 | | - | | ND4.23 | | ND4.23 | | ND4.23 | | - | | ND4.23 | | ND2.09 | | ND4.23 | | ND2.09 |
| N-nitrosodi-n-propylamine (µg/L) | 88,667 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| N-nitrosodiphenylamine (µg/L) | 290 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Phenanthrene (µg/L) | - | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Pyrene (µg/L) | 28,000 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| 1,2,4-trichlorobenzene (µg/L) | 9,333 | | ND | | - | | ND | | ND | | ND | | ND | | 0.12 | | ND | | 0.12 | | ND |
| PCB/Pesticides | | | | | | | | | | | | | | | | | | | | | |
| Aldrin (µg/L) | 0.003 | | ND0.10 | | - | | ND0.10 | | ND0.10 | | ND0.09 | | ND0.09 | | ND0.09 | | ND0.09 | | ND0.09 | | ND0.09 |
| Alpha-BHC (µg/L) | 1,600 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Beta-BHC (µg/L) | 560 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Gamma-BHC (µg/L) | 11 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Delta-BHC (µg/L) | 1600 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |

| PARAMETERS | SWQS[2] | Hardness SWQS | Summer 2012 | Hardness SWQS | Winter 2012-13 | Hardness SWQS | Summer 2013 | Hardness SWQS | Winter 2013-14 | Hardness SWQS | Summer 2014 | Hardness SWQS | Winter 2014-15 | Hardness SWQS | Summer 2015 | Hardness SWQS | Winter 2015-16 | Hardness SWQS | Summer 2016 | Hardness SWQS | Winter 2016-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | | 07/04/12 | | 01/26/13 | | 07/05/13 | | 11/22/13 | | 07/05/14 | | 12/13/14 | | 07/13/15 | | 01/04/16 | | 08/09/16 | | 12/22/16 | |
| Chlordane (µg/L) | 3.2 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| 4,4'-DDT (µg/L) | 1.1 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| 4,4'-DDE (µg/L) | 1.1 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| 4,4'-DDD (µg/L) | 1.1 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Dieldrin (µg/L) | 0.003 | | ND0.07 | | - | | ND0.07 | | ND0.07 | | ND0.05 | | ND0.05 | | ND0.05 | | ND0.05 | | ND0.05 | | ND0.05 |
| Alpha-endosulfan (µg/L) | 3 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Beta-endosulfan (µg/L) | 3 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Endosulfan sulfate (µg/L) | 3 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Endrin (µg/L) | 0.004 | | ND0.10 | | - | | ND0.10 | | ND0.10 | | ND0.09 | | ND0.09 | | ND0.09 | | ND0.09 | | ND0.09 | | ND0.09 |
| Endrin aldehyde (µg/L) | 0.7 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Heptachlor (µg/L) | 0.9 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| Heptachlor epoxide (µg/L) | 0.9 | | ND | | - | | ND | | ND | | ND | | ND | | ND | | ND | | ND | | ND |
| PCB-1242 (AROCLOR-1242) (µg/L) | 0.001 | | ND0.10 | | - | | ND0.10 | | ND0.10 | | ND0.1 | | ND0.23 | | ND0.23 | | ND0.23 | | ND0.23 | | ND0.23 |
| PCB-1254 (AROCLOR-1254) (µg/L) | 0.001 | | ND0.07 | | - | | ND0.07 | | ND0.07 | | ND0.19 | | ND0.07 | | ND0.07 | | ND0.07 | | ND0.07 | | ND0.07 |
| PCB-1221 (AROCLOR-1221) (µg/L) | 0.001 | | ND0.09 | | - | | ND0.09 | | ND0.09 | | ND0.09 | | ND0.09 | | ND0.09 | | ND0.09 | | ND0.09 | | ND0.09 |
| PCB-1232 (AROCLOR-1232) (µg/L) | 0.001 | | ND0.16 | | - | | ND0.16 | | ND0.16 | | ND0.11 | | ND0.11 | | ND0.11 | | ND0.11 | | ND0.11 | | ND0.11 |
| PCB-1248 (AROCLOR-1248) (µg/L) | 0.001 | | ND0.16 | | - | | ND0.16 | | ND0.16 | | ND0.19 | | ND0.19 | | ND0.19 | | ND0.19 | | ND0.19 | | ND0.19 |
| PCB-1260 (AROCLOR-1260) (µg/L) | 0.001 | | ND0.25 | | - | | ND0.25 | | ND0.25 | | ND0.1 | | ND0.10 | | ND0.10 | | ND0.10 | | ND0.10 | | ND0.10 |
| PCB-1016 (AROCLOR-1016) (µg/L) | 0.001 | | ND0.10 | | - | | ND0.10 | | ND0.10 | | ND0.05 | | ND0.05 | | ND0.05 | | ND0.05 | | ND0.05 | | ND0.05 |
| Toxaphene (µg/L) | 0.005 | | ND5.08 | | - | | ND5.08 | | ND5.08 | | ND0.71 | | ND0.71 | | ND0.71 | | ND0.71 | | ND0.71 | | ND0.71 |

Note: Results higher than SWQ are shown in red font. Non-detectable results with the Method Detection Limit (MDL) above the SWQS are shown as ND with the MDL in parentheses.

1 - Partial Body Contact (PBC), Aquatic & Wildlife ephemeral (A&We) or Agricultural Livestock watering (AgL).

2 - Surface Water Quality Standards (A.A.C R18-11-101 through Appendix B) selected from lowest of PBC, A&We or AgL.

3 - Average flow rate during the sampling event. m3/s = meters cubed per second.

4 - Hardness of sample event is used to calculate SWQS for Cadmium, Chromium, Copper, Lead, Nickel, Sliver, and Zinc.

5 - mg/l = milligram per liter

6 - µg/L = micrograms per liter

7 - CFU/100 ml = colony forming unit per 100 milliliters, MPN = Most probable number per 100 ml

8 - SWQS for Total Metals are denoted with "T". SWQS for Dissolved Metal for A&We are denoted with a "D".

9 - Volatile Organic Compounds

10 - Dash means information unavailable (ie. SWQS was not established or sample was not collected).

11 - Total of α-BHC, β-BHC, γ-BHC,

12 - Refer to Appendix Part 13O for Analytical Laboratory Reports

## 10. Assessment of Monitoring Data

### A. Stormwater Quality

This report is the sixth of a five-year permit. Stormwater from all five sites were sampled in the fiscal year and all five sites were sampled for 133 compounds under the expanded list of parameters. Sufficient data has been collected to discern the difference between outliers and trends in the water quality parameters.

### B. Surface Water Quality Standards (SWQS)

Analytical results from the sampling period were tabulated along with the applicable SWQS (Part 9). Results higher than SWQS are also reported (Tables 13 through 17, Figures 4 through 8) and discussed. Several parameters, namely Benzo(a)anthracene, Benzo(a)pyrene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, N-nitrosodi-methylamine, Aldrin, Dieldrin, Endrin, 7 PCBs and Toxaphene, have Method Detection Limits (MDLs) that are higher than the Surface Water Quality Standards established for the designated uses of the watersheds draining to the five monitor sites. The MDL used by the primary laboratory has been accepted by ADHS under laboratory license AZO159 for the associated methods, as shown in Appendix Q. MDLs are performed in accordance with 40 CFR, part 136 Appendix B. Alteration of this method is considered a major modification and may not be performed without permission from ADHS and Region 9 EPA so the analytical methods limit the direct comparison of results to SWQSs. Two VOCs, Diethyl phthalate and Di-n-butyl phthalate, used as plasticizers, were detected at very low concentrations. Given there were no other organic compounds detected, the stormwater was likely free of the compounds with MDLs above the SWQSs.

### C. Pollutant Concentration Greater than Applicable SWQS

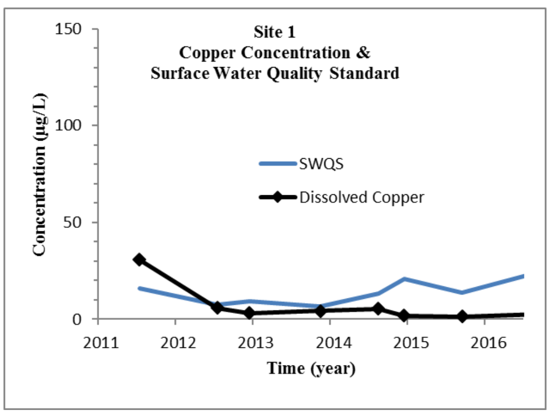
A brief summary of the water quality results is provided. Elevated dissolved copper concentration were observed for Sites 3 and 5 and ranged from 8.8 to 35.2 μg/L. Elevated *E. coli* concentrations were observed for Sites 2, 4 and 5 and ranged from 582 to 6,100 Most Probable Number. Elevated dissolved silver concentrations were observed for Sites 1 and 4, and ranged from 0.63 to 42.9 μg/L. The pH was normal for all five sites. The dissolved copper and *E. coli* results are similar to previous year's results.

A historical description of the water quality parameters that are higher than the SWQS has been prepared for each wet weather monitor site. The data is tabulated and charts are provided for copper and *E. coli* to illustrate temporal trends.

**Table 13. Summary of Parameters with Concentrations* Higher than SWQS at Site #1**

| Site ID: 1<br>Receiving Water: Rillito | FY2011/12<br>Summer Winter | | FY2012/13<br>Summer Winter | | FY2013/2014<br>Summer Winter | | FY2014/15<br>Summer Winter | | FY2015/16<br>Summer Winter | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | 07/15/12 | 12/14/12 | - | 11/22/13 | 08/12/14 | 12/17/14 | 09/21/15 | - | 09/07/16 | - |
| Hardness (mg/L) | 30.7 | 37.4 | - | 26.0 | 54.5 | 88.9 | 58.0 | - | 105.0 | - |
| $Copper_{Dissolved}$ SWQS (µg/L) | 7.6 | 9.2 | - | 6.5 | 13.1 | 20.8 | 13.9 | - | 24.36 | - |
| $Copper_{Dissolved}$ Result (µg/L) | 5.8 | 3.3 | - | 4.2 | 5.3 | 1.9 | 1.45 | - | 2.8 | - |
| Result > SWQS? | No | No | - | No | No | No | No | - | No | - |
| $Silver_{Dissolved}$ SWQS (µg/L) | 0.42 | 0.59 | - | 0.32 | 1.13 | 2.63 | 1.26 | - | 3.5 | - |
| $Silver_{Dissolved}$ Result (µg/L) | <1 | 2.66 | - | <1 | <1 | <1 | <1 | - | 42.9 | - |
| Result > SWQS? | No | Yes | - | No | No | No | No | - | Yes | - |
| *E.coli* Result (MPN) | 10 | 41 | - | 10 | 487 | 15,500 | 1300 | - | 200 | - |
| Result>SWQS?(575 MPN) | No | - | - | No | No | Yes | Yes | - | No | - |
| pH Result (SU) | 7.6 | 8.1 | - | 6.9 | 8.0 | 7.0 | 8.6 | - | 7 | - |
| Results > SWQS (6.5-9.0) | No | No | - | No | No | No | No | - | No | - |

* Concentrations are in micrograms per liter, unless noted otherwise.



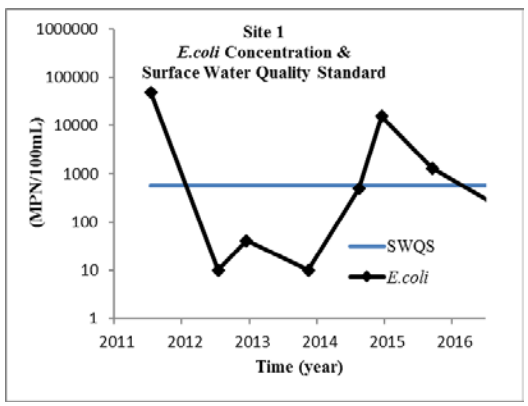




**Figure 3. Comparison of Copper and *E. coli* Concentration to SWQS at Site #1**

The overall trend for water quality at Site #1, low density residential land use, shows a decrease in dissolved copper. Dissolved copper concentrations have been below the SWQS since July 2012. *E. coli* concentrations have been below the SWQS five times and above the SWQS three times. The high *E. coli* concentrations could be related to improper pet waste management or wildlife waste. The site is next to a wash, which acts as a wildlife corridor. Further actions are not recommended for this wet weather monitoring site. There was a one-time occurrence of dissolved silver and pH that were outside the SWQS.

**Table 14. Summary of Parameters with Concentrations* Higher than SWQS at Site #2**

| Site ID: 2<br>Receiving Water: Rillito | FY2012/13<br>Summer | Winter | FY2013/14<br>Summer | Winter | FY2014/2015<br>Summer | Winter | FY2015/16<br>Summer | Winter | FY2016/17<br>Summer | Winter |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | - | 01/26/13 | 08/22/13 | 11/22/13 | 07/05/14 | 12/13/14 | 07/05/15 | 01/04/16 | 7/28/2016 | 12/17/2016 |
| Hardness (mg/L) | - | 48.9 | 147.0 | 62.5 | 154.0 | 57.7 | 87.2 | 82.2 | 64.3 | 53.5 |
| $Copper_{Dissolved}$ SWQS (µg/L) | - | 11.9 | 33.4 | 14.9 | 34.9 | 13.9 | 20.4 | 19.3 | 15.3 | 12.9 |
| $Copper_{Dissolved}$ Result (µg/L) | - | 6.4 | 8.2 | 7.5 | 14.4 | 11.8 | 13.0 | 9.0 | 19.7 | 11.5 |
| Result > SWQS? | - | No | No | No | No | No | No | No | yes | no |
| $Silver_{Dissolved}$ SWQS (µg/L) | - | 0.9 | 6.2 | 1.4 | 6.8 | 1.3 | 2.5 | 2.3 | 1.5 | 1.1 |
| $Silver_{Dissolved}$ Result (µg/L) | - | <1 | <1 | <1 | 1.14 | <1 | <1 | <1 | <1 | <1 |
| Result > SWQS? | - | No | No | No | No | No | No | No | No | No |
| *E.coli* Result (MPN) | - | 4,884 | 19,863 | 4,884 | 24,810 | 14,400 | 14,100 | 12,000 | 582 | 19,900 |
| Result>SWQS?(575 MPN) | - | Yes | Yes | Yes | Yes | Yes | Yes | Yes | yes | yes |
| pH Result (SU) | - | 8.7 | - | 6.7 | 6.4 | 6.4 | 8.4 | 8.0 | 7.7 | 6.7 |
| Results > SWQS (6.5-9.0) | - | No | - | No | Yes | Yes | No | No | No | No |

* Concentrations are in micrograms per liter, unless noted otherwise.

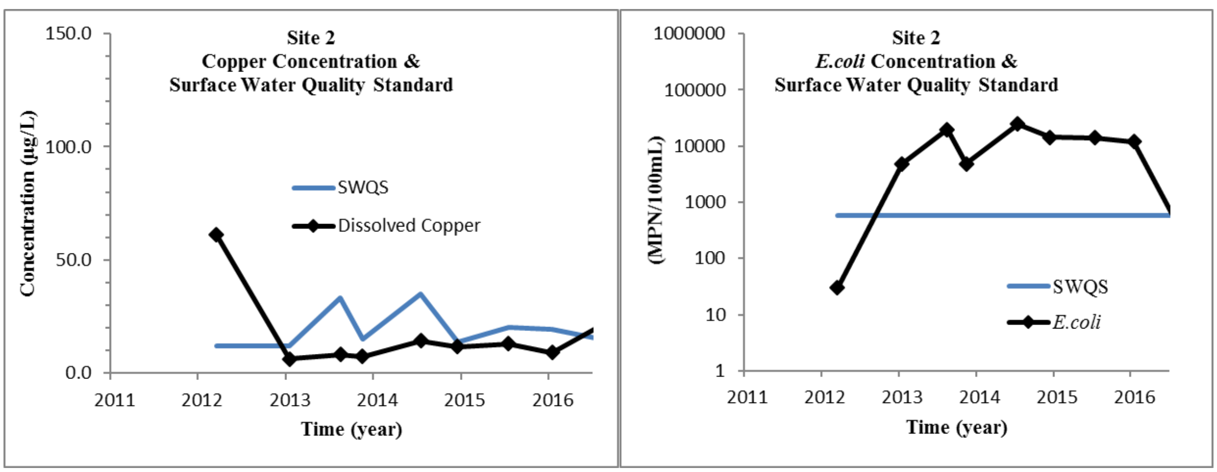



**Figure 4. Comparison of Copper and *E. coli* Concentration to SWQS at Site #2**

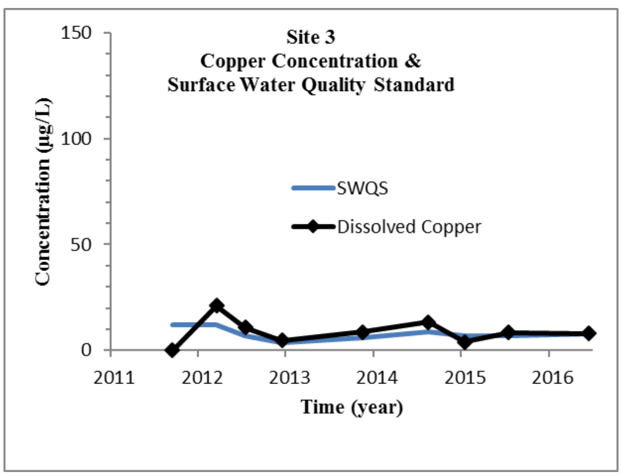
The overall trend for water quality at Site #2, medium density residential land use, shows dissolved copper concentrations are typically below the SWQS. The *E. Coli* concentrations have been consistently higher than the SWQS since the first sampling in 2011. Two samples had a slightly pH outside the SWQS indicative of acidic conditions in the second half of 2014. The pH has been in the normal range since 2015. The high E. coli concentrations could be related to improper pet waste management in the medium density residential neighborhood. An outreach program is being developed to educate the neighborhood.

The outreach program planned to be implemented in FY16/17 has been delayed to FY17/18 in order to train the addition of new personnel to the stormwater management program.

**Table 15. Summary of Parameters with Concentrations* Higher than SWQS at Site #3**

| **Site ID: 3 Receiving Water: Rillito** | **FY2012/13 Summer** | **Winter** | **FY2013/14 Summer** | **Winter** | **FY2014/15 Summer** | **Winter** | **FY2015/16 Summer** | **Winter** | **FY2016/17 Summer** | **Winter** |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | 07/20/12 | 12/14/12 | - | 11/22/13 | 08/26/14 | 01/30/15 | 07/05/15 | - | 6/29/2016 | - |
| Hardness (mg/L) | 27.4 | 13.4 | - | 23.5 | 35.9 | 27.1 | 28.3 | - | 30.9 | - |
| $Copper_{Dissolved}$ SWQS (µg/L) | 6.9 | 3.5 | - | 5.9 | 8.9 | 6.8 | 7.08 | - | 7.69 | - |
| $Copper_{Dissolved}$ Result (µg/L) | 10.9 | 4.7 | - | 8.7 | 13.3 | 3.9 | 8.46 | - | 8.08 | - |
| Result > SWQS? | Yes | Yes | - | Yes | Yes | No | Yes | - | yes | - |
| $Silver_{Dissolved}$ SWQS (µg/L) | 0.4 | 1.0 | - | 0.3 | 0.6 | 0.3 | 0.4 | - | 0.43 | - |
| $Silver_{Dissolved}$ Result (µg/L) | <1 | 2.3 | - | <1 | <1 | <1 | <1 | - | <1 | - |
| Result > SWQS? | No | Yes | - | No | No | No | No | - | No | - |
| *E.coli* Result (MPN) | 20 | 63 | - | 100 | 10 | 59 | 78.6 | - | 43.6 | - |
| Result>SWQS?(575 MPN) | No | No | - | No | No | No | No | - | no | - |
| pH Result (SU) | 7.2 | 7.5 | - | 7.1 | - | 6.2 | 8.5 | - | 6.8 | - |
| Results > SWQS (6.5-9.0) | No | No | - | No | - | Yes | No | - | No | - |

* Concentrations are in micrograms per liter, unless noted otherwise.



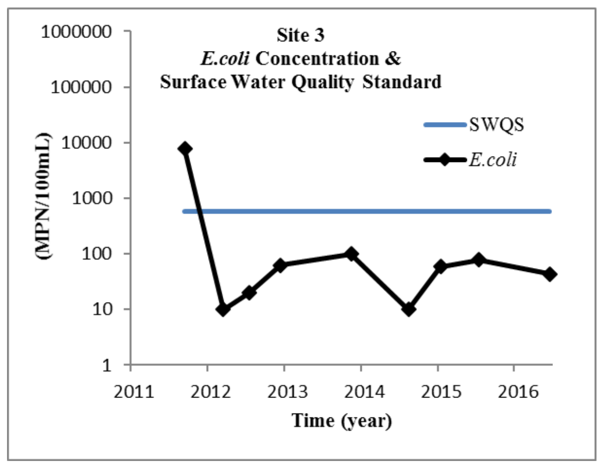
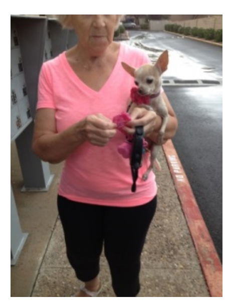




**Figure 5. Comparison of Copper and *E. coli* Concentration to SWQS at Site #3**

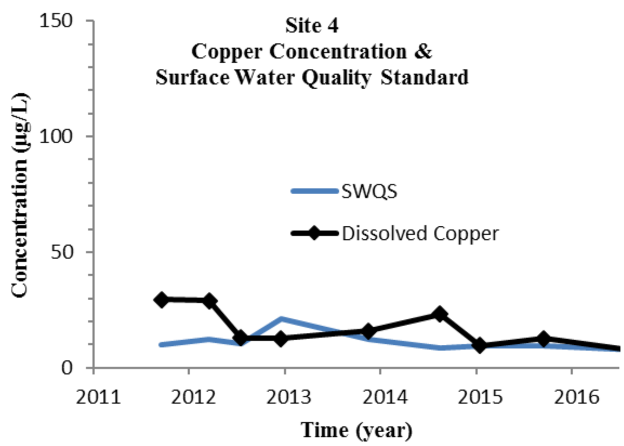
The overall trend for water quality at Site #3, high density residential land use, shows dissolved copper concentrations have consistently been slightly higher than the SWQS. Aside from the first sampling event, *E. Coli* concentrations have consistently been below the SWQS, reflective of the neighborhood members taking pet waste management very seriously. The photo to the left shows a pet owner with a pink plastic dog bone as a carrying case for pink plastic bags for disposal of pet waste. The dissolved silver concentration was above the SWQS once. The pH has been outside the SWQS range twice.



No further actions are recommended for this site.

| Table 16. Summary of Parameters with Concentrations* Higher than SWQS at Site #4 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Site ID: 4 Receiving Water: Rillito** | **FY2012/13 Summer** | **Winter** | **FY2013/14 Summer** | **Winter** | **FY2014/15 Summer** | **Winter** | **FY2015/16 Summer** | **Winter** | **FY2016/17 Summer** | **Winter** |
| Sample Date | 07/15/12 | 12/14/12 | - | 11/22/13 | 8/12/14 | 01/30/15 | 09/13/15 | - | 09/07/16 | - |
| Hardness (mg/L) | 42.3 | 90.9 | - | 50.0 | 35.4 | 38.2 | 38.2 | - | 24.5 | - |
| $Copper_{Dissolved}$ SWQS (µg/L) | 10.3 | 21.3 | - | 12.1 | 8.7 | 9.4 | 9.4 | - | 7.43 | - |
| $Copper_{Dissolved}$ Result (µg/L) | 12.9 | 12.7 | - | 16.0 | 23.1 | 9.5 | 12.6 | - | 7.0 | - |
| Result > SWQS? | Yes | No | - | Yes | Yes | Yes | Yes | - | No | - |
| $Silver_{Dissolved}$ SWQS (µg/L) | 0.7 | 2.7 | - | 1 | 0.5 | 0.6 | 0.6 | - | 0.4 | - |
| $Silver_{Dissolved}$ Result (µg/L) | 0.2 | 1.0 | - | <1 | <1 | <1 | <1 | - | 0.63 | - |
| Result > SWQS? | No | No | - | No | No | No | No | - | Yes | - |
| *E.coli* Result (MPN) | 1,789 | 1,850 | - | 1,178 | 1,850 | 249 | 384 | - | 3100 | - |
| Result>SWQS?(575 MPN) | Yes | Yes | - | Yes | Yes | No | No | - | Yes | - |
| pH Result (SU) | 7.7 | 7.8 | - | 6.7 | 7.5 | 8.5 | 7.9 | - | 7.6 | - |
| Results > SWQS (6.5-9.0) | No | No | - | No | No | No | No | - | No | - |

* Concentrations are in micrograms per liter, unless noted otherwise.



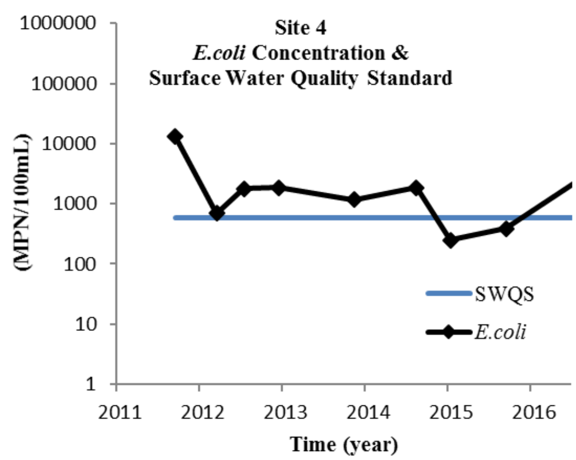




**Figure 6. Comparison of Copper and *E. coli* Concentration to SWQS at Site #4**

The overall trend for water quality at Site #4, commercial land use, shows dissolved copper concentrations have consistently been higher than the SWQS, with the exception of the 12/14/12 and 09/07/16 samples. *E. coli* concentrations have been above the SWQS, with the exception of the 12/14/12 and 09/07/16 samples. The dissolved silver concentration was slightly higher than the SWQS. The pH has consistently met the SWQS.

An outreach program is being developed to approach the commercial owners about adding pet waste stations as a way of reducing microbiologic pollution in stormwater. The program intended to be implemented in FY16/17 was delayed to FY17/18 to allow training of new personnel added to the stormwater management program.

**Table 17. Summary of Parameters with Concentrations* Higher than SWQS at Site #5**

| Site ID: 5 Receiving Water: Santa Cruz | FY2012/13 | | FY2013/14 | | FY2014/15 | | FY2015/16 | | FY2016/17 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Summer | Winter | Summer | Winter | Summer | Winter | Summer | Winter | Summer | Winter |
| Sample Date | 07/04/12 | 01/26/13 | 07/05/13 | 11/22/13 | 07/05/14 | 12/13/14 | 07/13/15 | 01/04/16 | 08/09/16 | 12/22/16 |
| Hardness (mg/L) | 143.0 | 68.7 | 185.0 | 86.7 | 466.0 | 55.6 | 101.0 | 112.0 | 175 | 55.1 |
| Copper$_{\text{Dissolved}}$ SWQS (µg/L) | 32.6 | 16.3 | 41.5 | 20.3 | 85.9 | 13.4 | 23.48 | 25.88 | 39.4 | 13.3 |
| Copper$_{\text{Dissolved}}$ Result (µg/L) | 41.2 | 19.8 | 60.2 | 28.9 | 132.0 | 17.1 | 32.9 | 23.4 | 12.0 | 35.2 |
| Result > SWQS? | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No | No | Yes |
| Silver$_{\text{Dissolved}}$ SWQS (µg/L) | 6 | 1.7 | 9.3 | 2.5 | 34.9 | 1.2 | 3.3 | 3.9 | 8.42 | 1.15 |
| Silver$_{\text{Dissolved}}$ Result (µg/L) | 0.8 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 0.15 |
| Result > SWQS? | No | No | No | No | No | No | No | No | No | No |
| *E.coli* Result (MPN) | 52 | 4,106 | 11,199 | 3,873 | 181 | 7,270 | 450 | 551 | 6130 | 3080 |
| Result>SWQS?(575 MPN) | No | Yes | Yes | Yes | No | Yes | No | No | Yes | Yes |
| pH Result (SU) | 7.8 | 8.0 | 7.6 | 6.8 | 7.5 | 6.8 | 8.4 | 6.4 | 8.7 | 7.9 |
| Results > SWQS (6.5-9.0) | No | No | No | No | No | No | No | Yes | No | No |

* Concentrations are in micrograms per liter, unless noted otherwise.

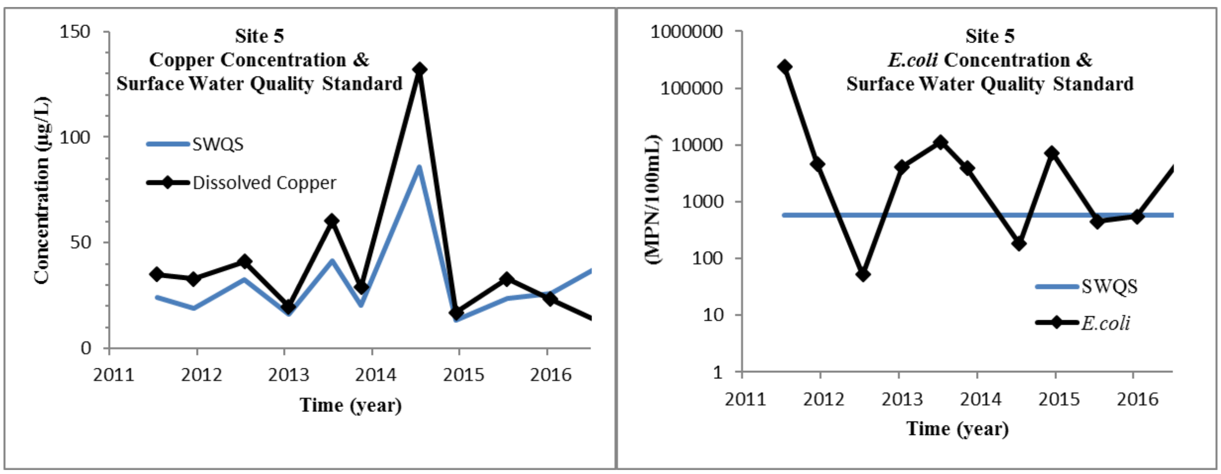



**Figure 7. Comparison of Copper and *E. coli* Concentration to SWQS at Site #5**

The overall trend for water quality at Site #5, industrial land use, shows that dissolved copper has consistently been above the SWQS, with the exception of the 01/04/16 and 08/09/16 samples. The summer 2014 sample was anomalously high for metals and Total Suspended Solids. Summer concentrations are relatively higher than winter samples indicating seasonal influences. *E. coli* concentrations have been higher than the SWQS seven times in five years. One pH has been outside the SWQS.

The businesses in this watershed use guard dogs to maintain security. The outreach program developed for Site #2 will be enhanced to address pet wastes from guard dogs at businesses.

A literature review of copper concentration in runoff provides a framework to compare ambient copper concentrations with those in urban runoff in Pima County and mining district streams. The ambient surface water quality is established by stream data from Cienega Creek, Davidson Canyon, and Harshaw Creek. Near the confluence of Cienega Creek and Davidson Canyon, the concentration of total copper ranged between 1.0 to 2.2 μg/L from stream samples collected between September 2008 and February 2012 (PAG, 2013). The natural background level of dissolved copper in the Harshaw Creek ranged between 2.01 and 3.59 μg/L (ADEQ, 2003). The runoff data from the five monitor sites shows the dissolved copper concentrations range from 3.3 to 132 μg/L since the new permit became effective in July 2011. During the previous permit the total copper concentrations ranged between 1 and 260 μg/L. The few concentrations higher than 100 μg/L were associated with samples having a Total Suspended Solids concentration greater than 230 mg/L (PDEQ, 2011).

Additional data from mining areas in southern Arizona show the maximum dissolved copper concentration was 130 μg/L in the ASARCO Mission Complex (EPA, 2008) and was frequently above 250 μg/L in the mining districts in Alum Gulch and Humboldt Canyon (ADEQ, 2012). This analysis shows ambient dissolved copper concentrations range from 1.0 to 4 μg/L, while urban runoff ranges between 1 to 132 μg/L and mining areas are typically higher than 130 μg/L.

Sources of copper in stormwater include vehicle brake pads; architectural copper; copper pesticides in landscaping, wood preservatives and pool, spa, and fountain algaecides; industrial copper use; deposition of air-borne copper emissions from fossil fuel combustion and industrial facilities; and vehicle fluid leaks and dumping (TDC Environmental, 2006). The Brake Pad Partnership showed brakes account for 35 to 60 percent of copper in California's urban watershed runoff (Copper Development Association, 2013). A study of runoff from copper roofs and gutters shows first flush concentrations immediately downstream from the roof have a mean greater than 1340 ug/L for both total and dissolved copper (Michels, et al, 2001). This study noted roofs with the oxidation by-product brochantite release about half as much as copper roofs exposed to air.

The outreach program was once intended to include vehicle maintenance for brake pads as well as using pads with lower concentrations of copper. Given the brake manufacturing industry has decided to phase out the use of copper in brake pads in fifteen years, the outreach program will not be providing education materials regarding brake pads.

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## 11. Estimate of Annual Pollutant Load

### A. Method of estimating Pollutant Load

Estimates of the annual pollutant loadings were calculated using the “Simple Method” (SMRC, 2012). The Simple Method uses analytical water quality data, precipitation and percent impervious cover to estimate pollutant loadings in urban areas. The data collected at five monitor points represent five land uses within the MS4, namely low density residential, medium density residential, high density residential, commercial, and industrial. Pima County calculated the annual pollutant load estimate for each Monitor Site and each land use category within the permit area.

The following sections describe the methods Pima County used to calculate statistics and estimate the seasonal pollutant load. The results are presented and evaluated.

The amount of pollutants are estimated by multiplying the volume of water that runs off from a precipitation event and the concentration of the pollutants. Runoff is estimated as a fraction of the precipitation based on the type of land use permeability. Pollutant concentration is measured by collecting the stormwater samples after a representative precipitation event occurs. The pollutant load equation is as follows:

$$L = P * P_f * R_c * C * A * 0.0446$$

*where*

$L$ = annual pollutant load (tons)
$P$ = annual precipitation (inches)
$P_f$ = annual precipitation fraction producing runoff (given a value of 0.9)
$R_c$ = runoff coefficient (unitless)
$C$ = concentration (event mean) of a pollutant (mg/L)
$A$ = area of catchment draining to sample point (acres)
0.0446 = correction factor for measurement units

The parameters in the equation above are defined as follows:

- ***Pollutant load (L)*** is the estimate of total amount of a specific pollutant discharged per time period for the drainage area of each monitor site. The time period employed for this report was both annual and seasonal (winter and summer).

- ***Annual Precipitation***[1] ***(P)*** is the total inches of rainfall occurring during the reporting period July 1, 2016 to June 30, 2017. Analysis of available rainfall data for the Tucson metropolitan area shows approximately 52% (or 13.17 cm) of the annual rainfall occurs

[1] The use of average rainfall data for pollutant load calculations de-emphasizes the effect of spatial rainfall variability. This, in turn, makes aggregation of pollutant load estimates less reliable.

during the summer season and 48% (or 12.16 cm) of the annual rainfall occurs during the winter season.

- ***Annual Precipitation fraction***[2] ***($P_f$)*** is an adjustment factor for the number of storm events producing measurable runoff. A typical value for this fraction is 0.9 (USEPA, 1992).

- ***Runoff coefficient (Rc)*** is a relative measure of imperviousness, or the percentage of rainfall that becomes surface runoff (EPA, 1992). The following equation was used to calculate "*R*" values for each representative land use category associated with an outfall (EPA, 1992):

$$R = 0.05 + 0.9*Ia$$

  where *Ia* is the percent impervious area within the drainage area of each monitor site.

- ***Event-mean concentration***[3] ***(C)*** of a pollutant is the flow-weighted average of the pollutant concentration for the summer monsoon sample and the winter rain sample.

$$C = Fs/(Fs+Fw)*Cs + Fw/(Fs+Fw)*Cw$$

  *where*
  Fs = Flow during summer sample
  Fw = Flow during winter sample
  Cs = Concentration of summer sample
  Cw = Concentration of winter sample

- ***Area (A)*** is the area of the catchment draining to the sample point.

Parameters specific to each catchment, namely *Ia*, *Rc* and *A* were previously derived during preparation of the Sample and Analysis Plan (Pima County, 2012).

The "Simple Method" transforms a complex set of hydrological processes into an empirical equation. This equation is used to provide reasonable estimates of pollutant loads in storm water runoff (Ohrel, 2000). At the same time, by simplifying these processes, the level of uncertainty increases when attempting to distinguish the influences from runoff characteristics such as rainfall intensity, rainfall duration, runoff, first-flush effects concentrating pollutants, land use, and antecedent weather conditions.

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[2] A measured value is unavailable for the Sonoran Desert region so EPA's standard value (EPA, 1992) was employed.

[3] Analytical results for the monitored parameters ranged from one to five data points per pollutant. These limited data were used to calculate event-mean concentration ("emc") values. As a result, pollutant load estimates may not be representative of the rainfall events, pollutants, outfalls, seasons, and/or land use categories.

Specifically, Schiff (1996) states that "[A]ssumptions based upon extrapolations to un-sampled storms introduces uncertainty because of flow-related variability." For example, he notes the importance of capturing data from representative storm events. Collecting data from the largest storm of the year may result in disproportionately large event mean concentrations and would potentially overestimate un-sampled, smaller storms during the time period of interest. Similarly, capturing smaller storm events might underestimate the actual discharge for a given reporting period. Schiff asserts that "[T]he magnitude of bias associated with un-sampled storm events cannot be assessed" because monitoring programs do not often have sufficient temporal sampling procedures to adequately address the issue. Such is the case for Pima County's monitoring program. This is due, in part, to the fact that the County's program is not designed to measure annual pollutant loads at a specific site, or regional pollutant loads for a specific land use.

According to Dixon and Chiswell (1996), most monitoring programs are instead designed to address regulatory compliance, identify sources of pollutants, and evaluate management actions such as the effectiveness of best management practices. Pima County's program focuses on just such information needs.

Schiff identifies the need to better understand the relationships of water quality to antecedent dry periods and rainfall intensity or duration (pollutant transport). Concepts such as "first flush" and "seasonal flushing" are examples of interactions that have yet to be adequately quantified. The following subsections provide seasonal pollutant load estimates for Pima County's Monitoring sites and identified land use categories within the permit area.

### B. Results of Calculations

Analytical results, annual rainfall, drainage area and imperviousness were used to calculate pollutant loads for the five monitor sites were tabulated (Table 18). No loadings were calculated for silver and thallium as the concentrations were below the detection limits.

### C. Evaluation of Results

The pollutant load estimates[4] should be used for comparative purposes only. For the reasons discussed in subsection 11.A, these values cannot be interpreted as representing actual pollutant loads for the watersheds within the permit area. Furthermore, it would be equally inappropriate to extrapolate these estimates in order to predict potential impacts to receiving water bodies.

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[4] The term "pollutant load estimate" does not have the same meaning as the term "pollutant load." The Simple Method should only be used when *estimates* are desired and should not be used when *load* values are required (Ohrel, 2000).

**Table 18. Pollutant Load Estimates for Monitor Sites**

| | Site #1 Low Density Residential | | Site #2 Med Density Residential | | Site #3 High Density Residential | | Site #4 Commercial | | Site #5 Industrial | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Annual Precipitation (in)** | **9.3** | | **10.5** | | **9.3** | | **9.3** | | **14.2** | |
| **Area (acres)** | **3.0** | | **12.4** | | **2.3** | | **59** | | **56.9** | |
| **Impervious (%)** | **25%** | | **65%** | | **85%** | | **95%** | | **70%** | |
| **Parameter** | **Flow-weighted Concen-tration** | **Load (tons)** | **Flow-weighted Concen-tration** | **Load (tons)** | **Flow-weighted Concen-tration** | **Load (tons)** | **Flow-weighted Concen-tration** | **Load (tons)** | **Flow-weighted Concen-tration** | **Load (tons)** |
| Conventional Parameters | | | | | | | | | | |
| BOD (mg/L) | 3.5 | 1 | 12.0 | 47 | 10.3 | 8 | 46.8 | 1007 | 5.3 | 127 |
| COD (mg/L) | 84.0 | 28 | 94.4 | 368 | 83.0 | 63 | 239.0 | 5143 | 91.1 | 2189 |
| TDS (mg/L) | 326.0 | 108 | 81.0 | 315 | 60.0 | 45 | 80.0 | 1721 | 100.4 | 2415 |
| TSS (mg/L) | 286.0 | 95 | 65.0 | 253 | 9.0 | 7 | 25.0 | 538 | 464.4 | 11166 |
| Nutrients | | | | | | | | | | |
| TN (mg/L) | 1.7 | 0.6 | 4.7 | 18.1 | 1.7 | 1.3 | 1.3 | 26.9 | 3.2 | 76.9 |
| NH4 (mg/L) | 0.21 | 0.1 | 0.86 | 3.3 | 0.68 | 0.5 | 0.28 | 6.0 | 0.35 | 8.4 |
| TKN (mg/L) | 0.00 | 0.0 | 1.3 | 5.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 8.4 |
| TP (mg/L) | 0.46 | 0.2 | 0.5 | 1.8 | 0.2 | 0.1 | 0.1 | 3.0 | 0.6 | 14.4 |
| Total Metals | | | | | | | | | | |
| Sb (µg/L) | 0.00 | 0.00 | 0.45 | 0.00 | 0.46 | 0.00 | 0.98 | 0.02 | 0.64 | 0.02 |
| As (µg/L) | 4.35 | 0.00 | 1.57 | 0.01 | 0.65 | 0.00 | 0.67 | 0.01 | 5.35 | 0.13 |
| Ba (µg/L) | 175.00 | 0.06 | 41.97 | 0.16 | 12.90 | 0.01 | 25.50 | 0.55 | 164.07 | 3.94 |
| Be (µg/L) | 1.41 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cd (µg/L) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cr (µg/L) | 5.29 | 0.00 | 1.86 | 0.01 | 0.56 | 0.00 | 1.00 | 0.02 | 6.93 | 0.17 |
| Cu (µg/L) | 2.80 | 0.00 | 17.26 | 0.07 | 8.08 | 0.01 | 6.98 | 0.15 | 12.19 | 0.29 |
| Pb (µg/L) | 0.00 | 0.00 | 1.32 | 0.01 | 0.00 | 0.00 | 6.29 | 0.14 | 0.48 | 0.01 |
| Hg (µg/L) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Ni (µg/L) | 0.52 | 0.00 | 1.10 | 0.00 | 0.87 | 0.00 | 0.54 | 0.01 | 0.65 | 0.02 |
| Se (µg/L) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.46 | 0.08 |
| Ag (µg/L) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Th (µg/L) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Zn (µg/L) | 0.88 | 0.00 | 41.35 | 0.16 | 63.80 | 0.05 | 26.90 | 0.58 | 3.38 | 0.08 |
| Total | | 233 | | 1,012 | | 125 | | 8,447 | | 16,011 |

Relative comparisons can be made between outfalls and parameters. The conventional parameters contribute to 99% or greater of the pollutant load for each catchment. TSS is the largest contributor to pollutant load in the low density residential and industrial watersheds. TDS is the largest contributor to pollutant load in the medium density residential and commercial watersheds. COD is the largest contributor to pollutant load in the high density residential watershed. Nutrients contribute less than 3% of the pollutant load and metals contribute less than 0.05%. The low contribution of metals is important due to the higher toxicity levels.

### D. Limitations of Pollutant Load Estimation Results

The “Simple Method” is an arithmetic equation based on empirical relationships for complex hydrological processes and average pollutant concentrations in storm water runoff. This method can be used to obtain quick and reasonable storm water pollutant load estimates (Ohrel, 2000), but should only be used for planning-level calculations or identifying data-collection needs.

Numerical results presented in Table 18 are pollutant load estimates. Employing event mean concentrations derived from first flush data may result in calculated pollutant load estimates that are higher that the remaining rainfall events.

This type of analysis can be misleading when evaluating potential environmental effects from non-point sources (Silverman et al, 1986). Rainfall events in southern Arizona are sporadic, with loads concentrated into limited periods of time during and after precipitation. Specifically, flow-related variability may introduce uncertainties when extrapolating from sampled to un-sampled rainfall events. Schiff (1996) uses the example of overestimation for data collected from large storms, versus underestimation for data collected from smaller storm events. In the absence of a sufficient temporal sampling program, the error level associated with un-sampled storm events can be substantial, especially when the un-sampled storm events follow the first flush event.

Estimation errors may also be introduced when using average seasonal precipitation values to calculate pollutant loads. For example, smaller runoff volumes (due to low intensity or short duration rainfall events accompanied by extended antecedent dry periods) may produce disproportionately higher pollutant concentrations per sampling event.

Alternatively, dilution from large volume runoffs (accompanied by shorter antecedent dry periods) may produce lower pollutant concentrations per sampling event. Given that the average seasonal precipitation values might not be representative of a specific storm, calculated values for the estimated pollutant loads might in turn be questionable.

Additionally, the monitoring program was not specifically designed to measure pollutant loads. As a result, phenomena such as pollutant build-up, first flush of pollutants, rainfall intensity, duration, and seasonal flushing of pollutants are not adequately addressed by the County’s current monitoring program. These phenomena are an unavoidable consequence of the weather conditions and climatology of southern Arizona.

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## 12. Annual Expenditures

The itemized budget presents total expenditures for activities occurring within all of Pima County (Table 19) for the AZPDES permit.

**Table 19. Stormwater Program Costs for Fiscal Year 15/16 & Budget for Fiscal Year 16/17**

| Activity | Fiscal Year 2015/2016 Actual Costs | Fiscal Year 2015/2016 Department Subtotal | Fiscal Year 2016/2017 Budgeted Costs | Fiscal Year 2016/2017 Department Subtotal |
|---|---|---|---|---|
| **Environmental Quality** | | $280,000 | | $280,000 |
| AZPDES Stormwater | $280,000 | | $280,000 | |
| **Regional Flood Control District** | | $5,276,167 | | $6,852,052 |
| Floodplain Permitting [(2)] | 1,527,118 | | 1,585,639 | |
| Development Review | - | | - | |
| Engineering Support [(2)] | 823,356 | | 1,266,996 | |
| Long Range Planning | - | | - | |
| Basin & Drainage Studies [(3)] | - | | - | |
| FEMA/Mappings [(3)] | 815,331 | | 1,323,451 | |
| Drainage Way Maintenance | 2,110,362 | | 2,675,966 | |
| **Transportation** | | 11,200,594 | | 10,889,297 |
| Environmental Planning & Compliance | 132,580 | | 191,526 | |
| Maintenance Administration | 988,735 | | 1,052,307 | |
| Maintenance District # 1 | 1,432,312 | | 1,765,469 | |
| Maintenance District # 4 | 1,503,907 | | 1,720,573 | |
| Maintenance District # 5 | 2,039,724 | | 1,448,236 | |
| Maintenance Support | 2,190,881 | | 2,203,728 | |
| Contract Maintenance Dist. #2 | 1,249,824 | | 1,151,530 | |
| Contract Maintenance Dist. #3 | 1,662,631 | | 1,355,928 | |
| **Development Services** | | 2,678,267 | | 2,925,172 |
| Regional Comprehensive Plan | - | | - | |
| Landscaping Review | - | | - | |
| Development Review [(1)] | 2,687,267 | | 2,925,172 | |
| Rezoning | - | | - | |
| **Regional Wastewater Reclamation** | | 15,000 | | 15,000 |
| Ina Road Laboratory Analysis | 15,000 | | 15,000 | |
| **Stormwater Program Total** | **$19,459,028** | **$19,459,028** | **$20,961,521** | **$20,961,521** |

Landscaping expenses incorporated.
(1) Plan Reviews and Permit issuance activities are now included in Development Review.
(2) FEMA/Mapping, Basin and Drainage Studies are now budgeted within Planning and Development.

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