CITY OF Salem AT YOUR SERVICE
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October 27, 2016

Nancy Gramlich
Middle Willamette Basin Coordinator
Oregon Department of Environmental Quality
4026 Fairview Industrial Drive SE
Salem OR 97302

SUBJECT: **City of Salem Total Maximum Daily Load Implementation Plan Progress Report FY 2015-16**

Dear Ms. Gramlich:

The enclosed Total Maximum Daily Load (TMDL) Implementation Plan progress report describes activities completed by the City of Salem from July 1, 2015, through June 20, 2016. As a Designated Management Agency, the City of Salem is pleased to submit this progress report per the requirements listed in *Oregon Administrative Rule*, Chapter 340, Division 042. We trust you will find this report sufficiently demonstrates the City of Salem is fulfilling its responsibilities associated with the Willamette Basin and Molalla/Pudding Subbasin TMDLs.

Please contact Heather Dimke, Stormwater Management Analyst, at 503-588-6063, extension 7734, if you have any questions or request additional information.

Sincerely,

Mark Becktel, AICP
Operations Division Manager

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Enclosure: City of Salem TMDL Implementation Plan Progress Report FY 2015-16
cc: Peter Fernandez, PE, Public Works Director
Nitin Joshi, Environmental and Regulatory Affairs Manager
Keith Bondaug-Winn, Stormwater Quality Supervisor
File: Chrono; Regulatory

TOTAL MAXIMUM DAILY LOAD (TMDL) IMPLEMENTATION PLAN PROGRESS REPORT: FY 2015-2016

For the

City of Salem

October 28, 2016

City of Salem, Oregon
Public Works Department
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1 INTRODUCTION

This report summarizes the progress of Total Maximum Daily Load (TMDL) associated implementation activities conducted by the City of Salem (the City) in response to the Willamette Basin and Molalla-Pudding Subbasin TMDLs and as described in the City's TMDL Implementation Plan, which was approved by the State of Oregon Department of Environmental Quality (DEQ) in July 2010. This is the City of Salem's sixth annual TMDL progress report, detailing implementation activities for the fiscal year beginning July 1, 2015, and ending June 30, 2016 (FY 2015-16).

2 BACKGROUND AND REPORTING REQUIREMENTS

On September 21, 2006, DEQ issued the Willamette Basin TMDL as an Order, and submitted the TMDL to the Environmental Protection Agency (EPA) for approval. In late December 2008, DEQ similarly issued the Molalla-Pudding Subbasin TMDL as an Order, and subsequently submitted that TMDL to the EPA for approval. DEQ developed a Water Quality Management Plan (WQMP) to describe the overall framework for implementing the TMDLs for both basins. The WQMP includes a description of activities, programs, legal authorities, and other measures for which DEQ and other designated management agencies (DMAs) have regulatory responsibility. TMDL implementation activities would be carried out under existing regulatory authorities, programs, and water quality restoration plans, as well as by TMDL Implementation Plans that certain DMAs would develop to fulfill requirements of the TMDL.

As a DMA, the City of Salem was required to develop a TMDL Implementation Plan for review and approval by DEQ, and to subsequently implement activities associated with the approved plan. On January 22, 2010, City and DEQ staff met regarding the inter-relationship between the City's existing National Pollutant Discharge Elimination System (NPDES) permits, the Willamette Basin and Molalla-Pudding Subbasin TMDL programs, and associated annual reports. It was agreed that November 1st was an acceptable date for the City's submission of its TMDL Implementation Plan Progress Report, and that report would encompass the City's responsibilities under both the Willamette and Molalla-Pudding TMDLs. However, because of the differing effective dates of the two TMDLs (which in turn trigger subsequent reporting requirements), the following specific reporting requirements were agreed upon:

- The TMDL Progress Report (for both TMDLs) will be submitted to the DEQ by November 1st of each year, coinciding with the City's Municipal Separate Storm Sewer System (MS4) Permit Annual Report.

- The MS4 Permit Annual Report will be submitted to DEQ's Portland Office, with a copy being provided to DEQ's Salem Office as an exhibit or appendix to the TMDL Progress Report.

- The first Progress Report for the Willamette Basin TMDL will be submitted by **November 1, 2010**. It will encompass the time period from August 5, 2009 (date of DEQ's approval of the City's Implementation Plan), through June 30, 2010 (end of fiscal year).

- The first Progress Report for the Molalla-Pudding Subbasin TMDL will be submitted by **November 1, 2011**, and encompass the time period beginning with the date of DEQ's approval of the City's

Implementation Plan through June 30, 2011. It will also encompass the City's activities relative to the Willamette TMDL and serve as the City's second Progress Report for that TMDL.

The City's TMDL Implementation Plan includes Best Management Practice (BMP) activities that are related to the NPDES MS4 Permit and Stormwater Management Plan (SWMP), the NPDES Wastewater Discharge Permit, and additional non-point source BMPs. The non-point source BMPs were identified to supplement activities associated with the compliance of the DEQ-issued NPDES permits.

The BMP activities are listed in the TMDL Implementation Plan BMP Progress Matrix (provided in Appendix A). A column labeled "BMP Source" identifies the origin of the activity. The MS4 SWMP encompasses a significant component of the City's TMDL strategies, therefore a summary of MS4 SWMP activities completed in FY 2015-16 can be found in the MS4 Annual Report (Appendix C).

The TMDL Implementation Plan BMP Progress Matrix was updated in FY 2011-12 to reflect appropriately the BMP activities currently required under the renewed MS4 Permit and 2010 SWMP.

2.1 5TH YEAR REVIEW AND 2016 IMPLEMENTATION PLAN UPDATE

On January 27, 2016, the City submitted to the DEQ a 5th Year Review Template and Matrix, which identified continued progress on the strategies identified in the City's Willamette Basin and Molalla/Pudding Subbasin TMDL Implementation Plan (2010). The 5th Year Review Template and Matrix further identified options for improved strategies during the next 5 year TMDL cycle. As a result of this review, an updated TMDL Implementation Plan for the City of Salem was submitted to the DEQ on March 31, 2016. The matrix of updated strategies (Temperature Reduction Strategies) has been included as Appendix B. of this report. The City anticipates reporting upon the strategies identified in Appendix B. in the 2017 TMDL Annual Report.

3 LOCAL AREA TMDL WATER BODIES

3.1 WILLAMETTE RIVER TMDL

The Willamette Basin TMDL pollutants of concern are elevated summer temperatures, elevated bacteria levels, and mercury. This TMDL encompasses the Willamette River and tributaries within the City of Salem's jurisdiction.

3.2 MOLALLA-PUDDING TMDL

The Molalla-Pudding Subbasin TMDL pollutants of concern are elevated summer temperatures, elevated bacteria levels, iron, and DDT. The Molalla-Pudding Subbasin encompasses an eastern portion of Salem's wastewater and stormwater service area. All wastewater collected from within the eastern City limits and adjacent service areas within the unincorporated East Salem Service District (within Salem's Urban Growth Boundary but outside the City limits) is collected and transported to the Willow Lake Water Pollution Control Facility (WLWPCF) for treatment and discharge to the Willamette River. The City's stormwater system is intertwined with the stormwater system owned and operated by Marion County (through the East Salem Service District). The collected (and in many cases co-mingled) stormwater runoff in much of East Salem is ultimately discharged at several locations into the Little Pudding River drainage system.

4 RELEVANT WATER QUALITY PERMITS AND PROGRAMS

City of Salem activities associated with maintaining compliance with four (4) individual DEQ-issued NPDES water quality permits contribute, in part, to maintaining compliance with the City's DEQ-approved TMDL Implementation Plan. These activities are summarized in the sub-sections that follow, in context of the following NPDES permits:

- City of Salem Willow Lake Water Pollution Control Facility (WLWPCF) National Pollutant Discharge Elimination System (NPDES) Wastewater Discharge Permit (Permit No. 101145, File No. 78140)
- City of Salem NPDES Municipal Separate Storm Sewer System (MS4) Discharge Permit (Permit No. 101513, File No. 108919)
- City of Salem 1200-CA Permit (File No. 109744) for Erosion Prevention and Sediment Control (EPSC) on All City Land Disturbing Construction Projects
- City of Salem 1200-Z Industrial Stormwater Permit for McNary Field Airport Operations (File No. 106923)

4.1 NPDES WASTEWATER DISCHARGE PERMIT

The City of Salem submitted its NPDES Wastewater Discharge Permit Annual Report for FY 2015-16 to the DEQ on August 3, 2016. The submittal consisted of two separate reports as required by the City's NPDES Permit. These reports included:

1. Inflow Removal Program Report
2. Salem's Management, Operation, and Maintenance (sMOM) Program Report

During the reporting period of FY 2015-16, the City continued to comply with requirements of its NPDES Wastewater Discharge Permit, and as a result, in part, has satisfied requirements of its TMDL Implementation Plan.

4.2 NPDES MS4 PERMIT

The MS4 Permit and associated Stormwater Management Plan (SWMP) authorize discharges from the municipal stormwater system into waters of the state. The City's current NPDES MS4 Permit was issued on December 30, 2010 and the approved 2010 SWMP has been incorporated into this renewed MS4 Permit by reference and is now reflected in the TMDL Implementation Plan BMP Progress Matrix (Appendix A). The MS4 Permit was scheduled to expire on December 29, 2015. An MS4 Permit Renewal application (which includes proposed revisions to the City's 2010 SWMP) was submitted to the DEQ on December 29, 2015. In a subsequent letter from the DEQ (dated March 1, 2016), the City received confirmation that the current permit will not expire until final action regarding renewal is taken by the DEQ.

The Environmental Protection Agency (EPA) conducted an inspection of the City's MS4 and SWMP from July 31, 2012, through August 2, 2012, to assess compliance with the NPDES MS4 Permit. The results of the audit were released during the FY 2013-14 reporting period, and indicated that the City was deficient in meeting its construction site runoff control requirements. An EPA Administrative Compliance Order by Consent (Consent Order) was issued for the City of Salem to: 1) develop and document its construction site plan review procedures; 2) develop and document inspection procedures for construction sites; and 3) submit a separate report of all construction site inspections annually through the expiration of the current MS4 permit. The City remedied the deficiencies in its construction site erosion control program within 90 days of the Consent Order, submitted its first annual construction site inspection report on November 1, 2013, and continues to meet the requirements of the NPDES MS4 Permit and the EPA Consent Order.

As reported in the City's NPDES MS4 Annual Report (FY 2015-16), the City continues to implement activities identified in the 2010 SWMP. Pending DEQ approval of the report, the City believes itself in continued compliance with MS4 Permit requirements, and as a result, continues to satisfy, in part, the requirements of its TMDL Implementation Plan.

4.3 NPDES 1200-CA PERMIT

The City possesses an NPDES 1200-CA Permit that addresses Erosion Prevention and Sediment Control (EPSC) measures for all land disturbing construction projects conducted and owned by the City. By minimizing the potential for sediment-laden runoff from construction sites, pollutants associated with sediment (principally metals, but also bacteria, iron, and DDT) are also minimized. As a result, EPSC requirements are incorporated into construction drawings and specifications, the 1200-CA Permit is included in City contract documents, and EPSC measures are an agenda item at all preconstruction conferences.

The City initiated its local EPSC program in 2001 with the adoption of Salem Revised Code (SRC) Chapter 75, *Erosion Prevention and Sediment Control*. Amendments to SRC Chapter 75 were initiated in FY 2012-13 and completed in FY 2013-14 to ensure consistency with MS4 Permit requirements. The EPSC program continues to be managed adaptively and proactively to provide increased education and training as well as enforcement. During this reporting period, EPSC training was provided to regional area contractors, design consultants, and municipal employees by City and local agency staff at the "5th Annual Mid-Willamette Valley Erosion Control and Stormwater Management Summit" on January 26, 2016. There were 102 participants at this event. In addition, staff facilitated and participated in a Certified Erosion & Sediment Control Lead (CESCL) certification training that was held at City Operations on May 24 and 26, 2016. The City continued to utilize a dedicated EPSC inspector during this fiscal year to ensure compliance at all 1200-CA permitted projects.

During the reporting period of FY 2015-16, the City continued to comply with requirements of its 1200-CA Permit, and as a result, in part, has satisfied requirements of its TMDL Implementation Plan.

4.4 NPDES 1200-Z PERMIT

Effective July 1, 2012, the DEQ assigned renewed coverage of the City of Salem's National Pollutant Discharge Elimination System (NPDES) 1200-Z Stormwater Permit for the Salem Municipal Airport (McNary Field). This permit, which expires on June 30, 2017, requires that the airport facility implements and updates as necessary, a DEQ-approved Stormwater Pollution Control Plan. This permit also requires monthly facility inspections as well as the routine collection of stormwater outfall samples.

During the FY 2015-16 reporting period, Public Works staff were not required to collect stormwater outfall samples but continued to perform the monthly facility inspections required under the 1200-Z Permit. In addition, the Airport continued to maintain a proactive geese control and pocket gopher eradication program which provides a secondary stormwater benefit of reducing the impact that wildlife may be having on bacteria levels in the Airport's stormwater runoff.

During the reporting period of FY 2015-16, the City continued to comply with requirements of its NPDES 1200-Z Permit, and as a result, in part, has satisfied requirements of its TMDL Implementation Plan.

5 HIGHLIGHTS OF BACTERIA MANAGEMENT STRATEGIES

5.1 WASTEWATER TREATMENT FACILITIES

The Willow Lake Water Pollution Control Facility (WLWPCF) has continued to comply with NPDES Wastewater Permit effluent standards for bacteria. The City continues to invest in improvements at the WLWPCF, the North River Road Wet Weather Treatment Facility (NRRWWTF), and various collection system/pump station improvements as part of its efforts to reduce SSOs and to comply with DEQ's water quality bacteria standard. The total treatment capacity of the wastewater treatment system is 205 MGD. The following improvement projects were identified in the Adopted CIP Plan for the 2015-16 fiscal year:

- WLWPCF – Cogeneration Facility Upgrade ($150,000)
- WLWPCF – DCS Remote I/O Module Upgrades ($200,000)
- WLWPCF – Gravity Thickener Rehabilitation ($1,130,000)

Future improvement projects will be identified in the 5-year Capital Improvement Plan and budgeted for annually. A copy of the Adopted CIP Plan has been placed on the City's website at the following location: http://www.cityofsalem.net/Departments/AdministrativeServices/Finance/capital-improvememts-program-cip/Pages/default.aspx.

5.2 PUBLIC EDUCATION AND OUTREACH

Outreach activities have been identified in the City's 2010 SWMP and TMDL Implementation Plan BMP Progress Matrix (Appendix A) that enhance the City's comprehensive effort to improve local water quality through public education. During FY 2012-13, a 5-year stormwater outreach plan was completed to further identify options for addressing targeted pollutants of concern (including TMDL pollutants) and appropriate audiences using a variety of tools and resources. Staff have continued to operate under the guidance of this plan, with continued emphasis on targeting E. coli. Activities conducted during this reporting period are highlighted in the following section as well as in Appendix A and C.

5.2.1 MS4 PET WASTE CAMPAIGN

The City of Salem, City of Keizer, and Marion County continued efforts to collaborate on and promote community involvement in the Capital Canine Club (CCC) in FY 2015-16. The CCC is based on social marketing principles for promoting a desired public behavior (i.e., pet waste pick up). When CCC members pledge to pick up after their pets, the City agrees to post their pet's photo on the CCC webpage and provides a free clip-on leash mutt mitt dispenser. Outreach efforts promoting the CCC generated 114 new members this year.

On October 3, 2015, the City once again partnered with Marion County and the City of Keizer to host "Howl-a-Palooza," a community resource event for dog owners that includes pet waste information and the opportunity to become a CCC member. Approximately 350 people attended this event. In addition, 300 mutt mitt dispensers were handed out to local partner groups in order to further promote the importance of cleaning up pet waste. Additional details regarding outreach activities can be found in the MS4 Annual Report (Appendix C).

5.3 RETROFIT PLAN & PROJECT IDENTIFICATION

Schedule A.6 of the MS4 Permit requires that the City complete a retrofit plan as well as identify and construct a retrofit project that targets the reduction of bacteria. A total of $180,000 was budgeted for the design and construction of this facility. Through desktop and field analyses, City staff evaluated multiple retrofit sites, and decided to pursue a retrofit to an existing flow-through detention basin in Eola Ridge Park NW to a stormwater treatment train employing a Contech CDS Hydrodynamic Separator and a subsurface flow treatment wetland. This stormwater retrofit project is one component of a larger Parks Capital Improvement Project. A letter identifying this as the City's retrofit project was sent to the DEQ on October 28, 2013. Project construction was completed during this reporting period (October 30, 2015).

As part of the identification and selection process for the aforementioned retrofit project, City staff developed desktop and field analysis methods for evaluating future potential stormwater retrofit sites. This process was incorporated into the City's Stormwater Retrofit Plan (submitted to DEQ on October 30, 2014), and will continue to guide future project prioritization. The implementation of Low Impact Development (LID) stormwater retrofits can result in reductions in stormwater volume, bacteria concentrations, total suspended solids (TSS), metals (such as iron and mercury), and DDT in areas lacking existing stormwater treatment.

6 HIGHLIGHTS OF MERCURY MANAGEMENT STRATEGIES

6.1 WASTEWATER MERCURY MANAGEMENT STRATEGIES

Through implementation of SRC Chapter 74 *Pretreatment Provisions*, the City established local discharge limits for mercury to reduce its introduction to the wastewater collection system and WLWPCF. Compliance with discharge limits is achieved through the City's Industrial Wastewater Pretreatment Program, which consists of regular inspections of both permitted and non-permitted facilities. In addition, the WLWPCF collects monthly influent and effluent mercury concentration data that is submitted to DEQ as part of the NPDES Wastewater Annual Report.

6.2 STORMWATER MANAGEMENT DESIGN STANDARDS

During FY 2013-14, revisions to the Stormwater Management Design Standards (Design Standards) and a new stand-alone stormwater chapter (Chapter 71) for the Salem Revised Code (SRC) were completed. The revised Design Standards now include requirements for structural stormwater quality facilities (e.g., stormwater planters, rain gardens, and vegetated filter strips), as well as measures to further address stormwater quantity and source controls. Under these new requirements, single family projects and commercial development projects that generate 1,300 and 10,000 square feet, respectively, of new or replaced impervious surface area must now address the increased water quantity and quality concerns and employ green stormwater infrastructure to the maximum extent feasible. Through infiltration or filtration mechanisms, these treatment facilities can result in significant reductions in flow, bacteria, total suspended solids (TSS), and heavy metals such as mercury. The revised Design Standards and new SRC Chapter 71 became effective on January 1, 2014, and apply citywide to both public and private development and redevelopment projects. The Design Standards will continue to be updated as new information becomes available. There were no changes made during the FY 2015-16 reporting year.

6.3 AMALGAM SEPARATORS

Environmental Services staff continued to survey dental offices in FY 2013-14 to certify compliance with Oregon Senate Bill 704. Senate Bill 704 requires new dental offices to install amalgam separators and comply with BMPs recommended by the Oregon Dental Association (ODA); and it requires established offices operating in accordance with the BMPs to have installed amalgam separators by January 1, 2011. Although the City has no responsibility for regulatory oversight under SB 704, Environmental Services continues to track new dentists through the building permit process and verify amalgam separator installations and good mercury housekeeping practices in order to limit discharges of mercury to the WLWPCF.

<u>Accomplishments during the life of the program:</u>

- 261 dentists/offices surveyed
- 148 amalgam separator installations verified
- 54 do not use amalgam due to the nature of their practice

Accomplishments during fiscal year 2015-16:

- 2 new dentists/offices identified through the plans review process
- 0 new surveys returned
- 2 surveys will be sent upon completion of the project

6.4 EROSION CONTROL OUTREACH

According to DEQ's analysis in the Willamette Basin TMDL, the two principal contributors of mercury to the Willamette River are surface soil erosion (50.2 percent) and air deposition either directly through the air or through runoff (43.6 percent). Effective implementation of the City's erosion prevention program follows requirements of its MS4 Permit and 1200-CA Permit. As mentioned in Section 4.3, the City continues to provide training to City staff, local consultants and developers, individual homebuilders, and subcontractors. As part of the Mid-Willamette Outreach Group (M-WOG), Salem staff continued to collaborate with the City of Keizer, City of Albany, City of Corvallis, Marion County, and the Marion Soil and Water Conservation District to coordinate the annual "Mid-Valley Erosion Control and Stormwater Management Summit". This year's event was held on January 26, 2016, at Keizer City Hall.

6.5 MERCURY TAKE-BACK PROGRAMS

The City does not currently administer its own public take back program for mercury, and thus has focused its energy collaborating with local partners by promoting existing residential and small business programs administered by Marion County. The Salem-Keizer Recycling & Transfer Station now takes mercury-containing waste, including compact fluorescent lights (CFLs), seven days-a-week excluding major holidays. The new hours improve recycling opportunities and convenience, while reducing the need to plan and promote designated collection events.

Under the Resource Conservation and Recovery Act (RCRA), the City's Environmental Services section administers an internal hazardous waste program. This program includes mercury waste collection (including spent CFLs) by the City's Facilities section for all City facilities. The Facilities staff is responsible for the collection of thousands of spent CFLs annually, and the Environmental Services section is responsible for the proper storage and disposal of these materials through a licensed hazardous waste contractor.

7 HIGHLIGHTS OF TEMPERATURE MANAGEMENT STRATEGIES

7.1 WASTEWATER TREATMENT TEMPERATURE MANAGEMENT STRATEGIES

Maximum wastewater discharge limits for temperature as well as other water quality constituents are enforced for area businesses per SRC Chapter 74 *Pretreatment Provisions* and associated City-issued wastewater discharge permits. A waste load allocation for temperature will be incorporated into the WLWPCF NPDES Wastewater Discharge Permit once it is renewed. The City has complied and will continue to comply with its NPDES Wastewater Discharge Permit at its treatment facilities, and it will continue to enforce industrial pretreatment temperature effluent limits on local businesses.

7.2 CHANNEL AND STREAM BANK ENHANCEMENTS

In FY 2015-16, City Council authorized the City to enter an agreement with the Army Corps of Engineers (ACOE) and Oregon Department of State Lands (DSL) to implement a Stream Mitigation Banking (SMB) Program for City-funded projects that require mitigation for in-stream impacts. One objective under the program is to preserve and improve targeted stream reaches on a prioritized basis. The SMB consists of the following:

- An Umbrella Mitigation Bank Instrument
- Bank site(s) – resource area restored/enhanced
- Credit/debit calculation methodology
- Long term management plan for bank sites.

The City's SMB Program endeavors to increase the ecological value of mitigation projects, coordinate multiple mitigation efforts, increase project success, reduce costs, and increase the predictability of permitting needs. It is designed to provide a basis for planning and implementing cost-effective stream restoration projects. Completed projects will be routinely monitored to ensure the long term establishment of native vegetation, to ensure streambank stability, and ensure additional site specific performance standards are achieved.

The Waln Creek Enhancement and Battle Creek Culvert Removal Project has been selected as the pilot project mitigation site. Additional sites will be selected and submitted to an Interagency Review Team (consisting of staff from the Environmental Protection Agency, National Marine Fisheries Service, Oregon Department of Fish and Wildlife, and DEQ) in the future for approval. Annual updates on activities associated with the SMB will continue to be provided in TMDL Annual Reports (see updated TMDL Matrix – Appendix B).

7.3 RIPARIAN PROTECTION AND ENHANCEMENT

The City's Riparian Action Plan was completed in 2009 to prioritize the protection of riparian areas through identified objectives and action items, to identify staff and budget needs, and to create a strategic timeframe for recommended activities. The defined priorities of this plan are to protect existing riparian areas, increase riparian vegetation coverage, and increase public awareness of riparian benefits and good development practices.

In tandem, the City has conducted several analyses related to riparian and urban tree canopy. Although no actual reduction in temperature loading takes place through these studies, the activities help prioritize and identify specific locations for future temperature-related projects. To date, the City has conducted the following activities:

- Completed a Riparian Shade Inventory (FY 2008-09)

- Conducted a Riparian Shade Prioritization study, including the development of a GIS-based decision support tool (FY 2010-11)

Since FY 2012-13, data from the Riparian Shade Prioritization Study and Urban Tree Canopy study has helped the City to identify priority locations for targeted riparian and neighborhood tree planting activities (see Section 7.3.1). These efforts will continue during the next fiscal year and are included in the updated TMDL BMP Matrix (Temperature Reduction Strategies) that is attached to this report in Appendix B. It is the long-term goal of the project to increase native riparian canopy shade and reduce temperature in the waterbodies.

7.3.1 RIPARIAN DEMONSTRATION PROJECT

One of the objectives of the City's Riparian Action Plan (2009) is to increase public awareness about riparian areas while also increasing riparian vegetation. In FY 2012-13, City staff discussed options for using riparian shade inventory data to select sites for riparian planting and enhancement as well as options for enlisting partners to facilitate public involvement in planting efforts. In FY 2013-14, the City contracted with Friends of Trees (FOT) and selected Clark Creek Park as a pilot project to receive targeted riparian planting/restoration work. Staff from FOT coordinated the volunteer based planting events, provided outreach to neighboring property owners, provided assistance with the removal of invasive vegetation, streambank stabilization measures, and supplied native plants for this project. During this reporting period, Public Works staff continued to collaborate with FOT. Two separate riparian planting events were held in FY 2015-16 in Woodmansee Park in South Salem. With the assistance of over 200 volunteers (enlisted by FOT) these events added 2250 native trees and shrubs to the riparian area along Pringle Creek. During this reporting period, City staff also initiated riparian restoration efforts upstream of Woodmansee Park on riparian property owned by the Salem-Keizer School District. It is anticipated that restoration and enhancement efforts with FOT and the School District will continue in FY 2016-17.

7.4 TREE AND WETLAND PRESERVATION

The City recognizes that the preservation of urban trees and existing wetlands aids in water quality, minimizes the quantity of stormwater runoff, and reduces erosion while enhancing habitat. As such, the City continues to coordinate with its departments and the public regarding tree and wetland preservation, consistent with Chapters 808 (Preservation of Trees and Vegetation) and 600 (Willamette Greenway) of the Salem Revised Code (SRC). In May of 2013, Salem City Council requested that the street tree code (SRC Chapter 86) be updated and revised. A stakeholder committee was formed and changes to the code were drafted. In addition to code revisions, tree design standards were proposed to ensure proper tree planting, tree selection, and tree protection standards. During this reporting period, proposed revisions to SRC Chapter 86 (Trees on City Owned Property) and associated Administrative Rule (AR 109-500-002) were adopted by City Council. The revisions and AR have been designed to protect healthy trees owned by the City-owned trees from the impacts of construction activities, provide permit application requirements, provide planting and pruning guidance, and clarify approved and prohibited street trees.

7.4.1 URBAN TREE CANOPY

The City updated its Urban Tree Canopy study in FY 2010-11 and conducted a Potential Urban Tree Canopy study in FY 2011-12. In FY 2012-13, a stakeholder Community Forestry Advisory Committee was formed to assist in developing a strategic plan, including a recommendation to set a canopy goal. This group completed the Community Forestry Strategic Plan in December 2012. This Plan includes six goals and 145 specific actions related to protecting, increasing, and enhancing the City's urban forest. The Plan also recommends the involvement of a nonprofit tree group, such as Friends of Trees, to increase the visibility of tree planting opportunities, train and recruit local volunteers, and provide services to the public that may otherwise lay outside the City's capacity (like securing charitable funds). Friends of Trees was contracted by the City in March of 2013 to begin conducting community tree plantings in neighborhoods identified as having low canopy cover. Community planting efforts with Friends of Trees continued during FY 2015-16 with a fall planting in the Northeast Salem Community Association, Northeast Neighbors, Highland, and Lansing Neighborhoods (November 7, 2015) and a second community planting in Northgate and Lansing Parks (April 2, 2016). These events resulted in the planting of 109 trees with assistance from 200 local volunteers.

8 HIGHLIGHTS OF TOTAL SUSPENDED SOLIDS (TSS) STRATEGIES

Total Suspended Solids (TSS) is closely correlated to iron and DDT, and therefore serves as a surrogate for those pollutants in the Molalla-Pudding Subbasin TMDL. Although iron is a naturally occurring material, it may be contributed in unnatural concentrations through runoff and erosion. Similarly, DDT may be introduced to water bodies through runoff and/or bank erosion at higher stream flows. In both cases, erosion is seen as a potential source of iron and DDT.

The City has continued its efforts to reduce erosion into local area water bodies through point source and non-point source BMPs. The City continued to comply with the requirements of the NPDES 1200-CA Permit during the FY 2015-16 reporting period and ensures best practices are in place to minimize the potential for pollution and sediment-laden runoff from construction sites (see Section 4.3). Concurrently, improvements to the City's EPSC program as a result of an EPA Consent Order (see section 4.2) were completed to maintain compliance with the requirements listed under Schedule A.4.c of the NPDES MS4 Permit.

The City's Stormwater Retrofit plan and Hydromodification Assessment (submitted to DEQ October 30, 2014) highlight opportunities for continuing to improve the water quality and flow control capabilities of the City's MS4 infrastructure. Funds have been allocated to the Stormwater Quality budget as well as to the City's CIP Plan for FY 2016-17 for continued construction of retrofit projects.

Salem Revised Code Chapter 71 (Stormwater) and the associated Stormwater Design Standards (see Section 6.2) now require the application of Low Impact Development and Green Stormwater Infrastructure techniques to be employed to the maximum extent feasible. This effort is currently underway to help reduce the concentration of TSS and other potential pollutants in stormwater discharges.

9 PRESCRIPTION DRUG TAKE-BACK PROGRAM

Water pollution prevention organizations have been concerned for several years over the method of disposal of prescription drugs. Improper disposal down sinks and toilets have contributed to the drugs showing up in treatment facilities and passing through to rivers and streams. Likewise, improper disposal in household waste has led to drugs leaching through landfills and ending up in rivers and streams. This program is not included in the City's TMDL Implementation Plan but remains relevant to the goals of improving water quality.

In October of 2011 the City opened a prescription drug collection facility in the Salem Police Department lobby. Citizens may bring unwanted prescriptions and medications to the site for free disposal 24 hours a day, seven days a week. A total of 1012.4 pounds of medications and associated packaging were received during the 2015-16 reporting year.

10 COMPLIANCE WITH LAND USE REQUIREMENTS

The City has sole jurisdiction for the administration of land use requirements and actions within its City limits. Accordingly, all of the strategies outlined in the TMDL Implementation Plan are considered to be consistent with the City's land use plans and codes. The City will continue to evaluate and endeavor to maintain consistency with local and statewide land use laws in any future actions related to TMDL implementation.

11 FISCAL ANALYSIS

On December 6, 2010, Salem City Council approved the adoption of a stormwater utility with a separate stormwater fee. The stormwater fee consists of both a base fee and a fee that is calculated based on the impervious surface area associated with each ratepayer's property. Implementation of the stormwater utility was phased in over a four year period which began on January 1, 2013. The Stormwater Utility now provides an equitable and stable funding mechanism that supports citywide stormwater management activities in the City's MS4 permit and SWMP. Stormwater-specific budgets are provided in the MS4 Annual Report (Appendix C, Section 3, Table 17).

The stormwater utility will also continue to fund many of the management strategies for non-point source pollutants identified in the TMDL Implementation Plan (e.g public education & outreach, riparian tree planting, and GIS data analysis). Options for additional support for riparian enhancement and streambank stabilization activities through the City's Capital Improvement Program will continue to be explored.

12 LEGAL AUTHORITY

12.1 WASTEWATER

The City operates its wastewater collection system, NRRWWTF, and WLWPCF, in accordance with its DEQ-issued NPDES Permit. The legal authority governing the system's operation is generally set forth by SRC

Chapter 73 (Sewers), with much more specific authority and responsibilities set forth by SRC Chapter 74 (Pretreatment Provisions). SRC Chapter 74 specifically addresses the operation of the City's wastewater collection system, NRRWWTF, WLWPCF, and constitutes the City's "Pretreatment Ordinance."

12.2 STORMWATER

In addition to the specific SRC Chapters 73 and 74 related to wastewater and stormwater management, the City also has the legal authority to implement and enforce its Erosion Prevention and Sediment Control (EPSC) Program through SRC Chapter 75. Additional riparian protections are contained in SRC Chapter 808 (Preservation of Trees and Vegetation), SRC Chapter 601 (Floodplain Overlay Zones), and SRC Chapter 600 (Willamette Greenway).

In conjunction with the revisions to the Stormwater Management Design Standards (see Section 6.2), a stand-alone chapter for stormwater (SRC Chapter 71) was adopted during FY 2013-14. Salem City Council approved the updated SRC in December 2013, and both the revised Design Standards and stormwater-dedicated chapter became effective on January 1, 2014. With these updates, the City has the authority to implement the requirements of the renewed MS4 Permit.

13 CONCLUSION

During this reporting period, the City has continued to fulfill the requirements of the City's NPDES Wastewater Discharge Permit, MS4 Permit, 1200-CA Permit, and 1200-Z Permit, and implemented non-point source BMP's identified in the 2010 TMDL Implementation Plan and BMP Progress Matrix (see Appendix A). A 5th Year Review of the 2010 Plan and Matrix were submitted to the DEQ in January 2016. Based upon this review, the City submitted an updated TMDL Implementation Plan (2016) to the DEQ on March 31, 2016.

Appendix A of this report contains the 2010 BMP Progress Matrix with additional updates on activities completed during this FY 2015-16 reporting period. This Matrix also includes three additional columns to clarify the following:

- 5th Year Review – Status of Activity
- Proposed Matrix Update
- Measurable Milestones

A majority of the activities listed in this matrix (the first 66 BMP activities) are the same activities currently listed in the City's 2010 SWMP. These activities were marked as "completed" in the 5th Year Review because most of the associated measurable goals and tracking measures have been completed and/or will continue to be ongoing. Proposed changes to the SWMP (these 66 BMPs) were submitted to the DEQ as part of the MS4 Permit renewal application in December 2015. The City is still awaiting feedback from DEQ on these proposed changes as part of the upcoming Phase I permit renewal process. During the 5th Year Review, the City has proposed to remove these BMPs from the TMDL Matrix as they will continue to be reported upon each year as a part of the MS4 Annual Reporting process. The MS4 Annual Report is included as an attachment to this report (Appendix C). The City will continue to submit future MS4 Annual Reports (with associated MS4 sampling data) as an Appendix to future TMDL Annual Reports.

The 2010 Matrix also included six BMP activities associated with the City's NPDES Wastewater Discharge Permit (WW1 through WW6). Five of these activities have been completed. One activity (WW5) has not been completed as anticipated as necessary updates to the Wastewater Treatment Plant have been incorporated directly into the CIP rather than inserted in an updated Wastewater Master Plan. Based on the 5th Year Review, the City has proposed to remove these activities from the updated TMDL Matrix (Temperature Reduction Strategies – Appendix B.)

The remainder of non-point BMP activities listed in the 2010 Matrix have either been completed or are ongoing. The majority of these activities have been revised and incorporated into the updated TMDL Matrix included in Appendix B. Additional detail regarding these proposed changes can be found in Appendix A.

The City will continue to operate under the conditions of the NPDES Permits listed above and described in this report. These permits are designed to address point source pollutants and TMDL wasteload allocations (bacteria, mercury, TSS) but do not address TMDL load allocations for elevated stream temperatures. The updated TMDL Plan and associated matrix (Appendix B) has been designed reduce redundancy in annual reports and better emphasize an increase in efforts to address temperature.

Appendix A

TMDL Implementation Plan BMP Progress Matrix (2010)

TMDL Implementation Plan BMP Progress Matrix for the Willamette Basin and Molalla/Pudding Subbasin (2010 TMDL Plan)

Best Management Practices and Tasks	BMP Source	Tracking Measures	Measurable Goals	Justifications: Explanation of Key Points in Analysis of BMP	5th Year Review - Status of Activity	Proposed Matrix Update (March 2016)	Measurable Milestones	Status/Reporting Summary (Through June 30, 2016)
RC1 - Planning								
1. Provide City-wide Master Planning for stormwater to address both water quality and water quantity. As part of master planning efforts, continue to evaluate new detention and water quality opportunities within the Urban Growth Boundary (UGB), and consider sites in upstream areas that may affect Salem, and in downstream areas that may be affected by runoff from Salem.	2010 SWMP	Track Schedule for updating the Master Plan. Report on master plan update actions.	Maintain Master Plan and complete next update within the MS4 permit cycle.	Community is involved with permit review process. This task is implemented citywide and addresses regulatory requirements addressed by the TMDL.	Complete - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
2. Develop and maintain watershed management plans by developing a prioritized schedule and implementing watershed management plans based on available funding. Develop the Pilot Pringle Creek Watershed Management Plan as a model for the City's other prioritized urban watersheds. Identify capital improvement needs and potential "early action" activities and projects to ensure that the plan has a strong implementation component.	2010 SWMP	Report on completion of hydromodification study.Report on completion of retrofit plan.Track implementation actions of Pringle Creek Watershed Management Plan.Report on strategy for completing future watershed management plans.	Complete a hydromodification study and retrofit plan by November 1, 2014.Incorporate recommendations and early action items of watershed management plans with completion of hydromodification study and retrofit plan.Develop strategy for completing future watershed management plans by November 1, 2014.	A pilot watershed plan would address issues and areas that are in need of water quality improvement. This plan would also identify priority capital improvement projects within a watershed. The pilot watershed plan would identify areas within an urban watershed that require attention and offer guidance on what to look for and areas to address in other urban watersheds. The point of this task is to identify activities that would aid in water quality enhancement and identify ways to implement watershed CIPs and activities. The Pringle Creek Watershed Plan is currently available in draft form.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
3. City staff will continue to update the official "waterways" map for use by City staff in applying various regulations and standards. As studies are performed that warrant the revision of the designated waterways, including goundtruthing, that information will be incorporated into the update process.	2010 SWMP	Track completion of groundtruthing and map updates.	Compile database of maps and waterways references.Complete field groundtruthing by end of FY 2011-12. Update map by end of FY 2012-13.	The official waterways map is in the constant process of being updated. This waterways map does not directly effect pollutants or regulatory factors. The main purpose for the waterways map is so that the city has a standard to go by that can act as an official document.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
4. City staff will meet a minimum of once per year to discuss coordination of efforts relating to stormwater. Topics may include the following, as they are applicable: grant funding, outreach, program review, annual report, monitoring, sharing of data, adaptive management, review/update of documents and programs, training needs, documentation of protocols, coordination of databases, involvement of inspections, maintenance, and operations in plan review and program developed, checklists, effective Erosion Prevention and Sediment Control Program including enforcement, strategizing addressing hotspots, plan review, stormwater BMPs, and development of written enforcement strategy. Provide factsheets/manuals to new employees at the City to inform them about the City's efforts for pollution prevention. At least annual trainings will be provided to specified City of Salem employees involved in MS4-related activities regarding the permit, including its intentions and their responsibilities in relation to the MS4. Feedback for improving processes will be encouraged and brought to the coordination meeting(s). Training needs will be determined by City staff meeting mentioned above. Consider adding stormwater pollution prevention training as an action item of the FY 2011-12 Environmental Action Plan that addresses pollution prevention on a city-wide level.	2010 SWMP	Prepare an annual meeting summary.Track changes made to the implementation of the stormwater program based on coordination discussions.Track major items of coordination.Track training attendance.Share and document training suggestions for MS4 implementation changes.	Conduct annual formal coordination meetings for stormwater, more often if necessary. Conduct annual training of employees involved in MS4-related positions, more often if necessary.	NPDES MS4 Permit	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
5. Coordinate with other agencies such as NGOs, private environmental groups, and watershed councils.	2010 SWMP	Document any MOAs.	Develop a list of contacts and identify issues of coordination.	NPDES MS4 Permit	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)

TMDL Implementation Plan BMP Progress Matrix for the Willamette Basin and Molalla/Pudding Subbasin (2010 TMDL Plan)

Best Management Practices and Tasks	BMP Source	Tracking Measures	Measurable Goals	Justifications: Explanation of Key Points in Analysis of BMP	5th Year Review - Status of Activity	Proposed Matrix Update (March 2016)	Measurable Milestones	Status/Reporting Summary (Through June 30, 2016)
6. The City will work with Marion and Polk Counties and the City of Keizer to coordinate stormwater management programs and activities within the greater Salem-Keizer Urban Growth Boundary. Coordination may include the establishment of appropriate intergovernmental agreements (IGAs) regarding potential uniform stormwater design standards, operations and maintenance activities, and public education and involvement efforts within the UGB.	2010 SWMP	Report on significant coordination activities or programs.Report on completion of SKAPAC Agreement and other IGAs.	Review and update the October 2000 SKAPAC Stormwater Management Agreement by the end of the permit term to reflect each jurisdiction's respective MS4 Permit and SWMP.	Pollutants are not directly effected by coordinating operations and maintenance activities between city and county. This process is not very readily implemented and also does not directly address regulatory programs. The City coordinates with the county when we are performing operations in their area and have the opportunity to help them. The city occasionally cleans ditches for the county and we also share the workload of the inmate crew between the City and the County; This is more of a utilities planning issue.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
7. Evaluate existing detention facilities and potential new detention sites for potential conjunctive uses (as water quality facilities and for retrofitting opportunities). Continue to perform facility site searches to locate ponds, wetlands, vegetated swales and other water quality facilities as existing water quantity and quality facilities are evaluated and potential new sites are identified. Coordinate with RC1-1 and RC1-2.	2010 SWMP	Complete a retrofit plan before end of year four of the MS4 permit cycle. Develop a strategy to identify and prioritize potential retrofit projects by November 1, 2013.Identify a minimum annual budget for stormwater retrofit projects as part of the retrofit strategy by November 1, 2014.	Report on available budget and completion of retrofit project efforts.	Evaluation of sites, no action done that would impact water quality.Activity is a tracking and planning activity, does not directly impact actual water quality or regulatory factors.Community involvement projects such as Eola Basin, 12th street bioswale and Kroger Park.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
8. The City will continue to be an active member of the Oregon Association of Clean Water Agencies (ORACWA). The City will use this medium to obtain copies of materials that have been produced by others. City staff will stay current on latest available educational and technical guidance materials.	2010 SWMP	Report on City participation with ORACWA events.	Attend a minimum of one stormwater-related workshop or conference annually. Attend groundwater-related workshops and conferences as funds allow.Make information obtained at these events available to other City staff.	The City attends many ACWA meetings that address varying issues. This task does not address pollutants directly, but does highly address regulatory factors by means of City staff gaining insight on implementation of jurisdictional requirements. This is an educational opportunity as well as an opportunity to share and learn about successes, failures, and processes that have been acted out by other jurisdictions. This task is highly implemented and meetings are attended by staff citywide.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
RC2 - Capital Improvements								
1. Implement stormwater projects (including stormwater conveyance, quantity, quality, and stream/habitat improvement) based on priorities established under the Capital Improvement Program (CIP) and the Stormwater Master Plan consistent with available funding.	2010 SWMP	Track number and description of projects completed. Report updated CIP list annually.	• Include a funding line item for CIPs in proposed stormwater budget. • Review and prioritize CIPs and budget annually. • Implement CIPs based on prioritization and available funding.	Sediment bonded pollutant loading decreased by pipe replacements, no anticipated impact on pesticides; projects include structures for fish passage.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
2. Continue to coordinate capital improvement projects with the Water Resources Section to integrate multiple resource agency permitting needs. The review is intended to identify integrated opportunities and permitting needs to meet water quality-related requirements.	2010 SWMP	• Track number of projects reviewed. • Track number of projects permitted.	• Review and integrate multiple resource agency permitting needs, including MS4 permit requirements, into 100% of CIP projects.	Integrated water quality requirements are up and coming. This task has the potential of addressing certain polluting factors and reducing polluting factors. Both regulatory organizations are addressed through this task.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
3. The City continues to acquire physical access-easements for public and private stormwater facilities. This is done by identifying existing facilities for which easements, rights-of-way, or permit-of-entry agreements are needed for stormwater facilities; and developing a plan for acquiring the same, given current funding limitations.	2010 SWMP	• Report on easement acquisition and prioritization process.	• Within one year of completion of the hydromodification study and retrofit plan, prioritize easement acquisitions for stormwater facilities. • Following prioritization, identify funding source(s) for inclusion in budget.	Stormwater Services has a file of Stormwater easements within the city. The next step would be to identify assets that are not among those listed in the file.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)

TMDL Implementation Plan BMP Progress Matrix for the Willamette Basin and Molalla/Pudding Subbasin (2010 TMDL Plan)

Best Management Practices and Tasks	BMP Source	Tracking Measures	Measurable Goals	Justifications: Explanation of Key Points in Analysis of BMP	5th Year Review - Status of Activity	Proposed Matrix Update (March 2016)	Measurable Milestones	Status/Reporting Summary (Through June 30, 2016)
RC3 - Update of Stormwater Management Design Standards								
1. Continue to encourage the use of structural BMPs for stormwater quality improvement and flood peak reduction opportunities. Develop stormwater quality design and associated maintenance standards for new and redevelopment. Continue to evaluate opportunities to provide incentives for alternative stormwater management practices, including Low Impact Development (LID). Maintain and update the Stormwater Management Design Standards after they are developed.	2010 SWMP	• Document revisions made to Stormwater Management Design Standards. • Document the development of any incentives for implementation of LID techniques.	• Develop incentives for LID and other stormwater quantity and quality management practices. • Develop updated stormwater design standards to include structural stormwater quality BMPs. • Maintain Stormwater Management Design Standards and update as needed.	The process of reviewing and recommending does not directly affect pollutants or regulatory factors. Current design standards, when implemented, are to follow that of the City of Portland and Clean Water Services. Design standards and stormwater code currently being revised and developed.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
2. Continue to implement process to identify and remove barriers for implementing LID techniques. Update the Stormwater Management Design Standards and associated Salem Revised Code (SRC) provisions as appropriate.	2010 SWMP	• Document the review of design standards and SRC to minimize barriers to implementation of LID techniques.	• Within three years of implementing the revised stormwater design standards, review and, as appropriate, modify design standards and SRC to minimize barriers to implementation of LID techniques.	NPDES MS4 Permit	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
3. City staff is implementing the Water Quality Development Standards set forth by SRC Chapter 141 for all development requiring a Willamette Greenway Permit.	2010 SWMP	• Track number of Willamette Greenway Permits issued and description of water quality measures employed. • Track number of new facilities constructed.	• Implement Water Quality Development Standards in Willamette Greenway.	Water quality development standards set forth in SRC 141 are designed to protect and enhance the floodway and riparian zone of the Willamette Greenway. This task directly addresses certain pollutants and regulatory requirements. The code is implemented and requires public involvement in order to be reviewed and accepted.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
4. Continue to review all residential, commercial, and industrial plans submitted for City-issued building permits for compliance with the City's Stormwater Management Design Standards. Conduct inspections of completed projects prior to the City's acceptance of those projects and project close-out to ensure work was done in accordance with approved plans. Maintain database of plans reviewed and final inspections conducted. See IND1-Task 2 for standards specific to industrial facilities.	2010 SWMP	• Maintain database of plans reviewed and final inspections conducted.	• Review all residential, commercial, and industrial plans submitted for City-issued permits for compliance with the City's Stormwater Management Design Standards and associated SRC provisions. • Conduct inspections once construction is completed to ensure work was done in accordance with approved plans.	NPDES MS4 Permit	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
RC4 - Operations & Maintenance								
1. Continue with the existing street sweeping schedule for all areas, maintaining the record of observations, quantity, and quality of material collected in the daily log books. Collect and compile this information for making recommendations for modified methods, schedules, and for NPDES MS4 permit annual reporting and overall program evaluation.	2010 SWMP	• Record quantity of material collected during sweeping operations. • Record number of curb-miles of streets swept. • Track and report changes made to sweeping schedule, if any.	• Review street sweeping program annually for effectiveness and any necessary revisions to sweeping schedule. • Continue sweeping City streets on four zone schedule, sweeping heaviest zone 8 times per year and lightest zone 2-3 times per year. • Continue sweeping City-owned parking lots as needed.	Street sweeping mainly effects the amount of debris settable solids that enter or do not enter the storm system and the pollutants that are associated with those solids. TMDL is affected by addressing polluting factors that are associated with sediment particles and of concerns in the mid-Willamette Basin watershed. ESA is addressed due to the effects street sweeping has on the sediment load that enters water bodies within the city, in turn increasing the quality of water for fish use. A leaf pick-up program is implemented every fall, city wide, by the street sweeping crew to pick up leaves throughout the city in coordination with volunteers.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)

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Best Management Practices and Tasks	BMP Source	Tracking Measures	Measurable Goals	Justifications: Explanation of Key Points in Analysis of BMP	5th Year Review - Status of Activity	Proposed Matrix Update (March 2016)	Measurable Milestones	Status/Reporting Summary (Through June 30, 2016)
2. The City will continue to perform de-icing operations in a way that minimizes stormwater pollution such as conducting annual inspections and training to ensure proper operation of the de-icing chemical storage facility, utilization of the expanded covered storage areas for de-icing materials, maintaining proper function of sediment traps and catch basins in the storage yard, and coordinating de-icing activities with Airport Operations and their 1200-Z permit. The City is also looking for ways to improve current operations by investigating and evaluating potential cost-effective recycling opportunities for used de-icing sand material.	2010 SWMP	• Document review of recycling opportunities. • Document dates of activities for annual inspections and training. • Document de-icing quantities applied annually.	• Continue current de-icing operations to prevent stormwater pollution. • Investigate potential cost-effective recycling opportunities for de-icing sand material	Dissolved oxygen and Debris Settable Solids are of concern because they are pollutants that are effected by de-icing activities. De-icing does not occur very often and on a limited scale, so regulatory factors are effected on a limited scale. This BMP addresses the proper handling of pollutants to decrease runoff and regulatory factors that are concerned with those pollutants. This is also an implemented task.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
3. Continue to review and update the O&M practices and activity schedules defined in the Drainage Program Evaluation Notebook (DPEN) (including updating GIS database). Utilize Hansen IMS data to develop and refine work programs. This review will serve as a basis for budgeting and allocating resources; scheduling work; and reporting on and evaluating the performance and costs for the overall O&M program and specific activities.	2010 SWMP	• Track revisions made to O&M practices and activity schedules.	• Update DPEN and IMS database activities and schedules. • Create line items in budget for specific O&M activities. • Review and update O&M practices and activity schedules every 3 years.	Utilization and updates to the O&M practices and activity schedules databases and mapping systems does not directly effect pollutants or regulatory factors. This task is moderately implemented.Setting performance standards for this program would affect certain pollutants concentrations and would address regulatory criteria based on the performance standards put into action. This is a way to address the effectiveness of the program and implement new actions. Direct impact on types of material replaced- pvc replacing metal, timing of schedule to reduce most amount of sediment load through system.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
4. Continue to improve the O&M training program and activities especially with regards to safety and protection of water quality.	2010 SWMP	• Document reviews and modifications to the O&M training program. • Record O&M training activities completed. • Document ACWA meetings and workshops attended.	• Conduct O&M safety meetings twice per month. • Attend ACWA committee meetings and workshops as scheduled. • Conduct weekly tailgate meetings with Operations crews.	Relates directly to how operations conducts business, erosion control measures taken in field, SOP's; primary effect is on sediment and sediment bound pollutants.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
5. Integrated Pest Management (IPM) Program: Salem Parks Operations Division will continue their program for careful monitoring and management of pesticides, herbicides and fertilizers, and will provide public information. Review and refine the IPM Program during the permit cycle, ensuring proper handling and storage of pesticides, herbicides, and fertilizers.	2010 SWMP	• Document revisions made to IPM Program. • Document inspections of storage facilities.	• Review and refine IPM Program during the MS4 permit cycle. • Routine inspections of storage facilities for proper storage of materials and chemicals.	Integrated Pest Management, when implemented on a citywide scale through the Parks department, greatly decreases the amount of pesticides that enter a waterway and directly address regulatory organizations by enhancing water quality within city waterways. City of Salem Parks currently has standards that exceed the Oregon Department of Agriculture standards for pesticide applications.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
6. Continue the storm sewer cleaning and TV inspection program, concentrating on known areas of localized flooding complaints (this alerts the City to locations of debris build-up and minimizes erosion potential) and persistent operation and maintenance problems, and looking for potential illicit discharges and seepage from sanitary sewers, see ILL2. Also focus on significant industrial/commercial areas where potential illicit discharges may be of concern.	2010 SWMP	• Track number of inspections; identify areas with persistent O&M problems. • Track number of cross-connections found. • Track length of conveyance system cleaned and inspected.	• Concentrate storm sewer cleaning and TV inspection on areas with historical problems and high potential for illicit discharges. • Inspect 120,000 LF of conveyance system annually.	Pollutants that are sediment bound are affected by the cleaning of storm sewer systems are addressed by this task. This is a highly implemented program and in certain situations can address issues that are focused on by ESA and TMDL.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
7. Continue supporting annual Stream Cleaning Program. More than one half of the stream miles in the City of Salem are inspected annually by walking each stream segment. Using summer interns the City inspects the riparian areas and streams, picks up litter and garbage, inspects for illicit discharges (ILL2), addresses potential conveyance concerns, and evaluates areas for stream restoration.	2010 SWMP	• Track length of waterways walked each year. • Document stream restoration projects completed each year. • Document the amount of litter and garbage removed each year.	• Walk 50% of the waterways within the City each year for stream cleanup and enhancement. • Complete one stream restoration project each year.	Removal of trash and excess debris, invasive species removal and restoration and replanting projects all directly effect pollutant levels in the stream and address issues pertaining to regulatory organizations. Community involvement is also a key role in the stream cleanup program, which involves attending community events such as watershed council meetings and preparing and presenting data at these events. This program is implemented annually.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)

TMDL Implementation Plan BMP Progress Matrix for the Willamette Basin and Molalla/Pudding Subbasin (2010 TMDL Plan)

Best Management Practices and Tasks	BMP Source	Tracking Measures	Measurable Goals	Justifications: Explanation of Key Points in Analysis of BMP	5th Year Review - Status of Activity	Proposed Matrix Update (March 2016)	Measurable Milestones	Status/Reporting Summary (Through June 30, 2016)
8. Continue to regularly inspect and maintain public structural stormwater control facilities. Coordinate with RC4 Task 9.	2010 SWMP	• Track number of public facilities inspected and maintained. • Track amount of sediment and debris removed from all facilities.	• Regularly inspect all public detention and water quality facilities.	Low ratings for pollutants based on minimal sediment retained in a detentions facility. ESA is a factor due to fish passage concerns on detention designs. Since the facilities are private, there is a level of community involvement that takes place such as contacting the owner of the basin. This is also a highly implemented task.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
9. Develop and implement a long-term maintenance strategy for public and private stormwater control facilities. This strategy will identify procedures and/or priorities for inventorying, mapping, inspecting, and maintaining facilities.	2010 SWMP	• Track number of private facilities located, mapped, and inspected. • Track progress toward developing a facility long-term maintenance strategy.	• Document and implement a long-term maintenance strategy for public and private stormwater control facilities during the MS4 permit cycle.	NPDES MS4 Permit	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
10. Ditch maintenance is performed to assure adequate conveyance, and consists of two components: (1) Ditch Cleaning – Cleaning consists of removal of sediment in the bottom of roadside ditches only as needed for proper conveyance, with limited vegetation disturbance and the use of straw wattles to reduce sedimentation and erosion within the ditch. (2) Ditch Mowing – Mowing is typically conducted by inmate crews using hand-held equipment. Vegetation cutting facilities conveyance and reduces the risk of potential fires in summer months.	2010 SWMP	• Track length of ditch maintenance performed (cleaning and mowing). • Track amount of sediment and debris removed.	• Regularly inspect and maintain 100% of City ditches using appropriate water quality BMPs.	NPDES MS4 Permit	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
11. Public catch basins are cleaned on a regular basis with a Vactor truck. During catch basin cleaning activities, inspections are done and repairs are scheduled if needed.	2010 SWMP	• Track the number and percent of catch basins cleaned annually. • Report on any analysis of removed material.	• Clean and inspect 75% of catch basins annually. • Periodically analyze the material removed from the catch basins.	NPDES MS4 Permit	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
12. Continue to refine the maintenance program for public and private stormwater detention and water quality facilities. The City maintains an informational packet outlining ownership and maintenance responsibilities and compliance assurance procedures to encourage owners of private detention and water quality systems to perform maintenance. Coordinate with RC 4 Task 9.	2010 SWMP	• Track number of information packets distributed regarding private stormwater control facilities. • Track maintenance requirements of long-term maintenance strategy.	• Maintain informational package for ownership maintenance responsibilities for detention and water quality facilities. • Implement maintenance activities and requirements identified in long-term maintenance strategy (RC4 Task 9).	Low rating for WQ parameters of concerns based on minimal water retention time in detention basin. Fish passage on design criteria for these structures is a main concern in placement and types used. Letter are also sent out to inform the public and private owners about responsibilities and maintenance if their detention basin is in poor condition, thus enhancing community involvement and implementation of the program.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
RC5 - Public Education & Participation								
1. Develop and implement a public outreach and education strategy with goals, objectives, identified target audiences, partners, identified target contaminants, and messaging. Conduct a public education program effectiveness evaluation of outreach procedures/efforts. Adjust the program based on the results in year five. (See Table A.1 – Public Outreach Program Matrix, June 2008).	2010 SWMP	• Document public outreach and involvement activities for two (2) education campaigns. • Document outreach activities for other divisions. • Document the results of the effectiveness evaluation and subsequent changes to the outreach procedures/efforts.	• Create two (2) public education campaigns* from the Public Outreach Program Matrix. • Support outreach and educational activities for other divisions**. • Conduct an effectiveness evaluation of the outreach program before the end of year four of the MS4 permit cycle.	Public information to support the SWMP is highly implemented through public response efforts conducted through the stormwater division and other operations divisions throughout the City. Informing public on SWMP issues does address regulatory requirements, but does not have a direct effect on pollutants by actively removing them. This task is based on public involvement. Public information is a step to increase the involvement of the public and the active removal of pollutants.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)

TMDL Implementation Plan BMP Progress Matrix for the Willamette Basin and Molalla/Pudding Subbasin (2010 TMDL Plan)

Best Management Practices and Tasks	BMP Source	Tracking Measures	Measurable Goals	Justifications: Explanation of Key Points in Analysis of BMP	5th Year Review - Status of Activity	Proposed Matrix Update (March 2016)	Measurable Milestones	Status/Reporting Summary (Through June 30, 2016)
2. Coordinate activities of various groups within the Public Works Department and other City departments assigned responsibility for public outreach and citizen contacts on stormwater matters.	2010 SWMP	• Document quarterly meetings and outcomes.	• Quarterly meetings of various groups assigned responsibility for public outreach and citizen contacts on stormwater matters.	NPDES MS4 Permit	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
3. Increase the use of community partnerships to carry out outreach goals.	2010 SWMP	• Document partnerships and outcomes of partnership activities.	• Develop one new partnership per year to carry out outreach goals.	This task also addresses public awareness and education while correlating with other organizations to address issues of common concern. This task supports public involvement and is highly implemented. This task supports efforts to constructively deal with regulations and concerns within the community to give different organizations an understanding of view points.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
4. Investigate the use of a stormwater utility to provide an adequate funding base to support expanded public outreach (see RC6).	2010 SWMP	• Document public education budget and expenditures. • Document Utility implementation plan showing public education and outreach needs.	• Develop a yearly public education budget. • Document public education and outreach needs in the Stormwater Utility Implementation Plan.	NPDES MS4 Permit	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
RC6 - Stormwater Management Program Financing								
1. In conjunction with the updated Stormwater Master Plan (RC1-1), review and update the Stormwater System Development Charge (SDC) methodology to address both stormwater quantity and quality.	2010 SWMP	• Report on update to Stormwater SDC methodology.	• Adopt updated Stormwater SDC methodology by the end of the MS4 permit cycle.	Modify system development charges with incentives for pervious surface in order to decrease storm water discharge load. SDCs are implemented city-wide, but review process of SDCs is on a small scale. SDC program methodology has no direct impact on pollutants, but can decrease pollutant loading in storm water discharge in the long run by encouraging pervious surface and decrease urban runoff.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
2. Implement a new stormwater utility capable of generating stormwater fees historically paid for by water and/or sewer utility customers. The new utility will include incentives to encourage users to implement alternative stormwater management practices such as LID.	2010 SWMP	• Report on adoption of new stormwater utility.	• Adopt new stormwater utility by the end of the MS4 permit cycle.	This task fits in as a requirement under the WQMP in order to secure funds for water quality monitoring and sampling. This task does not directly effect pollutants, but could have a decreasing pollutant load effect by encouraging pervious surface through a stormwater utility. This task is not currently implemented, and would effect the public on a city-wide scale.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
3. Identify and pursue grant opportunities for stormwater quality projects, including potential retrofit and LID project opportunities.	2010 SWMP	• Track number of grants applied for each year. • Track number of grants received each year.	• Pursue grant opportunities as staff resources allow.	NPDES MS4 Permit	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)

TMDL Implementation Plan BMP Progress Matrix for the Willamette Basin and Molalla/Pudding Subbasin (2010 TMDL Plan)

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RC7 - Maintain & Update GIS System								
1. Continue maintenance of the GIS database and Hansen IMS database. These on-going updates will also reflect completion of any stormwater Master Plan capital improvement projects, new facilities added to the system, potential "hot-spots" for illicit discharges, refinement of data for the existing system, updated information on wetlands, perennial streams, waterways, and floodplain/floodway designations, and information updated on a periodic basis for the City's Urban Growth Boundary. The GIS database will be accessible by City departments for review purposes.	2010 SWMP	• Record maintenance/updates made to database.	• Continue performing database updates annually. • Create record of GIS maintenance activities.	This task is based on updating an information source, therefore; does not directly effect pollutants, regulatory requirements, or require any public involvement. All maintenance activities are updated on an ongoing basis.This task has no direct effect on pollutants, but effects ESA by designating waterways and hydraulic connections where fish are or would be present. The completion of this task would increase the knowledge base of potential impacts for TMDL and methodology for collecting and analyzing data. This information is not updated on a consistent basis.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
2. Integrate the information in the GIS and IMS. The City plans to integrate the data from both the GIS and Hansen IMS databases so that information in the Hansen IMS database can be visualized using the GIS system.	2010 SWMP	• Track completion of action plan items. • Track implementation status of database integration.	• Create an action plan for how the GIS and IMS system will be integrated and updated. • Implement action plan to integrate GIS and IMS.	This task is pursued for 2010. Currently stormwater services attaches a GIS JPEG to Hansen Service Requests and Work Orders. This task is implemented, but has no direct effect on pollutants or regulatory requirements.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
RC8 - City Stormwater Grant Program								
1. Expand matching grant program for watershed protection and preservation to allow for funding of stormwater-related activities, such as promoting water-wise landscaping, reduction of stormwater discharges, restoring riparian areas, stormwater quantity reduction, stormwater quality/treatment, etc.	2010 SWMP	• Maintain a list of grant awards tracking funding and projects.	• Continue to fund $50,000 grant program. • Expand matching grant program for watershed protection. • Promote the grant program in conjunction with RC5 outreach activities.	Grants awarded can greatly impact local water quality and some enhancement projects can greatly reduce the potential erosion and subsequent pollution of surface water bodies. It is expected that community involvement and awareness would increase with an expanded grant program while addressing issues of concern enforced by regulatory programs. Impact of small scale project have limited effect of overall stream temperature. This program only targets stream side property owners limiting its scope of community involvement without much advertisement.Programs that encourage riparian protection and enhancement effect most pollutants by decreasing soil erosion and increase stream bank infiltration, hence increasing the uptake of potential water pollutants. The riparian vegetation also enhances shade area over waterways in turn addressing specific ESA and TMDL parameters. The free tree program is highly implemented and based on public involvement.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
RC9 - Legal/Ordinances								
1. In process of revising the Stormwater Management Design Standards (RC 3 Task 1) and developing a stormwater-dedicated chapter to the SRC (RC 9 Task 3), coordinate with Community Development's effort to adopt a Unified Development Code (UDC). It is envisioned that the stormwater dedicated SRC would be integrated into the UDC framework.	2010 SWMP	• Report on progress for adoption of UDC and integration of stormwater-related SRC.	• Adopt the UDC and integrate stormwater-related revisions to the SRC by the end of the MS4 permit cycle.	NPDES MS4 Permit	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
2. Continue to enforce the SRC and review and revise it as necessary to reflect the updated Stormwater Management Design Standards that principally focus on requirements associated with on-site water quality facilities for new development or redevelopment (RC3).	2010 SWMP	• Track any MS4 stormwater pertinent revisions made to the SRC.	• Revise SRC (as needed).	NPDES MS4 Permit	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)

TMDL Implementation Plan BMP Progress Matrix for the Willamette Basin and Molalla/Pudding Subbasin (2010 TMDL Plan)

Best Management Practices and Tasks	BMP Source	Tracking Measures	Measurable Goals	Justifications: Explanation of Key Points in Analysis of BMP	5th Year Review - Status of Activity	Proposed Matrix Update (March 2016)	Measurable Milestones	Status/Reporting Summary (Through June 30, 2016)
3. Develop a new SRC chapter dedicated solely to stormwater management. It is currently envisioned that this will be done after the City's renewed MS4 Permit is issued, and in conjunction with implementation of the new stormwater utility and updated Stormwater SDC Methodology (RC6) and the updated Stormwater Master Plan (RC1).	2010 SWMP	• Report on adoption of the new SRC chapter for stormwater, and processes/milestones enroute to formal adoption of the SRC revisions.	• Adopt the new SRC chapter for stormwater by the end of the MS4 permit cycle.	City codes and revisions involve the public for review. This task has the possibility of being implemented on a city wide scale, but is not currently at that level. Pollutants are directly effected with the revision of city codes due to the code focusing on reducing pollutant load and enforcing water quality treatment facilities	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
ILL1 - Spill Prevention & Response								
1. Continue to review and refine the existing spill prevention and emergency response program to protect ground and surface water quality. New activities will be proposed and implemented as appropriate, and coordination and cooperation among other relevant agencies and ODOT will be maintained and improved. This review will be coordinated with the de-icing activities of the Airport Operations and their 1200-Z permit, and possibly the Oregon Air National Guard.	2010 SWMP	• Document refinements to cleanup procedures for vehicular accidents and structural fires.	• Continue to implement the spill prevention and emergency response program and review and revise as needed.	Refining spill emergency response plan directly effects spill pollutants by improving the response and clean-up of these pollutants. This task does not require public involvement, but does address regulatory requirements.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
2. Continue to coordinate timely responses to, and clean-up of emergency response sites and structural fires among Fire, Building and Safety, Development Services, and Environmental Services staff. The Fire Department has the lead role for response at emergency response and structural fire sites and all major vehicular accidents. Environmental Services (ES) staff will provide assistance when requested by the on-scene incident commander. One of the ES responsibilities is to make sure that the cleanup activities are conducted in an environmentally sensitive manner.	2010 SWMP	• Track the number and category of spill events responded to, including an estimate of the amount of spilled materials collected and any associated enforcement actions.	• Develop a review schedule with a checklist for the spill response plan.	Spill materials, house fires, and car crashes are factors that are being considered in comparison to polluting factors that this task is addressing. Habitat requirements and spill materials addresses ESA requirements. This task can also be implemented as part of the TMDL Implementation plan as a spill response effort.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)

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3. Continue to conduct daily City vehicle and equipment inspections for leaks and repairs as needed. Staff will review current procedures on an ongoing basis and implement improvements as necessary.	2010 SWMP	• Report revisions to the daily inspection program	• Continue to implement the daily equipment inspection program.	Daily inspections are performed by operator and turned into fleet services daily. This is a cause to reduce runoff pollution by preventative measures. Most polluting factors are not addressed by this task, although regulatory requirements are being addressed by decreasing pollutant loading in a proactive manner. This task is highly implemented.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
4. Develop an updated Operations Pollution Prevention Plan; incorporating new/expanded/relocated Operations-oriented facilities.	2010 SWMP	• Track progress toward updating the Operations Pollution Prevention Plan. • Track implementation of the Operations Pollution Prevention Plan.	• Update the Operations Pollution Prevention Plan by the end of the MS4 permit cycle. • Implement the updated Operations Prevention Plan upon completion.	NPDES MS4 Permit	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
ILL2 - Illicit Discharge Elimination Program								
1. Continue to respond to reports of unusual discharges or suspicious water quality conditions within the stormwater system and urban streams. Where able, identify sources/causes and implement appropriate corrective actions. Utilize database to document associated activities.	2010 SWMP	• Track calls and mitigation actions taken in database.	• Respond to reports of illicit discharges and suspicious water quality conditions. • Maintain database to document unusual/suspicious discharges, sources found, and corrective actions taken.	This task directly impacts the discharge of point source pollutants and their effects on water quality. This task is also highly implemented and reports of unusual discharges are recorded into a database for further tracking.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
2. Environmental Services staff will continue inspections of the City's wastewater users, through the pretreatment program, verifying the proper handling and disposal of both wastewater and stormwater.	2010 SWMP	• Track number of inspections and associated findings.	• Inspect City's wastewater users for proper management of wastewater and stormwater.	Inspections help to ensure that proper pollution load reduction methods are being taken for permit holders.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
3. Work with Wastewater Collection Services to identify and correct cross-connections between the sanitary sewer and stormwater systems.	2010 SWMP	• Document number of cross-connections identified and corrective actions taken.	• Review stormwater and ambient stream monitoring data to identify possible cross-connection discharges into the stormwater system. • Maintain communications with Wastewater Collections and other City staff to identify any stream cross connection problems.	NPDES MS4 Permit	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
4. Develop and update a storm sewer outfall dry weather inspection and monitoring prioritization plan.	2010 SWMP	• Document review of outfall monitoring plan. • Document priorities established for monitoring and inspection. • Track dry weather inspections conducted and results of inspection.	• Prioritize outfalls for storm sewer outfall inspection and monitoring, and inspect annually. • Coordinate prioritization process with ILL 2 Task 5.	Dry weather discharge sampling being implemented by stormwater services. This sampling is random and identifies pollution sources therefore having no direct effect on pollutants. The sampling is a monitoring process that is in coordination with the TMDL Implementation plan. This task is in the process of being implemented and involves the public if they report or are the cause of a dry weather discharge.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)

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5. Identify and map contaminated sites in the GIS system. With input from other City departments, identify a list of areas where there either has been a substantial spill or there is the potential for a spill or illicit discharge. These areas are identified based on activities on site, history of problems, or specific industry, for example. These areas will be mapped in the GIS system for use across City departments.	2010 SWMP	• Track number of contaminated sites added to the GIS system.	• Continue to identify and map contaminated sites in the GIS system.	NPDES MS4 Permit	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
ILL3 - Illegal Dumping Control Program								
1. Continue to sponsor the Adopt-a-Street Program. The program is an effective way to get residents involved in keeping the community's streets clean and consequently preventing trash and debris from entering the storm drainage system.	2010 SWMP	• Record the miles of adopted streets, number of participating groups, and volume of litter collected through the Adopt-a-Street Program.	• Continue to support the Adopt-a-Street Program.	Adopt-A-Street program decreases the amount of trash on streets that would eventually enter the waterways by encouraging litter pick up. This program is highly implemented and on a citywide scale.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
2. Continue to provide the 24-hour Public Works Dispatch Reporting Center to receive and respond to calls regarding illegal dumping and other environmental complaints/problems and responses thereto. Continue to advertise hotline on City website, utility bill inserts, business cards, public brochures, and consumer confidence reports. As circumstances warrant, publicly report illicit discharges through use of various media outlets.	2010 SWMP	• Record number and types of reported illegal dumping incidents. • Track media outreach when a discharge warrants.	• Continue to operate the 24-hour Public Works Dispatch Reporting Center. • Assign reports to appropriate City staff for action, including actions taken under ILL2-1.	Taking calls and recording illegal dumping incidents does not directly effect pollutants, but is highly implemented. This task is based on public involvement and city residence calling in to report illegal dumping. The follow-up on this task is addressed in ILL-2 task 3.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
3. Continue to support the Adopt-a-Stream program, which involves teachers and students in gathering water quality data from streams, thereby providing water resource education to students through experience. The City supports the program by facilitating projects and providing technical assistance and resources.	2010 SWMP	• Maintain a descriptive list of adopt a stream program projects, objectives, outcomes upon completion, and number of participants.	• Continue to support the Adopt-A-Stream Program.	The Adopt-a-Stream program addresses regulatory factors by assisting the City with water quality testing. The program also encourages riparian area enhancement. The restoration projects that are completed through the Adopt-a-Stream program aid in water quality enhancement by increasing infiltration in riparian zones which increases the uptake of nutrients from the waterway and decreasing erosion potential. Increased riparian vegetation also increases shade zones within the streams.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
4. Continue to support Marion County in their efforts to provide convenient alternatives for legal disposal of household hazardous wastes and other recyclable materials.	2010 SWMP	• Document frequency and type of support activities	• Continue to support Marion County in providing alternatives for household hazardous waste disposal.	Offering convenient means for waste disposal has the potential to reduce pollutant loads of certain polluting factors that are commonly found in hazardous waste. This program is based on public involvement and is highly implemented. This program also addresses priority issues in the TMDL Implementation Plan and ESA habitat requirements.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
5. Continue to support the annual yard debris cleanup effort.	2010 SWMP	• Record amount of debris cleaned up and level of participation.	• Support the annual yard debris cleanup effort.	Debris clean-up addresses a few specific polluting factors directly, but in a major way. Regulatory requirements are addressed by directly impacting these polluting factors. This task is implemented and is based on public involvement.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)

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IND1 - Industrial Stormwater Discharge Program								
1. Environmental Services will inspect stormwater systems while conducting inspections of City-permitted industrial wastewater users, and work with DEQ to coordinate the permitting and compliance processes for industrial users in the Salem area, including DEQ-issued 1200-Z permitted sources, underground storage tank (UST) removal, and site remediation permits issued by DEQ for sources/sites within the City. Coordination options include: receiving information on proposed 1200-Z permits, commenting on proposed permits, and meeting periodically with DEQ on coordination efforts.	2010 SWMP	• Track coordination efforts with DEQ. • Include stormwater observations as appropriate on inspection reports and follow-up actions.	• Inspect stormwater systems while conducting inspections of City-permitted wastewater users. • Develop process to coordinate with DEQ on industrial permits within the City.	Coordinating the permitting process has no direct effect on pollutants. Coordinating with DEQ will assist the City with addressing TMDL issues through permit requirements. New permits are open for public comment.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
2. During plan review, review industrial facilities for the potential of requiring pretreatment of stormwater prior to discharge based on the industrial activities of the specific facility. Conduct inspections of industrial facilities requiring stormwater pretreatment to ensure structural controls have been built according to approved plans.	2010 SWMP	• Maintain database of plans reviewed and final inspections conducted.	• Review industrial plans as necessary for additional stormwater treatment. • Conduct inspections once construction is completed to ensure work was done in accordance with approved plans.	Reviewing plans for stormwater pretreatment addresses regulatory factors by assessing the water quality and level at which the City will allow non-treated discharge to enter the storm system. This task also includes identifying and managing those sources. This influences waste load allocations, critical habitat improvements, and the overall water quality of the storm system. Certain levels of pollutants are addressed with the requirement of pretreatment facilities. This task also requires public involvement.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
3. Surveys are sent to applicable business classes (restaurants, metal finishers/platers, radiator shops, dry cleaners, printing shops, photo processors, etc.) as part of the pretreatment business survey database, part of the industrial pretreatment program for wastewater. Customers will be surveyed on major on-site activities to identify potential locations for public education, future sampling, and tracking down illicit discharges. Illicit stormwater discharges from these business groups are address in ILL2.	2010 SWMP	• Track number of surveys sent out. • Track number of surveys returned and entered into database. • Track targeted public education activities for specific industries.	• Send surveys to new customers as accounts are opened. • Enter survey results into database – on-going as surveys are returned.	NPDES MS4 Permit	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
4. Continue the semi-annual Technical Bulletin for the City's industrial users and produce other materials for these users. This activity is principally associated with the City's wastewater Pretreatment Program, but will be used as a vehicle to address stormwater related issues as well.	2010 SWMP	• Track published technical materials prepared for industrial users each year.	• Produce two technical bulletins for industrial users each year.	Impact of technical material provided to user on user behavior is unknown at this time	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
CON1 - Construction Site Control Program								
1. Continue implementation of the Erosion Prevention and Sediment Control program for developments that meet or exceed the threshold indicated in SRC Chapter 75, which includes the submission of erosion prevention and sediment control plans with structural and non-structural BMPs. Review program experiences annually and implement improvements as appropriate including Code amendments if needed.	2010 SWMP	• Track number of erosion control plans reviewed for compliance with SRC 75.	• Implement SRC 75. • Conduct annual program reviews. • Implement appropriate improvements and/or Code amendments. • Perform plan reviews for erosion control requirements.	Implementing SRC 75 addresses pollution reduction for those pollutants associated with sediment loads and erosion. This task also addresses TMDL with sediment pollution load reduction strategies. This task is implemented , but enforcement actions are minimal. DEQ 1200-C coordination could be better. This task does not involve the public.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
2. Continue to train and educate City staff and private contractors about stormwater pollution at construction sites, with an emphasis on prevention and control BMPs. Provide notice to construction site operators concerning where education and training to meet erosion and sediment control requirements can be obtained.	2010 SWMP	• Track education and training programs conducted and number of staff/public trained.	• Provide annual erosion control training to City staff and private contractors.	This task does not directly effect pollutants, but addresses the educational component of the TMDL Implementation. Educating city staff allows for further education of the public and a smarter work force.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)

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3. Document and streamline site plan review, inspection, and enforcement procedures for the construction site runoff control program.	2010 SWMP	• Track completion of documented procedures.	• Complete documentation of site plan review, inspection, and enforcement procedures before the end of year four of the MS4 permit cycle.	NPDES MS4 Permit	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
4. Continue to review and update the Erosion Prevention and Sediment Control Technical Guidance Handbook.	2010 SWMP	• Track updates made to the Technical Guidance Handbook.	• Update Technical Guidance Handbook before the end of year four of the MS4 permit cycle.	The Technical Guidance Handbook addresses pollution reduction by means of standards set forth within the guidebook. Setting standards for pollution reduction methods addresses TMDL . This task is implemented and involves the public on a limited scale.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
5. Continue to coordinate with the City's 1200-CA Permit for City construction projects subject to its program.	2010 SWMP	• Track renewal of 1200-CA permit.	• Requirements for 1200-CA compliance incorporated into City construction plans, specifications, and contract documents. • Make erosion prevention and sediment control a key agenda item at all pre-construction conferences. • Include inspection of all site erosion prevention and sediment control measures as part of City projects.	Compliance of the permit requires pollution reduction within the permit's jurisdiction. TMDL is addressed by complying with the permit standards in order to address pollution load reductions. The standards are not always met when the city is permitted by the 1200-CA permit.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
MON1 - Monitoring								
1. Continue to install and maintain flow and water quality monitoring stations in City waterways to support selection of capital improvement projects, update the hydrologic-hydraulic computer model, and help direct policies to protect the health of these water bodies. The actual rate of installation and the total number of stations will be based on the maintenance requirements of the stations, available funding, and coordination with urban watershed assessments/plans.	2010 SWMP	• Track number of additional monitoring stations implemented.	• Install additional monitoring stations. • Monitor the station alarms in conjunction with the illicit discharge control program (ILL2, Task 1). • Follow up on potential hotspots or problem areas as may be identified through data analyses.	Monitoring water quality has no impact on it, but is essential for establishing baseline condition, in forming benchmarks and recording if progress is being made towards meeting those benchmarks.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
2. Continue the urban stream and Willamette River water quality sampling program, with emphasis on reviewing and evaluating sampling data to prioritize investigations and improvement/maintenance projects. This sampling augments the monitoring plan included in the City's 2008 NPDES MS4 Permit Renewal application.	2010 SWMP	• Document findings regarding trends.	• Update database for collected data. • Review collected data for purposes of trending and benchmarking by the end of the permit term. • Follow-up on potential hotspots or problem areas as may be identified by the data review.	Sampling does not directly affect the outlined pollutants, but does address critical measures enforced by the TMDL. Implementation and community involvement of this procedure continue to increase with participation of community organizations to take part in sampling and the increasing improvements in our sapling technique and materials. Cooperation with North Salem HS for data gathering.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)
3. Continue to implement all components (MS4 outfall, instream, pesticide, and macro-invertebrate) of the City's "Surface Water and Stormwater Monitoring Plan."	2010 SWMP	• Provide summary statistics for sampling results from each wet-weather season. • Track any modifications to the monitoring plan.	• Implement the City's Stormwater Monitoring Plan, including MS4 outfall, instream, pesticide, and macro-invertebrate monitoring components	Bioassessments quantify the amount of pollutants found, but have no direct impact on the pollutant load of the area. Pringle Creek Watershed Bioassessment is still in the process of completion, therefore no other bioassessments have been implemented. We are not currently in the position to prioritize watershed basins for assessments.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove Stormwater Management Plan (SWMP) BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The updated TMDL Implementation Plan Matrix (Temperature Reduction Strategies) identifies strategies specifically designed to address the City's TMDL Load Allocation (LA) for temperature. Temperature is not addressed through the MS4 Permit or SWMP. Measurable Goals/Tracking Measures for these activities are in the MS4 Annual Report.	See FY 2015-16 MS4 Annual Report (Appendix B)

TMDL Implementation Plan BMP Progress Matrix for the Willamette Basin and Molalla/Pudding Subbasin (2010 TMDL Plan)

Best Management Practices and Tasks	BMP Source	Tracking Measures	Measurable Goals	Justifications: Explanation of Key Points in Analysis of BMP	5th Year Review - Status of Activity	Proposed Matrix Update (March 2016)	Measurable Milestones	Status/Reporting Summary (Through June 30, 2016)
NPDES Wastewater Permit								
WW1. Complete the new River Road Wet Weather Treatment Facility.	NPDES Wastewater Discharge Permit	Construction Completed and Facilities Operational	Completed November 2008	Compliance with Willow Lake NPDES Permit and MAO	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove NPDES WW Permit BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies).	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The City will continue to maintain compliance with NPDES Wastewater Permit. The River Road Wet Weather Treatment Facility has been completed.	Completed November 2008
WW2. Increase the Willow Lake WPCF hydraulic capacity from 105 to 155 MGD maximum wet weather flow.	NPDES Wastewater Discharge Permit	Construction Completed and Facilities Operational	Completed November 2009	Compliance with Willow Lake NPDES Permit and MAO	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove NPDES WW Permit BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies).	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The City will continue to maintain compliance with NPDES Wastewater Permit. The River Road Wet Weather Treatment Facility has been completed.	Completed November 2009
WW3. Maintain compliance with the NPDES Permit and MAO for the Willow Lake WPCF.	NPDES Wastewater Discharge Permit	Monthly Discharge Monitoring Report (DMR) Submitted to the DEQ	On-going and December 31, 2009	Compliance with Willow Lake NPDES Permit and MAO	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove NPDES WW Permit BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies).	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The City will continue to maintain compliance with NPDES Wastewater Permit. The River Road Wet Weather Treatment Facility has been completed.	The City's obligation under MAO No. WQ/M-WR-97-147 has been fulfilled and the MAO was terminated on March 1, 2012.
WW4. Submit the annual Collection System Report to the DEQ.	NPDES Wastewater Discharge Permit	Annual Report Submitted to the DEQ	Annually - November 1st	Compliance with Willow Lake NPDES Permit and MAO	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove NPDES WW Permit BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies).	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The City will continue to maintain compliance with NPDES Wastewater Permit. The River Road Wet Weather Treatment Facility has been completed.	Submitted August 2, 2013
WW5. Update the Wastewater Master Plan and Willow Lake WPCF Facilities Plan.	NPDES Wastewater Discharge Permit	Adopted Master Plan	Incorporate wastewater projects into 5-year CII	Needed to Reflect Completed CIP Projects and Success at Reducing SSOs.	**Delete** - Strategy not implemented and will not be implemented in 2015-2020.	Remove NPDES WW Permit BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies).	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The City will continue to maintain compliance with NPDES Wastewater Permit. The River Road Wet Weather Treatment Facility has been completed.	On-going
WW6. Collect Willow Lake WPCF influent and effluent mercury concentration data monthly, and twice a year low-level analytical data of the influent and effluent concentrations for total and methyl mercury.	NPDES Wastewater Discharge Permit	Sampling Results reported in Monthly Discharge Monitoring Report (DMR)	On-going	Compliance with Willow Lake NPDES Permit and MAO	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove NPDES WW Permit BMPs from TMDL Implementation Plan Matrix (Temperature Reduction Strategies).	TMDL Wasteload Allocations (WLAs) are addressed through NPDES Permits. The City will continue to maintain compliance with NPDES Wastewater Permit. The River Road Wet Weather Treatment Facility has been completed.	On-going
Non-point								
NP1. Assess Salem tree canopy, conduct a riparian shade analysis, and identify priority areas which are heat sink locations.	Riparian plan	Completed Shade Inventory Completed Canopy Study Completed Riparian Shade Prioritization	Shade Inventory occurred in FY 08/09. Riparian Shade Prioritization and Tree Canopy Study completed in FY 10/11.	No actual reduction in temperature loading takes place through these activities, but activities set up site specific locations for future temperature-related projects.	**Complete** - Strategy implemented and/or is ongoing as expected.	**See Strategy #1 in updated TMDL Implementation Plan Matrix (Temperature Management Strategies)**	Riparian Shade Inventory and Prioritization to be reviewed and updated during next TMDL cycle per Strategy 1 in updated matrix.	Data from Riparian Shade Inventory used to identify targeted area for riparian planting in FY 15-16 (Woodmansee Park).
NP2. Temperature reduction incentives plan, using locations identified in the shade prioritization study in 10-12, target neighborhoods using various pre-existing programs and funds, including free tree, the watershed protection grant, OWEB grants, and Oregon 319 grants.	Riparian plan	Use of prioritization in incentive plan and targeted projects.	Target native riparian plantings by FY12-13 and ongoing based on prioritization.Promote riparian restoration and plantings through Watershed Protection and Preservation Grant Program.		**Complete** - Strategy implemented and/or is ongoing as expected.	**See Strategy #2 in updated TMDL Implementation Plan Matrix (Temperature Management Strategies)**	The City's Free Tree Program and more recently through… Targeted native riparian plantings using collected data and multiple funding sources will continue to be a primary strategy of the City's TMDL Implementation Plan/Temperature Reduction Matrix.	See BMP RC 8-1 of MS4 Annual Report for a list of FY 2015-16 projects that received funding through the City's Watershed Protection & Preservation Grant Program. Shade Inventory/Prioritization was used to target priority taxlots for riparian planting in FY 2015-16 (Woodmansee Park). Funds for targeted riparian planting were previously allocated to citywide "Free Tree Program".

TMDL Implementation Plan BMP Progress Matrix for the Willamette Basin and Molalla/Pudding Subbasin (2010 TMDL Plan)

Best Management Practices and Tasks	BMP Source	Tracking Measures	Measurable Goals	Justifications: Explanation of Key Points in Analysis of BMP	5th Year Review - Status of Activity	Proposed Matrix Update (March 2016)	Measurable Milestones	Status/Reporting Summary (Through June 30, 2016)
NP3. Look for opportunities to incorporate riparian restoration when conducting City CIP projects, and pursue acquisition of easements on riparian lands both on and near CIP sites.	Non-point (Temperature CIP Plan)	Document number of easements and restoration activities conducted within the CIP process, number and mapping of properties acquired.	Easement acquisition shall occur on an individual project by project basis.	Conservation and restoration of riparian areas has a solid well documented improvement on water quality, however scores assigned to individual parameters are lower than typically reported due to the City being reactive to builders and building project, and not having funding for City implementation for proactive plan in either CIP processes or private building sector.	**Complete** - Strategy implemented and/or is ongoing as expected.	**See Strategy #4 in updated TMDL Implementation Plan Matrix (Temperature Management Strategies)**	Funding has been inserted in the City's CIP Plan for FY 2016-17 to support streambank stabilization/riparian enhancement project incorporating biongineering practices and large woody debris.	See RC 2-3 of the MS4 Annual Report for an update on process for easement prioritization and acquisition. Funding to support implementation of riparian restoration projects was requested for insertion in the City's CIP during this reporting period.
NP4. Assess and address target audiences with public education efforts; cooperate with others to leverage resources.	Non-Point	Update list of stakeholders and target groups, including relation to stormwater program.	Check permit	Public education efforts does not directly effect pollutants, but does assist in addressing polluting sources and reducing water quality polluting factors within the city.	**Complete** - Strategy implemented and/or is ongoing as expected.	**See Strategy #6 in updated TMDL Implementation Plan Matrix (Temperature Management Strategies)**	This task will be ongoing.	A five-year outreach plan was completed in FY 2012-13 that includes options for addressing targeted pollutants (E. coli and turbidity). See RC 5 of MS4 Annual Report for a summary public education & outreach activities conducted during this reporting period.
NP5. Creatively use a combination of publications, media and other appropriate public information tools to support and implement the Stormwater Management Program. Coordinate with the public information activities of related programs and allied agencies. Where appropriate, utilize cooperative public information opportunities. Much of this effort will be a product of other BMPs from this Stormwater Management Plan, but should consider the following areas: *Erosion and sediment control (one for general use, one for engineers-developers-contractors, and one for City staff – especially construction inspectors) *Water quality facilities and best management practices (general use and engineers-developers-contractors) *Stream and riparian restoration, including fish issues, the Endangered Species Act, and water quality (temperature) *Wetlands for both habitat and water quality management *Stormwater system maintenance *Chemical use reduction (fertilizers and pesticides)	Non-Point	List of materials and methods used for public information; list of cooperative programs and agencies used by the City.	On-going	Public information to support the SWMP is highly implemented through public response efforts conducted through the stormwater division and other operations divisions throughout the City. Informing public on SWMP issues does address regulatory requirements, but does not have a direct effect on pollutants by actively removing them. This task is based on public involvement. Public information is a step to increase the involvement of the public and the active removal of pollutants.	**Complete** - Strategy implemented and/or is ongoing as expected.	**See Strategy #6 in updated TMDL Implementation Plan Matrix (Temperature Management Strategies)**	This task will be ongoing.	See RC5 of the MS4 Annual Report (Public Education and Participation).
NP6. Participate in watershed council and neighborhood association meetings; assist local citizens groups.	Non-Point	List of relative requests and follow up action items	On-going	This task also addresses public awareness and education while correlating with other organizations to address issues of common concern. This task supports public involvement and is highly implemented. This task supports efforts to constructively deal with regulations and concerns within the community to give different organizations an understanding of view points.	**Complete** - Strategy implemented and/or is ongoing as expected.	**See Strategies #2 & #6 in updated TMDL Implementation Plan Matrix (Temperature Management Strategies)**	This task will be ongoing. Staff will continue to pursue and utilize partners and volunteer groups under the MS4 SWMP as well as updated TMDL Plan.	See RC1 (Planning)Task 5 of the MS4 Annual Report.
NP7. Distribute an updated "perceptionnaire" (Your Opinion Please) to the public via mail, personal contact, urban watershed workshops, and the City's Internet site. An updated perceptionnaire will be developed and targeted for distribution during fiscal year 2005 - 06.	Non-Point	Survey results/indications	Once per permit term.	The development of a public response/feedback form about various resources within the City of Salem's departments would be a great way to gain insight on the overall opinion of the public and the City's response to their needs and concerns. This task does not directly effect pollutants or regulatory factors, but does increase involvement within the community and allows the City to gain further information on public contact methods that could be improved and gain an overall understanding of the public's general perception.	**Complete** - Strategy implemented and/or is ongoing as expected.	**See Strategy #6 in updated TMDL Implementation Plan Matrix (Temperature Management Strategies)**	A survey for streamside residents requesting information about pollution prevention behaviors was created and mailed during FY 2011-12. Another survey of Salem residents was conducted in FY 2014-15.	No surveys were distributed during this reporting period. See RC 5 of the MS4 Annual Report for a complete summary of public education & outreach activiities in FY 2015-16.
NP8. Continue to regularly maintain the Water Resources website. Website topics include: Natural resources issues (landslide hazards, wetlands, fish and the Endangered Species Act, trees, and native plants), outreach educational programs, topical news, and current events. Water Resources staff will maintain the website, with stormwater quality items and community feedback opportunities being regular features.	Non-Point	List of website updates and number of "hits."	DELETE TASK: The City of Salem changed to a unified website that does not track website hits. This performance indicator is no longer valid.	Website maintenance does not directly effect pollutants or regulatory requirements, but does involve the public and is highly implemented.	**Delete** - Strategy not implemented and will not be implemented in 2015-2020.	**See Strategy #6 in updated TMDL Implementation Plan Matrix (Temperature Management Strategies)**	Public education and public participation is an important element of the MS4 Permit and associated Stormwater Management Plan. Public education activities specifically to address temperature have been inorporated into updated matrix. Updates to the City's website will be one of many outreach tools employed by staff.	Water Resources Section no longer exists. Staff have initiated an effort to create a more user friendly City website. Updates are in the works with an updated City of Salem website is anticipated in FY 16-17.

TMDL Implementation Plan BMP Progress Matrix for the Willamette Basin and Molalla/Pudding Subbasin (2010 TMDL Plan)

Best Management Practices and Tasks	BMP Source	Tracking Measures	Measurable Goals	Justifications: Explanation of Key Points in Analysis of BMP	5th Year Review - Status of Activity	Proposed Matrix Update (March 2016)	Measurable Milestones	Status/Reporting Summary (Through June 30, 2016)
NP9. Review consistency of public education / participation program goals and objectives against the Stormwater Master Plan and BMPs set forth in the revised Stormwater Management Plan.	Non-point	Education and participation addressing goals and objectives of Master Plan and Management Plan.	Annually	Reviewing goals of public education/participation objectives does not directly effect pollutants. The review of BMP objectives is important to consider when providing public education and addressing stormwater concerns within the City. The public is not involved in the review process, but is effected by it. BMP objectives are related to regulatory requirements, therefore; regulating factors are addressed in the review process of BMPs when considering public education.	**Incomplete** - Strategy started, but measures not 100% or interim steps still underway because of unanticipated delays.	**See Strategy #6 in updated TMDL Implementation Plan Matrix (Temperature Management Strategies)**	Public education and public participation is an important element of the MS4 Permit and associated Stormwater Management Plan. Public education activities specifically to address temperature have been inporporated into updated matrix. These activities have no relation to the Stormwater Master Plan.	See FY 2015-16 MS4 Annual Report (Appendix B) Public Education & Participation details are listed under RC-5.
NP10. Continue to coordinate with City departments and educate the public regarding trees, consistent with Chapters 68, 86, and 132, and new stormwater and erosion control codes of the Salem Revised Code (SRC).	Non-point	Development of outreach and education plan for trees	Coordination began FY 2009-10, and will be ongoing. Development of outreach and education plan to begin FY 2010/11	Preservation of urban trees aids in water quality and quantity treatment of stormwater runoff and reduces erosion while enhancing habitat. Response to the public about tree concerns is implemented citywide.	**Complete** - Strategy implemented and/or is ongoing as expected.	**See Strategy #6 in updated TMDL Implementation Plan Matrix (Temperature Management Strategies)**	This effort will continue to be ongoing and is included in the updated updated matrix.	Updates to SRC Ch 86 (Trees on City Owned Property) were approved by City Council in FY 15-16. Tree City USA outreach efforts were intitiated in April 2016 and will continue until April 2017.
NP11. City Pet Waste Program, continue to work with public and interested parties to reduce dog waste, including presentations about dog fecal disposal during Take the pledge presentations, Bark in the Park, and installation of mutt mitt stations in city parks	Non-Point (Bacterial Education Sections)	Development of program and number of groups included with distribution of program material, number of bags equipped and stations installed, and number of park patrol volunteers participating in the program. Types and number of information dissemination.	Campaign was held in FY 08/09, and limited in 09/10. Targeted pet waste campaign re-initiated in FY 11/12.	It is recognized that this program results in actual reduction in fecal matter waste streams in Salem park areas, therefore warranting a 2 rating on bacterial reduction, it was however not given a greater reduction value because it is unknown at this time effectiveness of volunteer effort in lbs of reduction and removal of Fecal matter, as information of program increases and implementation expands this will increase values of bacterial reduction.	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove this BMP from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	Education and outreach activities addressing E.coli are included in the City's Stormwater Management Plan and reported upon annual in MS4 Annual Report. These activities will continue to be ongoing.	See FY 2015-16 MS4 Annual Report (Appendix B) Public Education & Participation details are listed under RC-5.
NP12. Review city code conditions, and other regional examples to determine if an Animal Waste Ordinance is needed and whether it would provide benefit	Non-Point (Bacterial Education Sections)	Determine if code is necessary and/or politically feasible	FY 2010-11	It is unknown the effect a City ordinance would have on bacterial loads with in the city.	**Incomplete** - Strategy started, but measures not 100% or interim steps still underway because of unanticipated delays.	Remove this BMP from TMDL Implementation Plan Matrix (Temperature Reduction Strategies).	No need for an Animal Waste Ordinance has been identified. Education and outreach activities addressing E.coli are included in the City's Stormwater Management Plan and reported upon annual in MS4 Annual Report. These activities will continue to be ongoing.	See FY 2015-16 MS4 Annual Report (Appendix B) Public Education & Participation details are listed under RC-5.
NP13. Public mercury educational program, collaborate with local partners by promoting take back programs already operating in area for mercury containing items	Non-point (Mercury, public sector)	Promotion of mercury take back opportunities and events with Marion County.	On-going	Marion County is the leading local agency regarding mercury take back. The City will assist with promoting activities. City currently does not actively have a program schedule for promoting take back program and does not currently have drop off sites thus at this time the mercury waster load is not being reduced by this city activity	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove this BMP from TMDL Implementation Plan Matrix (Temperature Reduction Strategies).	Staff will continue to support Marion County's efforts.	The Salem-Keizer Recycling & Transfer Station now takes CFLs 7 days/week excluding major holidays. The hours improve recycling opportunities and convenience, and reduce the need to hold collection events. The City continued to participate in advertising that the facility now accepts CFLs from residents during business hours.
NP14. Internal City operational mercury reduction program, review and update and ensure Standard Operating Procedures for material replacement and waste containing mercury is done properly	Non-point (Mercury , internal)	Reduction strategies identified and implemented. Coordinate with Tye and Don.	Review of current mercury reduction strategies in City Operations FY 2010-11, particularly fleet and facilities. Implementation of mercury reduction strategies --ongoing	Proper handling and disposal of mercury - containing items ensures, that HG is not improperly disposed.	**Incomplete** - Strategy started, but measures not 100% or interim steps still underway because of unanticipated delays.	Remove this BMP from TMDL Implementation Plan Matrix (Temperature Reduction Strategies).	Staff will continue to ensure proper handling and disposal of mercury containing items but official Mercury Reduction Program never completed.	Fleet Services conitnued to follow all pertinent laws regarding proper disposal of mercury switches found in older vehicles; Facilities collects, packages, and stores CFLs, then contacts Environmental Services to dispatch pickup by City's contracted Hazardous Waste hauler.
NP15. Work closely with Marion County staff on mercury reduction programs. Distribute water and sewer bill inserts, and participate in compact fluorescent light take back program.	Non-Point	Number of inserts distributed. Number of CFLs Recycled.	On-going	Compliance with Mercury TMDL	**Delete** - Strategy not implemented and will not be implemented in 2015-2020.	Remove this BMP from TMDL Implementation Plan Matrix (Temperature Reduction Strategies).	Efforts to keep soil from local streams & waterways likely have greater impact on mercury reductions in streams and will continue to be reported upon in MS4 Annual Report.	Staff continued to promote proper household hazardous waste disposal through a radio segment.

TMDL Implementation Plan BMP Progress Matrix for the Willamette Basin and Molalla/Pudding Subbasin (2010 TMDL Plan)

Best Management Practices and Tasks	BMP Source	Tracking Measures	Measurable Goals	Justifications: Explanation of Key Points in Analysis of BMP	5th Year Review - Status of Activity	Proposed Matrix Update (March 2016)	Measurable Milestones	Status/Reporting Summary (Through June 30, 2016)
NP16. Environmental Services will track new dentists through the building permit process and will verify sites for amalgam separator installations and good mercury housekeeping practices; visit with all of the community's identified, existing dentists and provide compliance certifications to ODA	Non-Point	Number of dentists contacted. Number of Amalgam Separators Installed and Certified. Pounds of Mercury Collected Annually.	On-going	Compliance with Mercury TMDL	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove this BMP from TMDL Implementation Plan Matrix (Temperature Reduction Strategies).	This task will continue to be ongoing. However, efforts to keep soil from local streams & waterways likely have greater impact on mercury reductions in streams and will continue to be reported upon in MS4 Annual Report.	2 new dental offices were identified during the plans review process in FY 15-16. These offices were sent surveys.
E. Coli outreach tasks	Non-Point	Will vary based on program elements, but can include measures such as: number of Mutt Mitts in Parks replenished annually; number of participants in public involvement; number of responses to promotions; number of partners sharing our message; survey of pet owners.	On-going	Compliance with Bacteria TMDL	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove this BMP from TMDL Implementation Plan Matrix (Temperature Reduction Strategies). The MS4 Annual Report will continue to be submitted to DEQ as an Appendix to theTMDL Annual Report.	Education and outreach activities addressing E.coli are included in the City's Stormwater Management Plan and reported upon annual in MS4 Annual Report. These activities will continue to be ongoing.	See FY 2015-16 MS4 Annual Report (Appendix B) Public Education & Participation details are listed under RC-5.
Mercury outreach tasks	Non-Point	Will vary based on program elements, but can include measures such as: number of retailers in Salem-Keizer that participate in a Take-Back CFLs program; erosion outreach plan development; increase in minimum buffer width; number of promotions for mercury take-back; number of riparian plants planted, including ground cover; number of dentists receiving fact sheets or information packets.	On-going	Compliance with Mercury TMDL	**Complete** - Strategy implemented and/or is ongoing as expected.	Remove this BMP from TMDL Implementation Plan Matrix (Temperature Reduction Strategies).	The City surveyed 261 dental offices and verified the installation of 148 amalgam separators during this TMDL cycle. Surveys will continue to be sent to any new dentists. Per the City's SWMP, staff will also continue to support and encourage proper disposal of household hazardous wastes, and continue to coordinate outreach and trainings pertaining to the City's Erosion Prevention & Sediment Control Program. Details of these efforts will continue to be included in the MS4 Annual Reports.	
Temperature outreach tasks	Non-Point	Will vary based on program elements, but can include measures such as: number of trees and shrubs planted; number of site plans developed and planted; number of milestones of Elements of the Riparian Action Plan Enacted.	On-going	Compliance with Temperature TMDL	**Complete** - Strategy implemented and/or is ongoing as expected.	**See Strategy #6 in updated TMDL Implementation Plan Matrix (Temperature Management Strategies)**	**Projects with Friends of Trees** (Since 12-13) - Total Trees & Shrubs Planted: (Riparian + Upland) =8702 Total Volunteers: =1052	**Projects with Friends of Trees** (FY 15-16) - Total Trees & Shrubs Planted: (Riparian + Upland) =2359 Total Volunteers: =400

Appendix B

Temperature Reduction Strategies (2016 TMDL BMP Progress Matrix)

Temperature Reduction Strategies (2016 TMDL BMP Progress Matrix)

	Management Strategy		Measurable Goals	Milestones	FY 16-17	FY 17-18	FY 18-19	FY 19-20	FY 20-21	Annual Goal Tracking	Annual Status Update
GIS Data Review & Assessment	**1. Utilize GIS data to assess shade/canopy cover, prioritize and document planting projects, and to evaluate changes in the City's tree canopy.**	**1A**	Assess 2009 Riparian Shade Inventory to determine applicable updates that may include options for improved constraint/opportunities mapping and increasing the number of available shade categories (FY 16-17).	Convene workgroup to review 2009 Inventory data and to develop project scope that incorporates collective data needs among different sections.	x					Identify workgroup involvement, track meetings and signficant decisions/outcomes. Track progress made on desktop tasks and field verification and analysis.	
				Develop scope of work with project goals (and budget if consultant services needed).	x						
				Conduct desktop/field analysis internally or with assistance of consultant services.	x	x					
		1B	Review Riparian Prioritization Database and weighting criteria for potential improvements and increased utility (FY 16-17).	Convene workgroup to determine desired functionality for increased use.	x					Identify workgroup involvment, track meetings and significant decisions, field inspections	
				Identify high priority areas/taxlots based on data review (shade, constraints, ownership, access, opportunity for community involvement etc.)		x					
				Generate prioritized list of future targeted areas for planting and riparian enhancements (FY 17-18).		x					
		1C	Create GIS database to document all upland and riparian projects (FY 17-18).	Develop criteria and tracking mechanism for database.	x					Identify workgroup involvement, track meetings and signficant decisions/ outcomes. Track the number of fines, planting sites, and # plants planted.	
				Work with Community Development to ensure knowledge of priority sites for planting (fines).	x						
				Generate a master map to assist with internal communication and update as needed based on available project data.		x					
		1D	Complete next update to 2010 Salem Canopy Study (FY 20-21).	Develop scope of work, hire COR, and update study.					x	Track progress made on next canopy study.	

Trees & Native Vegetation	**2. Partner with local agencies, non-profits, volunteer groups, and local residents to coordinate plantings and to control invasive vegetation along Salem streams.**	**2A**	Continue to utilize contracted services to coordinate multi-year riparian planting projects on City owned parcels. (Annually).	Update annual Scope of Work with contractor to outline project location(s), site preparation, planting plan, maintenance needs, and estimated schedule of activities.	x	x	x	x	x	Track annually the # linear feet planted, # trees/shrubs installed, and # volunteers involved.	
				With consideration for the time needed for site prep and invasive vegetation removal in mind, ensure that at least 150 linear feet of streambank are planted with native trees/shrubs and/or receive targeted invasive vegetation removal each year (Annually).	x	x	x	x	x		
				Reassess and document continued project maintenance needs (Annually).	x	x	x	x	x		
				Reassess contract renewal/continued contracting needs for future planting events.		x					
		2B	Pursue MOA with local school district for multi-year riparian and upland planting projects on school owned lands. (FY 16-17).	Meet with District staff to discuss possible collaboration and potential concerns.	x					Document collaboration efforts with District, Council acceptance, progress and/or changes made to MOA, and any associated planting activities. Track # plants provided, and area planted.	
				Draft MOA that meets District needs and clarifies project scope, boundaries, and future maintenance responsibilities.	x						
				Submit MOA to City Council for approval to execute.	x						
				Initiate planting efforts on school owned properties under MOA or alternate agreement.		x	x	x	x		
		2C	Continue to offer native vegetation to targeted streamside properties (Annually).	Continue to offer native vegetation to at least 20 private streamside residents to supplement public planting projects. These residents are typically adjacent to the contracted project area and identified as having low riparian shade.	x	x	x	x	x	Track # properties receiving assistance and the # plants provided.	
				If available, continue to provide native trees and shrubs (or offer alternate resources) for additional requests received.	x	x	x	x	x		
		2D	Initiate a collaborative effort with another partnering agency to assist private streamside property owners in Salem with invasive vegetation removal and control (FY 15-16).	Finalize and submit to City Council a staff report with request to enter a MOA. If necessary, identify alternate partnering options.	x					Document Council Action, # properties to receive assistance, and assistance provided.	
				Review existing streamside data and identify a proposed list of taxlots to receive assistance.	x						
				Seek approval/interest from identified streamside residents and initiate control efforts.	x						
				Create tracking mechanism to document location of efforts and continued progress made.	x						
				Continue to provide and track assistance as resources allow.		x	x	x	x		

		2E	Develop a process for pursuing strategic planting and/or other riparian enhancements on lands donated/vacated to the City and on newly developed/ re-developed properties (FY 19-20).	Initiate internal meeting(s) with staff from multiple Divisions/Departments to determine core stakeholders, needs, and discuss options forward.		x	x			Document efforts/progress made on the development of an internal process.	
				Finalize and document internal procedures based on predetermined need.				x			
		2F	Develop mechanism to offer replacement trees to residents/businesses where fallen trees have been removed (FY 17-18).	Develop long term approach for providing replacement trees/vegetation and planting assistance if needed.		x				Document internal coordination and determined approach for replacement trees.	
				Ensure appropriate tracking mechanism for this assistance is developed, as needed.		x					
Stream Mitigation Bank	**3. Implement Stream Mitigation Banking (SMB) Program as a means to offset impacts to waterways from public infrastructure improvements projects.**	3A	Continue to monitor the approved SMB Project Site (Waln Creek) according to established performance standards (Annually).	Maintain riparian vegetation and control noxious/invasive weeds to ensure establishment of the approved native plant communities.	x	x	x	x	x	Track completion of required monitoring activities. Implement management recommendations.	
				Monitor established stream cross-sections to ensure continued streambank stability.	x	x	x	x	x		
				Document site conditions with photographs from established points.	x	x	x	x	x		
				Meet permit and SMB standards for channel stability and habitat.	x	x	x	x	x		
		3B	Submit an annual monitoring report and SMB Report to the ACOE and DSL by January 31 of each year (Annually).	Report to agencies for seven years.	x	x	x	x	x	Track completion of required reports.	
				Develop a Long-term Management Plan for the SMB Project Site.		x					
Stream Stabilization	**4. Pursue options for streambank stabilization and riparian enhancement projects that incorporate bioengineering practices, the instream placement of woody debris, and native plants.**	4A	Complete at least one streambank stabilization/enhancement pilot project per TMDL plan cycle that incorporates bioengineering practices and the instream placement of large woody debris and (FY 20-21).	Evaluate options for project funding (FY 16-17).	x					Document determined funding mechanism, identified project location/scope, and efforts to project completion.	
				Based on available funding mechanism determine pilot project location and estimated scope of effort.		x					
				Finalize project scope and design.			x	x			
				Initiate bioengineering methods and installation of large woody debris.				x			
				Complete intitial pilot project per final scope and design.					x		
		4B	Pursue development of no cost home new options/programs to assist residents with streambank erosion and planting (FY 19-20).	Inititiate internal meetings to determine best approach forward toward development of a new alternatives for assistance.		x				Identify workgroup involvment, track meetings and significant decisions, and progress made on assistance program.	
				Finalize plan for providing assistance with streambank erosion.				x			

Riparian Protections	**5. Continue to review and revise Salem Revised Code (SRC) provisions to ensure protection of riparian area buffers.**	**5A**	Complete next review of SRC and Administrative Rules to identify inconsistencies and/or barriers to adequate enforcement (FY20-21)	Inititiate internal workgroup to review recently reorganized SRC.		x				Identify workgroup involvment, track meetings and significant decisions, and changes proposed to SRC.	
				Coordinate with staff from Public Works, Community Development, and Legal on any proposed adjustments to SRC and/or the Administrative Rules.		x	x	x	x		
				Ensure protections for areas identified as having ample riparian canopy cover based on available GIS data.		x	x	x	x		
Public Education & Outreach	**6. Assess and engage the community in education efforts focused on stream temperature.**	**6A**	Assess the low-shade audience for development of a targeted outreach plan and schedule (FY 17-18).	Use updated riparian shade inventory and priortization database to identify low canopy areas for targeted outreach.	x	x				Determine feasible target number for yearly outreach. Create schedule and track number of contacts, interested parties, and plants planted.	
				Assess barriers to audience identified above.		x	x				
				Develop outreach schedule for targeted properties.		x	x				
				Pursue the development of incentives to encourage planting along streambanks.		x	x	x	x		
		6B	Update Riparian Outreach Plan incorporating results of streamside survey (FY 18-19)	Develop and conduct survey for streamside residents.		x				Track survey development, # of surveys completed, and results.	
				Update outreach plan based on the survey results.		x	x				
		6C	Use a varierty of tools to convey riparian values to the general public (Annually).	Update retooled website with "key components" information from Riparian Outreach Plan.	x	x	x	x	x	Track #/content of updated materials to website. Document planting incentives (materials, trainings, etc.) provided to citizens.	
				Compile updated information for streamside mailers, online ads, radio, presentations.	x	x	x	x	x		
		6D	Continue/develop partnerships to share messages and leverage resources (Annually).	Assist with development and implementation of a local backyard habitat program.	x	x	x	x	x	Track progress made on habitat program, # applications, partners and participants.	
				Continue to participate in in MWOG and regional coalition.	x	x	x	x	x		
				Develop and implement streamside workshops for riparian landowners.			x	x	x		
		6E	Continue to support/promote weed control efforts of Salem based volunteer groups (Annually).	Promote efforts by local volunteer groups by providing materials to the public during community events, utilizing social media and internal communications, and advertising their efforts and the associated benefits through other tools as the resources are available.	x	x	x	x	x	Track advertising activities and all efforts assoicated with planting projects on public or private streamside properties.	
				Pursue options to utilize volunteer weed removal services to supplement both public planting projects and efforts to assist private streamside properties.	x	x	x	x	x		

Internal Communication	**7. Ensure internal awareness of TMDL requirements, Implementation Plan strategies, and project updates/needs.**	**7A**	Develop informational report that provides an overview of the City's TMDL Implementation Plan (Plan) and annual reporting requirements to Salem City Council (FY 16-17).	Provide staff report to City Council once per 5-year TMDL cycle.	x					Track progress made/comments on staff report, # event summaries provided in management reports, and # articles completed.	
			Ensure that information about TMDL requirements and/or associated tree planting events is included in management reports and internal newsletter. (Ongoing/Annually)	Draft an event summary following each coordinated planting event.	x	x	x	x	x		
				Complete 2 TMDL related articles per year for internal newsletter.	x	x	x	x	x		

Appendix C

NPDES MS4 Annual Report (FY 2015-16)

CITY OF Salem AT YOUR SERVICE
Public Works Department
555 Liberty Street SE / Room 325 • Salem OR 97301-3513 • Phone 503-588-6211 • Fax 503-588-6025

October 27, 2016

Mark Riedel, Stormwater Specialist
Oregon Department of Environmental Quality
Western Region
165 E 7th Avenue Suite 100
Eugene OR 97401

SUBJECT: **National Pollutant Discharge Elimination System**
Municipal Separate Storm Sewer System
FY 2015-16 Annual Report
Permit No. 101513, File No. 108919

Dear Mr. Riedel:

The City of Salem is pleased to submit the enclosed National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) annual report. This report describes *Stormwater Management Plan* activities completed by the City of Salem during the period of July 1, 2015, through June 30, 2016. Additionally, this report addresses the 11 requirements listed under Schedule B(5) of the City's NPDES MS4 Permit (Permit No. 101513, File No. 108919) received December 30, 2010.

This annual report was placed on the City's website from October 12, 2016, through October 26, 2016, and an official press release was issued to solicit comments from the public. No comments were received.

Please contact Heather Dimke, Stormwater Management Analyst, at 503-588-6063, extension 7734, if you have any questions or request additional information.

Sincerely,

Mark Becktel, AICP
Operations Division Manager

HD:VLS/KC:G:\Group\Files\CHRONO\2016\HD 102716 MS4_AnnualReport_CoverLetter.docx
Enclosure: City of Salem NPDES MS4 Annual Report FY 2015-16
cc: Peter Fernandez, PE, Public Works Director
Nitin Joshi, Environmental and Regulatory Affairs Manager
Keith Bondaug-Winn, Stormwater Quality Supervisor
File: Chrono; Regulatory

CITY OF SALEM, OREGON

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) PERMIT

(Permit Number 101513, File Number 108919)

ANNUAL REPORT
FY 2015-16

October 27, 2016

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 gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the 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.

10/31/2016

Mark Becktel, AICP, Operations Division Manager Date

Prepared by
City of Salem Public Works Department

CITY OF Salem AT YOUR SERVICE

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LIST OF ACRONYMS

ACWA	Association of Clean Water Agencies
BMP	Best Management Practice
CFR	Code of Federal Regulations
CIP	Capital Improvement Plan
COE	U.S. Army Corps of Engineers
CON	Construction-related BMPs
DEQ	Oregon Department of Environmental Quality
EPA	U.S. Environmental Protection Agency
EPSC	Erosion Prevention and Sediment Control
ES	Environmental Services (City of Salem)
FEMA	Federal Emergency Management Act
GIS	Geographic Information System
IDEP	Illicit Discharge Elimination Program
IGA	Inter-governmental Agreement
ILL	Illicit discharge-related BMPs
IND	Industrial-related BMPs
MEP	Maximum Extent Practicable
mg/L	Milligrams per liter
MOA	Memorandum of Agreement
MS4	Municipal Separate Storm Sewer System
MWOG	Mid-Willamette Valley Outreach Group
ODA	Oregon Department of Agriculture
ODOT	Oregon Department of Transportation
ppm	Parts per million
RC	Residential and commercial area-related BMPs
SDC	System Development Charge
SKAPAC	Salem/Keizer Area Planning Advisory Committee
SRC	Salem Revised Code
SSORP	Sanitary Sewer Overflow Response Plan
SWMP	Stormwater Management Plan
TMDL	Total Maximum Daily Load

1 INTRODUCTION

1.1 Permit Background

In 1990, the United States Environmental Protection Agency (EPA) published its Phase I regulations governing stormwater discharges under the National Pollutant Discharge Elimination System (NPDES) program of the Clean Water Act. In Oregon, EPA has delegated the permitting of NPDES municipal separate storm sewer system (MS4) discharges to the Oregon Department of Environmental Quality (DEQ).

Under EPA's initial Phase I implementation of the program, municipalities having a population greater than 100,000 were required to obtain an NPDES MS4 permit. The City of Salem (the City) passed that threshold with the 1990 Census and was included in the program by the DEQ, with the Oregon Department of Transportation (ODOT) originally designated as a co-permittee with Salem.

The regulations established a two-part application process for obtaining an NPDES Permit to discharge municipal stormwater to "waters of the state." The City submitted the Part 1 NPDES stormwater permit application in April 1994. The supplemental Part 2 application and associated Stormwater Management Plan (SWMP) were subsequently finalized and submitted to DEQ in July 1996. DEQ issued the City's initial NPDES MS4 permit in December 1997, with an expiration date of September 2002.

An application for permit renewal was submitted to the DEQ in April 2002, and the City's second MS4 permit was issued in March 2004. The next permit renewal application was submitted to the DEQ in 2008. This application included a revised SWMP (2008 SWMP) that was developed in part using the EPA document *Municipal Separate Storm Sewer System Program Evaluation Guidance* (January 2008). Following permit negotiations, the 2008 SWMP was further revised and submitted to the DEQ on August 13, 2010.

The City's renewed (third) MS4 permit was issued on December 30, 2010. Consistent with requirements of Schedule D.6 of the renewed MS4 permit, the City re-submitted the SWMP (revised 2010 SWMP) to the DEQ on March 17, 2011. The EPA conducted an inspection of the City's MS4 program from July 31, 2012, through August 2, 2012, to assess compliance with the NPDES MS4 permit. The results of the audit were released during the FY 2013-14 reporting period, and indicated that the City was deficient in meeting its construction site runoff control requirements. An EPA Administrative Compliance Order by Consent (Consent Order) was issued for the City of Salem to: 1) develop and document its construction site plan review procedures; 2) develop and document inspection procedures for construction sites; and 3) submit a separate report of all construction site inspections annually through the expiration of the current MS4 permit. The City remedied the deficiencies in its construction site erosion control program within 90 days of the Consent Order, submitted its first annual construction site inspection report on November 1, 2013, and continues to meet the requirements of the NPDES MS4 permit and the EPA Consent Order.

The City's current permit had an expiration date of December 29, 2015. A renewal application was submitted in December 2015 (per the conditions listed under Schedule F, Section A.4) and the DEQ has confirmed (in a letter dated March 1, 2016) that the permit has been administratively extended. A copy of the MS4 permit, revised 2010 SWMP, and 2015 permit renewal application has been posted on the City's website (www.cityofsalem.net) along with all subsequent annual reports associated with the current permit cycle. This document represents the City's Fiscal Year 2015-16 (FY 15-16) Annual Report, and describes the status of BMP-related activities in the revised 2010 SWMP.

1.2 Purpose and Scope

The MS4 permit area is defined as the area included within its city limits (encompassing 47 square miles), as exhibited in Figure 1. This is the area for which the City has responsibility for implementing its stormwater management program. Land use within the permit area is exhibited in Figure 2.

This NPDES MS4 Annual Report summarizes stormwater-related activities listed in the 2010 SWMP that were completed during the period of July 1, 2015, through June 30, 2016, to address the requirements of the City's current MS4 permit. The information presented in this report is based on the requirements listed in Schedule B.5 of the MS4 Permit (see Table 1).

Table 1. Annual Reporting Requirements for the MS4 Permit

Permit Section	Reporting Requirement	Location in Annual Report
B(5)(a)	The status of implementing the stormwater management program and each SWMP program element, including progress in meeting the measurable goals identified in the SWMP.	Section 2
B(5)(b)	Status or results, or both, of any public education program effectiveness evaluation conducted during the reporting year and a summary of how the results were or will be used for adaptive management.	Section 2 (RC 5-1)
B(5)(c)	A summary of the adaptive management process implementation during the reporting year, including any proposed changes to the stormwater management program (e.g., new BMPs) identified through implementation of the adaptive management process.	Section 1.3
B(5)(d)	Any proposed changes to SWMP program elements that are designed to reduce TMDL pollutants.	Section 1.3
B(5)(e)	A summary of total stormwater program expenditures and funding sources over the reporting fiscal year, and those anticipated in the next fiscal year.	Section 3
B(5)(f)	A summary of monitoring program results, including monitoring data that are accumulated throughout the reporting year and/or assessments or evaluations.	Section 2 (MON 1-1, 1-2, and 1-3), Appendix A
B(5)(g)	Any proposed modifications to the monitoring plan that are necessary to ensure that adequate data and information are collected to conduct stormwater program assessments.	Appendix A
B(5)(h)	A summary describing the number and nature of enforcement actions, inspections, and public education programs, including results of ongoing field screening and follow-up activities related to illicit discharges.	Section 2 (ILL 2-4), Section 4, Appendix A,
B(5)(i)	An overview, as related to MS4 discharges, of concept planning, land use changes and new development activities that occurred within the Urban Growth Boundary (UGB) expansion areas during the reporting year, and those forecast for the following year including the number of new post-construction permits issued, and the estimate of the total new or replaced impervious surface area related to new development and redevelopment projects commenced during the reporting year.	Section 5
B(5)(j)	Results of ongoing field screening and follow-up activities related to illicit discharges.	Section 2 (ILL 2-4), Appendix A

1.3 Adaptive Management

The stormwater management program that is described in the City of Salem's current SWMP is the result of adaptively managing (e.g., implementing, evaluating, and adjusting) the program since first being issued an MS4 permit in 1997. The history of this adaptive management approach may be found in Section 2 of the City of Salem's "National Pollutant Discharge Elimination System Municipal Separate Storm Sewer System Permit Renewal (September 2, 2008)," and describes how the current DEQ-approved SWMP meets the 'maximum extent practicable' requirement. By adaptively managing its stormwater management program, the City of Salem continues to reduce the discharge of pollutants from its stormwater system.

Consistent with Schedule D.4 of the MS4 permit, City staff submitted an "Adaptive Management Approach" to the DEQ on October 24, 2011, that will continue to be adhered to through expiration of the MS4 permit. This approach involves both an annual review of BMP activities and collected data, as well as a comprehensive assessment of BMP activities in preparation for MS4 permit renewal.

Per the Adaptive Management Approach, a series of 12 meetings were held with staff across the City during the last reporting year (FY 14-15) to review BMP activities completed over the permit term, information received through the annual adaptive management process, and to complete a comprehensive assessment of BMP activities listed in the 2010 SWMP. Information collected through this assessment informed the proposed SWMP modifications that were submitted to the DEQ as part of the MS4 Permit Renewal Package in December 2015. The proposed revisions were posted on the City's website for an open public comment period prior to submittal to DEQ.

In preparation of this annual report and as described in the Adaptive Management Approach, City staff were again asked to consider if changes in BMP activities were anticipated or proposed in the next fiscal year (FY 16-17). No additional changes to the SWMP were proposed during this reporting period.

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Figure 1. Permit Area Map

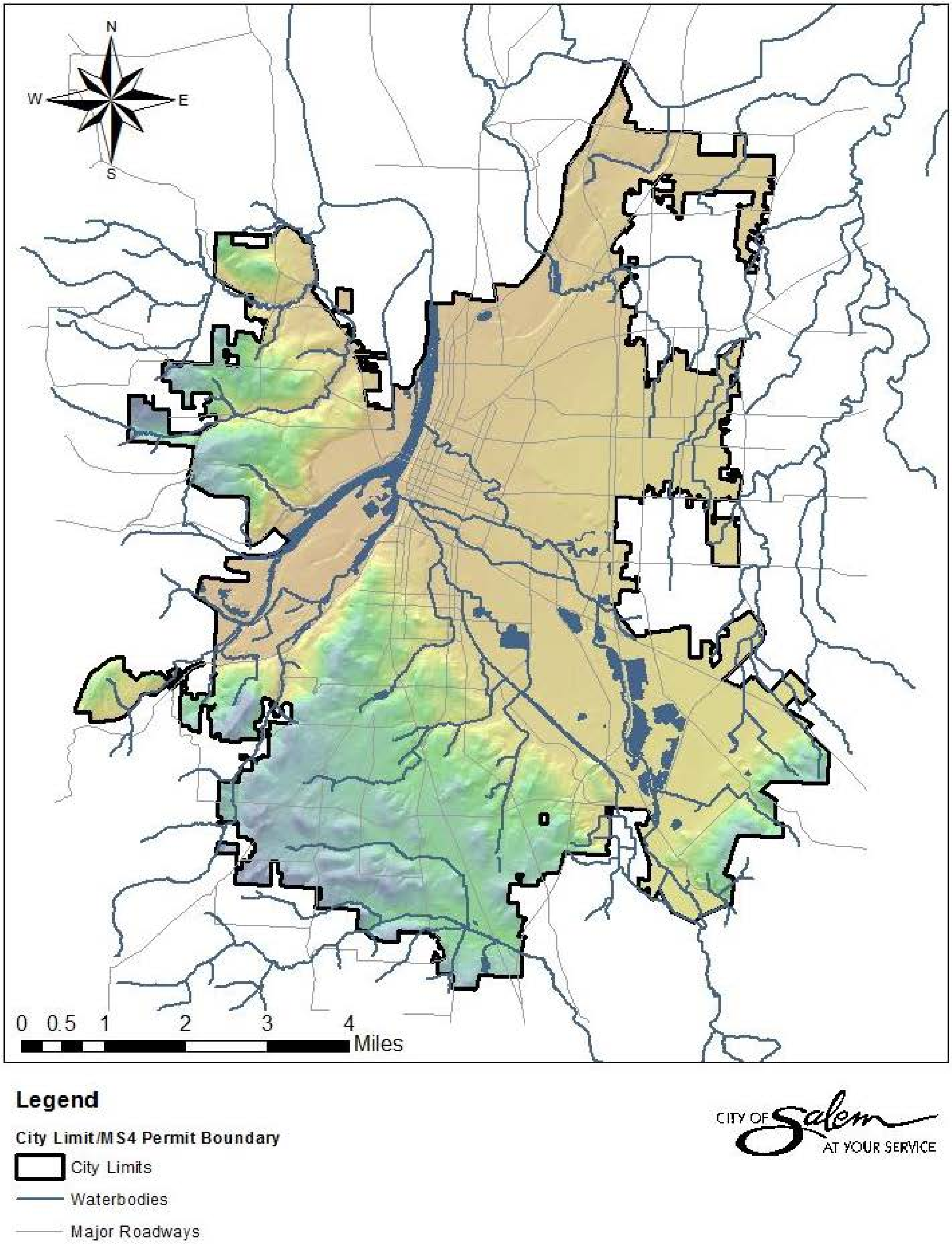

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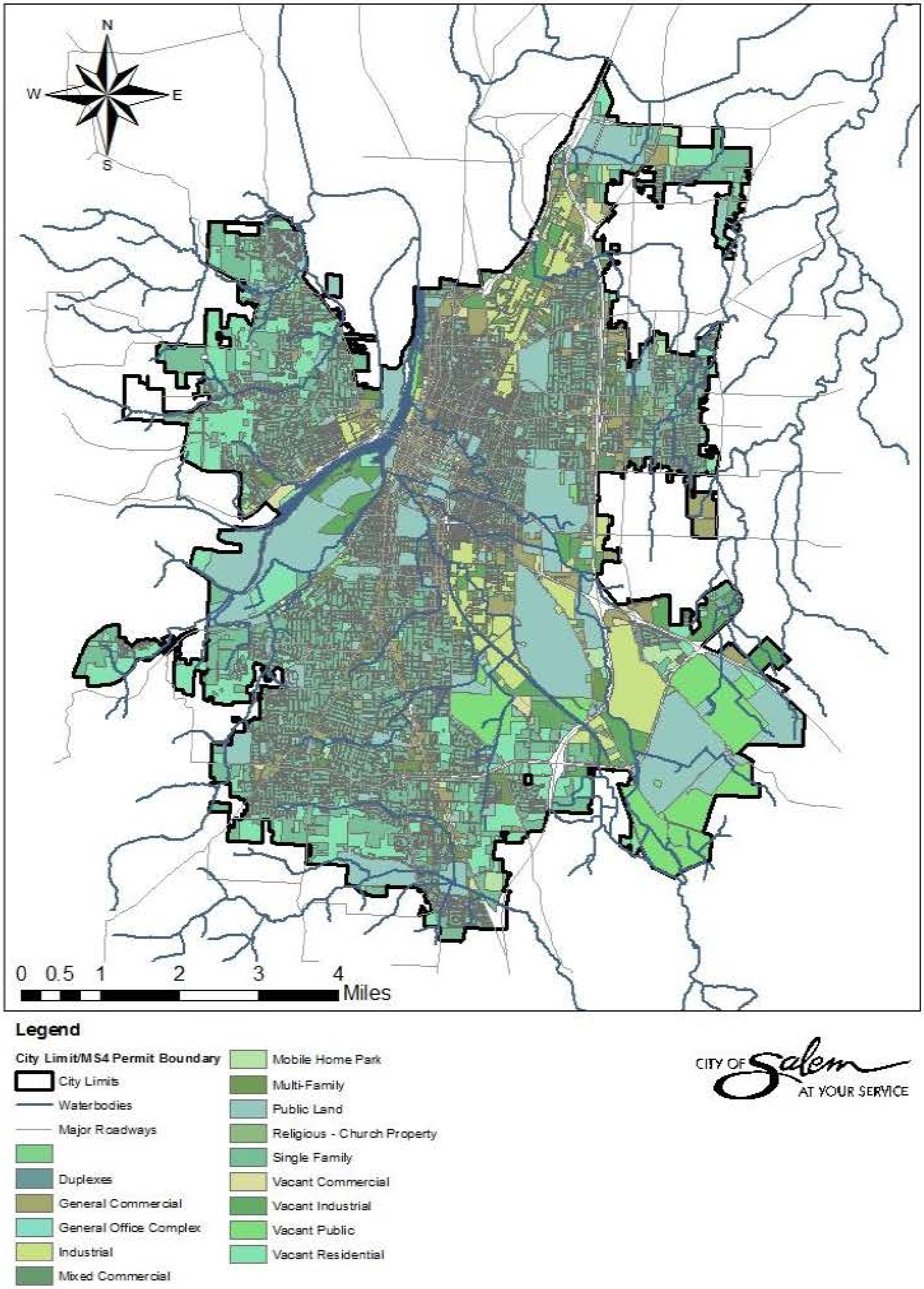
Figure 2. Land Use



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2 STATUS OF THE STORMWATER MANAGEMENT PLAN

The primary objective of the SWMP is to provide an outline of City activities that will satisfy the NPDES Phase I stormwater regulatory requirements (the MS4 permit) [40 CFR 122.26(d)(2)(iv)]. The intent of the regulations is to allow each permittee the opportunity to design a stormwater management program tailored to suit the individual and unique needs and conditions of the permit area, and reduce the discharge of pollutants from the stormwater sewer system to the maximum extent practicable.

The status of BMP activities listed in the 2010 SWMP is discussed in this section of the Annual Report. BMPs within the SWMP have been categorized into five types:

1. Structural and source controls for residential and commercial areas (RC);
2. A program for the control of illicit discharges and improper disposal into the storm drainage system (ILL);
3. A program to monitor and control pollutants from industrial facilities, hazardous waste treatment, storage and disposal facilities, and municipal landfills (IND);
4. A program to implement and maintain structural and non-structural BMPs to reduce pollutants from construction sites (CON); and
5. A program to conduct water quality monitoring activities within the MS4 drainage system and City waterways (MON).
6. Each BMP identified in the 2010 SWMP is discussed in this report with the following information:
   - A table describing BMP tasks, associated measurable goals, and tracking measures as stated in the 2010 SWMP.
   - A summary of activities completed during fiscal year 2015-2016 (July 1, 2015 through June 30, 2016) that demonstrates progress toward meeting the measurable goals and tracking measures.

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Table 2. RC1—Planning

Task Description	Measurable Goals	Tracking Measures	FY 2015-16 Activities
RC 1-1: Provide City-wide Master Planning for stormwater to address both water quality and water quantity. As part of master planning efforts, continue to evaluate new detention and water quality opportunities within the Urban Growth Boundary (UGB), and consider sites in upstream areas that may affect Salem, and in downstream areas that may be affected by runoff from Salem.	Maintain Master Plan and complete next update within the MS4 permit cycle.	Track schedule for updating Master Plan. Report on Master Plan update actions.	The draft Stormwater Master Plan has been completed. The draft includes supporting content such as background, regulatory context, goals, policies, and financial planning. With the exception of the Battle Creek basin, the Public Facilities Plan and the other basin plans are based on the material carried forward from the City's 2000 Stormwater Master Plan. The Battle Creek Basin Plan is new and contains the results of comprehensive data collection and computer modeling. Data collection and survey work are currently being conducted on the next basin plan to be produced, which will be for Mill Creek/Pringle Creek basins. These two basins, analyzed separately in 2000, have been combined for this master plan update owing to the hydraulic connectivity between them.
RC 1-2: Develop and maintain watershed management plans by developing a prioritized schedule and implementing watershed management plans based on available funding. Develop the Pilot Pringle Creek Watershed Management Plan as a model for the City's other prioritized urban watersheds. Identify capital improvement needs and potential "early action" activities and projects to ensure that the plan has a strong implementation component.	Complete a hydromodification study and retrofit plan by November 1, 2014. Incorporate recommendations and early action items of watershed management plans with completion of hydromodification study and retrofit plan. Develop strategy for completing future watershed management plans by November 1, 2014.	Report on completion of hydromodification study. Report on completion of retrofit plan. Track implementation actions of Pringle Creek Watershed Management Plan. Report on strategy for completing future watershed management plans.	The Hydromodification Assessment and Stormwater Retrofit Plan were completed and submitted to the DEQ on October 28, 2014. During this reporting period, City staff and contracted professionals conducted survey work and developed a list of early action activities (taking into consideration data collected from the Hydromodification Assessment and Stormwater Retrofit Plan), to inform the Battle Creek Basin Plan and Pringle/Mill Creek Basin Plan currently being developed per the updated Stormwater Master Plan (See RC 1-1).
RC 1-3: City staff will continue to update the official "waterways" map for use by City staff in applying various regulations and standards. As studies are performed that warrant the revision of the designated waterways, including groundtruthing, that information will be incorporated into the update process.	Compile database of maps and waterways references. Complete field groundtruthing by end of FY 2011-12. Update map by end of FY 2012-13.	Track completion of groundtruthing and map updates.	Minor edits were made to the waterways in the 2015-16 fiscal year as errors were brought to the attention of GIS staff. At this time, no additional errors are known to exist.
RC 1-4: City staff will meet a minimum of once per year to discuss coordination of efforts relating to stormwater. Topics may include the following, as they are applicable: grant funding, outreach, program review, annual report, monitoring, sharing of data, adaptive management, review/update of documents and programs, training needs, documentation of protocols, coordination of databases, involvement of inspections, maintenance, and operations in plan review and program development, checklists, effective Erosion Prevention and Sediment Control Program including enforcement, strategizing addressing hotspots, plan review, stormwater BMPs, and development of written enforcement strategy. Provide factsheets/manuals to new employees at the City to inform them about the City's efforts for pollution prevention. At least annual trainings will be provided to specified City of Salem employees involved in MS4-related activities regarding the permit, including its intentions and their responsibilities in relation to the MS4. Feedback for improving processes will be encouraged and brought to the coordination meeting(s). Training needs will be determined by City staff meeting mentioned above. Consider adding stormwater pollution prevention training as an action item of the FY 2011-12 Environmental Action Plan that addresses pollution prevention on a city-wide level.	Conduct annual formal coordination meetings for stormwater, more often if necessary. Conduct annual training of employees involved in MS4-related positions, more often if necessary.	Prepare an annual meeting summary. Track changes made to the implementation of the stormwater program based on coordination discussions. Track major items of coordination. Track training attendance. Share and document training suggestions for MS4 implementation changes.	Throughout the 2015-16 reporting period, City staff from a variety of workgroups continued to participate in multiple MS4 coordination meetings in order to review MS4 program tasks and to complete permit deliverables. These coordination meetings included but were not limited to the following MS4 related efforts: 2015 MS4 Permit Renewal Package (proposed SWMP revisions, proposed Monitoring Plan revisions, MEP Evaluation, map updates), public education & outreach (routine coordination meetings for the annual "Mid-Valley Erosion Control and Stormwater Summit"), review of Erosion Prevention and Sediment Control procedures, Battle & Pringle Creek Master Planning data needs, Dry Weather Outfall Screening procedures, Operations & Maintenance (review progress made on catch basin and storm line cleaning, stormwater facility inspections, potential revisions to O&M requirements in Admin Rule 109-011), Integrated Pest Management Plan needs/updates, and process for identification of potential retrofit projects per submitted Retrofit Plan. An "Employee Guide for Pollution Prevention" has been developed for distribution to new employees during employee orientation. Public Works Operations employees receive annual training on spill prevention and response, good housekeeping, chemical storage, and on the importance of proper erosion prevention/sediment control practices. Staff involved with pesticide applications receive annual trainings pertaining to licensing requirements. Staff continued to participate in Oregon Association of Clean Water Agencies (ACWA) MS4 Phase I and Stormwater subcommittees this last year (see RC1 Task 8).
RC 1-5: Coordinate with other agencies such as NGOs, private environmental groups, and watershed councils.	Develop a list of contacts and identify issues of coordination.	Document any MOAs.	<u>Claggett Creek Watershed Council (CCWC):</u> Public Works staff continued to provide council support through active participation in the following CCWC activities this reporting period: • Sep 9: Attended first meeting • Oct 10: Assisted with water quality station for two environmental science classes from McNary High School • Feb 10: Attended planning meeting for "Watershed Discovery Night" • Apr 27: Attended the "Discover Your Watershed" event and provided assistance with macroinvertebrate exploration activity and coordination with McNary High School AP Environmental Science students to share their research on Claggett Creek <u>Straub Environmental Center (SEC):</u> Public Works staff sits on the SEC Board as well as Executive and Finance Committees. During this reporting period staff participated in the following activities: application review and interviews for a new Executive Director, "From Cart to Art" fundraising event at the Salem Conference Center (Nov 14), "Green Awards" fundraising event at the Elsinore Theater (Mar 12), and assisted with the premiere showing of UPRIVER (film about Willamette River Restoration – Sep 20). There were approximately 150

Task Description	Measurable Goals	Tracking Measures	FY 2015-16 Activities
			attendees at the UPRIVER event. In addition, staff participated in the following coordination meetings: • Executive Committee: (Jul 28, Aug 25, Nov 24, Jan 26, Feb 23, Apr 26) - to review/develop key concepts • SEC Board: (Sep 1, Oct 6, Nov 3, Dec 7, Jan 1, Mar 1, Apr 5, May 3, Jun 7) - to discuss governance of the SEC • Finance Committee: (Sep 15 & Jan 19) - to assess, update, and retool the current fiscal year budget and develop a plan for solvency • Education Meetings: (Jan 12 & Feb 9) FY 15-16 SEC Totals: • School programs served approximately 1,300 students in Grades 1-8 • Adult and family programs served more than 500 people in the Salem area • Special events garnered a combined attendance of roughly 425 people from Marion and Polk Counties <u>Oregon Green Schools:</u> Public Works staff sits on the Board and Executive Committee; providing organizational guidance to plan and implement environmental education programs. During this reporting period staff participated in the following: • Board Meetings: (Aug 20, Sep 22, Oct 15, Dec 17, Jan 28, Feb 18, Mar 10) • Oregon Green School Summit (Apr 1)—34 schools attended <u>Salem No Ivy Coalition:</u> Public Works staff routinely assist with planning meetings and at ivy removal events in Salem Parks. The group held the following "Ivy Pulls" during the FY 15-16 reporting period: • Aug 22: Waldo Park: (18 volunteer hours) • Sept 19: Wallace Marine Park: (360 volunteer hours) • Oct 17: Fircrest Park: (36 volunteer hours) • Nov 21: Wallace Marine Park: (36 volunteer hours) • Dec 19: Wallace Marine Park: (33 volunteer hours) • Jan 18: Wallace Marine Park: (48 volunteer hours) • Jan 23: Woodmansee Park: (27 volunteer hours) • Feb 20: Wallace Marine Park: (33 volunteer hours) • Mar 19: Wallace Marine Park: (27 volunteer hours) • Apr 16: Pringle Park Plaza: (24 volunteer hours) • May 21: E River Road Park: (18 volunteer hours) • Jun 11: River Road Park: (12 volunteer hours) • Jun 20: River Road Park: (15 volunteer hours) • Jun 24: River Road Park: (18 volunteer hours) Total Volunteer Hours: 705—Trees freed of ivy: 614—Cubic yards of ivy removed: 142 <u>Friends of Trees (FOT):</u> The City continued to contract with Friends of Trees to coordinate upland and riparian plantings during this reporting period. The following is a summary of FY 15-16 events: • Oct 17: FOT Crew Leader Training at North Salem High School – (65 plants/35 volunteers) • Nov 17: Northeast, Lansing, & NESCA Neighborhoods Upland Tree/Highland Elementary School Planting - (72 plants/116 volunteers) • Jan 23: Woodmansee Park Riparian Planting—(725 plants/94 volunteers) • Mar 5: Woodmansee Park Riparian Planting—(1500 plants/122 volunteers) • Apr 2: Northgate & Lansing Parks Upland Tree Planting—(39 plants/83 volunteers) Total Plants: 2401 - Volunteers: 445 <u>Mid-Willamette Valley Outreach Group (MWOG):</u> Public Works staff are members of the local outreach group that focuses on regional stormwater issues. The following is a summary of FY 15-16 event coordination activities: • Jul 21: 2015 Erosion Control Summit (ECS) survey review and 2016 ECS planning • Aug 18: ECS event planning • Sep 15: ECS event planning, education & outreach objectives • Nov 17: ECS event planning and logistics • Jan 05: ECS logistics • Jan 26: 2016 ECS: 102 attendees • Feb 16: ECS post-event review, continued education & outreach planning, Regional Alliance—

Task Description	Measurable Goals	Tracking Measures	FY 2015-16 Activities
			statewide education planning • Mar 15: Claggett Creek Watershed event, Water Festival proposal, ECS 2017 planning calendar, Demonstration Rain Garden @ State Fairgrounds, ACWA education—statewide collaboration • May 24: Water Festival—(8 classes/225 students) • Jun 14: Water Festival debrief, EC Summit calendar and preparations, public/private partnerships, draft Phase II Permit requirements and outreach collaboration
RC 1-6: The City will work with Marion and Polk Counties and the City of Keizer to coordinate stormwater management programs and activities within the greater Salem-Keizer Urban Growth Boundary. Coordination may include the establishment of appropriate intergovernmental agreements (IGAs) regarding potential uniform stormwater design standards, operations and maintenance activities, and public education and involvement efforts within the UGB.	Review and update the October 2000 SKAPAC Stormwater Management Agreement by the end of the permit term to reflect each jurisdiction's respective MS4 Permit and SWMP.	Report on significant coordination activities or programs. Report on completion of SKAPAC Agreement and other IGAs.	Staff from the City of Salem, City of Keizer, and Marion County made a collective decision during the FY 13-14 reporting period that the existing SKAPAC Agreement adequately addresses any concerns the jurisdictions may have regarding potential development activities in identified Stormwater Agreement Areas. No updates to the agreement are presently necessary. SKAPAC participants will continue to meet if needed to review public or private development projects that may impact the agreement. Stormwater staff continued to work with Marion County, the Marion Soil and Water Conservation District, the City of Keizer, the City of Albany, and the City of Corvallis through the Mid-Willamette Valley Outreach Group (MWOG) to coordinate outreach pertaining to Erosion Prevention and Sediment Control and Low Impact Development practices (see RC 5 and CON 1). There were no new IGAs developed during this reporting period pertaining to stormwater design standards, operations and maintenance, or public education.
RC 1-7: Evaluate existing detention facilities and potential new detention sites for potential conjunctive uses (as water quality facilities and for retrofitting opportunities). Continue to perform facility site searches to locate ponds, wetlands, vegetated swales and other water quality facilities as existing water quantity and quality facilities are evaluated and potential new sites are identified. Coordinate with RC1-1 and RC1-2.	Complete a retrofit plan before end of year four of the MS4 permit cycle. Develop a strategy to identify and prioritize potential retrofit projects by November 1, 2013. Identify a minimum annual budget for stormwater retrofit projects as part of the retrofit strategy by November 1, 2014.	Report on available budget and completion of retrofit project efforts.	The Stormwater Retrofit Plan was completed October 1, 2014, and submitted to DEQ. During this reporting period, representatives from the City's Engineering, Stormwater Quality, and Public Works Operations sections met quarterly to review a variety of engineering projects, including stormwater retrofits. The $180,000 stormwater retrofit project targeting bacteria at Eola Ridge Park in West Salem was completed on October 30, 2015. A letter identifying this as the City's MS4 permit required retrofit project was sent to the DEQ on October 28, 2013. This project constructed successfully a new Contech CDS Hydrodynamic Separator in the parking lot, and the retrofit of an existing flow through detention basin in the park to a subsurface treatment wetland. The construction of this stormwater retrofit project garnered community involvement, which resulted in a grant partnership between the City, the Glenn & Gibson Watershed Council, the Polk County Soil & Water Conservation District, and the non-profit organization "Friends of Trees". The City matched Oregon Watershed Enhancement Board's $10,000 small grant funds, which will be used to conduct invasive species removal and the planting of native riparian trees and shrubs during the next reporting period. The efforts to involve community organizations to improve water quality and stream health downstream of a newly retrofitted stormwater facility serves as a promising model for future stormwater retrofit and restoration activities. In addition, several stormwater CIP projects were evaluated to determine if they were suitable for retrofitting. A total of $200,000 has been allocated in the CIP program budget for stormwater retrofit projects.
RC 1-8: The City will continue to be an active member of the Oregon Association of Clean Water Agencies (ORACWA). The City will use this medium to obtain copies of materials that have been produced by others. City staff will stay current on latest available educational and technical guidance materials.	Attend a minimum of one stormwater-related workshop or conference annually. Attend groundwater-related workshops and conferences as funds allow. Make information obtained at these events available to other City staff.	Report on City participation with ORACWA events.	During this reporting period, Public Works staff continued to actively participate in Oregon Association of Clean Water Agencies through attendance at regularly scheduled Stormwater Committee meetings. Three City staff attended the Annual Conference that was held in Bend on July 22-24, 2015. Three Stormwater staff members attended the ACWA Stormwater Summit on May 11, 2016. Information acquired through ACWA meetings/events is routinely passed on to other City staff.

Table 3. RC2—Capital Improvements

Task Description	Measurable Goals	Tracking Measures	FY 2015-16 Activities
RC 2-1: Implement stormwater projects (including stormwater conveyance, quantity, quality, and stream/habitat improvement) based on priorities established under the Capital Improvement Program (CIP) and the Stormwater Master Plan consistent with available funding.	Include a funding line item for CIPs in proposed stormwater budget. Review and prioritize CIPs and budget annually. Implement CIPs based on prioritization and available funding.	Track number and description of projects completed. Report updated CIP list annually.	During this reporting period the following stormwater projects were completed: • Shelton Ditch Erosion, East of Winter St. • Eola Ridge Park Sub-surface Treatment Wetland (Stormwater Retrofit Project) • ODOT Stormwater Retrofit (final phase) In addition, the following CIP projects were completed which had a stormwater component (treatment and flow control): • Skyline Drive • Winter Street Bridge at Shelton Ditch A copy of stormwater projects included in the subsequent 5-year Capital Improvement Plan (FY 2016-17 through FY 2020-21) is included as Appendix B of this report.
RC 2-2: Continue to coordinate capital improvement projects with the Water Resources Section to integrate multiple resource agency permitting needs. The review is intended to identify integrated opportunities and permitting needs to meet water quality-related requirements.	Review and integrate multiple resource agency permitting needs, including MS4 permit requirements, into 100% of CIP projects.	Track number of projects reviewed. Track number of projects permitted.	Due to recent organizational changes, the Water Resources Section no longer exists. However, all projects are reviewed to determine permitting needs. Projects that need a permit from the resource agencies obtain a permit prior to starting construction. Permitting needs are met utilizing City staff and outside consultants.
RC 2-3: The City continues to acquire physical access-easements for public and private stormwater facilities. This is done by identifying existing facilities for which easements, rights-of-way, or permit-of-entry agreements are needed for stormwater facilities; and developing a plan for acquiring the same, given current funding limitations.	Within one year of completion of the hydromodification study and retrofit plan, prioritize easement acquisitions for stormwater facilities. Following prioritization, identify funding source(s) for inclusion in budget.	Report on easement acquisition and prioritization process.	The Retrofit Plan and Hydromodification Assessment that were submitted to the DEQ by the November 1, 2014, deadline identified prioritized areas for stormwater improvement projects. Priorities will be further defined as part of the Stormwater Master Plan update that is currently underway on a basin by basin basis. Easement acquisitions, if needed, will be prioritized and pursued as projects are funded. Easement acquisition costs will be factored in and budgeted for along with all other associated project costs.

Table 4. RC3—Update of Stormwater Design Standards

Task Description	Measurable Goals	Tracking Measures	FY 2015-16 Activities
RC 3-1: Continue to encourage the use of structural BMPs for stormwater quality improvement and flood peak reduction opportunities. Develop stormwater quality design and associated maintenance standards for new and redevelopment. Continue to evaluate opportunities to provide incentives for alternative stormwater management practices, including Low Impact Development (LID). Maintain and update the Stormwater Management Design Standards after they are developed.	Develop incentives for LID and other stormwater quantity and quality management practices. Develop updated stormwater design standards to include structural stormwater quality BMPs. Maintain Stormwater Management Design Standards and update as needed.	Document revisions made to Stormwater Management Design Standards. Document the development of any incentives for implementation of LID techniques.	Incentives for Low Impact Development (LID) have been incorporated into Salem's Stormwater Utility in the form of credits that allow the impervious surface-based portion of the utility fee to be reduced based on the presence of stormwater quality and quantity facilities on the ratepayer's property. The first phase of the Stormwater Utility fee was implemented in January 2013 and the utility was fully implemented January 1, 2016. New Stormwater Design Standards were approved as Administrative Rules completed in late 2013 and have been effective since January 1, 2014. The new standards are consistent with the new stormwater regulations, apply to new development as well as redevelopment projects, and include design criteria for green stormwater infrastructure.
RC 3-2: Continue to implement process to identify and remove barriers for implementing LID techniques. Update the Stormwater Management Design Standards and associated Salem Revised Code (SRC) provisions as appropriate.	Within three years of implementing the revised stormwater design standards, review and, as appropriate, modify design standards and SRC to minimize barriers to implementation of LID techniques.	Document the review of design standards and SRC to minimize barriers to implementation of LID techniques.	Barriers to implementing Low Impact Development techniques have been identified and modified through Ordinance 34-13, which was adopted by Salem City Council on November 4, 2013. Updating the Stormwater Management Design Standards related to LID techniques was completed in late 2013 and new standards became effective on January 1, 2014 (see RC3-1).
RC 3-3: City staff is implementing the Water Quality Development Standards set forth by SRC Chapter 141 for all development requiring a Willamette Greenway Permit.	Implement Water Quality Development Standards in Willamette Greenway.	Track number of Willamette Greenway Permits issued and description of water quality measures employed. Track number of new facilities constructed.	Willamette Greenway permits are processed as either conditional uses or as administrative conditional uses, depending on their location. Greenway permits are tracked through AMANDA, the City's permit tracking system. No Greenway permit applications were received during this reporting period.
RC 3-4: Continue to review all residential, commercial, and industrial plans submitted for City-issued building permits for compliance with the City's Stormwater Management Design Standards. Conduct inspections of completed projects prior to the City's acceptance of those projects and project close-out to ensure work was done in accordance with approved plans. Maintain database of plans reviewed and final inspections conducted. See IND1-Task 2 for standards specific to industrial facilities.	Review all residential, commercial, and industrial plans submitted for City-issued permits for compliance with the City's Stormwater Management Design Standards and associated SRC provisions. Conduct inspections once construction is completed to ensure work was done in accordance with approved plans.	Maintain database of plans reviewed and final inspections conducted.	All residential, commercial, and industrial plans submitted for City-issued permits are reviewed by Public Works staff for compliance with Stormwater Management Design Standards. Construction of stormwater-related facilities are inspected by Plumbing Inspectors within Community Development and/or Public Works to ensure that work was done in accordance with approved plans. All plan reviews and inspections are tracked in AMANDA, the City's permit tracking database.

Table 5. RC4—Operations and Maintenance

Task Description	Measurable Goals	Tracking Measures	FY 2015-16 Activities
RC 4-1: Continue with the existing street sweeping schedule for all areas, maintaining the record of observations, quantity, and quality of material collected in the daily log books. Collect and compile this information for making recommendations for modified methods, schedules, and for NPDES MS4 permit annual reporting and overall program evaluation.	Review street sweeping program annually for effectiveness and any necessary revisions to sweeping schedule. Continue sweeping City streets on four zone schedule, sweeping heaviest zone 8 times per year and lightest zone 2-3 times per year. Continue sweeping City-owned parking lots as needed.	Record quantity of material collected during sweeping operations. Record number of curb-miles of streets swept. Track and report changes made to sweeping schedule, if any.	The City continued to utilize two regenerative air sweepers during this reporting year to sweep residential and collector streets that have been categorized as having High, Medium, or Light debris accumulation. The Heavy debris accumulation zone contains 19 routes and is swept 13 times per year. The Medium debris accumulation zone contains 15 routes and is swept 8 times per year. The Light debris accumulation zone contains 8 routes and is swept 6 times a year. A fourth zone that encompasses the Central Business District (CBD) and Capitol Mall is swept at night on a weekly basis. Heavy debris areas within the CBD are also swept three times per week during summer and twice per week in fall through spring. Arterial streets are swept at night, approximately every four weeks. A third machine is operated during peak season leaf season or when one of the other machines is broken down. Two operators sweep residential and collector streets during the day and two operators sweep arterial streets during the night time. City-owned parking lots are swept on an as-needed basis. The City does not sweep any commercial parking lots as these are the responsibility of the property owner. During this reporting year the City swept a total of 14,285 miles, collected approximately 1,410 tons of street sweeping debris and removed approximately 6080 cubic yards of leaves.
RC 4-2: The City will continue to perform de-icing operations in a way that minimizes stormwater pollution such as conducting annual inspections and training to ensure proper operation of the de-icing chemical storage facility, utilization of the expanded covered storage areas for de-icing materials, maintaining proper function of sediment traps and catch basins in the storage yard, and coordinating de-icing activities with Airport Operations and their 1200-Z permit. The City is also looking for ways to improve current operations by investigating and evaluating potential cost-effective recycling opportunities for used de-icing sand material.	Continue current de-icing operations to prevent stormwater pollution. Investigate potential cost-effective recycling opportunities for de-icing sand material.	Document review of recycling opportunities. Document dates of activities for annual inspections and training. Document de-icing quantities applied annually.	No recycling opportunities for used deicing sand material have yet been found. Sanding material cannot be reused due to the loss of angular surfaces (from vehicle wear and tear) which bite into snow and ice to provide traction. As well, when the material is recovered by street sweepers other contaminants present from street surface (heavy metals, petro-chemicals, trash, etc.) is also captured at the same time; further eliminating recycling opportunities. Sand material can presently only be utilized as fill in approved fill sites depending on levels of intermingled debris or contaminants. Deicing material usage is documented on time sheets and the liquid deicing storage facility log book. Lane miles treated each year are also documented within a units of accomplishment report. This past fiscal year we treated 737 lane miles with liquid deicer. This equates to the application of approximately 5,896 gallons of deicer. The annual Snow/Ice Training was held on November 30, 2015 this year.
RC 4-3: Continue to review and update the O&M practices and activity schedules defined in the Drainage Program Evaluation Notebook (DPEN) (including updating GIS database). Utilize Hansen IMS data to develop and refine work programs. This review will serve as a basis for budgeting and allocating resources; scheduling work; and reporting on and evaluating the performance and costs for the overall O&M program and specific activities.	Update DPEN and IMS database activities and schedules. Create line items in budget for specific O&M activities. Review and update O&M practices and activity schedules every 3 years.	Track revisions made to O&M practices and activity schedules.	During the FY 15-16 reporting period Operations & Maintenance staff continued to conduct inspections of stormwater quality facilities, detention basins, catch basins, ditches, and stream crossings. The detention basin inspection program was reviewed in order to develop a more realistic approach to inspecting all of the sub-basins within the City. It has been determined that detention basins will be inspected on a three year cycle. All associated asset/inspection information was entered into the City's Hansen and GIS databases for work order record keeping and inventory purposes. The City has initiated an effort to link the City's GIS and Hansen databases for workflow and record keeping efficiencies. This effort will require an accurate inventory of all stormwater assets. Significant technical work continued to occur during this reporting period to update the City's stormwater asset inventory and GIS maps.

Task Description	Measurable Goals	Tracking Measures	FY 2015-16 Activities
RC 4-4: Continue to improve the O&M training program and activities especially with regards to safety and protection of water quality.	Conduct O&M safety meetings twice per month. Attend ACWA committee meetings and workshops as scheduled. Conduct weekly tailgate meetings with Operations crews.	Document reviews and modifications to the O&M training program. Record O&M training activities completed. Document ACWA meetings and workshops attended.	During this reporting period City staff continued to conduct biweekly safety meetings on the following topics: MS4 spill prevention, Confined Space Procedures, Chemical Storage/Labeling, Hand Tool Safety, Environmental Hazards, Power Tools, Gas Detectors, Blood Borne Pathogens, Alcohol/Drug Awareness, Erosion Control, Excavation/Trench Safety, Lifting/Back Injuries, Heat Stress, Housekeeping (slips, trips, falls), Heavy Equipment, Personal Protection Equipment, Chainsaw Safety, Fire/Electrical (Lockout/Tag-out) Safety, Bypass Pumping, Asbestos Procedures, and Vehicle Operation. There were no significant modifications to the O&M Training program. An attendance sheet for all biweekly O&M training activities is kept on file. Public Works staff also continued to participate ORACWA Committee meetings during the FY 15-16 reporting year (see RC1 Task 8).
RC 4-5: Integrated Pest Management (IPM) Program: Salem Parks Operations Division will continue their program for careful monitoring and management of pesticides, herbicides and fertilizers, and will provide public information. Review and refine the IPM Program during the permit cycle, ensuring proper handling and storage of pesticides, herbicides, and fertilizers.	Review and refine IPM Program during the MS4 permit cycle. Routine inspections of storage facilities for proper storage of materials and chemicals.	Document revisions made to IPM Program. Document inspections of storage facilities.	In FY 15-16 City staff utilized contracted services to assist with an evaluation of the City's IPM Plan. The study concluded a need for a comprehensive, citywide database for the tracking of integrative pest management activities. An IPM team was created to address this data gap and focus on the development of a new GIS-based record-keeping system. This system will enable field crews and managers to electronically record and visually analyze pesticide application data. The new tracking tool is anticipated to be completed during FY 16-17. During this reporting period, Stormwater and Environmental Services staff continued to perform and document routine inspections of material/chemical storage facilities.
RC 4-6: Continue the storm sewer cleaning and TV inspection program, concentrating on known areas of localized flooding complaints (this alerts the City to locations of debris build-up and minimizes erosion potential) and persistent operation and maintenance problems, and looking for potential illicit discharges and seepage from sanitary sewers, see ILL2. Also focus on significant industrial/commercial areas where potential illicit discharges may be of concern.	Concentrate storm sewer cleaning and TV inspection on areas with historical problems and high potential for illicit discharges. Inspect 120,000 LF of conveyance system annually.	Track number of inspections; identify areas with persistent O&M problems. Track number of cross-connections found. Track length of conveyance system cleaned and inspected.	Cleaning activities included 150,191 LF of storm main and 14,785 LF of storm main root cut. 12,261 catch basins were cleaned. 791.75 cubic yards of material were removed from the storm system. CCTV Inspection activities included 160,714 LF of storm main inspected.
RC 4-7: Continue supporting annual Stream Cleaning Program. More than one half of the stream miles in the City of Salem are inspected annually by walking each stream segment. Using summer interns the City inspects the riparian areas and streams, picks up litter and garbage, inspects for illicit discharges (ILL2), addresses potential conveyance concerns, and evaluates areas for stream restoration.	Walk 50% of the waterways within the City each year for stream cleanup and enhancement. Complete one stream restoration project each year.	Track length of waterways walked each year. Document stream restoration projects completed each year. Document the amount of litter and garbage removed each year.	The Stream Cleaning Program typically runs from May/June to September/October (spanning two reporting periods) each year. The 2015 Stream Cleaning Crew (Summer of 2015) walked 45.24 miles of Salem's waterways removing trash, debris jams, recyclable materials, and invasive vegetation. With a crew of 10 people, they managed to remove: • 16,063 pounds of trash, • 2,229 pounds of recyclables, and • 44.25 cubic yards of natural debris. The 2016 Stream Cleaning Crew (as of September 20, 2016) has cleaned and inspected 45.49 miles of Salem's waterways and removed: • 10,657 pounds of trash, • 432 pounds of recyclables, and • 74 cubic yards of natural debris. The crew completed one restoration project and assisted multiple streamside residents with riparian enhancement projects to address streambank erosion and invasive vegetation. The 2016 Crew also spent a large amount of time working on specialized projects, service requests, and working with O&M and Monitoring crews. The additional projects included a weed mapping effort (targeting Japanese Knotweed along Pringle Creek), the collection of water quality samples at Detroit Lake, and assistance with the Dry Weather Outfall Sampling Program. The crew also helped control invasive vegetation at the continuous water quality monitoring stations throughout Salem; making the monitoring equipment more accessible to staff and encouraging native vegetation at each station. The service requests included bank stabilization projects, the removal of invasive vegetation from riparian areas, and the continued removal of trash and debris from streams.

Task Description	Measurable Goals	Tracking Measures	FY 2015-16 Activities
RC 4-8: Continue to regularly inspect and maintain public structural stormwater control facilities. Coordinate with RC4 Task 9.	Regularly inspect all public detention and water quality facilities.	Track number of public facilities inspected and maintained. Track amount of sediment and debris removed from all facilities.	During this reporting period, staff conducted 535 public water quality facility inspections and removed a total of 32.1 cubic yards of sediment/debris. The breakdown of water quality facility (WQ) inspections and debris removed through maintenance activities is listed below: • WQ Manholes: 59 inspections / 27.1 cubic yards removed; • WQ Catch Basins: 9 inspections / 0 cubic yards removed; • WQ Tree Boxes: 253 inspections / 3.2 cubic yards removed; • WQ Planters: 124 inspections / 1.7 cubic yards removed • WQ Vegetated Facilities (rain garden, bioswale, etc.): 90 inspections / 0.1 cubic yards removed In addition to the aforementioned facilities, field crews inspected 332 detention basins and associated control structures; removing a total of 14 cubic yards of accumulated sediment.
RC 4-9: Develop and implement a long-term maintenance strategy for public and private stormwater control facilities. This strategy will identify procedures and/or priorities for inventorying, mapping, inspecting, and maintaining facilities.	Document and implement a long-term maintenance strategy for public and private stormwater control facilities during the MS4 permit cycle.	Track number of private facilities located, mapped, and inspected. Track progress toward developing a facility long-term maintenance strategy.	During the reporting period, the City continued implementation of its Stormwater Facility Inventory, Inspection, and Maintenance Program for private and public water quality facilities. This program outlines the City's process for mapping public and private stormwater facilities in GIS, as well as the asset tracking methodology used in the Hansen database. Since implementation, the City has inventoried, mapped, inspected, and maintained all of its 174 public vegetative (e.g. bioswales, rain gardens) and 167 public mechanical (e.g. water quality manholes, tree boxes) treatment facilities through a quarterly inspection process. The City has also inventoried, mapped, and inspected 230 private vegetative and 340 private mechanical treatment facilities. Stormwater and GIS technical staff have completed a full inventory of all public and private water quality facilities, and continue to update the list as new plans are approved, old plans are reviewed, and field crews discover previously unknown facilities in the field.
RC 4-10: Ditch maintenance is performed to assure adequate conveyance, and consists of two components: (1) Ditch Cleaning – Cleaning consists of removal of sediment in the bottom of roadside ditches only as needed for proper conveyance, with limited vegetation disturbance and the use of straw wattles to reduce sedimentation and erosion within the ditch. (2) Ditch Mowing – Mowing is typically conducted by inmate crews using hand-held equipment. Vegetation cutting facilitates conveyance and reduces the risk of potential fires in summer months.	Regularly inspect and maintain 100% of City ditches using appropriate water quality BMPs.	Track length of ditch maintenance performed (cleaning and mowing). Track amount of sediment and debris removed.	During FY 15-16 City crews: • Inspected and mowed 26.6 miles of roadside ditches (ditches along roadways); • Inspected and cleaned 6.9 miles of roadside ditches; • Removed 460 cubic yards of accumulated sediment/debris from roadside ditches During FY 15-16 City and Inmate crews: • Inspected and mowed 37 miles of drainage ditches (ditches nonadjacent to roadways, and commonly located on private property); • Removed 563 cubic yards of grass and vegetative debris from drainage ditches
RC 4-11: Public catch basins are cleaned on a regular basis with a Vactor truck. During catch basin cleaning activities, inspections are done and repairs are scheduled if needed.	Clean and inspect 75% of catch basins annually. Periodically analyze the material removed from the catch basins.	Track the number and percent of catch basins cleaned annually. Report on any analysis of removed material.	During FY 15-16, City crews inspected and cleaned 12,261 (80.2%) of 15,289 public catch basins. Through this process, an estimated 382.6 cubic yards of sediment/debris was removed from these structures using a Vactor truck and/or hand tools. As resources allow, staff anticipate utilizing GIS to map debris accumulations throughout the city, so that a prioritization scheme may be developed for future inspections and cleanings.

Task Description	Measurable Goals	Tracking Measures	FY 2015-16 Activities
RC 4-12: Continue to refine the maintenance program for public and private stormwater detention and water quality facilities. The City maintains an informational packet outlining ownership and maintenance responsibilities and compliance assurance procedures to encourage owners of private detention and water quality systems to perform maintenance. Coordinate with RC 4 Task 9.	Maintain informational package for ownership maintenance responsibilities for detention and water quality facilities. Implement maintenance activities and requirements identified in long-term maintenance strategy (RC4 Task 9).	Track number of information packets distributed regarding private stormwater control facilities. Track maintenance requirements of long-term maintenance strategy.	City staff have inventoried 570 private water quality facilities on 227 private property taxlots, and created a dynamic GIS database for tracking purposes. This database is updated with new public and private stormwater quality facilities as new construction plans are approved and as-builts are received. During the reporting year, City staff made contact with five private water quality facility owners, distributed five packets, and continued efforts to notify property owners of the water quality facilities located on their properties as well as the required maintenance needed for each. The purpose of the packets are to provide private facility owners – who constructed these facilities before the 2014 Stormwater Design Standards were adopted – with information on the number of facilities on their site, the type of facilities, maintenance procedures and/or checklists, an inspection log, and other resources to help them keep facilities operational. As adopted in the 2014 Stormwater Design Standards, owners of newly installed private water quality facilities will be required to enter into a Private Stormwater Facilities Agreement. This agreements holds the property owner responsible for the maintenance, inspection, recordkeeping, and repair of each facility. Additionally, private facility owners are required, at a minimum, to inspect their facilities quarterly for the first two years, and two times per year thereafter, unless otherwise stated in the manufacturer's maintenance specifications. This is to ensure proper functioning of the facility for maximum pollutant removal. As a result of implementing the Private Stormwater Facilities Agreement during the construction phase of a development project, the City has a more reliable way of inventorying all of its private stormwater quality facilities.

Table 6. RC5—Public Education and Participation

Task Description	Measurable Goals	Tracking Measures	FY 2015-16 Activities
RC 5-1: Develop and implement a public outreach and education strategy with goals, objectives, identified target audiences, partners, identified target contaminants, and messaging. Conduct a public education program effectiveness evaluation of outreach procedures/efforts. Adjust the program based on the results in year five. (See Table A.1 – Public Outreach Program Matrix, June 2008).	Create two (2) public education campaigns* from the Public Outreach Program Matrix. Support outreach and educational activities for other divisions**. Conduct an effectiveness evaluation of the outreach program before the end of year four of the MS4 permit cycle.	Document public outreach and involvement activities for two (2) education campaigns. Document outreach activities for other divisions. Document the results of the effectiveness evaluation and subsequent changes to the outreach procedures/efforts.	This year's outreach focused on the pet waste campaign in order to address the target contaminants of nutrients and E. coli. The following campaign activities/strategies were utilized during this reporting period to promote pet waste education/information: Outreach Events • City's Green Fair (July 15) - 40 participants, 8 new Capital Canine Club (CCC) members • Walk N Wag (September 12) - 375 participants, 13 new CCC members • Nature's Pet Anniversary (September 19) - 150 people, 19 new CCC • Howlapalooza (October 3) - 350 participants, 35 new CCC members • Bark for Life (May 22) – Approximately 250 people, 10 new CCC • Willamutt Strut (June 12) - 500+ dogs, 29 new CCC members Total new CCC members: 114 Partnerships Mutt Mitt Dispenser Supplies and information cards were provided to the following: • 50 dispensers provided to Salem Dogs to add to pet adoption kits • 250 dispensers provided to Willamette Valley Hospice for their Walk & Wag event In addition, the City increased the number of mutt mitt dispensers (96 to 112) and number of parks that have dispensers (47 to 59) in FY 15-16. Other • Radio advertisements aired during August 10–14, September 28 - October 1, February 29—March 4, and June 13– 17 • Facebook posts: September 4 (event announcement), September 16 (CCC), September 22 (CCC), September 28 (event announcement), Feb 24 (Salem Dogs efforts to help), June 16 (event announcement), July 28 (post with KOIN video on RV waste disposal) Erosion & Turbidity Outreach Staff also provided outreach and education pertaining to erosion and turbidity. Two erosion control trainings were conducted this reporting year (one in conjunction with the Mid-Willamette Outreach Group (MWOG) and the other with Northwest Environmental Training Center). In addition, the annual Erosion Control and Stormwater Management Summit (coordinated by MWOG) took place on January 26, 2016. There were 102 participants at this event. Tree City USA In April 2016 the City celebrated 40 years as a Tree City USA, and outreach to celebrate the Year of the Tree began in April 2016 that is anticipated to continue through April 2017. The following efforts have supplemented traditional outreach activities. • April 2: The City's kick-off Arbor Day event was tremendous! Eighty-three volunteers (62 adults and 21 youth) planted 39 trees at Northgate Park, which is located in the low tree canopy neighborhood of Northgate. • April 4: A panel of judges for a tree related artwork contest had the difficult task of choosing one winning entry per division from over 300 poster entries. Thanks to a grant from Oregon Community Trees, each of our winning participants received a $70 gift certificate for the Art Department and the teachers of the winning students each received a $50 gift certificate for Fred Meyers. Seven in-class presentations regarding the importance of trees in riparian areas were provided between January 2016 and March 2016. A spring break tree activity was provided at the library for 150 young children.

Task Description	Measurable Goals	Tracking Measures	FY 2015-16 Activities
			• April 5: An Arbor Week/tree-themed display was installed in the windows of the City's main library throughout May. The display featured several posters from the contest, puppets in their tree habitats, tree-related books, and plant art. • April 25: An Arbor Day proclamation announcing the period between April 2016 and April 2017 as Salem's YEAR OF THE TREE was made by Mayor Anna Peterson. The contest winners received framed posters and Oregon Department of Forestry congratulated Salem for achieving the 40-year milestone. • May 14: Four intrepid participants braved the weather for the Tree Walk at Bush Park. • May 17: Eighty-one children and 20 adults enjoyed the pre-school storytime presented by City Library Staff. • June 4: Twenty-five community members enjoyed the Tree City USA art show that showcased the amazing talent of our Tree City USA poster artists at the Straub Environmental Center. • June 11: Thirty-seven participants enjoyed a tour of trees at Lord and Schryver grounds.

RC 5-2: Coordinate activities of various groups within the Public Works Department and other City departments assigned responsibility for public outreach and citizen contacts on stormwater matters.	Quarterly meetings of various groups assigned responsibility for public outreach and citizen contacts on stormwater matters.	Document quarterly meetings and outcomes.	<u>Strategic Communications Group:</u>
			City staff involved in public communication meet routinely to discuss communication issues (e.g., changes to the City newsletter, website, social media accounts, etc.), that influence how information across the City is communicated internally and externally. This group also provides suggestions to the management team on Citywide communications. During this reporting period the following activities occurred:
			• Jul 30: Discussion about changes in social media management
			• Aug 6: Discussion about goals of website changes, how team members can help, and the timeline
			• Sep 11: Social media Q & A
			• Feb 9: Review of Citywide Strategic Communications Plan
			• Jun 22: Strategic Plan Update and Photo Library
			
			<u>Additional Outreach Coordination:</u>
			• Public Works staff hosted a two-day CECSL certification training (conducted by the Northwest Environmental Training Center) for City staff and local developers on May 24 and 25. Twenty-one people participated and became CESCL certified.
			• Staff and consultants met multiple times to review, revise, and submit an updated TMDL plan to DEQ in March 2016.
			    ○ Jan 14: 5th year review and review of document form
			    ○ Jan 29: Review of plan projects and outreach
			    ○ Feb 11: Review of associated documents and plans (Riparian Action Plan, Strategic Plan, 5th Year Review, and other TMDL Plans to generate a preliminary list of outstanding/ongoing activities to highlight or focus on in revised Plan.
			    ○ March 4: TMDL matrix review
			    ○ March 14: Final TMDL review prior to final submittal
			• Staff meetings to discuss regulations, retrofits, and outreach:
			    ○ Jan 14: Discussion of resident-proposed raingarden/bioswale retrofit project. Staff met with residents to provide and receive information regarding potential project. Project has been placed on FY 2016-17 CIP list.
			    ○ Jan 25: Discussion of projects to include for retrofits. List of potential projects was created and submitted for inclusion in current year and/or FY 2016-17 project list.
			    ○ Feb 3: Staff met to discuss Court Street Rain Garden projects. Project on hold for this fiscal year.
			    ○ Feb 12: Discussion regarding implemention of the Stormwater Retrofit Plan.
			    ○ Feb 24: IPM workshop with City staff

Task Description	Measurable Goals	Tracking Measures	FY 2015-16 Activities
			○ Apr 26: Discuss stormwater tasks, questions, concerns, policies, and information sharing.
RC 5-3: Increase the use of community partnerships to carry out outreach goals.	Develop one new partnership per year to carry out outreach goals.	Document partnerships and outcomes of partnership activities.	A Clean Streams Partnership was initiated in FY 15-16. This is a statewide effort in which project partners are looking at options to leverage public education resources and share consistent stormwater messaging throughout the state. The Steering Committee consists of staff from the following agencies: the City of Salem, City of Eugene, City of Keizer, Clean Water Services, Multnomah County, and the Intertwine Alliance. The following efforts were completed during this reporting period: Feb 2016 • Call (led by Multnomah County) for supporters of a Statewide Stormwater Outreach Program. The City of Salem expressed interest. • Presentation at a joint ACWA Stormwater/Groundwater/Education Committee meeting to introduce the partnership and solicit interest in development of a Steering Committee. March 2016 • Steering Committee/Intertwine Alliance conference call to discuss plans details for a Clean Rivers & Streams Forum. April 2016 • Second Forum planning meeting on April 15. May 2016 • Third Forum planning meeting on May 12. June 2016 • Clean Rivers & Streams Forum on June 8. Approximately 21 people attended the event. Efforts to develop statewide messaging will continue in the next fiscal year with continued Steering Committee meetings and Forums.
RC 5-4: Investigate the use of a stormwater utility to provide an adequate funding base to support expanded public outreach (see RC6-2).	Develop a yearly public education budget. Document public education and outreach needs in the Stormwater Utility Implementation Plan.	Document public education budget and expenditures. Document Utility implementation plan showing public education and outreach needs.	The outreach budget for FY 2015-16 was $50,850. A breakdown of budgeted expenses follows: Materials Mail: $600 Supplies: $5,000 Advertisement: $9,000 Other Professional Services as follows- * Outreach/Education: $10,000 * Translation Services: $2,000 * Tree Planting: $20,000 Memberships: $250 Copy: $4,000 Total: $50,850 The stormwater utility was adopted by City Council in December 2010 (See RC 6-2).

Table 7. RC6—Stormwater Management Program Financing

Task Description	Measurable Goals	Tracking Measures	FY 2015-16 Activities
RC 6-1: **In conjunction with the updated Stormwater Master Plan (RC1-1), review and update the Stormwater System Development Charge (SDC) methodology to address both stormwater quantity and quality.**	Adopt updated Stormwater SDC methodology by the end of the MS4 permit cycle.	Report on update to Stormwater SDC methodology.	Reviewing and updating the Stormwater System Development Charge (SDC) methodology will be conducted in concert with updating the Stormwater Master Plan. (See Activities & Accomplishments under RC1 Task 1.) A consultant contract is currently underway to support work to update all five SDC methodologies -- water, wastewater, stormwater, transportation, and parks.
RC 6-2: **Implement a new stormwater utility capable of generating stormwater fees historically paid for by water and/or sewer utility customers. The new utility will include incentives to encourage users to implement alternative stormwater management practices such as LID.**	Adopt new stormwater utility by the end of the MS4 permit cycle.	Report on adoption of new stormwater utility.	The new Stormwater Utility was adopted by Salem City Council in December 2010 and the first of four phases implementing the stormwater fee took place in January 2013. The fee is now fully implemented. The fee structure includes credits that provide for reductions in the impervious surface-based portion of the utility fee for ratepayers who have stormwater treatment and/or flow control facilities on their property. Generally, the credit is higher for facilities that are categorized as green stormwater infrastructure than for more traditional stormwater facilities.
RC 6-3: **Identify and pursue grant opportunities for stormwater quality projects, including potential retrofit and LID project opportunities.**	Pursue grant opportunities as staff resources allow.	Track number of grants applied for each year. Track number of grants received each year.	The City completed the final phase of the ODOT Stormwater Retrofit project. This project captures drainage from the Marion and Center Street bridges and diverts the water to stormwater treatment facilities. During this reporting period, the City entered into a matching grant agreement with the Polk County Soil & Water Conservation District (SWCD) for application to the Oregon Watershed Enhancement Board's (OWEB) small grant program. OWEB awarded Polk County SWCD and its project partners $10,000 in small grant funds to conduct invasive species removal and the planting of native riparian trees and shrubs along Turnage Brook in Eola Ridge City Park in West Salem.

Table 8. RC7—Maintain and Update GIS System

Task Description	Measurable Goals	Tracking Measures	FY 2015-16 Activities
RC 7-1: Continue maintenance of the GIS database and Hansen IMS database. These on-going updates will also reflect completion of any stormwater Master Plan capital improvement projects, new facilities added to the system, potential "hot-spots" for illicit discharges, refinement of data for the existing system, updated information on wetlands, perennial streams, waterways, and floodplain/floodway designations, and information updated on a periodic basis for the City's Urban Growth Boundary. The GIS database will be accessible by City departments for review purposes.	Continue performing database updates annually. Create record of GIS maintenance activities.	Record maintenance / updates made to database.	The GIS team worked on 100,136 linear feet of pipes in the sanitary sewer and storm system during this reporting period. This footage reflects both new line work created for permitted developments, capital improvement projects or City operations projects, as well as updates to existing infrastructure to match as-built information for City owned and certain privately owned sewer and storm assets.
RC 7-2: Integrate the information in the GIS and IMS. The City plans to integrate the data from both the GIS and Hansen IMS databases so that information in the Hansen IMS database can be visualized using the GIS system.	Create an action plan for how the GIS and IMS system will be integrated and updated. Implement action plan to integrate GIS and IMS.	Track completion of action plan items. Track implementation status of database integration.	After analyzing the systems and current workflows, the City put together an implementation plan for integrating GIS and the asset management system (Infor Public Sector). The City is using a phased approach starting with the sanitary sewer section. Teams have worked on system setup, configuration, data cleanup and synchronization. The sewer section is scheduled to use the integrated system beginning in September 2016.

Table 9. RC8—City Stormwater Grant Program

Task Description	Measurable Goals	Tracking Measures	FY 2015-16 Activities
RC 8-1: Expand matching grant program for watershed protection and preservation to allow for funding of stormwater-related activities, such as promoting water-wise landscaping, reduction of stormwater discharges, restoring riparian areas, stormwater quantity reduction, stormwater quality/treatment, etc.	Continue to fund $50,000 grant program. Expand matching grant program for watershed protection. Promote the grant program in conjunction with RC5 outreach activities.	Maintain a list of grant awards tracking funding and projects.	The FY 15-16 budget included $50,000 to fund the City's Watershed Protection & Preservation Grant. This grant continues to support stormwater-related activities. During this reporting period the following grant related activities occurred: • A $7,500 grant was awarded to the North Santiam Watershed Council for project implementation. • A grant request for a stormwater bioswale was submitted, but not awarded due to the associated cost estimate. Negotiations are taking place to determine how this project can move forward. • Staff began working with streamside property owners on two additional grants to address streamside erosion. Though the process started during FY 15-16, the grant applications are not expected to be submitted until FY 16-17.

Table 10. RC9—Legal/Ordinances

Task Description	Measurable Goals	Tracking Measures	FY 2015-16 Activities
RC 9-1: In process of revising the Stormwater Management Design Standards (RC 3 Task 1) and developing a stormwater-dedicated chapter to the SRC (RC 9 Task 3), coordinate with Community Development's effort to adopt a Unified Development Code (UDC). It is envisioned that the stormwater dedicated SRC would be integrated into the UDC framework.	Adopt the UDC and integrate stormwater-related revisions to the SRC by the end of the MS4 permit cycle.	Report on progress for adoption of UDC and integration of stormwater-related SRC.	City staff incorporated selected chapters of the Salem Revised Code (SRC) into a single, Unified Development Code (UDC). Led by the Community Development Department, the effort involved grouping related sections and subsections of existing chapters of the SRC into the more cohesive UDC format. The new Unified Development Code went into effect May 14, 2015. Additional information and details are provided on the City's website at: http://www.cityofsalem.net/Departments/CommunityDevelopment/Planning/Documents/Unified-Development-Code_Ord-No-31-13.pdf This activity is complete.
RC 9-2: Continue to enforce the SRC and review and revise it as necessary to reflect the updated Stormwater Management Design Standards that principally focus on requirements associated with on-site water quality facilities for new development or redevelopment (RC3).	Revise SRC (as needed).	Track any MS4 stormwater pertinent revisions made to the SRC.	Salem Revised Code (SRC) Chapter 20J (Administrative Rule Making and Contested Case Procedures) contains provisions for enforcement proceedings and civil penalties. Subsections in SRC Chapter 70 (Utilities General) were adopted by City Council in December 2012 that clarify inspection procedures for enforcing the Utility Code and establishes operation and maintenance requirements for owners/operators of private stormwater facilities. This task will remain ongoing.
RC 9-3: Develop a new SRC chapter dedicated solely to stormwater management. It is currently envisioned that this will be done after the City's renewed MS4 Permit is issued, and in conjunction with implementation of the new stormwater utility and updated Stormwater SDC Methodology (RC6) and the updated Stormwater Master Plan (RC1).	Adopt the new SRC chapter for stormwater by the end of the MS4 permit cycle.	Report on adoption of the new SRC chapter for stormwater, and processes/milestones enroute to formal adoption of the SRC revisions.	A new chapter of the Salem Revised Code (SRC) specific to stormwater was adopted in December 2013 and became effective January 1, 2014. An update to City's Public Works Design Standards was completed in December 2013 and became effective January 1, 2014. This activity has been completed.

Table 11. ILL1—Spill Prevention and Response Program

Task Description	Measurable Goals	Tracking Measures	FY 2015-16 Activities
ILL 1-1: Continue to review and refine the existing spill prevention and emergency response program to protect ground and surface water quality. New activities will be proposed and implemented as appropriate, and coordination and cooperation among other relevant agencies and ODOT will be maintained and improved. This review will be coordinated with the de-icing activities of the Airport Operations and their 1200-Z permit, and possibly the Oregon Air National Guard.	Continue to implement the spill prevention and emergency response program and review and revise as needed.	Document refinements to cleanup procedures for vehicular accidents and structural fires.	Salem Fire continues to respond to emergencies related to vehicular crashes, structural fires, and hazardous materials incidents utilizing Salem Fire Standard Operation Guideline (SOG) Tactical Guideline #4.16 – Minor Spill Response and Tactical Guideline #4.39 - Sanitary Dump Stations. These Tactical Guidelines provide guidance on Best Management Practices (BMP) for preventing discharge into storm drains and how to appropriately identify and safely flush contaminates such as foam from engine company tanks into approved locations. Salem Fire will continue to respond to any spill at the Salem Airport. Salem Fire continues to use Standard Operation Guideline (SOG) #2.6.3 – Live Fire Training, to incorporate best management practices related to the prevention and/or control of materials related to firefighter training. This guideline includes site surveys and procedures to eliminate runoff/discharge from firefighter training exercises into storm drain systems.
ILL 1-2: Continue to coordinate timely responses to, and clean-up of emergency response sites and structural fires among Fire, Building and Safety, Development Services, and Environmental Services staff. The Fire Department has the lead role for response at emergency response and structural fire sites and all major vehicular accidents. Environmental Services (ES) staff will provide assistance when requested by the on-scene incident commander. One of the ES responsibilities is to make sure that the cleanup activities are conducted in an environmentally sensitive manner.	Develop a review schedule with a checklist for the spill response plan.	Track the number and category of spill events responded to, including an estimate of the amount of spilled materials collected and any associated enforcement actions.	Salem Fire continues to respond hazardous/chemical spills as requested by the emergency dispatch center. If spills and/or leaks are beyond Salem Fire's capability or exceed the amount of equipment carried on their response vehicles, the Fire Department incident commander will request assistance from Environmental Services. During this reporting period Fire Department staff responded to the following spill events: • Chemical leaks or spills = 21 • Vehicle accidents = 1100 • Fuel or oil spills =185
ILL 1-3: Continue to conduct daily City vehicle and equipment inspections for leaks and repairs as needed. Staff will review current procedures on an ongoing basis and implement improvements as necessary.	Continue to implement the daily equipment inspection program.	Report revisions to the daily inspection program.	City staff continued to conduct daily inspections of City vehicles and equipment during this reporting period. All inspections are documented on weekly inspection sheets that are routinely submitted to Section Supervisors. In the event that a leak/repair is identified the vehicle/equipment is promptly turned into Fleet for servicing.
ILL 1-4: **Develop an updated Operations Pollution Prevention Plan; incorporating new/expanded/relocated Operations-oriented facilities.**	Update the Operations Pollution Prevention Plan by the end of the MS4 permit cycle. Implement the updated Operations Prevention Plan upon completion.	Track progress toward updating the Operations Pollution Prevention Plan. Track implementation of the Operations Pollution Prevention Plan.	During this reporting period, Stormwater Quality staff continued to distribute (via email) to all Shops managers and supervisors, the Shops Complex Monthly Inspection Report, which identifies observed housekeeping practices (positive and negative) to encourage compliance with City policies that protect the stormwater system, and to hold accountable those responsible for changing undesirable behaviors. Stormwater staff also provided presentations to the various Public Works Operations work groups on the importance of good housekeeping practices, erosion control, and materials recycling. One of the resources used to educate staff is the Rain Check Employee Training Stormwater Pollution Prevention for MS4s video from Excal Visual, which covers BMPs applicable to municipal operations. The Stormwater Quality Supervisor served on the Shops Yardmaster Committee in FY 15-16. This committee is responsible for developing and implementing policies and programs, including the Shops Complex Stormwater Pollution Control Plan, which was completed in September 2012. On August 1, 2013, the Shops Complex was awarded an EarthWISE certification by the Marion County Public Works Department, which expired in May 2016. In an effort to reduce waste and increase recycling in municipal operations, the City's Stormwater Quality Supervisor will take part in Marion County's Master Recycler Program in the fall of 2016 to better prepare the City for its EarthWISE recertification application in the fall of 2016. The EarthWISE recertification process is anticipated to include changes to the Shops Recycling Center to reduce stormwater runoff.

Table 12. ILL2—Illicit Discharge Elimination Program

Task Description	Measurable Goals	Tracking Measures	FY 2015-16 Activities
ILL 2-1: Continue to respond to reports of unusual discharges or suspicious water quality conditions within the stormwater system and urban streams. Where able, identify sources/causes and implement appropriate corrective actions. Utilize database to document associated activities.	Respond to reports of illicit discharges and suspicious water quality conditions. Maintain database to document unusual/suspicious discharges, sources found, and corrective actions taken.	Track calls and mitigation actions taken in database.	Environmental Services continues to provide staff to respond, 24/7, to reports of unusual discharges or suspicious water quality conditions. Staff responded to 104 water quality related responses during the reporting year. All responses and corrective measures are tracked in the Environmental Services database and the Hansen database. A summary of enforcement actions and inspections is provided in Section 4 of this report.
ILL 2-2: Environmental Services staff will continue inspections of the City's wastewater users, through the pretreatment program, verifying the proper handling and disposal of both wastewater and stormwater.	Inspect City's wastewater users for proper management of wastewater and stormwater.	Track number of inspections and associated findings.	During the reporting year Environmental Services staff continued to inspect wastewater users for proper handling and disposal of wastewater and stormwater. Staff completed the following inspections and business contacts during the reporting year: • Business Inspections = 857 • Business Communications (includes email, letters, meetings, news articles, and phone calls) = 129 • New Businesses Identified = 309
ILL 2-3: Work with Wastewater Collection Services to identify and correct cross-connections between the sanitary sewer and stormwater systems.	Review stormwater and ambient stream monitoring data to identify possible cross-connection discharges into the stormwater system. Maintain communications with Wastewater Collections and other City staff to identify any system cross connection problems.	Document number of cross-connections identified and corrective actions taken.	If stream water quality data from flow monitors indicate a rapid change in pH, conductivity, turbidity, etc. (particularly during dry weather) system alarms will trigger and personnel are dispatched to the location to determine the cause. Dry weather outfall screening may also show signs of possible cross connections. If evidence of cross connections is witnessed by any City staff, Environmental Services is notified. Environmental Services will investigate and log and track the issue in their database. Wastewater Collections staff can provide smoke and dye inspection of lines to identify cross connections if needed. Corrective action is taken immediately to fix a cross connection. No cross-connections were identified during this reporting year.
ILL 2-4: Develop and update a storm sewer outfall dry weather inspection and monitoring prioritization plan.	Prioritize outfalls for storm sewer outfall inspection and monitoring, and inspect annually. Coordinate prioritization process with ILL 2 Task 5.	Document review of outfall monitoring plan. Document priorities established for monitoring and inspection. Track dry weather inspections conducted and results of inspection.	The FY 15-16 dry weather outfall screening effort included a total of 35 outfall inspections (outfall structures or the first available upstream manhole), 19 of which received some sort of analytical sampling. A total of 15 pipeshed investigations were conducted based on the results of these inspections resulting in a total of 8 manholes that received some sort of analytical sampling. Of the 35 outfalls inspected, 34 were identified in the "City of Salem's Dry Weather Outfall and Illicit Discharge Screening Plan" and one outfall was inspected at the suggestion of the City's Environmental Services Section. One of the structures (D42456216) identified in the plan has not been inspected since the inception of the plan due to access constraints and will likely be removed from the plan. For further information on the results of the inspections refer to Appendix A. For coordination with ILL2 Task 5, a geo-connected database is being designed to store all Dry Weather Outfall Inspection data and response actions.
ILL 2-5: Identify and map contaminated sites in the GIS system. With input from other City departments, identify a list of areas where there either has been a substantial spill or there is the potential for a spill or illicit discharge. These areas are identified based on activities on site, history of problems, or specific industry, for example. These areas will be mapped in the GIS system for use across City departments.	Continue to identify and map contaminated sites in the GIS system.	Track number of contaminated sites added to the GIS system.	Environmental Services provides information on any newly discovered contaminated sites to the Public Works GIS Supervisor in the Engineering Division. This Division adds new sites to the City GIS mapping system used throughout the City. A variety of sources/activities can lead to site contamination (leaks from storage tanks and process lines, releases during loading or off-loading activities, or discharges during accidents or emergencies. During the reporting year there were 2 new sites added to Public Works GIS mapping system.

Table 13. ILL3—Illegal Dumping Control Program

Task Description	Measurable Goals	Tracking Measures	FY 2015-16 Activities
ILL 3-1: Continue to sponsor the Adopt-a-Street Program. The program is an effective way to get residents involved in keeping the community's streets clean and consequently preventing trash and debris from entering the storm drainage system.	Continue to support the Adopt-a-Street Program.	Record the miles of adopted streets, number of participating groups, and volume of litter collected through the Adopt-a-Street Program.	The City continued to sponsor the Adopt-a-Street Program during this last reporting year and utilized an internal database to track active/inactive volunteer group activity, dates of cleanup activities, total pounds of trash removed, and miles of street right-of-way maintained. During FY 15-16 there were 90 different participating groups, 2,000 total volunteers, 180 street miles maintained, and 12,500 pounds of litter removed through this program.
ILL 3-2: Continue to provide the 24-hour Public Works Dispatch Reporting Center to receive and respond to calls regarding illegal dumping and other environmental complaints/problems and responses thereto. Continue to advertise hotline on City website, utility bill inserts, business cards, public brochures, and consumer confidence reports. As circumstances warrant, publicly report illicit discharges through use of various media outlets.	Continue to operate the 24-hour Public Works Dispatch Reporting Center. Assign reports to appropriate City staff for action, including actions taken under ILL2-1.	Record number and types of reported illegal dumping incidents. Track media outreach when a discharge warrants.	Environmental Services provides staff to respond, 24/7, to reports of illegal dumping and environmental complaints received through the Public Works Dispatch Center. Stormwater staff provide public education and outreach to inform the public of environmental issues. Actions taken when responding to calls includes the completion of "Service Requests", a computerized record of calls received and actions taken. This database is in the Public Works Dispatch Center. Staff responded to 474 incidents during this reporting period. Refer to Section 4 for a list of MS4 related enforcement actions during the reporting year.
ILL 3-3: Continue to support the Adopt-a-Stream program, which involves teachers and students in gathering water quality data from streams, thereby providing water resource education to students through experience. The City supports the program by facilitating projects and providing technical assistance and resources.	Continue to support the Adopt-A-Stream Program.	Maintain a descriptive list of adopt a stream program projects, objectives, outcomes upon completion, and number of participants.	Staff continued to support the Adopt-A-Stream Program during this past fiscal year. Presentations and supplies were provided to interested teachers as well as help with project facilitation and technical assistance. We also budget expenses for field trips to local waterways, the drinking water facility, or the wastewater facility. Staff assisted four schools with Adopt-A-Stream studies this fiscal year: <u>Chapman Hill Elementary School:</u> • September 16: Staff provided an introduction to macroinvertebrate presentation prior to the site visit of Glenn Creek at Orchard Heights Park for the stream studies. 54 participants • September 18: Staff assisted with macroinvertebrate collection. 54 participants • October 2: Staff assisted with collecting temperature data. 5 participants • October 5: Staff assisted with collecting flow data. 7 participants • Provided funding for classes to participate in Salmon Watch in Fall 2015. <u>Forest Ridge Elementary School:</u> • January 19: Staff provided a stream pollution prevention (Enviroscape) presentation to two classes. 45 participants • May 20: Staff assisted with macroinvertebrate identification at the "Down by the Riverside" event at Willamette Mission Park. 60 participants <u>South Salem High School:</u> • April 6: Staff provided assistance of macroinvertebrate sampling for a comparative study at Bush Park and Gilmore Field. 51 participants • April 27: Staff assisted students in determining if roads and mines impact turbidity at Opal Creek. 8 participants <u>McNary High School:</u> • October 12: Staff assisted with stream studies of Claggett Creek. 50 participants • January 11: Tours of Willow Lake Wastewater Treatment Plant (funded by the AAS program) 50 participants <u>Sprague High School:</u> • January 11: Willow Lake staff presented on the Wastewater Treatment Plant. 375 participants. The students built and tested their own wastewater treatment plants. Staff provided information regarding the City's watershed grant program and the Pacific Northwest Clean Water Association's Adopt-A-School grant specifically designed for providing funds for wastewater education. The class bought turbidity meters for the class project of designing and testing a "wastewater" system.
ILL 3-4: Continue to support Marion County in their efforts to provide convenient alternatives for legal disposal of household hazardous	Continue to support Marion County in providing alternatives for household hazardous waste disposal.	Document frequency and type of support activities.	During this reporting period, five of 52 weeks (9.6%) of our aired radio spots featured proper disposal of household hazardous waste, recyclable materials, or

Task Description	Measurable Goals	Tracking Measures	FY 2015-16 Activities
wastes and other recyclable materials.			composting. The dates and associated radio messaging for FY 15-16 are provided below: October 26 - November 1: CFL disposal (mercury) November 9 - November 15: Electronics recycling (heavy metals) November 30 - December 4: Fall Leaf Haul December 21 - 25: Electronics Recycling (heavy metals) March 7 - 12: Battery recycling (heavy metals)
ILL 3-5: Continue to support the annual yard debris cleanup effort.	Support the annual yard debris cleanup effort.	Record amount of debris cleaned up and level of participation.	The City held the Fall Leaf Haul on Saturday, September 5 at two location sites: the State Fairgrounds and Sprague High School. Approximately 270 cubic yards of leaves at the two sites were collected by 45 volunteers.

Table 14. IND1—Industrial Stormwater Discharge Program

Task Description	Measurable Goals	Tracking Measures	FY 2015-16 Activities
IND 1-1: Environmental Services will inspect stormwater systems while conducting inspections of City-permitted industrial wastewater users, and work with DEQ to coordinate the permitting and compliance processes for industrial users in the Salem area, including DEQ-issued 1200-Z permitted sources, underground storage tank (UST) removal, and site remediation permits issued by DEQ for sources/sites within the City. Coordination options include: receiving information on proposed 1200-Z permits, commenting on proposed permits, and meeting periodically with DEQ on coordination efforts.	Inspect stormwater systems while conducting inspections of City-permitted wastewater users. Develop process to coordinate with DEQ on industrial permits within the City.	Track coordination efforts with DEQ. Include stormwater observations as appropriate on inspection reports and follow-up actions.	Environmental Services continues to inspect area stormwater systems as part of facility inspections performed under the industrial pretreatment program. Inspection records are maintained in the Environmental Services database. Salem is not a permitting agent for DEQ's 1200-Z program but has been developing a process (consistent with the MS4 permit) to notify the DEQ when a site in Salem is undergoing development which may be subject to State permitting. Environmental Services notified the facility owner or contact person by letter. Regional staff for the DEQ Western Region were contacted by email with a scanned copy of the letter that was sent to the facility. Refer to ILL2 Task 2 for a summary of facility inspections, and IND1 Task 2 for a summary of facility plans reviewed.
IND 1-2: During plan review, review industrial facilities for the potential of requiring pretreatment of stormwater prior to discharge based on the industrial activities of the specific facility. Conduct inspections of industrial facilities requiring stormwater pretreatment to ensure structural controls have been built according to approved plans.	Review industrial plans as necessary for additional stormwater treatment. Conduct inspections once construction is completed to ensure work was done in accordance with approved plans.	Maintain database of plans reviewed and final inspections conducted.	During this reporting period, Environmental Services continued to participate in the plan review and inspection processes to help ensure appropriate treatment is included during construction, or remodel of industrial sites. All plans reviewed and inspections completed are tracked in the Environmental Services database and the AMANDA database. Staff reviewed 362 industrial and commercial plans during the reporting year.
IND 1-3: Surveys are sent to applicable business classes (restaurants, metal finishers/platers, radiator shops, dry cleaners, printing shops, photo processors, etc.) as part of the pretreatment business survey database, part of the industrial pretreatment program for wastewater. Customers will be surveyed on major on-site activities to identify potential locations for public education, future sampling, and tracking down illicit discharges. Illicit stormwater discharges from these business groups are address in ILL2.	Send surveys to new customers as accounts are opened. Enter survey results into database – on-going as surveys are returned.	Track number of surveys sent out. Track number of surveys returned and entered into database. Track targeted public education activities for specific industries.	Environmental Services continued to send or deliver surveys to newly identified targeted businesses. Businesses failing to return the survey were visited by an inspector to obtain the necessary information. 11 surveys were distributed, completed and returned during the reporting year.
IND 1-4: Continue the semi-annual Technical Bulletin for the City's industrial users and produce other materials for these users. This activity is principally associated with the City's wastewater Pretreatment Program, but will be used as a vehicle to address stormwater related issues as well.	Produce two technical bulletins for industrial users each year.	Track published technical materials prepared for industrial users each year.	During this reporting period, targeted and individualized (via email and direct phone call) communication with permitted industrial users continued in order to ensure compliance with pretreatment and stormwater regulations. This form of communication has proven more effective than the continued production of technical bulletins that may not be applicable to all.

Table 15. CON1—Construction Site Control Program

Task Description	Measurable Goals	Tracking Measures	FY 2015-16 Activities
CON 1-1: Continue implementation of the Erosion Prevention and Sediment Control program for developments that meet or exceed the threshold indicated in SRC Chapter 75, which includes the submission of erosion prevention and sediment control plans with structural and non-structural BMPs. Review program experiences annually and implement improvements as appropriate including Code amendments if needed.	Implement SRC 75. Conduct annual program reviews. Implement appropriate improvements and/or Code amendments. Perform plan reviews for erosion control requirements.	Track number of erosion control plans reviewed for compliance with SRC 75.	City staff continued to utilize SRC Chapter 75 (Erosion Prevention & Sediment Control) as the basis for EPSC plan review, inspection procedures, and enforcement. An annual internal program review was completed and it was determined that dedicated staffing levels are providing for 100% plan review availability. During the FY 15-16 reporting period, 184 EPSC plans were reviewed by staff. In addition 491 single family applications were reviewed.
CON 1-2: Continue to train and educate City staff and private contractors about stormwater pollution at construction sites, with an emphasis on prevention and control BMPs. Provide notice to construction site operators concerning where education and training to meet erosion and sediment control requirements can be obtained.	Provide annual erosion control training to City staff and private contractors.	Track education and training programs conducted and number of staff/public trained.	The Mid-Willamette Erosion Control and Stormwater Management Summit (coordinated through MWOG – see RC 5-2) training took place on January 26, 2016, and provided training to regional area contractors and design consultants. In addition, staff facilitated a training on May 24-25, 2016, (see RC 5-2) to City staff and local area engineering firms for Certified Erosion and Sediment Control Lead for construction activities and to ensure compliance with 1200 series and MS4 permits. Additional training is tentatively scheduled for November 2016. Outreach to Home Builders, Contractors, and Material Suppliers concerning standard construction specifications and standard drawing updates continued during this reporting period.
CON 1-3: Document and streamline site plan review, inspection, and enforcement procedures for the construction site runoff control program.	Complete documentation of site plan review, inspection, and enforcement procedures before the end of year four of the MS4 permit cycle.	Track completion of documented procedures.	Site plan review procedures and checklists are in place and actively used. Staff continue to update the checklists as procedures change. Inspection procedures and reports are in place and actively being followed by Public Works Inspectors. Training and accountability on inspection documentation details and photo integration is ongoing. Enforcement procedures are adopted and implemented when appropriate. Training on procedures and practices is ongoing.
CON 1-4: Continue to review and update the Erosion Prevention and Sediment Control Technical Guidance Handbook.	Update Technical Guidance Handbook before the end of year four of the MS4 permit cycle.	Track updates made to the Technical Guidance Handbook.	City Design Standards were updated and adopted on January 1, 2014. These include a complete section devoted to EPSC. City Standard Construction Specifications for erosion prevention and sediment control were developed for implementation on August 1, 2015. EPSC Standard Plans were updated and adopted on March 10, 2014. These three items continue to be followed for all design and construction activities and have systematically replaced the need for the Technical Guidance Handbook.
CON 1-5: Continue to coordinate with the City's 1200-CA Permit for City construction projects subject to its program.	Requirements for 1200-CA compliance incorporated into City construction plans, specifications, and contract documents. Make erosion prevention and sediment control a key agenda item at all pre-construction conferences. Include inspection of all site erosion prevention and sediment control measures as part of City projects.	Track renewal of 1200-CA permit.	1200 CA Permits are included in City contract documents. 1200 CA Permit and EPSC enforcement is key discussion point at pre-construction conferences. Designated EPSC Inspector inspects all City 1200 CA permitted projects.

Table 16. MON1—Monitoring

Task Description	Measurable Goals	Tracking Measures	FY 2015-16 Activities
MON 1-1: Continue to install and maintain flow and water quality monitoring stations in City waterways to support selection of capital improvement projects, update the hydrologic-hydraulic computer model, and help direct policies to protect the health of these water bodies. The actual rate of installation and the total number of stations will be based on the maintenance requirements of the stations, available funding, and coordination with urban watershed assessments/plans.	Install additional monitoring stations. Monitor the station alarms in conjunction with the illicit discharge control program (ILL2, Task 1). Follow up on potential hotspots or problem areas as may be identified through data analyses.	Track number of additional monitoring stations implemented.	During FY 15-16, the City did not install any new stream gaging or water quality continuous monitoring stations. No additional stations are planned for next fiscal year. Environmental Services staff responded to 39 water quality alarms during this reporting period. Of the 39 alarms, one was deemed erroneous due to sensor failure. Of the remaining 38 alarms, 20 occurred during storm conditions and 18 occurred during dry conditions. Some alarms were caused by permissible activities, (e.g. in water work periods, exemptions identified in the NPDES MS4 permit such as water main break/emergency repairs), and some were the result of wildlife and/or kids playing in the creek. Of the 18 alarms during dry conditions, 4 were likely due to animals, 7 were likely erroneous (a wiper parking over a sensor or station being turned on before it stabilized), and 7 were due to an illicit discharge that was finally pinpointed and fixed (water softener back flushing into drainage ditch). Regardless of cause, each of the 39 alarms elicited some type of follow-up response. All alarms that occurred during dry conditions were considered hot spot/problem areas that prompted field investigation. Furthermore, when dry condition alarms show a recurring pattern, some form of source tracking activity was conducted, including TV inspection and/or smoke testing.
MON 1-2: Continue the urban stream and Willamette River water quality sampling program, with emphasis on reviewing and evaluating sampling data to prioritize investigations and improvement/maintenance projects. This sampling augments the monitoring plan included in the City's 2008 NPDES MS4 Permit Renewal application.	Update database for collected data. Review collected data for purposes of trending and benchmarking by the end of the permit term. Follow-up on potential hotspots or problem areas as may be identified by the data review.	Document findings regarding trends.	The data that are collected monthly are input into the database each month. This data is verified by at least two staff, once before it goes into the database, and again on a yearly basis as a thorough review of all data for that year is completed. Data are then marked as approved/usable data in the database. The urban stream data (called Monthly Instream in the City's NPDES MS4 permit) has been used for a time trend analysis that was provided to the DEQ as part of the City's TMDL Pollutant Load Reduction Evaluation last fiscal year. The data was also used for a spatial trends analysis submitted with this annual report. Every year staff produce an Appendix of Monitoring Data that is included in the Annual Report submission. This summarizes the data for the year and documents water quality exceedances. This provides a very easy visual for comparing stream health year to year, and helps staff target where issues may be occurring
MON 1-3: Continue to implement all components (MS4 outfall, instream, pesticide, and macro-invertebrate) of the City's "Surface Water and Stormwater Monitoring Plan."	Implement the City's Stormwater Monitoring Plan, including MS4 outfall, instream, pesticide, and macro-invertebrate monitoring components.	Provide summary statistics for sampling results from each wet-weather season. Track any modifications to the monitoring plan.	During FY 15-16, the City fulfilled all of the monitoring requirements listed in Table B-1 of the City's NPDES MS4 permit. Because this permit was administratively extended, the City will continue to implement the "Surface Water and Stormwater Monitoring Plan" and report all results as part of the Annual Report. Appendix A contains summary statistics for all sampling that was conducted during this reporting period.

3 PROGRAM EXPENDITURES AND FUNDING SOURCES

Stormwater-related program costs in Salem have been historically funded through wastewater rates, which are comprised of a water consumption (flow) component and a fixed user charge. In December of 2010, Salem City Council approved the adoption of a separate stormwater service charge or utility. Initial implementation of the stormwater utility began on January 1, 2013, and will be phased in over a period of four rate cycles.

The stormwater utility has been developed to provide an equitable way of paying for Salem's stormwater programs by more accurately and fairly linking the stormwater impacts of the ratepayer's property to the rate paid by each ratepayer. The stormwater service charge is based on each property's impervious surface and an assessment of stormwater programmatic costs that are shared equally among all ratepayers. Additionally, properties that take steps to reduce their impervious surface areas, or that have onsite facilities that reduce stormwater impacts, have an opportunity to reduce their stormwater service charge. There currently is no mechanism for residential ratepayers to reduce their stormwater service charge.

Table 17 provides a summary of the total stormwater program expenditures for the current reporting year, as well as those anticipated through the next (FY 16-17) as identified in the adopted budget.

Table 17. Stormwater Expenditures

Stormwater Operating Costs	FY 2015-16 Budget	FY 2016-17 Budget
Stormwater Operations & Maintenance	$2,602,320	$2,946,460
Stormwater Quality	$1,904,310	$2,184,550
Cleaning	$381,540	$354,630
T.V. Inspection	$325,211	$398,300
Water and Environmental Resources	$0	$0
Environmental Services	$297,129	$355,990
Planning & Development	$880,797	$1,025,373
Laboratory	$40,908	$26,323
Operations Administration	$328,539	$338,710
Utility Billing	$622,690	$601,480
Dispatch	$92,660	$94,700
Debt for Capital	$740,090	$692,478
Department Administration and Indirect Costs (Nondivisional)	$1,632,222	$1,440,187
Nondivisional (Street Sweeping, Watershed Grants, HazMat/Emergency Management)	$1,399,130	$1,283,210
Budgeted Capital Improvements	$4,803,080	$4,878,140
TOTAL:	**$16,050,626**	**$16,620,530**

*The Water and Environmental Resources Section was eliminated at the end of last fiscal year.

4 ENFORCEMENT ACTIONS, INSPECTIONS, AND OUTREACH

Environmental Services staff responded to 104 water quality related incidents and reported seven prohibited/illicit discharge violations during this reporting period. Enforcement actions related to these violations included warnings, a notice of violation, and a citation.

Erosion control and 1200-CA Permit requirements are an integral part of all City-issued construction plans and specifications. The City of Salem continues to coordinate efforts with Department of Environmental Quality (DEQ) staff regarding 1200-C permitted sites. During the FY 15-16 reporting period 6,173 erosion control-related inspections were conducted by Public Works Inspectors, 260 erosion related enforcement actions, and a total of 675 erosion control permits issued (refer to CON 1 Task 1 through 5).

A description of outreach activities that occurred during this reporting year can be found in Section 2 of this report.

Table 18. MS4 Violations

Name	Date	Violation	Action	Discharge	SRC
Chipoltle Mexican Restaurant	07/15/15	Illicit Discharge Violation	Notice of Violation	Food Waste	73.160
Avamere Care	09/01/15	Illicit Discharge Violation	Warning	Drum Containment	73.165
Evening Land Vineyards	10/02/15	Prohibited Discharge To The Storm Sewer	Warning	Process Wastewater	73.160
AA+ Carpet Cleaning	03/17/16	Prohibited Discharge To The Environment	Notice of Violation	Carpet Cleaning	73.160
Mercado San Francisco Meat Market	09/23/15	Prohibited Discharge To The Storm Sewer	Warning	Mop Water	73.160
War Paint International	11/18/15	Prohibited Discharge To The Storm Sewer	Citation	Wash Water	73.160
Private Residence- Cheney-Oil Spill	01/14/16	Prohibited Discharge To The Storm Sewer	Warning	Pollutants entering storm drain	73.160

5 PLANNING, LAND USE CHANGES, AND DEVELOPMENT

The City of Salem Public Works Department Stormwater Management Design Standards (Design Standards) were revised in FY 13-14 to reflect the post-construction requirements presented in the MS4 Permit. Before these updates were adopted via the City's relatively new administrative rule process, a new stand-alone stormwater chapter (SRC 71) was developed and approved. This new stormwater dedicated chapter was adopted by City Council in December 2013. SRC 71 and the updated Design Standards became effective on January 1, 2014. The Design Standards will continue to be revised as new information becomes available.

5.1 Land Use Changes

Five City-initiated enclave annexations (approved by Salem voters in 2012) took effect during this reporting period. All five enclave annexations (22.5 acres) are zoned for residential use. In addition, two additional Health Hazard annexations zoned for residential use (1.06) took effect during this reporting period. In all, 23.56 acres of residential land use were annexed in FY 15-16.

5.2 New Development

The City of Salem has continued to see a steady stream of new projects at all phases of development. During the FY 15-16 reporting period, there was an addition of 1,861,411 square feet (42.7 acres) of new or replaced impervious surface area related to development projects in Salem. The list below includes projects that were recently completed or are moving forward in the development process:

Under Construction/Recently Completed:

- River Bend Apartments – 642-750 River Valley Dr. NW. 60-unit multi-family development. Under construction.
- Cash and Carry – 1410 Barnes Rd. SE. Grocery store and parking area. Completed.
- Skyline Apartments – 4857-4895 Skyline Rd. S. 69-unit multi-family development. Under construction.
- Kurth Meadows – 6000 Block of Lone Oak Rd. SE. 26-lot subdivision. Public improvements under construction.
- Project Blue – 4301 Henningsen Ct. SE. Phase 1 is new 183,000 square foot cold storage building. Under construction.
- SAIF – 400 High St. Renovation, remodel, and addition of existing office campus. Under construction.
- Goodwill (West Salem) – 225 Wallace Rd. NW. Goodwill retail store/donation center plus two new commercial buildings. Under construction.
- Cascadia Canyon – 3855-3895 Cascadia Canyon Ave. SE. Multi-tenant industrial complex. Two new 24,000 square foot buildings. Completed.
- Building Addition/Parking Expansion – 1430 Tandem Ave. SE. Office building expansion and new parking lot for government services use. Under construction.
- Hyacinth 2195 Building – 2195 Hyacinth St. NE. New retail, eating and drinking uses plus parking expansion. Under construction.
- Family Building Blocks – 1857 State St. Redevelopment of former Deluxe Ice Cream site. Phase 1 under construction.
- Medical Office – 1100 22nd St. SE. New 5,010 square foot medical office. Completed.
- Home Builders Office – 2075 Madrona Ave. SE. New 7,000 square foot office building. Near completion.
- Fedex Addition – 3120 Blossom Dr. NE. 5,850 square foot addition to existing building with site improvements. Under construction.
- Office Building – 1255 Cross St. SE. New 5,460 square foot retail/office building. Completed.
- Little Ceasers – 1395 Edgewater St. NE. New 2,675 square foot eating/drinking and office building. Near completion.
- Wilco – 3285 Commercial St. SE. Redevelopment of former grocery store with parking improvements. Near completion.
- D & O Gargage – 1060 Boone Rd. SE – Gravel storage area expansion. Under construction.
- Corbon College – 5000 Deer Park Dr. SE. 6,372 square foot 2-story welcome center. Under construction.

- Baggage Depot – 500 13th St. SE. Rehabilitation of historic building and site alterations for Greyhound bus terminal. Under construction.
- Warehouse/Office Building – 2600 Pringle Rd. SE. Parking lot alterations, new tenants. Under construction.
- Salem Pallet Expansion – 1650 Salem Industrial Dr. New loading docks, 2,000 square foot modular office building, and site alterations. Under construction.
- Kettle Foods Warehouse – 1745 Oxford St. SE. Change of use for existing building with new parking and vehicle storage areas. Under construction.
- Kettle Foods Expansion – 3125 Kettle Ct. SE. Addition of approximately 1,000 square feet. Under construction.
- Taylor Metals – 4566 Ridge Dr. NE. 35,000 square foot building addition and site improvements. Near completion.
- Oak Grove Industrial Park – 4400 Block Burright Ln. SE. Multi-building industrial park. Under construction.
- Restaurant – 3883 Commercial St. SE. 4,750 square foot building and site improvements. Near completion.
- Building Addition – 1505 Madison St. NE. 9,960 square foot addition to existing warehouse building. Completed.
- Medical Office – 2045 Madrona Ave. SE. New 6,000 square foot medical office building. Completed.
- State Fairgrounds – 2330 17th St. New 1,925 square foot metal building. Completed.
- Fairway Apartments – 6161 Commercial St. SE. 201-Units. Under construction.
- Hyacinth Apartments – 3257-3297 Hyacinth St. NE. 56-Units. Under construction.

<u>Estimate of Potential Future Development:</u>

- North Campus of the State Hospital – 2600 Center St. NE. Potential redevelopment.
- Boise Cascade North Block - 315 Commercial St. SE. Redevelopment. New care facility and office building. In review.
- Walling Phased Development – 2685 Lancaster Dr. SE. New warehouses and office building. In review.
- Keizer Mist – 3139-3159 Broadway St. NE. New car wash and convenience store. In review.
- Marietta – 3311-3325 Marietta St. SE. Integrated phased development – five new buildings. In review.
- Oregon Military Department – 3225 State St. Expansion of emergency management facility. In review.
- Turner Road Storage Units – 2150 Turner Rd. SE. Self-service storage facility (4.62 acres). Land use approval received – building permits required.
- Cordon Road Storage Units – 1500-1700 Block Cordon Rd. SE. Self-service storage facility (3.1 acres). Land use approval received – building permits required.
- Cordon Road Apartments (Hawks Ridge Phase 2) – 1500-1700 Block Cordon Rd. SE. 82-Units. Land use approval received – building permits in review.
- Starbucks Drive-Through – 205 Church St. SE. Redevelopment of former Barricks Funeral Home Site. In review.
- May's Trucking – 3940 Airway Dr. SE. New 24,000 metal building for hanger. In review.
- Boulder Creek Medical Office – 2500 12th St. SE. New 38,860 square foot medical office building. Land use approval received – building permits in review.
- Roths – 3045 Commercial St. SE. Parking area redevelopment. In review.
- Public Utility Commission Building – 550 Capitol St. NE. Parking lot alterations, vehicle charging station, landscaping upgrades. Permits issued.
- Corbon College – 5000 Deer Park Dr. SE. Outdoor dining canopy and future plans for 5 new 2-story dormitory buildings. In review.
- Contractor's Office & Storage – 1980 Oxford St. SE. Adding new 1,440 square foot building with gravel storage yard. In review.
- Eye Clinic – 1415 Capitol St. NE. Redevelopment of site, new medical office. Land use approval received.
- Self-Storage Facility Expansion – 3141 Del Webb. New 9,000 self-storage building. Permits issued.
- May's Landing – 23rd & Mission St. SE. 96-Units. Land use approval received.

- Pembrook Apartments – 4752 Liberty Rd. S. 88-Units. Land use approval received.
- Red Leaf Apartments – 5710 Red Leaf Dr. S. 127-Units. In review.
- Harold Drive Apartments – 3271 Lancaster Dr. NE. 84-Units. In review.
- Rushing Mixed Use – 5775 Commercial St. SE. 61,500 square foot mixed use building with 52-Units. Land use approval received.
- Arthur Way – 900-1000 Arthur Way NW. Land Division and application of Compact Development Overlay for duplexes. In review.

APPENDIX A. SUMMARY OF WATER QUALITY DATA

City of Salem
National Pollutant Discharge Elimination System (NPDES)
Municipal Separate Storm Sewer System (MS4)

Summary of Water Quality Data
For Reporting Year 2015/2016

Prepared by:
City Salem Public Works Department
Stormwater Services
Stormwater Monitoring Staff

November 1, 2016

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1.0 Introduction

This document provides all monitoring data collected for the reporting year of July 1, 2015, to June 30, 2016 (RY 2015/16), in accordance with the City of Salem's NPDES MS4 permit requirements listed in Schedule B(5)(f)&(g). A background narrative for each monitoring element for which data were collected and a brief summary of results for RY 2015/16 is provided below, and all collected data are provided in the attached tables and figures. A more detailed analysis of data for the entire permit term can be found in Attachment A.

2.0 Monitoring Elements

Specific details for each monitoring element can be found in the City's *Stormwater and Surface Water Monitoring Plan*. Progress toward meeting the monitoring requirements defined in Table B-1 of the City's MS4 Permit are summarized in Table 1. Monitoring site locations are described in Table 2 and denoted in Figure 1, and the parameters analyzed for each monitoring element are listed in Table 3.

2.1 Monthly Instream Monitoring

Sampling of designated urban streams for the Monthly Instream[1] monitoring element is conducted on a predetermined monthly schedule at 24 different locations. This monitoring element includes the collection of grab samples and field measurements on 11 of Salem's MS4 stormwater runoff receiving streams and the Willamette River. Ten of these streams are paired with upstream (at or near where the stream enters the City's jurisdiction) and downstream (at or near where the stream exits the City's jurisdiction or enters a receiving stream) site locations. The eleventh stream, the West Fork Little Pudding River, only has a downstream site location, because the West Fork Little Pudding River starts in the greater Salem area and runs dry during the summer months. The Willamette River has three sites located upstream, mid-way, and downstream of city limits.

The general locations of all sites are provided in Table 2 and Figure 1.

A general suite of water quality parameters are collected for each site, with additional water quality parameters analyzed for the sites within the Pringle Creek Watershed (PRI1, PRI5, CLA1, and CLA10), West Fork Little Pudding River (LPW1), and the Willamette River (WR1, WR5, and WR10); these additional parameters are denoted with parentheses in the list below.

Water quality parameters collected include:

- Temperature
- Turbidity
- Specific Conductivity
- pH
- Dissolved Oxygen (DO)
- Nitrate + Nitrite as Nitrogen (NO_3+NO_2-N)

[1] Identified as "Urban Streams monitoring" in the City of Salem Stormwater Management Plan 2010.

- *Escherichia coli (E. coli)*
- Biochemical Oxygen Demand (BOD_{stream})
- Zinc -total recoverable and dissolved (CLA1, CLA10, PRI1, PRI5 only)
- Copper -total recoverable and dissolved (CLA1, CLA10, PRI1, PRI5 only)
- Lead -total recoverable and dissolved (CLA1, CLA10, PRI1, PRI5 only)
- Hardness (CLA1, CLA10, PRI1, PRI5only)
- Total Suspended Solids (TSS) (LPW1, WR1, WR5, WR10 only)
- Alkalinity (WR1, WR5, WR10 only)
- Ammonia (WR1, WR5, WR10 only)
- Total Phosphorus (TP) (WR1, WR5, WR10 only)
- Total Solids (TS) (WR1, WR5, WR10 only)
- Total Dissolved Solids (TDS) (WR1, WR5, WR10 only)

Data for this monitoring element are provided in Tables 5 through 8, and Figures 2 and 3. Some general observations from this reporting period compared to the last reporting period include:

- **E. coli** – fewer exceedances of the 406 MPN/100 mL threshold overall, fewer exceedances of the 2420 MPN/100 mL laboratory threshold, and lower means and medians
- **Copper** – fewer exceedances than last year
- **Lead** – fewer exceedances than last year
- **Zinc** – fewer exceedances than last year
- **Nitrate & Nitrite** – results were a bit higher than last year
- **BOD** – results were a bit higher than last year
- **Specific Conductivity** – remained the same
- **pH** – remained the same
- **Turbidity** – significant decrease in turbidity results overall
- **Rainfall** – more rainfall observed in the 24 hours prior to sample collection than last year

2.2 Continuous Instream Monitoring

The City maintains a network of Continuous Instream water quality monitoring sites and stream gauging sites on seven different urban streams within the city. There are currently 11 water quality and stream gauging sites and two stream gauge-only sites (PRI4 and LPW1) within city limits. The City also maintains three stream gauge-only sites as part of a flood warning system for the Mill Creek Watershed, all of which reside outside of Salem city limits and therefore are not included in this document. Figure 1 denotes the locations of each site that resides within city limits.

The Continuous Instream water quality and stream gaging site on Shelton Ditch was non-operational for the entire reporting year, while construction work to replace the historic Winter Street Bridge was performed. Due to the fact that this is a newer site and is not included in Table B-1 of the City's MS4 permit, all requirements for Continuous Instream monitoring were still met.

The monitoring sites for this monitoring element are positioned in an upstream/downstream configuration. The upstream sites are adjacent to where the stream enters the City and the downstream sites are either above the confluence with another stream or where the stream exits the City's jurisdictional boundary.

Continuous data collected includes:

- Turbidity
- Specific Conductivity
- Temperature
- pH
- DO
- Stage

All data are recorded in 15-minute intervals. All continuous statistical data summaries presented in the various tables and figures were computed using grade A and/or grade B data. Qualifications for what constitutes grade A and grade B data are provided in Table 9, and monthly medians for collected data are summarized in Table 10. Plots of continuous data are provided in Figures 4 through 6.

Overall, for reporting year 2015/2016 there were less data gaps in the figures, most likely due to higher quality data being available. There were no significant changes in data trends or exceedances from last year.

The Continuous Instream monitoring element incorporates an alarm system that supports the City's Illicit Discharge Detection and Elimination (IDDE) program. The alarm system is used to record, notify, and prompt investigation of water quality abnormalities that may be indicative of illicit discharges. It serves as an important tool to aid in the elimination of periodic illicit discharges, helps to prioritize dry weather outfall screening activities (see section 2.5), and serves as an outreach/education opportunity for residents.

Figure 7 shows the number of alarms that occurred each year at any station that alarmed from 2009/2010 through 2015/2016. It should be noted that for this reporting year a station that does not normally get alarms, PRI12, had 7 alarms. Stormwater monitoring staff were able to work with Environmental Services staff to eventually locate a water softener with a drain line emptying into a ditch, which went into the creek and was causing spikes in conductivity each night. Environmental Services staff were able to get the property owner to correct the problem, and it was a great example of collaboration to find and fix a problem.

2.3 Instream Storm Monitoring

Instream Storm refers to the monitoring of MS4 receiving streams during defined storm events. Sampling occurs at three sites in the Pringle Creek Watershed (continuous instream monitoring sites PRI12, PRI3, and CLK1). Data collected are used to increase understanding of receiving waters within the Pringle Creek Watershed and help guide Salem's stormwater management strategies in watersheds throughout the city. This monitoring element was initiated this permit cycle and is expected to continue beyond the current MS4 permit; ultimately providing a dataset for long-term trending and spatial analyses.

Sampling consists of flow weighted composite samples, grab samples, and field measurements. Parameters include:

- *E. coli*
- Dissolved Oxygen
- pH
- Temperature
- Specific Conductivity
- Copper (Total Recoverable and Dissolved)
- Zinc (Total Recoverable and Dissolved)
- Lead (Total Recoverable and Dissolved)
- Hardness
- Ammonia Nitrogen (NH_3)
- NO_3+NO_2-N
- Ortho Phosphorus
- Total Phosphorus (TP)
- BOD_{stream}
- TSS

Data for this monitoring element are provided in Table 11. For reporting year 2015/2016, staff worked diligently to capture five separate storm events of adequate size, and met the requirements for this monitoring element.

2.4 Stormwater Monitoring

The City has collected water quality samples from a number of sites throughout the piped MS4 system since 1995. Three monitoring sites are identified in the current monitoring plan, one each for residential, commercial, and industrial land use. The commercial and industrial sites are new sites for this permit cycle, but the residential site had been sampled previously during the last MS4 Permit and continued to be sampled through this permit cycle. Data from this monitoring element will be aggregated with previous data collected from similar land use types. The aggregated datasets will be used to characterize Salem's MS4 stormwater runoff pollutant concentrations by land use and compare them with the ACWA characterized land use concentrations.

Sampling consists of flow weighted[2] composite samples, grab samples, and field measurements.

Parameters include:

- *E. coli*
- Dissolved Oxygen
- pH
- Temperature
- Specific Conductivity
- Copper (Total Recoverable and Dissolved)
- Zinc (Total Recoverable and Dissolved)

[2] Due to hydraulic conditions, accurate flow pace sampling is not achievable at the residential land use site (Electric), therefore the City has employed a time paced sampling protocol for this site.

- Lead (Total Recoverable and Dissolved)
- Hardness
- Ammonia Nitrogen (NH_3)
- NO_3+NO_2-N
- Ortho Phosphorus
- Total Phosphorus (TP)
- $BOD_{5\text{-day}}$
- TSS

Data for this monitoring element are provided in Table 12. For reporting year 2015/2016, staff collected samples during two separate storm events, and met the requirements for this monitoring element.

2.5 Priority Dry Weather Outfall/Manhole Screening

The RY 2015/2016 dry weather outfall screening effort included a total of 35 outfall inspections (outfall structures or the first available upstream manhole), 19 of which received analytical sampling due to the presence of flowing water. A total of 15 pipesheds were investigated based on these outfall inspections; four pipesheds were not investigated due to lack of time and resources. As part of the pipeshed investigations, a total of eight additional manholes received analytical confirmation sampling to identify the origin of flow.

Of the 35 outfalls inspected, 34 were identified in the City of Salem's *Dry Weather Outfall and Illicit Discharge Screening Plan* and 1 outfall was inspected at the suggestion of the City's Environmental Services Department after receiving a report of "white material" at the outfall. One of the structures (D42456216) identified in the plan has not been inspected since the inception of the plan, due to access constraints and will likely be removed from the plan.

Observational data collected at outfalls did not produce any direct indication of an illicit discharge at any of the 35 priority outfalls. However, increased pipeshed investigations for flowing outfalls resulted in the discovery and repair of 10 municipal drinking water leaks and one sanitary sewer leak that that were infiltrating the storm sewer system. A potentially illicit discharge was detected at D42466227, a manhole above outfall D42466417. After the initial sample was collected at this location, a short duration increase in flow occurred. A sample was collected from this increased flow for comparison and the City's Environmental Services Department was called to investigate the source of the flow; no source for this discharge was identified.

For RY2015/2016, pipeshed investigations were performed based on the presence of flow as opposed to the exceedance of a screening parameter. Once the origins of flow were isolated to a single pipe section or location, one or more of the following activities were conducted:

- Confirmation sampling
- CCTV inspections
- Water Distribution leak detection
- Environmental Services field investigation

Due to the additional time and effort required for this increased source tracking, the source(s) of all flowing outfalls were not able to be completely identified and/or resolved in RY 2015/2016, and will need to be investigated in subsequent years.

Field screening parameters include temperature, pH, specific conductivity, turbidity, chlorine, fluoride, detergents/surfactants, and ammonia, which were analyzed using a multi-parameter colorimeter and multi-parameter data sonde. Laboratory parameters include Potassium, Sodium, and E. coli, which were analyzed by the City's laboratory at the Willow Lake Water Pollution Control Facility. Results of the investigation of these outfalls/manholes include:

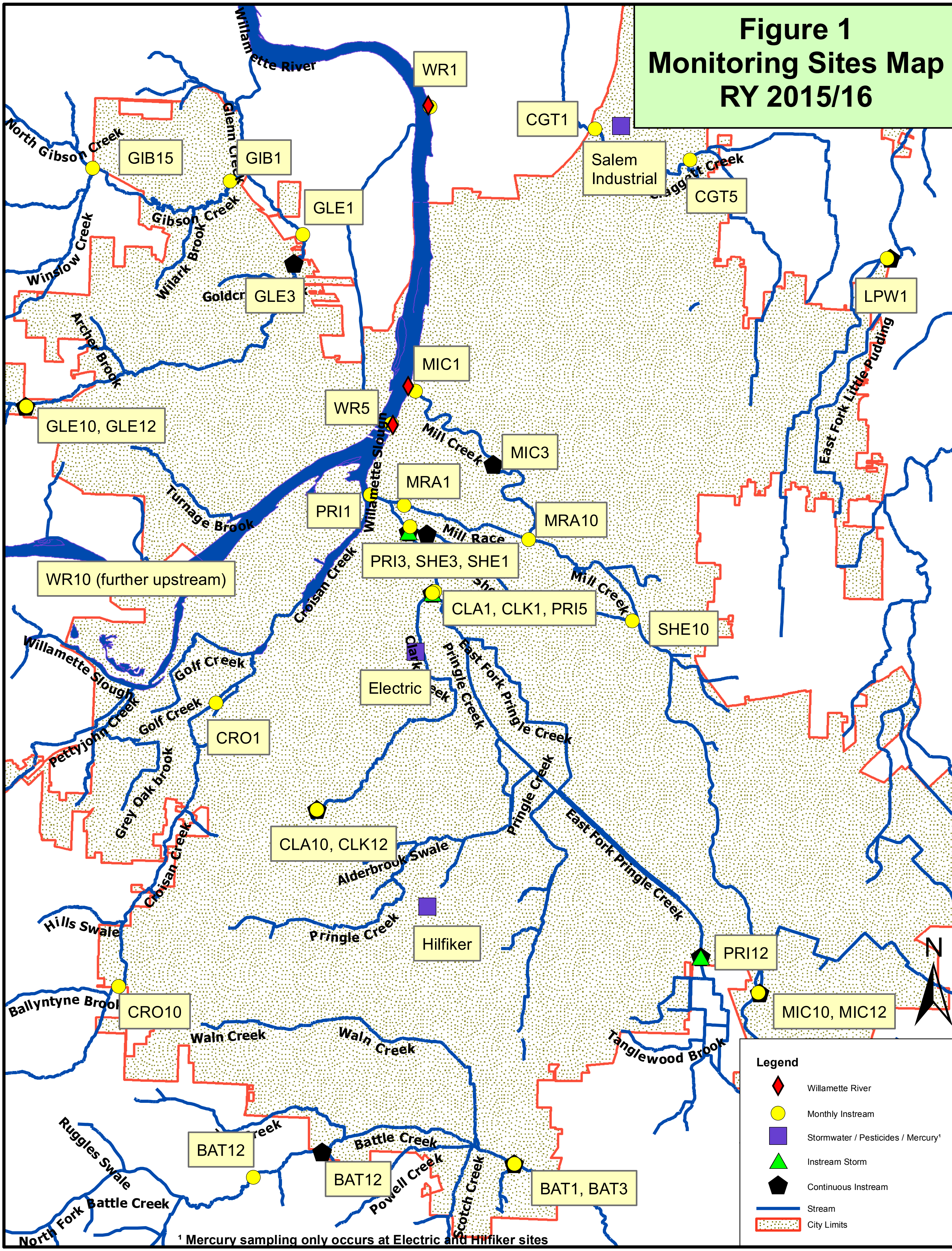
- 18 structures had concentrations of chlorine above the action level (> 0 mg/L),
- 23 structures had concentrations of fluoride exceeding the action level (0.1 mg/L),
- 1 structure had a specific conductivity exceeding the action limit (250 µS/cm),
- 1 structure had a concentration of detergents/surfactants exceeding the action limit (0.25mg/L),
- 1 structure had a concentration of Potassium exceeding the action limit (0.5 mg/L),
- 1 structure had a concentration of ammonia equal to the action limit (0.5 mg/L),
- 2 structures had concentrations of sodium exceeding the action limit (15 mg/L),
- 4 structures had E. coli concentrations exceeding the action limit (406 MPN/100mL).

Data collected for this permit requirement are provided in Table 13.

3.0 Conclusion

The City completed all MS4 Permit monitoring requirements for this reporting year and met all of the minimum monitoring requirements outlined in the MS4 Permit before its original expiration date of December 29, 2015. As the permit was administratively extended, staff will continue to collect data following Table B-1 in the upcoming reporting year 2016-2017. Cumulatively, data collected throughout this MS4 Permit cycle will be used to meet monitoring objectives identified in the City's monitoring plan, while also supporting data analyses.

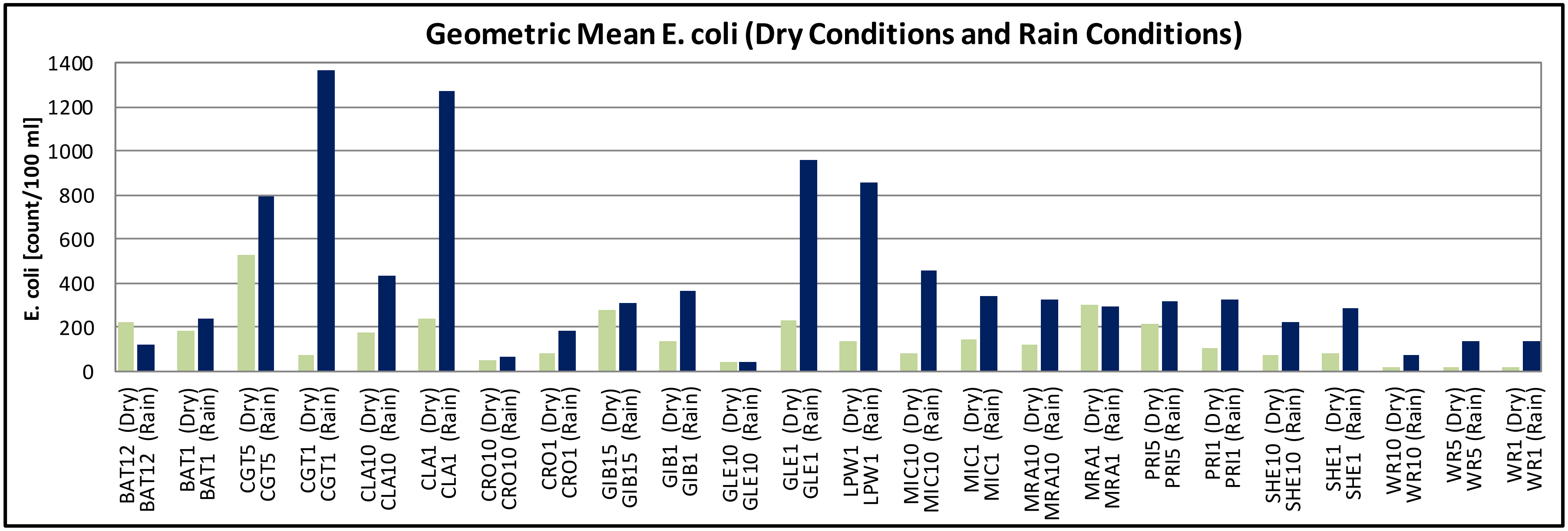
Figure 1
Monitoring Sites Map
RY 2015/16

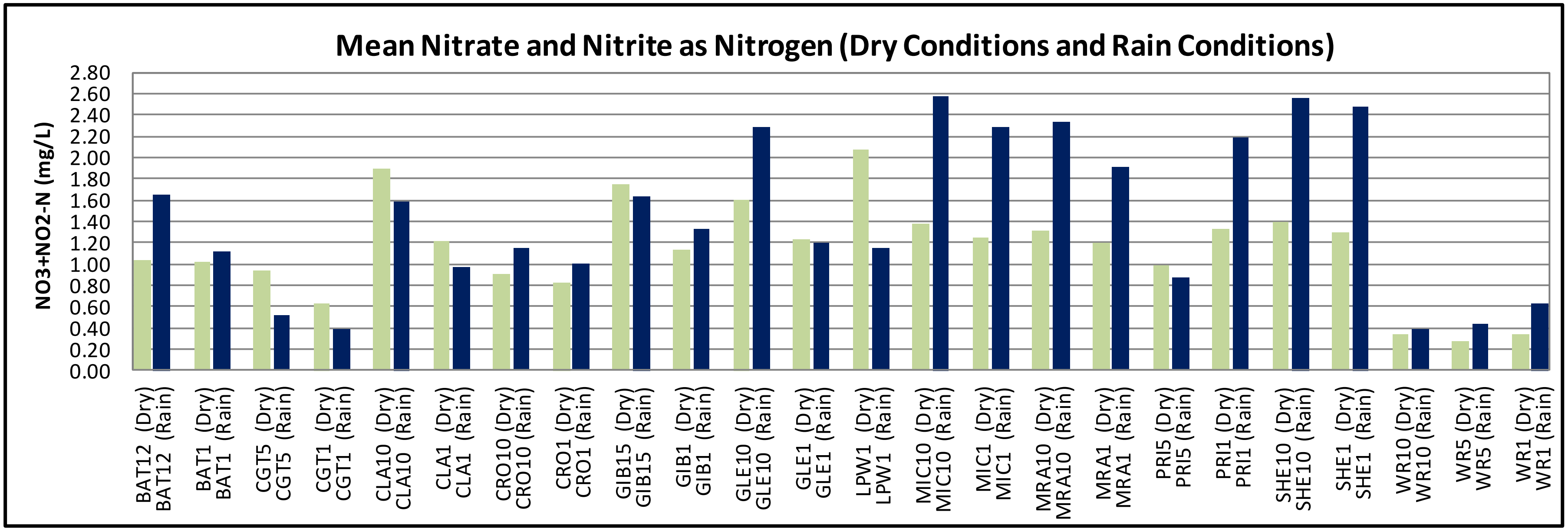


[1] Mercury sampling only occurs at Electric and Hilfiker sites

Figure 2

Monthly Instream Mean Value Comparison for Dry and Rain Conditions (Reporting Year 2015/2016)

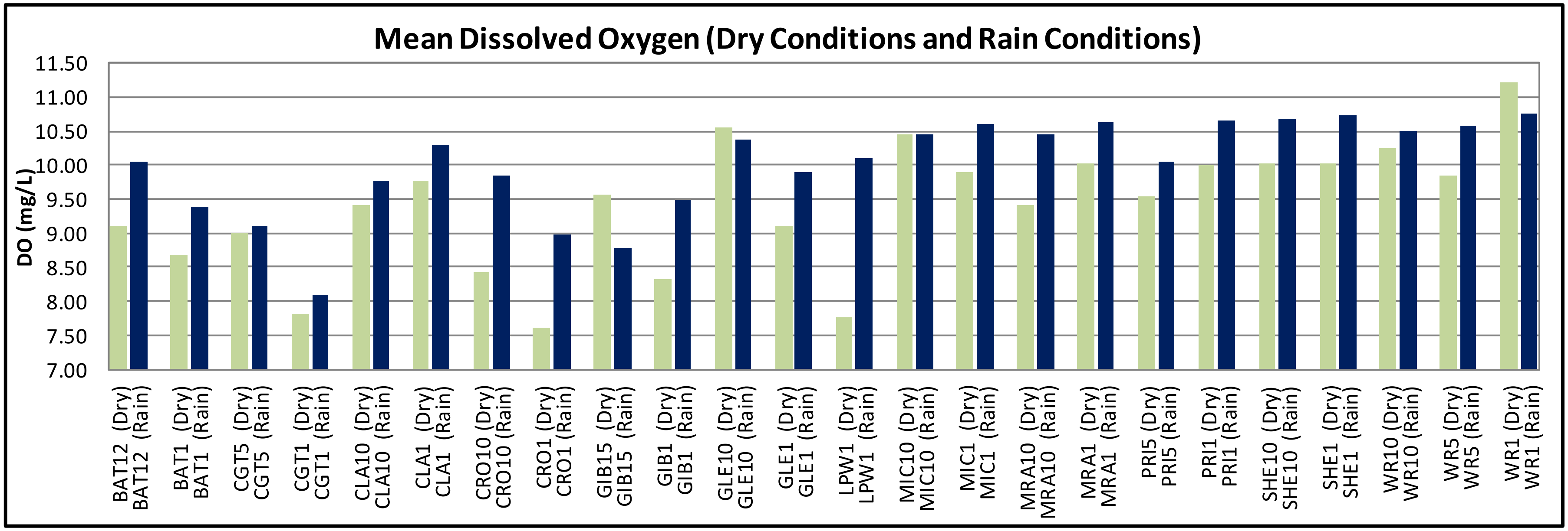


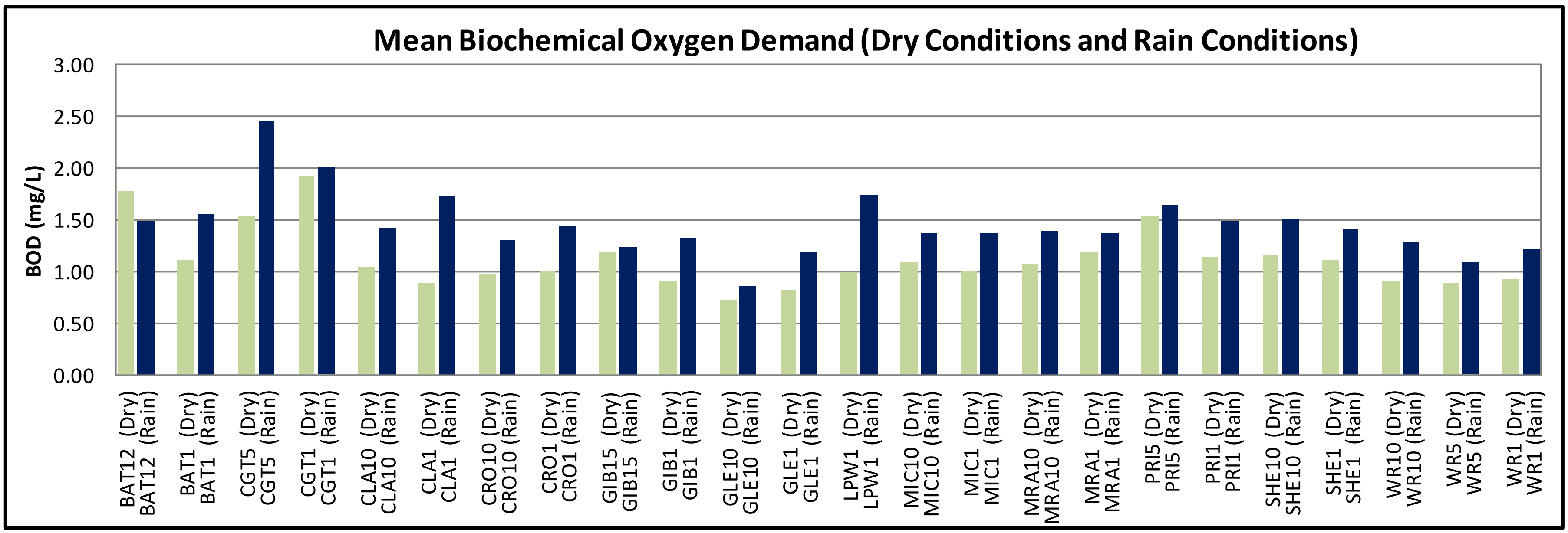


<u>**Dry**</u> conditions defined as less than 0.5 inches of rainfall in the 24 hours prior to sample collection; <u>**rain**</u> conditions defined as greater than or equal to 0.05 inches of rainfall in the 24 hours prior to sample collection.

Figure 2

Monthly Instream Mean Value Comparison for Dry and Rain Conditions (Reporting Year 2015/2016)

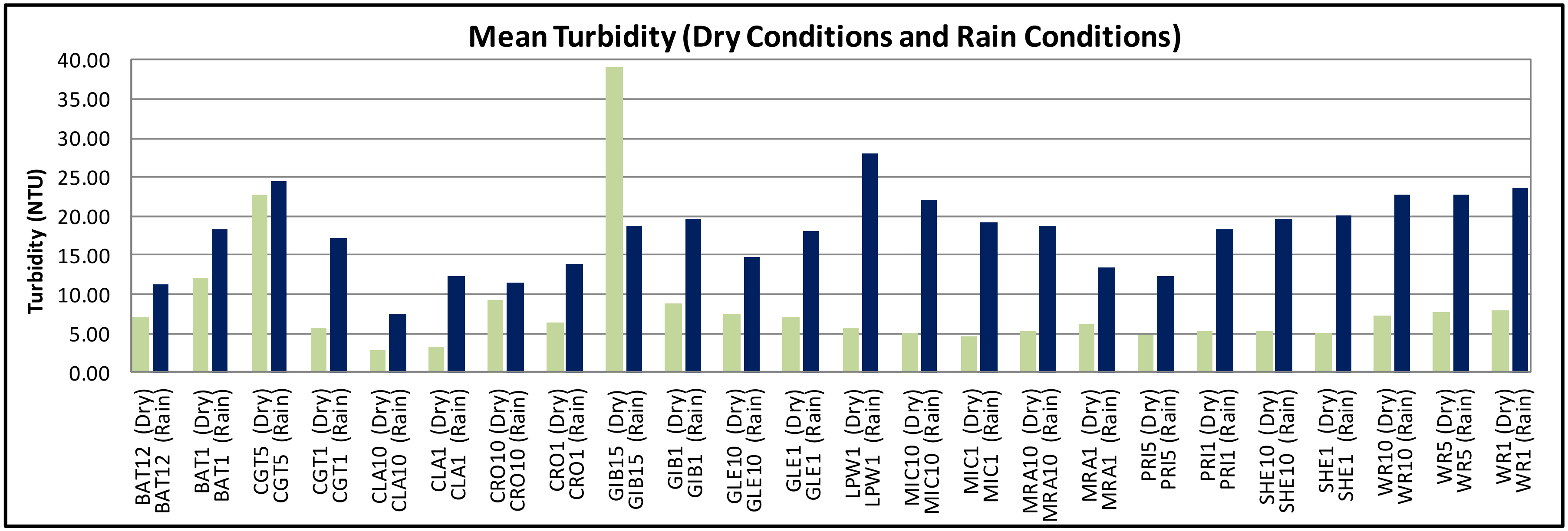


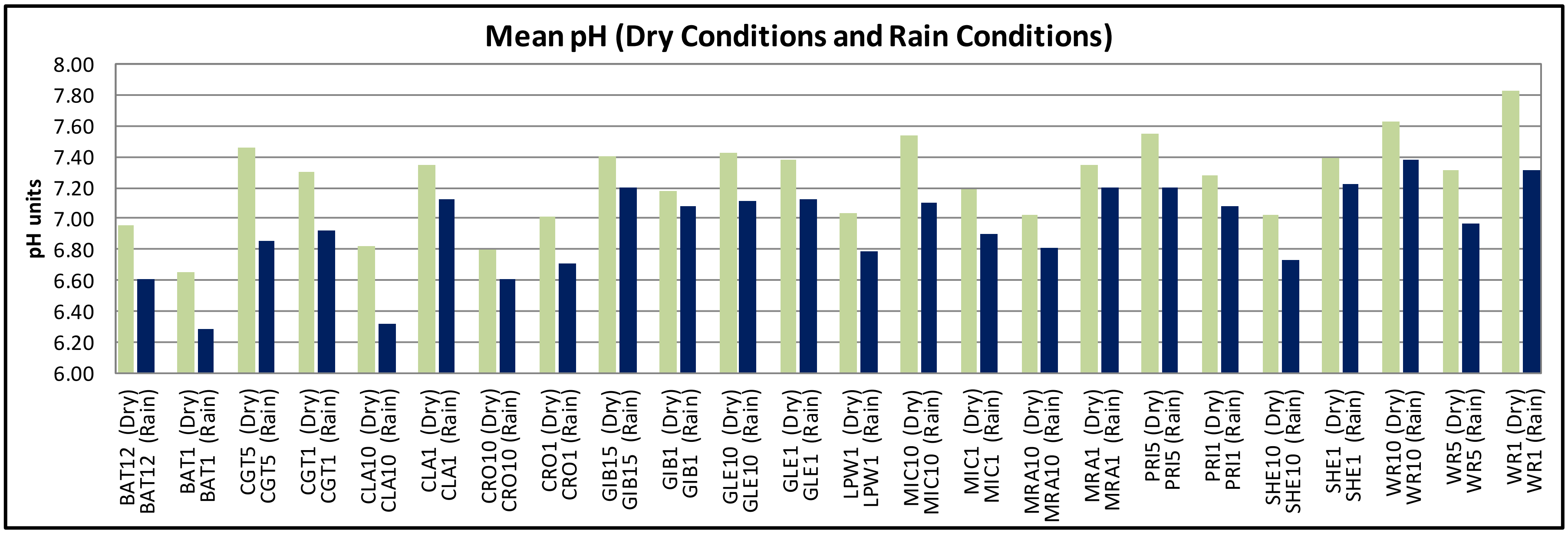


Dry conditions defined as less than 0.5 inches of rainfall in the 24 hours prior to sample collection; **rain** conditions defined as greater than or equal to 0.05 inches of rainfall in the 24 hours prior to sample collection.

Figure 2

Monthly Instream Mean Value Comparison for Dry and Rain Conditions (Reporting Year 2015/2016)

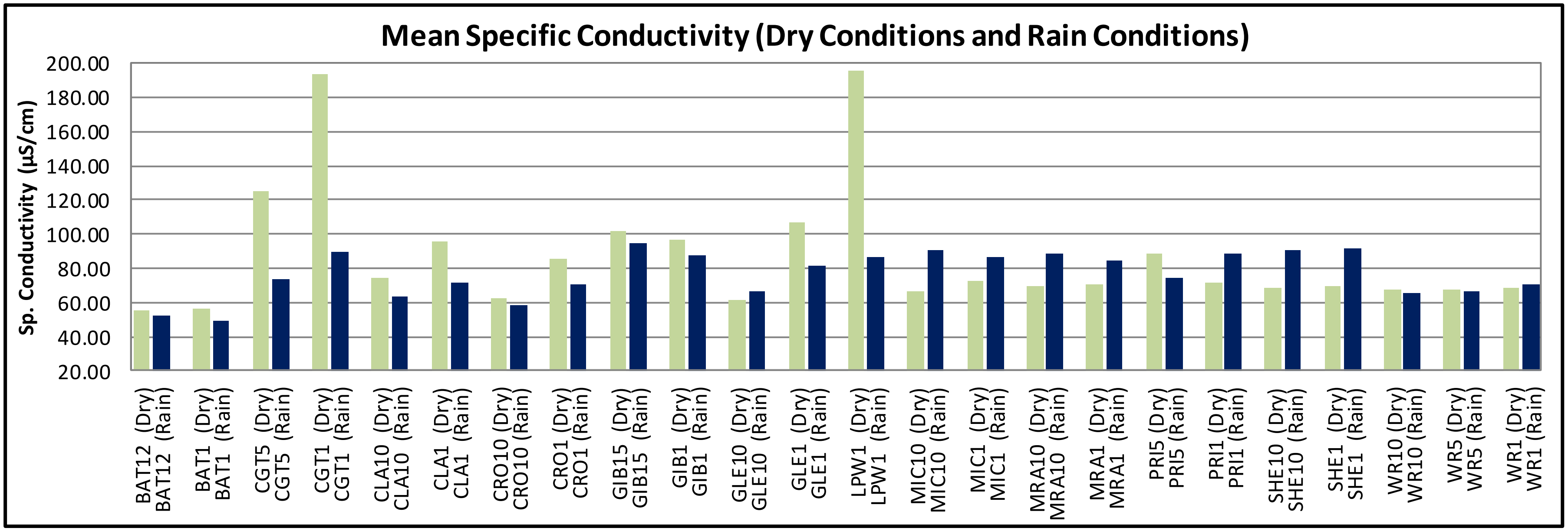




Dry conditions defined as less than 0.5 inches of rainfall in the 24 hours prior to sample collection; **rain** conditions defined as greater than or equal to 0.05 inches of rainfall in the 24 hours prior to sample collection.

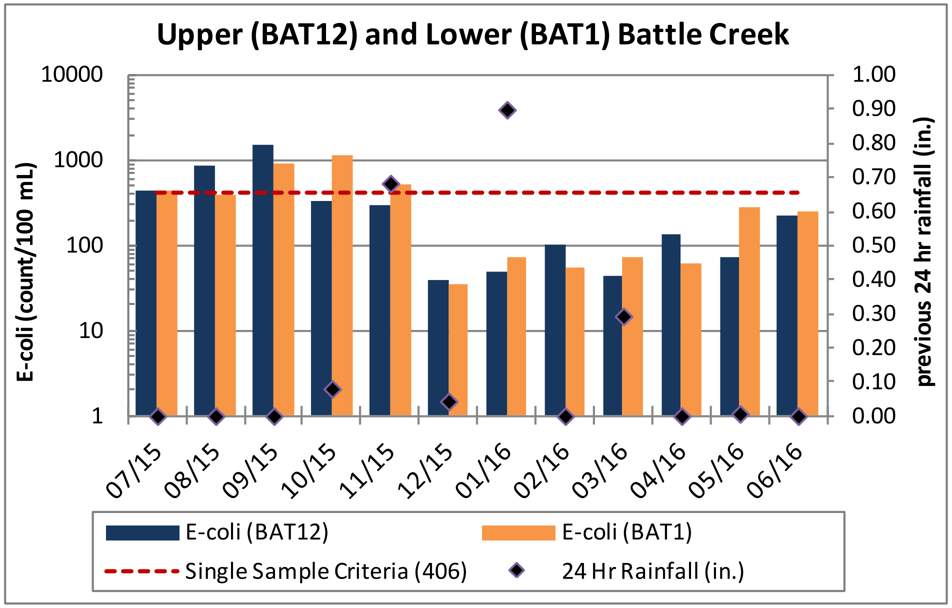
Figure 2

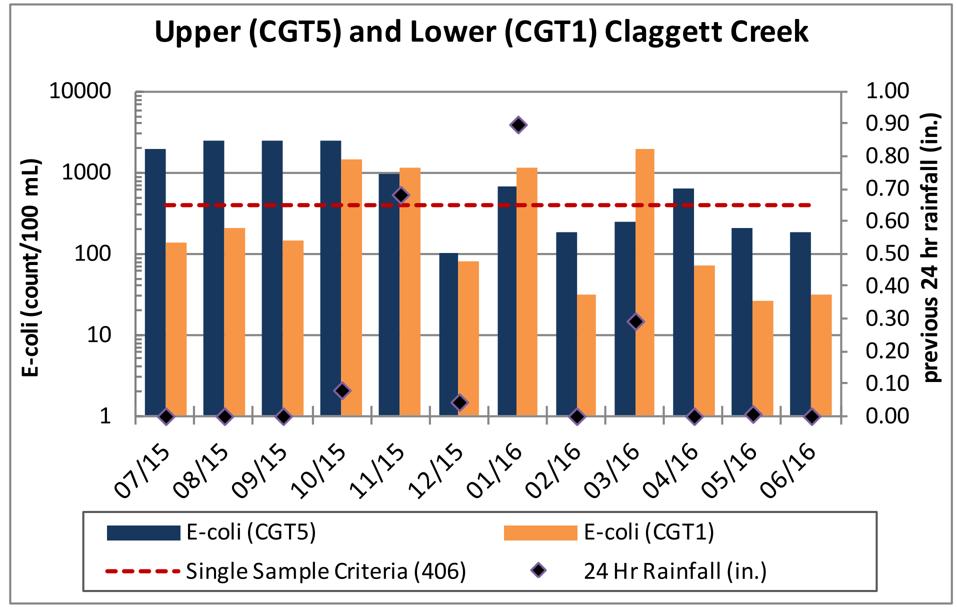
Monthly Instream Mean Value Comparison for Dry and Rain Conditions (Reporting Year 2015/2016)

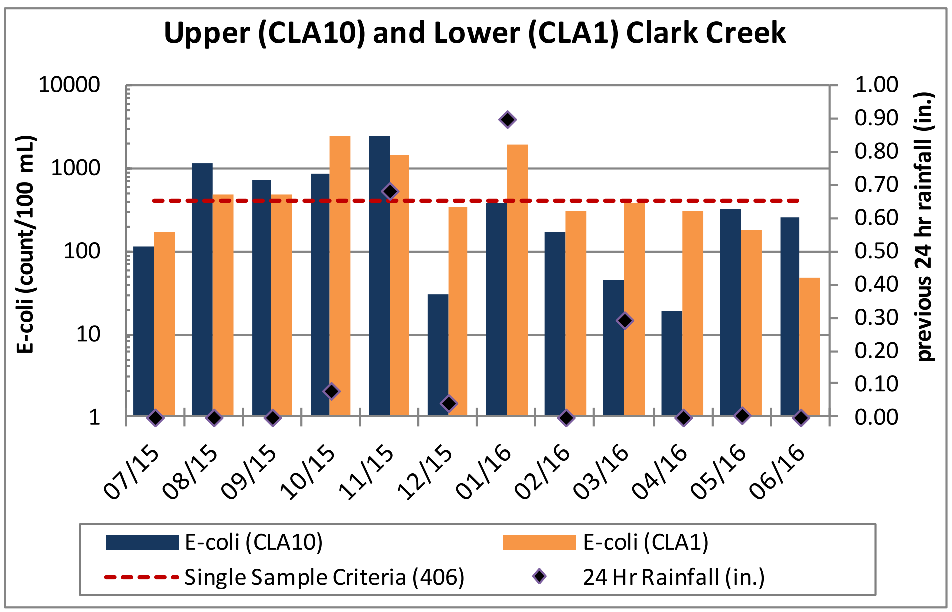


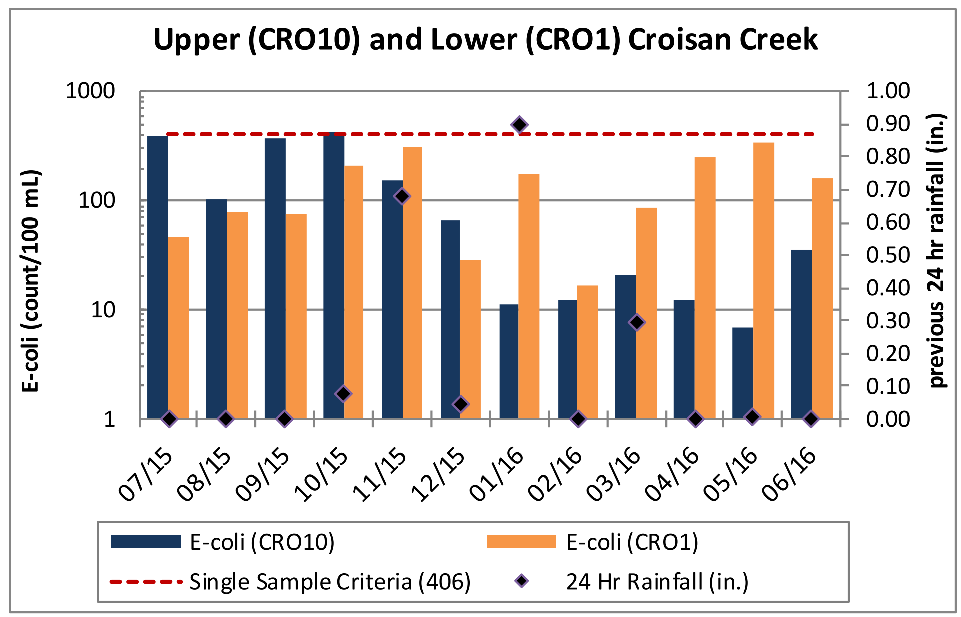
Dry conditions defined as less than 0.5 inches of rainfall in the 24 hours prior to sample collection; **rain** conditions defined as greater than or equal to 0.05 inches of rainfall in the 24 hours prior to sample collection.

Figure 3
Monthly Instream E. Coli Upstream / Downstream Site Comparison (Reporting Year 2015/2016)



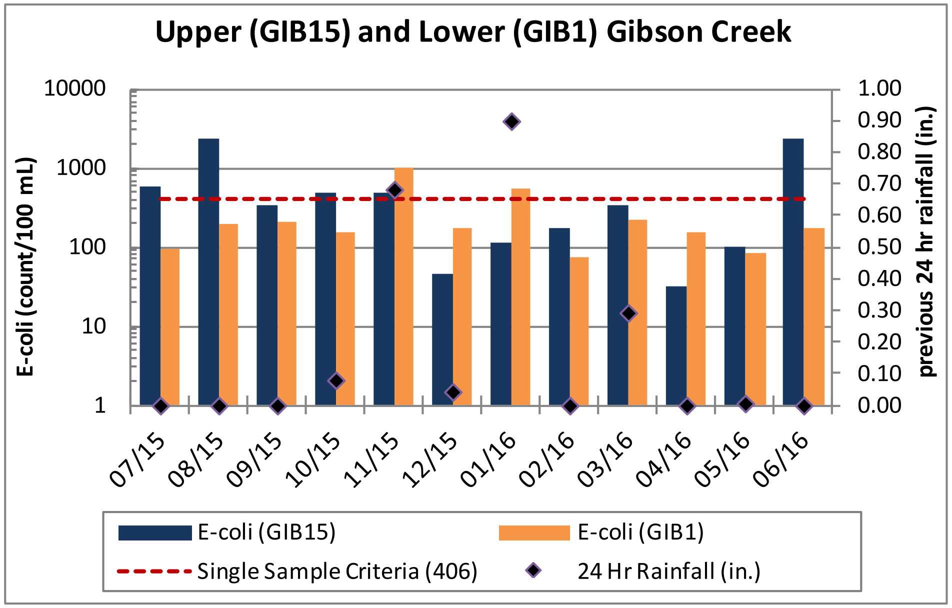


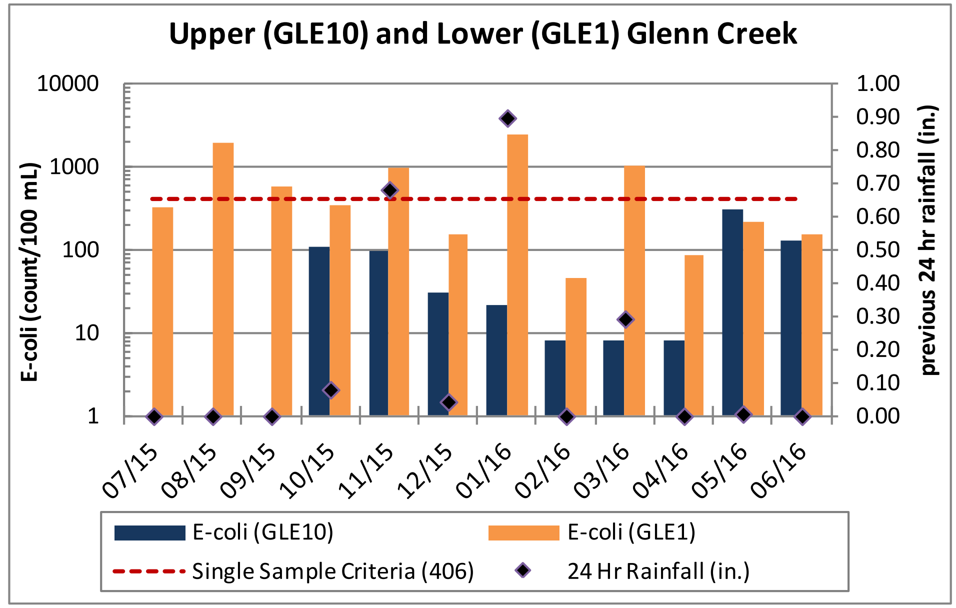


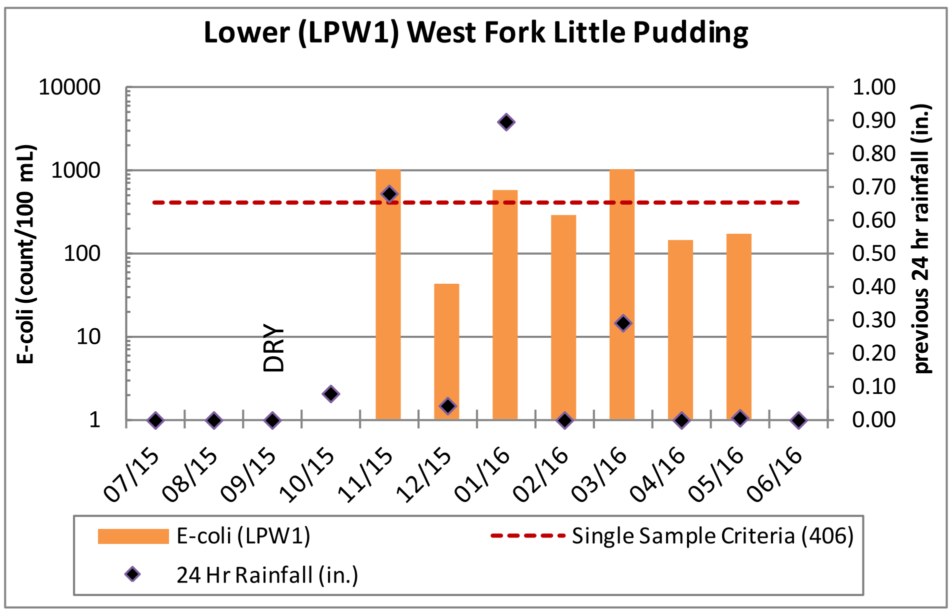


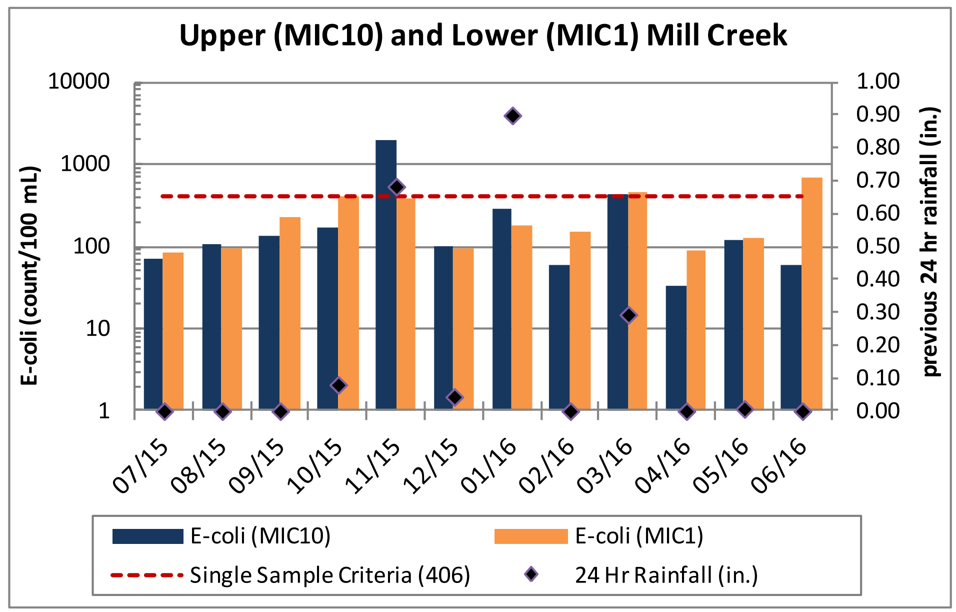
If 24 hour rainfall depth prior to sample collection differed between upstream and downstream sites, the average rainfall of the two sites was used.

Figure 3
Monthly Instream E. Coli Upstream / Downstream Site Comparison (Reporting Year 2015/2016)



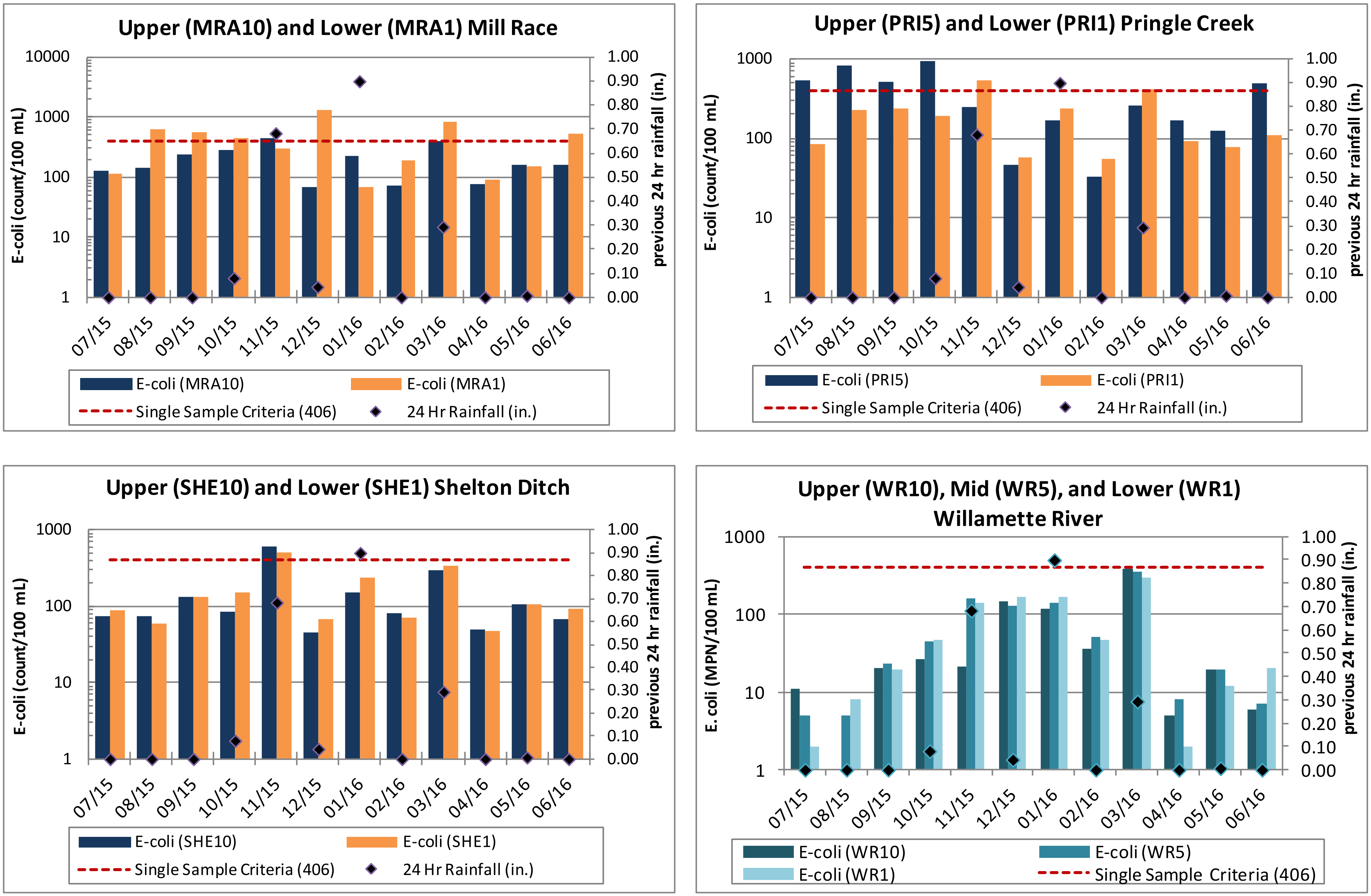






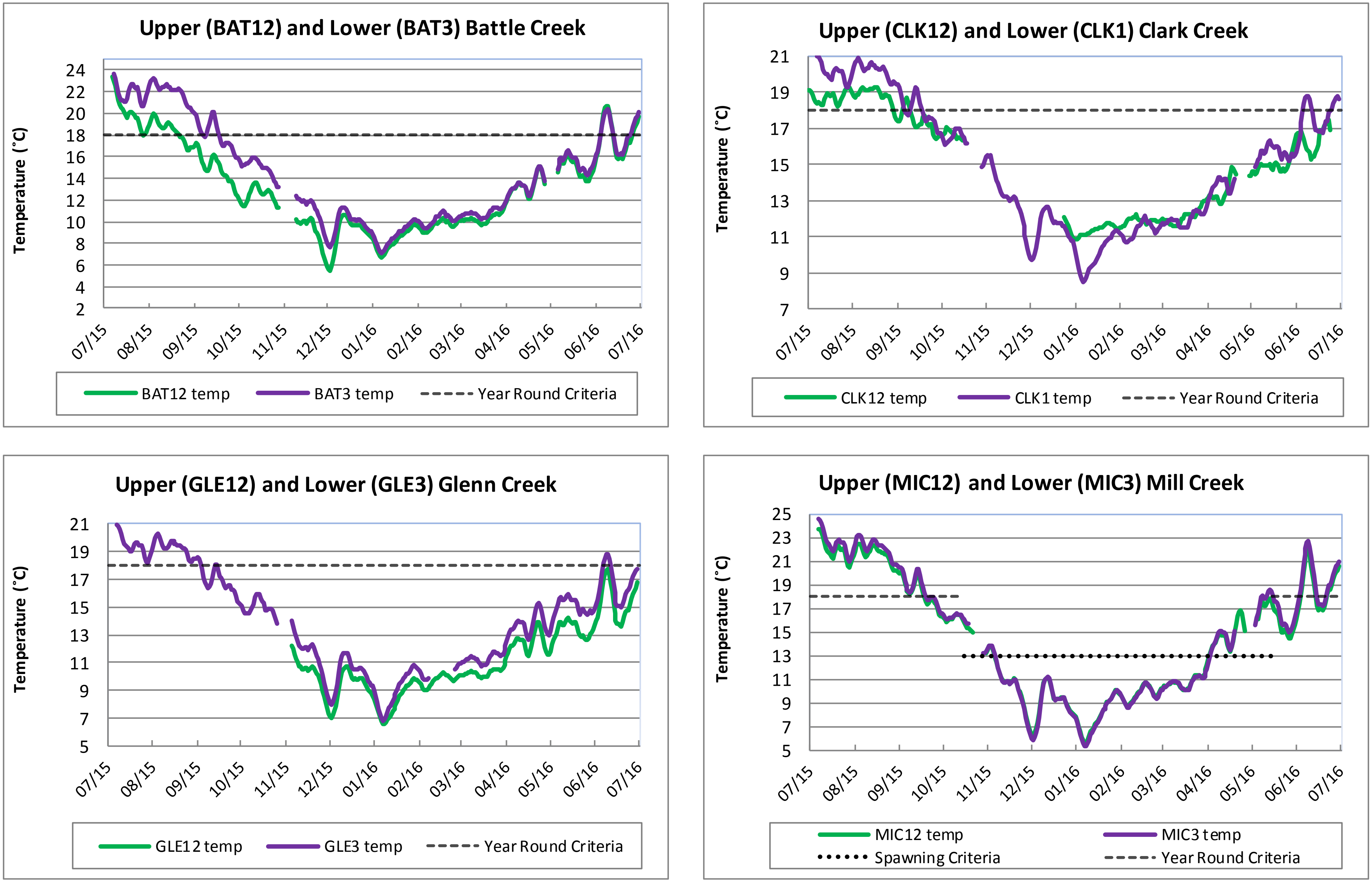
If 24 hour rainfall depth prior to sample collection differed between upstream and downstream sites, the average rainfall of the two sites was used.

Figure 3
Monthly Instream E. Coli Upstream / Downstream Site Comparison (Reporting Year 2015/2016)



If 24 hour rainfall depth prior to sample collection differed between upstream and downstream sites, the average rainfall of the two sites was used.

Figure 4
Continuous Instream Temperature 7-Day Moving Average Maximum (Reporting Year 2015/2016)

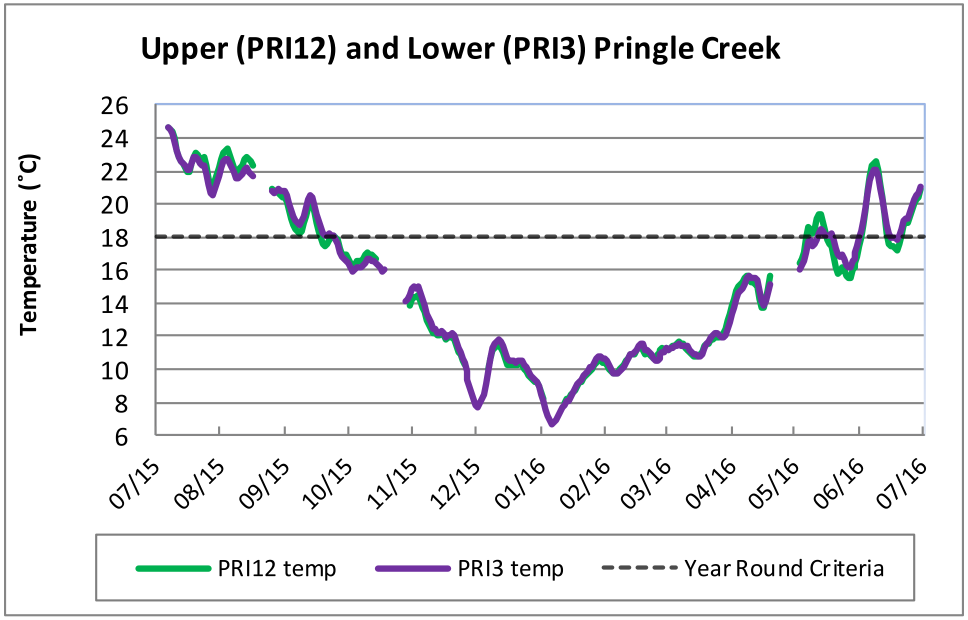


Presented temperature data consists of A grade data with greater than 80% of data points collected per day. Temperature criteria is defined in OAR 340--04100028 and OAR 340-0340, Tables 340A & B.

- Spawning Minimum Criteria for applicable streams may not exceed 7-day average maximum of 13 degrees C.
- Year Round Minimum Criteria may not exceed 7-day average maximum of 18 degrees C.

Figure 4

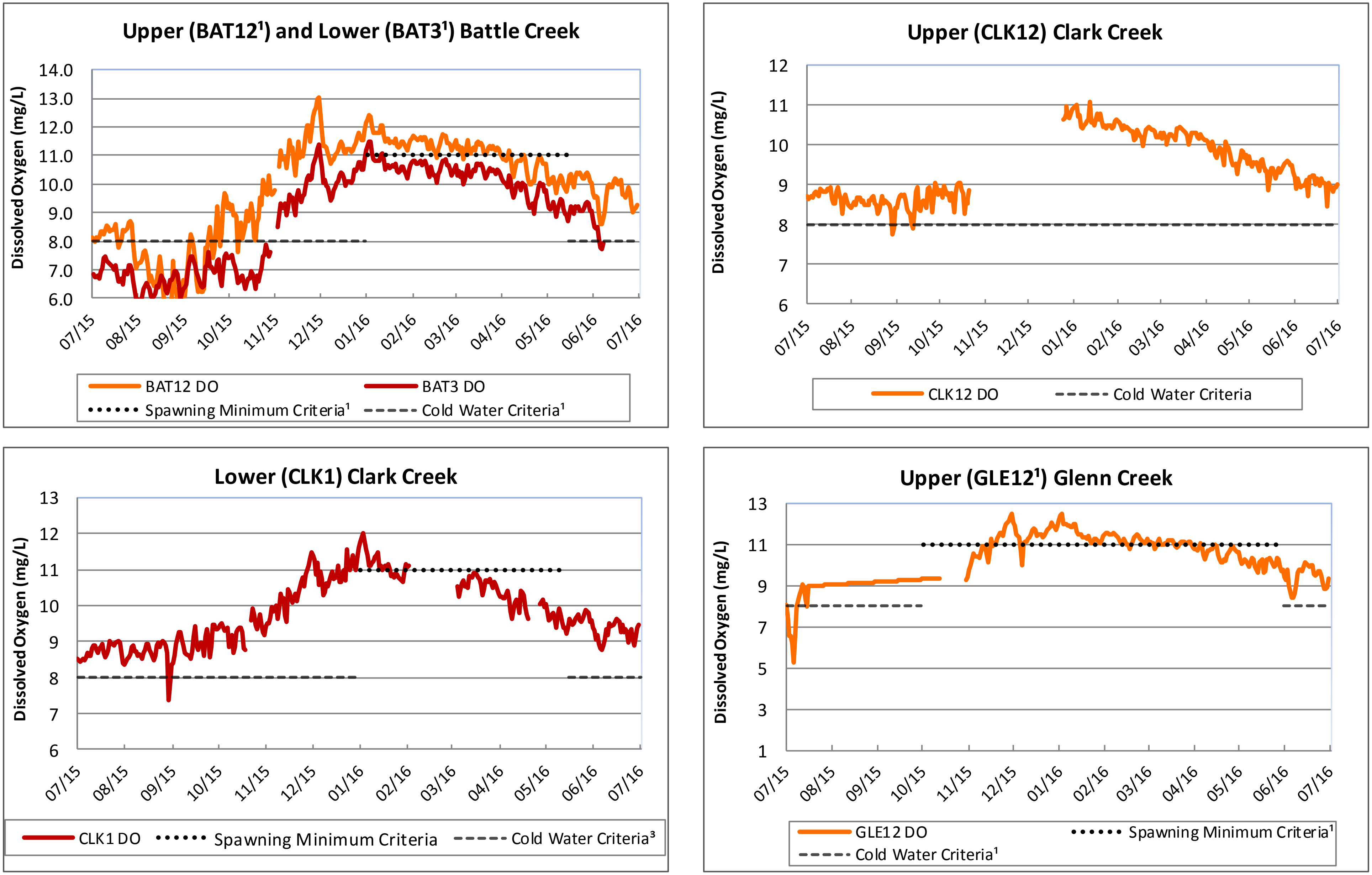
Continuous Instream Temperature 7-Day Moving Average Maximum (Reporting Year 2015/2016)



Presented temperature data consists of A grade data with greater than 80% of data points collected per day. Temperature criteria is defined in OAR 340--04100028 and OAR 340-0340, Tables 340A & B.

- Spawning Minimum Criteria for applicable streams may not exceed 7-day average maximum of 13 degrees C.
- Year Round Minimum Criteria may not exceed 7-day average maximum of 18 degrees C.

Figure 5
Continuous Instream Dissolved Oxygen Daily Mean (Reporting Year 2015/2016)

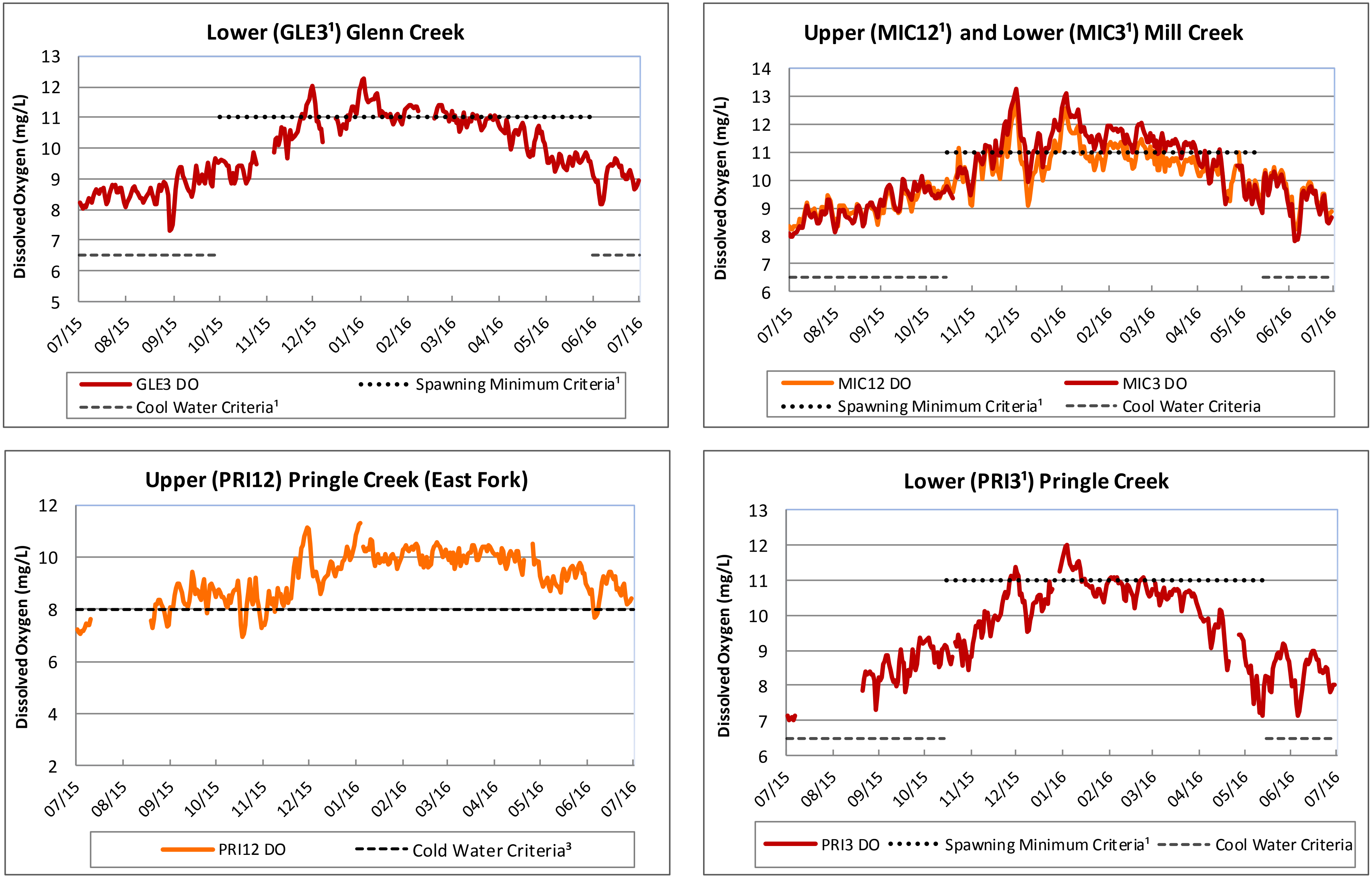


Presented DO data consists of A and B grade data with greater than or equal to 80% of data points collected per day. DO Criteria as defined in OAR 340-041-0016 and OAR 340-0340, Tables 340 A & B.

- Spawning Minimum Criteria for applicable streams may not be less than 11 mg/L.
- Oregon Cold Water Criteria for applicable streams may not be less than 8 mg/L.

[1] Oregon's 2010 Integrated Report Section 303(d) listed.

Figure 5
Continuous Instream Dissolved Oxygen Daily Mean (Reporting Year 2015/2016)

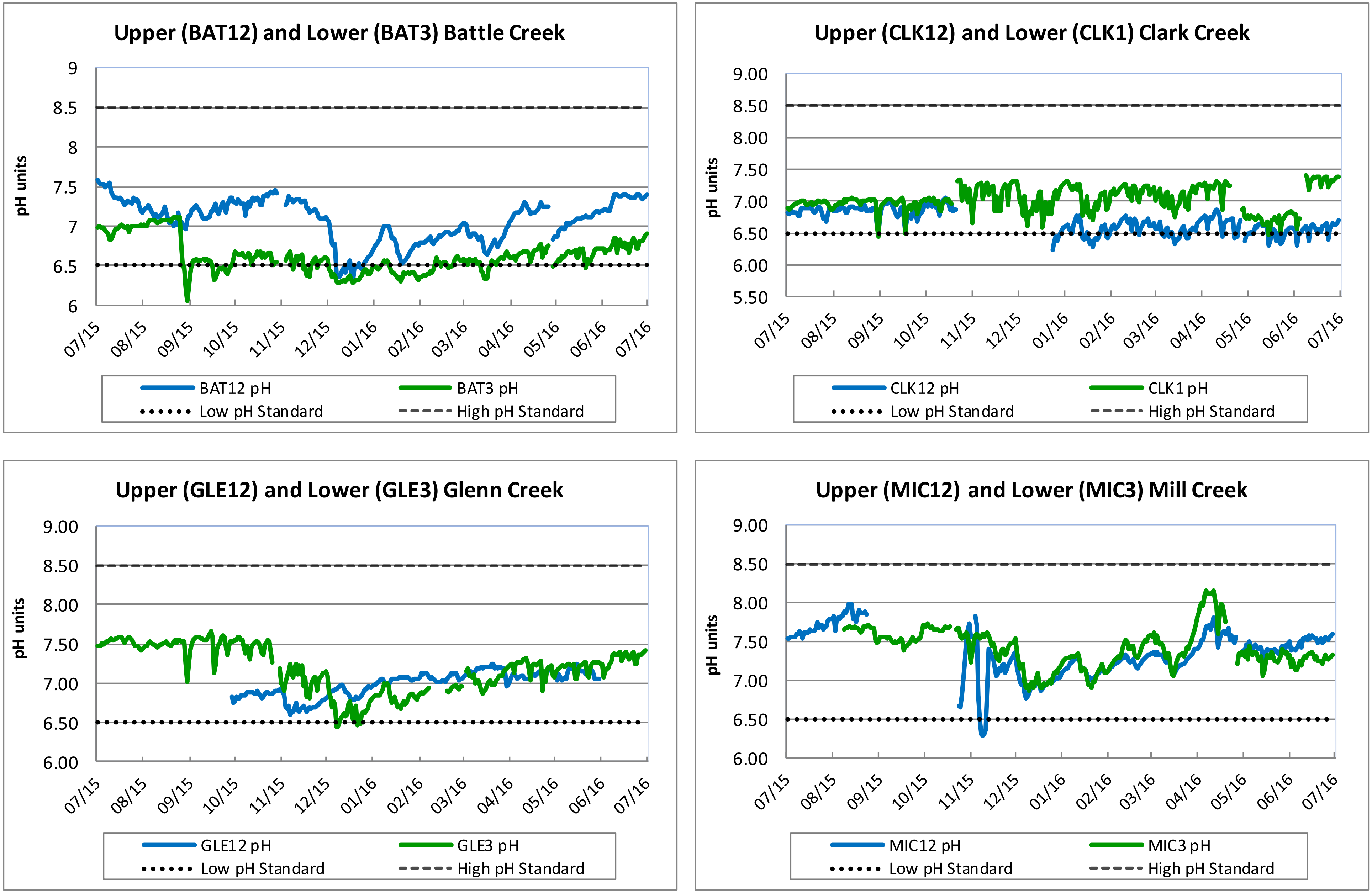


Presented DO data consists of A and B grade data with greater than or equal to 80% of data points collected per day. DO Criteria as defined in OAR 340-041-0016 and OAR 340-0340, Tables 340 A & B.

- Spawning Minimum Criteria for applicable streams may not be less than 11 mg/L.
- Oregon Cold Water Criteria for applicable streams may not be less than 8 mg/L.

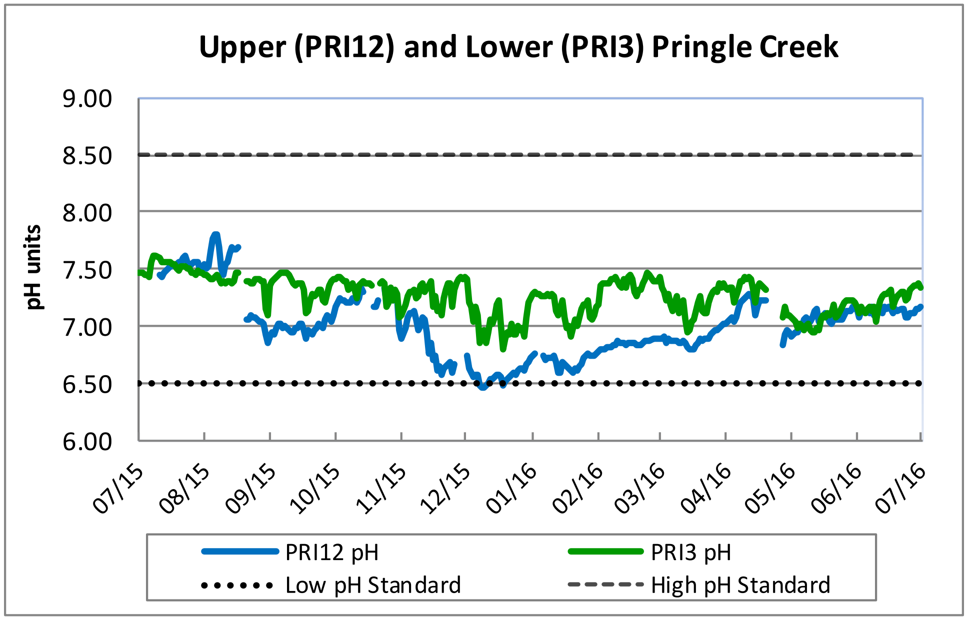
[1] Oregon's 2010 Integrated Report Section 303(d) listed.

Figure 6
Continuous Instream pH Daily Mean (Reporting Year 2015/2016)



Presented pH data consist of A and B grade data with greater than or equal to 80% of data points collected per day.
As defined in OAR 341-041-0035 Water Quality Standards for the Willamette Basin, pH should not fall outside the ranges of 6.5 to 8.5 pH units.

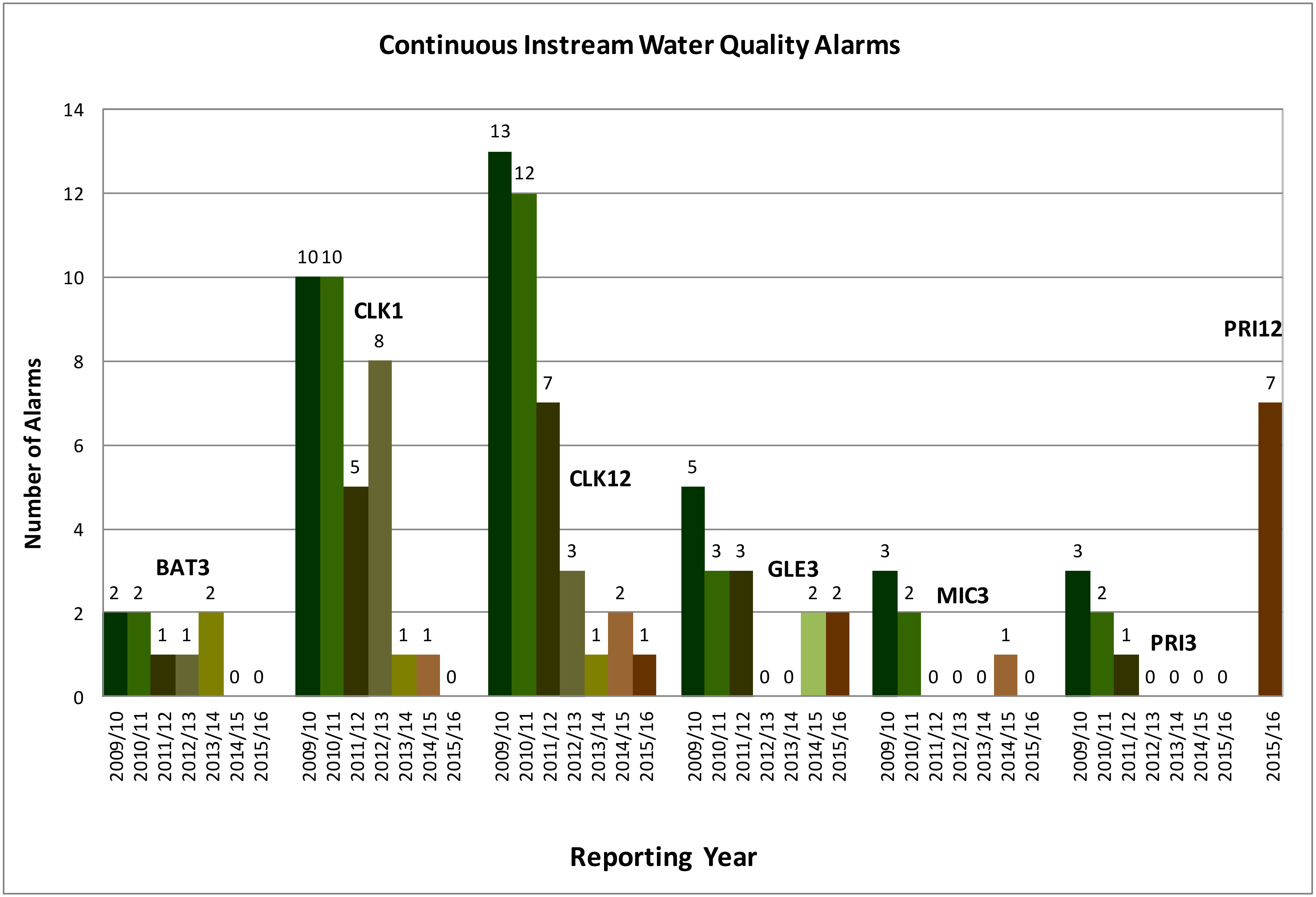
Figure 6
Continuous Instream pH Daily Mean (Reporting Year 2015/2016)



Presented pH data consist of A and B grade data with greater than or equal to 80% of data points collected per day.
As defined in OAR 341-041-0035 Water Quality Standards for the Willamette Basin, pH should not fall outside the ranges of 6.5 to 8.5 pH units.

Figure 7

Continuous Instream Water Quality Alarms (Reporting Year 2009/2010 to 2015/2016)



Note: Alarm counts have been filtered to remove alarms that occurred during rain events, as well alarms that were erroneous or caused by sensor malfunction.

Table 1.

Completion of Table B-1 Environmental Monitoring Elements

Monitoring Type	# of sites	Total “Events” Needed	Completed 2010/2011	Completed 2011/2012	Completed 2012/2013	Completed 2013/2014	Completed 2014/2015	Completed 2015/2016	Remaining "Events" Needed
Monthly Instream	21	48 / site	12[1]	12[1]	12[1]	12[1]	12[1]	12[1]	COMPLETE
Continuous Instream	10	On going	NA	NA	NA	NA	NA	NA	COMPLETE
Instream Storm	3	25 / site	0[2]	6	6	5	4	4	COMPLETE
Stormwater (MS4)	3	15 / site	0[2]	4	4	4	1	2	COMPLETE
Pesticides	3	4 / site	0[2]	1	2	0	1	COMPLETE	
Mercury	2	2 / site / year	0[2]	2	1	1	COMPLETE[3]		
Macroinvertebrates	3	2 / site	0[2]	1	1	COMPLETE			

[1] Due to no flow or access issues, several of the sites had less than 12 data collection events; however, all sites are on track to meet the minimum permit requirements.

[2] The City's monitoring plan was not approved by the Department until June 29th, 2011; therefore, no sampling was conducted during this year for this element.

[3] Following Table B-1 Special Condition #6 of the City's NPDES MS4 permit, the City requested and received approval from Department to eliminate the mercury and methyl mercury monitoring requirement after completing the required two years of monitoring.

Table 2.
Site Locations for Each Monitoring Element

Monthly Instream	
Site ID	Site Location
BAT 1	Commercial St SE
BAT 12	Rees Hill Rd SE
CGT 1	Mainline Dr NE
CGT 5	Hawthorne St NE @ Hyacinth St NE
CLA 1	Bush Park
CLA 10	Ewald St SE
CRO 1	Courthouse Athletic Club
CRO 10	Ballantyne Rd S
GIB 1	Wallace Rd NW
GIB 15	Brush College Rd NW
GLE 1	River Bend Rd NW
GLE 10	Hidden Valley Dr NW
LPW 1	Cordon Rd NE
MIC 1	Front St Bridge
MIC 10	Turner Rd SE
MRA 1	High St SE
MRA 10	Mill Race Park
PRI 1	Riverfront Park
PRI 5	Bush Park
SHE 1	Church St SE
SHE 10	State Printing Office
WR1	Sunset Park (Keizer)
WR5	Union St. Railroad Bridge
WR10	Halls Ferry Road (Independence)

Continuous Instream	
Site ID	Site Location
BAT3	Commercial St SE
BAT12	Lone Oak Rd SE
CLK1[1]	Bush Park
CLK12	Ewald St SE
GLE3	Wallace Rd NW
GLE12	Hidden Valley Dr NW
LPW1[2]	Cordon Rd
MIC3	North Salem High School
MIC12	Turner Rd SE
PRI3[1]	Pringle Park
PRI4[2]	Salem Hospital Footbridge
PRI12[1]	Trelstad Ave SE
SHE3	Winter St. Bridge

Stormwater / Pesticides / Mercury	
Site Id	Site Location
Electric[3]	Electric St. SE and Summer St. SE
Hilfiker[3]	Hilfiker Ln. SE and Commercial St. SE
Salem Industrial	Salem Industrial Dr. NE and Hyacinth St. NE

[1] Instream Storm sampling done at these sites. [2] Stage-only gauging station. [3] Mercury monitoring conducted at these sites.

BAT = Battle Creek, CGT = Claggett Creek, CLA / CLK = Clark Creek, CRO = Croisan Creek, GIB = Gibson Creek, GLE = Glenn Creek, MIC = Mill Creek, MRA = Mill Race, PRI = Pringle Creek, SHE = Shelton Ditch, LPW = West Fork Little Pudding River, WR = Willamette River

Table 3.
Parameters for Each Monitoring Element

Parameter	Units	Monitoring Element			
		Instream Storm	Stormwater	Monthly Instream	Continuous Instream
Alkalinity	mg/L			x[1]	
Biological Oxygen Demand (BOD_{stream})	mg/L	x		x	
Biological Oxygen Demand (BOD_{5day})	mg/L		x		
Specific Conductivity (Sp. Cond)	µS/cm	x	x	x	x
Copper (Total Recoverable and Dissolved)	mg/L	x	x	x[2]	
Dissolved Oxygen (DO)	mg/L	x	x	x	x
E. coli	MPN/100 mL	x	x	x	
Hardness	mg/L	x	x	x[2]	
Lead (Total Recoverable and Dissolved)	mg/L	x	x	x[2]	
Ammonia Nitrogen (NH_3-N)	mg/L	x	x	x[1]	
Nitrate and Nitrite (NO_3-NO_2)	mg/L	x	x	x	
pH	S.U.	x	x	x	x
Total Dissolved Solids (TDS)	mg/L			x[1]	
Temperature	˚C	x	x	x	x
Total Phosphorus (TP)	mg/L	x	x	x[1]	
Ortho Phosphorus	mg/L	x	x		
Total Solids (TS)	mg/L			x[1]	
Total Suspended Solids (TSS)	mg/L	x	x	x[1,3]	
Turbidity	NTU			x	x
Zinc (Total Recoverable and Dissolved)	mg/L	x	x	x[2]	

[1] Willamette River sites only (WR1, WR5, and WR10).

[2] Pringle Creek Watershed sites only (PRI1, PRI5, CLA1, and CLA10).

[3] West Fork of Little Pudding River site only (LPW 1).

Table 4.
Water Quality Criteria for Monitored Streams

Parameter	Season	Criteria	Applicable Waterbody
Dissolved Oxygen	January 1-May 15	Spawning: Not less than 11.0 mg/L or 95% saturation	Battle Creek*, Claggett Creek*, Clark Creek*[3], Croisan Creek*, Glenn Creek*, West Fork Little Pudding River*
	October 1- May 31	Spawning: Not less than 11.0 mg/L or 95% saturation	Gibson Creek*□ , Willamette River
	October 15 - May 15	Spawning: Not less than 11.0 mg/L or 95% saturation	Mill Creek*, Pringle Creek*[1], Shelton Ditch*
	Year Around (Non-spawning)	Cold water: Not less than 8.0 mg/L or 90% saturation	Battle Creek*, Croisan Creek*, Clark Creek, Glenn Creek*[4], Pringle Creek[2]
		Cool water: Not less than 6.5 mg/L	Claggett Creek*, Glenn Creek*, Mill Creek, Pringle Creek[1], Shelton Ditch, West Fork Little Pudding River
pH	Year Around	Must be within the range of 6.5 to 8.5 pH units	All Monitoring Streams
Temperature	October 15 - May 15	Salmon and steelhead spawning: 13˚C 7-day average maximum	Mill Creek, Shelton Ditch
	October 1- May 31	Salmon and steelhead spawning: 13˚C 7-day average maximum	Gibson Creek□
	Year Around (Non-spawning)	Salmon and trout rearing and migration: 18˚C 7-day average maximum	All Monitoring Streams
E. coli	Fall-Winter-Spring	30 day log mean of 126 E. coli organisms per 100 ml (or) no single sample > 406 organisms per 100 ml	All Monitoring Streams
	Summer	30 day log mean of 126 E. coli organisms per 100 ml (or) no single sample > 406 organisms per 100 ml	All Monitoring Streams
Biological Criteria	Year Around	Waters of the state must be of sufficient quality to support aquatic species without detrimental changes in the resident biological communities.	Claggett Creek*, Clark Creek*, Croisan Creek*, Glenn Creek*, Pringle Creek Trib*, Willamette River*
Copper	Year Around	Freshwater Acute and Chronic Criteria: 18 and 12 µg/L respectively with values calculated for a hardness of 100 mg/L	Pringle Creek*
Lead	Year Around	Freshwater Acute and Chronic Criteria: 82 and 3.2 µg/L respectively with values calculated for a hardness of 100 mg/L	Pringle Creek*
Zinc	Year Around	Freshwater Acute and Chronic Criteria: 120 and 110 µg/L respectively with values calculated for a hardness of 100 mg/L	Pringle Creek*

Note: All waterbodies in this table are included under the Willamette Basin or Molalla-Pudding Subbasin TMDL for Temperature and E. coli.

* Oregon's 2010 Integrated Report Section 303(d) listed.

□ Gibson Creek is referred as Gibson Gulch in Oregon's 2010 Integrated Report.

[1] Applies to Pringle Creek from river mile 0 to 2.6.

[2] Applies to Pringle Creek from river mile 2.6 to 6.2.

[3] Applies to Clark Creek from river mile 0 to 1.9.

[4] Applies to Glenn Creek from river mile 4.1 to 7.

Table 5.
Median Values for Monthly Instream Sites (RY 2015/16)

Site ID	Number of Samples	Temperature (C)	DO (mg/L)	Sp. Cond (µS/cm)	Turbidity (NTUs)	pH (S.U.)	E. Coli (MPN/100 mL)	NO_3-NO_2 (mg/L)	BOD_{stream} (mg/L)
BAT 1	12	13.5	9.5	51.5	15.7	6.6	262.5	0.78	1.19
BAT 12	12	11.9	10.1	47.8	7.9	7.0	180.0	0.69	0.96
CGT 1	12	16.1	8.5	172.1	6.3	7.2	140.5	0.38	1.77
CGT 5	12	14.6	8.7	98.7	19.8	7.2	668.0	0.46	1.67
CLA 1	12	14.1	9.9	93.2	3.0	7.3	366.0	0.95	0.96
CLA 10	12	13.7	9.4	71.2	3.4	6.8	293.5	1.62	1.18
CRO 1	12	12.7	9.8	74.9	7.1	7.0	124.5	0.63	1.14
CRO 10	12	12.1	9.6	56.4	10.2	6.8	50.5	0.67	1.11
GIB 1	12	14.4	9.4	92.7	8.8	7.2	175.0	1.30	0.94
GIB 15	12	13.5	9.5	95.4	9.6	7.3	345.0	1.83	1.01
GLE 1	12	13.6	9.6	94.1	8.2	7.3	335.5	1.04	0.88
GLE 10	9	11.0	10.5	61.6	7.9	7.3	30.0	2.07	0.75
LPW 1	7	11.0	9.3	176.6	6.8	7.0	285.0	1.13	1.16
MIC 1	12	14.1	10.1	74.5	3.6	7.1	163.0	1.03	1.18
MIC 10	12	13.6	10.4	72.9	5.0	7.5	113.0	1.20	1.11
MRA 1	12	14.1	10.3	72.5	5.9	7.3	367.0	1.17	1.26
MRA 10	12	13.9	9.7	73.7	5.5	6.8	159.0	1.17	1.10
PRI 1	12	14.1	10.2	75.8	4.8	7.2	152.5	1.36	1.12
PRI 5	12	15.2	9.8	87.3	5.3	7.5	254.5	0.71	1.29
SHE 1	12	13.9	10.3	74.8	4.4	7.4	99.0	1.20	1.09
SHE 10	12	13.8	10.2	73.2	5.7	6.9	83.5	1.31	1.09
WR1	12	16.1	11.1	68.5	6.9	7.6	33.0	0.33	1.02
WR5	12	14.2	10.2	66.4	5.6	7.3	33.5	0.28	0.88
WR10	12	14.5	10.7	67.8	5.9	7.5	20.5	0.27	1.02

Table 6.
Number of Water Quality Criteria Exceedances for Monthly Instream Sites (RY 2015/16)

Site ID	Number of Samples	Dissolved Oxygen	pH	E. Coli[5]			Copper[6]		Lead[6]		Zinc[6]	
				Total #	Dry[2]	Rain[3]	Total	Dissolved	Total	Dissolved	Total	Dissolved
BAT 1	12	8	6	4	2	2						
BAT 12	12	6	2	3	3							
CGT 1	12	6		4	4							
CGT 5	12	1		7	4	3						
CLA 1	12	1		5	2	3	1				1	
CLA 10	12		4	4	2	2					1	1
CRO 1	12	5										
CRO 10	12	6	3	1		1						
GIB 1	12	6[1]		2		2						
GIB 15	12	7[1]		5	3	2						
GLE 1	12	3		5	2	3						
GLE 10[4]	9	3										
LPW 1[4]	7	3		3		3						
MIC 1	12	5	1	3	1	2						
MIC 10	12	6		2		2						
MRA 1	12	NA		6	4	2						
MRA 10	12	NA	1	1		1						
PRI 1	12	3		2		2						
PRI 5	12	5		5	4	1						
SHE 1	12	3		1		1						
SHE 10	12	4	2	1		1						
WR1	12	4										
WR5	12	4	1									
WR10	12	7										

Note: Copper, lead, and zinc collected at Pringle Creek Watershed sites only (PRI1, PRI5, CLA1, and CLA10).

NA = Not available (No dissolved oxygen water quality criteria associated with this waterbody).

[1] No year-round dissolved oxygen water quality criteria associated with this waterbody.

[2] Dry is < 0.05 inches of rainfall in previous 24 hours.

[3] Rain is ≥ 0.05 inches of rainfall in previous 24 hours.

[4] Unable to sample all 12 due to lack of flow/too high of flow.

[5] Single sample criterion of > 406 organisms per 100 mL used.

[6] Exceedences calculated based on hardness concentration for each event.

Table 7.
Monthly Instream Data - Battle Creek (RY 2015/16)

Site Name: BAT1
Site Description: Commercial St

Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTU)	pH (S.U.)	E-Coli (#/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/21/2015 11:30	18.9	6.65	72.1	22	6.7	435	0.26	1.18	0.00
8/18/2015 12:43	20.4	6.65	63.2	15.9	6.81	387	0.17	1.46	0.00
9/15/2015 10:27	13.4	7.14	67.4	20.2	6.8	921	0.15	1.38	0.00
10/20/2015 10:55	14.4	6.84	60	20.9	6.49	1120	0.16	2.12	0.08
11/17/2015 11:00	11.8	9.32	51	10.9	6.35	517	0.74	1.52	0.68
12/15/2015 11:00	9.4	10.56	54.9	15.5	6.14	36	2.88	0.87	0.04
1/19/2016 11:45	8.8	10.46	40.4	25.3	5.85	71	1.69	1.2	0.90
2/16/2016 11:27	10.4	10.47	48.2	4.6	6.41	55	2.06	0.83	0.00
3/15/2016 10:45	9.1	10.89	45	16.5	6.43	74	1.85	1.4	0.29
4/19/2016 11:15	13.5	9.69	47.2	5.26	6.69	61	1.19	0.99	0.00
5/17/2016 0:00	13.8	9.59	47.8	5.89	6.84	276	0.81	1.18	0.01
6/21/2016 10:35	15	8.68	52	6.72	6.81	249	0.6	0.92	0.00
Median	**13.45**	**9.46**	**51.50**	**15.70**	**6.59**	**263**	**0.78**	**1.19**	

Site Name: BAT12
Site Description: Rees Hill Rd.

Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTU)	pH (S.U.)	E-Coli (#/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/21/2015 11:05	18.3	7.85	66.7	12	7.24	435	0.16	1.04	0.00
8/18/2015 10:45	16.5	5.57	74.1	9.12	7.1	866	0.12	7.8	0.00
9/15/2015 10:10	11.1	8.07	75.6	9.38	7.27	1553	0.1	1.11	0.00
10/20/2015 10:45	13	8.73	71.9	5.68	7.1	326	<0.05	3.13	0.08
11/17/2015 10:40	10.1	10.05	49.6	7.63	6.62	291	0.42	1.1	0.68
12/15/2015 10:45	8.9	10.82	52.5	6.63	6.17	40	3.11	0.93	0.04
1/19/2016 11:35	8.7	10.55	45.9	17	6.22	50	2.44	0.8	0.90
2/16/2016 11:05	9.9	10.7	45.5	2.94	6.75	102	2.42	0.98	0.00
3/15/2016 10:30	8.8	10.82	43.2	14.5	6.5	45	2.09	0.94	0.29
4/19/2016 11:00	12.7	10.24	42.5	3.77	6.91	132	1.37	0.87	0.00
5/17/2016 10:38	13	10.23	42.1	4.46	7.05	72	0.69	0.7	0.01
6/21/2016 10:20	15.2	9.35	45.4	8.15	7.14	228	0.25	0.82	0.00
Median	**11.90**	**10.14**	**47.75**	**7.89**	**6.98**	**180**	**0.69**	**0.96**	

Note: Data in red exceed applicable water quality criteria (see Table 4). Single sample criterion (406 organisms/100 mL) used for E. Coli.

Table 7.
Monthly Instream Data - Claggett Creek (RY 2015/16)

Site Name: CGT1
Site Description: Mainline Dr S

Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTU)	pH (S.U.)	E-Coli (#/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/21/2015 13:10	23	5.8	210.5	4.38	7.24	133	<0.05	1.86	0.00
8/18/2015 13:40	23.3	7.68	206	4.46	7.63	201	<0.05	1.42	0.00
9/15/2015 11:37	16.3	3.44	154.9	6.12	7.32	148	0.05	4.47	0.00
10/20/2015 12:30	15.9	4.64	139.9	11.3	7.04	1414	0.13	2.58	0.08
11/17/2015 12:40	11.3	8.83	66.3	15.5	6.9	1120	0.32	1.76	0.68
12/15/2015 12:30	8.7	9.2	155.4	7.65	7.03	81	1.93	1.19	0.04
1/19/2016 14:05	8.3	NA	48	28	6.68	1120	0.44	1.78	0.90
2/16/2016 13:15	12	10.77	188.8	6.55	7.33	31	0.86	1.3	0.00
3/15/2016 12:45	9.5	10.81	104	13.8	7.06	1986	0.68	1.94	0.29
4/19/2016 13:45	19	7.86	223.2	5.34	7.26	72	0.45	1.6	0.00
5/17/2016 13:20	18.6	8.47	197.3	4.82	7.21	26	0.28	1.75	0.01
6/21/2016 12:20	20.3	9.2	212.7	5.76	7.4	32	0.19	1.79	0.00
Median	**16.10**	**8.47**	**172.10**	**6.34**	**7.23**	**141**	**0.38**	**1.77**	

Site Name: CGT5
Site Description: Hawthorne Ave

Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTU)	pH (S.U.)	E-Coli (#/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/21/2015 12:55	20.9	7.79	74.9	46.7	7.29	1986	<0.05	1.47	0.00
8/18/2015 13:43	22.5	7.93	90.4	27.1	7.58	2420	<0.05	1.61	0.00
9/15/2015 11:20	13.9	6.86	97.6	49.3	7.19	>2420	<0.05	2.07	0.00
10/20/2015 12:15	15.3	6.92	85.1	25.4	6.99	>2420	0.08	3.34	0.08
11/17/2015 12:25	12	9.28	60.9	23.2	6.89	980	0.54	2.33	0.68
12/15/2015 12:15	9.2	10.55	164.9	12.8	7.03	102	3.14	1.2	0.04
1/19/2016 13:40	8.3	NA	39.3	33.2	6.57	687	0.46	2.49	0.90
2/16/2016 13:00	12.1	11.58	175.8	9.43	7.83	187	1.15	1.14	0.00
3/15/2016 12:25	9.5	11.12	106.9	16.4	6.98	248	0.99	1.69	0.29
4/19/2016 13:12	18.7	10.09	179.6	6.08	7.85	649	0.09	1.84	0.00
5/17/2016 12:55	17.1	8.72	117.3	15.2	7.54	210	0.18	1.64	0.01
6/21/2016 12:05	17	8.57	99.7	15.6	7.36	187	0.08	1.41	0.00
Median	**14.60**	**8.72**	**98.65**	**19.80**	**7.24**	**668**	**0.46**	**1.67**	

Note: Data in red exceed applicable water quality criteria (see Table 4). Single sample criterion (406 organisms/100 mL) used for E. Coli.

Table 7.
Monthly Instream Data - Clark Creek (RY 2015/16)

Site Name: CLA1
Site Description: Bush Park

Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTU)	pH (S.U.)	E-Coli (#/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/21/2015 10:05	18.2	9.03	97.6	3.93	7.03	167	0.69	0.84	0.00
8/18/2015 9:55	17.8	8.84	94.2	2.72	7.38	488	0.59	0.98	0.00
9/15/2015 10:00	14.64	9.49	93.2	2.16	7.33	488	0.54	0.78	0.00
10/20/2015 10:05	15.3	9.07	91	2.72	7.13	>2420	0.56	1.16	0.08
11/17/2015 10:25	12.6	9.96	74.8	9	7.31	1414	0.98	2.45	0.68
12/15/2015 10:10	11	10.68	101	6.32	7.33	345	2.52	1.16	0.04
1/19/2016 10:43	8.7	11.11	43	27.1	6.87	1986	0.91	1.82	0.90
2/16/2016 10:40	11.3	10.8	96.6	3.09	7.47	308	1.96	0.76	0.00
3/15/2016 10:15	10	11.08	75	10.7	7.19	387	1.42	1.47	0.29
4/19/2016 10:56	14	NA	97.8	2.32	7.4	308	1.48	0.9	0.00
5/17/2016 10:05	14.1	9.88	93.2	2.35	7.35	178	1.11	0.93	0.01
6/21/2016 9:55	15.5	9.62	88.6	2.88	7.5	47	0.83	0.76	0.00
Median	**14.05**	**9.88**	**93.20**	**2.99**	**7.33**	**366**	**0.95**	**0.96**	

Site Name: CLA1
Site Description: Bush Park

Collection Date/Time	Total Copper (mg/L)	Dissolved Copper (mg/L)	Total Lead (mg/L)	Dissolved Lead (mg/L)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Hardness
7/21/2015 10:05	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.0043	0.0073	40
8/18/2015 9:55	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.0042	0.0031	32
9/15/2015 10:00	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.0041	0.0028	34
10/20/2015 10:05	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.0104	0.0095	31
11/17/2015 10:25	0.0033	0.0026	< 0.0005	< 0.0005	0.019	0.0153	23
12/15/2015 10:10	< 0.0025	< 0.0025	< 0.0010	< 0.0010	0.0108	0.0085	30
1/19/2016 10:43	0.0037	< 0.0025	0.0019	< 0.0005	0.0302	0.0157	18
2/16/2016 10:40	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.0093	0.0079	32
3/15/2016 10:15	< 0.0025	< 0.0025	0.0005	< 0.0005	0.0171	0.0127	24
4/19/2016 10:56	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.0098	0.0085	32
5/17/2016 10:05	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.0095	0.0074	29
6/21/2016 9:55	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.0045	0.0037	27
Median	**NA**	**NA**	**NA**	**NA**	**0.0097**	**0.0082**	**30.50**

Note: Data in red exceed applicable water quality criteria (see Table 4). Single sample criterion (406 organisms/100 mL) used for E. Coli.

NA= Medians not calculated for copper and lead due to the large number of censored values.

Table 7.

Monthly Instream Data - Clark Creek (RY 2015/16)

Site Name:	CLA10								
Site Description:	Ewald Ave								
Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTU)	pH (S.U.)	E-Coli (#/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/21/2015 9:51	16.8	8.96	70.2	3.64	7.05	113	1.16	0.83	0.00
8/18/2015 8:48	17.6	8.44	70.8	3.85	7.13	1120	1.08	1.54	0.00
9/15/2015 9:20	14.4	9	72.4	3.96	7.01	727	1.12	1.3	0.00
10/20/2015 9:50	15.5	8.92	70.2	3.25	6.81	866	1	1.19	0.08
11/17/2015 9:45	13.6	9.14	64.9	9.36	6.15	2420	1.46	2.22	0.68
12/15/2015 9:25	12.3	10.14	86.4	2.47	6.1	30	3.01	0.65	0.04
1/19/2016 10:20	9.3	10.67	42.4	11.5	5.89	387	1.4	1.29	0.90
2/16/2016 10:05	11.7	10.34	76.6	2.02	6.64	166	2.68	0.55	0.00
3/15/2016 9:40	11	10.35	74.2	5.83	6.41	44	2.49	0.98	0.29
4/19/2016 10:05	13	9.67	73.6	2.17	6.75	19	2.39	1.16	0.00
5/17/2016 9:56	13.7	9.69	71.6	2.2	6.95	326	1.94	0.81	0.01
6/21/2016 9:35	14.6	9.12	70.5	3.07	6.91	261	1.78	1.47	0.00
Median	**13.65**	**9.41**	**71.20**	**3.45**	**6.78**	**294**	**1.62**	**1.18**	

Site Name:	CLA10						
Site Description:	Ewald Ave						
Collection Date/Time	Total Copper (mg/L)	Dissolved Copper (mg/L)	Total Lead (mg/L)	Dissolved Lead (mg/L)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Hardness
7/21/2015 9:51	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.0043	0.0062	25
8/18/2015 8:48	< 0.0025	< 0.0025	< 0.0010	< 0.0005	0.0039	0.0053	21
9/15/2015 9:20	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.004	0.004	26
10/20/2015 9:50	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.0653	0.0615	21
11/17/2015 9:45	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.0289	0.027	19
12/15/2015 9:25	< 0.0025	< 0.0025	< 0.0010	< 0.0010	0.0108	0.0102	27
1/19/2016 10:20	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.0164	0.0122	13
2/16/2016 10:05	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.0107	0.0107	25
3/15/2016 9:40	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.0123	0.0113	22
4/19/2016 10:05	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.0076	0.0069	24
5/17/2016 9:56	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.0188	0.0167	21
6/21/2016 9:35	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.011	0.0099	12
Median	**NA**	**NA**	**NA**	**NA**	**0.0109**	**0.0105**	**21.50**

Note: Data in red exceed applicable water quality criteria (see Table 4). Single sample criterion (406 organisms/100 mL) used for E. Coli.

NA= Medians not calculated for copper and lead due to the large number of censored values.

Table 7.
Monthly Instream Data - Croisan Creek (RY 2015/16)

Site Name: CRO1
Site Description: River Rd S

Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTU)	pH (S.U.)	E-Coli (#/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/21/2015 10:20	19.3	3.57	106	5.97	6.95	47	0.19	1.33	0.00
8/18/2015 10:10	17.9	2.72	108.8	7.55	6.98	79	0.13	1.17	0.00
9/15/2015 9:40	13.4	3.85	103.8	13.3	6.94	74	0.16	1.1	0.00
10/20/2015 10:00	14.6	3.86	91	9.16	6.56	214	0.18	1.87	0.08
11/17/2015 10:05	11	9.75	77.8	10.6	6.8	313	0.69	1.28	0.68
12/15/2015 9:55	9	11.4	66	6.65	6.58	29	2.6	1.1	0.04
1/19/2016 10:35	8.9	11.02	54.1	21.9	6.54	178	1.53	1.4	0.90
2/16/2016 10:20	10.1	11.1	65.2	4.06	7.17	17	1.55	0.73	0.00
3/15/2016 9:55	9.2	11.28	58.6	14.1	6.95	88	1.62	1.24	0.29
4/19/2016 10:20	12.5	10.19	70.3	3.97	7.21	248	0.92	1.03	0.00
5/17/2016 10:10	12.8	9.76	71.9	2.2	7.22	345	0.57	0.96	0.01
6/21/2016 9:50	14.1	8.25	89.3	6.27	7.06	161	0.44	0.64	0.00
Median	**12.65**	**9.76**	**74.85**	**7.10**	**6.95**	**125**	**0.63**	**1.14**	

Site Name: CRO10
Site Description: Ballantyne Rd.

Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTU)	pH (S.U.)	E-Coli (#/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/21/2015 10:45	17.5	3.78	82.2	14.6	6.87	387	0.37	1.2	0.00
8/18/2015 10:30	16.5	6.56	79.7	15	6.94	104	0.22	1.37	0.00
9/15/2015 9:56	12.4	6.99	78.2	16	6.91	365	0.21	1.04	0.00
10/25/2015 10:25	13.6	8.07	78.6	10.5	6.82	435	0.11	1.45	0.08
11/17/2015 10:25	10.8	9.62	60.2	11.3	6.44	156	0.79	1.17	0.68
12/15/2015 10:30	8.8	10.91	55.9	4.76	6.28	66	2.78	0.93	0.04
1/19/2016 11:00	8.8	10.7	47.7	14.3	6.45	11	1.95	1.41	0.90
2/16/2016 10:45	10	10.55	47.8	5.52	6.82	12	1.73	0.57	0.00
3/15/2016 10:15	9	11.03	47.5	9.9	6.71	21	1.74	1.18	0.29
4/19/2016 10:38	11.8	9.87	47.9	4.39	6.9	12	0.88	0.97	0.00
5/17/2016 10:25	12.5	9.56	50.5	6.18	6.77	7	0.55	0.9	0.01
6/21/2016 10:05	13.7	9.11	56.9	7.65	6.84	35	0.44	0.76	0.00
Median	**12.10**	**9.59**	**56.40**	**10.20**	**6.82**	**51**	**0.67**	**1.11**	

Note: Data in red exceed applicable water quality criteria (see Table 4). Single sample criterion (406 organisms/100 mL) used for E. Coli.

Table 7.
Monthly Instream Data - Gibson Creek (RY 2015/16)

Site Name: GIB1
Site Description: Wallace Rd.

Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTU)	pH (S.U.)	E-Coli (#/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/21/2015 11:06	19.1	5.64	117.5	7.16	6.66	96	0.3	1.2	0.00
8/18/2015 11:00	20.2	4.69	117.3	8.55	7.03	196	0.24	1.3	0.00
9/15/2015 11:05	13.74	7.36	109.3	9.21	7.17	210	0.27	0.93	0.00
10/20/2015 11:10	15.1	6.23	110.6	8.3	7	150	0.2	1.66	0.08
11/17/2015 11:15	11.4	9.75	96.2	17	7.13	980	1.41	1.51	0.68
12/15/2015 11:00	8.6	11.04	76.6	16.6	7.17	178	2.68	0.61	0.04
1/19/2016 11:55	8.6	10.84	68.5	30.5	6.88	548	1.86	1.19	0.90
2/16/2016 11:40	10.7	10.78	80.6	9.02	7.28	76	2.18	0.54	0.00
3/15/2016 11:15	9.1	11.16	73.7	22.9	7.28	219	1.84	0.95	0.29
4/19/2016 12:00	15.8	9.39	87.9	5.98	7.32	150	1.58	0.84	0.00
5/17/2016 11:00	15	9.5	89.7	5.29	7.36	86	1.19	0.87	0.01
6/21/2016 10:40	15.7	8.17	95.7	7.74	7.4	172	0.64	0.91	0.00
Median	**14.37**	**9.45**	**92.70**	**8.79**	**7.17**	**175**	**1.30**	**0.94**	

Site Name: GIB15
Site Description: Brush College Rd.

Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTU)	pH (S.U.)	E-Coli (#/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/21/2015 11:30	18.3	8.22	121.6	9.17	7.18	579	0.63	1	0.00
8/18/2015 11:10	18.7	9.12	125	119	7.48	>2420	0.5	2.27	0.00
9/15/2015 11:20	12.94	9.23	115	5.95	7.63	345	0.84	1	0.00
10/20/2015 11:20	14	7.65	118.5	7.03	7.2	488	0.66	1.57	0.08
11/17/2015 11:25	10.5	9.82	106.4	15.4	7.18	488	1.63	1.59	0.68
12/15/2015 11:17	9.2	11.03	82.4	9.98	7.2	45	2.77	1.01	0.04
1/19/2016 12:10	9.1	10.67	74.7	23.8	7.19	111	2.02	0.88	0.90
2/16/2016 11:55	10.7	10.69	86.7	7.15	7.43	179	2.73	0.64	0.00
3/15/2016 11:35	9.6	6.99	77.2	28.7	7.25	345	2.2	0.9	0.29
4/19/2016 12:20	15.1	9.73	91.4	5.14	7.32	32	2.87	1.25	0.00
5/17/2016 11:10	14.5	9.87	92.3	6.78	7.45	101	2.12	0.97	0.01
6/21/2016 10:55	16.1	8.72	98.5	150	7.52	>2420	1.53	1.36	0.00
Median	**13.47**	**9.48**	**95.40**	**9.58**	**7.29**	**345**	**1.83**	**1.01**	

Note: Data in red exceed applicable water quality criteria (see Table 4). Single sample criterion (406 organisms/100 mL) used for E. Coli.

Table 7.
Monthly Instream Data - Glenn Creek (RY 2015/16)

Site Name:	GLE1								
Site Description:	River Bend Rd.								
Collection Date/Time	**Temp (°C)**	**DO (mg/L)**	**Sp Cond (µS/cm)**	**Turb (NTU)**	**pH (S.U.)**	**E-Coli (#/ 100 mL)**	**NO_3-NO_2 (mg/L)**	**BOD (mg/L)**	**Rainfall previous 24 hrs**
7/21/2015 11:00	18.3	7.53	120.3	8.23	7.17	326	0.62	0.78	0.00
8/18/2015 10:30	17.2	7.29	125.1	10	7.42	1986	0.51	0.82	0.00
9/15/2015 10:50	13.31	8.23	121.9	6.4	7.41	579	0.43	0.8	0.00
10/20/2015 11:00	14.9	7.85	93.6	8.22	7.12	345	0.19	1.35	0.08
11/17/2015 11:00	11.6	9.89	90.9	16.8	7.25	980	1.06	1.32	0.68
12/15/2015 10:48	9.4	10.86	89.2	9.13	7.17	155	3.05	0.91	0.04
1/19/2016 11:40	8.9	10.83	62.1	29.1	6.95	2420	1.63	1.19	0.90
2/16/2016 11:15	10.8	10.73	90.4	7.1	7.46	46	2.02	< 0.50	0.00
3/15/2016 11:00	9.5	11.06	79.9	17.9	7.18	1046	1.89	0.88	0.29
4/19/2016 11:50	14.6	9.56	94.5	5.28	7.4	86	1.32	0.9	0.00
5/17/2016 10:45	13.8	9.71	101.3	4.92	7.44	214	1.02	0.82	0.01
6/21/2016 10:27	15.1	9.02	108.2	5.81	7.58	154	0.79	0.72	0.00
Median	**13.56**	**9.64**	**94.05**	**8.23**	**7.33**	**336**	**1.04**	**0.88**	

Site Name:	GLE10								
Site Description:	Hidden Valley Dr.								
Collection Date/Time	**Temp (°C)**	**DO (mg/L)**	**Sp Cond (µS/cm)**	**Turb (NTU)**	**pH (S.U.)**	**E-Coli (#/ 100 mL)**	**NO_3-NO_2 (mg/L)**	**BOD (mg/L)**	**Rainfall previous 24 hrs**
7/21/2015 11:55	No Flow								
8/18/2015 11:20	No Flow								
9/15/2015 12:00	No Flow								
10/20/2015 11:35	13.9	9.18	75.8	2.15	6.98	111	<0.05	1.01	0.08
11/17/2015 11:45	11	10.18	79.3	10.5	7.14	99	2.1	1.01	0.68
12/15/2015 11:30	9	11.04	61.6	9.42	7.29	30	3.13	0.71	0.04
1/19/2016 12:30	8.8	10.99	55.4	29.2	7.05	22	2.49	0.64	0.90
2/16/2016 12:05	10.4	10.85	55.8	7.89	7.41	8	2.03	< 0.50	0.00
3/15/2016 12:00	9.3	11.19	56.4	17	7.27	8	2.24	0.75	0.29
4/19/2016 12:40	13.7	10.09	56.8	7.07	7.32	8	1.25	0.81	0.00
5/17/2016 11:25	12.7	10.53	62.6	7.2	7.52	308	0.9	0.62	0.01
6/21/2016 11:05	13.9	10.22	68.1	6.24	7.6	130	0.67	< 0.50	0.00
Median	**11.00**	**10.53**	**61.60**	**7.89**	**7.29**	**30**	**2.07**	**0.75**	

Note: Data in red exceed applicable water quality criteria (see Table 4). Single sample criterion (406 organisms/100 mL) used for E. Coli.

Table 7.
Monthly Instream Data - West Fork Little Pudding River (RY 2015/16)

Site Name:	LPW1									
Site Description:	Cordon Rd.									
Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTU)	pH (S.U.)	E-Coli (#/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs	TSS
7/21/2015 12:35	No Flow									
8/18/2015 13:30	No Flow									
9/15/2015 11:00	No Flow									
10/20/2015 11:30	No Flow									
11/17/2015 11:40	11	8.69	59.6	11.4	6.71	1046	0.62	1.48	0.68	3.2
12/15/2015 11:35	8.3	9.31	187	6.84	6.78	43	5.08	0.89	0.04	3.3
1/19/2016 13:20	8.3	10.15	67.8	60.5	6.67	579	1.13	2.6	0.90	42
2/16/2016 12:20	11.3	11.6	198.9	5.35	7.27	285	2.54	0.68	0.00	3.3
3/15/2016 12:05	9.1	11.47	132.7	12.4	6.98	1046	1.71	1.16	0.29	4.4
4/19/2016 12:00	15.3	5.44	221.7	4.12	7.07	147	0.44	0.93	0.00	3.6
5/17/2016 12:36	15.3	4.7	176.6	6.16	7.02	172	0.23	1.48	0.01	3.6
6/21/2016 11:10	No Flow									
Median	**11.00**	**9.31**	**176.60**	**6.84**	**6.98**	**285**	**1.13**	**1.16**		**3.6**

Note: Data in red exceed applicable water quality criteria (see Table 4). Single sample criterion (406 organisms/100 mL) used for E. Coli.

Table 7.
Monthly Instream Data - Mill Creek (RY 2015/16)

Site Name: MIC1
Site Description: Front St.

Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTU)	pH (S.U.)	E-Coli (#/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/21/2015 9:02	21.1	8.72	58.2	3.46	7.02	86	0.1	0.98	0.00
8/18/2015 8:40	19.9	8.69	59	2.97	7.32	96	0.1	0.92	0.00
9/15/2015 8:30	14.7	9.83	58.4	3.75	7.03	225	0.08	0.73	0.00
10/20/2015 9:00	14.8	9.86	69.5	2.6	7	411	0.14	1.39	0.08
11/17/2015 8:55	10.8	10.61	116.1	15.4	7.08	387	4.04	1.34	0.68
12/15/2015 8:45	8.2	11.79	103.4	10.2	6.47	93	4.37	1.29	0.04
1/19/2016 9:35	9.1	10.95	82.6	21.4	6.61	179	2.74	1.27	0.90
2/16/2016 9:20	10.6	11.03	87	8.29	7.26	147	3.02	0.84	0.00
3/15/2016 8:55	9.4	10.97	79.4	37.2	6.92	461	2.18	1.47	0.29
4/19/2016 9:20	15.8	9.45	91.6	2.3	7.53	91	1.46	1.26	0.00
5/17/2016 9:15	13.4	10.29	67.4	3.04	7.36	125	0.59	1.1	0.01
6/21/2016 8:30	17.1	9.42	58.2	3.44	7.57	687	0.27	0.96	0.00
Median	**14.05**	**10.08**	**74.45**	**3.61**	**7.06**	**163**	**1.03**	**1.18**	

Site Name: MIC10
Site Description: Turner Rd

Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTU)	pH (S.U.)	E-Coli (#/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/21/2015 12:25	19.9	9.92	55.8	3.34	7.88	70	0.19	1.09	0.00
8/18/2015 13:05	20.7	10.01	55	2.71	8.17	105	0.11	1.25	0.00
9/15/2015 10:45	13.2	10.36	55.3	3.62	7.66	133	0.07	0.92	0.00
10/20/2015 11:20	14.5	10.52	67.1	3.1	7.55	166	0.17	1.34	0.08
11/17/2015 11:15	10.5	10.1	131.7	31.6	7.05	1986	4.91	1.71	0.68
12/15/2015 11:15	8.3	10.95	98.3	9.26	6.73	99	4.91	1.07	0.04
1/19/2016 12:55	8.4	10.35	84.6	23.8	6.9	291	2.87	1.1	0.90
2/16/2016 11:56	10.4	11.02	82.3	7.98	7.17	58	3.1	0.78	0.00
3/15/2016 11:00	8.3	10.86	79.2	29.3	6.89	435	2.38	1.37	0.29
4/19/2016 11:40	15.2	10.59	78.7	4.17	7.54	34	1.82	1.51	0.00
5/17/2016 12:05	14	10.82	56.1	5.21	7.65	121	0.58	1.11	0.01
6/21/2016 10:55	16.5	9.96	49.6	4.78	7.52	61	0.25	1.03	0.00
Median	**13.60**	**10.44**	**72.90**	**5.00**	**7.53**	**113**	**1.20**	**1.11**	

Note: Data in red exceed applicable water quality criteria (see Table 4). Single sample criterion (406 organisms/100 mL) used for E. Coli.

Table 7.
Monthly Instream Data - Mill Race (RY 2015/16)

Site Name: MRA1
Site Description: High St.

Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTU)	pH (S.U.)	E-Coli (#/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/21/2015 9:42	20.5	9	56.2	3.68	6.96	112	0.08	1.04	0.00
8/18/2015 9:30	19.6	8.98	56.9	5.97	7.29	613	0.07	1.2	0.00
9/15/2015 9:25	14.65	9.94	55.2	3.06	7.23	548	0.08	0.85	0.00
10/20/2015 9:40	14.5	9.75	67.4	2.97	7.19	435	0.13	1.48	0.08
11/17/2015 9:43	10	10.73	113.5	7.88	7.22	299	3.49	1.4	0.68
12/15/2015 9:30	6.6	10.57	113.2	14	6.91	1300	3.77	1.36	0.04
1/19/2016 10:04	8.1	10.94	78.6	12.7	7.01	69	2.24	1.32	0.90
2/16/2016 10:05	10.5	11.37	85.5	7.06	7.66	186	2.97	0.91	0.00
3/15/2016 9:35	8.2	11.1	77.5	30.1	7.4	816	1.76	1.31	0.29
4/19/2016 10:10	16.3	10.06	87.7	4.02	7.69	88	1.77	1.81	0.00
5/17/2016 9:40	13.7	10.7	59.7	5.21	7.6	153	0.58	1.15	0.01
6/21/2016 9:15	17.2	9.51	51.7	5.73	7.47	517	0.25	1.16	0.00
Median	**14.10**	**10.32**	**72.45**	**5.85**	**7.26**	**367**	**1.17**	**1.26**	

Site Name: MRA10
Site Description: 19th St.

Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTU)	pH (S.U.)	E-Coli (#/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/21/2015 9:14	20.3	8.15	56.2	4.25	6.56	124	0.08	0.99	0.00
8/18/2015 8:55	19.3	8.27	55.7	2.98	6.77	145	0.06	1.12	0.00
9/15/2015 8:45	14.39	9.29	55.2	3.35	6.81	238	0.06	0.91	0.00
10/20/2015 9:00	14.3	9.33	67.1	3.02	6.78	276	0.14	1.36	0.08
11/17/2015 8:55	9.6	10.67	122.7	16.5	6.8	435	4.03	1.47	0.68
12/15/2015 9:00	7.9	11.11	103.5	8.49	6.6	70	4.64	1.08	0.04
1/19/2016 9:30	8.3	10.85	83.4	22.1	6.43	225	2.98	1.35	0.90
2/16/2016 9:35	10.1	11.04	85.7	7.76	7.4	74	3.06	0.87	0.00
3/15/2016 9:05	8.3	10.98	80.3	33.5	7.22	387	2.2	1.41	0.29
4/16/2016 9:40	16	8.73	89.2	3.99	7.37	75	1.77	1.62	0.00
5/17/2016 9:12	13.5	10.11	59.8	6.21	7.4	162	0.57	0.95	0.01
6/21/2016 8:40	17.2	8.55	51.4	4.87	7.25	156	0.29	1	0.00
Median	**13.90**	**9.72**	**73.70**	**5.54**	**6.81**	**159**	**1.17**	**1.10**	

Note: Data in red exceed applicable water quality criteria (see Table 4). Single sample criterion (406 organisms/100 mL) used for E. Coli.

Table 7.
Monthly Instream Data - Pringle Creek (RY 2015/16)

Site Name:	PRI1								
Site Description:	Waterfront Park								
Collection Date/Time	**Temp (°C)**	**DO (mg/L)**	**Sp Cond (µS/cm)**	**Turb (NTU)**	**pH (S.U.)**	**E-Coli (#/ 100 mL)**	**NO_3-NO_2 (mg/L)**	**BOD (mg/L)**	**Rainfall previous 24 hrs**
7/21/2015 9:30	20.3	8.96	59.6	3.42	6.95	84	0.11	1.06	0.00
8/18/2015 9:10	19.3	9.01	58.8	3.82	7.21	225	0.08	1.18	0.00
9/15/2015 9:05	14.4	9.87	57.9	3.39	7.12	233	0.09	0.9	0.00
10/20/2015 9:30	14.4	9.74	72.3	2.68	7.08	194	0.17	1.27	0.08
11/17/2015 9:10	10	10.7	121.6	16.5	7.1	548	3.75	1.94	0.68
12/15/2015 9:20	8	11.44	102.8	9.36	6.82	58	4.36	1.4	0.04
1/19/2016 9:50	8.4	11.05	79.2	20.1	6.91	236	2.66	1.02	0.90
2/16/2016 9:50	10.1	11.18	85.6	8.08	7.46	56	2.94	0.87	0.00
3/15/2016 9:20	8.4	11.14	79.9	33.5	7.22	411	2.16	1.72	0.29
4/19/2016 9:53	16.1	9.57	88.2	3.83	7.56	93	2.12	1.72	0.00
5/17/2016 9:30	13.7	10.47	61.2	5.22	7.52	79	0.6	0.95	0.01
6/21/2016 9:00	17.1	9.52	53.4	4.28	7.62	111	0.27	1.06	0.00
Median	**14.05**	**10.17**	**75.75**	**4.75**	**7.17**	**152.5**	**1.36**	**1.12**	

Site Name:	PRI1						
Site Description:	Waterfront Park						
Collection Date/Time	**Total Copper (mg/L)**	**Dissolved Copper (mg/L)**	**Total Lead (mg/L)**	**Dissolved Lead (mg/L)**	**Total Zinc (mg/L)**	**Dissolved Zinc (mg/L)**	**Hardness**
7/21/2015 9:30	< 0.0025	< 0.0025	< 0.0005	< 0.0005	< 0.0025	0.0043	32
8/18/2015 9:10	< 0.0025	< 0.0025	< 0.0005	< 0.0005	< 0.0025	0.0031	21
9/15/2015 9:05	< 0.0025	< 0.0025	< 0.0005	< 0.0005	< 0.0025	< 0.0025	26
10/20/2015 9:30	< 0.0025	< 0.0025	< 0.0005	< 0.0005	< 0.0025	< 0.0025	30
11/17/2015 9:10	0.0034	< 0.0025	< 0.0005	< 0.0005	0.0079	< 0.0025	44
12/15/2015 9:20	< 0.0025	< 0.0025	< 0.0010	< 0.0010	0.0034	< 0.0025	34
1/19/2016 9:50	0.0026	< 0.0025	< 0.0005	< 0.0005	0.0086	0.0055	27
2/16/2016 9:50	< 0.0025	< 0.0025	< 0.0005	< 0.0005	< 0.0025	< 0.0025	35
3/15/2016 9:20	< 0.0025	< 0.0025	0.0005	< 0.0005	0.0079	0.0033	30
4/19/2016 9:53	0.0035	< 0.0025	< 0.0005	< 0.0005	0.0027	< 0.0025	33
5/17/2016 9:30	< 0.0025	< 0.0025	< 0.0005	< 0.0005	< 0.0025	< 0.0025	25
6/21/2016 9:00	< 0.0025	< 0.0025	< 0.0005	< 0.0005	< 0.0025	< 0.0025	22
Median	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**30**

Note: Data in red exceed applicable water quality criteria (see Table 4). Single sample criterion (406 organisms/100 mL) used for E. Coli.

NA= Medians not calculated for copper and lead due to the large number of censored values.

Table 7.
Monthly Instream Data - Pringle Creek (RY 2015/16)

Site Name: PRI5
Site Description: Bush Park

Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTU)	pH (S.U.)	E-Coli (#/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/21/2015 10:12	20.7	8.4	88	3.03	7.26	548	0.2	1.29	0.00
8/18/2015 10:05	20	8.34	90.1	3.01	7.58	816	0.15	1.29	0.00
9/15/2015 10:10	15.76	9.21	86.5	9.79	7.63	517	0.15	3.2	0.00
10/20/2015 10:20	14.7	8.79	84.9	5.22	7.3	921	0.17	2.24	0.08
11/17/2015 10:35	11.4	9.78	73.3	9.59	7.35	248	0.54	1.64	0.68
12/15/2015 10:15	9.4	10.57	98.7	8.61	7.22	46	2.9	1.14	0.04
1/19/2016 11:10	8.8	10.72	61.8	20.4	6.89	166	1.37	1.52	0.90
2/16/2016 10:50	10.8	11.29	90.2	5.37	7.72	33	1.92	1.14	0.00
3/15/2016 10:25	9.5	10.85	76.1	13.7	7.28	261	1.38	1.16	0.29
4/19/2016 11:10	16.2	NA	88.3	3.35	7.62	166	1.3	1.68	0.00
5/17/2016 10:10	16.2	9.78	89.1	2.56	7.62	126	0.88	1.26	0.01
6/21/2016 10:05	18	9.18	81.6	2.97	7.78	488	0.35	1.26	0.00
Median	**15.23**	**9.78**	**87.25**	**5.30**	**7.47**	**254.5**	**0.71**	**1.29**	

Site Name: PRI5
Site Description: Bush Park

Collection Date/Time	Total Copper (mg/L)	Dissolved Copper (mg/L)	Total Lead (mg/L)	Dissolved Lead (mg/L)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Hardness
7/21/2015 10:12	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.0031	0.0032	44
8/18/2015 10:05	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.0027	0.003	30
9/15/2015 10:10	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.0026	< 0.0025	41
10/20/2015 10:20	0.0025	< 0.0025	< 0.0005	< 0.0005	0.0049	0.005	35
11/17/2015 10:35	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.012	0.0086	27
12/15/2015 10:15	< 0.0025	< 0.0025	< 0.0010	< 0.0010	0.0082	0.0065	32
1/19/2016 11:10	< 0.0025	< 0.0025	0.0006	< 0.0005	0.0204	0.0137	23
2/16/2016 10:50	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.0063	0.0048	34
3/15/2016 10:25	< 0.0025	< 0.0025	0.0005	< 0.0005	0.0138	0.01	25
4/19/2016 11:10	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.0052	0.0038	34
5/17/2016 10:10	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.0038	< 0.0025	33
6/21/2016 10:05	< 0.0025	< 0.0025	< 0.0005	< 0.0005	0.0032	< 0.0025	31
Median	**NA**	**NA**	**NA**	**NA**	**0.0051**	**0.0050**	**32.50**

Note: Data in red exceed applicable water quality criteria (see Table 4). Single sample criterion (406 organisms/100 mL) used for E. Coli.

NA= Medians not calculated for copper and lead due to the large number of censored values.

Table 7.
Monthly Instream Data - Shelton Ditch (RY 2015/16)

Site Name: SHE1
Site Description: Church St.

Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTU)	pH (S.U.)	E-Coli (#/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/21/2015 9:50	20.1	8.96	57.6	3.44	7.07	89	0.09	0.91	0.00
8/18/2015 9:40	19.3	8.94	56.6	2.53	7.38	58	0.07	0.97	0.00
9/15/2015 9:35	14.28	9.85	55.4	3.1	7.3	135	0.08	0.88	0.00
10/20/2015 9:50	14.3	9.97	69.3	2.47	7.32	154	0.15	1.33	0.08
11/17/2015 10:10	9.9	10.81	134.1	22.2	7.38	517	4.64	1.78	0.68
12/15/2015 9:35	7.8	11.52	102.8	10.5	7.05	68	4.5	1.12	0.04
1/19/2016 10:15	8.3	11	83.9	21.7	6.94	236	2.93	1.1	0.90
2/16/2016 10:15	10.1	11.28	84.9	7.16	7.52	72	2.9	1.07	0.00
3/15/2016 9:50	8.3	11.19	80.3	34.2	7.24	345	2.2	1.44	0.29
4/19/2016 10:20	15.8	9.59	89.1	4.07	7.54	47	1.82	2.01	0.00
5/17/2016 9:52	13.5	10.55	59.1	4.78	7.6	107	0.58	0.95	0.01
6/21/2016 9:25	17	9.57	50.8	3.8	7.67	91	0.26	0.97	0.00
Median	**13.89**	**10.26**	**74.80**	**4.43**	**7.35**	**99**	**1.20**	**1.09**	

Site Name: SHE10
Site Description: Airport Road

Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTU)	pH (S.U.)	E-Coli (#/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/21/2015 9:02	20.7	8.98	56.2	3.2	6.83	74	0.13	1.01	0.00
8/18/2015 8:30	19.5	8.98	55.7	2.42	6.8	74	0.07	1.04	0.00
9/15/2015 8:20	14.14	9.88	54.5	3.47	6.87	131	0.06	0.84	0.00
10/20/2015 8:45	14.5	9.83	66.9	2.75	6.78	86	0.15	1.36	0.08
11/17/2015 8:40	9.9	10.9	133.3	19.6	6.8	613	4.74	2.32	0.68
12/15/2015 8:45	8.6	11.24	101.3	9.2	6.22	46	4.69	1.14	0.04
1/19/2016 9:07	8.5	11	84.2	23.2	6.22	150	3.19	0.83	0.90
2/16/2016 9:20	10	11.18	83.7	8.22	7.22	81	3.28	0.91	0.00
3/15/2016 8:40	8.6	10.98	79.4	33.4	7.11	291	2.18	1.51	0.29
4/19/2016 9:25	15.5	9.81	88.3	5.23	7.46	50	1.98	2.09	0.00
5/17/2016 8:53	13.4	10.55	58.2	4.91	7.17	105	0.64	0.98	0.01
6/21/2016 8:20	17	9.61	50.1	6.17	7.59	69	0.24	1.17	0.00
Median	**13.77**	**10.22**	**73.15**	**5.70**	**6.85**	**83.5**	**1.31**	**1.09**	

Note: Data in red exceed applicable water quality criteria (see Table 4). Single sample criterion (406 organisms/100 mL) used for E. Coli.

Table 7.
Monthly Instream Data - Willamette River (RY 2015/16)

Site Name:	WR1								
Site Description:	Sunset Park (Keizer)								
Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTU)	pH (S.U.)	E-Coli (#/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/21/2015 13:40	24	12	80.8	1.73	8.41	2	0.09	0.99	0.00
8/18/2015 14:00	23.2	11.96	74.2	4.34	8.02	8	0.06	1.03	0.00
9/15/2015 12:10	17.3	10.01	75.5	2.69	7.88	19	0.06	0.7	0.00
10/20/2015 13:00	16.4	10.14	79.4	9.42	7.54	46	0.13	1.28	0.08
11/17/2015 13:05	10.9	10.71	77.4	13.6	7.36	141	0.84	1.05	0.68
12/15/2015 12:55	7.8	11.09	58.7	33.8	6.89	166	1	1.04	0.04
1/19/2016 14:25	7.8	11.09	60.1	39.5	7.05	166	0.82	1.03	0.90
2/16/2016 13:40	10.2	10.89	58.3	12.9	7.4	46	0.64	0.68	0.00
3/15/2016 13:10	8.6	11.09	63.4	32.2	7.28	299	0.69	1.56	0.29
4/19/2016 14:14	15.8	10.88	68.1	3.15	7.61	2	0.4	1.01	0.00
5/17/2016 13:50	17.1	11.56	66	3.31	8.13	12	0.26	0.97	0.01
6/21/2016 12:45	19.5	11.29	68.8	1.77	8.3	20	0.14	0.92	0.00
Median	**16.10**	**11.09**	**68.45**	**6.88**	**7.58**	**33**	**0.33**	**1.02**	

Site Name:	WR1				
Site Description:	Sunset Park (Keizer)				
Alkalinity (mg/L)	Ammonia (mg/L)	TP (mg/L)	TDS (mg/L)	TS (mg/L)	TSS (mg/L)
30	< 0.050	0.037	63	66	3.2
33	< 0.050	0.038	76	78	2.4
31	< 0.050	0.035	77.6	82	4.4
31	< 0.050	0.06	101	111	10
28	< 0.050	0.066	77	88	10.8
20	< 0.050	0.104	58	88	30
22	< 0.050	0.12	60	98	38
24	< 0.050	0.064	51	63	12
24	< 0.050	0.12	68	103	34.8
29	< 0.050	0.037	59	63	4.4
29	< 0.050	0.036	67	72	5.2
29	< 0.050	0.029	78	80	2.4
29	**NA**	**0.049**	**67.5**	**81**	**7.6**

Note: Data in red exceed applicable water quality criteria (see Table 4). Single sample criterion (406 organisms/100 mL) used for E. Coli.

Table 7.
Monthly Instream Data - Willamette River (RY 2015/16)

Site Name: WR5 **Site Description:** Union Street Railroad Bridge									
Collection Date/Time	**Temp (°C)**	**DO (mg/L)**	**Sp Cond (µS/cm)**	**Turb (NTU)**	**pH (S.U.)**	**E-Coli (#/ 100 mL)**	**NO_3-NO_2 (mg/L)**	**BOD (mg/L)**	**Rainfall previous 24 hrs**
7/21/2015 9:25	21.6	8.63	76.7	2.07	7.19	5	0.07	0.88	0.00
8/18/2015 9:00	20.3	8.49	73.8	2.03	7.6	5	0.07	1.09	0.00
9/15/2015 8:50	16	9.34	77.1	3.62	7.33	23	0.06	0.66	0.00
10/20/2015 9:25	15.3	9.32	74.9	7.54	7.05	44	0.12	1.1	0.08
11/17/2015 9:10	10.1	10.77	70.5	12.2	6.92	158	0.33	0.87	0.68
12/15/2015 9:00	7	11.18	58.1	32.3	6.41	127	0.66	1.06	0.04
1/19/2016 9:55	8	11.09	59	35.7	6.69	142	0.72	0.88	0.90
2/16/2016 9:40	9.6	11.07	56.9	13.3	7.31	50	0.56	0.78	0.00
3/15/2016 9:15	8.4	11.19	63.1	35.6	7.2	345	0.58	1.47	0.29
4/19/2016 9:36	14.5	10.04	66.1	3.28	7.44	8	0.38	1.05	0.00
5/17/2016 9:28	13.8	10.28	64.5	3.07	7.46	19	0.23	0.88	0.01
6/21/2016 9:00	17.3	9.64	66.6	2.65	7.78	7	0.15	0.74	0.00
Median	**14.15**	**10.16**	**66.35**	**5.58**	**7.26**	**33.5**	**0.28**	**0.88**	

Site Name: WR5 **Site Description:** Union Street Railroad Bridge					
Alkalinity (mg/L)	**Ammonia (mg/L)**	**TP (mg/L)**	**TDS (mg/L)**	**TS (mg/L)**	**TSS (mg/L)**
30	< 0.050	0.037	67	71	4.4
32	< 0.050	0.042	67	72	4.8
30	< 0.050	0.038	64.8	72	7.2
29	< 0.050	0.052	94	105	10.5
28	< 0.050	0.058	66	76	9.6
20	< 0.050	0.112	63	91	28
23	< 0.050	0.123	62	93	31.2
24	< 0.050	0.064	51	64	12.8
24	0.051	0.12	68	106	37.6
27	< 0.050	0.037	54	59	4.8
27	< 0.050	0.036	58	63	4.7
28	< 0.050	0.032	62	64	2.4
27.5	**NA**	**0.047**	**63.9**	**72**	**8.4**

Note: Data in red exceed applicable water quality criteria (see Table 4). Single sample criterion (406 organisms/100 mL) used for E. Coli.

Table 7.
Monthly Instream Data - Willamette River (RY 2015/16)

Site Name:	WR10								
Site Description:	Halls Ferry Road (Independence)								
Collection Date/Time	**Temp (°C)**	**DO (mg/L)**	**Sp Cond (µS/cm)**	**Turb (NTU)**	**pH (S.U.)**	**E-Coli (#/ 100 mL)**	**NO_3-NO_2 (mg/L)**	**BOD (mg/L)**	**Rainfall previous 24 hrs**
7/21/2015 12:40	22.9	9.12	76.7	1.72	7.71	11	0.08	0.89	0.00
8/18/2015 11:40	21.8	9.67	74	1.94	7.69	1	0.08	1.08	0.00
9/15/2015 12:20	17.06	9.58	74.5	2.41	7.81	20	0.07	0.67	0.00
10/20/2015 12:05	15.7	9.41	75.4	8.31	7.41	26	0.13	1.18	0.08
11/17/2015 12:00	10.3	10.62	69.5	11.1	7.58	21	0.25	1.23	0.68
12/15/2015 12:40	8	10.77	56.4	32.1	7.27	146	0.83	0.91	0.04
1/19/2016 13:25	7.9	10.95	57.6	37.8	7.13	118	0.68	1.1	0.90
2/16/2016 12:50	9.7	10.9	59.4	11.7	7.45	36	0.57	0.79	0.00
3/15/2016 13:00	8.3	11.05	60.6	33.9	7.38	387	0.51	1.62	0.29
4/19/2016 13:10	14.9	10.39	68.3	3.42	7.37	5	0.53	1.1	0.00
5/17/2016 12:30	14.1	10.95	63.7	2.58	7.62	19	0.28	0.96	0.01
6/21/2016 12:15	18.2	10.72	67.3	1.83	8.11	6	0.23	0.9	0.00
Median	**14.50**	**10.67**	**67.80**	**5.87**	**7.52**	**20.5**	**0.27**	**1.02**	

Site Name:	WR10				
Site Description:	Halls Ferry Road (Independence)				
Alkalinity (mg/L)	**Ammonia (mg/L)**	**TP (mg/L)**	**TDS (mg/L)**	**TS (mg/L)**	**TSS (mg/L)**
31	< 0.050	0.033	60	62	2
33	< 0.050	0.04	60	64	4.4
32	< 0.050	0.036	69.2	74	4.8
30	< 0.050	0.058	94	105	10.5
28	< 0.050	0.054	62	70	7.5
21	< 0.050	0.105	65	89	24.4
22	< 0.050	0.118	60	93	32.8
24	< 0.050	0.061	48	60	12
24	< 0.050	0.118	69	105	35.6
27	< 0.050	0.036	53	61	8
26	< 0.050	0.036	63	68	4.8
28	< 0.050	0.031	71	75	3.6
27.5	**NA**	**0.047**	**62.5**	**72**	**7.75**

Note: Data in red exceed applicable water quality criteria (see Table 4). Single sample criterion (406 organisms/100 mL) used for E. Coli.

Table 8.
Monthly Instream Data - Duplicates (RY 2015/16)

Site ID	Collection Date/Time	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (#/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	TSS	Total Copper (mg/L)	Dissolved Copper (mg/L)	Total Lead (mg/L)	Dissolved Lead (mg/L)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Hardness
GIB1	7/21/2015 11:08	19.1	6.2	116.7	7.38	6.76	96	0.31	0.93								
BAT1	07/21/2015 11:10	18.5	7.5	66.6	11.7	7.23	461	0.14	1								
GIB15	07/21/2015 11:32	18.3	8.21	121.6	9.32	7.19	517	0.69	0.73								
MIC10	08/18/2015 13:08	20.4	10.11	55.5	2.52	8.2	71	0.1	1								
CGT5	08/18/2015 13:46	20.2	8.39	91.1	23.4	7.52	>2420	< 0.05	1.22								
SHE10	09/15/2015 08:25	14.14	9.88	54.5	3.15	6.85	105	0.07	0.7								
CGT1	09/15/2015 11:41	16.4	3.36	155.1	6.21	7.35	61	0.05	4								
MIC1	10/20/2015 09:05	14.7	9.91	69.8	2.33	6.97	387	0.14	1.34								
MRA10	10/20/2015 09:05	14.2	9.33	67.1	2.7	6.82	210	0.15	1.33								
PRI1	11/17/2015 09:15	9.9	10.73	121.8	17.1	7.09	461	3.97	1.35		0.0034	< 0.0025	< 0.0005	< 0.0005	0.0079	0.003	44
MRA1	11/17/2015 09:50	10	10.73	113.5	7.67	7.34	517	3.69	1.35								
CLA10	12/15/2015 09:30	12.6	10.1	83.6	2.17	6.15	26	3.44	0.54		< 0.0025	< 0.0025	< 0.0010	< 0.0010	0.0108	0.01	24
SHE1	12/15/2015 09:40	8.1	11.37	102.6	9.98	7.06	68	4.71	0.78								
CRO1	12/15/2015 10:00	9	11.37	66	6.1	6.52	37	2.65	0.88								
CLA1	01/19/2016 10:45	8.7	11.11	43	28.4	6.81	2420	0.91	9		0.0039	< 0.0025	0.0018	< 0.0005	0.0299	0.0161	16
CRO10	01/19/2016 11:05	8.7	10.77	47.8	12.7	6.4	34	2.04	0.83								
PRI5	01/19/2016 11:12	8.8	10.69	61.7	21.1	7	138	1.35	10.5		< 0.0025	< 0.0025	0.0005	< 0.0005	0.0201	0.0138	22
BAT12	02/16/2016 11:08	9.7	10.78	45.6	2.89	6.6	125	2.37	< 0.50								
GLE1	02/16/2016 11:20	10.8	10.75	90.4	6.97	7.54	48	2.04	< 0.50								
BAT1	02/16/2016 11:32	10.3	10.52	48.3	5.4	6.57	60	1.95	< 0.50								
MIC10	03/15/2016 11:10	8.2	10.93	79.6	30.2	7.04	461	2.3	1.31								
GIB1	03/15/2016 11:16	9.3	11.02	73.6	24.2	7.22	142	1.94	0.74								
GIB15	03/15/2016 11:40	9.7	10.93	77	24.8	7.33	461	2.23	0.73								
LPW1	04/16/2016 12:16	15.2	5.39	217.7	4.04	7.08	238	0.46	0.97	5.8							
GLE10	04/19/2016 12:42	13.7	10.08	56.8	7.15	7.31	13	1.31	0.62								
CGT5	04/19/2016 13:12	18.7	10.06	179.5	6.55	7.85	387	0.1	1.61								
SHE10	05/17/2016 08:55	13.3	10.56	58.2	4.96	7.18	116	0.58	0.87								
CGT1	05/17/2016 13:25	18.7	8.45	197.3	4.9	7.2	39	0.27	1.87								
MIC1	06/21/2016 08:40	17.1	9.43	58	3.37	7.58	276	0.26	0.78								
MRA10	06/21/2016 08:45	17.2	8.54	51.4	4.35	7.24	121	0.24	0.96								

Note: Duplicate field measurements and duplicate grab samples are taken at a minimum of 10 percent of the sites each month. These sites are selected prior to sampling.

Table 8.
Monthly Instream Data - Willamette River Duplicates (RY 2015/16)

Site ID	Collection Date/Time	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (#/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Alkalinity (mg/L)	Ammonia (mg/L)	TP (mg/L)	TDS (mg/L)	TS (mg/L)	TSS (mg/L)
WR10	09/15/2015 12:25	17.06	9.57	74.4	2.1	7.81	17	0.07	0.75	32	< 0.050	0.031	62	68	6
WR1	10/20/2015 13:05	16.4	10.16	80	10.6	7.57	83	0.12	0.98	31	< 0.050	0.059	92	102	10
WR5	11/17/2015 09:19	10	10.8	69	11.6	6.99	62	0.33	0.88	28	< 0.050	0.057	74	82	8
WR10	05/17/2016 12:35	14	10.99	64.1	2.93	7.6	20	0.28	0.98	26	na	0.039	63	69	5.6
WR1	06/21/2016 12:50	19.3	11.4	68.5	1.7	8.41	20	0.14	0.79	na	< 0.050	0.028	70	73	2.8

Note: Duplicate field measurements and duplicate grab samples are taken at a minimum of 10 percent of the sites each month. These sites are selected prior to sampling.

Table 9.
Continuous Instream Grade A and Grade B Data Qualifications

Grade Values	Temperature (˚C)	pH	Specific Conductivity (µS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)
A	± < 0.5	± ≤ 0.30	≤ 10%	± ≤ 3 or 5% (whichever is greater)	± ≤ 0.3
B	± 0.51 to 2.00	± > 0.3 to 0.50	> 10% to ≤ 15%	± ≤ 5 or 30% (whichever is greater)	± > 0.3 to ± ≤ 1.0

Note: As stated in the "Continuous Water Quality Monitoring Program Quality Assurance Project Plan", data grades are a result of the absolute difference (value or percent) of station instrument reading and audit instrument reading at the time of site audit.

Table 10.
Monthly Median Values for Continuous Instream Data (RY 2015/16)

Monthly Medians for Turbidity at Continuous Instream Sites

	Jul 2015	Aug 2015	Sep 2015	Oct 2015	Nov 2015	Dec 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	Jun 2016
Station Name	Turbidity (NTU)	Turbidity (NTU)	Turbidity (NTU)	Turbidity (NTU)	Turbidity (NTU)	Turbidity (NTU)	Turbidity (NTU)	Turbidity (NTU)	Turbidity (NTU)	Turbidity (NTU)	Turbidity (NTU)	Turbidity (NTU)
BAT3	12.27	12.16	13.17	15.82			9.83	5.82	8.50	5.96	7.80	9.52
BAT12	5.15	3.17	3.15	3.33	3.12		2.63	0.68	2.26	0.78	1.98	2.74
CLK1	1.90	1.40	0.70	1.50	3.10	6.50	5.70	2.90	4.70	1.90	1.80	2.80
CLK12		2.90	1.90	1.90			3.10	1.10	2.60	1.60	2.50	1.90
GLE3	7.10	6.50	4.80	4.70					8.90	4.30	3.40	3.50
GLE12					3.30	14.00	9.10	8.20	12.70	8.00	5.40	4.50
MIC3	3.58	2.86	2.96	2.57	4.79	14.63	8.28	6.21	9.29	3.33	2.90	2.90
MIC12	4.14	3.65	4.12	4.47	5.03	11.34	7.53	5.76	8.46	3.27	4.20	4.51
PRI3	7.56	6.37	3.13	2.17	4.65	9.48	7.60	5.63	8.34	2.16	2.40	2.57
PRI12			4.42	10.32	9.72	14.84	8.13	4.96	6.63	4.62	5.50	4.25
SHE3	Station offline for entire reporting year due to bridge replacement project											

Monthly Medians for Specific Conductivity at Continuous Instream Sites

	Jul 2015	Aug 2015	Sep 2015	Oct 2015	Nov 2015	Dec 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	Jun 2016
Station Name	Specific Conductivity (µS/cm)	Specific Conductivity (µS/cm)	Specific Conductivity (µS/cm)	Specific Conductivity (µS/cm)	Specific Conductivity (µS/cm)	Specific Conductivity (µS/cm)	Specific Conductivity (µS/cm)	Specific Conductivity (µS/cm)	Specific Conductivity (µS/cm)	Specific Conductivity (µS/cm)	Specific Conductivity (µS/cm)	Specific Conductivity (µS/cm)
BAT3	62.41	65.36	65.13	65.08	58.04	54.17	50.76	50.82				
BAT12	61.50	66.93	64.18	64.18	50.85	52.65	48.47	47.19	44.28	45.24	44.57	46.83
CLK1	95.00	99.00	95.00	94.00			87.00			96.00	95.00	91.00
CLK12	70.00	72.00	73.00	72.00			79.00	76.00	65.00	75.00	73.00	72.00
GLE3	121.00	134.00	125.00	115.00	107.00				85.00	92.00	103.00	110.00
GLE12								62.00	62.00	58.00	64.00	70.00
MIC3	58.14	60.12	64.01	69.72	119.99	97.59	93.55	87.09	88.86	85.11	62.06	57.27
MIC12		53.54	55.93	61.74	118.00	95.28	93.31	87.27	86.32	83.37	68.44	61.53
PRI3	97.70	101.40		101.14	99.40	93.26	92.00	95.74	89.67	95.71	97.56	94.30
PRI12	62.80	63.64	66.30	83.23	117.41	92.96	86.74	87.35	83.12	86.17	73.07	64.23
SHE3	Station offline for entire reporting year due to bridge replacement project											

Presented median values consist of A and B grade data only. NA = 60% of the continuous record for a given month is not represented by A and B grade data.

Table 10.
Monthly Median Values for Continuous Instream Data (RY 2015/16)

Monthly Medians for **Temperature** at Continuous Instream Sites												
	Jul 2015	Aug 2015	Sep 2015	Oct 2015	Nov 2015	Dec 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	Jun 2016
Station Name	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)
BAT3	19.58	19.51	16.15	13.97	10.67	9.55	8.67	9.36	9.84	11.98	13.76	16.05
BAT12	17.81	17.40	13.37	11.33	8.50	9.12	8.26	8.85	9.29	11.50	13.28	15.41
CLK1	18.52	18.72	16.54	15.23	12.24	10.87	9.67	10.67	11.12	12.82	14.32	16.17
CLK12	17.13	17.57	16.35	15.73			11.02	11.31	11.41	12.46	13.60	14.96
GLE3	18.32	18.16	15.34	14.08	11.09	9.80	8.99	9.51	10.42	12.40	14.01	15.50
GLE12					9.64	9.30	8.36	9.05	9.51	11.07	12.25	13.92
MIC3	21.24	20.46	16.83	14.66	9.80	8.57	7.89	9.09	10.10	13.18	15.52	18.07
MIC12	20.38	19.78	16.50	14.36	9.80	8.61	7.90	9.05	9.97	12.99	14.72	17.25
PRI3	20.74	19.84	17.08	14.93	11.13	9.78	8.83	9.95	10.75	13.75	15.90	18.05
PRI12	20.19	19.53	16.28	14.24	10.89	9.56	8.69	9.51	10.08	12.39	14.48	17.10
SHE3	Station offline for entire reporting year due to bridge replacement project											

Monthly Medians for **pH** at Continuous Instream Sites												
	Jul 2015	Aug 2015	Sep 2015	Oct 2015	Nov 2015	Dec 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	Jun 2016
Station Name	pH (S.U)	pH (S.U)	pH (S.U)	pH (S.U)	pH (S.U)	pH (S.U)	pH (S.U)	pH (S.U)	pH (S.U)	pH (S.U)	pH (S.U)	pH (S.U)
BAT3	6.98	7.06	6.51	6.62	6.57	6.35	6.42	6.51	6.56	6.66	6.65	6.78
BAT12	7.37	7.10	7.21	7.34	7.24	6.52	6.77	6.88	6.84	7.20	7.09	7.35
CLK1	6.96	6.98	6.97	7.01	7.23	7.00	7.08	7.21	7.11	7.24	6.74	7.35
CLK12	6.85	6.87	6.85	6.94			6.52	6.67	6.55	6.70	6.54	6.60
GLE3	7.54	7.50	7.55	7.50	7.08	6.66	6.83	6.93	7.05	7.23	7.22	7.35
GLE12					6.87	6.70	6.89	7.05	7.07	7.19	7.11	7.13
MIC3		7.63	7.49	7.62	7.47	7.02	7.15	7.35	7.36	7.65	7.24	7.26
MIC12	7.53	7.65			7.19	6.96	7.13	7.23	7.26	7.49	7.34	7.47
PRI3	7.50	7.40	7.35	7.36	7.32	7.00	7.18	7.37	7.21	7.30	7.08	7.25
PRI12	7.53	7.49	6.98	7.21	6.79	6.56	6.71	6.83	6.87	7.14	7.04	7.11
SHE3	Station offline for entire reporting year due to bridge replacement project											

Presented median values consist of A and B grade data only. NA = 60% of the continuous record for a given month is not represented by A and B grade data.

Table 10.
Monthly Median Values for Continuous Instream Data (RY 2015/16)

Monthly Medians for **Dissolved Oxygen** at Continuous Instream Sites												
	Jul 2015	Aug 2015	Sep 2015	Oct 2015	Nov 2015	Dec 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	Jun 2016
Station Name	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)
BAT3	6.94	6.41	7.05	6.94	9.60	10.21	10.69	10.61	10.43	9.77	9.15	
BAT12	8.29	6.49	7.75	9.05	11.27	11.30	11.55	11.45	11.25	10.70	10.20	9.64
CLK1	8.73	8.70	8.98	9.29	10.17	10.86	11.06		10.61	10.09	9.63	9.26
CLK12	8.75	8.53	8.60	8.76			10.52	10.35	10.24	9.80	9.47	9.07
GLE3	8.44	8.47	9.06	9.32	10.60	10.96	11.19	11.27	10.92	10.42	9.63	9.10
GLE12					10.97	11.55	11.44	11.28	11.07	10.70	10.21	9.63
MIC3	8.56	8.80	9.55	9.66	11.11	11.42	11.74	11.64	11.22	10.33	9.71	9.08
MIC12	8.69	8.60	9.28	9.62	10.79	10.58	11.03	11.05	10.59	9.99	9.84	9.23
PRI3			8.61	8.93	9.99	10.42	10.95	10.85	10.54	9.47	8.48	8.37
PRI12			8.60	8.32	8.53	9.58	10.01	10.13	9.96	9.80	9.21	8.73
SHE3	Station offline for entire reporting year due to bridge replacement project											

Monthly Medians for **Stage** at Continuous Instream Sites												
	Jul 2015	Aug 2015	Sep 2015	Oct 2015	Nov 2015	Dec 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	Jun 2016
Station Name	Stage (ft)	Stage (ft)	Stage (ft)	Stage (ft)	Stage (ft)	Stage (ft)	Stage (ft)	Stage (ft)	Stage (ft)	Stage (ft)	Stage (ft)	Stage (ft)
BAT3	3.94	3.91	3.92	3.93	4.31	5.92	5.24	4.85	5.19	4.46	4.23	4.15
BAT12	4.66	4.57	4.60	4.66	4.90	5.36	5.05	4.82	4.94	4.59	4.45	4.35
CLK1	3.78	3.76	3.87	3.90	4.30	4.67	4.46	4.30	4.46	4.24	4.11	4.08
CLK12	3.91	3.90	3.93	3.93	4.11	4.44	4.33	4.15	4.27	4.05	3.97	3.96
GLE3	4.07	4.03	4.03	4.07	4.44	5.36	4.88	4.55	4.76	4.39	4.23	4.15
GLE12	NA	NA	NA	0.68	0.90	1.36	1.24	1.06	1.17	0.94	0.84	0.78
LPW1	NA	NA	NA	NA	NA	2.24	1.98	1.79	2.18	1.57	NA	NA
MIC3	5.36	5.40	5.48	5.46	5.77	7.30	6.57	6.18	6.46	5.43	5.21	5.16
MIC12	7.03	7.04	6.98	6.79	7.35	8.90	8.16	7.89	8.11	7.26	7.17	7.15
PRI3	4.24	4.18	4.22	4.20	4.49	6.06	5.04	4.66	4.86	4.44	4.34	4.31
PRI4	7.51	7.46	7.51	7.45	7.83	8.64	8.25	7.94	8.16	7.67	7.51	7.47
PRI12	4.31	4.22	4.21	4.01	4.20	5.06	4.72	4.51	4.68	4.39	4.42	4.39
SHE3	Station offline for entire reporting year due to bridge replacement project											

Presented median values consist of A and B grade data only. NA = 60% of the continuous record for a given month is not represented by A and B grade data.

Table 11.
Instream Storm Monitoring Data (RY 2015/16)

Site Name: **CLK1**
Site Description: Lower Clark Creek just upstream of confluence with Pringle Creek

Sample Collection Date/Time	E. Coli	Diss. Oxygen	pH	temp	Sp. Cond, field	Sp. Cond, comp	Cu	Cu diss	Zn	Zn diss	Pb	Pb diss	Hardness	NH3	NO_3-NO_2	Ortho P	TP	BODs	TSS
mm/dd/yyyy HH:MM	MPN/100 mL	mg/L	S.U	˚C	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
08/29/2015 05:24	9804	7.04	6.74	19.3	128.2														
08/30/2015 09:31						83.9	0.0378	0.0224	0.378	0.258	0.009	0.0006	44	< 0.050	1.59	< 0.010	0.662	> 13.9	168
9/17/2015 3:15	17330	9.26	7.09	15.3	46.2														
9/17/2015 11:00						46.4	0.0192	0.0053	0.1536	0.0558	0.0095	< 0.0005	33	0.156	0.53	0.082	0.476	11.7	180
10/28/2015 03:57	1733	9.19	7.15	14.46	84.3														
10/28/2015 12:00						52.3	0.0085	0.0048	0.0522	0.034	0.0026	0.0015	35	0.137	0.52	0.088	0.187	7.8	36
12/02/2015 09:20	327	11.21	6.71	8.23	71.7														
12/02/2015 09:20						31	0.0078	0.0032	0.0803	0.0452	0.0011	< 0.0005	38	0.124	0.8	0.09	0.177	6.2	33.6
1/28/2016 5:00	676	10.47	7.11	11.43	61.9														
1/28/2016 10:55						38.8	0.0077	< 0.0025	0.0603	0.0126	0.0043	< 0.0005	18	< 0.050	0.7	0.018	0.157	4.1	79
Median	**1733**	**9.26**	**7.09**	**14.46**	**71.70**	**46.4**	**0.0085**	**0.00505**	**0.0803**	**0.0452**	**0.0043**	**NA**	**35**	**0.137**	**0.7**	**0.085**	**0.187**	**7.00**	**79.0**

Data in red exceed applicable water quality criteria (see Table 4).

NA= Median not calculated because ≥ 50% of values were censored values.

Table 11.
Instream Storm Monitoring Data (RY 2015/16)

Site Name:	**PRI3**																		
Site Description:	Lower Pringle Creek in Pringle Park, just upstream of confluence with Shelton Ditch																		
Sample Collection Date/Time	**E. Coli**	**Diss. Oxygen**	**pH**	**temp**	**Sp. Cond, field**	**Sp. Cond, comp**	**Cu**	**Cu diss**	**Zn**	**Zn diss**	**Pb**	**Pb diss**	**Hardness**	**NH3**	**NO_3-NO_2**	**Ortho P**	**TP**	**BODs**	**TSS**
mm/dd/yyyy HH:MM	MPN/100 mL	mg/L	S.U	˚C	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
8/29/2015 5:54	9208	7.36	6.97	19.8	123.8														
9/30/2015 9:47						104	0.0269	0.0186	0.292	0.181	0.0059	0.0005	49	0.065	0.53	0.082	0.537	> 15.3	127
9/17/2015 3:50	9804	8.7	7.29	15.9	67.7														
9/17/2015 11:35						59.5	0.0159	0.0037	0.1449	0.0181	0.0071	< 0.0005	29	0.114	0.42	0.029	0.468	9.6	153
10/28/2015 4:19	548	9.2	7.23	13.09	91.8														
10/28/2015 12:20						70.5	0.0047	< 0.0025	0.0289	0.0166	0.0018	< 0.0005	24	< 0.050	0.45	0.044	0.126	4.4	36
12/1/2015 19:00	228	11.3	6.81	7.13	100.7														
12/2/2015 10:10						24.8	0.0052	< 0.0025	0.0495	0.0143	0.0016	< 0.0005	31	< 0.050	0.69	0.033	0.164	4	51.2
1/28/2016 5:13	148	10.33	7.18	11.21	59.9														
1/28/2016 5:15 - DUP	175	10.32	7.18	11.21	59.7														
1/28/2016 10:35						45.1	0.005	< 0.0025	0.0515	0.0129	0.0029	< 0.0005	22	< 0.050	0.96	0.016	0.145	2.6	66
Median	**388**	**9.76**	**7.18**	**12.15**	**79.75**	**59.5**	**0.0052**	**NA**	**0.0515**	**0.0166**	**0.0029**	**NA**	**29**	**NA**	**0.53**	**0.033**	**0.164**	**2.33**	**66.0**

Data in red exceed applicable water quality criteria (see Table 4).

NA= Median not calculated because ≥ 50% of values were censored values.

Table 11.
Instream Storm Monitoring Data (RY 2015/16)

Site Name:	**PRI12**																		
Site Description:	Upper East Fork Pringle Creek																		
Sample Collection Date/Time	**E. Coli**	**Diss. Oxygen**	**pH**	**temp**	**Sp. Cond, field**	**Sp. Cond, comp**	**Cu**	**Cu diss**	**Zn**	**Zn diss**	**Pb**	**Pb diss**	**Hardness**	**NH3**	**NO_3-NO_2**	**Ortho P**	**TP**	**BODs**	**TSS**
mm/dd/yyyy HH:MM	MPN/100 mL	mg/L	S.U	˚C	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
8/29/2015 6:19	1850	6.22	6.99	19.3	83.9														
8/30/2015 11:07						66.8	< 0.0025	< 0.0025	0.0152	0.0083	< 0.0005	< 0.0005	39	< 0.050	0.7	0.01	0.087	4.3	8
9/17/2015 4:22	2481	7.99	7.08	14.9	63.8														
9/17/2015 4:24	1396	7.96	7.06	14.9	63.9														
9/17/2015 9:45						59.6	0.0026	< 0.0025	0.0092	0.0095	< 0.0005	< 0.0005	25	< 0.050	0.28	0.02	0.083	3.7	15.5
10/28/2015 4:47	345	8.65	7.28	11.63	84.9														
10/28/2015 4:50	248	8.64	7.23	11.62	85														
10/28/2015 11:30						92.7	< 0.0025	< 0.0025	0.0082	0.0041	< 0.0005	< 0.0005	37	< 0.050	0.52	0.02	0.085	2.4	17.6
12/1/2015 19:30	63	9.86	6.89	7.67	70.3														
12/1/2015 19:33	63	9.83	6.87	7.67	70.3														
12/2/2015 10:50						36.5	0.0157	< 0.0025	12.2	2.43	0.0173	< 0.0005	63	< 0.050	2.15	0.013	0.73	2.5	312
1/28/2016 6:02	41	9.54	6.7	10.52	61.1														
1/28/2016 11:20						68.6	< 0.0025	< 0.0025	0.0454	0.0137	0.0008	< 0.0005	28	< 0.050	2.4	0.022	0.099	1.2	29
Median	**297**	**8.65**	**7.025**	**11.63**	**70.30**	**66.8**	**NA**	**NA**	**0.0152**	**0.0095**	**0.00905**	**NA**	**37**	**NA**	**0.7**	**0.02**	**0.087**	**2.5**	**17.6**

Data in red exceed applicable water quality criteria (see Table 4).

NA= Median not calculated because ≥ 50% of values were censored values.

Table 12.
Stormwater Monitoring Data (RY 2015/16)

Site Name: Electric[1]
Land use Type: Residential

Sample Collection Date/Time	E. Coli	Diss. Oxygen	pH	temp	Sp. Cond, field	Sp. Cond, comp	Cu	Cu diss	Zn	Zn diss	Pb	Pb diss	Hardness	NH3	NO_3-NO_2	Ortho P	TP	BOD5	TSS
mm/dd/yyyy HH:MM	MPN/100 mL	mg/L	S.U	˚C	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
8/29/2015 5:18	857	8.58	6.61	21.26	123.7														
8/30/2015 10:13						102	0.0198	0.0185	0.157	0.15	0.0008	< 0.0005	44	0.191	0.27	0.213	0.397	19.2	11.5
12/1/2015 18:20	4350	11.97	6.88	7.88	38.4														
12/2/2015 9:50						12.8	0.0058	0.0029	0.0567	0.0272	0.0031	< 0.0005	23	< 0.050	0.45	0.092	0.199	8.1	36

Site Name: Hilfiker
Land use Type: Commercial

Sample Collection Date/Time	E. Coli	Diss. Oxygen	pH	temp	Sp. Cond, field	Sp. Cond, comp	Cu	Cu diss	Zn	Zn diss	Pb	Pb diss	Hardness	NH3	NO_3-NO_2	Ortho P	TP	BOD5	TSS
mm/dd/yyyy HH:MM	MPN/100 mL	mg/L	S.U	˚C	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
8/29/2015 5:45	272	8.66	6.46	19.66	67.5														
8/30/2015 10:50						49.8	0.039	0.0289	0.299	0.262	0.0036	0.0005	36	0.67	0.84	0.064	0.399	20.2	68
9/17/2015 2:50	1553	9.95	6.92	14.4	13.03														
9/17/2015 10:25						18.2	0.0078	0.0043	0.0663	0.0521	0.0012	< 0.0005	11	0.233	0.22	0.047	0.102	4.8	18
21/1/15 18:00	9800	11.02	6.62	8.99	106.4														
12/2/2015 11:10						15.1	0.0075	0.0033	0.1	0.0749	0.0025	< 0.0005	21	0.167	0.22	0.019	0.089	4.9	28.4

Site Name: Salem Industrial
Land use Type: Industrial

Sample Collection Date/Time	E. Coli	Diss. Oxygen	pH	temp	Sp. Cond, field	Sp. Cond, comp	Cu	Cu diss	Zn	Zn diss	Pb	Pb diss	Hardness	NH3	NO_3-NO_2	Ortho P	TP	BOD5	TSS
mm/dd/yyyy HH:MM	MPN/100 mL	mg/L	S.U	˚C	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
8/29/2015 6:30	19860	7.81	6.38	18.79	67.4														
8/29/2015 6:36	24200	7.86	6.35	18.4	66.9														
8/30/2015 11:40						60	0.0201	0.0096	0.231	0.147	0.003	< 0.0005	30	0.28	1	0.073	0.49	13.3	104
12/1/2015 20:00	529	12.03	6.99	6.03	18.1														
12/2/2015 11:35						8	0.0046	< 0.0025	0.128	0.0996	0.0014	< 0.0005	23	< 0.050	0.12	0.05	0.171	3.2	29.2

[1]Due to the velocity and lift of water coming through the pipe at this site, the flow module is unable to detect the height of the water and often doesn't sample; therefore a time paced sampling method is utilized.

Table 13.
Priority Dry Weather Outfall/Manhole Screening Data (RY 2015/16)

Site Info				Flow		Field Screening					Laboratory Testing						Notes
Priority Outfall	Inspectin Location	Asset Type	Date/Time	Flow Present?	Est. flow (gpm)	Temp (°C)	pH	Specific Cond. (µS/cm)	Turbidity (NTU)	Total Chlorine (mg/L)	Fluoride (mg/L)	Detergents (mg/L)	Amonia (mg/L)	Potassium (mg/L)	Sodium (mg/L)	E. coli (MPN/100 mL)	
D39456229	D39456229	Outfall	08/05/2015 10:30	yes	1 to 5	16.50	6.52	73.30	1.23	0.27	0.2	0					
D30470203	D30470203	Outfall	08/10/2015 09:45	no													
D36472203	D36472203	Outfall	08/10/2015 10:45	yes	1 to 5	21.10	7.21	84.00	4.47	0.05	0.6	0	0	0.90	7.88	47	ES notified after source tracking, TV inspection, and notification of sewer dept.
D36472203	D36476211	ManHole	08/10/2015 13:50	yes	1 to 5	22.90	7.09	75.50	8.77	0.66	0.6			0.70	6.66		Notified Water dept., TV inspection later found water leak.
D48464249	D48464249	Outfall	08/10/2015 12:10	no													
D42468235	D42468235	Outfall	08/20/2015 13:20	no													
D42468244	D42468244	Outfall	08/20/2015 09:55	yes	20-30	19.20	7.52	119.30	3.37	0.03	0.3	0	0	0.69	7.70		
D42468PVT	D42468PVT	ManHole	08/20/2015 08:57	yes	1	18.80	7.37	109.90	19.40	0.14	0.2	0	0.03	1.54	9.04		
D45466212	D45466212	Outfall	08/20/2015 13:10	no													
D48464203	D48464203	Outfall	08/20/2015 12:10	no													
D42480223	D42480223	Outfall	08/25/2015 09:20	yes	30-50	18.50	7.34	94.60	1.24	0.00	0.7	0	0	0.90	6.86	63	Large water leak found with follow up - repaired
D42480223	D45478221	ManHole	08/25/2015 11:40	yes	30-50	20.10	7.36	65.30	0.56	1.26	0.7			0.60	6.37	< 1	
D42480223	D48478222	ManHole	08/25/2015 13:00	yes	1												Leak from fire hydrant - repaired
D45476207	D45476207	Outfall	08/27/2015 09:40	yes	50-100	18.00	7.70	274.60	0.67	0.00	0	0	0	2.00	9.40	209	flow tracked to wetland near penitentary, follow up needed.
D45476207	D45476255	ManHole	08/27/2015 14:00	yes	1	24.60	7.56	73.00	1.79	0.98	0.593			0.60	6.30	<10	likely a drinking water leak
D42480205	D42480205	Outfall	09/08/2015 13:00	no													
D42480215	D42480215	Outfall	09/08/2015 10:10	yes	30-50	19.70	7.54	63.90	1.10	0.00	0.6	0	0	0.79	19.50	<10	traced to broken water main, water dept. notified - repaired
D42480223	D42480223	Outfall	09/08/2015 10:06	yes	<1												follow up after repair, not sampled
D42482223	D42482223	Outfall	09/08/2015 13:20	yes	<1	17.90	7.42	85.80	3.11	0.03	0.6	0.75	0.5	1.61	7.00	2990	multiple sources upstream, included several water leaks
D42472264	D42472240	ManHole	09/10/2015 10:00	yes	20-30	20.00	7.38	126.30	2.11	0.00	0.3	0	0.02	1.60	7.54		white material present below outfall days prior, inspection requested by ES
D42482223	D48482278	ManHole	09/10/2015 14:10	yes	1 to 5					0.14							flow coming from catch basin
D42482224	D42482209	ManHole	09/10/2015 10:50	yes													standing water, further tracking revealed water leak
D42482224	D45482214	CleanOut	09/10/2015 13:30	yes						1.00							water leak, reported to water dept.

Data in red exceed action levels, see Dry Weather Outfall and Illicit Discharge Screening Plan for more information.

Table 13.

Priority Dry Weather Outfall/Manhole Screening Data (RY 2015/16)

Site Info				Flow		Field Screening					Laboratory Testing						Notes
Priority Outfall	Inspectin Location	Asset Type	Date/Time	Flow Present?	Est. flow (gpm)	Temp (°C)	pH	Specific Cond. (µS/cm)	Turbidity (NTU)	Total Chlorine (mg/L)	Fluoride (mg/L)	Detergents (mg/L)	Amonia (mg/L)	Potassium (mg/L)	Sodium (mg/L)	E. coli (MPN/100 mL)	
D54486217	D54486217	Outfall	09/23/2015 10:00	yes	50-100	15.40	7.41	71.80	1.51	0.00	0.6	0	0.00	0.82	6.46	226	leak coming from private service, unable to TV
D48486207	D48486207	Outfall	09/30/2015 14:20	no													backwater from wetland
D51486201	D51486203	ManHole	09/30/2015 13:10	no													affected by backwater from wetland, checked upstream manholes
D51486201	D51486203	ManHole	09/30/2015 13:30	yes	1 to 5	17.20	7.42	143.30	5.45	0.04	0.7	0	0.02	1.56	15.00	4884	animal living in stormline below where sample collected and above manhole
D51486216	D51486212	ManHole	09/30/2015 12:15	yes	1 to 5	19.20	7.25	80.00	0.88	0.00	0.8	0	0.05	0.84	6.19	238	
D51488236	D51488236	Outfall	09/30/2015 10:51	no													
D54494201	D54494201	Outfall	09/30/2015 10:15	no													access blocked by blackberries, no flow in upstream manholes
D39460252	D39460252	Outfall	10/15/2015 13:15	yes	1	17.30	6.29	64.90	2.09	0.01	0.4	0	0	0.44	5.51	175	
D42466417	D42466227	ManHole	10/15/2015 11:06	yes	5 to 10	19.20	7.20	88.30	1.91	0.25	0.1	0	0.05	0.99	7.36	< 10	
D42466417	D42466227	ManHole	10/15/2015 11:20	yes	20-30	19.30	7.34	110.10	24.30	0.74	0.24	> 0.25	0.25	2.26	11.20	474	second sample taken due to sudden increase in flow
D48460229	D42460231	ManHole	10/15/2015 14:00	no													
D42476203	D42476203	Outfall	10/09/2015 13:00	no													
D45468241	D45468241	Outfall	10/09/2015 09:25	yes	15-20	17.70	7.93	165.40	0.80	0.02	0.1	0	0	1.02		10	
D45476217	D45476217	Outfall	10/09/2015 13:20	yes	1 to 5	18.00	7.60	201.50	6.56	0.06	0.5	0	0	2.83	8.85	121	
D51470205	D51470205	Outfall	10/09/2015 10:30	no													
D51488203	D51488203	Outfall	10/09/2015 11:25	yes	5 to 10	16.70	7.63	69.60	2.81	0.00	0.6	0	0.02	1.03	6.11	10	
D39478271	D39478270	ManHole	10/15/2015 09:10	yes	15-20	16.50	7.43	127.70	5.46	0.04	0.3	0	0	0.86	13.90	496	
D42476279	D39476232	ManHole	10/15/2015 08:45	no													
D45464207	D45464206	ManHole	10/15/2015 10:35	yes	5 to 10	15.80	7.52	90.90	1.62	0.02	0.5	0	0	0.42	6.23	86	
D54470205	D54470205	Outfall	10/15/2015 10:00	no													

Data in red exceed action levels, see Dry Weather Outfall and Illicit Discharge Screening Plan for more information.

Attachment A. Evaluation of Surface Water and Stormwater Quality Monitoring Data, July 2001 – July 2016

City of Salem
National Pollutant Discharge Elimination System (NPDES)
Municipal Separate Storm Sewer System (MS4)

Evaluation of Surface Water and Stormwater Quality Monitoring Data

July 2001 - July 2016

Prepared by:
City Salem Public Works Department
Stormwater Services

Stormwater Quality Monitoring Staff

November 1, 2016

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Attachment 1.	Salem Modified WQI Calculation Procedure

List of Acronyms

BOD	Biochemical Oxygen Demand (mg/L)
Cond/ Cond (Sp.)	Specific Conductivity (µS/cm)
DO	Dissolved Oxygen (mg/L)
E. coli	*Escherichia coli* (MPN/100 mL)
NO2NO3	Nitrite-Nitrate as N (mg/L)
TSS	Total Suspsended Solids (mg/L)
TS	Total Solids (mg/L)
TDS	Total Dissolved Solids (mg/L)
Cu (Diss) / Cu (Tot)	Copper, dissolved / Copper, total recoverable (mg/L)
Pb (Diss) / Pb (Tot)	Lead, dissolved / Lead, total recoverable (mg/L)
Zn (Diss) / Zn (Tot)	Zinc, dissolved / Zinc, total recoverable (mg/L)
TP	Total Phosphorous (mg/L)
Ortho	Orthophosphates (mg/L)
Temp	Temperature (°C)
Turb	Turbidity (NTU)
Alk	Alkalinity
Hard	Hardness (Total Ca)

1.0 Introduction

In 2008, the City of Salem (City) hired Geosyntec Consultants to review and evaluate the City's available surface water and stormwater data in support of the City's 2008 permit renewal application. In addition to helping inform future monitoring efforts based on the results, the report was also intended to serve as a template for the City to perform its own data analysis for future permit renewals. The final report, "Evaluation of City of Salem Stormwater and Ambient Urban Stream Water Quality Monitoring Data" (Geosyntec Consultants, July 11, 2008), was provided to the City and included as an attachment to the final 2008 permit renewal package.

The City is now operating under its 3rd National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit, which was issued December 30th, 2010 and administratively extended until further notice in December, 2015. The City submitted a permit renewal package with an updated monitoring plan to the Department of Environmental Quality (DEQ) in December 2015. This evaluation document is being submitted now with the 2016 Annual Report so that an additional six months of data could be used for evaluation of long term trends, and still fits into the requirement (written into the City's current monitoring plan) that this document be submitted before the current MS4 permit expires. This evaluation document closely replicates the 2008 Geosyntec report, so that any changes that have occurred over time can be more easily compared.

2.0 Available Monitoring Data

The Geosyntec report was only able to analyze four types of monitoring data (due to availability), and although the City's current NPDES MS4 permit has added new monitoring elements (mercury/methyl mercury, benthic macroinvertebrate, and pesticides), not enough data have been collected for a thorough analysis, and therefore were not included in this evaluation document.

Table 2 summarizes the types of monitoring data that were used, frequency of sampling, parameters collected, and types of analyses completed. The following sub sections describe the data used for this evaluation.

2.1 Monthly Instream Monitoring (formerly Urban Stream Monitoring Data)

This program, formerly called Urban Stream Monitoring, began in July 2001, and consists of grab samples and field measurements being collected once a month on a predetermined basis. There are 21 sites located on 11 different streams within Salem, and with the exception of the upstream Battle Creek site, which was moved in 2003 due to a lack of access, all sites have remained in the same location. Ten of these streams are paired with upstream (at or near where the stream enters the City's jurisdiction) and downstream (at or near where the stream exits the City's jurisdiction or enters a receiving stream) site locations. The eleventh stream, the West Fork Little Pudding River, only has one site location, because the West Fork Little Pudding River starts in the greater Salem area and runs dry during the summer months.

In 2013, Stormwater Services took over the Monthly Instream program from Environmental Services, and merged it with another program, Willamette River Water Quality Sampling Program, to become one large monthly monitoring program. This added three sites on the

Willamette River, located upstream, mid-way, and downstream of city limits. A brief description of each site and its location can be found in Table 3.

A general suite of water quality parameters are collected for each site, with additional water quality parameters analyzed for the sites within the Pringle Creek Watershed (PRI1, PRI5, CLA1, and CLA10), West Fork Little Pudding River (LPW1), and the Willamette River (WR1, WR5, and WR10); these additional parameters are denoted with parentheses in the list below.

Water quality parameters collected include:

- Temperature
- Turbidity
- Specific Conductivity
- pH
- Dissolved Oxygen (DO)
- Nitrate - Nitrite as Nitrogen (NO_3-NO_2-N)
- *Escherichia coli (E. coli)*
- Biochemical Oxygen Demand (BOD_{stream})
- Zinc -total recoverable and dissolved (CLA1, CLA10, PRI1, PRI5 only)
- Copper -total recoverable and dissolved (CLA1, CLA10, PRI1, PRI5 only)
- Lead -total recoverable and dissolved (CLA1, CLA10, PRI1, PRI5 only)
- Hardness (CLA1, CLA10, PRI1, PRI5only)
- Total Suspended Solids (TSS) (LPW1, WR1, WR5, WR10 only)
- Alkalinity (WR1, WR5, WR10 only)
- Ammonia (WR1, WR5, WR10 only)
- Total Phosphorus (TP) (WR1, WR5, WR10 only)
- Total Solids (TS) (WR1, WR5, WR10 only)
- Total Dissolved Solids (TDS) (WR1, WR5, WR10 only)

Due to the geographical distribution of the sites and the duration for which samples have been collected, this is the City's most comprehensive, long term data set and can be used for assessing long term water quality trends and stream health.

2.2 Willamette River Monitoring Data

The Willamette River Water Quality Sampling Program started in the early 1990s as a way of monitoring possible impacts from the Willow Lake Water Pollution Control Facility on the water quality of the Willamette River. This program was not part of any permit requirement, although it did eventually get included in the 2008 Stormwater Management Plan (SWMP). Because it was established for a different workgroup and program, different water quality parameters were collected and the data were not directly comparable with the other urban stream monitoring programs. In 2013 when Willow Lake lab was faced with budget cuts, the Stormwater Services group took ownership of this program and combined it with the Monthly Instream Monitoring Program (see Section 2.1 above). More information about this monitoring element can be found in the *City of Salem Surface Water and Stormwater Monitoring Plan*. For parameter specifics, see above.

2.3 Continuous Instream Monitoring

The City began installing continuous instream monitoring stations in 2006, with the last stations being installed in 2012. To date there are 11 continuous instream water quality / stream gaging stations, and two continuous stream gaging only stations within City limits on seven different streams. The continuous water quality stations collect stage/flow, temperature, dissolved oxygen, specific conductivity, pH, and turbidity data every 15 minutes. It should be noted that data from only 10 of the 11 continuous instream stations was used for this report, as the newest station did not have enough data (a bridge replacement project took the station offline for over a year), and is not included in the City's MS4 permit.

The monitoring stations are positioned in an upstream/downstream configuration. The upstream sites are adjacent to where the stream enters the City and the downstream sites are either above the confluence with another stream or where the stream exits the City's jurisdictional boundary. More information about this monitoring element can be found in the *City of Salem Surface Water and Stormwater Monitoring Plan*. Figure 2 shows the locations of the continuous monitoring stations, and Table 4 provides location details.

Due to the short term record for most of the monitoring stations when the Geosyntec report was completed in 2008, the monitoring stations played a very small role in the 2008 report. This report is the first time data from these stations has been used for long term trends and spatial analyses.

2.4 Instream Storm Monitoring

Instream Storm is a new monitoring element that was added to the current permit, and only 25 samples have been collected, not enough data for a thorough analysis. This monitoring element replaces the instream component of the stormwater sampling requirement of the last permit, in which four stormwater manhole sites were sampled from 2006-2010 with instream grab samples being collected upstream and downstream of the outfall.

This new monitoring element refers to the monitoring of MS4 receiving streams during defined storm events. Sampling occurs at three sites in the Pringle Creek Watershed (continuous instream monitoring sites PRI12, PRI3, and CLK1). Data collected are used to increase understanding of receiving waters within the Pringle Creek Watershed and help guide Salem's stormwater management strategies in watersheds throughout the city. This monitoring element will eventually provide a dataset for long-term trending and spatial analyses.

Sampling consists of flow weighted composite samples, grab samples, and field measurements. Parameters include:

- *E. coli*
- Dissolved Oxygen
- pH
- Temperature
- Specific Conductivity
- Copper (Total Recoverable and Dissolved)
- Zinc (Total Recoverable and Dissolved)
- Lead (Total Recoverable and Dissolved)

- Hardness
- Ammonia Nitrogen (NH_3)
- NO_3+NO_2-N
- Ortho Phosphorus
- Total Phosphorus (TP)
- BOD_{stream}
- TSS

More information about this monitoring element can be found in *the City of Salem Surface Water and Stormwater Monitoring Plan*. Figure 3 shows the locations of the Instream Storm monitoring sites.

2.5 Stormwater Monitoring

The City has been conducting stormwater (in-pipe) sampling since 1995. This monitoring element has seen the most change over the years, starting with four land-use based monitoring sites from 1995-2005 (flow weighted composites), to four modified in-pipe and instream monitoring sites from 2006-2010 (time-weighted composites), and then back to three land-used based monitoring sites (flow-weighted composites) for the current permit. Due to the variation in sites, parameters, and reporting limits for this monitoring element, data was not aggregated together, and instead was shown separately and only used for statistical summaries and box plots. None of the datasets had enough data to determine long term trends, nor were comparable for a spatial analysis.

The pollutant parameters that the samples are analyzed for has also changed over time, each time to reflect the current requirements listed in the NPDES MS4 permit. For this permit term, parameters include:

- *E. coli*
- Dissolved Oxygen
- pH
- Temperature
- Specific Conductivity
- Copper (Total Recoverable and Dissolved)
- Zinc (Total Recoverable and Dissolved)
- Lead (Total Recoverable and Dissolved)
- Hardness
- Ammonia Nitrogen
- NO_3+NO_2-N
- Ortho Phosphorus
- Total Phosphorus
- Biochemical Oxygen $Demand_{5\text{-}day}$
- TSS

Site locations and descriptions can be found in Table 4, Figure 3 shows the locations for the current sampling sites.

3.0 Data Summary and Evaluation

Every year the City provides a general summary of the data collected for the most recent fiscal year as an appendix to the Annual Report. This evaluation document is intended to go above and beyond what is submitted with the Annual Report each year and complete a thorough evaluation of the entire dataset for each of the monitoring elements discussed in Sections 2.1 through 2.5. The same statistical tests that Geosyntec used were used for this evaluation, and whenever possible data are displayed graphically and in tables in a similar fashion for comparability.

3.1 Data Processing / Selection

An initial analysis of data available for each monitoring element was conducted to determine whether enough data existed to perform any type of analysis, and what type of analyses could be conducted. For each dataset, basic descriptive statistics were computed as a first step in the analysis process, and at a minimum, each monitoring element had summary statistics and box plots computed.

Following ACWA guidance, if a data set had 5 years of data and 30 data points it was considered enough data to conduct statistical tests such as spatial and time trends. For the Monthly Instream monitoring element, a minimum of 10 uncensored data points were considered acceptable for metals and Total Suspended Solids, due to the limited duration that theses parameters have been collected.

3.1.1 Seasonality/Rainfall

Whenever rainfall data is available, it is assumed to be the best indicator of seasonal influences on a stream. The City has a network of rain gages across Salem that report in 15 minute increments, many stations have data back to the late 1990s. The Stormwater monitoring group has taken on the QA/QC of some of these stations to assist with data analysis, and for the long term trends and spatial analyses, rainfall was used. If total rainfall in the previous 24 hours was less than 0.1 inches (<0.1 inches), it was considered “No Rain”, and if there was greater than or equal to 0.1 inches (≥0.1 inches), it was considered “Rain”.

Geosyntec’s budget did not allow them to process the City’s vast collection of citywide rainfall data, and therefore they relied on seasonal comparisons of data with year round results. The report attempted to separate out a wet and dry season in order to qualitatively assess the role of rainfall without having to analyze rainfall data. The wet season was defined as October through May (Fall-Winter-Spring), and the dry season was defined as April through September (Summer).

For the sake of comparison of the Monthly Instream data between 2008 and 2016, a balance was struck between using seasons (Water Quality Index, statistical summaries and box plots for Monthly Instream) and rainfall data. When prioritizing between accuracy and comparability, accuracy was deemed more important, and therefore rainfall data was used for the spatial trends analysis and long term trends analysis, as described above.

3.1.2 Method Reporting Limits (MRL)

A review of each data set was conducted to determine whether any changes in Method Reporting Limit had occurred. The only monitoring element that saw a change was Stormwater, and this occurred with the new permit in 2010 when the City was required to adjust their reporting limits for metals lower to be comparable with other Phase I municipalities in Oregon. Because the two Stormwater data sets used in the evaluation were already different enough, the data was not aggregated and instead left separate, therefore no data was omitted or adjusted to compensate for MRL. If future analyses are conducted to try and compare all Stormwater data, this will have to be taken into consideration.

3.1.3 Censored Values

A censored value is any value that is less than or greater than the detection limit (MRL) and is provided from the laboratory with a less than (<) or greater than (>) symbol. Parameters that included censored values were Ammonia, BOD, NO2-NO3, Orthophosphate, Total Phosphorous, E. coli, and metals. If greater than 50 % of the values in a data set were censored, then statistical tests were not conducted on that dataset.

Each Oregon Phase I municipality has chosen different ways of handling censored values; Salem has chosen to remove the < or > symbol and leave the numerical value as it is (set at the detection limit). The statistical tests are not overly influenced with this method of handling less than censored values, because they compensate for ties, and if a value is censored with a less than, the real value is even lower than the method can detect and even less of a water quality concern. Values censored with a greater than symbol (mostly E. coli) are more difficult, because the value could be 10 to 100 times greater than the 2420 MPN/100 mL reporting limit. As a way to try and alleviate future censored E. coli values, all Stormwater and Instream Storm samples, as well as some Monthly Instream sites with recurring high E. coli are run at a dilution (1 to 10 or 1 to 100) to get a more accurate value.

3.1.4 Significance Level

A significance level (α) of 0.05 (95% confidence that a trend exists and the data are statistically different than the null hypothesis) was chosen to establish that a significant increasing or decreasing trend exists. A significance level of 0.1 (90% confidence a trend exists) was used to show that a somewhat significant increasing or decreasing trend exists. If the p-value (results given in statistical test) is less than or equal to the alpha (significance level), than the null hypothesis is rejected and then results are considered statistically significant.

3.2 Graphical Displays of Data

For each monitoring element data set, data were displayed graphically using time trend graphs (time series plots for monthly instream and continuous instream monitoring elements) and box plots (all). Time trend graphs show the entire record and allow a view of how variable some parameters can be, as well as how they have changed over time. These graphs also help visualize if streams are meeting applicable water quality criteria (see Table 1). When appropriate, water quality criteria were displayed to show exceedances. This mostly applies to Dissolved Oxygen, Temperature, E. coli, and pH.

Box plots display the medians of each dataset in a side by side comparison of statistical characteristics. Each boxplot shows:

- central tendency, or spread of the data;
- confidence intervals for the median;

- skewness of the data; and
- presence of any outliers in the dataset (symbolized with asterisk).

3.3 Summary Statistics

Basic descriptive summary statistics were computed and provided for each dataset, and tailored to provide the most useful data for each dataset. Generally, each table includes number of samples (N), minimum, maximum, mean, median, and percentile statistics. For Monthly Instream, the Summary Statistics are also provided with the box plots for easier visualization and comparison.

3.4 Spatial Observations: Mann-Whitney Statistical Comparison

In order to evaluate the potential influence of discharges from the MS4 on receiving stream water quality, a spatial analysis was done on instream water quality parameters by comparing upstream and downstream monitoring site/station data. The statistical software package, Minitab 17, was used for all analyses. The non-parametric Mann-Whitney (rank-sum) test was used, and for each site/station and parameter, the null hypothesis (that upstream and downstream data is equal) was selected. The test was then run for less than, not equal to, or greater than (with confidence level of 95%). If the results for less than, not equal to, or greater than all had a p-value > 0.5, it was assumed that the null hypothesis was correct. If the p-value was < 0.5 for less than, not equal to, or greater than, the direction of the trend was noted in the table.

3.4.1 Continuous Instream

For Continuous Instream monitoring stations, the sheer volume of data required the daily medians for each parameter to be compared. Using the Aquarius Times Series Database, upstream and downstream stations on each stream were grouped together and separated by "Rain" (≥0.1 inch rain) or "No Rain" (<0.1 inch). For this analysis, only grade A quality data with more than 80 percent data available each day was used. Once the data had been grouped, it was mined to remove any blanks (i.e. each station had to have a median for that day), with an end result being one dataset with the sample sample size for each creek. Because the data is a daily median, and only computed if more than 80% data existed for that day, variability between upstream and downstream stations should be fairly consistent. The results for Continuous Instream Monitoring Stations can be found in Table 10, separated by "Rain" and "No Rain".

3.4.2 Monthly Instream

This data set consists of discrete samples, not times series like Continuous Instream, so the raw, untransformed data was used for this spatial analysis. For comparability with the 2008 Geosyntec report, year round median values were computed by the software. Because sampling for the upstream and downstream site is done in the same day and somewhat similar time frame, it was assumed that the sites would receive similar rainfall, and that this seasonality would be captured in the year round comparison. The results for Monthly Instream sites can be found in Table 7.

3.4.3 Instream Storm

The 25 sampling events for Instream Storm were used to get a general idea of difference between stormwater influences on upstream and downstream locations. CLK1 (upstream of the confluence with Pringle Creek) was compared to PRI3 (upstream of the confluence with Shelton Ditch), and PRI12 was compared to PRI3. The raw, untransformed data were used for this analysis. Sampling is only done during rain events, so this variable was not analyzed. Results can be found in Table 13.

3.5 Time Trend Analysis: Seasonal Mann-Kendall Trend Analysis

To evaluate long term trends on the streams throughout Salem, a time trend analysis was done of each parameter for each Monthly Instream site and Continuous Instream monitoring station. This time trend analysis was done using the Mann-Kendall statistical test, which compares one parameter against itself over time to determine a trend. Seasonality was removed by separating data by “Rain” and “No Rain” to remove inherent variability that is typical in environmental data. The test assumes the null hypothesis (water quality parameter does not change over time), and the test provides results with whether or not the null is rejected, and if so which direction the trend is going in.

3.5.1 Continuous Instream

As was done for the Mann-Whitney statistical test, the daily medians were used for each monitoring station. Grade A and B quality data were used when coverage was 80% or greater in a day, and data was separated between “Rain” and “No Rain”. The results for Continuous Instream monitoring stations can be found in Table 11.

3.5.2 Monthly Instream

Although the Geosyntec report used seasons to separate the Monthly Instream data instead of rainfall, it was decided to use rainfall for this evaluation, because it is the most accurate way to remove variability. This makes the data slightly less comparable to the 2008 report, but provides a better picture of the City’s effect on water quality. Results for Monthly Instream sites can be found in Table 8.

3.6 Oregon Water Quality Index

The Oregon DEQ developed the Oregon Water Quality Index (WQI) as a way of comparing spatial and temporal changes in water quality and providing streams/rivers with a rating from “very poor” to “excellent”. Following Geosyntec’s lead, once again the Monthly Instream sites were used to calculate WQI scores to provide an overall picture of water quality and stream health.

The WQI score is a single number computed from eight different water quality variables (temperature, dissolved oxygen, biochemical oxygen demand, pH, ammonia nitrogen, total phosphorus, total solids, and fecal coliform). This method originated in the 1970s and was modified in 2001 and 2005 by Curtis Cude (Evaluating Water Quality Management Effectiveness, Cude 2005). For each parameter, a sub-index is computed and then the subindexes are combined as an unweighted square harmonic mean to provide one value (rating). The values range from 0 to 100.

Because the Monthly Instream data do not include measurements for ammonia nitrogen, total phosphorus, total solids, or fecal coliform, some adaptations had to be made. A modified OWQI (referred to as Salem Modified WQI) was computed based on six parameters instead of eight, following procedures documented by Geosyntec (Attachment 1). Additionally, nitrate-nitrite data was substituted for ammonia nitrogen, and an expression was used to convert E. coli to fecal coliform. It should be noted that a stream could rate very well on 5 out of the 6 parameters, but if a single parameter or parameters were low enough, a station would receive a very low score. In the future, it might be beneficial to assess each sub index and provide that data as well. Scores for the Monthly Instream sites can be found in Table 5, along with a comparison to the 2008 scores.

4.0 Review and Evaluation of Results

Tables and Figures are grouped by monitoring element so that all results can be looked at as a whole, and compared to 2008 Geosyntec report. Therefore, discussion of results in the sections below will be grouped by monitoring element, not type of analysis like they were above.

4.1 Monthly Instream Monitoring Data

Monthly Instream results can be found in Tables 5 through 8, and Figures 4 and 5.

4.1.1 Water Quality Index Results

Table 5 provides the Year Round, Summer, and Fall-Winter-Spring results for the 21 urban stream Monthly Instream sites, as well as the 3 Willamette River sites. Table 5 also shows a comparison between the Mean Year Round scores for 2016 and 2008. The results support the following observations:

- All urban streams received a Year Round rating of poor or very poor. All Willamette River sites received a Year Round rating of good or excellent.
- The Summer scores were better for larger streams, while the Fall-Winter-Spring scores were better for smaller urban streams. This could be due to low flow affecting dissolved oxygen, E. coli and temperatures on the smaller streams in summer, and nitrate levels affecting the larger streams in the winter.
- Depending on the stream, some upstream sites had higher scores than downstream sites, while others had lower upstream scores and higher downstream scores.
- E.coli, BOD, and Nitrate levels had the most significant impact on scores; most stations had very good pH, Temperature, and Dissolved Oxygen scores.
- With the exception of two stations, the Year Round Mean ratings from 2016 were an improvement over 2008.

4.1.2 Statistical Summaries of Parameters

- Biochemical Oxygen Demand (BOD) summary statistics for 2001-2016 showed slight improvement (decreasing numbers), in general, over 2001-2007 scores.

- Dissolved Oxygen (DO) summary statistics for 2001-2016 showed improvement (increasing numbers), in general, over 2001-2007.
- E. coli summary statistics shows a bit more variability, with some sites showing improvement over 2001-2007 results, while others showed the opposite. The number of exceedances went up, because the sample size (N) is larger (over double the number of data points), however percent exceedances stayed roughly the same or decreased at some stations.
- Nitrate-Nitrite levels at most stations decreased (significantly at LPW1) or stayed about the same, with the exception of Mill Creek, Mill Race, Pringle Creek, and Shelton Ditch sites where levels increased.
- pH summary statistics stayed the same or increased slightly at most stations.
- Specific Conductivity statistics increased at all stations from 2001-2007 to 2001-2016.
- Temperature statistics were fairly variable, with roughly equal amounts staying the same, decreasing, and increasing.
- Turbidity statistics did not change dramatically between 2001-2007 and 2001-2016.

The Summary Statistics paint a very broad and general picture of how parameters have changed over the length of this monitoring element. The Mann-Kendall statistical analysis of trends over time will provide a better evaluation of these changes by site.

4.1.3 Mann-Whitney Statistical Comparison of Upstream/Downstream Median Values (Year Round)

The spatial comparison of upstream and downstream median values for Monthly Instream sites show quite a substantial increase in the number of stations that have statistically significant differences in upstream-downstream results compared to 2001-2007. For the 2008 Geosyntec report, only 17 of the upstream/downstream comparisons by parameter rejected the null hypothesis (Ho), meaning that median values between upstream and downstream sites were statistically different. For this report, 59 of the upstream/downstream comparisons by parameter rejected the null hypothesis. None of the 17 Reject Ho changed from 2008 and 2016 (i.e. if the downstream site was statistically greater in 2008, it was still that way in 2016). It should be noted that metals data for the Clark and Pringle sites, and all data for the downstream and middle Willamette River sites were included in this report, but where not available in the 2008 report.

For this evaluation, with a few exceptions, most sites show a decline in water quality from upstream to downstream. This typically includes increase in BOD, increase in temperature, increase in NO2-NO3, and increase in E.coli. For dissolved oxygen, about half of the stations showed an increase in DO levels downstream (improvement in water quality).

4.1.4 Season Mann-Kendall Long Term Trend Analysis

Because the 2008 and 2016 results used different variables to distinguish seasonality (defined seasons versus rainfall), a thorough comparison of results from the two reports will not be discussed. Instead, discussion will revolve around current trends, separated by Rain and No Rain.

During periods of Rain, most monitoring sites show improving trends, where significant trends existed. These generally included decreasing BOD, decreasing nitrate-nitrite, decreasing metals, and one decreasing E. coli trend at SHE10. There were four sites (CLA10, GLE1, GLE10, and WR5) that did show increasing trends in E. coli (declining water quality).

During periods of No Rain, the number of significant trends increased dramatically, with most showing significant improvement (increasing dissolved oxygen, decreasing E. coli, decreasing BOD, decreasing nitrate-nitrite, and decreasing metals). There were four sites again that had increasing trends in E.coli (CGT5, GIB15, GLE10, WR5).

Regardless of location or rainfall, the majority of sites have been showing an increase in Specific conductivity since 2001. This could be due to an increase in total dissolved solids (TDS), however this increase is not being considered a declining water quality trend.

4.1.5 Graphical Displays

The time trend graphs and box plots provided in Figures 4 and 5 show how much sites vary across the city.

With the exception of E. coli which has a single sample criterion, water quality criteria were not displayed on the graphs. Monthly instream parameters are collected once a month at a single moment in time, and do not accurately represent how a stream is meeting water quality criteria for dissolved oxygen or temperature. These parameters are very diurnal, and further temperature water quality criteria are based upon a 7-day moving average maximum, which cannot be determined with a single data point a month. Time trend graphs are provided to graphically display trends in data over time, by stream.

4.2 Continuous Instream

Results for continuous instream can be found in Tables 9 through 11 and Figures 6 and 7All data for the Continuous Instream monitoring element was separated by Rain/No Rain. Because the Continuous Instream monitoring stations were fairly new in 2008, they played a very minor role in the Geosyntec report. Therefore, there is very little to compare between 2008 and 2016. Instead, the following discussion will focus around how the stations have changed over time (as shown by the different statistical tests) by parameter.

4.2.1 Dissolved Oxygen

- Battle Creek: Both stations routinely drop below the cold water criteria of 8 mg/L in the summer. The downstream station also often is below the minimum spawning criteria in the winter of 11 mg/L. The median values at the upstream station are statistically greater than the downstream. Overall, Battle Creek showed a decreasing trend in dissolved oxygen during Rain and No Rain.
- Clark Creek: Both stations will sporadically fall below the cold water criteria, and both stations are often below the minimum spawning criteria, with the upstream station being a greater offender than the downstream. The median values at the downstream station are statistically greater than the upstream. Clark Creek showed a decreasing trend in dissolved oxygen only during No Rain.
- Glenn Creek: Both stations will sporadically fall below the cold water criteria, and both stations have fallen below the minimum spawning criteria at some point. The median

values at the upstream station are statistically greater than the downstream. The upstream station had an increasing trend in dissolved oxygen during Rain and No Rain, while the downstream station had a decreasing trend in dissolved oxygen during Rain and No Rain.

- Mill Creek: Neither station has fallen below the cool water criteria of 6.5 mg/L, and both stations exceed the minimum spawning criteria more often than not. The median values at the downstream station are statistically greater than the upstream. Mill Creek showed a decreasing trend in dissolved oxygen only during No Rain.
- Pringle Creek: The upstream station has only a cold water criteria, which it drops below during the hot summer months, and the downstream site has a cool water criteria which it always stays above, however it does fall below the minimum spawning criteria. The median values at the downstream station are statistically greater than the upstream. Pringle Creek showed an increasing trend in dissolved oxygen at the upstream station during No Rain.

4.2.2 pH

- Battle Creek: The upstream station rarely falls below the low standard of 6.5, and never exceeds the high standard of 8.5. The downstream station often drops below the low standard, and never exceeds the high standard. Median pH values at the upstream station are statistically greater than downstream, and there is an increasing trend in pH at both during Rain and No Rain.
- Clark Creek: Neither station exceeds the high standard, and the upstream station frequently dips below the low standard while the downstream station only does so sporadically. pH values at the downstream station are statistically greater than upstream, and there is an increasing trend at the upstream station during Rain and No Rain, and a decreasing trend at the downstream station during No Rain.
- Glenn Creek: Both upstream and downstream stations stay between the low and high standard, with only minor dips below the low standard. Median pH values at the downstream station are statistically greater, and a decreasing trend in the downstream station during Rain, and an increasing trend at the upstream and downstream station during No Rain.
- Mill Creek: Both upstream and downstream station stay between the low and high standard, with only minor dips below the low standard. Median pH values at the downstream station are statically greater than upstream, and there is an increasing trend in pH at both during Rain and No Rain.
- Pringle Creek: Both stations stay below the high standard, and the upstream station dips below the low standard sporadically. The median pH values at the downstream station are statistically greater than the upstream, and there is an increasing trend at both during Rain and No Rain.

4.2.3 Specific Conductivity

There are no water quality criteria associated with specific conductivity. For all stations, the median specific conductivity values at the downstream station are statistically greater than the upstream station, regardless of Rain or No Rain. Battle Creek had a decreasing trend in specific conductivity during Rain, and downstream Clark and downstream Glenn had decreasing trends in specific conductivity during No Rain.

4.2.4 Temperature

All stations have a Year Round Criteria (Non-Spawning) of 18 degrees Celsius, and every station (upstream and downstream) has exceeded this criteria at some point. Mill Creek also has additional temperature criteria for Salmon/Steelhead Spawning of 13 degrees Celsius from October 15-May15, which it has sporadically exceeded.

- Battle Creek: Median temperature values at downstream station are statistically greater than upstream, and there is an increasing trend during Rain and No Rain at both stations.
- Clark Creek: Median temperature values at upstream site are statistically greater than downstream during Rain, while downstream values are statistically greater than upstream during No Rain. Both stations show an increasing trend in temperature during Rain and No Rain.
- Glenn Creek: Median temperature values at downstream site are statistically greater than upstream site, and there is an increasing trend in temperature at both stations during Rain and No Rain.
- Mill Creek: Median temperature values at downstream station were statistically higher than upstream during No Rain (no trend during Rain), and there is an increasing trend at both stations during Rain and No Rain.
- Pringle Creek: Median temperature values at downstream station are statistically greater than upstream station, and there is an increasing trend at both stations during Rain (no trend present during No Rain).

4.2.5 Turbidity

There are no water quality criteria associated with turbidity, and it tends to be extremely variable.

- Battle Creek, Clark Creek, and Glenn Creek had statistically greater medians at downstream stations during Rain, while Mill Creek and Pringle Creek had statistically greater medians at upstream stations during Rain.
- Battle Creek had statistically greater medians downstream during No Rain, while Clark and Glenn Creek were not statistically different, and Mill and Pringle had statistically greater medians at upstream stations during No Rain.
- With the exception of upstream Pringle Creek during No Rain, all other stations had decreasing trends over time during Rain and No Rain.

4.3 Continuous Instream

Results for Continuous Instream statistical analyses can be found in Tables 12 and 13, and Figures 8 and 9. As can be seen in the box plots, for the most part, CLK1 had the poorest water quality during storm events. This can be seen in the high ammonia, BOD, copper, E. coli, lead, Orthophosphate, temperature, total phosphorus, and zinc data. PRI12 was worse for Nitrate-Nitrite.

The data from 2006-2010 was more difficult to analyze, and did not necessarily show the same results. Those samples were collected as grab samples, while the Instream Storm for 2010-2016 are from a flow-weighted composite of the entire storm event, and therefore represents a more accurate depiction of the effects on receiving streams.

Results of the spatial comparison of CLK1 vs PRI3 show the same picture of water quality being worse at CLK1 than PRI3, and it should be noted that water from Pringle Creek dilutes the influences of Clark Creek by the time it gets to PRI3. Also as expected, when comparing PRI12 vs PRI3, water quality declines from upstream (at City limits) to downstream, potentially in part due to the influence of Clark Creek.

4.4 Stormwater

Results for Stormwater statistical analyses can be found in Table 14 and 15, and Figures 10 and 11 Results varied greater by parameter and land use type, see box plots for specific comparisons.

It should be noted for both Instream Storm and Stormwater results from 2010-2016, E.coli results appear higher than 2006-2010. This does not necessarily indicate a greater E. coli problem, but instead is indicative of more accurate lab results, because samples are now run at a 1 to 10 and 1 to 100 dilution. Most of the 2006-2010 E. coli results were censored and capped at >2419.

5.0 Conclusion

This report in its entirety summarizes the influence that MS4 discharges (stormwater) have on water quality parameters throughout Salem’s streams. There is data to indicate some improving trends over time, which we hope continues into the future. It is also evident that as more data are collected for each monitoring type and as sample size increases, the statistical tests become more accurate. The results from this report can be used to help guide the City in permit negotiations and in continuing to encourage and require low impact development and on-site treatment of stormwater runoff.

Table 1.
303 (d) Listings from DEQ 2010 Integrated Report
Salem Streams within Middle Willamette Basin

Waterbody	River Miles	Parameter	Season	Criteria
Battle Creek	0 to 9.1	Dissolved Oxygen	January 1 - May 15	Spawning: Not less than 11.0 mg/L or 95% of saturation
			Year Around (non-spawning)	Cold water: Not less than 8.0 mg/L or 90% of saturation
Claggett Creek	0 to 5.2	Biological Criteria	Year Around	Biocriteria: Waters of the state must be of sufficient quality to support aquatic species without detrimental changes in the resident biological communities.
		Dissolved Oxygen	January 1 - May 15	Spawning: Not less than 11.0 mg/L or 95% of saturation
			Year Around (non-spawning)	Cool water: Not less than 6.5 mg/L
		Dieldrin	Year Around	Table 40 Human Health Criteria for Toxic Pollutants
Clark Creek	0 to 1.9	Dissolved Oxygen	January 1 - May 15	Spawning: Not less than 11.0 mg/L or 95% of saturation
		Biological Criteria	Year Around	Biocriteria: Waters of the state must be of sufficient quality to support aquatic species without detrimental changes in the resident biological communities.
Croisan Creek	0 to 6.5	Dissolved Oxygen	January 1 - May 15	Spawning: Not less than 11.0 mg/L or 95% of saturation
			Year Around (non-spawning)	Cold water: Not less than 8.0 mg/L or 90% of saturation
		Dissolved Oxygen	October 1 - May 31	Spawning: Not less than 11.0 mg/L or 95% of saturation
Gibson Gulch	0 to 2.8	Biological Criteria	Year Around	Biocriteria: Waters of the state must be of sufficient quality to support aquatic species without detrimental changes in the resident biological communities.
Glenn Creek	0 to 7	Dissolved Oxygen	January 1 - May 15 (residential trout)	Spawning: Not less than 11.0 mg/L or 95% of saturation
			October 1 - May 31 (salmonid fish spawning)	Spawning: Not less than 11.0 mg/L or 95% of saturation
			Year Around (non-spawning)	Cool water: Not less than 6.5 mg/L
			Year Around (non-spawning)	Cold water: Not less than 8.0 mg/L or 90% of saturation
	4.1 to 7	Dissolved Oxygen	October 15 - May 15	Spawning: Not less than 11.0 mg/L or 95% of saturation
Mill Creek	0 to 19	Copper	Year Around	Table 20 Toxic Substances
Pringle Creek	0 to 6.2	Dieldrin	Year Around	Table 20 Toxic Substances
		Dissolved Oxygen	October 15 - May 15	Spawning: Not less than 11.0 mg/L or 95% of saturation
		Lead	Year Around	Table 20 Toxic Substances
		Zinc	Year Around	Table 20 Toxic Substances
		Biological Criteria	Year Around	Biocriteria: Waters of the state must be of sufficient quality to support aquatic species without detrimental changes in the resident biological communities.
Pringle Creek Trib	0 to 2.8	Heptachlor		Table 20 Toxic Substances
		Dissolved Oxygen	October 15 - May 15	Spawning: Not less than 11.0 mg/L or 95% of saturation
Shelton Ditch	0 to 2.2	Dissolved Oxygen	January 1 - May 15	Spawning: Not less than 11.0 mg/L or 95% of saturation
West Fork Little Pudding	0 to 5.1	Biological Criteria	Year Around	Biocriteria: Waters of the state must be of sufficient quality to support aquatic species without detrimental changes in the resident biological communities.
Willamette River	54.8 to 108	Iron	Year Around	Table 20 Toxic Substances
		Dissolved Oxygen	October 1 - May 31	Spawning: Not less than 11.0 mg/L or 95% of saturation
	54 to 186.5	Dissolved Oxygen	October 15 - May 15	Spawning: Not less than 11.0 mg/L or 95% of saturation

Table 2.
Summary of Data Collected and Analyses Completed

Monitoring Element	Collection Method	Years	# of sites	Frequency	Parameters	Analyses completed:
Monthly Instream Sampling - Urban Streams	grab samples, field measurements	2001 - present	21	Monthly	Biochemical Oxygen Demand (BOD), Temperature, Dissolved Oxygen (DO), Turbidity, Conductivity, pH, Nitrate-Nitrite, E. coli, Total Suspended Solids (TSS)[1], Copper[2], Lead[2], Zinc[2], Hardness[2]	summary statistics, spatial trends comparison between up/down sites, long term trends by parameter, boxplots, time trend graphs
Monthly Instream Sampling - Willamette River	grab samples, field measurements	2000 - present	3	Monthly	Alkalinity, BOD, Conductivity, DO, pH, Temperature, Turbidity, TSS, Total Solids, Total Dissolved Solids, Total Phosphorus (TP), Ammonia Nitrogen, Nitrate-Nitrite, Copper, Lead, Zinc	summary statistics, spatial trends comparison between up/down sites, long term trends by parameter, boxplots, time trend graphs
Continuous Instream	In-situ field measurements	2006 - present	10	15 minutes	DO, temperature, conductivity, turbidity, pH, stage, flow	summary statistics, spatial trends comparison between up/down stations, long term trends by parameter, boxplots time trend graphs
Instream Storm	grab samples, field measurements, flow weighted composites	2010-present	3	5 times a year	BOD, TSS, Hardness, Temperature, DO, conductivity, pH, Nitrate-Nitrite, Ammonia Nitrogen, TP, Copper, Lead, Zinc, Ortho Phos.	Summary Statistics, Boxplots, Spatial comparison of upstream/downstream sites
Stormwater - 2010 to 2016	grab samples, field measurements, flow weighted composites	2010-present	3	3 times a year	BOD, TSS, Hardness, Temperature, DO, conductivity, pH, Nitrate-Nitrite, Ammonia Nitrogen, TP, Copper, Lead, Zinc, Ortho Phos.	Summary Statistics, Boxplots
Stormwater - 2006 to 2010	grab samples, field measurements, time weighted composites	2006-2010	4	15 times	Copper, Lead, Zinc, E.coli, TP, pH, Temperature, Hardness, TSS,	Summary Statistics, Boxplots
Pesticides	grab samples	2010-2015	3	4 times total	halogenated pesticide screen, chlorinated herbicide screen	Not enough data for analysis
Mercury	grab samples	2010-2015	2	4 times total	low level methyl mercury (total and dissolved), low level mercury (total and dissolved)	Not enough data for analysis
Macroinvertebrates	physical habitat data collection, macroinvertebrate collection	2010-2015	3	2 times total	physical habitat data, macroinvertebrates	Not enough data for analysis

[1] TSS collected at LPW1, WR1, WR5, WR10 only

[2] Copper, Lead, Zinc, and Hardness collected at CLA1, CLA10, PRI1, and PRI5 only

Table 3.
Site Descriptions for Monthly Instream Sites

Monthly Instream			
Site ID	**Stream Location**	**Site Location**	**General Land Use Description**
BAT 1	Battle Creek (Downstream)	Commercial St SE @ I-5	Commercial/Residential
BAT 12	Battle Creek (Upstream)	Rees Hill Rd SE	Residential/Forested
CGT 1	Claggett Creek (Downstream)	Mainline Dr NE	Industrial/Commercial
CGT 5	Claggett Creek (Upstream)	Hawthorne St NE @ Hyacinth St NE	Residential/Commercial
CLA 1	Clark Creek (Downstream)	Bush Park	Residential
CLA 10	Clark Creek (Upstream)	Ewald St SE	Residential
CRO 1	Croisan Creek (Downstream)	Courthouse Athletic Club	Residential/Agricultural/Forested
CRO 10	Croisan Creek (Upstream)	Ballantyne Rd S	Forested/Agricultural
GIB 1	Gibson Creek (Downstream)	Wallace Rd NW	Residential
GIB 15	Gibson Creek (Upstream)	Brush College Rd NW	Agricultural/Forested
GLE 1	Glenn Creek (Downstream)	River Bend Rd NW	Agricultural/Residential
GLE 10	Glenn Creek (Upstream)	Hidden Valley Dr NW	Residential/Forested
LPW 1	West Fork Little Pudding River	Cordon Rd NE	Agricultural/Residential
MIC 1	Mill Creek (Downstream)	Front St Bridge	Commercial/Industrial
MIC 10	Mill Creek (Upstream)	Turner Rd SE	Agricultural
MRA 1	Mill Race (Downstream)	High St SE	Commercial
MRA 10	Mill Race (Upstream)	Mill Race Park	Commercial/Residential
PRI 1	Pringle Creek (Downstream)	Commercial St Bridge	Commercial
PRI 5	Pringle Creek (Upstream)	Bush Park	Residential/Commercial
SHE 1	Shelton Ditch (Downstream)	Church St SE	Commercial
SHE 10	Shelton Ditch (Upstream)	State Printing Office	Industrial/Commercial/Agricultural
WR1	Willamette River (Downstream)	Sunset Park (Keizer)	Residential/Forested
WR5	Willamette River (Middle)	Union St. Railroad Bridge	Commercial/Industrial
WR10	Willamette River (Upstream)	Halls Ferry Road (Independence)	Agricultural

Table 4.
Site Descriptions for Continuous Instream Monitoring Stations / Instream Storm Sampling Sites & Stormwater Sampling Sites

Continuous Instream Monitoring Stations / Instream Storm Sampling Sites			
Site ID	Stream Location	Site Location	General Land Use Description
BAT3	Battle Creek (Downstream)	Commercial St SE	Commercial/Residential
BAT12	Battle Creek (Upstream)	Lone Oak Rd SE	Residential/Forested
CLK1[1]	Clark Creek (Downstream)	Bush Park	Residential
CLK12	Clark Creek (Upstream)	Ewald St SE	Residential
GLE3	Glenn Creek (Downstream)	Wallace Rd NW	Residential
GLE12	Glenn Creek (Upstream)	Hidden Valley Dr NW	Residential/Forested
MIC3	Mill Creek (Upstream)	North Salem High School	Residential/Commercial
MIC12	Mill Race (Downstream)	Turner Rd SE	Agricultural
PRI3[1]	Pringle Creek (Downstream)	Pringle Park	Commercial/Residential
PRI12[1]	Pringle Creek (Upstream)	Trelstad Ave SE	Agricultural/Commercial
SHE3[2]	Shelton Ditch (Downstream)	Winter St. Bridge	Commercial

[1] Instream Storm Sampling conducted at these monitoring stations

[2] This monitoring station w as installed in July 2012, and then w as non-operational FY 15/16 w hile Winter St. Bridge w as replaced, therefore data w as not used in analyses

Stormwater Sampling Sites (2010-2016)			
Site Id	Receiving Stream	Site Location	Land Use Type
Electric	Clark Creek	Electric St. SE and Summer St. SE	Residential
Hilfiker	Pringle Creek	Hilfiker Ln. SE and Commercial St. SE	Commercial
Salem Industrial	Claggett Creek	Salem Industrial Dr. NE and Hyacinth St. NE	Industrial

Stormwater Sampling Sites (2006-2010)			
Site Id	Receiving Stream	Site Location	Land Use Type
Clark Storm	Clark Creek	Vista Ave & Winter St.	Residential/Commercial
Glenn Storm	Glenn Creek	Popcorn St. & Sunburst Ave	Residential
Mill Storm	Mill Creek	D St. SE & Church St NE	Residential/Commercial
Pringle Storm	Pringle Creek	Wilbur St. & 12th St. SE	Commercial/Industrial

Table 5.
Oregon Water Quality Index (WQI)
Monthly Instream Monitoring Sites

2001-2016 Water Quality Index											
WQI	Year Round					Summer			Fall-Winter-Spring		
Location	N	Mean	Min	Max	Rating	N	Mean	Rating	N	Mean	Rating
BAT1[1]	177	**65**	17	89	poor	58	**50**	very poor	119	**73**	poor
BAT12[1]	153	**74**	24	91	poor	50	**72**	poor	103	**75**	poor
CGT1[1]	173	**69**	17	90	poor	56	**62**	poor	117	**73**	poor
CGT5[1]	144	**59**	16	91	very poor	30	**38**	very poor	114	**65**	poor
CLA1[1]	175	**62**	17	88	poor	58	**59**	very poor	117	**64**	poor
CLA10[1]	178	**62**	17	88	poor	59	**56**	very poor	119	**64**	poor
CRO1[1]	176	**73**	22	94	poor	57	**67**	poor	119	**76**	poor
CRO10[1]	177	**78**	22	94	poor	58	**75**	poor	119	**80**	fair
GIB1[1]	174	**71**	23	90	poor	56	**76**	poor	118	**68**	poor
GIB15[1]	172	**52**	17	93	very poor	54	**52**	very poor	118	**53**	very poor
GLE1[1]	173	**69**	22	89	poor	56	**69**	poor	117	**69**	poor
GLE10[1]	160	**71**	22	94	poor	46	**69**	poor	113	**72**	poor
LPW1[1]	123	**59**	17	91	very poor	16	**46**	very poor	107	**61**	poor
MIC1[1]	175	**65**	17	92	poor	58	**78**	poor	117	**58**	very poor
MIC10[1]	173	**68**	17	93	poor	55	**86**	good	118	**59**	very poor
MRA1[1]	160	**68**	17	93	poor	56	**82**	fair	104	**61**	poor
MRA10[1]	174	**65**	22	89	poor	58	**80**	fair	116	**57**	very poor
PRI1[1]	165	**69**	22	92	poor	58	**84**	fair	107	**60**	poor
PRI5[1]	173	**74**	17	90	poor	57	**75**	poor	116	**69**	poor
SHE1[1]	175	**67**	22	95	poor	57	**86**	good	118	**58**	very poor
SHE10[1]	176	**66**	17	92	poor	58	**84**	fair	118	**57**	very poor
Willamette River Sites											
WR1	236	**90**	71	96	excellent	103	**90**	excellent	135	**90**	excellent
WR5	237	**90**	53	96	excellent	103	**90**	excellent	134	**89**	good
WR10	35	**87**	27	94	good	11	**89**	good	24	**86**	good

[1] WQI was modified to incorporate 6 parameters (Temperature, DO, BOD, pH, NO2NO3, E.coli) instead of 8 (no TS or TP data) due to data availabilty. Modification followed same protocol Geosyntec used in previous study.

Attachment 1)

WQI	2016	2008
Location	Mean	Mean
BAT1	**65**	**58**
BAT12	**74**	**68**
CGT1	**69**	**69**
CGT5	**59**	**53**
CLA1	**62**	**58**
CLA10	**62**	**64**
CRO1	**73**	**72**
CRO10	**78**	**75**
GIB1	**71**	**67**
GIB15	**52**	**46**
GLE1	**69**	**73**
GLE10	**71**	**66**
LPW1	**59**	**52**
MIC1	**65**	**61**
MIC10	**68**	**65**
MRA1	**68**	**63**
MRA10	**65**	**63**
PRI1	**69**	**68**
PRI5	**74**	**70**
SHE1	**67**	**65**
SHE10	**66**	**64**
WR1	**90**	**NA**
WR5	**90**	**90**
WR10	**87**	**NA**

very poor	10-59
poor	60-79
fair	80-84
good	85-89
excellent	90-100
improving score	
declining score	

Table 6a.
Statistical Summary for Biochemical Oxygen Demand
Monthly Instream Monitoring Sites (2001-2016)

Biological Oxygen Demand (mg/L) 2001-2016																		
Monitoring Site	Year Around						Summer						Fall-Winter-Spring					
	N	Median	Mean	90th percentile	Min	Max	N	Median	Mean	90th percentile	Min	Max	N	Median	Mean	90th percentile	Min	Max
BAT1	179	1.18	1.4	2.00	0.5	7	60	1.10	1.54	2.34	0.5	7	119	1.2	1.27	1.82	0.6	3.69
BAT12	179	1.1	1.2	1.80	0.4	7.8	60	1.00	1.31	2	0.4	7.8	119	1.1	1.18	1.7	0.5	3.5
CGT1	179	1.8	2.1	3.22	0.4	9.7	60	1.89	2.34	4.49	0.9	9.7	119	1.8	1.94	2.738	0.4	4.99
CGT5	146	1.75	2.3	3.37	0.9	9.9	31	2.00	2.81	7.1	1.2	9.9	115	1.7	2.11	3.16	0.9	9.59
CLA1	179	1.2	1.5	2.50	0.6	9.4	60	1.00	1.39	2	0.6	9.4	119	1.3	1.54	2.5	0.63	5.47
CLA10	179	1	1.2	1.91	0.2	4.18	60	1.00	1.16	2	0.4	4.18	119	1.07	1.18	1.82	0.2	3.9
CRO1	179	1.17	1.3	1.89	0.4	8.7	60	1.09	1.38	2	0.5	8.7	119	1.2	1.28	1.874	0.4	3.77
CRO10	178	1.175	1.3	1.90	0.4	6.2	59	1.10	1.31	2	0.4	6.2	119	1.2	1.23	1.7	0.5	3.02
GIB1	178	1.195	1.3	2.00	0.5	7.81	59	1.15	1.47	2.06	0.5	7.81	119	1.2	1.26	1.858	0.5	3.3
GIB15	176	1.2	1.4	2.00	0.5	9.4	57	1.05	1.53	2.58	0.55	9.4	119	1.2	1.27	1.72	0.5	3.85
GLE1	176	1.2	1.3	1.95	0.3	7.86	58	1.02	1.38	2	0.3	7.86	118	1.3	1.28	1.8	0.3	3.6
GLE10	165	1	1.1	1.66	0.05	5.7	48	0.94	1.26	2.12	0.05	5.7	117	1	1.02	1.446	0.2	2.18
LPW1	125	1.5	2.1	2.70	0.66	26.8	17	2.70	3.69	7.41	1	9.9	108	1.5	1.79	2.23	0.66	26.8
MIC1	176	1.19	1.2	1.80	0.3	3.5	60	0.93	1.05	1.6	0.5	3.5	116	1.3	1.30	1.8	0.3	2.43
MIC10	178	1.2	1.3	1.70	0.6	3.8	59	1.10	1.16	1.62	0.6	2	119	1.4	1.38	1.734	0.6	3.8
MRA1	177	1.3	1.4	2.00	0.5	3.26	59	1.00	1.15	1.76	0.5	2.2	118	1.4	1.47	2	0.64	3.26
MRA10	178	1.25	1.3	1.95	0.58	6.2	60	1.00	1.22	1.73	0.6	6.2	118	1.36	1.38	1.953	0.58	2.84
PRI1	167	1.3	1.4	2.00	0.5	4	60	1.00	1.16	1.61	0.6	4	107	1.41	1.48	2	0.5	3.21
PRI5	179	1.4	1.6	2.10	0.5	8.8	60	1.30	1.65	2.133	0.5	8.8	119	1.5	1.58	2.1	0.6	5.83
SHE1	179	1.2	1.3	1.90	0.5	4	60	0.95	1.06	1.64	0.5	2	119	1.3	1.39	1.9	0.5	4
SHE10	177	1.2	1.3	1.90	0.54	2.83	59	1.04	1.11	1.54	0.6	2	118	1.375	1.39	1.9	0.54	2.83
WR1	139	0.8	0.86	1.284	0.5	2.4	59	0.68	0.71	0.95	0.5	1.6	80	0.96	0.98	1.31	0.50	2.40
WR5	139	0.8	0.86	1.352	0.5	2.5	59	0.6	0.65	0.864	0.5	1.35	80	0.96	1.01	1.40	0.50	2.50
WR10	36	0.95	1.00	1.33	0.5	1.67	Not enough data to separate seasonally						Not enough data to separate seasonally					

Table 6b.
Statistical Summary for Dissolved Oxygen
Monthly Instream Monitoring Sites (2001-2016)

Dissolved Oxygen (mg/L) 2001-2016																		
	Year Around						Summer						Fall-Winter-Spring					
Monitoring Site	N	Median	Mean	90th percentile	Min	Max	N	Median	Mean	90th percentile	Min	Max	N	Median	Mean	90th percentile	Min	Max
BAT1	179	9.57	9.3	11.21	1.8	14.07	60	7.95	7.56	9.132	1.8	9.6	119	10.36	10.17	11.33	6.04	14.07
BAT12	179	10.16	9.9	11.56	4.92	14.91	60	8.40	8.27	9.864	4.92	10.96	119	10.8	10.67	11.884	6.75	14.91
CGT1	176	9.495	9.3	12.18	1.75	14.9	58	8.00	8.52	12.91	1.75	14.8	118	9.87	9.61	11.856	4.64	14.9
CGT5	145	9.18	8.6	11.44	1.76	13.49	31	5.88	5.80	8.26	1.76	9.73	114	9.95	9.33	11.543	3.2	13.49
CLA1	176	10.18	10.1	11.35	7.22	13.48	59	9.21	9.10	9.698	7.22	10.6	117	10.61	10.60	11.478	7.96	13.48
CLA10	179	9.49	9.5	10.51	7.31	11.26	60	9.02	8.97	9.371	7.97	10.3	119	9.87	9.82	10.68	7.31	11.26
CRO1	179	10.1	9.5	11.89	0.94	14.7	60	7.27	7.08	9.125	0.94	9.84	119	10.9	10.76	12.166	3.86	14.7
CRO10	178	9.525	9.1	11.27	1.19	14.3	59	7.17	6.91	8.942	1.19	9.58	119	10.3	10.12	11.432	2.95	14.3
GIB1	176	9.375	9.1	11.23	4.12	12.32	58	6.96	6.93	8.23	4.12	9	118	10.44	10.13	11.367	6.23	12.32
GIB15	174	9.685	9.6	11.22	6.25	14.68	56	8.21	8.21	9.06	6.25	10.01	118	10.425	10.25	11.518	6.99	14.68
GLE1	174	9.935	9.8	11.49	5.97	16.67	57	8.39	8.30	9.234	5.97	9.81	117	10.76	10.60	11.682	7.85	16.67
GLE10	163	10.18	9.8	11.39	2.58	18.78	47	8.60	8.08	9.864	2.58	10.25	116	10.675	10.48	11.53	4.49	18.78
LPW1	127	9.85	9.6	13.58	0.43	17.38	19	4.75	4.63	7.94	0.43	9.37	108	10.335	10.52	13.724	4.7	17.38
MIC1	177	10.4	10.5	11.98	6.76	14.35	60	9.25	9.25	10.004	6.76	11.37	117	10.98	11.07	12.336	8.87	14.35
MIC10	177	10.63	10.7	12.09	7.34	13.98	59	9.79	9.83	10.56	7.34	11.96	118	11.01	11.13	12.365	8.29	13.98
MRA1	176	10.7	10.6	12.12	6.34	14.19	59	9.45	9.38	10.282	6.34	11	117	11.3	11.28	12.376	8.75	14.19
MRA10	178	10.24	10.2	11.80	7.11	13.8	60	9.02	9.04	9.797	7.11	12.5	118	10.975	10.83	12.016	8.73	13.8
PRI1	167	10.55	10.5	12.03	7.21	13.67	60	9.49	9.50	10.159	7.21	12.8	107	11.14	11.09	12.2	8.06	13.67
PRI5	175	10.1	10.2	11.72	6.66	14.54	58	8.89	8.82	9.575	6.66	9.9	117	10.85	10.82	12.032	8.6	14.54
SHE1	177	10.68	10.6	12.11	6.17	14.1	59	9.39	9.40	10.238	6.17	12.6	118	11.15	11.21	12.301	9.47	14.1
SHE10	178	10.61	10.6	12.05	7.16	13.95	60	9.46	9.47	10.271	7.16	12.4	118	11.11	11.14	12.423	7.87	13.95
WR1	241	10.14	10.21	11.78	7.76	13.20	106	9.2	9.33	10.33	7.76	12.00	136	10.90	10.88	12.00	9.10	13.20
WR5	241	10	10.01	11.60	7.50	13.20	106	8.93	8.98	10.00	7.50	10.50	135	10.77	10.81	11.96	9.02	13.20
WR10	35	10.5	10.45	11.22	9.12	12.46	Not enough data to separate seasonally						Not enough data to separate seasonally					

Table 6c.
Statistical Summary for E. coli
Monthly Instream Monitoring Sites (2001-2016)

E. Coli (counts/100 mL) 2001-2016																								
	Year Around								Summer								Fall-Winter-Spring							
Monitoring Site	N	Median	Mean	90th percentile	% > 406	# > 406	Min	Max	N	Median	Mean	90th percentile	% > 406	# > 406	Min	Max	N	Median	Mean	90th percentile	% > 406	# > 406	Min	Max
BAT1	179	260	596.9	1783.60	38.0%	68.00	10	2420	60	1046.00	1184.98	2419	78.3%	47	192	2420	119	128	300.41	826	17.6%	21	10	2420
BAT12	178	172	346.1	921.00	23.6%	42.00	4	2420	60	355.00	627.57	1571	45.0%	27	47	2420	118	77.5	202.92	472.7	12.7%	15	4	2420
CGT1	178	161.5	465.8	1414.00	28.7%	51.00	3	2420	59	248.00	629.10	2419.00	39.0%	23	12	2420	119	111	384.77	1222.4	23.5%	28	3	2420
CGT5	147	326	710.3	2419.00	46.9%	69.00	15	2420	32	1700.00	1466.03	2420	78.1%	25	58	2420	115	238	500.04	1553	38.3%	44	15	2420
CLA1	179	461	733.9	1733.00	54.2%	97.00	20	2420	60	668.00	941.55	2420	66.7%	40	47	2420	119	387	629.27	1441.8	47.9%	57	20	2420
CLA10	179	238	574.9	1986.00	34.1%	61.00	1	2420	60	748.50	896.38	2419	58.3%	35	47	2420	119	139	412.78	1441.8	21.8%	26	1	2420
CRO1	179	185	383.2	1046.00	21.2%	38.00	13	2420	60	345.00	566.28	1414	36.7%	22	47	2419	119	116	290.86	617.2	13.4%	16	13	2420
CRO10	178	35	131.6	291.00	6.7%	12.00	1	2419	59	105.00	283.98	695	16.9%	10	11	2419	119	22	56.11	132.8	1.7%	2	1	613
GIB1	179	122	271.8	593.00	16.2%	29.00	4	2420	60	188.00	339.97	665.7	20.0%	12	59	2419	119	86	237.43	500	14.3%	17	4	2420
GIB15	176	88	419.2	1859.50	23.3%	41.00	2	2420	57	387.00	978.12	2420	49.1%	28	13	2420	119	46	151.52	411	10.9%	13	2	1986
GLE1	176	236	444.1	1013.00	30.7%	54.00	23	2420	58	423.00	700.26	1986	51.7%	30	144	2420	118	155.5	318.19	770	20.3%	24	23	2420
GLE10	165	35	214.9	535.60	13.9%	23.00	1	2420	48	236.50	469.69	1208.2	37.5%	18	12	2420	117	21	110.44	131.4	4.3%	5	1	2420
LPW1	126	255	512.5	1573.50	33.3%	42.00	4	2420	18	431.00	754.28	2419.30	50.0%	9	16	2420	108	243.5	472.19	1120	30.6%	33	4	2420
MIC1	177	276	393.5	816.00	30.5%	54.00	46	2420	60	326.00	454.55	816	41.7%	25	86	2419	117	184	362.20	744.2	24.8%	29	46	2420
MIC10	178	151	246.2	469.10	15.7%	28.00	8	2420	59	184.00	240.61	445.6	16.9%	10	24	770	119	119	249.04	484.6	15.1%	18	8	2420
MRA1	177	201	363.3	836.00	26.6%	47.00	7	2420	60	276.00	360.72	616.6	31.7%	19	32	1553	117	161	364.59	944.6	23.9%	28	7	2420
MRA10	179	214	323.5	735.60	19.0%	34.00	28	2420	60	248.50	315.22	488	15.0%	9	96	1553	119	150	327.62	779.2	21.0%	25	28	2420
PRI1	167	166	315.8	788.40	20.4%	34.00	28	2420	60	226.50	292.70	461	16.7%	10	81	2419	107	135	328.79	1006.4	22.4%	24	28	2420
PRI5	178	159	346.1	831.00	25.8%	46.00	6	2420	60	345.00	512.90	921	46.7%	28	56	2420	118	96	261.27	589.2	15.3%	18	6	2420
SHE1	179	104	248.7	554.20	14.5%	26.00	19	2420	60	122.50	186.17	326	8.3%	5	33	1203	119	99	280.20	727	17.6%	21	19	2420
SHE10	178	129	242.8	506.00	13.5%	24.00	22	2420	60	160.50	234.72	308	5.0%	3	64	2420	118	106	246.97	660.4	17.8%	21	22	1986
WR1	141	20	43.10	91	0.71%	1	2	722	61	16	17.80	30	0.00%	0	2	76	80	31.45	62.38	153.4	1.25%	1	2	722
WR5	141	11	39.96	82	1.42%	2	1	1203	61	7	7.61	13	0.00%	0	1	23	80	25	64.63	135.7	0.025	2	3	1203
WR10	36	14	82.08	132	2.78%	1	1	1553	Not enough data to separate seasonally								Not enough data to separate seasonally							

Table 6d.
Statistical Summary for Nitrate-Nitrite
Monthly Instream Monitoring Sites (2001-2016)

Nitrate-Nitrite as N (mg/L) 2001-2016																		
Monitoring Site	Year Around						Summer						Fall-Winter-Spring					
	N	Median	Mean	90th percentile	Min	Max	N	Median	Mean	90th percentile	Min	Max	N	Median	Mean	90th percentile	Min	Max
BAT1	178	0.865	1.0	1.79	0.06	2.93	59	0.59	0.58	0.78	0.15	0.9	119	1.2	1.22	1.9	0.06	2.93
BAT12	178	0.745	0.9	2.00	0.05	3.26	59	0.24	0.30	0.508	0.08	0.79	119	1.25	1.25	2.11	0.05	3.26
CGT1	178	0.39	0.5	1.09	0.05	3.9	59	0.10	0.22	0.49	0.05	1.53	119	0.51	0.65	1.20	0.05	3.9
CGT5	147	0.33	0.6	1.44	0.04	5.1	32	0.09	0.13	0.218	0.05	0.51	115	0.52	0.76	1.56	0.04	5.1
CLA1	178	1.065	1.2	1.80	0	4.6	59	0.85	0.87	1.212	0	1.38	119	1.21	1.30	1.96	0.2	4.6
CLA10	177	1.5	1.6	2.21	0.29	5.3	59	1.29	1.34	1.564	0.8	3.25	118	1.68	1.71	2.28	0.29	5.3
CRO1	178	0.5	0.8	1.55	0.1	3.94	59	0.36	0.35	0.452	0.13	0.52	119	0.88	0.96	1.61	0.1	3.94
CRO10	177	0.45	0.8	1.71	0.05	4.94	58	0.25	0.24	0.379	0.05	0.44	119	0.94	1.01	1.83	0.05	4.94
GIB1	177	1.18	1.3	2.55	0.2	4.67	58	0.57	0.60	0.956	0.24	1.25	119	1.64	1.68	2.68	0.2	4.67
GIB15	175	2.13	2.2	3.74	0.09	14.8	56	1.32	1.37	2.375	0.09	5.17	119	2.48	2.64	4.03	0.19	14.8
GLE1	175	0.95	1.2	2.37	0.19	3.67	57	0.67	0.72	0.934	0.27	1.6	118	1.4	1.48	2.54	0.19	3.67
GLE10	164	1.185	1.3	2.53	0.05	4.46	47	0.42	0.55	1.2	0.05	2.01	117	1.53	1.59	2.70	0.05	4.46
LPW1	125	0.97	1.5	3.41	0.05	12.7	17	0.12	0.25	0.82	0.05	0.97	108	1.155	1.70	3.76	0.05	12.7
MIC1	176	1.13	1.5	3.53	0.08	7	59	0.23	0.29	0.484	0.08	1.04	117	2.09	2.17	4.06	0.12	7
MIC10	177	1.37	1.6	3.75	0	8.2	58	0.22	0.27	0.498	0	0.89	119	2.3	2.32	4.11	0.14	8.2
MRA1	177	1.15	1.5	3.51	0.06	6.8	59	0.21	0.27	0.492	0.06	0.93	118	2.095	2.16	4.05	0.11	6.8
MRA10	177	1.14	1.5	3.70	0.01	6.7	59	0.21	0.26	0.5	0.01	1.03	118	2.11	2.19	3.98	0.12	6.7
PRI1	166	0.955	1.4	3.00	0.05	7.2	59	0.24	0.28	0.5	0.05	0.98	107	1.99	1.98	3.57	0.16	7.2
PRI5	178	0.785	0.9	1.81	0.09	3	59	0.37	0.37	0.532	0.09	0.83	119	1.16	1.21	1.99	0.17	3
SHE1	178	1.225	1.6	3.76	0.07	6.6	59	0.20	0.27	0.464	0.07	0.84	119	2.18	2.20	3.97	0.11	6.6
SHE10	177	1.16	1.6	3.67	0.05	5.28	59	0.23	0.28	0.512	0.05	0.96	118	2.185	2.22	4.14	0.11	5.28
WR1	240	0.2	0.28	0.64	0.05	1.1	104	0.15	0.16	0.23	0.06	0.34	137	0.28	0.38	0.79	0.05	1.1
WR5	240	0.19	0.25	0.52	0.05	0.91	104	0.145	0.15	0.24	0.06	0.3	136	0.23	0.32	0.65	0.05	0.91
WR10	36	0.225	0.30	0.64	0.07	0.83	Not enough data to separate seasonally						Not enough data to separate seasonally					

Table 6e.
Statistical Summary for pH
Monthly Instream Monitoring Sites (2001-2016)

pH (S.U) 2001-2016																		
	Year Around						Summer						Fall-Winter-Spring					
Monitoring Site	N	Median	Mean	90th percentile	Min	Max	N	Median	Mean	90th percentile	Min	Max	N	Median	Mean	90th percentile	Min	Max
BAT1	177	6.81	6.8	7.22	4.64	7.6	58	6.81	6.76	7.10	5.07	7.22	119	6.83	6.76	7.252	4.64	7.6
BAT12	178	6.95	6.9	7.28	5.08	7.6	59	6.96	6.87	7.21	5.08	7.4	119	6.95	6.85	7.31	5.32	7.6
CGT1	175	7.08	7.1	7.43	5.49	8.17	57	7.11	7.16	7.62	5.49	8.17	118	7.045	7.01	7.35	5.94	8.17
CGT5	147	7.03	7.0	7.51	5.4	8.14	32	7.10	7.06	7.56	5.4	8.14	115	7.02	7.03	7.50	6.07	8.13
CLA1	178	7.1	7.1	7.45	5.42	8.78	59	7.21	7.14	7.47	6.3	8.08	119	7.07	7.03	7.44	5.42	8.78
CLA10	178	6.81	6.7	7.06	5.14	7.33	59	6.87	6.76	7.03	5.8	7.33	119	6.78	6.68	7.07	5.14	7.32
CRO1	178	7.01	6.9	7.25	5.53	7.38	59	6.98	6.90	7.17	5.53	7.29	119	7.03	6.93	7.26	5.76	7.38
CRO10	177	6.87	6.8	7.22	5.33	7.88	58	6.82	6.74	7.06	5.33	7.22	119	6.9	6.82	7.28	5.43	7.88
GIB1	177	7.05	7.0	7.30	5.38	7.72	58	7.08	7.05	7.30	6.4	7.68	119	7.04	6.95	7.30	5.38	7.72
GIB15	175	7.06	7.0	7.38	5.39	7.94	56	7.17	7.16	7.47	6.45	7.94	119	7.02	6.96	7.30	5.39	7.83
GLE1	175	7.1	7.0	7.38	5.41	7.68	57	7.16	7.10	7.39	6.3	7.68	118	7.075	6.94	7.37	5.41	7.5
GLE10	163	7.08	7.0	7.36	5.75	7.6	47	7.11	6.95	7.34	6.01	7.6	116	7.065	7.01	7.36	5.75	7.58
LPW1	125	6.95	6.9	7.22	5.98	7.45	18	6.87	6.80	7.04	5.98	7.11	107	6.98	6.91	7.24	6.06	7.45
MIC1	176	7.035	7.0	7.33	5.11	7.57	59	7.04	6.98	7.32	5.11	7.57	117	7.03	6.94	7.32	5.65	7.53
MIC10	177	7.12	7.0	7.42	5.13	8.38	58	7.14	7.11	7.55	5.13	8.17	119	7.1	7.01	7.38	5.15	8.38
MRA1	176	7.15	7.1	7.58	4.55	7.92	58	7.25	7.20	7.60	6.2	7.92	118	7.1	7.02	7.52	4.55	7.86
MRA10	177	6.95	6.9	7.26	5.1	7.81	59	6.97	6.91	7.35	5.1	7.81	118	6.945	6.87	7.24	5.65	7.55
PRI1	166	7.1	7.1	7.49	5.85	7.81	59	7.17	7.11	7.47	6.18	7.63	107	7.05	7.02	7.48	5.85	7.81
PRI5	178	7.145	7.1	7.58	5.9	8.82	59	7.22	7.23	7.61	6.46	7.81	119	7.11	7.09	7.54	5.9	8.82
SHE1	178	7.155	7.1	7.53	6.08	7.74	59	7.21	7.17	7.61	6.3	7.74	119	7.12	7.07	7.52	6.08	7.74
SHE10	177	6.7	6.7	7.24	5.12	8.37	59	6.74	6.81	7.42	6.03	8.37	118	6.675	6.65	7.21	5.12	7.46
WR1	240	7.285	7.24	7.60	6.11	8.49	105	7.33	7.31	7.65	6.25	8.49	136	7.24	7.19	7.52	6.11	8.36
WR5	240	7.21	7.13	7.45	6.21	9.16	105	7.25	7.16	7.49	6.26	7.78	135	7.17	7.10	7.43	6.21	9.16
WR10	36	7.425	7.41	7.70	6.89	8.11	Not enough data to separate seasonally						Not enough data to separate seasonally					

Table 6f.
Statistical Summary for Specific Conductivity
Monthly Instream Monitoring Sites (2001-2016)

Specific Conductivity (uS/cm) 2001-2016	Year Around						Summer						Fall-Winter-Spring					
Monitoring Site	N	Median	Mean	90th percentile	Min	Max	N	Median	Mean	90th percentile	Min	Max	N	Median	Mean	90th percentile	Min	Max
BAT1	179	46.4	47.0	57.02	20.6	72.1	60	51.60	52.25	64.11	30.1	72.1	119	44.9	44.28	54.04	20.6	64
BAT12	179	42.4	44.6	57.60	10.2	128	60	48.45	50.10	63.73	30.7	75.6	119	41.5	41.82	48.02	10.2	128
CGT1	178	170.35	156.0	222.72	25.7	244	59	191.10	182.11	231.20	72.6	244	119	156.1	143.00	203.84	25.7	238
CGT5	147	125.5	126.2	190.68	30.6	279	32	119.40	129.74	211.58	47.8	220	115	130.8	125.23	186.44	30.6	279
CLA1	177	88.8	83.7	96.72	27.5	109.3	59	89.40	87.20	94.12	56.2	99.9	118	88.4	81.98	97.60	27.5	109.3
CLA10	178	66.3	63.9	73.69	22.1	86.4	59	66.50	65.08	70.86	54.8	76.2	119	65.9	63.39	74.66	22.1	86.4
CRO1	179	68.4	72.5	96.44	37.3	108.8	60	89.20	86.55	103.15	37.3	108.8	119	62.9	65.42	86.32	37.4	101.5
CRO10	178	50.05	53.1	72.46	28	93.3	59	64.60	64.17	79.20	40.5	93.3	119	46.1	47.63	60.58	28	84.2
GIB1	177	87.5	90.7	116.50	47	131	59	108.40	106.08	122.06	68	131	118	82.3	83.01	100.12	47	121.1
GIB15	175	91.7	93.1	116.36	26.5	125	57	107.70	104.41	120.68	42	125	118	87.8	87.65	105.70	26.5	120.4
GLE1	175	93.2	94.5	123.96	20.3	140.6	58	114.05	110.82	131.55	42	140.6	117	89.8	86.47	106.46	20.3	135.9
GLE10	164	59.25	64.0	85.09	11.4	137.2	48	69.05	75.41	107.38	11.4	137.2	116	57.2	59.32	75.60	36	95.1
LPW1	127	172.8	166.1	236.94	38.4	342	19	181.80	185.39	292.16	72.8	342	108	171.2	162.72	230.00	38.4	297.8
MIC1	177	67.8	70.2	92.84	42.1	125.8	60	53.60	53.73	62.36	42.1	73.4	117	79.4	78.69	97.00	49	125.8
MIC10	178	63.2	64.5	90.33	30	131.7	60	47.50	47.61	56.58	30.5	63.8	118	74.55	73.13	93.21	30	131.7
MRA1	176	71.15	71.3	95.65	34	129.1	59	51.70	52.31	61.08	34	71.7	117	81.2	80.85	100.70	41.1	129.1
MRA10	177	69.5	70.9	94.08	36	129	59	52.20	52.66	61.44	36	74.5	118	81.55	80.01	98.84	48.7	129
PRI1	166	66.65	70.0	91.90	42	121.6	59	55.50	55.50	63.22	43	74.4	107	76.9	77.95	95.88	42	121.6
PRI5	177	81.3	79.1	92.28	9.1	130.1	59	80.80	79.76	92.04	9.1	130.1	118	81.45	78.75	92.56	35.9	103.1
SHE1	177	70.6	70.9	92.50	30.3	134.1	59	54.30	55.21	68.38	39.4	99.5	118	79.8	78.80	98.51	30.3	134.1
SHE10	177	67.8	69.6	92.58	35.9	133.3	59	52.00	51.35	59.60	35.9	71	118	79.25	78.66	100.18	38.1	133.3
WR1	242	60	60.61	75.95	30.7	112	106	64.2	63.52	76.50	38.9	112	137	58.3	58.35	74.32	30.7	99
WR5	241	60	60.34	74.90	31.2	112	106	63.55	63.61	76.85	38.3	112	135	58	57.77	72.60	31.2	97
WR10	36	64.35	65.46	75.90	53.6	77.2	Not enough data to separate seasonally						Not enough data to separate seasonally					

Table 6g.
Statistical Summary for Temperature
Monthly Instream Monitoring Sites (2001-2016)

Temperature (°C) 2001-2016																		
	Year Around						Summer						Fall-Winter-Spring					
Monitoring Site	N	Median	Mean	90th percentile	Min	Max	N	Median	Mean	90th percentile	Min	Max	N	Median	Mean	90th percentile	Min	Max
BAT1	179	11.2	11.8	16.78	4.6	20.4	60	15.95	16.14	19.11	12.6	20.4	119	9.4	9.61	12.7	4.6	14.6
BAT12	179	10.1	11.2	16.66	4.2	19.5	60	15.70	15.57	17.93	11.1	19.5	119	8.7	8.98	11.90	4.2	13.4
CGT1	178	13.65	14.3	22.19	5.1	26.4	59	20.40	20.55	23.42	14.9	26.4	119	11	11.23	16.70	5.1	20.6
CGT5	147	11.3	11.9	18.00	2.3	23.7	32	17.55	17.90	21.29	13.9	23.7	115	10	10.22	14.92	2.3	18.7
CLA1	177	12.4	12.7	17.60	6	20.3	59	16.60	16.51	18.44	9.8	20.3	118	10.95	10.81	13.80	6	15.5
CLA10	179	12.6	12.8	15.90	7	17.6	60	15.40	15.32	16.61	12.5	17.6	119	11.2	11.51	13.62	7	15.7
CRO1	179	10.5	11.0	16.12	2.2	19.4	60	15.15	15.17	17.70	12	19.4	119	8.8	8.84	11.52	2.2	14.6
CRO10	178	10.45	11.1	16.03	4.1	18.8	59	15.20	15.16	17.32	12.4	18.8	119	8.8	9.02	12.06	4.1	14.5
GIB1	176	11.35	12.0	17.10	4.1	21.8	58	16.40	16.61	19.10	13.5	21.8	118	9.3	9.66	13.39	4.1	16.8
GIB15	175	11.4	12.2	17.86	4.5	21.4	57	16.80	16.85	19.28	12.9	21.4	118	9.6	9.89	13.59	4.5	16.1
GLE1	175	11.5	11.9	17.20	4.7	20	58	15.95	16.03	17.90	13	20	117	9.6	9.89	13.28	4.7	16.2
GLE10	163	10.6	11.0	15.24	4.8	18.4	48	14.55	14.73	16.79	10.8	18.4	115	9.4	9.47	12.04	4.8	14.5
LPW1	127	10.8	11.4	16.80	3.1	23	19	17.60	17.99	21.06	14.4	23	108	10	10.19	14.48	3.1	16.6
MIC1	177	11.8	12.1	18.00	3.2	21.3	60	17.15	16.92	19.53	13.4	21.3	117	9.5	9.65	13.72	3.2	15.8
MIC10	178	11	11.7	17.23	3.2	20.9	60	16.25	16.36	19.36	11.3	20.9	118	9	9.35	13.36	3.2	15.2
MRA1	176	11.25	12.0	18.00	3.6	21.3	59	17.20	17.03	19.62	9.4	21.3	117	9.3	9.47	13.82	3.6	16.3
MRA10	178	11.3	11.7	17.80	3	21.1	60	17.00	16.62	19.30	9.9	21.1	118	9.05	9.26	13.50	3	16
PRI1	167	11.7	12.2	18.04	3.3	20.8	60	16.90	16.79	19.33	10.9	20.8	107	9.5	9.62	13.78	3.3	16.1
PRI5	177	12.1	13.0	19.34	4.8	23.6	59	18.10	18.20	20.16	14.4	23.6	118	10.05	10.41	14.39	4.8	17.2
SHE1	177	11	11.9	17.94	3.4	21.6	59	17.30	16.92	19.34	9.5	21.6	118	9.2	9.37	13.36	3.4	15.8
SHE10	178	11.2	11.7	17.70	3.3	20.9	60	16.85	16.48	19.11	10.1	20.9	118	9.15	9.32	13.33	3.3	15.5
WR1	242	14.25	13.92	20.2	4.1	24	106	18.45	18.21	21.5	12.7	24	137	10.6	10.61	14.84	4.1	17.1
WR5	242	13.95	13.84	20	4.1	23.6	106	18.2	18.01	20.95	12.3	23.6	136	10.6	10.58	14.5	4.1	16.4
WR10	36	14.25	13.72	22.1	5.1	24.2	Not enough data to separate seasonally						Not enough data to separate seasonally					

Table 6h.
Statistical Summary for Turbidity
Monthly Instream Monitoring Sites (2001-2016)

Turbidity (NTU) 2001-2016																		
Monitoring Site	Year Around						Summer						Fall-Winter-Spring					
	N	Median	Mean	90th percentile	Min	Max	N	Median	Mean	90th percentile	Min	Max	N	Median	Mean	90th percentile	Min	Max
BAT1	179	11.6	14.5	24.12	4.55	109	60	13.50	16.46	24.47	6.72	59.5	119	9.9	13.55	22.06	4.55	109
BAT12	179	7.5	8.6	13.32	2.94	44.4	60	9.34	9.98	13.26	5.2	19.1	119	6.2	7.90	13.08	2.94	44.4
CGT1	179	8.1	13.9	22.72	2.4	255	60	5.78	12.34	15.87	2.4	255	119	9.2	14.63	25.64	3.7	110
CGT5	146	16	21.0	36.80	6	116	31	19.40	23.39	46.70	7.4	57.1	115	16	20.35	36.60	6	116
CLA1	178	4.8	9.6	19.00	1.7	204	60	4.30	8.90	9.41	2.16	204	118	5.1	10.02	26.72	1.7	77
CLA10	179	4.1	6.3	11.54	1.9	57.6	60	4.73	5.85	6.81	2.8	57.6	119	3.87	6.58	13.42	1.9	56.5
CRO1	179	6.8	10.3	15.92	2.2	120	60	6.80	8.47	12.67	4.7	34.7	119	6.8	11.28	17.42	2.2	120
CRO10	178	7.735	9.3	14.93	3.55	32.4	59	9.30	10.93	16.36	4	28.2	119	6.8	8.43	13.30	3.55	32.4
GIB1	178	9.3	13.7	22.69	5.29	132	59	9.10	10.58	13.56	6	40.6	119	9.4	15.23	26.76	5.29	132
GIB15	174	9.99	18.9	36.52	3.3	237	56	10.40	25.38	71.30	4.7	237	118	9.84	15.76	30.58	3.3	110
GLE1	176	8.15	13.1	23.00	3.08	164	58	8.22	11.56	12.08	4.5	93	118	8.055	13.86	29.37	3.08	164
GLE10	163	7.2	10.5	19.40	0.6	88	47	6.24	10.89	15.28	2.1	88	116	7.9	10.39	19.55	0.6	68.3
LPW1	124	8.875	15.7	30.90	2.2	161	17	5.71	17.43	47.04	2.4	80.6	107	9.3	15.40	30.30	2.2	161
MIC1	177	6.1	10.1	16.80	2.3	118	60	5.70	5.82	8.01	2.97	14	117	7.4	12.27	21.12	2.3	118
MIC10	179	6.8	10.5	19.34	2.71	115	60	6.50	6.97	8.22	2.71	39.4	119	7.4	12.24	24.26	3.1	115
MRA1	178	6.845	10.4	17.36	2.4	101	60	6.10	6.62	8.91	3.06	18.9	118	7.415	12.28	23.25	2.4	101
MRA10	178	6.395	10.1	16.68	2.7	123	60	5.87	5.99	8.00	2.98	12.9	118	7.15	12.16	19.40	2.7	123
PRI1	167	6.02	9.5	16.62	2.5	130	60	5.40	6.00	7.80	2.8	32	107	6.8	11.50	20.62	2.5	130
PRI5	179	5.7	9.8	19.02	2	106	60	4.10	5.50	8.52	2.7	23.5	119	6.8	11.90	23.54	2	106
SHE1	179	5.9	10.0	18.46	1.9	107	60	4.96	5.36	7.41	2.4	15.7	119	7.1	12.32	21.74	1.9	107
SHE10	178	6.135	10.2	18.73	2.42	176	60	5.40	5.62	7.11	2.42	9.6	118	6.875	12.60	22.63	2.75	176
WR1	242	3.96	6.23	11.94	1.6	42.1	106	3.055	3.18	4.14	1.6	7.19	137	5.19	8.56	17.84	2.4	42.1
WR5	242	3.735	6.09	11.69	1.72	45.2	106	2.715	2.97	4.05	1.72	6.8	136	5.28	8.51	17.30	2.4	45.2
WR10	36	4.075	9.83	29.35	1.4	37.8	Not enough data to separate seasonally						Not enough data to separate seasonally					

Table 7.
Mann-Whitney Statistical Comparison of Upstream and Downstream Year Round Median Values
Monthly Instream Monitoring Sites

Site		Parameter	Difference in Medians (DS minus US)	95 % confidence Interval		Ho: No difference vs Ha: Statistically significant difference			
Upstream (US)	Downstream (DS)			Lower	Upper	W Statistic	p-value	Result	Interpretation
BAT12	**BAT1**	BOD	0.08	-0.0001	0.1900	34283.5	0.0140	**Reject Ho**	**Median BOD values at DS site are statistically greater than US site**
BAT12	**BAT1**	Cond (Sp.)	4	2.0000	5.2000	36102	0.0000	**Reject Ho**	**Median Cond values at DS site are statistically greater than US site**
BAT12	**BAT1**	DO	-0.59	-0.8400	-0.1800	29155	0.0012	**Reject Ho**	**Median DO values at US site are statistically greater than DS site**
BAT12	**BAT1**	E. coli	88	20.0000	133.1000	35081	0.0009	**Reject Ho**	**Median E. coli values at DS site are statistically greater than US site**
BAT12	**BAT1**	NO2-NO3	0.12	0.0300	0.2900	34061	0.0092	**Reject Ho**	**Median NO2-NO3 values at DS site are statistically greater than US site**
BAT12	**BAT1**	pH	-0.14	-0.1800	-0.0200	29104.5	0.0065	**Reject Ho**	**Median pH values at US site are statistically greater than DS site**
BAT12	**BAT1**	Temp	1.1	-0.1000	1.3000	33722	0.0521	**Reject Ho**	**Median Temp values at DS site are statistically greater than US site**
BAT12	**BAT1**	Turb	4.1	3.0200	4.8300	40403.5	0.0000	**Reject Ho**	**Median Turb values at DS site are statistically greater than US site**
CGT5	**CGT1**	BOD	0.05	-0.1101	0.1401	29365.5	0.8230	Do Not Reject Ho	Median values at US and DS site are not statistically different
CGT5	**CGT1**	Cond (Sp.)	44.85	19.5000	44.6000	33209.5	0.0000	**Reject Ho**	**Median Cond values at DS site are statistically greater than US site**
CGT5	**CGT1**	DO	0.315	-0.0900	1.0700	29701.5	0.0495	**Reject Ho**	**Median DO values at DS site are statistically greater than US site**
CGT5	**CGT1**	E. coli	-164.5	-174.0000	-29.0000	26163.5	0.0004	**Reject Ho**	**Median E.coli values at US site are statistically greater than DS site**
CGT5	**CGT1**	NO2-NO3	0.06	-0.0600	0.0600	28960.5	0.9498	Do Not Reject Ho	Median values at US and DS site are not statistically different
CGT5	**CGT1**	pH	0.05	-0.0500	0.0900	28718.5	0.5841	Do Not Reject Ho	Median values at US and DS site are not statistically different
CGT5	**CGT1**	Temp	2.35	1.0000	3.4990	32116.5	0.0001	**Reject Ho**	**Median Temp values at DS site are statistically greater than US site**
CGT5	**CGT1**	Turb	-7.9	-8.8020	-5.9000	22172	0.0000	**Reject Ho**	**Median Turb values at US site are statistically greater than DS site**
CLA10	**CLA1**	BOD	0.2	0.1000	0.3000	36416.5	0.0000	**Reject Ho**	**Median BOD values at DS site are statistically greater than US site**
CLA10	**CLA1**	Cond (Sp.)	22.5	20.6000	24.1990	43294	0.0000	**Reject Ho**	**Median Cond values at DS site are statistically greater than US site**
CLA10	**CLA1**	DO	0.69	0.3800	0.7800	36733	0.0000	**Reject Ho**	**Median DO values at DS site are statistically greater than US site**
CLA10	**CLA1**	E. coli	223	96.9000	239.0000	36723.5	0.0000	**Reject Ho**	**Median E. coli values at DS site are statistically greater than US site**
CLA10	**CLA1**	NO2-NO3	-0.435	-0.5200	-0.3400	23768.5	0.0000	**Reject Ho**	**Median NO2-NO3 values at US site are statistically greater than DS site**
CLA10	**CLA1**	pH	0.29	0.2600	0.4000	40296.5	0.0000	**Reject Ho**	**Median pH values at DS site are statistically greater than US site**
CLA10	**CLA1**	Temp	-0.2	-0.8000	0.5000	31171	0.6630	Do Not Reject Ho	Median values at US and DS site are not statistically different
CLA10	**CLA1**	Turb	0.7	-0.0300	0.9500	33641.5	0.0340	**Reject Ho**	**Median Turb values at DS site are statistically greater than US site**
CLA10	**CLA1**	Cu (Diss)	0	0.0000	0.0000	4654	0.2287	Do Not Reject Ho	Median values at US and DS site are not statistically different
CLA10	**CLA1**	Cu (Tot)	0	0.0000	0.0000	4698	0.1603	Do Not Reject Ho	Median values at US and DS site are not statistically different
CLA10	**CLA1**	Pb (Diss)	0	0.0000	0.0000	4504.5	0.6007	Do Not Reject Ho	Median values at US and DS site are not statistically different
CLA10	**CLA1**	Pb (Tot)	0	0.0000	0.0000	4820	0.0250	**Reject Ho**	**Median Pb (total) values at DS site are greater than US site**
CLA10	**CLA1**	Zn (Diss)	0.00025	-0.0019	0.0010	4218	0.4378	Do Not Reject Ho	Median values at US and DS site are not statistically different
CLA10	**CLA1**	Zn (Tot)	0.00006	-0.0019	0.0019	4376	0.9546	Do Not Reject Ho	Median values at US and DS site are not statistically different
CRO10	**CRO1**	BOD	-0.005	-0.0900	0.1000	32159	0.9040	Do Not Reject Ho	Median values at US and DS site are not statistically different
CRO10	**CRO1**	Cond (Sp.)	18.35	15.7980	21.7000	42177.5	0.0000	**Reject Ho**	**Median Cond values at DS site are statistically greater than US site**
CRO10	**CRO1**	DO	0.575	0.0900	0.9000	34343.5	0.0091	**Reject Ho**	**Median DO values at DS site are statistically greater than US site**
CRO10	**CRO1**	E. coli	150	81.0000	154.0000	40873	0.0000	**Reject Ho**	**Median E. coli values at DS site are statistically greater than US site**
CRO10	**CRO1**	NO2-NO3	0.05	-0.0100	0.1400	33340.5	0.0434	**Reject Ho**	**Median NO2-NO3 values at DS site are statistically greater than US site**
CRO10	**CRO1**	pH	0.14	0.0400	0.1800	34780	0.0007	**Reject Ho**	**Median pH values at DS site are statistically greater than US site**
CRO10	**CRO1**	Temp	0.05	-0.9000	0.7000	31847	0.8427	Do Not Reject Ho	Median values at US and DS site are not statistically different
CRO10	**CRO1**	Turb	-0.935	-1.2700	-0.0700	29951.5	0.0161	**Reject Ho**	**Median Turb values at US site are statistically greater than DS site**

Table 7.
Mann-Whitney Statistical Comparison of Upstream and Downstream Year Round Median Values
Monthly Instream Monitoring Sites

Site		Parameter	Difference in Medians (DS minus US)	95 % confidence Interval		Ho: No difference vs Ha: Statistically significant difference			
Upstream (US)	Downstream (DS)			Lower	Upper	W Statistic	p-value	Result	Interpretation
GIB15	**GIB1**	BOD	-0.005	-0.1000	0.1000	31770.5	0.8556	Do Not Reject Ho	Median values at US and DS site are not statistically different
GIB15	**GIB1**	Cond (Sp.)	-4.2	-6.7000	0.1000	29428.5	0.0289	**Reject Ho**	**Median Cond values at US site are statistically greater than DS site**
GIB15	**GIB1**	DO	-0.31	-0.7601	-0.0200	28918	0.0187	**Reject Ho**	**Median DO values at US site are statistically greater than DS site**
GIB15	**GIB1**	E. coli	34	-0.9000	44.0000	33548	0.0326	**Reject Ho**	**Median E. coli values at DS site are statistically greater than US site**
GIB15	**GIB1**	NO2-NO3	-0.95	-1.0600	-0.6199	24216.5	0.0000	**Reject Ho**	**Median NO2-NO3 values at US site are statistically greater than DS site**
GIB15	**GIB1**	pH	-0.01	-0.0900	0.0200	30025	0.2302	Do Not Reject Ho	Median values at US and DS site are not statistically different
GIB15	**GIB1**	Temp	-0.5	-1.0000	0.6000	30443.5	0.5757	Do Not Reject Ho	Median values at US and DS site are not statistically different
GIB15	**GIB1**	Turb	-0.69	-1.0990	0.7010	31076.5	0.7217	Do Not Reject Ho	Median values at US and DS site are not statistically different
GLE10	**GLE1**	BOD	0.2	0.1000	0.2900	33871.5	0.0000	**Reject Ho**	**Median BOD values at DS site are statistically greater than US site**
GLE10	**GLE1**	Cond (Sp.)	33.95	29.0000	35.8000	40133.5	0.0000	**Reject Ho**	**Median Cond values at DS site are statistically greater than US site**
GLE10	**GLE1**	DO	-0.245	-0.4000	0.2100	28847.5	0.5324	Do Not Reject Ho	Median values at US and DS site are not statistically different
GLE10	**GLE1**	E. coli	201	116.0000	183.0000	38581	0.0000	**Reject Ho**	**Median E. coli values at DS site are statistically greater than US site**
GLE10	**GLE1**	NO2-NO3	-0.235	-0.2100	0.1800	29696	0.9527	Do Not Reject Ho	Median values at US and DS site are not statistically different
GLE10	**GLE1**	pH	0.02	-0.0600	0.0700	29795	0.8831	Do Not Reject Ho	Median values at US and DS site are not statistically different
GLE10	**GLE1**	Temp	0.9	0.1000	1.6000	31681.5	0.0123	**Reject Ho**	**Median Temp values at DS site are statistically greater than US site**
GLE10	**GLE1**	Turb	0.95	0.4010	2.1000	32487.5	0.0022	**Reject Ho**	**Median Turb values at DS site are statistically greater than US site**
MIC10	**MIC1**	BOD	-0.01	-0.2000	0.0000	28939.5	0.0084	**Reject Ho**	**Median BOD values at US site are statistically greater than DS site**
MIC10	**MIC1**	Cond (Sp.)	4.6	2.4010	9.5980	34517.5	0.0009	**Reject Ho**	**Median Cond values at DS site are statistically greater than US site**
MIC10	**MIC1**	DO	-0.23	-0.5300	-0.0200	29360.5	0.0163	**Reject Ho**	**Median DO values at US site are statistically greater than DS site**
MIC10	**MIC1**	E. coli	125	50.0200	129.0000	36289.5	0.0000	**Reject Ho**	**Median E. coli values at DS site are statistically greater than US site**
MIC10	**MIC1**	NO2-NO3	-0.24	-0.2001	0.1199	30768	0.6891	Do Not Reject Ho	Median values at US and DS site are not statistically different
MIC10	**MIC1**	pH	-0.085	-0.1500	-0.0200	28804	0.0072	**Reject Ho**	**Median pH values at US site are statistically greater than DS site**
MIC10	**MIC1**	Temp	0.8	-0.5000	1.3000	32392	0.3597	Do Not Reject Ho	Median values at US and DS site are not statistically different
MIC10	**MIC1**	Turb	-0.7	-1.2000	0.0000	29607	0.0203	**Reject Ho**	**Median Turb values at US site are statistically greater than DS site**
MRA10	**MRA1**	BOD	0.05	-0.0300	0.1400	32552.5	0.2788	Do Not Reject Ho	Median values at US and DS site are not statistically different
MRA10	**MRA1**	Cond (Sp.)	1.65	-3.2980	3.8990	31304	0.8744	Do Not Reject Ho	Median values at US and DS site are not statistically different
MRA10	**MRA1**	DO	0.46	0.1700	0.7000	34282	0.0008	**Reject Ho**	**Median DO values at DS site are statistically greater than US site**
MRA10	**MRA1**	E. coli	-13	-26.0000	38.0000	31864.5	0.7110	Do Not Reject Ho	Median values at US and DS site are not statistically different
MRA10	**MRA1**	NO2-NO3	0.01	-0.1499	0.1399	31328.5	0.9268	Do Not Reject Ho	Median values at US and DS site are not statistically different
MRA10	**MRA1**	pH	0.2	0.1400	0.2800	36386	0.0000	**Reject Ho**	**Median pH values at DS site are statistically greater than US site**
MRA10	**MRA1**	Temp	-0.05	-0.6990	1.2000	31794.5	0.5649	Do Not Reject Ho	Median values at US and DS site are not statistically different
MRA10	**MRA1**	Turb	0.45	-0.3000	0.8700	32676	0.3526	Do Not Reject Ho	Median values at US and DS site are not statistically different

Table 7.
Mann-Whitney Statistical Comparison of Upstream and Downstream Year Round Median Values
Monthly Instream Monitoring Sites

Site		Parameter	Difference in Medians (DS minus US)	95 % confidence Interval		Ho: No difference vs Ha: Statistically significant difference			
Upstream (US)	Downstream (DS)			Lower	Upper	W Statistic	p-value	Result	Interpretation
PRI5	**PRI1**	BOD	-0.1	-0.2800	-0.1000	25684.5	0.0002	**Reject Ho**	**Median BOD values at US site are statistically greater than DS site**
PRI5	**PRI1**	Cond (Sp.)	-14.65	-14.3000	-7.5980	23096.5	0.0000	**Reject Ho**	**Median Cond values at US site are statistically greater than DS site**
PRI5	**PRI1**	DO	0.45	0.1000	0.6400	31070.5	0.0039	**Reject Ho**	**Median DO values at DS site are statistically greater than US site**
PRI5	**PRI1**	E. coli	7	-18.0000	44.0000	29822.5	0.3146	Do Not Reject Ho	Median values at US and DS site are not statistically different
PRI5	**PRI1**	NO2-NO3	0.17	-0.0499	0.3499	29870	0.0902	**Reject Ho**	**Median NO2NO3 values at DS site are statistically greater than US site (p-value= 0.1)**
PRI5	**PRI1**	pH	-0.045	-0.1499	0.0000	26781	0.0222	**Reject Ho**	**Median pH values at US site are statistically greater than DS site**
PRI5	**PRI1**	Temp	-0.4	-1.7000	0.2000	27322	0.0536	**Reject Ho**	**Median temp values at US site are statistically greater than DS site**
PRI5	**PRI1**	Turb	0.32	-0.1500	1.0990	30414	0.0608	**Reject Ho**	**Median turb values at DS site are statistically greater than US site (p-value= 0.1)**
PRI5	**PRI1**	Cu (Diss)	0	0.0000	0.0000	4098	0.9906	Do Not Reject Ho	Median values at US and DS site are not statistically different
PRI5	**PRI1**	Cu (Tot)	0	0.0000	0.0000	4121.5	0.9025	Do Not Reject Ho	Median values at US and DS site are not statistically different
PRI5	**PRI1**	Pb (Diss)	0	0.0000	0.0000	4048.5	0.8284	Do Not Reject Ho	Median values at US and DS site are not statistically different
PRI5	**PRI1**	Pb (Tot)	0	0.0000	0.0000	3899	0.3570	Do Not Reject Ho	Median values at US and DS site are not statistically different
PRI5	**PRI1**	Zn (Diss)	-0.00225	-0.0023	-0.0003	3388.5	0.0004	**Reject Ho**	**Median Zinc (Dissolved) values at US site are statistically greater than DS site**
PRI5	**PRI1**	Zn (Tot)	-0.00345	-0.0037	-0.0011	3336.5	0.0002	**Reject Ho**	**Median Zinc (Total) values at US site are statistically greater than DS site**
SHE10	**SHE1**	BOD	0	-0.1001	0.0600	31294.5	0.4984	Do Not Reject Ho	Median values at US and DS site are not statistically different
SHE10	**SHE1**	Cond (Sp.)	2.8	-2.3010	5.1990	32224	0.4025	Do Not Reject Ho	Median values at US and DS site are not statistically different
SHE10	**SHE1**	DO	0.07	-0.2200	0.2900	31812.5	0.7516	Do Not Reject Ho	Median values at US and DS site are not statistically different
SHE10	**SHE1**	E. coli	-25	-33.0100	5.0200	30640.5	0.0755	**Reject Ho**	**Median E. coli values at US site are statistically greater than DS site (p-value=0.1)**
SHE10	**SHE1**	NO2-NO3	0.065	-0.1501	0.1401	31601.5	0.9324	Do Not Reject Ho	Median values at US and DS site are not statistically different
SHE10	**SHE1**	pH	0.455	0.3200	0.5000	39804.5	0.0000	**Reject Ho**	**Median pH values at DS site are statistically greater than US site**
SHE10	**SHE1**	Temp	-0.2	-0.8000	1.0000	31760	0.7931	Do Not Reject Ho	Median values at US and DS site are not statistically different
SHE10	**SHE1**	Turb	-0.235	-0.8000	0.3000	31095	0.3321	Do Not Reject Ho	Median values at US and DS site are not statistically different
WR5	**WR1**	Alkalinity	0	0.0000	1.0000	58326	0.6879	Do Not Reject Ho	Median values at US and DS site are not statistically different
WR5	**WR1**	Ammonia	0	0.0000	0.0000	49450	0.2920	Do Not Reject Ho	Median values at US and DS site are not statistically different
WR5	**WR1**	BOD	0	-0.0500	0.0900	19714	0.6290	Do Not Reject Ho	Median values at US and DS site are not statistically different
WR5	**WR1**	Cond (Sp.)	0	-2.0000	2.0000	58685	1.0000	Do Not Reject Ho	Median values at US and DS site are not statistically different
WR5	**WR1**	DO	0.14	0.0000	0.4400	61121.5	0.0281	**Reject Ho**	**Median DO values at DS site are statistically greater than US site**
WR5	**WR1**	E. coli	9	4.4000	10.0000	23121	0.0000	**Reject Ho**	**Median E. coli values at DS site are statistically greater than US site**
WR5	**WR1**	NO2-NO3	0.01	-0.0100	0.0300	59608	0.2138	Do Not Reject Ho	Median values at US and DS site are not statistically different
WR5	**WR1**	pH	0.075	0.0400	0.1500	63106.5	0.0002	**Reject Ho**	**Median pH values at DS site are statistically greater than US site**
WR5	**WR1**	TDS	-0.8	-1.1990	2.0010	58055	0.8257	Do Not Reject Ho	Median values at US and DS site are not statistically different
WR5	**WR1**	Temp	0.3	-0.9000	0.9000	58871.5	0.9038	Do Not Reject Ho	Median values at US and DS site are not statistically different
WR5	**WR1**	TP	0	-0.0020	0.0020	57722	0.9360	Do Not Reject Ho	Median values at US and DS site are not statistically different
WR5	**WR1**	TS	0	-2.0000	2.0000	57866.5	0.9234	Do Not Reject Ho	Median values at US and DS site are not statistically different
WR5	**WR1**	TSS	0	-0.5997	0.2002	56258	0.3353	Do Not Reject Ho	Median values at US and DS site are not statistically different
WR5	**WR1**	Turb	0.225	-0.1000	0.5000	60674.5	0.0980	**Reject Ho**	**Median turb values at DS site are statistically greater than US site (p-value= 0.1)**

Table 8.
Seasonal Mann-Kendall Statistical Long Term Trend Analysis, Rain (> 0.1 inches previous 24 hours)
Monthly Instream Monitoring Sites

Station	Parameter	H_o: No Trend vs. H_a: Increasing/Decreasing Trend			Result	Trend
		N	Z statistic	p-Value		
BAT 1	BOD	40	-0.22171		Do Not Reject Ho - No Detectable Trend	
BAT 1	Conductivity (specific)	40	2.00411	0.0225289	**Strongly Reject H_o**	**Increasing trend (Conductivity)**
BAT 1	Dissolved Oxygen	40	-0.41952		Do Not Reject Ho - No Detectable Trend	
BAT 1	E. Coli	40	0.384763		Do Not Reject Ho - No Detectable Trend	
BAT 1	NO2-NO3	40	-1.47988	0.0694523	Reject Ho	Somewhat significant decreasing trend
BAT 1	pH	40	0.58275		Do Not Reject Ho - No Detectable Trend	
BAT 1	Temperature	40	-0.32652		Do Not Reject Ho - No Detectable Trend	
BAT 1	Turbidity	40	-1.29344	0.0979294	Reject Ho	Somewhat significant decreasing trend
BAT12	BOD	33	-0.37266		Do Not Reject Ho - No Detectable Trend	
BAT12	Conductivity (specific)	33	2.96014	0.0015375	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
BAT12	Dissolved Oxygen	33	-0.8214		Do Not Reject Ho - No Detectable Trend	
BAT12	E. Coli	33	0.759591		Do Not Reject Ho - No Detectable Trend	
BAT12	NO2-NO3	33	-1.25535		Do Not Reject Ho - No Detectable Trend	
BAT12	pH	33	-1.72126	0.042602	**Strongly Reject Ho**	**Decreasing trend (pH)**
BAT12	Temperature	33	0.931194		Do Not Reject Ho - No Detectable Trend	
BAT12	Turbidity	33	1.02275		Do Not Reject Ho - No Detectable Trend	
CGT1	BOD	36	-0.10904		Do Not Reject Ho - No Detectable Trend	
CGT1	Conductivity (specific)	35	-1.0084		Do Not Reject Ho - No Detectable Trend	
CGT1	Dissolved Oxygen	34	-0.54856		Do Not Reject Ho - No Detectable Trend	
CGT1	E. Coli	36	1.26855		Do Not Reject Ho - No Detectable Trend	
CGT1	NO2-NO3	36	-3.12247	0.0008967	**Strongly Reject Ho**	**Decreasing trend (NO2-NO3)**
CGT1	pH	35	-0.15642		Do Not Reject Ho - No Detectable Trend	
CGT1	Temperature	35	0.554322		Do Not Reject Ho - No Detectable Trend	
CGT1	Turbidity	36	-0.16347		Do Not Reject Ho - No Detectable Trend	
CGT5	BOD	36	-0.09541		Do Not Reject Ho - No Detectable Trend	
CGT5	Conductivity (specific)	37	0.3924		Do Not Reject Ho - No Detectable Trend	
CGT5	Dissolved Oxygen	36	-0.109		Do Not Reject Ho - No Detectable Trend	
CGT5	E. Coli	37	0.419086		Do Not Reject Ho - No Detectable Trend	
CGT5	NO2-NO3	37	-0.15705		Do Not Reject Ho - No Detectable Trend	
CGT5	pH	37	0.117838		Do Not Reject Ho - No Detectable Trend	
CGT5	Temperature	37	0.641451		Do Not Reject Ho - No Detectable Trend	
CGT5	Turbidity	36	0		Do Not Reject Ho - No Detectable Trend	
CLA1	BOD	43	0.38761		Do Not Reject Ho - No Detectable Trend	
CLA1	Conductivity (specific)	43	0.669787		Do Not Reject Ho - No Detectable Trend	
CLA1	Copper (Dissolved)	18	0		Do Not Reject Ho - No Detectable Trend	
CLA1	Copper (Total)	18	-1.89492	0.0290514	**Strongly Reject Ho**	**Decreasing trend (Copper)**
CLA1	Dissolved Oxygen	43	-0.19888		Do Not Reject Ho - No Detectable Trend	
CLA1	E. Coli	43	0.598994		Do Not Reject Ho - No Detectable Trend	
CLA1	NO2-NO3	43	-1.83195	0.0334794	**Strongly Reject Ho**	**Decreasing trend (NO2-NO3)**
CLA1	Lead (Dissolved)	18	-0.94912		Do Not Reject Ho - No Detectable Trend	
CLA1	Lead (Total)	18	-1.75347	0.039761	**Strongly Reject Ho**	**Decreasing trend (Lead)**
CLA1	pH	43	2.34623	0.0094823	**Strongly Reject Ho**	**Increasing trend (pH)**
CLA1	Temperature	43	0.691046		Do Not Reject Ho - No Detectable Trend	
CLA1	Hardness	18	0.152241		Do Not Reject Ho - No Detectable Trend	
CLA1	Turbidity	43	-0.02093		Do Not Reject Ho - No Detectable Trend	
CLA1	Zinc (Dissolved)	18	-0.11371		Do Not Reject Ho - No Detectable Trend	
CLA1	Zinc (Total)	18	-0.98482		Do Not Reject Ho - No Detectable Trend	

Table 8.
Seasonal Mann-Kendall Statistical Long Term Trend Analysis, Rain (> 0.1 inches previous 24 hours)
Monthly Instream Monitoring Sites

Station	Parameter	H_o: No Trend vs. H_a: Increasing/Decreasing Trend			Result	Trend
		N	Z statistic	p-Value		
CLA10	BOD	39	0.934633		Do Not Reject Ho - No Detectable Trend	
CLA10	Conductivity (specific)	38	1.81064	0.0350983	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
CLA10	Copper (Dissolved)	17	0.714435		Do Not Reject Ho - No Detectable Trend	
CLA10	Copper (Total)	17	-0.56829		Do Not Reject Ho - No Detectable Trend	
CLA10	Dissolved Oxygen	39	0.266131		Do Not Reject Ho - No Detectable Trend	
CLA10	E. Coli	39	2.41016	0.0079728	**Strongly Reject Ho**	**Increasing trend (E. coli)**
CLA10	NO2-NO3	39	-2.09322	0.0181648	**Strongly Reject Ho**	**Decreasing trend (NO2-NO3)**
CLA10	Lead (Dissolved)	17	-1.41618	0.0783619	Reject Ho	Somewhat significant decreasing trend
CLA10	Lead (Total)	17	-1.75114	0.0399609	**Strongly Reject Ho**	**Decreasing trend (Lead)**
CLA10	pH	39	-0.19361		Do Not Reject Ho - No Detectable Trend	
CLA10	Temperature	39	0.472043		Do Not Reject Ho - No Detectable Trend	
CLA10	Hardness	17	0		Do Not Reject Ho - No Detectable Trend	
CLA10	Turbidity	39	0.471813		Do Not Reject Ho - No Detectable Trend	
CLA10	Zinc (Dissolved)	17	0.453119		Do Not Reject Ho - No Detectable Trend	
CLA10	Zinc (Total)	17	-0.08246		Do Not Reject Ho - No Detectable Trend	
CRO1	BOD	40	-0.05839		Do Not Reject Ho - No Detectable Trend	
CRO1	Conductivity (specific)	40	2.09733	0.0179822	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
CRO1	Dissolved Oxygen	40	-0.51268		Do Not Reject Ho - No Detectable Trend	
CRO1	E. Coli	40	0.477757		Do Not Reject Ho - No Detectable Trend	
CRO1	NO2-NO3	40	-1.55029		Do Not Reject Ho - No Detectable Trend	
CRO1	pH	40	0.874065		Do Not Reject Ho - No Detectable Trend	
CRO1	Temperature	40	0.361378		Do Not Reject Ho - No Detectable Trend	
CRO1	Turbidity	40	0.349555		Do Not Reject Ho - No Detectable Trend	
CRO10	BOD	40	-0.52532		Do Not Reject Ho - No Detectable Trend	
CRO10	Conductivity (specific)	40	2.84343	0.0022315	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
CRO10	Dissolved Oxygen	40	0.734015		Do Not Reject Ho - No Detectable Trend	
CRO10	E. Coli	40	-0.29145		Do Not Reject Ho - No Detectable Trend	
CRO10	NO2-NO3	40	-1.3056	0.0958451	Reject Ho	Somewhat significant decreasing trend
CRO10	pH	40	-0.26806		Do Not Reject Ho - No Detectable Trend	
CRO10	Temperature	40	0.209894		Do Not Reject Ho - No Detectable Trend	
CRO10	Turbidity	40	0.186455		Do Not Reject Ho - No Detectable Trend	
GIB1	BOD	37	-0.11793		Do Not Reject Ho - No Detectable Trend	
GIB1	Conductivity (specific)	37	1.962	0.0248812	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
GIB1	Dissolved Oxygen	37	-0.30087		Do Not Reject Ho - No Detectable Trend	
GIB1	E. Coli	37	1.12527		Do Not Reject Ho - No Detectable Trend	
GIB1	NO2-NO3	37	-2.2892	0.011034	**Strongly Reject Ho**	**Decreasing trend (NO2-NO3)**
GIB1	pH	37	2.51322	0.0059817	**Strongly Reject Ho**	**Increasing trend (pH)**
GIB1	Temperature	36	1.29535	0.0976002	Reject Ho	Somewhat significant increasing trend
GIB1	Turbidity	37	-0.49724		Do Not Reject Ho - No Detectable Trend	
GIB15	BOD	36	-1.71905	0.0428024	**Strongly Reject Ho**	**Decreasing trend (BOD)**
GIB15	Conductivity (specific)	36	1.29455	0.0977385	Reject Ho	Somewhat significant increasing trend
GIB15	Dissolved Oxygen	36	0.245199		Do Not Reject Ho - No Detectable Trend	
GIB15	E. Coli	36	0.858807		Do Not Reject Ho - No Detectable Trend	
GIB15	NO2-NO3	36	-1.81158	0.0350256	**Strongly Reject Ho**	**Decreasing trend (NO2-NO3)**
GIB15	pH	36	3.51669	0.0002185	**Strongly Reject Ho**	**Increasing trend (pH)**
GIB15	Temperature	36	0.490701		Do Not Reject Ho - No Detectable Trend	
GIB15	Turbidity	35	-1.40608	0.0798497	Reject Ho	Somewhat significant decreasing trend

Table 8.
Seasonal Mann-Kendall Statistical Long Term Trend Analysis, Rain (> 0.1 inches previous 24 hours)
Monthly Instream Monitoring Sites

Station	Parameter	H_o: No Trend vs. H_a: Increasing/Decreasing Trend			Result	Trend
		N	Z statistic	p-Value		
GLE1	BOD	38	0.088103		Do Not Reject Ho - No Detectable Trend	
GLE1	Conductivity (specific)	38	1.69734	0.0448161	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
GLE1	Dissolved Oxygen	38	-0.86767		Do Not Reject Ho - No Detectable Trend	
GLE1	E. Coli	38	2.22728	0.0129642	**Strongly Reject Ho**	**Increasing trend (E. coli)**
GLE1	NO2-NO3	38	-1.70978	0.0436534	**Strongly Reject Ho**	**Decreasing trend (NO2-NO3)**
GLE1	pH	38	3.22061	0.0006396	**Strongly Reject Ho**	**Increasing trend (pH)**
GLE1	Temperature	38	1.00692		Do Not Reject Ho - No Detectable Trend	
GLE1	Turbidity	38	-0.76695		Do Not Reject Ho - No Detectable Trend	
GLE10	BOD	36	-0.91532		Do Not Reject Ho - No Detectable Trend	
GLE10	Conductivity (specific)	36	3.09194	0.0009943	Strongly Reject Ho	**Increasing trend (Conductivity)**
GLE10	Dissolved Oxygen	36	0.831029		Do Not Reject Ho - No Detectable Trend	
GLE10	E. Coli	36	1.67568	0.0469004	**Strongly Reject Ho**	**Increasing trend (E. coli)**
GLE10	NO2-NO3	36	-2.19378	0.0141257	**Strongly Reject Ho**	**Decreasing trend (NO2-NO3)**
GLE10	pH	36	2.64368	0.0041005	**Strongly Reject Ho**	**Increasing trend (pH)**
GLE10	Temperature	35	0.128067		Do Not Reject Ho - No Detectable Trend	
GLE10	Turbidity	36	-0.38142		Do Not Reject Ho - No Detectable Trend	
LPW1	BOD	36	0.204643		Do Not Reject Ho - No Detectable Trend	
LPW1	Conductivity (specific)	38	0.641218		Do Not Reject Ho - No Detectable Trend	
LPW1	Dissolved Oxygen	38	0.08801		Do Not Reject Ho - No Detectable Trend	
LPW1	E. Coli	37	0.642848		Do Not Reject Ho - No Detectable Trend	
LPW1	NO2-NO3	37	-0.91591		Do Not Reject Ho - No Detectable Trend	
LPW1	pH	37	-0.49744		Do Not Reject Ho - No Detectable Trend	
LPW1	Temperature	38	-0.42758		Do Not Reject Ho - No Detectable Trend	
LPW1	Total Suspended Solids	15	-0.89077		Do Not Reject Ho - No Detectable Trend	
LPW1	Turbidity	36	0.504067		Do Not Reject Ho - No Detectable Trend	
MIC1	BOD	41	-0.61817		Do Not Reject Ho - No Detectable Trend	
MIC1	Conductivity (specific)	41	1.57257	0.0579091	Reject Ho	Somewhat significant increasing trend
MIC1	Dissolved Oxygen	41	-0.82024		Do Not Reject Ho - No Detectable Trend	
MIC1	E. Coli	41	-1.61839	0.0527897	Reject Ho	Somewhat significant decreasing trend
MIC1	NO2-NO3	41	-0.66277		Do Not Reject Ho - No Detectable Trend	
MIC1	pH	41	0.853897		Do Not Reject Ho - No Detectable Trend	
MIC1	Temperature	41	0		Do Not Reject Ho - No Detectable Trend	
MIC1	Turbidity	41	-0.19097		Do Not Reject Ho - No Detectable Trend	
MIC10	BOD	36	-0.46419		Do Not Reject Ho - No Detectable Trend	
MIC10	Conductivity (specific)	36	1.77088	0.0382903	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
MIC10	Dissolved Oxygen	36	-0.50407		Do Not Reject Ho - No Detectable Trend	
MIC10	E. Coli	36	-0.55856		Do Not Reject Ho - No Detectable Trend	
MIC10	NO2-NO3	36	-1.43046	0.0762926	Reject Ho	Somewhat significant decreasing trend
MIC10	pH	37	1.21724		Do Not Reject Ho - No Detectable Trend	
MIC10	Temperature	36	0.122634		Do Not Reject Ho - No Detectable Trend	
MIC10	Turbidity	37	-0.39247		Do Not Reject Ho - No Detectable Trend	
MRA1	BOD	41	-1.39608	0.081345	Reject Ho	Somewhat significant decreasing trend
MRA1	Conductivity (specific)	42	1.07296		Do Not Reject Ho - No Detectable Trend	
MRA1	Dissolved Oxygen	42	-1.20316		Do Not Reject Ho - No Detectable Trend	
MRA1	E. Coli	42	-0.17349		Do Not Reject Ho - No Detectable Trend	
MRA1	NO2-NO3	42	-0.672		Do Not Reject Ho - No Detectable Trend	
MRA1	pH	41	2.05683	0.0198513	**Strongly Reject Ho**	**Increasing trend (pH)**
MRA1	Temperature	42	0.097596		Do Not Reject Ho - No Detectable Trend	
MRA1	Turbidity	42	-1.38773	0.0826098	Reject Ho	Somewhat significant decreasing trend

Table 8.
Seasonal Mann-Kendall Statistical Long Term Trend Analysis, Rain (> 0.1 inches previous 24 hours)
Monthly Instream Monitoring Sites

Station	Parameter	H_o: No Trend vs. H_a: Increasing/Decreasing Trend			Result	Trend
		N	Z statistic	p-Value		
MRA10	BOD	38	-1.94027	0.0261735	**Strongly Reject Ho**	**Decreasing trend (BOD)**
MRA10	Conductivity (specific)	38	1.4332	0.0759008	Reject Ho	Somewhat significant increasing trend
MRA10	Dissolved Oxygen	38	-0.5659		Do Not Reject Ho - No Detectable Trend	
MRA10	E. Coli	38	-1.40902	0.0794148	Reject Ho	Somewhat significant decreasing trend
MRA10	NO2-NO3	38	0.037719		Do Not Reject Ho - No Detectable Trend	
MRA10	pH	38	2.03761	0.0207942	**Strongly Reject Ho**	**Increasing trend (pH)**
MRA10	Temperature	38	0		Do Not Reject Ho - No Detectable Trend	
MRA10	Turbidity	38	-0.55316		Do Not Reject Ho - No Detectable Trend	
PRI1	BOD	36	-1.11889		Do Not Reject Ho - No Detectable Trend	
PRI1	Conductivity (specific)	36	1.96159	0.0249051	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
PRI1	Copper (Dissolved)	17	0		Do Not Reject Ho - No Detectable Trend	
PRI1	Copper (Total)	17	-1.79109	0.0366392	**Strongly Reject Ho**	**Decreasing trend (Copper)**
PRI1	Dissolved Oxygen	36	-0.54499		Do Not Reject Ho - No Detectable Trend	
PRI1	E. Coli	36	-0.9545		Do Not Reject Ho - No Detectable Trend	
PRI1	NO2-NO3	36	0		Do Not Reject Ho - No Detectable Trend	
PRI1	Lead (Dissolved)	17	-0.44096		Do Not Reject Ho - No Detectable Trend	
PRI1	Lead (Total)	17	-1.85495	0.0318019	**Strongly Reject Ho**	**Decreasing trend (Lead)**
PRI1	pH	36	2.23486	0.0127132	**Strongly Reject Ho**	**Increasing trend (pH)**
PRI1	Temperature	36	-0.36808		Do Not Reject Ho - No Detectable Trend	
PRI1	Hardness	17	0.704269		Do Not Reject Ho - No Detectable Trend	
PRI1	Turbidity	36	-0.54489		Do Not Reject Ho - No Detectable Trend	
PRI1	Zinc (Dissolved)	17	-1.94212	0.0260612	**Strongly Reject Ho**	**Decreasing trend (Zinc)**
PRI1	Zinc (Total)	17	-1.69562	0.0449785	**Strongly Reject Ho**	**Decreasing trend (Zinc)**
PRI5	BOD	43	-0.72295		Do Not Reject Ho - No Detectable Trend	
PRI5	Conductivity (specific)	43	2.41791	0.007805	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
PRI5	Copper (Dissolved)	18	-0.57824		Do Not Reject Ho - No Detectable Trend	
PRI5	Copper (Total)	18	-2.2153	0.0133698	**Strongly Reject Ho**	**Decreasing trend (Copper)**
PRI5	Dissolved Oxygen	43	-0.12561		Do Not Reject Ho - No Detectable Trend	
PRI5	E. Coli	43	-0.52371		Do Not Reject Ho - No Detectable Trend	
PRI5	NO2-NO3	43	-1.39213	0.0819416	Reject Ho	Somewhat significant decreasing trend
PRI5	Lead (Dissolved)	18	-1.19415		Do Not Reject Ho - No Detectable Trend	
PRI5	Lead (Total)	18	-2.25661	0.0120163	**Strongly Reject Ho**	**Decreasing trend (Lead)**
PRI5	pH	43	2.88951	0.0019292	**Strongly Reject Ho**	**Increasing trend (pH)**
PRI5	Temperature	43	0.502597		Do Not Reject Ho - No Detectable Trend	
PRI5	Hardness	18	1.10241		Do Not Reject Ho - No Detectable Trend	
PRI5	Turbidity	43	-0.96292		Do Not Reject Ho - No Detectable Trend	
PRI5	Zinc (Dissolved)	18	0.454532		Do Not Reject Ho - No Detectable Trend	
PRI5	Zinc (Total)	18	-0.83331		Do Not Reject Ho - No Detectable Trend	
SHE1	BOD	42	-1.50944		Do Not Reject Ho - No Detectable Trend	
SHE1	Conductivity (specific)	42	0.899556		Do Not Reject Ho - No Detectable Trend	
SHE1	Dissolved Oxygen	42	-0.41187		Do Not Reject Ho - No Detectable Trend	
SHE1	E. Coli	42	-0.99743		Do Not Reject Ho - No Detectable Trend	
SHE1	NO2-NO3	42	-0.15172		Do Not Reject Ho - No Detectable Trend	
SHE1	pH	42	2.3417	0.009598	**Strongly Reject Ho**	**Increasing trend (pH)**
SHE1	Temperature	42	0.086723		Do Not Reject Ho - No Detectable Trend	
SHE1	Turbidity	42	0.140894		Do Not Reject Ho - No Detectable Trend	

Table 8.
Seasonal Mann-Kendall Statistical Long Term Trend Analysis, Rain (> 0.1 inches previous 24 hours)
Monthly Instream Monitoring Sites

Station	Parameter	H_o: No Trend vs. H_a: Increasing/Decreasing Trend			Result	Trend
		N	Z statistic	p-Value		
SHE10	BOD	38	-1.21035		Do Not Reject Ho - No Detectable Trend	
SHE10	Conductivity (specific)	39	0.689572		Do Not Reject Ho - No Detectable Trend	
SHE10	Dissolved Oxygen	39	-1.07686		Do Not Reject Ho - No Detectable Trend	
SHE10	E. Coli	39	-1.75477	0.039649	**Strongly Reject Ho**	**Decreasing trend (E. coli)**
SHE10	NO2-NO3	39	-1.37904	0.0839407	Reject Ho	Somewhat significant decreasing trend
SHE10	pH	39	3.46072	0.0002694	**Strongly Reject Ho**	**Increasing trend (pH)**
SHE10	Temperature	39	0.980062		Do Not Reject Ho - No Detectable Trend	
SHE10	Turbidity	39	-0.84691		Do Not Reject Ho - No Detectable Trend	
WR1	Alkalinty	42	0.48026		Do Not Reject Ho - No Detectable Trend	
WR1	Ammonia	42	-2.98826	0.0014028	**Strongly Reject Ho**	**Decreasing trend (Ammonia)**
WR1	BOD	20	0.911162		Do Not Reject Ho - No Detectable Trend	
WR1	Conductivity (specific)	42	-1.48615	0.0686199	Reject Ho	Somewhat significant decreasing trend
WR1	Dissolved Oxygen	42	0.433716		Do Not Reject Ho - No Detectable Trend	
WR1	E. Coli	20	0.584305		Do Not Reject Ho - No Detectable Trend	
WR1	NO2-NO3	42	0		Do Not Reject Ho - No Detectable Trend	
WR1	Total Phosphorus	42	-0.7372		Do Not Reject Ho - No Detectable Trend	
WR1	pH	42	4.68285	0.0000014	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
WR1	Total Dissolved Solids	42	-0.38055		Do Not Reject Ho - No Detectable Trend	
WR1	Temperature	42	-0.17344		Do Not Reject Ho - No Detectable Trend	
WR1	Total Solids	42	-0.1302		Do Not Reject Ho - No Detectable Trend	
WR1	Total Suspended Solids	42	-0.26097		Do Not Reject Ho - No Detectable Trend	
WR1	Turbidity	42	0.888666		Do Not Reject Ho - No Detectable Trend	
WR5	Alkalinty	47	-0.0648		Do Not Reject Ho - No Detectable Trend	
WR5	Ammonia	30	-1.42476	0.0771137	Reject Ho	Somewhat significant decreasing trend
WR5	BOD	23	1.29456	0.0977354	Reject Ho	Somewhat significant increasing trend
WR5	Conductivity (specific)	47	-2.07351	0.0190624	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
WR5	Dissolved Oxygen	47	0.458651		Do Not Reject Ho - No Detectable Trend	
WR5	E. Coli	23	1.8758	0.0303416	**Strongly Reject Ho**	**Increasing trend (E. coli)**
WR5	NO2-NO3	47	-0.76182		Do Not Reject Ho - No Detectable Trend	
WR5	Total Phosphorus	47	-0.51385		Do Not Reject Ho - No Detectable Trend	
WR5	pH	47	2.95363	0.0015703	**Strongly Reject Ho**	**Increasing trend (pH)**
WR5	Total Dissolved Solids	47	-1.0096		Do Not Reject Ho - No Detectable Trend	
WR5	Temperature	47	-0.8532		Do Not Reject Ho - No Detectable Trend	
WR5	Total Solids	47	-0.11016		Do Not Reject Ho - No Detectable Trend	
WR5	Total Suspended Solids	47	0.80893		Do Not Reject Ho - No Detectable Trend	
WR5	Turbidity	47	1.19226		Do Not Reject Ho - No Detectable Trend	

Table 8.
Seasonal Mann-Kendall Statistical Long Term Trend Analysis, No Rain (< 0.1 inches previous 24 hours)
Monthly Instream Monitoring Sites

Station	Parameter	H_o: No Trend vs. H_a: Increasing/Decreasing Trend			Result	Trend
		N	Z statistic	p-Value		
BAT 1	BOD	139	-3.94465	0.00004	**Strongly Reject Ho**	**Decreasing trend (BOD)**
BAT 1	Conductivity (specific)	139	6.09692	0.00000	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
BAT 1	Dissolved Oxygen	139	2.29628	0.01083	**Strongly Reject Ho**	**Increasing trend (Dissolved Oxygen)**
BAT 1	E. Coli	139	-2.70835	0.0033809	**Strongly Reject Ho**	**Decreasing trend (E. coli)**
BAT 1	NO2-NO3	138	-2.1796	0.0146437	**Strongly Reject Ho**	**Decreasing trend (NO2-NO3)**
BAT 1	pH	137	0.16378		Do Not Reject Ho - No Detectable Trend	
BAT 1	Temperature	139	0.358778		Do Not Reject Ho - No Detectable Trend	
BAT 1	Turbidity	139	-3.54759	0.0001944	**Strongly Reject Ho**	**Decreasing trend (Turbidity)**
BAT12	BOD	122	-4.90503	0.0000005	**Strongly Reject Ho**	**Decreasing trend (BOD)**
BAT12	Conductivity (specific)	122	4.83577	0.0000007	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
BAT12	Dissolved Oxygen	122	2.19753	0.0139912	**Strongly Reject Ho**	**Increasing trend (Dissolved Oxygen)**
BAT12	E. Coli	121	-2.22283	0.0131136	**Strongly Reject Ho**	**Decreasing trend (E. coli)**
BAT12	NO2-NO3	121	-0.55813		Do Not Reject Ho - No Detectable Trend	
BAT12	pH	121	-0.23529		Do Not Reject Ho - No Detectable Trend	
BAT12	Temperature	122	-0.02656		Do Not Reject Ho - No Detectable Trend	
BAT12	Turbidity	122	-0.35853		Do Not Reject Ho - No Detectable Trend	
CGT1	BOD	143	-0.23242		Do Not Reject Ho - No Detectable Trend	
CGT1	Conductivity (specific)	143	5.51882	0.000000	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
CGT1	Dissolved Oxygen	142	-1.29638	0.0974225	Reject Ho	Somewhat significant decreasing trend
CGT1	E. Coli	142	-0.26459		Do Not Reject Ho - No Detectable Trend	
CGT1	NO2-NO3	142	-2.63833	0.0041658	**Strongly Reject Ho**	**Decreasing trend (NO2-NO3)**
CGT1	pH	140	5.48853	0.000000	**Strongly Reject Ho**	**Increasing trend (pH)**
CGT1	Temperature	143	0.790694		Do Not Reject Ho - No Detectable Trend	
CGT1	Turbidity	143	-2.1505	0.0157577	**Strongly Reject Ho**	**Decreasing trend (Turbidity)**
CGT5	BOD	110	-1.17371		Do Not Reject Ho - No Detectable Trend	
CGT5	Conductivity (specific)	110	2.90602	0.0018303	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
CGT5	Dissolved Oxygen	109	2.23625	0.0126676	**Strongly Reject Ho**	**Increasing trend (Dissolved Oxygen)**
CGT5	E. Coli	110	2.72853	0.0031809	**Strongly Reject Ho**	**Increasing trend (E. coli)**
CGT5	NO2-NO3	110	-1.52449	0.0636934	Reject Ho	Somewhat significant decreasing trend
CGT5	pH	110	6.68593	0.00000	**Strongly Reject Ho**	**Increasing trend (pH)**
CGT5	Temperature	110	2.51111	0.0060176	**Strongly Reject Ho**	**Increasing trend in (Temperature)**
CGT5	Turbidity	110	1.17023		Do Not Reject Ho - No Detectable Trend	
CLA1	BOD	136	-3.64765	0.0001323	**Strongly Reject Ho**	**Decreasing trend (BOD)**
CLA1	Conductivity (specific)	134	6.24016	0.000000	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
CLA1	Copper (Dissolved)	48	-1.63912	0.0505942	Reject Ho	Somewhat significant decreasing trend
CLA1	Copper (Total)	48	-1.38935	0.0823627	Reject Ho	Somewhat significant decreasing trend
CLA1	Dissolved Oxygen	133	2.22923	0.0128992	**Strongly Reject Ho**	**Increasing trend (Dissolved Oxygen)**
CLA1	E. Coli	136	-2.59897	0.0046752	**Strongly Reject Ho**	**Decreasing trend (E. coli)**
CLA1	NO2-NO3	135	-3.43952	0.0002914	**Strongly Reject Ho**	**Decreasing trend (NO2-NO3)**
CLA1	Lead (Dissolved)	48	-1.51133	0.0653521	Reject Ho	Somewhat significant decreasing trend
CLA1	Lead (Total)	48	-0.90417		Do Not Reject Ho - No Detectable Trend	
CLA1	pH	135	5.77213	0.00000	**Strongly Reject Ho**	**Increasing trend (pH)**
CLA1	Temperature	134	0.073099		Do Not Reject Ho - No Detectable Trend	
CLA1	Hardness	47	2.36413	0.0090363	**Strongly Reject Ho**	**Increasing trend (Hardness)**
CLA1	Turbidity	135	-3.6114	0.0001523	**Strongly Reject Ho**	**Decreasing trend (Turbidity)**
CLA1	Zinc (Dissolved)	48	-0.16006		Do Not Reject Ho - No Detectable Trend	
CLA1	Zinc (Total)	48	-0.55127		Do Not Reject Ho - No Detectable Trend	

Table 8.
Seasonal Mann-Kendall Statistical Long Term Trend Analysis, No Rain (< 0.1 inches previous 24 hours)
Monthly Instream Monitoring Sites

		H_o: No Trend vs. H_a: Increasing/Decreasing Trend				
Station	**Parameter**	**N**	**Z statistic**	**p-Value**	**Result**	**Trend**
CLA10	BOD	140	-0.8722		Do Not Reject Ho - No Detectable Trend	
CLA10	Conductivity (specific)	140	10.5848	0.000000	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
CLA10	Copper (Dissolved)	49	-1.51539	0.0648368	Reject Ho	Somewhat significant decreasing trend
CLA10	Copper (Total)	49	-1.23133		Do Not Reject Ho - No Detectable Trend	
CLA10	Dissolved Oxygen	140	3.28258	0.0005143	**Strongly Reject Ho**	**Increasing trend (Dissolved Oxygen)**
CLA10	E. Coli	140	0.437867		Do Not Reject Ho - No Detectable Trend	
CLA10	NO2-NO3	138	0.811823		Do Not Reject Ho - No Detectable Trend	
CLA10	Lead (Dissolved)	49	-0.34857		Do Not Reject Ho - No Detectable Trend	
CLA10	Lead (Total)	49	0.620057		Do Not Reject Ho - No Detectable Trend	
CLA10	pH	139	2.49714	0.00626	**Strongly Reject Ho**	**Increasing trend (pH)**
CLA10	Temperature	140	0.461299		Do Not Reject Ho - No Detectable Trend	
CLA10	Hardness	48	1.91563	0.0277059	**Strongly Reject Ho**	**Increasing trend (Hardness)**
CLA10	Turbidity	140	-3.43829	0.0002927	**Strongly Reject Ho**	**Decreasing trend (Turbidity)**
CLA10	Zinc (Dissolved)	49	0.732922		Do Not Reject Ho - No Detectable Trend	
CLA10	Zinc (Total)	49	0.181061		Do Not Reject Ho - No Detectable Trend	
CRO1	BOD	139	-3.24151	0.0005945	**Strongly Reject Ho**	**Decreasing trend (BOD)**
CRO1	Conductivity (specific)	139	3.46172	0.0002684	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
CRO1	Dissolved Oxygen	139	0.988798		Do Not Reject Ho - No Detectable Trend	
CRO1	E. Coli	139	-0.97995		Do Not Reject Ho - No Detectable Trend	
CRO1	NO2-NO3	138	-0.56343		Do Not Reject Ho - No Detectable Trend	
CRO1	pH	138	3.83155	0.0000637	**Strongly Reject Ho**	**Increasing trend (pH)**
CRO1	Temperature	139	0.595523		Do Not Reject Ho - No Detectable Trend	
CRO1	Turbidity	139	-1.08734		Do Not Reject Ho - No Detectable Trend	
CRO10	BOD	138	-4.67758	0.0000015	**Strongly Reject Ho**	**Decreasing trend (BOD)**
CRO10	Conductivity (specific)	138	4.43257	0.0000047	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
CRO10	Dissolved Oxygen	138	2.0506	0.020153	**Strongly Reject Ho**	**Increasing trend (Dissolved Oxygen)**
CRO10	E. Coli	138	-0.34799		Do Not Reject Ho - No Detectable Trend	
CRO10	NO2-NO3	137	1.39589	0.0813731	Reject Ho	Somewhat significant increasing trend
CRO10	pH	137	0.681179		Do Not Reject Ho - No Detectable Trend	
CRO10	Temperature	138	-0.22643		Do Not Reject Ho - No Detectable Trend	
CRO10	Turbidity	138	0.977573		Do Not Reject Ho - No Detectable Trend	
GIB1	BOD	141	-2.99338	0.0013795	**Strongly Reject Ho**	**Decreasing trend (BOD)**
GIB1	Conductivity (specific)	140	1.6917	0.0453515	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
GIB1	Dissolved Oxygen	139	1.68444	0.0460484	**Strongly Reject Ho**	**Increasing trend (Dissolved Oxygen)**
GIB1	E. Coli	142	-1.68105	0.0463771	**Strongly Reject Ho**	**Decreasing trend (E. coli)**
GIB1	NO2-NO3	140	-0.89907		Do Not Reject Ho - No Detectable Trend	
GIB1	pH	140	4.86147	0.0000006	**Strongly Reject Ho**	**Increasing trend (pH)**
GIB1	Temperature	140	0.945918		Do Not Reject Ho - No Detectable Trend	
GIB1	Turbidity	141	-1.30686	0.0956303	Reject Ho	Somewhat significant decreasing trend
GIB15	BOD	140	-2.76642	0.0028338	**Strongly Reject Ho**	**Decreasing trend (BOD)**
GIB15	Conductivity (specific)	139	4.31583	0.000008	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
GIB15	Dissolved Oxygen	138	1.1247		Do Not Reject Ho - No Detectable Trend	
GIB15	E. Coli	140	2.75018	0.0029781	**Strongly Reject Ho**	**Increasing trend (E. coli)**
GIB15	NO2-NO3	139	-2.31631	0.0102706	**Strongly Reject Ho**	**Decreasing trend (NO2-NO3)**
GIB15	pH	139	5.9105	0.00000	**Strongly Reject Ho**	**Increasing trend (pH)**
GIB15	Temperature	139	1.24206		Do Not Reject Ho - No Detectable Trend	
GIB15	Turbidity	139	-0.40792		Do Not Reject Ho - No Detectable Trend	

Table 8.
Seasonal Mann-Kendall Statistical Long Term Trend Analysis, No Rain (< 0.1 inches previous 24 hours)
Monthly Instream Monitoring Sites

		H_o: No Trend vs. H_a: Increasing/Decreasing Trend				
Station	Parameter	N	Z statistic	p-Value	Result	Trend
GLE1	BOD	138	-1.55812	0.0596018	Reject Ho	Somewhat significant decreasing trend
GLE1	Conductivity (specific)	137	3.90229	0.0000476	Strongly Reject Ho	Increasing trend (Conductivity)
GLE1	Dissolved Oxygen	136	0.52302		Do Not Reject Ho - No Detectable Trend	
GLE1	E. Coli	138	-2.99173	0.001387	Strongly Reject Ho	Decreasing trend (E. coli)
GLE1	NO2-NO3	137	0.736941		Do Not Reject Ho - No Detectable Trend	
GLE1	pH	137	6.56542	0.00000	Strongly Reject Ho	Increasing trend (pH)
GLE1	Temperature	137	0.666282		Do Not Reject Ho - No Detectable Trend	
GLE1	Turbidity	138	-1.80784	0.035316	Strongly Reject Ho	Decreasing trend (Turbidity)
GLE10	BOD	129	-3.6716	0.0001205	Strongly Reject Ho	Decreasing trend (BOD)
GLE10	Conductivity (specific)	128	4.65735	0.0000016	Strongly Reject Ho	Increasing trend (Conductivity)
GLE10	Dissolved Oxygen	127	3.44706	0.0002834	Strongly Reject Ho	Increasing trend (Dissolved Oxygen)
GLE10	E. Coli	129	1.89804	0.0288452	Strongly Reject Ho	Increasing trend (E. coli)
GLE10	NO2-NO3	128	-0.56859		Do Not Reject Ho - No Detectable Trend	
GLE10	pH	127	6.97238	0.000000	Strongly Reject Ho	Increasing trend (pH)
GLE10	Temperature	128	0.164809		Do Not Reject Ho - No Detectable Trend	
GLE10	Turbidity	127	0.741983		Do Not Reject Ho - No Detectable Trend	
LPW1	BOD	89	-1.1636		Do Not Reject Ho - No Detectable Trend	
LPW1	Conductivity (specific)	89	3.12929	0.0008761	Strongly Reject Ho	Increasing trend (Conductivity)
LPW1	Dissolved Oxygen	89	-1.03836		Do Not Reject Ho - No Detectable Trend	
LPW1	E. Coli	89	0.850673		Do Not Reject Ho - No Detectable Trend	
LPW1	NO2-NO3	88	-1.69476	0.0450601	Strongly Reject Ho	Decreasing trend (NO2-NO3)
LPW1	pH	88	4.03052	0.0000278	Strongly Reject Ho	Increasing trend (pH)
LPW1	Temperature	89	1.22286		Do Not Reject Ho - No Detectable Trend	
LPW1	Total Suspended Solids	33	-2.55863	0.0052543	Strongly Reject Ho	Decreasing trend (Tot. Suspended Solids)
LPW1	Turbidity	88	0.77492		Do Not Reject Ho - No Detectable Trend	
MIC1	BOD	135	-3.17522	0.0007486	Strongly Reject Ho	Decreasing trend (BOD)
MIC1	Conductivity (specific)	136	4.53227	0.0000029	Strongly Reject Ho	Increasing trend (Conductivity)
MIC1	Dissolved Oxygen	136	0.248348		Do Not Reject Ho - No Detectable Trend	
MIC1	E. Coli	136	-3.81283	0.0000687	Strongly Reject Ho	Decreasing trend (E. coli)
MIC1	NO2-NO3	135	-0.24351		Do Not Reject Ho - No Detectable Trend	
MIC1	pH	135	6.16229	0.00000	Strongly Reject Ho	Increasing trend (pH)
MIC1	Temperature	136	0.86738		Do Not Reject Ho - No Detectable Trend	
MIC1	Turbidity	136	-3.22503	0.0006298	Strongly Reject Ho	Decreasing trend (Turbidity)
MIC10	BOD	142	-3.73603	0.0000935	Strongly Reject Ho	Decreasing trend (BOD)
MIC10	Conductivity (specific)	142	5.47477	0.000000	Strongly Reject Ho	Increasing trend (Conductivity)
MIC10	Dissolved Oxygen	141	0.276299		Do Not Reject Ho - No Detectable Trend	
MIC10	E. Coli	142	-3.42372	0.0003088	Strongly Reject Ho	Decreasing trend (E. coli)
MIC10	NO2-NO3	141	0.199655		Do Not Reject Ho - No Detectable Trend	
MIC10	pH	140	6.64884	0.000000	Strongly Reject Ho	Increasing trend (pH)
MIC10	Temperature	142	1.06015		Do Not Reject Ho - No Detectable Trend	
MIC10	Turbidity	142	-2.2087	0.0135977	Strongly Reject Ho	Decreasing trend (Turbidity)
MRA1	BOD	136	-2.37685	0.0087305	Strongly Reject Ho	Decreasing trend (BOD)
MRA1	Conductivity (specific)	134	3.07762	0.0010433	Strongly Reject Ho	Increasing trend (Conductivity)
MRA1	Dissolved Oxygen	134	0.176964		Do Not Reject Ho - No Detectable Trend	
MRA1	E. Coli	135	-0.77628		Do Not Reject Ho - No Detectable Trend	
MRA1	NO2-NO3	135	-0.25303		Do Not Reject Ho - No Detectable Trend	
MRA1	pH	135	6.19476	0.00000	Strongly Reject Ho	Increasing trend (pH)
MRA1	Temperature	134	0.913756		Do Not Reject Ho - No Detectable Trend	
MRA1	Turbidity	136	-2.6513	0.0040091	Strongly Reject Ho	Decreasing trend (Turbidity)

Table 8.
Seasonal Mann-Kendall Statistical Long Term Trend Analysis, No Rain (< 0.1 inches previous 24 hours)
Monthly Instream Monitoring Sites

Station	Parameter	H_o: No Trend vs. H_a: Increasing/Decreasing Trend			Result	Trend
		N	Z statistic	p-Value		
MRA10	BOD	140	-2.97207	0.001479	**Strongly Reject Ho**	**Decreasing trend (BOD)**
MRA10	Conductivity (specific)	139	3.72762	0.0000966	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
MRA10	Dissolved Oxygen	140	-0.93863		Do Not Reject Ho - No Detectable Trend	
MRA10	E. Coli	140	-1.26316		Do Not Reject Ho - No Detectable Trend	
MRA10	NO2-NO3	139	-0.29503		Do Not Reject Ho - No Detectable Trend	
MRA10	pH	139	5.79696	0.00000	**Strongly Reject Ho**	**Increasing trend (pH)**
MRA10	Temperature	140	0.927918		Do Not Reject Ho - No Detectable Trend	
MRA10	Turbidity	140	-2.0199	0.021697	**Strongly Reject Ho**	**Decreasing trend (Turbidity)**
PRI1	BOD	131	-2.65981	0.0039092	**Strongly Reject Ho**	**Decreasing trend (BOD)**
PRI1	Conductivity (specific)	130	3.58647	0.0001676	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
PRI1	Copper (Dissolved)	46	-1.39061	0.0821719	Reject Ho	Somewhat significant decreasing trend
PRI1	Copper (Total)	46	-0.5353		Do Not Reject Ho - No Detectable Trend	
PRI1	Dissolved Oxygen	131	0.905336		Do Not Reject Ho - No Detectable Trend	
PRI1	E. Coli	131	-1.98993	0.0232995	Strongly reject Ho	**Decreasing trend (E. coli)**
PRI1	NO2-NO3	130	-0.10265		Do Not Reject Ho - No Detectable Trend	
PRI1	Lead (Dissolved)	46	-1.66638	0.0478194	Strongly reject Ho	**Decreasing trend (Lead)**
PRI1	Lead (Total)	46	-0.43631		Do Not Reject Ho - No Detectable Trend	
PRI1	pH	130	5.13876	0.0000001	Strongly reject Ho	**Increasing trend (pH)**
PRI1	Temperature	131	0.752163		Do Not Reject Ho - No Detectable Trend	
PRI1	Hardness	46	1.04494		Do Not Reject Ho - No Detectable Trend	
PRI1	Turbidity	131	-1.76725	0.0385934	Strongly reject Ho	**Decreasing trend (Turbidity)**
PRI1	Zinc (Dissolved)	46	-1.91481	0.0277587	Strongly reject Ho	**Decreasing trend (Zinc)**
PRI1	Zinc (Total)	46	-2.35083	0.0093657	Strongly reject Ho	**Decreasing trend (Zinc)**
PRI5	BOD	136	-0.94637		Do Not Reject Ho - No Detectable Trend	
PRI5	Conductivity (specific)	134	5.92252	0.000000	Strongly reject Ho	**Increasing trend (Conductivity)**
PRI5	Copper (Dissolved)	48	-1.89989	0.0287239	Strongly reject Ho	**Decreasing trend (Copper)**
PRI5	Copper (Total)	48	-2.26816	0.0116597	Strongly reject Ho	**Decreasing trend (Copper)**
PRI5	Dissolved Oxygen	132	0.247873		Do Not Reject Ho - No Detectable Trend	
PRI5	E. Coli	135	-0.68104		Do Not Reject Ho - No Detectable Trend	
PRI5	NO2-NO3	135	-0.72672		Do Not Reject Ho - No Detectable Trend	
PRI5	Lead (Dissolved)	48	-1.34914	0.0886455	Reject Ho	Somewhat significant decreasing trend
PRI5	Lead (Total)	48	-0.9178		Do Not Reject Ho - No Detectable Trend	
PRI5	pH	135	6.30782	0.000000	**Strongly Reject Ho**	**Increasing trend (pH)**
PRI5	Temperature	134	0.775225		Do Not Reject Ho - No Detectable Trend	
PRI5	Hardness	47	1.55643	0.0598028	Reject Ho	Somewhat significant increasing trend
PRI5	Turbidity	136	-2.27308	0.0115107	**Strongly Reject Ho**	**Decreasing trend (Turbidity)**
PRI5	Zinc (Dissolved)	48	-0.63295		Do Not Reject Ho - No Detectable Trend	
PRI5	Zinc (Total)	48	-1.56502	0.0587895	Reject Ho	Somewhat significant decreasing trend
SHE1	BOD	137	-3.07355	0.0010576	**Strongly Reject Ho**	**Decreasing trend (BOD)**
SHE1	Conductivity (specific)	135	2.46721	0.0068086	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
SHE1	Dissolved Oxygen	135	0.01712		Do Not Reject Ho - No Detectable Trend	
SHE1	E. Coli	137	-2.76546	0.0028421	**Strongly Reject Ho**	**Decreasing trend (E. coli)**
SHE1	NO2-NO3	136	-0.2653		Do Not Reject Ho - No Detectable Trend	
SHE1	pH	136	5.59021	0.000000	**Strongly Reject Ho**	**Increasing trend (pH)**
SHE1	Temperature	135	0.894123		Do Not Reject Ho - No Detectable Trend	
SHE1	Turbidity	137	-1.54476	0.0612018	Reject Ho	Somewhat significant decreasing trend

Table 8.
Seasonal Mann-Kendall Statistical Long Term Trend Analysis, No Rain (< 0.1 inches previous 24 hours)
Monthly Instream Monitoring Sites

Station	Parameter	H_o: No Trend vs. H_a: Increasing/Decreasing Trend			Result	Trend
		N	Z statistic	p-Value		
SHE10	BOD	139	-2.71238	0.0033401	**Strongly Reject Ho**	**Decreasing trend (BOD)**
SHE10	Conductivity (specific)	138	3.98336	0.000034	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
SHE10	Dissolved Oxygen	139	-0.05827		Do Not Reject Ho - No Detectable Trend	
SHE10	E. Coli	139	-1.87952	0.0300871	**Strongly Reject Ho**	**Decreasing trend (E. coli)**
SHE10	NO2-NO3	138	0.287178		Do Not Reject Ho - No Detectable Trend	
SHE10	pH	138	5.90576	0.00000	**Strongly Reject Ho**	**Increasing trend (pH)**
SHE10	Temperature	139	0.992541		Do Not Reject Ho - No Detectable Trend	
SHE10	Turbidity	139	-1.3825	0.0834092	Reject Ho	Somewhat significant decreasing trend
WR1	Alkalinty	198	2.76177	0.0028744	**Strongly Reject Ho**	**Increasing trend (Alkalinity)**
WR1	Ammonia	198	-4.51875	0.0000031	**Strongly Reject Ho**	**Decreasing trend (Ammonia)**
WR1	BOD	119	3.89273	0.0000496	**Strongly Reject Ho**	**Increasing trend (BOD)**
WR1	Conductivity (specific)	200	-4.57109	0.0000024	**Strongly Reject Ho**	**Decreasing trend (Conductivity)**
WR1	Dissolved Oxygen	199	4.41716	0.000005	**Strongly Reject Ho**	**Increasing trend (Dissolved Oxygen)**
WR1	E. Coli	121	-0.53795		Do Not Reject Ho - No Detectable Trend	
WR1	NO2-NO3	198	-1.49279	0.067746	Reject Ho	Somewhat significant decreasing trend
WR1	Total Phosphorus	198	-4.7999	0.0000008	**Strongly Reject Ho**	**Decreasing trend (Tot. Phos)**
WR1	pH	198	10.214	0.000000	**Strongly Reject Ho**	**Increasing trend (pH)**
WR1	Total Dissolved Solids	198	-3.02645	0.0012372	**Strongly Reject Ho**	**Decreasing trend (TDS)**
WR1	Temperature	200	-0.75458		Do Not Reject Ho - No Detectable Trend	
WR1	Total Solids	198	-3.1515	0.0008122	**Strongly Reject Ho**	**Decreasing trend (Total Solids)**
WR1	Total Suspended Solids	198	-2.67133	0.0037776	**Strongly Reject Ho**	**Decreasing trend (Tot. Suspended Solids)**
WR1	Turbidity	200	0.714382		Do Not Reject Ho - No Detectable Trend	
WR5	Alkalinty	193	1.48718	0.0684843	Reject Ho	Somewhat significant increasing trend
WR5	Ammonia	130	-4.43011	0.0000047	**Strongly Reject Ho**	**Decreasing trend (Ammonia)**
WR5	BOD	116	3.16739	0.0007691	**Strongly Reject Ho**	**Increasing trend (BOD)**
WR5	Conductivity (specific)	194	-4.6358	0.0000018	**Strongly Reject Ho**	**Decreasing trend (Conductivity)**
WR5	Dissolved Oxygen	194	1.73337	0.0415153	**Strongly Reject Ho**	**Increasing trend (Dissolved Oxygen)**
WR5	E. Coli	118	2.87254	0.002036	**Strongly Reject Ho**	**Increasing trend (E. coli)**
WR5	NO2-NO3	193	-1.91525	0.02773	**Strongly Reject Ho**	**Decreasing trend (NO2-NO3)**
WR5	Total Phosphorus	192	-5.49003	0.000000	**Strongly Reject Ho**	**Decreasing trend (Tot. Phos)**
WR5	pH	193	8.67845	0.000000	**Strongly Reject Ho**	**Increasing trend (pH)**
WR5	Total Dissolved Solids	193	-3.65643	0.0001279	**Strongly Reject Ho**	**Decreasing trend (TDS)**
WR5	Temperature	195	-1.37532	0.0845165	Reject Ho	Somewhat significant decreasing trend
WR5	Total Solids	193	-3.9805	0.0000344	**Strongly Reject Ho**	**Decreasing trend (Total Solids)**
WR5	Total Suspended Solids	193	-2.37105	0.0088689	**Strongly Reject Ho**	**Decreasing trend (Tot. Suspended Solids)**
WR5	Turbidity	195	0.263415		Do Not Reject Ho - No Detectable Trend	

Table 9.
Statistical Summaries for Continuous Instream Monitoring Stations (2006 - 2016)
Separated by Rain / No Rain

BAT3 NO RAIN

Variable	N	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Cond	1249	53.62	7.046	43.29	47.67	52.2	59.025	116.1
DO	1311	9.0629	1.6185	5.729	7.63	9.0745	10.47	13.354
pH	1386	6.6728	0.2241	5.66	6.53	6.68	6.8403	7.157
Temp	1498	13.372	4.374	1.896	9.679	13.81	17.096	22.325
Turb	848	11.273	4.029	4.05	8.078	11.34	13.754	36.213

BAT3 RAIN

Variable	N	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Cond	529	48.691	6.431	28.8	45.015	47.684	51.418	104.525
DO	590	9.8452	1.0842	6.16	9.2469	10.11	10.5962	12.842
pH	606	6.4206	0.221	5.58	6.28	6.42	6.56	7.1313
Temp	684	10.377	2.553	2.869	8.711	9.968	11.678	19.17
Turb	310	16.32	10.064	4.83	9.654	14.308	20.912	90.394

BAT12 NO RAIN

Variable	N	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Cond	1196	49.541	8.434	33	43.1	46.873	54.475	75.44
DO	1360	10.07	1.595	5.25	8.86	10.11	11.4	14.084
pH	1295	7.1115	0.2578	6.27	6.97	7.12	7.288	7.745
Temp	1455	12.399	4.401	0.867	8.635	12.67	16.177	23.495
Turb	1246	6.5577	2.9849	-0.08	4.7553	6.3362	8.2036	28.14

BAT12 RAIN

Variable	N	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Cond	542	46.261	5.788	34	42.977	44.9	48.275	78.5
DO	646	10.998	0.908	5.17	10.6	11.205	11.545	13.315
pH	605	6.9551	0.2903	6.19	6.77	6.98	7.1605	7.6035
Temp	669	9.4792	2.4227	2.02	8.0633	9.18	10.695	18.1656
Turb	501	10.213	8.954	0.14	5.809	8.371	12.334	123.745

CLK1 NO RAIN

Variable	N	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Cond	1759	94.595	5.148	46.01	91	94.21	97.4	113.78
DO	1663	9.7903	0.9875	6.03	9	9.564	10.575	12.452
pH	1631	7.13	0.2161	6.5875	6.98	7.102	7.28	7.9725
Temp	1907	14.007	3.277	4.16	11.29	14.47	16.843	20.157
Turb	1310	4.5507	2.437	0.4	2.9	4.2	6.0225	23.3

CLK1 RAIN

Variable	N	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Cond	668	82.424	14.656	35.55	73.309	85.778	93.29	128.5
DO	725	10.396	0.824	7.28	9.912	10.53	10.99	13.143
pH	677	6.9603	0.2398	6.23	6.8	6.97	7.14	7.6775
Temp	834	11.477	2.456	4.098	9.81	11.078	12.897	19.14
Turb	494	14.682	14.272	1.3	6.315	10.98	18.516	154.6

CLK12 NO RAIN

Variable	N	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Cond	1726	71.221	6.676	54.307	68.061	71	73.492	190
DO	1571	9.4886	0.7371	5.71	8.965	9.39	10.133	11.155
pH	1678	6.7149	0.2537	5.89	6.54	6.72	6.8767	7.45
Temp	1915	13.628	2.38	7.364	11.51	13.77	15.756	18.265
Turb	1133	4.846	7.213	0.6	3.1	4.47	5.815	232.5

CLK12 RAIN

Variable	N	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Cond	756	70.505	11.976	31.085	66.102	70.905	75	189.05
DO	610	9.8333	0.7035	7.0825	9.44	10.03	10.3305	11.494
pH	679	6.4356	0.2373	5.65	6.31	6.42	6.575	7.253
Temp	780	11.808	1.948	5.989	10.373	11.348	12.917	17.94
Turb	394	9.002	10.036	0.8	4.091	6.578	10.561	110.6

GLE3 NO RAIN

Variable	N	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Cond	1485	113.07	16.7	62.63	98	115	126	160
DO	1585	9.9317	1.2326	6.93	8.905	9.7	10.9203	14.28
pH	1594	7.3061	0.2076	6.65	7.1687	7.3	7.48	7.812
Temp	1786	12.957	3.938	0.965	9.718	13.557	16.295	21.11
Turb	1239	7.541	4.249	2.3	5.2	6.9	8.54	61.2

GLE3 RAIN

Variable	N	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Cond	446	91.983	15.102	55.78	82.383	90	100	139.91
DO	523	10.586	0.869	7.32	10.02	10.71	11.17	13.56
pH	583	7.0455	0.2008	6.36	6.935	7.07	7.17	7.69
Temp	672	10.638	2.668	3.37	8.796	10.24	12.208	19.735
Turb	356	16.604	11.805	2.2	8.65	12.25	21.175	76.8

Table 9.
Statistical Summaries for Continuous Instream Monitoring Stations (2006 - 2016)
Separated by Rain / No Rain

GLE12 NO RAIN

Variable	N	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Cond	1205	75.421	20.28	51.79	61	68	83.537	175
DO	1290	10.148	1.479	1.6	9.335	10.39	11.16	13.35
pH	1340	7.0874	0.1926	6.34	6.98	7.12	7.22	7.46
Temp	1510	11.411	3.483	0.96	8.703	11.39	14.318	19.483
Turb	1152	8.793	15.445	-0.1	4.3	6.4	10.145	413.2

GLE12 RAIN

Variable	N	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Cond	448	66.491	13.255	51.744	58.797	61	70	185
DO	520	10.667	1.013	1.395	10.256	10.855	11.267	12.75
pH	499	6.9814	0.1885	6.33	6.87	7	7.12	7.41
Temp	605	9.5092	2.189	3.18	8.045	9.31	10.6633	18.73
Turb	418	17.2	22.88	-0.1	6	11.72	19.61	296.16

MIC3 NO RAIN

Variable	N	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Cond	1696	71.574	18.655	43.39	56.225	65.813	85.805	141.3
DO	1741	10.033	1.393	6.97	8.883	9.75	11.147	14.268
pH	1581	7.458	0.2446	6.69	7.28	7.488	7.644	8.21
Temp	1895	14.146	5.246	-0.265	9.769	14.844	18.593	26.515
Turb	1588	8.497	6.748	1.67	5.296	7.354	9.48	122.733

MIC3 RAIN

Variable	N	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Cond	705	86.907	16.79	43.715	79.422	87.5	95.645	136.07
DO	702	10.959	0.927	8.63	10.315	11.03	11.61	13.373
pH	625	7.3257	0.2517	6.67	7.16	7.32	7.5098	8.12
Temp	764	9.911	3.173	0.74	7.866	9.48	11.711	20.12
Turb	629	21.139	22.454	-0.082	7.115	12.63	26.502	161.3

MIC12 NO RAIN

Variable	N	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Cond	1565	68.958	19.067	40.76	52.1	66.235	82.285	145.225
DO	1697	9.9244	1.2451	7.26	8.93	9.74	10.8077	13.9265
pH	1645	7.2413	0.2447	6.27	7.0898	7.25	7.43	7.83
Temp	1953	13.687	4.976	0.289	9.523	14.071	17.944	25.185
Turb	1146	9.09	4.989	0.735	5.965	8.854	10.766	89.6

MIC12 RAIN

Variable	N	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Cond	794	83.957	17.313	41.67	74.404	82.575	93.029	140.033
DO	732	10.478	0.781	7.37	9.989	10.455	10.96	13.172
pH	739	7.0281	0.2707	6.03	6.84	7.04	7.206	7.69
Temp	838	9.82	2.9	1.63	7.86	9.387	11.46	19.53
Turb	567	22.056	21.832	0.87	8.777	13.54	29.03	180.97

PRI3 NO RAIN

Variable	N	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Cond	1268	94.869	6.586	72.22	90.776	94.89	98.898	126.75
DO	1062	9.6459	1.3751	7.115	8.4795	9.4925	10.7904	13.5495
pH	1111	7.2393	0.2184	6.55	7.095	7.225	7.37	7.897
Temp	1241	13.878	4.694	1.398	10.042	14.197	18.011	24.44
Turb	799	6.191	3.372	1.25	4.372	5.705	7.1	36.97

PRI3 RAIN

Variable	N	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Cond	732	82.687	12.134	43.55	75.123	83.315	91.393	125.5
DO	630	10.239	0.974	7.45	9.525	10.39	10.88	12.88
pH	608	7.1212	0.2621	6.17	6.9612	7.11	7.26	7.9835
Temp	705	10.866	3.055	3.223	8.81	10.26	12.56	20.89
Turb	428	18.43	21.16	1.79	7.96	12.55	22.29	336.55

PRI12 NO RAIN

Variable	N	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Cond	1333	76.78	16.854	42.73	62.692	77.7	86.1	128.1
DO	1167	9.1922	1.1641	3.7623	8.3155	9.15	10.01	13.0145
pH	1125	6.8196	0.2583	6.03	6.63	6.81	7.03	7.546
Temp	1339	13.214	4.52	0.848	9.533	13.39	16.987	23.757
Turb	1030	8.967	3.89	3.199	6.47	8.241	10.573	37.824

PRI12 RAIN

Variable	N	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Cond	780	85.381	14.653	47.24	76.5	82.278	92.697	131.7
DO	730	9.2924	0.9962	4.029	8.7035	9.5298	9.9593	12.401
pH	678	6.6116	0.2361	6.01	6.46	6.59	6.74	7.463
Temp	728	10.517	2.706	3.461	8.656	10.058	12.066	19.05
Turb	608	19.882	17.373	3.075	9.628	14.193	23.994	157.818

Table 10.
Mann-Whitney Statistical Comparison of Median Values, Rain (> 0.1 inches rain previous 24 hours)
Continuous Instream Monitoring Stations

Station			Difference in Medians (DS minus US)	95 % confidence Interval		Ho: No difference vs Ha: Statistically significant difference			
Upstream (US)	Downstream (DS)	Parameter		Lower	Upper	W Statistic	p-value	Result	Interpretation
BAT12	**BAT3**	Cond (Sp.)	2.82	2.1200	3.3800	127740.5	0.0000	Reject Ho	Median Cond values at DS station are statistically greater than US station
BAT12	**BAT3**	DO	-1.043	-1.0900	-0.8880	81701	0.0000	Reject Ho	Median DO values at US station are statistically greater than DS station
BAT12	**BAT3**	pH	-0.55	-0.5700	-0.5000	72371	0.0000	Reject Ho	Median pH values at US station are statistically greater than DS station
BAT12	**BAT3**	Temp	0.6833	0.5134	0.9799	503371.5	0.0000	Reject Ho	Median Temp values at DS station are statistically greater than US station
BAT12	**BAT3**	Turb	6.308	4.4700	7.1920	66528.5	0.0000	Reject Ho	Median Turb values at DS station are statistically greater than US station
CLK12	**CLK1**	Cond (Sp.)	15.275	13.7010	16.3090	336641	0.0000	Reject Ho	Median Cond values at DS station are statistically greater than US station
CLK12	**CLK1**	DO	0.485	0.4500	0.6310	110759	0.0000	Reject Ho	Median DO values at DS station are statistically greater than US station
CLK12	**CLK1**	pH	0.538	0.4800	0.5400	222711	0.0000	Reject Ho	Median pH values at DS station are statistically greater than US station
CLK12	**CLK1**	Temp	-0.398	-0.7800	-0.3600	501339.5	0.0000	Reject Ho	Median Temp values at US station are statistically greater than DS station
CLK12	**CLK1**	Turb	3.74	2.2300	4.6300	65224.5	0.0000	Reject Ho	Median Turb values at DS station are statistically greater than US station
GLE12	**GLE3**	Cond (Sp.)	27.055	24.3500	27.5010	60905	0.0000	Reject Ho	Median Cond values at DS station are statistically greater than US station
GLE12	**GLE3**	DO	-0.225	-0.3400	-0.0700	42554	0.0017	Reject Ho	Median DO values at US station are statistically greater than DS station
GLE12	**GLE3**	pH	0.05	0.0100	0.0700	126135	0.0017	Reject Ho	Median pH values at DS station are statistically greater than US station
GLE12	**GLE3**	Temp	0.963	0.7850	1.3100	368473	0.0000	Reject Ho	Median Temp values at DS station are statistically greater than US station
GLE12	**GLE3**	Turb	0.677	0.4390	3.4450	33487.5	0.0059	Reject Ho	Median Turb values at DS station are statistically greater than US station
MIC12	**MIC3**	Cond (Sp.)	4.2	1.6900	5.1990	343825.5	0.0001	Reject Ho	Median Cond values at DS station are statistically greater than US station
MIC12	**MIC3**	DO	0.594	0.4000	0.6310	157486	0.0000	Reject Ho	Median DO values at DS station are statistically greater than US station
MIC12	**MIC3**	pH	0.22	0.1800	0.2600	201399.5	0.0000	Reject Ho	Median pH values at DS station are statistically greater than US station
MIC12	**MIC3**	Temp	0.0275	-0.2851	0.2851	539118.5	0.9996	**Do Not Reject**	**Median values at US and DS station are not statistically different**
MIC12	**MIC3**	Turb	-1.137	-2.4740	0.0790	158077.5	0.0324	Reject Ho	Median turb values at US station are statistically greater than DS station
PRI12	**PRI3**	Cond (Sp.)	0.7	-2.4500	0.3110	352471.5	0.1335	**Do Not Reject**	**Median values at US and DS station are not statistically different**
PRI12	**PRI3**	DO	0.904	0.7600	0.9900	116291.5	0.0000	Reject Ho	Median DO values at DS station are statistically greater than US station
PRI12	**PRI3**	pH	0.475	0.4250	0.4900	124507	0.0000	Reject Ho	Median pH values at DS station are statistically greater than US station
PRI12	**PRI3**	Temp	0.351	0.1420	0.7800	362613.5	0.0022	Reject Ho	Median Temp values at DS station are statistically greater than US station
PRI12	**PRI3**	Turb	1.26	-0.7700	2.1910	62576.5	0.3629	**Do Not Reject**	**Median values at US and DS station are not statistically different**

Table 10.
Mann-Whitney Statistical Comparison of Median Values, No Rain (< 0.1 inches previous 24 hours)
Continuous Instream Monitoring Stations

Station		Parameter	Median Difference (DS minus US)	95 % confidence Interval		Ho: No difference vs Ha: Statistically significant difference			
Upstream (US)	Downstream (DS)			Lower	Upper	W Statistic	p-value	Result	Interpretation
BAT12	**BAT3**	Cond (Sp.)	7.49	4.6700	5.9700	733385.5	0.0000	Reject Ho	Median Cond values at DS station are statistically greater than US station
BAT12	**BAT3**	DO	-0.811	-1.0600	-0.7360	427743.5	0.0000	Reject Ho	Median DO values at US station are statistically greater than DS station
BAT12	**BAT3**	pH	-0.46	-0.4667	-0.4200	268865	0.0000	Reject Ho	Median pH values at US station are statistically greater than DS station
BAT12	**BAT3**	Temp	1.055	0.6400	1.3280	1882608	0.0000	Reject Ho	Median Temp values at DS station are statistically greater than US station
BAT12	**BAT3**	Turb	5.475	4.6000	5.4400	605021	0.0000	Reject Ho	Median Turb values at DS station are statistically greater than US station
CLK12	**CLK1**	Cond (Sp.)	23.685	23.6700	24.3200	2657729	0.0000	Reject Ho	Median Cond values at DS station are statistically greater than US station
CLK12	**CLK1**	DO	0.065	0.1113	0.2600	617890	0.0000	Reject Ho	Median DO values at DS station are statistically greater than US station
CLK12	**CLK1**	pH	0.4375	0.4200	0.4700	940421.5	0.0000	Reject Ho	Median pH values at DS station are statistically greater than US station
CLK12	**CLK1**	Temp	0.719	0.3600	0.744	3510975	0.0000	Reject Ho	Median Temp values at DS station are statistically greater than US station
CLK12	**CLK1**	Turb	-0.0535	-0.0444	0.3813	608352	0.1219	**Do Not Reject Ho**	**Median values at US and DS station are not statistically different**
GLE12	**GLE3**	Cond (Sp.)	41	33.0000	36.8500	707916.5	0.0000	Reject Ho	Median Cond values at DS station are statistically greater than US station
GLE12	**GLE3**	DO	-0.316	-0.3020	-0.0200	330643.5	0.0122	Reject Ho	Median DO values at US station are statistically greater than DS station
GLE12	**GLE3**	pH	0.17	0.1700	0.2100	1256046	0.0000	Reject Ho	Median pH values at DS station are statistically greater than US station
GLE12	**GLE3**	Temp	1.691	1.0950	1.6600	2154947	0.0000	Reject Ho	Median Temp values at DS station are statistically greater than US station
GLE12	**GLE3**	Turb	0.3	-0.3752	0.4255	372640	0.8127	**Do Not Reject Ho**	**Median values at US and DS station are not statistically different**
MIC12	**MIC3**	Cond (Sp.)	2.722	2.6300	5.4480	1288635	0.0000	Reject Ho	Median Cond values at DS station are statistically greater than US station
MIC12	**MIC3**	DO	0.056	0.0099	0.2401	890013	0.0167	Reject Ho	Median DO values at DS station are statistically greater than US station
MIC12	**MIC3**	pH	0.1558	0.1450	0.1900	761767	0.0000	Reject Ho	Median pH values at DS station are statistically greater than US station
MIC12	**MIC3**	Temp	0.621	0.0400	0.7430	3096799	0.0144	Reject Ho	Median Temp values at DS station are statistically greater than US station
MIC12	**MIC3**	Turb	0.008	-1.7499	-1.0899	596158	0.0000	Reject Ho	Median Turb values at US station are statistically greater than DS station
PRI12	**PRI3**	Cond (Sp.)	15.771	16.2150	18.5310	1173674	0.0000	Reject Ho	Median Cond values at DS station are statistically greater than US station
PRI12	**PRI3**	DO	0.3225	0.2516	0.6451	156246.5	0.0000	Reject Ho	Median DO values at DS station are statistically greater than US station
PRI12	**PRI3**	pH	0.38	0.3598	0.4105	352200	0.0000	Reject Ho	Median pH values at DS station are statistically greater than US station
PRI12	**PRI3**	Temp	1.119	0.5190	1.3000	1319915	0.0000	Reject Ho	Median Temp values at DS station are statistically greater than US station
PRI12	**PRI3**	Turb	-1.937	-2.1898	-1.5499	191897.5	0.0000	Reject Ho	Median Turb values at US station are statistically greater than DS station

Table 11.
Seasonal Mann-Kendall Statistical Long Term Trend Analysis, Rain (> 0.1 inches previous 24 hours)
Continuous Instream Monitoring Stations

Station	Parameter	H_o: No Trend vs. H_a: Increasing/Decreasing Trend			Result	Trend
		N	Z statistic	p-Value		
BAT3	Conductivity (specific)	529	3.70318	0.0001065	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
BAT3	Dissolved Oxygen	590	0.817055		Do Not Reject Ho - No Detectable Trend	
BAT3	pH	606	7.585	0.0000000	**Strongly Reject Ho**	**Increasing trend (pH)**
BAT3	Temperature	684	4.18529	0.0000142	**Strongly Reject Ho**	**Increasing trend (Temperature)**
BAT3	Turbidity	310	-7.15452	0.0000000	**Strongly Reject Ho**	**Decreasing trend (Turbidity)**
BAT12	Conductivity (specific)	542	-1.78734	0.0369416	**Strongly Reject Ho**	**Decreasing trend (Conductivity)**
BAT12	Dissolved Oxygen	646	-2.27401	0.0114826	**Strongly Reject Ho**	**Decreasing trend (Dissolved Oxygen)**
BAT12	pH	605	7.59201	0.0000000	**Strongly Reject Ho**	**Increasing trend (pH)**
BAT12	Temperature	669	4.47861	0.0000038	**Strongly Reject Ho**	**Increasing trend (Temperature)**
BAT12	Turbidity	501	-13.7488	0.0000000	**Strongly Reject Ho**	**Decreasing trend (Turbidity)**
CLK1	Conductivity (specific)	668	-3.58039	0.0001715	**Strongly Reject Ho**	**Decreasing trend (Conductivity)**
CLK1	Dissolved Oxygen	725	-1.13468		Do Not Reject Ho - No Detectable Trend	
CLK1	pH	677	-1.38383	0.0832046	Reject Ho	Somewhat significant decreasing trend
CLK1	Temperature	834	4.92859	0.0000004	**Strongly Reject Ho**	**Increasing trend (Temperature)**
CLK1	Turbidity	494	-7.79856	0.0000000	**Strongly Reject Ho**	**Decreasing trend (Turbidity)**
CLK12	Conductivity (specific)	756	2.28544	0.0111436	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
CLK12	Dissolved Oxygen	610	-1.51231	0.0652270	Reject Ho	Somewhat significant decreasing trend
CLK12	pH	679	8.24947	0.0000000	**Strongly Reject Ho**	**Increasing trend (pH)**
CLK12	Temperature	780	5.28524	0.0000001	**Strongly Reject Ho**	**Increasing trend (Temperature)**
CLK12	Turbidity	394	-6.20182	0.0000000	**Strongly Reject Ho**	**Decreasing trend (Turbidity)**
GLE3	Conductivity (specific)	446	-0.82235		Do Not Reject Ho - No Detectable Trend	
GLE3	Dissolved Oxygen	523	-3.14313	0.0008357	**Strongly Reject Ho**	**Decreasing trend (Dissolved Oxygen)**
GLE3	pH	583	-4.10808	0.0000199	**Strongly Reject Ho**	**Decreasing trend (pH)**
GLE3	Temperature	672	5.42164	0.0000000	**Strongly Reject Ho**	**Increasing trend (Temperature)**
GLE3	Turbidity	356	-4.1263	0.0000184	**Strongly Reject Ho**	**Decreasing trend (Turbidity)**
GLE12	Conductivity (specific)	454	6.23864	0.0000000	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
GLE12	Dissolved Oxygen	520	1.81647	0.0346491	**Strongly Reject Ho**	**Increasing trend (Dissolved Oxygen)**
GLE12	pH	499	1.59414	0.0554518	Reject Ho	Somewhat significant increasing trend
GLE12	Temperature	605	6.01496	0.0000000	**Strongly Reject Ho**	**Increasing trend (Temperature)**
GLE12	Turbidity	418	-3.28832	0.0005039	**Strongly Reject Ho**	**Decreasing trend (Turbidity)**
MIC3	Conductivity (specific)	705	2.69952	0.0034720	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
MIC3	Dissolved Oxygen	702	-0.15113		Do Not Reject Ho - No Detectable Trend	
MIC3	pH	625	3.34537	0.0004109	**Strongly Reject Ho**	**Increasing trend (pH)**
MIC3	Temperature	764	2.98325	0.0014260	**Strongly Reject Ho**	**Increasing trend (Temperature)**
MIC3	Turbidity	629	-6.51514	0.0000000	**Strongly Reject Ho**	**Decreasing trend (Turbidity)**
MIC12	Conductivity (specific)	794	3.95684	0.0000380	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
MIC12	Dissolved Oxygen	732	-0.64631		Do Not Reject Ho - No Detectable Trend	
MIC12	pH	741	11.7811	0.0000000	**Strongly Reject Ho**	**Increasing trend (pH)**
MIC12	Temperature	838	4.46079	0.0000041	**Strongly Reject Ho**	**Increasing trend (Temperature)**
MIC12	Turbidity	567	-7.49941	0.0000000	**Strongly Reject Ho**	**Decreasing trend (Turbidity)**
PRI3	Conductivity (specific)	732	2.8254	0.0023611	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
PRI3	Dissolved Oxygen	630	-1.5404	0.0617311	Reject Ho	Somewhat significant decreasing trend
PRI3	pH	608	10.8802	0.0000000	**Strongly Reject Ho**	**Increasing trend (pH)**
PRI3	Temperature	705	3.52801	0.0002093	**Strongly Reject Ho**	**Increasing trend (Temperature)**
PRI3	Turbidity	428	-5.2972	0.0000001	**Strongly Reject Ho**	**Decreasing trend (Turbidity)**
PRI12	Conductivity (specific)	780	3.87213	0.0000539	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
PRI12	Dissolved Oxygen	730	0.776453		Do Not Reject Ho - No Detectable Trend	
PRI12	pH	678	8.32717	0.0000000	**Strongly Reject Ho**	**Increasing trend (pH)**
PRI12	Temperature	728	3.23028	0.0006183	**Strongly Reject Ho**	**Increasing trend (Temperature)**
PRI12	Turbidity	608	-1.85253	0.0319749	**Strongly Reject Ho**	**Decreasing trend (Turbidity)**

Table 11.
Seasonal Mann-Kendall Statistical Long Term Trend Analysis, No Rain (< 0.1 inches previous 24 hours)
Continuous Instream Monitoring Stations

Station	Parameter	H_o: No Trend vs. H_a: Increasing/Decreasing Trend			Result	Trend
		N	Z statistic	p-Value		
BAT3	Conductivity (specific)	1249	9.35298	0.0000000	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
BAT3	Dissolved Oxygen	1311	-6.31577	0.0000000	**Strongly Reject Ho**	**Decreasing trend (Dissolved Oxygen)**
BAT3	pH	1386	12.6246	0.0000000	**Strongly Reject Ho**	**Increasing trend (pH)**
BAT3	Temperature	1498	6.36403	0.0000000	**Strongly Reject Ho**	**Increasing trend (Temperature)**
BAT3	Turbidity	848	-10.0301	0.0000000	**Strongly Reject Ho**	**Decreasing trend (Turbidity)**
BAT12	Conductivity (specific)	1196	4.62455	0.0000019	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
BAT12	Dissolved Oxygen	1360	-7.68289	0.0000000	**Strongly Reject Ho**	**Decreasing trend (Dissolved Oxygen)**
BAT12	pH	1295	11.292	0.0000000	**Strongly Reject Ho**	**Increasing trend (pH)**
BAT12	Temperature	1455	4.82166	0.0000007	**Strongly Reject Ho**	**Increasing trend (Temperature)**
BAT12	Turbidity	1246	-27.7899	0.0000000	**Strongly Reject Ho**	**Decreasing trend (Turbidity)**
CLK1	Conductivity (specific)	1759	-8.90053	0.0000000	**Strongly Reject Ho**	**Decreasing trend (Conductivity)**
CLK1	Dissolved Oxygen	1663	-4.73735	0.0000011	**Strongly Reject Ho**	**Decreasing trend (Dissolved Oxygen)**
CLK1	pH	1631	-7.91007	0.0000000	**Strongly Reject Ho**	**Decreasing trend (pH)**
CLK1	Temperature	1907	8.06728	0.0000000	**Strongly Reject Ho**	**Increasing trend (Temperature)**
CLK1	Turbidity	1310	-24.0937	0.0000000	**Strongly Reject Ho**	**Decreasing trend (Turbidity)**
CLK12	Conductivity (specific)	1726	3.38082	0.0003613	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
CLK12	Dissolved Oxygen	1571	-4.50019	0.0000034	**Strongly Reject Ho**	**Decreasing trend (Dissolved Oxygen)**
CLK12	pH	1678	9.52881	0.0000000	**Strongly Reject Ho**	**Increasing trend (pH)**
CLK12	Temperature	1915	8.71331	0.0000000	**Strongly Reject Ho**	**Increasing trend (Temperature)**
CLK12	Turbidity	1133	-11.492	0.0000000	**Strongly Reject Ho**	**Decreasing trend (Turbidity)**
GLE3	Conductivity (specific)	1485	-7.80018	0.0000000	**Strongly Reject Ho**	**Decrasing trend (Conductivity)**
GLE3	Dissolved Oxygen	1585	-3.67018	0.0001212	**Strongly Reject Ho**	**Decreasing trend (Dissolved Oxygen)**
GLE3	pH	1594	5.43375	0.0000000	**Strongly Reject Ho**	**Increasing trend (pH)**
GLE3	Temperature	1786	7.14514	0.0000000	**Strongly Reject Ho**	**Increasing trend (Temperature)**
GLE3	Turbidity	1239	-14.6537	0.0000000	**Strongly Reject Ho**	**Decreasing trend (Turbidity)**
GLE12	Conductivity (specific)	1205	-1.28102		Do Not Reject Ho - No Detectable Trend	
GLE12	Dissolved Oxygen	1290	3.47039	0.0002599	**Strongly Reject Ho**	**Increasing trend (Dissolved Oxygen)**
GLE12	pH	1340	6.2346	0.0000000	**Strongly Reject Ho**	**Increasing trend (pH)**
GLE12	Temperature	1510	3.19149	0.0007077	**Strongly Reject Ho**	**Increasing trend (Temperature)**
GLE12	Turbidity	1152	-5.8648	0.0000000	**Strongly Reject Ho**	**Decreasing trend (Turbidity)**
MIC3	Conductivity (specific)	1696	3.56039	0.0001852	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
MIC3	Dissolved Oxygen	1741	-2.24103	0.0125119	**Strongly Reject Ho**	**Decreasing trend (Dissolved Oxygen)**
MIC3	pH	1581	13.3612	0.0000000	**Strongly Reject Ho**	**Increasing trend (pH)**
MIC3	Temperature	1895	5.03451	0.0000002	**Strongly Reject Ho**	**Increasing trend (Temperature)**
MIC3	Turbidity	1588	-20.6782	0.0000000	**Strongly Reject Ho**	**Decreasing trend (Turbidity)**
MIC12	Conductivity (specific)	1565	8.09472	0.0000000	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
MIC12	Dissolved Oxygen	1697	-2.70612	0.0034037	**Strongly Reject Ho**	**Decreasing trend (Dissolved Oxygen)**
MIC12	pH	1645	18.6206	0.0000000	**Strongly Reject Ho**	**Increasing trend (pH)**
MIC12	Temperature	1953	7.32464	0.0000000	**Strongly Reject Ho**	**Increasing trend (Temperature)**
MIC12	Turbidity	1146	-18.162	0.0000000	**Strongly Reject Ho**	**Decreasing trend (Turbidity)**
PRI3	Conductivity (specific)	1268	5.94918	0.0000000	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
PRI3	Dissolved Oxygen	1062	0.491927		Do Not Reject Ho - No Detectable Trend	
PRI3	pH	1111	16.0661	0.0000000	**Strongly Reject Ho**	**Increasing trend (pH)**
PRI3	Temperature	1241	-1.24796		Do Not Reject Ho - No Detectable Trend	
PRI3	Turbidity	799	-6.64878	0.0000000	**Strongly Reject Ho**	**Decreasing trend (Turbidity)**
PRI12	Conductivity (specific)	1333	5.49174	0.0000000	**Strongly Reject Ho**	**Increasing trend (Conductivity)**
PRI12	Dissolved Oxygen	1169	3.99601	0.0000322	**Strongly Reject Ho**	**Increasing trend (Dissolved Oxygen)**
PRI12	pH	1125	6.25006	0.0000000	**Strongly Reject Ho**	**Increasing trend (pH)**
PRI12	Temperature	1339	-0.19686		Do Not Reject Ho - No Detectable Trend	
PRI12	Turbidity	1030	5.53007	0.0000000	**Strongly Reject Ho**	**Increasing trend (Turbidity)**

Table 12.
Statistical Summaries (2010 - 2016)
Instream Storm Sampling Sites

Instream Storm Sampling - CLK1																			
Variable	Ammonia	BOD	Cond (comp)	Cond (field)	Cu (Diss)	Cu (Tot)	DO	Ecoli	NO2NO3	Ortho	TP	Pb (Tot)	Pb (Diss)	pH	Temp	Tot Hard	TSS	Zn (Diss)	Zn (Tot)
N	25	26	26	26	26	26	26	27	26	26	26	26	26	26	26	26	26	26	26
Mean	0.1368	5.689	70.7	80.6	0.004938	0.01272	10.284	4621	0.7273	0.03877	0.2781	0.00744	0.000758	6.9862	11.618	35	102.3	0.0819	0.1562
StDev	0.1875	3.003	52.6	51.7	0.004714	0.01276	1.08	7164	0.2944	0.02793	0.2579	0.00971	0.000478	0.2474	3.374	22.62	119.8	0.1369	0.2006
Minimum	0.045	2.3	28.5	28.3	0.002	0.0045	7.04	178	0.26	0.01	0.071	0.0008	0.0005	6.5	5.6	15	8.8	0.0126	0.0354
Q1	0.05	3.5	45.6	49.9	0.0025	0.00707	9.678	770	0.51	0.01975	0.15	0.00313	0.0005	6.7325	9.513	19.75	39.3	0.0234	0.0602
Median	0.05	4.05	55.2	68.7	0.0036	0.00885	10.48	1986	0.68	0.0295	0.2055	0.005	0.0005	7.085	11.365	30	69	0.0335	0.0849
Q3	0.1465	7.855	80.4	87.5	0.004725	0.01112	10.955	6130	0.9275	0.0465	0.2758	0.0079	0.000925	7.155	13.95	38.5	114	0.0648	0.1434
Maximum	0.938	13.9	299	277	0.0224	0.066	12.09	27000	1.59	0.109	1.33	0.0519	0.0025	7.39	19.3	104	616	0.677	0.961

Instream Storm Sampling - PRI3																			
Statistic	Ammonia	BOD	Cond (comp)	Cond (field)	Cu (Diss)	Cu (Tot)	DO	Ecoli	NO2NO3	Ortho	TP	Pb (Tot)	Pb (Diss)	pH	Temp	Tot Hard	TSS	Zn (Diss)	Zn (Tot)
N	25	24	25	26	26	26	26	27	26	25	25	26	26	26	26	25	24	26	26
Mean	0.0719	3.896	76.91	99.8	0.003662	0.00778	10.177	2477	0.7819	0.02664	0.1844	0.00415	0.000608	7.2031	11.329	32.44	59.2	0.02611	0.0671
StDev	0.0703	3.128	36.95	72.5	0.003814	0.00703	1.209	5080	0.3599	0.02121	0.1705	0.004775	0.0002	0.2797	3.836	11.74	58.9	0.03385	0.067
Minimum	0.011	1.3	24.8	46.9	0.002	0.0025	7.36	96	0.3	0.01	0.028	0.0005	0.0005	6.81	4.3	20	3.6	0.0052	0.0064
Q1	0.05	2.115	52.85	68.4	0.0025	0.00325	9.23	172	0.44	0.0135	0.055	0.00095	0.0005	7.0175	8.105	24.5	11.7	0.0111	0.0244
Median	0.05	2.65	70.5	79.3	0.0025	0.0049	10.335	548	0.825	0.018	0.126	0.00185	0.0005	7.19	11.125	29	33	0.01775	0.048
Q3	0.05	4.3	86.8	95.2	0.0026	0.00822	11.043	1733	1.005	0.032	0.216	0.005975	0.000625	7.2975	13.658	35.5	97.4	0.02475	0.0769
Maximum	0.379	15.3	208	367.5	0.0186	0.0269	12.55	24200	1.71	0.095	0.662	0.0197	0.001	8.13	19.8	68	216	0.181	0.292

Instream Storm Sampling - PRI12																			
Statistic	Ammonia	BOD	Cond (comp)	Cond (field)	Cu (Diss)	Cu (Tot)	DO	Ecoli	NO2NO3	Ortho	TP	Pb (Tot)	Pb (Diss)	pH	Temp	Tot Hard	TSS	Zn (Diss)	Zn (Tot)
N	25	26	26	26	26	26	26	27	26	26	26	26	26	26	26	26	26	26	26
Mean	0.05936	2.114	76.08	80.96	0.002631	0.003769	9.466	580	1.484	0.01892	0.108	0.001412	0.000623	6.8992	12.88	33.73	29	0.1065	0.496
StDev	0.02756	1.615	12.46	11.8	0.000557	0.002844	1.164	907	0.73	0.01608	0.1399	0.003298	0.000286	0.1862	13.2	10.8	58.8	0.4743	2.388
Minimum	0.05	0.84	36.5	58.93	0.002	0.0025	6.22	22	0.28	0.01	0.018	0.0005	0.0005	6.61	4.6	24	5.4	0.003	0.005
Q1	0.05	1.16	70.85	73.21	0.0025	0.0025	8.89	83	0.895	0.01	0.0352	0.0005	0.0005	6.74	7.69	28	8.1	0.0063	0.01
Median	0.05	1.365	76.15	80.78	0.0025	0.0025	9.55	162	1.365	0.013	0.084	0.0005	0.0005	6.89	10.4	30.5	13.8	0.0084	0.016
Q3	0.05	2.525	83.25	89.22	0.0025	0.00365	10.225	435	2.192	0.022	0.1133	0.0009	0.0005	7.0025	12.44	37	29.4	0.0147	0.034
Maximum	0.166	8	94	111.9	0.005	0.0157	11.45	3448	2.68	0.087	0.73	0.0173	0.0017	7.33	75.69	71	312	2.43	12.2

Table 13.
Mann-Whitney Statistical Comparison of Upstream / Downstream Median Values
Instream Storm Sampling Sites

Station			Difference in Medians (DS minus US)	95 % confidence Interval		Ho: US station = DS station vs Ha: Statistically significant difference			
Upstream (US)	Downstream (DS)	Parameter		Lower	Upper	W Statistic	p-value	Result	Interpretation
CLK1	PRI3	Ammonia	0	-0.0390	-0.00003	559	0.0391	Reject Ho	Median Ammonia values at CLK1 are statistically greater than PRI3
CLK1	PRI3	BOD	-1.59	-3.4990	-0.50900	464.5	0.0021	Reject Ho	Median BOD values at CLK1 are statistically greater than PRI3
CLK1	PRI3	Cond (comp)	10.8	-3.7000	23.41000	726	0.0774	Reject Ho	Median Cond values at PRI3 are statistically greater than CLK1 (p-value=0.1)
CLK1	PRI3	Cu (Diss)	-0.0008	-0.0014	0.00000	539.5	0.0022	Reject Ho	Median Cu (diss) values at CLK1 are statistically greater than PRI3
CLK1	PRI3	Cu (Tot)	-0.0037	-0.0053	-0.00190	514.5	0.0007	Reject Ho	Median Cu (tot) values at CLK1 are statistically greater than PRI3
CLK1	PRI3	DO	-0.13	-0.7700	0.52000	665.5	0.6738	Do Not Reject Ho	Median DO values at CLK1 and PRI3 are not statistically different
CLK1	PRI3	E. coli	-658	-1695.2000	-99.20000	600.5	0.0072	Reject Ho	Median E. coli values at CLK1 are statistically greater than PRI3
CLK1	PRI3	NO2NO3	0.04	-0.1199	0.23000	712	0.6804	Do Not Reject Ho	Median NO2NO3 values at CLK1 and PRI3 are not statistically different
CLK1	PRI3	Ortho Phos.	-0.008	-0.0160	-0.00099	533.5	0.0144	Reject Ho	Median Orthophosphate values at CLK1 are statistically greater than PRI3
CLK1	PRI3	Tot. Phos.	-0.075	-0.1319	-0.01100	533	0.0141	Reject Ho	Median Total Phosphorous values at CLK1 are statistically greater than PRI3
CLK1	PRI3	Pb (diss)	0	-0.0001	0.00000	635	0.2475	Do Not Reject Ho	Median Pb (diss) values at CLK1 and PRI3 are not statistically different
CLK1	PRI3	Pb (tot)	-0.0024	-0.0039	-0.00050	553	0.0066	Reject Ho	Median Pb (tot) values at CLK1 are statistically greater than PRI3
CLK1	PRI3	pH	0.15	0.0300	0.30000	776	0.0090	Reject Ho	Median pH values at PRI3 are statistically greater than CLK1
CLK1	PRI3	Temp	-0.185	-2.2100	1.72900	677.5	0.8404	Do Not Reject Ho	Median Temp values at CLK1 and PRI3 are not statistically different
CLK1	PRI3	Tot. Hard.	1	-6.0000	7.00000	671.5	0.6920	Do Not Reject Ho	Median Hardness values at CLK1 and PRI3 are not statistically different
CLK1	PRI3	TSS	-28	-52.9900	-4.39000	456	0.0136	Reject Ho	Median TSS values at CLK1 are statistically greater than PRI3
CLK1	PRI3	Zn (Diss)	-0.0168	-0.0278	-0.00799	495	0.0002	Reject Ho	Median Zn (diss) values at CLK1 are statistically greater than PRI3
CLK1	PRI3	Zn (Tot)	-0.0389	-0.0695	-0.01710	516	0.0008	Reject Ho	Median Zn (tot) values at CLK1 are statistically greater than PRI3
PRI12	PRI3	Ammonia	0	0.0000	-0.00001	653	0.6639	Do Not Reject Ho	Median Ammonia values at PRI12 and PRI3 are not statistically different
PRI12	PRI3	BOD	1.18	0.6000	1.83000	789.5	0.0003	Reject Ho	Median BOD values at PRI3 are statistically greater than PRI12
PRI12	PRI3	Cond (comp)	-6.3	-17.1000	4.20000	585	0.2242	Do Not Reject Ho	Median Cond values at PRI12 and PRI3 are not statistically different
PRI12	PRI3	Cu (Diss)	0	0.0000	0.00010	761.5	0.0457	Reject Ho	Median Cu (diss) values at PRI3 are statistically greater than PRI12
PRI12	PRI3	Cu (Tot)	0.00215	0.0006	0.00370	893.5	0.0001	Reject Ho	Median Cu (tot) values at PRI3 are statistically greater than PRI12
PRI12	PRI3	DO	0.705	0.0400	1.30000	802	0.0197	Reject Ho	Median DO values at PRI3 are statistically greater than PRI12
PRI12	PRI3	E. coli	301	62.9000	785.90000	900.5	0.0032	Reject Ho	Median E. coli values at PRI3 are statistically greater than PRI12
PRI12	PRI3	NO2NO3	-0.625	-1.0998	-0.27000	499.5	0.0003	Reject Ho	Median NO2NO3 values at PRI12 are statistically greater than PRI3
PRI12	PRI3	Ortho Phos.	0.005	0.0000	0.01000	762.5	0.0167	Reject Ho	Median Orthophosphate values at PRI3 are greater than PRI12
PRI12	PRI3	Tot. Phos.	0.0495	0.0030	0.01280	769	0.0128	Reject Ho	Median Total Phosphorous values at PRI3 are statistically greater than PRI12
PRI12	PRI3	Pb (diss)	0	0.0000	0.00000	707.5	0.6539	Do Not Reject Ho	Median Pb (diss) values at PRI3 and PRI12 are not statistically different
PRI12	PRI3	Pb (tot)	0.0012	0.0005	0.00320	898.5	0.0000	Reject Ho	Median Pb (tot) values at PRI3 are statistically greater than CLK1
PRI12	PRI3	pH	0.275	0.1600	0.39000	863.5	0.0000	Reject Ho	Median pH values at PRI3 are statistically greater than PRI12
PRI12	PRI3	Temp	0.765	-1.1490	2.79900	736.5	0.3897	Do Not Reject Ho	Median Temp values at PRI3 and PRI12 are no statistically different
PRI12	PRI3	Tot. Hard.	-2	-5.0000	2.00000	0.3746	0.3746	Do Not Reject Ho	Median Hardness values at PRI3 and PRI12 are not statistically different
PRI12	PRI3	TSS	15.2	2.3900	44.39000	689.5	0.0048	Reject Ho	Median TSS values at PRI3 are statistically greater than PRI12
PRI12	PRI3	Zn (Diss)	0.008	0.0034	0.01280	852	0.0005	Reject Ho	Median Zn (diss) values at PRI3 are statistically greater than PRI12
PRI12	PRI3	Zn (Tot)	0.02135	0.0108	0.04422	867.5	0.0002	Reject Ho	Median Zn (tot) values at PRI3 are statistically greater than PRI12

Table 14.
Statistical Summaries (2010 - 2016)
Stormwater Sampling Sites

Stormwater Sampling - Electric (Residential)

Statistic	NH3	BOD	Cond (comp)	Cond (field	Cu (Diss)	Cu (Tot)	DO	E. coli	NO2NO3	Ortho	TP	Pb (Diss)	Pb (Tot)	pH	Temp	Hard	TSS	Zn (Diss)	Zn (Tot)
N	14	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Mean	0.111	8.75	88.4	94.6	0.00592	0.00803	10.75	3485	0.742	0.1118	0.2065	0.000813	0.002187	6.7353	11.36	36	29.23	0.0507	0.0694
StDev	0.1337	7.78	125.9	175.6	0.00525	0.00507	1.02	4959	0.3811	0.0869	0.1331	0.000613	0.001	0.1718	4.00	47	21.17	0.0449	0.0533
Minimum	0.004	2.2	12.8	19.7	0.0025	0.0041	8.58	488	0.22	0.043	0.015	0.0005	0.0006	6.4	6.42	13	11	0.0158	0.0211
Q1	0.05	2.7	38.4	36.6	0.0029	0.005	10.47	866	0.45	0.051	0.111	0.0005	0.0012	6.59	8.04	19	12	0.0203	0.0334
Median	0.05	5	58.2	41.3	0.0035	0.0056	10.62	1046	0.67	0.081	0.178	0.0005	0.0023	6.74	11.30	23	26	0.0298	0.0415
Q3	0.1138	17.6	90.6	67.4	0.0061	0.0081	11.60	3654	0.99	0.148	0.214	0.001	0.0031	6.88	12.60	32	36	0.0603	0.103
Maximum	0.435	26.4	534	723	0.0185	0.0198	12.27	17330	1.39	0.354	0.529	0.0029	0.004	7.04	21.26	204	94.4	0.15	0.193

Stormwater Sampling - Hilfiker (Commercial)

Statistic	NH3	BOD	Cond (comp)	Cond (field	Cu (Diss)	Cu (Tot)	DO	E. coli	NO2NO3	Ortho	TP	Pb (Diss)	Pb (Tot)	pH	Temp	Hard	TSS	Zn (Diss)	Zn (Tot)
N	14	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Mean	0.1973	9.33	73.9	51.4	0.00768	0.01494	10.56	2938	0.31	0.03167	0.2025	0.000847	0.00402	6.508	10.74	26	54.8	0.0914	0.1416
StDev	0.2062	6.38	185.3	50.9	0.00711	0.01039	1.14	5820	0.2126	0.0271	0.1861	0.000513	0.002169	0.3058	4.05	48	42.1	0.0807	0.1084
Minimum	0.05	2.8	14	12	0.0025	0.0061	8.66	1	0.05	0.01	0.074	0.0005	0.0012	5.97	5.80	6	18	0.0274	0.0501
Q1	0.068	4.6	15.8	13.8	0.0033	0.0075	9.60	41	0.14	0.013	0.102	0.0005	0.0025	6.38	7.28	10	27	0.0431	0.0702
Median	0.1075	7.3	25.1	32.5	0.0049	0.012	10.68	248	0.22	0.016	0.143	0.0006	0.0036	6.45	10.50	13	45.5	0.0749	0.105
Q3	0.2408	15.1	32.1	67.5	0.009	0.0178	11.82	1553	0.41	0.053	0.206	0.001	0.0054	6.62	13.75	21	68	0.089	0.157
Maximum	0.67	21	742	204.8	0.0289	0.039	12.02	19860	0.84	0.099	0.807	0.0021	0.008	7.08	19.66	197	190	0.299	0.451

Stormwater Sampling - Salem Industrial (Industrial)

Statistic	NH3	BOD	Cond (comp)	Cond (field	Cu (Diss)	Cu (Tot)	DO	E. coli	NO2NO3	Ortho	TP	Pb (Diss)	Pb (Tot)	pH	Temp	Hard	TSS	Zn (Diss)	Zn (Tot)
N	14	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Mean	0.088	5.57	41.18	37.16	0.0058	0.01103	9.75	3731	0.2853	0.0558	0.2781	0.000613	0.0017	6.564	10.58	23	58.3	0.09774	0.1422
StDev	0.1095	5.15	26.45	22.18	0.002716	0.0058	1.47	7783	0.3201	0.0433	0.1893	0.000203	0.001164	0.3582	3.45	14	49.1	0.0382	0.0651
Minimum	0.004	2	8	18.1	0.0025	0.0046	6.54	3	0.05	0.017	0.1	0.0005	0.0005	5.9	6.00	11	20	0.0517	0.0731
Q1	0.05	2.8	24.2	20.37	0.0041	0.0064	8.62	58	0.12	0.032	0.168	0.0005	0.001	6.37	8.75	13	25	0.0677	0.0928
Median	0.05	3.8	32.2	28.7	0.0047	0.01	9.93	291	0.15	0.046	0.23	0.0005	0.0011	6.53	10.00	15	32.4	0.0913	0.129
Q3	0.05	5.6	60	39.45	0.0083	0.0118	10.59	866	0.28	0.058	0.319	0.0006	0.0025	6.88	12.30	30	75	0.13	0.156
Maximum	0.398	21	106	83.4	0.0119	0.0252	12.03	24200	1.09	0.194	0.864	0.001	0.0043	7.23	18.79	58	201	0.187	0.327

Table 15.
Statistical Summaries (2006 - 2010)
Stormwater Sampling Sites

Sample Location	Statistics	Cu Diss	Cu Tot	Ecoli	Hg Tot	Pb Diss	Pb Tot	pH	Temp	Hard	TSS	Zn Diss	Zn Tot
Clark Downstream (Instream grabs)	N	9	9	9	3	9	9	9	9	9	9	9	9
	Mean	0.017	0.015111	463.5	0.00002	0.000778	0.00433	7.0689	10.09	23.36	40	0.424	0.443
	StDev	0.00497	0.000333	279.4	0.000017	0.000667	0.00403	0.137	3.03	5.31	32.1	1.08	1.038
	Minimum	0.015	0.015	61	0.00001	0.0005	0.0009	6.83	5.8	16	4.4	0.025	0.025
	Q1	0.015	0.015	175.4	0.00001	0.0005	0.0018	6.99	7.4	18.25	19.1	0.025	0.025
	Median	0.015	0.015	579.4	0.00001	0.0005	0.0026	7.03	10.8	23.9	25.6	0.047	0.067
	Q3	0.0165	0.015	709.5	0.00004	0.00075	0.00635	7.19	11.65	27.25	64.6	0.143	0.237
	Maximum	0.03	0.016	816	0.00004	0.0025	0.0133	7.28	15.8	32	98	3.3	3.2
Clark Storm (Composite Sampler)	N	8	8	9	8	8	8	9	9	8	8	8	8
	Mean	0.01825	0.0245	1050	0.000012	0.000588	0.00394	6.8811	10.87	21.16	42.7	0.069	0.0928
	StDev	0.00526	0.01035	556	0.000005	0.000181	0.00441	0.1905	3.1	4.25	31.5	0.0951	0.1508
	Minimum	0.015	0.015	261	0.00001	0.0005	0.0009	6.6	5.8	16	4.4	0.025	0.025
	Q1	0.015	0.01625	581	0.00001	0.0005	0.00185	6.76	8.35	18.07	28	0.025	0.025
	Median	0.0155	0.02	1203	0.00001	0.0005	0.00245	6.8	11	20.5	34.5	0.0335	0.033
	Q3	0.0205	0.03375	1427	0.000012	0.00065	0.00377	7.075	12.85	23.85	54.3	0.056	0.07
	Maximum	0.03	0.043	1986	0.000025	0.001	0.0146	7.18	15.6	29.2	111	0.302	0.463
Clark Upstream (Instream grabs)	N	9	9	9	3	9	9	9	9	9	9	9	9
	Mean	0.01667	0.015	249.5	0.000023	0.000556	0.0044	7.05	10.311	23.67	35.5	0.0543	0.0823
	StDev	0.005	0	280.8	0.000023	0.000167	0.00524	0.2396	2.933	4.89	43.3	0.0679	0.1204
	Minimum	0.015	0.015	46	0.00001	0.0005	0.0005	6.74	6.2	13.5	2.8	0.025	0.025
	Q1	0.015	0.015	84.3	0.00001	0.0005	0.0013	6.875	7.5	21.05	8.6	0.025	0.025
	Median	0.015	0.015	122	0.00001	0.0005	0.0024	7.01	10.9	25.2	14.8	0.025	0.025
	Q3	0.015	0.015	425.2	0.00005	0.0005	0.0069	7.24	12.05	26	67.3	0.056	0.1095
	Maximum	0.03	0.015	816.4	0.00005	0.001	0.0162	7.48	15.5	29.7	116	0.227	0.372

Table 15.
Statistical Summaries (2006 - 2010)
Stormwater Sampling Sites

Sample Location	Statistics	Cu Diss	Cu Tot	Ecoli	Hg Tot	Pb Diss	Pb Tot	pH	Temp	Hard	TSS	Zn Diss	Zn Tot
Glenn Downstream (Instream grabs)	N	13	13	15	4	13	13	14	14	13	13	13	14
	Mean	0.01962	0.01969	528	0.000012	0.000685	0.001777	6.8143	10.814	26.55	63.9	0.694	0.758
	StDev	0.00721	0.01633	764	0.000003	0.000305	0.001483	0.3317	2.645	8.94	82.6	2.189	2.472
	Minimum	0.015	0.015	1	0.00001	0.0005	0.0005	6.22	5.1	18.6	3.6	0.025	0.025
	Q1	0.015	0.015	49	0.00001	0.0005	0.0008	6.49	9.225	21.25	15.5	0.025	0.025
	Median	0.015	0.015	205	0.00001	0.0005	0.0012	6.955	10.65	24.9	43.6	0.05	0.053
	Q3	0.03	0.015	649	0.000015	0.001	0.00255	7.06	13.175	28.2	71	0.132	0.172
	Maximum	0.03	0.074	2419	0.000016	0.0014	0.0057	7.27	14.5	54	320	7.97	9.34
Glenn Storm (Composite Sampler)	N	11	12	14	12	11	12	15	15	13	12	12	13
	Mean	0.01909	0.016667	364	0.00001	0.00312	0.001692	6.681	11.96	23.29	59.8	0.04328	0.0519
	StDev	0.00701	0.003025	385	0	0.00826	0.00151	0.421	3.094	5.49	69.3	0.02381	0.03238
	Minimum	0.015	0.015	1	0.00001	0.0005	0.0005	5.64	7.3	16.1	10.4	0.025	0.025
	Q1	0.015	0.015	44	0.00001	0.0005	0.00065	6.36	9.9	17.95	15.1	0.025	0.025
	Median	0.015	0.015	204	0.00001	0.0005	0.00125	6.76	11	23.2	38.8	0.0277	0.0447
	Q3	0.03	0.01825	770	0.00001	0.001	0.0022	7.02	14	27.9	62.3	0.07175	0.068
	Maximum	0.03	0.024	1200	0.00001	0.028	0.0059	7.12	17.6	32	242	0.08	0.124
Glenn Upstream (Instream grabs)	N	13	13	15	4	13	13	14	14	13	13	13	14
	Mean	0.01962	0.02054	543	0.000011	0.000615	0.001454	6.885	11.257	25.52	61	0.1182	0.1349
	StDev	0.00721	0.01744	722	0.000002	0.000219	0.001584	0.2136	2.974	5.51	92.7	0.156	0.2025
	Minimum	0.015	0.015	8	0.00001	0.0005	0.0005	6.37	5.2	16	4.8	0.025	0.025
	Q1	0.015	0.015	50	0.00001	0.0005	0.0005	6.825	9.6	22.35	7	0.025	0.025
	Median	0.015	0.015	222	0.00001	0.0005	0.001	6.905	11	25	20	0.05	0.0255
	Q3	0.03	0.015	921	0.000014	0.00075	0.0016	6.9975	14.125	28.1	94.1	0.171	0.225
	Maximum	0.03	0.078	2419	0.000015	0.001	0.006	7.27	15.4	37	341	0.573	0.768

Table 15.
Statistical Summaries (2006 - 2010)
Stormwater Sampling Sites

Sample Location	Statistics	Cu Diss	Cu Tot	Ecoli	Hg Tot	Pb Diss	Pb Tot	pH	Temp	Hard	TSS	Zn Diss	Zn Tot
Mill Downstream (Instream grabs)	N	12	12	13	4	12	12	13	13	12	12	12	12
	Mean	0.02	0.01992	414	0.00001	0.000667	0.001733	7.0723	10.185	30.64	11.78	0.03125	0.025083
	StDev	0.00739	0.01703	486	0	0.000246	0.00172	0.2646	2.915	5.06	10.82	0.01131	0.000289
	Minimum	0.015	0.015	70	0.00001	0.0005	0.0005	6.72	3.7	20.3	2	0.025	0.025
	Q1	0.015	0.015	105	0.00001	0.0005	0.000525	6.815	8.75	27.57	4.8	0.025	0.025
	Median	0.015	0.015	186	0.00001	0.0005	0.00095	7.06	9.3	31.1	8.55	0.025	0.025
	Q3	0.03	0.015	629	0.00001	0.001	0.003125	7.29	12.8	32.22	13.33	0.04375	0.025
	Maximum	0.03	0.074	1733	0.00001	0.001	0.005	7.5	14.4	40.9	36.8	0.05	0.026
Mill Storm (Composite Sampler)	N	12	13	13	13	12	13	13	13	13	13	12	13
	Mean	0.02225	0.02454	725	0.000013	0.001967	0.01072	6.7292	11.038	23.28	49.48	0.03358	0.05754
	StDev	0.00654	0.00649	693	0.000003	0.002255	0.00782	0.3573	3.055	6.29	34.36	0.01169	0.01908
	Minimum	0.015	0.015	36	0.00001	0.0005	0.004	5.97	5	12	22.8	0.025	0.032
	Q1	0.015	0.0185	101	0.000011	0.00055	0.00505	6.51	9.35	19.55	26.8	0.025	0.04
	Median	0.0215	0.026	613	0.000013	0.001	0.0071	6.77	10.7	23.8	35.6	0.025	0.061
	Q3	0.03	0.0305	1083	0.000015	0.00215	0.0169	7.005	14.4	26.65	64.8	0.04725	0.0735
	Maximum	0.03	0.032	2419	0.00002	0.007	0.026	7.24	15.5	33.3	146	0.054	0.093
Mill Upstream (Instream grabs)	N	12	12	13	4	12	12	13	13	12	12	12	12
	Mean	0.02	0.015167	268.5	0.000013	0.000867	0.001217	7.0285	10.525	29.1	8.14	0.0315	0.03008
	StDev	0.00739	0.000577	265	0.000007	0.000828	0.001772	0.3179	2.368	5.54	5.34	0.01119	0.01761
	Minimum	0.015	0.015	39.3	0.00001	0.0005	0.0005	6.47	7.03	18.1	1.6	0.025	0.025
	Q1	0.015	0.015	93.5	0.00001	0.0005	0.0005	6.805	9	25.42	4	0.025	0.025
	Median	0.015	0.015	156	0.00001	0.0005	0.0005	7.03	9.5	28.45	6.2	0.025	0.025
	Q3	0.03	0.015	363	0.000021	0.001	0.000875	7.335	12.8	32.8	14.17	0.0445	0.025
	Maximum	0.03	0.017	921	0.000024	0.0034	0.0066	7.47	14.6	39.6	17	0.05	0.086

Table 15.
Statistical Summaries (2006 - 2010)
Stormwater Sampling Sites

Sample Location	Statistics	Cu Diss	Cu Tot	Ecoli	Hg Tot	Pb Diss	Pb Tot	pH	Temp	Hard	TSS	Zn Diss	Zn Tot
Pringle Downstream (Instream grabs)	N	11	11	14	4	11	11	13	14	11	11	11	11
	Mean	0.01909	0.02136	422	0.00001	0.000636	0.002027	6.892	10.371	27.12	21.22	0.03336	0.03273
	StDev	0.00701	0.01832	619	0.000001	0.000234	0.002585	0.41	2.87	6.37	28.61	0.01181	0.01771
	Minimum	0.015	0.015	14	0.00001	0.0005	0.0005	5.87	5.7	12	1.8	0.025	0.025
	Q1	0.015	0.015	46	0.00001	0.0005	0.0005	6.805	8.225	27.2	3.6	0.025	0.025
	Median	0.015	0.015	308	0.00001	0.0005	0.0008	6.94	10.75	29	8.8	0.025	0.025
	Q3	0.03	0.015	511	0.000012	0.001	0.0022	7.16	11.925	31	31.4	0.05	0.025
	Maximum	0.03	0.076	2420	0.000012	0.001	0.0088	7.35	15.8	32.8	89.2	0.05	0.077
Pringle Storm (Composite Sampler)	N	11	12	14	12	11	12	13	14	12	12	11	12
	Mean	0.02309	0.02958	338	0.000015	0.002236	0.01785	6.769	10.714	12.23	97.9	0.04555	0.1395
	StDev	0.00982	0.01777	687	0.000011	0.003184	0.03171	0.593	3.175	5.84	118.4	0.03221	0.1561
	Minimum	0.015	0.015	5	0.00001	0.0005	0.0033	4.98	6	5.6	18	0.025	0.03
	Q1	0.015	0.015	17	0.00001	0.0005	0.00475	6.635	8.025	8.57	45.4	0.025	0.0555
	Median	0.016	0.0255	60	0.00001	0.0008	0.00695	6.95	10.6	10.2	56.2	0.031	0.091
	Q3	0.03	0.038	220	0.000012	0.0022	0.01565	7.185	12.875	15.3	120	0.05	0.1477
	Maximum	0.043	0.075	2419	0.00004	0.0094	0.117	7.23	16.9	25.5	456	0.129	0.606
Pringle Upstream (Instream grabs)	N	12	12	14	4	12	12	13	14	12	11	12	12
	Mean	0.02	0.02167	448	0.00001	0.000708	0.001975	6.695	10.514	25.86	17.24	0.03125	0.0305
	StDev	0.00739	0.02127	640	0	0.000257	0.002321	0.586	2.868	6.37	21.65	0.01131	0.01287
	Minimum	0.015	0.015	15	0.00001	0.0005	0.0005	4.97	5.5	11.6	3	0.025	0.025
	Q1	0.015	0.015	49	0.00001	0.0005	0.0009	6.55	8.35	21.35	6.8	0.025	0.025
	Median	0.015	0.015	243	0.00001	0.0005	0.0011	6.77	10.85	27.35	11	0.025	0.025
	Q3	0.03	0.015	573	0.00001	0.001	0.00165	7.055	12.4	30.73	16.5	0.04375	0.025
	Maximum	0.03	0.089	2420	0.00001	0.001	0.0086	7.28	15.1	32	80	0.05	0.06

Figure 1
Monthly Instream Monitoring Sites

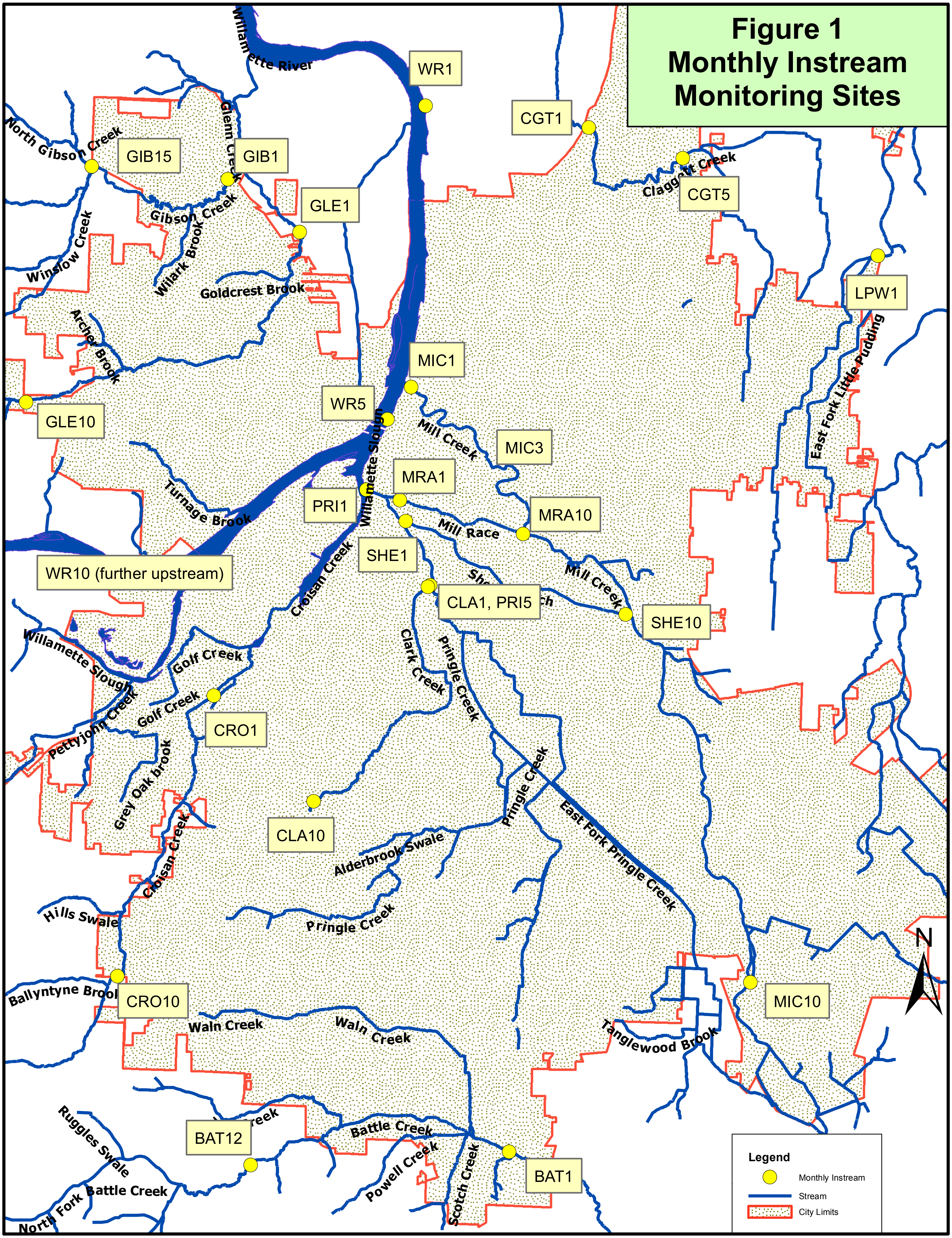
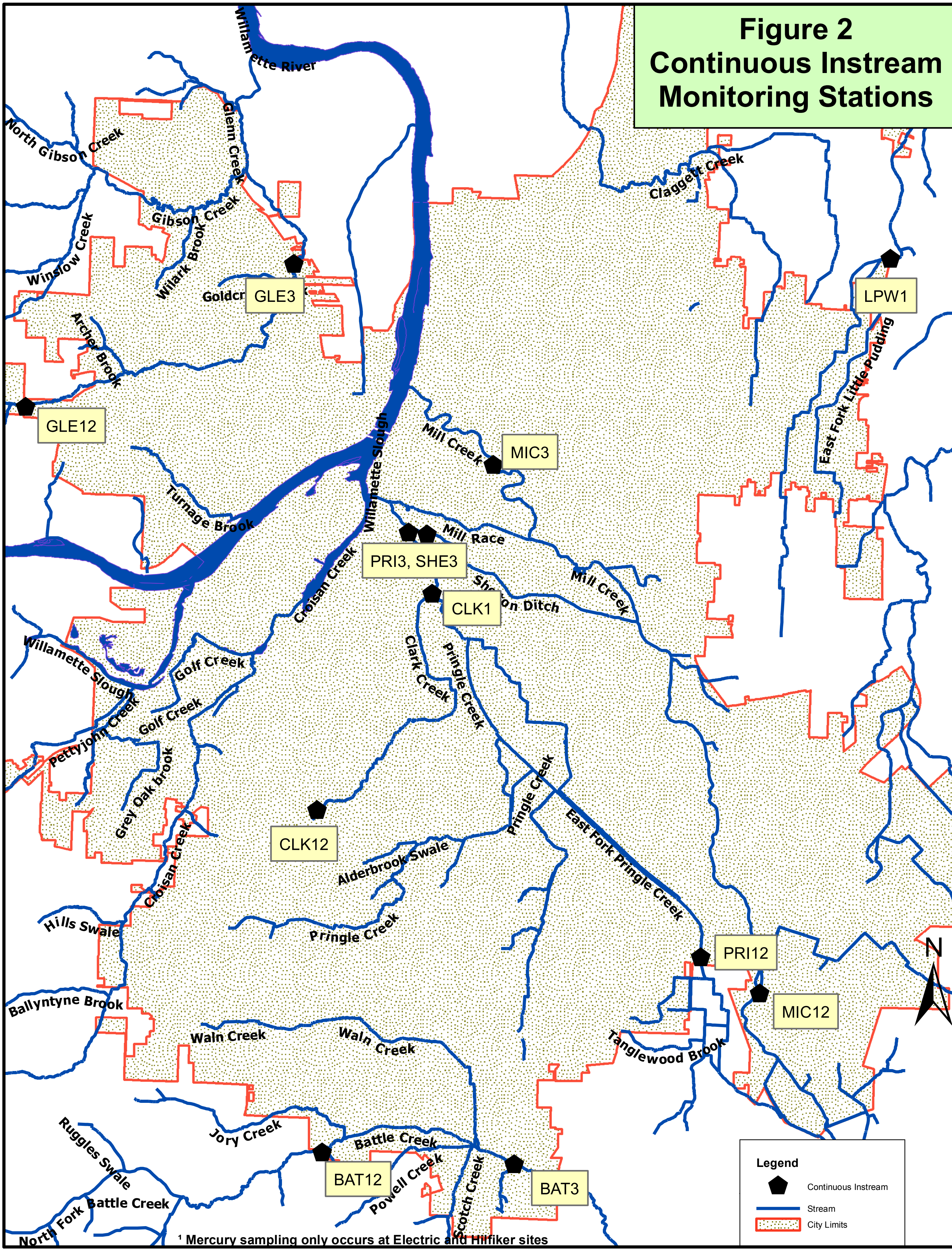


Figure 2
Continuous Instream Monitoring Stations



[1] Mercury sampling only occurs at Electric and Hilfiker sites

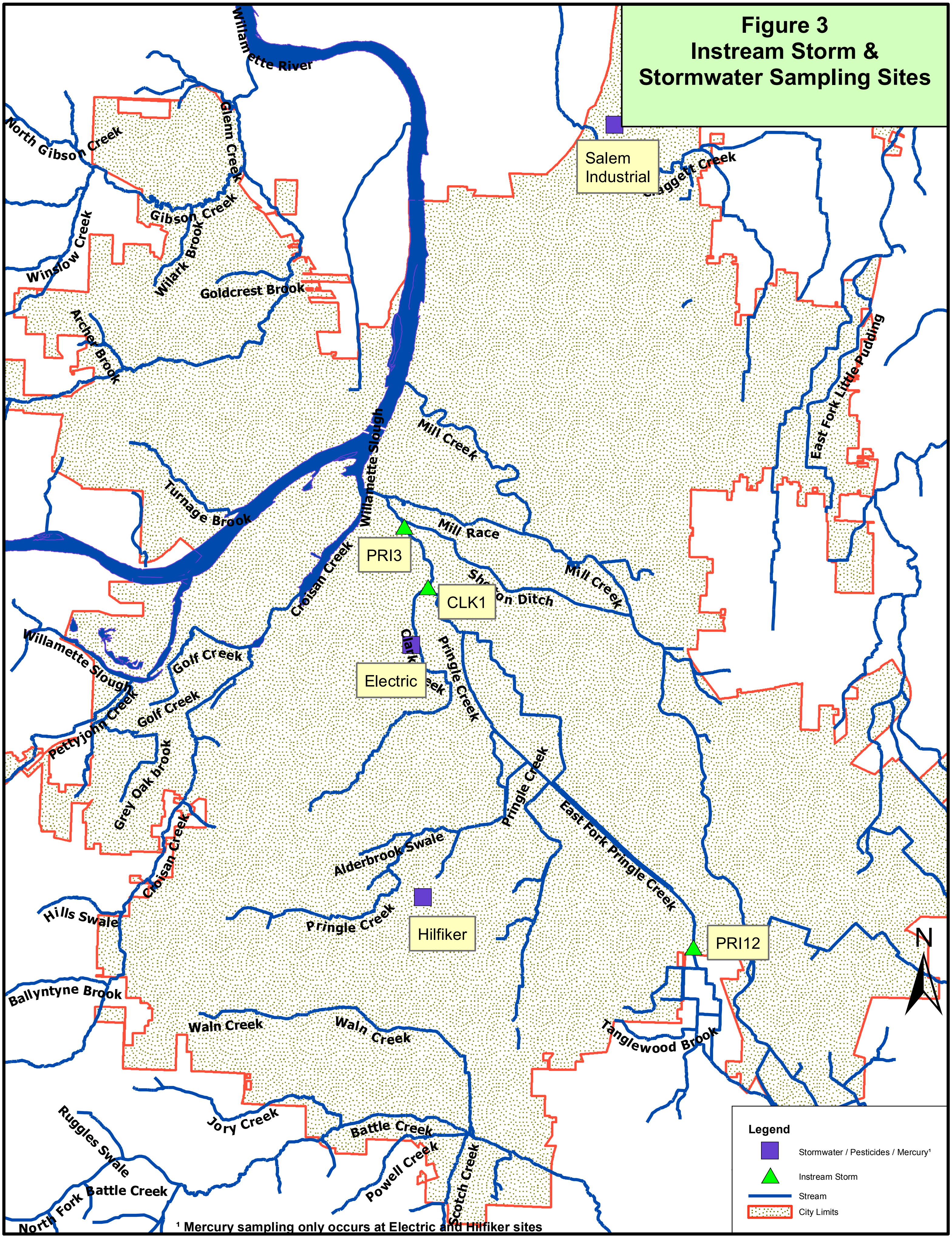
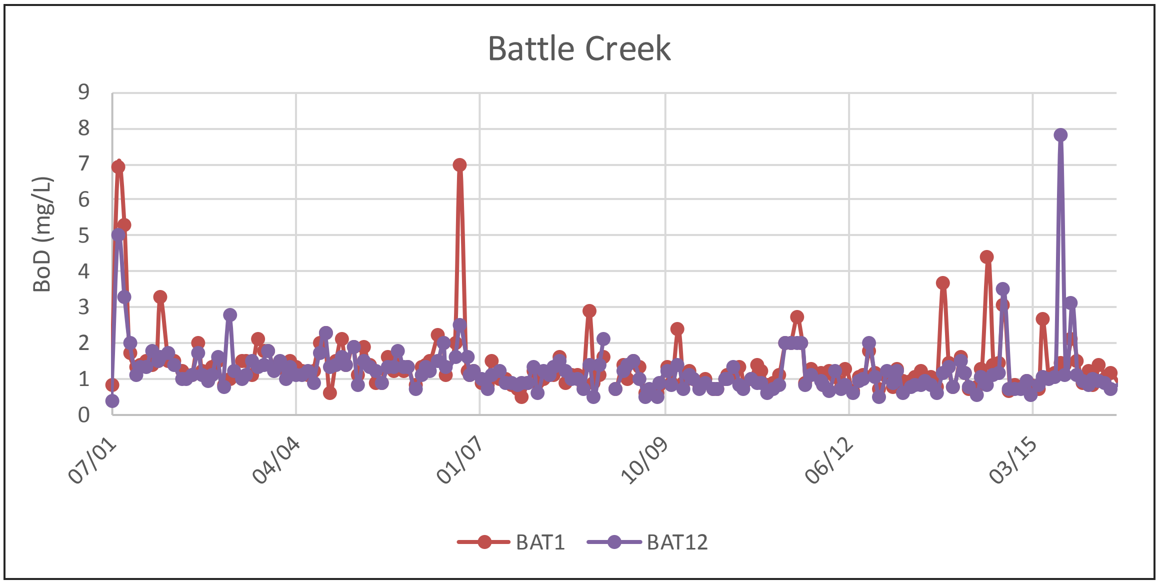


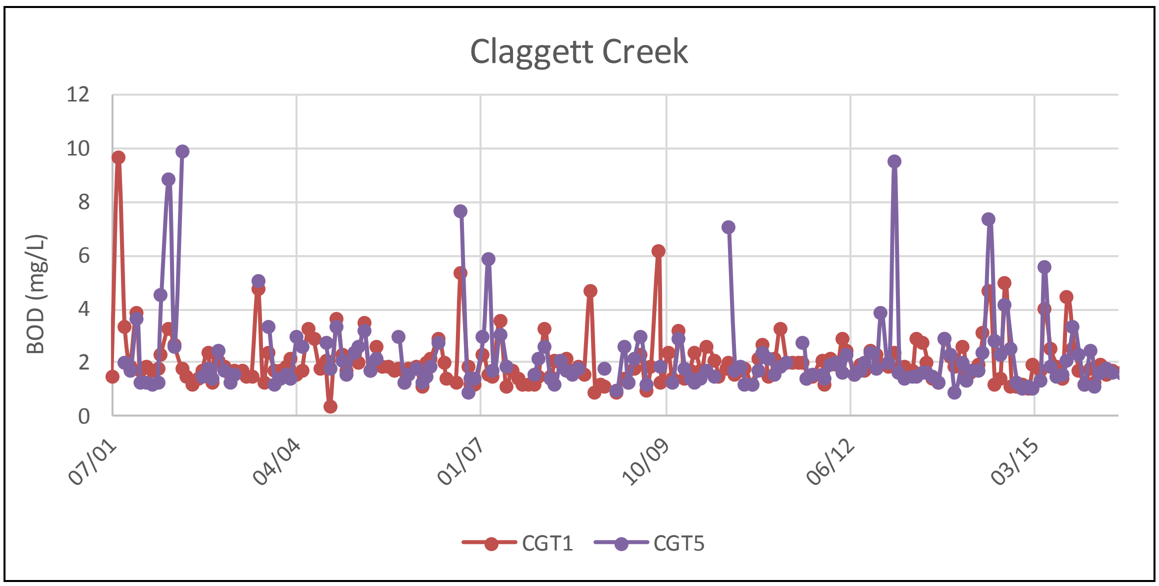
Figure 3
Instream Storm &
Stormwater Sampling Sites
Willamette River
Salem Industrial
Glenn Creek
North Gibson Creek
Claggett Creek
Gibson Creek
Winslow Creek
Wilark Brook
Goldcrest Brook
Archer Brook
East Fork Little Pudding
Mill Creek
Willamette Slough
Turnage Brook
Mill Race
PRI3
Croisan Creek
Shelton Ditch
Mill Creek
CLK1
Willamette Slough
Clark Creek
Pringle Creek
Golf Creek
Electric
Golf Creek
Pettyjohn Creek
Grey Oak brook
Pringle Creek
East Fork Pringle Creek
Croisan Creek
Alderbrook Swale
Hills Swale
Pringle Creek
Hilfiker
PRI12
Ballyntyne Brook
Waln Creek
Waln Creek
Tanglewood Brook
Jory Creek
Ruggles Swale
Battle Creek
Powell Creek
Scotch Creek
North Fork Battle Creek
N
Legend
Stormwater / Pesticides / Mercury¹
Instream Storm
Stream
City Limits
¹ Mercury sampling only occurs at Electric and Hilfiker sites

Figure 4.1

Biochemical Oxygen Demand Time Trend Graphs

Monthly Instream Monitoring





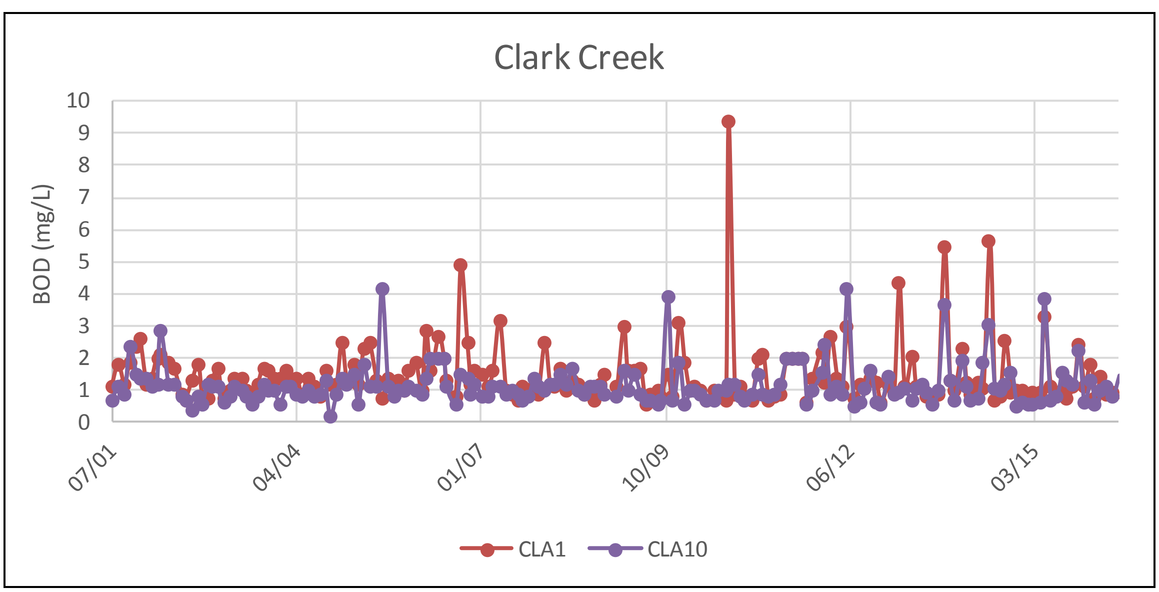
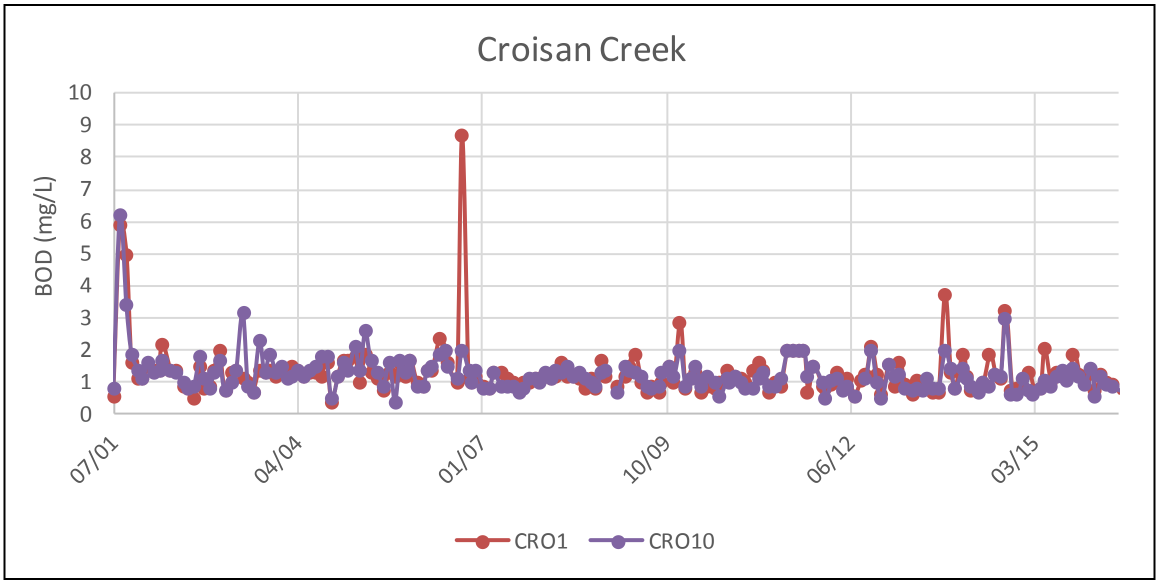
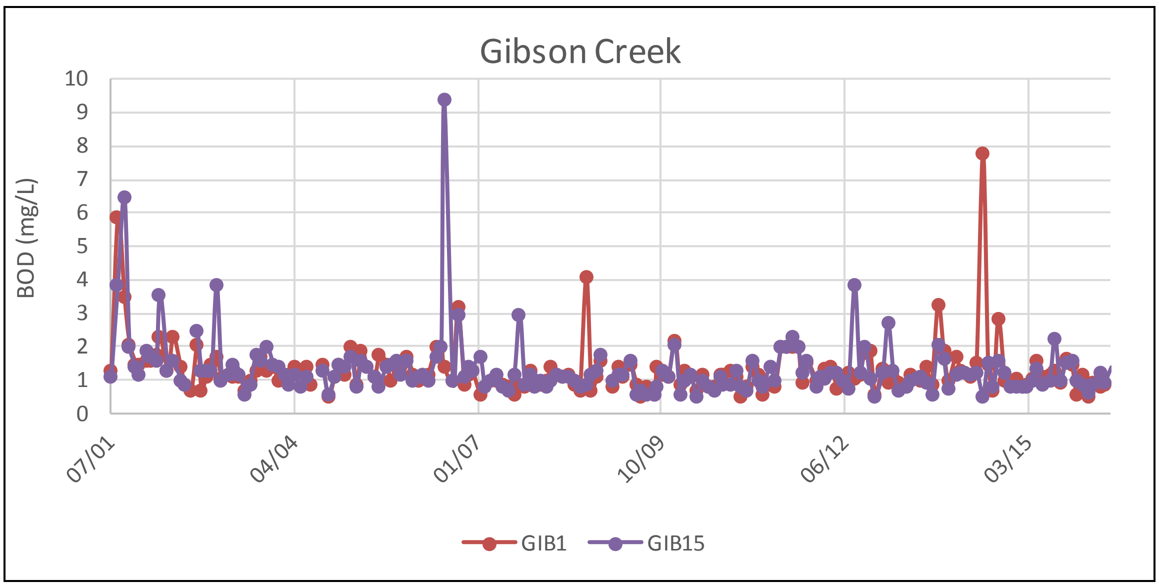


Figure 4.1
Biochemical Oxygen Demand Time Trend Graphs
Monthly Instream Monitoring





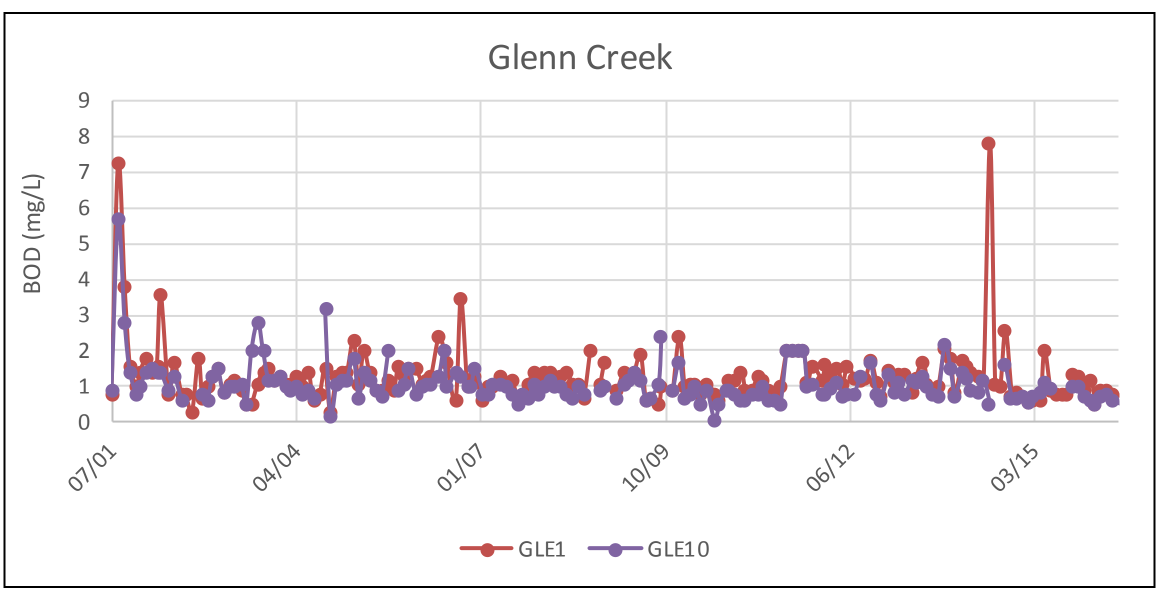
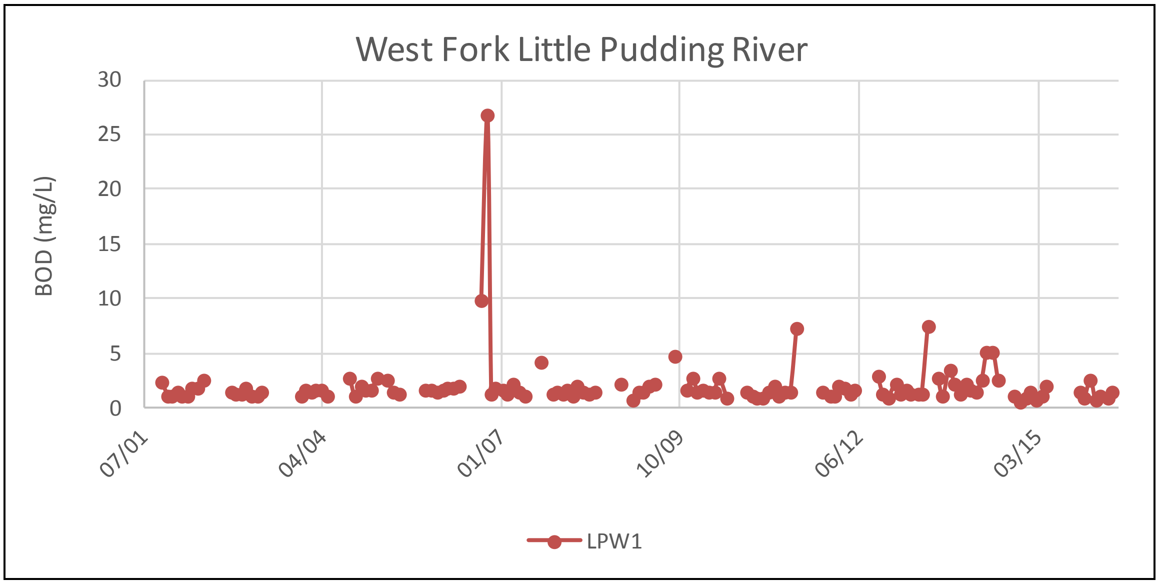
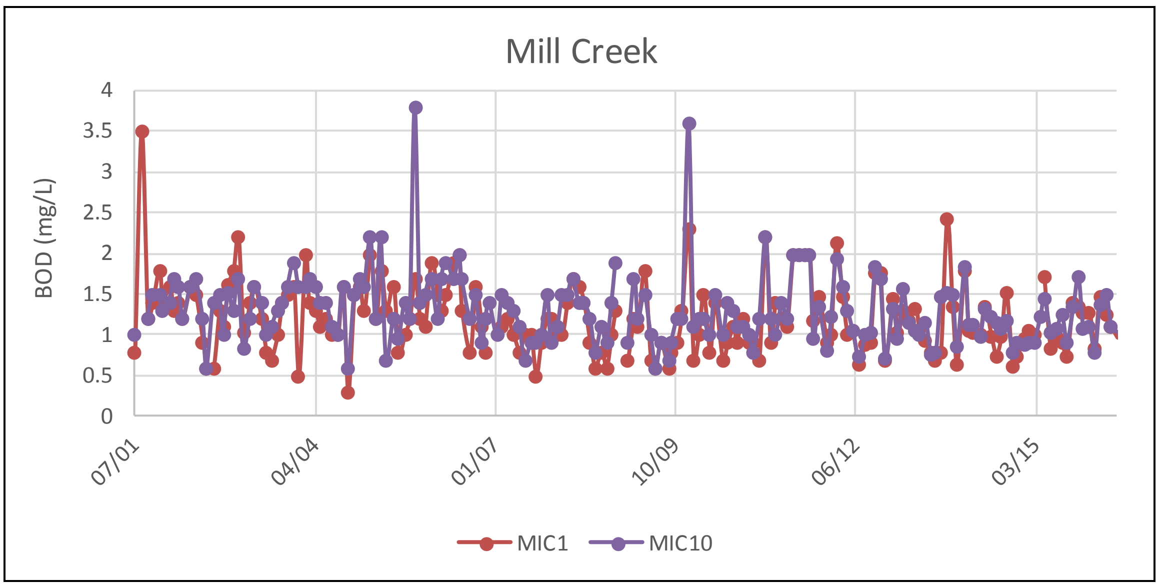


Figure 4.1

Biochemical Oxygen Demand Time Trend Graphs

Monthly Instream Monitoring





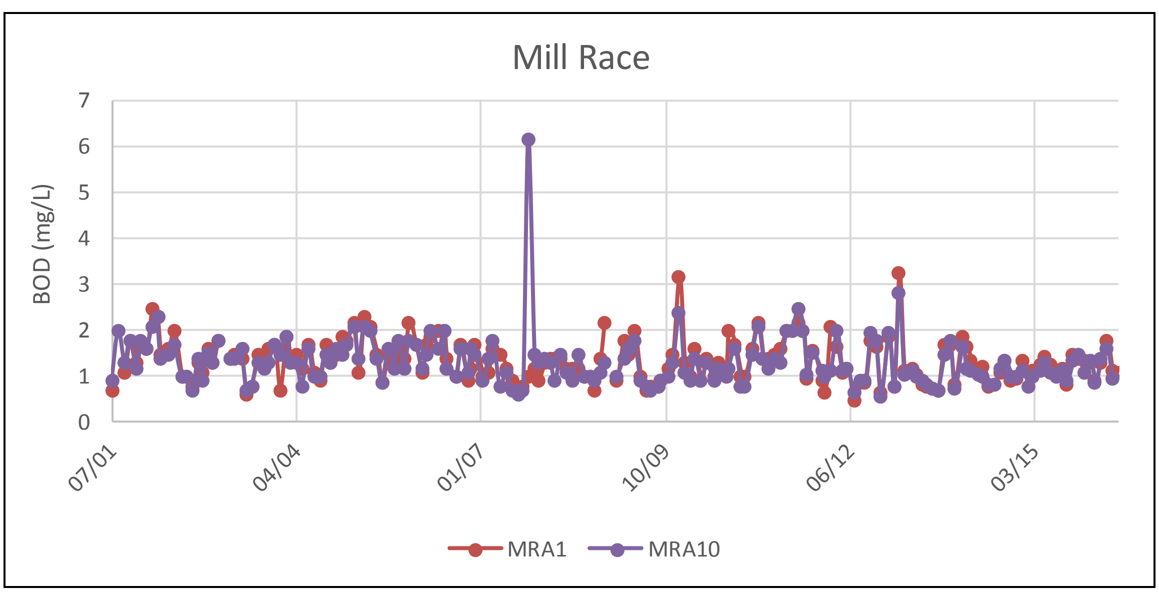
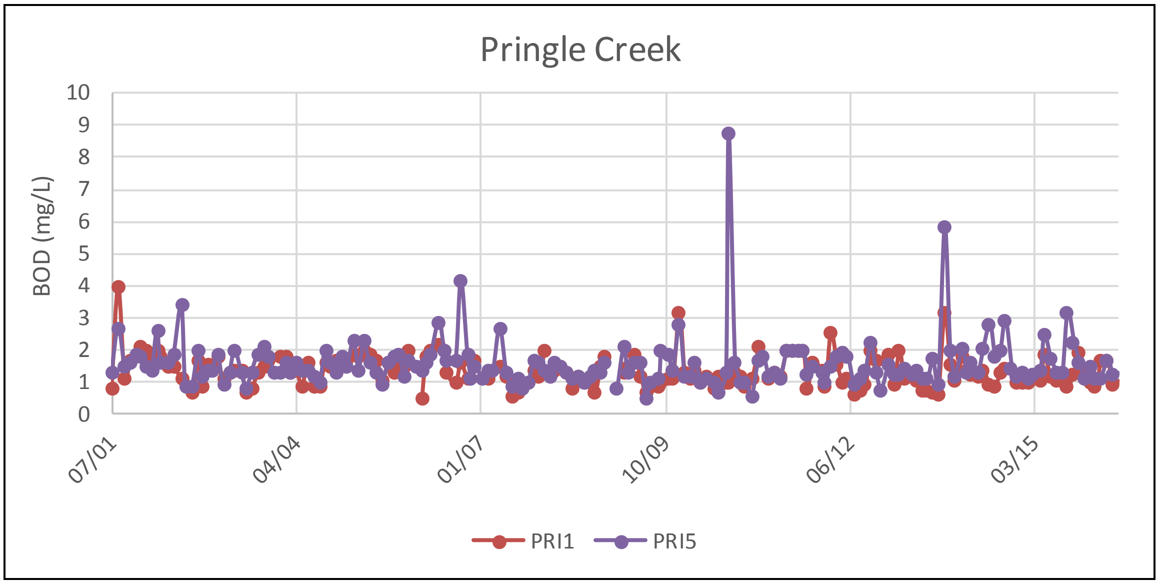
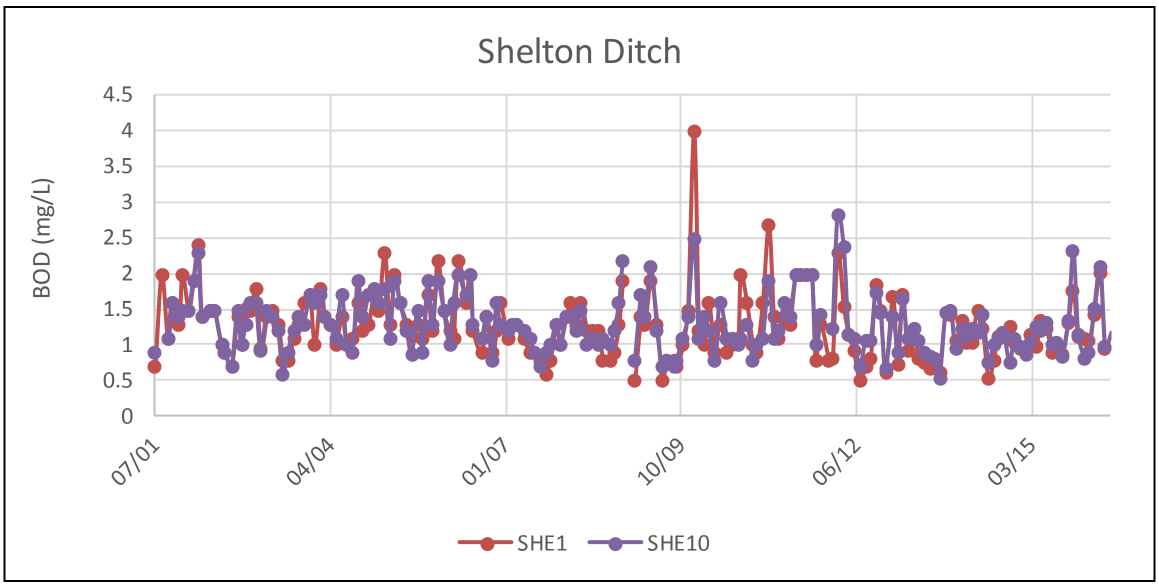


Figure 4.1

Biochemical Oxygen Demand Time Trend Graphs

Monthly Instream Monitoring





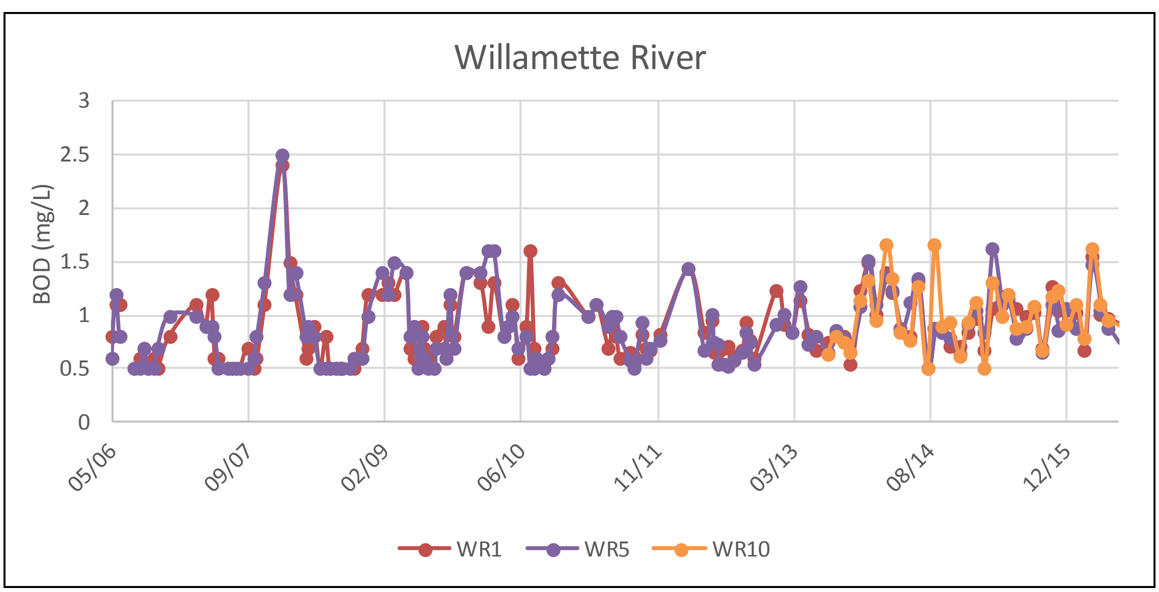
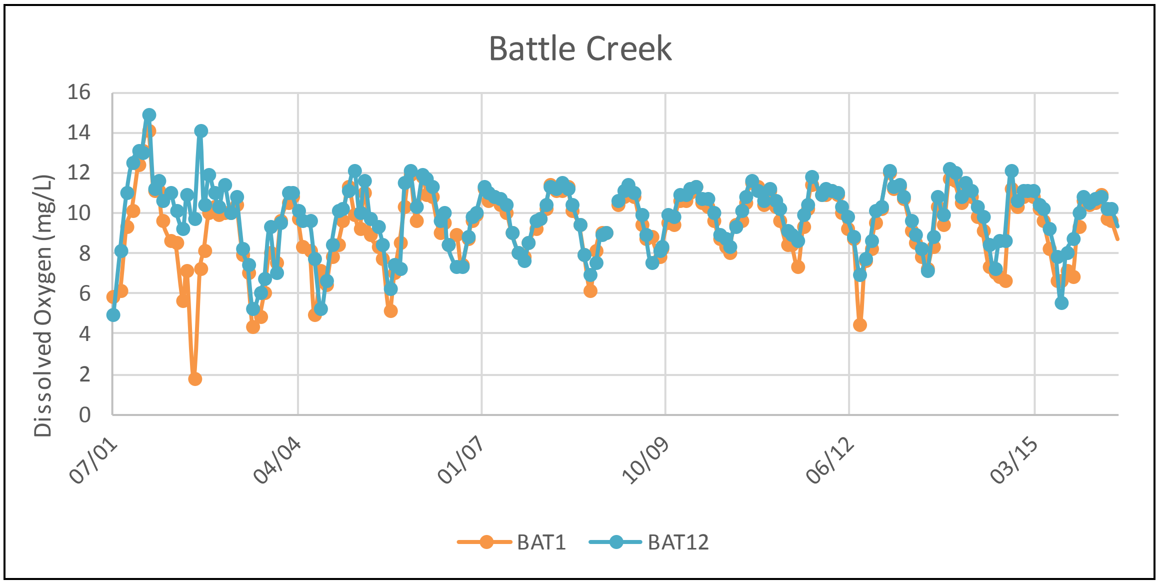
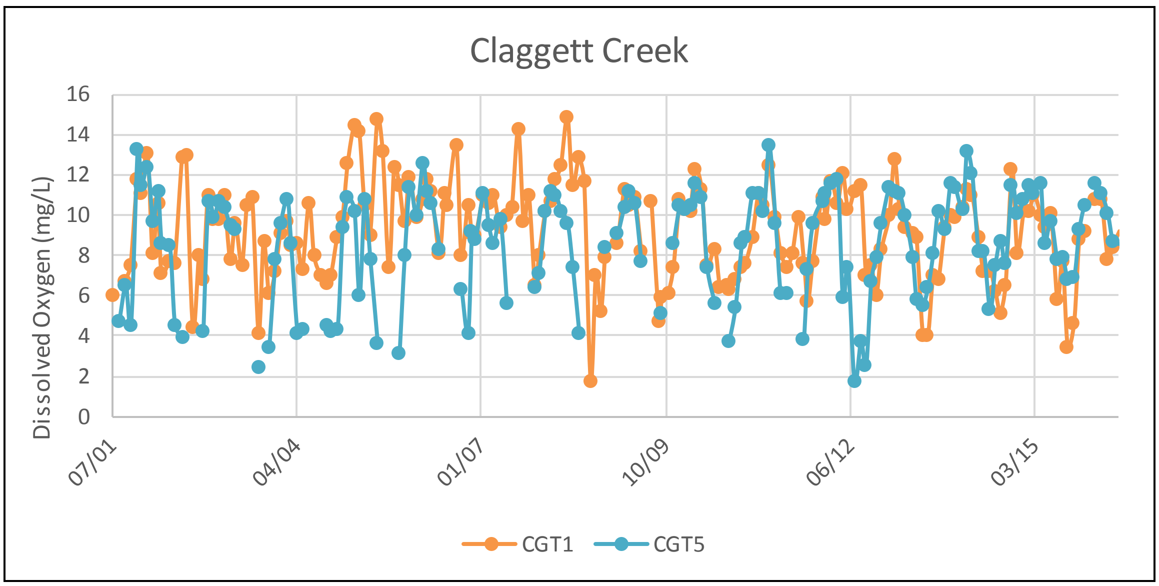


Figure 4.2
Dissolved Oxygen Time Trend Graphs
Monthly Instream Monitoring





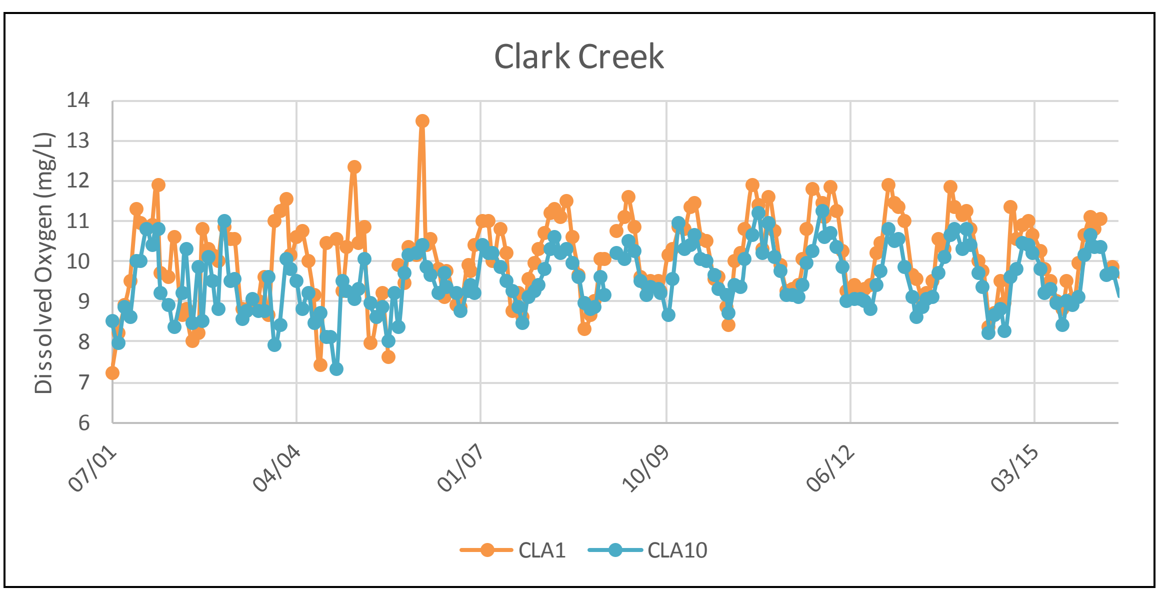
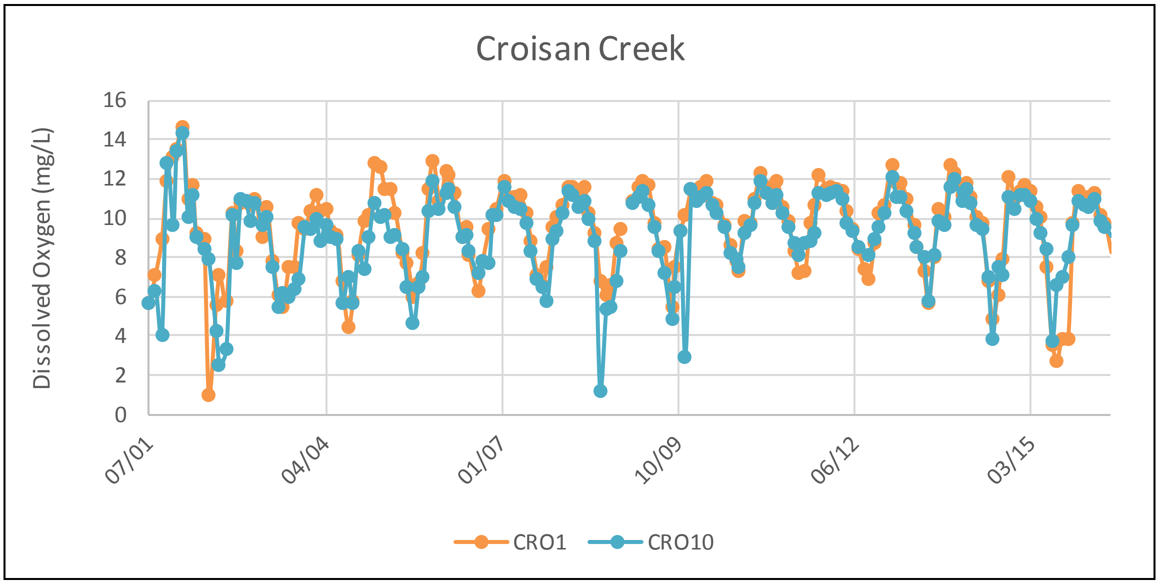
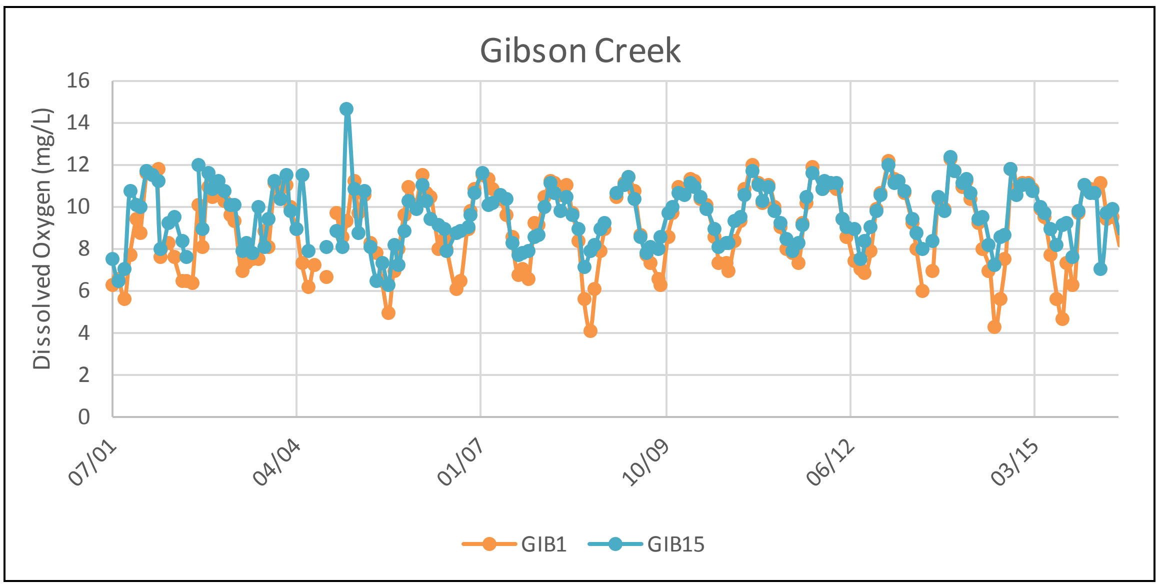


Figure 4.2

Dissolved Oxygen Time Trend Graphs

Monthly Instream Monitoring





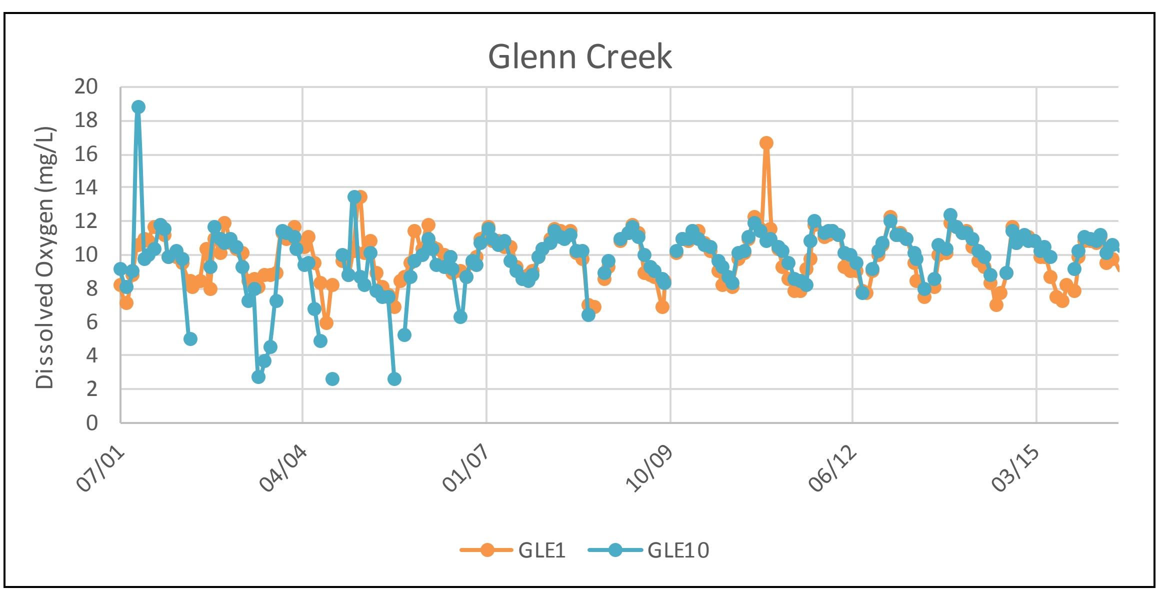
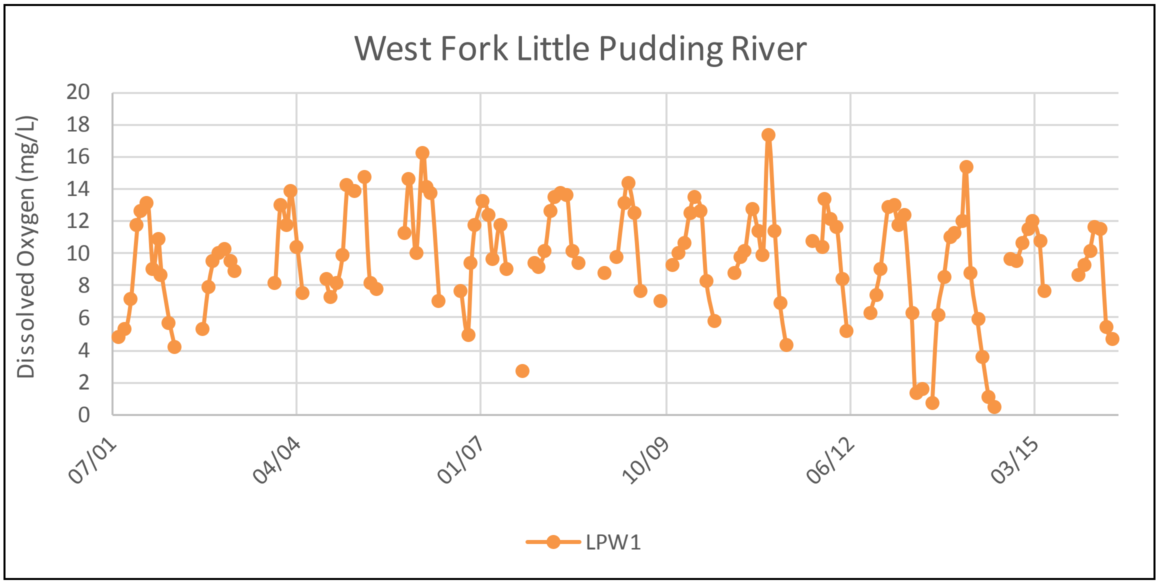
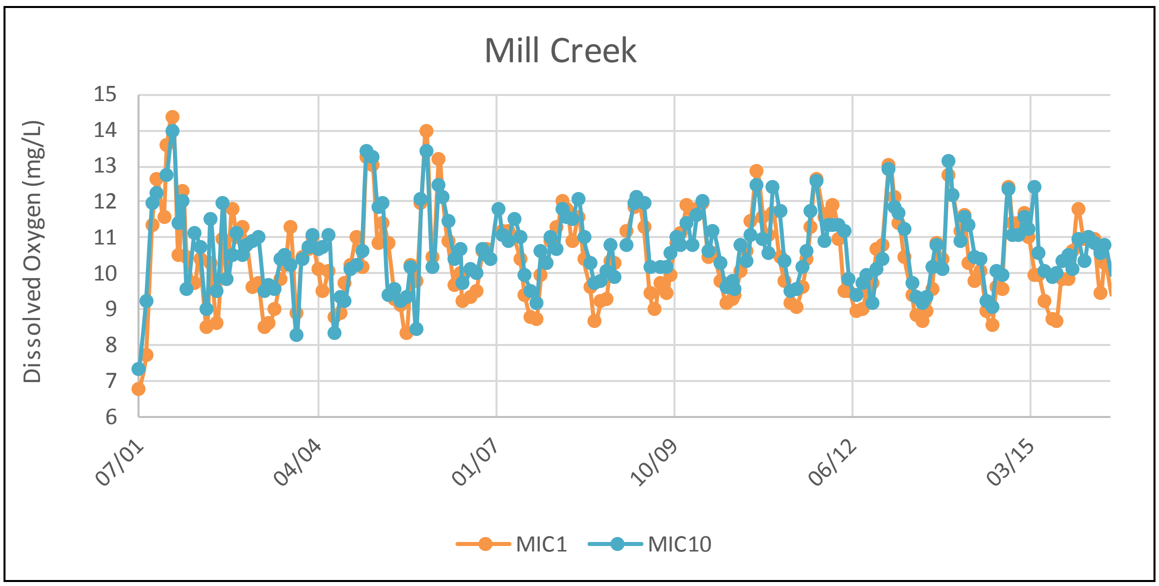


Figure 4.2

Dissolved Oxygen Time Trend Graphs

Monthly Instream Monitoring





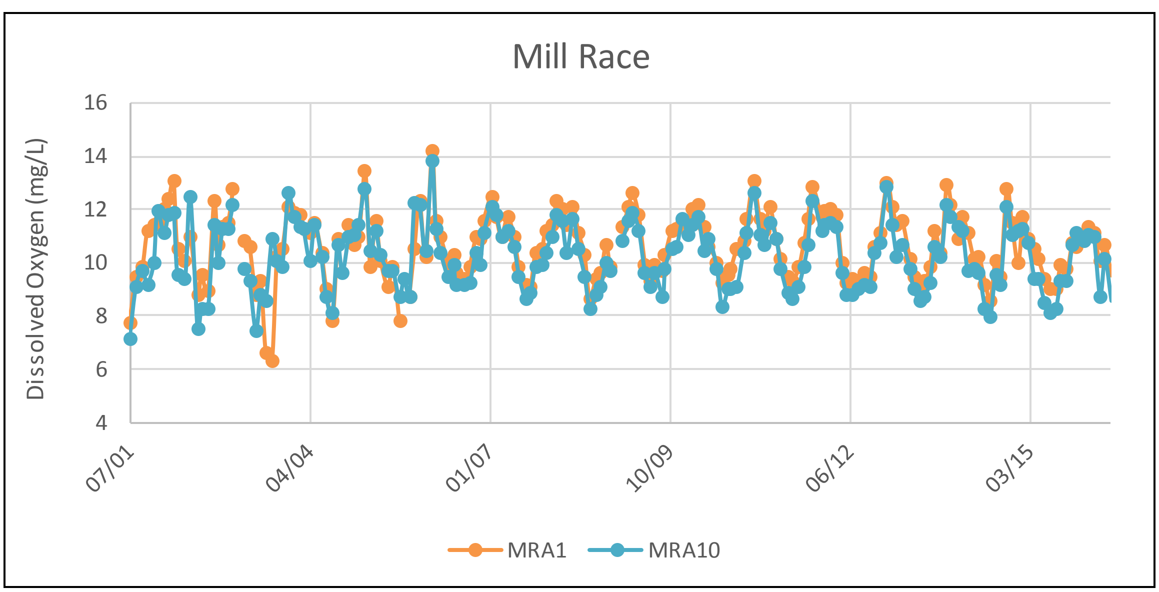
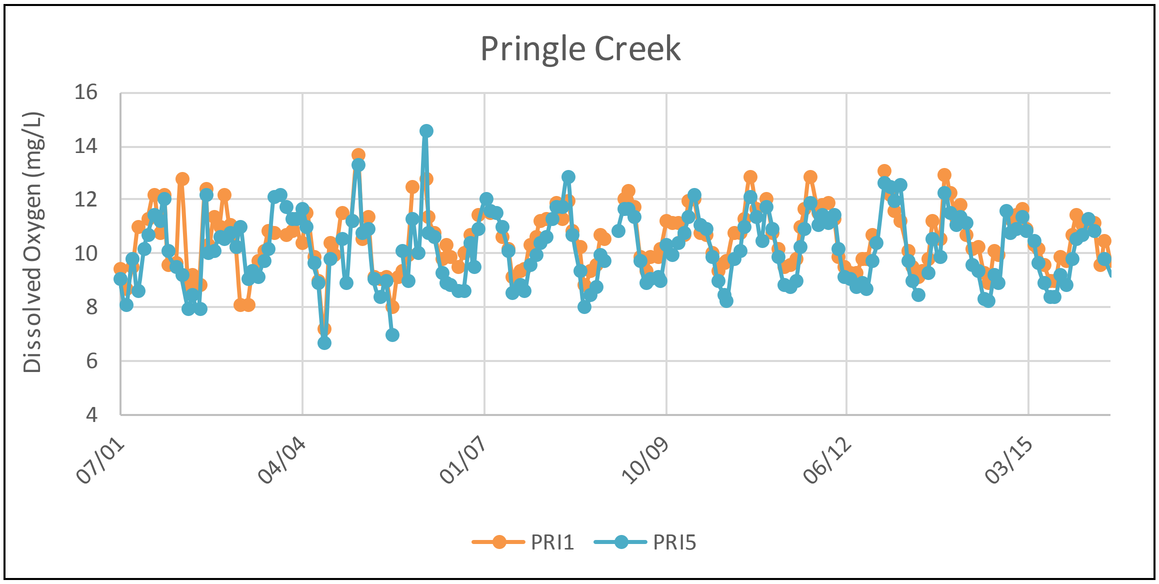
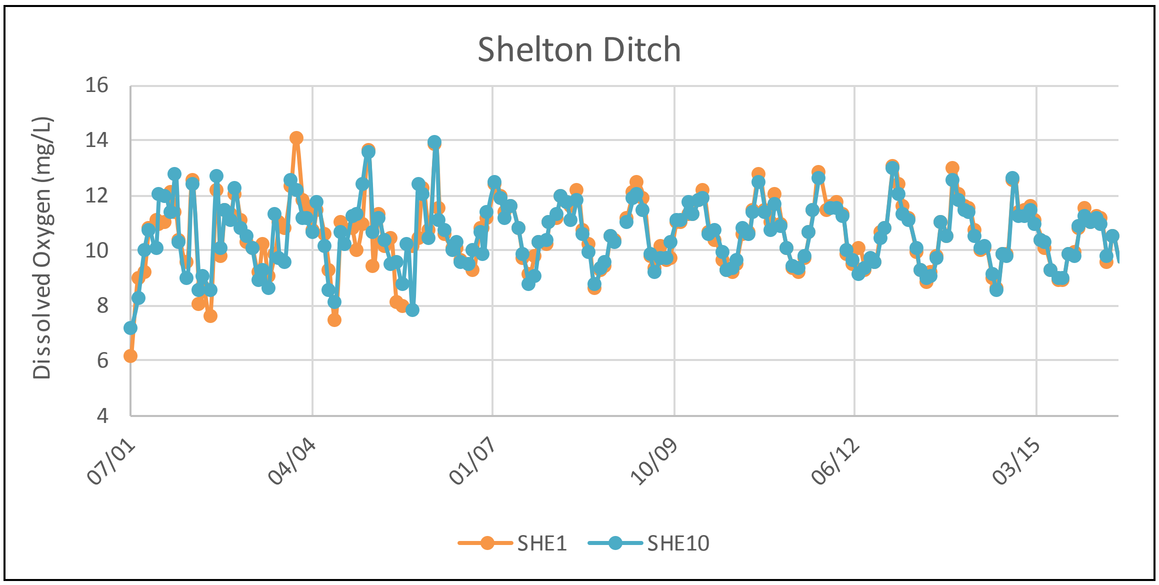


Figure 4.2

Dissolved Oxygen Time Trend Graphs

Monthly Instream Monitoring





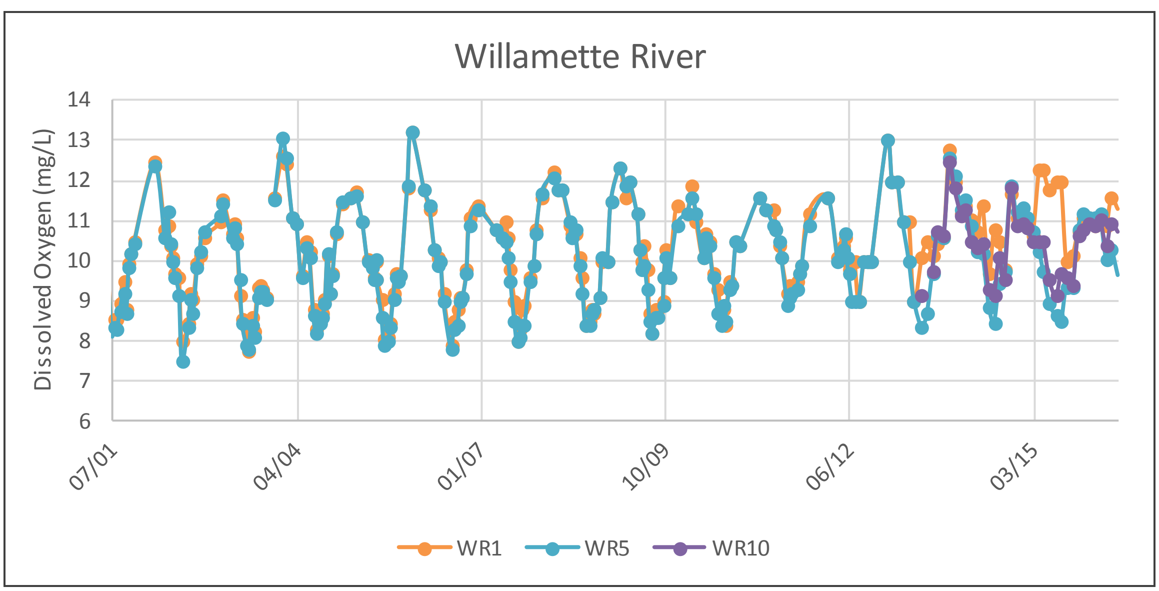
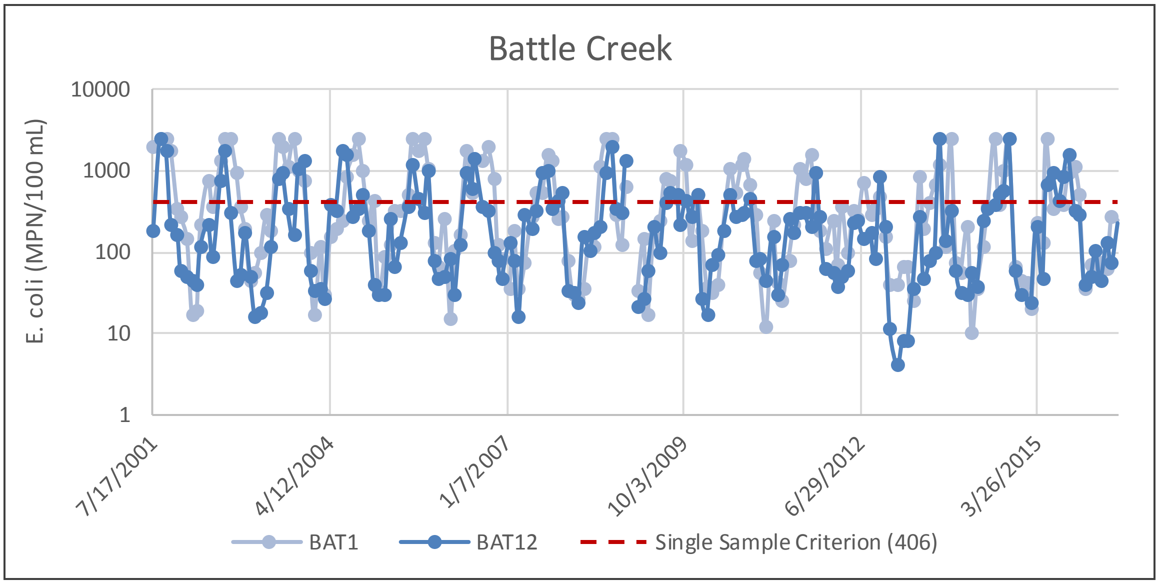
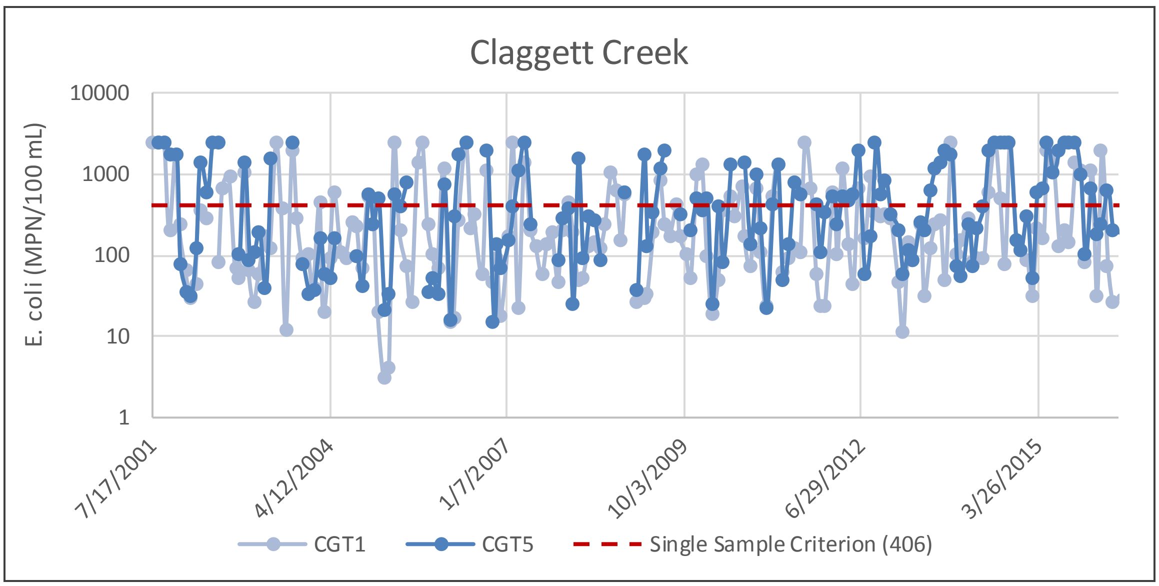


Figure 4.3
E. Coli Time Trend Graphs
Monthly Instream Monitoring





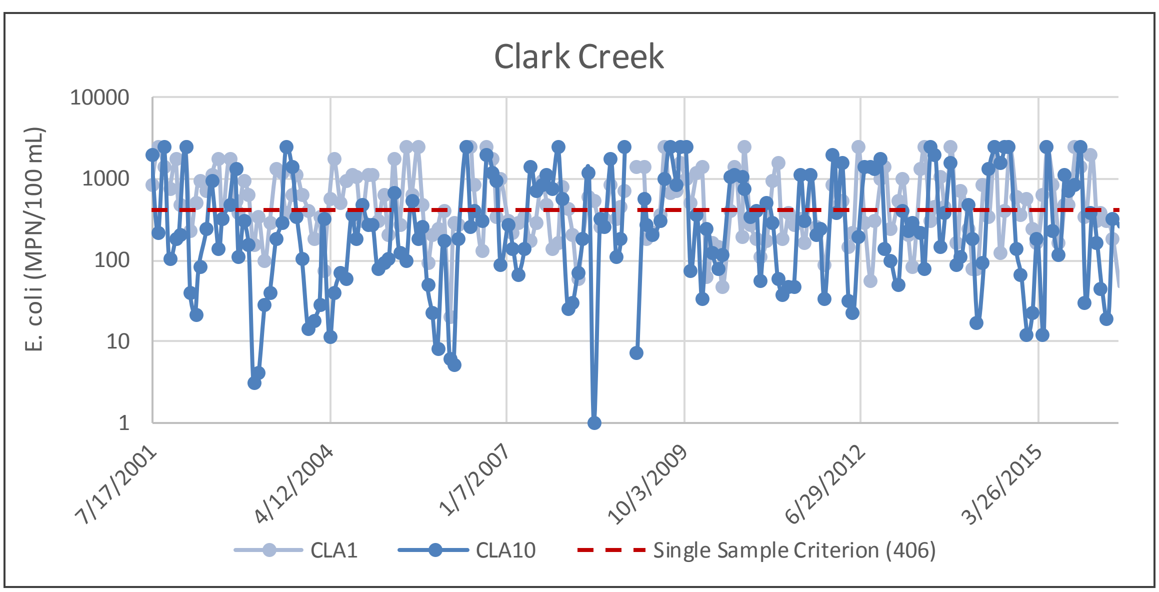
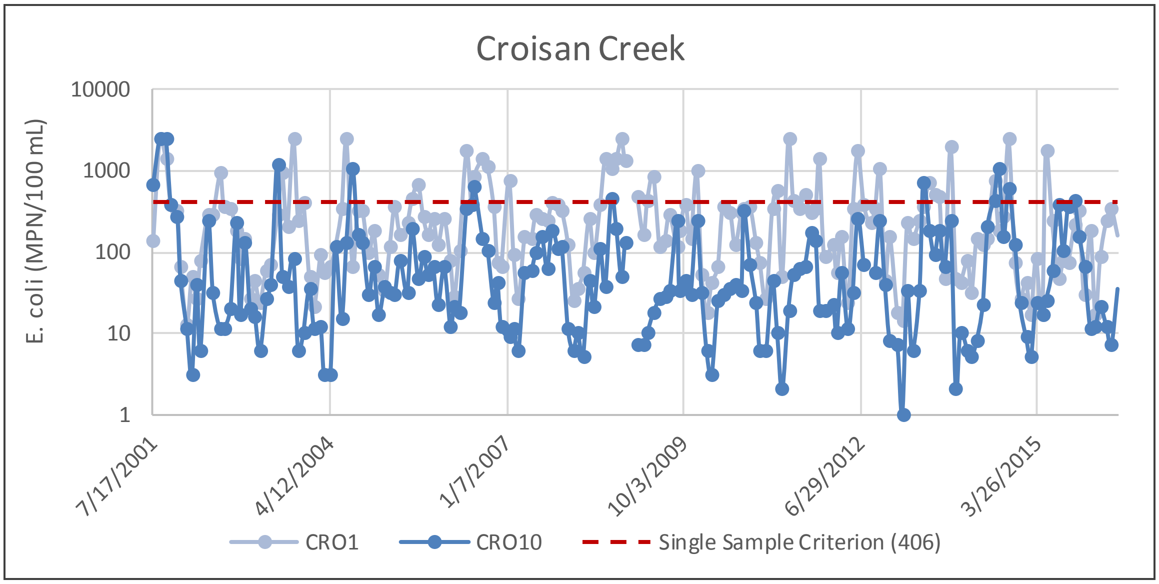
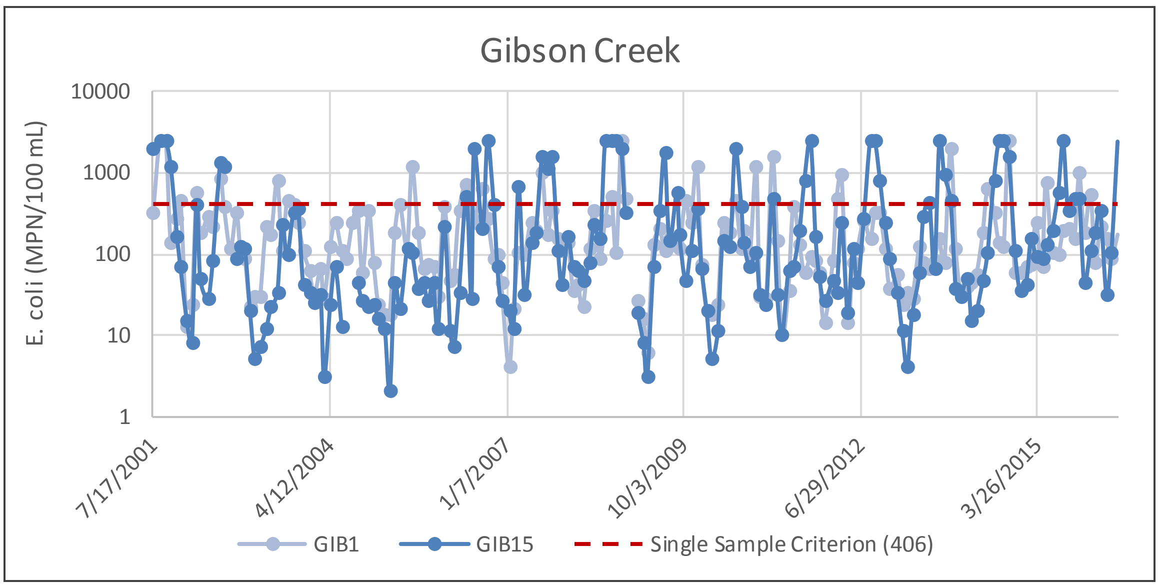


Figure 4.3

E. Coli Time Trend Graphs

Monthly Instream Monitoring





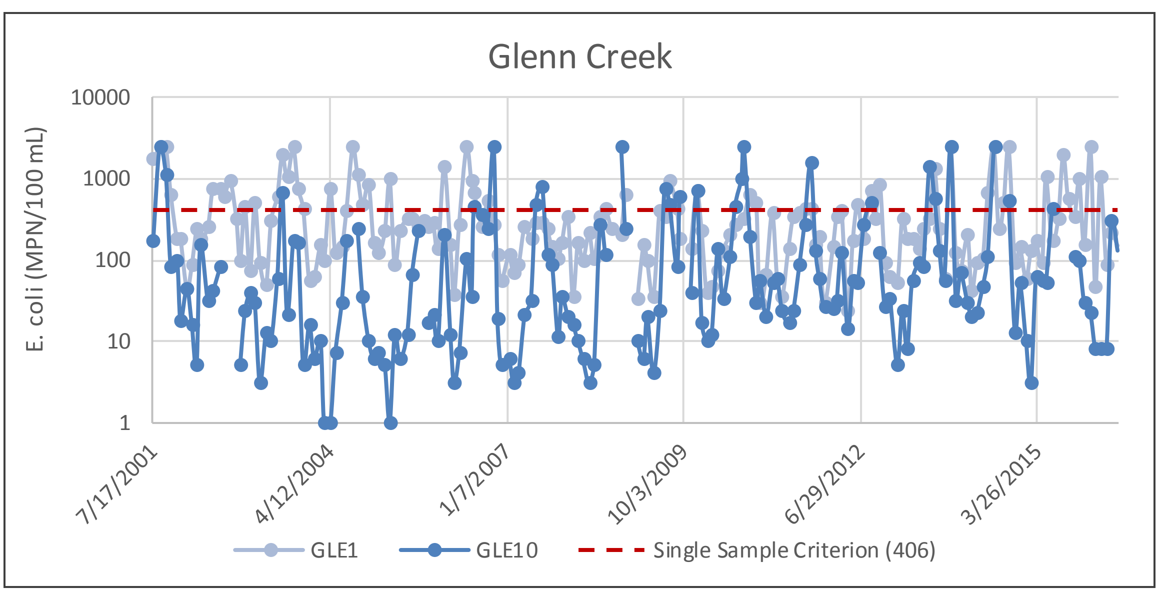
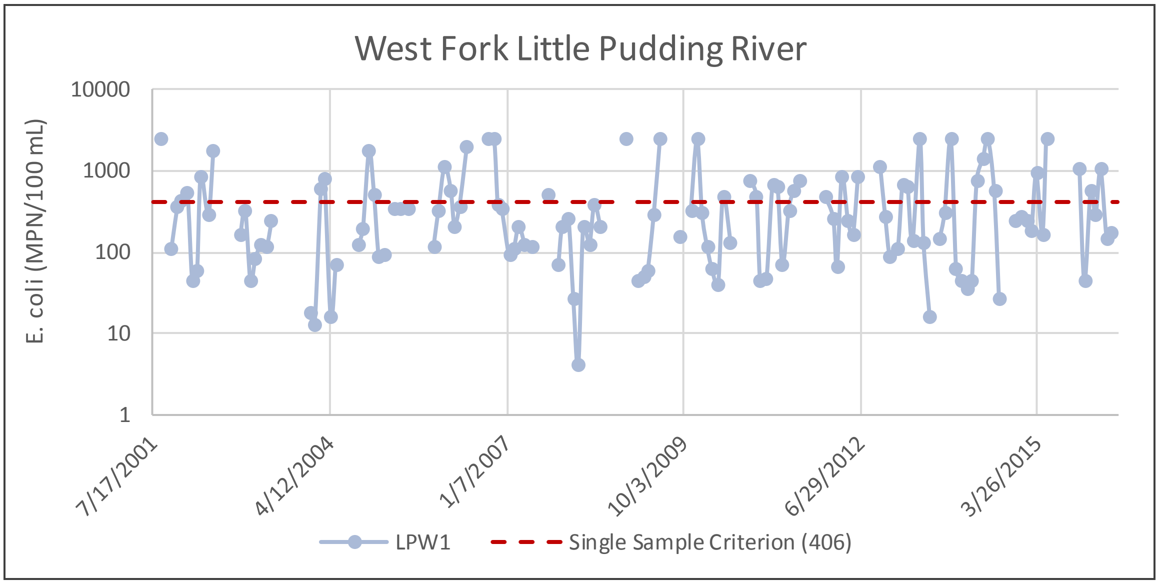
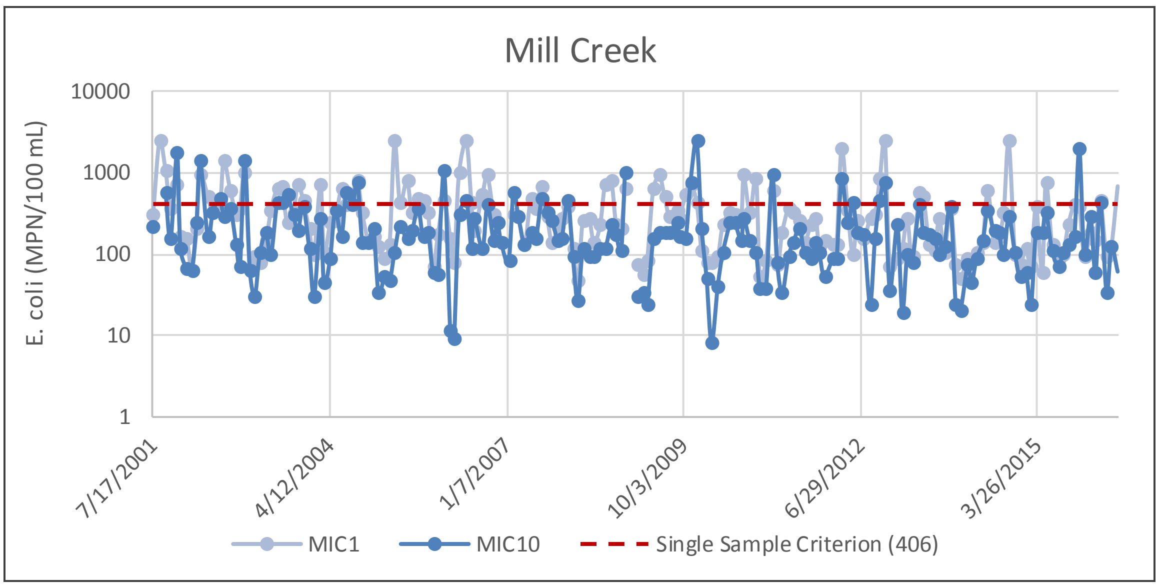


Figure 4.3
E. Coli Time Trend Graphs
Monthly Instream Monitoring





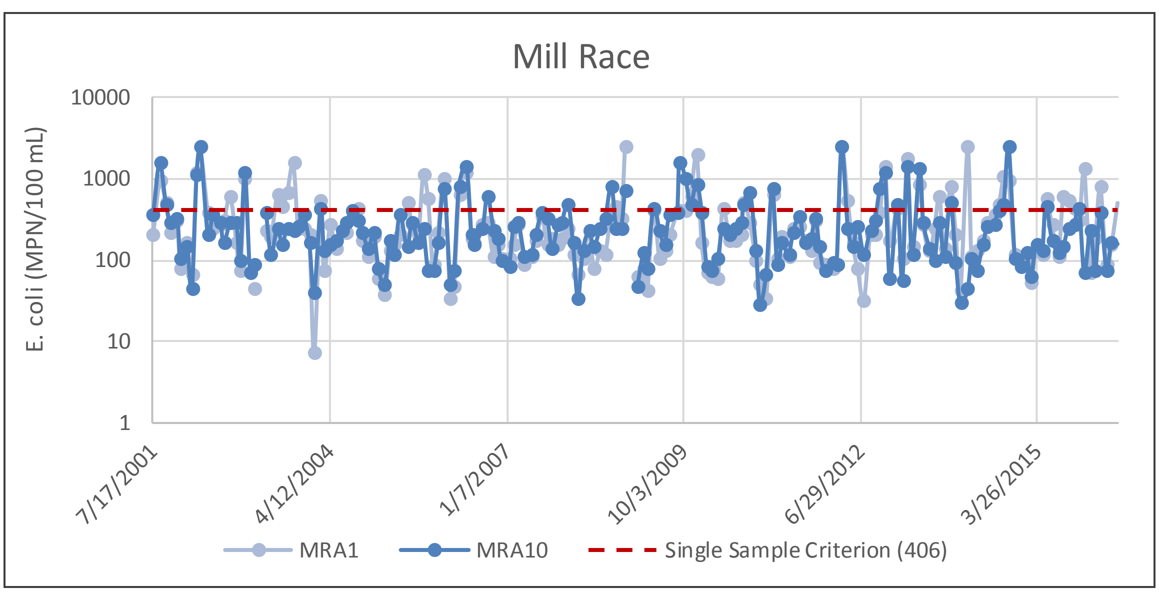
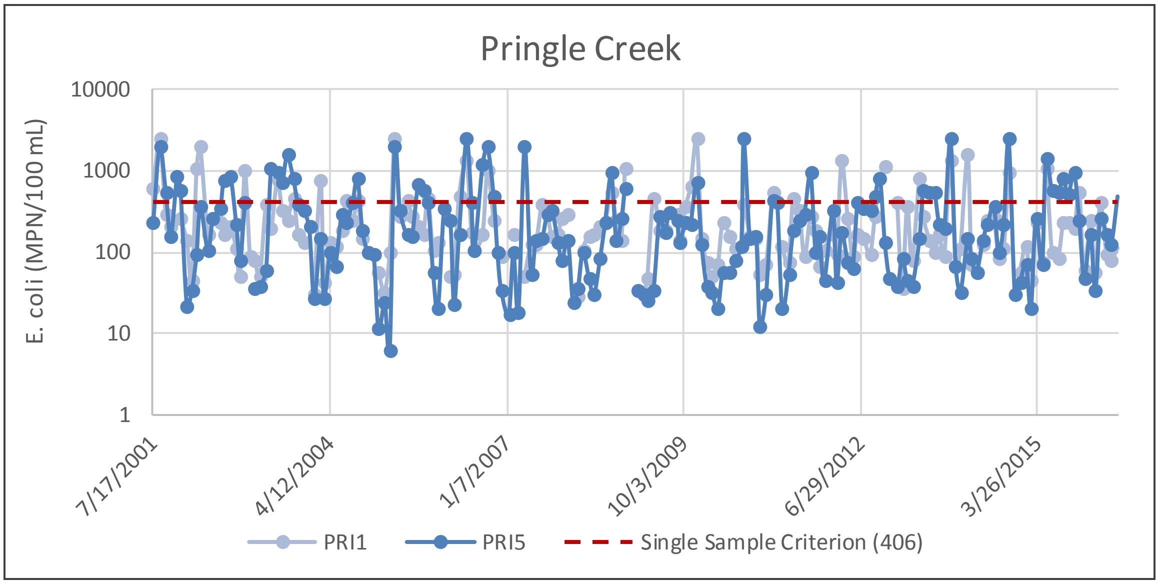
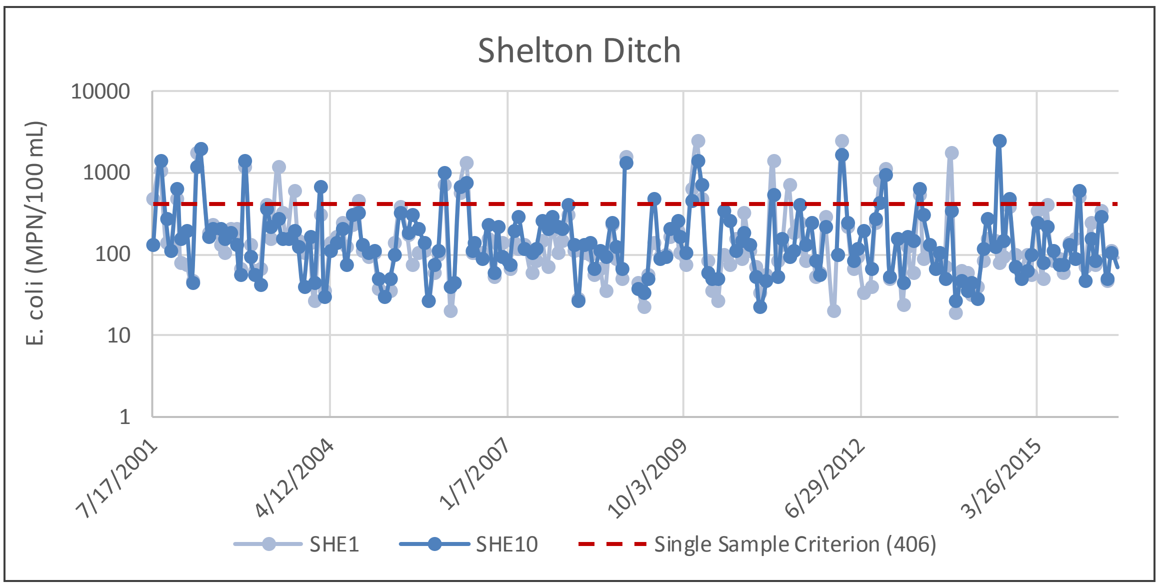


Figure 4.3
E. Coli Time Trend Graphs
Monthly Instream Monitoring





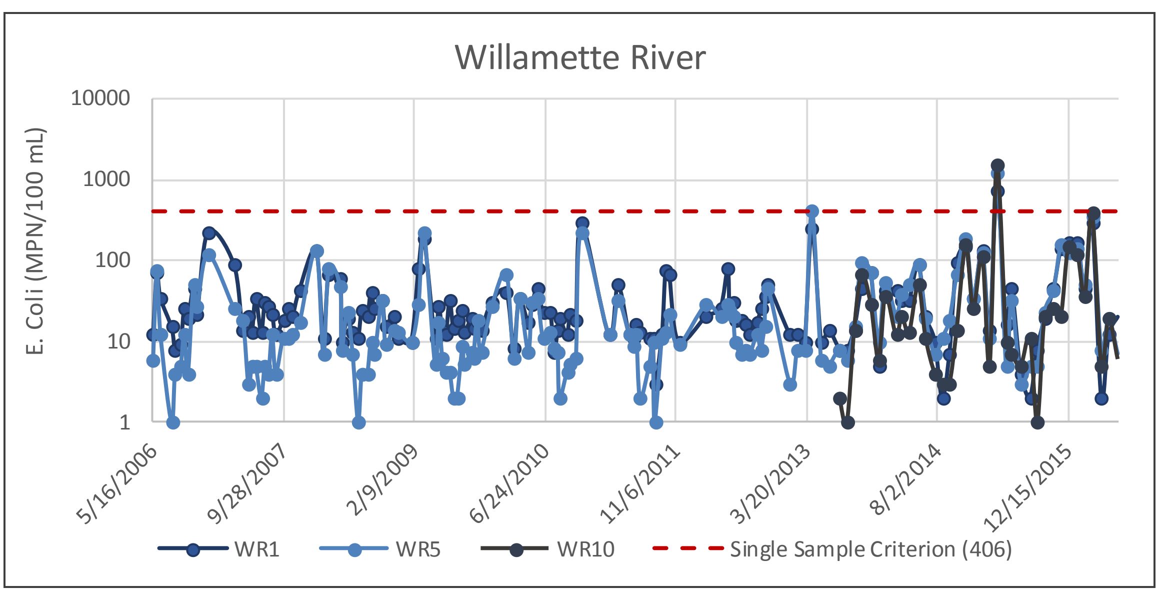
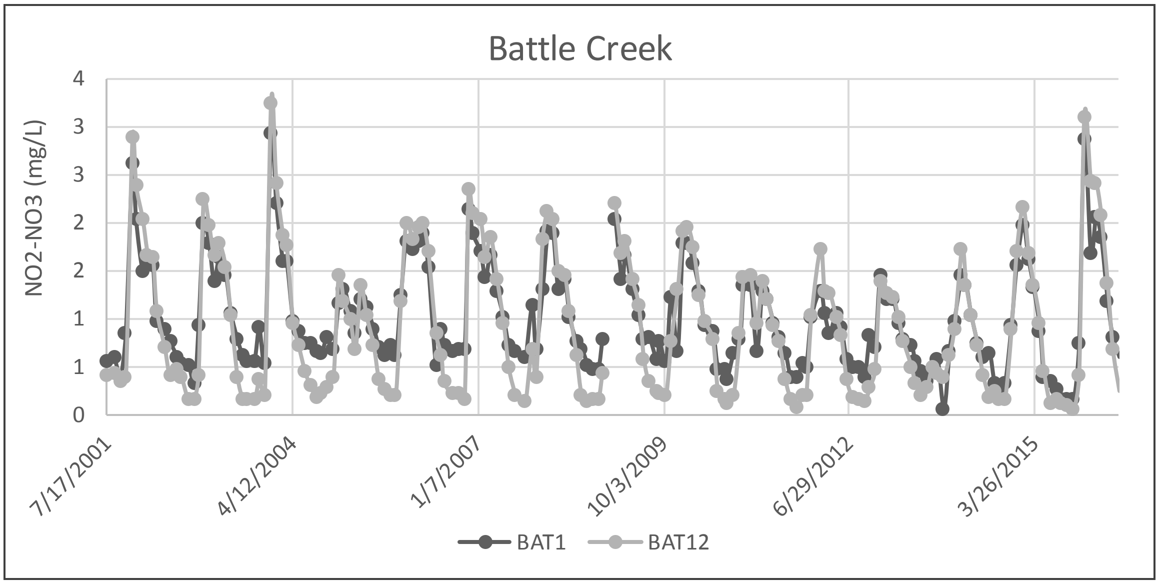
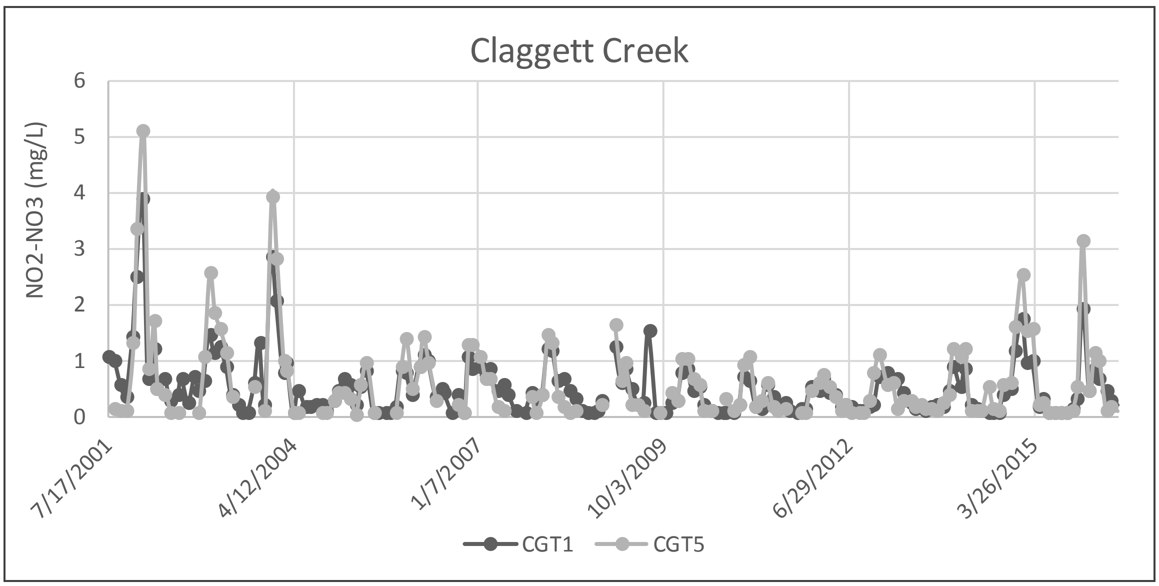


Figure 4.4
Nitrate-Nitrite Time Trend Graphs
Monthly Instream Monitoring





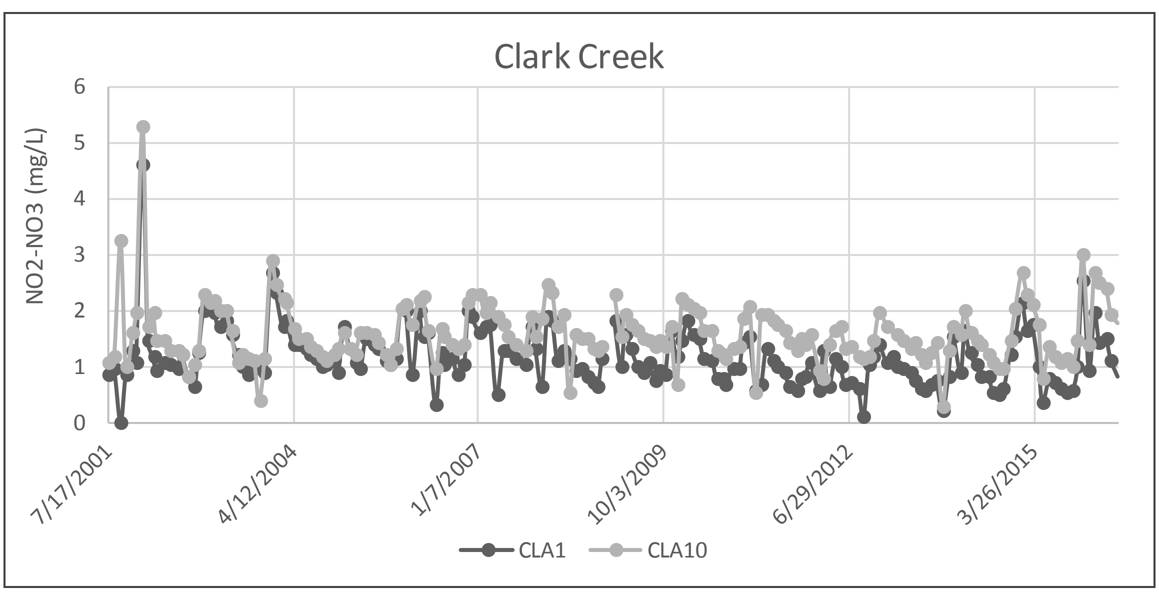
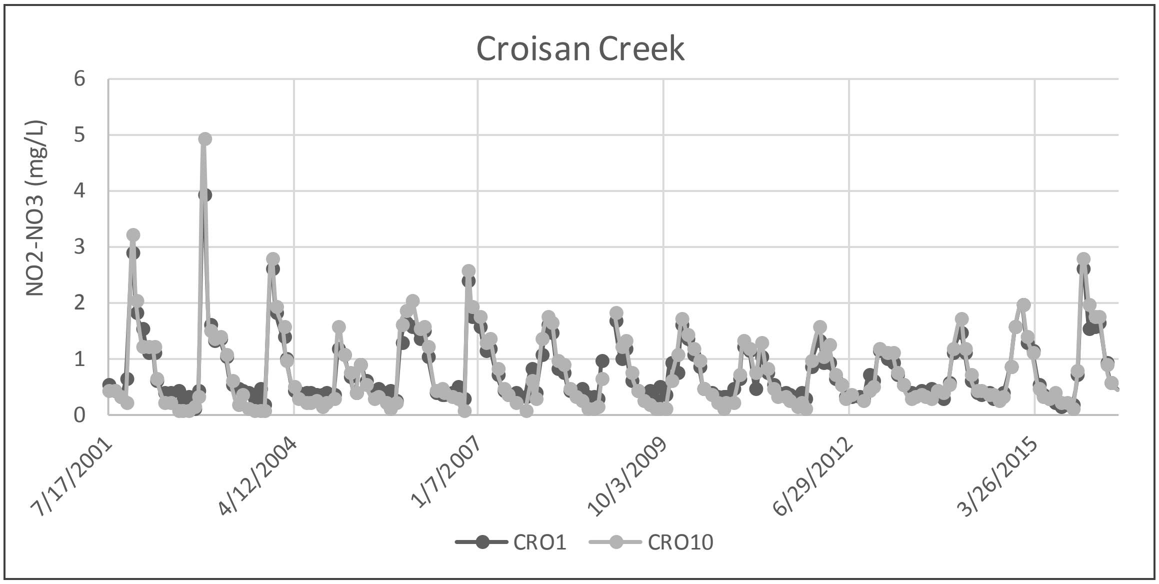
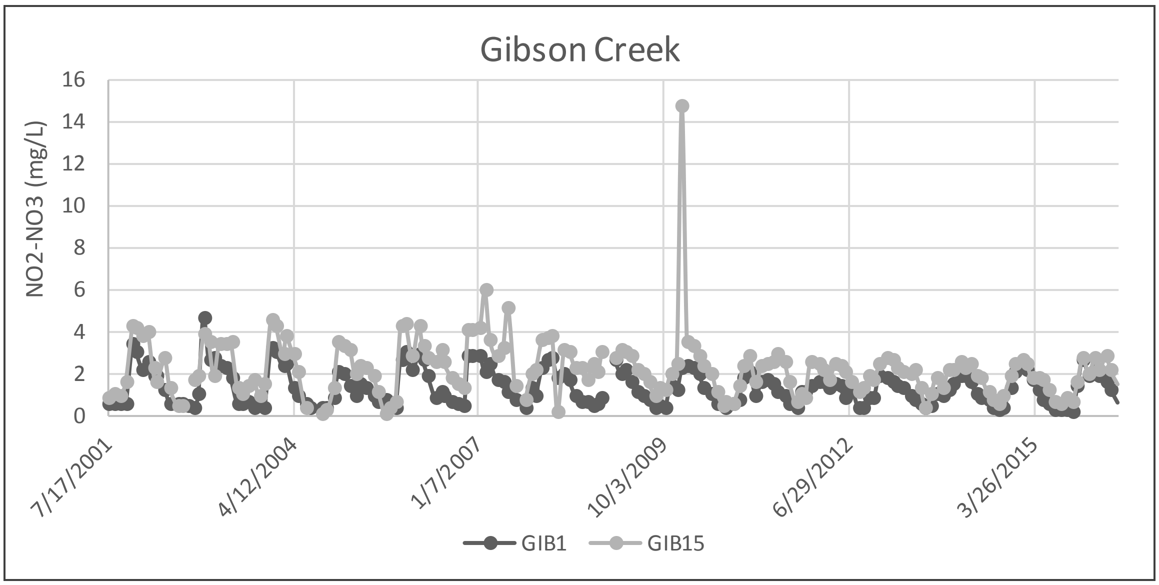


Figure 4.4

Nitrate-Nitrite Time Trend Graphs

Monthly Instream Monitoring





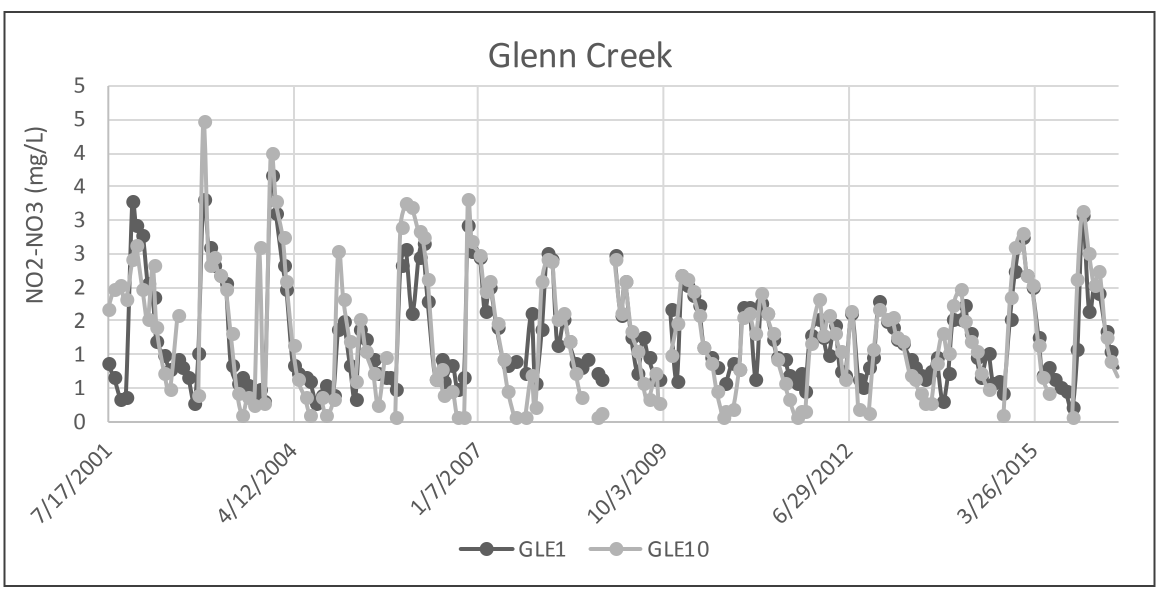
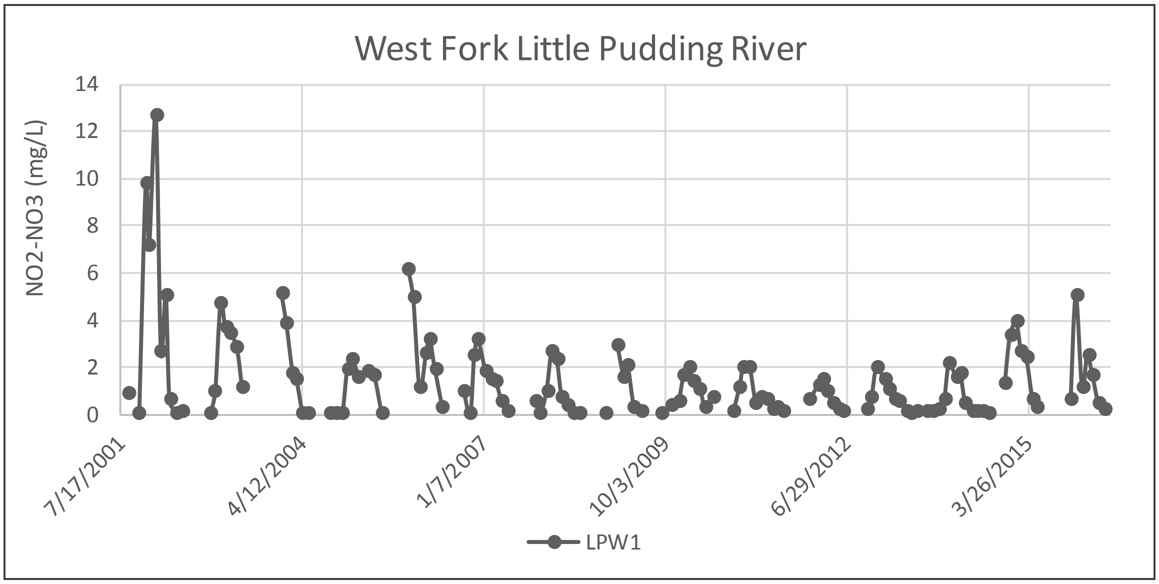
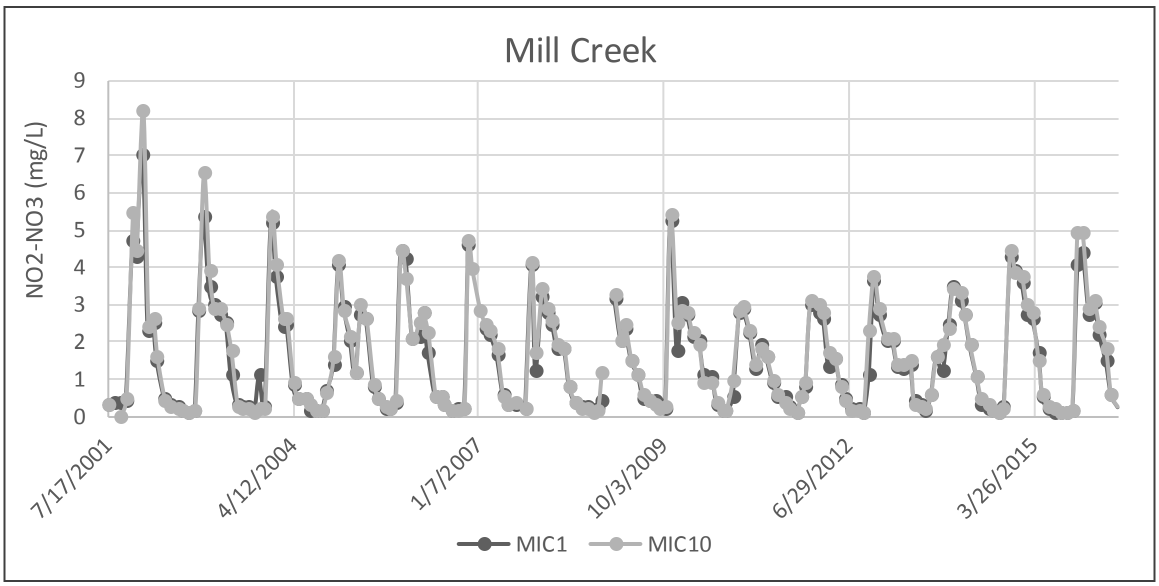


Figure 4.4
Nitrate-Nitrite Time Trend Graphs
Monthly Instream Monitoring





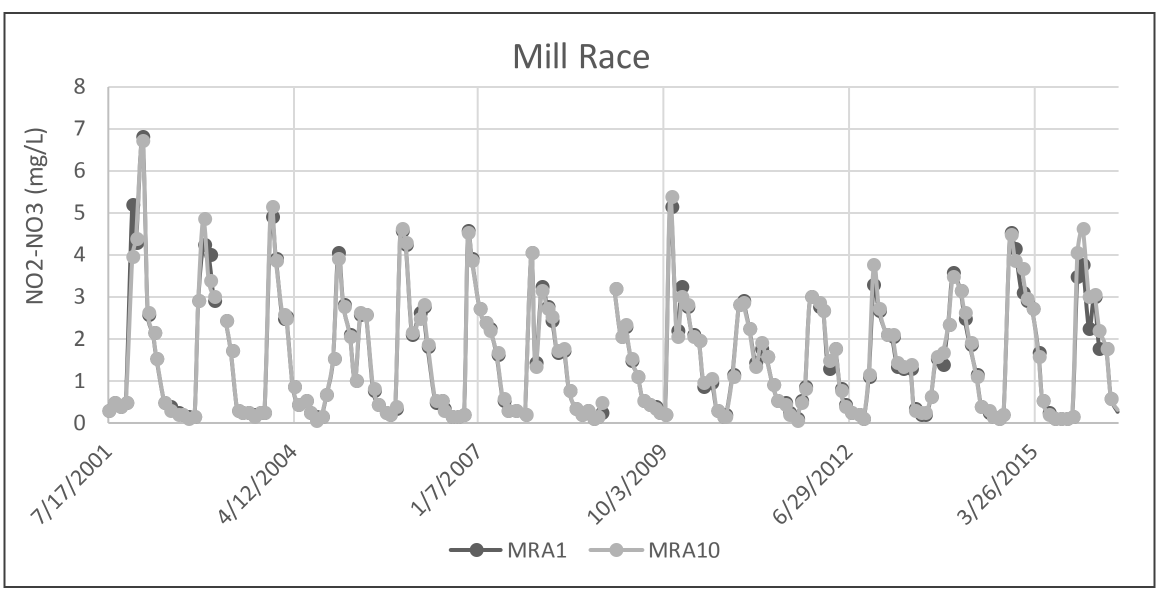
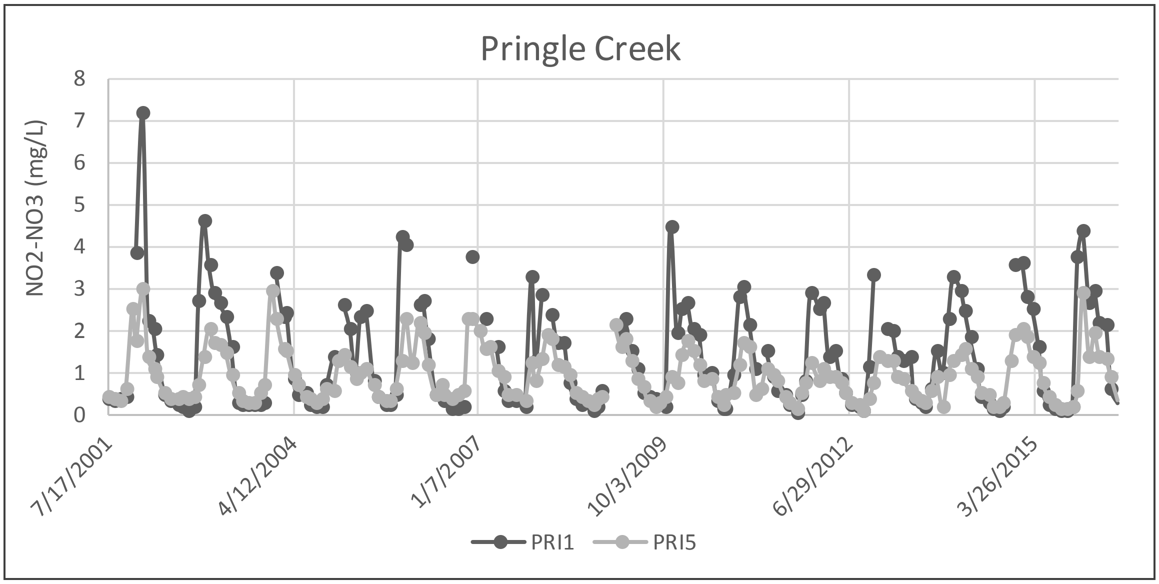
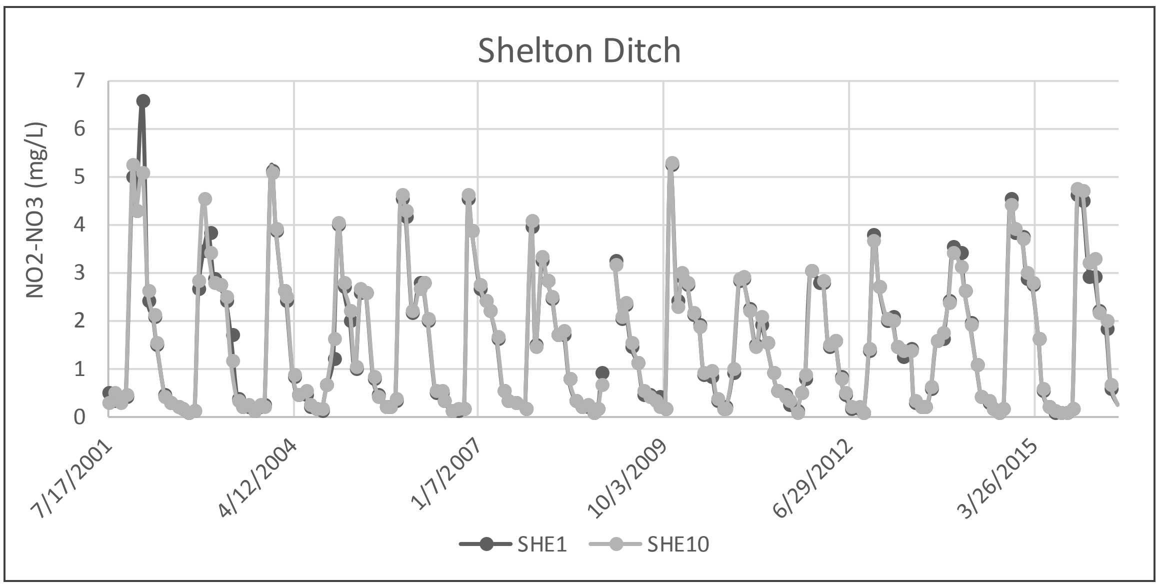


Figure 4.4

Nitrate-Nitrite Time Trend Graphs

Monthly Instream Monitoring





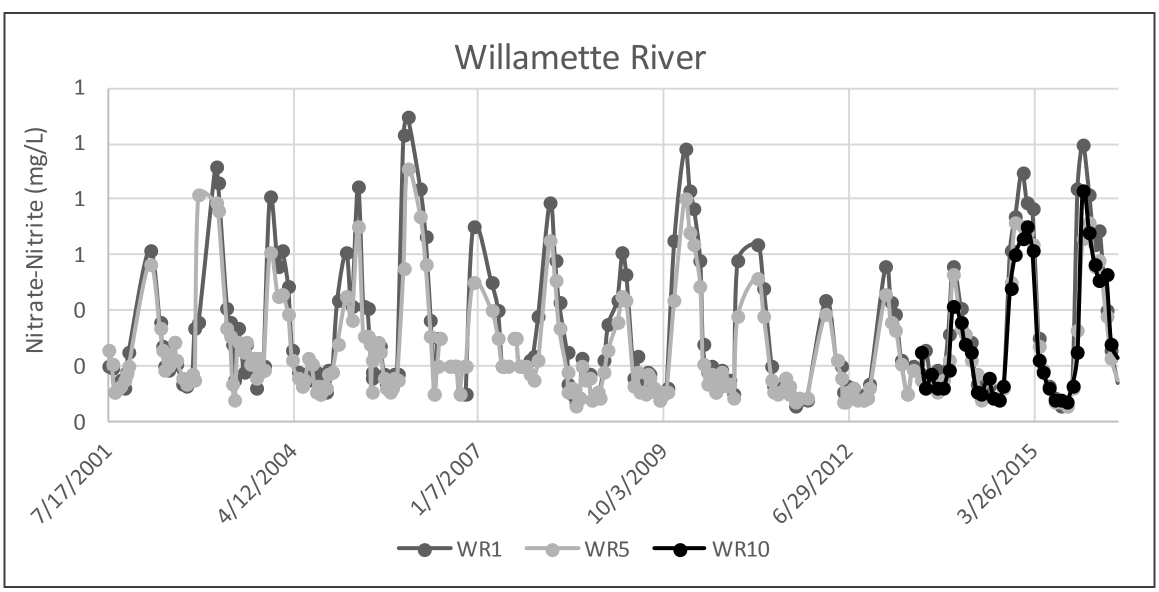
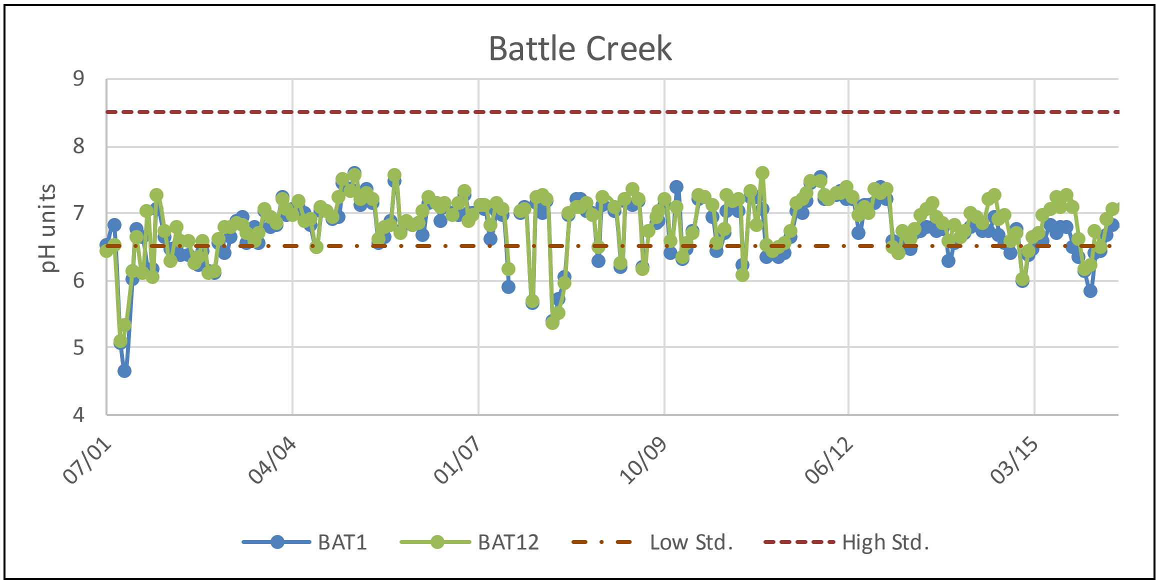
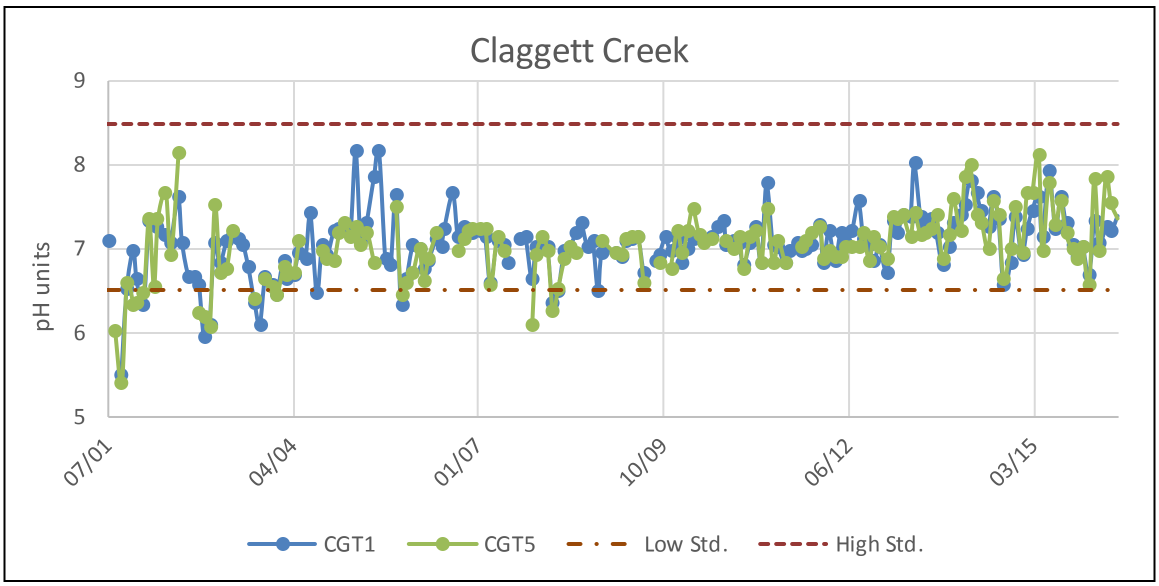


Figure 4.5

pH Time Trend Graphs

Monthly Instream Monitoring





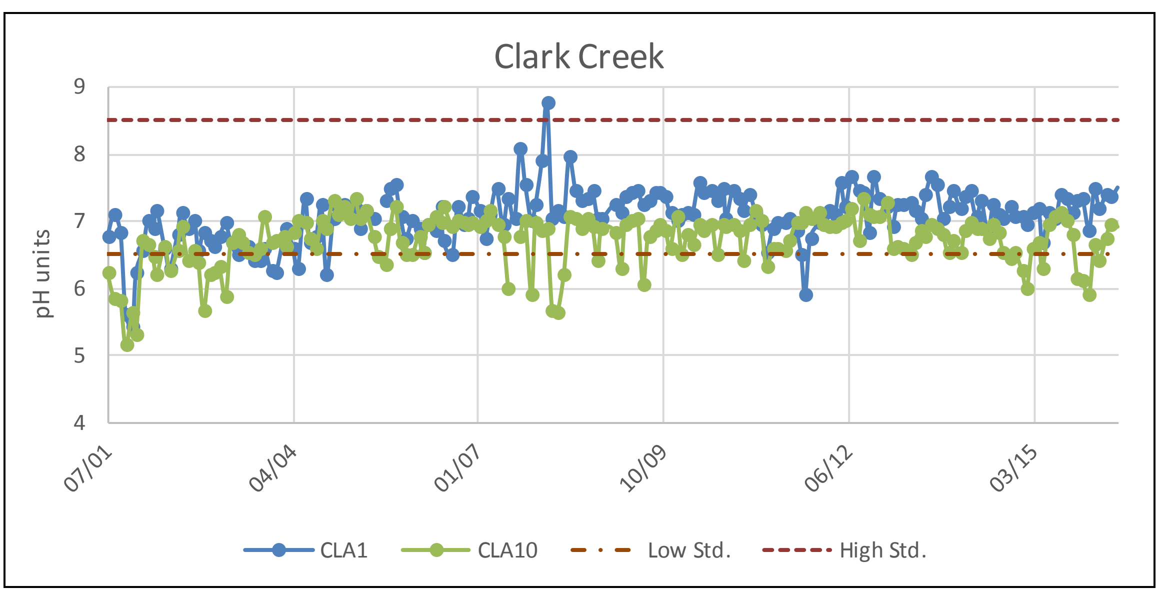
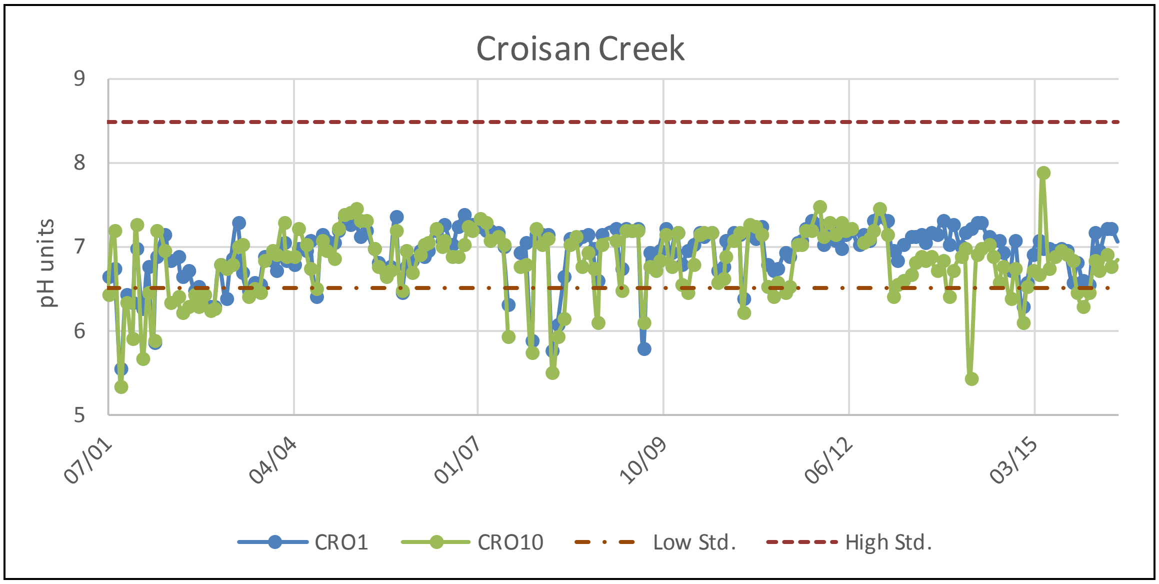
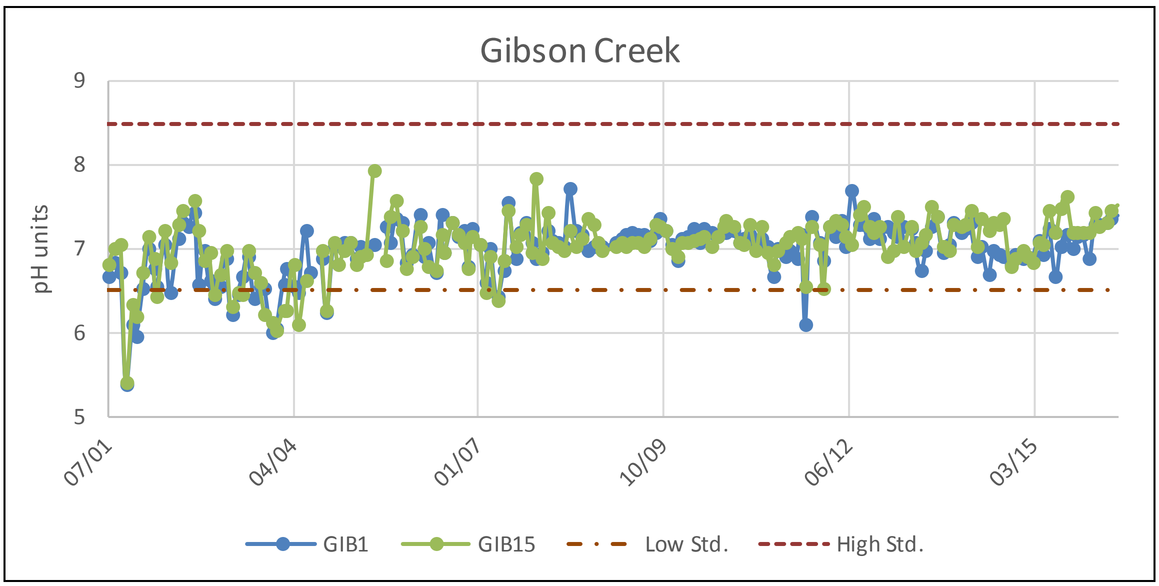


Figure 4.5

pH Time Trend Graphs

Monthly Instream Monitoring





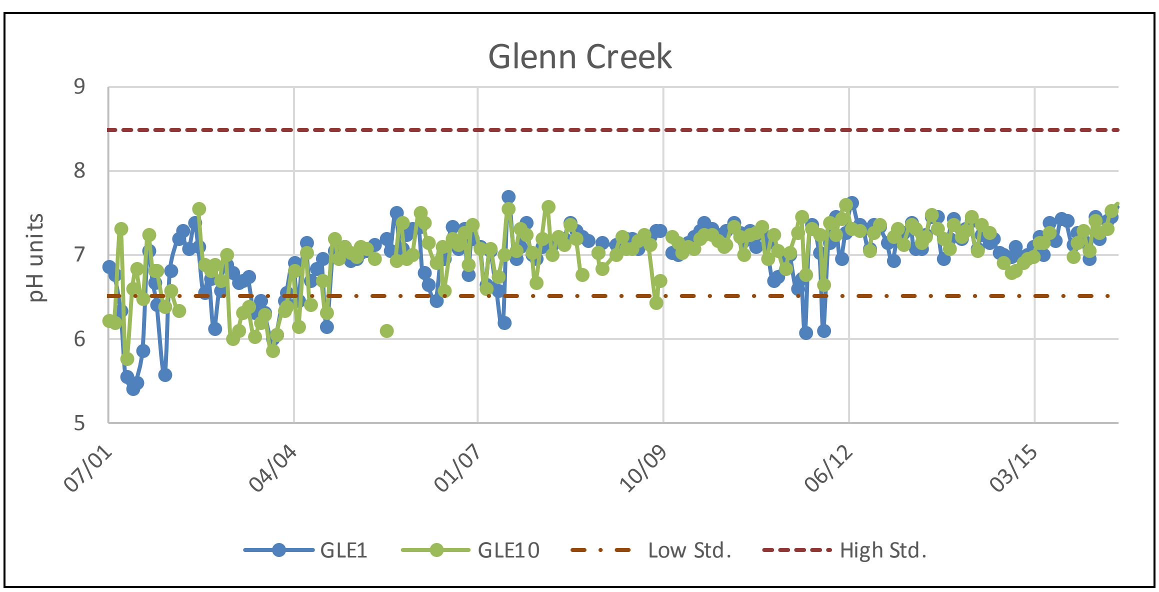
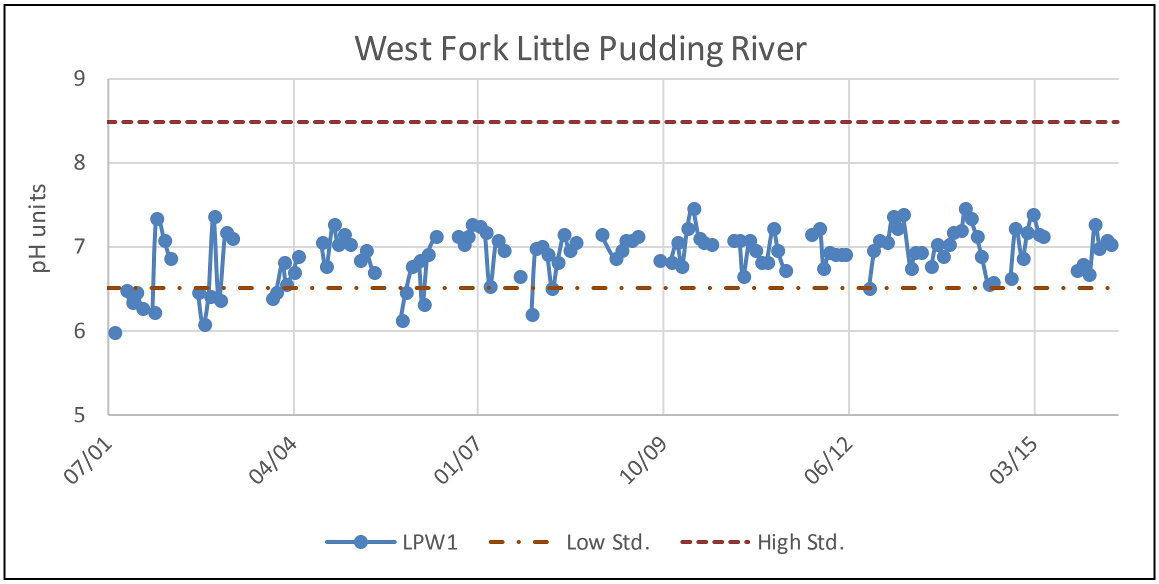
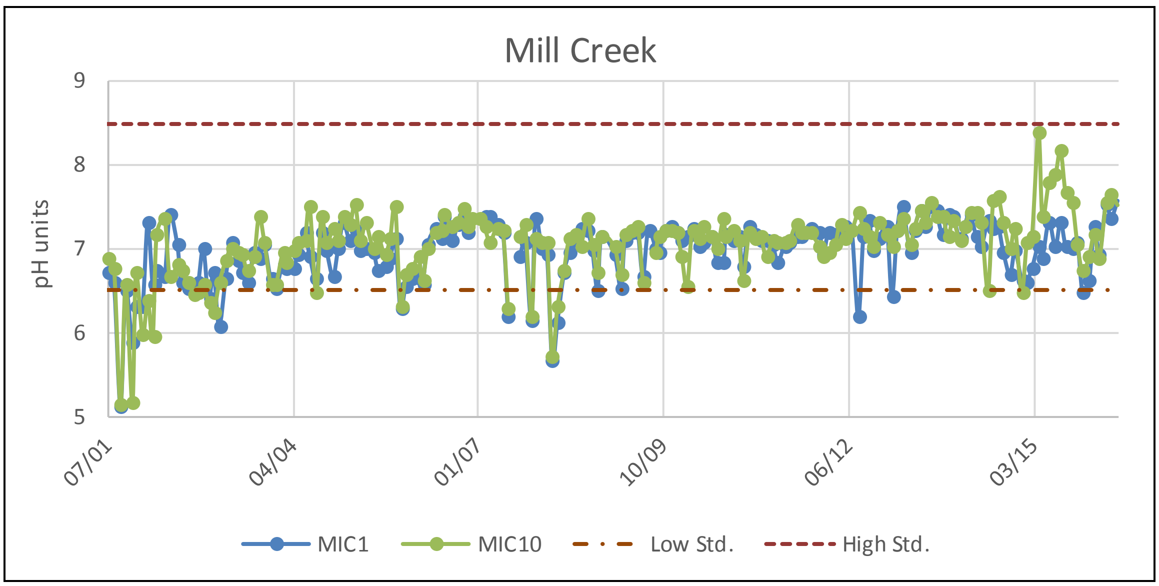


Figure 4.5
pH Time Trend Graphs
Monthly Instream Monitoring





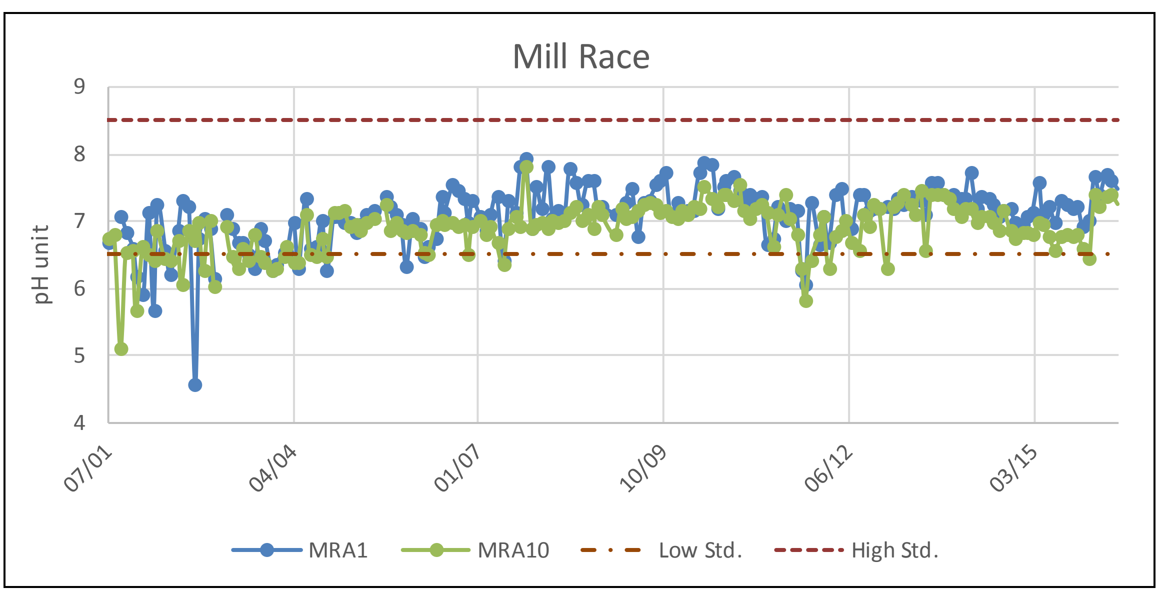
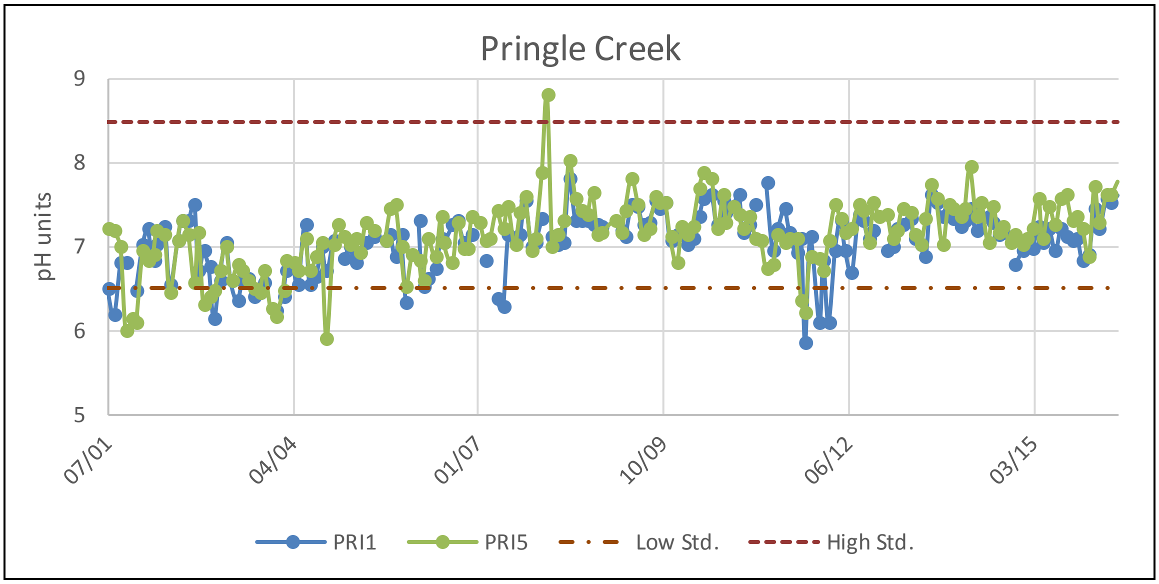
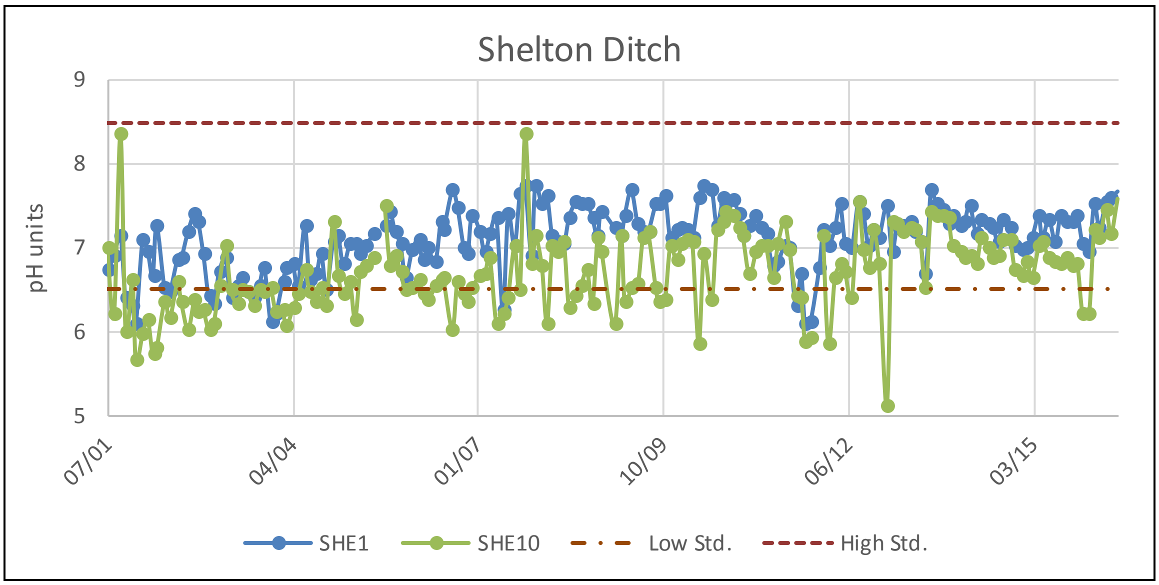


Figure 4.5

pH Time Trend Graphs

Monthly Instream Monitoring





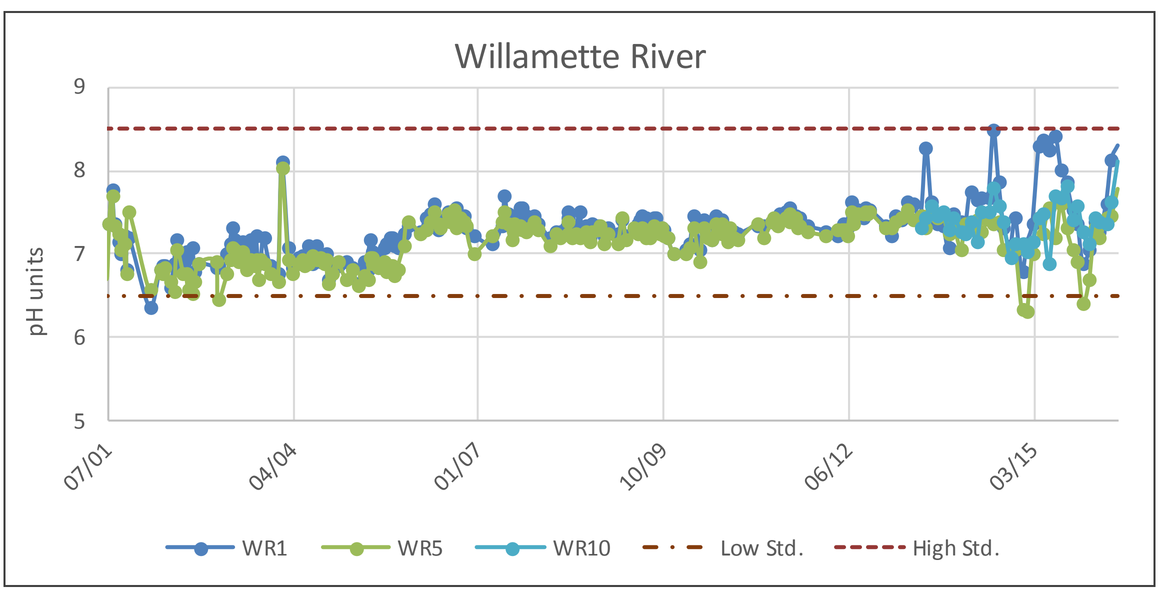
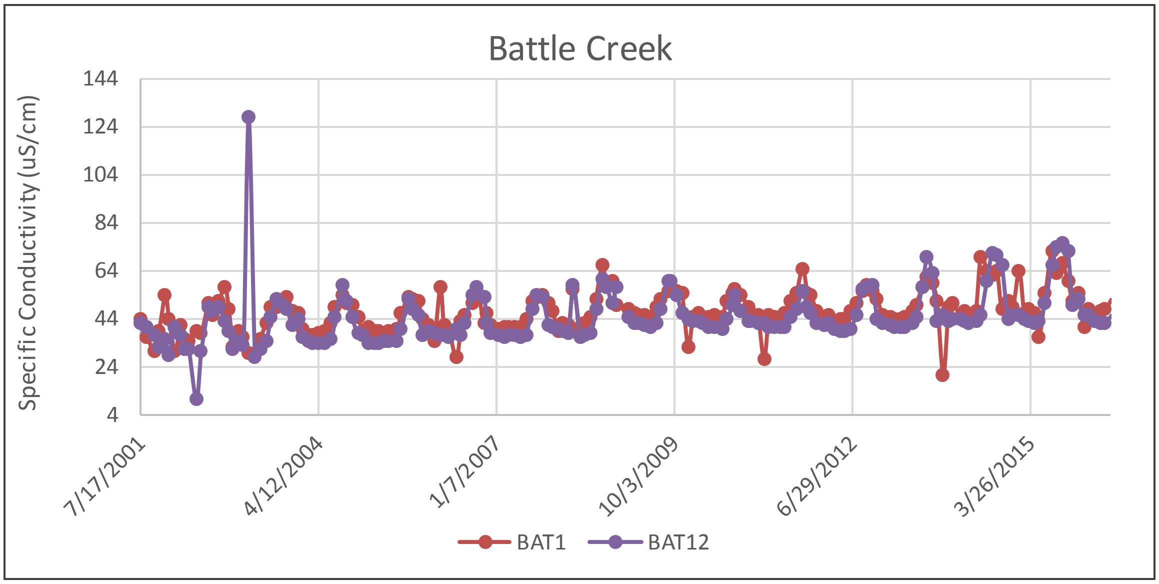
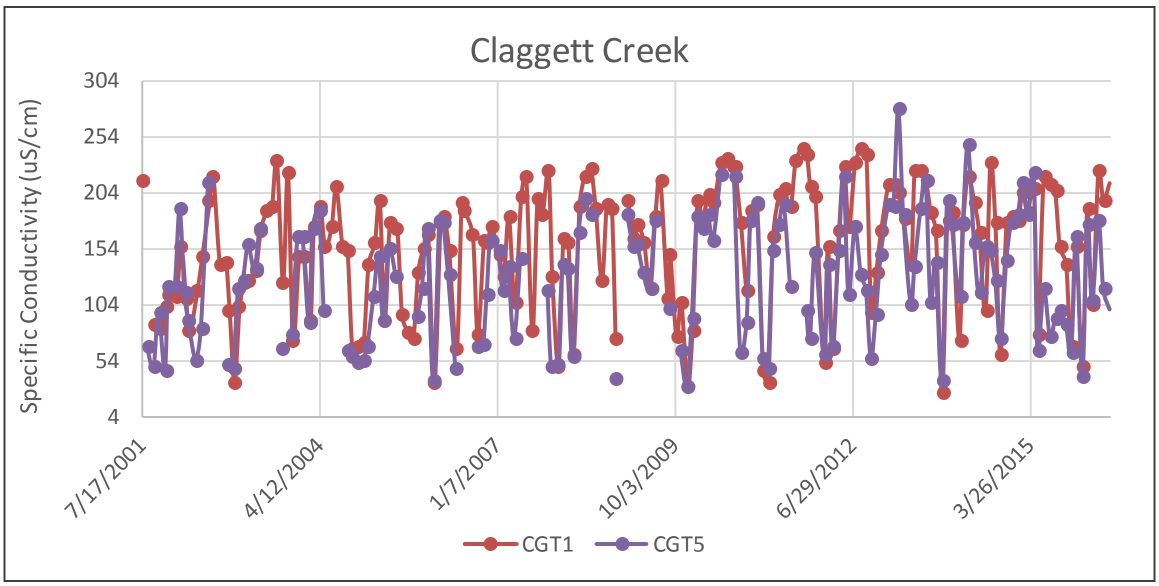


Figure 4.6

Specific Conductivity Time Trend Graphs

Monthly Instream Monitoring





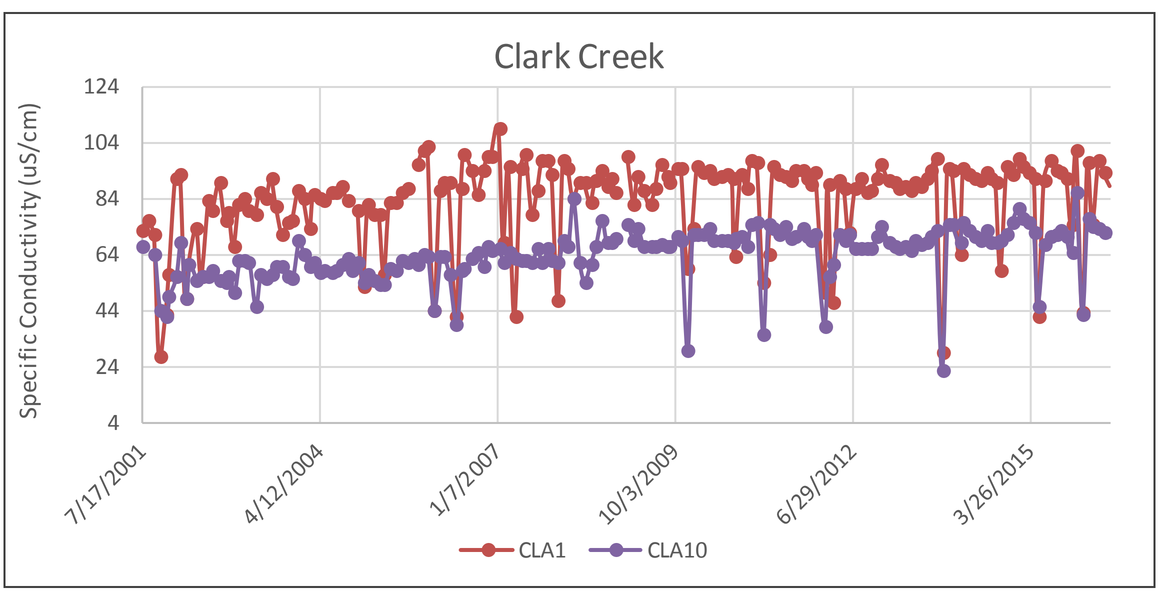
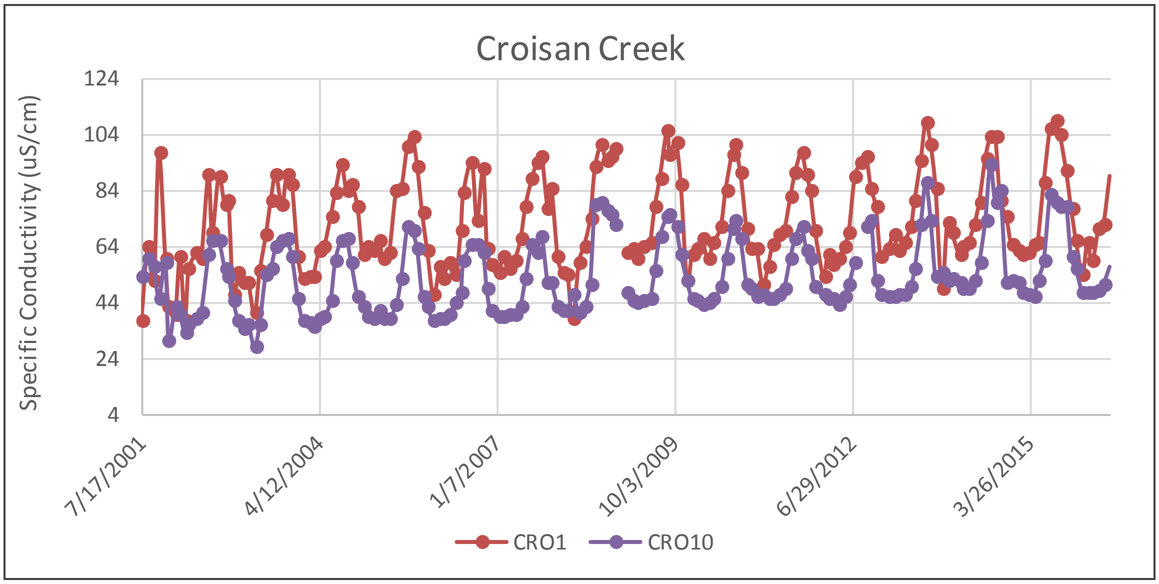
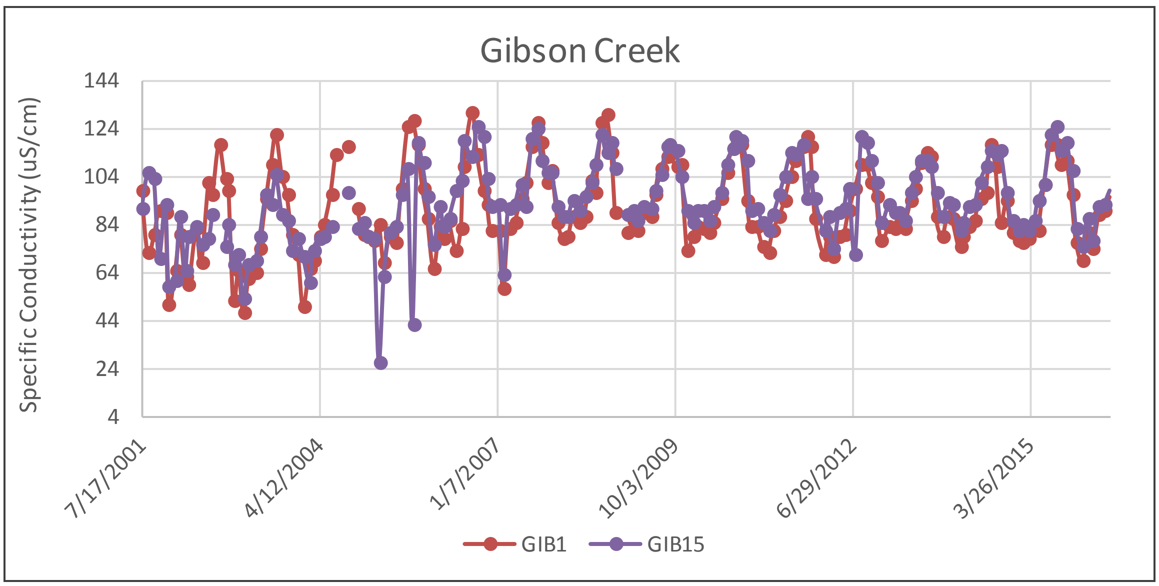


Figure 4.6

Specific Conductivity Time Trend Graphs

Monthly Instream Monitoring





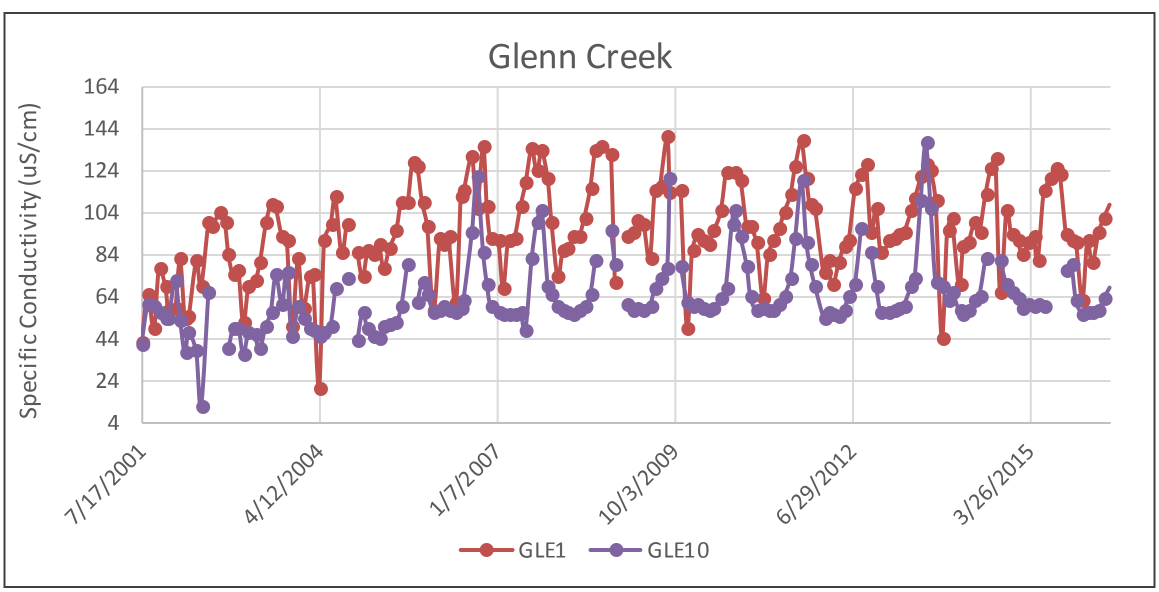
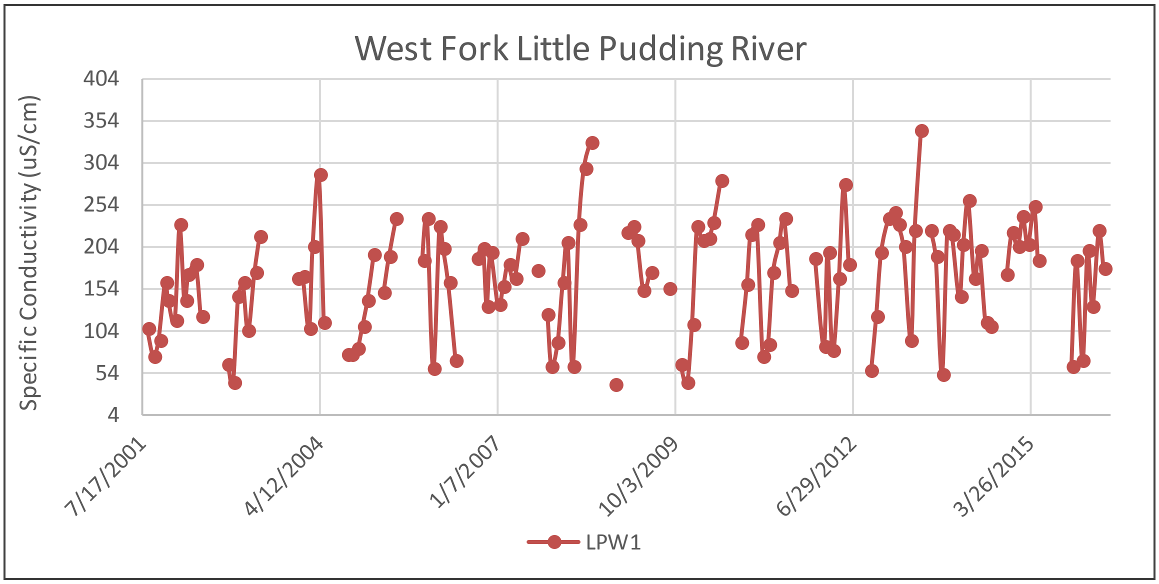
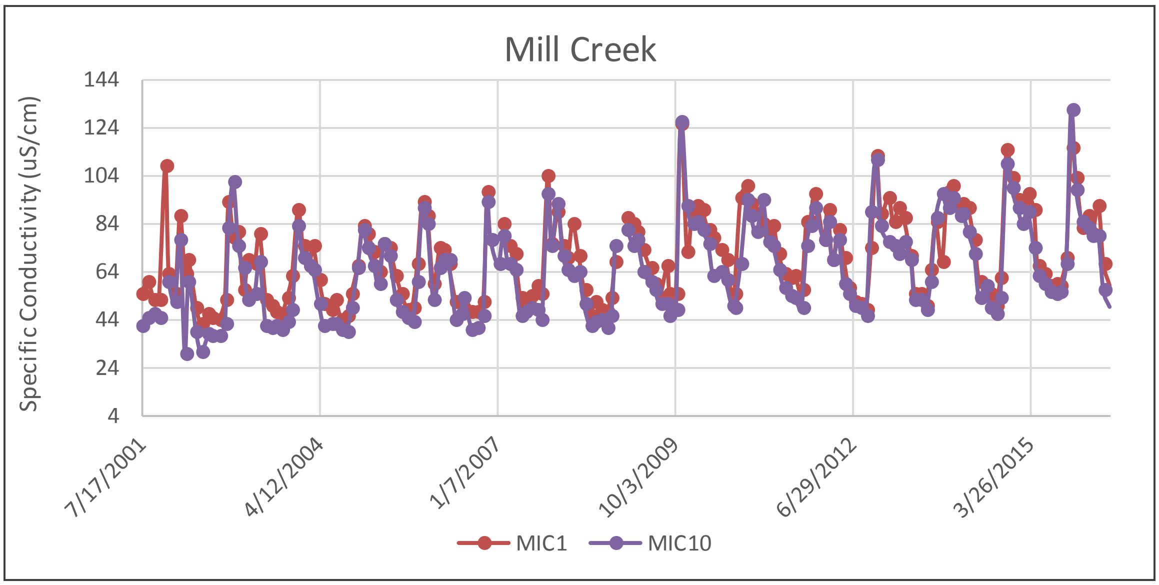


Figure 4.6

Specific Conductivity Time Trend Graphs

Monthly Instream Monitoring





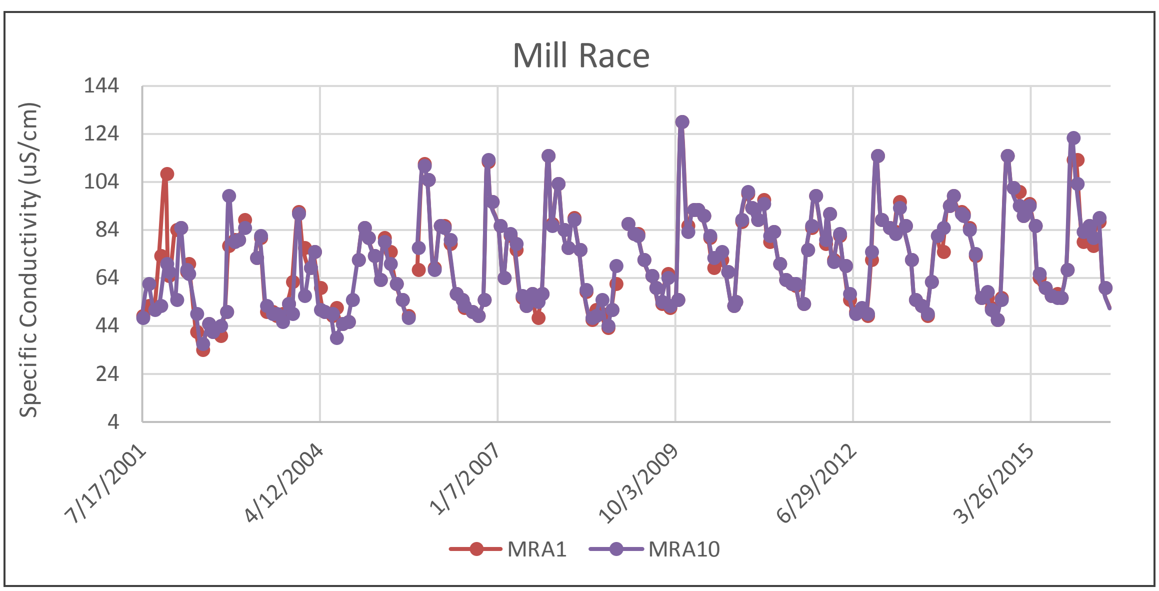
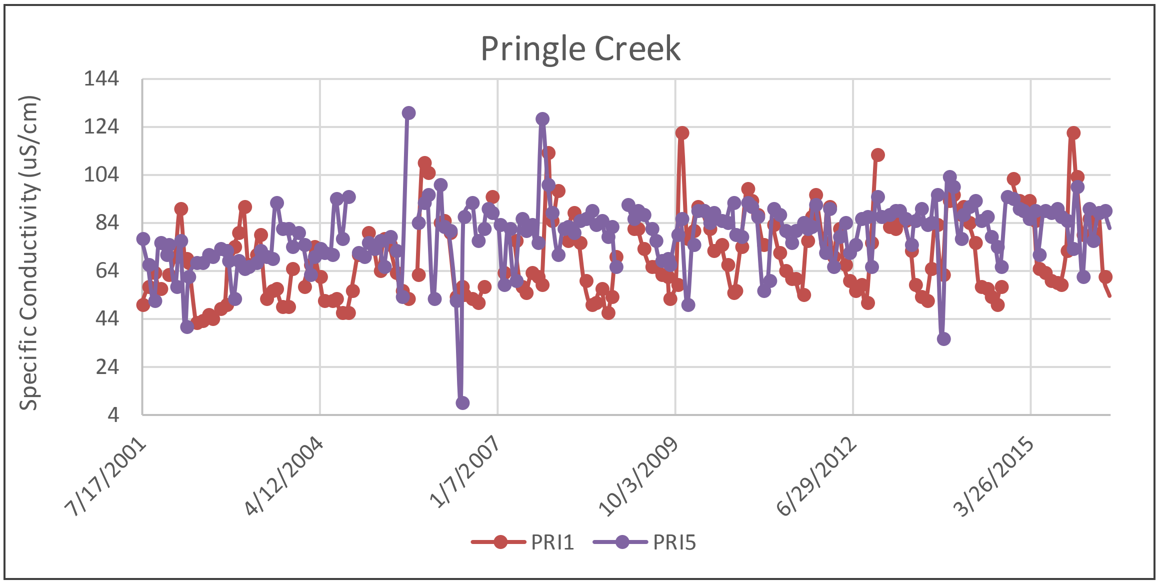
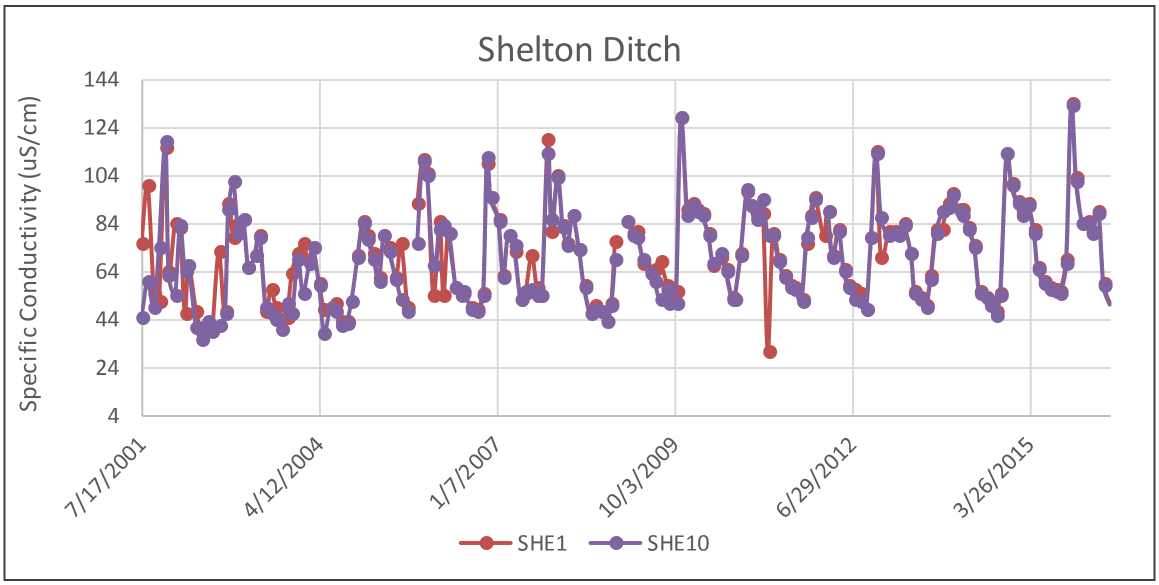


Figure 4.6
Specific Conductivity Time Trend Graphs
Monthly Instream Monitoring





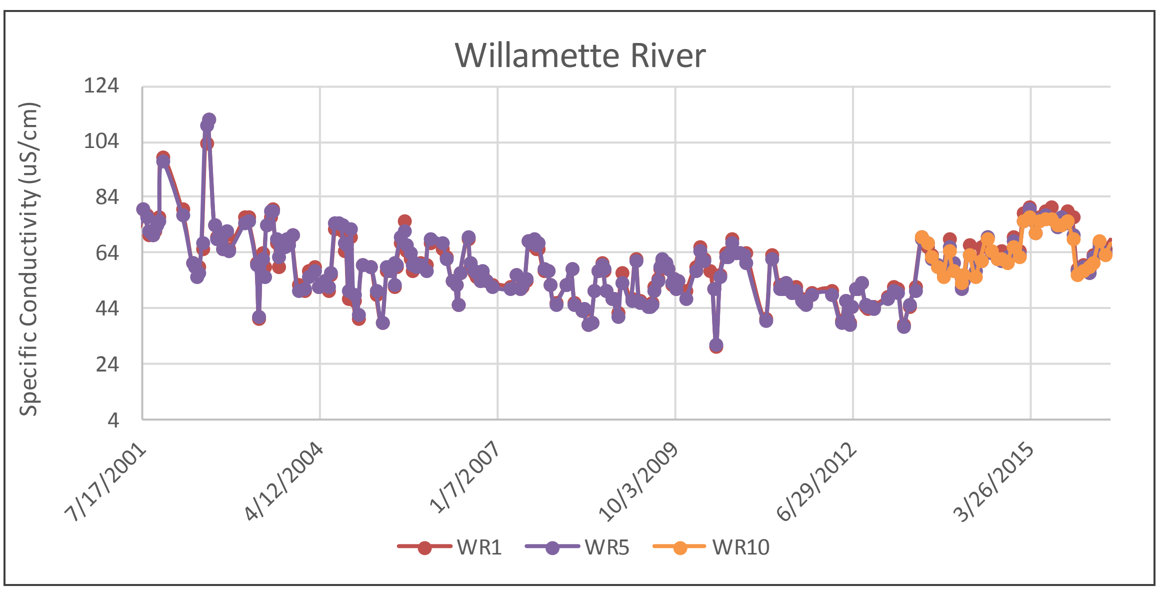
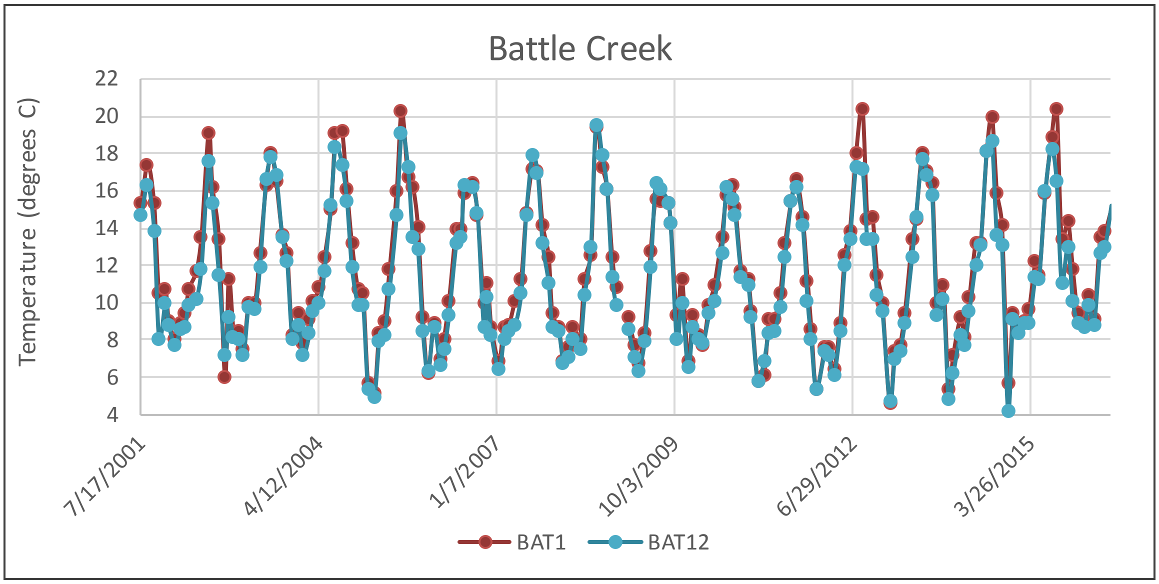
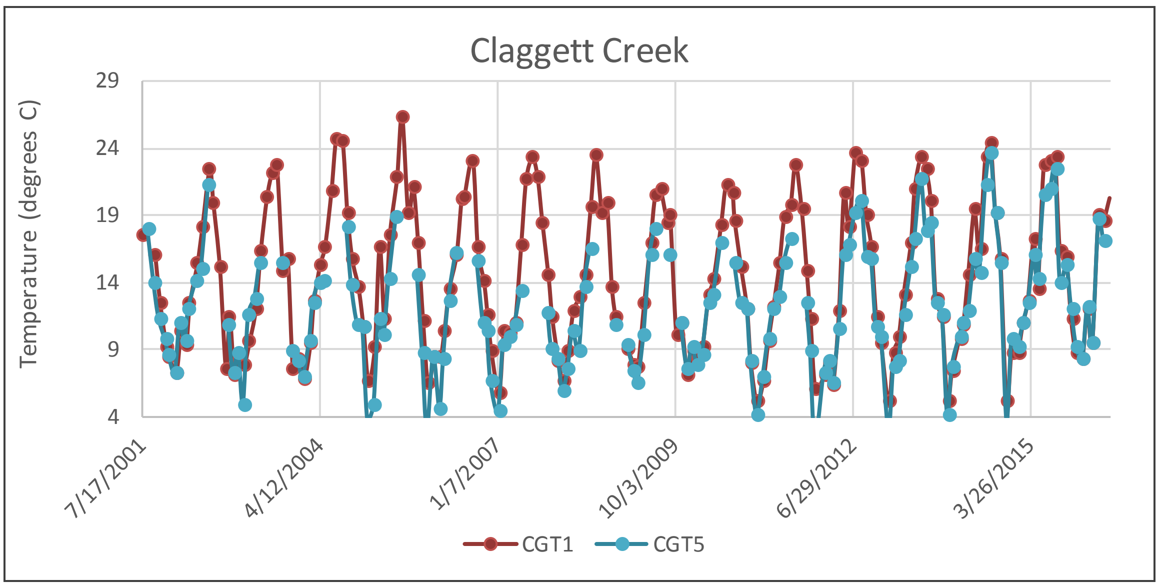


Figure 4.7

Temperature Time Trend Graphs

Monthly Instream Monitoring





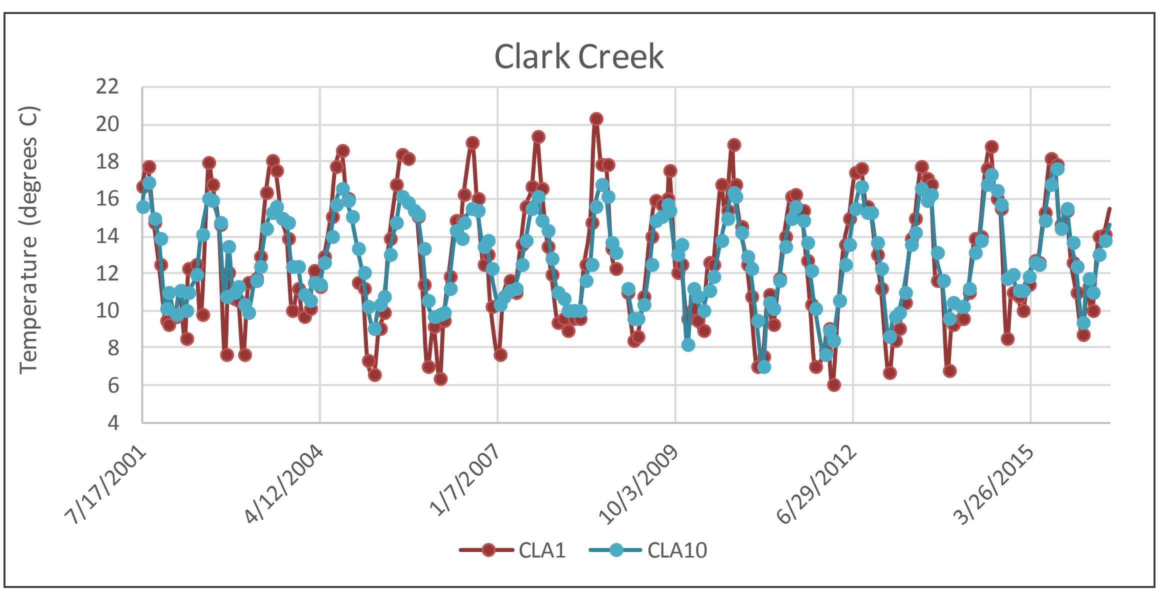
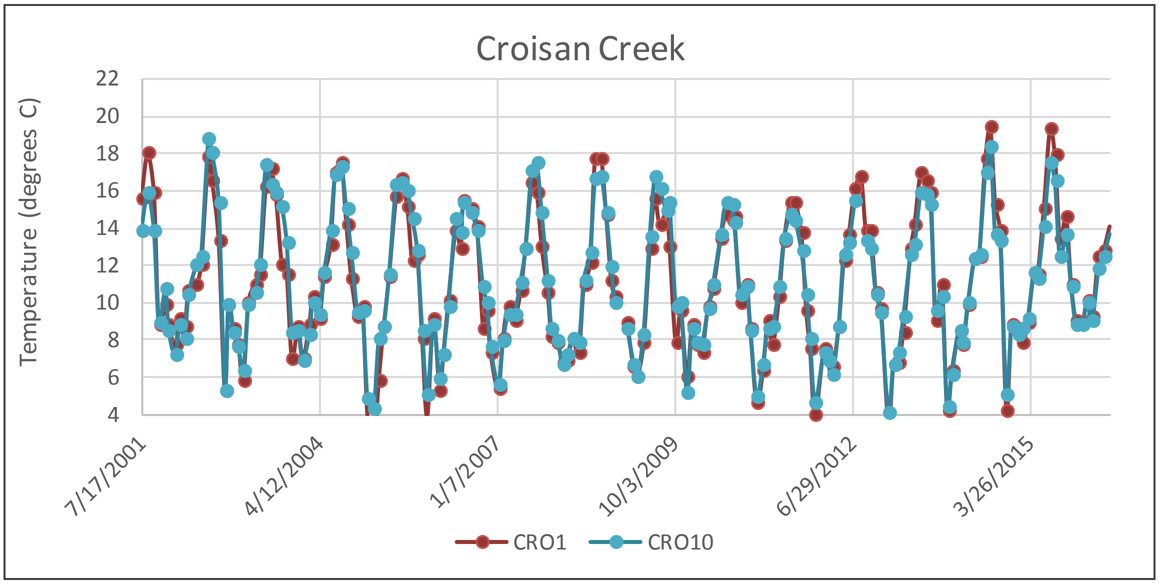
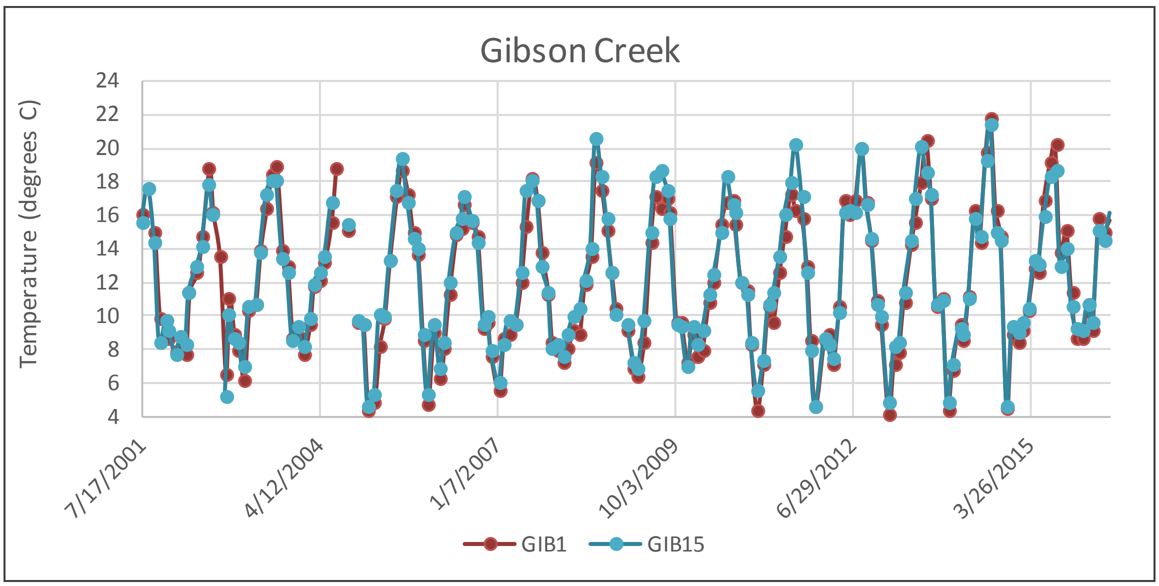


Figure 4.7

Temperature Time Trend Graphs

Monthly Instream Monitoring





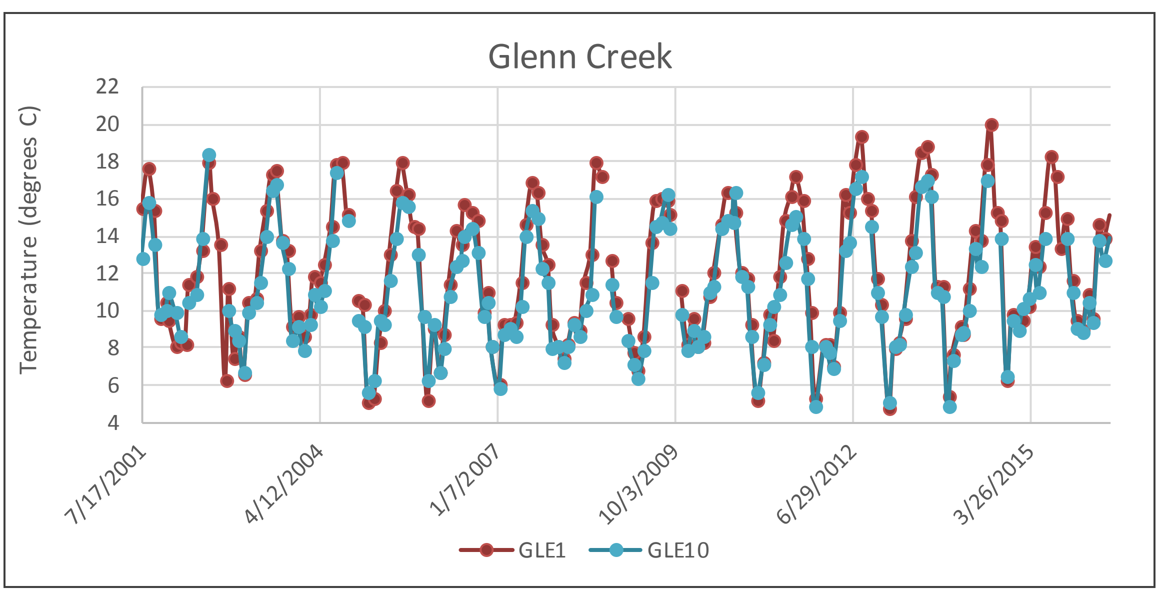
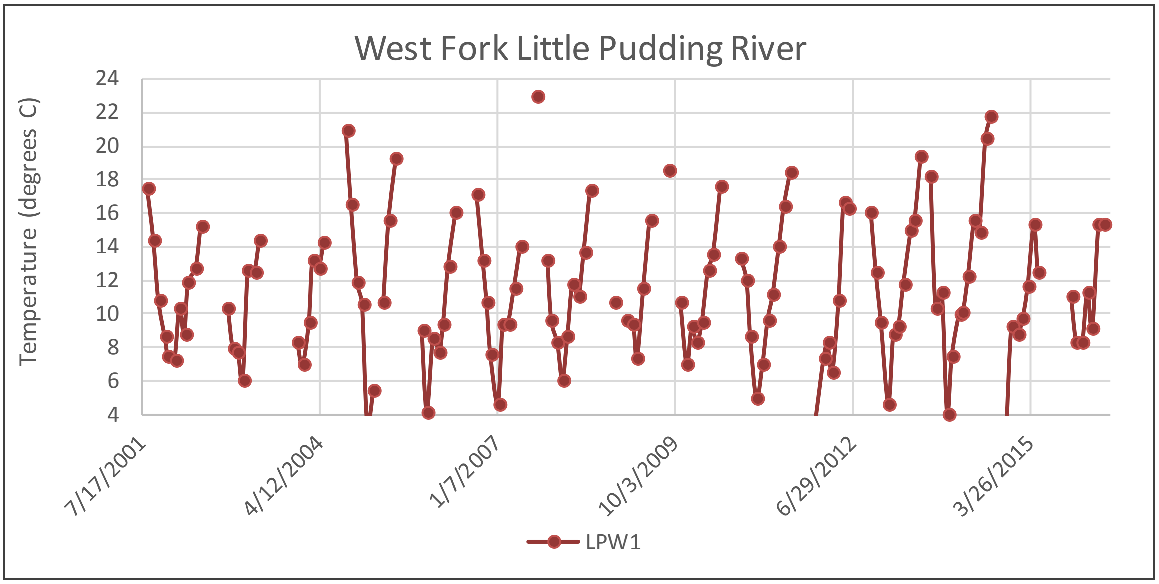
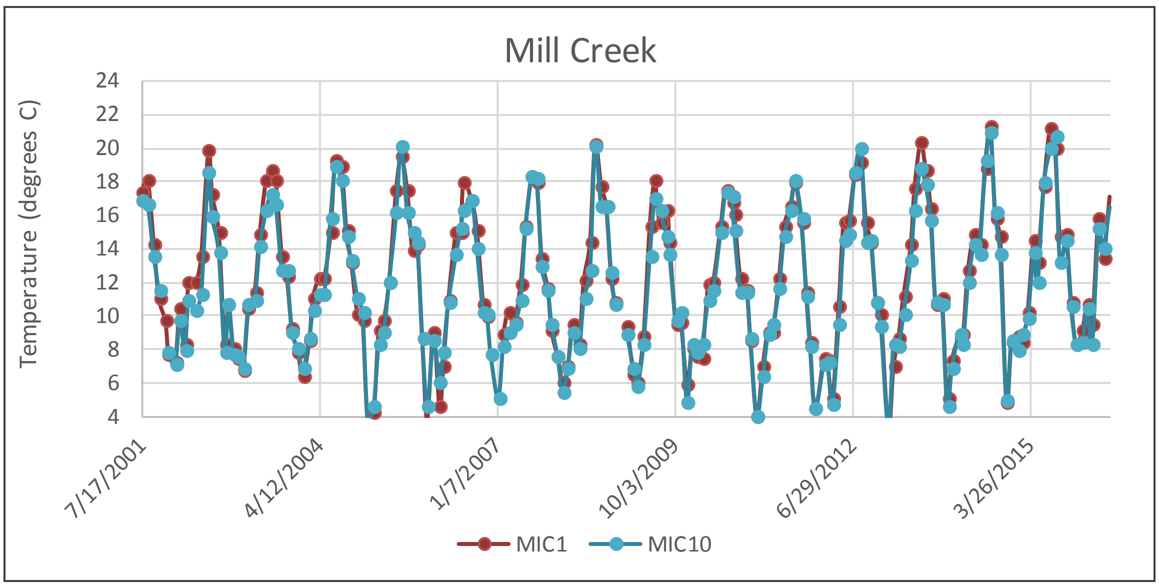


Figure 4.7
Temperature Time Trend Graphs
Monthly Instream Monitoring





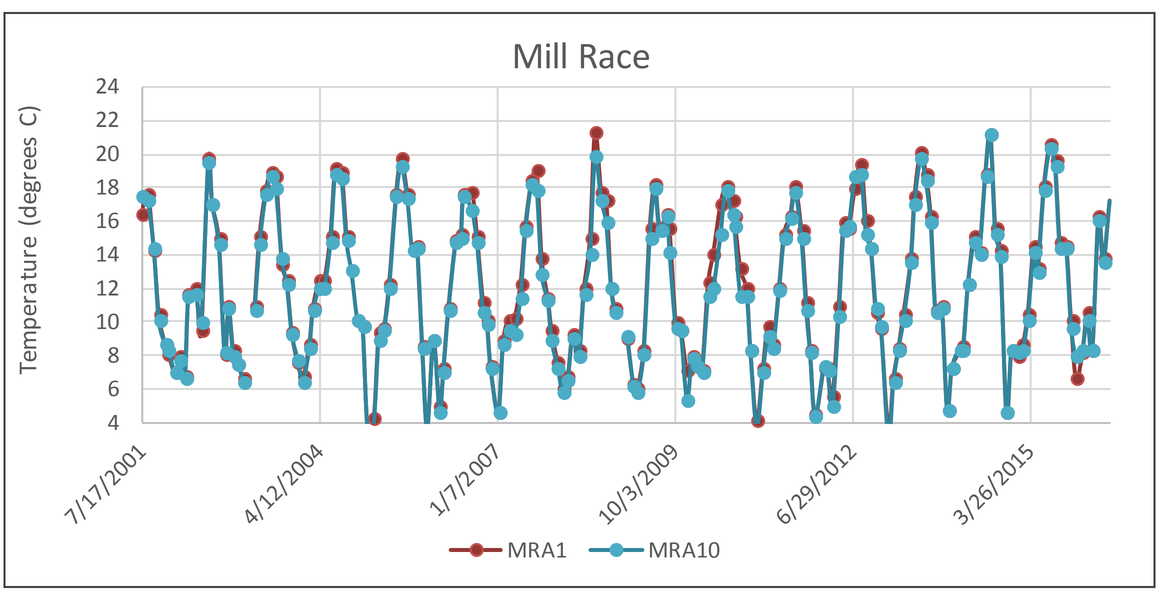
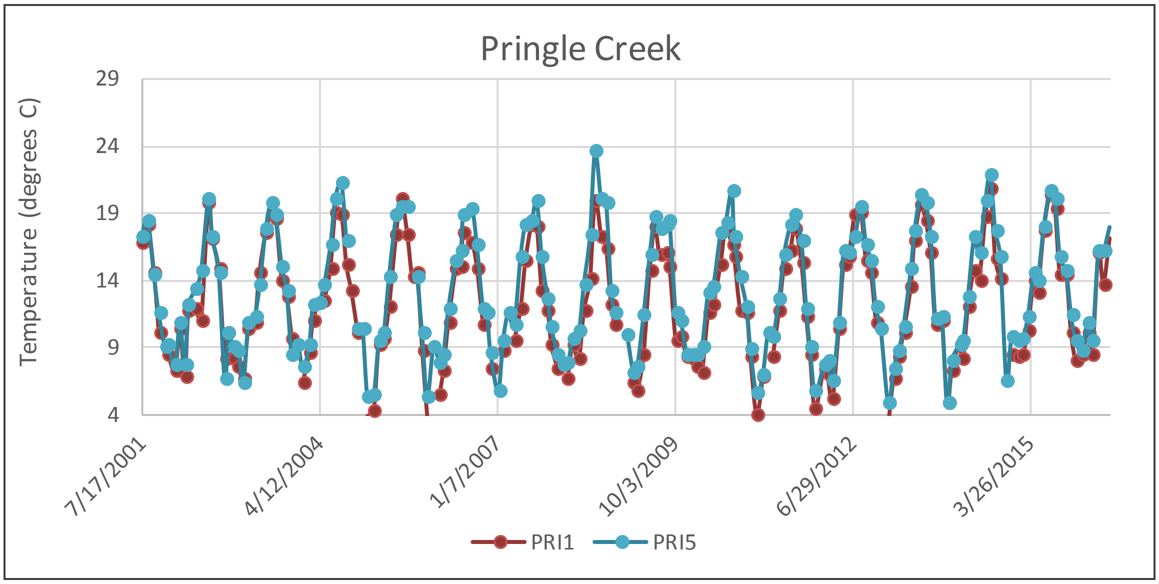
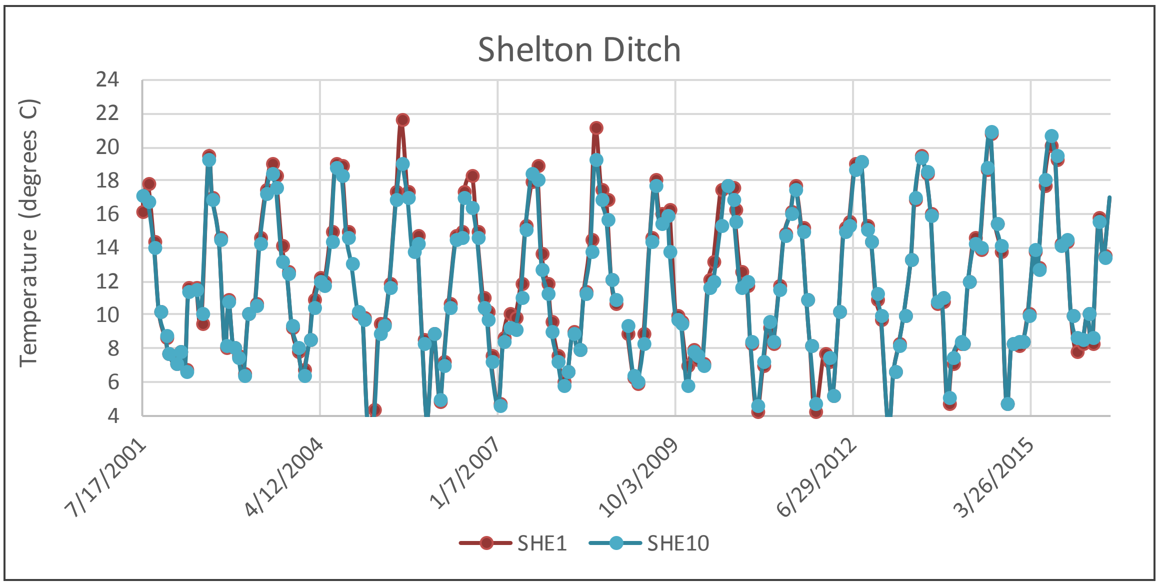


Figure 4.7

Temperature Time Trend Graphs

Monthly Instream Monitoring





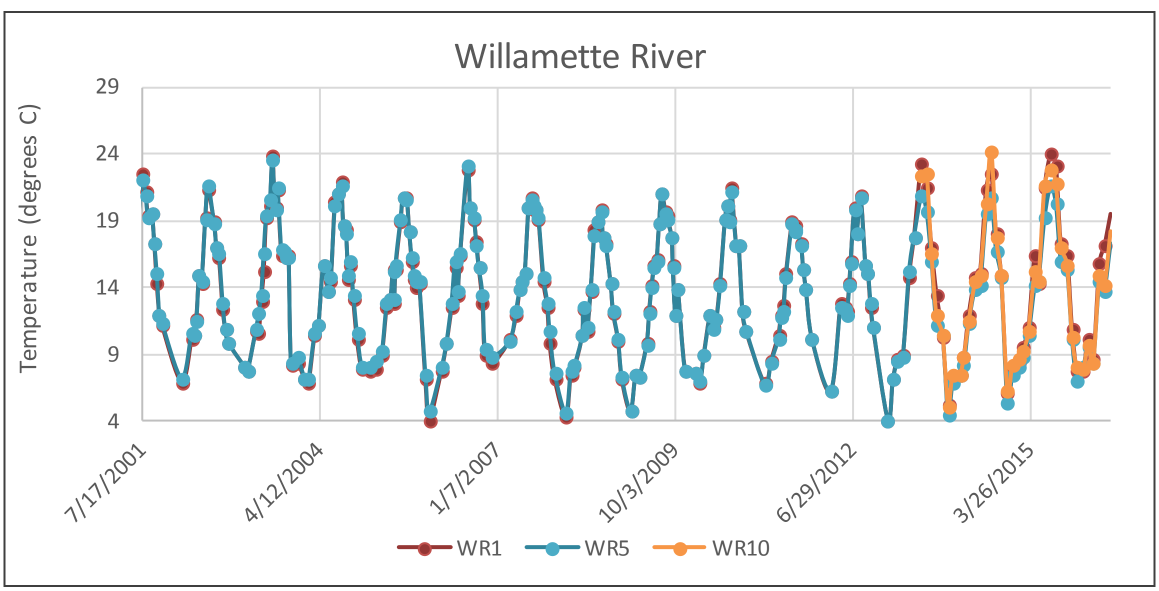
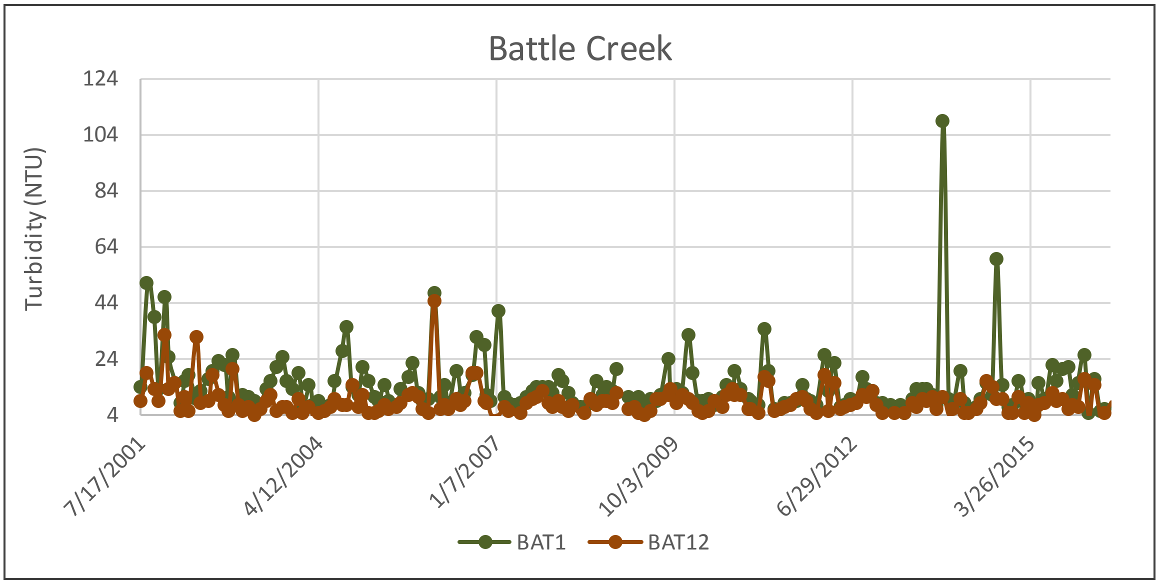
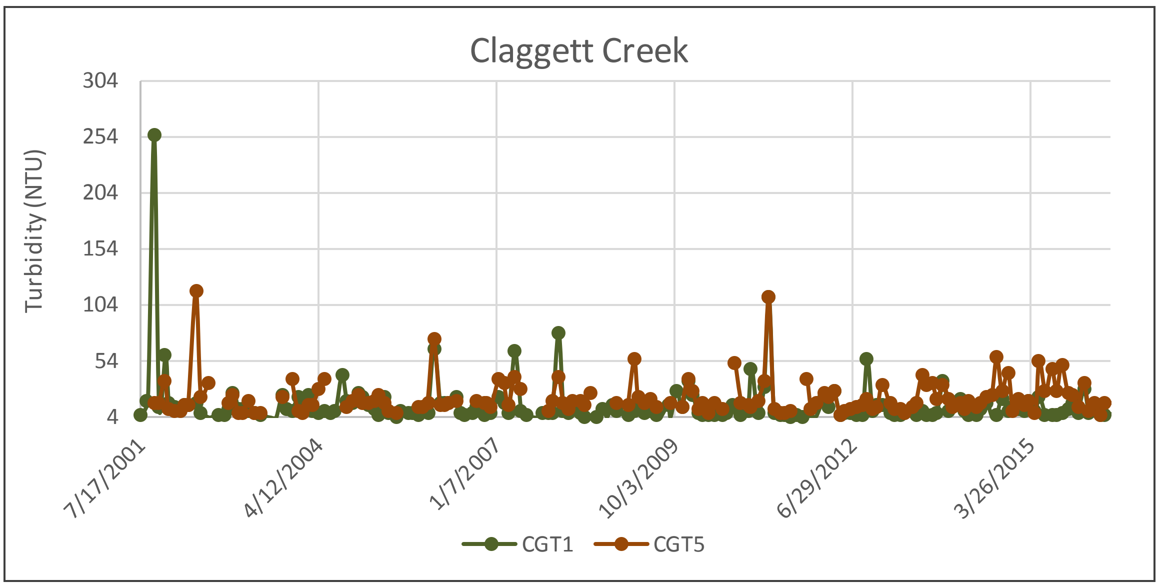


Figure 4.8

Turbidity Time Trend Graphs

Monthly Instream Monitoring





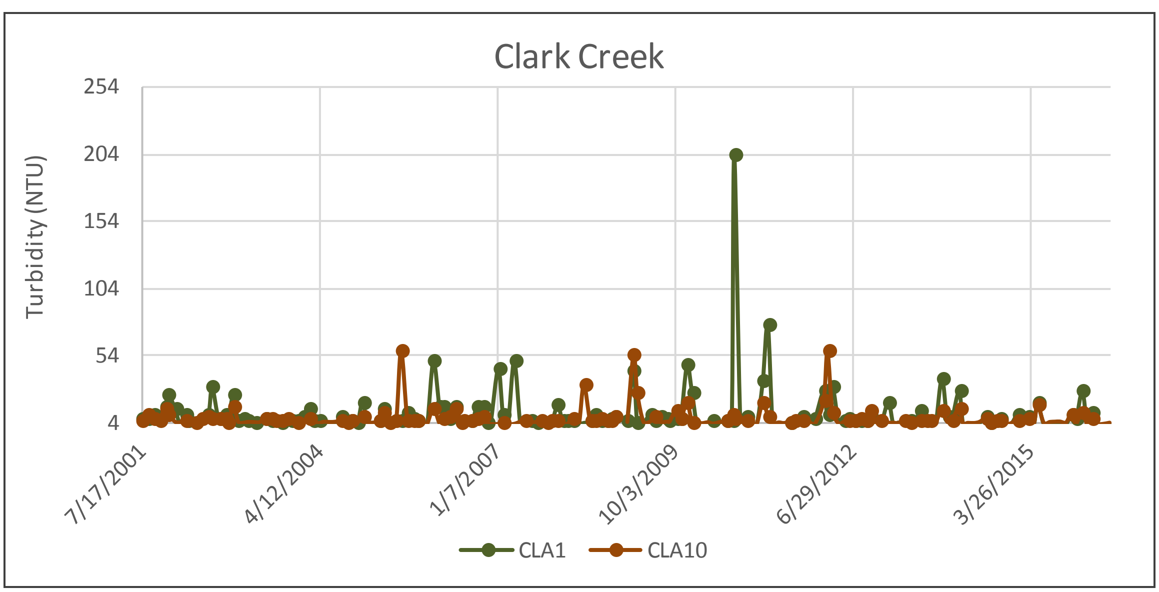
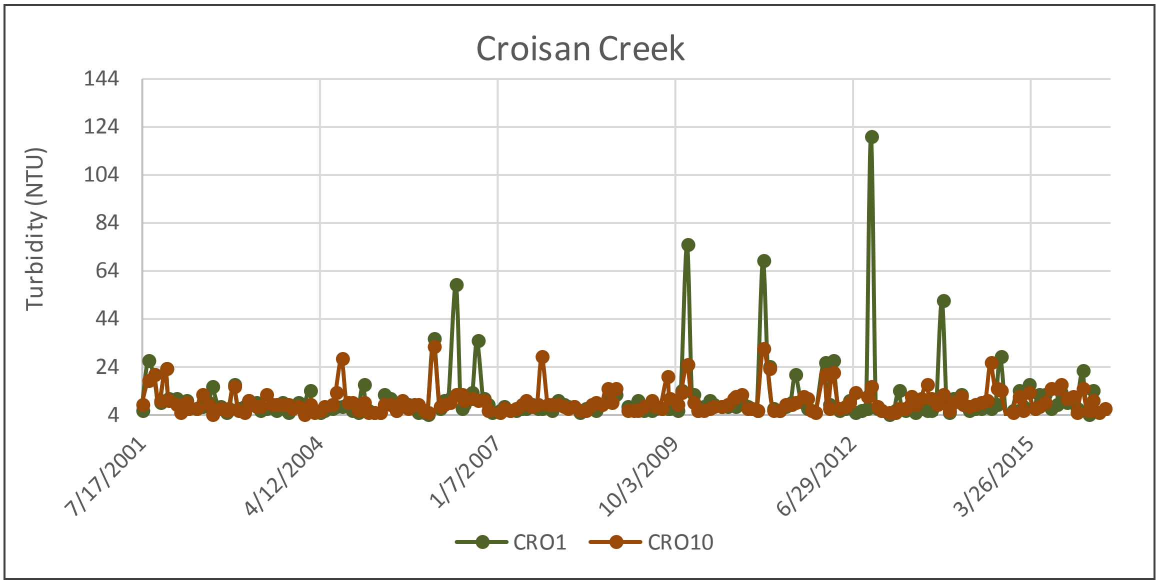
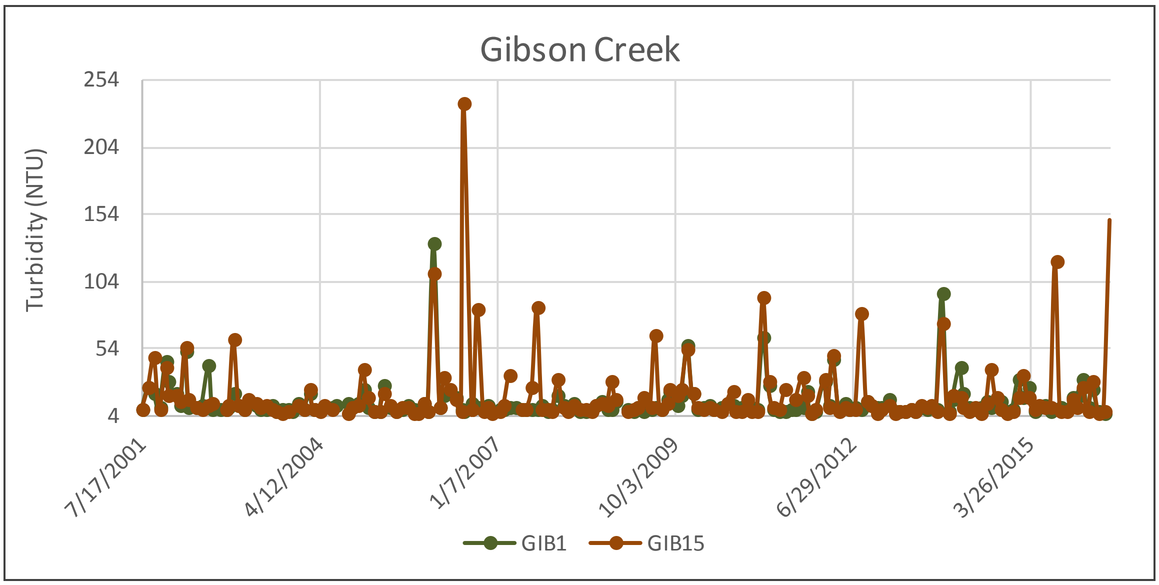


Figure 4.8
Turbidity Time Trend Graphs
Monthly Instream Monitoring





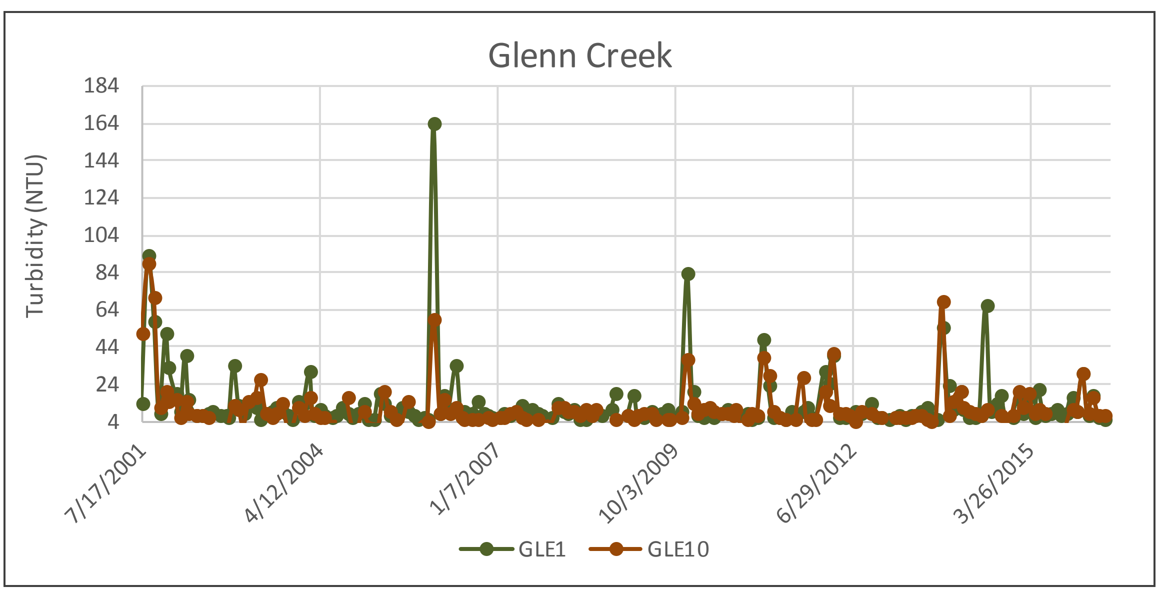
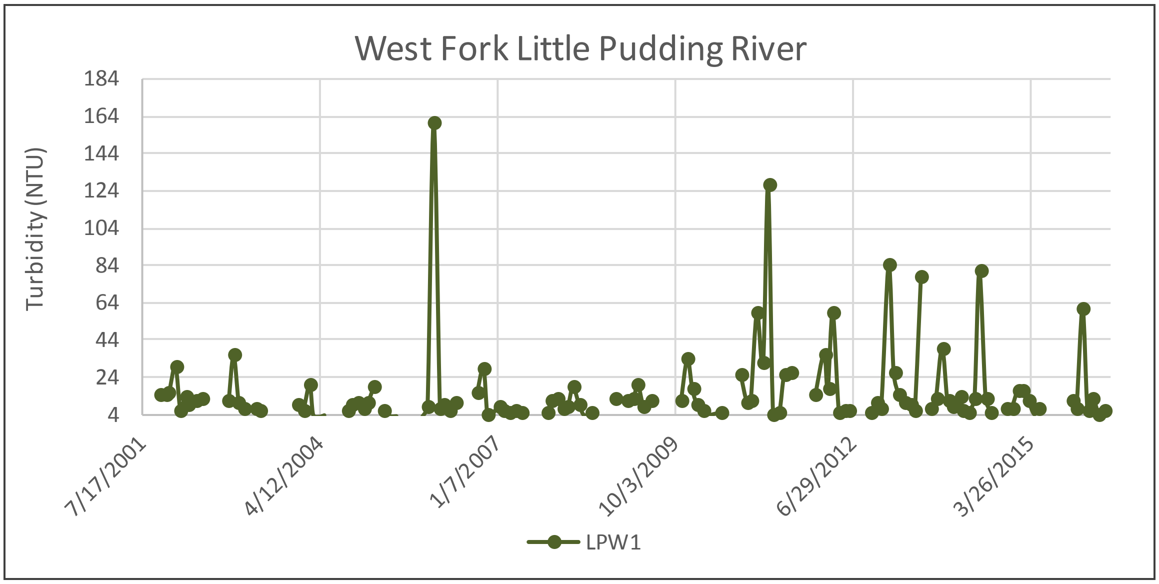
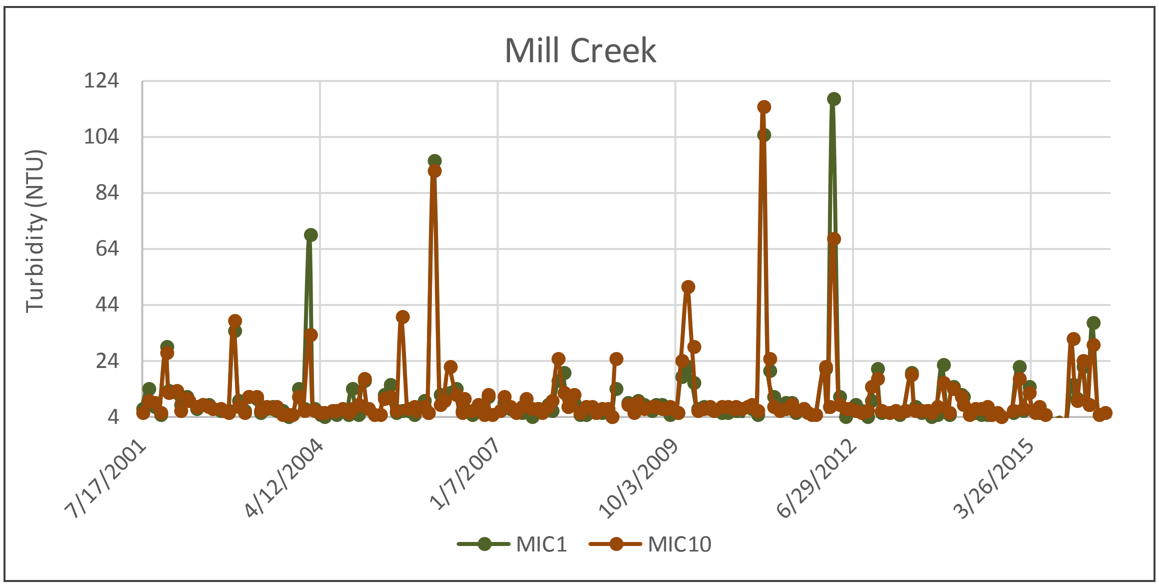


Figure 4.8

Turbidity Time Trend Graphs

Monthly Instream Monitoring





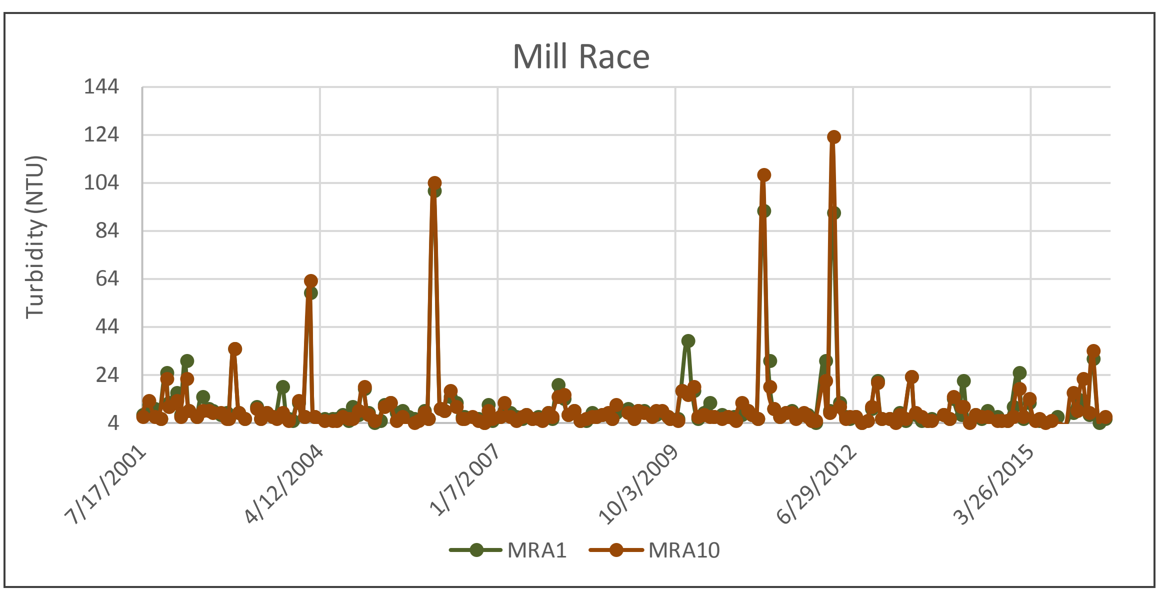
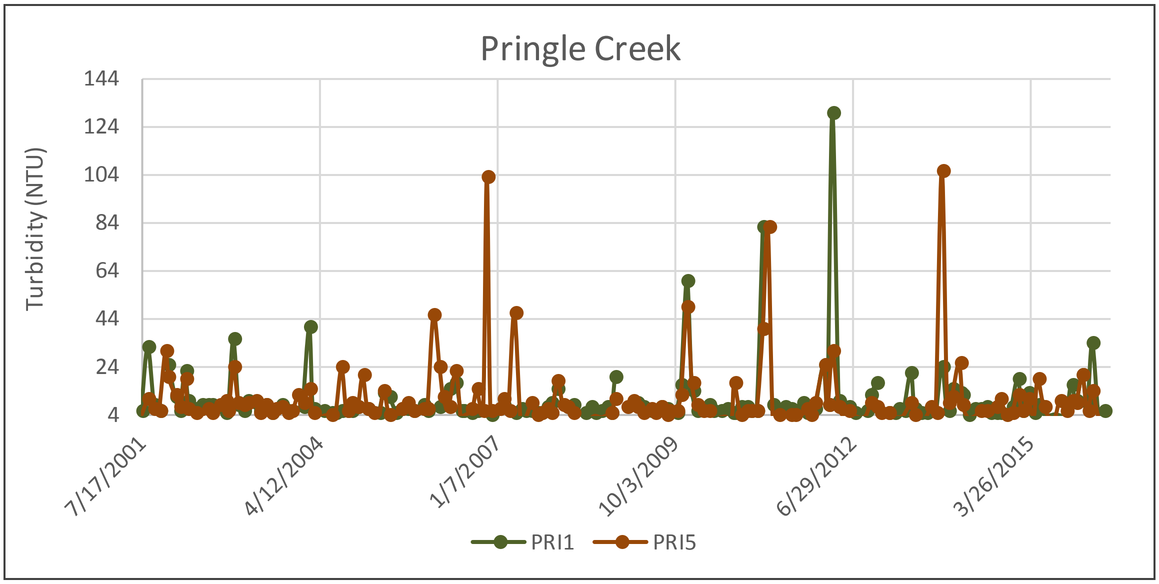
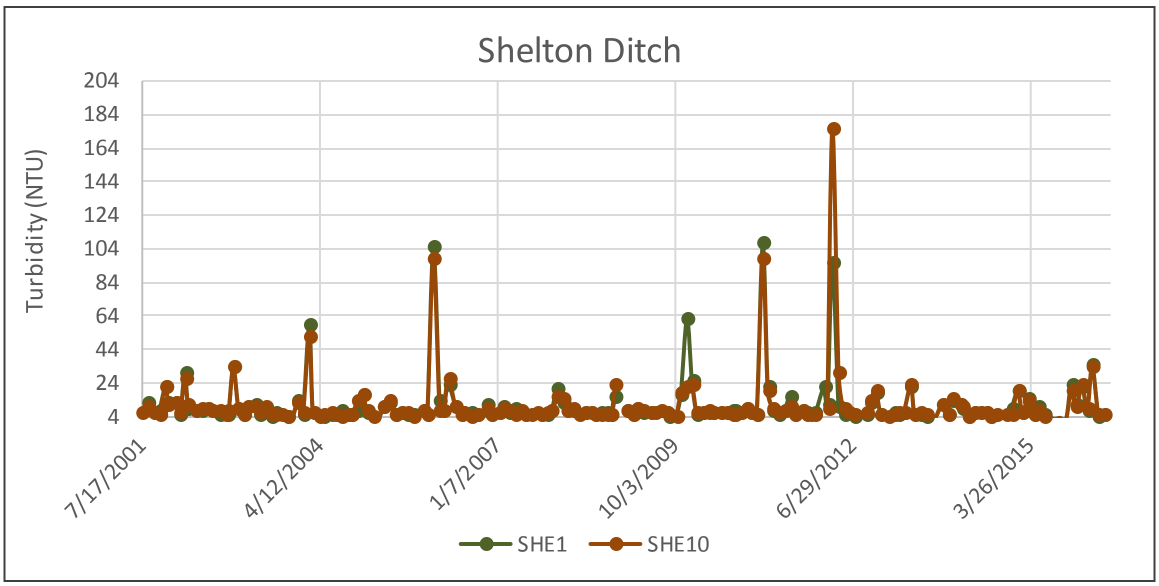


Figure 4.8
Turbidity Time Trend Graphs
Monthly Instream Monitoring





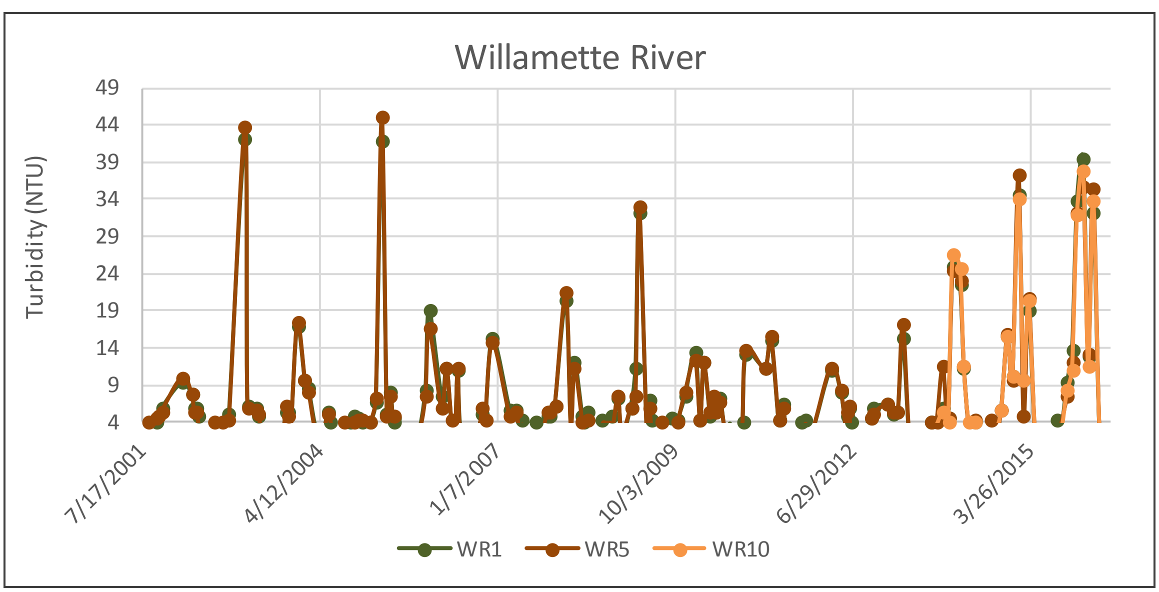
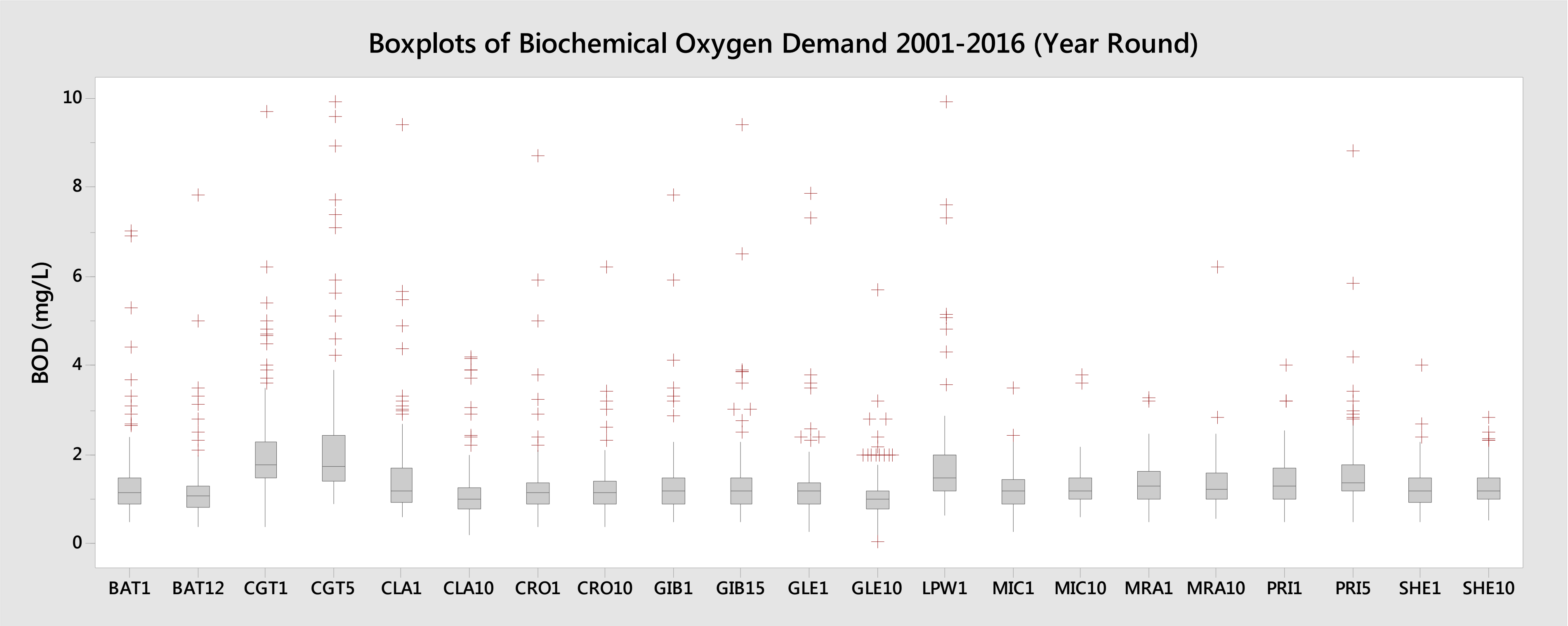


Figure 5.1

Biochemical Oxygen Demand Box Plots

Monthly Instream Monitoring

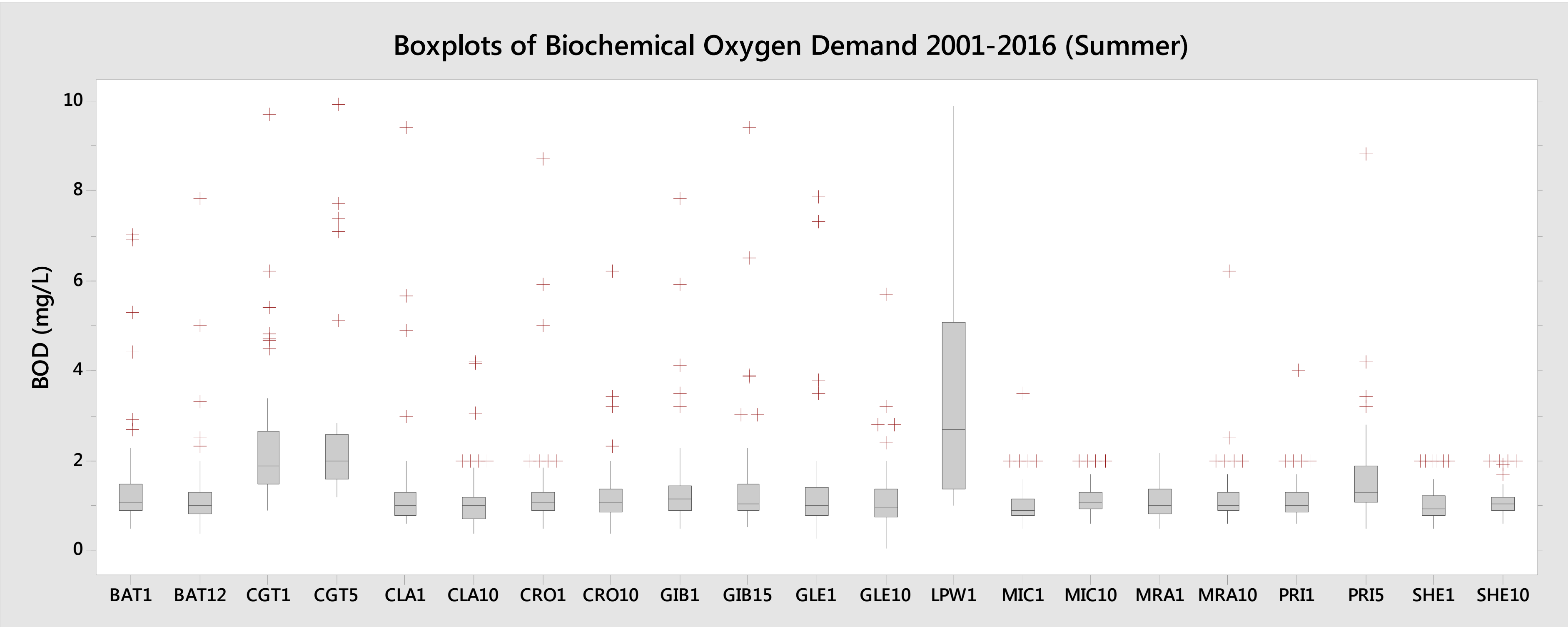


	BAT1	BAT12	CGT1	CGT5	CLA1	CLA10	CRO1	CRO10	GIB1	GIB15	GLE1	GLE10	LPW1	MIC1	MIC10	MRA1	MRA10	PRI1	PRI5	SHE1	SHE10
N	179	179	179	146	179	179	179	178	178	176	176	165	125	176	178	177	178	167	179	179	177
median	1.18	1.10	1.80	1.75	1.20	1.00	1.17	1.18	1.20	1.20	1.20	1.00	1.50	1.19	1.20	1.30	1.25	1.30	1.40	1.20	1.20
mean	1.36	1.22	2.07	2.26	1.49	1.17	1.32	1.26	1.33	1.35	1.31	1.09	2.05	1.22	1.31	1.36	1.33	1.36	1.60	1.28	1.30
90th percentile	2.00	1.80	3.22	3.37	2.50	1.91	1.89	1.90	2.00	2.00	1.95	1.66	2.70	1.80	1.70	2.00	1.95	2.00	2.10	1.90	1.90
min	0.5	0.4	0.4	0.9	0.6	0.2	0.4	0.4	0.5	0.5	0.3	0.05	0.66	0.3	0.6	0.5	0.58	0.5	0.5	0.5	0.54
max	7	7.8	9.7	9.9	9.4	4.18	8.7	6.2	7.81	9.4	7.86	5.7	26.8*	3.5	3.8	3.26	6.2	4	8.8	4	2.83
Q1 (25%)	0.90	0.83	1.50	1.44	0.94	0.80	0.90	0.90	0.90	0.90	0.90	0.80	1.23	0.90	1.00	1.00	1.00	1.00	1.20	0.96	1.00
Q3 (75%)	1.49	1.31	2.30	2.41	1.70	1.25	1.40	1.40	1.49	1.50	1.40	1.20	2.00	1.47	1.50	1.64	1.59	1.70	1.80	1.50	1.50

Figure 5.1

Biochemical Oxygen Demand Box Plots

Monthly Instream Monitoring

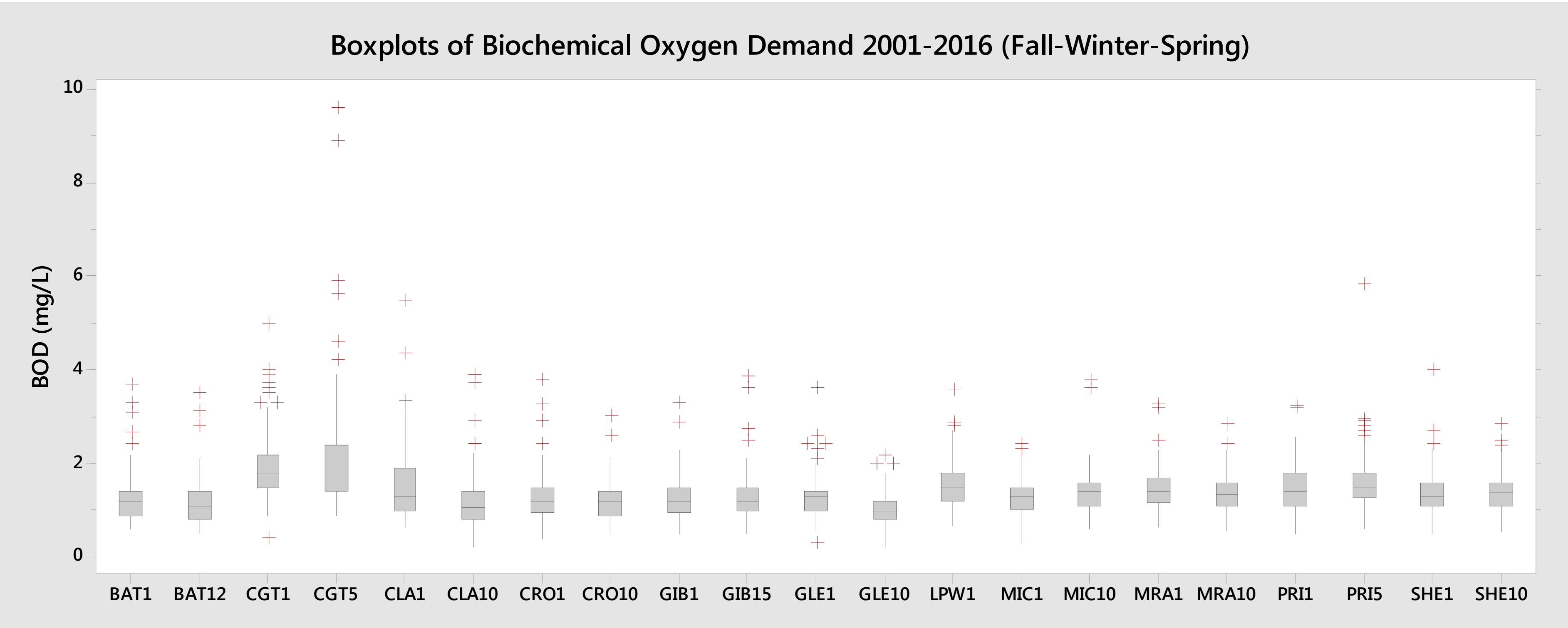


	BAT1	BAT12	CGT1	CGT5	CLA1	CLA10	CRO1	CRO10	GIB1	GIB15	GLE1	GLE10	LPW1	MIC1	MIC10	MRA1	MRA10	PRI1	PRI5	SHE1	SHE10
N	60	60	60	31	60	60	60	59	59	57	58	48	17	60	59	59	60	60	60	60	59
median	1.1	1	1.89	2	1	1	1.09	1.1	1.15	1.05	1.02	0.94	2.7	0.93	1.1	1	1	1	1.3	0.95	1.04
mean	1.54	1.31	2.34	2.81	1.39	1.16	1.38	1.31	1.47	1.53	1.38	1.26	3.69	1.05	1.16	1.15	1.22	1.16	1.65	1.06	1.11
90th percentile	2.34	2	4.49	7.1	2	2	2	2	2.06	2.58	2	2.12	7.41	1.6	1.62	1.76	1.73	1.61	2.13	1.64	1.54
min	0.5	0.4	0.9	1.2	0.6	0.4	0.5	0.4	0.5	0.55	0.3	0.05	1	0.5	0.6	0.5	0.6	0.6	0.5	0.5	0.6
max	7	7.8	9.7	9.9	9.4	4.18	8.7	6.2	7.81	9.4	7.86	5.7	9.9	3.5	2	2.2	6.2	4	8.8	2	2
Q1 (25%)	0.90	0.83	1.50	1.64	0.80	0.78	0.90	0.88	0.90	0.90	0.80	0.75	1.40	0.80	0.98	0.83	0.90	0.90	1.10	0.80	0.90
Q3 (75%)	1.50	1.30	2.63	2.49	1.30	1.20	1.30	1.39	1.43	1.50	1.36	1.33	5.05	1.13	1.30	1.35	1.30	1.30	1.90	1.23	1.20

Figure 5.1

Biochemical Oxygen Demand Box Plots

Monthly Instream Monitoring

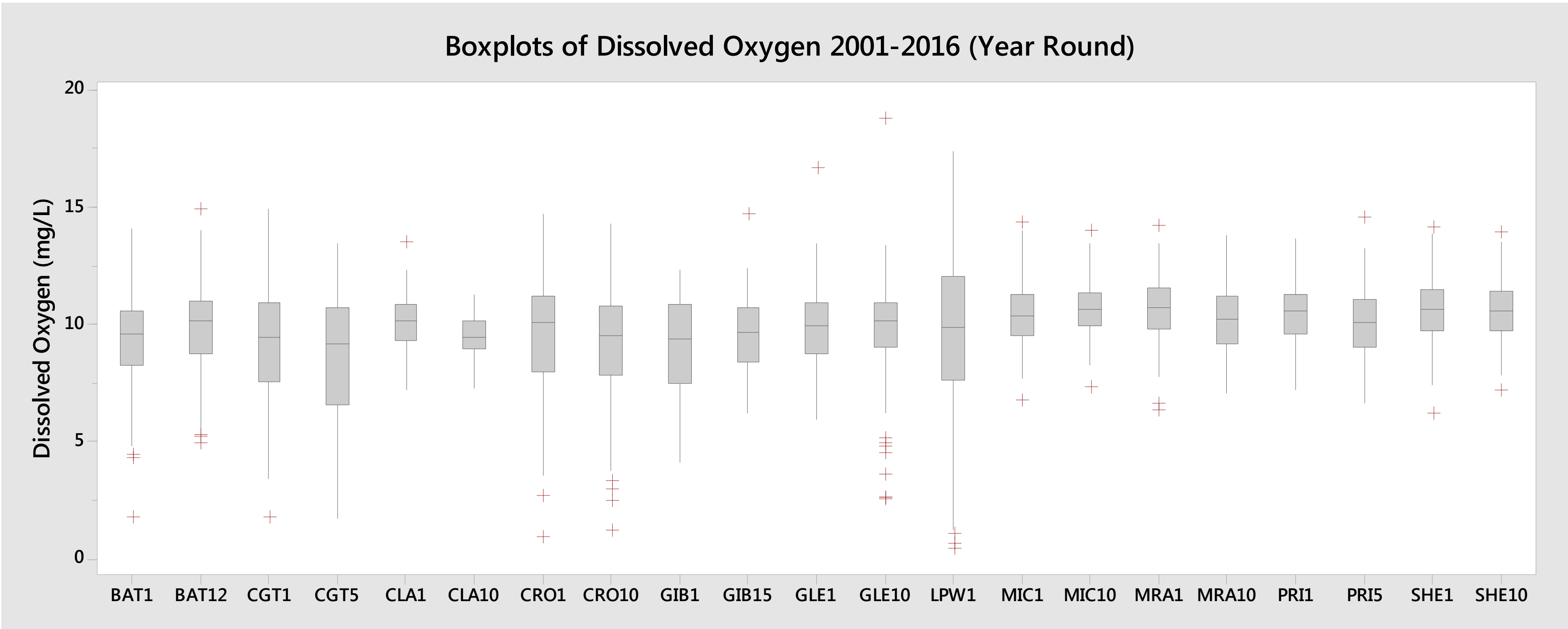


	BAT1	BAT12	CGT1	CGT5	CLA1	CLA10	CRO1	CRO10	GIB1	GIB15	GLE1	GLE10	LPW1	MIC1	MIC10	MRA1	MRA10	PRI1	PRI5	SHE1	SHE10
N	119	119	119	115	119	119	119	119	119	119	118	117	108	116	119	118	118	107	119	119	118
median	1.2	1.1	1.8	1.7	1.3	1.07	1.2	1.2	1.2	1.2	1.3	1	1.5	1.3	1.4	1.4	1.36	1.41	1.5	1.3	1.375
mean	1.27	1.18	1.94	2.11	1.54	1.18	1.28	1.23	1.26	1.27	1.28	1.02	1.79	1.30	1.38	1.47	1.38	1.48	1.58	1.39	1.39
90th percentile	1.82	1.70	2.74	3.16	2.50	1.82	1.87	1.70	1.86	1.72	1.80	1.45	2.23	1.80	1.73	2.00	1.95	2.00	2.10	1.90	1.90
min	0.6	0.5	0.4	0.9	0.63	0.2	0.4	0.5	0.5	0.5	0.3	0.2	0.66	0.3	0.6	0.64	0.58	0.5	0.6	0.5	0.54
max	3.69	3.5	4.99	9.59	5.47	3.9	3.77	3.02	3.3	3.85	3.6	2.18	26.8*	2.43	3.8	3.26	2.84	3.21	5.83	4	2.83
Q1 (25%)	0.91	0.83	1.50	1.40	1.00	0.80	0.95	0.90	0.97	1.00	1.00	0.80	1.20	1.01	1.10	1.19	1.10	1.11	1.28	1.10	1.10
Q3 (75%)	1.42	1.36	2.20	2.41	1.86	1.36	1.45	1.41	1.50	1.50	1.40	1.20	1.80	1.50	1.60	1.70	1.60	1.80	1.75	1.60	1.60

Figure 5.2

Dissolved Oxygen Box Plots

Monthly Instream Monitoring

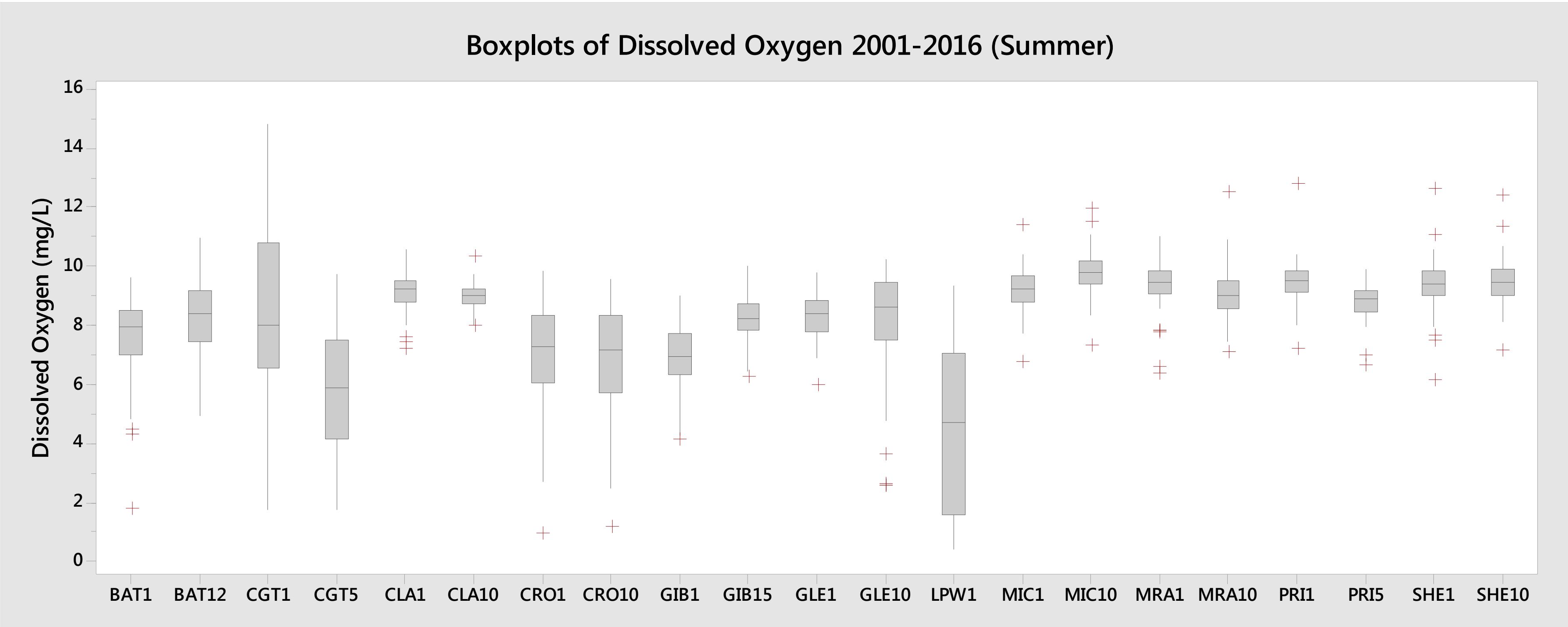


	BAT1	BAT12	CGT1	CGT5	CLA1	CLA10	CRO1	CRO10	GIB1	GIB15	GLE1	GLE10	LPW1	MIC1	MIC10	MRA1	MRA10	PRI1	PRI5	SHE1	SHE10
N	179	179	176	145	176	179	179	178	176	174	174	163	127	177	177	176	178	167	175	177	178
median	9.57	10.16	9.50	9.18	10.18	9.49	10.10	9.53	9.38	9.69	9.94	10.18	9.85	10.40	10.63	10.70	10.24	10.55	10.10	10.68	10.61
mean	9.30	9.86	9.25	8.58	10.09	9.53	9.52	9.06	9.08	9.59	9.85	9.79	9.64	10.45	10.70	10.64	10.22	10.52	10.16	10.61	10.58
90th percentile	11.21	11.56	12.18	11.44	11.35	10.51	11.89	11.27	11.23	11.22	11.49	11.39	13.58	11.98	12.09	12.12	11.80	12.03	11.72	12.11	12.05
min	1.8	4.92	1.75	1.76	7.22	7.31	0.94	1.19	4.12	6.25	5.97	2.58	0.43	6.76	7.34	6.34	7.11	7.21	6.66	6.17	7.16
max	14.07	14.91	14.9	13.49	13.48	11.26	14.7	14.3	12.32	14.68	16.67	18.78	17.38	14.35	13.98	14.19	13.8	13.67	14.54	14.1	13.95
Q1 (25%)	8.26	8.77	7.55	6.73	9.39	9.01	8.04	7.89	7.52	8.44	8.75	9.06	7.75	9.51	10.00	9.81	9.21	9.61	9.04	9.75	9.74
Q3 (75%)	10.61	11.03	10.91	10.74	10.83	10.16	11.22	10.75	10.83	10.70	10.90	10.96	12.02	11.32	11.38	11.54	11.20	11.30	11.09	11.47	11.39

Figure 5.2

Dissolved Oxygen Box Plots

Monthly Instream Monitoring

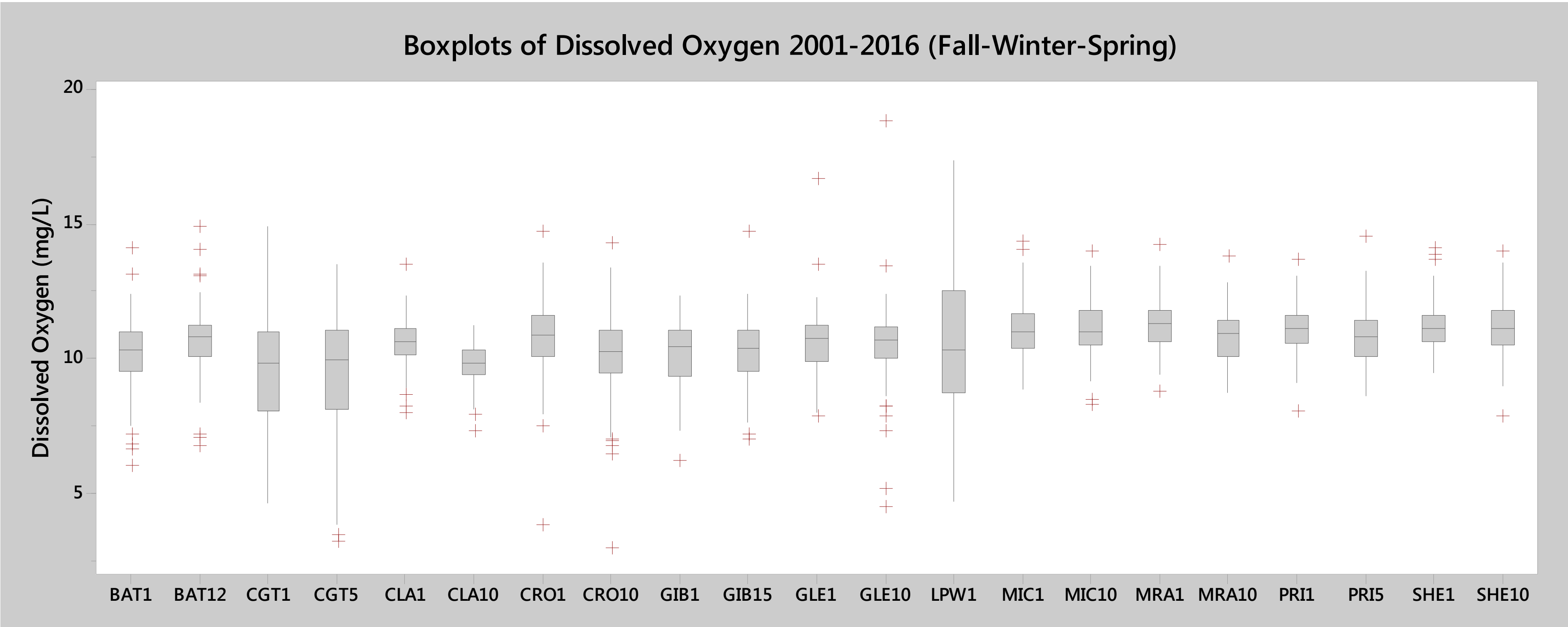


	BAT1	BAT12	CGT1	CGT5	CLA1	CLA10	CRO1	CRO10	GIB1	GIB15	GLE1	GLE10	LPW1	MIC1	MIC10	MRA1	MRA10	PRI1	PRI5	SHE1	SHE10
N	60	60	58	31	59	60	60	59	58	56	57	47	19	60	59	59	60	60	58	59	60
median	7.95	8.40	8.00	5.88	9.21	9.02	7.27	7.17	6.96	8.21	8.39	8.60	4.75	9.25	9.79	9.45	9.02	9.49	8.89	9.39	9.46
mean	7.56	8.27	8.52	5.80	9.10	8.97	7.08	6.91	6.93	8.21	8.30	8.08	4.63	9.25	9.83	9.38	9.04	9.50	8.82	9.40	9.47
90th percentile	9.13	9.86	12.91	8.26	9.70	9.37	9.13	8.94	8.23	9.06	9.23	9.86	7.94	10.00	10.56	10.28	9.80	10.16	9.58	10.24	10.27
min	1.8	4.92	1.75	1.76	7.22	7.97	0.94	1.19	4.12	6.25	5.97	2.58	0.43	6.76	7.34	6.34	7.11	7.21	6.66	6.17	7.16
max	9.6	10.96	14.8	9.73	10.6	10.3	9.84	9.58	9	10.01	9.81	10.25	9.37	11.37	11.96	11	12.5	12.8	9.9	12.6	12.4
Q1 (25%)	7.00	7.47	6.59	4.34	8.79	8.73	6.09	5.74	6.37	7.84	7.82	7.65	2.15	8.81	9.44	9.10	8.58	9.11	8.47	9.10	9.04
Q3 (75%)	8.50	9.11	10.72	7.46	9.50	9.22	8.28	8.37	7.67	8.73	8.85	9.36	6.99	9.65	10.18	9.84	9.51	9.86	9.17	9.82	9.89

Figure 5.2

Dissolved Oxygen Box Plots

Monthly Instream Monitoring

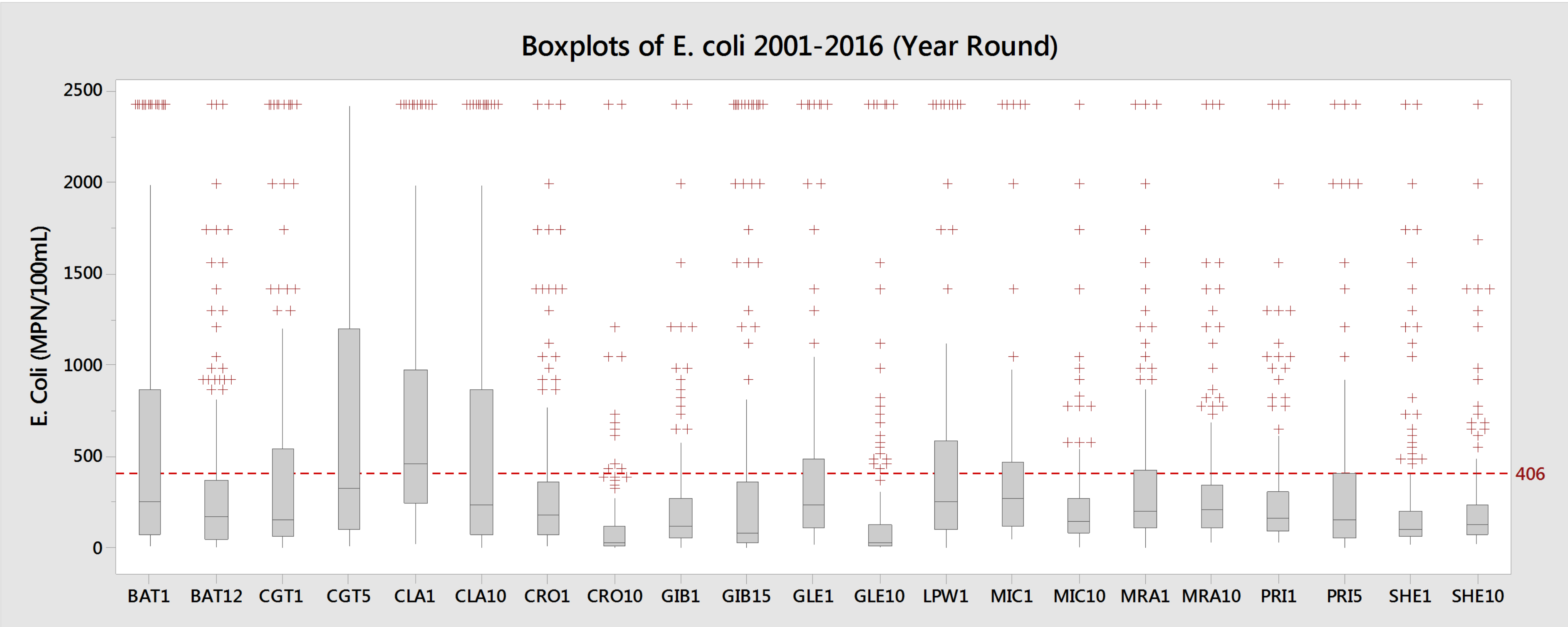


	BAT1	BAT12	CGT1	CGT5	CLA1	CLA10	CRO1	CRO10	GIB1	GIB15	GLE1	GLE10	LPW1	MIC1	MIC10	MRA1	MRA10	PRI1	PRI5	SHE1	SHE10
N	119	119	118	114	117	119	119	119	118	118	117	116	108	117	118	117	118	107	117	118	118
median	10.36	10.8	9.87	9.95	10.61	9.87	10.9	10.3	10.44	10.43	10.76	10.68	10.34	10.98	11.01	11.30	10.98	11.14	10.85	11.15	11.11
mean	10.17	10.67	9.61	9.33	10.60	9.82	10.76	10.12	10.13	10.25	10.60	10.48	10.52	11.07	11.13	11.28	10.83	11.09	10.82	11.21	11.14
90th percentile	11.33	11.88	11.86	11.54	11.48	10.68	12.17	11.43	11.37	11.52	11.68	11.53	13.72	12.34	12.37	12.38	12.02	12.20	12.03	12.30	12.42
min	6.04	6.75	4.64	3.2	7.96	7.31	3.86	2.95	6.23	6.99	7.85	4.49	4.7	8.87	8.29	8.75	8.73	8.06	8.6	9.47	7.87
max	14.07	14.91	14.9	13.49	13.48	11.26	14.7	14.3	12.32	14.68	16.67	18.78	17.38	14.35	13.98	14.19	13.8	13.67	14.54	14.1	13.95
Q1 (25%)	9.57	10.09	8.11	8.24	10.17	9.40	10.11	9.49	9.37	9.57	9.91	10.01	8.78	10.40	10.54	10.68	10.10	10.60	10.10	10.67	10.54
Q3 (75%)	10.96	11.25	10.98	11.07	11.10	10.33	11.60	11.06	11.05	11.03	11.25	11.15	12.51	11.70	11.75	11.78	11.44	11.60	11.40	11.64	11.75

Figure 5.3

E. coli Box Plots

Monthly Instream Monitoring

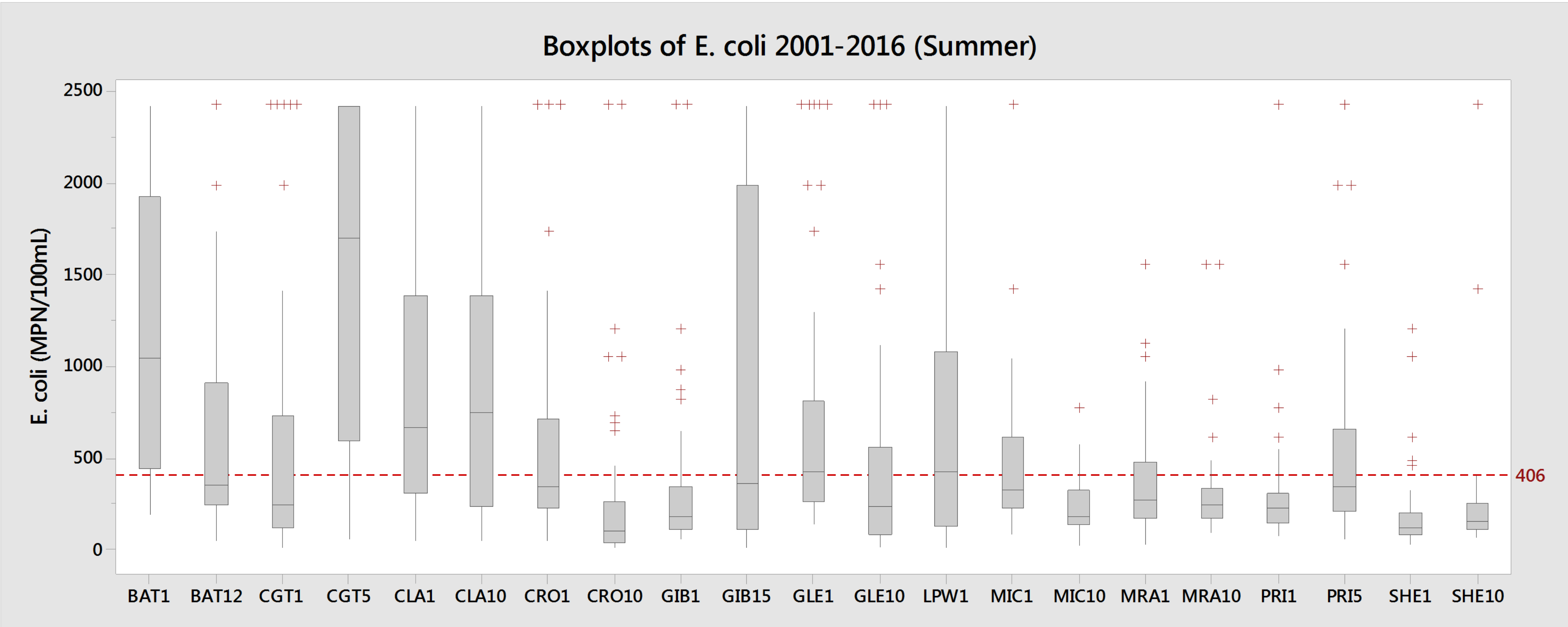


	BAT1	BAT12	CGT1	CGT5	CLA1	CLA10	CRO1	CRO10	GIB1	GIB15	GLE1	GLE10	LPW1	MIC1	MIC10	MRA1	MRA10	PRI1	PRI5	SHE1	SHE10
N	179	178	178	147	179	179	179	178	179	176	176	165	126	177	178	177	179	167	178	179	178
median	260.00	172.00	161.50	326.00	461.00	238.00	185.00	35.00	122.00	88.00	236.00	35.00	255.00	276.00	151.00	201.00	214.00	166.00	159.00	104.00	129.00
mean	596.92	346.06	465.76	710.33	733.94	574.88	383.18	131.64	271.80	419.23	444.10	214.95	512.49	393.50	246.25	363.28	323.46	315.82	346.09	248.68	242.84
90th percentile	1783.60	921.00	1414.00	2419.00	1733.00	1986.00	1046.00	291.00	593.00	1859.50	1013.00	535.60	1573.50	816.00	469.10	836.00	735.60	788.40	831.00	554.20	506.00
min	10	4	3	15	20	1	13	1	4	2	23	1	4	46	8	7	28	28	6	19	22
max	2420	2420	2420	2420	2420	2420	2420	2419	2420	2420	2420	2420	2420	2420	2420	2420	2420	2420	2420	2420	2420
Q1 (25%)	80.50	50.25	68.00	103.00	248.00	76.50	72.00	12.00	61.00	31.00	116.75	12.00	107.00	126.00	88.00	111.00	115.50	94.50	56.00	65.00	73.00
Q3 (75%)	866.00	365.00	548.00	1161.50	980.00	866.00	365.00	115.50	276.00	350.00	488.00	130.00	579.00	461.00	275.00	411.00	336.50	308.00	411.00	203.00	239.00

Figure 5.3

E. coli Box Plots

Monthly Instream Monitoring

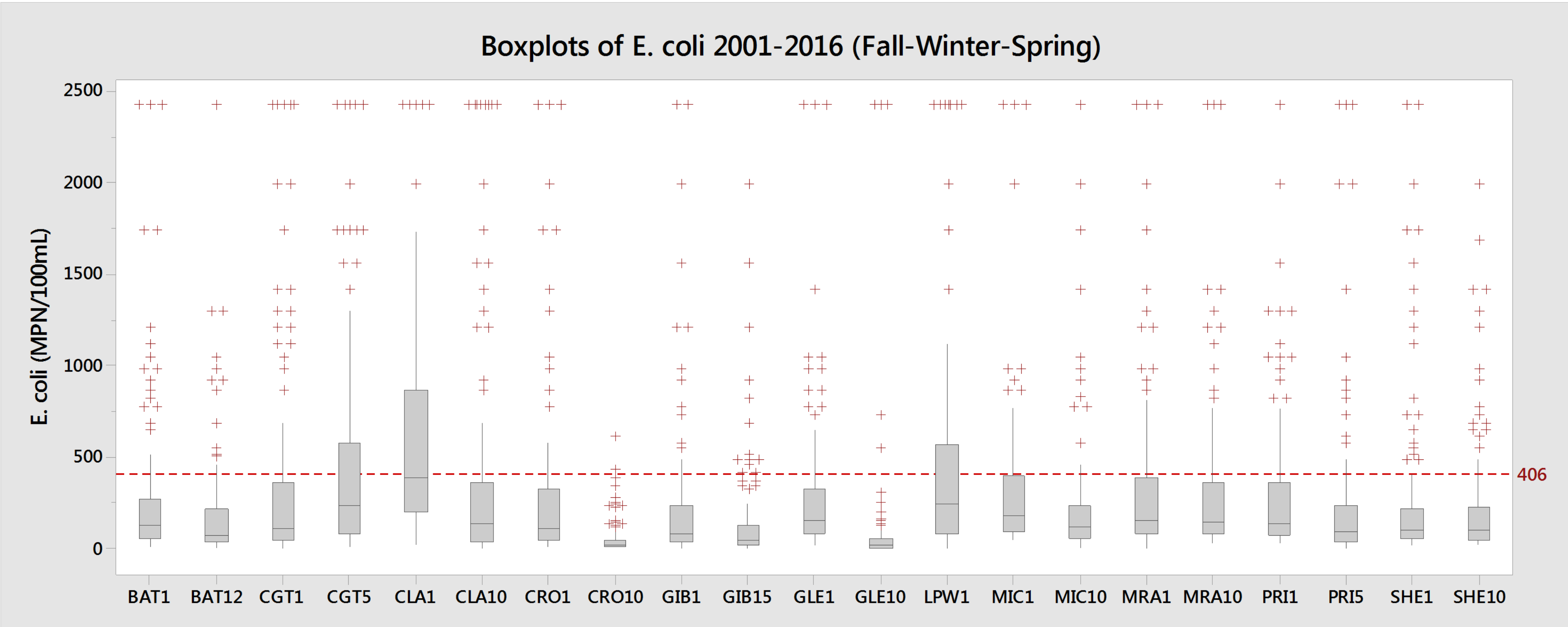


	BAT1	BAT12	CGT1	CGT5	CLA1	CLA10	CRO1	CRO10	GIB1	GIB15	GLE1	GLE10	LPW1	MIC1	MIC10	MRA1	MRA10	PRI1	PRI5	SHE1	SHE10
N	60	60	59	32	60	60	60	59	60	57	58	48	18	60	59	60	60	60	60	60	60
median	1046	355.00	248.00	1700.00	668.00	748.50	345.00	105.00	188.00	387.00	423.00	236.50	431.00	326.00	184.00	276.00	248.50	226.50	345.00	122.50	160.50
mean	1184.98	627.57	629.10	1466.03	941.55	896.38	566.28	283.98	339.97	978.12	700.26	469.69	754.28	454.55	240.61	360.72	315.22	292.70	512.90	186.17	234.72
90th percentile	2419.00	1571.00	2419.00	2420.00	2420.00	2419.00	1414.00	695.00	665.70	2420.00	1986.00	1208.20	2419.30	816.00	445.60	616.60	488.00	461.00	921.00	326.00	308.00
min	192	47	12	58	47	47	47	11	59	13	144	12	16	86	24	32	96	81	56	33	64
max	2420	2420	2420	2420	2420	2420	2419	2419	2419	2420	2420	2420	2420	2419	770	1553	1553	2419	2420	1203	2420
Q1 (25%)	454.50	266.50	128.00	631.50	313.00	252.00	234.00	43.00	117.00	122.00	276.75	86.25	136.50	242.25	142.50	184.00	177.25	148.25	220.00	86.00	113.25
Q3 (75%)	1796.25	879.75	707.00	2419.00	1328.50	1328.50	697.00	248.50	344.25	1986.00	770.00	532.50	842.00	613.00	317.00	467.75	330.75	308.00	606.00	197.25	245.25

Figure 5.3

E. coli Box Plots

Monthly Instream Monitoring

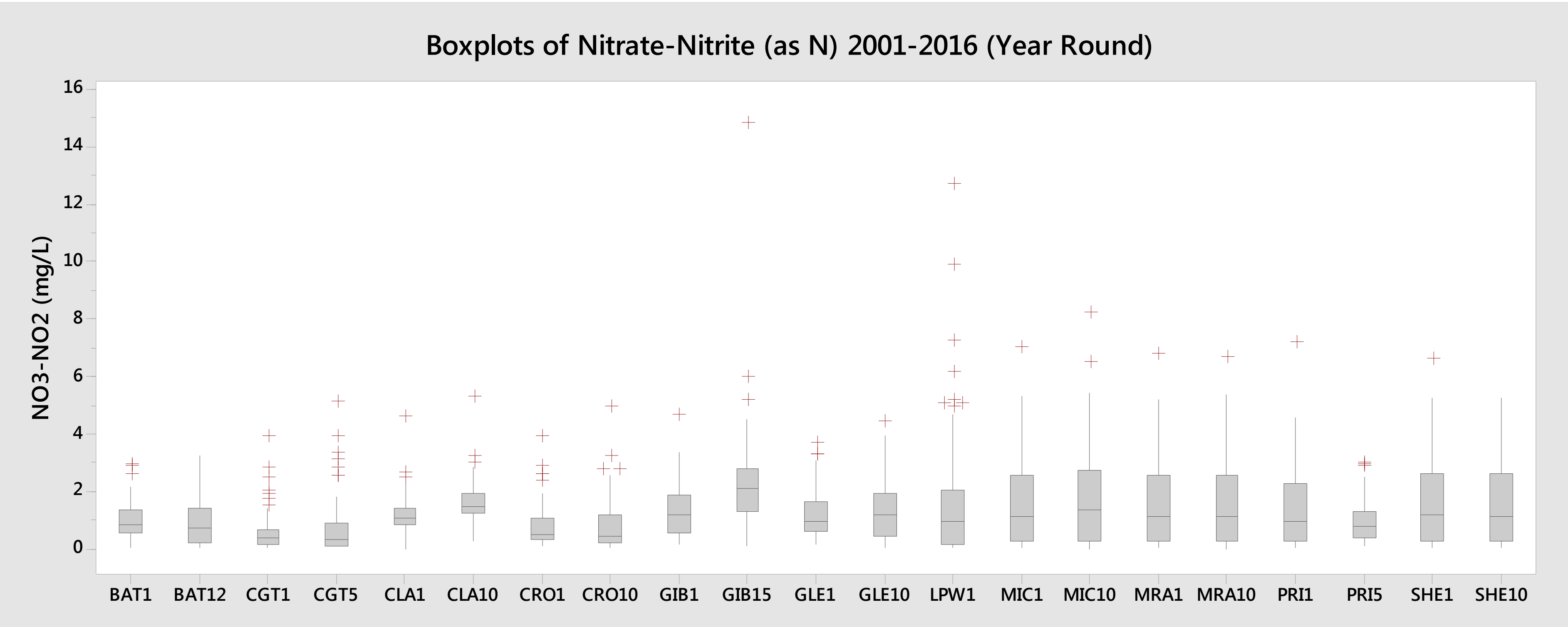


	BAT1	BAT12	CGT1	CGT5	CLA1	CLA10	CRO1	CRO10	GIB1	GIB15	GLE1	GLE10	LPW1	MIC1	MIC10	MRA1	MRA10	PRI1	PRI5	SHE1	SHE10
N	119	118	119	115	119	119	119	119	119	119	118	117	108	117	119	117	119	107	118	119	118
median	128	77.5	111	238	387	139	116	22	86	46.00	155.50	21.00	243.50	184.00	119.00	161.00	150.00	135	96	99	106
mean	300.41	202.92	384.77	500.04	629.27	412.78	290.86	56.11	237.43	151.52	318.19	110.44	472.19	362.20	249.04	364.59	327.62	328.79	261.27	280.20	246.97
90th percentile	826.00	472.70	1222.40	1553.00	1441.80	1441.80	617.20	132.80	500.00	411.00	770.00	131.40	1120.00	744.20	484.60	944.60	779.20	1006.40	589.20	727.00	660.40
min	10	4	3	15	20	1	13	1	4	2	23	1	4	46	8	7	28	28	6	19	22
max	2420	2420	2420	2420	2420	2420	2420	613	2420	1986	2420	2420	2420	2420	2420	2420	2420	2420	2420	2420	1986
Q1 (25%)	54.50	39.25	51.00	85.00	205.00	42.00	49.50	10.00	36.00	22.00	88.00	8.00	89.75	99.00	59.50	91.00	86.00	73.00	37.25	56.00	51.50
Q3 (75%)	276.00	217.75	339.00	579.00	866.00	355.00	319.50	50.50	238.00	126.00	321.50	54.00	556.50	387.00	231.50	387.00	346.50	328.00	233.25	212.00	221.25

Figure 5.4

Nitrate-Nitrite Box Plots

Monthly Instream Monitoring

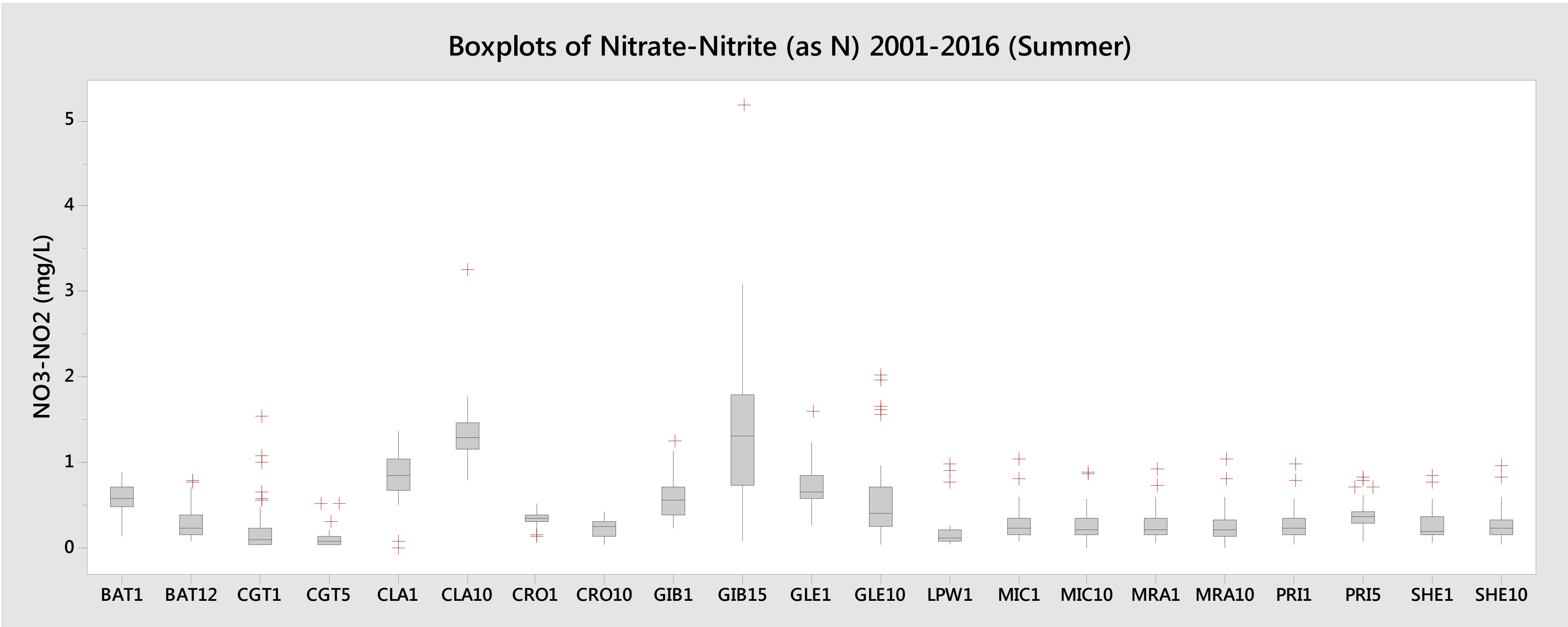


	BAT1	BAT12	CGT1	CGT5	CLA1	CLA10	CRO1	CRO10	GIB1	GIB15	GLE1	GLE10	LPW1	MIC1	MIC10	MRA1	MRA10	PRI1	PRI5	SHE1	SHE10
N	178	178	178	147	178	177	178	177	177	175	175	164	125	176	177	177	177	166	178	178	177
median	0.87	0.75	0.39	0.33	1.07	1.50	0.50	0.45	1.18	2.13	0.95	1.19	0.97	1.13	1.37	1.15	1.14	0.96	0.79	1.23	1.16
mean	1.01	0.94	0.51	0.62	1.16	1.59	0.76	0.76	1.33	2.23	1.23	1.29	1.51	1.54	1.65	1.53	1.55	1.37	0.93	1.56	1.57
90th percentile	1.79	2.00	1.09	1.44	1.80	2.21	1.55	1.71	2.55	3.74	2.37	2.53	3.41	3.53	3.75	3.51	3.70	3.00	1.81	3.76	3.67
min	0.06	0.05	0.05	0.04	0	0.29	0.1	0.05	0.2	0.09	0.19	0.05	0.05	0.08	0	0.06	0.01	0.05	0.09	0.07	0.05
max	2.93	3.26	3.9	5.1	4.6	5.3	3.94	4.94	4.67	14.8	3.67	4.46	12.7	7	8.2	6.8	6.7	7.2	3	6.6	5.28
Q1 (25%)	0.61	0.27	0.15	0.10	0.84	1.26	0.37	0.25	0.58	1.33	0.66	0.45	0.21	0.31	0.28	0.27	0.27	0.28	0.41	0.29	0.29
Q3 (75%)	1.35	1.46	0.70	0.94	1.42	1.92	1.08	1.18	1.90	2.81	1.65	1.96	2.04	2.55	2.70	2.54	2.60	2.31	1.30	2.61	2.61

Figure 5.4

Nitrate-Nitrite Box Plots

Monthly Instream Monitoring

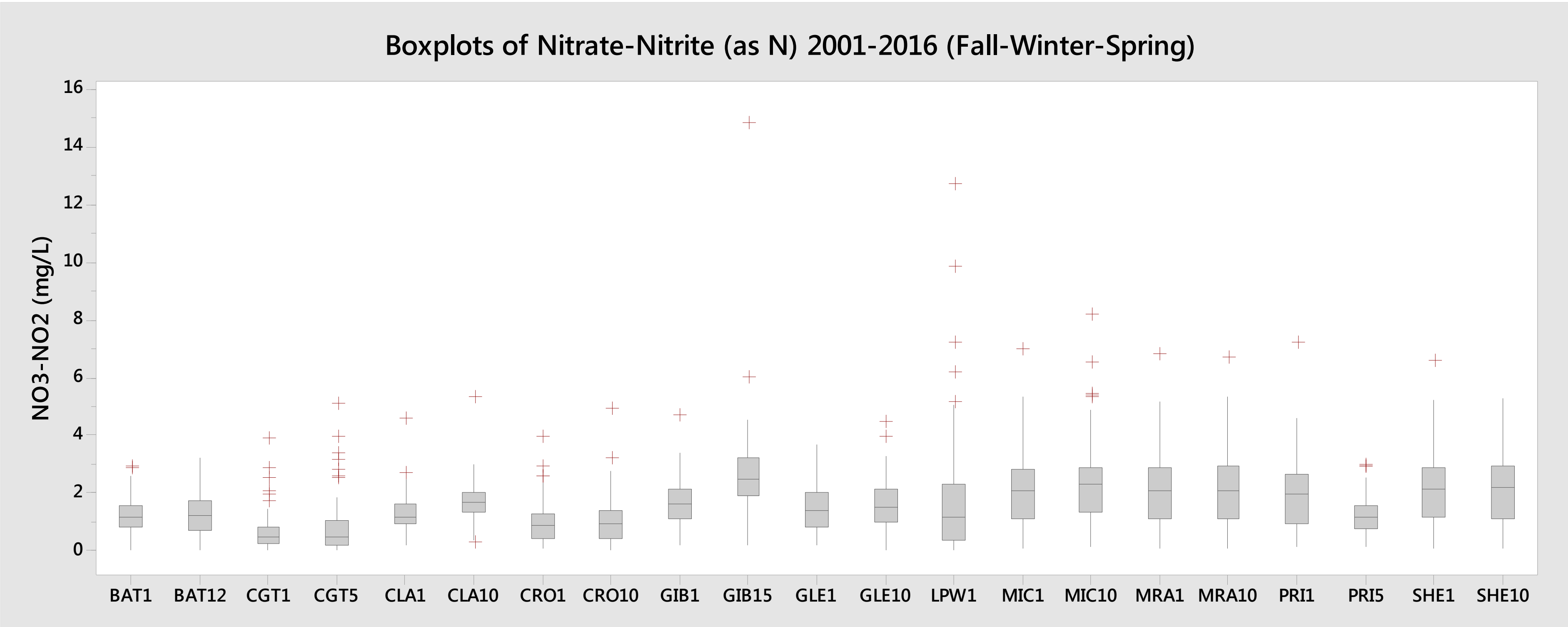


	BAT1	BAT12	CGT1	CGT5	CLA1	CLA10	CRO1	CRO10	GIB1	GIB15	GLE1	GLE10	LPW1	MIC1	MIC10	MRA1	MRA10	PRI1	PRI5	SHE1	SHE10
N	59	59	59	32	59	59	59	58	58	56	57	47	17	59	58	59	59	59	59	59	59
median	0.59	0.24	0.10	0.09	0.85	1.29	0.36	0.25	0.57	1.32	0.67	0.42	0.12	0.23	0.22	0.21	0.21	0.24	0.37	0.20	0.23
mean	0.58	0.30	0.22	0.13	0.87	1.34	0.35	0.24	0.60	1.37	0.72	0.55	0.25	0.29	0.27	0.27	0.26	0.28	0.37	0.27	0.28
90th percentile	0.78	0.51	0.49	0.22	1.21	1.56	0.45	0.38	0.96	2.38	0.93	1.20	0.82	0.48	0.50	0.49	0.50	0.50	0.53	0.46	0.51
min	0.15	0.08	0.05	0.05	0	0.8	0.13	0.05	0.24	0.09	0.27	0.05	0.05	0.08	0	0.06	0.01	0.05	0.09	0.07	0.05
max	0.9	0.79	1.53	0.51	1.38	3.25	0.52	0.44	1.25	5.17	1.6	2.01	0.97	1.04	0.89	0.93	1.03	0.98	0.83	0.84	0.96
Q1 (25%)	0.48	0.16	0.05	0.06	0.70	1.17	0.31	0.16	0.39	0.75	0.58	0.26	0.08	0.17	0.16	0.16	0.15	0.16	0.29	0.16	0.16
Q3 (75%)	0.72	0.40	0.23	0.14	1.03	1.46	0.40	0.32	0.71	1.76	0.84	0.71	0.18	0.35	0.35	0.36	0.33	0.35	0.44	0.37	0.34

Figure 5.4

Nitrate-Nitrite Box Plots

Monthly Instream Monitoring

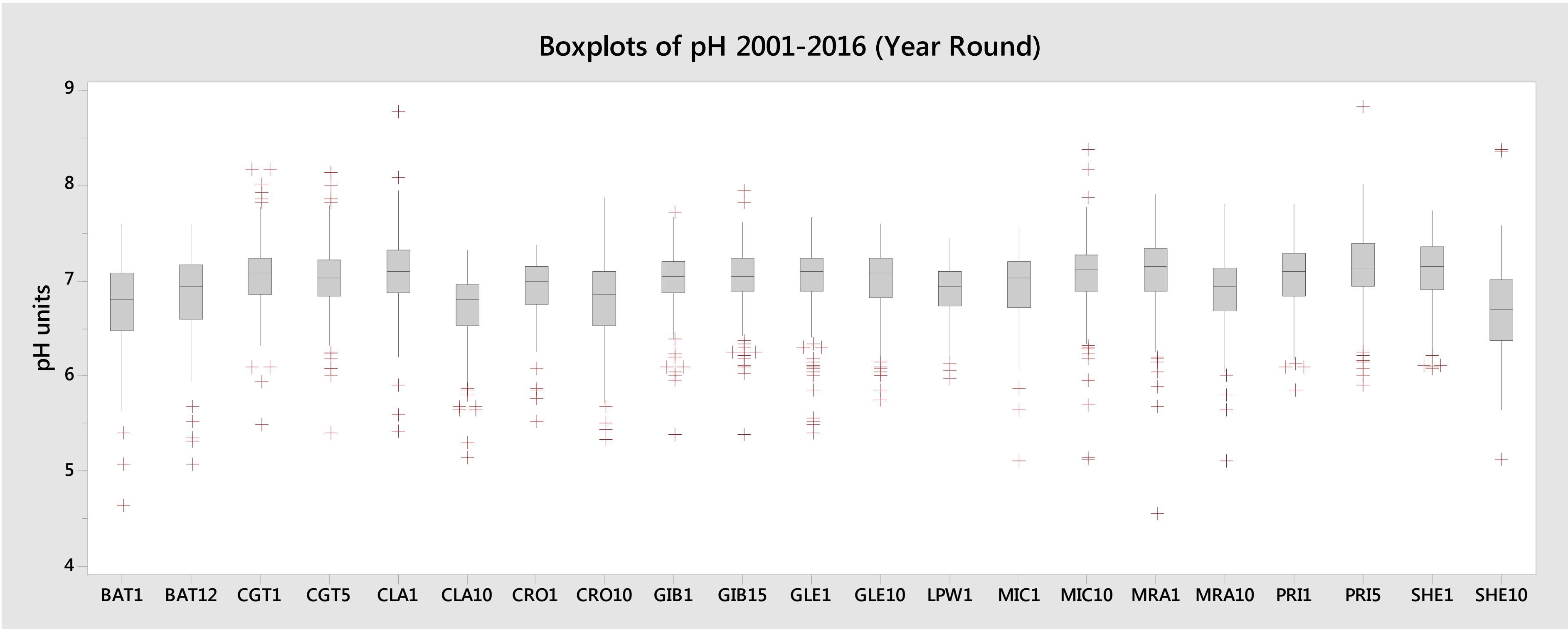


	BAT1	BAT12	CGT1	CGT5	CLA1	CLA10	CRO1	CRO10	GIB1	GIB15	GLE1	GLE10	LPW1	MIC1	MIC10	MRA1	MRA10	PRI1	PRI5	SHE1	SHE10
N	119	119	119	115	119	118	119	119	119	119	118	117	108	117	119	118	118	107	119	119	118
median	1.2	1.25	0.51	0.52	1.21	1.68	0.88	0.94	1.64	2.48	1.40	1.53	1.16	2.09	2.30	2.10	2.11	1.99	1.16	2.18	2.185
mean	1.22	1.25	0.65	0.76	1.30	1.71	0.96	1.01	1.68	2.64	1.48	1.59	1.70	2.17	2.32	2.16	2.19	1.98	1.21	2.20	2.22
90th percentile	1.90	2.11	1.20	1.56	1.96	2.28	1.61	1.83	2.68	4.03	2.54	2.70	3.76	4.06	4.11	4.05	3.98	3.57	1.99	3.97	4.14
min	0.06	0.05	0.05	0.04	0.2	0.29	0.1	0.05	0.2	0.19	0.19	0.05	0.05	0.12	0.14	0.11	0.12	0.16	0.17	0.11	0.11
max	2.93	3.26	3.9	5.1	4.6	5.3	3.94	4.94	4.67	14.8	3.67	4.46	12.7	7	8.2	6.8	6.7	7.2	3	6.6	5.28
Q1 (25%)	0.83	0.72	0.28	0.20	0.98	1.37	0.47	0.45	1.14	1.91	0.85	1.04	0.42	1.13	1.37	1.18	1.18	0.99	0.78	1.23	1.21
Q3 (75%)	1.59	1.75	0.84	1.08	1.62	2.03	1.30	1.38	2.18	3.20	2.02	2.17	2.21	2.81	2.91	2.90	2.92	2.67	1.56	2.87	2.91

Figure 5.5

pH Box Plots

Monthly Instream Monitoring

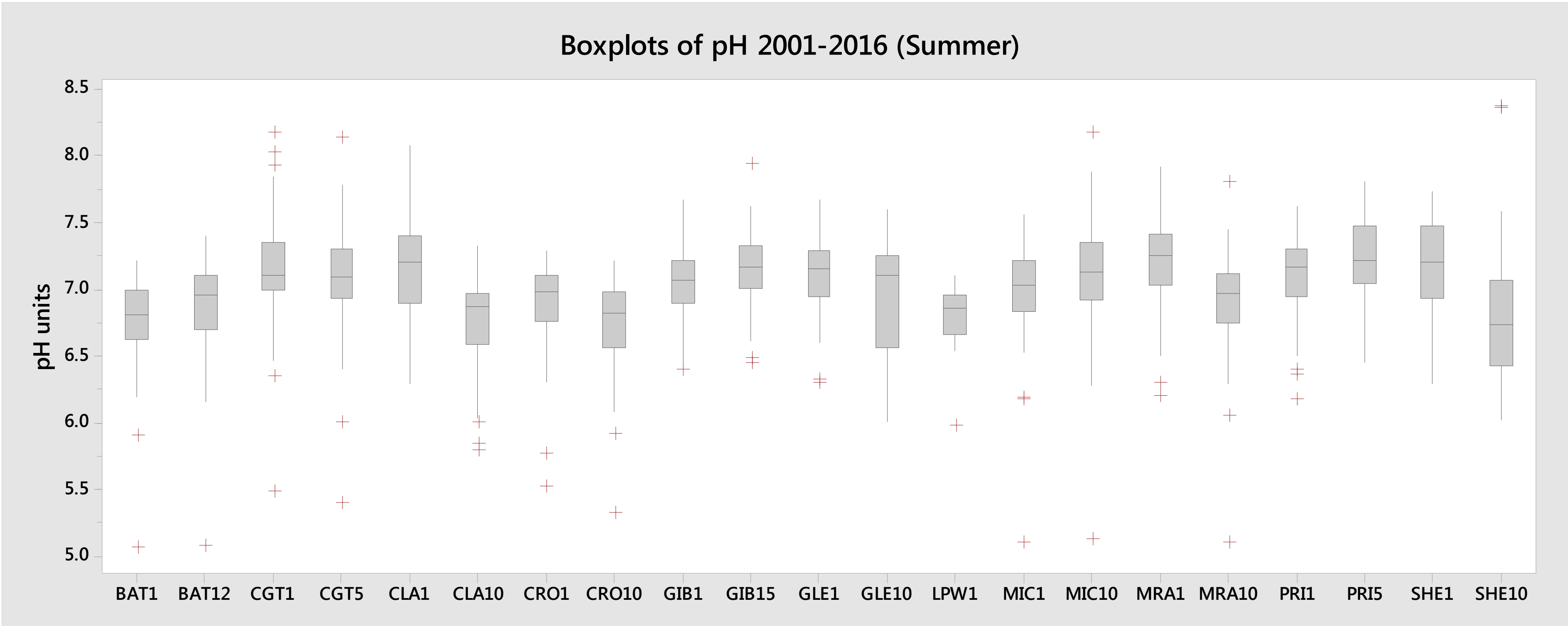


	BAT1	BAT12	CGT1	CGT5	CLA1	CLA10	CRO1	CRO10	GIB1	GIB15	GLE1	GLE10	LPW1	MIC1	MIC10	MRA1	MRA10	PRI1	PRI5	SHE1	SHE10
N	177	178	175	147	178	178	178	177	177	175	175	163	125	176	177	176	177	166	178	178	177
median	6.81	6.95	7.08	7.03	7.10	6.81	7.01	6.87	7.05	7.06	7.10	7.08	6.95	7.04	7.12	7.15	6.95	7.10	7.15	7.16	6.70
mean	6.76	6.85	7.06	7.04	7.07	6.70	6.92	6.80	6.98	7.03	6.99	6.99	6.89	6.96	7.04	7.08	6.89	7.05	7.14	7.10	6.71
90th percentile	7.22	7.28	7.43	7.51	7.45	7.06	7.25	7.22	7.30	7.38	7.38	7.36	7.22	7.33	7.42	7.58	7.26	7.49	7.58	7.53	7.24
min	4.64	5.08	5.49	5.4	5.42	5.14	5.53	5.33	5.38	5.39	5.41	5.75	5.98	5.11	5.13	4.55	5.1	5.85	5.9	6.08	5.12
max	7.6	7.6	8.17	8.14	8.78	7.33	7.38	7.88	7.72	7.94	7.68	7.6	7.45	7.57	8.38	7.92	7.81	7.81	8.82	7.74	8.37
Q1 (25%)	6.49	6.61	6.86	6.85	6.88	6.53	6.77	6.55	6.88	6.90	6.90	6.83	6.74	6.74	6.90	6.90	6.71	6.86	6.96	6.92	6.38
Q3 (75%)	7.07	7.17	7.24	7.23	7.33	6.96	7.16	7.11	7.20	7.25	7.25	7.25	7.11	7.20	7.27	7.34	7.14	7.30	7.40	7.36	7.02

Figure 5.5

pH Box Plots

Monthly Instream Monitoring

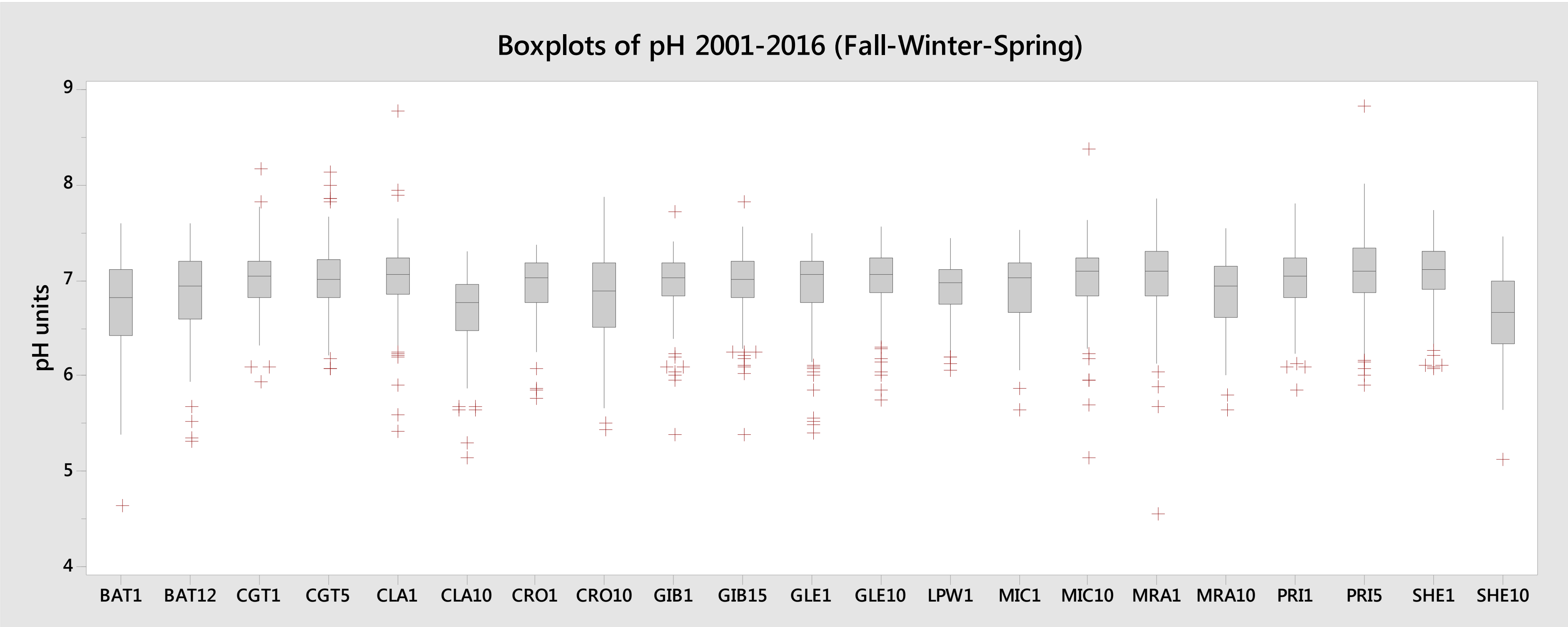


	BAT1	BAT12	CGT1	CGT5	CLA1	CLA10	CRO1	CRO10	GIB1	GIB15	GLE1	GLE10	LPW1	MIC1	MIC10	MRA1	MRA10	PRI1	PRI5	SHE1	SHE10
N	58	59	57	32	59	59	59	58	58	56	57	47	18	59	58	58	59	59	59	59	59
median	6.81	6.96	7.11	7.10	7.21	6.87	6.98	6.82	7.08	7.17	7.16	7.11	6.87	7.04	7.14	7.25	6.97	7.17	7.22	7.21	6.74
mean	6.76	6.87	7.16	7.06	7.14	6.76	6.90	6.74	7.05	7.16	7.10	6.95	6.80	6.98	7.11	7.20	6.91	7.11	7.23	7.17	6.81
90th percentile	7.10	7.21	7.62	7.56	7.47	7.03	7.17	7.06	7.30	7.47	7.39	7.34	7.04	7.32	7.55	7.60	7.35	7.47	7.61	7.61	7.42
min	5.07	5.08	5.49	5.4	6.3	5.8	5.53	5.33	6.4	6.45	6.3	6.01	5.98	5.11	5.13	6.2	5.1	6.18	6.46	6.3	6.03
max	7.22	7.4	8.17	8.14	8.08	7.33	7.29	7.22	7.68	7.94	7.68	7.6	7.11	7.57	8.17	7.92	7.81	7.63	7.81	7.74	8.37
Q1 (25%)	6.64	6.72	7.02	6.95	6.93	6.60	6.77	6.57	6.90	7.01	6.95	6.63	6.69	6.84	6.94	7.06	6.76	6.97	7.06	6.96	6.46
Q3 (75%)	7.00	7.11	7.36	7.30	7.39	6.96	7.10	6.98	7.22	7.32	7.29	7.26	6.94	7.22	7.35	7.40	7.11	7.31	7.48	7.46	7.06

Figure 5.5

pH Box Plots

Monthly Instream Monitoring

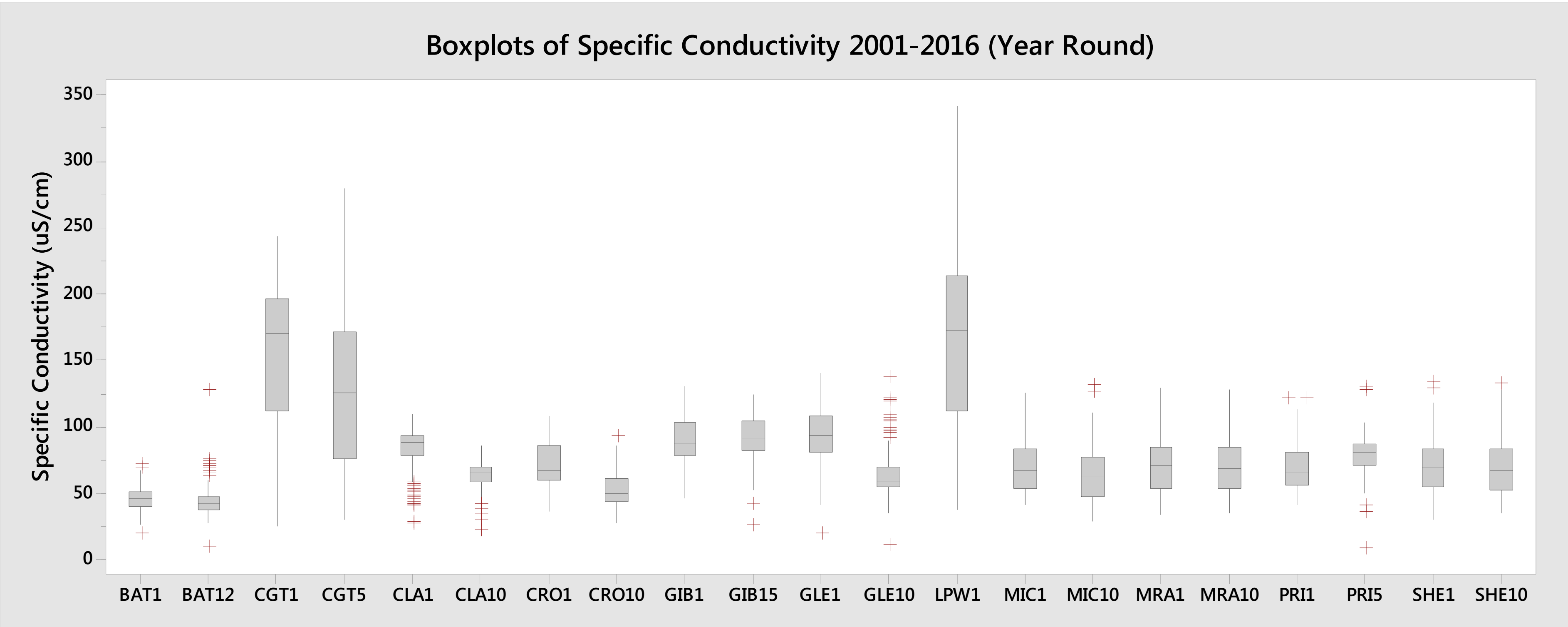


	BAT1	BAT12	CGT1	CGT5	CLA1	CLA10	CRO1	CRO10	GIB1	GIB15	GLE1	GLE10	LPW1	MIC1	MIC10	MRA1	MRA10	PRI1	PRI5	SHE1	SHE10
N	119	119	118	115	119	119	119	119	119	119	118	116	107	117	119	118	118	107	119	119	118
median	6.83	6.95	7.045	7.02	7.07	6.78	7.03	6.9	7.04	7.02	7.08	7.07	6.98	7.03	7.10	7.10	6.95	7.05	7.11	7.12	6.675
mean	6.76	6.85	7.01	7.03	7.03	6.68	6.93	6.82	6.95	6.96	6.94	7.01	6.91	6.94	7.01	7.02	6.87	7.02	7.09	7.07	6.65
90th percentile	7.25	7.31	7.35	7.50	7.44	7.07	7.26	7.28	7.30	7.30	7.37	7.36	7.24	7.32	7.38	7.52	7.24	7.48	7.54	7.52	7.21
min	4.64	5.32	5.94	6.07	5.42	5.14	5.76	5.43	5.38	5.39	5.41	5.75	6.06	5.65	5.15	4.55	5.65	5.85	5.9	6.08	5.12
max	7.6	7.6	8.17	8.13	8.78	7.32	7.38	7.88	7.72	7.83	7.5	7.58	7.45	7.53	8.38	7.86	7.55	7.81	8.82	7.74	7.46
Q1 (25%)	6.43	6.61	6.83	6.83	6.88	6.50	6.78	6.53	6.85	6.84	6.78	6.88	6.76	6.69	6.87	6.86	6.62	6.82	6.88	6.92	6.35
Q3 (75%)	7.12	7.21	7.21	7.22	7.25	6.96	7.19	7.18	7.18	7.21	7.20	7.24	7.13	7.20	7.24	7.31	7.15	7.25	7.35	7.31	7.01

Figure 5.6

Specific Conductivity Box Plots

Monthly Instream Monitoring

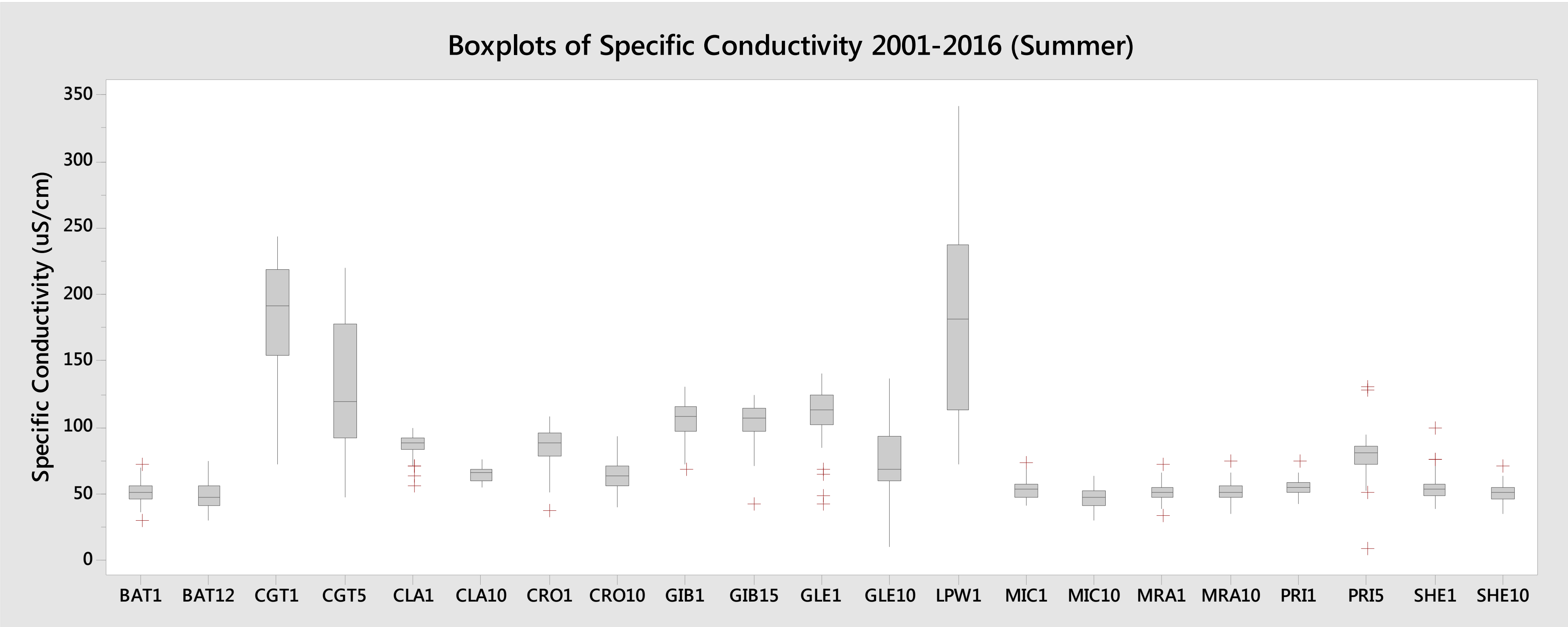


	BAT1	BAT12	CGT1	CGT5	CLA1	CLA10	CRO1	CRO10	GIB1	GIB15	GLE1	GLE10	LPW1	MIC1	MIC10	MRA1	MRA10	PRI1	PRI5	SHE1	SHE10
N	179	179	178	147	177	178	179	178	177	175	175	164	127	177	178	176	177	166	177	177	177
median	46.40	42.40	170.35	125.50	88.80	66.30	68.40	50.05	87.50	91.70	93.20	59.25	172.80	67.80	63.20	71.15	69.50	66.65	81.30	70.60	67.80
mean	46.95	44.60	155.96	126.21	83.72	63.95	72.51	53.11	90.70	93.11	94.54	64.03	166.11	70.23	64.53	71.28	70.90	69.97	79.09	70.94	69.56
90th percentile	57.02	57.60	222.72	190.68	96.72	73.69	96.44	72.46	116.50	116.36	123.96	85.09	236.94	92.84	90.33	95.65	94.08	91.90	92.28	92.50	92.58
min	20.6	10.2	25.7	30.6	27.5	22.1	37.3	28	47	26.5	20.3	11.4	38.4	42.1	30	34	36	42	9.1	30.3	35.9
max	72.1	128	244	279	109.3	86.4	108.8	93.3	131	125	140.6	137.2	342	125.8	131.7	129.1	129	121.6	130.1	134.1	133.3
Q1 (25%)	41.15	38.35	113.58	78.80	79.60	59.48	60.40	44.23	79.10	83.40	82.70	55.88	113.00	54.60	48.50	54.38	54.40	56.40	71.10	55.00	53.30
Q3 (75%)	51.90	47.90	197.15	171.50	93.30	70.20	86.40	61.23	103.00	104.90	108.95	69.70	213.05	84.30	77.58	85.33	85.20	81.58	88.00	83.90	83.40

Figure 5.6

Specific Conductivity Box Plots

Monthly Instream Monitoring

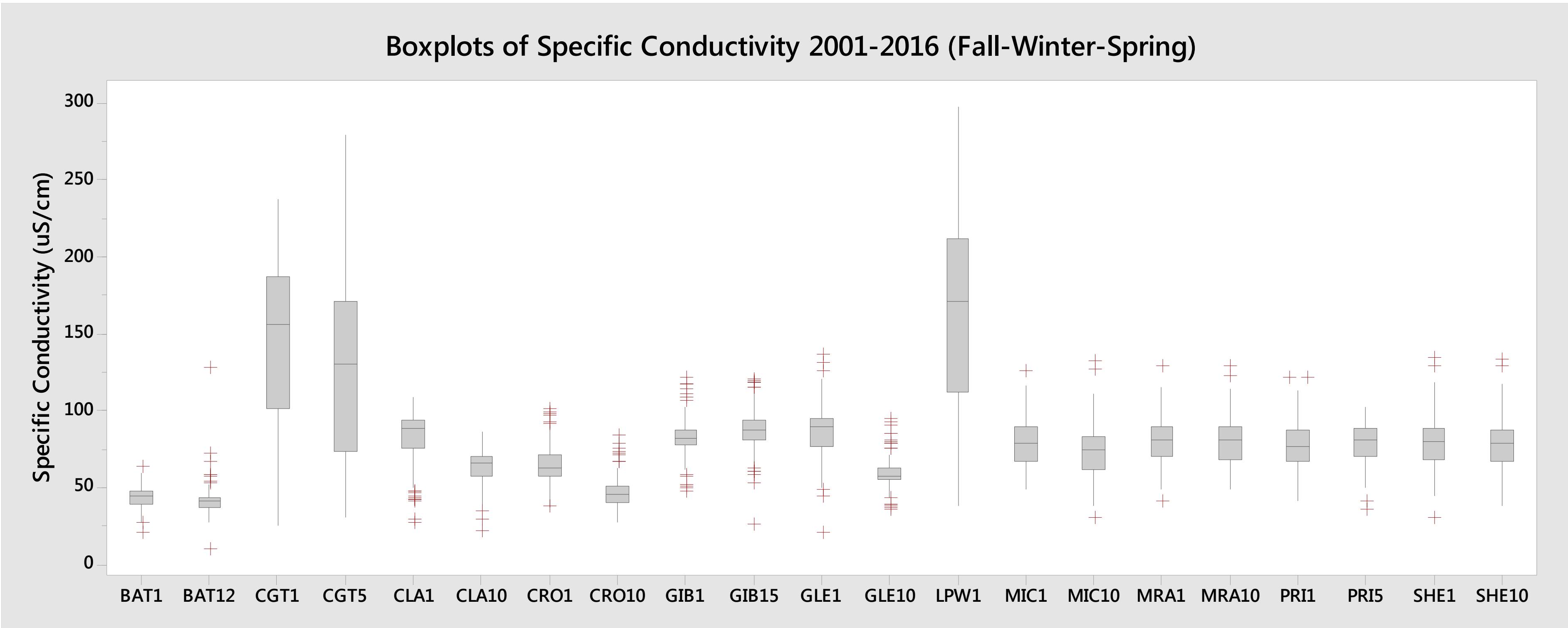


	BAT1	BAT12	CGT1	CGT5	CLA1	CLA10	CRO1	CRO10	GIB1	GIB15	GLE1	GLE10	LPW1	MIC1	MIC10	MRA1	MRA10	PRI1	PRI5	SHE1	SHE10
N	60	60	59	32	59	59	60	59	59	57	58	48	19	60	60	59	59	59	59	59	59
median	51.6	48.45	191.10	119.40	89.40	66.50	89.20	64.60	108.40	107.70	114.05	69.05	181.80	53.60	47.50	51.70	52.20	55.50	80.80	54.30	52.00
mean	52.25	50.10	182.11	129.74	87.20	65.08	86.55	64.17	106.08	104.41	110.82	75.41	185.39	53.73	47.61	52.31	52.66	55.50	79.76	55.21	51.35
90th percentile	64.11	63.73	231.20	211.58	94.12	70.86	103.15	79.20	122.06	120.68	131.55	107.38	292.16	62.36	56.58	61.08	61.44	63.22	92.04	68.38	59.60
min	30.1	30.7	72.6	47.8	56.2	54.8	37.3	40.5	68	42	42	11.4	72.8	42.1	30.5	34	36	43	9.1	39.4	35.9
max	72.1	75.6	244	220	99.9	76.2	108.8	93.3	131	125	140.6	137.2	342	73.4	63.8	71.7	74.5	74.4	130.1	99.5	71
Q1 (25%)	46.78	42.10	155.65	95.80	84.80	60.85	78.68	56.60	97.45	97.20	103.73	60.08	116.55	48.40	42.08	48.20	48.35	51.20	72.75	48.95	47.30
Q3 (75%)	56.03	57.00	218.90	174.30	91.90	68.80	96.38	71.40	116.40	115.20	124.05	92.38	230.80	58.23	52.63	55.30	56.65	59.65	86.30	57.90	55.65

Figure 5.6

Specific Conductivity Box Plots

Monthly Instream Monitoring

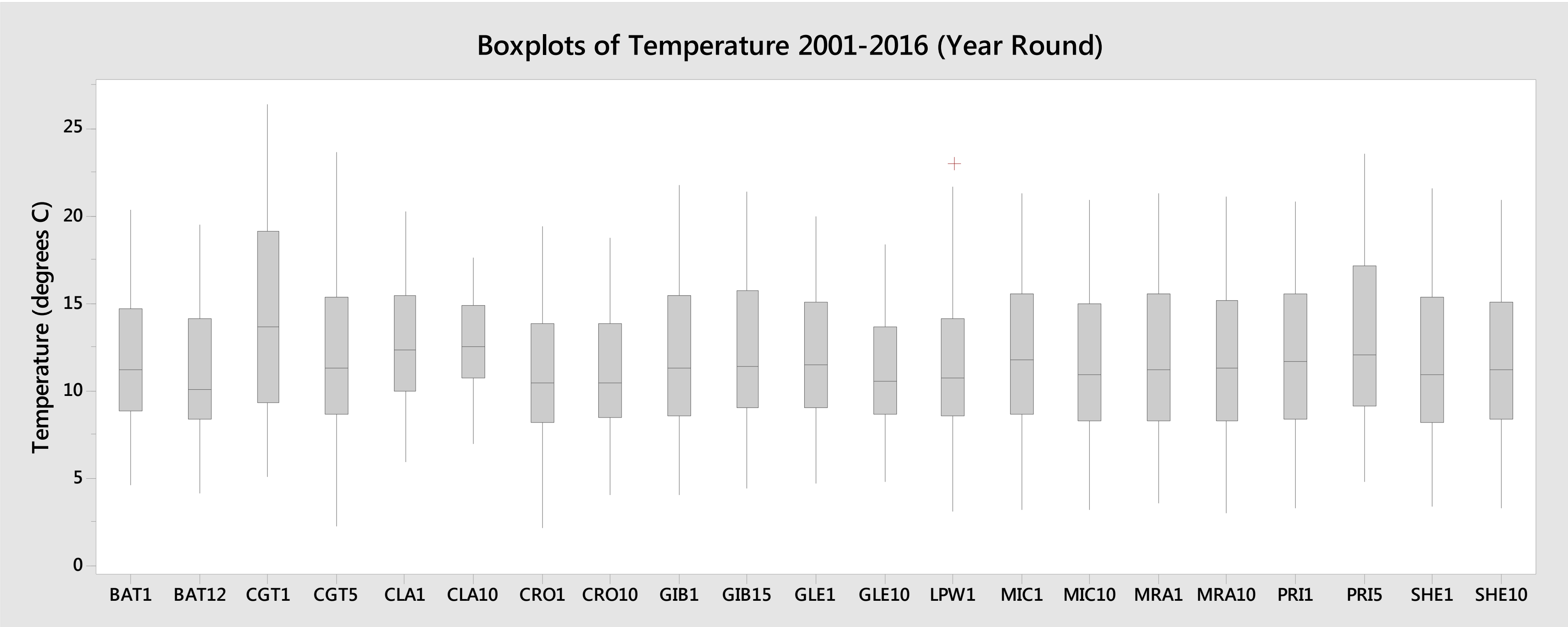


	BAT1	BAT12	CGT1	CGT5	CLA1	CLA10	CRO1	CRO10	GIB1	GIB15	GLE1	GLE10	LPW1	MIC1	MIC10	MRA1	MRA10	PRI1	PRI5	SHE1	SHE10
N	119	119	119	115	118	119	119	119	118	118	117	116	108	117	118	117	118	107	118	118	118
median	44.9	41.5	156.1	130.8	88.4	65.9	62.9	46.1	82.3	87.80	89.80	57.20	171.20	79.40	74.55	81.20	81.55	76.9	81.45	79.8	79.25
mean	44.28	41.82	143.00	125.23	81.98	63.39	65.42	47.63	83.01	87.65	86.47	59.32	162.72	78.69	73.13	80.85	80.01	77.95	78.75	78.80	78.66
90th percentile	54.04	48.02	203.84	186.44	97.60	74.66	86.32	60.58	100.12	105.70	106.46	75.60	230.00	97.00	93.21	100.70	98.84	95.88	92.56	98.51	100.18
min	20.6	10.2	25.7	30.6	27.5	22.1	37.4	28	47	26.5	20.3	36	38.4	49	30	41.1	48.7	42	35.9	30.3	38.1
max	64	128	238	279	109.3	86.4	101.5	84.2	121.1	120.4	135.9	95.1	297.8	125.8	131.7	129.1	129	121.6	103.1	134.1	133.3
Q1 (25%)	40.05	37.15	101.75	73.55	76.03	57.80	57.85	40.85	77.60	81.70	77.00	55.28	112.33	67.80	62.90	71.10	68.90	67.00	70.93	68.28	67.65
Q3 (75%)	48.05	43.50	186.50	171.00	93.85	70.95	70.75	50.95	87.85	93.75	95.10	62.70	211.35	89.60	83.80	89.40	89.50	87.20	88.55	88.70	87.58

Figure 5.7

Temperature Box Plots

Monthly Instream Monitoring

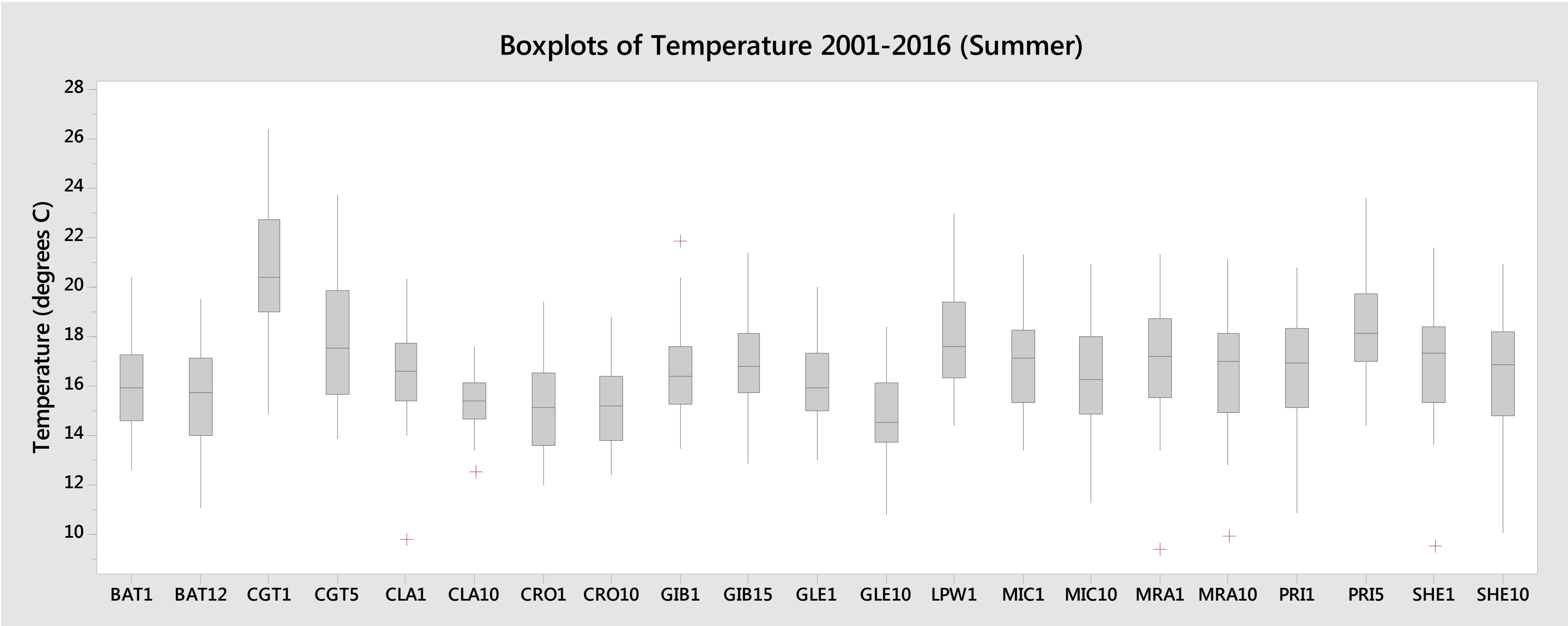


	BAT1	BAT12	CGT1	CGT5	CLA1	CLA10	CRO1	CRO10	GIB1	GIB15	GLE1	GLE10	LPW1	MIC1	MIC10	MRA1	MRA10	PRI1	PRI5	SHE1	SHE10
N	179	179	178	147	177	179	179	178	176	175	175	163	127	177	178	176	178	167	177	177	178
median	11.20	10.10	13.65	11.30	12.40	12.60	10.50	10.45	11.35	11.40	11.50	10.60	10.80	11.80	11.00	11.25	11.30	11.70	12.10	11.00	11.20
mean	11.79	11.19	14.32	11.89	12.71	12.79	10.96	11.06	11.95	12.16	11.93	11.02	11.36	12.11	11.71	12.01	11.74	12.19	13.01	11.89	11.74
90th percentile	16.78	16.66	22.19	18.00	17.60	15.90	16.12	16.03	17.10	17.86	17.20	15.24	16.80	18.00	17.23	18.00	17.80	18.04	19.34	17.94	17.70
min	4.6	4.2	5.1	2.3	6	7	2.2	4.1	4.1	4.5	4.7	4.8	3.1	3.2	3.2	3.6	3	3.3	4.8	3.4	3.3
max	20.4	19.5	26.4	23.7	20.3	17.6	19.4	18.8	21.8	21.4	20	18.4	23	21.3	20.9	21.3	21.1	20.8	23.6	21.6	20.9
Q1 (25%)	8.90	8.40	9.40	8.75	10.00	10.85	8.30	8.50	8.60	9.10	9.15	8.75	8.60	8.70	8.30	8.30	8.30	8.40	9.20	8.30	8.40
Q3 (75%)	14.65	14.05	19.08	15.40	15.50	14.85	13.85	13.88	15.43	15.80	15.10	13.65	14.10	15.50	15.00	15.60	15.20	15.50	17.20	15.30	15.08

Figure 5.7

Temperature Box Plots

Monthly Instream Monitoring

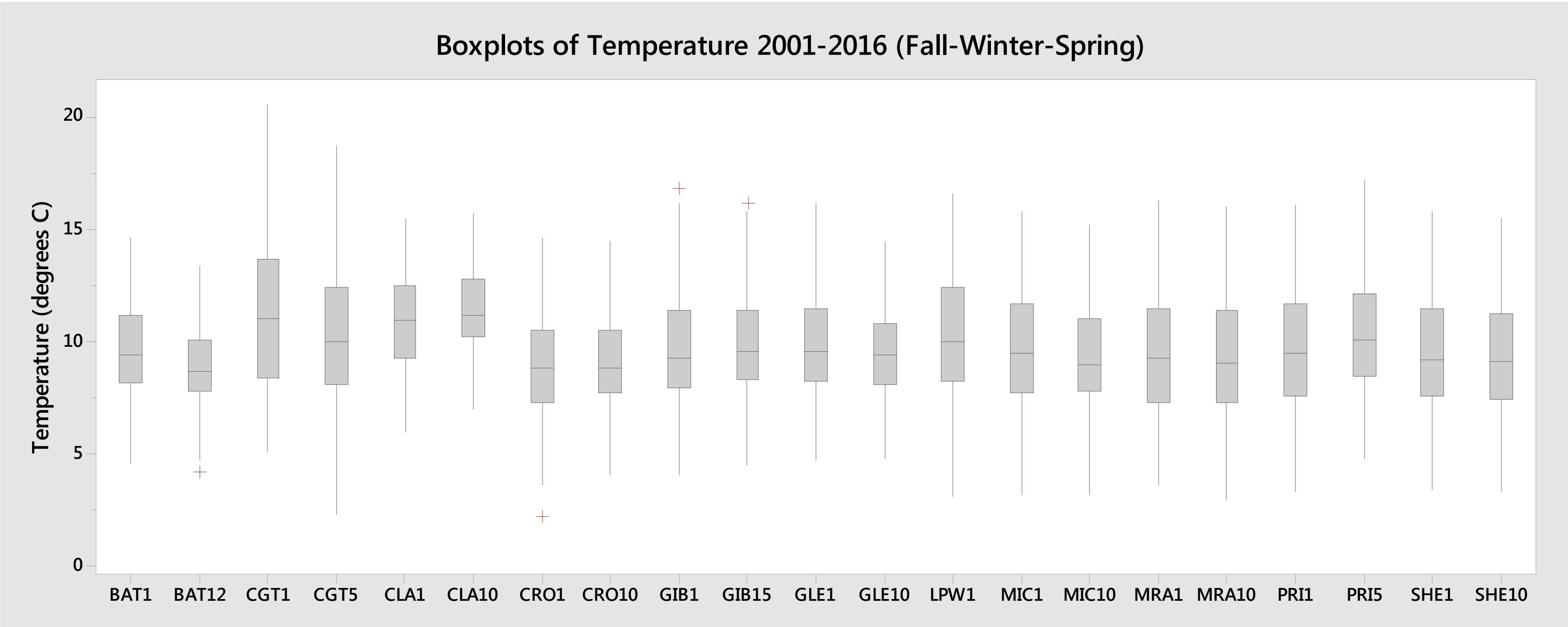


	BAT1	BAT12	CGT1	CGT5	CLA1	CLA10	CRO1	CRO10	GIB1	GIB15	GLE1	GLE10	LPW1	MIC1	MIC10	MRA1	MRA10	PRI1	PRI5	SHE1	SHE10
N	60	60	59	32	59	60	60	59	58	57	58	48	19	60	60	59	60	60	59	59	60
median	15.95	15.70	20.40	17.55	16.60	15.40	15.15	15.20	16.40	16.80	15.95	14.55	17.60	17.15	16.25	17.20	17.00	16.90	18.10	17.30	16.85
mean	16.14	15.57	20.55	17.90	16.51	15.32	15.17	15.16	16.61	16.85	16.03	14.73	17.99	16.92	16.36	17.03	16.62	16.79	18.20	16.92	16.48
90th percentile	19.11	17.93	23.42	21.29	18.44	16.61	17.70	17.32	19.10	19.28	17.90	16.79	21.06	19.53	19.36	19.62	19.30	19.33	20.16	19.34	19.11
min	12.6	11.1	14.9	13.9	9.8	12.5	12	12.4	13.5	12.9	13	10.8	14.4	13.4	11.3	9.4	9.9	10.9	14.4	9.5	10.1
max	20.4	19.5	26.4	23.7	20.3	17.6	19.4	18.8	21.8	21.4	20	18.4	23	21.3	20.9	21.3	21.1	20.8	23.6	21.6	20.9
Q1 (25%)	14.68	14.13	19.00	15.83	15.45	14.70	13.68	13.85	15.33	15.80	15.10	13.78	16.35	15.30	14.95	15.55	14.98	15.18	17.10	15.30	14.93
Q3 (75%)	17.23	17.05	22.70	19.35	17.70	16.10	16.50	16.35	17.43	18.00	17.30	16.10	19.30	18.15	17.93	18.55	17.98	18.18	19.60	18.35	18.08

Figure 5.7

Temperature Box Plots

Monthly Instream Monitoring

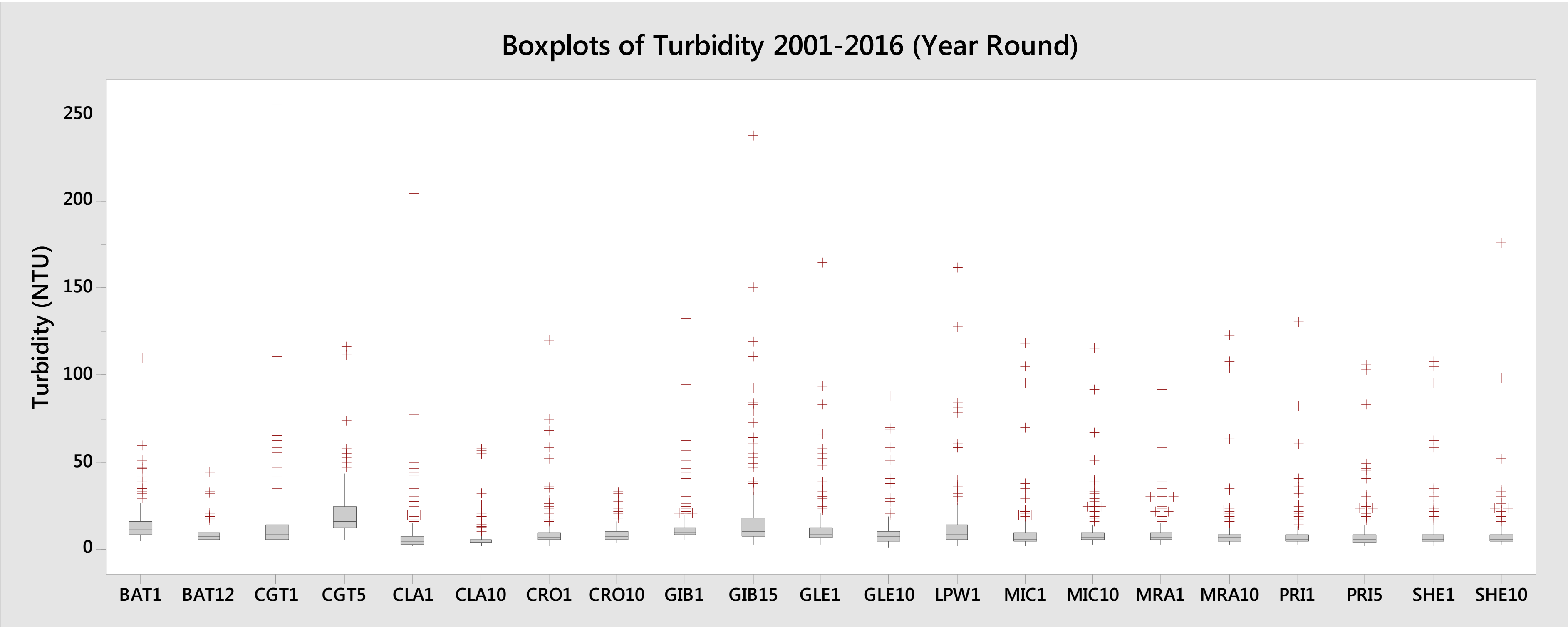


	BAT1	BAT12	CGT1	CGT5	CLA1	CLA10	CRO1	CRO10	GIB1	GIB15	GLE1	GLE10	LPW1	MIC1	MIC10	MRA1	MRA10	PRI1	PRI5	SHE1	SHE10
N	119	119	119	115	118	119	119	119	118	118	117	115	108	117	118	117	118	107	118	118	118
median	9.4	8.7	11	10	10.95	11.2	8.8	8.8	9.3	9.60	9.60	9.40	10.00	9.50	9.00	9.30	9.05	9.5	10.05	9.2	9.15
mean	9.61	8.98	11.23	10.22	10.81	11.51	8.84	9.02	9.66	9.89	9.89	9.47	10.19	9.65	9.35	9.47	9.26	9.62	10.41	9.37	9.32
90th percentile	12.70	11.90	16.70	14.92	13.80	13.62	11.52	12.06	13.39	13.59	13.28	12.04	14.48	13.72	13.36	13.82	13.50	13.78	14.39	13.36	13.33
min	4.6	4.2	5.1	2.3	6	7	2.2	4.1	4.1	4.5	4.7	4.8	3.1	3.2	3.2	3.6	3	3.3	4.8	3.4	3.3
max	14.6	13.4	20.6	18.7	15.5	15.7	14.6	14.5	16.8	16.1	16.2	14.5	16.6	15.8	15.2	16.3	16	16.1	17.2	15.8	15.5
Q1 (25%)	8.25	7.85	8.45	8.15	9.33	10.25	7.40	7.75	8.00	8.33	8.30	8.10	8.28	7.80	7.80	7.30	7.33	7.80	8.50	7.63	7.55
Q3 (75%)	11.15	10.10	13.65	12.40	12.48	12.70	10.40	10.45	11.38	11.40	11.50	10.80	12.40	11.60	10.98	11.40	11.35	11.70	12.08	11.30	11.20

Figure 5.8

Turbidity Box Plots

Monthly Instream Monitoring

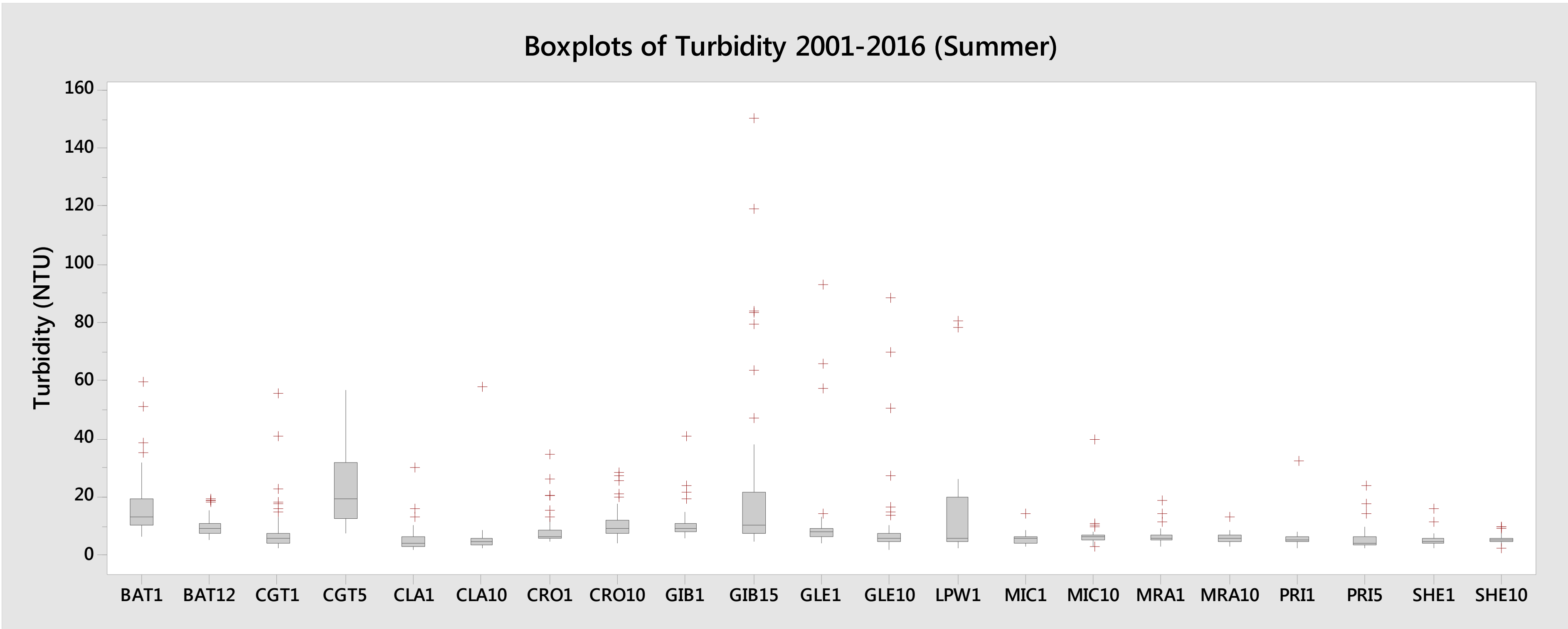


	BAT1	BAT12	CGT1	CGT5	CLA1	CLA10	CRO1	CRO10	GIB1	GIB15	GLE1	GLE10	LPW1	MIC1	MIC10	MRA1	MRA10	PRI1	PRI5	SHE1	SHE10
N	179	179	179	146	178	179	179	178	178	174	176	163	124	177	179	178	178	167	179	179	178
median	11.60	7.50	8.10	16.00	4.80	4.10	6.80	7.74	9.30	9.99	8.15	7.20	8.88	6.10	6.80	6.85	6.40	6.02	5.70	5.90	6.14
mean	14.53	8.60	13.86	21.00	9.64	6.34	10.34	9.26	13.69	18.86	13.11	10.54	15.68	10.08	10.47	10.37	10.08	9.52	9.75	9.99	10.25
90th percentile	24.12	13.32	22.72	36.80	19.00	11.54	15.92	14.93	22.69	36.52	23.00	19.40	30.90	16.80	19.34	17.36	16.68	16.62	19.02	18.46	18.73
min	4.55	2.94	2.4	6	1.7	1.9	2.2	3.55	5.29	3.3	3.08	0.6	2.2	2.3	2.71	2.4	2.7	2.5	2	1.9	2.42
max	109	44.4	255	116	204	57.6	120	32.4	132	237	164	88	161	118	115	101	123	130	106	107	176
Q1 (25%)	8.46	5.40	5.35	12.10	3.10	3.40	5.60	6.12	8.17	7.30	6.20	4.90	5.48	4.60	5.50	5.30	5.10	4.85	4.00	4.55	5.00
Q3 (75%)	16.15	9.87	14.15	24.30	7.88	5.94	9.45	10.58	12.60	17.58	12.13	10.60	14.33	9.70	9.40	9.35	8.80	8.20	8.88	8.98	8.78

Figure 5.8

Turbidity Box Plots

Monthly Instream Monitoring

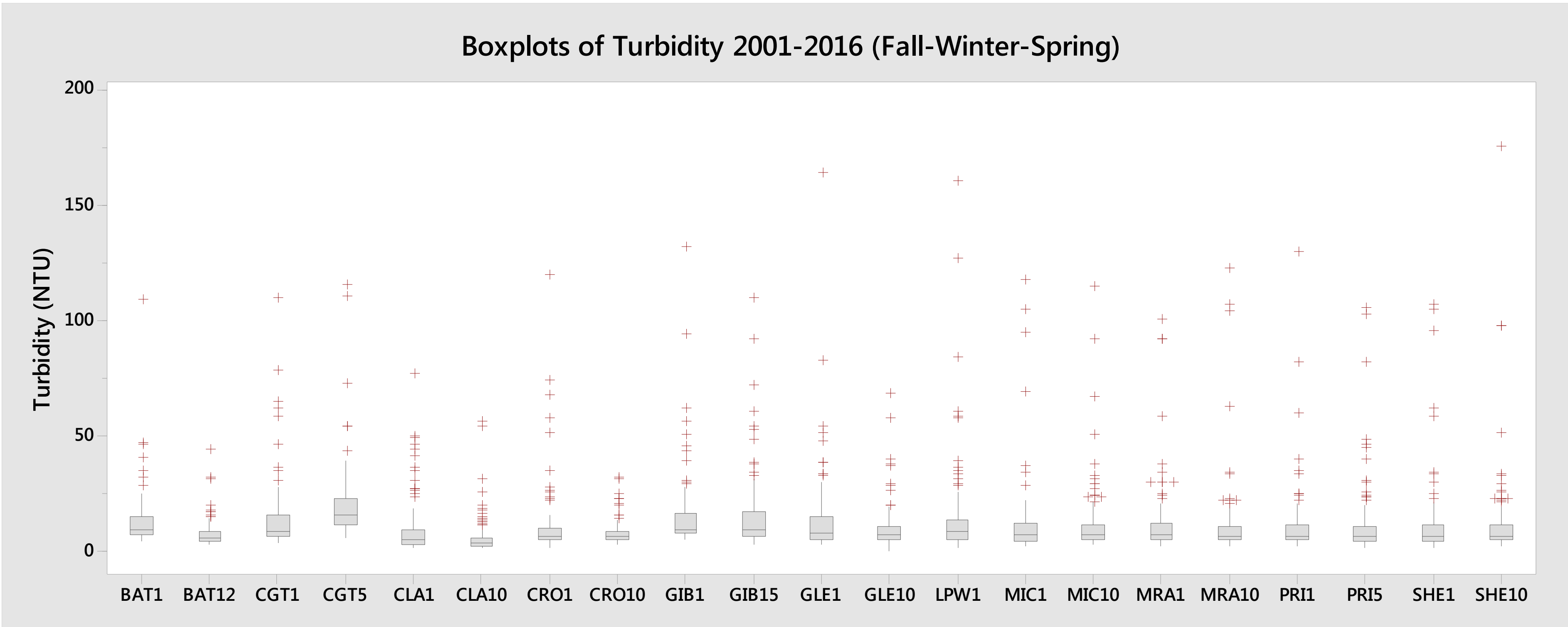


	BAT1	BAT12	CGT1	CGT5	CLA1	CLA10	CRO1	CRO10	GIB1	GIB15	GLE1	GLE10	LPW1	MIC1	MIC10	MRA1	MRA10	PRI1	PRI5	SHE1	SHE10
N	60	60	60	31	60	60	60	59	59	56	58	47	17	60	60	60	60	60	60	60	60
median	13.5	9.34	5.78	19.40	4.30	4.73	6.80	9.30	9.10	10.40	8.22	6.24	5.71	5.70	6.50	6.10	5.87	5.40	4.10	4.96	5.40
mean	16.46	9.98	12.34	23.39	8.90	5.85	8.47	10.93	10.58	25.38	11.56	10.89	17.43	5.82	6.97	6.62	5.99	6.00	5.50	5.36	5.62
90th percentile	24.47	13.26	15.87	46.70	9.41	6.81	12.67	16.36	13.56	71.30	12.08	15.28	47.04	8.01	8.22	8.91	8.00	7.80	8.52	7.41	7.11
min	6.72	5.2	2.4	7.4	2.16	2.8	4.7	4	6	4.7	4.5	2.1	2.4	2.97	2.71	3.06	2.98	2.8	2.7	2.4	2.42
max	59.5	19.1	255	57.1	204	57.6	34.7	28.2	40.6	237	93	88	80.6	14	39.4	18.9	12.9	32	23.5	15.7	9.6
Q1 (25%)	10.78	7.98	4.23	13.35	3.40	3.95	6.08	7.80	8.07	7.48	6.60	4.70	4.70	4.58	5.58	5.18	4.89	4.60	3.55	4.17	4.98
Q3 (75%)	18.70	11.10	7.96	29.55	6.45	5.92	8.69	12.10	11.20	22.08	9.40	7.85	15.30	6.50	7.20	7.13	6.83	6.48	6.30	6.04	6.20

Figure 5.8

Turbidity Box Plots

Monthly Instream Monitoring



	BAT1	BAT12	CGT1	CGT5	CLA1	CLA10	CRO1	CRO10	GIB1	GIB15	GLE1	GLE10	LPW1	MIC1	MIC10	MRA1	MRA10	PRI1	PRI5	SHE1	SHE10
N	119	119	119	115	118	119	119	119	119	118	118	116	107	117	119	118	118	107	119	119	118
median	9.9	6.2	9.2	16	5.1	3.87	6.8	6.8	9.4	9.84	8.06	7.90	9.30	7.40	7.40	7.42	7.15	6.8	6.8	7.1	6.875
mean	13.55	7.90	14.63	20.35	10.02	6.58	11.28	8.43	15.23	15.76	13.86	10.39	15.40	12.27	12.24	12.28	12.16	11.50	11.90	12.32	12.60
90th percentile	22.06	13.08	25.64	36.60	26.72	13.42	17.42	13.30	26.76	30.58	29.37	19.55	30.30	21.12	24.26	23.25	19.40	20.62	23.54	21.74	22.63
min	4.55	2.94	3.7	6	1.7	1.9	2.2	3.55	5.29	3.3	3.08	0.6	2.2	2.3	3.1	2.4	2.7	2.5	2	1.9	2.75
max	109	44.4	110	116	77	56.5	120	32.4	132	110	164	68.3	161	118	115	101	123	130	106	107	176
Q1 (25%)	7.82	4.70	7.07	11.85	3.02	2.92	5.50	5.60	8.20	7.16	5.73	5.40	5.75	4.60	5.40	5.30	5.22	5.11	4.50	4.95	5.21
Q3 (75%)	15.40	8.80	16.20	22.90	9.63	5.95	10.30	9.09	16.55	17.33	15.23	11.00	14.05	12.70	11.90	12.10	11.10	11.50	10.75	11.70	11.38

Figure 5.9

Box Plots of Willamette River Parameters - Year Round

Monthly Instream Monitoring

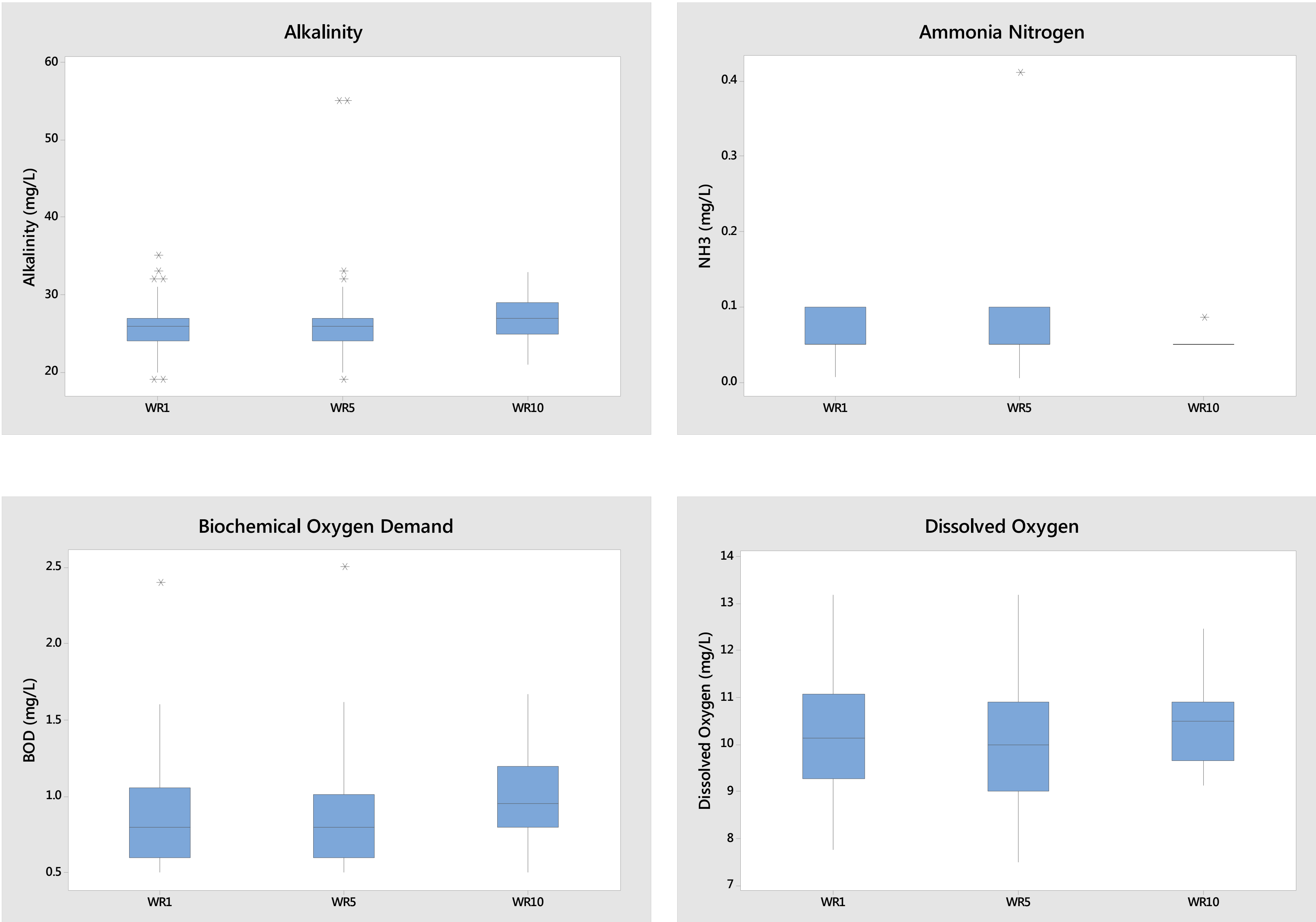


Figure 5.9

Box Plots of Willamette River Parameters - Year Round

Monthly Instream Monitoring

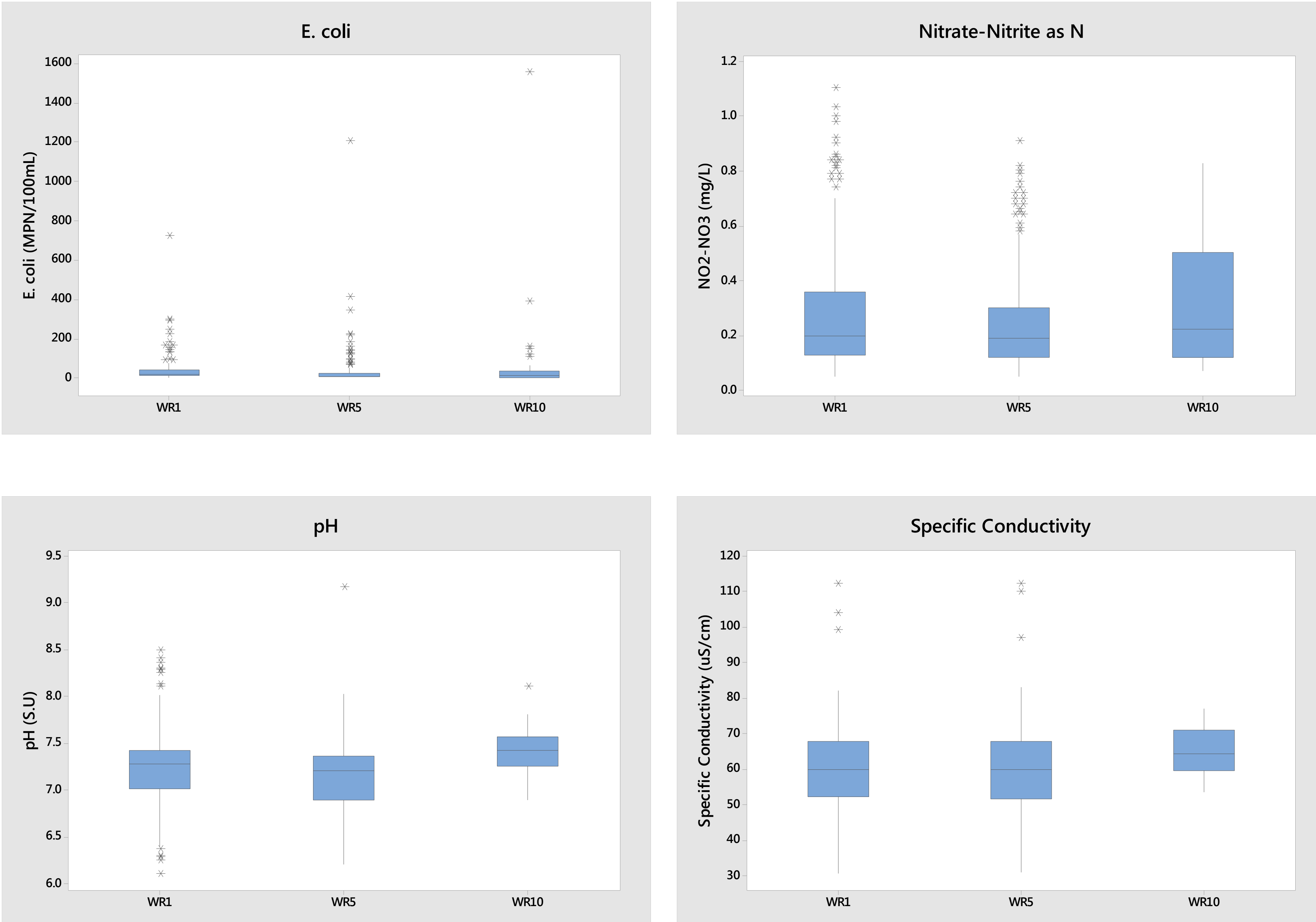


Figure 5.9

Box Plots of Willamette River Parameters - Year Round

Monthly Instream Monitoring

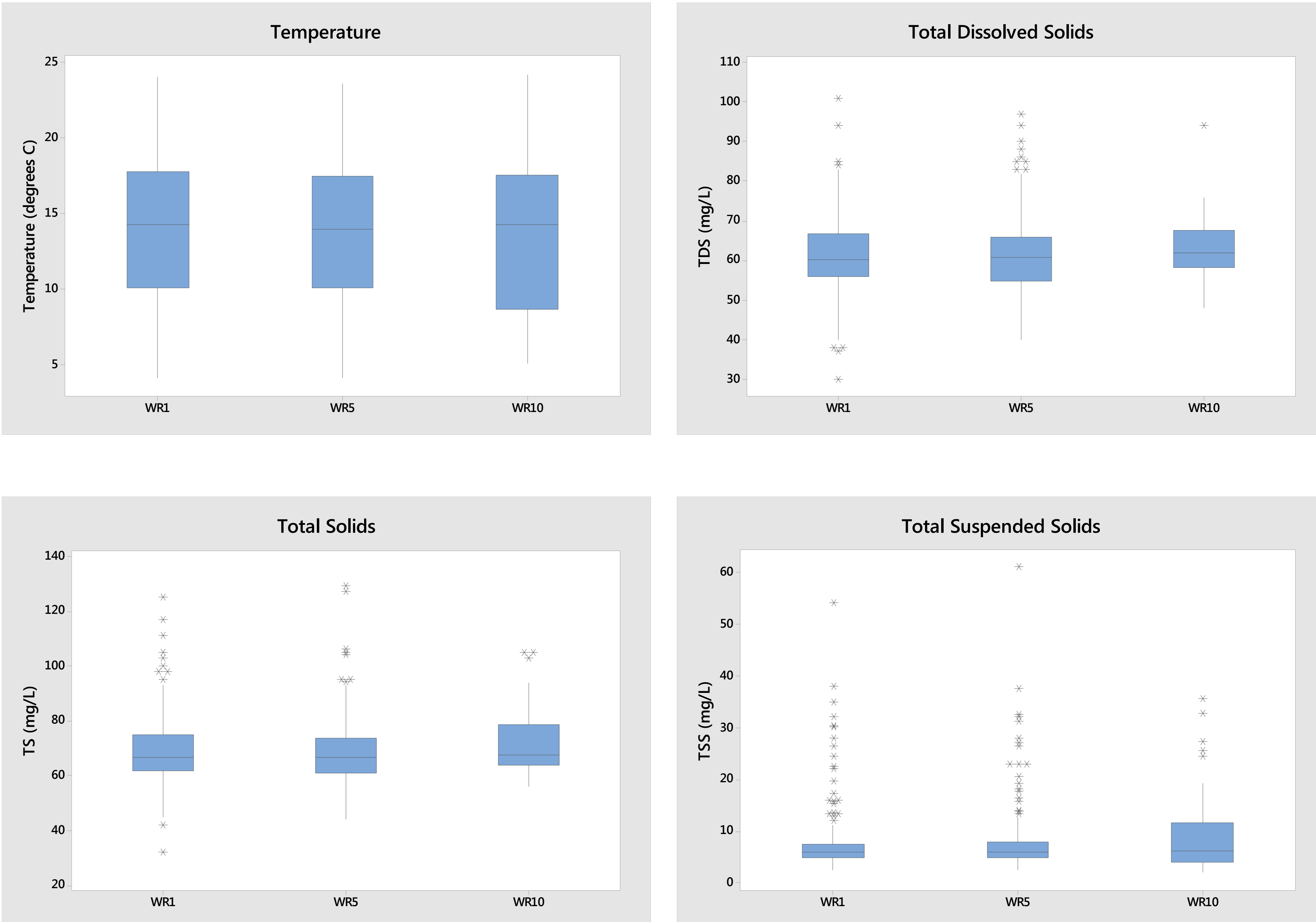
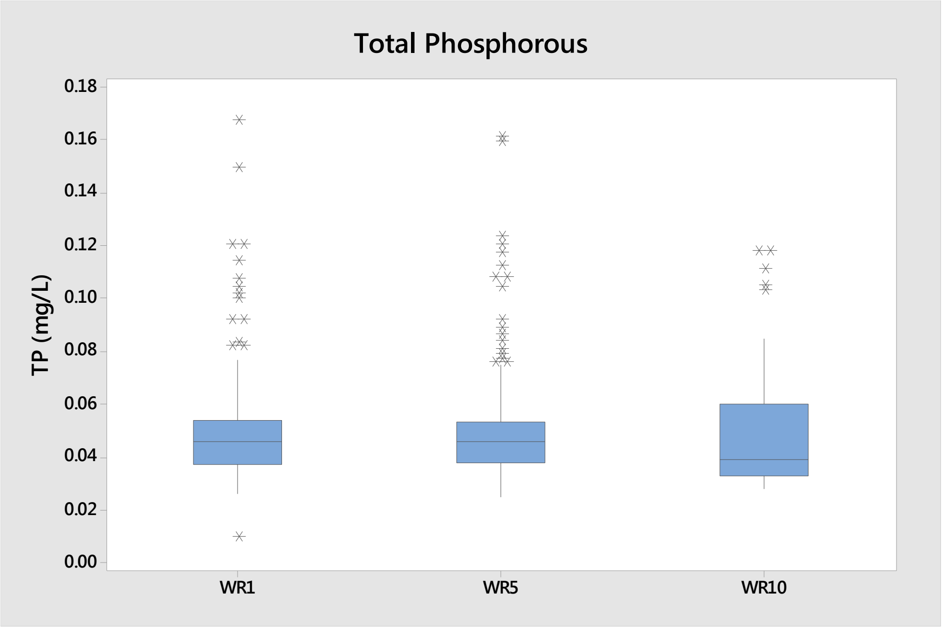


Figure 5.9

Box Plots of Willamette River Parameters - Year Round

Monthly Instream Monitoring



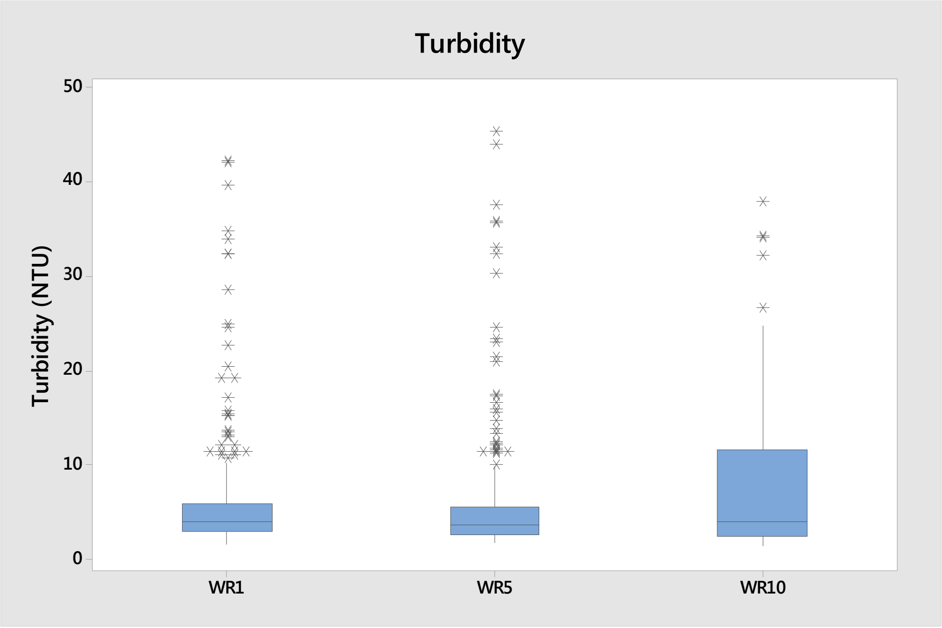


Figure 6.1

Dissolved Oxygen Time Trend Graphs

Continuous Instream Monitoring

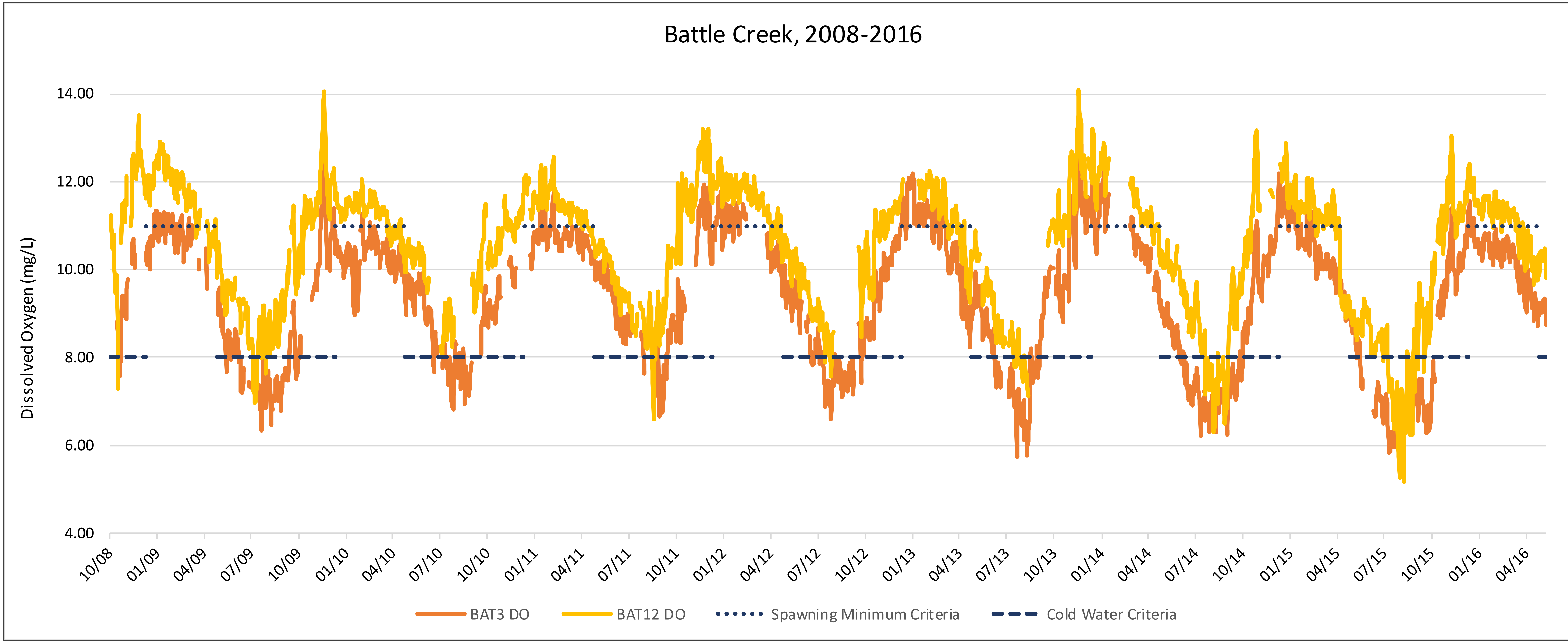


Figure 6.1

Dissolved Oxygen Time Trend Graphs

Continuous Instream Monitoring

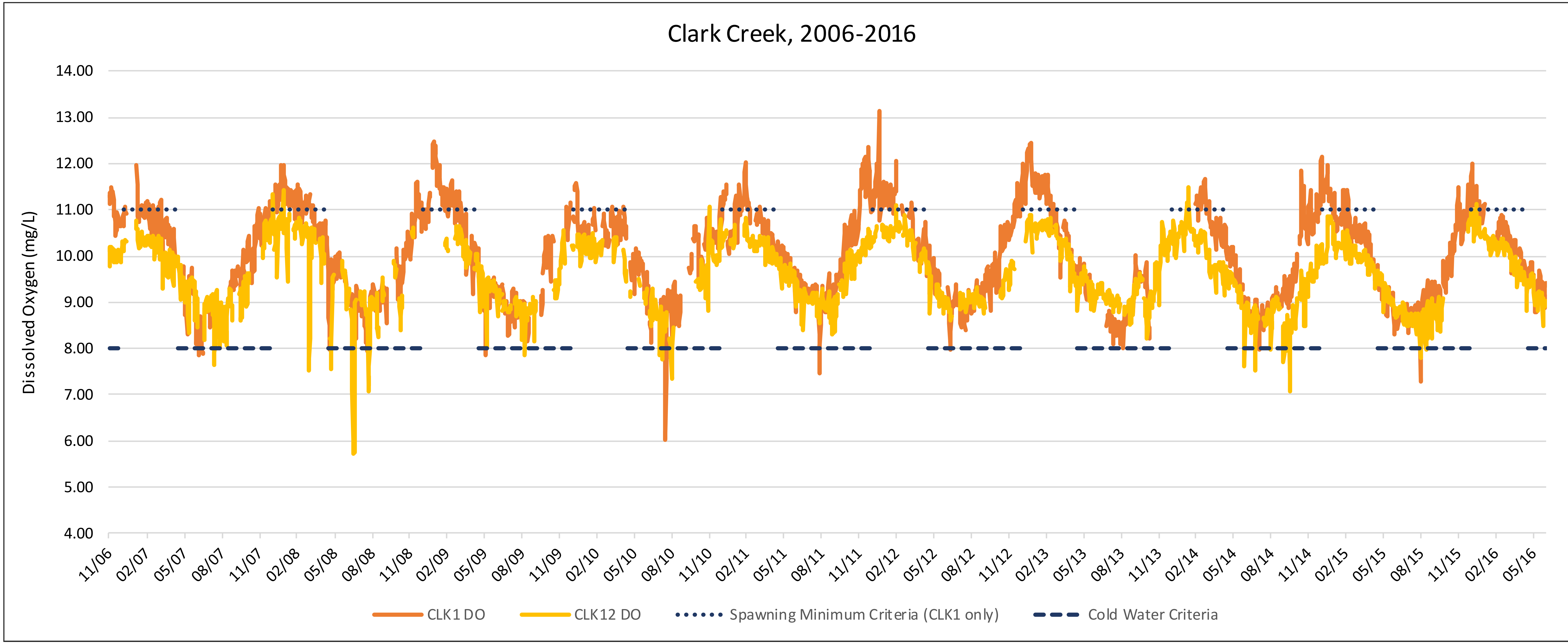


Figure 6.1

Dissolved Oxygen Time Trend Graphs

Continuous Instream Monitoring

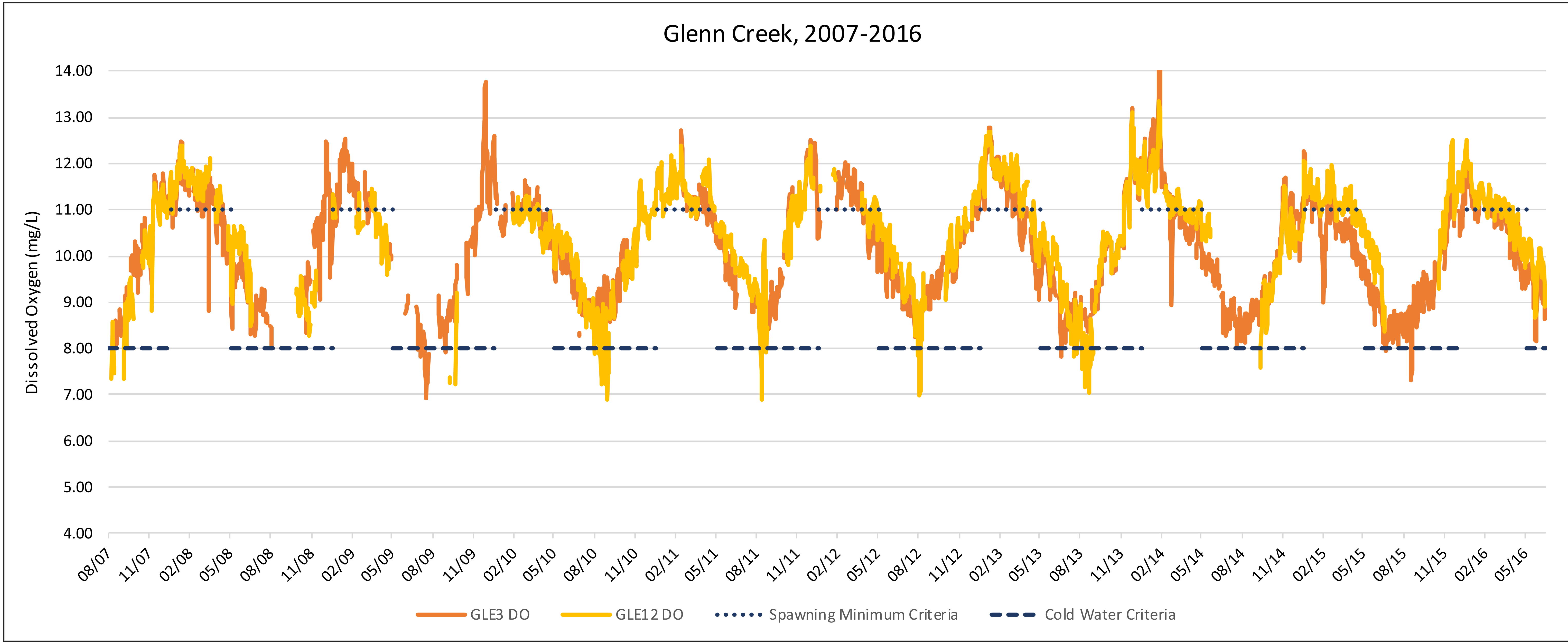


Figure 6.1

Dissolved Oxygen Time Trend Graphs

Continuous Instream Monitoring

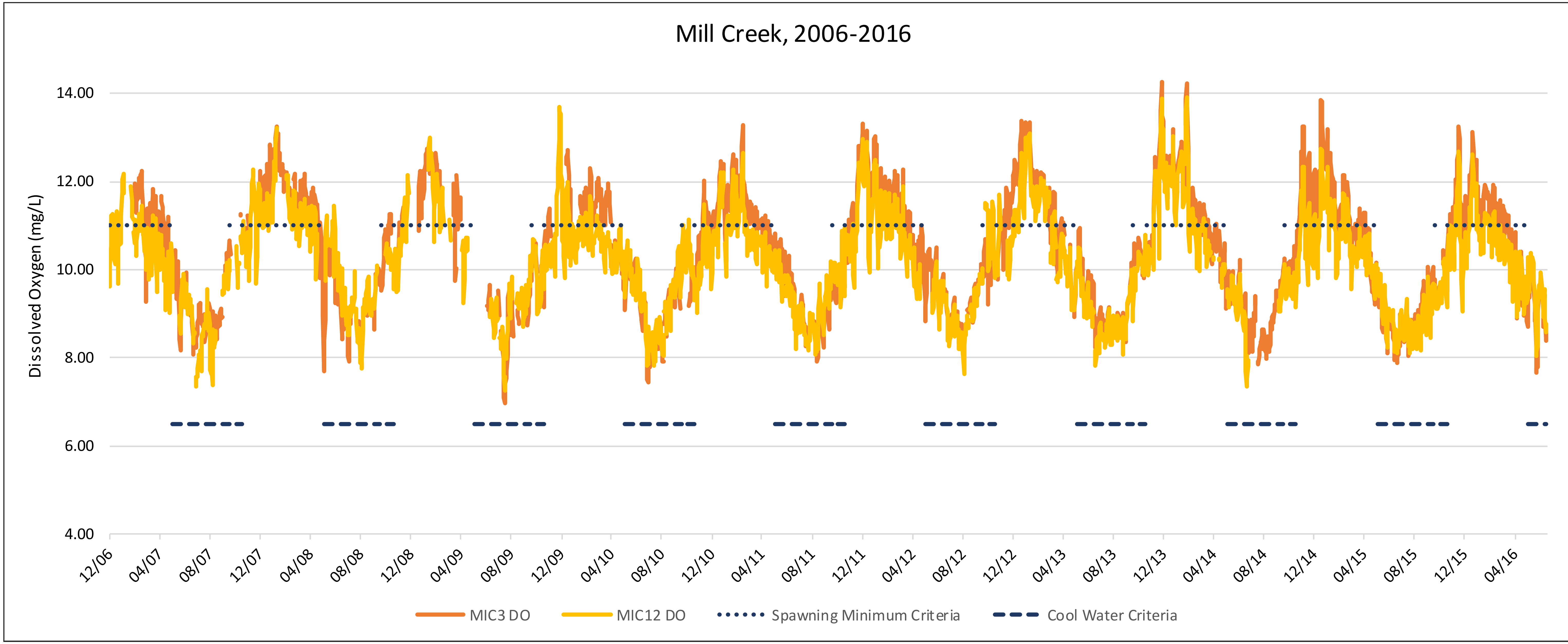


Figure 6.1

Dissolved Oxygen Time Trend Graphs

Continuous Instream Monitoring

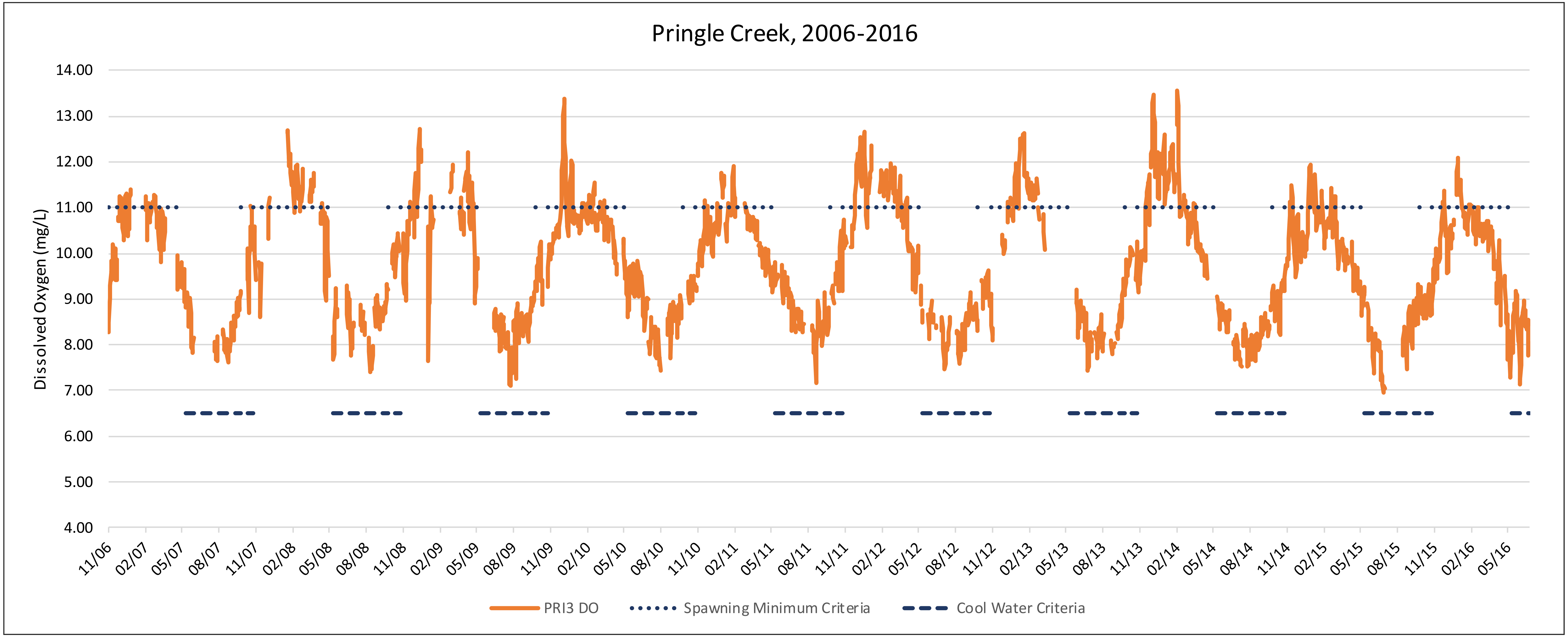


Figure 6.1

Dissolved Oxygen Time Trend Graphs

Continuous Instream Monitoring

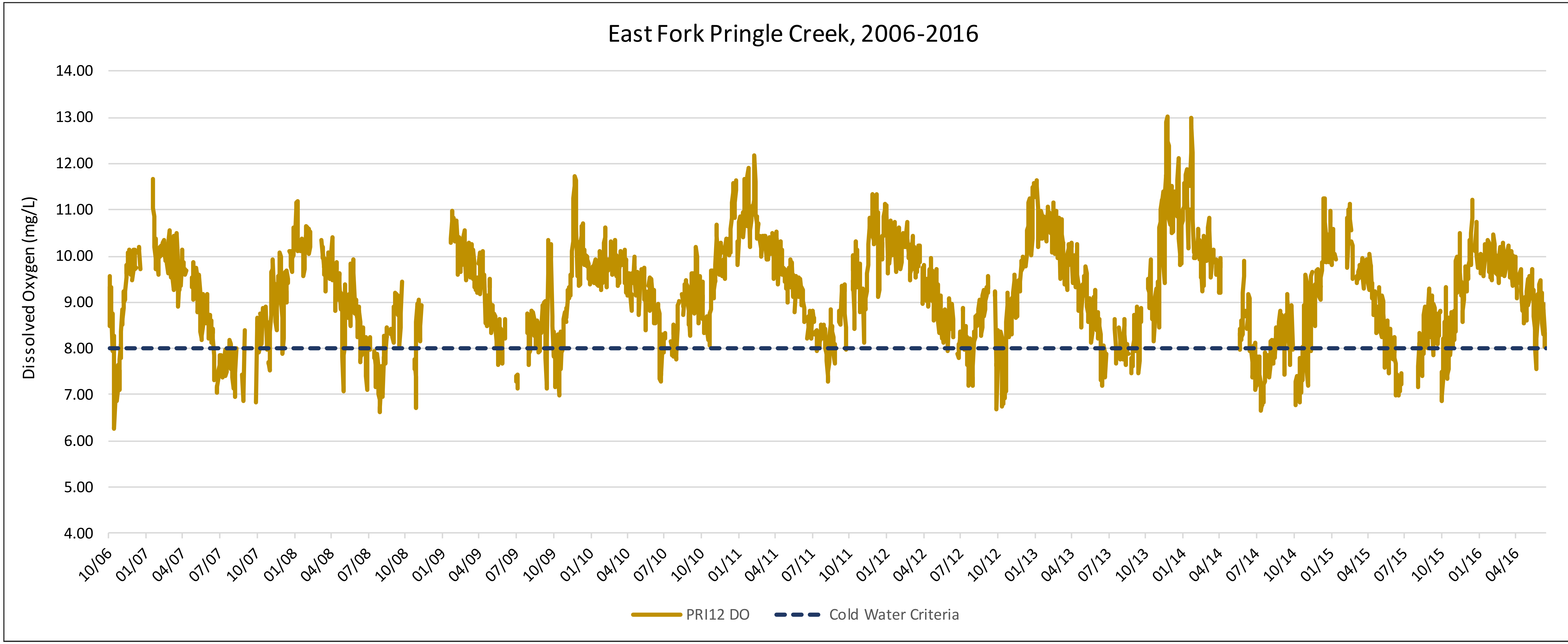


Figure 6.2
pH Time Trend Graphs
Continuous Instream Monitoring

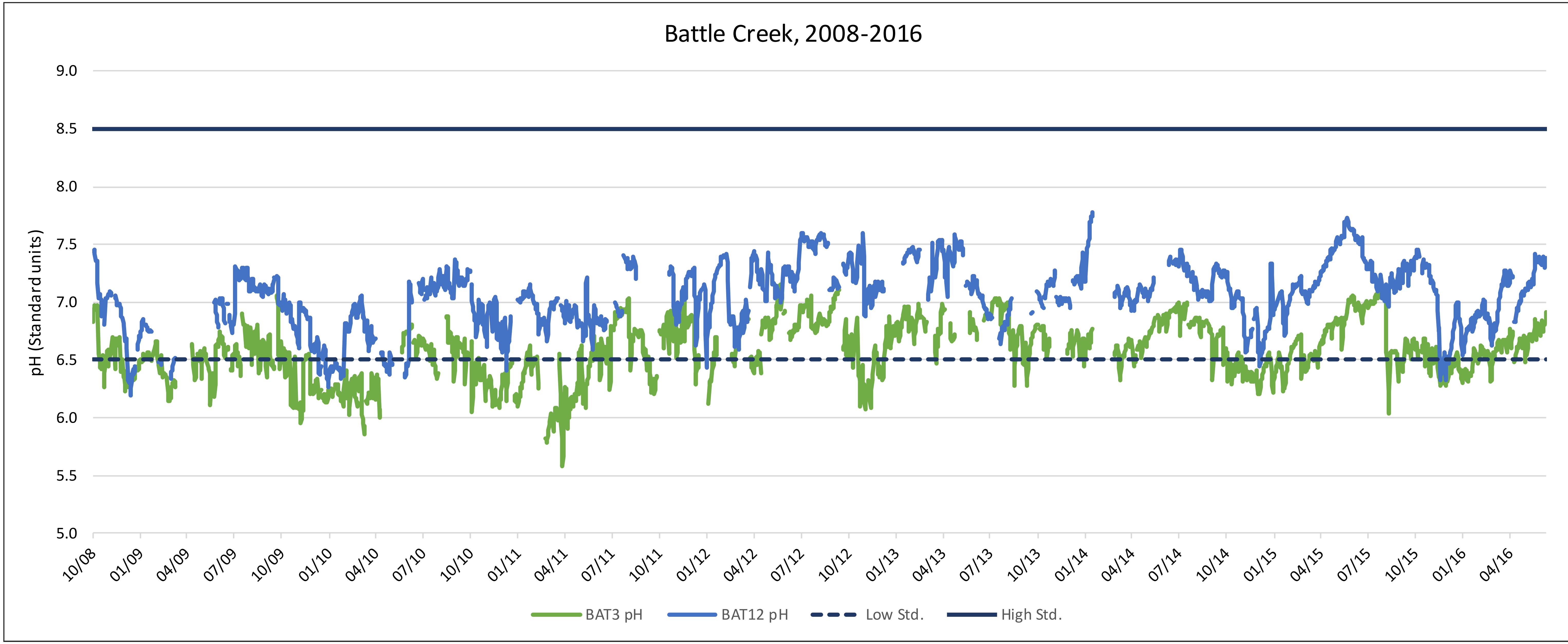


Figure 6.2
pH Time Trend Graphs
Continuous Instream Monitoring

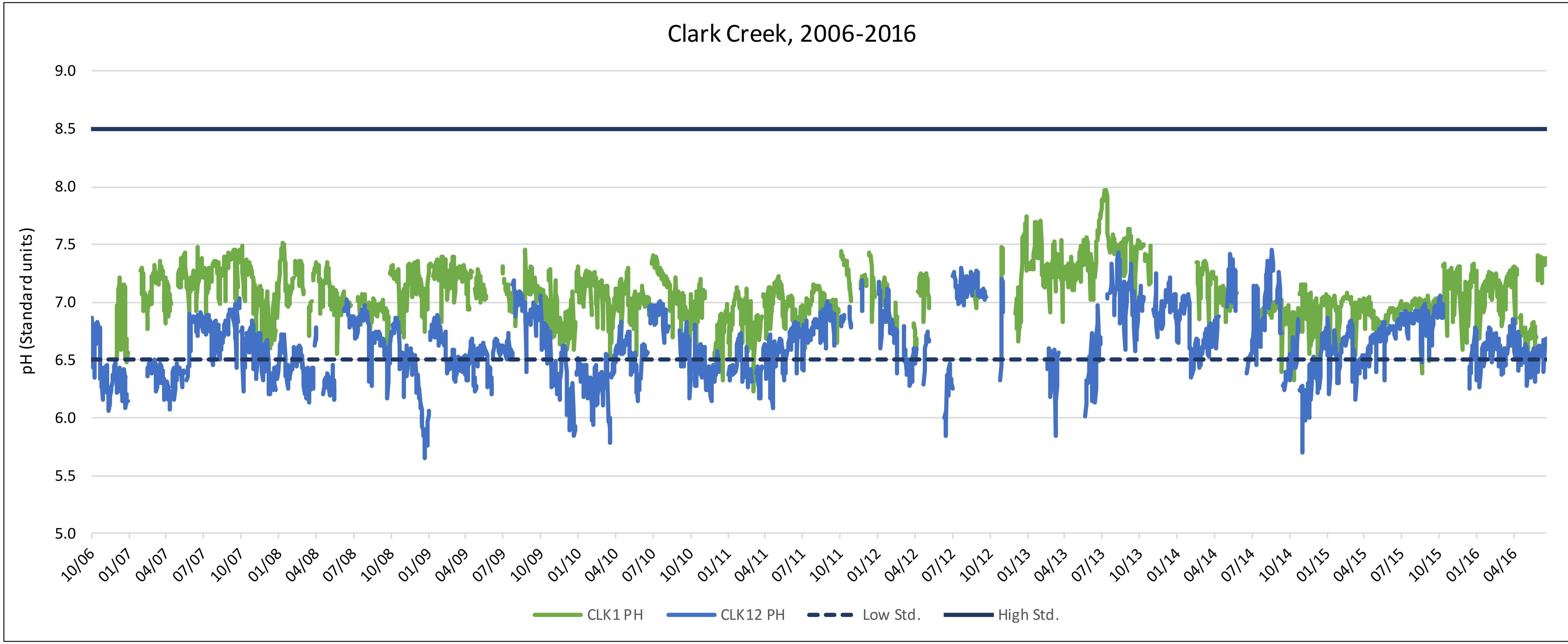


Figure 6.2

pH Time Trend Graphs

Continuous Instream Monitoring

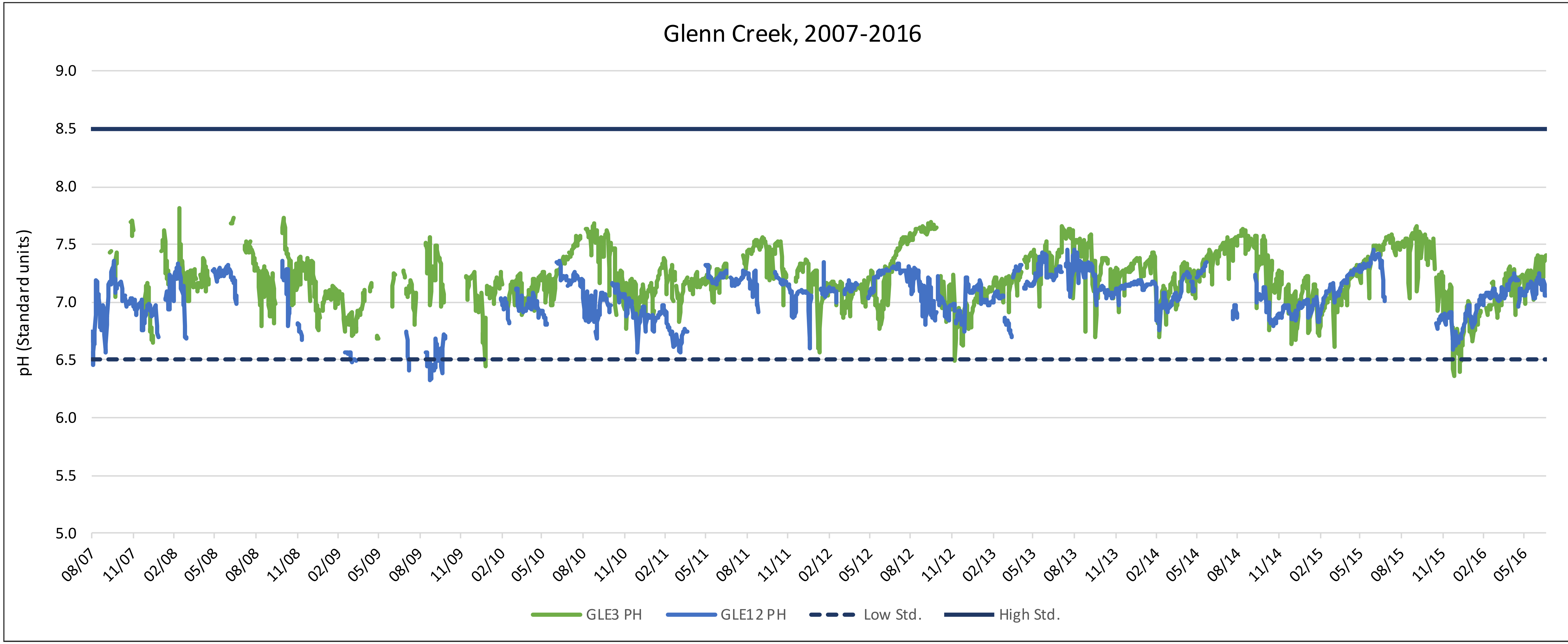


Figure 6.2

pH Time Trend Graphs

Continuous Instream Monitoring

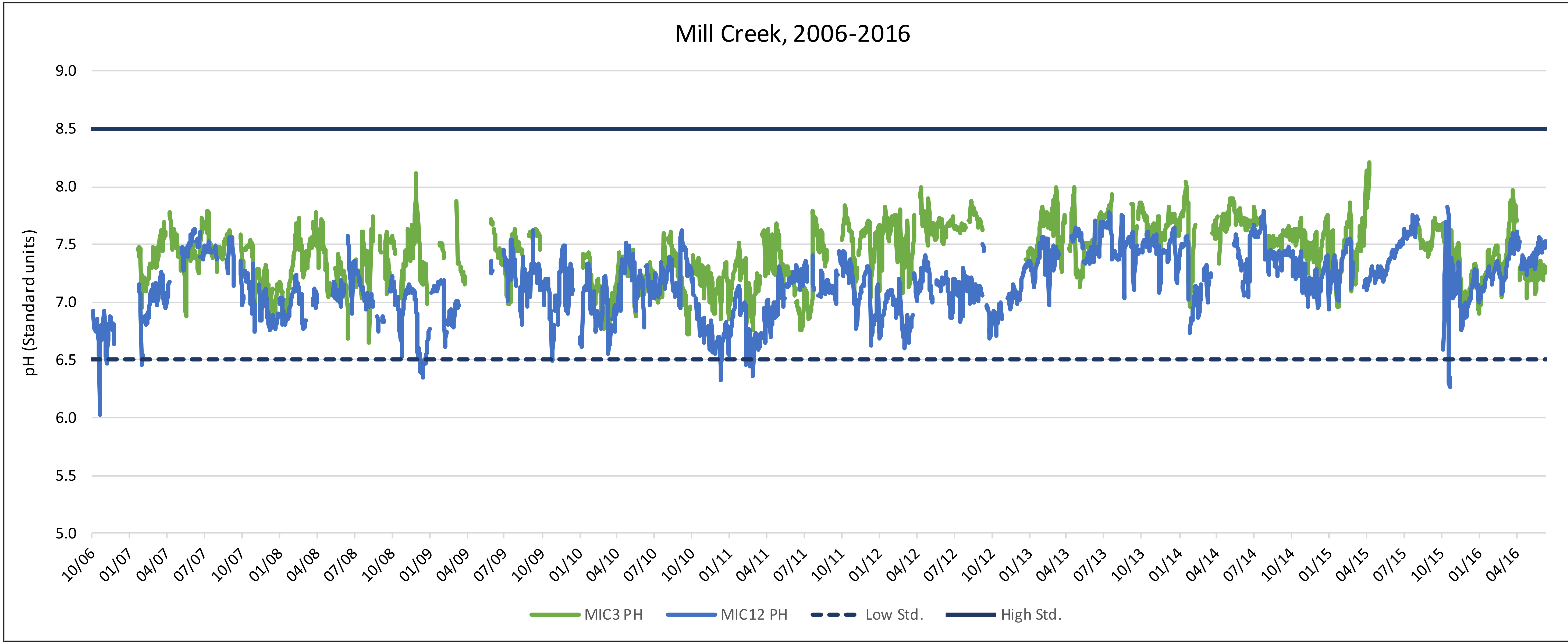


Figure 6.2

pH Time Trend Graphs

Continuous Instream Monitoring

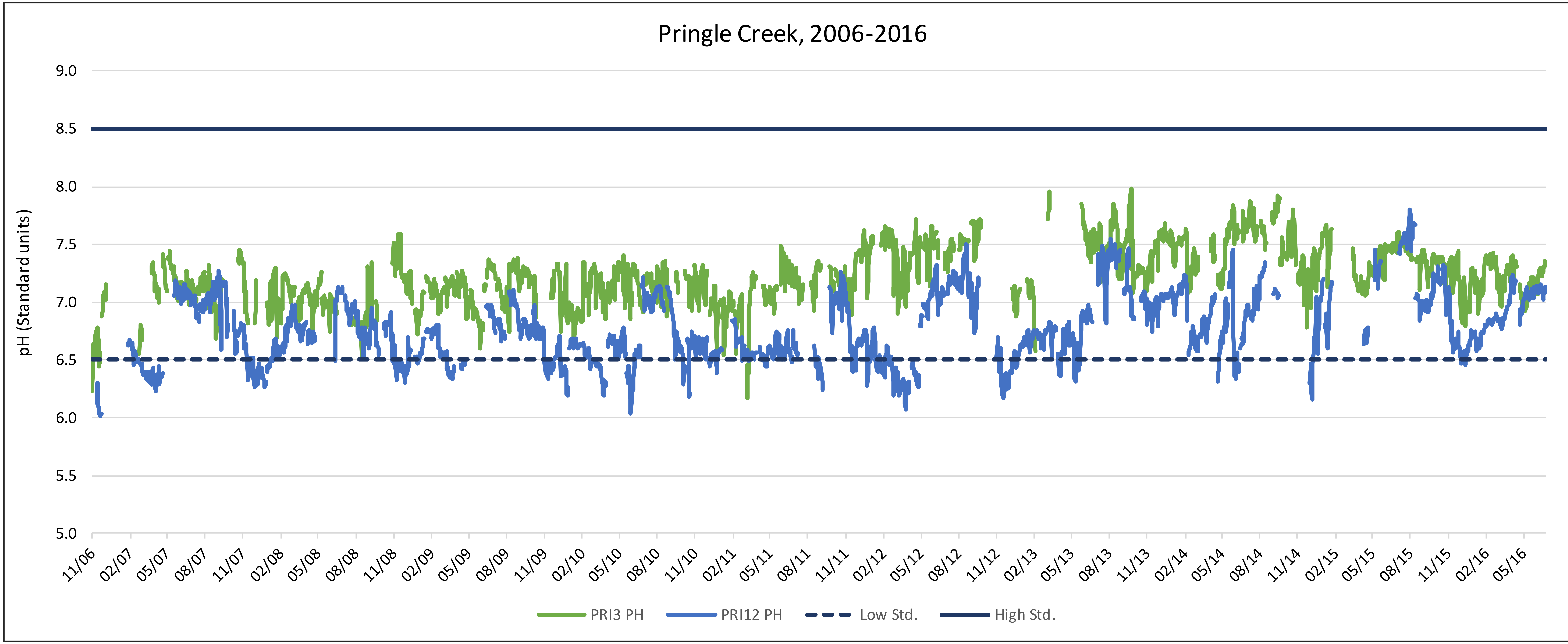


Figure 6.3

Specific Conductivity Time Trend Graphs

Continuous Instream Monitoring

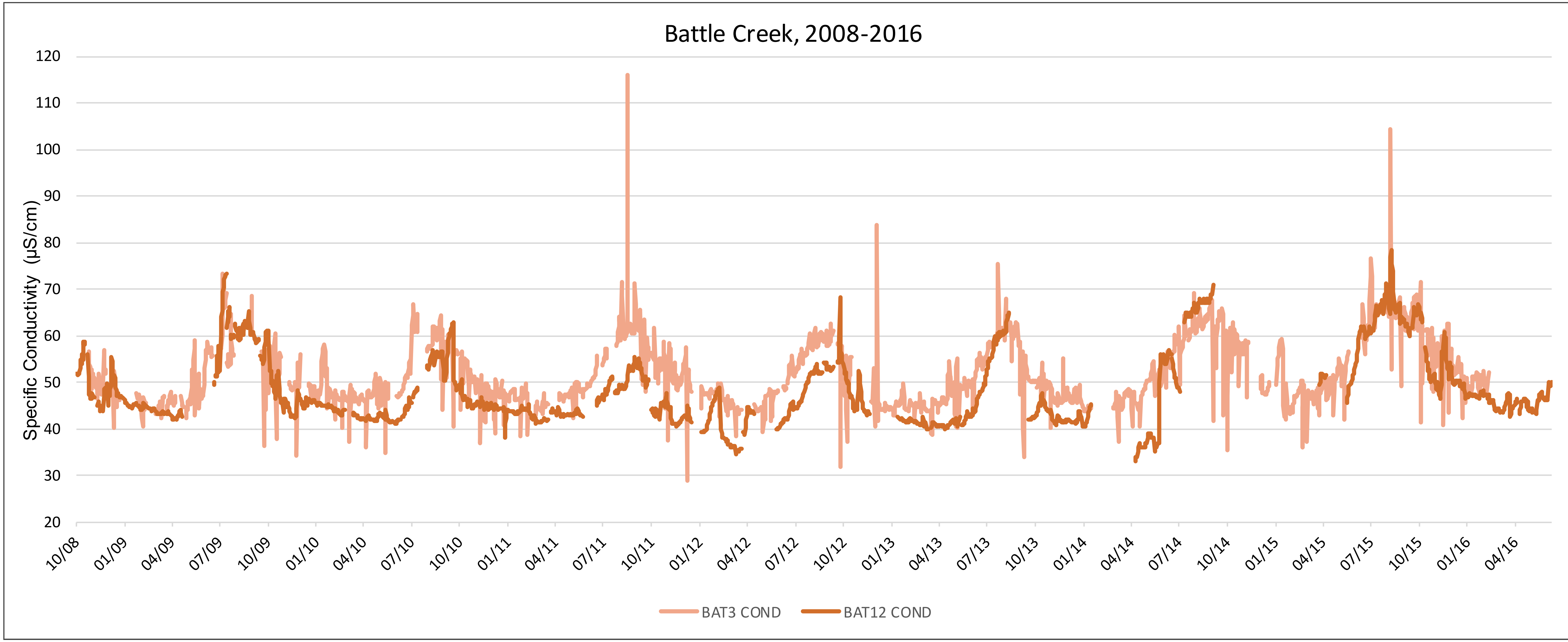


Figure 6.3

Specific Conductivity Time Trend Graphs

Continuous Instream Monitoring

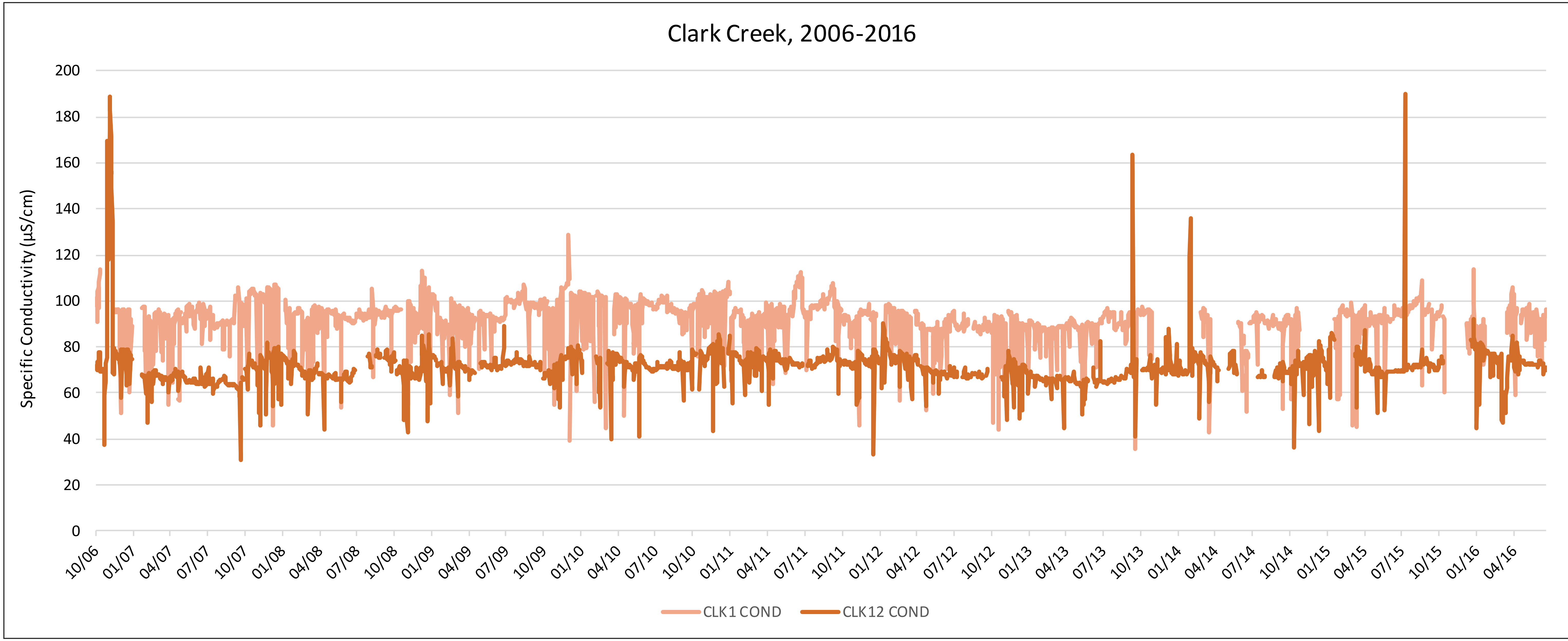


Figure 6.3

Specific Conductivity Time Trend Graphs

Continuous Instream Monitoring

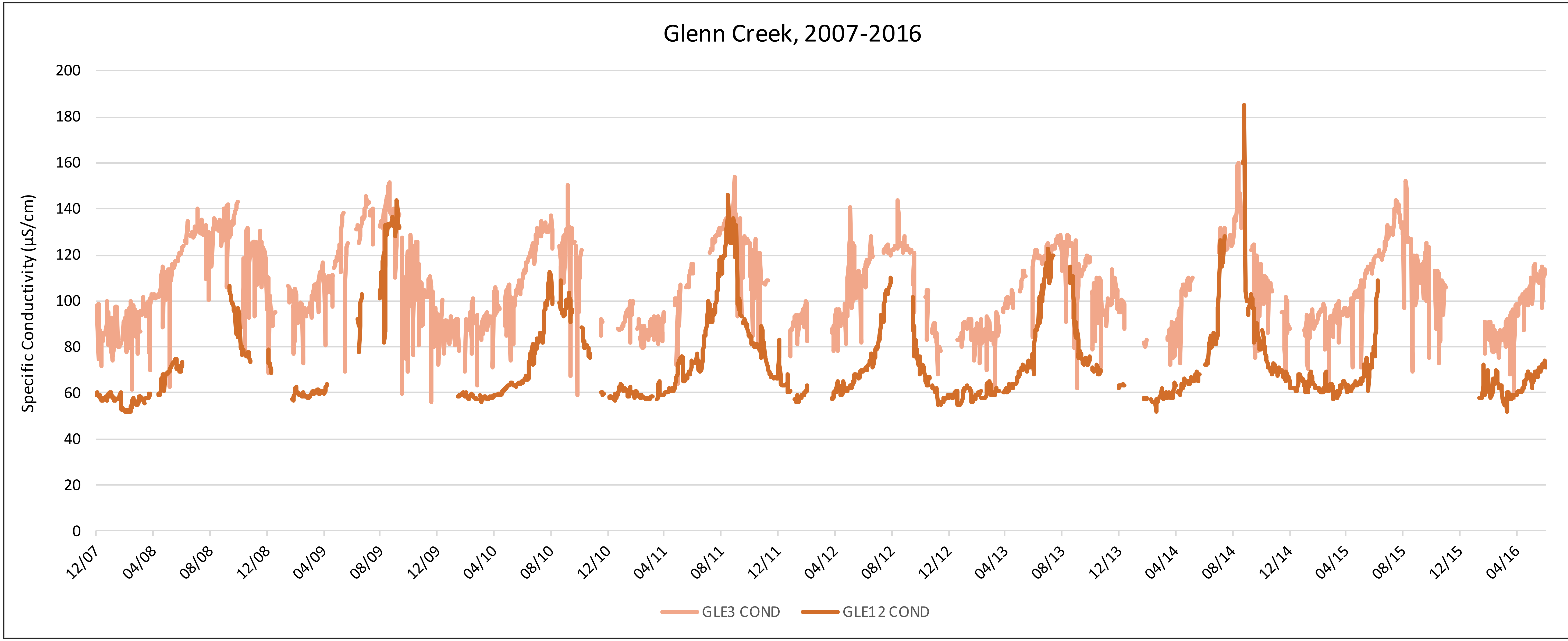


Figure 6.3

Specific Conductivity Time Trend Graphs

Continuous Instream Monitoring

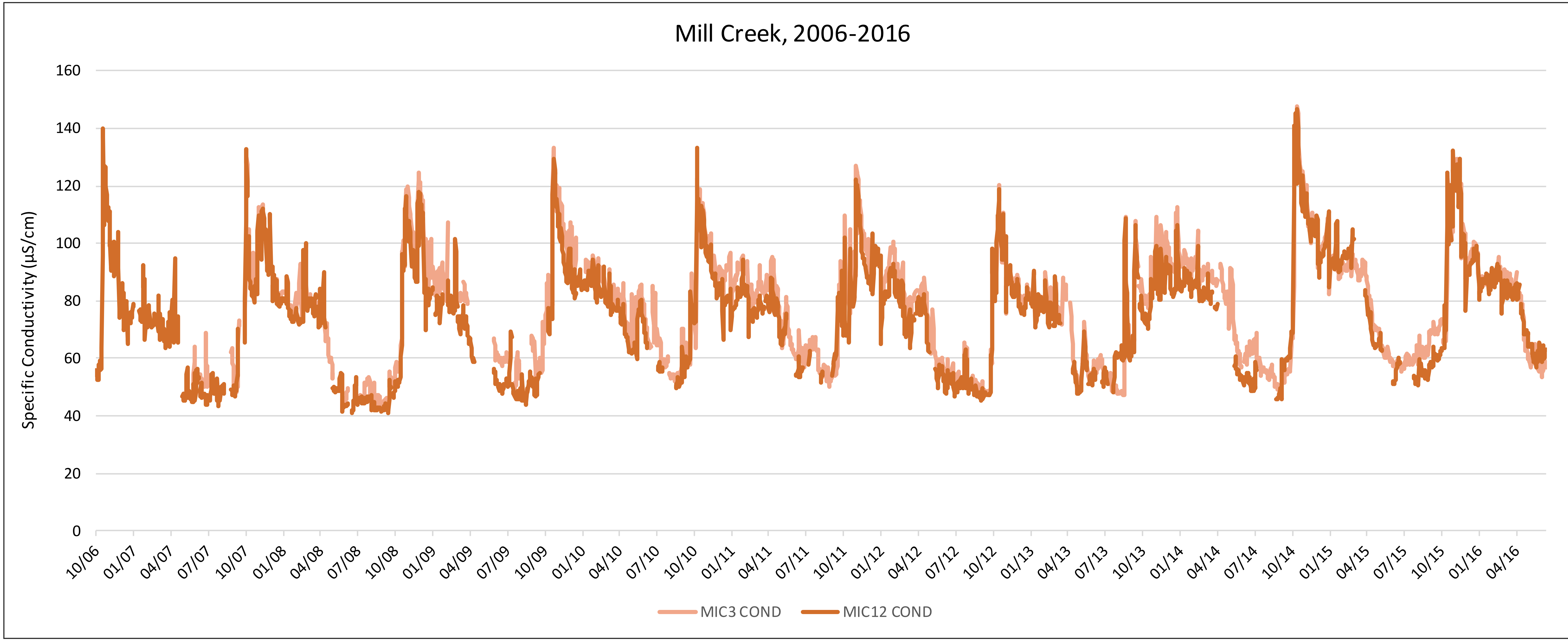


Figure 6.3

Specific Conductivity Time Trend Graphs

Continuous Instream Monitoring

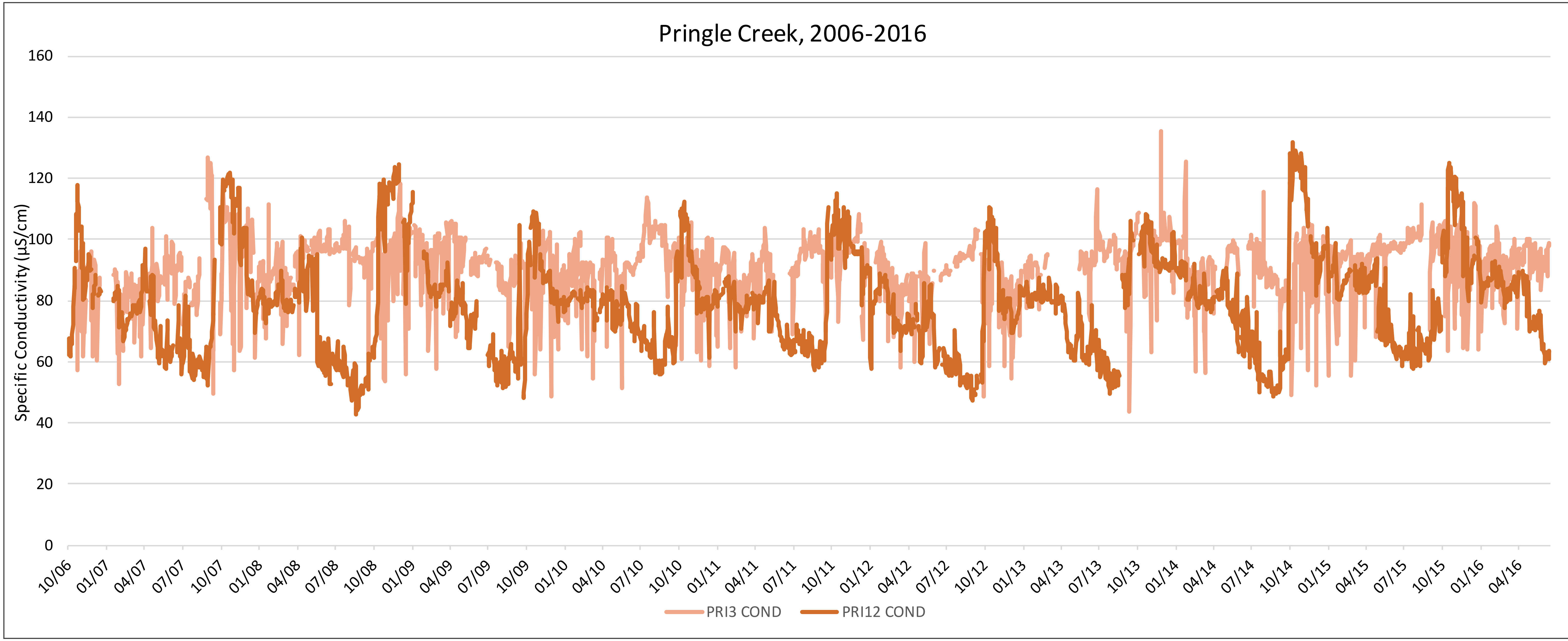


Figure 6.4
Temperature Time Trend Graphs
Continuous Instream Monitoring

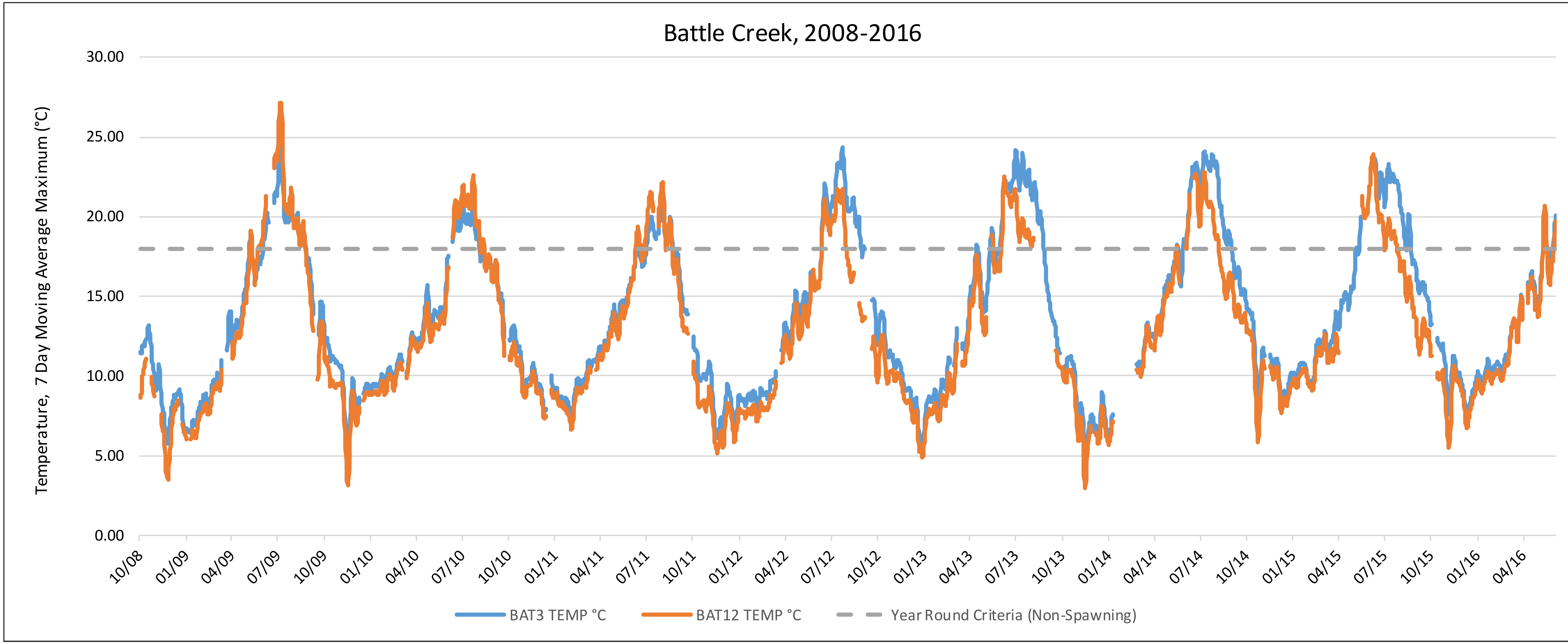


Figure 6.4

Temperature Time Trend Graphs

Continuous Instream Monitoring

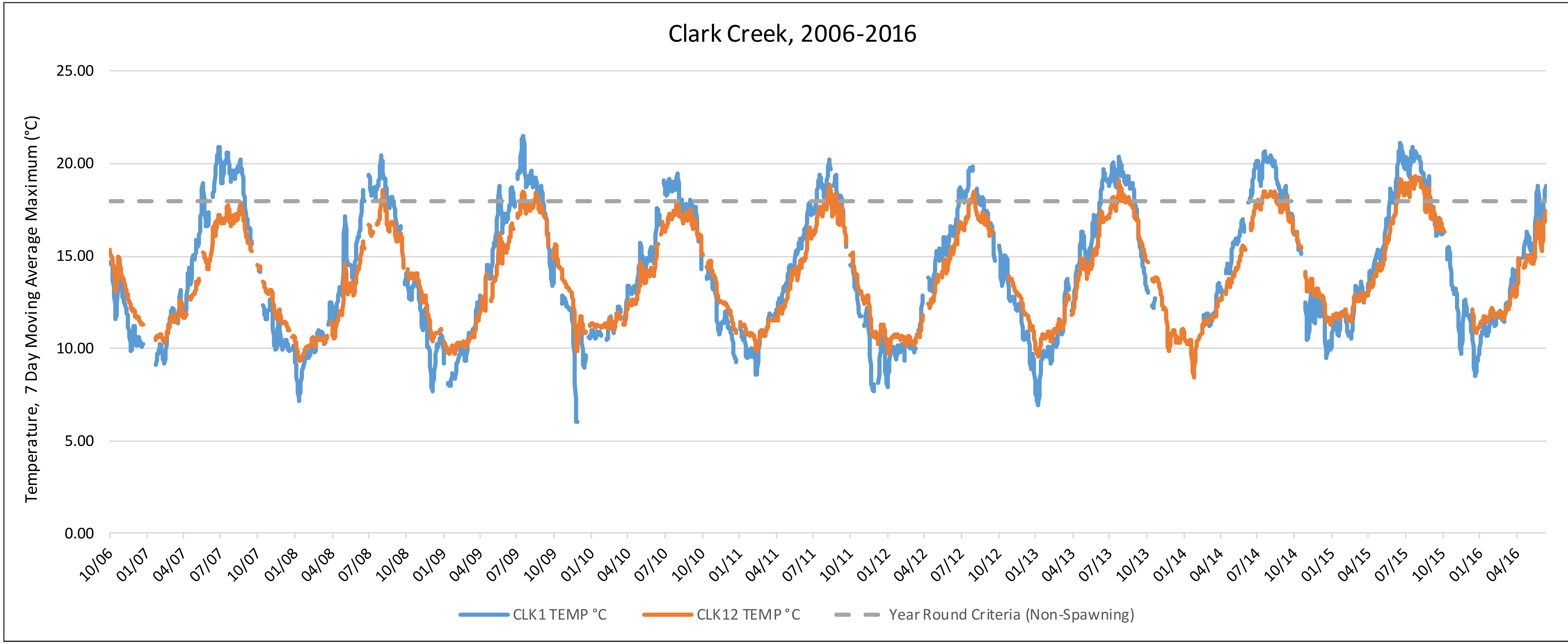


Figure 6.4
Temperature Time Trend Graphs
Continuous Instream Monitoring

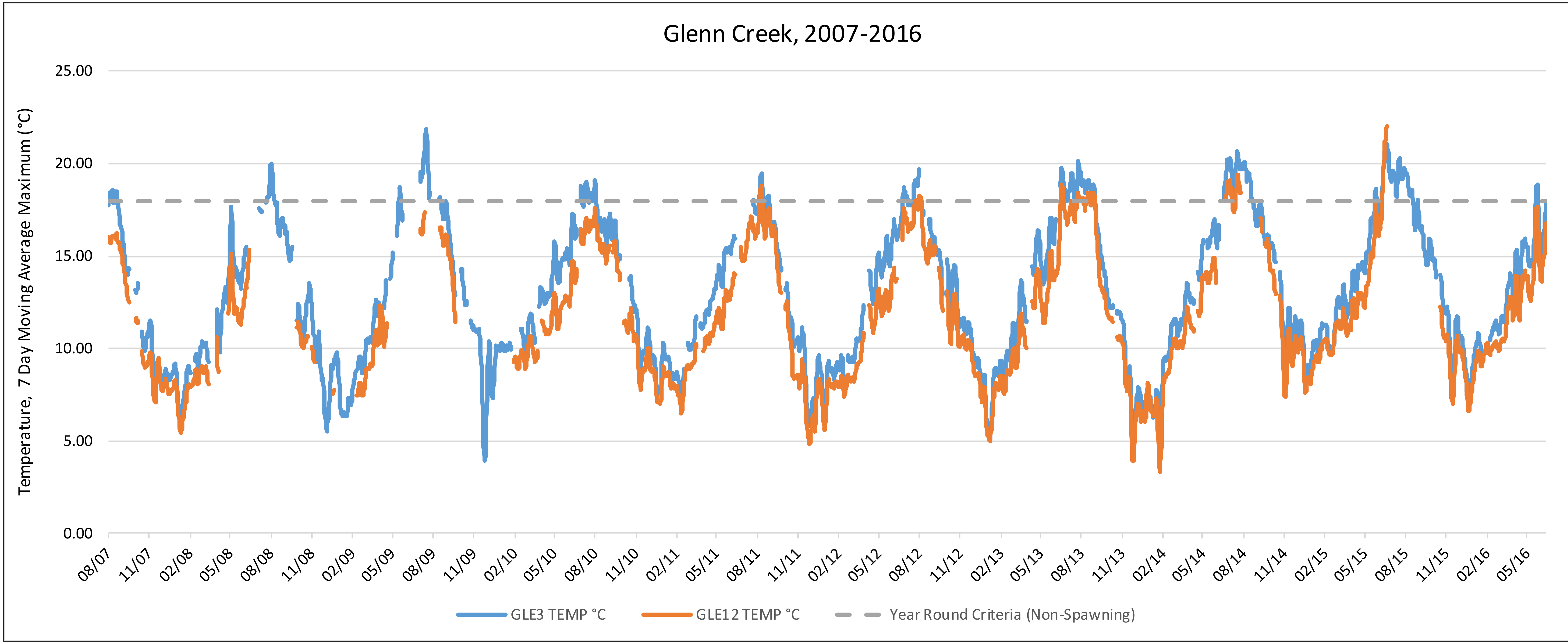


Figure 6.4

Temperature Time Trend Graphs

Continuous Instream Monitoring

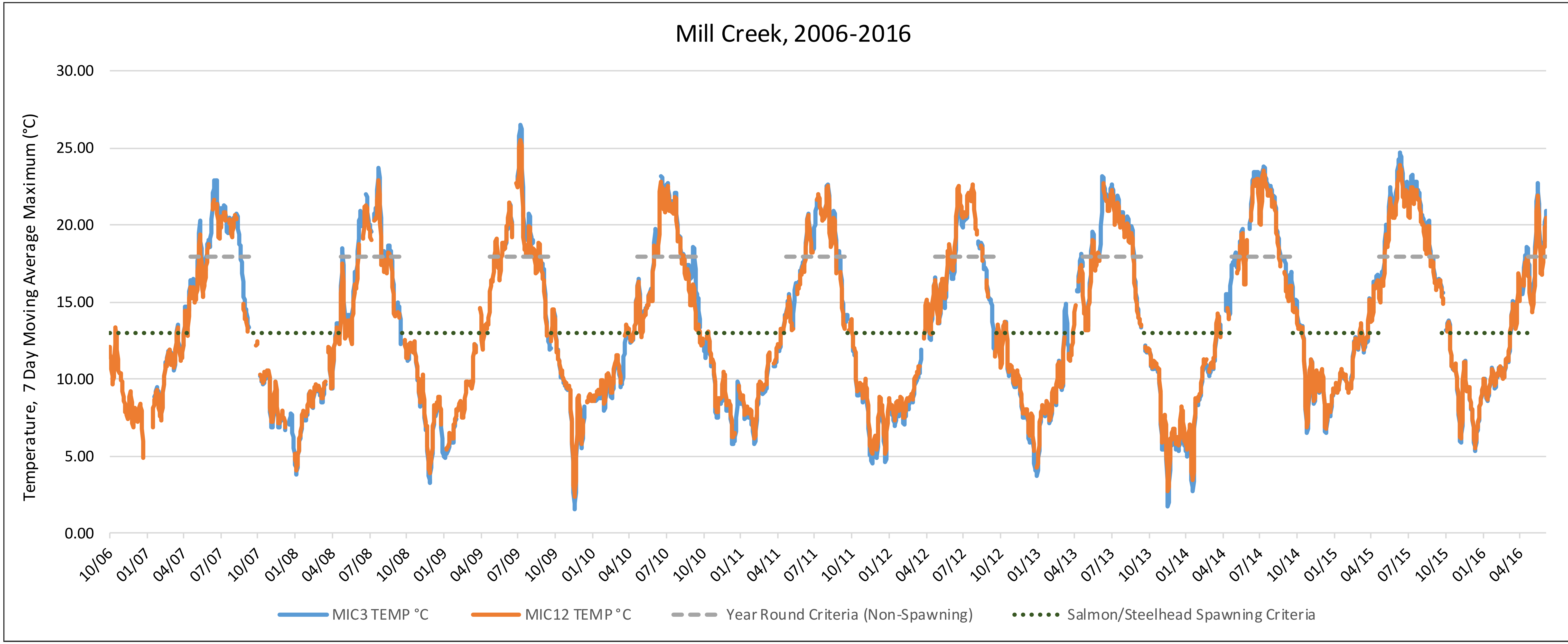


Figure 6.4

Temperature Time Trend Graphs

Continuous Instream Monitoring

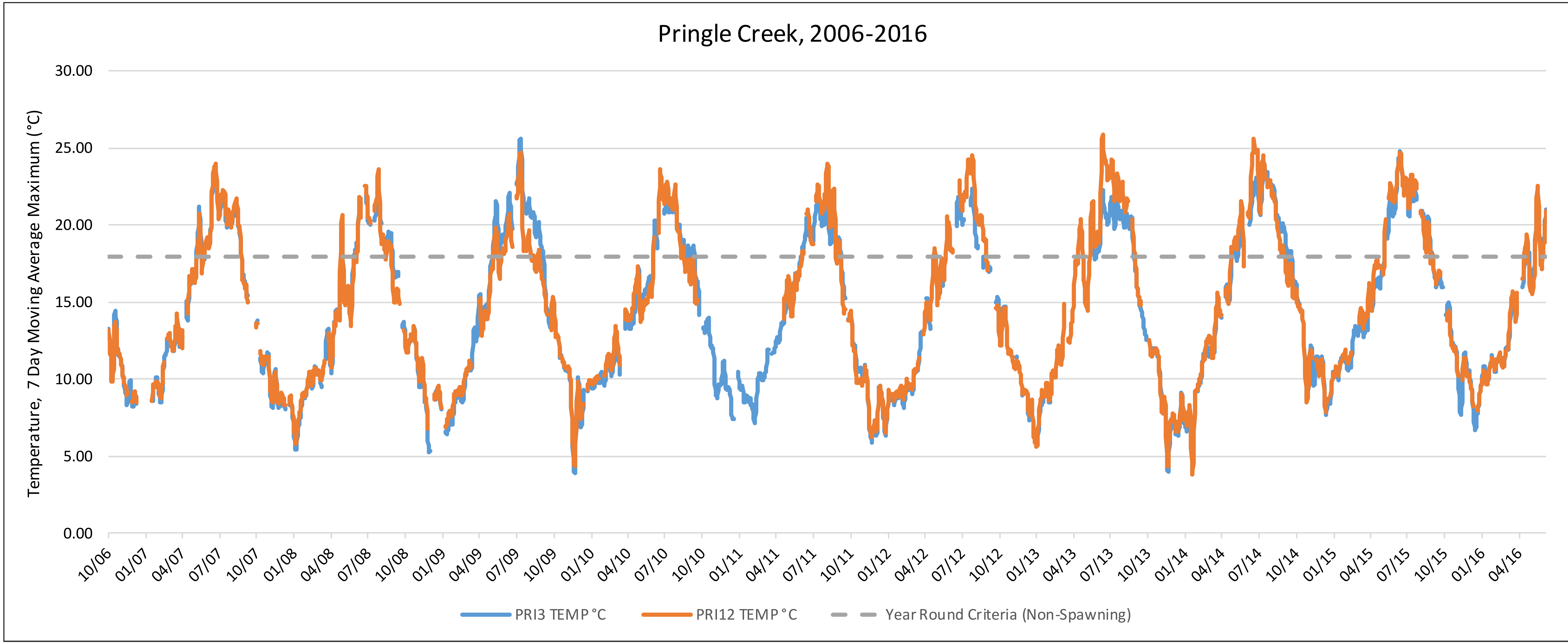


Figure 6.5

Turbidity Time Trend Graphs

Continuous Instream Monitoring

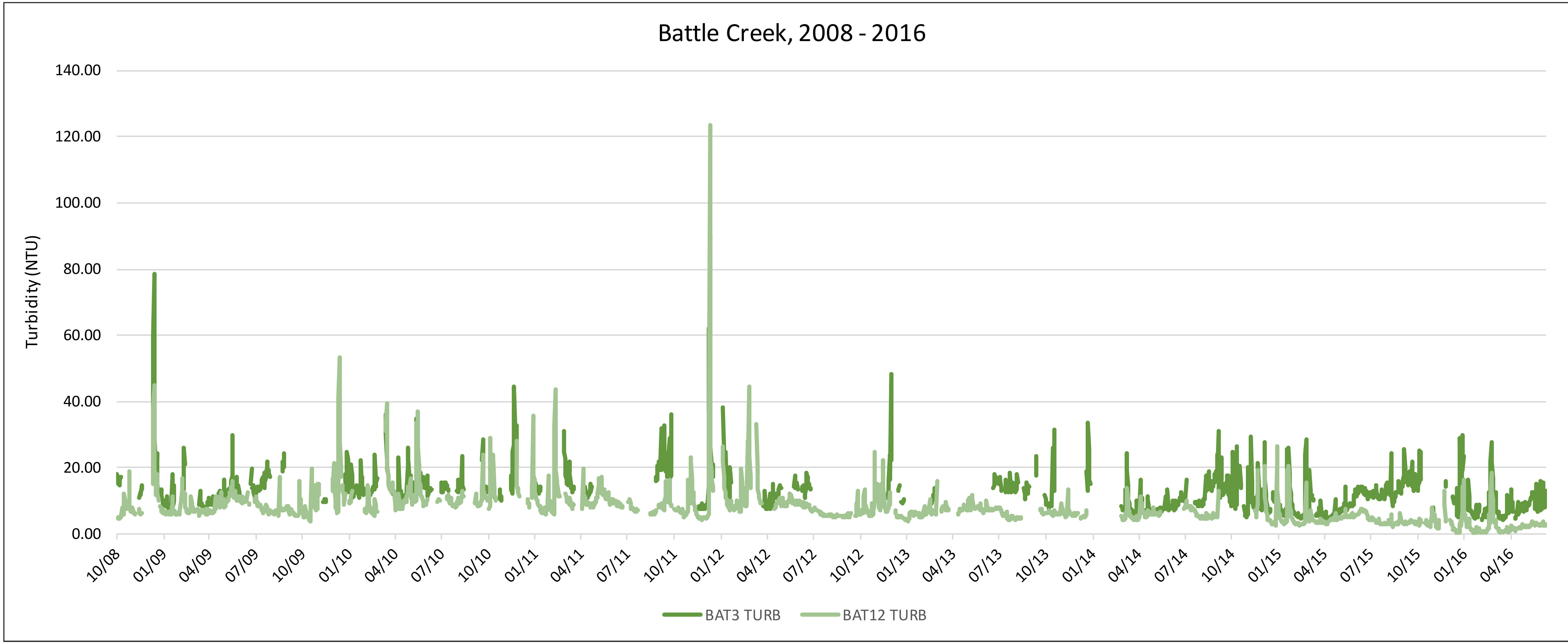


Figure 6.5

Turbidity Time Trend Graphs

Continuous Instream Monitoring

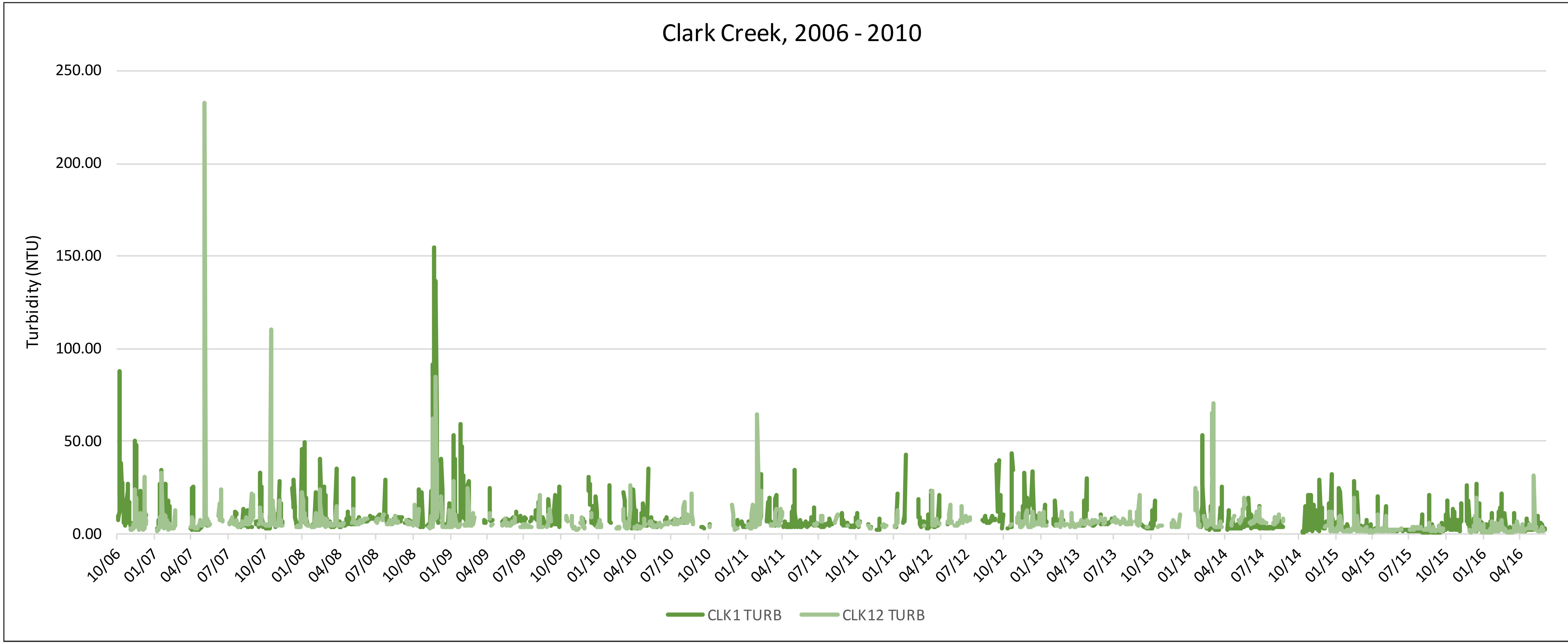


Figure 6.5

Turbidity Time Trend Graphs

Continuous Instream Monitoring

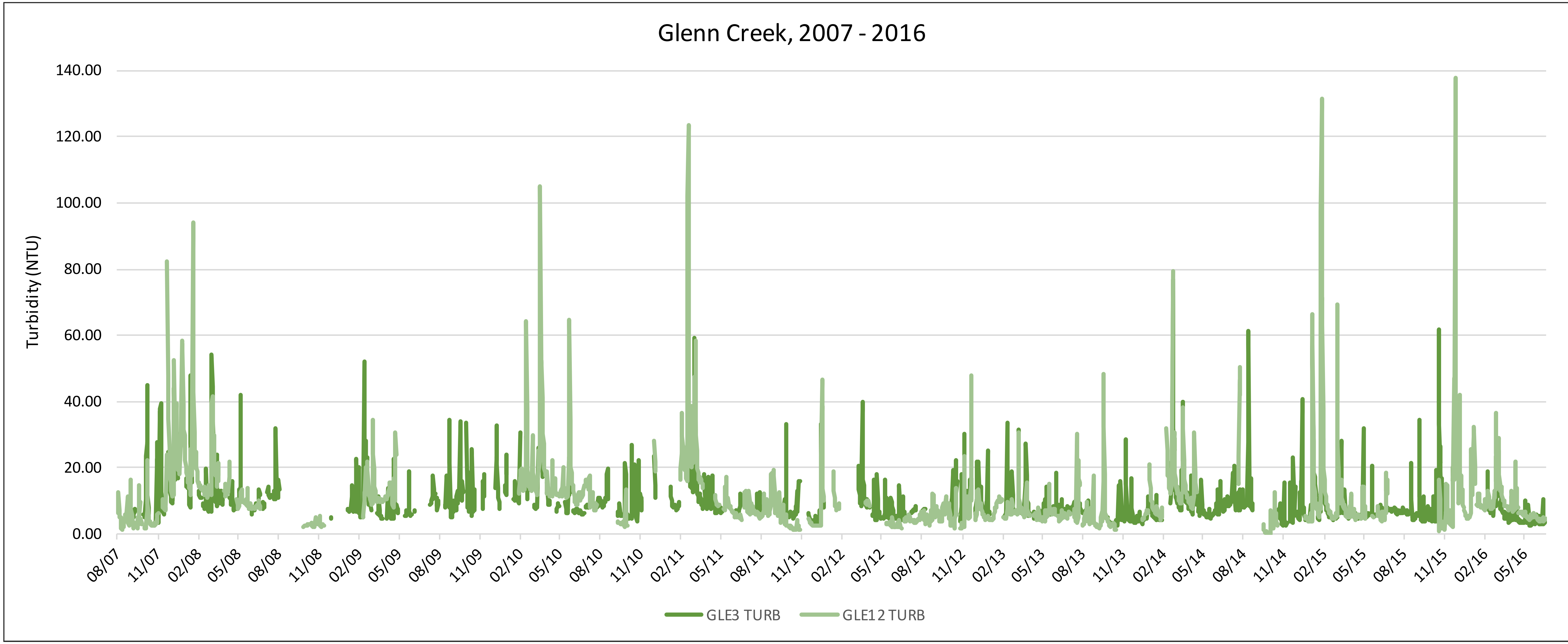


Figure 6.5
Turbidity Time Trend Graphs
Continuous Instream Monitoring

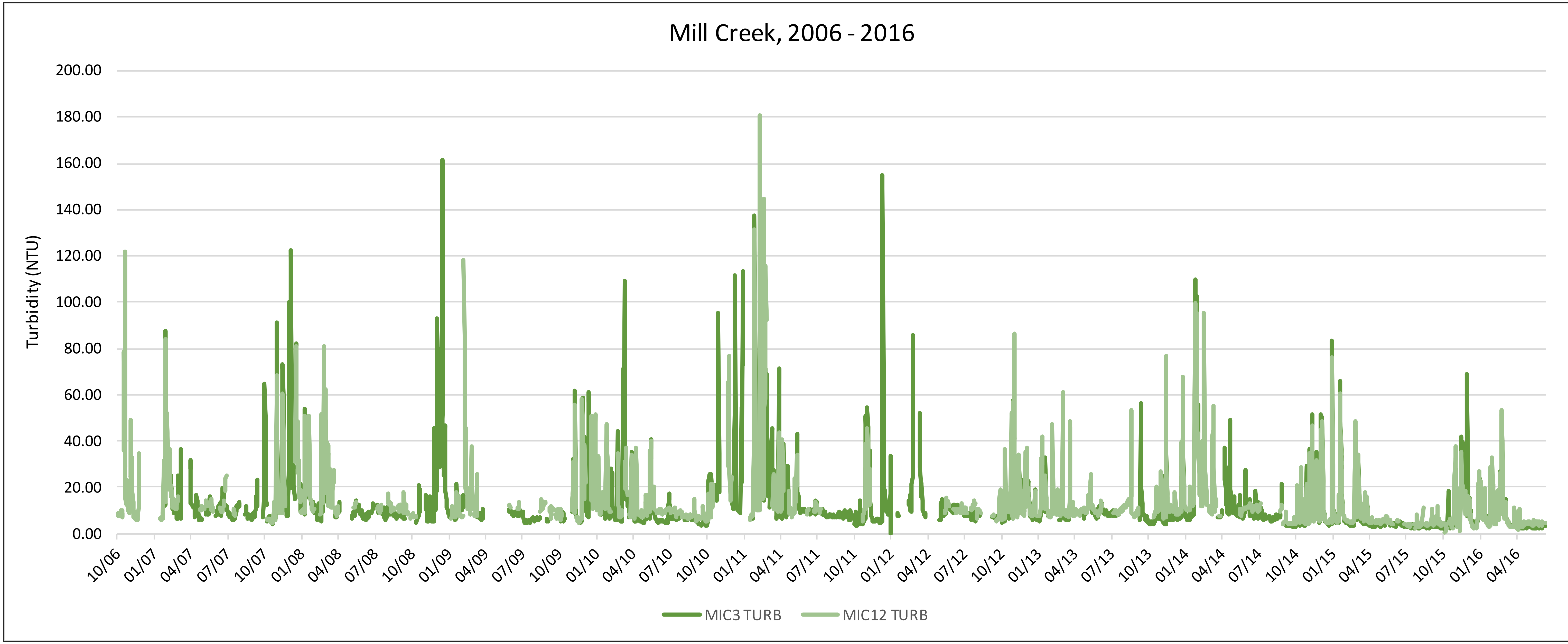


Figure 6.5

Turbidity Time Trend Graphs

Continuous Instream Monitoring

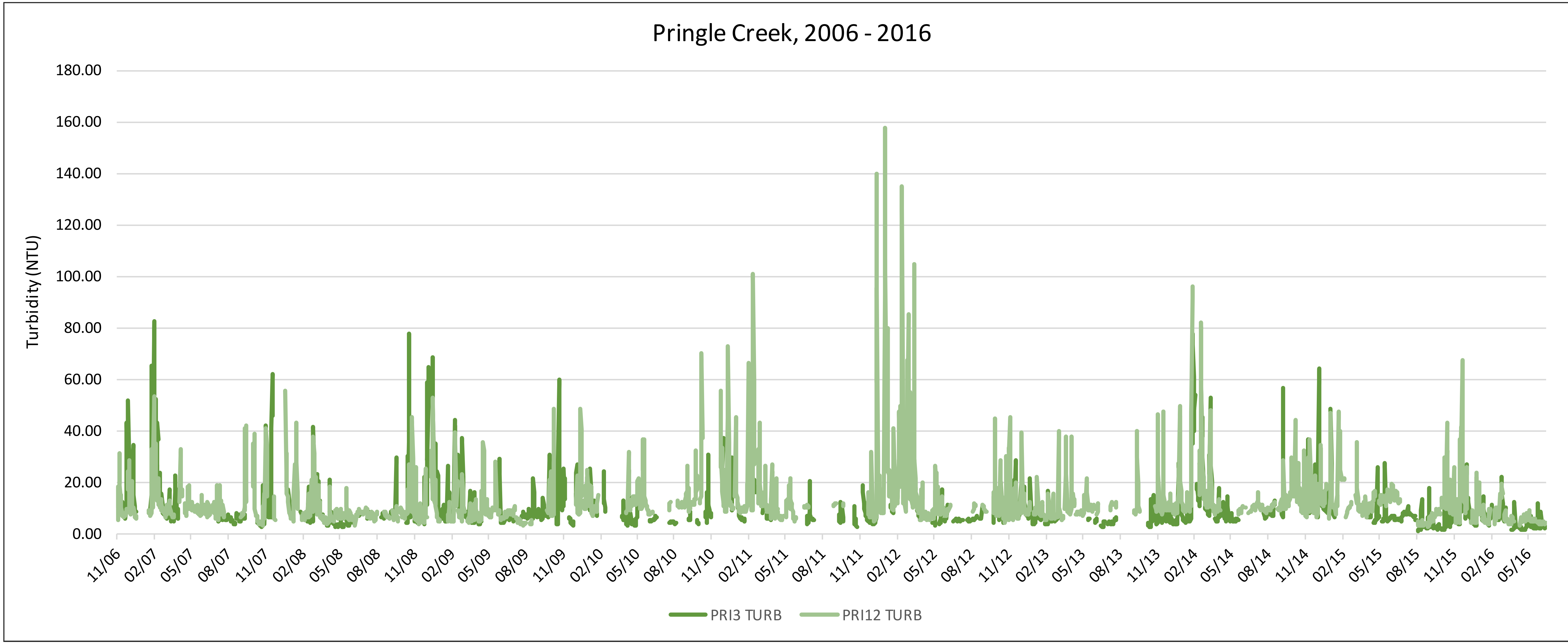
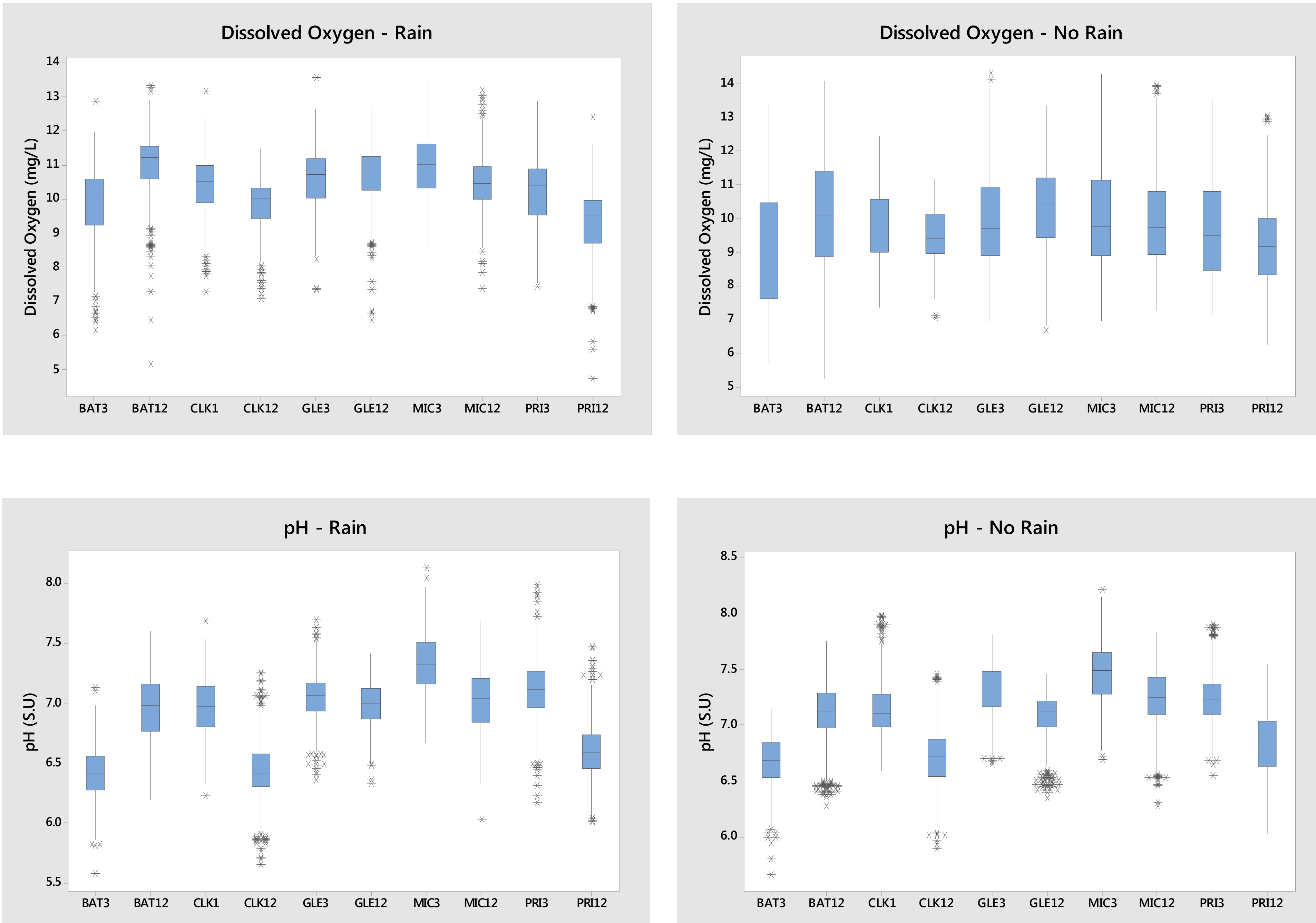


Figure 7.

Box Plots Separated by Rain / No Rain

Continuous Instream Monitoring



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Box Plots Separated by Rain / No Rain

Continuous Instream Monitoring

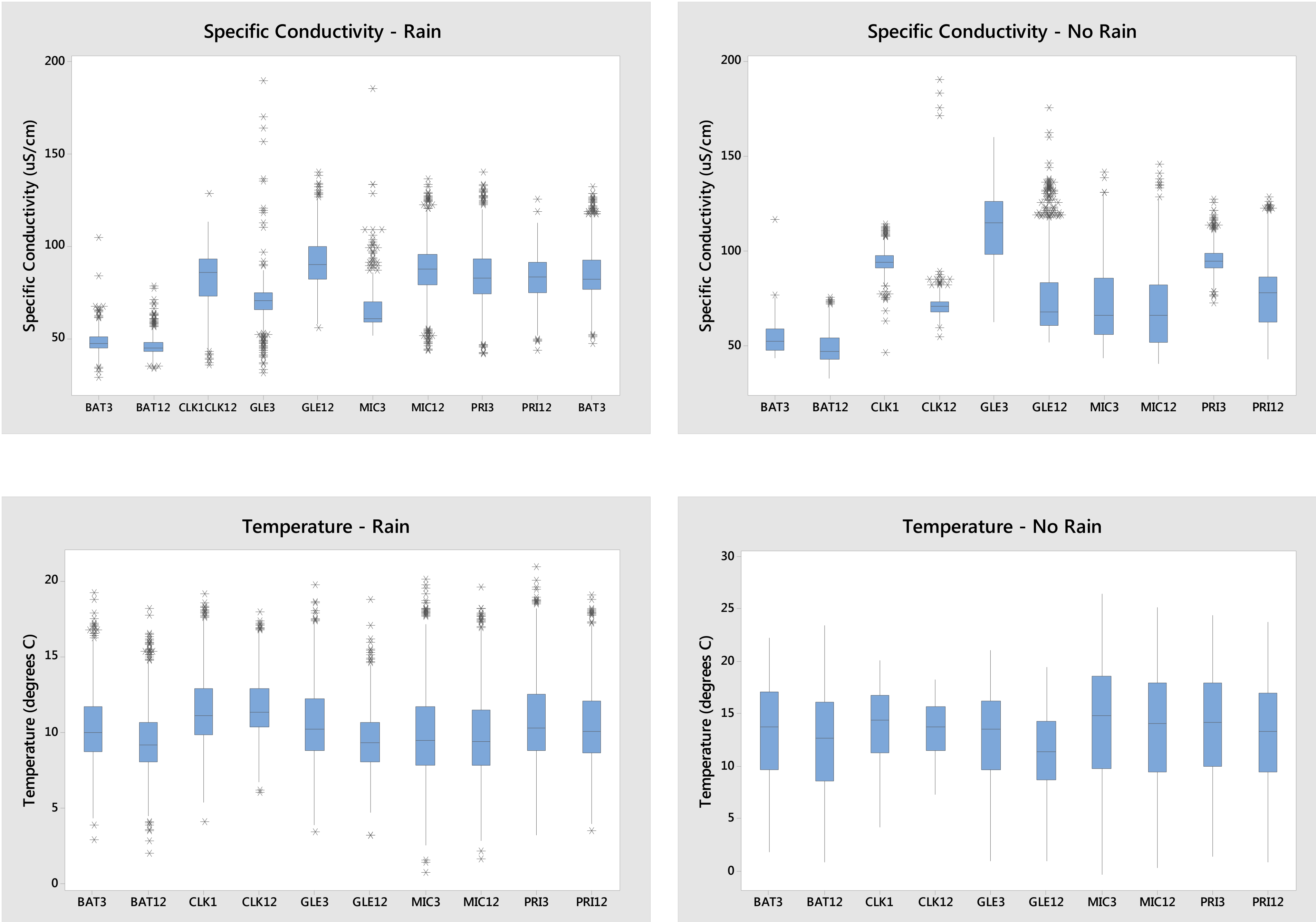
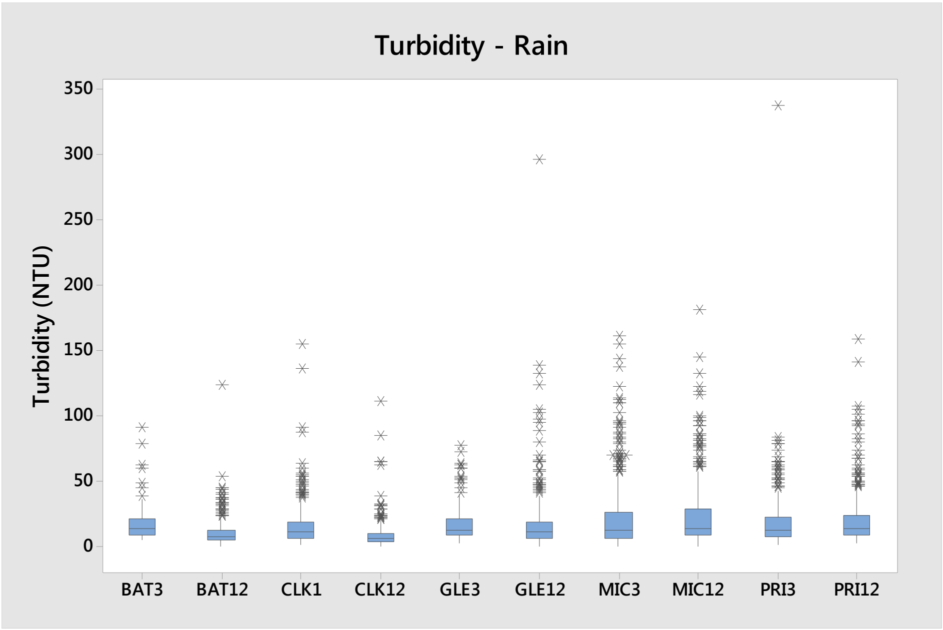


Figure 7.

Box Plots Separated by Rain / No Rain

Continuous Instream Monitoring



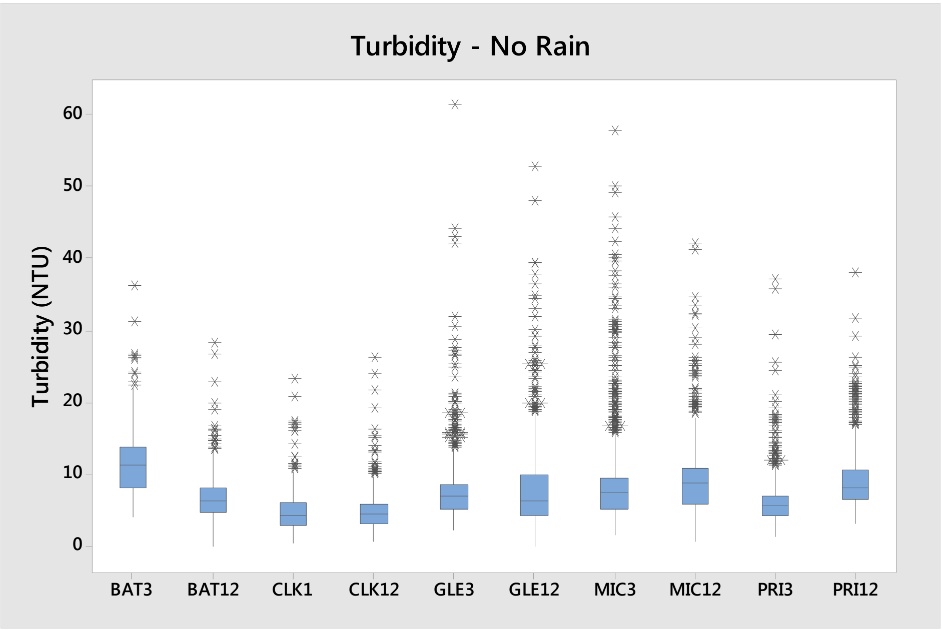
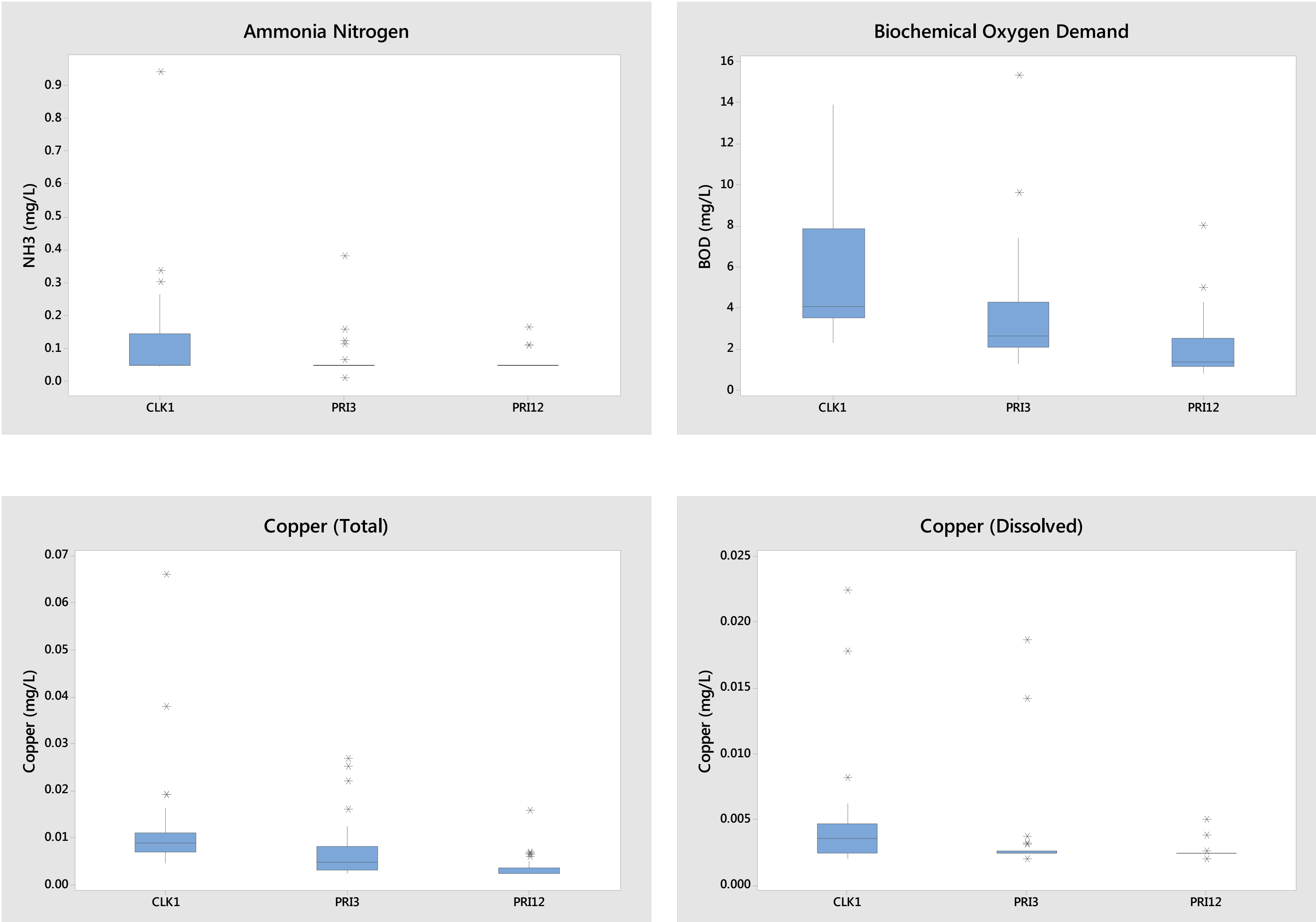


Figure 8.

Box Plots by Pollutant Parameter

Instream Storm Sampling Sites (2010-2016)



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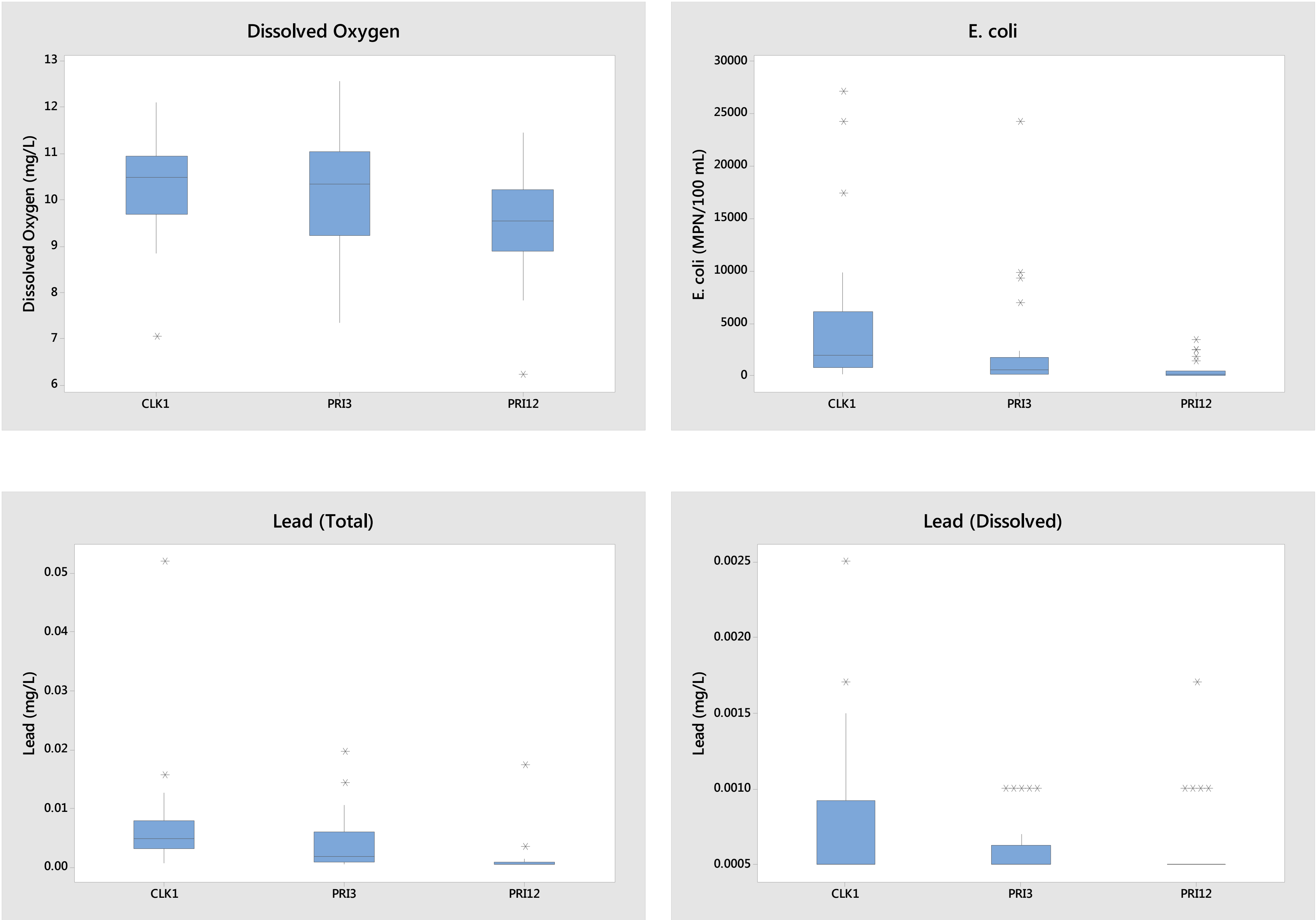

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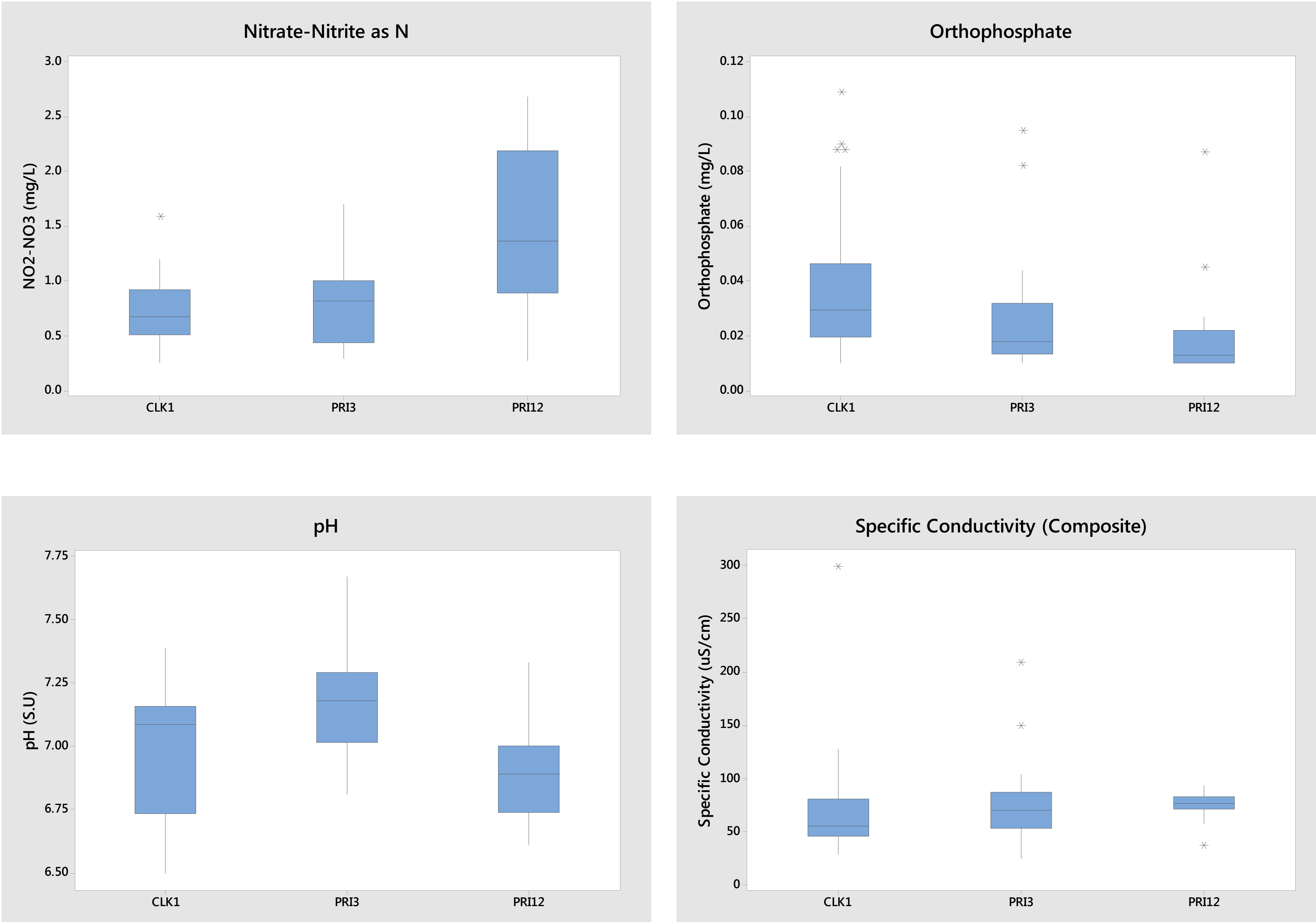

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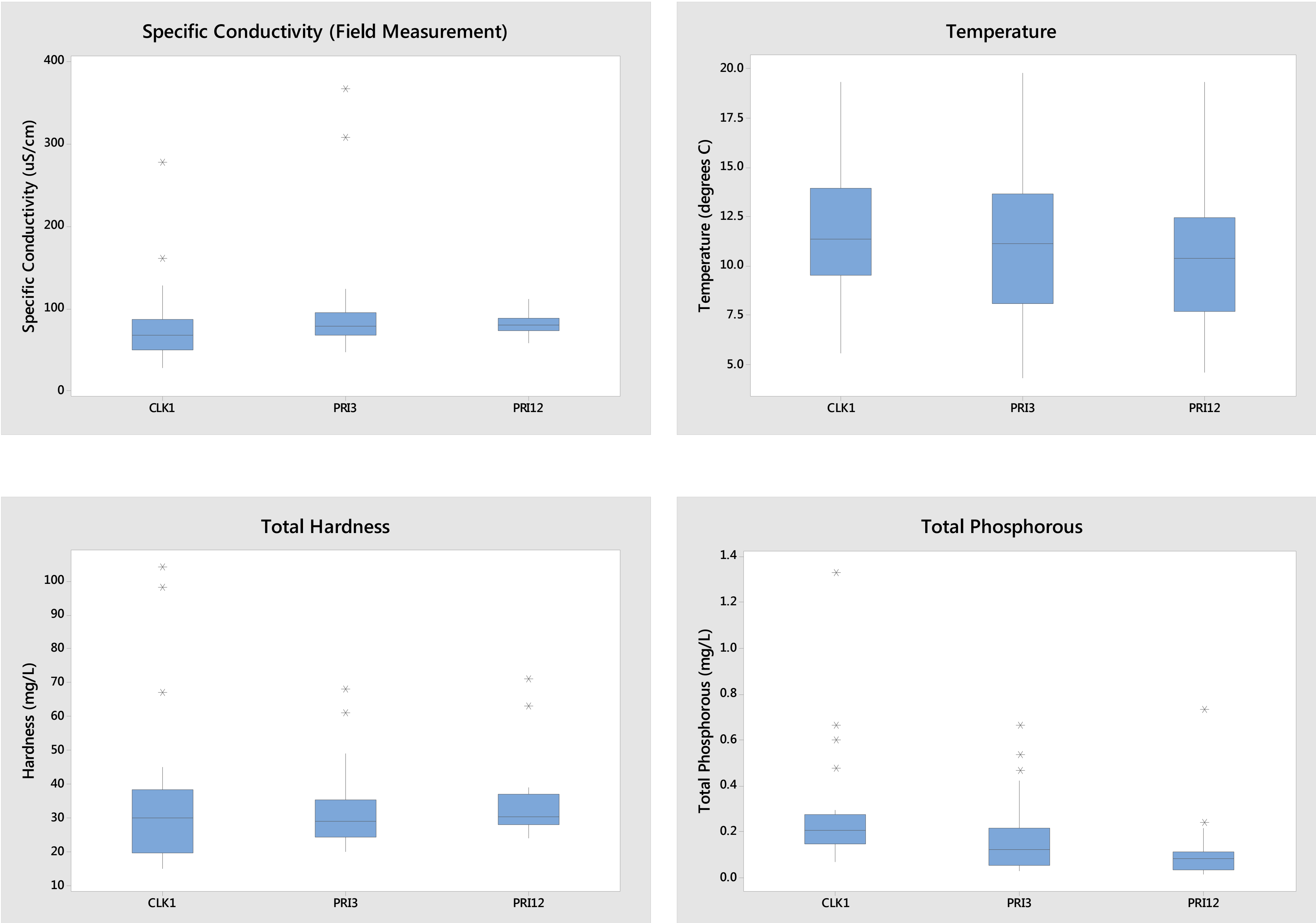

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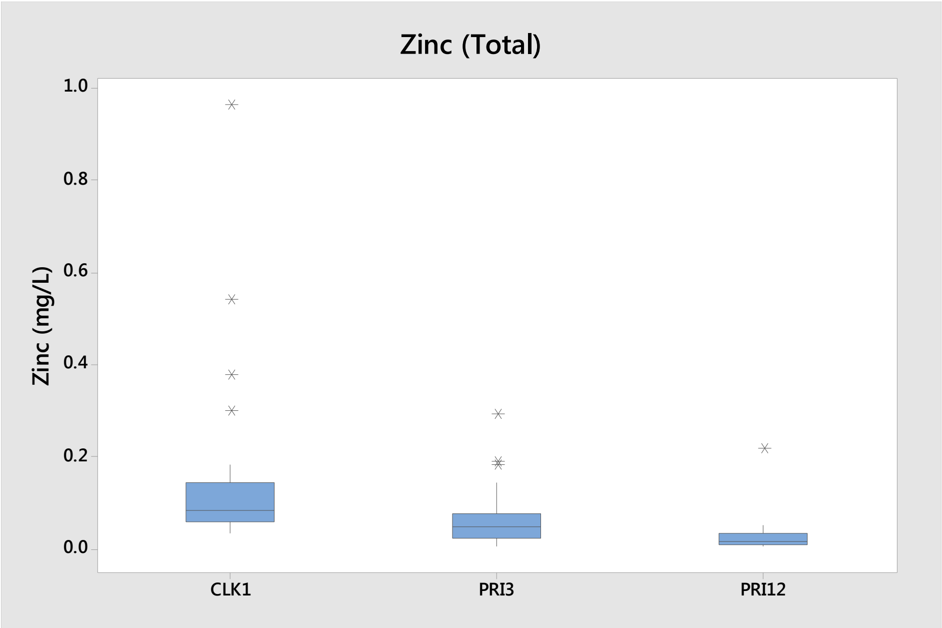


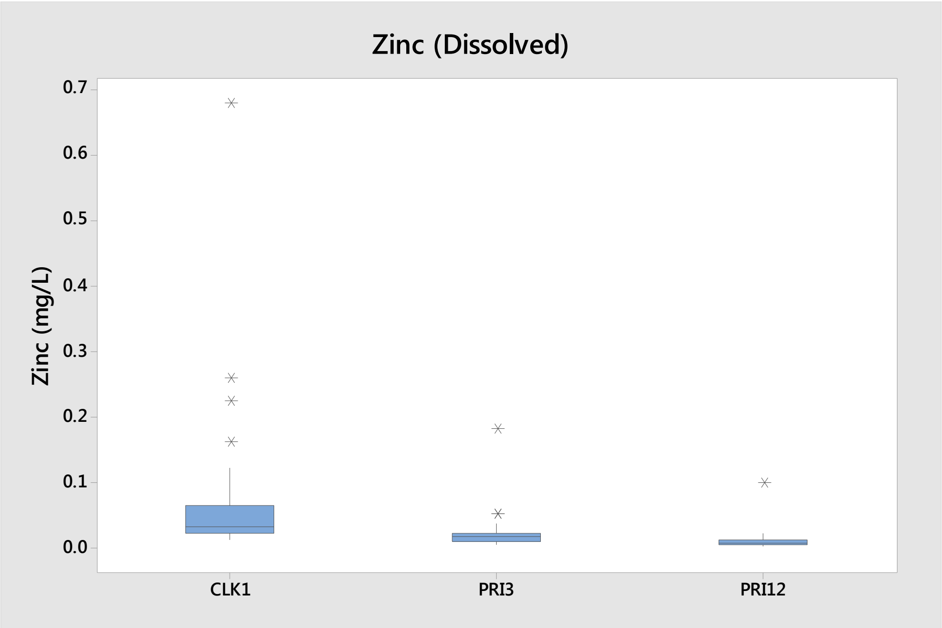
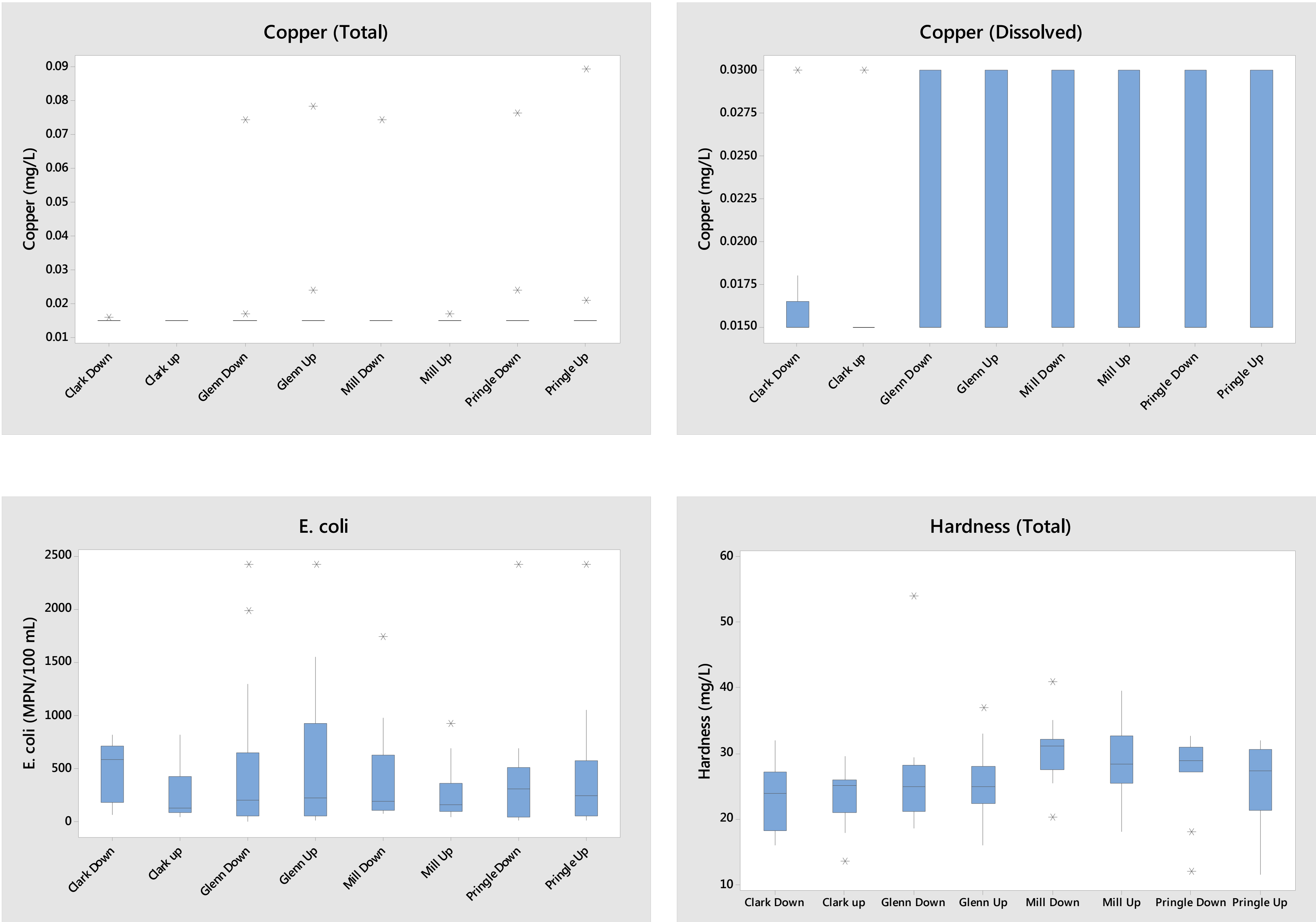


Figure 9.

Box Plots by Pollutant Parameter

Instream Storm Sampling Sites (2006-2010)



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Box Plots by Pollutant Parameter

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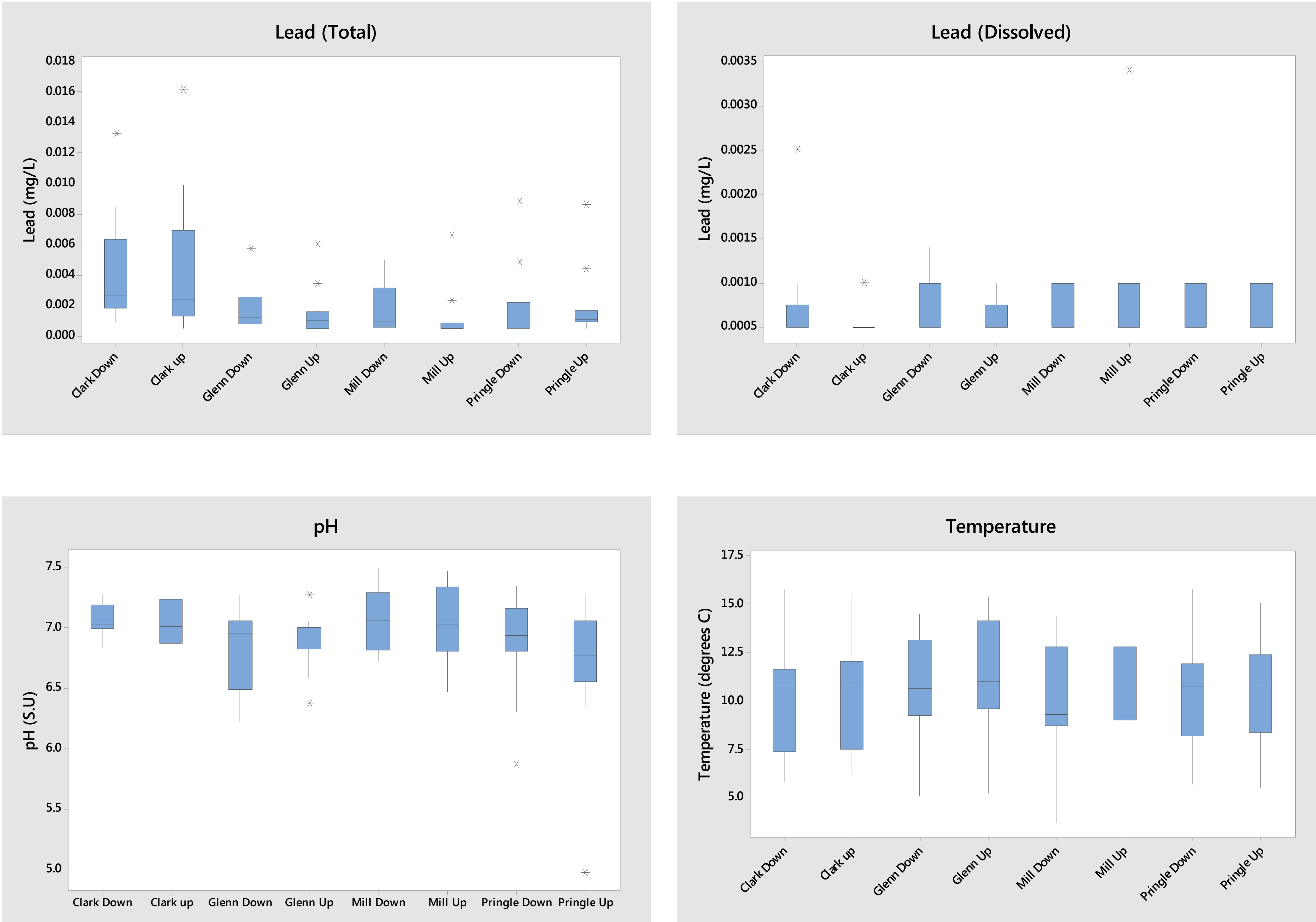

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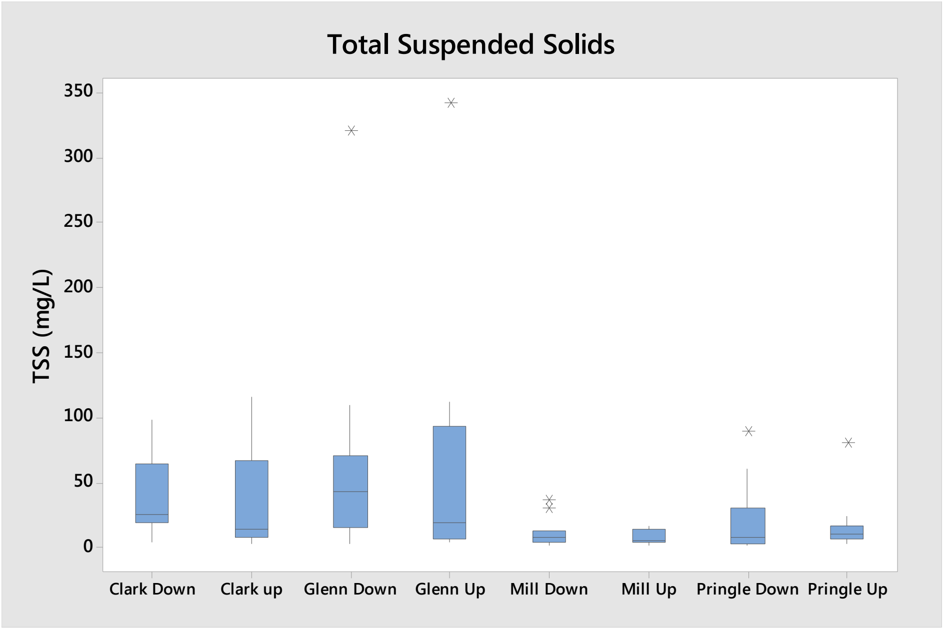

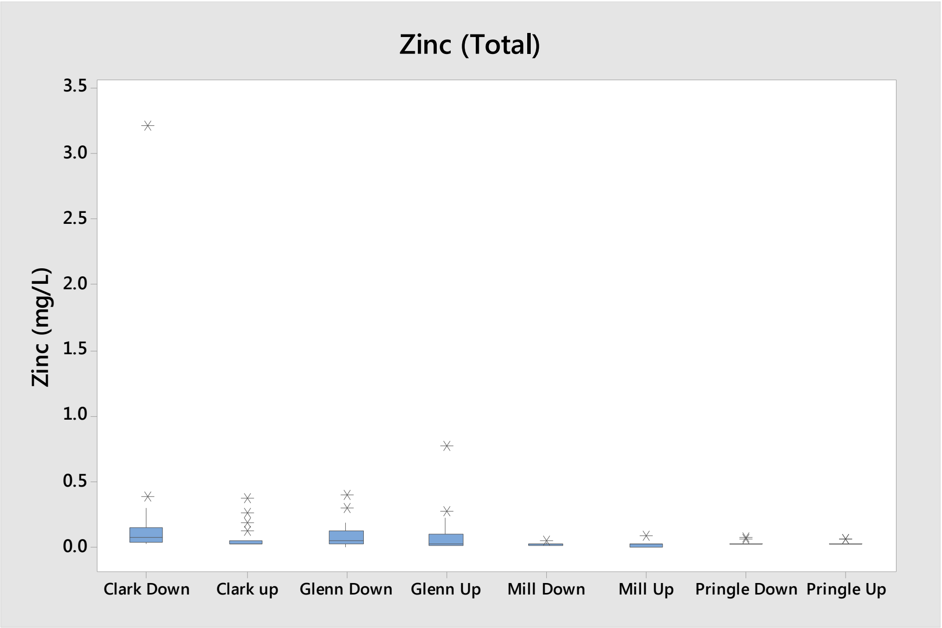

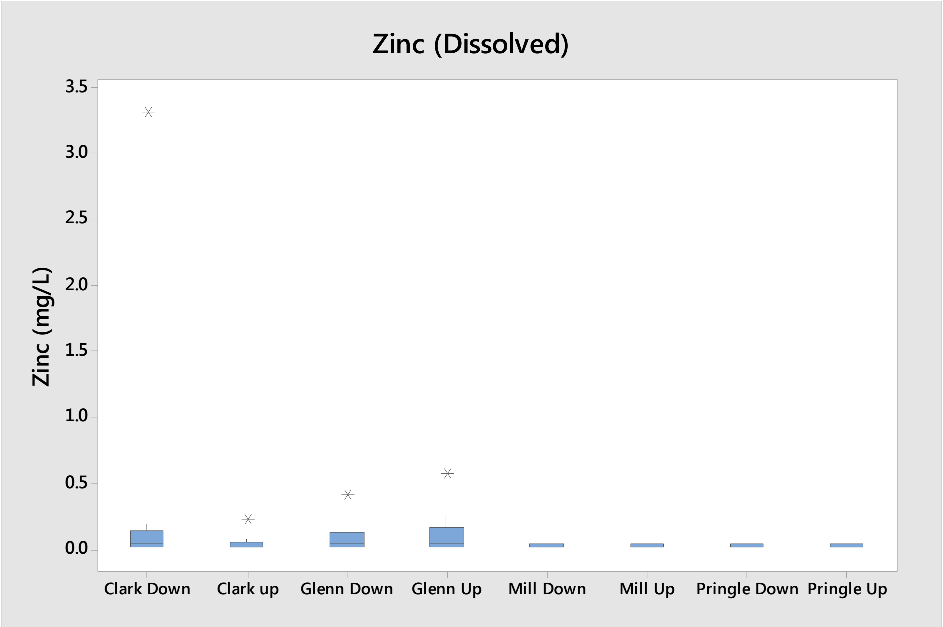

Figure 10.

Box Plots by Pollutant Parameter

Stormwater Sampling Sites (2010-2016)

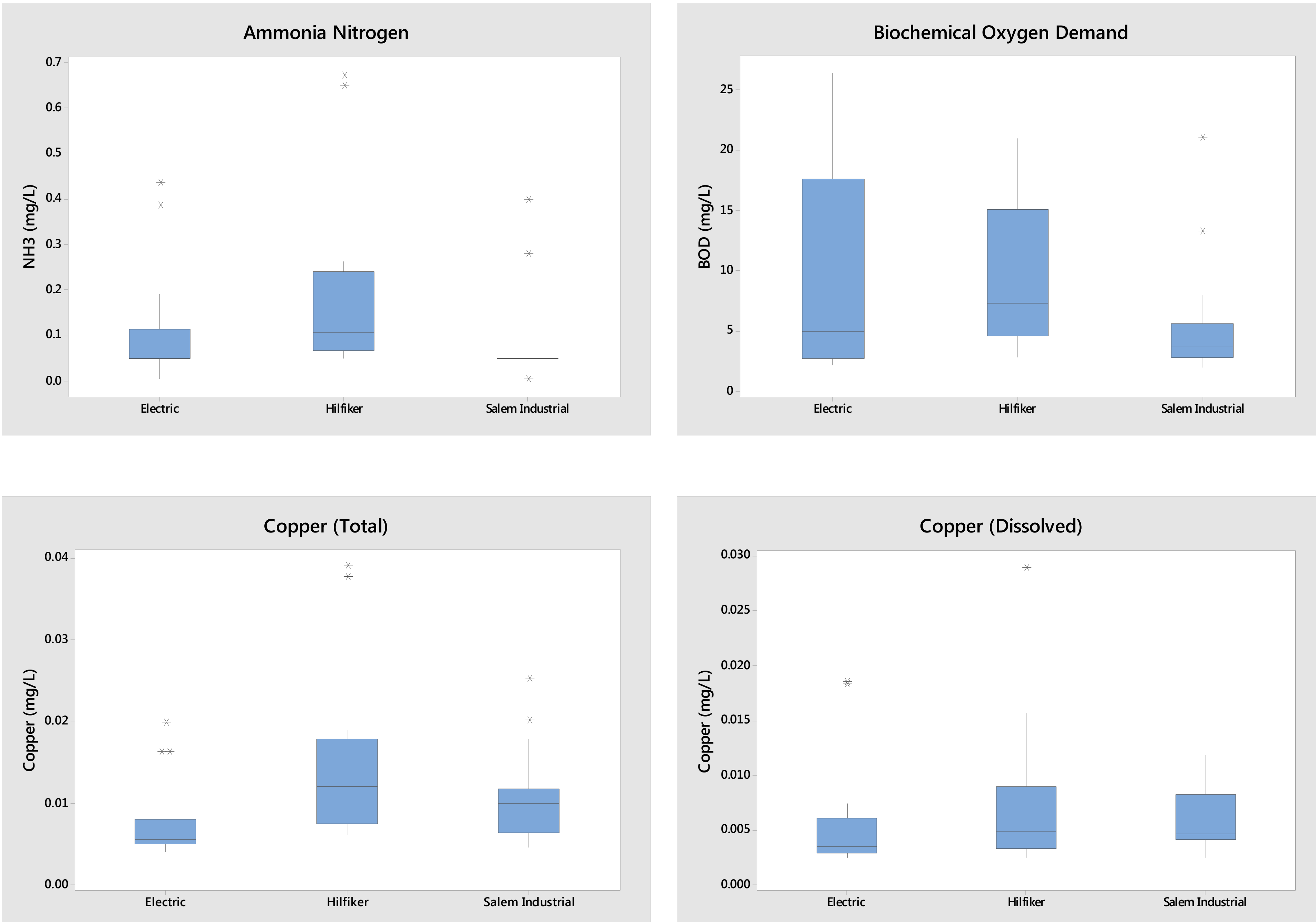

Figure 10.

Box Plots by Pollutant Parameter

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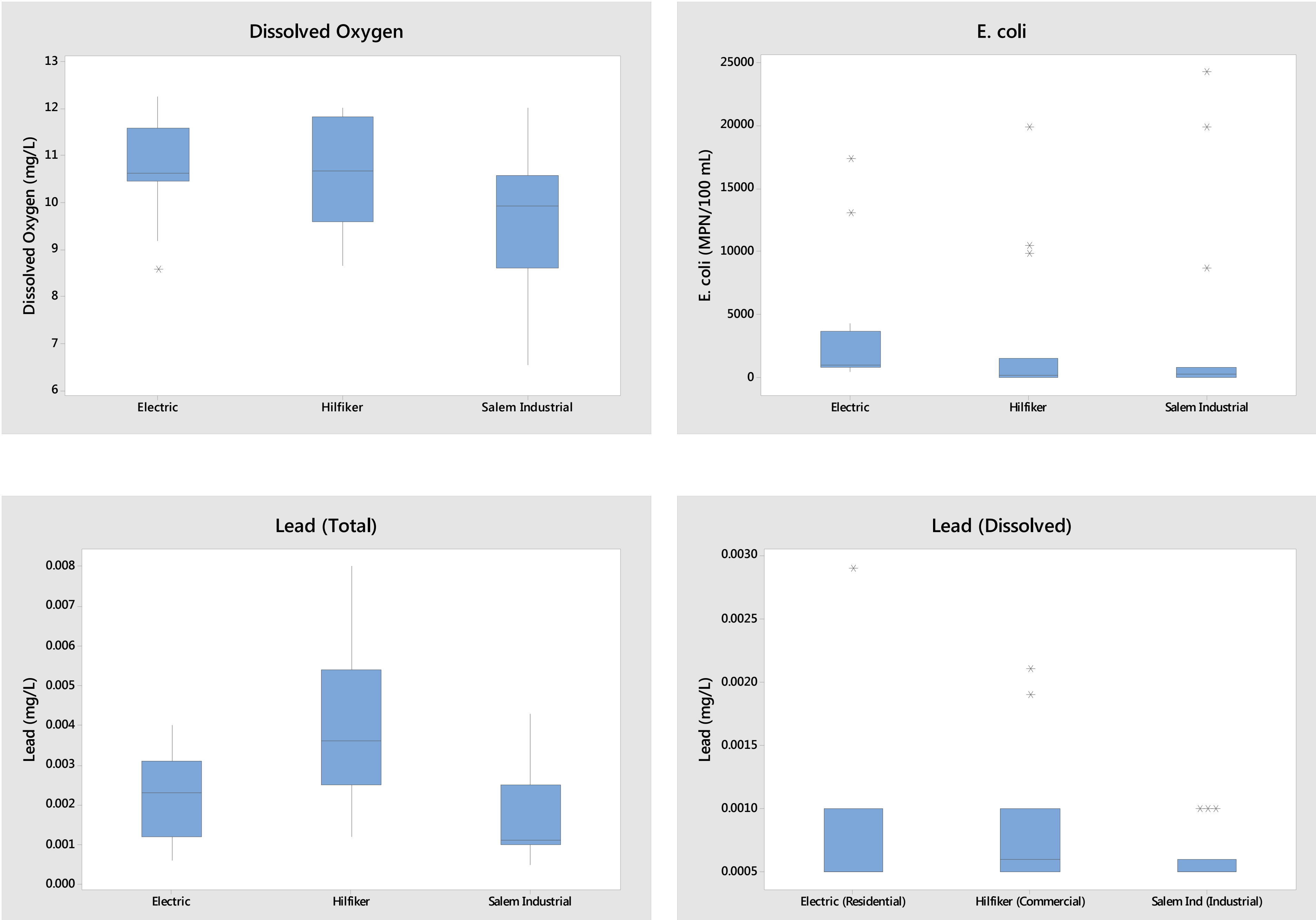

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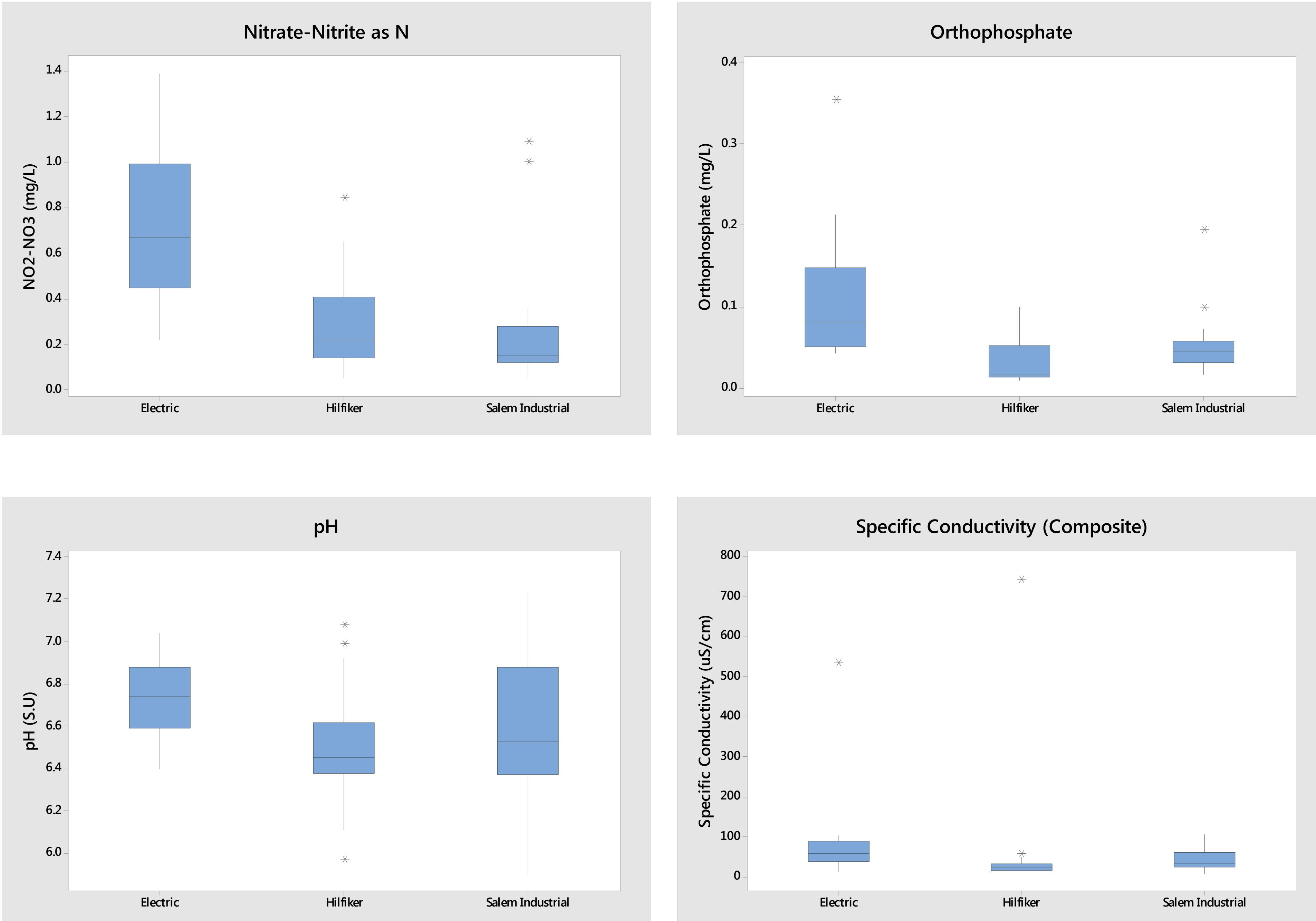

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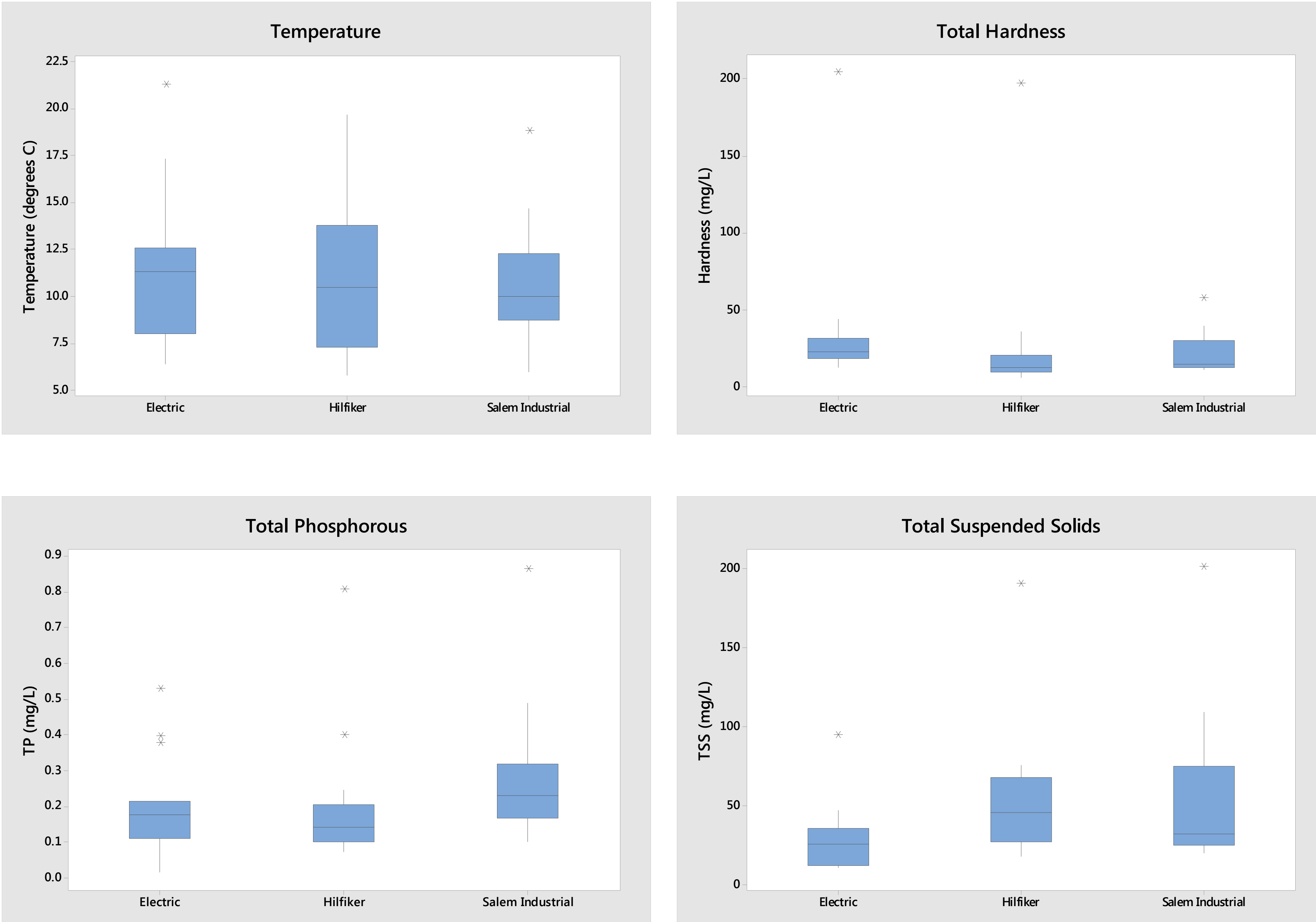

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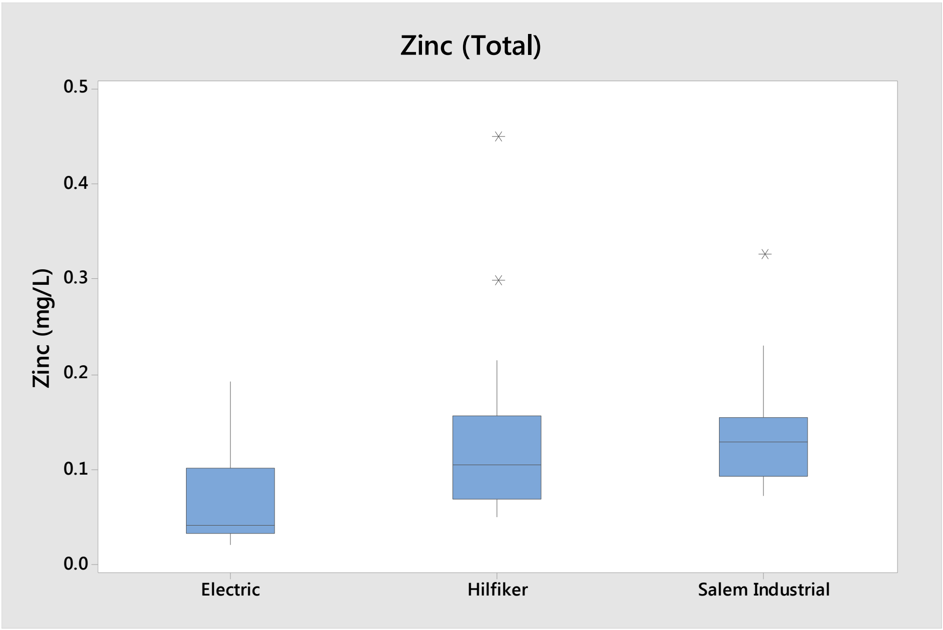

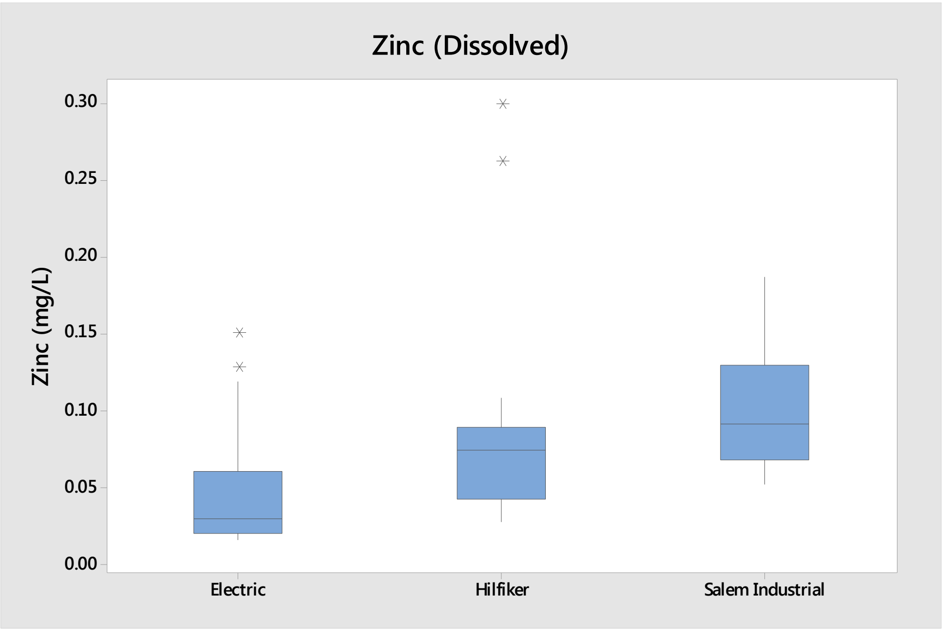

Figure 11.

Box Plots by Pollutant Parameter

Stormwater Sampling Sites (2006-2010)

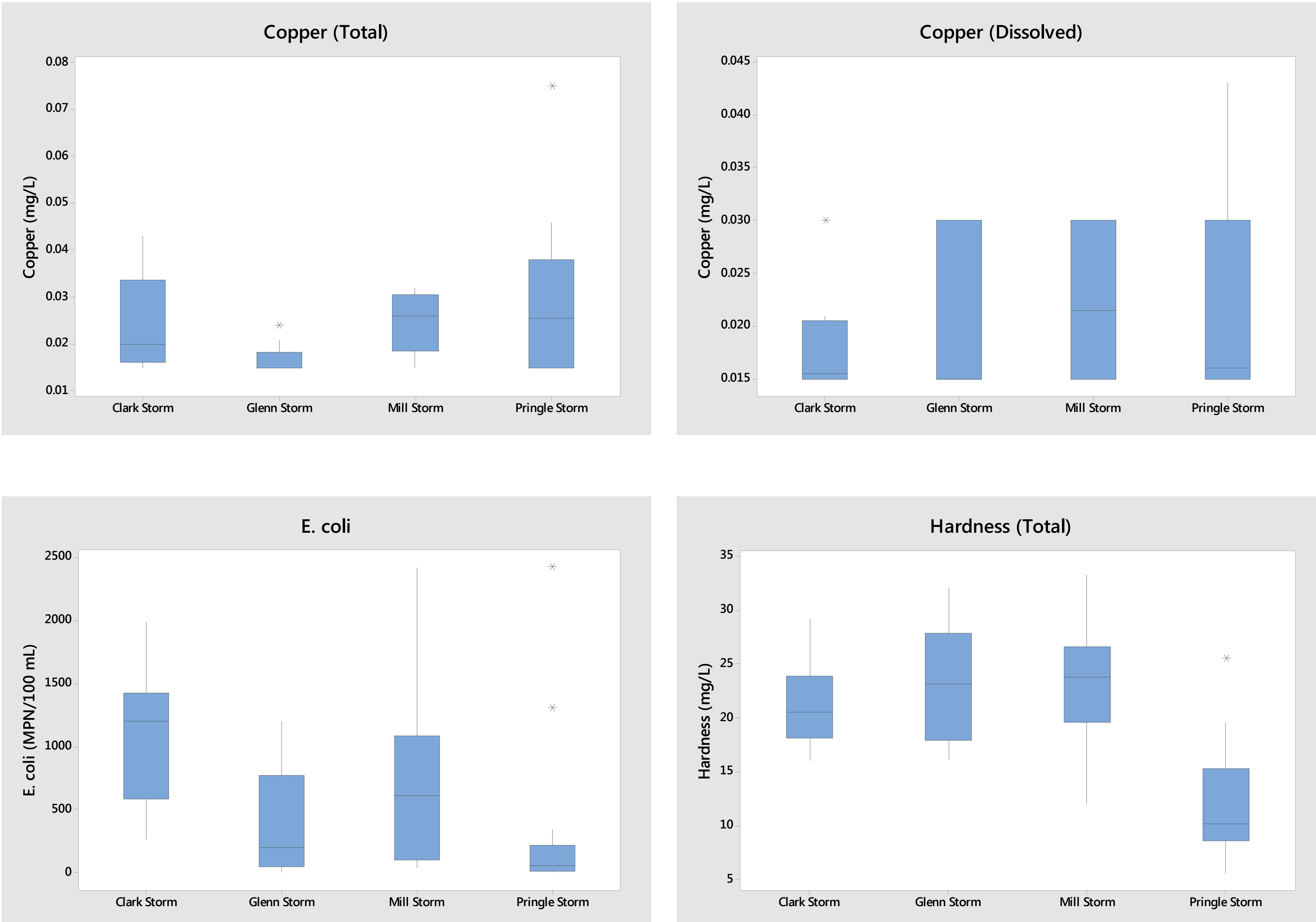

Figure 11.

Box Plots by Pollutant Parameter

Stormwater Sampling Sites (2006-2010)

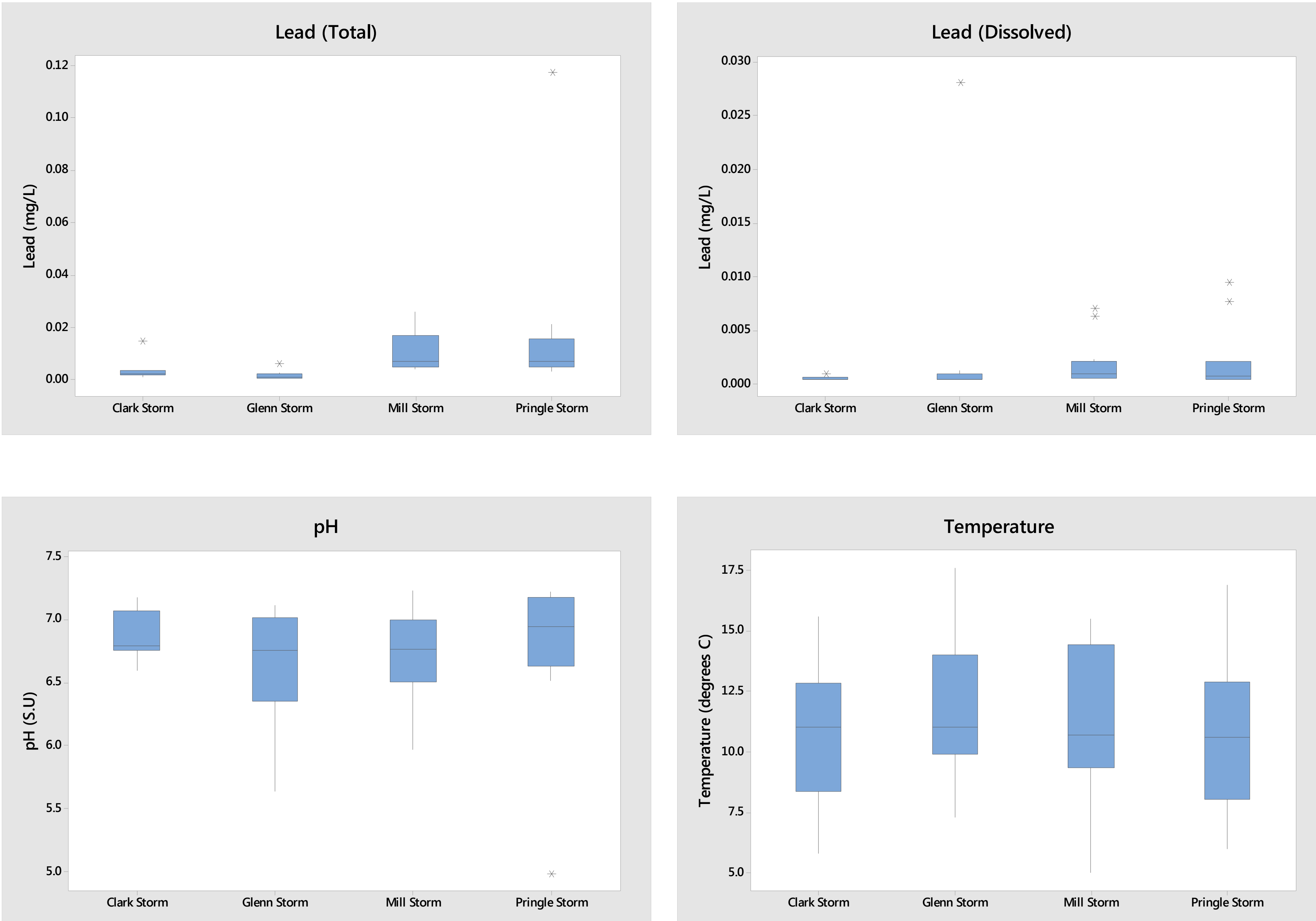

Figure 11.

Box Plots by Pollutant Parameter

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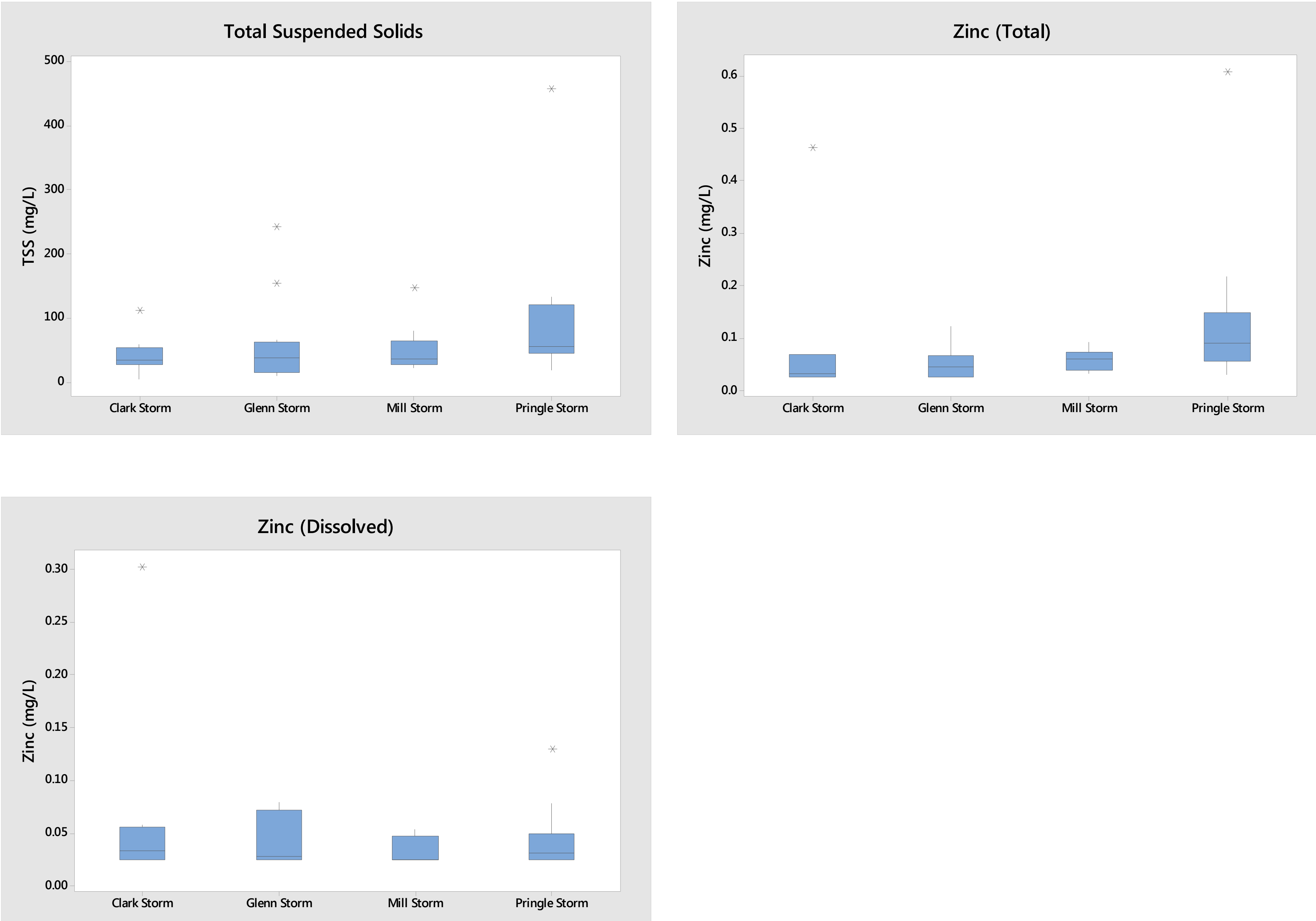

Attachment 1. Salem Modified WQI Calculation Procedure

Salem Modified WQI Calculation Procedure

Index	OWQI Procedure	Salem Modified WQI Procedure
Temperature subindex (SI_T)	$T \le 11C$: $SI_T = 100$ $11C < T \le 29C$: $SI_T = 76.54 + 4.172*T - 0.1623*T^2 - 2.0557E\text{-}3*T^3$ $29C < T$: $SI_T = 10$	Same as OWQI
DO subindex (SI_{DO})	DO concentration (DOc) ≤ 3.3 mg/L $SI_{DO} = 10$ 3.3 mg/L $< DO_C <$ 10.5 mg/L $SI_{DO} = -80.29 + 31.88*DO_C - 1.401*DO_C^2$ 10.5 mg/L $\le DO_C$ $SI_{DO} = 100$	Same as OWQI
BOD subindex (SI_{BOD})	BOD $\le$ 8 mg/L: $SI_{BOD} = 100 * \exp(BOD * -0.1993)$ 8 mg/L < BOD: $SI_{BOD} = 10$	Same as OWQI
pH subindex (SI_{pH})	$pH < 4$: $SI_{pH} = 10$ $4 \le pH < 7$: $SI_{pH} = 2.628 * \exp(pH * 0.5200)$ $7 \le pH \le 8$: $SI_{pH} = 100$ $8 < pH \le 11$: $SI_{pH} = 100 * \exp((pH-8) * -0.5188)$ $11 < pH$: $SI_{pH} = 10$	Same as OWQI
Total Solids subindex (SI_{TS})	TS $\le$ 40 mg/L: $SI_{TS} = 100$ 40 mg/L < TS $\le$ 280 mg/L: $SI_{TS} = 123.4 * \exp(TS * -5.296E\text{-}3)$ 280 mg/L < TS: $SI_{TS} = 10$	Not calculated, data not available.
Nitrate+Ammonia subindex (SI_N)	N $\le$ 3 mg/L: $SI_N = 100 * \exp(N * -0.4605)$ 3 mg/L < N: $SI_N = 10$	Same as OWQI, except substituted nitrate+nitrite-N concentration for nitrate+ammonia-N concentration.
Total phosphorus subindex (SI_p)	P $\le$ 0.25 mg/L: $SI_P = 100 - 299.5*P - 0.1384*P^2$ 0.25 mg/L < P: $SI_P = 10$	Not calculated, data not available.
Fecal coliform subindex (SI_{FC})	FC $\le$ 50 #/100 mL: $SI_{FC} = 98$ 50 #/100 mL < FC $\le$ 1600 #/100 mL: $SI_{FC} = 98 * \exp((FC-50) * -9.9178E\text{-}4)$ 1600 #/100 mL < FC: $SI_{FC} = 10$	Same as OWQI, except transformed measured E. coli concentration to FC concentration using the expression from Crude (2005): Fecal coliform = 1.82 * (*E. coli*) ^ 0.946
Water Quality Index	$OWQI = \sqrt{\dfrac{n}{\sum_{i=1}^{n} \frac{1}{SI_i^2}}}$ =SQRT(8/(1/ SI_T^2+1/ SI_{DO}^2+1/ SI_{BOD}^2+1/ SI_{PH}^2+1/ SI_{TS}^2+1/ SI_N^2+1/ SI_P^2+1/ SI_{FC}^2))	Same as OWQI, except SI_{TS} and SI_P are omitted as described above. Consequently n=6.

APPENDIX B. CITY OF SALEM CAPITAL IMPROVEMENT PLAN FY 2016-2021 (STORMWATER)

Stormwater

The City of Salem provides its residents with stormwater services within an area that comprises more than 48 square miles and 13 urban watersheds. The services include: stormwater system operation and maintenance, stormwater quality monitoring, public education and involvement, flood response, street sweeping, stream cleaning, spill response, municipal regulations, stormwater quality complaint response, facility inspections, and capital projects for growth, replacement, efficiency, and level of service compliance.

Salem's stormwater collection system consists of more than:

- 85 miles of open channels and ditches;
- 90 miles of waterways;
- 420 miles of pipes and culverts;
- 900 detention basins;
- 22,000 storm drainage structures;
- 5 controls, diversions, and fish passage structures; and
- 30 monitoring and water quality facilities.

The stormwater system has an estimated replacement value of approximately $950,000,000.

Stormwater Projects by Funding Source

Funding Source	FY 2016-17	FY 2017-18	FY 2018-19	FY 2019-20	FY 2020-21	Total
FEMA	1,100,000	-	-	-	-	1,100,000
Utility Rates	2,231,000	345,000	1,205,000	1,595,000	4,316,000	9,692,000
Total:	$ 3,331,000	$ 345,000	$ 1,205,000	$ 1,595,000	$ 4,316,000	$ 10,792,000

Stormwater Project Details

Project Number:	0000121	Score:	62.750
Category:	Stormwater	Ward:	1
Neighborhood:	Central Area Neighborhood (CAN-DO), West Salem Neighborhood Association		
Title:	Wallace Marine Park Boat Ramp and Parking Area Repairs		

Funding Source	FY 2016-17	FY 2017-18	FY 2018-19	FY 2019-20	FY 2020-21	Total
FEMA	600,000	-	-	-	-	600,000
Current CIP Total:	$ 600,000	$ -	$ -	$ -	$ -	$ 600,000
Amount Funded in Prior Years:						124,281
Total Estimated Project Cost:						$ 724,281

Design and construction to repair damages to the Willamette River bank sustained during the January 2012 flood event. An application for Federal Emergency Management Agency (FEMA) funding has been submitted.

Project Number:	0000126					Score:	43.000
Category:	Stormwater					Ward:	3
Neighborhood:	Southeast Mill Creek Association (SEMCA)						
Title:	Pipe Replacement - Campbell Dr / Cranston St Package						
Funding Source	**FY 2016-17**	**FY 2017-18**	**FY 2018-19**	**FY 2019-20**	**FY 2020-21**		**Total**
Utility Rates	675,000	-	-	-	-		675,000
Current CIP Total:	$ 675,000	$ -	$ -	$ -	$ -		$ 675,000
Amount Funded in Prior Years:							35,005
Total Estimated Project Cost:							$ 710,005

Design and construction for the replacement of approximately 1,300 linear feet of 12-inch pipe in the vicinity of Campbell Dr SE at 42nd Ave SE and Cranston St SE from Carson Dr SE to Campbell Dr SE.

Project Number:	0000180					Score:	55.000
Category:	Stormwater					Ward:	5
Neighborhood:	Northgate Neighborhood Association						
Title:	Salem Industrial Park, East of Tandem Avenue NE to Bill Frey Drive NE - Stormwater Improvements						
Funding Source	**FY 2016-17**	**FY 2017-18**	**FY 2018-19**	**FY 2019-20**	**FY 2020-21**		**Total**
Utility Rates	250,000	-	-	-	-		250,000
Current CIP Total:	$ 250,000	$ -	$ -	$ -	$ -		$ 250,000
Amount Funded in Prior Years:							1,100,000
Total Estimated Project Cost:							$ 1,350,000

Construction of approximately 2,100 linear feet of new 18-inch and 30-inch pipe required to abandon an existing underground injection control facility at Salem Industrial Park. This project provides additional funding for a project in the North Gateway Urban Renewal Area.

Project Number:	0000183					Score:	49.250
Category:	Stormwater					Ward:	1
Neighborhood:	Highland Neighborhood Association						
Title:	Broadway Street NE - Stormwater Improvements						
Funding Source	**FY 2016-17**	**FY 2017-18**	**FY 2018-19**	**FY 2019-20**	**FY 2020-21**		**Total**
Utility Rates	100,000	-	-	-	-		100,000
Current CIP Total:	$ 100,000	$ -	$ -	$ -	$ -		$ 100,000
Amount Funded in Prior Years:							219,999
Total Estimated Project Cost:							$ 319,999

Design and construction for the replacement of 465 feet of undersized 8-inch pipe with 10-inch pipe on Broadway St NE from Academy St NE to Columbia Ave NE.

Project Number:	0000217	Score:	48.250
Category:	Stormwater	Ward:	2
Neighborhood:	Northeast Neighbors (NEN)		
Title:	Center Street Pipe Relocation Phase A and B		

Funding Source	**FY 2016-17**	**FY 2017-18**	**FY 2018-19**	**FY 2019-20**	**FY 2020-21**	**Total**
Utility Rates	-	-	505,000	1,095,000	-	1,600,000
Current CIP Total:	$ -	$ -	$ 505,000	$ 1,095,000	$ -	$ 1,600,000
Amount Funded in Prior Years:						-
Total Estimated Project Cost:						$ 1,600,000

Design and construction to abandon existing 24-inch and 30-inch stormwater pipe that is located in back lots between B St NE and Breyman Ave NE and reinstall new 12-inch to 24-inch stormwater main within the street right-of-way.

Project Number:	0000218	Score:	44.250
Category:	Stormwater	Ward:	2
Neighborhood:	South Central Association of Neighbors (SCAN)		
Title:	Cedar Way SE: Fairview Avenue to Summer Street		

Funding Source	**FY 2016-17**	**FY 2017-18**	**FY 2018-19**	**FY 2019-20**	**FY 2020-21**	**Total**
Utility Rates	-	100,000	-	-	-	100,000
Current CIP Total:	$ -	$ 100,000	$ -	$ -	$ -	$ 100,000
Amount Funded in Prior Years:						-
Total Estimated Project Cost:						$ 100,000

Design and construction of stormwater infiltration facilities and associated improvements to address neighborhood drainage problems.

Project Number:	0000219	Score:	62.750
Category:	Stormwater	Ward:	7
Neighborhood:	Sunnyslope Neighborhood Association		
Title:	McKay Drive S: North of Leona to Dwight Drive Pipe Relocation		

Funding Source	**FY 2016-17**	**FY 2017-18**	**FY 2018-19**	**FY 2019-20**	**FY 2020-21**	**Total**
Utility Rates	-	245,000	-	-	-	245,000
Current CIP Total:	$ -	$ 245,000	$ -	$ -	$ -	$ 245,000
Amount Funded in Prior Years:						-
Total Estimated Project Cost:						$ 245,000

Design and construction to relocate/replace existing 10-inch clay pipe on McKay Dr S between Leona Ln S and Dwight Dr S.

Project Number:	0000271				Score:	45.875
Category:	Stormwater				Ward:	5
Neighborhood:	Highland Neighborhood Association					
Title:	Highland Avenue NE, Church Street NE to Laurel Avenue NE Pipe Replacement					
Funding Source	**FY 2016-17**	**FY 2017-18**	**FY 2018-19**	**FY 2019-20**	**FY 2020-21**	**Total**
Utility Rates	-	-	-	-	416,000	416,000
Current CIP Total:	$ -	$ -	$ -	$ -	$ 416,000	$ 416,000
Amount Funded in Prior Years:						-
Total Estimated Project Cost:						$ 416,000

Design and construction to replace 932 linear feet of 15-inch and 18-inch pipe from Laurel Ave NE to Church St NE.

Project Number:	0000272				Score:	47.625
Category:	Stormwater				Ward:	1
Neighborhood:	Highland Neighborhood Association, Northeast Neighbors (NEN)					
Title:	Woodrow Street Storm Pipeline Replacement					
Funding Source	**FY 2016-17**	**FY 2017-18**	**FY 2018-19**	**FY 2019-20**	**FY 2020-21**	**Total**
Utility Rates	-	-	-	-	200,000	200,000
Current CIP Total:	$ -	$ -	$ -	$ -	$ 200,000	$ 200,000
Amount Funded in Prior Years:						-
Total Estimated Project Cost:						$ 200,000

Design and construction to replace approximately 500 linear feet of failing 24-inch concrete pipe with 24-inch PVC on Woodrow St NE between the UPRR railroad track and Fairgrounds Rd NE.

Project Number:	0000506				Score:	66.750
Category:	Stormwater				Ward:	All
Neighborhood:	All					
Title:	Implementation of DEQ Retrofit Plan					
Funding Source	**FY 2016-17**	**FY 2017-18**	**FY 2018-19**	**FY 2019-20**	**FY 2020-21**	**Total**
Utility Rates	200,000	-	-	-	-	200,000
Current CIP Total:	$ 200,000	$ -	$ -	$ -	$ -	$ 200,000
Amount Funded in Prior Years:						-
Total Estimated Project Cost:						$ 200,000

Design and construction of stormwater system improvements identified in the Stormwater Retrofit Plan submitted to Oregon Department of Environmental Quality in November 2014 per the requirements of Salem's Municipal Separate Stormwater System Discharge Permit.

Project Number:	0000507				Score:	66.750
Category:	Stormwater				Ward:	3
Neighborhood:	Faye Wright Neighborhood Association					
Title:	Total Maximum Daily Load (TMDL) Implementation Plan Projects					
Funding Source	**FY 2016-17**	**FY 2017-18**	**FY 2018-19**	**FY 2019-20**	**FY 2020-21**	**Total**
Utility Rates	100,000	-	-	-	-	100,000
Current CIP Total:	$ 100,000	$ -	$ -	$ -	$ -	$ 100,000
Amount Funded in Prior Years:						-
Total Estimated Project Cost:						$ 100,000

Design and construction of long-term stream bank stabilization and riparian restoration in the section of Pringle Creek flowing from Jones Rd SE to Idylwood Dr SE. The project will address multiple regulatory requirements including those in the Total Maximum Daily Load (TMDL) Implementation Plan for controlling temperature in the Salem watershed.

Project Number:	0000531					
Category:	Stormwater				Ward:	All
Neighborhood:	City-Wide					
Title:	Stream Bank Restoration Mitigation for Various Projects					
Funding Source	**FY 2016-17**	**FY 2017-18**	**FY 2018-19**	**FY 2019-20**	**FY 2020-21**	**Total**
Utility Rates	100,000	-	-	-	-	100,000
Current CIP Total:	$ 100,000	$ -	$ -	$ -	$ -	$ 100,000
Amount Funded in Prior Years:						-
Total Estimated Project Cost:						$ 100,000

Plant establishment, long term monitoring, and maintenance of mitigation sites as required by state and federal environmental permits issued for capital improvement projects. Funding will be transferred to this project from other projects within the construction budget to cover the respective responsibility for each project.

Project Number:	0000532					
Category:	Stormwater				Ward:	1,2
Neighborhood:	Northeast Neighbors (NEN)					
Title:	13th Street NE and Mill Creek Rain Garden					
Funding Source	**FY 2016-17**	**FY 2017-18**	**FY 2018-19**	**FY 2019-20**	**FY 2020-21**	**Total**
Utility Rates	56,000	-	-	-	-	56,000
Current CIP Total:	$ 56,000	$ -	$ -	$ -	$ -	$ 56,000
Amount Funded in Prior Years:						-
Total Estimated Project Cost:						$ 56,000

Design and construction of a bio swale located at the end of the 13th St NE across Mill Creek from the Olinger Pool. The total impervious surface served by this facility is approximately 37,000 square feet.

Project Number: 0000544
Category: Stormwater — Ward: All
Neighborhood: City-Wide
Title: Battle Creek Stormwater Master Plan Improvements

Funding Source	FY 2016-17	FY 2017-18	FY 2018-19	FY 2019-20	FY 2020-21	Total
Utility Rates	-	-	-	500,000	2,200,000	2,700,000
Current CIP Total:	$ -	$ -	$ -	$ 500,000	$ 2,200,000	$ 2,700,000
Amount Funded in Prior Years:						-
Total Estimated Project Cost:						$ 2,700,000

Preliminary estimates for design and construction of stormwater improvement projects as identified in the Stormwater Master Plan for the Battle Creek basin. Projects may include flood mitigation, open channel/creek improvements, pipe capacity expansion and/or implementation of stormwater infiltration, flow control and treatment.

Project Number: 0000545
Category: Stormwater — Ward: All
Neighborhood: City-Wide
Title: Mill and Pringle Creeks Stormwater Master Plan Improvements

Funding Source	FY 2016-17	FY 2017-18	FY 2018-19	FY 2019-20	FY 2020-21	Total
Utility Rates	-	-	-	-	1,500,000	1,500,000
Current CIP Total:	$ -	$ -	$ -	$ -	$ 1,500,000	$ 1,500,000
Amount Funded in Prior Years:						-
Total Estimated Project Cost:						$ 1,500,000

Preliminary estimates for design and construction of stormwater improvement projects as identified in the Stormwater Master Plan for the Mill and Pringle Creek basins. Projects may include flood mitigation, open channel/creek improvements, pipe capacity expansion and/or implementation of stormwater infiltration, flow control and treatment.

Project Number: 0000553
Category: Stormwater — Ward: 2
Neighborhood: South East Salem Neighborhood Association (SESNA)
Title: 25th Street SE at Madrona Avenue SE Stormwater Improvements

Funding Source	FY 2016-17	FY 2017-18	FY 2018-19	FY 2019-20	FY 2020-21	Total
Utility Rates	750,000	-	-	-	-	750,000
Current CIP Total:	$ 750,000	$ -	$ -	$ -	$ -	$ 750,000
Amount Funded in Prior Years:						-
Total Estimated Project Cost:						$ 750,000

Design and construction of a new box culvert and associated channel, wall, and embankment improvements for the east fork of Pringle Creek at the intersection of 25th Street SE / Madrona Avenue SE.

Project Number:	0000140					
Category:	Stormwater				Ward:	2
Neighborhood:	South Central Association of Neighbors (SCAN)					
Title:	Summer Street at Clark Creek Stormwater Improvements					
Funding Source	**FY 2016-17**	**FY 2017-18**	**FY 2018-19**	**FY 2019-20**	**FY 2020-21**	**Total**
FEMA	500,000	-	-	-	-	500,000
Current CIP Total:	$ 500,000	$ -	$ -	$ -	$ -	$ 500,000
Amount Funded in Prior Years:						-
Total Estimated Project Cost:						$ 500,000

Repair of roadway and culvert replacement at Clark Creek due to the January 2012 flood event. Primary funding provided by the Federal Emergency Management Agency (FEMA).

Project Number:	0000557					
Category:	Stormwater				Ward:	2
Neighborhood:	South East Salem Neighborhood Association (SESNA)					
Title:	McGilchrist Street SE Stormwater Improvements					
Funding Source	**FY 2016-17**	**FY 2017-18**	**FY 2018-19**	**FY 2019-20**	**FY 2020-21**	**Total**
Utility Rates	-	-	700,000	-	-	700,000
Current CIP Total:	$ -	$ -	$ 700,000	$ -	$ -	$ 700,000
Amount Funded in Prior Years:						-
Total Estimated Project Cost:						$ 700,000

Work includes replacing stream crossing structures at the East and West Forks of Pringle Creek to coincide with Streets companion project (CIP 554). Funding for project represents partial match funding to support Transportation Investment Generating Economic Recovery (TIGER) Grant application.