**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 2017-18

**October 29, 2018**

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.

_____ _____

**Mark Becktel, AICP, Operations Division Manager** **Date**

**Prepared by**
**City of Salem Public Works Department**

This page intentionally left blank.

# Table of Contents



**LIST OF FIGURES**



**LIST OF TABLES**



**LIST OF APPENDICES**

**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 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 DEQ in April 2002, and the City's second MS4 permit was issued in March 2004. The next permit renewal application was submitted to 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 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 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 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/Pages/ms4-permits-and-annual-reports.aspx) along with all subsequent annual reports associated with the current permit cycle. This document represents the City's Fiscal Year 2017-18 (FY 17-18) 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, 2017, through June 30, 2018, 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 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.

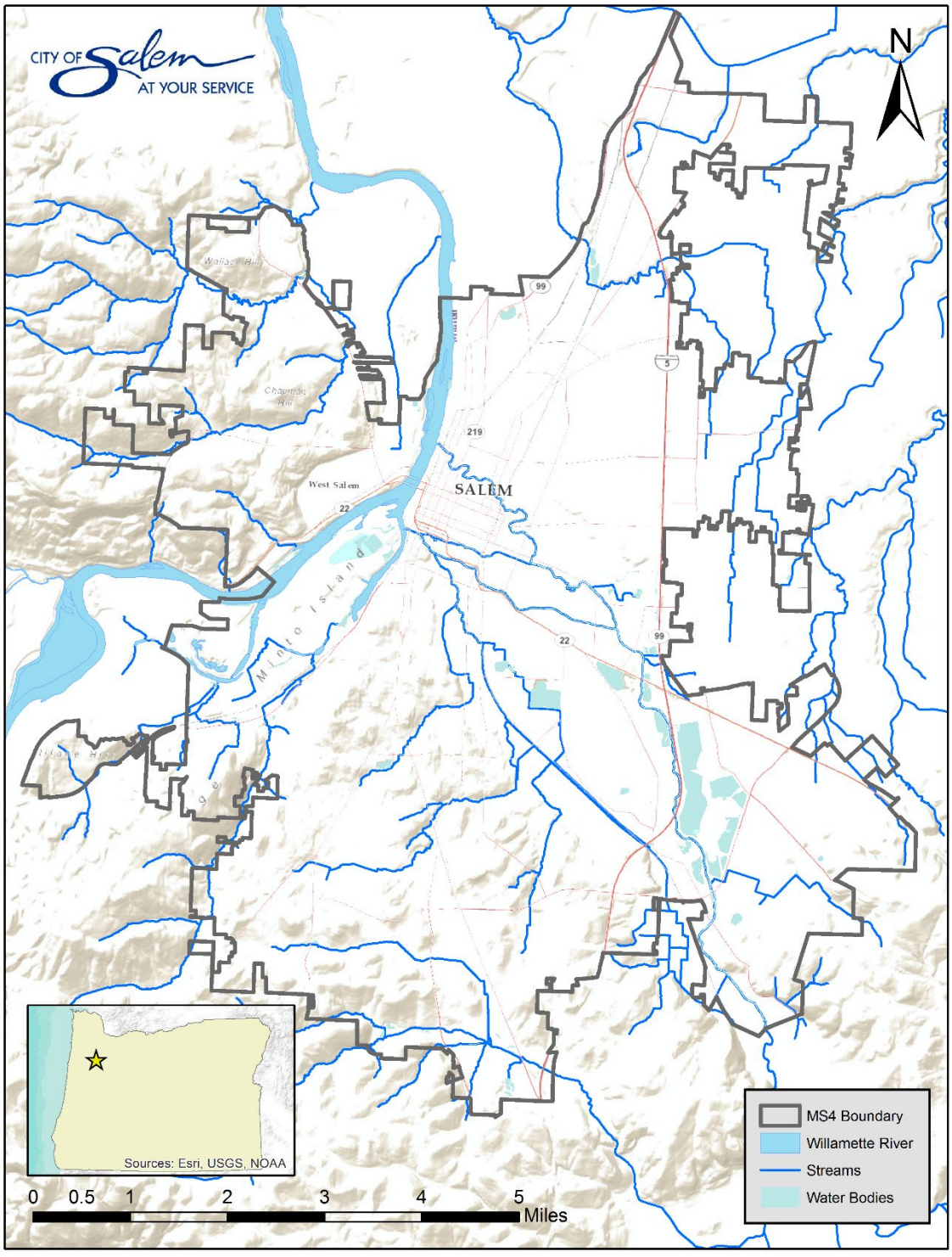
Consistent with Schedule D.4 of the MS4 permit, City staff submitted an "Adaptive Management Approach" to DEQ on October 24, 2011, that will continue to be adhered to through expiration of the MS4 permit. This approach involves both an annual review of BMP activities and collected data, as well as a 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 in 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 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 18-19). No additional changes to the SWMP were proposed during this reporting period.

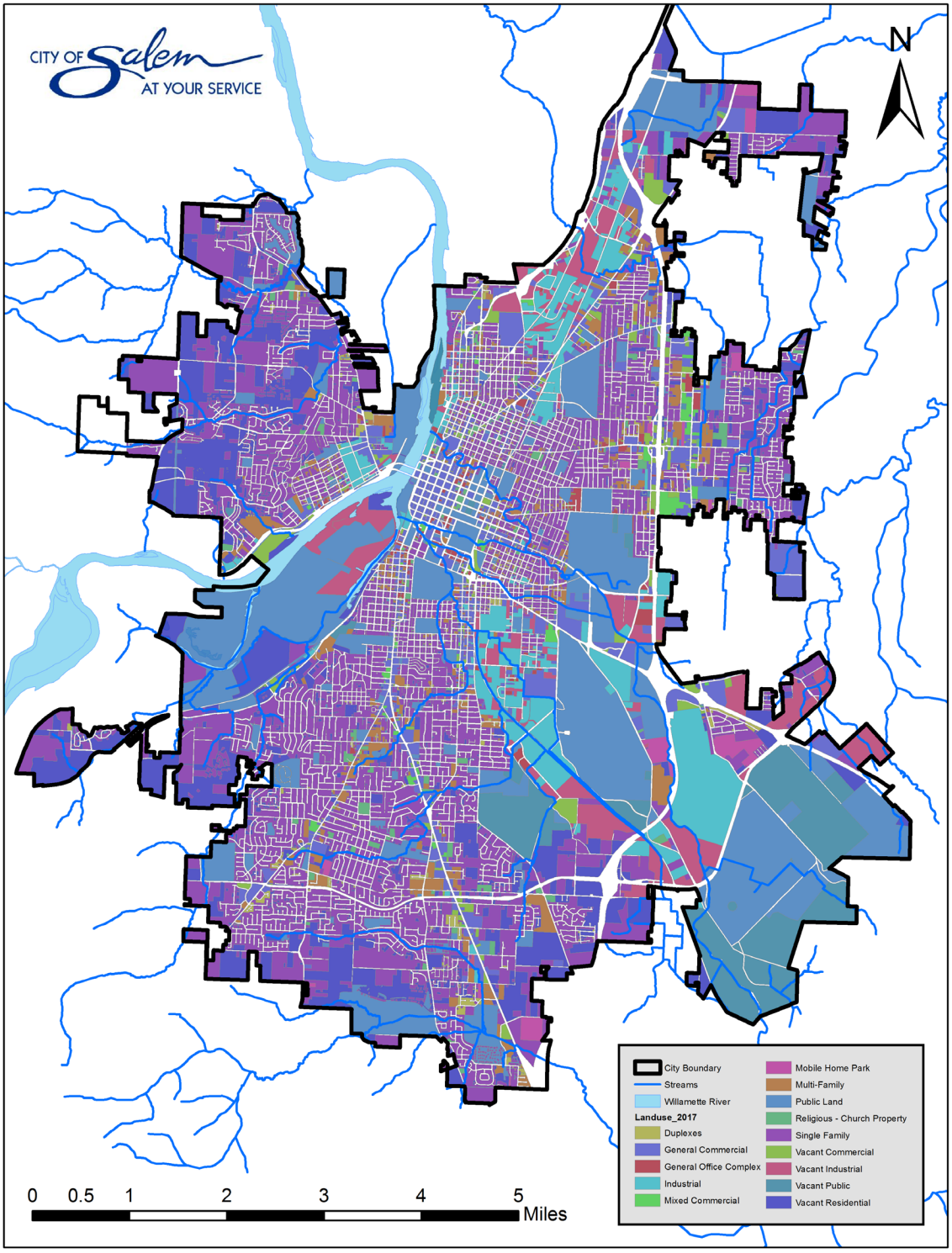
This page intentionally left blank.

**Figure 1. Permit Area Map**



This page intentionally left blank.

**Figure 2. Land Use**



This page intentionally left blank.

# 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).

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 2017-2018 (July 1, 2017 through June 30, 2018) that demonstrates progress toward meeting the measurable goals and tracking measures.

This page intentionally left blank.

**Table 2. RC1—Planning**

| Task Description | Measurable Goals | Tracking Measures | FY 2017-18 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.<br>Report on Master Plan update actions. | An updated Stormwater Master Plan has been drafted. The draft plan carries forward analysis conducted for the 2000 Stormwater Master Plan and will contain updated basin plans for Battle Creek, Mill Creek, and Pringle Creek. The plan for Battle Creek is in final draft. Surveys, data collection, and model calibration/validation have been completed. Projects have been identified and cost estimates are underway. The completed update to the Stormwater Master Plan is expected to go to City Council before the end of 2018. |
| **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.<br>Incorporate recommendations and early action items of watershed management plans with completion of hydromodification study and retrofit plan.<br>Develop strategy for completing future watershed management plans by November 1, 2014. | Report on completion of hydromodification study.<br>Report on completion of retrofit plan.<br>Track implementation actions of Pringle Creek Watershed Management Plan.<br>Report on strategy for completing future watershed management plans. | The Hydromodification Assessment and Stormwater Retrofit Plan were completed and submitted to DEQ on October 28, 2014.<br>During reporting period 2015/2016, City staff and contracted professionals conducted survey work and developed a list of early action activities (taking into consideration data collected from the 2013 Hydromodification Assessment), to inform the Battle Creek Basin Plan.<br>During reporting period 2016/2017, City staff and contracted professionals conducted survey work and developed a list of early action activities (taking into consideration data collected from the 2013 Hydromodification Assessment), to inform the Pringle Creek and Mill Creek Basin Plans currently being developed per the updated Stormwater Master Plan (See RC 1-1). Preliminary findings were reviewed with City staff in October 2017.<br>During the reporting period 2016/2017, City staff and contracted professionals worked on developing a stormwater retrofit prioritization tool based upon the strategies outlined in the Stormwater Retrofit Plan. This tool will enable City staff to organize and prioritize potential stormwater retrofit projects for the City's Capital Improvement Program, and it is anticipated to be completed in reporting year 2017/2018.<br>During the reporting period 2017/2018, City staff and contracted professionals completed the stormwater retrofit prioritization tool. The tool was used to score several potential retrofit projects, including the 13th Street and Marion St Community Rain Garden, which was funded and completed during the fiscal year. This tool will now be utilized as part of the annual CIP project identification process. |
| **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.<br>Complete field ground-truthing by end of FY 2011-12.<br>Update map by end of FY 2012-13. | Track completion of ground-truthing and map updates. | All waterway layers were consolidated into one "channels" feature layer in SDE (Spatial Database Engine) as part of the Stormwater utilities migration from Hansen to Infor Public Sector (IPS). This consolidated layer is the master data set for all waterways. |
| **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.<br>Conduct annual training of employees involved in MS4-related positions, more often if necessary. | Prepare an annual meeting summary.<br>Track changes made to the implementation of the stormwater program based on coordination discussions.<br>Track major items of coordination.<br>Track training attendance.<br>Share and document training suggestions for MS4 implementation changes. | City staff from a variety of workgroups continued to participate in MS4 coordination meetings throughout the 2017-18 reporting year in order to review and complete MS4 program tasks. These coordination meetings included but were not limited to the following MS4 related efforts: public education & outreach (routine coordination meetings for the annual "Mid-Valley Erosion Control and Stormwater Summit"), internal MS4 communication & coordination, Mill & Pringle Creek Master Planning data needs, Dry Weather Outfall Screening procedures, Operations & Maintenance, stormwater facility inspections, potential revisions to the Stormwater Design Standards listed in Admin Rule 109-004), and processes for prioritizing potential stormwater retrofit projects per the previously submitted Retrofit Plan.<br>An "Employee Guide for Pollution Prevention" was previously developed that is now distributed to all new employees during employee orientation. Public Works Operations employees receive annual training on spill prevention and response, good housekeeping, and chemical storage. Staff involved with pesticide applications receive annual trainings pertaining to licensing requirements. Staff continued to participate in Oregon Association of Clean Water Agencies (ACWA) Stormwater subcommittees this last year (see RC1 Task 8).<br>City staff attended the May 2018 Stormwater Summit in Eugene and the July 2018 Stormwater Summer Conference in Bend.<br>City staff attended the Annual Polk County Stormwater Meeting in June to discuss coordinating stormwater management practices within the urban growth boundaries outside of city limits.<br>City staff attends the City of Keizer's Stormwater Advisory Committee to discuss collaboration between the implementation of Salem's Phase 1 MS4 permit and Keizer's Phase 2 MS4 permit. |
| **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. | Clean Rivers Coalition |

| Task Description | Measurable Goals | Tracking Measures | FY 2017-18 Activities |
|---|---|---|---|
| | | | The Clean Rivers Coalition is a group of agencies and non-profit organizations building a statewide stormwater outreach campaign. Public Works staff attend regular meetings. Items of coordination included the following:<br>• Updating the organizational charter to reflect current operations.<br>• The CRC received a grant from Meyer Memorial Trust. A scope of work and request for proposals were developed.<br>• Review of request for proposals and consultant interviews occurred. BRINK consultants were selected for the grant project.<br>Claggett Creek Watershed Council<br>Public Works personnel attended watershed council meetings and assisted with planning of a collaborative Claggett Creek watershed story map.<br>Friends of Trees (FOT)<br>The City of Salem contracted with FOT again this year to assist with riparian and upland tree plantings. The group hosted one Crew Leader Training event and seven tree and shrub planting events. 676 volunteers planted a total of 8,032 plants of which 66 were large-stock upland trees, and 7,966 were small-stock native riparian trees and native riparian shrubs.<br>Glenn-Gibson Watershed Council<br>Public Works staff attend the monthly council meetings. Items of coordination included the following:<br>Follow-up maintenance activities for Eola Ridge Park, where the City of Salem provided matching funds for the clearing of invasive species and restorative native plantings. This was an OWEB small grant project that leveraged the partnership of the Glenn-Gibson Watershed Council, the Polk County Soil and Water Conservation District, Friends of Trees, and the City of Salem Public Works Department. During the reporting period, City staff provided a presentation to the council on the annual stream cleaning program and engaged the council on streambank erosion issues along Goldcrest Brook. City staff will continue to work with the Glenn-Gibson Watershed Council and private property homeowners in securing resources for streambank improvements.<br>Mid-Willamette Outreach Group<br>• On January 30, 2018, the Mid-Willamette Outreach Group (MWOG) hosted their seventh Erosion Control and Stormwater Management Summit (Summit). The event had 109 registered attendees.<br>• The group hosted seven classes (~210 students) at the Water Festival on May 15, 2018. Fourteen courses were provided by MWOG staff and associates and were dedicated to water and watershed health.<br>Oregon Green Schools<br>Public Works personnel sit on the board and the executive committee of Oregon Green Schools. Staff attends monthly meetings and provides overall direction for the organization. Highlights for the year include implementing a grant received from DEQ to address waste reduction in rural communities, implementing the recently developed strategic plan, and hosting the annual Oregon Green School Summit.<br>Salem Environmental Education<br>Staff serves on the board and attends regular board meetings to provide overall direction for the organization. Staff is helping to coordinate a session on urban ecology. Youth education staff provides eSTEM afterschool activities in coordination with SEE once a month for three different schools between October and May.<br>Salem No Ivy Coalition<br>City of Salem staff help coordinate ivy pull events at local parks. The City of Salem and the Salem No Ivy Coalition hosted or attended 10 events, with 361 volunteer hours, and rescued 456 trees from chocking ivy. Waldo Park, the City's smallest park, has had ivy pulls and treatment the last few years. A plant list and planting plan was developed. In fall of 2017, volunteers and staff planted the park with native plants. Staff waters the park during the dry summer months.<br>Straub Environmental Center |

| Task Description | Measurable Goals | Tracking Measures | FY 2017-18 Activities |
|---|---|---|---|
| | | | The City of Salem coordinated with Straub Environmental Center to provide a two-day service-learning opportunity for Girls, Inc. where they learned about urban ecology, stormwater management, and urban parks and open spaces. |
| **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.<br><br>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 2013-14 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 were deemed necessary during this reporting period. SKAPAC participants will continue to meet if needed to review public or private development projects that may impact the agreement.<br><br>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. |
| **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.<br><br>Develop a strategy to identify and prioritize potential retrofit projects by November 1, 2013.<br><br>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 and submitted to DEQ on October 28, 2014.<br><br>During this reporting period the City budgeted $100,000 towards the design and construction of stormwater retrofit projects as part of the City's Capital Improvement Program. 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.<br><br>The $180,000 stormwater retrofit project targeting bacteria at Eola Ridge Park in West Salem was completed on October 30, 2015, and maintenance activities at the site continued during this reporting period, which included weed removal within the basin, and routine inspection and cleaning of the mechanical treatment facility. During the 2015/16 reporting year, a $10,000 OWEB grant was awarded to the Glenn-Gibson Watershed Council in partnership with Polk County Soil & Water Conservation District, Friends of Trees, and the City's Public Work's Department to remove invasive species and plant native trees and shrubs at the Park. During this reporting year, all partners implemented invasive species removal activities and community tree plantings, which have improved the habitat of the receiving waterbody immediately downstream from the retrofit site within the same city park.<br><br>The following stormwater retrofit projects were completed during reporting period 2017/2018:<br><br>• Marion St NE and 13th St NE Stormwater Improvement Project: City staff designed and constructed a 1,000 SF rain garden and approximately 125 LF of 10-inch storm pipe upstream of a stormwater outfall to Mill Creek. Staff worked with North Salem High School students in the planting plan design and engaged the students in the planting of the basin. An interpretive sign was created for this site for educational purposes. The Rain Garden is designed per City standards, and will be treating approximately 31,000 square feet of impervious area. The total basin has approximately 183,000 square feet of impervious area.<br><br>• McKay Drive S Stormwater Improvement: City staff designed and constructed the replacement of approximately 800 LF of 10-inch storm pipe.<br><br>• Summer Street at Clark Creek Culvert Replacement: City staff designed and constructed the replacement of an existing box culvert.<br><br>• Union Street NE at Commercial St NE Intersection Improvements: City staff designed and constructed intersection improvements, which also created the installation of two stormwater quality basins.<br><br>Starting in fiscal year 2016/2017, $100,000 was budgeted in the City's Capital Improvement Program to go directly toward the design and construction of stormwater retrofits. It is anticipated that future Capital Improvement Program budgets will include the same amount for future stormwater retrofits.<br><br>During this reporting period, the following projects were in design, and are planned for construction/completion in the next fiscal year. These projects include:<br><br>• Stormwater to sanitary sewer diversion valve retrofit at airport Fire Station #6.<br><br>• Airport terminal entryway with treatment swales.<br><br>• 12th Street resurfacing and widening with subsurface gravel treatment wetland and treatment facilities. |

| Task Description | Measurable Goals | Tracking Measures | FY 2017-18 Activities |
|---|---|---|---|
| | | | • McGilchrist Street widening with stormwater treatment facilities. |
| **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.<br><br>Make information obtained at these events available to other City staff. | Report on City participation with ORACWA events. | Public Works staff continued to actively participate in Oregon Association of Clean Water Agencies during the 2017-18 reporting period through attendance at Stormwater, Pretreatment, Legislative, and Water Quality Committee meetings. City staff attended the May 2018 Stormwater Summit in Eugene and the July 2018 Stormwater Summer Conference in Bend. City staff also engaged a consultant and participated in DEQ's process of establishing a Mercury TMDL for the Willamette Basin.<br><br>Information acquired through ACWA meetings/events continues to be routinely passed on to other City staff. |

**Table 3. RC2—Capital Improvements**

| Task Description | Measurable Goals | Tracking Measures | FY 2017-18 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.<br><br>Review and prioritize CIPs and budget annually.<br><br>Implement CIPs based on prioritization and available funding. | Track number and description of projects completed.<br><br>Report updated CIP list annually. | During the 2017-18 reporting period the following projects were completed:<br><br>• Marion St NE and 13th St NE Stormwater Improvement Project: City staff designed and constructed a 1,000 SF rain garden and approximately 125 LF of 10-inch storm pipe upstream of a stormwater outfall to Mill Creek. Staff worked with North Salem High School students in the planting plan design and engaged the students in the planting of the basin. An interpretive sign was created for this site for educational purposes. The Rain Garden is designed per City standards, and will be treating approximately 31,000 square feet of impervious area. The total basin has approximately 183,000 square feet of impervious area.<br><br>• McKay Drive S Stormwater Improvement: City staff designed and constructed the replacement of approximately 800 LF of 10-inch storm pipe.<br><br>• Summer Street at Clark Creek Culvert Replacement: City staff designed and constructed the replacement of an existing box culvert.<br><br>• Union Street NE at Commercial St NE Intersection Improvements: City staff designed and constructed intersection improvements, which also created the installation of two stormwater quality basins.<br><br>Stormwater projects included in the 5-year Capital Improvement Plan (FY 2017-18 through FY 2021-22) 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.<br><br>Track number of projects permitted. | The Water Resource Section no longer exists. City staff in PW/ Planning provide assistance in obtaining agency permits for all work below ordinary high water (OHW). Engineering staff are knowledgeable regarding when permits are needed or will contact planning staff if they have any questions. All CIP and Operations projects that need a permit to be constructed go through the process to obtain the needed permits and the goal is being met. |
| **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.<br><br>Following prioritization, identify funding source(s) for inclusion in budget. | Report on easement acquisition and prioritization process. | Easement acquisitions have and will continue to be prioritized and pursued on a project by project basis. Acquisition costs are factored in and budgeted for along with all other associated project costs. The Retrofit Plan and Hydromodification Assessment that were submitted to 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 currently underway on a basin by basin basis. |

**Table 4. RC3—Update of Stormwater Design Standards**

| Task Description | Measurable Goals | Tracking Measures | FY 2017-18 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.<br><br>Develop updated stormwater design standards to include structural stormwater quality BMPs.<br><br>Maintain Stormwater Management Design Standards and update as needed. | Document revisions made to Stormwater Management Design Standards.<br><br>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 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. These standards will continue to be updated as new information becomes available (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.<br><br>Track number of new facilities constructed. | Willamette Greenway permits are processed as either conditional uses or as administrative conditional uses, depending on their location. All new or rehabilitation projects greater than 10,000 sq. ft. in the Willamette Greenway must utilize the current Public Works Design Standards. The Public Works Stormwater Design Standards are equal to or more stringent than the earlier Willamette Greenway standards. Greenway permits are tracked through AMANDA, the City's permit tracking system. Requirements from SRC 71 (Stormwater Code) and associated Design Standards for use in the Greenway are incorporated as appropriate. One Willamette Greenway permit was issued in June 2017. |
| **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.<br><br>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 2017-18 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.<br><br>Continue sweeping City streets on four zone schedule, sweeping heaviest zone 8 times per year and lightest zone 2-3 times per year.<br><br>Continue sweeping City-owned parking lots as needed. | Record quantity of material collected during sweeping operations.<br><br>Record number of curb-miles of streets swept.<br><br>Track and report changes made to sweeping schedule, if any. | The City continued to utilize two regenerative air sweepers in FY 2017-18 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. During this reporting year the City swept a total of 14,044 miles, collected approximately 1,786 tons of street sweeping debris, and removed approximately 4,732 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.<br><br>Investigate potential cost-effective recycling opportunities for de-icing sand material. | Document review of recycling opportunities.<br><br>Document dates of activities for annual inspections and training.<br><br>Document de-icing quantities applied annually. | Recycling opportunities for used deicing sand material have not been found. This material cannot be reused for sanding due to the loss of traction providing angular surfaces. Additionally, the sanding material recovered by street sweepers is mixed with additional debris and contaminants present from street surface (heavy metals, petro-chemicals, trash, etc.). At present, the used sand can only be utilized as fill material in approved sites depending on levels of intermingled debris or contaminants.<br><br>Material usage is documented on time sheets and the liquid deicing storage facility log book. Lane miles treated annually are also documented in a units of accomplishment report. This past fiscal year we treated 1,436 lane miles of streets with 15,310 gallons of liquid deicer. There was no sanding rock utilized during this time period.<br><br>The annual Snow/Ice Training was held in November 2017 and approximately 35 fulltime and seasonal city employees attended this training. |
| **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.<br><br>Create line items in budget for specific O&M activities.<br><br>Review and update O&M practices and activity schedules every 3 years. | Track revisions made to O&M practices and activity schedules. | During FY 2017-18, Stormwater Operations & Maintenance (O&M) staff implemented the use of Granite NET software for CCTV inspections. Granite NET uses a national standard scoring to rate sanitary sewer and stormwater systems to determine risk and consequence of pipe/structure failure. Based on the rating system, maintenance needs can be prioritized objectively based on flooding issues, pipe size, area affected, and customer impact. Flood prevention is the primary focus. This is the first year that the Stormwater O&M section has had two CCTV inspection trucks dedicated specifically to stormwater system inspections, which is different from previous years where stormwater and sanitary sewer workgroups shared the inspection crews.<br><br>In addition, efforts continued this year to link the City's GIS and Infor Public Service (IPS, previously Hansen) databases for improved efficiency and tracking. All inspection and maintenance activities will be tracked and documented in IPS, but a few maintenance activities are still being tracked in GIS as asset information has not yet been fully integrated. One thing to note is that during the transition from Hansen to IPS, many inspections and work orders were recorded manually on paper and will need to be manually entered into the new IPS asset inventory database, which will occur in the next fiscal year. |
| **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.<br><br>Attend ACWA committee meetings and workshops as scheduled.<br><br>Conduct weekly tailgate meetings with Operations crews. | Document reviews and modifications to the O&M training program.<br><br>Record O&M training activities completed.<br><br>Document ACWA meetings and workshops attended. | City staff continued to provide education and training for O&M staff during this reporting period. This included weekly tailgate meetings as well as online trainings. All required training is logged in the City's Target Solutions database. In addition, 5 staff members attended the 2018 MWOG Erosion Control and Stormwater Management Summit. |

| Task Description | Measurable Goals | Tracking Measures | FY 2017-18 Activities |
|---|---|---|---|
| | | | Public Works staff continued to participate in ACWA meetings and workshops in FY 2017-18 (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.<br><br>Routine inspections of storage facilities for proper storage of materials and chemicals. | Document revisions made to IPM Program.<br><br>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.<br><br>The new tracking tool was completed during FY 16-17. All records of pesticide use by City personnel and contractors employed on behalf of the City are kept on file.<br><br>During this report period, Stormwater and Environmental Service 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.<br><br>Inspect 120,000 LF of conveyance system annually. | Track number of inspections; identify areas with persistent O&M problems.<br><br>Track number of cross-connections found.<br><br>Track length of conveyance system cleaned and inspected. | CCTV Inspection activities included 147,790 LF of storm main inspected.<br><br>Cleaning activities included 214,240 LF of storm mainlines.<br><br>Root cutting/removal included 15,797 LF of storm mainlines.<br><br>One sewer to storm cross connection was identified and corrected during the reporting period. |
| **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.<br><br>Complete one stream restoration project each year. | Track length of waterways walked each year.<br><br>Document stream restoration projects completed each year.<br><br>Document the amount of litter and garbage removed each year. | During the 2017 Stream Crew field season the crew walked 47.83 miles of streams and creeks within Salem city limits. The stream reaches that were cleaned and inspected were within seven different watersheds – Battle Creek, Pringle Creek, Croisan/Pettijohn, Mill Creek, Little Pudding River, Claggett Creek, and Glenn/Gibson. The Stream Crew removed 5,497 pounds of trash and 55 cubic yards of invasive vegetation and woody debris. The Stream Crew also cleared 111 debris jams to help increase conveyance and reduce flooding hazards. The Stream Crew worked to remove a highly invasive aquatic plant, Ludwigia (Ludwigia hexapetala), from the banks of a pond that is adjacent to the North Santiam River at Geren Island. Stream Crew spent two days hand pulling the Ludwigia from the banks, removing roughly 16 cubic yards for the plant material. After removing the Ludwigia, the Stream Crew worked to replant 126 native shrub and tree species (Douglas spirea, Sitka willow, Oceanspray, Pacific willow, Red Osier Dogwood, and Red alder) along the banks. |
| **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.<br><br>Track amount of sediment and debris removed from all facilities. | During the reporting period, staff conducted 562 public water quality facility inspections of water quality manholes, catch basins, tree boxes, planters, rain gardens, and bioswales. In addition, field crews inspected 356 detention basins as part of the FEMA Community Rating System program.<br><br>With the completion of the City's new Construction Waste Processing and Transfer Facility on Airway Dr., Operations staff comingle vactor truck waste from a variety of sources (catch basins, storm and sewer mainlines and manholes, water quality facilities, etc.), and a procedure for delineating and estimating the quantity of waste from each functional workgroup will need to be developed for this facility. Development of this process/procedure will occur in the next fiscal year.<br><br>The cumulative amount of debris removed from the stormwater system in FY 2017/18 is estimated at approximately 1,500 cubic yards, consisting of:<br><br>• 432 cubic yards from catch basin and water quality facilities<br>• 458 cubic yards from roadside ditches<br>• 610 cubic yards from drainage ditches |
| **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.<br><br>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. 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. |

| Task Description | Measurable Goals | Tracking Measures | FY 2017-18 Activities |
|---|---|---|---|
| | | | Since implementation, the City has inventoried, mapped, inspected, and maintained all of its 260 public vegetative (e.g. bioswales, rain gardens) and 232 public mechanical (e.g. water quality manholes, tree boxes) treatment facilities through a quarterly inspection process. The City has also inventoried, mapped, and inspected 426 private vegetative and 358 private mechanical treatment facilities.<br><br>Stormwater and GIS technical staff have completed a full inventory of 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).<br><br>Track amount of sediment and debris removed. | During this reporting period, the inspection of roadside ditches was completed during the mowing process. The mower operator does a visual inspection once the ditch is mowed to determine if the level of sediment is impeding the flow.<br><br>Drainage ditches are mowed/weed-whacked with the use of Department of Corrections crews. All drainage ditches are mowed/weedwhacked twice, once in the summer and then in the fall. This reduces the risk of flooding in the winter and fire hazards in the summer.<br><br>During FY 17-18 City crews:<br><br>• Inspected and mowed 14.8 miles of roadside ditches (ditches along roadways);<br><br>• Inspected and cleaned 11.0 miles of roadside ditches;<br><br>• Removed 458 cubic yards of accumulated sediment/debris from roadside ditches<br><br>During FY 17-18 City and Inmate crews:<br><br>• Inspected and mowed 6.6 miles of drainage ditches (ditches nonadjacent to roadways and commonly located on private property);<br><br>• Removed 610 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.<br><br>Periodically analyze the material removed from the catch basins. | Track the number and percent of catch basins cleaned annually.<br><br>Report on any analysis of removed material. | During FY 17-18, City crews inspected and cleaned approximately 11,700 (75.2%) public catch basins. Through this process, an estimated 432 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. |
| **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.<br><br>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.<br><br>Track maintenance requirements of long-term maintenance strategy. | Since the effective date of this permit, City staff have inventoried 784 private water quality facilities on 381 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.<br><br>As adopted in the 2014 Stormwater Design Standards, owners of newly installed private water quality facilities are be required to enter into a Private Stormwater Facilities Agreement, which holds the property owner responsible for the maintenance, inspection, recordkeeping, and repair of each facility.<br><br>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.<br><br>As a result of implementing the Private Stormwater Facilities Agreement during the construction phase of development projects, the City has a more reliable way of inventorying all of its private stormwater quality facilities. There are currently 82 private stormwater quality facility maintenance agreements in the City's |

| Task Description | Measurable Goals | Tracking Measures | FY 2017-18 Activities |
|---|---|---|---|
| | | | permitting database with additional added as new facilities are permitted and constructed. |

**Table 6. RC5—Public Education and Participation**

| Task Description | Measurable Goals | Tracking Measures | FY 2017-18 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.<br><br>Support outreach and educational activities for other divisions.<br><br>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.<br><br>Document outreach activities for other divisions.<br><br>Document the results of the effectiveness evaluation and subsequent changes to the outreach procedures/efforts. | In an effort to help improve marketing for the Clean Streams initiative and campaigns within it, the City hired new fulltime staff. A new Clean Streams Marketing & Outreach Proposal was developed, old marketing materials were updated and new materials were developed. The Clean Streams information was provided in various formats, including the 34 outreach events attended by staff and reaching a total attendance of 29,391 community members.<br><br>In addition to community outreach events, other events included participation in educational events falling within the Youth Environmental Education Program (YEEP) and Adopt-A-Stream Program. The total number of educational events attended was 15, with the total number of students reached equaling 1,737.<br><br>During the reporting period, staff composed two proposals this fiscal year, one to address zinc and the other to address chromium.<br><br>Zinc Outreach Campaign<br><br>Through the initial proposal, several informational handouts were created on the runoff solutions, including rack cards on diverting downspouts, rain barrels, and rain gardens.<br><br>Chromium Outreach Campaign:<br><br>This campaign looks mainly at chrome plating on vehicles and paint, and encourages residents to choose alternatives to chrome plating and purchase chromium-free paint to help mitigate any residential sources of chromium in stormwater, in the hopes that purchase habits can affect local industrial applications. It was found that this is a difficult niche to break into, especially with information such as advising against chrome plating. Therefore the target audience was expanded to include Salem residents, encouraging them on two points – to use alternatives to chrome plating if they are looking to fix up a vehicle, and to seek out chromium-free paint. |
| **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. | Annual Streamside Mailer<br><br>Staff met to discuss the content for the annual streamside outreach mailer. Topics that were included this year focused on flooding issues and notifying residents of the early flood warning system. This document was mailed to all streamside residents in Spring of 2018.<br><br>Stormwater Messaging<br><br>Staff coordinated with street sweeping crews to provide messaging regarding keeping leaves out of the storm drains. Staff added an insert to the water bills, and promoted messages on social media, radio, and print.<br><br>Retrofits<br><br>Staff held meetings to develop a retrofit prioritization tool, which was completed during this fiscal year and will be used to prioritize and rank future potential projects. |
| **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. | This year our community partner was Friends of Mill Creek. They led a successful community effort to design and construct of a rain garden. The Rain Garden is designed per City standards, with the replacement of the exiting storm sewer and the installation of a solid lid on the catch basin on the northwest corner of Marion and 13th Streets. The rain garden will be treating approximately 31,000 square feet of impervious area before discharging into Mill Creek. This was a community-driven project that engaged students from North Salem High School. |
| **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.<br><br>Document public education and outreach needs in the Stormwater Utility Implementation Plan. | Document public education budget and expenditures.<br><br>Document Utility implementation plan showing public education and outreach needs. | The items budgeted for were received in FY 2017/18 and included the following:<br><br>Supplies: $5,500 Stormwater, $1,100 Youth Environmental Education Program<br>Advertising: $10,400<br>Mileage: $250 Youth Environmental Education Program<br>Erosion Control Summit: $3,500<br>Invasive Species-- Knotweed treatment: $10,000 |

| Task Description | Measurable Goals | Tracking Measures | FY 2017-18 Activities |
|---|---|---|---|
| | | | Adopt-A-Stream Support: $6,500<br>Translation Services: $2,000<br>Riparian Restoration: $40,000<br>Translation Services: $2,000<br>Copy services: $6,200<br><br>A request to move two part-time staff to full-time was submitted and approved for the FY 2018/19 budget. |

**Table 7. RC6—Stormwater Management Program Financing**

| Task Description | Measurable Goals | Tracking Measures | FY 2017-18 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 is being conducted independent of the work plan for the Stormwater Master Plan. A committee consisting of two City Councilors and representatives of the development community, home builders, and residents has been meeting regularly since the summer of 2017. Updating the stormwater SDC methodology will be done in conjunction with updating all five SDC methodologies -- water, wastewater, stormwater, transportation, and parks. Few, if any substantive changes are anticipated for the stormwater SDC methodology. |
| **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 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 stormwater 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.<br>Track number of grants received each year. | During this reporting year, the City of Salem worked with Willamette Riverkeeper on a pre-application to the Willamette Focused Investment Program to complete work at Minto-Brown Island Park to address invasive aquatic species (Ludwigia) growing in both Oxbow and Willamette Sloughs. In preparation for this application, the City has been collecting baseline water quality data to ensure that any action does not negatively affect water quality and wildlife in this natural area.<br>In this reporting year, the City provided project information to Willamette Riverkeeper, who then submitted the grant application. |

**Table 8. RC7—Maintain and Update GIS System**

| Task Description | Measurable Goals | Tracking Measures | FY 2017-18 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.<br><br>Create record of GIS maintenance activities. | Record maintenance / updates made to database. | All stormwater layers are consolidated in the Spatial Database Engine (SDE) and updated as required. All edits are tracked internally in the database and identifies the personnel responsible for the last update or asset creation. In addition, a log of incoming plan sets entered into GIS is maintained by Technical Services. Since GIS and IPS are now synced, only tracking one system is required rather than both. |
| **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.<br><br>Implement action plan to integrate GIS and IMS. | Track completion of action plan items.<br><br>Track implementation status of database integration. | All pertinent stormwater GIS layers were consolidated into feature layers in SDE (Spatial Database Engine) as part of the Stormwater utilities migration from Hansen to Infor Public Sector (IPS). SDE and IPS assets are fully synchronized. |

**Table 9. RC8—City Stormwater Grant Program**

| Task Description | Measurable Goals | Tracking Measures | FY 2017-18 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.<br><br>Expand matching grant program for watershed protection.<br><br>Promote the grant program in conjunction with RC5 outreach activities. | Maintain a list of grant awards tracking funding and projects. | The City of Salem provided $50,000 for the grant program in FY 2017/18 of which $49,527.50 was spent on eight grants:<br><br>1. Temple Beth Sholom – Removal of asphalt parking spaces and creation of stormwater rain garden ($27,610)<br><br>2. Straub Environmental Center – Urban habitat restoration ($3,590)<br><br>3. Straub Environmental Center – Science summer camp ($7,500)<br><br>4. Salem Env. Education – eStem afterschool activities ($1,300)<br><br>5. Salem Env. Education – Lecture series ($1,203)<br><br>6. Linda Wallmark – Plant for the Planet Tree Planting event ($150)<br><br>7. North Santiam Watershed Council – General restoration projects ($7,500)<br><br>8. Myers Elementary School – Eco Explorers field trip ($675)<br><br>The grant has been expanded previously and continues to have a larger range of project types for which grants may be requested. This year's grant recipients received funding for the following types of projects: environmental education, stormwater infiltration retrofit, habitat improvement and tree planting projects, and general project implementation.<br><br>The grant is promoted via a few outreach mechanisms and application materials online, but advertising for the program is most effective by word of mouth. |

**Table 10. RC9—Legal/Ordinances**

| Task Description | Measurable Goals | Tracking Measures | FY 2017-18 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<br><br>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.<br><br>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.<br><br>This activity has been completed. |

**Table 11. ILL1—Spill Prevention and Response Program**

| Task Description | Measurable Goals | Tracking Measures | FY 2017-18 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 continued 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 or leak of de-icing material 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. | During this reporting period Salem Fire Department staff responded to the following spill events:<br>• Chemical leaks or spills = 19<br>• Vehicle accidents = 1096<br>• Fuel or oil spills =202<br>Salem Fire continues to respond to hazardous/chemical spills as requested by our emergency dispatch center. If spills and/or leaks are beyond the Fire Department's capability or exceed the amount of equipment carried on their response vehicles, the Fire Department incident commander will request assistance from Environmental Services. |
| **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 in FY 2017-18. These inspections are documented on weekly inspection sheets that are routinely submitted to Section Supervisors. Per City policy, 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.<br>Implement the updated Operations Prevention Plan upon completion. | Track progress toward updating the Operations Pollution Prevention Plan.<br>Track implementation of the Operations Pollution Prevention Plan. | During this reporting period, Stormwater Quality staff continued to implement the Operations Pollution Prevention Plan, which included employee training and monthly visual inspections of the Shops Complex. Staff updated the inspection process to include the use of a mobile device (smart phone) and field collection software (FastField) for ease of use and consistency.<br>Stormwater staff also engaged in developing a plan to improve the recycling center in the East Yard. During the next fiscal year, staff engaged with the Public Works Yardmaster Committee to secure funding and implement improvements to the waste management system at the Shops Complex. |

**Table 12. ILL2—Illicit Discharge Elimination Program**

| Task Description | Measurable Goals | Tracking Measures | FY 2017-18 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.<br><br>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 263 water quality-related responses during the reporting year. All responses and corrective measures are tracked in the Environmental Services 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:<br>• Business Inspections = 528<br>• New Businesses Identified = 73 |
| **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.<br><br>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 instream 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, 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. Wastewater Collections also provide smoke and dye test inspection of lines to identify cross connections.<br><br>During the 2017/2018 reporting period, one cross-connection was identified and resolved. |
| **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.<br><br>Coordinate prioritization process with ILL 2 Task 5. | Document review of outfall monitoring plan.<br><br>Document priorities established for monitoring and inspection.<br><br>Track dry weather inspections conducted and results of inspection. | The reporting year 2017/2018, dry weather outfall screening effort included a total of 38 outfall inspections (outfall structures or the first available upstream manhole), 22 of which received analytical sampling. A total of 13 pipesheds were investigated based on these outfall inspections; 3 pipesheds had outfalls that received analytical sampling, but were not investigated because the pipeshed is sufficiently characterized and 1 pipeshed was not completed due to arrival of wet weather. As part of the pipeshed investigations, a total of 4 additional structures received analytical confirmation sampling to identify the origin of flow. Of the 38 outfalls inspected, 33 were identified in the City of Salem's Dry Weather Outfall and Illicit Discharge Screening Plan. The additional outfalls were inspected based upon Stream Crew reports of dry-weather flow and 1 outfall was inspected opportunistically due to its proximity to 2 existing priority outfalls. Two outfalls listed in the City of Salem's Dry Weather Outfall and Illicit Discharge Screening Plan are no longer inspected, outfall D48486207, which was determined to be a culvert structure above an existing priority outfall and D42456216, which requires confined space entry. For further information on the results of the inspections refer to Appendix A.<br><br>In reporting year 2017/2018, a custom mobile application was deployed with Stream Crew interns to document physical inspections of flowing outfalls and illicit discharges. The observations logged using this application have increased the number of outfall inspections performed and will be used to prioritize future outfalls for annual inspection. |
| **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). No new contaminated sites were identified and/or added to the City GIS during this reporting period. |

**Table 13. ILL3—Illegal Dumping Control Program**

| Task Description | Measurable Goals | Tracking Measures | FY 2017-18 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 this reporting year, there were 90 different participating groups, 1,800 total volunteers, 180 street miles maintained, and 16,000 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.<br><br>Assign reports to appropriate City staff for action, including actions taken under ILL2-1. | Record number and types of reported illegal dumping incidents.<br><br>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 437 incidents during this reporting period. Refer to Section 4 and 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. We provide presentations and supplies for interested teachers as well as project facilitation and technical assistance upon request. We also budget expenses for field trips to water bodies, the drinking water facility, or the wastewater facility. Through the Adopt-A-Stream program, students experience outdoor learning that piques their interest in both science and the environment, and connects students to the natural world ultimately promoting environmental awareness and stewardship of our natural waterways. Staff provided or assisted with the following activities this year:<br><br><u>North Salem High School</u><br><br>Staff provided a presentation to students about the Mill Creek Watershed, its adjoining watershed, and ways to protect water quality. Staff also provided AAS funding for a trip to the wastewater treatment facility. Staff also provided a presentation on how to design a rain garden for a new rain garden that was proposed by the Friends of Mill Creek. The class then developed a planting plan in association with City of Salem staff and helped plant the rain garden upon the completion of construction.<br><br><u>South Salem High School</u><br><br>Staff assisted with macroinvertebrate comparative studies of two streamside locations – Bush Park and Gilmore Field. Staff also assisted with field research at Opal Creek regarding water quality and macroinvertebrate studies.<br><br><u>Elementary Classes Receiving Adopt-A-Stream Outreach Activities</u><br><br>Kennedy Elementary 4th Grade; 3 classes 79 students<br><br>Weddle Elementary 3rd Grade; 3 classes 65 students<br><br>Battle Creek Elementary 2nd Grade; 4 classes 100 students<br><br>Forest Ridge Elementary 4th & 5th Grades; 5 classes 132 students<br><br>Chapman Hill Elementary 4th Grade; 2 classes 53 students |
| **ILL 3-4: Continue to support Marion County in their efforts to provide convenient alternatives for legal disposal of household hazardous wastes and other recyclable materials.** | Continue to support Marion County in providing alternatives for household hazardous waste disposal. | Document frequency and type of support activities. | Three of 52 weeks (5.7%) of our aired radio spots discussed proper disposal of household hazardous waste and recyclable materials. These items also align with our outreach pollutants of concern: household hazardous waste, mercury, and heavy metals.<br><br>Sept 5 - 9: HHW disposal<br><br>Dec 18- 24: E'cycling (Heavy metals)<br><br>Mar 19-25: Poison Prevention (HHW disposal)<br><br>May 21 - 25: Car maintenance (Oil recycling) |

| Task Description | Measurable Goals | Tracking Measures | FY 2017-18 Activities |
|---|---|---|---|
| **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. | Two Leaf Haul Events were held during 2017:<br>November 18<br>Leaves collected = 120 cubic yards<br># of volunteers at site = 5<br># of volunteer hours = 30<br>December 2<br>Leaves collected = 200 cubic yards<br># of volunteers at site (including drivers) = 15<br># of volunteer hours (including drivers) = 70<br>Total for FY 2017/18<br>Leaves collected = 320 cubic yards<br># of volunteers (including drivers) = 20<br># of volunteer hours (including drivers) = 100<br>Approximately 10 volunteers picked up 255 bags of leaves from the homes of 11 senior citizens. |

**Table 14. IND1—Industrial Stormwater Discharge Program**

| Task Description | Measurable Goals | Tracking Measures | FY 2017-18 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.<br><br>Develop process to coordinate with DEQ on industrial permits within the City. | Track coordination efforts with DEQ.<br><br>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 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 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 IND1-2 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.<br><br>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. | Environmental Services continued to participate in the plans 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 112 industrial and commercial plans during the reporting period. |
| **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.<br><br>Enter survey results into database – on-going as surveys are returned. | Track number of surveys sent out.<br><br>Track number of surveys returned and entered into database.<br><br>Track targeted public education activities for specific industries. | Environmental Services continues 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. During this reporting period Environmental Services staff distributed a total of 30 surveys (18 accidental spill prevention plans, 1 trash area management plan, and 11 waste management and disposal plans). |
| **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. | Targeted and individualized (email and/or direct phone call) communication with permitted industrial users continued during FY 2017-18 in order to better ensure compliance with pretreatment and stormwater regulations. This form of communication has proven more effective than continued production of technical bulletins. |

**Table 15. CON1—Construction Site Control Program**

| Task Description | Measurable Goals | Tracking Measures | FY 2017-18 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.<br>Conduct annual program reviews.<br>Implement appropriate improvements and/or Code amendments.<br>Perform plan reviews for erosion control requirements. | Track number of erosion control plans reviewed for compliance with SRC 75. | SRC 75 continues to be used as the basis for plan review, inspection procedures, and enforcement. An annual internal program review was completed. During FY 17/18, 26 Capital Improvement Projects and 225 Development ESPC plans were reviewed by City staff. In addition, 576 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 Outreach Group (of which Salem is an active participant) conducted their annual Mid-Willamette Erosion Control and Stormwater Management Summit training on January 30, 2018, to provide training for regional area contractors and design consultants. Five City employees attended this training. Staff also continued outreach to Home Builders, Contractors, and Material Suppliers concerning standard construction specifications and standard drawing updates. |
| **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. | The measurable goal for this task has already been achieved, and there has been no changes to this program from last year. Site plan review procedures and checklists are still in place and actively used. Staff continues to update the checklists as procedures change. Inspection procedures and reports are still 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 Standard, Standard Construction Specifications, and Standard Drawings for erosion prevention and sediment control have been implemented and are continued to be followed for all design and construction activities.<br>These three items 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.<br>Make erosion prevention and sediment control a key agenda item at all pre-construction conferences.<br>Include inspection of all site erosion prevention and sediment control measures as part of City projects. | Track renewal of 1200-CA permit. | No change from previous year cycle report. 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. Engineering Inspectors contacted and met with Oregon DEQ staff concerning renewal requirements for the City's 1200-CA permit. |

**Table 16. MON1—Monitoring**

| Task Description | Measurable Goals | Tracking Measures | FY 2017-18 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.<br><br>Monitor the station alarms in conjunction with the illicit discharge control program (ILL2, Task 1).<br><br>Follow up on potential hotspots or problem areas as may be identified through data analyses. | Track number of additional monitoring stations implemented. | During FY 2017/2018, the City installed one permanent continuous stream gaging station on Waln Creek and one permanent stream gaging and camera station on Clark Creek at Gilmore Field where there is a regional detention basin. The camera will be used to monitor the detention basin when it is functioning (filling).<br><br>The City adjusted the way it responds to and tracks alarms during storm conditions. After a thorough analysis of past alarm data collected during rain events, it was found that it was too difficult to identify illicit discharges during storm events. As a result, no alarms were activated on any stations when rain was forecasted.<br><br>No hotspots or problem areas were identified using the continuous instream stations this year, however, a problem area was resolved using data from the Monthly Instream program, see MON1-2. |
| **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.<br><br>Review collected data for purposes of trending and benchmarking by the end of the permit term.<br><br>Follow-up on potential hotspots or problem areas as may be identified by the data review. | Document findings regarding trends. | Staff input the data collected from the Monthly Instream Sampling Program into the Aquarius database on a monthly basis for field parameters, and as soon as possible upon receipt of laboratory results. Data are verified by at least 2 people, once before it is entered into the database, and again on a yearly basis when all data goes under a thorough review before being included in the annual report.<br><br>City staff completed an evaluation of monitoring data from 2001 to 2016 that included time series and spatial trends analyses, as well as summary statistics and boxplots of data. This data was submitted to DEQ as part of the 2016 annual report. The City will continue to update and compute trends analyses as needed.<br><br>Based on lab results from monthly instream sampling and a targeted outfall sampling project, an area of Clark Creek was identified as having very high bacteria. Upstream and downstream samples were compared and results showed elevated bacteria levels in this section of creek. Further investigation (including additional bacteria samples, TV inspection of storm and sewer lines, and dye testing) revealed a broken private sewer line at a high school that was infiltrating into their private storm system, and then discharging into Clark Creek. The school was informed and repairs were completed during this reporting period. 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 any water quality exceedances. This provides a visual comparison of stream health from 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.<br><br>Track any modifications to the monitoring plan. | The City continues to collect data as part of the monitoring requirements listed in Table B-1 of the City's NPDES MS4 permit. Because the permit was administratively extended, the City will continue to implement its "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 FY 2017/2018. |

# 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. Implementation of the stormwater utility was initiated on January 1, 2013, and completed over a period of four rate cycles.

The stormwater utility was 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 18-19) as identified in the adopted budget.

**Table 17. Stormwater Expenditures**

| Stormwater Operating Costs | FY 2017-18 Budget | FY 2018-19 Budget |
|---|---|---|
| Stormwater Operations & Maintenance | $3,758,970 | $4,249,720 |
| Stormwater Quality | $1,818,720 | $2,774,080 |
| Cleaning | $750,718 | $688,205 |
| T.V. Inspection | $265,022 | $440,833 |
| Water and Environmental Resources* | $0 | $0 |
| Environmental Services | $280,236 | $270,323 |
| Planning & Development | $989,313 | $1,102,025 |
| Laboratory | $39,752 | $47,250 |
| Operations Administration | $233,215 | $237,521 |
| Utility Billing | $689,298 | $726,621 |
| Dispatch | $115,791 | $132,385 |
| Debt for Capital | $631,129 | $624,997 |
| Department Administration and Indirect Costs (Nondivisional) | $1,329,619 | $1,692,707 |
| Nondivisional (Street Sweeping, Watershed Grants, HazMat/Emergency Management) | $1,566,190 | $1,264,940 |
| Budgeted Capital Improvements | $4,861,000 | $6,253,010 |
| **TOTAL:** | **$17,328,975** | **$20,504,618** |

*The Water and Environmental Resources Section was eliminated at the end of Fiscal Year 2013-14.

# 4 ENFORCEMENT ACTIONS, INSPECTIONS, AND OUTREACH

Environmental Services staff responded to 46 incidents directly related to water quality concerns and reported six 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 17-18 reporting period 8,309 erosion control-related inspections were conducted by Public Works Inspectors, there were 188 erosion-related enforcement actions, and a total of 827 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.

| Name | Date | Violation | Action | Discharge | SRC |
|---|---|---|---|---|---|
| **Evening Land Vineyards** | 09-28-2017 | Prohibited Discharge To The Storm Sewer | Warning | Dumpster leak | 71.050 |
| **Private Residence - Paint to Storm System** | 07-10-2017 | Prohibited Discharge To The Storm Sewer | Warning | Paint/Water | 71.050 |
| **Private Residence - Animal Waste** | 07-25-2017 | Prohibited Discharge To The Storm Sewer | Warning | Animal Waste | 71.050 |
| **Super Pho Vietnamese Cuisine** | 08-23-2017 | Prohibited Discharge To The Storm Sewer | Warning | Dirty Water | 71.050 |
| **Oregon Cherry Growers, LLC** | 09-01-2017 | Prohibited Discharge To The Environment | Warning | Dumpster Liquid | 71.050 |
| **River Bend Sand and Gravel** | 09-27-2017 | Prohibited Discharge To The Environment | Warning | Oil | 71.050 |
| **Private Residence - Leaking Vehicle** | 12-18-2017 | Prohibited Discharge To The Storm Sewer | Warning | Oil | 71.050 |
| **Albion Farms** | 12-20-2017 | Prohibited Discharge To The Storm Sewer | Warning | Water from rinsing marijuana grow materials | 71.050 |
| **Private Residence - Cooking Oils** | 12-27-2017 | Prohibited Discharge To The Storm Sewer | Warning | Cooking Oils | 71.050 |
| **Private Residence - Sewage** | 02-08-2018 | Prohibited Discharge To The Storm Sewer | Warning | Sewage | 71.050 |
| **Private Residence - Sewage** | 02-08-2018 | Prohibited Discharge To The Storm Sewer | Citation | Sewage | 71.050 |
| **RV - Sewage** | 02-08-2018 | Prohibited Discharge To The Storm Sewer | Warning | Sewage | 71.050 |
| **Private Residence - Leaking Vehicle** | 04-16-2018 | Prohibited Discharge To The Storm Sewer | Warning | Oil | 71.050 |
| **Bonn Roof Care** | 06-08-2018 | Prohibited Discharge To The Storm Sewer | Warning | Roof Treatment | 71.050 |
| **Oregon Hood Cleaning** | 06-13-2018 | Prohibited Discharge To The Storm Sewer | Citation | Cooking Grease & Oils | 71.050 |
| **Affordable Taxi** | 06-20-2018 | Prohibited Discharge To The Storm Sewer | Citation | Oil | 71.050 |

# 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

There were no annexations or significant land use changes to report on for FY 2017-18.

## 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 17-18 reporting period, there was an addition of approximately 60 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:

| Commercial/Industrial Development | Address | Description | Status |
|---|---|---|---|
| Baggage Depot | 500 13th Street SE | Rehab of historic building and site alterations for Greyhound bus terminal | Complete |
| Boulder Creek Medical Office | 2500 12th Street SE | New 38,860 square foot medical office building | Complete |
| Cordon Road Storage Units | 1500-1700 Block of Cordon Road SE | Self-service storage facility, 3.1 acres in size | Complete |
| Dutch Bros | 1330 Barnes | 1,500 sf drive-through | Complete |
| Gas Station/Convenience Store | 1570 Whitaker Drive SE | Development of new gas station and convenience store | Complete |
| Joint Force Headquarters of the Oregon Military Dept | 230 Geer Drive NE | 56,000 sf building, parking | Complete |
| Marion County Sheriff's Office - Public Safety Bldg | 3610 Aumsville Highway SE | 30,980 sf addition, parking, vehicle storage | Complete |
| May's Trucking | 3940 Airway Drive SE | New 24,000 metal building for hanger | Complete |
| McDonald's Rebuild/Expansion | 1011 Lancaster Drive SE | Rebuild/Expansion of Existing Site | Complete |
| PacTrust Phase 1 | 3315 Aumsville Highway SE | Two New Industrial/Commercial Shell Buildings, 67,000 SF and 49,000 SF | Complete |
| Roth's | 3045 Commercial Street SE | Building addition, removal/regrading of pavement, reconfiguration of parking | Complete |
| SAIF | 400 High Street SE | Renovation, remodel and addition to existing office campus | Complete |
| Starbucks / retail shell | 3165 Commercial Street SE | Redevelopment including new 1960 sf Starbucks and 6340 sf retail shell | Complete |
| Turner Rd Storage Units | 2150 Turner Road SE | Self-service storage facility, 4.62 acres in size | Complete |
| Carmax | 395 Lancaster Drive SE | 7,480 sq. ft. building | In Review |
| Church addition | 4227 Lone Oak Rd SE | 17,000 square feet | In Review |
| Commercial development | 4910 Turner Road SE | 9,000 sq. ft. buildings | In Review |
| Edgewater Landing | 1690 Edgewater Street NW | 22,500 square foot retail shell building | In Review |
| Kuebler Gateway Shopping Center - Costco | 2500 Block of Boone Road SE | Four new retail shell buildings, and 168,550 SF Costco building, with fuel station | In Review |
| Marion County Juvenile | 2970 Center Street NE | 20,460 square foot building | In Review |
| Memory Care Facility | 1805 Waln Drive SE | 68-unit memory care facility | In Review |

| Commercial/Industrial Development | Address | Description | Status |
|---|---|---|---|
| Northwest Rehabilitation Associates | 245 Patterson St NW | 9,900-square foot medical | In Review |
| Petco | 831 Lancaster Dr NE / 3811 Center St NE | 13,200 square foot retail | In Review |
| Vehicle storage for auto dealership | 700 Auto Group Ave NE | Vehicle storage lot | In Review |
| Memory Care Facility | 901 Front Street NE | 48-unit Memory care and 69-unit assisted living facility | Land Use Approval Received, Building Permits Required |
| Hawthorne Business Park | 865 Hawthorne Avenue SE | Three story, 72,150 sq. ft building | Land Use Approved |
| Keizer Mist | 3139-3159 Broadway Street NE | New car wash and convenience store | Land Use Approved |
| Mini-storage | 2535 Salem Dallas Hwy NW | 38,000 square feet | Land Use Approved |
| River Bend Mixed-Use | 1200 Block of River Bend Road NW | Two new retail buildings, approximately 11,250 square feet | Land Use Approved |
| City of Salem Police Facility | 333 Division Street NE | Approx. 104,000 square-foot new police facility | Land Use Approved |
| Corban University Dormitories | 5000 Deer Park Dr SE | 3 dorm buildings and 3 future dorm buildings | Land Use Approved, Building Permits in Review |
| Amazon Phase 1 | 4775 Depot Court SE | 1,018,020 SF Warehouse/Fulfillment Center for Amazon | Near Completion |
| Fred Meyer Fuel Facility | 3415 Commercial Street SE | 9 pump fueling station | Near Completion |
| Hyacinth/Claxter Storage Units | 1940 Claxter Road NE | Self-Service Storage Facility, 4.88 acres in size | Near Completion |
| Hotel | 390 Hawthorne Av SE | 82-room hotel | Permits Approved |
| Retail Shell Buildings | 3997 Carson Drive SE | Two New Retail Buildings, 6,000 sf and 2,375 sf | Permits Issued |
| Assisted Living Facility | 2950 Boone Road SE | 90-unit assisted living and 32-units for memory care | Under Construction |
| Court Street | 245 Court Street NE | 5-story Mixed Use Building | Under Construction |
| Industrial Park | 1745 Oxford Street SE | 96,000 sq. ft. building and 26,200 sq. ft. building | Under Construction |
| Marietta | 3311-3325 Marietta Street SE | Integrated phased development, five new buildings | Under Construction |
| Office Building | 2332 Saginaw Street S | New 2,400 SF Office Building | Under Construction |
| Self-Storage Facility | 1200 Block of Hawthorne Avenue NE | Development of new self-storage Facility | Under Construction |
| The Pointe at Glen Creek | Glen Creek Road/ Wallace Road | Redevelopment at SW corner of intersection, three new buildings | Under Construction |
| Vehicle storage | 1885 Fisher Rd NE | Auto inventory storage lot | Under Construction |
| Walling Properties | 2685 Lancaster Drive SE | 20,320 sf warehouse; future 12,000 sf office, 24,000 sf warehouse & 12,000 sf office | Under Construction |

| Future Commercial/Industrial Projects | Address | Description | Status |
|---|---|---|---|
| Capstone Phase II | 4775 Depot Court SE | 570,000 SF Industrial Building | |
| PacTrust Phase II and III | 3300 Block of Aumsville Highway SE | 4 new Industrial/Commercial Buildings | |
| State Hospital North Campus Redevelopment | 2600 Center Street NE | Comprehensive Plan Change and Zone Change for mixed use development | |
| North Salem High School | 765 14th Street | demo and addition to existing high school | |
| RV park | 365 Lancaster Drive | New RV Park | |
| Retail sales/ Office | 5669 Commercial Street | two story, 26,000 sq. ft office and 11,500 sq. ft retail | |
| Boise Cascade North Block | 295 Commercial Street SE | Mixed-use building consisting of hotel and post-acute rehabilitation facility | |
| Union Gospel Mission Men's Shelter Relocation | 700 to 800 Blocks of Commercial Street NE | Relocation of UGM Men's shelter with maximum capacity of 300 overnight occupants | Conditional Use Permit approved. |

| Multi-Family Residential | Address | Description | Status |
|---|---|---|---|
| Portland Road | 2500 Block of Rose Garden Street NE | 180-Units | Near Completion |
| Caplinger | 5200 Block of Caplinger Road SE | 108-Units | Under Construction |
| Greenway Development | 102 Pine Street NE | 8-Lots, Single Family or Duplex Dwellings, partially in Greenway | Land Use Approved |
| Claxter Road | 2758 Claxter Road NE | 24-Units | Near Completion |
| Cordon Road Apartments (Hawks Ridge Phase 2) | 1500-1700 Block of Cordon Road SE | 82-Units | Complete |
| Fairway Apartments | 1600-1700 Block of Waln Drive SE | 201-Units | Complete |
| May's Landing | 23rd and Mission Street SE | 96-Units | Building Permits Approved |
| River Valley Apartments | 642-750 River Valley Drive NW | 60-Units | Complete |
| Pembrook Apartments | 4752 Liberty Road S | 88-Units | Complete |
| Red Leaf Apartments | 5710 Red Leaf Drive S | 127-Units | Near Completion |
| Hyacinth Apartments | 3257-3297 Hyacinth Street NE | 56-Units | Complete |
| Harold Drive Apartments | 3271 Lancaster Drive NE | 84-Units | Under Construction |
| Rushing Mixed Use | 5775 Commercial Street SE | 61,500 square foot mixed use building with 52-units | Land Use Approved |
| Caplinger | 5200 Block of Caplinger Road SE | 108-Units | Under Construction |
| Orchard Heights Apartments | 1800-2000 Block of Linwood Street NW | 312-Units | Under Construction |
| River Bend Apartments | 1200 Block of River Bend Road NW | 48-units | Land Use Approved |
| The Grove at Fairview | 2250 Strong Road SE | 180-units | In Review |

| Future Multi-Family Projects | Address | Description | Status |
|---|---|---|---|
| State Street | 260 State Street | New 148-unit studio/microunit apartment/mixed-use building | Planning stage |
| Silverton at Lansing | 3010 Silverton Road NE | 96-Units | Land Use Approved |
| Capital Manor | 1955 Salem Dallas Highway NW | Demolition of existing dwellings, zone change, construction of multi-family | Land Use Approved |
| Pictsweet PUD | State St/Cordon Rd/Auburn Rd | Mix of housing types, approximately 800 units | Planning Stage |
| 280 Liberty Street | 280 Liberty Street NE | Four-story mixed-use building consisting of 49 multi-family dwelling units and ground floor commercial. | Planning Stage |

| Subdivisions | Address | Description | Status |
|---|---|---|---|
| Whispering Heights | 2960 Michigan City Lane NW | 110-Lot Phased Subdivision | Plat Recorded |
| Illahe Forest | 3800 Block of Illahe Hill Road S | 11-Lots | Plat in Review |
| Rainier Ridge | 197 Rainier Drive SE | 34-Lots | Public Construction Plans in Review |
| 9th Court Addition | 5320 Sunnyside Road SE | 11-Lots | Plat in Review |
| Dogwood Heights | 3700 & 3800 Blocks of Dogwood Drive S | 46-lots | Public Construction Plans in Review (Phase 1) |
| Fairview Woods | Pringle Road SE & Battle Creek Road SE | 16-lots | In Review |
| Coburn Grand View Estates | Reed Road and Battle Creek Road | 225-lots | In Review |
| Devin Estates | 6179 Devin Road SE | 86-Lots | 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 2017/2018

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

**November 1, 2018**

## Table of Contents



## List of Figures

(All Figures follow text of this document)



## List of Tables

(All Tables follow Figures of this document)

# List of Attachments

# 1.0 Introduction

This document provides all monitoring data collected for the reporting year of July 1, 2017, to June 30, 2018 (RY 2017/18), 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 2017/18 is provided below, and all collected data are provided in the attached tables and figures.

# 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).

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 ($BOD_{stream}$)

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

- 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, PRI5 only)
- 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** – this year saw a decrease in the number of exceedances of the 406 MPN/100mL single sample criterion.
- **Dissolved Oxygen** – 19 of 24 sampling site dissolved oxygen medians were higher than the previous year.
- **Copper** – there were less exceedances of the water quality standard for Copper than last reporting year.
- **Lead** – no exceedances of the Lead water quality standard occurred this reporting year.
- **Zinc** – there were more exceedances of the Zinc water quality standard than last year.
- **Nitrate & Nitrite** – medians for RY 2017/18 were generally lower than last reporting year.
- **BOD** – 66% of sampling sites saw higher monthly median values than last year.
- **Specific Conductivity** – results were similar to last year.
- **pH** – results trended lower than last reporting year.
- **Turbidity** – for the second year in a row, turbidity saw a significant decrease in results overall.
- **Rainfall** – this reporting year saw less rainfall observed in the 24 hours prior to sample collection than last year, and only 3 of 11 of the sampling days had seen measurable rainfall in the preceding 24 hours.

## 2.2 Continuous Instream Monitoring

The City maintains a network of Continuous Instream water quality monitoring stations and stream gauging stations on seven different urban streams within the city. There are currently ten water quality and stream gauging stations and three stream gauge-only stations (SHE3, PRI4 and LPW1) within city limits. The City added two new stream gauge-only stations for reporting year 2017/18, and they will be operating for next reporting year. Figure 1 identifies the location of each of the existing stations.

The monitoring stations for this monitoring element are positioned in an upstream/downstream configuration. The upstream stations are adjacent to where the stream enters the City and the downstream stations 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.** 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.

## 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 2017/2018, staff captured two storm events.**

## 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.

**For reporting year 2017/2018, no storm events were captured.**

## 2.5 Pesticide Monitoring

Staff collected one sample for the pesticide monitoring element for RY 2017/2018 during the spring. 2,4-D (herbicide) and Triclopyr (herbicide) were detected at the residential land use site; Carbaryl (insecticide) was detected at the commercial land use site; and Propiconazole (fungicide), Tebuconazole (fungicide), DCPMU (algicide and herbicide), and Diuron (algicide and herbicide) were detected at the industrial land use site.

**The analytical lab report from Pacific Agricultural Laboratory is provided as Attachment B.**

## 2.6 Macroinvertebrate Monitoring

The City utilized a consultant, Pacific Habitat Services, to collect benthic macroinvertebrates samples, fish samples, and physical habitat data on Pringle Creek, East Fork Pringle Creek, and Clark Creek during late summer 2017.

**The technical memo of the results is provided as Attachment C.**

## 2.7 Priority Dry Weather Outfall/Manhole Screening

The RY 2017/2018 dry weather outfall screening effort included a total of 38 outfall inspections (outfall structures or the first available upstream manhole). In total, 22 structures (outfalls and manholes) received analytical sampling as part of this inspection program. Of these 22 structures:

- 16 had detections for total chlorine (7 of these detections had total chlorine concentrations above 0.05 mg/L),

- 5 had concentrations of fluoride exceeding the action level (0.1 mg/L),
- 1 had a specific conductivity exceeding the action limit (250 µS/cm), and
- 5 had E. coli concentrations exceeding the action limit (406 MPN/100mL).

In general, if total chlorine results were below 0.05 mg/L, fluoride, detergents/surfactants, ammonia, potassium, sodium, and E. coli parameters were not analyzed unless physical indicators presented evidence of a potentially illicit discharge. Fluoride was not collected at all locations where chlorine was detected because the City's drinking water treatment plant was not fluorinating water at the time of the inspection or the fluoride dosage was variable. Due to ongoing bacteria issues in Clark Creek, all flowing outfalls in the Clark Creek basin were sampled for E. coli regardless of analytical screening results.
Based upon outfall inspection results:

- 13 pipesheds were investigated based upon the results of outfall inspections,
- 3 pipesheds had outfalls that received analytical sampling, but were not investigated because the pipeshed is characterized as having allowable discharges, and
- 1 pipeshed was not completed due to arrival of wet weather.

As part of these pipeshed investigations, a total of 4 additional structures received analytical confirmation sampling to identify the origin of flow.
Observational data collected at outfalls and subsequent pipeshed investigations revealed 1 illicit discharge (OERS reporting number 2018-0355) from leaking sanitary sewer laterals at South Salem High School (laterals have since been repaired) and 3 water main leaks. A pipeshed investigation for outfall D42480223, draining to the Willamette River, revealed potential exfiltration/infiltration from a damaged sewer main into a storm main. While a dye test did not indicate a positive connection, the sewer main is being lined due to consistently elevated bacteria results at outfall D42480223. The outfall and repair location will continue to be monitored to evaluate the impact of the repair.
Field screening parameters for RY 2017/2018 included temperature (outfall and receiving water), pH, specific conductivity, turbidity, total chlorine, fluoride, detergents/surfactants, and ammonia and were analyzed using a multi-parameter colorimeter and multi-parameter data sonde. Laboratory parameters included Potassium, Sodium, and E. coli and were analyzed by the City's laboratory at the Willow Lake Waste Water Treatment Plant.
Of the 38 outfalls inspected, 33 were identified in the City of Salem's *Dry Weather Outfall and Illicit Discharge Screening Plan*. The additional outfalls were inspected based upon Stream Crew reports of dry-weather flow and 1 outfall was inspected opportunistically due to its proximity to 2 existing priority outfalls. Two outfalls listed in the City of Salem's *Dry Weather Outfall and Illicit Discharge Screening Plan* are no longer inspected, outfall D48486207, which was determined to be a culvert structure above an existing priority outfall and D42456216, which requires confined space entry.
In addition to the priority outfall inspections detailed above, the City's Stream Cleaning Crew utilized a custom GIS smart phone application to document physical inspections of outfalls with dry weather flow over the course of 47.83 stream miles that they inspected. The crew documented a total of 78 outfalls with dry weather flow. Of these 78 outfalls, 4 received follow-up inspections with analytical sampling (listed above). The other 74 outfalls will be reviewed for possible inclusion in the City of Salem's *Dry Weather Outfall and Illicit Discharge Screening Plan* and used as data inputs for selecting future priority outfalls. No outfalls had physical indicators of an illicit discharge.

**Data for this monitoring element are provided as an Attachment A at the end of this document.**

# 3.0 Conclusion

The City continues to meet all monitoring requirements of its administratively extended MS4 Permit. 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.

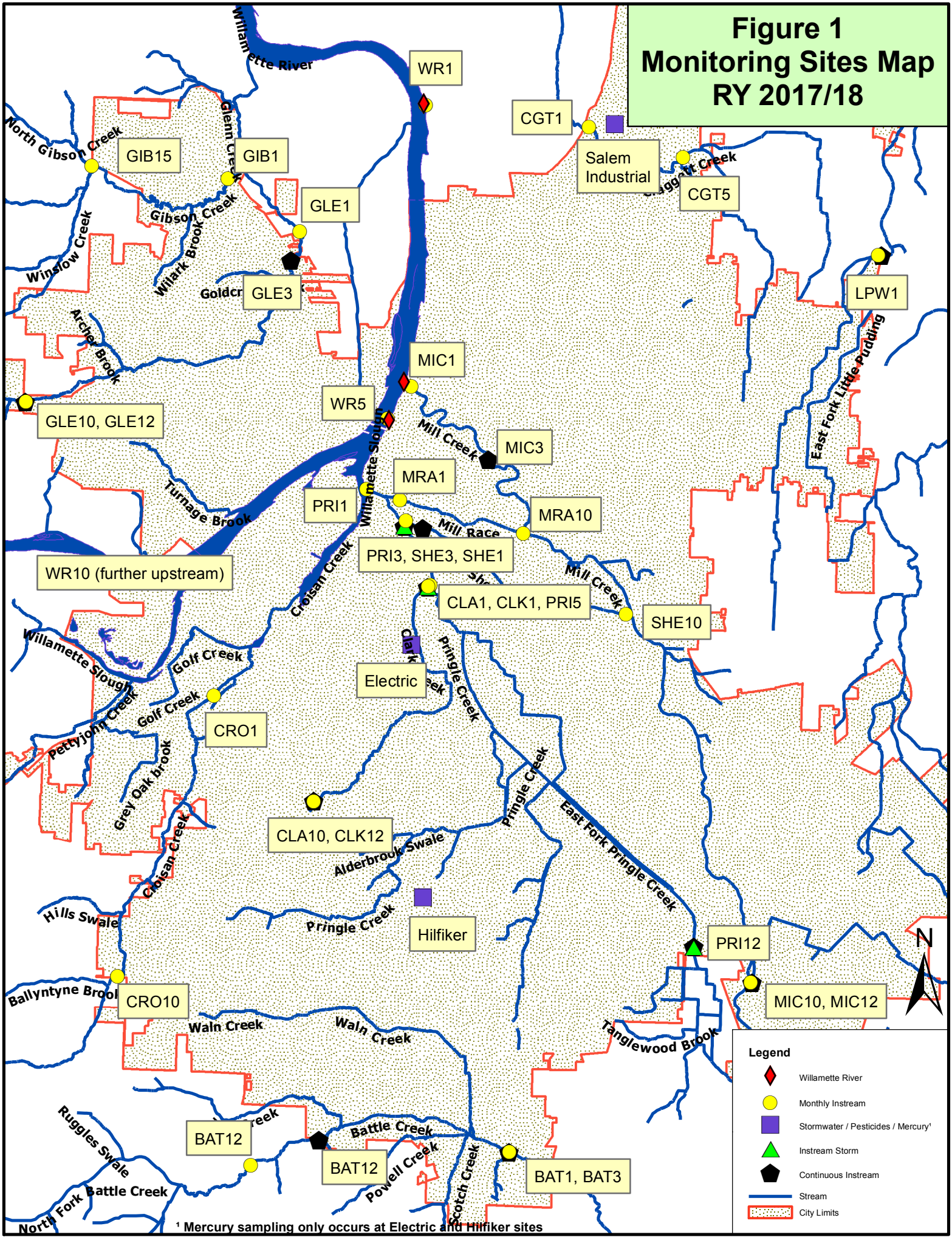
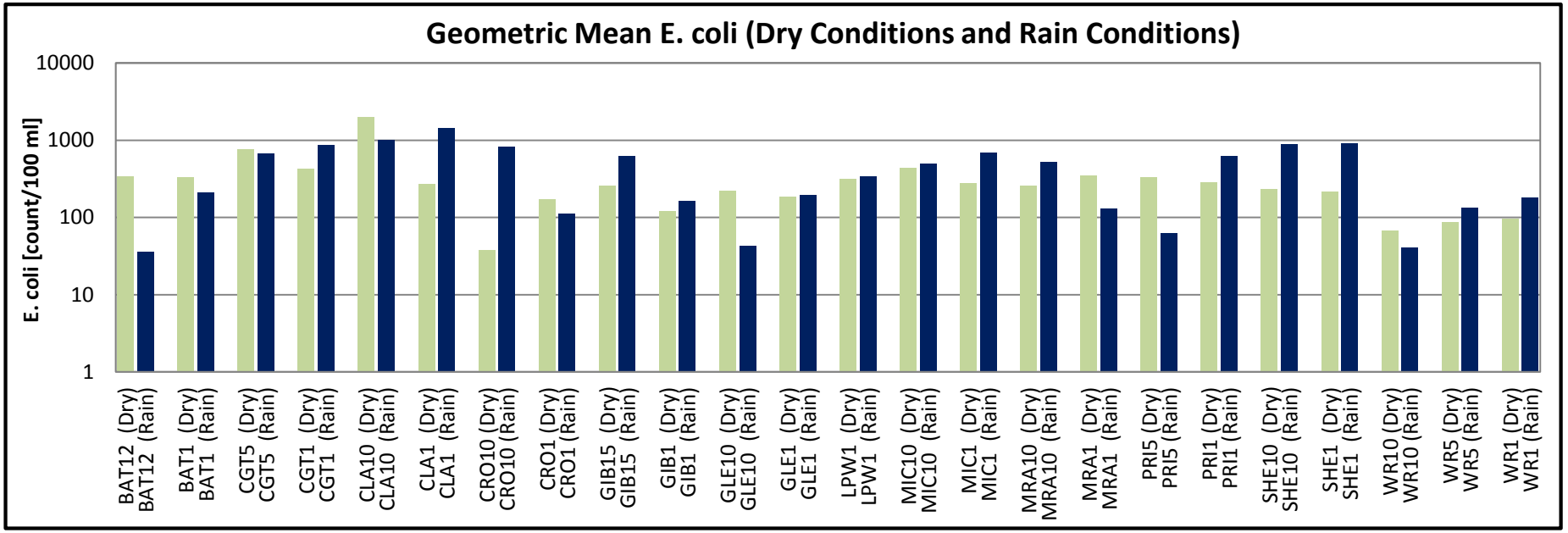
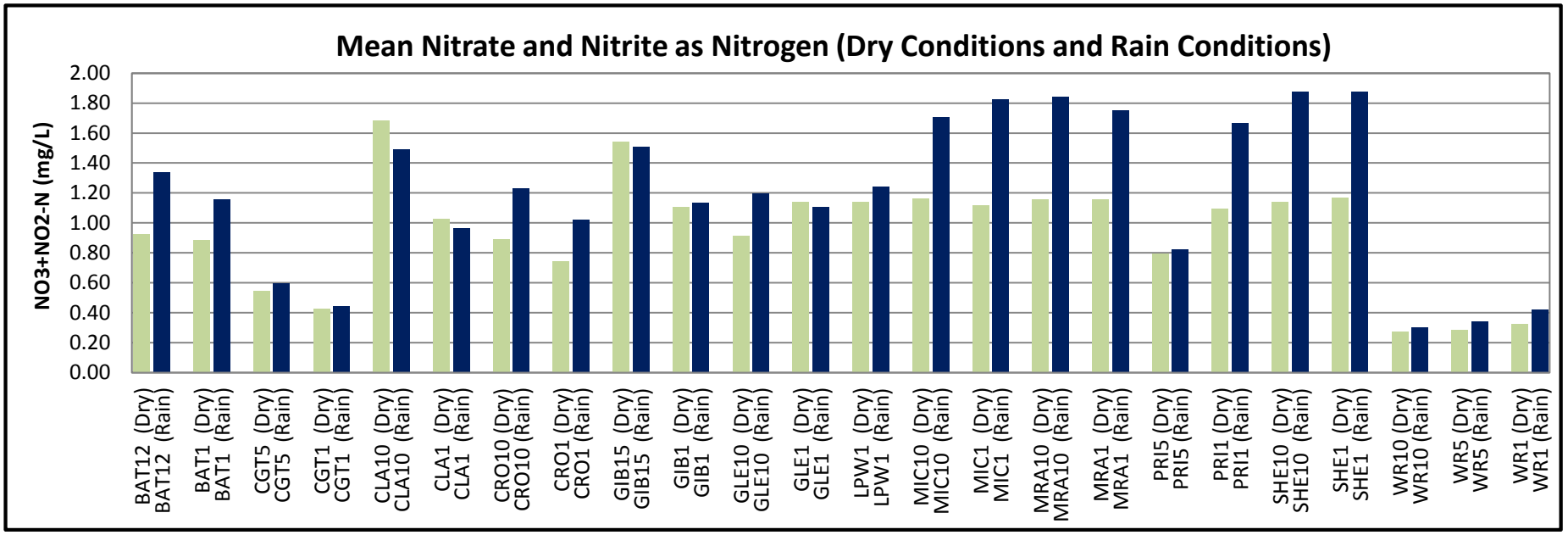


Figure 1
Monitoring Sites Map
RY 2017/18
Willamette River
WR1
CGT1
Salem Industrial
CGT5
GIB15
GIB1
GLE1
GLE3
LPW1
MIC1
WR5
MIC3
GLE10, GLE12
MRA1
PRI1
MRA10
PRI3, SHE3, SHE1
WR10 (further upstream)
CLA1, CLK1, PRI5
SHE10
Electric
CRO1
CLA10, CLK12
Hilfiker
PRI12
MIC10, MIC12
CRO10
BAT12
BAT12
BAT1, BAT3
North Gibson Creek
Gibson Creek
Glenn Creek
Winslow Creek
Wilark Brook
Archer Brook
Turnage Brook
Willamette Slough
Mill Creek
Mill Race
Croisan Creek
Pringle Creek
East Fork Little Pudding
Golf Creek
Pettyjohn Creek
Grey Oak brook
Alderbrook Swale
East Fork Pringle Creek
Hills Swale
Ballyntyne Brook
Waln Creek
Tanglewood Brook
Ruggles Swale
Battle Creek
Powell Creek
Scotch Creek
North Fork Battle Creek
N
Legend
Willamette River
Monthly Instream
Stormwater / Pesticides / Mercury¹
Instream Storm
Continuous Instream
Stream
City Limits
¹ Mercury sampling only occurs at Electric and Hilfiker sites

Figure 2

Monthly Instream Mean Value Comparison for Dry and Rain Conditions (Reporting Year 2017/2018)

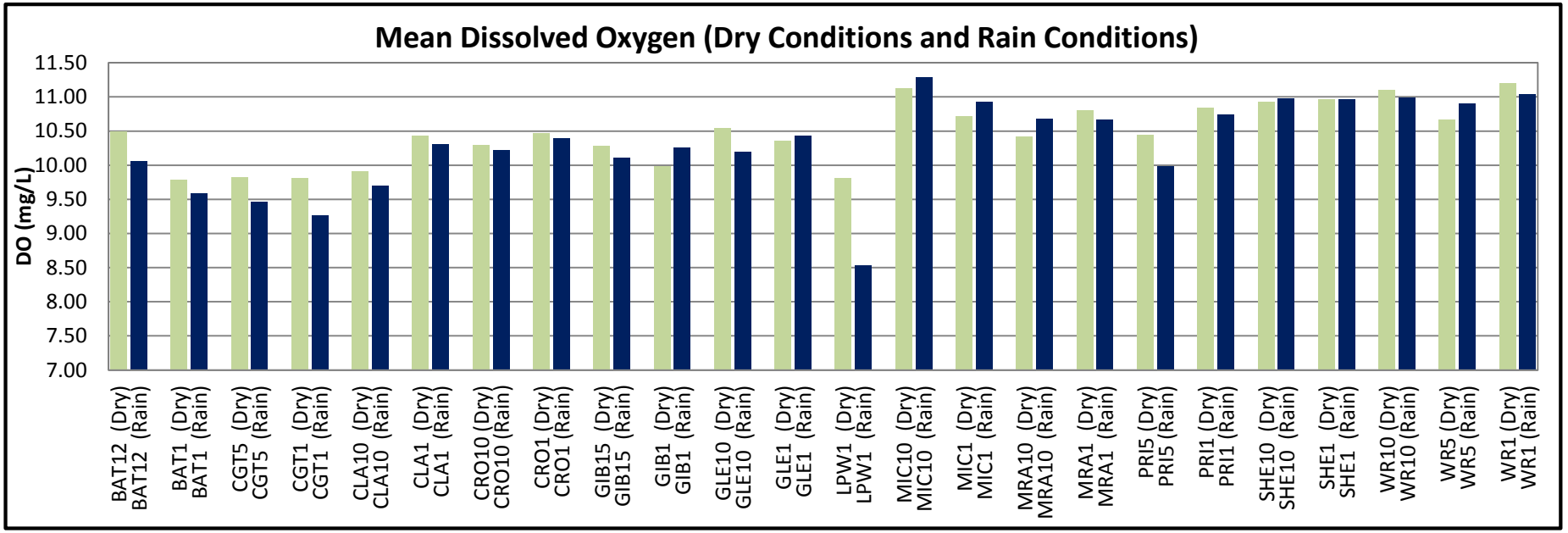


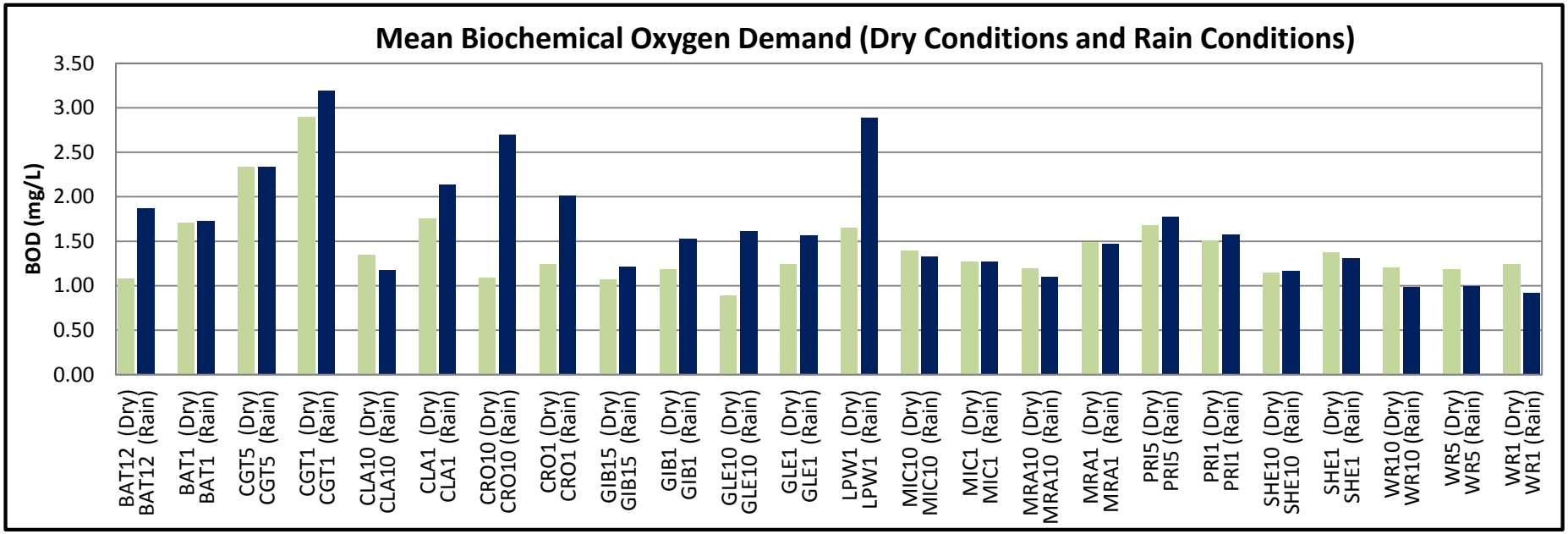




**Dry** conditions defined as less than 0.05 inches of rainfall in the 24 hours prior to sample collection; **rain** conditions defined as greater than or equal to 0.05 inches of rainfall in the 24 hours prior to sample collection.

Figure 2

Monthly Instream Mean Value Comparison for Dry and Rain Conditions (Reporting Year 2017/2018)

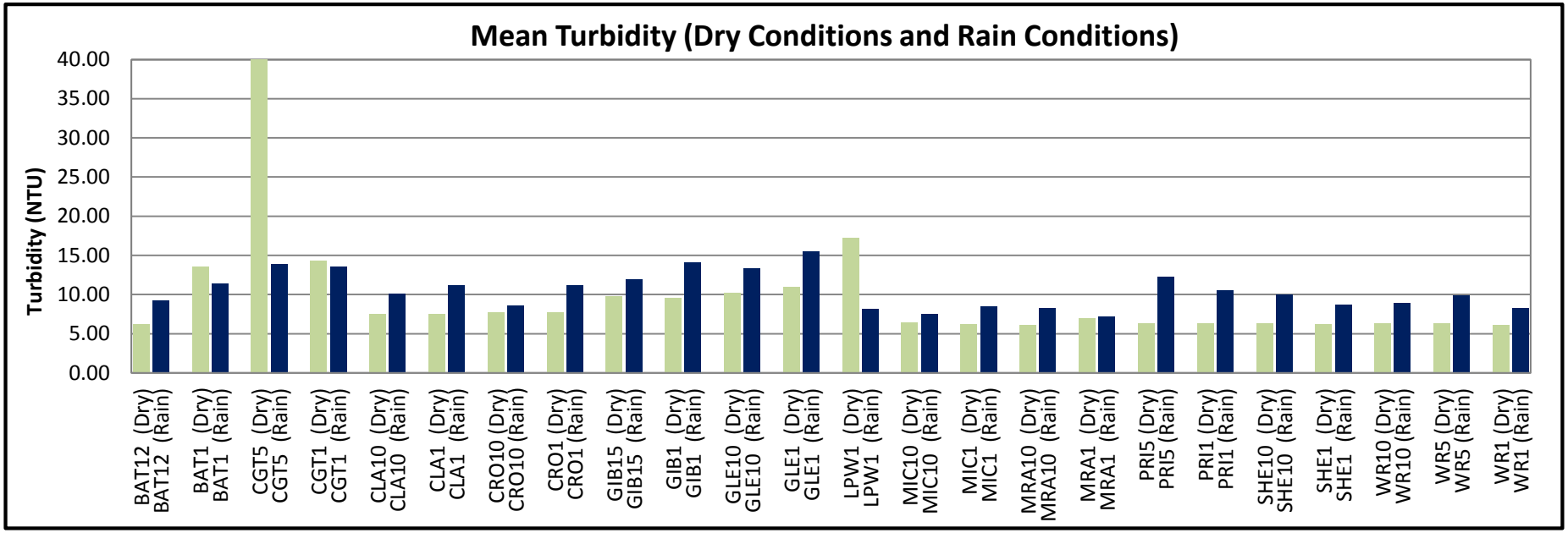


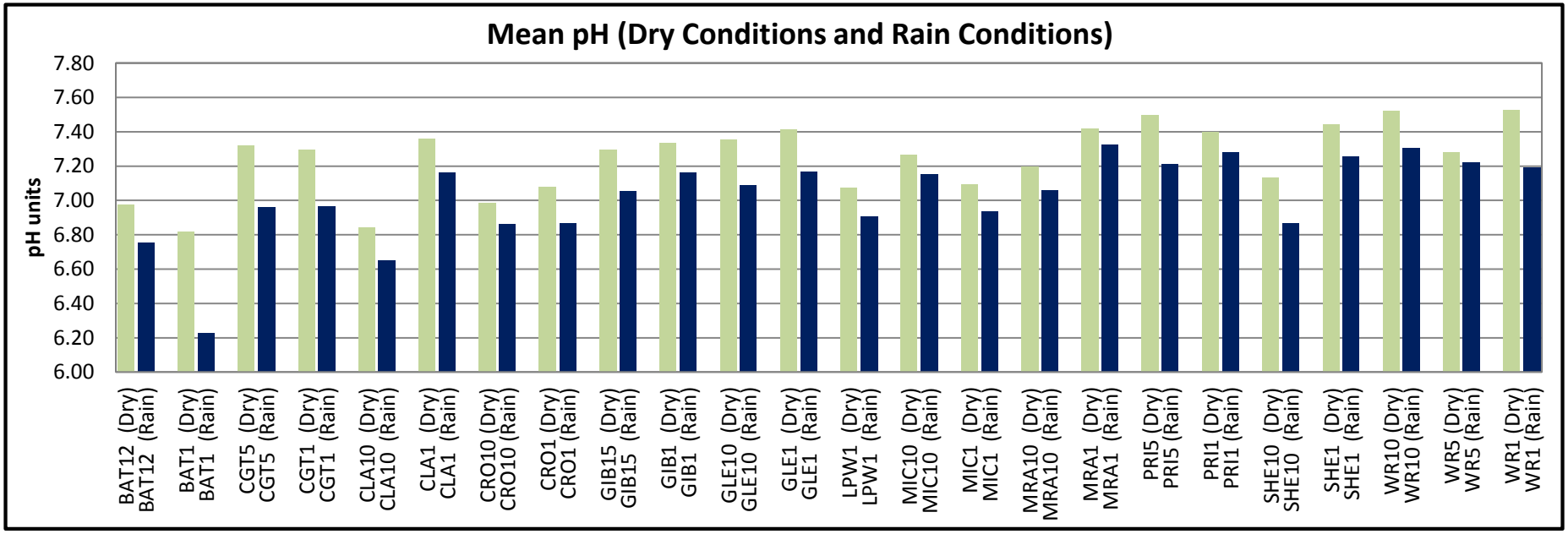




**Dry** conditions defined as less than 0.05 inches of rainfall in the 24 hours prior to sample collection; **rain** conditions defined as greater than or equal to 0.05 inches of rainfall in the 24 hours prior to sample collection.

Figure 2

Monthly Instream Mean Value Comparison for Dry and Rain Conditions (Reporting Year 2017/2018)

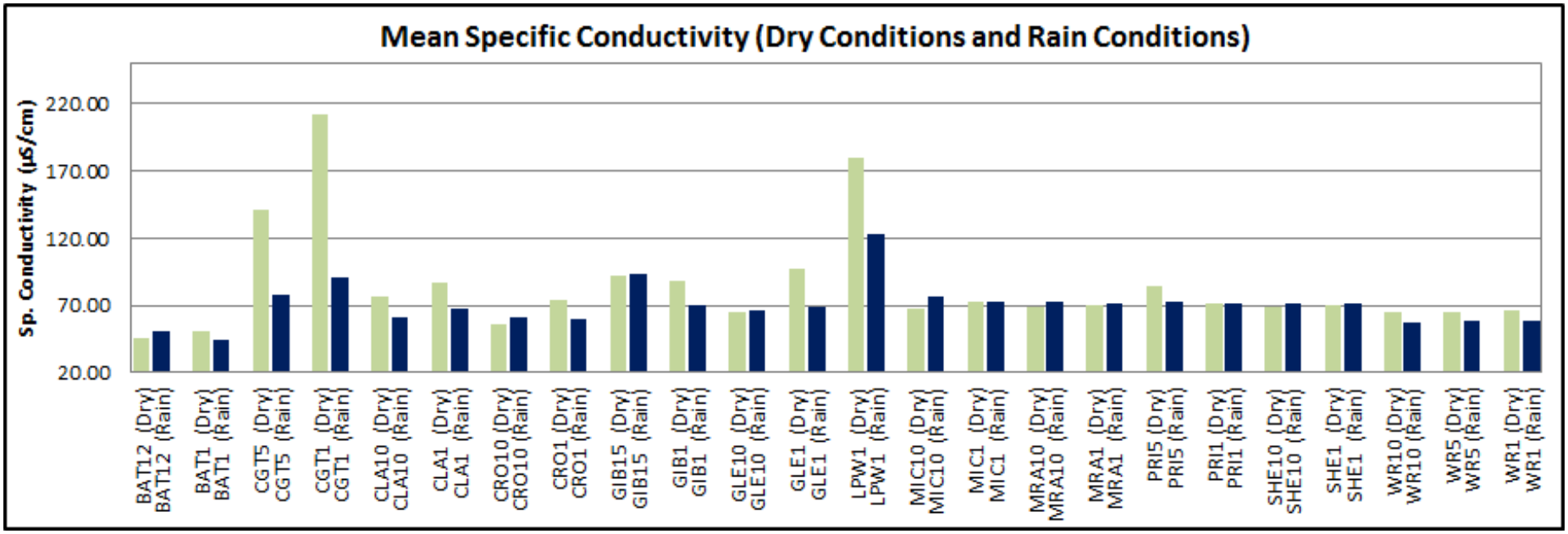



**Dry** conditions defined as less than 0.05 inches of rainfall in the 24 hours prior to sample collection; **rain** conditions defined as greater than or equal to 0.05 inches of rainfall in the 24 hours prior to sample collection.

Figure 2

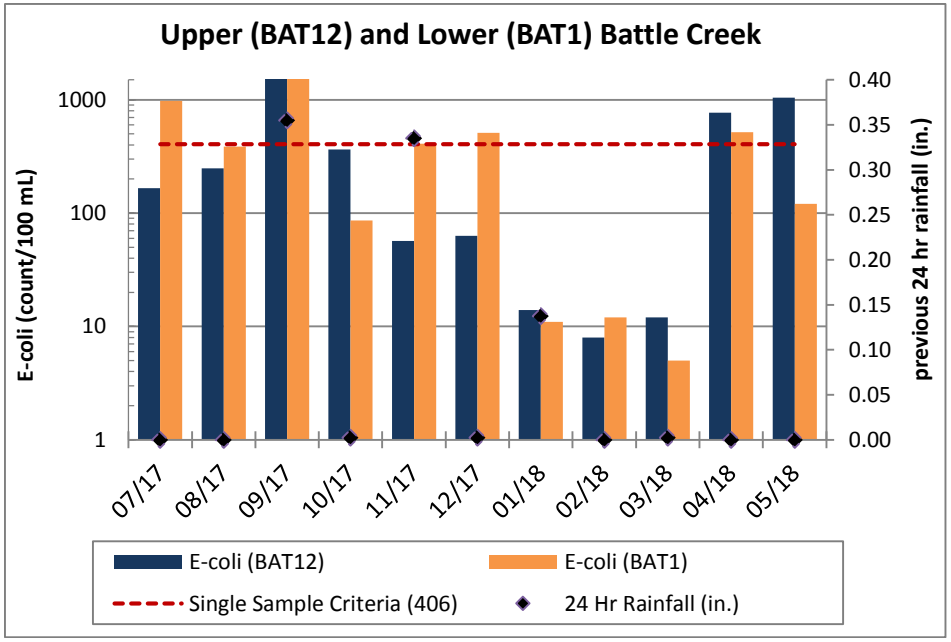
Monthly Instream Mean Value Comparison for Dry and Rain Conditions (Reporting Year 2017/2018)

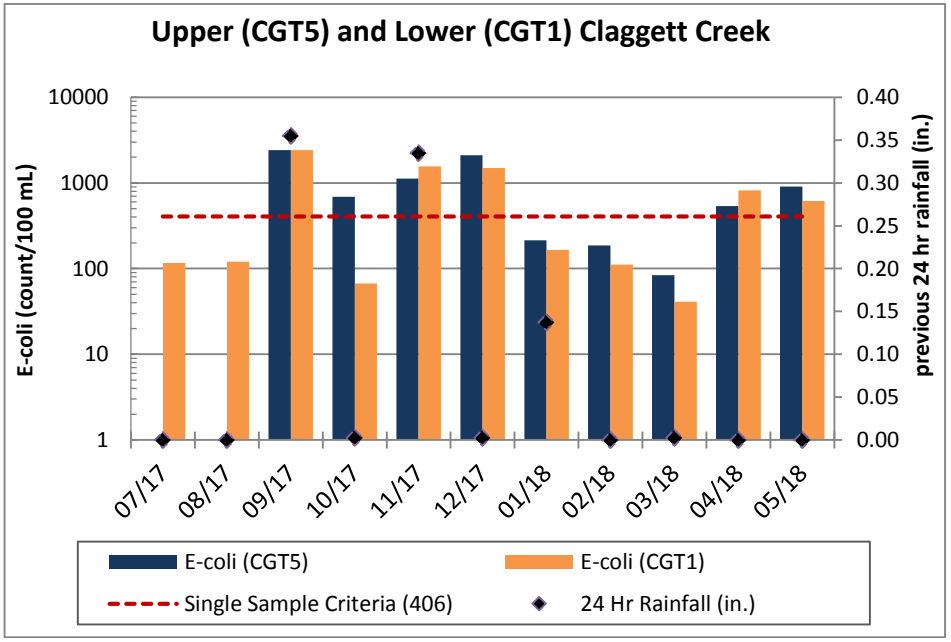


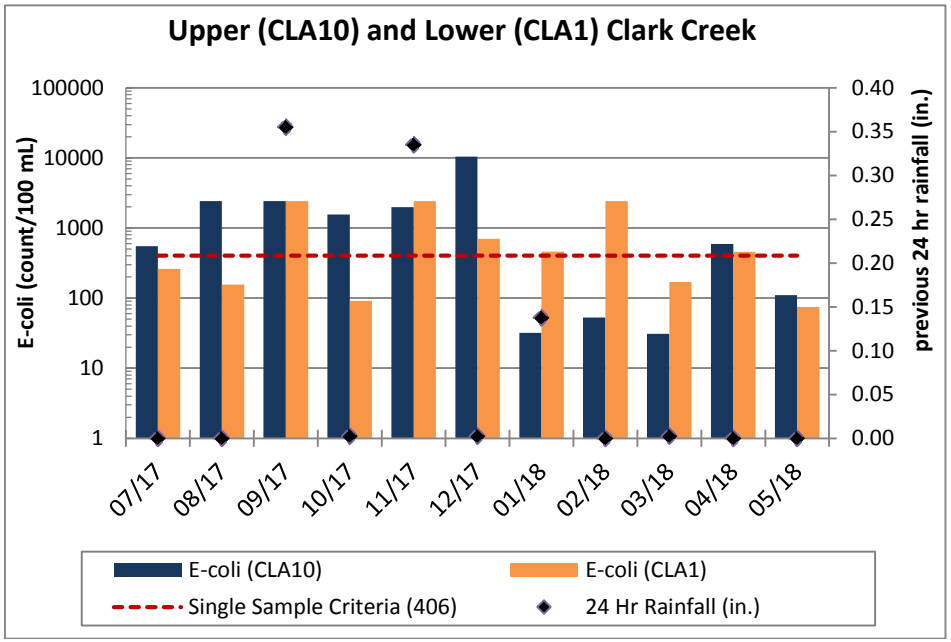

**Dry** conditions defined as less than 0.05 inches of rainfall in the 24 hours prior to sample collection; **rain** conditions defined as greater than or equal to 0.05 inches of rainfall in the 24 hours prior to sample collection.

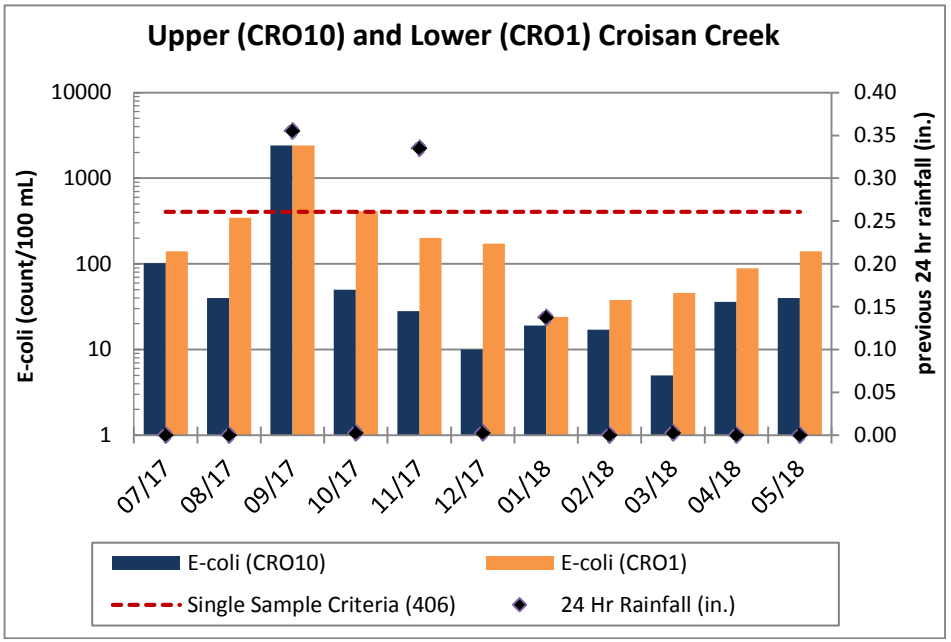
Figure 3

Monthly Instream E. Coli Upstream / Downstream Site Comparison (Reporting Year 2017/2018)



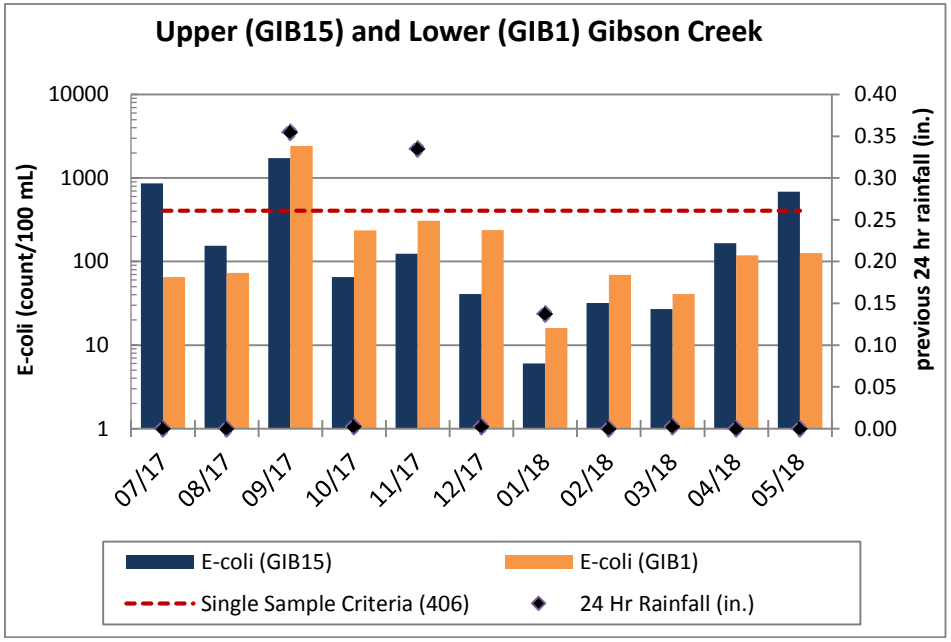



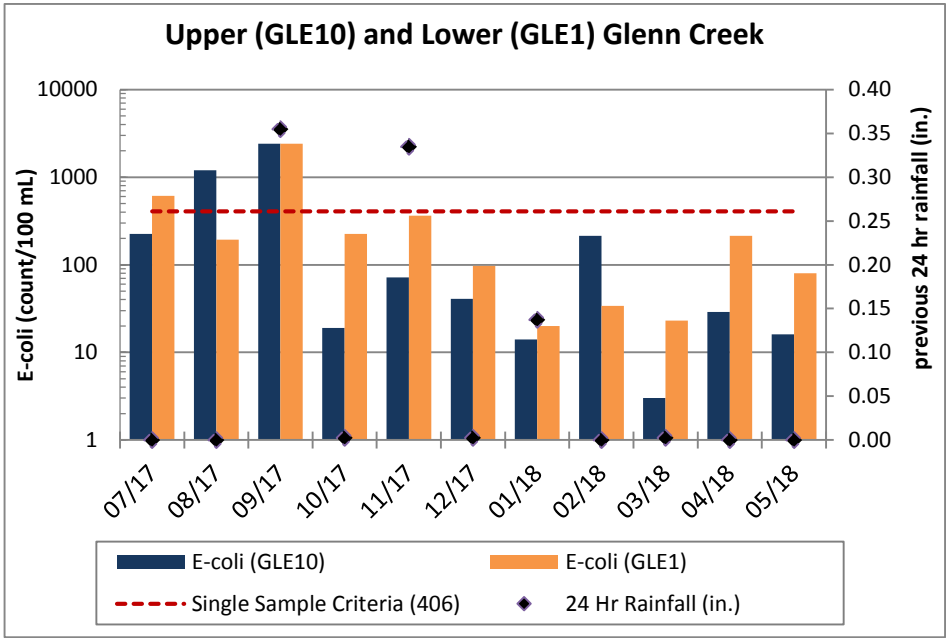



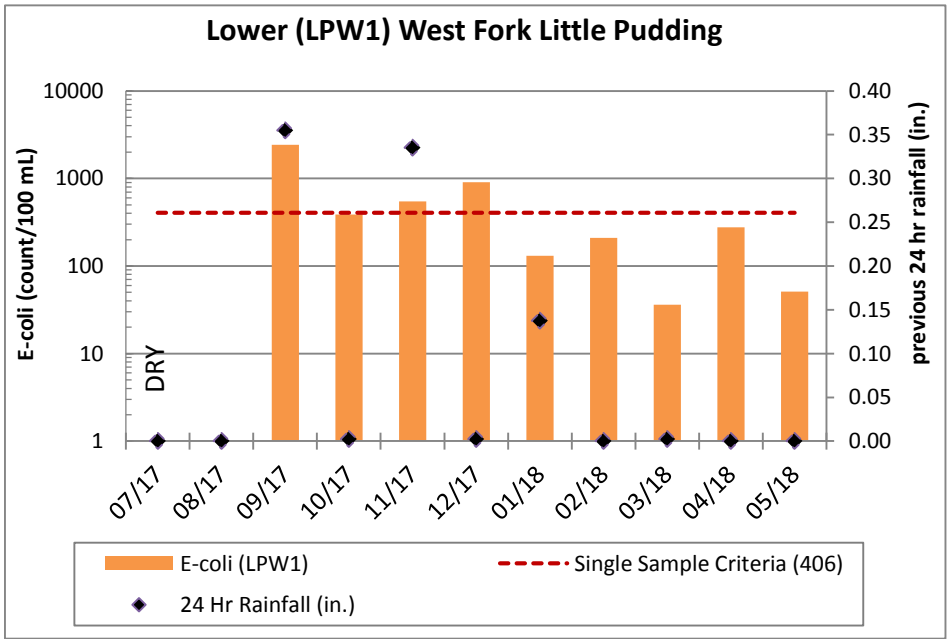

If 24 hour rainfall depth prior to sample collection differed between upstream and downstream sites, the average rainfall of the two sites was used.

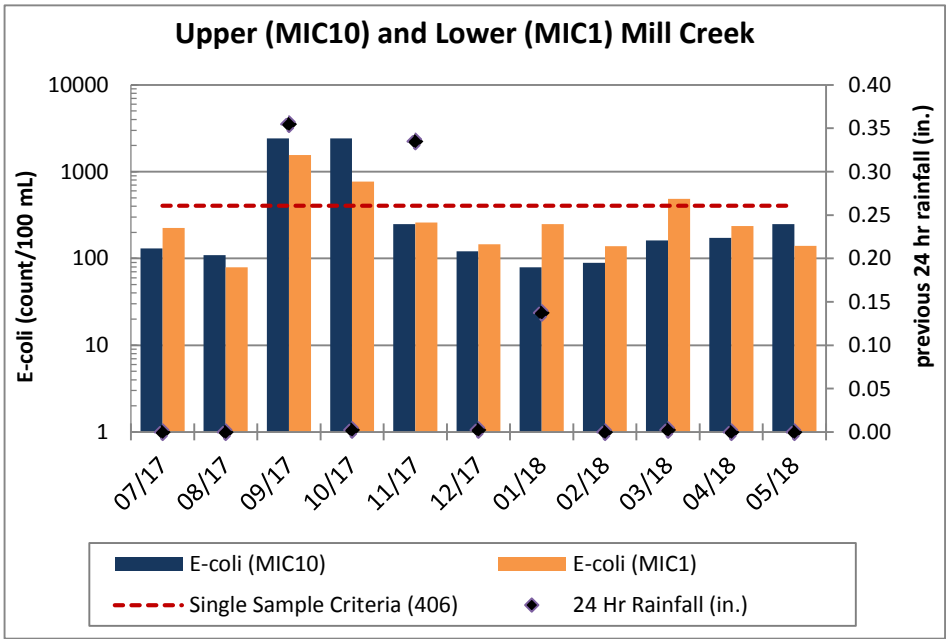
Figure 3

Monthly Instream E. Coli Upstream / Downstream Site Comparison (Reporting Year 2017/2018)



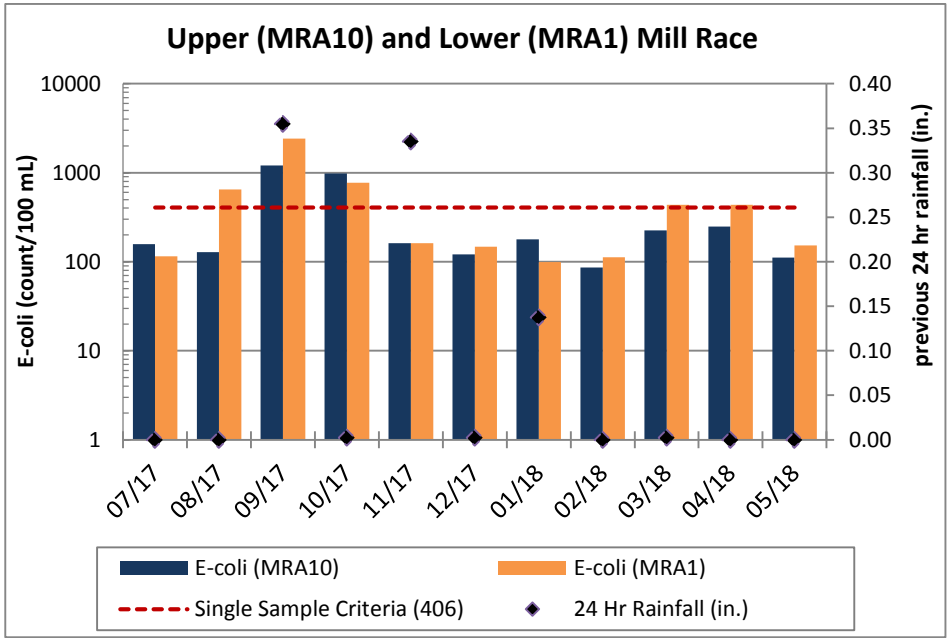



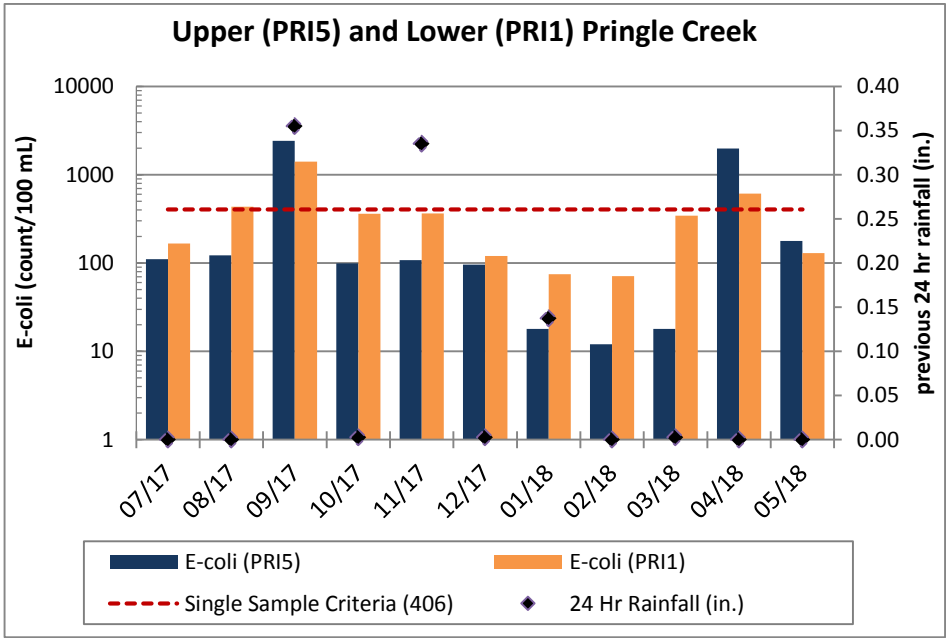



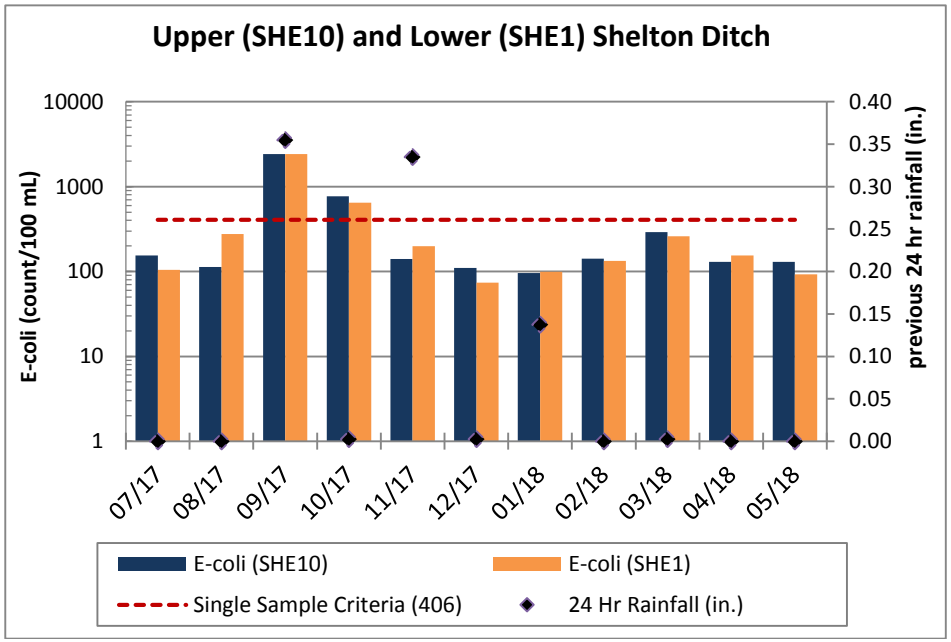

If 24 hour rainfall depth prior to sample collection differed between upstream and downstream sites, the average rainfall of the two sites was used.

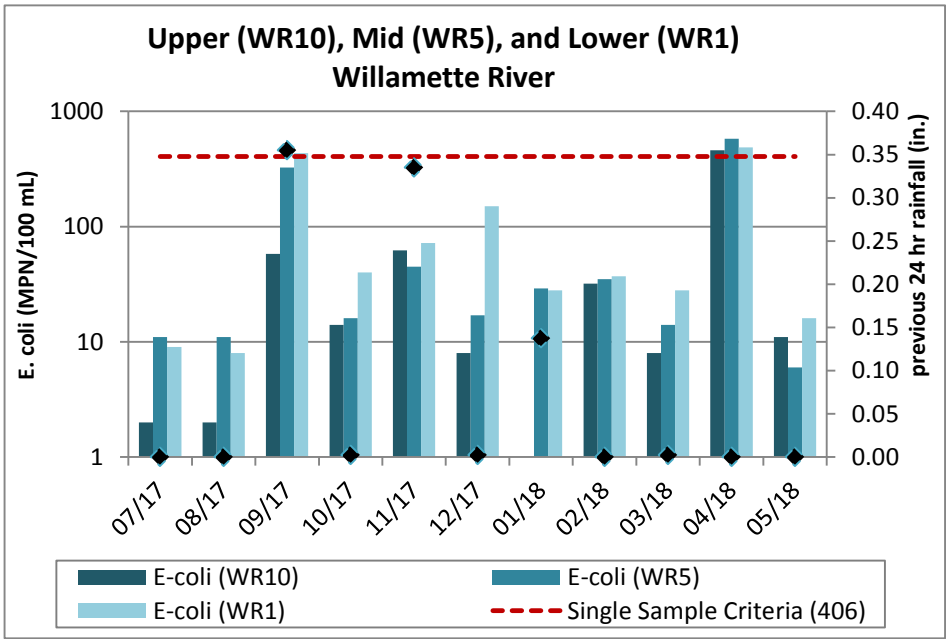
Figure 3

Monthly Instream E. Coli Upstream / Downstream Site Comparison (Reporting Year 2017/2018)



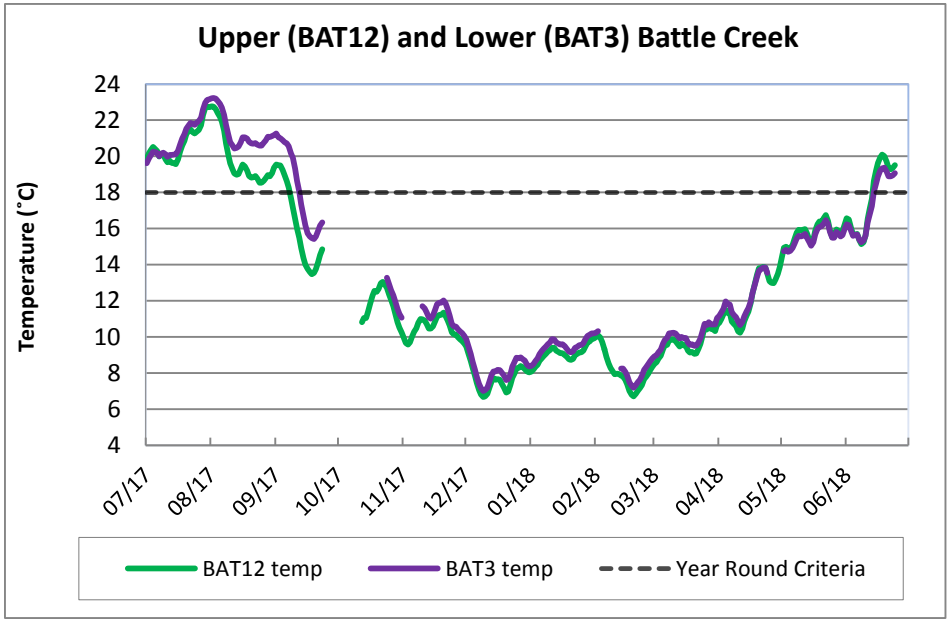



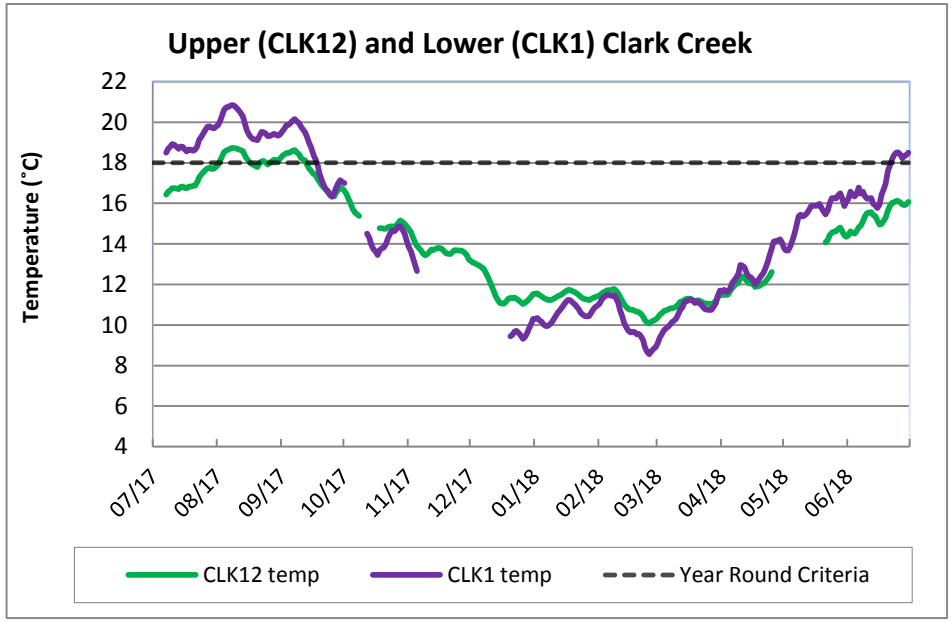



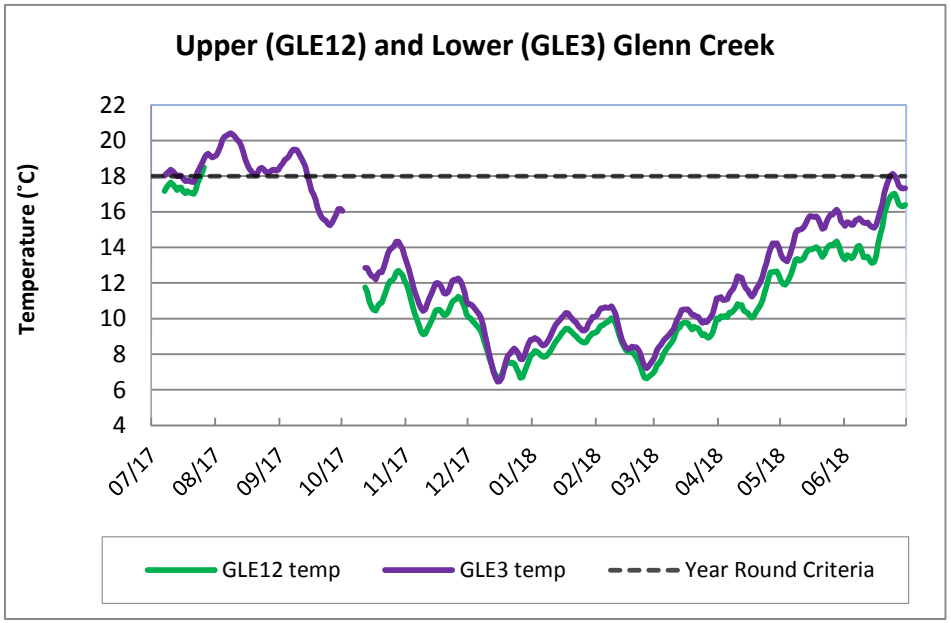

If 24 hour rainfall depth prior to sample collection differed between upstream and downstream sites, the average rainfall of the two sites was used.

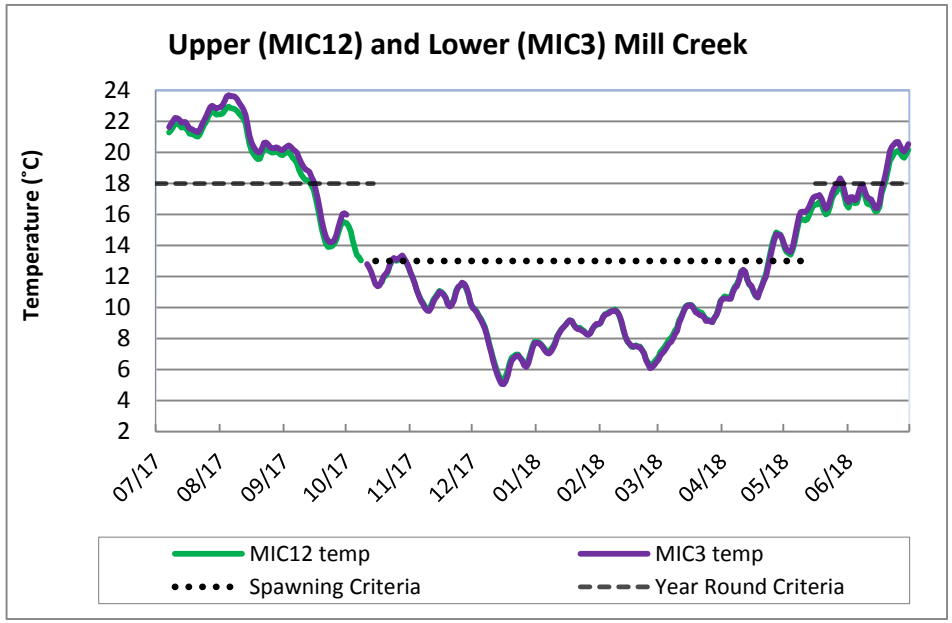
Figure 4

Continuous Instream Temperature 7-Day Moving Average Maximum (Reporting Year 2017/2018)



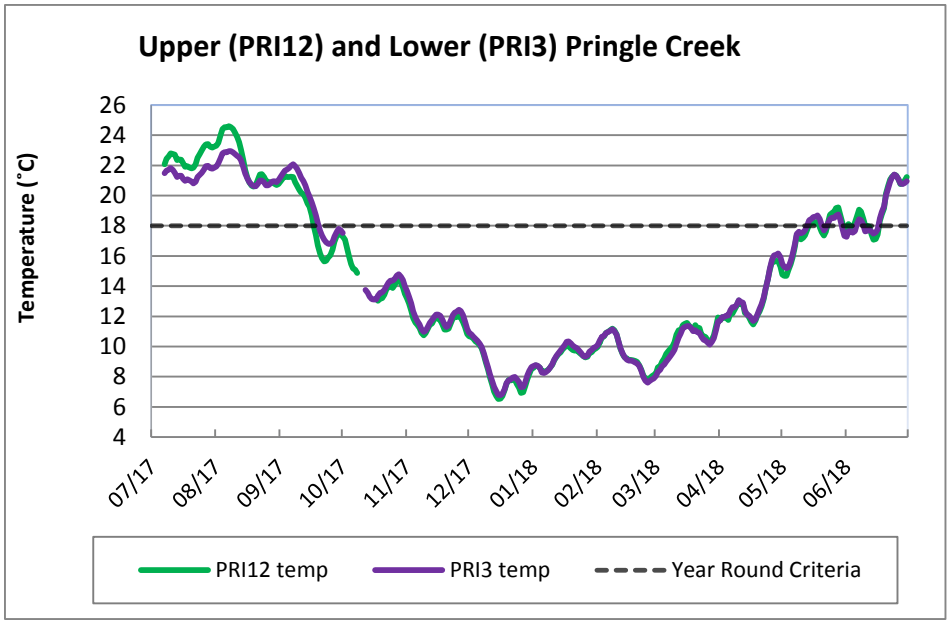




Presented temperature data consists of A grade data with greater than 80% of data points collected per day. Temperature criteria is defined in OAR 340--04100028 and OAR 340-0340, Tables 340A & B.

- 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

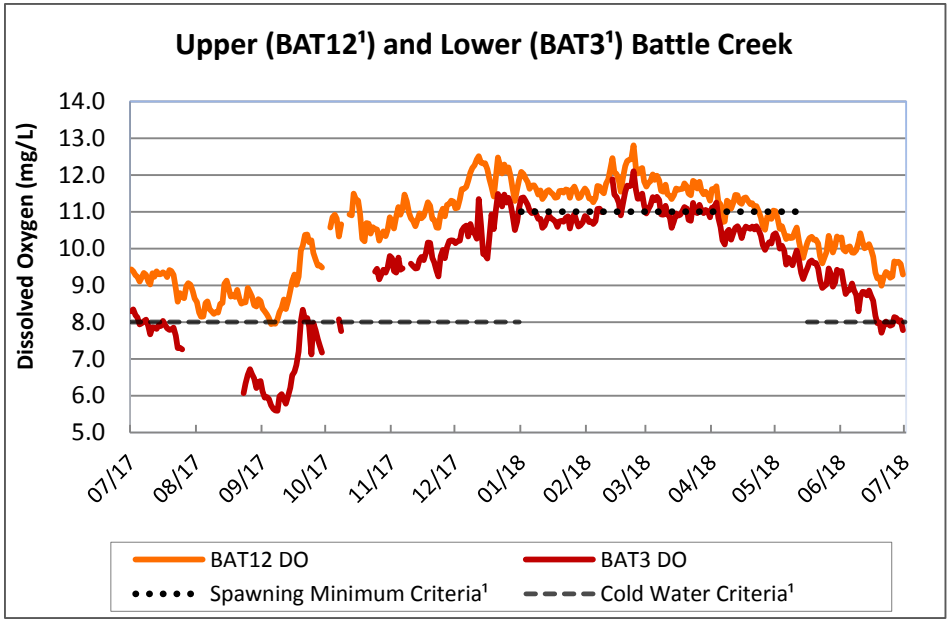
Continuous Instream Temperature 7-Day Moving Average Maximum (Reporting Year 2017/2018)

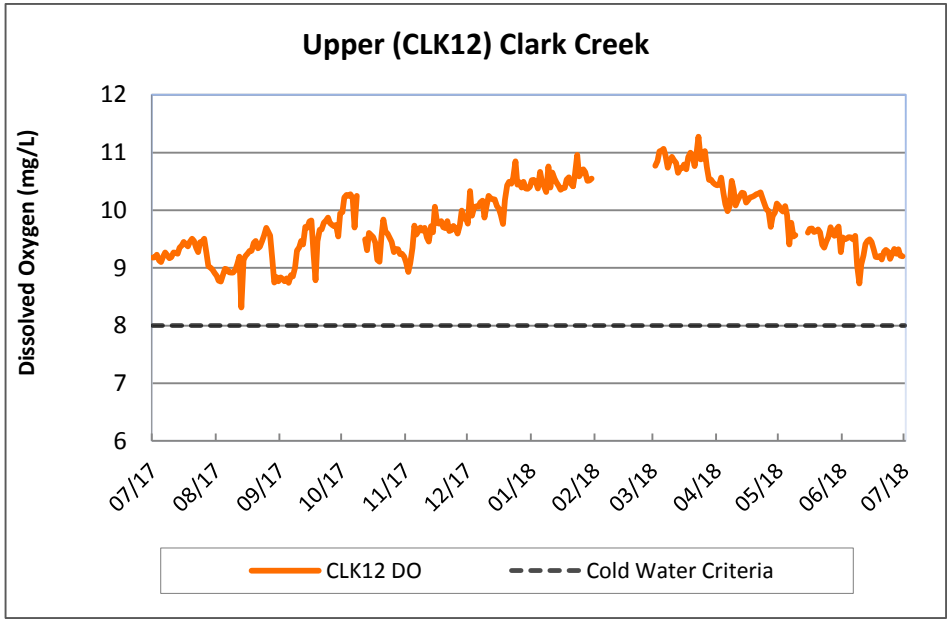


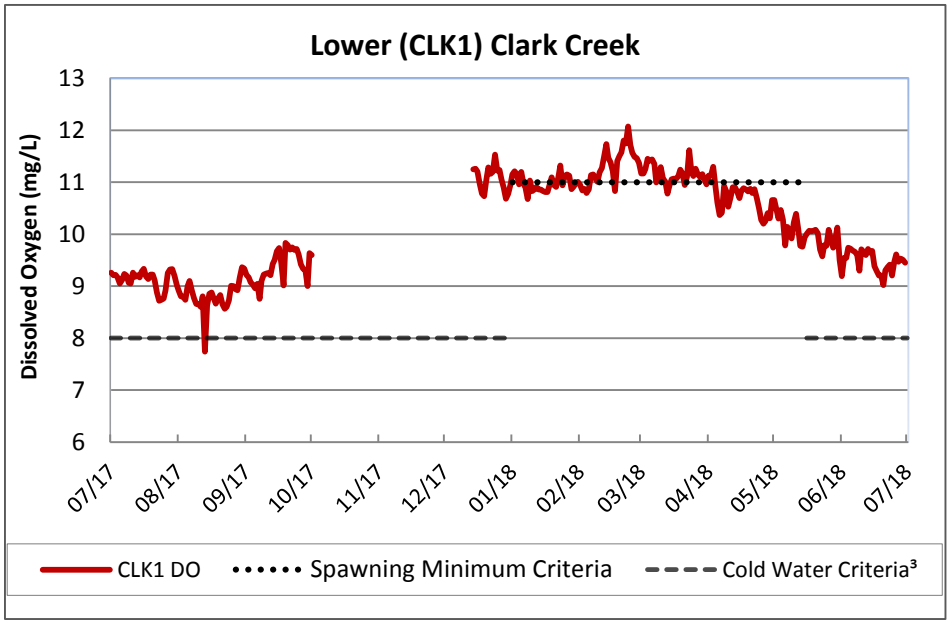

Presented temperature data consists of A grade data with greater than 80% of data points collected per day. Temperature criteria is defined in OAR 340--04100028 and OAR 340-0340, Tables 340A & B.

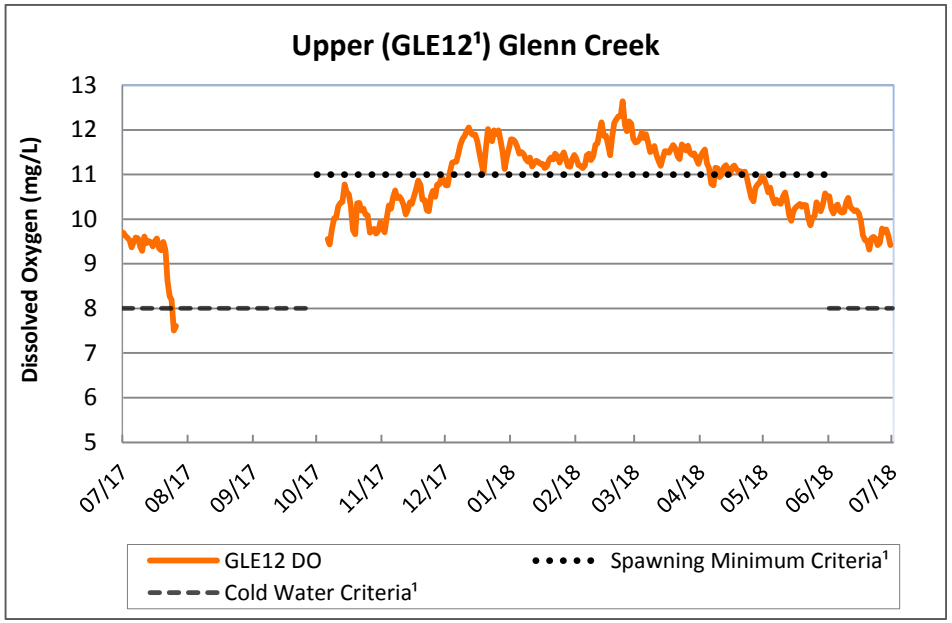
- Spawning Minimum Criteria for applicable streams may not exceed 7-day average maximum of 13 degrees C.
- Year Round Minimum Criteria may not exceed 7-day average maximum of 18 degrees C.

# Figure 5
## Continuous Instream Dissolved Oxygen Daily Mean (Reporting Year 2017/2018)



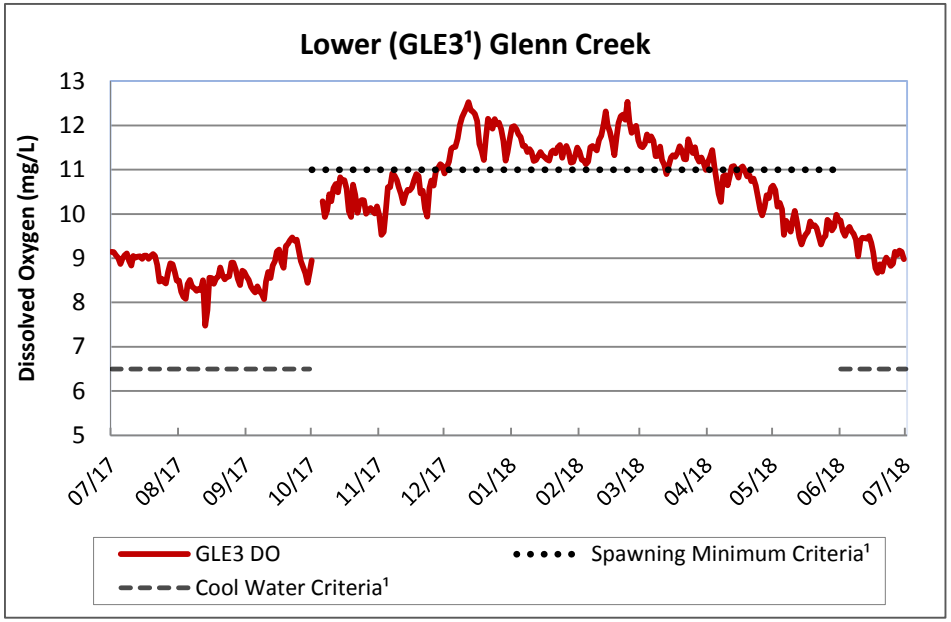

Presented DO data consists of A and B grade data with greater than or equal to 80% of data points collected per day. DO Criteria as defined in OAR 340-041-0016 and OAR 340-0340, Tables 340 A & B.

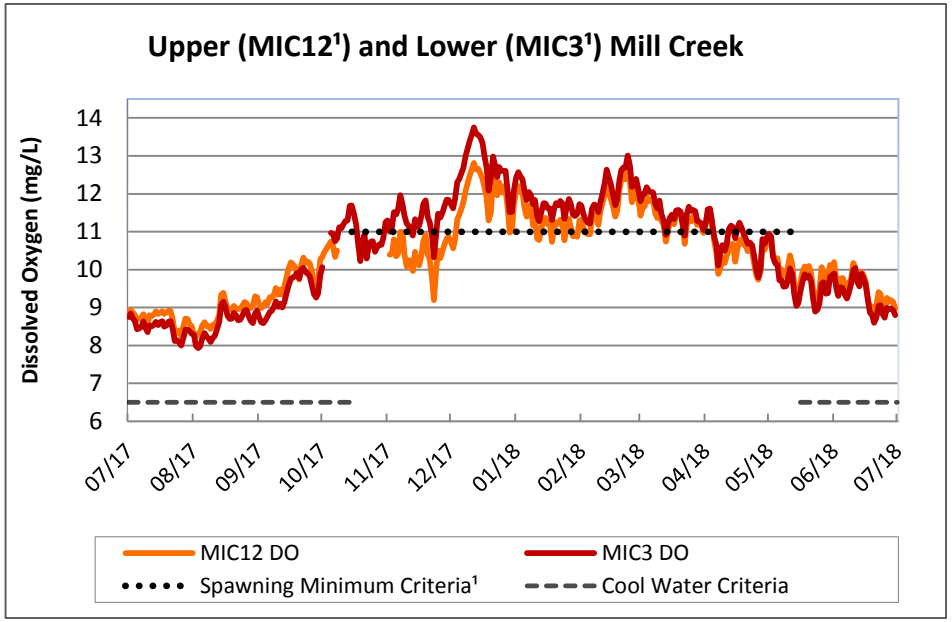
- Spawning Minimum Criteria for applicable streams may not be less than 11 mg/L.
- Oregon Cold Water Criteria for applicable streams may not be less than 8 mg/L.

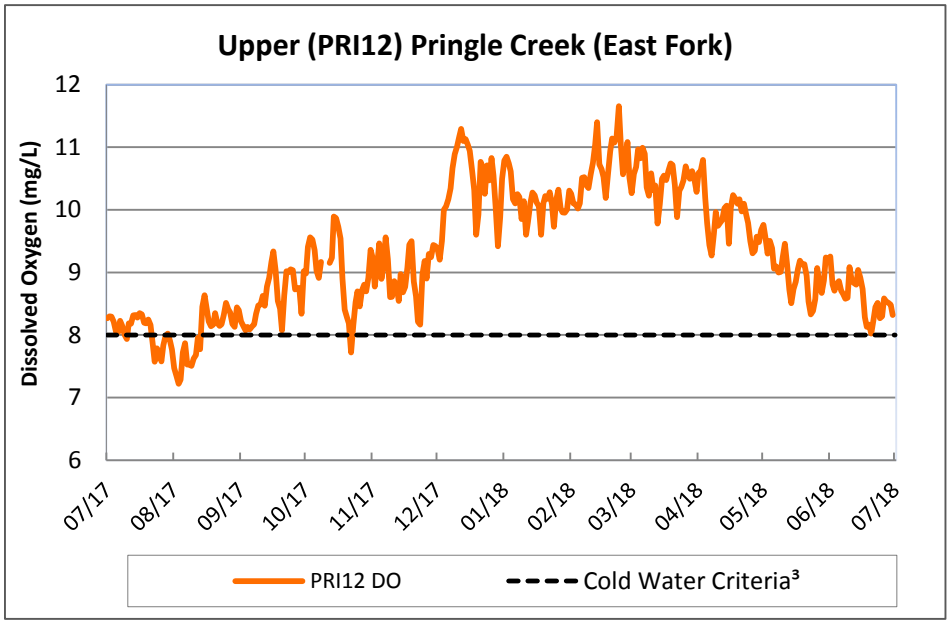
[1] Oregon's 2012 Integrated Report Section 303(d) listed.

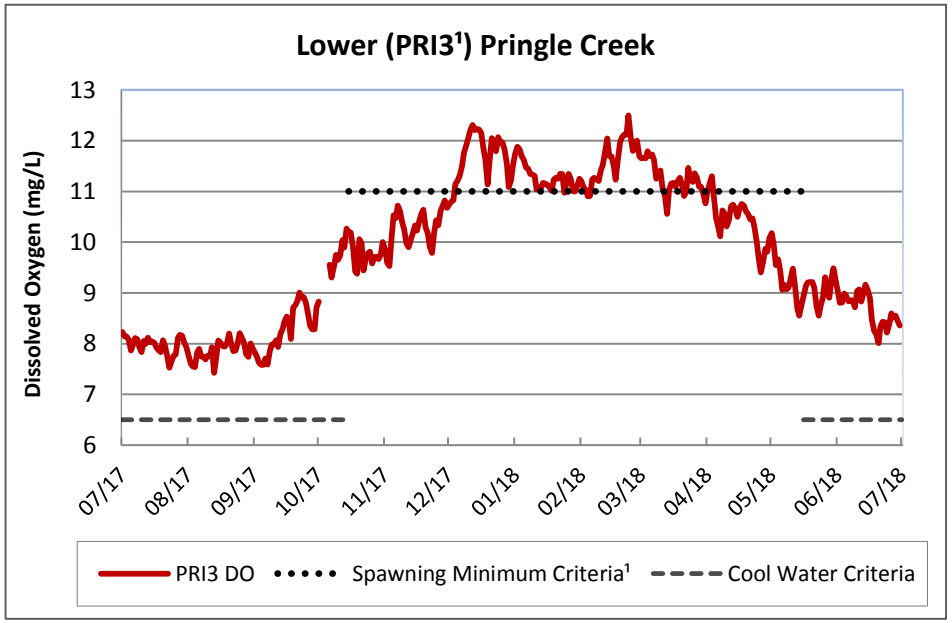
Figure 5

Continuous Instream Dissolved Oxygen Daily Mean (Reporting Year 2017/2018)



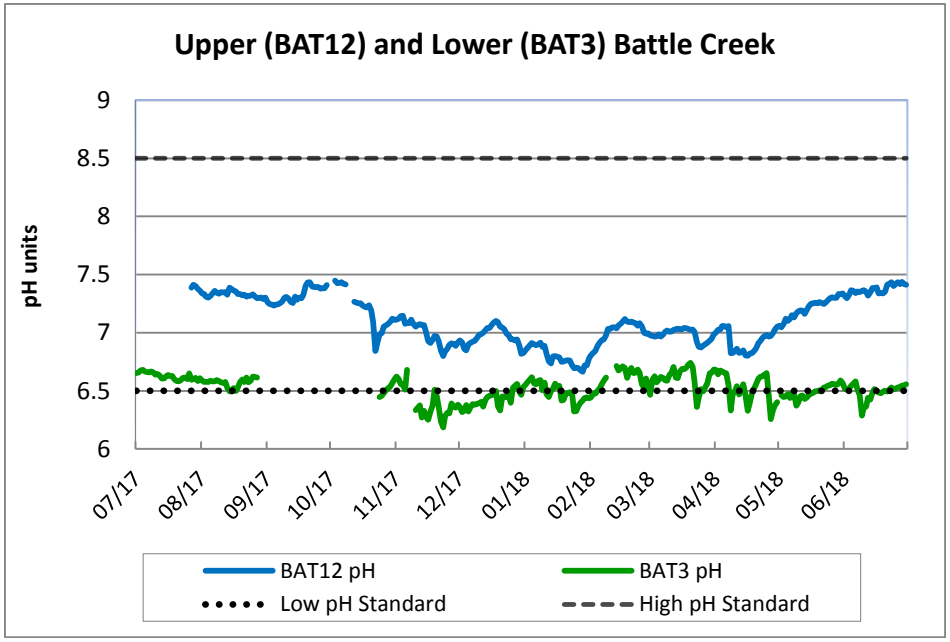

Presented DO data consists of A and B grade data with greater than or equal to 80% of data points collected per day. DO Criteria as defined in OAR 340-041-0016 and OAR 340-0340, Tables 340 A & B.

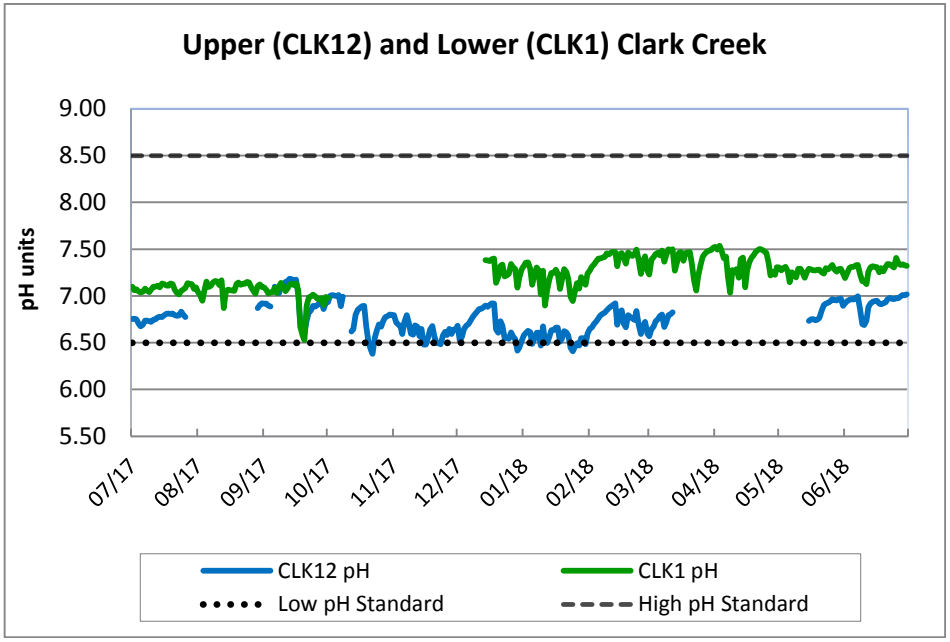
- Spawning Minimum Criteria for applicable streams may not be less than 11 mg/L.
- Oregon Cold Water Criteria for applicable streams may not be less than 8 mg/L.

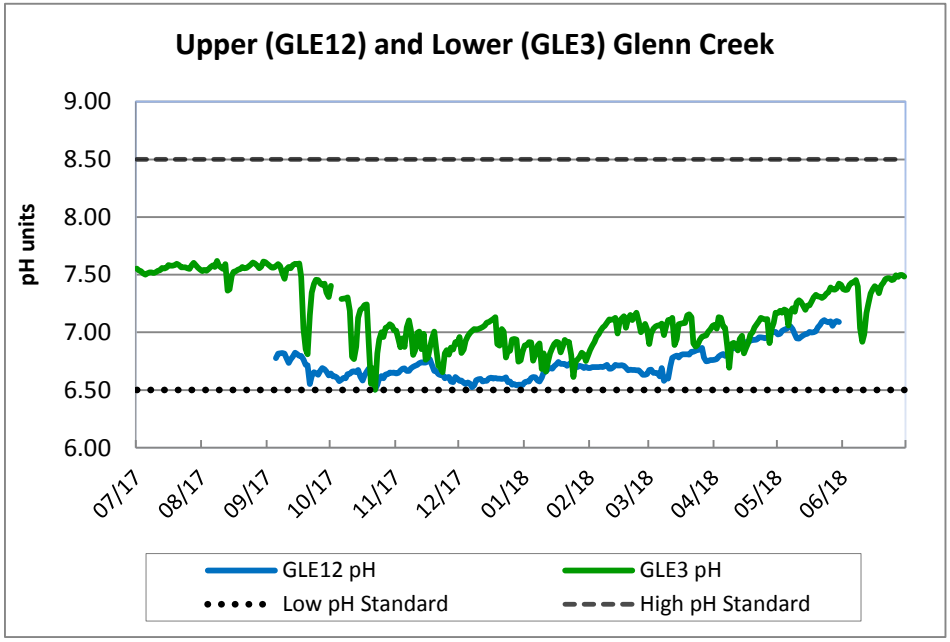
[1] Oregon's 2012 Integrated Report Section 303(d) listed.

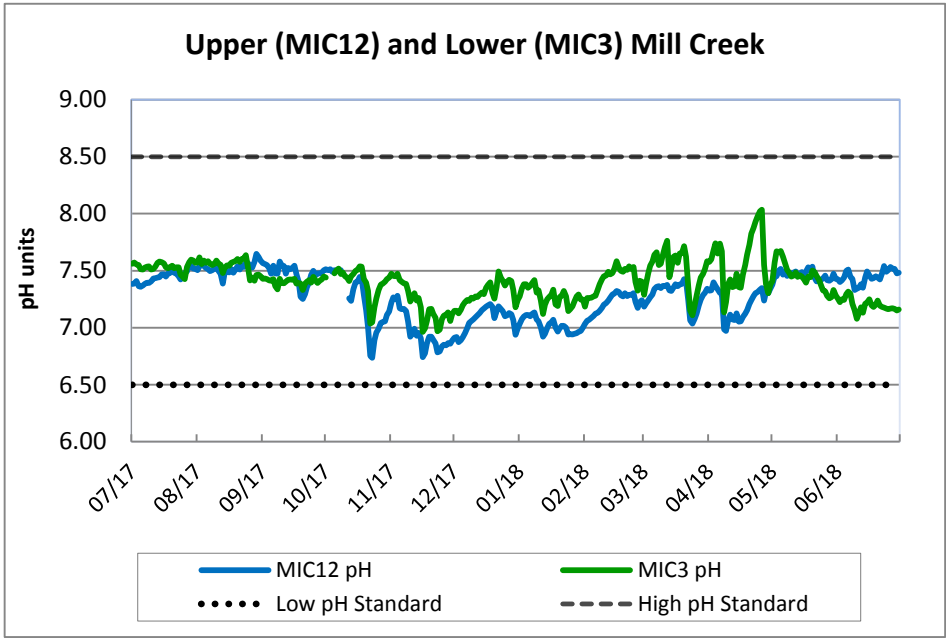
Figure 6

Continuous Instream pH Daily Mean (Reporting Year 2017/2018)



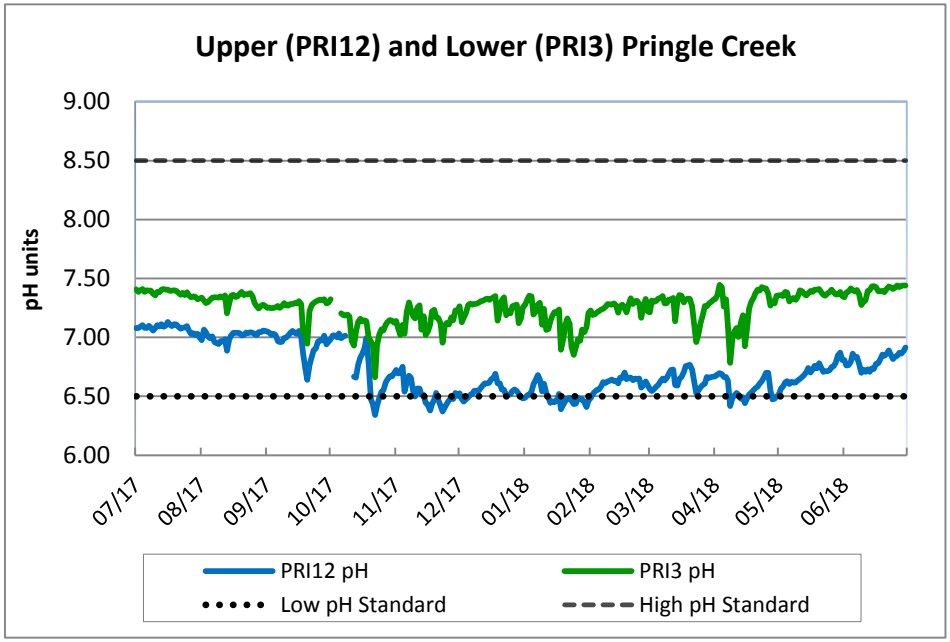




Presented pH data consist of A and B grade data with greater than or equal to 80% of data points collected per day.
As defined in OAR 341-041-0035 Water Quality Standards for the Willamette Basin, pH should not fall outside the ranges of 6.5 to 8.5 pH units.

Figure 6
Continuous Instream pH Daily Mean (Reporting Year 2017/2018)




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
Total Rainfall by Month Across Salem (Reporting Year 2017/2018)

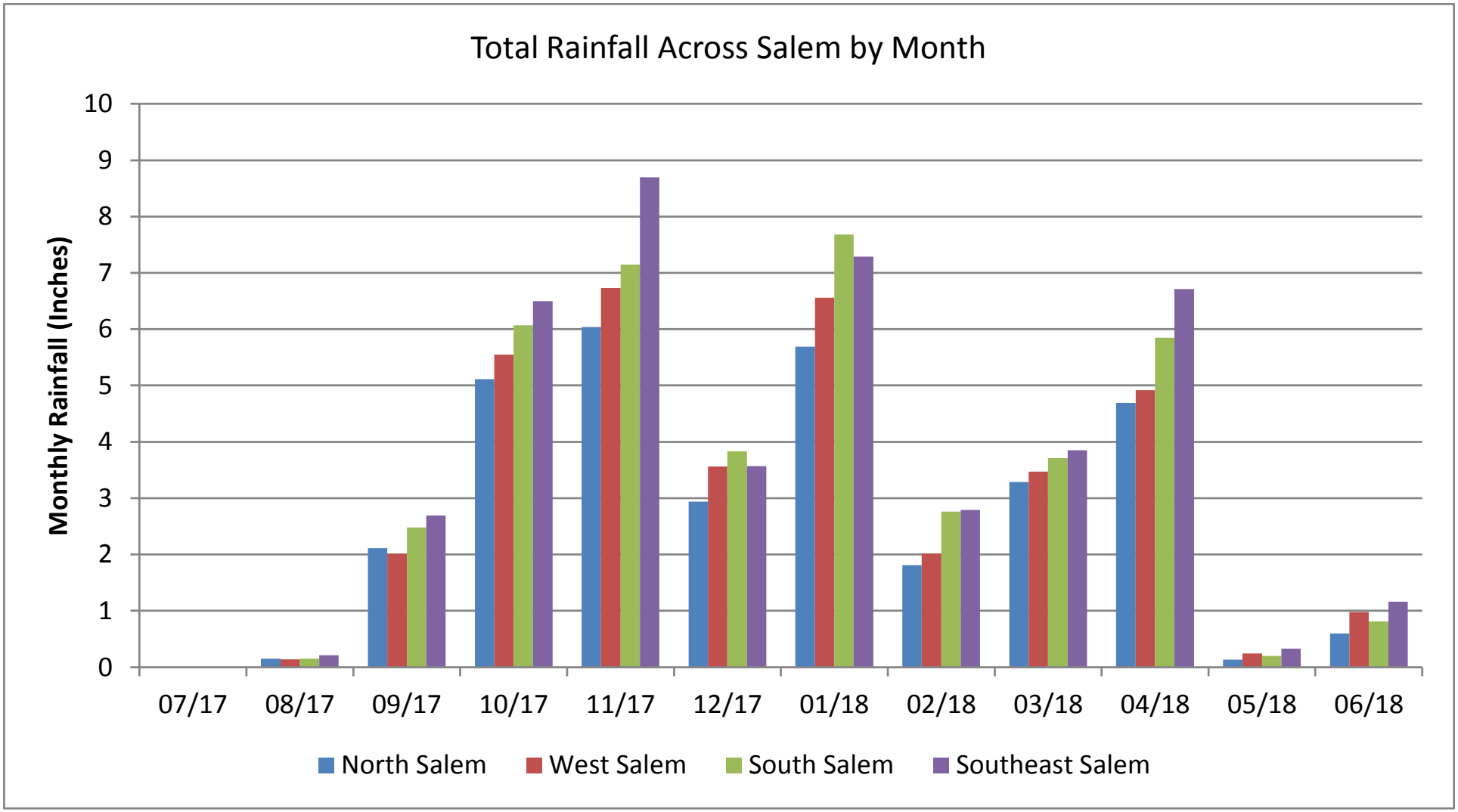


Table 1.
Completion of Table B-1 Environmental Monitoring Elements

| Monitoring Type | # of sites | Total "Events" Needed | 2011 / 2012 | 2012 / 2013 | 2013 / 2014 | 2014 / 2015 | 2015 / 2016 | 2016 / 2017 | 2017 / 2018 |
|---|---|---|---|---|---|---|---|---|---|
| Monthly Instream | 21 | 48 / site | 12[1] | 12[1] | 12[1] | 12[1] | 12[1] | 12[1] | 12[1] |
| Continuous Instream | 10 | On going | NA | NA | NA | NA | NA | NA | NA |
| Instream Storm | 3 | 25 / site | 6 | 6 | 5 | 4 | 4 | 1 | 2 |
| Stormwater (MS4) | 3 | 15 / site | 4 | 4 | 4 | 1 | 2 | 1 | 0 |
| Pesticides | 3 | 4 / site | 1 | 2 | 0 | 1 | 0 | 0 | 1 |
| Mercury | 2 | 2 / site / year | 2 | 1 | 1 | COMPLETE[2] | | | |
| Macroinvertebrates | 3 | 2 / site | 1 | 1 | 0 | 0 | 0 | 0 | 1 |

[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] 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*□ |
| | October 15 - May 15 | Spawning: Not less than 11.0 mg/L or 95% saturation | Mill Creek*, Pringle Creek*[1], Shelton Ditch*, Willamette River*[5] |
| | 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, Willamette River*[6] |
| **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*[3], 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*, Willamette River* |
| **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 2012 Integrated Report Section 303(d) listed.

□ Gibson Creek is referred as Gibson Gulch in Oregon's 2012 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.

[5] Applies to Willamette River from river mile 54.8 to 186.5

[6] Applies to Willamette River from river mile 50.6 to 186.5

Table 5.
Median Values for Monthly Instream Sites (RY 2017/18)

| 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 | 11 | 10.7 | 9.8 | 46.0 | 9.1 | 6.7 | 254.0 | 0.78 | 1.18 |
| BAT 12 | 11 | 9.7 | 10.8 | 43.0 | 6.6 | 6.9 | 114.5 | 1.17 | 1.05 |
| CGT 1 | 11 | 12.5 | 10.2 | 210.7 | 8.4 | 7.3 | 143.0 | 0.24 | 2.59 |
| CGT 5 | 9 | 10.5 | 10.0 | 134.5 | 16.6 | 7.3 | 668.0 | 0.39 | 1.95 |
| CLA 1 | 11 | 11.4 | 10.5 | 88.6 | 4.1 | 7.4 | 366.0 | 0.88 | 1.13 |
| CLA 10 | 11 | 11.2 | 10.1 | 71.4 | 3.9 | 6.8 | 571.0 | 1.71 | 0.97 |
| CRO 1 | 11 | 10.1 | 10.6 | 65.3 | 6.6 | 7.0 | 140.0 | 0.70 | 1.14 |
| CRO 10 | 11 | 9.8 | 10.3 | 50.0 | 6.6 | 7.0 | 36.0 | 1.04 | 1.07 |
| GIB 1 | 11 | 10.4 | 10.5 | 77.0 | 7.3 | 7.3 | 96.0 | 0.98 | 1.12 |
| GIB 15 | 11 | 10.3 | 10.5 | 84.5 | 8.1 | 7.3 | 345.0 | 1.84 | 0.96 |
| GLE 1 | 11 | 10.7 | 10.6 | 88.2 | 6.4 | 7.4 | 145.5 | 0.92 | 1.14 |
| GLE 10 | 11 | 9.7 | 10.5 | 57.0 | 9.3 | 7.3 | 35.0 | 0.98 | 0.90 |
| LPW 1 | 9 | 10.3 | 10.3 | 166.5 | 10.1 | 7.0 | 243.0 | 1.43 | 1.30 |
| MIC 1 | 11 | 10.4 | 10.9 | 81.9 | 5.7 | 7.1 | 236.0 | 1.62 | 1.30 |
| MIC 10 | 11 | 10.6 | 10.6 | 76.2 | 6.1 | 7.3 | 146.0 | 1.71 | 1.30 |
| MRA 1 | 11 | 10.4 | 10.6 | 80.4 | 6.7 | 7.4 | 157.0 | 1.82 | 1.43 |
| MRA 10 | 11 | 10.2 | 10.5 | 79.6 | 5.9 | 7.2 | 162.0 | 1.71 | 1.14 |
| PRI 1 | 11 | 10.5 | 10.8 | 79.6 | 6.2 | 7.4 | 345.0 | 1.70 | 1.47 |
| PRI 5 | 11 | 11.3 | 10.5 | 82.7 | 5.6 | 7.4 | 103.5 | 0.78 | 1.51 |
| SHE 1 | 11 | 10.4 | 10.9 | 78.9 | 5.8 | 7.4 | 155.0 | 1.77 | 1.33 |
| SHE 10 | 11 | 10.2 | 10.9 | 78.5 | 6.2 | 7.0 | 140.0 | 1.67 | 1.16 |
| WR1 | 11 | 10.0 | 10.9 | 62.7 | 5.3 | 7.3 | 37.0 | 0.39 | 1.13 |
| WR5 | 11 | 10.0 | 10.8 | 62.0 | 4.8 | 7.4 | 17.0 | 0.32 | 1.06 |
| WR10 | 11 | 9.7 | 11.0 | 61.6 | 4.9 | 7.4 | 11.0 | 0.28 | 1.15 |

Table 6.

Number of Water Quality Criteria Exceedances for Monthly Instream Sites (RY 2017/18)

| 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 | 11 | 4 | 4 | 5 | 3 | 2 | | | | | | |
| BAT 12 | 11 | 3 | 0 | 3 | 2 | 1 | | | | | | |
| CGT 1 | 11 | 5 | 0 | 5 | 3 | 2 | | | | | | |
| CGT 5[4] | 9 | 3 | 0 | 6 | 4 | 2 | | | | | | |
| CLA 1 | 11 | 3 | 0 | 6 | 3 | 3 | 1 | 0 | 0 | 0 | 1 | 1 |
| CLA 10 | 11 | 0 | 2 | 7 | 5 | 2 | 1 | 0 | 0 | 0 | 1 | 1 |
| CRO 1 | 11 | 1 | 0 | 2 | 1 | 1 | | | | | | |
| CRO 10 | 11 | 2 | 0 | 1 | 0 | 1 | | | | | | |
| GIB 1 | 11 | 5 | 0 | 1 | 0 | 1 | | | | | | |
| GIB 15 | 11 | 5 | 0 | 3 | 2 | 1 | | | | | | |
| GLE 1 | 11 | 2 | 0 | 2 | 1 | 1 | | | | | | |
| GLE 10[4] | 11 | 2 | 0 | 2 | 1 | 1 | | | | | | |
| LPW 1[4] | 9 | 4 | 1 | 3 | 1 | 2 | | | | | | |
| MIC 1 | 11 | 4 | 1 | 3 | 2 | 1 | | | | | | |
| MIC 10 | 11 | 3 | 0 | 2 | 1 | 1 | | | | | | |
| MRA 1 | 11 | NA | 0 | 5 | 4 | 1 | | | | | | |
| MRA 10 | 11 | NA | 0 | 2 | 1 | 1 | | | | | | |
| PRI 1 | 11 | 3 | 0 | 3 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| PRI 5 | 11 | 0 | 0 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| SHE 1 | 11 | 3 | 0 | 2 | 1 | 1 | | | | | | |
| SHE 10 | 11 | 3 | 0 | 2 | 1 | 1 | | | | | | |
| WR1 | 11 | 3 | 0 | 2 | 1 | 1 | | | | | | |
| WR5 | 11 | 3 | 1 | 1 | 1 | 0 | | | | | | |
| WR10 | 11 | 2 | 0 | 1 | 1 | 0 | | | | | | |

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 2017/18)

| 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 |
| 7/18/2017 11:33 | 17.5 | 8.09 | 53.6 | 9.12 | 6.96 | 980 | 0.52 | 1.18 | 0.00 |
| 8/15/2017 11:35 | 16.6 | 6.63 | 70 | 7.78 | 6.92 | 387 | 0.31 | 3.01 | 0.00 |
| 9/19/2017 11:15 | 13.3 | 8.25 | 44.2 | 17 | 5.8 | >2420 | 0.67 | 2.62 | 0.35 |
| 10/17/2017 11:23 | 10.7 | 9.51 | 56.3 | 9.58 | 6.64 | 86 | 0.44 | 1.13 | 0.00 |
| 11/21/2017 11:20 | 10.9 | 9.71 | 43.9 | 10.3 | 6.45 | 411 | 1.02 | 1.45 | 0.34 |
| 12/19/2017 13:00 | 9.2 | 10.25 | 39.6 | 52.3 | 7.13 | 512 | 0.48 | 4.12 | 0.00 |
| 1/16/2018 10:53 | 9 | 10.81 | 45.6 | 6.8 | 6.43 | 11 | 1.78 | 1.11 | 0.14 |
| 2/20/2018 10:42 | 5.8 | 11.78 | 46.3 | 4.5 | 6.8 | 12 | 1.42 | 1.21 | 0.00 |
| 3/20/2018 10:42 | 6.8 | 11.72 | 44.3 | 6.73 | 6.72 | 5 | 1.52 | 1.03 | 0.00 |
| 4/10/2018 11:00 | 10.3 | 10.45 | 46 | 12.9 | 6.46 | 517 | 1.61 | 0.95 | 0.00 |
| 5/15/2018 11:26 | 14 | 9.84 | 46.4 | 5.7 | 6.93 | 121 | 0.78 | 1.04 | 0.00 |
| **Median** | **10.70** | **9.84** | **46.00** | **9.12** | **6.72** | **254** | **0.78** | **1.18** | |

| 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 |
| 7/18/2017 11:18 | 17.1 | 8.93 | 49.6 | 8.45 | 7.26 | 166 | 0.19 | 0.92 | 0.00 |
| 8/15/2017 11:20 | 16.3 | 8.5 | 62.6 | 8.28 | 7.26 | 249 | 0.2 | 1.52 | 0.00 |
| 9/19/2017 10:58 | 13.2 | 9.15 | 66.2 | 15.5 | 7.09 | >2420 | 0.54 | 3.41 | 0.35 |
| 10/17/2017 11:10 | 9.7 | 10.82 | 49.4 | 6.62 | 6.83 | 365 | 0.17 | 1.19 | 0.00 |
| 11/21/2017 10:41 | 10.5 | 10.05 | 44.5 | 7.73 | 6.5 | 57 | 1.5 | 0.91 | 0.34 |
| 12/19/2017 11:40 | 8.7 | 10.81 | 42.9 | 5.15 | 7.33 | 63 | 1.17 | 1.05 | 0.00 |
| 1/16/2018 10:23 | 8.6 | 10.98 | 43 | 4.6 | 6.67 | 14 | 1.98 | 1.28 | 0.14 |
| 2/20/2018 10:25 | 5.4 | 12.09 | 42.6 | 2.39 | 6.85 | 8 | 1.55 | 1.05 | 0.00 |
| 3/20/2018 10:22 | 6.3 | 11.9 | 41.2 | 3.73 | 6.74 | 12 | 1.62 | 1 | 0.00 |
| 4/10/2018 10:45 | 9.7 | 10.76 | 41.1 | 10.5 | 6.51 | 770 | 1.75 | 0.91 | 0.00 |
| 5/15/2018 11:13 | 13.4 | 10.1 | 41.3 | 4.88 | 7.02 | 1046 | 0.77 | 1.01 | 0.00 |
| **Median** | **9.70** | **10.76** | **43.00** | **6.62** | **6.85** | **114.5** | **1.17** | **1.05** | |

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 2017/18)

| 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 |
| 7/18/2017 13:20 | 22.7 | 10.56 | 268.1 | 3.59 | 7.5 | 116 | 0.23 | 1.64 | 0.00 |
| 8/15/2017 13:12 | 21.7 | 9.68 | 258.8 | 1.71 | 7.29 | 120 | 0.09 | 2.36 | 0.00 |
| 9/19/2017 13:35 | 16.5 | 8.31 | 81.2 | 11.2 | 6.93 | >2420 | 0.36 | 3.59 | 0.35 |
| 10/17/2017 13:15 | 13.7 | 5.45 | 242.1 | 5.19 | 6.61 | 67 | 0.18 | 1.52 | 0.00 |
| 11/21/2017 13:10 | 10.4 | 9.33 | 41.9 | 21.2 | 6.84 | 1553 | 0.2 | 3.21 | 0.34 |
| 12/19/2017 14:00 | 9 | 10.16 | 72.5 | 70.5 | 7.22 | 1500 | 0.24 | 8.89 | 0.00 |
| 1/16/2018 12:50 | 9.6 | 10.15 | 148.9 | 8.4 | 7.13 | 166 | 0.77 | 2.79 | 0.14 |
| 2/20/2018 12:50 | 6.4 | 10.88 | 210.7 | 9.81 | 7.38 | 111 | 0.66 | 2.79 | 0.00 |
| 3/20/2018 12:38 | 9.5 | 11.07 | 219.5 | 7.94 | 7.37 | 41 | 0.64 | 1.63 | 0.00 |
| 4/10/2018 12:31 | 12.5 | 10.49 | 181.4 | 10.9 | 7.36 | 820 | 1.23 | 1.78 | 0.00 |
| 5/15/2018 12:38 | 19.9 | 10.2 | 245.5 | 4.9 | 7.62 | 616 | 0.15 | 2.59 | 0.00 |
| **Median** | **12.50** | **10.16** | **210.70** | **8.40** | **7.29** | **143** | **0.24** | **2.59** | |

| 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 |
| 7/18/2017 12:45 | No Flow | | | | | | | | 0.00 |
| 8/15/2017 12:45 | No Flow | | | | | | | | 0.00 |
| 9/19/2017 13:10 | 15 | 8.35 | 54 | 12.5 | 6.75 | >2420 | 0.39 | 3.51 | 0.35 |
| 10/17/2017 12:55 | 10.7 | 7.16 | 96.7 | 111 | 6.66 | 687 | 0.07 | 2.69 | 0.00 |
| 11/21/2017 12:25 | 10.5 | 9.71 | 44 | 16.6 | 6.84 | 1120 | 0.25 | 2.22 | 0.34 |
| 12/19/2017 14:08 | 8.7 | 10.9 | 37.3 | 187 | 7.36 | 2098 | 0.12 | 5.18 | 0.00 |
| 1/16/2018 12:33 | 9.5 | 10.31 | 134.5 | 12.5 | 7.29 | 214 | 1.15 | 1.28 | 0.14 |
| 2/20/2018 12:33 | 5.5 | 12.27 | 178.5 | 20.4 | 7.67 | 186 | 0.77 | 1.28 | 0.00 |
| 3/20/2018 12:13 | 8.5 | 11.65 | 196.8 | 17.8 | 7.66 | 84 | 0.82 | 1.07 | 0.00 |
| 4/10/2018 12:15 | 12.3 | 9.98 | 136.8 | 13.1 | 7.19 | 538 | 1.3 | 1.85 | 0.00 |
| 5/15/2018 12:26 | 15.4 | 6.99 | 198.2 | 14.8 | 7.38 | 909 | 0.21 | 1.95 | 0.00 |
| **Median** | **10.50** | **9.98** | **134.50** | **16.60** | **7.29** | **668** | **0.39** | **1.95** | |

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 2017/18)

| 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 |
| 7/18/2017 10:30 | 16.2 | 9.32 | 91.8 | 3.76 | 7.4 | 261 | 0.88 | 0.94 | 0.00 |
| 8/15/2017 10:50 | 16.6 | 9.15 | 91.6 | 3.17 | 7.41 | 156 | 0.72 | 1.31 | 0.00 |
| 9/19/2017 10:45 | 14.6 | 9.43 | 68.6 | 14.3 | 7.16 | >2420 | 0.74 | 2.81 | 0.35 |
| 10/17/2017 10:34 | 13.2 | 10.18 | 80.7 | 6.45 | 7.45 | 91 | 0.43 | 0.95 | 0.00 |
| 11/21/2017 10:35 | 10.8 | 10.55 | 42.5 | 15.4 | 6.95 | 2420 | 0.44 | 2.46 | 0.34 |
| 12/19/2017 10:15 | 9.9 | 10.62 | 80.3 | 24.3 | 7.38 | 703 | 0.61 | 4.53 | 0.00 |
| 1/16/2018 10:05 | 10.5 | 10.92 | 91.9 | 3.8 | 7.38 | 461 | 1.72 | 1.13 | 0.14 |
| 2/20/2018 10:00 | 7.5 | 11.93 | 89.7 | 2.57 | 7.53 | >2420 | 1.54 | 1.11 | 0.00 |
| 3/20/2018 9:30 | 8.2 | 11.52 | 93.2 | 4.1 | 7.31 | 169 | 1.57 | 0.98 | 0.00 |
| 4/10/2018 10:00 | 11.4 | 10.52 | 76.4 | 13.2 | 7.05 | 457 | 1.44 | 3.33 | 0.00 |
| 5/15/2018 9:55 | 13.6 | 10.17 | 88.6 | 2.39 | 7.35 | 75 | 1.05 | 0.91 | 0.00 |
| **Median** | **11.40** | **10.52** | **88.60** | **4.10** | **7.38** | **366** | **0.88** | **1.13** | |

| 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 |
| 7/18/2017 10:30 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0043 | 0.0026 | 30 |
| 8/15/2017 10:50 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0044 | <0.0025 | 30 |
| 9/19/2017 10:45 | 0.0035 | <0.0025 | 0.0008 | <0.001 | 0.0196 | 0.013 | 21 |
| 10/17/2017 10:34 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0044 | 0.0027 | 25 |
| 11/21/2017 10:35 | 0.0035 | 0.0026 | 0.001 | <0.0005 | 0.0218 | 0.0149 | 22 |
| 12/19/2017 10:15 | 0.0092 | 0.004 | 0.002 | <0.0005 | 0.1223 | 0.0667 | 22 |
| 1/16/2018 10:05 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0141 | 0.0116 | 32 |
| 2/20/2018 10:00 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0169 | 0.0141 | 30 |
| 3/20/2018 9:30 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0128 | 0.009 | 36 |
| 4/10/2018 10:00 | 0.0037 | <0.0025 | 0.0008 | <0.0005 | 0.0357 | 0.0267 | 25 |
| 5/15/2018 9:55 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0086 | 0.0065 | 27 |
| **Median** | **NA** | **NA** | **NA** | **NA** | **0.0141** | **0.0123** | **27** |

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 2017/18)

| 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 |
| 7/18/2017 10:15 | 15.6 | 9.08 | 71.2 | 2.96 | 6.86 | 548 | 1.71 | 0.81 | 0.00 |
| 8/15/2017 10:15 | 16.1 | 8.89 | 70.2 | 3.87 | 7.11 | 2420 | 1.53 | 1.22 | 0.00 |
| 9/19/2017 10:05 | 15.3 | 8.46 | 75.7 | 16.6 | 6.76 | >2420 | 1.52 | 1.55 | 0.35 |
| 10/17/2017 10:22 | 13.9 | 9.62 | 73.8 | 2.84 | 6.93 | 1553 | 1.34 | 0.85 | 0.00 |
| 11/21/2017 9:36 | 10.9 | 10.32 | 34.2 | 11.4 | 6.44 | 1986 | 0.57 | 0.97 | 0.34 |
| 12/19/2017 10:20 | 10.2 | 10.28 | 119.2 | 32.5 | 6.63 | 10460 | 0.69 | 4.45 | 0.00 |
| 1/16/2018 9:35 | 11.2 | 10.32 | 74 | 2.1 | 6.75 | 32 | 2.38 | 1 | 0.14 |
| 2/20/2018 9:35 | 9.4 | 10.77 | 72.1 | 4.04 | 6.89 | 53 | 2.21 | 0.81 | 0.00 |
| 3/20/2018 9:32 | 9.7 | 10.72 | 71.4 | 2.59 | 6.84 | 31 | 2.1 | 0.7 | 0.00 |
| 4/10/2018 10:00 | 11.2 | 10.13 | 69.9 | 7.74 | 6.4 | 594 | 2.01 | 1.19 | 0.00 |
| 5/15/2018 10:17 | 12.8 | 9.79 | 70.6 | 3.79 | 7.07 | 110 | 1.89 | 0.77 | 0.00 |
| **Median** | **11.20** | **10.13** | **71.40** | **3.87** | **6.84** | **571** | **1.71** | **0.97** | |

| 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 |
| 7/18/2017 10:15 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0044 | 0.0036 | 20 |
| 8/15/2017 10:15 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0059 | 0.0032 | 20 |
| 9/19/2017 10:05 | <0.0025 | <0.0025 | <0.0005 | <0.001 | 0.0282 | 0.0236 | 20 |
| 10/17/2017 10:22 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0067 | 0.0043 | 23 |
| 11/21/2017 9:36 | 0.0025 | <0.0025 | 0.0005 | <0.0005 | 0.0175 | 0.0139 | 16 |
| 12/19/2017 10:20 | 0.0096 | 0.005 | 0.0016 | <0.0005 | 9.705 | 9.46 | 40 |
| 1/16/2018 9:35 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0107 | 0.01 | 23 |
| 2/20/2018 9:35 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0445 | 0.0417 | 22 |
| 3/20/2018 9:32 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0154 | 0.0143 | 23 |
| 4/10/2018 10:00 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.015 | 0.0131 | 21 |
| 5/15/2018 10:17 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0101 | 0.0084 | 21 |
| **Median** | **NA** | **NA** | **NA** | **NA** | **0.0150** | **0.0131** | **21.00** |

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 2017/18)

| 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 |
| 7/18/2017 10:39 | 15 | 8.46 | 83.9 | 5.87 | 7.04 | 140 | 0.47 | 1.06 | 0.00 |
| 8/15/2017 10:45 | 14.6 | 8.06 | 99.5 | 3.87 | 7.11 | 345 | 0.33 | 1.42 | 0.00 |
| 9/19/2017 10:20 | 12.9 | 9.2 | 65.3 | 18 | 6.71 | >2420 | 0.53 | 3.56 | 0.35 |
| 10/17/2017 10:43 | 8.7 | 10.45 | 87 | 4.94 | 6.91 | 411 | 0.34 | 1.1 | 0.00 |
| 11/21/2017 9:55 | 10.1 | 10.62 | 54.5 | 9.03 | 6.99 | 201 | 0.83 | 1.4 | 0.34 |
| 12/19/2017 10:40 | 8.6 | 10.92 | 68.4 | 12.4 | 7.19 | 173 | 0.7 | 2.03 | 0.00 |
| 1/16/2018 9:53 | 8.6 | 11.36 | 59.3 | 6.6 | 6.9 | 24 | 1.7 | 1.08 | 0.14 |
| 2/20/2018 9:55 | 5.2 | 12.47 | 64.9 | 4.72 | 7.21 | 38 | 1.22 | 1.01 | 0.00 |
| 3/20/2018 9:52 | 5.7 | 12.38 | 59.4 | 7.07 | 7.13 | 46 | 1.2 | 0.96 | 0.00 |
| 4/10/2018 10:13 | 10.1 | 11.01 | 56.9 | 17.6 | 6.87 | 89 | 1.16 | 1.14 | 0.00 |
| 5/15/2018 10:32 | 12.9 | 10 | 68.5 | 5.48 | 7.18 | 140 | 0.55 | 1.21 | 0.00 |
| **Median** | **10.10** | **10.62** | **65.30** | **6.60** | **7.04** | **140** | **0.70** | **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 |
| 7/18/2017 10:55 | 14.9 | 8.79 | 61 | 9.56 | 7.01 | 102 | 0.6 | 0.99 | 0.00 |
| 8/15/2017 11:05 | 14.9 | 8.39 | 77.9 | 6.63 | 7.12 | 40 | 0.6 | 1.6 | 0.00 |
| 9/19/2017 10:40 | 12.4 | 9.23 | 84.7 | 14.8 | 7.03 | 2420 | 0.68 | 4.81 | 0.35 |
| 10/17/2017 10:55 | 9.5 | 10.09 | 63.8 | 8.35 | 6.71 | 50 | 0.24 | 1.15 | 0.00 |
| 11/21/2017 10:30 | 10.2 | 10.33 | 49.9 | 5.57 | 6.69 | 28 | 1.2 | 2.24 | 0.34 |
| 12/19/2017 11:10 | 8.2 | 10.63 | 50.4 | 6.31 | 7.24 | 10 | 1.04 | 1.05 | 0.00 |
| 1/16/2018 10:10 | 8.4 | 11.1 | 48.4 | 5.3 | 6.86 | 19 | 1.82 | 1.03 | 0.14 |
| 2/20/2018 10:10 | 5.8 | 11.81 | 48.4 | 4.8 | 6.85 | 17 | 1.31 | 0.96 | 0.00 |
| 3/20/2018 10:07 | 6.2 | 11.74 | 46.2 | 4.78 | 6.97 | 5 | 1.24 | 1.07 | 0.00 |
| 4/10/2018 10:28 | 9.8 | 10.88 | 45.5 | 14 | 6.83 | 36 | 1.37 | 0.8 | 0.00 |
| 5/15/2018 10:58 | 12.2 | 10.03 | 50 | 7.4 | 7.15 | 40 | 0.72 | 1.11 | 0.00 |
| **Median** | **9.80** | **10.33** | **50.00** | **6.63** | **6.97** | **36** | **1.04** | **1.07** | |

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 2017/18)

| 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 |
| 7/18/2017 11:40 | 18.3 | 8 | 101.3 | 6.31 | 7.4 | 65 | 0.57 | 1.07 | 0.00 |
| 8/15/2017 12:10 | 17.3 | 7.15 | 110.1 | 7.28 | 7.41 | 73 | 0.45 | 1.51 | 0.00 |
| 9/19/2017 11:35 | 14.3 | 8.94 | 66.8 | 16.9 | 7.14 | >2420 | 0.42 | 2.45 | 0.35 |
| 10/17/2017 12:00 | 10.3 | 9.87 | 104.9 | 7.17 | 7.36 | 236 | 0.47 | 1.16 | 0.00 |
| 11/21/2017 11:25 | 10.4 | 10.51 | 69.4 | 17.3 | 7.09 | 308 | 0.94 | 1.12 | 0.34 |
| 12/19/2017 10:55 | 8.7 | 10.84 | 74.1 | 18.9 | 7.31 | 238 | 0.98 | 1.79 | 0.00 |
| 1/16/2018 11:30 | 9 | 11.33 | 73.9 | 8 | 7.25 | 16 | 2.04 | 1.02 | 0.14 |
| 2/20/2018 11:16 | 5.3 | 12.39 | 80.6 | 6.8 | 7.44 | 69 | 1.68 | 1.12 | 0.00 |
| 3/20/2018 10:15 | 7 | 11.94 | 77 | 6.31 | 7.3 | 41 | 1.81 | 0.96 | 0.00 |
| 4/10/2018 10:50 | 11.1 | 10.58 | 71.9 | 18.6 | 7.16 | 119 | 1.69 | 0.82 | 0.00 |
| 5/15/2018 11:45 | 15.6 | 9.12 | 84.6 | 5.42 | 7.29 | 126 | 1.18 | 1.02 | 0.00 |
| **Median** | **10.40** | **10.51** | **77.00** | **7.28** | **7.30** | **96** | **0.98** | **1.12** | |

| 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 |
| 7/18/2017 12:00 | 18.1 | 8.55 | 103 | 10.9 | 7.38 | 866 | 0.96 | 0.87 | 0.00 |
| 8/15/2017 12:30 | 16.8 | 8.5 | 113.5 | 7.33 | 7.38 | 155 | 0.47 | 1.21 | 0.00 |
| 9/19/2017 11:50 | 14.5 | 9.08 | 116.5 | 7.68 | 7.09 | 1733 | 0.51 | 1.8 | 0.35 |
| 10/17/2017 12:10 | 9.3 | 10.46 | 109.4 | 5.73 | 7.38 | 65 | 0.78 | 1.28 | 0.00 |
| 11/21/2017 11:40 | 10.3 | 10.14 | 84.5 | 19.9 | 6.94 | 124 | 1.55 | 0.96 | 0.34 |
| 12/19/2017 11:05 | 8.8 | 10.83 | 83.3 | 13.8 | 7.4 | 41 | 1.84 | 1.38 | 0.00 |
| 1/16/2018 11:40 | 9.1 | 11.1 | 78.2 | 8.1 | 7.13 | 6 | 2.47 | 0.89 | 0.14 |
| 2/20/2018 11:22 | 6.2 | 12.02 | 83.8 | 7.15 | 7.3 | 32 | 2.24 | 1.39 | 0.00 |
| 3/20/2018 10:38 | 7.5 | 11.61 | 78 | 9.34 | 7.16 | 27 | 2.18 | 0.87 | 0.00 |
| 4/10/2018 11:07 | 10.7 | 10.72 | 74.4 | 16.4 | 7.1 | 166 | 1.92 | 0.64 | 0.00 |
| 5/15/2018 11:55 | 14.6 | 9.57 | 88.8 | 7.23 | 7.26 | 687 | 1.95 | 0.93 | 0.00 |
| **Median** | **10.30** | **10.46** | **84.50** | **8.10** | **7.26** | **345** | **1.84** | **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 - Glenn Creek (RY 2017/18)

| 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 |
| 7/18/2017 11:25 | 15.9 | 8.62 | 113.3 | 6.68 | 7.5 | 613 | 0.92 | 0.99 | 0.00 |
| 8/15/2017 11:55 | 15.7 | 8.26 | 118 | 5.01 | 7.46 | 194 | 0.85 | 1.35 | 0.00 |
| 9/19/2017 11:20 | 13.5 | 9.5 | 65.7 | 17.8 | 7.1 | >2420 | 0.53 | 2.3 | 0.35 |
| 10/17/2017 11:42 | 11 | 10.44 | 104.1 | 6.35 | 7.42 | 225 | 0.64 | 1.31 | 0.00 |
| 11/21/2017 11:10 | 10.6 | 10.55 | 61.7 | 22.5 | 7.05 | 365 | 0.81 | 1.54 | 0.34 |
| 12/19/2017 10:42 | 9.2 | 10.85 | 93.4 | 34.4 | 7.46 | 97 | 0.98 | 1.91 | 0.00 |
| 1/16/2018 11:15 | 9.5 | 11.22 | 81.2 | 6.2 | 7.35 | 20 | 1.97 | 0.84 | 0.14 |
| 2/20/2018 10:47 | 5.9 | 12.28 | 88.2 | 6.22 | 7.49 | 34 | 1.5 | 1.07 | 0.00 |
| 3/20/2018 9:58 | 7.1 | 11.9 | 86.2 | 5.94 | 7.4 | 23 | 1.62 | 1.14 | 0.00 |
| 4/10/2018 10:35 | 10.7 | 10.72 | 79.8 | 17.2 | 7.11 | 214 | 1.72 | 1.11 | 0.00 |
| 5/15/2018 11:30 | 14.7 | 9.76 | 94.9 | 5.63 | 7.49 | 80 | 0.91 | 1.08 | 0.00 |
| **Median** | **10.70** | **10.55** | **88.20** | **6.35** | **7.42** | **146** | **0.92** | **1.14** | |

| 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 |
| 7/18/2017 13:05 | 14.9 | 9.26 | 73.2 | 8.16 | 7.47 | 225 | 0.56 | 0.71 | 0.00 |
| 8/15/2017 12:50 | 14.9 | 8.23 | 90.7 | 7.93 | 7.29 | 1203 | 0.17 | 1.28 | 0.00 |
| 9/19/2017 12:00 | 13.7 | 8.8 | 81.5 | 15 | 6.95 | >2420 | 0.23 | 3.39 | 0.35 |
| 10/17/2017 12:22 | 10.2 | 10.48 | 80.6 | 2.6 | 7.43 | 19 | 0.16 | 0.91 | 0.00 |
| 11/21/2017 11:55 | 10.3 | 10.54 | 62.1 | 15.6 | 7.1 | 72 | 1.32 | 0.75 | 0.34 |
| 12/19/2017 11:23 | 8.4 | 10.95 | 55.3 | 11.6 | 7.51 | 41 | 0.98 | 1.23 | 0.00 |
| 1/16/2018 11:53 | 9.1 | 11.24 | 55.6 | 9.3 | 7.21 | 14 | 2.04 | 0.71 | 0.14 |
| 2/20/2018 11:40 | 5.6 | 12.31 | 53.4 | 8.23 | 7.41 | 214 | 1.37 | 0.92 | 0.00 |
| 3/20/2018 10:56 | 7.3 | 11.84 | 55.7 | 10.7 | 7.25 | 3 | 1.57 | 0.9 | 0.00 |
| 4/10/2018 11:25 | 10.2 | 10.93 | 54.2 | 24.2 | 7.13 | 29 | 1.68 | 0.53 | 0.00 |
| 5/15/2018 12:12 | 12.2 | 10.32 | 57 | 8.36 | 7.33 | 16 | 0.85 | 0.67 | 0.00 |
| **Median** | **9.65** | **10.54** | **57.00** | **9.30** | **7.29** | **35** | **0.98** | **0.90** | |

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 2017/18)

| 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 |
| 7/18/2017 12:15 | No Flow | | | | | | | | | |
| 8/15/2017 12:15 | No Flow | | | | | | | | | |
| 9/19/2017 12:28 | 14.8 | 6.25 | 125.6 | 6.01 | 6.74 | >2420 | 1.12 | 5.97 | 0.35 | 4.20 |
| 10/17/2017 12:01 | 10.6 | 2.91 | 112 | 11.6 | 6.45 | 387 | <0.05 | 1.93 | 0.00 | 9.3 |
| 11/21/2017 12:05 | 10.3 | 8.86 | 76.8 | 12.3 | 6.89 | 548 | 0.44 | 1.53 | 0.34 | 10.00 |
| 12/19/2017 13:45 | 8.5 | 10.34 | 65.3 | 56.7 | 7.32 | 908 | 0.35 | 3.35 | 0.00 | 151.00 |
| 1/16/2018 11:40 | 8.9 | 10.47 | 166.5 | 6 | 7.09 | 131 | 2.17 | 1.17 | 0.14 | 5.10 |
| 2/20/2018 12:07 | 5.8 | 14.47 | 216 | 12.6 | 7.61 | 210 | 1.74 | 1.06 | 0.00 | 15.60 |
| 3/20/2018 11:26 | 7.7 | 12.45 | 227.5 | 10.1 | 7.3 | 36 | 1.76 | 1.02 | 0.00 | 6.40 |
| 4/10/2018 12:00 | 12.2 | 11.32 | 168.4 | 8.06 | 7.03 | 276 | 1.76 | 1.24 | 0.00 | 4.00 |
| 5/15/2018 12:06 | 15.8 | 7.35 | 292.5 | 4.57 | 6.74 | 51 | 0.09 | 1.3 | 0.00 | 3.30 |

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 2017/18)

| 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 |
| 7/18/2017 9:08 | 18.4 | 9.04 | 56.7 | 4.38 | 7.07 | 225 | 0.24 | 1.08 | 0.00 |
| 8/15/2017 9:10 | 16.3 | 9.54 | 50.2 | 4.68 | 6.98 | 79 | 0.15 | 1.38 | 0.00 |
| 9/19/2017 9:07 | 12.6 | 10.31 | 46.6 | 6.61 | 6.64 | 1553 | 0.11 | 1.55 | 0.35 |
| 10/17/2017 9:30 | 10.4 | 10.9 | 76.2 | 4.27 | 6.36 | 770 | 0.42 | 1.65 | 0.00 |
| 11/21/2017 8:47 | 10.2 | 10.86 | 88.1 | 10.3 | 7.07 | 260 | 2.67 | 1.35 | 0.34 |
| 12/19/2017 9:25 | 8 | 11.46 | 84.1 | 5.68 | 7.39 | 146 | 1.68 | 1.65 | 0.00 |
| 1/16/2018 8:55 | 8.3 | 11.61 | 83.3 | 8.6 | 7.1 | 248 | 2.69 | 0.92 | 0.14 |
| 2/20/2018 8:55 | 4.9 | 12.71 | 84.6 | 5.56 | 7.32 | 138 | 1.97 | 1.2 | 0.00 |
| 3/20/2018 8:41 | 7.4 | 11.81 | 81.9 | 5.85 | 7.34 | 488 | 1.62 | 1.3 | 0.00 |
| 4/10/2018 9:20 | 10.8 | 10.77 | 81.9 | 14.9 | 7.05 | 236 | 2.29 | 1.1 | 0.00 |
| 5/15/2018 9:10 | 16.4 | 9.48 | 63.9 | 3.91 | 7.25 | 140 | 0.6 | 0.84 | 0.00 |
| **Median** | **10.40** | **10.86** | **81.90** | **5.68** | **7.07** | **236** | **1.62** | **1.30** | |

| 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 |
| 7/18/2017 11:58 | 18.1 | 9.82 | 53.4 | 6.67 | 7.6 | 131 | 0.27 | 1.32 | 0.00 |
| 8/15/2017 11:53 | 15.6 | 10.33 | 48.6 | 4.19 | 7.46 | 109 | 0.14 | 1.61 | 0.00 |
| 9/19/2017 12:07 | 12.3 | 10.16 | 54.2 | 11.9 | 7.25 | >2420 | 0.33 | 2.3 | 0.35 |
| 10/17/2017 11:45 | 10.6 | 11.45 | 75.5 | 5.61 | 6.85 | 2420 | 0.37 | 1.96 | 0.00 |
| 11/21/2017 11:40 | 10.2 | 10.18 | 89.6 | 11.5 | 7.01 | 248 | 3.06 | 1.09 | 0.34 |
| 12/19/2017 13:22 | 8.1 | 11.25 | 77 | 5.2 | 7.22 | 121 | 1.71 | 1.28 | 0.00 |
| 1/16/2018 11:20 | 8.3 | 11.23 | 79.3 | 8.2 | 7.03 | 79 | 2.79 | 1.23 | 0.14 |
| 2/20/2018 11:10 | 4.8 | 12.73 | 79.8 | 6.05 | 7.33 | 89 | 2.06 | 1.3 | 0.00 |
| 3/20/2018 11:05 | 6.9 | 12.41 | 76.2 | 5.37 | 7.36 | 161 | 1.76 | 1.22 | 0.00 |
| 4/10/2018 11:19 | 10.6 | 10.55 | 77.8 | 13.3 | 6.92 | 172 | 2.39 | 0.97 | 0.00 |
| 5/15/2018 11:46 | 15 | 10.42 | 57.4 | 5.5 | 7.37 | 249 | 0.6 | 1.48 | 0.00 |
| **Median** | **10.60** | **10.55** | **76.20** | **6.05** | **7.25** | **146** | **1.71** | **1.30** | |

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 2017/18)

| 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 |
| 7/18/2017 10:00 | 18.8 | 9.24 | 53.2 | 4.99 | 7.47 | 115 | 0.25 | 1.37 | 0.00 |
| 8/15/2017 10:18 | 16.3 | 9.77 | 48.3 | 6.69 | 7.42 | 649 | 0.12 | 1.53 | 0.00 |
| 9/19/2017 10:20 | 12.9 | 10.47 | 45.3 | 7.74 | 7.34 | >2420 | 0.1 | 1.8 | 0.35 |
| 10/17/2017 10:10 | 10.4 | 11.21 | 71.3 | 8.2 | 7.29 | 770 | 0.41 | 1.8 | 0.00 |
| 11/21/2017 9:50 | 10.1 | 10.62 | 85.2 | 8.7 | 7.25 | 162 | 2.58 | 1.4 | 0.34 |
| 12/19/2017 9:45 | 7.9 | 11.68 | 80.4 | 7.07 | 7.55 | 148 | 1.82 | 1.59 | 0.00 |
| 1/16/2018 9:27 | 7.9 | 10.91 | 84.5 | 5 | 7.39 | 99 | 2.58 | 1.21 | 0.14 |
| 2/20/2018 9:30 | 4.8 | 13.04 | 81.5 | 6.58 | 7.57 | 112 | 1.94 | 1.43 | 0.00 |
| 3/20/2018 9:08 | 7.3 | 11.9 | 82.1 | 5.71 | 7.42 | 435 | 1.86 | 1.68 | 0.00 |
| 4/10/2018 9:35 | 11 | 9.85 | 81.8 | 10.8 | 7.21 | 435 | 2.26 | 1.25 | 0.00 |
| 5/15/2018 9:25 | 16.3 | 9.72 | 60.3 | 5.51 | 7.44 | 152 | 0.6 | 1.29 | 0.00 |
| **Median** | **10.40** | **10.62** | **80.40** | **6.69** | **7.42** | **157** | **1.82** | **1.43** | |

| 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 |
| 7/18/2017 9:10 | 18.5 | 8.48 | 53.5 | 5.73 | 7.33 | 158 | 0.28 | 1.1 | 0.00 |
| 8/15/2017 9:15 | 15.9 | 9.32 | 48.5 | 4.99 | 7.11 | 128 | 0.11 | 1.38 | 0.00 |
| 9/19/2017 9:10 | 12.4 | 10.02 | 45.9 | 7.04 | 6.87 | 1203 | 0.1 | 1.36 | 0.35 |
| 10/17/2017 9:30 | 10.2 | 10.43 | 71.5 | 5.02 | 6.83 | 980 | 0.38 | 1.4 | 0.00 |
| 11/21/2017 8:55 | 10.1 | 10.65 | 88.8 | 10.3 | 7.11 | 162 | 2.77 | 0.93 | 0.34 |
| 12/19/2017 9:15 | 7.9 | 11.32 | 80.6 | 4.21 | 7.4 | 121 | 1.88 | 1.14 | 0.00 |
| 1/16/2018 9:00 | 8.1 | 11.37 | 82.8 | 7.3 | 7.2 | 179 | 2.66 | 1.01 | 0.14 |
| 2/20/2018 9:00 | 4.8 | 12.63 | 81.3 | 6.07 | 7.29 | 86 | 1.96 | 1.18 | 0.00 |
| 3/20/2018 8:39 | 7.1 | 11.48 | 79.6 | 5.86 | 7.26 | 225 | 1.71 | 1.24 | 0.00 |
| 4/10/2018 9:10 | 10.7 | 10.48 | 80.6 | 12.6 | 7.13 | 248 | 2.35 | 1.02 | 0.00 |
| 5/15/2018 8:55 | 16.1 | 9.16 | 60.2 | 4.5 | 7.23 | 111 | 0.6 | 1.14 | 0.00 |
| **Median** | **10.20** | **10.48** | **79.60** | **5.86** | **7.20** | **162** | **1.71** | **1.14** | |

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 2017/18)

| 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 |
| 7/18/2017 9:45 | 18.5 | 9.18 | 55.1 | 4.91 | 7.46 | 166 | 0.2 | 1.32 | 0.00 |
| 8/15/2017 9:50 | 16.6 | 9.68 | 45.8 | 4.8 | 7.41 | 435 | 0.13 | 1.57 | 0.00 |
| 9/19/2017 10:00 | 13.4 | 9.85 | 51.4 | 13.5 | 7.4 | 1414 | 0.18 | 2.09 | 0.35 |
| 10/17/2017 10:00 | 10.5 | 11.23 | 69.7 | 4.25 | 7.28 | 361 | 0.4 | 1.63 | 0.00 |
| 11/21/2017 9:15 | 10.2 | 10.8 | 82 | 9.98 | 7.18 | 365 | 2.3 | 1.46 | 0.34 |
| 12/19/2017 9:35 | 8.1 | 11.43 | 92.8 | 6.2 | 7.47 | 120 | 1.72 | 1.83 | 0.00 |
| 1/16/2018 9:17 | 8.3 | 11.57 | 82 | 8.2 | 7.26 | 75 | 2.52 | 1.18 | 0.14 |
| 2/20/2018 9:20 | 4.9 | 12.92 | 82 | 7.41 | 7.55 | 71 | 1.83 | 1.47 | 0.00 |
| 3/20/2018 8:55 | 7.1 | 12.03 | 80.5 | 4.79 | 7.4 | 345 | 1.7 | 1.62 | 0.00 |
| 4/10/2018 9:22 | 10.7 | 10.69 | 79.6 | 13.6 | 7.15 | 613 | 2.17 | 1.38 | 0.00 |
| 5/15/2018 9:15 | 16.4 | 9.57 | 61.8 | 5.05 | 7.48 | 130 | 0.6 | 1.26 | 0.00 |
| **Median** | **10.50** | **10.80** | **79.60** | **6.20** | **7.40** | **345** | **1.70** | **1.47** | |

| 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 |
| 7/18/2017 9:45 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | <0.0025 | <0.0025 | 21 |
| 8/15/2017 9:50 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | <0.0025 | <0.0025 | 19 |
| 9/19/2017 10:00 | <0.0025 | <0.0025 | 0.0006 | <0.0005 | 0.0128 | 0.0049 | 18 |
| 10/17/2017 10:00 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | <0.0025 | <0.0025 | 28 |
| 11/21/2017 9:15 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0082 | 0.0057 | 36 |
| 12/19/2017 9:35 | <0.0025 | <0.0025 | <0.001 | <0.0005 | 0.0171 | 0.0125 | 30 |
| 1/16/2018 9:17 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0051 | 0.0039 | 28 |
| 2/20/2018 9:20 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | <0.0025 | <0.0025 | 31 |
| 3/20/2018 8:55 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | <0.0025 | <0.0025 | 30 |
| 4/10/2018 9:22 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0066 | 0.0041 | 29 |
| 5/15/2018 9:15 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0025 | <0.0025 | 24 |
| **Median** | **NA** | **NA** | **NA** | **NA** | **NA** | **NA** | **28** |

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 2017/18)

| 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 |
| 7/18/2017 10:40 | 19.2 | 8.76 | 82.7 | 4.65 | 7.47 | 111 | 0.37 | 1.41 | 0.00 |
| 8/15/2017 10:55 | 18.7 | 8.7 | 85.7 | 4.95 | 7.43 | 122 | 0.26 | 2.23 | 0.00 |
| 9/19/2017 10:50 | 15.7 | 8.47 | 66.3 | 21.4 | 7.15 | >2420 | 0.24 | 2.77 | 0.35 |
| 10/17/2017 10:42 | 11.3 | 10.53 | 82.7 | 3.92 | 7.42 | 99 | 0.43 | 1.42 | 0.00 |
| 11/21/2017 10:40 | 10.8 | 10.25 | 72.1 | 9.8 | 7.09 | 108 | 0.77 | 1.51 | 0.34 |
| 12/19/2017 10:20 | 8.2 | 11.13 | 84.5 | 7.63 | 7.54 | 96 | 0.97 | 2.67 | 0.00 |
| 1/16/2018 10:19 | 9.2 | 11.23 | 81.8 | 5.6 | 7.39 | 18 | 1.46 | 1.05 | 0.14 |
| 2/20/2018 10:10 | 6.4 | 12.58 | 85.7 | 6.89 | 7.8 | 12 | 1.17 | 1.98 | 0.00 |
| 3/20/2018 9:37 | 7.6 | 11.99 | 88.4 | 3.31 | 7.53 | 18 | 1.15 | 1.24 | 0.00 |
| 4/10/2018 10:15 | 11.3 | 10.51 | 79.9 | 17 | 7.19 | 1986 | 1.22 | 1.52 | 0.00 |
| 5/15/2018 10:05 | 17 | 9.29 | 84.2 | 2.33 | 7.58 | 178 | 0.78 | 1 | 0.00 |
| **Median** | **11.30** | **10.51** | **82.70** | **5.60** | **7.43** | **103.5** | **0.78** | **1.51** | |

| 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 |
| 7/18/2017 10:40 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0041 | <0.0025 | 30 |
| 8/15/2017 10:55 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0043 | <0.0025 | 30 |
| 9/19/2017 10:50 | 0.0025 | <0.0025 | 0.0007 | <0.0005 | 0.0181 | 0.0075 | 24 |
| 10/17/2017 10:42 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0041 | <0.0025 | 33 |
| 11/21/2017 10:40 | 0.0026 | <0.0025 | <0.0005 | <0.0005 | 0.0186 | 0.0123 | 31 |
| 12/19/2017 10:20 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0171 | 0.0119 | 30 |
| 1/16/2018 10:19 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0177 | 0.015 | 29 |
| 2/20/2018 10:10 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0069 | 0.0037 | 33 |
| 3/20/2018 9:37 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.006 | 0.0038 | 33 |
| 4/10/2018 10:15 | <0.0025 | <0.0025 | 0.0013 | <0.0005 | 0.0125 | 0.0074 | 28 |
| 5/15/2018 10:05 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0032 | <0.0025 | 30 |
| **Median** | **NA** | **NA** | **NA** | **NA** | **0.0069** | **0.0075** | **30.00** |

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 2017/18)

| 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 |
| 7/18/2017 10:10 | 18.5 | 9.37 | 54.3 | 4.67 | 7.51 | 105 | 0.28 | 1.1 | 0.00 |
| 8/15/2017 10:25 | 16.3 | 9.85 | 49.7 | 3.34 | 7.55 | 276 | 0.12 | 1.51 | 0.00 |
| 9/19/2017 10:30 | 12.7 | 10.32 | 47.9 | 8.07 | 7.25 | 2420 | 0.11 | 1.42 | 0.35 |
| 10/17/2017 10:20 | 10.4 | 11.16 | 72.4 | 4.75 | 7.31 | 649 | 0.41 | 1.63 | 0.00 |
| 11/21/2017 10:15 | 10.1 | 10.91 | 86.5 | 9.83 | 7.21 | 199 | 2.87 | 1.18 | 0.34 |
| 12/19/2017 9:53 | 8 | 11.54 | 84.7 | 4.74 | 7.54 | 74 | 1.82 | 1.55 | 0.00 |
| 1/16/2018 9:40 | 8.2 | 11.65 | 81.4 | 8.1 | 7.31 | 99 | 2.65 | 1.33 | 0.14 |
| 2/20/2018 9:40 | 4.8 | 13.09 | 80.5 | 7.13 | 7.58 | 133 | 1.95 | 1.27 | 0.00 |
| 3/20/2018 9:17 | 7 | 12.26 | 79.1 | 5.76 | 7.43 | 260 | 1.77 | 1.52 | 0.00 |
| 4/10/2018 9:44 | 10.6 | 10.8 | 78.9 | 15.5 | 7.15 | 155 | 2.37 | 1.19 | 0.00 |
| 5/15/2018 9:35 | 15.9 | 9.69 | 60.3 | 3.98 | 7.47 | 93 | 0.62 | 1.23 | 0.00 |
| **Median** | **10.40** | **10.91** | **78.90** | **5.76** | **7.43** | **155** | **1.77** | **1.33** | |

| 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 |
| 7/18/2017 9:00 | 18.1 | 9.32 | 52.9 | 5.33 | 7.22 | 155 | 0.28 | 1.16 | 0.00 |
| 8/15/2017 9:00 | 15.6 | 9.84 | 48.2 | 4.7 | 7.12 | 113 | 0.11 | 1.38 | 0.00 |
| 9/19/2017 8:45 | 12.3 | 10.42 | 45.7 | 11.7 | 6.7 | 2420 | 0.1 | 1.59 | 0.35 |
| 10/17/2017 9:12 | 10.2 | 11.04 | 72.3 | 4.43 | 6.84 | 770 | 0.41 | 1.33 | 0.00 |
| 11/21/2017 8:35 | 10.1 | 10.85 | 89 | 9.86 | 6.9 | 140 | 2.85 | 0.8 | 0.34 |
| 12/19/2017 9:05 | 7.9 | 11.56 | 79.4 | 3.98 | 7.37 | 110 | 1.75 | 0.97 | 0.00 |
| 1/16/2018 8:45 | 8.2 | 11.65 | 80.8 | 8.3 | 7 | 96 | 2.69 | 1.09 | 0.14 |
| 2/20/2018 8:50 | 4.8 | 12.84 | 80 | 6.29 | 7.2 | 142 | 1.97 | 1.11 | 0.00 |
| 3/20/2018 8:27 | 6.9 | 12.01 | 78.5 | 6.17 | 7.29 | 291 | 1.67 | 1.18 | 0.00 |
| 4/10/2018 8:40 | 10.5 | 10.75 | 78.8 | 14.5 | 7 | 130 | 2.35 | 0.83 | 0.00 |
| 5/15/2018 10:25 | 15.6 | 10.07 | 59 | 5.37 | 7.01 | 130 | 0.59 | 1.23 | 0.00 |
| **Median** | **10.20** | **10.85** | **78.50** | **6.17** | **7.01** | **140** | **1.67** | **1.16** | |

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 2017/18)

| 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 |
| 7/18/2017 13:45 | 21.2 | 10.33 | 71.1 | 1.29 | 7.98 | 9 | 0.19 | 1.02 | 0.00 |
| 8/15/2017 13:49 | 17.9 | 10.02 | 58.9 | 1.53 | 7.74 | 8 | 0.08 | 1.34 | 0.00 |
| 9/19/2017 13:51 | 15.3 | 10.71 | 60.3 | 3.14 | 7.05 | 435 | 0.13 | 1.13 | 0.35 |
| 10/17/2017 13:33 | 12.1 | 10.7 | 61.5 | 4.61 | 6.87 | 40 | 0.08 | 1.33 | 0.00 |
| 11/21/2017 13:40 | 9 | 10.94 | 53.3 | 13.8 | 7.22 | 72 | 0.46 | 0.7 | 0.34 |
| 12/19/2017 14:15 | 7.3 | 11.44 | 68.4 | 6 | 7.35 | 150 | 0.39 | 1.28 | 0.00 |
| 1/16/2018 13:10 | 7.8 | 11.45 | 62.7 | 7.9 | 7.31 | 28 | 0.68 | 0.93 | 0.14 |
| 2/20/2018 13:10 | 6 | 12.18 | 72.3 | 6.44 | 7.41 | 37 | 0.59 | 1.09 | 0.00 |
| 3/20/2018 13:05 | 8.7 | 12.04 | 70.8 | 5.26 | 7.33 | 28 | 0.54 | 1.13 | 0.00 |
| 4/10/2018 13:00 | 10 | 10.68 | 59.9 | 21.6 | 7.28 | 488 | 0.62 | 1.4 | 0.00 |
| 5/15/2018 13:05 | 16.4 | 12.21 | 65 | 2.11 | 8.24 | 16 | 0.13 | 1.35 | 0.00 |
| **Median** | **10.00** | **10.94** | **62.70** | **5.26** | **7.33** | **37** | **0.39** | **1.13** | |

| 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) |
| 29 | <0.05 | 0.036 | 59 | 61 | 2.3 |
| 27 | <0.05 | 0.033 | 57 | 62 | 4.6 |
| 28 | <0.05 | 0.026 | 52 | 57 | 4.6 |
| 26 | <0.05 | 0.029 | 58 | 64 | 6.4 |
| 22 | <0.05 | 0.061 | 52 | 69 | 17.5 |
| 30 | <0.05 | 0.05 | 60 | 70 | 9.8 |
| 24 | <0.05 | 0.051 | 63 | 72 | 8.9 |
| 29 | <0.05 | 0.038 | 63 | 67 | 4.4 |
| 30 | <0.05 | 0.036 | 64 | 68 | 4.4 |
| 25 | 0.141 | 0.082 | 58 | 83 | 25 |
| 27 | <0.05 | 0.03 | 59 | 62 | 3.2 |
| **27** | **NA** | **0.036** | **59** | **67** | **4.6** |

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 2017/18)

| 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 |
| 7/18/2017 9:35 | 19.6 | 8.85 | 71.7 | 1.47 | | 11 | 0.18 | 1.06 | 0.00 |
| 8/15/2017 9:40 | 17.1 | 9.31 | 59.1 | 1.99 | 7.39 | 11 | 0.09 | 1.2 | 0.00 |
| 9/19/2017 9:30 | 14.1 | 9.99 | 61.5 | 2.4 | 6.77 | 326 | 0.11 | 0.99 | 0.35 |
| 10/17/2017 9:55 | 11.7 | 10.57 | 59.9 | 4.75 | 6.46 | 16 | 0.09 | 1.04 | 0.00 |
| 11/21/2017 9:10 | 9 | 11.12 | 52.9 | 19.5 | 7.37 | 45 | 0.32 | 1.04 | 0.34 |
| 12/19/2017 9:45 | 7.4 | 11.78 | 67.2 | 4.69 | 7.57 | 17 | 0.32 | 1.06 | 0.00 |
| 1/16/2018 9:13 | 7.7 | 11.6 | 62 | 7.7 | 7.52 | 29 | 0.6 | 0.96 | 0.14 |
| 2/20/2018 9:12 | 5.6 | 12.26 | 69.6 | 6.49 | 7.43 | 35 | 0.47 | 1.32 | 0.00 |
| 3/20/2018 8:58 | 7.9 | 11.67 | 67.6 | 4.97 | 7.44 | 14 | 0.48 | 1.1 | 0.00 |
| 4/10/2018 9:33 | 10 | 10.82 | 59.5 | 23.7 | 7.16 | 579 | 0.52 | 1.43 | 0.00 |
| 5/15/2018 9:44 | 15.8 | 10.07 | 62.1 | 2.89 | 7.52 | 6 | 0.13 | 1.23 | 0.00 |
| **Median** | **10.00** | **10.82** | **62.00** | **4.75** | **7.41** | **17** | **0.32** | **1.06** | |

| 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) |
| 29 | <0.05 | 0.035 | 59 | 62 | 2.6 |
| 28 | <0.05 | 0.035 | 52 | 58 | 6 |
| 27 | <0.05 | 0.034 | 48 | 52 | 4 |
| 26 | <0.05 | 0.032 | 57 | 63 | 6.4 |
| 22 | <0.05 | 0.066 | 58 | 77 | 18.8 |
| 28 | <0.05 | 0.03 | 68 | 71 | 2.8 |
| 25 | <0.05 | 0.05 | 70 | 79 | 9.2 |
| 29 | <0.05 | 0.039 | 56 | 61 | 5.2 |
| 30 | <0.05 | 0.036 | 65 | 70 | 4.6 |
| 25 | 0.152 | 0.078 | 55 | 80 | 25 |
| 26 | <0.05 | 0.027 | 51 | 56 | 4.8 |
| **27** | **NA** | **0.035** | **57** | **63** | **5.2** |

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 2017/18)

| 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 |
| 7/18/2017 13:30 | 20.8 | 11.02 | 71.9 | 1.22 | 8.14 | 2 | 0.2 | 0.97 | 0.00 |
| 8/15/2017 13:25 | 17.9 | 9.83 | 59.8 | 4.85 | 7.54 | 2 | 0.11 | 1.3 | 0.00 |
| 9/19/2017 12:35 | 15.2 | 10.38 | 61.6 | 4.2 | 7.35 | 58 | 0.11 | 1.09 | 0.35 |
| 10/17/2017 12:45 | 12 | 10.61 | 59 | 4.81 | 7.57 | 14 | 0.08 | 1.15 | 0.00 |
| 11/21/2017 12:20 | 8.8 | 11.01 | 51.2 | 14.6 | 7.27 | 62 | 0.29 | 0.87 | 0.34 |
| 12/19/2017 12:05 | 7 | 11.63 | 67.3 | 3.68 | 7.45 | 8 | 0.28 | 1.16 | 0.00 |
| 1/16/2018 12:22 | 7.6 | 11.56 | 60.4 | 7.8 | 7.3 | 1 | 0.5 | 1 | 0.14 |
| 2/20/2018 12:05 | 5.7 | 12.23 | 68 | 6.92 | 7.42 | 32 | 0.48 | 1.19 | 0.00 |
| 3/20/2018 11:22 | 8.1 | 11.7 | 67.4 | 5.17 | 7.35 | 8 | 0.49 | 1.13 | 0.00 |
| 4/10/2018 11:57 | 9.7 | 10.75 | 57.1 | 20.9 | 7.21 | 461 | 0.42 | 1.48 | 0.00 |
| 5/15/2018 12:40 | 15.5 | 11.02 | 68.3 | 3.11 | 7.51 | 11 | 0.14 | 1.23 | 0.00 |
| **Median** | **9.70** | **11.02** | **61.60** | **4.85** | **7.42** | **11** | **0.28** | **1.15** | |

| 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) |
| 29 | <0.05 | 0.035 | 60 | 63 | 2.8 |
| 28 | <0.05 | 0.033 | 56 | 60 | 4.4 |
| 28 | <0.05 | 0.021 | 53 | 56 | 2.8 |
| 25 | <0.05 | 0.031 | 56 | 63 | 6.8 |
| 22 | <0.05 | 0.057 | 54 | 71 | 17.2 |
| 30 | <0.05 | 0.03 | 66 | 70 | 3.6 |
| 25 | <0.05 | 0.046 | 78 | 87 | 8.8 |
| 29 | <0.05 | 0.037 | 60 | 66 | 5.6 |
| 30 | <0.05 | 0.036 | 66 | 71 | 5.2 |
| 24 | 0.148 | 0.081 | 56 | 82 | 25.6 |
| 26 | <0.05 | 0.025 | 58 | 62 | 4 |
| **28** | **NA** | **0.035** | **58** | **66** | **5.2** |

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 2017/18)

| 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 | 07/18/2017 11:42 | 18.3 | 7.94 | 101.4 | 6.28 | 7.35 | 81 | 0.54 | 0.94 | | | | | | | | |
| GIB15 | 07/18/2017 12:05 | 18.1 | 8.55 | 103 | 10.3 | 7.4 | 816 | 0.94 | 0.76 | | | | | | | | |
| MIC10 | 07/18/2017 12:05 | 18.2 | 9.85 | 53.4 | 5.34 | 7.66 | 147 | 0.29 | 1.04 | | | | | | | | |
| GLE10 | 08/15/2017 12:55 | 14.4 | 8.06 | 89.7 | 6.95 | 7.24 | 980 | 0.16 | 1.2 | | | | | | | | |
| CGT1 | 08/15/2017 13:18 | 21.8 | 9.82 | 258.6 | 1.62 | 7.31 | 83 | 0.08 | 2.05 | | | | | | | | |
| SHE10 | 09/19/2017 08:50 | 12.3 | 10.42 | 45.7 | 10.7 | 6.7 | 2420 | 0.1 | 1.44 | | | | | | | | |
| MIC1 | 09/19/2017 09:10 | 12.6 | 10.32 | 46.5 | 7.19 | 6.58 | 1733 | 0.12 | 1.45 | | | | | | | | |
| MRA10 | 10/17/2017 09:35 | 10.2 | 10.43 | 71.5 | 4.65 | 6.88 | 727 | 0.37 | 1.45 | | | | | | | | |
| CLA10 | 10/17/2017 10:26 | 13.9 | 9.6 | 73.8 | 2.71 | 6.95 | 2420 | 1.3 | 0.89 | | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0051 | 0.0041 | 23 |
| PRI1 | 11/21/2017 09:20 | 10.2 | 10.81 | 81.9 | 10.1 | 7.18 | 238 | 2.27 | 1.1 | | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0088 | 0.0058 | 35 |
| MRA1 | 11/21/2017 09:55 | 20.1 | 10.62 | 85.1 | 8.57 | 7.25 | 167 | 2.52 | 1.16 | | | | | | | | |
| CRO1 | 11/21/2017 10:02 | 10.1 | 10.61 | 54.5 | 9.03 | 6.99 | 248 | 0.84 | 1.18 | | | | | | | | |
| SHE1 | 12/19/2017 09:56 | 8 | 11.53 | 84.6 | 5.26 | 7.51 | 135 | 1.89 | 1.43 | | | | | | | | |
| CRO10 | 12/19/2017 11:18 | 8.2 | 10.63 | 50.3 | 6.2 | 6.85 | 10 | 1.17 | 1.46 | | | | | | | | |
| BAT12 | 12/19/2017 11:50 | 8.7 | 10.79 | 42.8 | 6.82 | 6.89 | 85 | 1.18 | 1 | | | | | | | | |
| CLA1 | 01/16/2018 10:07 | 10.5 | 10.91 | 91.8 | 3.8 | 7.37 | 238 | 1.74 | 0.93 | | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0146 | 0.0111 | 28 |
| PRI5 | 01/16/2018 10:21 | 9.2 | 11.23 | 81.9 | 5.5 | 7.39 | 21 | 1.53 | 1.03 | | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0172 | 0.0143 | 29 |
| BAT1 | 01/16/2018 10:56 | 9 | 10.78 | 45.6 | 6.8 | 6.38 | 19 | 1.71 | 0.86 | | | | | | | | |
| GLE1 | 02/20/2018 10:49 | 5.9 | 12.28 | 88.2 | 5.98 | 7.49 | 36 | 1.55 | 0.96 | | | | | | | | |
| MIC10 | 02/20/2018 11:16 | 4.9 | 12.74 | 79.8 | 6.05 | 7.41 | 118 | 2.11 | 1.34 | | | | | | | | |
| LPW1 | 02/20/2018 12:12 | 5.8 | 14.52 | 216 | 12.1 | 7.63 | 124 | 1.76 | 1.38 | 14 | | | | | | | |
| GIB1 | 03/20/2018 10:16 | 7.1 | 11.88 | 76.8 | 6.53 | 7.24 | 37 | 1.77 | 0.96 | | | | | | | | |
| GIB15 | 03/20/2018 10:39 | 7.5 | 11.6 | 78 | 7.27 | 7.14 | 31 | 2.25 | 0.9 | | | | | | | | |
| CGT5 | 03/20/2018 12:19 | 8.6 | 11.65 | 196.7 | 21.4 | 7.69 | 135 | 0.86 | 1.1 | | | | | | | | |
| GLE10 | 04/10/2018 11:30 | 10.2 | 10.93 | 54.2 | 24.4 | 7.1 | 45 | 1.68 | 0.64 | | | | | | | | |
| CGT1 | 04/10/2018 12:32 | 12.5 | 10.52 | 181.3 | 10.9 | 7.37 | 1050 | 1.26 | 2.28 | | | | | | | | |
| MIC1 | 05/15/2018 09:15 | 16.4 | 9.48 | 63.9 | 3.84 | 7.25 | 161 | 0.6 | 1.2 | | | | | | | | |

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 2017/18)

| 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) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WR1 | 08/15/2017 13:57 | 17.9 | 10.03 | 59 | 1.95 | 7.69 | 8 | 0.08 | 1.22 | 27 | <0.05 | 0.035 | 52 | 57 | 4.8 |
| WR10 | 09/19/2017 12:40 | 15.2 | 10.38 | 61.5 | 3.58 | 7.37 | 59 | 0.12 | 0.95 | 29 | <0.05 | 0.019 | 47 | 49 | 2.4 |
| WR5 | 10/17/2017 09:58 | 11.7 | 10.55 | 60 | 4.83 | 6.51 | 26 | 0.09 | 1.1 | 26 | <0.05 | 0.034 | 58 | 63 | 5.2 |
| WR1 | 04/10/2018 13:03 | 10.1 | 10.68 | 60 | 19.9 | 7.21 | 517 | 0.62 | 1.32 | 25 | 0.139 | 0.083 | 54 | 79 | 24.6 |
| WR10 | 05/15/2018 12:45 | 15.5 | 11 | 66.5 | 2.21 | 7.49 | 6 | 0.15 | 1.08 | 26 | <0.05 | 0.029 | 55 | 59 | 3.6 |

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 2017/18)

| Monthly Medians for **Turbidity** at Continuous Instream Sites | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jul 2017 | Aug 2017 | Sep 2017 | Oct 2017 | Nov 2017 | Dec 2017 | Jan 2018 | Feb 2018 | Mar 2018 | Apr 2018 | May 2018 | Jun 2018 |
| 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 | 9.48 | 11.64 | 12.14 | NA | 9.11 | 6.85 | 9.76 | 6.30 | 6.42 | 7.86 | 5.89 | 6.84 |
| BAT12 | 3.92 | 2.85 | 3.40 | 3.53 | 4.20 | 2.83 | 6.21 | 1.81 | 2.57 | 3.73 | 3.57 | 3.93 |
| CLK1 | 2.70 | 2.50 | 2.10 | NA | NA | NA | 5.50 | 2.47 | 3.07 | 3.10 | 2.24 | 2.79 |
| CLK12 | 2.00 | 3.20 | 2.40 | 2.40 | 3.10 | 2.60 | 2.80 | 1.60 | 3.60 | 2.10 | NA | 3.00 |
| GLE3 | 7.10 | 6.00 | 7.90 | 7.70 | 9.40 | 5.70 | NA | 7.50 | 8.40 | 9.70 | 6.30 | 6.30 |
| GLE12 | 5.30 | NA | NA | 2.70 | 5.50 | 5.50 | 11.40 | 8.70 | 10.70 | 9.70 | 7.40 | 6.20 |
| MIC3 | 4.32 | 4.53 | 4.48 | 4.41 | 11.25 | 8.78 | 11.86 | 5.70 | 6.66 | 4.66 | 3.57 | 3.72 |
| MIC12 | 5.57 | NA | NA | NA | NA | NA | NA | 7.98 | NA | NA | NA | NA |
| PRI3 | 2.72 | 3.46 | 3.07 | 3.51 | 6.71 | 3.93 | 8.72 | 4.16 | 5.88 | NA | 1.55 | 2.16 |
| PRI12 | NA | 4.36 | NA | 9.94 | 6.15 | 2.95 | NA | 3.70 | 4.26 | 4.15 | 3.07 | 3.02 |

| Monthly Medians for **Specific Conductivity** at Continuous Instream Sites | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jul 2017 | Aug 2017 | Sep 2017 | Oct 2017 | Nov 2017 | Dec 2017 | Jan 2018 | Feb 2018 | Mar 2018 | Apr 2018 | May 2018 | Jun 2018 |
| 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 | 60.09 | 64.05 | NA | NA | 48.71 | 46.50 | 46.19 | 45.69 | 45.68 | 44.24 | 45.69 | 51.55 |
| BAT12 | 50.22 | 59.29 | 60.48 | NA | 47.99 | 47.00 | 45.06 | 43.79 | 43.24 | 42.90 | 42.86 | 46.78 |
| CLK1 | 94.00 | 93.00 | 95.00 | NA | NA | NA | 92.61 | 95.62 | 93.45 | 94.84 | 95.19 | 99.21 |
| CLK12 | 74.00 | 74.00 | 77.00 | 78.00 | 77.00 | 78.00 | 76.00 | 76.00 | 77.00 | NA | NA | 72.15 |
| GLE3 | 117.00 | 123.00 | 123.00 | 113.00 | 96.00 | 96.00 | 85.00 | 87.00 | 87.00 | 85.00 | 98.00 | 110.00 |
| GLE12 | 74.00 | NA | NA | 81.00 | 66.00 | 60.00 | 62.00 | 58.00 | NA | 56.00 | 59.00 | 72.00 |
| MIC3 | 55.30 | 50.36 | 47.23 | 67.33 | 93.44 | 89.57 | 85.19 | 83.30 | 81.66 | 78.79 | 60.81 | 57.01 |
| MIC12 | 60.37 | NA | NA | 93.92 | 92.81 | 87.10 | 85.26 | 83.92 | NA | 78.05 | 63.13 | 52.88 |
| PRI3 | 101.66 | 105.03 | 99.39 | 96.99 | 91.50 | 96.42 | 86.43 | 92.70 | 91.91 | 89.79 | 94.35 | 97.02 |
| PRI12 | NA | 63.35 | 57.63 | 92.76 | 87.64 | 86.23 | 79.60 | 83.18 | 81.48 | 76.40 | 74.94 | 71.05 |

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 2017/18)

| Monthly Medians for **Temperature** at Continuous Instream Sites | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jul 2017 | Aug 2017 | Sep 2017 | Oct 2017 | Nov 2017 | Dec 2017 | Jan 2018 | Feb 2018 | Mar 2018 | Apr 2018 | May 2018 | Jun 2018 |
| 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 | 18.40 | 19.41 | 16.64 | NA | 10.64 | 7.64 | 8.77 | 7.70 | 8.56 | 10.25 | 13.88 | 15.70 |
| BAT12 | 17.10 | 17.41 | 14.55 | 10.70 | 9.97 | 7.15 | 8.37 | 7.29 | 8.07 | 9.80 | 13.71 | 15.33 |
| CLK1 | 17.36 | 18.52 | 16.89 | 13.72 | NA | NA | 10.18 | 9.15 | 9.92 | 11.56 | 13.91 | 15.53 |
| CLK12 | 15.89 | 17.15 | 16.40 | 14.42 | 13.20 | 10.96 | 11.16 | 10.35 | 10.57 | 11.33 | NA | 14.54 |
| GLE3 | 17.06 | 17.97 | 15.92 | 12.50 | 10.71 | 7.67 | 9.08 | 7.87 | 8.98 | 10.95 | 14.13 | 15.14 |
| GLE12 | 15.71 | NA | NA | 10.94 | 9.80 | 7.00 | 8.35 | 7.21 | 7.97 | 9.76 | 12.34 | 13.43 |
| MIC3 | 20.49 | 19.97 | 16.10 | 12.05 | 9.84 | 6.12 | 7.97 | 6.96 | 8.60 | 10.97 | 15.29 | 17.34 |
| MIC12 | 19.91 | 19.36 | 15.28 | 11.92 | 9.89 | 6.37 | 7.96 | 7.04 | 8.41 | 10.70 | 14.69 | 16.67 |
| PRI3 | 19.65 | 20.19 | 17.77 | 13.27 | 10.97 | 7.39 | 9.07 | 8.15 | 9.42 | 11.67 | 16.10 | 17.78 |
| PRI12 | 19.14 | 19.21 | 16.18 | 12.37 | 10.50 | 7.05 | 8.70 | 7.78 | 8.73 | 10.77 | 14.93 | 16.86 |

| Monthly Medians for **pH** at Continuous Instream Sites | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jul 2017 | Aug 2017 | Sep 2017 | Oct 2017 | Nov 2017 | Dec 2017 | Jan 2018 | Feb 2018 | Mar 2018 | Apr 2018 | May 2018 | Jun 2018 |
| 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 | 6.63 | 6.58 | NA | NA | 6.36 | 6.42 | 6.50 | 6.62 | 6.62 | 6.53 | 6.49 | 6.50 |
| BAT12 | NA | 7.33 | 7.34 | 7.22 | 6.98 | 6.96 | 6.78 | 7.03 | 6.99 | 6.91 | 7.23 | 7.37 |
| CLK1 | 7.09 | 7.10 | 7.03 | NA | NA | NA | 7.22 | 7.42 | 7.44 | 7.39 | 7.28 | 7.31 |
| CLK12 | 6.76 | NA | 6.93 | 6.80 | 6.63 | 6.69 | 6.58 | 6.77 | NA | NA | NA | 6.95 |
| GLE3 | 7.55 | 7.56 | 7.51 | 7.06 | 6.90 | 6.98 | 6.85 | 7.08 | 7.04 | 7.02 | 7.27 | 7.41 |
| GLE12 | 7.07 | NA | NA | 6.74 | 6.63 | 6.67 | 6.58 | 6.69 | 6.69 | 6.78 | 6.91 | 7.02 |
| MIC3 | 7.52 | 7.51 | 7.38 | 7.42 | 7.19 | 7.29 | 7.27 | 7.38 | 7.40 | 7.52 | 7.38 | 7.14 |
| MIC12 | 7.36 | 7.41 | 7.38 | 7.25 | 6.91 | 7.09 | 7.01 | 7.22 | 7.28 | 7.20 | 7.41 | 7.37 |
| PRI3 | 7.38 | 7.32 | 7.27 | 7.11 | 7.15 | 7.28 | 7.15 | 7.24 | 7.26 | 7.28 | 7.36 | 7.39 |
| PRI12 | 7.06 | 6.99 | 6.96 | 6.76 | 6.50 | 6.54 | 6.49 | 6.60 | 6.62 | 6.57 | 6.68 | 6.80 |

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 2017/18)

| Monthly Medians for **Dissolved Oxygen** at Continuous Instream Sites | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jul 2017 | Aug 2017 | Sep 2017 | Oct 2017 | Nov 2017 | Dec 2017 | Jan 2018 | Feb 2018 | Mar 2018 | Apr 2018 | May 2018 | Jun 2018 |
| 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 | 7.82 | NA | 6.55 | NA | 9.72 | 10.65 | 10.81 | 11.28 | 11.02 | 10.46 | 9.53 | 8.43 |
| BAT12 | 9.15 | 8.50 | 9.02 | 10.64 | 10.94 | 11.99 | 11.56 | 11.91 | 11.66 | 11.21 | 10.21 | 9.76 |
| CLK1 | 9.14 | 8.82 | 9.38 | NA | NA | NA | 10.93 | 11.32 | 11.15 | 10.74 | 10.03 | 9.51 |
| CLK12 | 9.27 | 9.12 | 9.57 | 9.51 | 9.61 | 10.21 | 10.47 | NA | 10.84 | 10.21 | NA | 9.35 |
| GLE3 | 8.91 | 8.48 | 8.77 | 10.24 | 10.60 | 11.85 | 11.41 | 11.75 | 11.40 | 10.80 | 9.73 | 9.24 |
| GLE12 | 9.39 | NA | NA | 10.08 | 10.47 | 11.65 | 11.35 | 11.80 | 11.58 | 11.04 | 10.34 | 9.97 |
| MIC3 | 8.43 | 8.58 | 9.38 | 10.84 | 11.35 | 12.65 | 11.72 | 12.05 | 11.56 | 10.82 | 9.65 | 9.26 |
| MIC12 | 8.60 | 8.75 | 9.73 | NA | 10.39 | 11.99 | 11.21 | 11.74 | 11.35 | 10.49 | 9.89 | 9.48 |
| PRI3 | 7.95 | 7.84 | 8.23 | 9.71 | 10.32 | 11.75 | 11.23 | 11.64 | 11.25 | 10.51 | 9.16 | 8.68 |
| PRI12 | 8.01 | 8.05 | 8.58 | 8.95 | 8.98 | 10.48 | 10.09 | 10.60 | 10.38 | 9.79 | 8.94 | 8.54 |

| Monthly Medians for **Stage** at Continuous Instream Sites | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jul 2017 | Aug 2017 | Sep 2017 | Oct 2017 | Nov 2017 | Dec 2017 | Jan 2018 | Feb 2018 | Mar 2018 | Apr 2018 | May 2018 | Jun 2018 |
| 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 | 4.07 | 4.17 | 4.24 | 4.24 | 5.24 | 4.74 | 5.40 | 4.62 | 4.77 | 5.05 | 4.27 | 4.18 |
| BAT12 | 4.27 | 4.21 | 4.19 | 4.32 | 4.85 | 4.72 | 4.93 | 4.65 | 4.70 | 4.82 | 4.45 | 4.34 |
| CLK1 | 3.71 | 3.73 | 3.73 | 4.06 | 4.33 | 4.26 | 4.46 | 4.28 | 4.27 | 4.25 | 3.89 | 3.97 |
| CLK12 | NA | NA | NA | NA | NA | NA | 4.56 | 4.34 | 4.42 | 4.40 | 3.99 | 4.01 |
| GLE3 | 4.09 | 4.05 | 4.04 | 4.20 | 4.56 | 4.46 | 4.62 | 4.39 | 4.45 | 4.47 | 4.16 | 4.09 |
| GLE12 | NA | NA | NA | 0.82 | 1.01 | 1.05 | 1.13 | 0.99 | 1.03 | 1.08 | 0.90 | 0.82 |
| LPW1 | 0.00 | 0.00 | 0.00 | 0.00 | 1.76 | 1.67 | 1.99 | 1.76 | 1.97 | 2.21 | 1.45 | 0.00 |
| MIC3 | 5.40 | 5.63 | 5.79 | 5.46 | 6.69 | 6.24 | 6.74 | 6.00 | 6.14 | 6.34 | 5.65 | 5.62 |
| MIC12 | 7.11 | 7.11 | 7.15 | 7.04 | 8.20 | 7.82 | 8.33 | 7.64 | 7.71 | 7.82 | 7.25 | 7.20 |
| PRI3 | 4.26 | 4.25 | 4.25 | 4.44 | 4.88 | 4.65 | 4.97 | 4.55 | 4.69 | 4.66 | 4.39 | 4.35 |
| PRI4 | 7.34 | 7.32 | 7.34 | 7.52 | 8.09 | 7.86 | 8.19 | 7.72 | 7.84 | 7.85 | 7.50 | 7.46 |
| PRI12 | 4.27 | 4.24 | 4.21 | 4.13 | 4.57 | 4.37 | 4.68 | 4.36 | 4.44 | 4.49 | 4.32 | 4.32 |
| SHE3 | 6.19 | 6.07 | 6.08 | 6.17 | 6.94 | 6.65 | 7.03 | 6.51 | 6.55 | 6.64 | 6.24 | 6.20 |

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 2017/18)

| 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 |
| 10/19/2017 09:25 | 5172 | 9.31 | 7.6 | 14.28 | 68.6 | | | | | | | | | | | | | | |
| 10/19/2017 09:28 - DUP | 4611 | 9.27 | 7.61 | 14.33 | 68.5 | | | | | | | | | | | | | | |
| 10/20/2017 09:00 | | | | | | 30.8 | 0.0134 | 0.0031 | 0.0812 | 0.024 | 0.0079 | < 0.0005 | 47 | 0.075 | 0.3 | 0.037 | 0.283 | 5.6 | 108 |
| 03/21/2018 12:32 | >2420 | 10.66 | 6.92 | 10.1 | 67.2 | | | | | | | | | | | | | | |
| 03/21/2018 12:34 - DUP | >2420 | 10.66 | 6.92 | 10.1 | 66.4 | | | | | | | | | | | | | | |
| 03/22/2018 12:40 | | | | | | 37.2 | 0.0055 | < 0.0025 | 0.124 | 0.0809 | 0.0027 | < 0.0005 | 21 | < 0.050 | 0.83 | 0.02 | 0.115 | 1.9 | 42 |

| 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 |
| 10/19/2017 9:49 | 677 | 9.19* | 7.41 | 13.51 | 89.7 | | | | | | | | | | | | | | |
| 10/20/2017 09:35 | | | | | | 40.4 | 0.0092 | < 0.0025 | 0.0703 | 0.0202 | 0.0053 | < 0.0005 | 22 | < 0.050 | 0.26 | 0.018 | 0.239 | 4.1 | 106 |
| 3/21/2018 13:25 | 1414 | 11.4 | 7.38 | 9.9 | 81.5 | | | | | | | | | | | | | | |
| 3/22/2018 13:00 | | | | | | 42 | 0.0043 | < 0.0025 | 0.0547 | 0.0272 | 0.0019 | < 0.0005 | 25 | < 0.050 | 0.71 | 0.011 | 0.119 | 1.9 | 39 |

| 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 |
| 10/19/2017 10:12 | 216 | 8.57 | 7.3 | 12.81 | 103.4 | | | | | | | | | | | | | | |
| 10/20/2017 10:10 | | | | | | 71.2 | 0.0059 | < 0.0025 | 0.0229 | 0.0073 | 0.0017 | < 0.0005 | 34 | < 0.050 | 0.54 | 0.011 | 0.231 | 2.7 | 66.5 |
| 3/21/2018 12:59 | 66 | 11.38 | 6.87 | 8.7 | 78.2 | | | | | | | | | | | | | | |
| 3/22/2018 12:15 | | | | | | 50.1 | < 0.0025 | < 0.0025 | 0.0213 | 0.0126 | < 0.0005 | < 0.0005 | 27 | < 0.050 | 1.32 | 0.01 | 0.066 | < 1.00 | 15.8 |

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

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

Attachment A. Dry Weather Priority Outfall Screening Inspection Results (RY 2017/2018)

# Dry Weather Priority Out Fall Screening Inspection Results - RY 2017/2018

| Basin | Primary Outfall | Inspection Location | Asset Type | Date | Time | Flow? | Est. Flow (GPM) | Temp °C Receiving Water | Temp °C | pH S.U. | Sp Cond µS/cm | Turbidity NTU | Total Cl mg/L | Fl mg/L | Detergents mg/L | NH3 mg/L | K mg/L | NA mg/L | E. coli MPN/100 mL | Outfall Notes | Inspection Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Clark Creek | D39460252 | D39460252 | Outfall | 9/28/2017 | 11:40 | Yes | 10-15 | 16.8 | 16.8 | 7.35 | 72.1 | 1.20 | 0.01 | | | | | | 186 | Source of Clark Creek. Confirmed as ground water. | Pipeshed inspection for Liberty St portion of line requires coordination with traffic engineering and after hours work. |
| Clark Creek | D42466417 | D42466417 | Outfall | 9/28/2017 | 11:20 | Yes | 10-15 | 16.1 | 18.3 | 7.20 | 84.3 | 1.93 | 0.02 | | | | | | 727 | | Recommend deploying temperature logger and flow sensor next spring to narrow down time of day flow surges begin. |
| Clark Creek | D42468233 | D42468233 | Outfall | 9/28/2017 | 09:25 | Yes | 10-15 | 15.6 | 17.1 | 7.58 | 155.6 | 2.33 | 0.0 | 0.2 | | 0.13 | 2.1 | 10.7 | > 2420 | *Outfall previously listed as D42468PVT. | High E coli result prompted further investigation including dye testing at highschool and TV inspection. Investigation revealed leaking sewer lateral/s at South Salem High School. Dye test revealed effluent from school traveling subsurface into stormline. |
| Clark Creek | D42468244 | D42468244 | Outfall | 9/28/2017 | 11:00 | Yes | 10-15 | 16.2 | 17.7 | 7.8 | 113.2 | 1.9 | 0.03 | | | | | | 201 | | |
| East Bank Willamette | 42482230 | 42482230 | Outfall | 9/26/2017 | 10:30 | No | | | | | | | | | | | | | | | |
| East Bank Willamette | D42480205 | D42480205 | Outfall | 9/26/2017 | 12:41 | No | | | | | | | | | | | | | | | |
| East Bank Willamette | D42480215 | D42480215 | Outfall | 7/31/2017 | 14:16 | Yes | 20-30 | 22.4 | 19.8 | 7.72 | 80.3 | 3.1 | 0.10 | 0.0 | | | | | | | Waiting for leak detection |
| East Bank Willamette | D42480223 | D42480223 | Outfall | 7/31/2017 | 13:55 | Yes | 1-5 | 22.4 | 17.1 | 7.20 | 302.4 | 3.7 | | 0.18 | | 0.61 | 3.364 | 12.4 | 5172 | 10" sewer line above stormline in bad repair. Location near to report of I&I. Dye test performed, but was negative. Sewer main scheduled for slip lining. | Pipeshed performed by TV crew (SR 10000965). |
| East Bank Willamette | D42480223 | D45478209 | ManHole | 9/26/2017 | 13:50 | Yes | 5-10 | | | | | | 0.08 | 0.2 | | 0.76 | 2.3 | 11.5 | 2851 | | Manhole sampling based on pipeshed investigation. |
| East Bank Willamette | D42482212 | D42482212 | Outfall | 9/26/2017 | 11:37 | Yes | 15-20 | 15.1 | 16.0 | 7.32 | 61.3 | 1.1 | 0.09 | | 0.0 | 0.04 | 0.6 | 11.5 | < 10 | | |
| East Bank Willamette | D42482213 | D42482213 | Outfall | 2/26/2017 | 10:50 | No | | | | | | | | | | | | | | | |

| Basin | Primary Outfall | Inspection Location | Asset Type | Date | Time | Flow? | Est. Flow (GPM) | Temp °C Receiving Water | Temp °C | pH S.U. | Sp Cond µS/cm | Turbidity NTU | Total Cl mg/L | Fl mg/L | Detergents mg/L | NH3 mg/L | K mg/L | NA mg/L | E. coli MPN/100 mL | Outfall Notes | Inspection Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| East Bank Willamette | D42482223 | D42482223 | Outfall | 9/26/2017 | 12:45 | Yes | 10-15 | 15.1 | 17.1 | 7.66 | 197.0 | 1.5 | 0.03 | 0.20 | 0.0 | 0.03 | 1.5 | 8.688 | 2755 | | Need to identify location of water leak before determining location of any exfiltration from sewer. |
| East Bank Willamette River | D42476279 | D39476238 | ManHole | 8/24/2017 | 10:50 | No | | | | | | | | | | | | | | Outfall is under water in the Willamette. Inspection needs to take place at MH D39476238 | |
| Lower Claggett Creek | D51488203 | D51488203 | Outfall | 9/26/2017 | 10:30 | No | | | | | | | | | | | | | | | |
| Lower Claggett Creek | D51488236 | D51488236 | Outfall | 9/26/2017 | 10:23 | No | | | | | | | | | | | | | | | |
| Lower Claggett Creek | D54494201 | D54494201 | Outfall | 9/26/2017 | 09:45 | No | | | | | | | | | | | | | | | Checked 3 upstream manholes from 2 separate lines. All dry. |
| Mill Creek | D42476203 | D42476203 | Outfall | 8/24/2017 | 11:50 | No | | | | | | | | | | | | | | | |
| Mill Creek | D42478237 | D42478237 | Outfall | 7/31/2017 | 13:13 | No | 1 | 21.0 | 21.7 | | 50.3 | 14.7 | 0.77 | 0.1 | | | | | | | Reported to Leak Detection |
| Mill Creek | D45476207 | D45476207 | Outfall | 8/24/2017 | 12:00 | Yes | 100-200 | 18.2 | 17.9 | 7.28 | 173.0 | 10.8 | 0.39 | | | | | | | | Hydrant flush at Belmont and Cottage (due to main repair at Market & Winter) taking place at time of sample collection. |
| Mill Creek | D45476217 | D45476217 | Outfall | 8/24/2017 | 12:45 | Yes | 1-5 | 18.5 | 20.1 | 7.67 | 224 | 5.2 | 0.04 | | | | | | | | Smoke test confirmed infiltration of non-city irrigation water through Capitol Mall. |
| Mill Creek | D51470205 | D51470205 | Outfall | 8/23/2017 | 10:30 | Yes | 5-10 | | | | | | | | | | | | | Flow not discernable at first 6 manholes. At seventh manhole, which is inaccessible for sampling a splashing can be heard. Review of CCTV footage reveals one potential drinking water leak (Reported to Water Department) and one source of water from nearby | |
| Mill Creek | D54470205 | D54470205 | Outfall | 8/23/2017 | 09:50 | Yes | < 1 | | 18.5 | 6.80 | 94.17 | 14.2 | 0.11 | | 0.0 | 0.08 | | | | | Irrigation repairs taking place at time of inspection. Flow could be due to leaking sprinkler heads infilitrating to line below. |
| Pringle Creek | D39456229 | D39456229 | Outfall | 9/28/2017 | 12:30 | Yes | 10-15 | 16.5 | 16.8 | 7.21 | 79.4 | 0.76 | 0.0 | | | | | | | | |
| Pringle Creek | D42468235 | D42468235 | Outfall | 9/28/2017 | 09:15 | No | | | | | | | | | | | | | | | |

| Basin | Primary Outfall | Inspection Location | Asset Type | Date | Time | Flow? | Est. Flow (GPM) | Temp °C Receiving Water | Temp °C | pH S.U. | Sp Cond µS/cm | Turbidity NTU | Total Cl mg/L | Fl mg/L | Detergents mg/L | NH3 mg/L | K mg/L | NA mg/L | E. coli MPN/100 mL | Outfall Notes | Inspection Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pringle Creek | D45464207 | D42464206 | ManHole | 9/28/2017 | 13:10 | Yes | 1-5 | | 18.7 | 7.19 | 163.6 | 4.9 | 0.01 | | | | | | | | Flowing entering manhole from two directions. Results for each recorded seperately. This inspection is for flow from MH D45464205 to MH D45464206 |
| Pringle Creek | D45464207 | D45464206 | ManHole | 9/28/2017 | 13:00 | Yes | 5-10 | | 17.6 | 7.36 | 98 | 4.8 | | | | | | | | Outfall partially submerged. Inspction performed at first upstream manhole | Flowing entering manhole from two directions. Results for each recorded seperately. This inspection is for flow from MH D45464257 to MH D45464206 |
| Pringle Creek | D45466212 | D45466217 | ManHole | 8/24/2017 | 14:44 | No | | | | | | | | | | | | | | | Manhole wet. No flow. |
| Pringle Creek | D48460229 | D48460229 | Outfall | 9/28/2017 | 10:05 | No | | | | | | | | | | | | | | Beaver dam backing water up very far into the line. | |
| Pringle Creek | D48464203 | D48464203 | Outfall | 9/28/2017 | 11:15 | No | | | | | | | | | | | | | | | First manhole upstream is dry. |
| Pringle Creek | D48464249 | D48464249 | Outfall | 9/28/2017 | 11:15 | No | | | | | | | | | | | | | | | Pipe dries out after second manhole. |
| Shelton Ditch | D45468241 | D45468241 | Outfall | 9/28/2017 | 13:45 | Yes | 50-100 | 16.2 | 18.3 | 7.65 | 144.8 | 2.4 | 0.02 | | | | | | | Lines leading to outfall from from Mission St connect to ditch at north side of airport. Ditch has water in it year round. Water from outfall is from this perennial source. Lines leading from south are along course small stream that is noted on historica | |
| Upper Claggett Creek | D51486201 | D51486201 | Outfall | 9/26/2017 | 10:45 | Yes | | | | | | | | | | | | | | Outfall and storm main/ditch have backwater. | |
| Upper Claggett Creek | D51486216 | D51486216 | Outfall | 8/24/2017 | 13:30 | Yes | 1-5 | 16.9 | 17.2 | 7.74 | 83.3 | 3.2 | 0.04 | | | | | | | | |
| Upper Claggett Creek | D54486217 | D54482247 | Outfall | 8/23/2017 | 12:00 | Yes | 30-50 | 17.7 | 17.7 | 8.30 | 186.2 | 1.7 | 0.03 | | | | | | | Investigation for D54486217. Daylight of stream at Lansing Park | |
| Upper Claggett Creek | D54486217 | D54486217 | Outfall | 8/23/2017 | 11:35 | Yes | 30-50 | 18.8 | 18.8 | | | 2.1 | 0.05 | | | | | | | Outfall is really daylighting of piped stream. Multiple water leaks have been repaired upstream. | Source tracked to daylighting at Lansing Park (See results for OF D544822247). |
| Waln Creek | D36450241 | D36450241 | Outfall | 7/27/2017 | 10:00 | Yes | 5-10 | 14.2 | 15.5 | 5.81 | | 0.49 | 0.0 | 0.0 | | | | | | | |

| Basin | Primary Outfall | Inspection Location | Asset Type | Date | Time | Flow? | Est. Flow (GPM) | Temp °C Receiving Water | Temp °C | pH S.U. | Sp Cond µS/cm | Turbidity NTU | Total Cl mg/L | Fl mg/L | Detergents mg/L | NH3 mg/L | K mg/L | NA mg/L | E. coli MPN/100 mL | Outfall Notes | Inspection Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Willamette Bank | D30470203 | D30470203 | Outfall | 8/24/2017 | 09:30 | Yes | < 1 | | | | | | | | | | | | | Outfall becoming dangerous to access. Property owner is piling riprap to extend property. Slope is 20-30 feet and extremely unstable. Recommend removing from list. | Traced water to MH 205. Source of water is small seep. Unable to collect sample due to sediment. Ampule sucks in too much sediment. |
| Willamette Bank | D36472203 | D36474226 | ManHole | 8/24/2017 | 10:35 | No | | | | | | | | | | | | | | | Manhole is wet, but has no discernable flow. Need to TV line to confirm moisture due to high E coli results from previous year. |
| Willamette Slough | D39470220 | D39470220 | Outfall | 7/27/2017 | 12:15 | Yes | 50-100 | | 17.6 | 6.69 | 74.2 | 5.17 | 0.04 | 0.1 | 0.0 | 0.01 | | | 41 | Difficult access via Minto Brown. | |
| Willamette Slough | D39470220 | D39470236 | CleanOut | 8/31/2017 | 11:00 | Yes | 30-50 | | 19.4 | 7.85 | 50.5 | 2.5 | 0.43 | 0.20 | | < 0.050 | 0.499 | 5.140 | < 1 | | Large water leak at private service. Reported to water department. |
| Willamette Slough | D39478271 | D39478271 | Outfall | 8/24/2017 | 11:15 | Yes | 30-50 | | 18.9 | 6.72 | 99.4 | | 2.5 | | | | | | | Outfall is daylighting of piped stream visible on historical topo maps. | |

Attachment B. Analytical Report for Pesticide Screening - Pacific Agricultural Laboratory (March 28, 2018)

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Analytical Report

**Client Sample ID:** Electric
**Matrix:** water

**PAL Sample ID:** P180319-01
**Sample Date:** 3/13/18

**Method:** Modified EPA 8081B (GC-ECD)

| Extraction Date | Analysis Date | Analyte | Amount Detected | Limit of Quantitation | Notes |
|---|---|---|---|---|---|
| 3/16/18 | 3/27/18 | a-BHC | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Acetochlor | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Alachlor | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Aldrin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | b-BHC | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Benfluralin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Bifenthrin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Captafol | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Captan | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Chlordane | Not Detected | 0.60 ug/L | |
| 3/16/18 | 3/27/18 | Chlorobenzilate | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Chloroneb | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Chlorothalonil | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Chlorpyrifos | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Cyfluthrin | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Cyhalothrin | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Cypermethrin | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Dacthal | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | d-BHC | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Deltamethrin | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Dichlobenil | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Dicloran | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Dicofol | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Dieldrin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Dithiopyr | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Endosulfan I | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Endosulfan II | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Endosulfan sulfate | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Endrin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Endrin aldehyde | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Endrin ketone | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Esfenvalerate | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Ethalfluralin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Etridiazole | Not Detected | 0.12 ug/L | |

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Analytical Report

**Client Sample ID:** Electric
**Matrix:** water

**PAL Sample ID:** P180319-01
**Sample Date:** 3/13/18

| Extraction Date | Analysis Date | Analyte | Amount Detected | Limit of Quantitation | Notes |
|---|---|---|---|---|---|
| 3/16/18 | 3/27/18 | Fenarimol | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Fenvalerate | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Flutolanil | Not Detected | 1.2 ug/L | |
| 3/16/18 | 3/27/18 | Folpet | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | g-BHC | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Heptachlor | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Heptachlor epoxide | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Hexachlorobenzene | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Iprodione | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Methoxychlor | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Metolachlor | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Mirex | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Norflurazon | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Ovex | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Oxadiazon | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Oxyfluorfen | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | p,p'-DDD | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | p,p'-DDE | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | p,p'-DDT | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | PCNB | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Pendimethalin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Permethrin | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Prodiamine | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Pronamide | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Propachlor | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Propanil | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Propiconazole | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Terbacil | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Toxaphene | Not Detected | 6.0 ug/L | |
| 3/16/18 | 3/27/18 | Trifloxystrobin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Triflumizole | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Trifluralin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Vinclozalin | Not Detected | 0.12 ug/L | |

**Surrogate Recovery:** 96 %
**Surrogate Recovery Range:** 38-143
(DCBP used as Surrogate)

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Analytical Report

**Client Sample ID:** Electric
**Matrix:** water

**PAL Sample ID:** P180319-01
**Sample Date:** 3/13/18

**Method:** Modified EPA 8141B (GC-FPD)

| Extraction Date | Analysis Date | Analyte | Amount Detected | Limit of Quantitation | Notes |
|---|---|---|---|---|---|
| 3/16/18 | 3/22/18 | Aspon | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Azinphos-methyl | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Carbofenothion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Chlorfenvinphos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Chlorpyrifos-methyl | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Coumaphos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Demeton | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Diazinon | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Dichlorofenthion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Dichlorvos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Dicrotophos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Dimethoate | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Disulfoton | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | EPN | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Ethion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Ethoprop | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Famphur | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Fenamiphos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Fenitrothion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Fensulfothion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Fenthion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Malathion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Merphos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Methidathion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Mevinphos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Monocrotophos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Parathion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Parathion methyl | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Phorate | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Phosmet | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Phosphamidon | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Pirimiphos-methyl | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Ronnel | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Sulprofos | Not Detected | 0.30 ug/L | |

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Analytical Report

**Client Sample ID:** Electric
**Matrix:** water

**PAL Sample ID:** P180319-01
**Sample Date:** 3/13/18

| Extraction Date | Analysis Date | Analyte | Amount Detected | Limit of Quantitation | Notes |
|---|---|---|---|---|---|
| 3/16/18 | 3/22/18 | Terbufos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Tetrachlorvinphos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Tokuthion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Trichloronate | Not Detected | 0.30 ug/L | |

**Surrogate Recovery:** 99 %
**Surrogate Recovery Range:** 46-157
(TPP-d15 used as Surrogate)

**Method:** Modified EPA 8151A (GC-MS/MS)

| | | | | | |
|---|---|---|---|---|---|
| 3/19/18 | 3/26/18 | 2,4,5-T | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 2,4,5-TP | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 2,4-D | 0.24 ug/L | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 2,4-DB | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Acifluorfen | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Bentazon | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Clopyralid | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Dicamba | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Dichlorprop | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Dinoseb | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | MCPA | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | MCPP | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Picloram | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Quinclorac | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Triclopyr | 1.6 ug/L | 0.080 ug/L | |

**Surrogate Recovery:** 76 %
**Surrogate Recovery Range:** 64-139
(DCPAA used as Surrogate)

**Method:** Modified EPA 8270D (GC-MS/MS)

| | | | | | |
|---|---|---|---|---|---|
| 3/16/18 | 3/19/18 | Ametryn | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Amitraz | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/19/18 | Atrazine | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Bromopropylate | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Cyanazine | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/19/18 | Diclofop-methyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Dimethenamid | Not Detected | 0.060 ug/L | |

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Analytical Report

**Client Sample ID:** Electric
**Matrix:** water

**PAL Sample ID:** P180319-01
**Sample Date:** 3/13/18

| Extraction Date | Analysis Date | Analyte | Amount Detected | Limit of Quantitation | Notes |
|---|---|---|---|---|---|
| 3/16/18 | 3/19/18 | Diphenylamine | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Ethofumesate | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Fenbuconazole | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Fenoxaprop-ethyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Fipronil | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/19/18 | Fluazifop-p-butyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Fludioxonil | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Fluroxypyr-meptyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Hexazinone | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Mefenoxam | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Metalaxyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Metribuzin | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Myclobutanil | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Napropamide | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Pirimicarb | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Prometon | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Prometryn | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Propazine | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Pyridaben | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Simazine | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Simetryn | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Sulfentrazone | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Tebuconazole | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Tebuthiuron | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/19/18 | Triadimefon | Not Detected | 0.12 ug/L | |

**Surrogate Recovery:** 96 %
**Surrogate Recovery Range:** 29-130
(DCBP used as Surrogate)

**Method:** Modified EPA 8321B (LC-MS/MS)

| | | | | | |
|---|---|---|---|---|---|
| 3/16/18 | 3/22/18 | 3-Hydroxycarbofuran | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Aldicarb | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Aldicarb Sulfone | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Aldicarb Sulfoxide | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Azoxystrobin | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Bendiocarb | Not Detected | 0.060 ug/L | |

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Analytical Report

**Client Sample ID:** Electric
**Matrix:** water

**PAL Sample ID:** P180319-01
**Sample Date:** 3/13/18

| Extraction Date | Analysis Date | Analyte | Amount Detected | Limit of Quantitation | Notes |
|---|---|---|---|---|---|
| 3/16/18 | 3/23/18 | Bensulide | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Boscalid | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Bromacil | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Carbaryl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Carbofuran | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Carfentrazone-ethyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Clothianidin | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | DCPMU | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Diuron | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Fenobucarb | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Fenuron | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/23/18 | Flumioxazin | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Fluometuron | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Imidacloprid | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Isoxaben | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Linuron | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Methiocarb | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Methomyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Monuron | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Neburon | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Oxamyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Propargite | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/22/18 | Propoxur | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Pyraclostrobin | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Pyrimethanil | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Sethoxydim | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Siduron | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Thiabendazole | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Thiobencarb | Not Detected | 0.060 ug/L | |

**Surrogate Recovery:** 100 %
**Surrogate Recovery Range:** 60-140
(TPP-d15 used as Surrogate)

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Analytical Report

**Client Sample ID:** Hilfiker
**Matrix:** water

**PAL Sample ID:** P180319-02
**Sample Date:** 3/13/18

**Method:** Modified EPA 8081B (GC-ECD)

| Extraction Date | Analysis Date | Analyte | Amount Detected | Limit of Quantitation | Notes |
|---|---|---|---|---|---|
| 3/16/18 | 3/27/18 | a-BHC | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Acetochlor | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Alachlor | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Aldrin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | b-BHC | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Benfluralin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Bifenthrin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Captafol | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Captan | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Chlordane | Not Detected | 0.60 ug/L | |
| 3/16/18 | 3/27/18 | Chlorobenzilate | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Chloroneb | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Chlorothalonil | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Chlorpyrifos | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Cyfluthrin | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Cyhalothrin | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Cypermethrin | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Dacthal | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | d-BHC | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Deltamethrin | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Dichlobenil | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Dicloran | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Dicofol | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Dieldrin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Dithiopyr | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Endosulfan I | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Endosulfan II | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Endosulfan sulfate | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Endrin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Endrin aldehyde | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Endrin ketone | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Esfenvalerate | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Ethalfluralin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Etridiazole | Not Detected | 0.12 ug/L | |

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Analytical Report

**Client Sample ID:** Hilfiker
**Matrix:** water

**PAL Sample ID:** P180319-02
**Sample Date:** 3/13/18

| Extraction Date | Analysis Date | Analyte | Amount Detected | Limit of Quantitation | Notes |
|---|---|---|---|---|---|
| 3/16/18 | 3/27/18 | Fenarimol | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Fenvalerate | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Flutolanil | Not Detected | 1.2 ug/L | |
| 3/16/18 | 3/27/18 | Folpet | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | g-BHC | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Heptachlor | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Heptachlor epoxide | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Hexachlorobenzene | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Iprodione | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Methoxychlor | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Metolachlor | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Mirex | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Norflurazon | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Ovex | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Oxadiazon | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Oxyfluorfen | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | p,p'-DDD | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | p,p'-DDE | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | p,p'-DDT | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | PCNB | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Pendimethalin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Permethrin | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Prodiamine | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Pronamide | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Propachlor | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Propanil | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Propiconazole | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Terbacil | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Toxaphene | Not Detected | 6.0 ug/L | |
| 3/16/18 | 3/27/18 | Trifloxystrobin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Triflumizole | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Trifluralin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Vinclozalin | Not Detected | 0.12 ug/L | |

**Surrogate Recovery:** 87 %
**Surrogate Recovery Range:** 38-143
(DCBP used as Surrogate)

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Analytical Report

**Client Sample ID:** Hilfiker
**Matrix:** water

**PAL Sample ID:** P180319-02
**Sample Date:** 3/13/18

**Method:** Modified EPA 8141B (GC-FPD)

| Extraction Date | Analysis Date | Analyte | Amount Detected | Limit of Quantitation | Notes |
|---|---|---|---|---|---|
| 3/16/18 | 3/22/18 | Aspon | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Azinphos-methyl | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Carbofenothion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Chlorfenvinphos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Chlorpyrifos-methyl | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Coumaphos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Demeton | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Diazinon | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Dichlorofenthion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Dichlorvos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Dicrotophos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Dimethoate | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Disulfoton | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | EPN | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Ethion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Ethoprop | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Famphur | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Fenamiphos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Fenitrothion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Fensulfothion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Fenthion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Malathion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Merphos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Methidathion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Mevinphos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Monocrotophos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Parathion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Parathion methyl | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Phorate | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Phosmet | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Phosphamidon | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Pirimiphos-methyl | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Ronnel | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Sulprofos | Not Detected | 0.30 ug/L | |

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Analytical Report

**Client Sample ID:** Hilfiker
**Matrix:** water

**PAL Sample ID:** P180319-02
**Sample Date:** 3/13/18

| Extraction Date | Analysis Date | Analyte | Amount Detected | Limit of Quantitation | Notes |
|---|---|---|---|---|---|
| 3/16/18 | 3/22/18 | Terbufos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Tetrachlorvinphos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Tokuthion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Trichloronate | Not Detected | 0.30 ug/L | |

**Surrogate Recovery:** 99 %
**Surrogate Recovery Range:** 46-157
(TPP-d15 used as Surrogate)

**Method:** Modified EPA 8151A (GC-MS/MS)

| | | | | | |
|---|---|---|---|---|---|
| 3/19/18 | 3/26/18 | 2,4,5-T | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 2,4,5-TP | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 2,4-D | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 2,4-DB | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Acifluorfen | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Bentazon | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Clopyralid | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Dicamba | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Dichlorprop | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Dinoseb | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | MCPA | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | MCPP | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Picloram | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Quinclorac | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Triclopyr | Not Detected | 0.080 ug/L | |

**Surrogate Recovery:** 71 %
**Surrogate Recovery Range:** 64-139
(DCPAA used as Surrogate)

**Method:** Modified EPA 8270D (GC-MS/MS)

| | | | | | |
|---|---|---|---|---|---|
| 3/16/18 | 3/19/18 | Ametryn | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Amitraz | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/19/18 | Atrazine | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Bromopropylate | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Cyanazine | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/19/18 | Diclofop-methyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Dimethenamid | Not Detected | 0.060 ug/L | |

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Analytical Report

**Client Sample ID:** Hilfiker
**Matrix:** water

**PAL Sample ID:** P180319-02
**Sample Date:** 3/13/18

| Extraction Date | Analysis Date | Analyte | Amount Detected | Limit of Quantitation | Notes |
|---|---|---|---|---|---|
| 3/16/18 | 3/19/18 | Diphenylamine | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Ethofumesate | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Fenbuconazole | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Fenoxaprop-ethyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Fipronil | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/19/18 | Fluazifop-p-butyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Fludioxonil | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Fluroxypyr-meptyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Hexazinone | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Mefenoxam | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Metalaxyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Metribuzin | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Myclobutanil | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Napropamide | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Pirimicarb | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Prometon | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Prometryn | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Propazine | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Pyridaben | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Simazine | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Simetryn | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Sulfentrazone | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Tebuconazole | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Tebuthiuron | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/19/18 | Triadimefon | Not Detected | 0.12 ug/L | |

**Surrogate Recovery:** 85 %
**Surrogate Recovery Range:** 29-130
(DCBP used as Surrogate)

**Method:** Modified EPA 8321B (LC-MS/MS)

| | | | | | |
|---|---|---|---|---|---|
| 3/16/18 | 3/22/18 | 3-Hydroxycarbofuran | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Aldicarb | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Aldicarb Sulfone | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Aldicarb Sulfoxide | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Azoxystrobin | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Bendiocarb | Not Detected | 0.060 ug/L | |

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Analytical Report

**Client Sample ID:** Hilfiker
**Matrix:** water

**PAL Sample ID:** P180319-02
**Sample Date:** 3/13/18

| Extraction Date | Analysis Date | Analyte | Amount Detected | Limit of Quantitation | Notes |
|---|---|---|---|---|---|
| 3/16/18 | 3/23/18 | Bensulide | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Boscalid | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Bromacil | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Carbaryl | 0.16 ug/L | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Carbofuran | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Carfentrazone-ethyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Clothianidin | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | DCPMU | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Diuron | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Fenobucarb | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Fenuron | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/23/18 | Flumioxazin | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Fluometuron | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Imidacloprid | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Isoxaben | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Linuron | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Methiocarb | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Methomyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Monuron | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Neburon | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Oxamyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Propargite | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/22/18 | Propoxur | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Pyraclostrobin | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Pyrimethanil | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Sethoxydim | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Siduron | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Thiabendazole | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Thiobencarb | Not Detected | 0.060 ug/L | |

**Surrogate Recovery:** 96 %
**Surrogate Recovery Range:** 60-140
(TPP-d15 used as Surrogate)

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Analytical Report

**Client Sample ID:** Salem Industrial
**Matrix:** water

**PAL Sample ID:** P180319-03
**Sample Date:** 3/13/18

**Method:** Modified EPA 8081B (GC-ECD)

| Extraction Date | Analysis Date | Analyte | Amount Detected | Limit of Quantitation | Notes |
|---|---|---|---|---|---|
| 3/16/18 | 3/27/18 | a-BHC | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Acetochlor | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Alachlor | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Aldrin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | b-BHC | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Benfluralin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Bifenthrin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Captafol | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Captan | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Chlordane | Not Detected | 0.60 ug/L | |
| 3/16/18 | 3/27/18 | Chlorobenzilate | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Chloroneb | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Chlorothalonil | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Chlorpyrifos | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Cyfluthrin | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Cyhalothrin | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Cypermethrin | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Dacthal | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | d-BHC | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Deltamethrin | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Dichlobenil | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Dicloran | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Dicofol | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Dieldrin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Dithiopyr | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Endosulfan I | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Endosulfan II | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Endosulfan sulfate | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Endrin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Endrin aldehyde | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Endrin ketone | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Esfenvalerate | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Ethalfluralin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Etridiazole | Not Detected | 0.12 ug/L | |

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Analytical Report

**Client Sample ID:** Salem Industrial
**Matrix:** water

**PAL Sample ID:** P180319-03
**Sample Date:** 3/13/18

| Extraction Date | Analysis Date | Analyte | Amount Detected | Limit of Quantitation | Notes |
|---|---|---|---|---|---|
| 3/16/18 | 3/27/18 | Fenarimol | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Fenvalerate | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Flutolanil | Not Detected | 1.2 ug/L | |
| 3/16/18 | 3/27/18 | Folpet | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | g-BHC | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Heptachlor | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Heptachlor epoxide | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Hexachlorobenzene | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Iprodione | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Methoxychlor | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Metolachlor | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Mirex | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Norflurazon | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Ovex | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Oxadiazon | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Oxyfluorfen | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | p,p'-DDD | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | p,p'-DDE | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | p,p'-DDT | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | PCNB | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Pendimethalin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Permethrin | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Prodiamine | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Pronamide | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Propachlor | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Propanil | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Propiconazole | 0.88 ug/L | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Terbacil | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Toxaphene | Not Detected | 6.0 ug/L | |
| 3/16/18 | 3/27/18 | Trifloxystrobin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Triflumizole | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Trifluralin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Vinclozalin | Not Detected | 0.12 ug/L | |

**Surrogate Recovery:** 88 %
**Surrogate Recovery Range:** 38-143
(DCBP used as Surrogate)

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Analytical Report

**Client Sample ID:** Salem Industrial
**Matrix:** water

**PAL Sample ID:** P180319-03
**Sample Date:** 3/13/18

**Method:** Modified EPA 8141B (GC-FPD)

| Extraction Date | Analysis Date | Analyte | Amount Detected | Limit of Quantitation | Notes |
|---|---|---|---|---|---|
| 3/16/18 | 3/26/18 | Aspon | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Azinphos-methyl | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Carbofenothion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Chlorfenvinphos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Chlorpyrifos-methyl | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Coumaphos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Demeton | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Diazinon | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Dichlorofenthion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Dichlorvos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Dicrotophos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Dimethoate | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Disulfoton | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | EPN | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Ethion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Ethoprop | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Famphur | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Fenamiphos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Fenitrothion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Fensulfothion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Fenthion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Malathion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Merphos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Methidathion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Mevinphos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Monocrotophos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Parathion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Parathion methyl | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Phorate | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Phosmet | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Phosphamidon | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Pirimiphos-methyl | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Ronnel | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Sulprofos | Not Detected | 0.30 ug/L | |

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Analytical Report

**Client Sample ID:** Salem Industrial
**Matrix:** water

**PAL Sample ID:** P180319-03
**Sample Date:** 3/13/18

| Extraction Date | Analysis Date | Analyte | Amount Detected | Limit of Quantitation | Notes |
|---|---|---|---|---|---|
| 3/16/18 | 3/26/18 | Terbufos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Tetrachlorvinphos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Tokuthion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Trichloronate | Not Detected | 0.30 ug/L | |

**Surrogate Recovery:** 83 %
**Surrogate Recovery Range:** 46-157
(TPP-d15 used as Surrogate)

**Method:** Modified EPA 8151A (GC-MS/MS)

| | | | | | |
|---|---|---|---|---|---|
| 3/19/18 | 3/26/18 | 2,4,5-T | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 2,4,5-TP | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 2,4-D | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 2,4-DB | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Acifluorfen | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Bentazon | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Clopyralid | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Dicamba | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Dichlorprop | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Dinoseb | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | MCPA | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | MCPP | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Picloram | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Quinclorac | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Triclopyr | Not Detected | 0.080 ug/L | |

**Surrogate Recovery:** 84 %
**Surrogate Recovery Range:** 64-139
(DCPAA used as Surrogate)

**Method:** Modified EPA 8270D (GC-MS/MS)

| | | | | | |
|---|---|---|---|---|---|
| 3/16/18 | 3/19/18 | Ametryn | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Amitraz | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/19/18 | Atrazine | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Bromopropylate | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Cyanazine | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/19/18 | Diclofop-methyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Dimethenamid | Not Detected | 0.060 ug/L | |

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Analytical Report

**Client Sample ID:** Salem Industrial
**Matrix:** water

**PAL Sample ID:** P180319-03
**Sample Date:** 3/13/18

| Extraction Date | Analysis Date | Analyte | Amount Detected | Limit of Quantitation | Notes |
|---|---|---|---|---|---|
| 3/16/18 | 3/19/18 | Diphenylamine | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Ethofumesate | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Fenbuconazole | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Fenoxaprop-ethyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Fipronil | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/19/18 | Fluazifop-p-butyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Fludioxonil | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Fluroxypyr-meptyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Hexazinone | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Mefenoxam | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Metalaxyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Metribuzin | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Myclobutanil | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Napropamide | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Pirimicarb | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Prometon | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Prometryn | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Propazine | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Pyridaben | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Simazine | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Simetryn | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Sulfentrazone | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Tebuconazole | 0.080 ug/L | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Tebuthiuron | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/19/18 | Triadimefon | Not Detected | 0.12 ug/L | |

**Surrogate Recovery:** 88 %
**Surrogate Recovery Range:** 29-130
(DCBP used as Surrogate)

**Method:** Modified EPA 8321B (LC-MS/MS)

| | | | | | |
|---|---|---|---|---|---|
| 3/16/18 | 3/22/18 | 3-Hydroxycarbofuran | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Aldicarb | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Aldicarb Sulfone | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Aldicarb Sulfoxide | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Azoxystrobin | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Bendiocarb | Not Detected | 0.060 ug/L | |

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Analytical Report

**Client Sample ID:** Salem Industrial
**Matrix:** water

**PAL Sample ID:** P180319-03
**Sample Date:** 3/13/18

| Extraction Date | Analysis Date | Analyte | Amount Detected | Limit of Quantitation | Notes |
|---|---|---|---|---|---|
| 3/16/18 | 3/23/18 | Bensulide | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Boscalid | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Bromacil | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Carbaryl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Carbofuran | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Carfentrazone-ethyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Clothianidin | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | DCPMU | 0.12 ug/L | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Diuron | 1.7 ug/L | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Fenobucarb | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Fenuron | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/23/18 | Flumioxazin | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Fluometuron | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Imidacloprid | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Isoxaben | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Linuron | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Methiocarb | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Methomyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Monuron | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Neburon | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Oxamyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Propargite | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/22/18 | Propoxur | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Pyraclostrobin | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Pyrimethanil | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Sethoxydim | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Siduron | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Thiabendazole | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Thiobencarb | Not Detected | 0.060 ug/L | |

**Surrogate Recovery:** 106 %
**Surrogate Recovery Range:** 60-140
(TPP-d15 used as Surrogate)

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Quality Assurance

**Method Blank Data** **Matrix:** water

| Extraction Date | Analysis Date | Batch QC Sample # | Analyte | % Recovery | Expected % Recovery | Notes |
|---|---|---|---|---|---|---|
| 3/16/18 | 3/22/18 | 8031601-BLK1 | 3-Hydroxycarbofuran | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | a-BHC | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Acetochlor | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Alachlor | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Aldicarb | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Aldicarb Sulfone | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Aldicarb Sulfoxide | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Aldrin | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Ametryn | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Amitraz | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Aspon | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Atrazine | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Azinphos-methyl | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Azoxystrobin | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | b-BHC | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Bendiocarb | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Benfluralin | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/23/18 | 8031601-BLK1 | Bensulide | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Bifenthrin | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Boscalid | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Bromacil | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Bromopropylate | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Captafol | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Captan | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Carbaryl | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Carbofenothion | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Carbofuran | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Carfentrazone-ethyl | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Chlordane | Not Detected | < 0.60 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Chlorfenvinphos | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Chlorobenzilate | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Chloroneb | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Chlorothalonil | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Chlorpyrifos | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Chlorpyrifos-methyl | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Clothianidin | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Coumaphos | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Cyanazine | Not Detected | < 0.12 ug/L | |

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

**Method Blank Data** **Matrix:** water

| Extraction Date | Analysis Date | Batch QC Sample # | Analyte | % Recovery | Expected % Recovery | Notes |
|---|---|---|---|---|---|---|
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Cyfluthrin | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Cyhalothrin | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Cypermethrin | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Dacthal | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | d-BHC | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | DCPMU | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Deltamethrin | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Demeton | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Diazinon | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Dichlobenil | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Dichlorofenthion | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Dichlorvos | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Diclofop-methyl | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Dicloran | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Dicofol | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Dicrotophos | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Dieldrin | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Dimethenamid | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Dimethoate | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Diphenylamine | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Disulfoton | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Dithiopyr | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Diuron | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Endosulfan I | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Endosulfan II | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Endosulfan sulfate | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Endrin | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Endrin aldehyde | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Endrin ketone | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | EPN | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Esfenvalerate | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Ethalfluralin | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Ethion | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Ethofumesate | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Ethoprop | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Etridiazole | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Famphur | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Fenamiphos | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Fenarimol | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Fenbuconazole | Not Detected | < 0.060 ug/L | |

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

**Method Blank Data** **Matrix:** water

| Extraction Date | Analysis Date | Batch QC Sample # | Analyte | % Recovery | Expected % Recovery | Notes |
|---|---|---|---|---|---|---|
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Fenitrothion | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Fenobucarb | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Fenoxaprop-ethyl | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Fensulfothion | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Fenthion | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Fenuron | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Fenvalerate | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Fipronil | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Fluazifop-p-butyl | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Fludioxonil | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/23/18 | 8031601-BLK1 | Flumioxazin | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Fluometuron | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Fluroxypyr-meptyl | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Flutolanil | Not Detected | < 1.2 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Folpet | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | g-BHC | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Heptachlor | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Heptachlor epoxide | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Hexachlorobenzene | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Hexazinone | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Imidacloprid | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Iprodione | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Isoxaben | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Linuron | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Malathion | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Mefenoxam | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Merphos | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Metalaxyl | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Methidathion | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Methiocarb | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Methomyl | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Methoxychlor | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Metolachlor | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Metribuzin | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Mevinphos | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Mirex | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Monocrotophos | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Monuron | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Myclobutanil | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Napropamide | Not Detected | < 0.060 ug/L | |

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

**Method Blank Data** **Matrix:** water

| Extraction Date | Analysis Date | Batch QC Sample # | Analyte | % Recovery | Expected % Recovery | Notes |
|---|---|---|---|---|---|---|
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Neburon | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Norflurazon | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Ovex | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Oxadiazon | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Oxamyl | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Oxyfluorfen | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | p,p'-DDD | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | p,p'-DDE | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | p,p'-DDT | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Parathion | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Parathion methyl | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | PCNB | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Pendimethalin | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Permethrin | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Phorate | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Phosmet | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Phosphamidon | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Pirimicarb | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Pirimiphos-methyl | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Prodiamine | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Prometon | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Prometryn | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Pronamide | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Propachlor | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Propanil | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Propargite | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Propazine | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Propiconazole | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Propoxur | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Pyraclostrobin | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Pyridaben | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Pyrimethanil | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Ronnel | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Sethoxydim | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Siduron | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Simazine | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Simetryn | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Sulfentrazone | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Sulprofos | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Tebuconazole | Not Detected | < 0.060 ug/L | |

Rick Jordan, Laboratory Manager

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

**Method Blank Data** **Matrix:** water

| Extraction Date | Analysis Date | Batch QC Sample # | Analyte | % Recovery | Expected % Recovery | Notes |
|---|---|---|---|---|---|---|
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Tebuthiuron | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Terbacil | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Terbufos | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Tetrachlorvinphos | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Thiabendazole | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Thiobencarb | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Tokuthion | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Toxaphene | Not Detected | < 6.0 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Triadimefon | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Trichloronate | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Trifloxystrobin | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Triflumizole | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Trifluralin | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Vinclozalin | Not Detected | < 0.12 ug/L | |

**Method Blank Data** **Matrix:** water

| Extraction Date | Analysis Date | Batch QC Sample # | Analyte | % Recovery | Expected % Recovery | Notes |
|---|---|---|---|---|---|---|
| 3/19/18 | 3/26/18 | 8031904-BLK1 | 2,4,5-T | Not Detected | < 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 8031904-BLK1 | 2,4,5-TP | Not Detected | < 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 8031904-BLK1 | 2,4-D | Not Detected | < 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 8031904-BLK1 | 2,4-DB | Not Detected | < 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 8031904-BLK1 | Acifluorfen | Not Detected | < 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 8031904-BLK1 | Bentazon | Not Detected | < 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 8031904-BLK1 | Clopyralid | Not Detected | < 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 8031904-BLK1 | Dicamba | Not Detected | < 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 8031904-BLK1 | Dichlorprop | Not Detected | < 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 8031904-BLK1 | Dinoseb | Not Detected | < 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 8031904-BLK1 | MCPA | Not Detected | < 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 8031904-BLK1 | MCPP | Not Detected | < 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 8031904-BLK1 | Picloram | Not Detected | < 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 8031904-BLK1 | Quinclorac | Not Detected | < 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 8031904-BLK1 | Triclopyr | Not Detected | < 0.080 ug/L | |

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

**Blank Spike Data** **Matrix:** water

| Extraction Date | Analysis Date | Batch QC Sample # | Analyte | % Recovery | Expected % Recovery | Notes |
|---|---|---|---|---|---|---|
| 3/16/18 | 3/19/18 | 8031601-BS1 | Atrazine | 82 | 79-125 | |
| 3/16/18 | 3/19/18 | 8031601-BSD1 | Atrazine | 84 | 79-125 | |
| 3/16/18 | 3/27/18 | 8031601-BS1 | Chlorpyrifos | 99 | 74-142 | |
| 3/16/18 | 3/27/18 | 8031601-BSD1 | Chlorpyrifos | 98 | 74-142 | |
| 3/16/18 | 3/22/18 | 8031601-BS1 | Diazinon | 92 | 66-124 | |
| 3/16/18 | 3/22/18 | 8031601-BSD1 | Diazinon | 87 | 66-124 | |
| 3/16/18 | 3/27/18 | 8031601-BS1 | Dieldrin | 105 | 53-131 | |
| 3/16/18 | 3/27/18 | 8031601-BSD1 | Dieldrin | 101 | 53-131 | |
| 3/16/18 | 3/22/18 | 8031601-BS1 | Diuron | 90 | 76-104 | |
| 3/16/18 | 3/22/18 | 8031601-BSD1 | Diuron | 97 | 76-104 | |
| 3/16/18 | 3/19/18 | 8031601-BS1 | Ethofumesate | 97 | 73-129 | |
| 3/16/18 | 3/19/18 | 8031601-BSD1 | Ethofumesate | 94 | 73-129 | |
| 3/16/18 | 3/22/18 | 8031601-BS1 | Fluometuron | 93 | 58-109 | |
| 3/16/18 | 3/22/18 | 8031601-BSD1 | Fluometuron | 93 | 58-109 | |
| 3/16/18 | 3/22/18 | 8031601-BS1 | Imidacloprid | 76 | 61-128 | |
| 3/16/18 | 3/22/18 | 8031601-BSD1 | Imidacloprid | 70 | 61-128 | |
| 3/16/18 | 3/19/18 | 8031601-BS1 | Napropamide | 100 | 64-112 | |
| 3/16/18 | 3/19/18 | 8031601-BSD1 | Napropamide | 98 | 64-112 | |
| 3/16/18 | 3/27/18 | 8031601-BS1 | Oxadiazon | 105 | 78-121 | |
| 3/16/18 | 3/27/18 | 8031601-BSD1 | Oxadiazon | 102 | 78-121 | |
| 3/16/18 | 3/22/18 | 8031601-BS1 | Parathion methyl | 89 | 72-128 | |
| 3/16/18 | 3/22/18 | 8031601-BSD1 | Parathion methyl | 86 | 72-128 | |
| 3/16/18 | 3/22/18 | 8031601-BS1 | Thiobencarb | 67 | 66-115 | |
| 3/16/18 | 3/22/18 | 8031601-BSD1 | Thiobencarb | 73 | 66-115 | |

**Blank Spike Data** **Matrix:** water

| Extraction Date | Analysis Date | Batch QC Sample # | Analyte | % Recovery | Expected % Recovery | Notes |
|---|---|---|---|---|---|---|
| 3/19/18 | 3/26/18 | 8031904-BS1 | 2,4-D | 66 | 22-136 | |
| 3/19/18 | 3/26/18 | 8031904-BSD1 | 2,4-D | 66 | 22-136 | |
| 3/19/18 | 3/26/18 | 8031904-BS1 | Dicamba | 82 | 67-127 | |
| 3/19/18 | 3/26/18 | 8031904-BSD1 | Dicamba | 86 | 67-127 | |
| 3/19/18 | 3/26/18 | 8031904-BS1 | Triclopyr | 78 | 48-138 | |
| 3/19/18 | 3/26/18 | 8031904-BSD1 | Triclopyr | 77 | 48-138 | |

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

## Analyte Information

Method: Modified EPA 8081B (GC-ECD)
Method: Modified EPA 8141B (GC-FPD)
Method: Modified EPA 8151A (GC-MS/MS)
Chlorinated acids were converted to free acids. Residues were quantitated as free acids.
Method: Modified EPA 8270D (GC-MS/MS)
Method: Modified EPA 8321B (LC-MS/MS)

Rick Jordan, Laboratory Manager

| | |
|---|---|
| Attachment C. | Results of Benthic Macroinvertebrate Sampling, Fish Sampling, and Physical Habitat Data - Pacific Habitat Services (October 24, 2017) |

# Results of
# Benthic Macroinvertebrate Sampling, Fish Sampling, and Physical Habitat Data Collection for
# Pringle Creek, Clark Creek, Battle Creek, and Waln Creek
# in Salem, Oregon

**Prepared for**

**City of Salem**
Attn: Anita Panko
Public Works Department
555 Liberty Street SE
Salem, Oregon 97301

**Prepared by**

Craig Tumer
Dale Groff
**Pacific Habitat Services, Inc.**
9450 SW Commerce Circle, Suite 180
Wilsonville, OR 97070
(503) 570-0800
(503) 570-0855 FAX

**PHS Project Number: 5244**

October 24, 2017

# TABLE OF CONTENTS

# 1.0 INTRODUCTION

This report describes the results of the benthic macroinvertebrate sampling, fish sampling, and physical habitat characterization conducted in May and June 2017 on reaches of Clark Creek, East Fork Pringle Creek, Pringle Creek, Battle Creek, and Waln Creek. Benthic macroinvertebrate sampling was conducted on May 8, 2017; fish sampling was conducted on June 29, 2017; and physical habitat characterization was conducted on various dates in May and June 2017. Benthic macroinvertebrates, fish and physical habitat parameters were collected along the same reaches and using the same methodology as in previous sampling conducted in 2011, 2012, and 2013. This memorandum provides the data from the 2017 sampling effort.

# 2.0 STUDY AREA AND SUMMARY OF PREVIOUS SAMPLING EFFORTS

In Fall 2011, PHS collected data on benthic macroinvertebrate communities, fish presence, and physical habitat characteristics on two reaches of Battle Creek and two reaches of Waln Creek to provide baseline information for assessing the success of the Waln Creek stream restoration activities. These data were collected on four sample reaches, as described below:

- Lower Waln Creek: Waln Creek, immediately upstream of its confluence with Battle Creek;
- Upper Waln Creek: Waln Creek, upstream of SE Wiltsey Road;
- Lower Battle Creek: Battle Creek, upstream from the culvert located near the eastern edge of the former Battle Creek Golf Course and downstream of the Waln Creek/Battle Creek confluence;
- Upper Battle Creek: Battle Creek, upstream of the Waln Creek/Battle Creek confluence and in the vicinity of previous City of Salem sampling efforts.

In the 2011, the Lower Waln Creek Reach consisted the reach of Waln Creek that was to be relocated to the east of its original location. This reach was sampled in order to provide baseline data against which data from the relocated stream channel could be compared. The Lower Waln Creek Reach sampled in 2017 consisted of the relocated stream channel, immediately upstream from Waln Creek's confluence with Battle Creek in subsequent sampling years.

The Upper Waln Creek reach is located approximately 1000 feet upstream of the Lower Waln Creek reach, upstream of Wiltsey Road. Data was collected along this portion of Waln Creek to document potential stream changes resulting from inputs occurring upstream of the project area. Between SE Madras Street and Wiltsey Road.

The Lower Battle Creek reach is located immediately downstream of the confluence of Waln Creek and Battle Creek. After it is relocated, Waln Creek will flow into Battle Creek near the upstream end of Lower Battle Creek. Data collected in this stream was collected to document changes that might occur in Battle Creek following the Waln Creek restoration project.

The Upper Battle Creek reach is located approximately 183 feet upstream of the confluence of Waln Creek and Battle Creek but still within the former Battle Creek Golf Course. Data was collected along this portion of Battle Creek to document potential stream changes resulting from

inputs to Battle Creek occurring upstream of the project area. The City has benthic macroinvertebrate data from pervious sampling efforts near the location of Upper Battle Creek. The data from this previous sampling effort may be used in conjunction with data collected during this study to evaluate pre-project conditions in Battle Creek.

In May and June 2013, PHS collected data on benthic macroinvertebrate communities, fish presence, and physical habitat characteristics at three sample reaches within the City of Salem. These reaches are the same reaches sampled by PHS in May and June 2012, and are in close proximity to a previous macroinvertebrate sampling effort that was conducted during 2000 and 2001 (Pringle Creek Watershed Bioassessment Project). General locations of each of the sampling reaches are as follows:

- East Fork Pringle Creek where the stream enters the City (2000/2001 sampling site PR00-15),
- Pringle Creek below the confluence with Clark Creek and upstream of confluence with Shelton Ditch (2000/2001 sampling site PR00-02), and
- Clark Creek in Gilmore Field (2000/2001 sampling site PR00-24).

The East Fork Pringle Creek sampling reach is located downstream (north) of Trelstad Avenue SE, near the Salem city limits. The upstream end of the reach begins just north of the riprap apron of the culverts that carry the stream under Trelstad Avenue and extends for 150 meters downstream. In this area, East Fork Pringle Creek has been channelized and straightened with a berm of discharged dredge material along the bank. A short concrete sluice is present near the downstream end of the reach. The substrate of the stream is generally dominated by fine gravel and smaller sediments.

The Pringle Creek sampling reach is located within Bush's Pasture Park, approximately 10 meters downstream of the confluence of Clark Creek and Pringle Creek, and extends for 292.5 meters downstream. Within this reach, Pringle Creek is gently meandering. The stream banks are generally low and gently to moderately sloped, though vertical and undercut, eroding banks are present in some areas. A vertical concrete wall is present along the right bank near the upstream limits of the sampling reach, where private residences occur in close proximity to the stream. Substrates within the channel are generally dominated by cobbles and coarse gravel.

The Clark Creek sampling reach is located within Gilmore Field, just south of Hoyt Street SE. The downstream end of the project reach begins upstream of the detention structure south of Hoyt Street SE and continues upstream for 150 meters along the west side of Gilmore Field. In general, the stream banks are steep and the stream channel is incised. Substrates within the channel are generally dominated by silt and fine gravel, with areas of exposed clay hardpan.

## 3.0 METHODOLOGY

As recommended in the "Technical Memorandum for the City of Salem's MS4 Permit Requirements for Benthic Macroinvertebrate Sampling and Hydromodification Assessment", dated March 21, 2011, PHS followed the Oregon Department of Environmental Quality's *Water Monitoring and Assessment Mode of Operations Manual* (*MOMs*) (June 2010) transect sampling

approach for collecting benthic macroinvertebrate samples and the methodologies found in the Environmental Protection Agency's *Environmental Monitoring and Assessment Program - Surface Waters: Western Pilot Study Field Operations Manual for Wadeable Streams* (EMAP-SW) for collecting physical habitat data within the project area. Both protocols require the collection of data at evenly spaced transects within the sampling reach. Therefore, prior to the initiation of sampling and data collection, PHS established permanent transects within each of the three sampling reaches.

Both the MOMs and EMAP-SW protocols specify that the length of the sampling reach is forty times the average wetted width of the channel or a minimum of 150 meters long, when the average wetted width is less than four meters. Because the average wetted widths of East Fork Pringle and Clark Creeks are less than four meters, PHS determined that the reach length for each of the reaches on these streams is 150 meters. PHS measured the wetted width of Pringle Creek at five representative locations and determined that the average wetted width is approximately 7.31 meters and the total reach length is 292.5 meters.

## 3.1 Benthic Macroinvertebrate Sampling

Benthic macroinvertebrates were sampled using a transect sampling approach, as described in the Oregon Department of Environmental Quality's *Water Monitoring and Assessment Mode of Operations Manual* (*MOMs*) (June 2010).

One kick-net sample was collected at each of the eleven transects on the reach beginning at Transect A, which is located at the downstream end of the reach. The Transect A sample was collected from the middle of the left one-third of the stream; the Transect B sample was collected from the middle of the center one-third of the stream; and the Transect C sample was collected from the middle of the right one-third. For transect D, the sample was collected from the left one-third, and the cycle was repeated for all 11 transects. Samples were not collected from the stream margins.

At each sampling location, a D-frame kick net with 500 µm mesh net was placed in the stream with the flat part of the hoop resting on the streambed and perpendicular to the stream flow. Substrate preventing the flat part of the kicknet from sitting flush with the bottom was removed, when necessary.

Macroinvertebrate samples were collected from a one-square-foot sample area immediately upstream of the net. Before disturbing the substrate, this area was inspected for large macroinvertebrates such as mussels, and any such organisms were picked by hand and placed directly into the sieve. Within the sample area, all substrate particles larger than approximately five centimeters were carefully rubbed by hand in front of the net to dislodge any clinging macroinvertebrates. After rubbing, the substrate materials were placed outside of the sample plot. After all large substrate materials within the sample area were scrubbed by hand and removed from the sample area, the remaining substrate in the sample area was disturbed with the hands or feet for one minute. When samples were collected in slow-moving water where the water current was not strong enough to carry any dislodged organisms into the net, the net was pulled through the water as the substrate is disturbed to capture suspended organisms. After the sample was collected and the net removed from the stream, large substrate was returned to the sample area. Following collection of each sample, the contents of the net were placed in a 500µm mesh sieve, and the

procedure was repeated at each transect, working from downstream (Transect A) to upstream (Transect K). The samples from each transect were composited into the sieve.

After the samples from all transects on the reach were completed and transferred to the sieve, large organic material and rocks were rinsed, carefully inspected for clinging macroinvertebrates, and removed. Fine sediment was washed away to the extent possible. The composite sample was placed in a jar labeled with the date and reach name and preserved with 95% denatured ethanol for transport to the lab for sorting and subsampling. A label with site information written in pencil on Rite in the Rain paper was placed inside the container. After all samples were collected, they were delivered to Aquatic Biology Associates, Inc. in Corvallis for sorting, subsampling, and data analysis.

## 3.2 Fish Sampling

An Oregon Scientific Take Permit (STP) must be obtained from the Oregon Department of Fish and Wildlife (ODFW) to conduct fish sampling within the State. Prior to conducting the fish sampling within the project area, PHS completed the online permit application (https://apps.nmfs.noaa.gov/) and obtained the necessary Oregon STP from ODFW. Due to the potential presence of salmonid species listed under the Endangered Species Act in the mainstem Pringle Creek reach, a permit from the National Marine Fisheries Service (NMFS) must also be obtained. Correspondence with NMFS personnel in 2012 indicated that such a permit would be difficult to obtain, and PHS did not pursue the permit from the NMFS. Therefore, fish sampling was not conducted on the mainstem Pringle Creek reach. Fish sampling was conducted on all other sampling reaches.

PHS conducted the fish sampling on June 29, 2017. Starting at the downstream end of the sampling reach and working upstream along the reach, fish sampling was conducted using a Smith-Root backpack electrofishing unit. A second person followed the operator of the electrofishing unit with a dip net to retrieve stunned fish. All retrieved fish were transferred to a five-gallon bucket equipped with an aerator for later processing. Following completion of electrofishing at the upstream end of the sampling reach, all captured fish were identified and counted before being returned to the stream.

Following completion of the fish sampling, PHS completed the follow-up reporting required by the Oregon STP.

## 3.3 Physical Habitat Characterization

The EMAP-SW protocol was used to collect physical habitat data for the three stream reaches. The habitat characterization portion of the EMAP-SW protocol includes five components: thalweg profile; woody debris tally; channel and riparian characterization; assessment of channel constraint, debris torrents, and major floods; and discharge. While the characterization of all of these components is not especially useful for a hydromodification assessment, collection of certain data prescribed by the protocol may be useful. The following additional data, as described by the EMAP-SW habitat characterization protocol, were collected for future hydromodification analysis:

- Water Depth - The water depth is determined along the thalweg profile at low flow for 10 uniformly spaced intervals between transects.
- Wetted Width - The wetted width is determined at the 11 transects also used for macroinvertebrate sampling and at the mid-points of the intervals between those transects for a total of 21 measurements. In addition, the stream substrate is assessed at each of these transects at 5 points: left and right edge of water, midpoint of channel, and the two points midway between center of channel and water's edge. The substrate at these 5 points is characterized by size as boulders (> 250 mm), cobbles (>64 to 250 mm), coarse gravel (>16 to 64 mm), fine gravel (>2 to 16 mm), sand (>0.06 to 2 mm), and fines (<2 mm). Indications of burial around substrate particles at each of the substrate locations within a radius of 5 cm are used to assess the embeddedness as a fraction of the sediment particles surrounded by sand or finer particles.
- Channel Morphology - The channel morphology is measured at the 11 transects also used for macroinvertebrate assays. The bank angles from the edge of water to the top of the stream bank are recorded. The distance of bank overhang (if occurring) is measured from the edge of water to the vertical projection of the edge of bank. The vertical distance from the water surface to the lowest floodplain terrace is recorded for each transect as well as the vertical distance to the bankfull elevation. The bankfull width is also recorded at each transect.

In addition to the information described above, PHS collected data related to riparian habitat condition. The methodologies used to collect the physical habitat data within the sampling reaches are described below. More detailed descriptions of the methodologies can be found in the EMAP-SW document.

## Thalweg Profile

Beginning at the downstream end of the reach, measurement stations were established at intervals between transects. As recommended by the EMAP-SW protocol procedures for streams with a wetted width less than 2.5 meters wide. Stations were numbered "0" through "14" at one-meter intervals beginning at the downstream end of the first transect (Transect "A") and measuring upstream to the next transect. The wetted width of the stream was measured to the nearest 0.1 m at stations "0" and "7". At station 7 the substrate particle size at the tip of the depth measuring rod was classified at the left wetted margin and at positions 25%, 50%, 75%, and 100% of the distance across the wetted width of the stream. Because the average wetted width of Pringle Creek is greater than 2.5 meters, stations numbered "0" through "9" were spaced at 2.9-meter intervals (one-tenth the distance between transects), as recommended by the EMAP-SW protocol procedures. The wetted width of the stream was measured at stations 0 and 5, and the substrate particle size was measured at station 5.

The procedure for determining substrate particle size at the mid-way station is identical to the substrate size evaluation procedure described for regular channel cross-sections A through K, except that for these mid-way supplemental cross-sections, substrate size is entered on the Thalweg Profile side of the field form.

At each thalweg profile station, a meter ruler was used to locate the deepest point (the "thalweg"), and the thalweg depth was measured to the nearest cm. The depth was read on the

side of the ruler to avoid inaccuracies due to the wave formed by the rod in moving water. At the point where the thalweg depth was measured, the presence or absence of “soft/small sediment” (defined as fine gravel, sand, silt, clay or muck readily apparent by "feeling" the bottom with the staff) was noted.

The channel unit code and pool forming element codes for the station were determined and recorded on the field data form using the standard codes provided on the form. According to the EMAP-SW protocol, the unit should be at least as long as the channel is wide to be recorded. The same measurements were recorded for all stations upstream to the next transect and for all stations to the upstream end of the sampling reach (Transect “K”).

## Large Woody Debris Tally

Large woody debris (LWD), defined by this methodology as woody material with a small end diameter of at least 10 cm and a length of at least 1.5 m, within the reach was tallied while working upstream to collect the thalweg profile data. All pieces of LWD that were at least partially in the baseflow channel, the "active channel" (flood channel up to bankfull stage), or spanning above the active channel were included in the tally. LWD in the active channel was tallied over the entire length of the reach, including the area between the channel cross-section transects. The procedure for tallying LWD is presented in more detail in Table 7-5 of the EMAP-SW methodology.

All pieces of LWD within the segment that are at least partially within the bankfull channel were tallied by class based on the diameter of the large end (0.1 m to < 0.3 m, 0.3 m to <0.6 m, 0.6 m to <0.8 m, or >0.8 m, and the class based on the length of the piece (1.5m to <5.0m, 5m to <15m, or >15m). A tally mark was placed in the appropriate box in the “Pieces All/Part In Bankfull Channel” section of the Thalweg Profile and Woody Debris Form.

All pieces of LWD within the segment that are not actually within the bankfull channel, but are at least partially spanning (bridging) the bankfull channel were tallied by class based on the diameter of the large end (0.1 m to < 0.3 m, 0.3 m to <0.6 m, 0.6 m to <0.8 m, or >0.8 m), and the length of the piece (1.5 m to <5.0 m, 5 m to <15 m, or >15 m). For each piece observed, a tally mark was placed in the appropriate box in the “Pieces Bridge Above Bankfull Channel” section of the Thalweg Profile and Woody Debris Form.

After all pieces within the segment were tallied and marked on the form, the total number of pieces for each class were written in the small box at the lower right-hand corner of each tally box.

## Substrate Size/Channel Dimensions

The wetted channel width was divided into four equal segments to locate substrate measurement points on the cross-section. The distances corresponding to 0% (Left), 25% (LCtr), 50% (Ctr), 75% (RCtr), and 100% (Right) of the measured wetted width were recorded in the “DistLB” fields of the form. The distance recorded for the right bank was the same as the wetted channel width. At each measurement point on the cross section, (Left, LCtr, Ctr, RCtr, Right), the depth of the water was recorded. Because the left and right measurement points were at the limits of the wetted width of the stream, the water depth at these points was recorded as “0”.

Substrate size and embeddedness were evaluated at each of the 11 cross-section transects. A substrate particle was picked up at each measuring point (unless the substrate was bedrock or consolidated hardpan material), and the size of the particle was visually estimated, according to the table on the Channel/Riparian Cross-section Form. The substrate embeddedness was also evaluated according to the guidelines on the form and in the EMAP-SW protocol and the value was recorded on the data form. By definition, sand and fine-grained sediments were considered 100 percent embedded; bedrock and hardpan were considered 0 percent embedded.

**Bank Characteristics**

Bank angle and bank undercut distance were determined on the left and right banks at each cross section transect. To measure bank angle, the surveyor's rod was laid against the bank, with one end at the water's edge. A clinometer was placed on the rod, and the bank angle in degrees was read from the external scale on the clinometer. The angle was recorded in the field for the left bank in the "Bank Measurement" section of the Channel/ Riparian Cross-section Form. If the bank was undercut, the horizontal distance of the undercutting (defined as the distance from the water's edge out to the point where a vertical plumb line from the bank would hit the water's surface) was measured to the nearest 0.01 m, and the distance was recorded on the field data form.

The incised height of the stream was measured by holding the surveyor's rod vertically, with its base at the water's edge. Using the surveyor's rod as a guide while examining both banks, the channel incision as the height up from the water surface to elevation of the first terrace of the valley floodplain was visually estimated, and the value was recorded in the "Incised Height" field of the bank measurement section on the field data form.

At each transect, both banks were examined to estimate and record the height of bankfull flow above the thalweg elevation. The EMAP-SW protocol calls for bankfull height to be measured relative to the water surface elevation at the time of sampling; however, recording bankfull height relative to the thalweg elevation allows for comparison from year to year without the need to account for differing flow conditions. Potential bankfull indicators looked for included the following:

- An obvious slope break that differentiates the channel from a relatively flat floodplain terrace higher than the channel;
- A transition from exposed stream sediments to terrestrial vegetation;
- Moss growth on the banks;
- Presence of drift material caught on overhanging vegetation; and/or
- Transition from flood- and scour-tolerant vegetation to that which is relatively intolerant of these conditions.

The procedure for obtaining bank and channel dimension measurements is presented in more detail in Table 7-8 of the EMAP-SW protocol.

## Canopy Cover

Canopy cover over the stream was determined at each of the 11 cross-section transects using a Convex Spherical Densiometer taped as shown in the procedures outlined in the EMAP-SW protocol. The EMAP-SW protocol recommends obtaining six measurements at each cross-section transect (four measurements in four directions at mid-channel and one at each bank). The mid-channel measurements are used to estimate canopy cover over the channel. The two bank measurements complement your visual estimates of vegetation structure and cover within the riparian zone itself, and are particularly important in wide streams, where riparian canopy may not be detected by the densiometer when standing midstream. Because the stream channels within the project area are relatively narrow, only the four mid-channel measurements were collected for this project.

Facing upstream at mid-channel at each cross-section transect and with the densitometer held level at 0.3 m (1 ft.) above the surface of the stream the number of grid intersection points covered by either a tree, a leaf, or a high branch were counted. The value (0 to 17) was recorded in the "CenUp" field of the canopy cover measurement section of the Channel/Riparian Cross-section and Thalweg Profile Form. Canopy cover values were then determined for the left bank, downstream, and right bank and recorded in the appropriate spaces of the field data form.

## Riparian Vegetation Structure

Riparian vegetation observations were made for a distance of 5 meters upstream and downstream of each of the 11 cross-section transects. The riparian vegetation observations were made for the visible area from the stream back a distance of 10m (30 ft.) shoreward from both the left and right banks, creating a 10 m × 10 m riparian plot on each side of the stream. The riparian plot dimensions were estimated and not measured.

Standing mid-channel at a cross-section transect, a 5-meter distance upstream and downstream was estimated for the purpose of assessing riparian vegetation cover. For one bank and then the other, a distance of 10 meters back into the riparian vegetation was estimated. Within this 10 m × 10 m area, the riparian vegetation was conceptually divided into three layers: a CANOPY LAYER (>5m high), an UNDERSTORY (0.5 to 5 m high), and a GROUND COVER layer (<0.5 m high), and the dominant vegetation type for the CANOPY LAYER (vegetation > 5 m high) was determined to be either Deciduous, Coniferous, broadleaf Evergreen, Mixed, or None.

The areal cover class of large trees (> 0.3 m [1 ft.] diameter at breast height [DBH]) and small trees (< 0.3 m DBH) within the canopy layer was determined separately, and the appropriate cover class was recorded on the field data form ("0"=absent: zero cover, "1"=sparse: <10%, "2"=moderate: 10-40%, "3"=heavy: 40-75%, or "4"=very heavy: >75%). Next, the dominant vegetation type for the understory layer was determined as described above for the canopy layer. The areal cover class for woody shrubs and saplings was determined separately from non-woody vegetation within the understory. Similarly, the areal cover class for woody shrubs and seedlings, non-woody vegetation, and the amount of bare ground present in the ground cover layer was determined as described above.

## In stream Fish Cover, Algae, and Aquatic Macrophysics

The areal cover of all of the fish cover and other listed features that are in the water and on the banks 5 meters upstream and downstream of the cross-section were recorded in the "Fish Cover/Other" section of the Channel /Riparian Cross-section Form.

Standing mid-channel at a cross-section transect, a 5-meter distance upstream and downstream (10 m total length) was estimated for the purpose of evaluating fish cover. The water and the banks within the 10-m segment of stream were examined for the following features and types of fish cover:

- filamentous algae - long streaming algae that often occur in slow moving waters;
- aquatic saprophytes - are water-loving plants, including mosses, in the stream that could provide cover for fish or macroinvertebrates;
- large woody debris – the larger pieces of wood that can influence cover and stream morphology (i.e., those pieces that would be included in the large woody debris tally);
- brush and small woody debris – smaller wood pieces that primarily affect cover but not morphology;
- in-channel live trees or roots - living trees that are within the channel -- estimate the areal cover provided by the parts of these trees or roots that are inundated;
- overhanging vegetation - includes tree branches, brush, twigs, or other small debris that is not in the water but is close to the stream (within 1 m of the surface) and provides potential cover;
- undercut banks;
- boulders - typically basketball- to car-sized particles; and
- artificial structures - include those designed for fish habitat enhancement, as well as in-channel structures discarded (e.g., cars or tires) or purposefully placed for diversion, impoundment, channel stabilization, or other purposes.

For each cover type, the areal cover was estimated as follows and recorded in the "FISH COVER/OTHER" section of the Channel/Riparian Cross-section Form. According to the EMAP-SW protocol the cover classes of in stream fish cover features were estimated as follows:

"0"=absent: zero cover,
"1"=sparse: <10%,
"2"=moderate: 10-40%,
"3"=heavy: 40-75%, or
"4"=very heavy: >75%.

## Human Influence

For the left and right banks at each of the 11 detailed Channel and Riparian Cross-Sections, the presence/absence and the proximity of 11 categories of human influences were evaluated.

Standing mid-channel at each cross-section transect, a 5-meter distance was estimated upstream and downstream (10 m total length), and a distance of 10 meters back into the riparian zone from

each bank was estimated to define a riparian plot area. The channel, bank and riparian plot area adjacent to the defined stream segment were examined for the following human influences:

(1) walls, dikes, revetments, riprap, and dams;
(2) buildings;
(3) pavement/cleared lot (e.g., paved, graveled, dirt parking lot, foundation);
(4) roads or railroads,
(5) inlet or outlet pipes;
(6) landfills or trash (e.g., cans, bottles, trash heaps);
(7) parks or maintained lawns;
(8) row crops;
(9) pastures, rangeland, hay fields, or evidence of livestock;
(10) logging; and
(11) mining (including gravel mining).

For each type of influence, its presence or absence and its proximity to the stream and riparian plot area was determined. The human disturbance items were considered to be present if they were visible from the cross-section transect. For each type of influence, the appropriate proximity class was recorded in the "Human Influence" part of the "Visual Riparian Estimates" section of the Channel/Riparian Cross-section Form. The proximity classes are defined by the EMAP-SW protocol as follows:

**B ("Bank") -** Present within the defined 10 m stream segment and located in the stream or on the stream bank.
**C ("Close") -** Present within the 10 × 10 m riparian plot area, but away from the bank.
**P ("Present") -** Present, but outside the riparian plot area.
**O ("Absent") -** Not present within or adjacent to the 10 m stream segment or the riparian plot area at the transect

A particular influence may be observed outside of more than one riparian observation plot (e.g., at both transects "D" and "E"). In such situations, the influence was recorded as present at every transect from which it was observed without having to site through another transect or its 10 m × 10 m riparian plot.

## Riparian "Legacy" Trees and Invasive Alien Plants

One tree was identified as a "legacy" tree at each transect, and at transect K, the legacy tree was identified as the largest tree within 4 channel widths upstream of the transect location. For each legacy tree, which was defined as the largest tree within sight of the transect, the following information was recorded:

- type of tree, and, the taxonomic group, as defined on the field data form and Table 7-13 of the EMAP-SW protocol;
- estimated height,
- diameter at breast height (dbh), and
- distance from the wetted margin of the stream.

At each transect, the presence of listed invasive plant species within the 10 m x 10 m riparian plots on either bank was recorded on the Riparian "Legacy" Trees and Invasive Alien Plants field form. In accordance with the EMAP-SW protocol, only the presence of plants which are targets in the state (as identified in the EMAP-SW protocol) were recorded, even though other invasive species may be present.

# 4.0 RESULTS AND DISCUSSION

## 4.1 Benthic Macroinvertebrate Sampling

Benthic macroinvertebrate sampling was originally conducted on May 8, 2017. Initial processing by Aquatic Biology Associates, Inc (ABA) showed that very few specimens were collected during the sampling effort – likely a result of the heavy rains and high stream flows in the weeks prior to sampling. Because of the low number of organisms collected, the initial samples were not analyzed. PHS re-sampled all of the stream reaches on June 5, 2017, after stream flows had receded, and the benthic macroinvertebrate samples were processed by ABA. Data and results from ABA's analysis are provided in Appendix B. A summary of the results of the analysis are present in the following sections.

### 4.1.1 Benthic Index of Biological Integrity

Each sample was scored according to the Benthic Index of Biological Integrity (BIBI), modified from Karr 1998, which is a quantitative method for determining and comparing the biological condition of streams. The BIBI scoring system is composed of the 10 metrics:

- Total number of taxa;
- Number of Ephemeroptera taxa;
- Number of Plecoptera taxa;
- Number of Trichoptera taxa;
- Number of long-lived taxa;
- Number of intolerant taxa;
- Percent tolerant taxa;
- Percent predators;

- Number of clinger taxa; and
- Percent dominant taxa.

Each individual metric is given a score of 1 through 5, with higher numbers given to conditions representative of streams unaltered by anthropogenic influence and exhibiting higher biological integrity. These metrics are then added together for the single, integrated overall BIBI score.

The results of the BIBI scoring for each of the sample reaches are summarized in Tables 1 and 2 and in the text below. The descriptions of metrics that follow are summarized from The Puget Sound Stream Benthos website (www.pugetsoundstreambenthos.org).

**Table 1. Benthic Invertebrate Index of Biological Integrity – BIBI (modified Karr 1998) for Clark Creek, East Fork Pringle Creek and Pringle Creek**

| Metric | Clark Creek | | East Fork Pringle Creek (PC1) | | Pringle Creek (PC2) | |
|---|---|---|---|---|---|---|
| | Value | Score[a] | Value | Score[a] | Value | Score[a] |
| Total Number of Taxa[b] | 34 | 3 | 39 | 3 | 38 | 3 |
| Number of Ephemeroptera Taxa[b] | 1 | 1 | 3 | 1 | 1 | 1 |
| Number of Plecoptera Taxa[b] | 0 | 1 | 0 | 1 | 0 | 1 |
| Number of Trichoptera Taxa[b] | 2 | 1 | 3 | 1 | 3 | 1 |
| Number of Long-lived Taxa[b] | 3 | 3 | 5 | 5 | 5 | 5 |
| Number of Intolerant Taxa[b] | 0 | 1 | 0 | 1 | 0 | 1 |
| Percent Tolerant Taxa[c] | 27 | 3 | 62 | 1 | 59 | 1 |
| Percent Predators[b] | 11 | 3 | 4.9 | 1 | 5.2 | 1 |
| Number of Clinger Taxa[b] | 11 | 3 | 13 | 3 | 14 | 3 |
| Percent Dominance (3 Taxa)[c] | 32 | 5 | 57 | 3 | 52 | 3 |
| **Total BIBI Score[d]:** | **n/a** | 24 | **n/a** | **20** | **n/a** | **20** |
| **Biological Condition:** | **Low** | | **Low** | | **Low** | |

Notes:
a. Each metric scored: 1 = Low; 3 = Moderate; 5 = High
b. Metric value generally decreases with declining biological integrity
c. Metric value general increases with declining biological integrity
d. Key to Total BIBI Scores:
BIBI scores 0 – 24 = Low biological integrity
BIBI scores 25 – 39 = Moderate biological integrity
BIBI scores 39 – 50 = High biological integrity

**Table 2. Benthic Invertebrate Index of Biological Integrity – BIBI (modified Karr 1998) for Battle Creek and Waln Creek**

| Metric | Lower Battle Creek | | Upper Battle Creek | | Lower Waln Creek | | Upper Waln Creek | |
|---|---|---|---|---|---|---|---|---|
| | Value | Score[a] | Value | Score[a] | Value | Score[a] | Value | Score[a] |
| Total Number of Taxa[b] | 47 | 5 | 50 | 5 | 26 | 3 | 30 | 3 |
| Number of Ephemeroptera Taxa[b] | 4 | 1 | 3 | 1 | 1 | 1 | 2 | 1 |
| Number of Plecoptera Taxa[b] | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 |
| Number of Trichoptera Taxa[b] | 2 | 1 | 2 | 1 | 0 | 1 | 1 | 1 |
| Number of Long-lived Taxa[b] | 3 | 3 | 5 | 5 | 2 | 1 | 4 | 3 |
| Number of Intolerant Taxa[b] | 2 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| Percent Tolerant Taxa[c] | 18 | 5 | 32 | 3 | 18 | 5 | 23 | 3 |
| Percent Predators[b] | 5.3 | 1 | 8.4 | 1 | 3.7 | 1 | 7.7 | 1 |
| Number of Clinger Taxa[b] | 13 | 3 | 13 | 3 | 9 | 1 | 11 | 3 |
| Percent Dominance (3 Taxa)[c] | 51 | 3 | 49 | 5 | 57 | 3 | 60 | 3 |
| **Total BIBI Score[d]:** | **n/a** | **24** | **n/a** | **26** | **n/a** | **18** | **n/a** | **20** |
| **Biological Condition:** | **Low** | | **Low** | | **Low** | | **Moderate** | |

Notes:
a. Each metric scored: 1 = Low; 3 = Moderate; 5 = High
b. Metric value generally decreases with declining biological integrity
c. Metric value general increases with declining biological integrity
d. Key to Total BIBI Scores:
BIBI scores 0 – 24 = Low biological integrity
BIBI scores 25 – 39 = Moderate biological integrity
BIBI scores 39 – 50 = High biological integrity

## Total Number of Taxa

The total number of taxa, or total taxa richness, is the total number of unique taxa identified within the sample. All types of invertebrates (mayflies, caddisflies, stoneflies, true flies, midges, clams, snails, and worms) collected from the sampling reach are included in this metric. The biodiversity of a stream declines as flow regimes are altered, habitat is lost, chemicals are introduced, energy cycles are disrupted, and alien taxa invade. The moderate scores given for total number of taxa in most of the sampling reaches indicates some level of disturbance within the assessment reaches.

## Number of Ephemeroptera Taxa

The number of Ephemeroptera taxa, or Ephemeroptera taxa richness, is the total number of unique mayfly (Family Ephemeroptera) taxa identified within the sample. Typically, the

diversity of mayflies declines in response to most types of human influence. The low numbers of mayfly taxa recorded in the sample reaches are indicative of disturbed systems.

### Number of Plecoptera Taxa

The number of Plecoptera taxa, or Plecoptera taxa richness, is the total number of unique stonefly (Family Plecoptera) taxa identified within the sample. In general, stoneflies are among the most sensitive benthic macroinvertebrates, and they are among the first macroinvertebrates to disappear from a stream as human disturbance increases. Many stoneflies are predators that stalk their prey and hide around and between rocks, and these hiding places are lost as sediment washes into a stream and the stream substrates become embedded. Like salmonids, most stoneflies require cool, well-oxygenated water, and increased stream temperatures adversely affect the stream's ability to support stoneflies. Stonefly larvae were recorded in only one sampling reach – Upper Battle Creek. The absence or low number of stonefly taxa recorded within the sampling reaches is indicative of disturbed systems.

### Number of Trichoptera Taxa

The number of Trichoptera taxa, or Trichoptera taxa richness, is the total number of unique caddisfly (Family Trichoptera) taxa identified within the sample. Caddisflies are a diverse family of insect. Various caddisfly taxa feed in a variety of ways: some spin nets to trap food, others collect or scrape food from the tops of exposed rocks. Many caddisflies build gravel or wood cases to protect them from predators, and others are predators themselves. Although caddisflies are a diverse family, taxa richness of caddisflies declines steadily as the variety and complexity of stream habitats decline. The low numbers of caddisfly taxa recorded within all of the sampling reaches are indicative of disturbed systems.

### Number of Long-Lived Taxa

The number of long-lived taxa is the total number of unique taxa that require more than one year to complete their life cycles. Because of their longer life cycles, these taxa are exposed to cumulatively more stream disturbances than taxa with shorter life cycles. If the stream is dry part of the year or subject to flooding, taxa with longer life cycles may disappear from the stream. Loss of long-lived taxa from a system may indicate an on-going problem that repeatedly interrupts their life cycles. The East Fork Pringle Creek, Pringle Creek, and Upper Battle Creek sampling reaches received high scores for the long-lived taxa metric. The moderate to low scores given for total number of long-lived taxa in the remaining sampling reaches indicate some level of disturbance within the assessment reaches.

### Number of Intolerant Taxa

The number of intolerant taxa is the total number of unique taxa that are intolerant of stream pollution. Chironomids are not included in this metric. Benthic macroinvertebrates identified as intolerant are the most sensitive taxa and represent approximately five to ten percent of the taxa present in the region. These taxa are the first to disappear as stream degradation increases. The low scores for the number of intolerant taxa in each of the sampling reaches indicate disturbance within the assessment reaches.

### Percent Tolerant Taxa

The percent tolerant taxa is the total number of individuals belonging to taxa tolerant to stream degradation, divided by the total number of individuals within the sample, multiplied by 100. Chironomids are not included in this metric. Tolerant taxa are present within most streams, but as disturbance increases, tolerant taxa represent an increasingly large percentage of the total macroinvertebrate community. The low scores for the percent tolerant taxa in the East Fork Pringle Creek and Pringle Creek sampling reaches suggest better water quality conditions compared to the other sampling reaches, which received moderate to high scores for this metric.

### Percent Predators

The percent predators metric is the total number of predator individuals identified within the sample, divided by the total number of individuals within the sample, multiplied by 100. Predator taxa represent the peak of the food web and depend on a reliable source of other invertebrates that they can eat. The percentage of animals that are obligate predators provides a measure of the trophic complexity supported by a site. Less disturbed sites generally support a greater diversity of prey items and, therefore, a larger diversity of predators to feed on them. The low to moderate scores for percent predators in each of the sampling reaches indicates some level of disturbance within the assessment reaches.

### Number of Clinger Taxa

This metric is the total number of unique clinger taxa within the sample. “Clingers” have physical adaptations that allow them to hold onto smooth substrates in fast water. These macroinvertebrates typically occupy the open areas between rocks and cobbles along the bottom of the stream; thus, they are particularly sensitive to fine sediments that fill these spaces and eliminate the variety and complexity of these small habitats. Sediment also prevents clingers from accessing the hyporheic zone of the stream bed. The moderate to low numbers of clinger taxa recorded within the assessment reaches are indicative of disturbed systems.

### Percent Dominance

Percent dominance is the sum of the individuals of the three most abundant taxa in the sample, divided by the total number of individuals in the sample, multiplied by 100. In general, as diversity declines, a fewer number of taxa make up a larger percentage of the total macroinvertebrate community. In contrast to most other metrics examined, the scores for percent dominance within all of the sample reaches were within the “moderate” or “high” categories.

### Total BIBI Score

Scores for all ten metrics are added together to arrive at a total BIBI score. The stream’s total BIBI score is a measure of the stream’s biological condition. Because there are ten metrics and each metric is scored 1 to 5, the total BIBI score can range from 10 to 50. A score closer to 50 indicates a high biotic condition similar to that found in a “natural” reference stream, which in the Willamette Valley Region is a relatively undisturbed Pacific Northwest montane stream. A score closer to 10 indicates a severely degraded stream with poor biological integrity. Total BIBI scores for the project area sampling reaches ranged from 18 to 26. Only the Upper Battle Creek sampling reach received a score in the moderate BIBI score range.

### 4.1.2 Other Stream Assessment Metrics

ABA provided scores for thirteen other metrics that may be useful in assessing the biological integrity of the project area streams. Values and biological integrity scores for each of these metrics are provided in Tables 3 and 4. For the first six metrics listed in Table 2 (total abundance, EPT taxa richness, predator richness, scraper richness, shredder richness, and percent intolerant taxa), the metric value generally decreases as biological integrity decreases. For the project-area sampling reaches, these metrics generally scored low overall, indicating low biological integrity for project area streams.

For the last seven metrics listed in Tables 3 and 4 (percent *Baetis tricaudatus*, percent collector, percent parasite, percent Oligochaeta, number of tolerant taxa, percent Simuliidae, and percent Chironomidae), the metric value generally increases as biological integrity decreases. Though scores for these metrics were variable for the project-area sampling reaches, approximately half of the scores were in the moderate to high range, indicating impaired biological integrity for project-area streams.

**Table 3. Other Community Composition Metrics that are Indicative of Biological Condition – Clark Creek, East Fork Pringle Creek, and Pringle Creek**

| Metric | Clark Creek | | East Fork Pringle Creek (PC1) | | Pringle Creek (PC2) | |
|---|---|---|---|---|---|---|
| | Value | Score[a] | Value | Score[a] | Value | Score[a] |
| Total Abundance[b] | 1592 | - | 1064 | - | 1464 | - |
| EPT Taxa Richness[b] | 3 | L | 6 | L | 4 | L |
| Predator Richness[b] | 4 | L | 8 | L | 5 | L |
| Scraper Richness[b] | 4 | L | 2 | L | 4 | L |
| Shredder Richness[b] | 2 | L | 2 | L | 2 | L |
| Percent Intolerant Taxa[b] | 3.2 | L | 0 | L | 0.5 | L |
| Percent *Baetis tricaudatus*[c] | 3.8 | H | 4.3 | H | 14.8 | M |
| Percent Collector[c] | 68 | L | 39 | M | 46 | M |
| Percent Parasite[c] | 0.3 | H | 2.3 | H | 0.5 | H |
| Percent Oligochaeta[c] | 8.4 | L | 5.3 | M | 7.3 | L |
| Number of Tolerant taxa[c] | 12 | L | 15 | L | 16 | L |
| Percent Simuliidae[c] | 1.2 | H | 3.8 | H | 2.3 | H |
| Percent Chironomidae | 51 | L | 17 | M | 27 | L |

Notes:
a. Low (L), moderate (M), and high (H) scores compared with a Pacific Northwest montane stream with high biological integrity.
b. Metric value generally decreases with declining biological integrity
c. Metric value generally increases with declining biological integrity

**Table 4. Other Community Composition Metrics that are Indicative of Biological Condition – Battle Creek and Waln Creek**

| Metric | Lower Battle Creek | | Upper Battle Creek | | Lower Waln Creek | | Upper Waln Creek | |
|---|---|---|---|---|---|---|---|---|
| | Value | Score[a] | Value | Score[a] | Value | Score[a] | Value | Score[a] |
| Total Abundance[b] | 569 | - | 462 | - | 2370 | - | 1523 | - |
| EPT Taxa Richness[b] | 6 | L | 6 | L | 1 | L | 3 | L |
| Predator Richness[b] | 6 | L | 9 | L | 6 | L | 6 | L |
| Scraper Richness[b] | 3 | L | 3 | L | 2 | L | 4 | L |
| Shredder Richness[b] | 3 | L | 3 | L | 0 | L | 2 | L |
| Percent Intolerant Taxa[b] | 6.8 | M | 2.2 | L | 2 | L | 17.3 | H |
| Percent *Baetis tricaudatus*[c] | 3.2 | H | 2.4 | H | 0.4 | H | 0.7 | H |
| Percent Collector[c] | 66 | L | 38 | M | 93 | L | 63 | L |
| Percent Parasite[c] | 2.6 | H | 4.1 | M | 0 | H | 0.3 | H |
| Percent Oligochaeta[c] | 2.1 | H | 3.3 | M | 2.2 | H | 6.3 | L |
| Number of Tolerant taxa[c] | 16 | L | 15 | L | 10 | L | 9 | M |
| Percent Simuliidae[c] | 1.7 | H | 3.7 | H | 0.5 | H | 1 | H |
| Percent Chironomidae | 78 | L | 56 | L | 81 | L | 84 | L |

Notes:
a. Low (L), moderate (M), and high (H) scores compared with a Pacific Northwest montane stream with high biological integrity.
b. Metric value generally decreases with declining biological integrity
c. Metric value generally increases with declining biological integrity

## 4.2 Fish Sampling

Table 5 summarizes the results of the fish sampling efforts within the project-sample reaches. As noted above, the purpose of this sampling was to document the types of fish inhabiting the project-area streams. The sampling effort was not designed to document the number of fish within the project-area reaches. As noted above, mainstem Pringle Creek was not sampled because it was not possible to get the necessary permits from the NMFS within the time constraints associated with this sampling effort.

Six fish taxa were identified within the reaches in which fish were surveyed. All fish collected at both reaches were native to the Willamette River watershed, and all appeared healthy. All cutthroat trout collected were juveniles, suggesting that breeding populations are present in East Fork Pringle Creek and Battle Creek.

**Table 5. Results of Fish Sampling for Project Area Sampling Reaches**

| Fish Species | Sampling Reach | | | | | |
|---|---|---|---|---|---|---|
| | Clark Creek | East Fork Pringle Creek | Lower Battle Creek | Upper Battle Creek | Lower Waln Creek | Upper Waln Creek |
| Cutthroat Trout | - | 2 | - | 1 | - | - |
| Redside Shiner | 16 | 74 | 13 | 57 | 61 | 113 |
| Dace sp. | 3 | 14 | - | - | 4 | 4 |
| Sculpin sp | 29 | 34 | 41 | 78 | 24 | 21 |
| Lamprey sp. | - | 1 | - | 1 | 3 | 1 |
| Longnose Sucker | 1 | - | - | 17 | 21 | 1 |
| **Total** | | | | | | |

## 4.3 Physical Habitat Characterization

As in previous monitoring efforts, PHS collected data related to thalweg profile, stream and riparian cross sections, substrate type, and presence of large woody debris for each of the sampling reaches. At the time of this monitoring effort, the entire Lower Waln Creek reach had been dammed by beavers and water three or more feet deep was present throughout the reach, and it was not possible to collect physical habitat data because of the depth of the water. The data are provided on data forms derived from those provided in the EMAP-SW protocol, and the data forms for each of the sampling reaches are in Appendices B - G. Comparison of the data contained in this report to data obtained in previous and future monitoring efforts can document changes in the streams over time. However, a comparison of data was beyond the scope of this project.

# 5.0 REFERENCES


Oregon Department of Environmental Quality. June 30, 2010. *Water Monitoring and Assessment Mode of Operations Manual* (*MOMs*), Version 3.3, DEQ03-LAB-0036-SOP, Laboratory and Environmental Assessment Division, Hillsboro, Oregon.

Peck, D.V., J.M. Lazorchak, and D.J. Klemm (editors). Unpublished draft. *Environmental Monitoring and Assessment Program -Surface Waters: Western Pilot Study Field Operations Manual for Wadeable Streams.* EPA/XXX/X-XX/XXXX. U.S. Environmental Protection Agency, Washington, D.C.

Pacific Habitat Services, Inc. March 21, 2011. *Technical Memorandum for the City of Salem's MS4 Permit Requirements for Benthic Macroinvertebrate Sampling and Hydromodification Assessment.*

Puget Sound Stream Benthos Website. www.pugetsoundstreambenthos.org. Accessed February 2012.

# Appendix A

## Benthic Macroinvertebrate Sampling Data

Aquatic Biology Associates, Inc
3490 NW Deer Run Street
Corvallis, OR 97330
aquaticbio.com

Robert Wisseman, Senior Scientist
541-740-1568
bob@aquaticbio.com

Date run:
'2017-07-09
Analysis program in developmental phase.

**Abundances and biomass (mg) converted to a standard full sample (if subsampled) and one square meter basis.**

Metrics most useful for tracking trends in biological integrity

| Waterbody | Battle Creek | Battle Creek | Clark Creek | Pringle Creek | Pringle Creek | Waln Creek | Waln Creek |
|---|---|---|---|---|---|---|---|
| Station | Lower | Upper | Upper | East Fork | Upper | Lower | Upper |
| Date | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 |
| Subsample count | 532 | 462 | 583 | 532 | 562 | 554 | 584 |
| Subsample correction factor to full sample | 1.07 | 1 | 2.73 | 2 | 2.61 | 4.29 | 2.61 |
| Area correction factor to square meter | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **SUMMARY METRICS** | | | | | | | |
| Total taxa richness | 47 | 50 | 34 | 39 | 38 | 26 | 30 |
| Total abundance | 569.17 | 462 | 1591.59 | 1064 | 1463.6 | 2370.08 | 1522.63 |
| EPT taxa richness | 6 | 6 | 3 | 6 | 4 | 1 | 3 |
| EPT abundance | 29.96 | 36 | 152.88 | 114 | 266.22 | 8.58 | 15.66 |
| Hilsenhoff Biotic Index (WY DEQ version) | 6.36 | 6.12 | 6.03 | 6.48 | 6.76 | 6.95 | 6.56 |
| **DOMINANCE AND DIVERSITY** | | | | | | | |
| % Dominant taxa | 25.38 | 23.81 | 11.32 | 37.97 | 26.39 | 34.39 | 26.23 |
| % Subdominant taxa | 19.93 | 18.4 | 10.98 | 13.16 | 14.8 | 12.49 | 17.14 |
| % Top 3 taxa | 50.57 | 48.7 | 32.25 | 56.95 | 51.89 | 57.2 | 60.17 |
| % Top 5 taxa | 60.35 | 57.36 | 49.4 | 66.54 | 65.8 | 69.87 | 71.99 |
| % Top 10 taxa | 76.51 | 71.86 | 78.04 | 82.33 | 85.24 | 87.79 | 89.65 |
| Shannon-Weaver Diversity (loge) | 2.79 | 2.91 | 2.88 | 2.48 | 2.57 | 2.35 | 2.37 |
| Shannon-Weaver Diversity (log2) | 4.02 | 4.19 | 4.16 | 3.57 | 3.71 | 3.39 | 3.42 |
| Shannon Evenness Index | 0.72 | 0.74 | 0.82 | 0.68 | 0.71 | 0.72 | 0.7 |
| **TOLERANT AND INTOLERANT TAXA** | | | | | | | |
| Total tolerant taxa richness | 16 | 15 | 12 | 15 | 16 | 10 | 9 |
| Total tolerant abundance | 83.46 | 135 | 371.28 | 614 | 650.89 | 412.84 | 336.69 |
| % Total tolerant by abundance | 14.66 | 29.22 | 23.33 | 57.71 | 44.47 | 17.42 | 22.11 |
| Baetis tricaudatus complex | 3.196 | 2.381 | 3.774 | 4.323 | 14.8 | 0.362 | 0.6857 |
| Adjusted % total tolerant | 17.856 | 31.601 | 27.104 | 62.033 | 59.27 | 17.782 | 22.7957 |
| Highly tolerant taxa richness | 3 | 1 | 3 | 3 | 3 | 2 | 2 |
| Highly tolerant abundance | 9.63 | 4 | 46.41 | 6 | 24.49 | 81.51 | 279.27 |
| % Highly tolerant by abundance | 1.692 | 0.8658 | 2.916 | 0.5639 | 1.673 | 3.439 | 18.34 |
| Moderately tolerant taxa richness | 13 | 14 | 9 | 12 | 13 | 8 | 7 |
| Moderately tolerant abundance | 73.83 | 131 | 324.87 | 608 | 626.4 | 331.33 | 57.42 |
| % Moderately tolerant by abundance | 12.97 | 28.35 | 20.41 | 57.14 | 42.8 | 13.98 | 3.771 |
| Total intolerant taxa richness | 5 | 3 | 1 | 0 | 1 | 1 | 2 |
| Total intolerant abundance | 38.52 | 10 | 51.87 | 0 | 7.83 | 47.19 | 263.61 |
| % Total intolerant by abundance | 6.768 | 2.165 | 3.259 | 0 | 0.535 | 1.991 | 17.31 |
| Highly intolerant taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Highly intolerant abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Highly intolerant by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Moderately intolerant taxa richness | 5 | 3 | 1 | 0 | 1 | 1 | 2 |
| Moderately intolerant abundance | 38.52 | 10 | 51.87 | 0 | 7.83 | 47.19 | 263.61 |
| % Moderately intolerant by abundance | 6.768 | 2.165 | 3.259 | 0 | 0.535 | 1.991 | 17.31 |

| Waterbody | Battle Creek | Battle Creek | Clark Creek | Pringle Creek | Pringle Creek | Waln Creek | Waln Creek |
|---|---|---|---|---|---|---|---|
| Station | Lower | Upper | Upper | East Fork | Upper | Lower | Upper |
| Date | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 |
| **VOLTINISM (length of life cycle)** | | | | | | | |
| TAXA RICHNESS | | | | | | | |
| Semivoltine (> 1 year life cycle) taxa richness | 6 | 9 | 5 | 8 | 6 | 3 | 5 |
| Univoltine (1 year life cycle) taxa richness | 9 | 8 | 4 | 6 | 4 | 3 | 6 |
| Multivoltine (< 1 year life cycle) taxa richness | 32 | 33 | 25 | 25 | 28 | 20 | 19 |
| ABUNDANCE | | | | | | | |
| Semivoltine (> 1 year life cycle) abundance | 50.22 | 106 | 267.54 | 624 | 552.71 | 298.01 | 94.96 |
| Univoltine (1 year life cycle) abundance | 26.75 | 42 | 229.32 | 90 | 138.33 | 81.51 | 112.23 |
| Multivoltine (< 1 year life cycle) abundance | 492.2 | 314 | 1094.73 | 350 | 772.56 | 1990.56 | 1315.44 |
| PERCENTAGE BY ABUNDANCE | | | | | | | |
| % Semivoltine (> 1 year life cycle) by abundance | 8.823 | 22.94 | 16.81 | 58.65 | 37.76 | 12.57 | 6.237 |
| % Univoltine (1 year life cycle) by abundance | 4.7 | 9.091 | 14.41 | 8.459 | 9.451 | 3.439 | 7.371 |
| % Multivoltine (< 1 year life cycle) by abundance | 86.48 | 67.97 | 68.78 | 32.89 | 52.78 | 83.99 | 86.39 |
| **GROWTH AND DEVELOPMENT** | | | | | | | |
| % Fast seasonal life cycle by abundance | 84.78 | 66.67 | 61.92 | 29.7 | 45.65 | 82.36 | 85.71 |
| % Slow seasonal life cycle by abundance | 10.9 | 29.65 | 27.1 | 60.15 | 48.57 | 5.11 | 8.742 |
| % Nonseasonal life cycle by abundance | 4.312 | 3.68 | 10.98 | 10.15 | 5.775 | 12.53 | 5.551 |
| **OCCURRENCE IN DRIFT** | | | | | | | |
| % Rare in drift by abundance | 13.71 | 31.17 | 43.57 | 67.29 | 54.35 | 17.64 | 14.46 |
| % Common in drift by abundance | 3.384 | 6.926 | 0.1715 | 6.579 | 1.962 | 0 | 0.1714 |
| % Abundant in drift by abundance | 82.9 | 61.9 | 56.26 | 26.13 | 43.69 | 82.36 | 85.36 |
| **SIZE AT MATURITY** | | | | | | | |
| TAXA RICHNESS | | | | | | | |
| Small size at maturity taxa richness | 31 | 35 | 24 | 27 | 27 | 19 | 21 |
| Medium size at maturity taxa richness | 13 | 12 | 7 | 9 | 7 | 5 | 6 |
| Large size at maturity taxa richness | 3 | 3 | 3 | 3 | 4 | 2 | 3 |
| ABUNDANCE | | | | | | | |
| Small size at maturity abundance | 503.97 | 325 | 1081.08 | 552 | 1106.64 | 2175.03 | 1148.4 |
| Medium size at maturity abundance | 37.45 | 46 | 444.99 | 102 | 261 | 193.05 | 365.4 |
| Large size at maturity abundance | 27.75 | 91 | 65.52 | 410 | 95.96 | 2 | 8.83 |
| PERCENTAGE BY ABUNDANCE | | | | | | | |
| % Small size at maturity by abundance | 88.54 | 70.35 | 67.92 | 51.88 | 75.61 | 91.77 | 75.42 |
| % Medium size at maturity by abundance | 6.58 | 9.957 | 27.96 | 9.586 | 17.83 | 8.145 | 24 |
| % Large size at maturity by abundance | 4.876 | 19.7 | 4.117 | 38.53 | 6.556 | 0.08439 | 0.5799 |
| **RHEOPHILY AND HABITAT AFFINITY** | | | | | | | |
| % Depositional only by abundance | 24.63 | 27.27 | 15.44 | 1.128 | 13.55 | 6.878 | 43.2 |
| % Depositional and erosional by abundance | 73.68 | 68.83 | 83.19 | 92.29 | 83.24 | 92.58 | 55.78 |
| % Erosional by abundance | 1.692 | 3.896 | 1.372 | 6.579 | 3.21 | 0.543 | 1.028 |
| **THERMAL PREFERENCE** | | | | | | | |
| % Cold stenothermal and cool eurythermal by abundance | 6.956 | 1.948 | 3.259 | 0 | 0.535 | 1.991 | 17.31 |
| % Cool/warm eurythermal by abundance | 92.86 | 98.05 | 96.4 | 99.44 | 99.47 | 96.92 | 82.69 |
| % Warm eurythermal by abundance | 0.188 | 0 | 0.3431 | 0.5639 | 0 | 1.086 | 0 |

| Waterbody | Battle Creek | Battle Creek | Clark Creek | Pringle Creek | Pringle Creek | Waln Creek | Waln Creek |
|---|---|---|---|---|---|---|---|
| Station | Lower | Upper | Upper | East Fork | Upper | Lower | Upper |
| Date | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 |
| **NON-INSECT AND INSECT ORDERS** | | | | | | | |
| TAXA RICHNESS | | | | | | | |
| Non-insect invertebrates taxa richness | 15 | 13 | 11 | 11 | 12 | 6 | 8 |
| Ephemeroptera (mayflies) taxa richness | 4 | 3 | 1 | 3 | 1 | 1 | 2 |
| Odonata (damsel- and dragonflies) taxa richness | 0 | 0 | 1 | 1 | 0 | 2 | 0 |
| Plecoptera (stoneflies) taxa richness | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Hemiptera (true bugs taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Megaloptera (alderflies and hellgramites) taxa richness | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Trichoptera (caddisflies) taxa richness | 2 | 2 | 2 | 3 | 3 | 0 | 1 |
| Lepidoptera (moths) taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Coleoptera (beetles) taxa richness | 2 | 4 | 0 | 2 | 0 | 0 | 1 |
| Diptera (total)(true flies) taxa richness | 24 | 27 | 19 | 18 | 22 | 17 | 18 |
| Chironomidae (midges) taxa richness | 20 | 22 | 16 | 14 | 19 | 15 | 15 |
| Chironomidae (midges -Nostoc midge) taxa richness | 20 | 22 | 16 | 14 | 19 | 15 | 15 |
| ABUNDANCE | | | | | | | |
| Non-insect invertebrates abundance | 80.18 | 138 | 597.87 | 684 | 766.73 | 412.84 | 207.19 |
| Ephemeroptera (mayflies) abundance | 23.54 | 22 | 60.06 | 76 | 216.63 | 8.58 | 13.05 |
| Odonata (damsel- and dragonflies) abundance | 0 | 0 | 2.73 | 8 | 0 | 5.29 | 0 |
| Plecoptera (stoneflies) abundance | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| Hemiptera (true bugs abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Megaloptera (alderflies and hellgramites) abundance | 0 | 0 | 0 | 2 | 0 | 0 | 0 |
| Trichoptera (caddisflies) abundance | 6.42 | 12 | 92.82 | 38 | 49.59 | 0 | 2.61 |
| Lepidoptera (moths) abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Coleoptera (beetles) abundance | 2.14 | 7 | 0 | 22 | 0 | 0 | 2.61 |
| Diptera (total)(true flies) abundance | 456.89 | 281 | 838.11 | 234 | 430.65 | 1943.37 | 1297.17 |
| Chironomidae (midges) abundance | 444.05 | 257 | 810.81 | 184 | 388.89 | 1909.05 | 1273.68 |
| Chironomidae (midges -Nostoc midge) abundance | 444.05 | 257 | 810.81 | 184 | 388.89 | 1909.05 | 1273.68 |
| PERCENTAGE BY ABUNDANCE | | | | | | | |
| % Non-insect invertebrates by abundance | 14.09 | 29.87 | 37.56 | 64.29 | 52.39 | 17.42 | 13.61 |
| % Ephemeroptera (mayflies) by abundance | 4.136 | 4.762 | 3.774 | 7.143 | 14.8 | 0.362 | 0.8571 |
| % Odonata (damsel- and dragonflies) by abundance | 0 | 0 | 0.1715 | 0.7519 | 0 | 0.2232 | 0 |
| % Plecoptera (stoneflies) by abundance | 0 | 0.4329 | 0 | 0 | 0 | 0 | 0 |
| % Hemiptera (true bugs by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Megaloptera (alderflies and hellgramites) by abundance | 0 | 0 | 0 | 0.188 | 0 | 0 | 0 |
| % Trichoptera (caddisflies) by abundance | 1.128 | 2.597 | 5.832 | 3.571 | 3.388 | 0 | 0.1714 |
| % Lepidoptera (moths) by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Coleoptera (beetles) by abundance | 0.376 | 1.515 | 0 | 2.068 | 0 | 0 | 0.1714 |
| % Diptera (total)(true flies) by abundance | 80.27 | 60.82 | 52.66 | 21.99 | 29.42 | 82 | 85.19 |
| % Chironomidae (midges) by abundance | 78.02 | 55.63 | 50.94 | 17.29 | 26.57 | 80.55 | 83.65 |
| % Chironomidae (midges -Nostoc midge) by abundance | 78.02 | 55.63 | 50.94 | 17.29 | 26.57 | 80.55 | 83.65 |
| **FAMILIES AND GROUPS** | | | | | | | |
| TAXA RICHNESS | | | | | | | |
| Oligochaeta (segmented worms) taxa richness | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

| Waterbody | Battle Creek | Battle Creek | Clark Creek | Pringle Creek | Pringle Creek | Waln Creek | Waln Creek |
|---|---|---|---|---|---|---|---|
| Station | Lower | Upper | Upper | East Fork | Upper | Lower | Upper |
| Date | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 |
| Mollusca (snails and bivalves) taxa richness | 4 | 4 | 5 | 4 | 5 | 2 | 5 |
| Crustacea taxa richness | 3 | 3 | 3 | 2 | 3 | 2 | 1 |
| Acari (mites) taxa richness | 6 | 5 | 1 | 3 | 1 | 0 | 0 |
| Baetidae (mayfly) taxa richness | 2 | 1 | 1 | 2 | 1 | 1 | 1 |
| Baetis tricaudatus (mayfly) taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ephemerellidae (mayfly) taxa richness | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Heptageniidae (mayfly) taxa richness | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Leptohyphidae (mayfly) taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Leptophlebiidae (mayfly) taxa richness | 1 | 1 | 0 | 1 | 0 | 0 | 1 |
| Chloroperlidae (mayfly) taxa richness | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Nemouridae (stonefly) taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Perlidae (stonefly) taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Perlodidae (stonefly) taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Peltoperlidae (stonefly) taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pteronarcyidae (stonefly) taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Brachycentridae (caddisfly) taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Glossosomatidae (caddisfly) taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hydropsychidae (caddisfly) taxa richness | 0 | 1 | 0 | 1 | 1 | 0 | 0 |
| Lepidostomatidae (caddisfly) taxa richness | 2 | 1 | 1 | 1 | 1 | 0 | 1 |
| Limnephilidae (caddisfly) taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Philopotamidae (caddisfly) taxa richness | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Rhyacophilidae (caddisfly) taxa richness | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Uenoidae (caddisfly) taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Elmidae (riffle beetle) taxa richness | 1 | 3 | 0 | 2 | 0 | 0 | 0 |
| Empididae (dance fly) taxa richness | 2 | 1 | 0 | 0 | 0 | 0 | 1 |
| Athericidae (higher flies) taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Simuliidae (black fly) taxa richness | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Tipulidae (crane fly) taxa richness | 1 | 1 | 1 | 0 | 1 | 0 | 1 |
| Chironomidae: Chironominae taxa richness | 8 | 7 | 5 | 4 | 7 | 4 | 4 |
| Tanytarsini taxa richness | 4 | 3 | 2 | 2 | 3 | 2 | 1 |
| Chironomidae: Diamesinae taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Chironomidae: Orthocladiinae taxa richness | 9 | 10 | 7 | 6 | 8 | 6 | 5 |
| Chironomidae: Prodiamesinae taxa richness | 1 | 0 | 1 | 0 | 1 | 1 | 1 |
| Chironomidae: Tanypodinae taxa richness | 1 | 4 | 2 | 3 | 2 | 3 | 4 |
| Cricotopus (Nostococladius) taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ABUNDANCE | | | | | | | |
| Oligochaeta (segmented worms) abundance | 11.77 | 15 | 133.77 | 56 | 107.01 | 51.48 | 96.57 |
| Mollusca (snails and bivalves) abundance | 48.15 | 94 | 270.27 | 596 | 550.71 | 300.3 | 104.4 |
| Crustacea abundance | 5.28 | 10 | 188.37 | 6 | 100.18 | 35.32 | 1 |
| Acari (mites) abundance | 13.91 | 19 | 2.73 | 24 | 5.22 | 0 | 0 |
| Baetidae (mayfly) abundance | 19.26 | 11 | 60.06 | 62 | 216.63 | 8.58 | 10.44 |
| Baetis tricaudatus (mayfly) abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ephemerellidae (mayfly) abundance | 0 | 1 | 0 | 0 | 0 | 0 | 0 |

| Waterbody | Battle Creek | Battle Creek | Clark Creek | Pringle Creek | Pringle Creek | Waln Creek | Waln Creek |
|---|---|---|---|---|---|---|---|
| Station | Lower | Upper | Upper | East Fork | Upper | Lower | Upper |
| Date | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 |
| Heptageniidae (mayfly) abundance | 1.07 | 0 | 0 | 0 | 0 | 0 | 0 |
| Leptohyphidae (mayfly) abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Leptophlebiidae (mayfly) abundance | 3.21 | 10 | 0 | 14 | 0 | 0 | 2.61 |
| Chloroperlidae (mayfly) abundance | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| Nemouridae (stonefly) abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Perlidae (stonefly) abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Perlodidae (stonefly) abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Peltoperlidae (stonefly) abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pteronarcyidae (stonefly) abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Brachycentridae (caddisfly) abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Glossosomatidae (caddisfly) abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hydropsychidae (caddisfly) abundance | 0 | 1 | 0 | 14 | 13.05 | 0 | 0 |
| Lepidostomatidae (caddisfly) abundance | 6.42 | 11 | 90.09 | 8 | 26.1 | 0 | 2.61 |
| Limnephilidae (caddisfly) abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Philopotamidae (caddisfly) abundance | 0 | 0 | 0 | 16 | 0 | 0 | 0 |
| Rhyacophilidae (caddisfly) abundance | 0 | 0 | 2.73 | 0 | 0 | 0 | 0 |
| Uenoidae (caddisfly) abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Elmidae (riffle beetle) abundance | 1.07 | 6 | 0 | 22 | 0 | 0 | 0 |
| Empididae (dance fly) abundance | 2.14 | 1 | 0 | 0 | 0 | 0 | 2.61 |
| Athericidae (higher flies) abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Simuliidae (black fly) abundance | 9.63 | 17 | 19.11 | 40 | 33.93 | 12.87 | 15.66 |
| Tipulidae (crane fly) abundance | 1.07 | 4 | 2.73 | 0 | 5.22 | 0 | 5.22 |
| Chironomidae: Chironominae abundance | 311.37 | 165 | 294.84 | 36 | 245.34 | 1222.65 | 733.41 |
| Tanytarsini abundance | 178.69 | 37 | 128.31 | 32 | 41.76 | 1059.63 | 73.08 |
| Chironomidae: Diamesinae abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Chironomidae: Orthocladiinae abundance | 78.11 | 55 | 273 | 106 | 41.76 | 570.57 | 143.55 |
| Chironomidae: Prodiamesinae abundance | 29.96 | 0 | 51.87 | 0 | 7.83 | 47.19 | 261 |
| Chironomidae: Tanypodinae abundance | 18.19 | 30 | 169.26 | 36 | 70.47 | 55.77 | 112.23 |
| Cricotopus (Nostococladius) abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PERCENTAGE BY ABUNDANCE | | | | | | | |
| % Oligochaeta (segmented worms) by abundance | 2.068 | 3.247 | 8.405 | 5.263 | 7.311 | 2.172 | 6.342 |
| % Mollusca (snails and bivalves) by abundance | 8.46 | 20.35 | 16.98 | 56.02 | 37.63 | 12.67 | 6.857 |
| % Crustacea by abundance | 0.9277 | 2.165 | 11.84 | 0.5639 | 6.845 | 1.49 | 0.06568 |
| % Acari (mites) by abundance | 2.444 | 4.113 | 0.1715 | 2.256 | 0.3567 | 0 | 0 |
| % Baetidae (mayfly) by abundance | 3.384 | 2.381 | 3.774 | 5.827 | 14.8 | 0.362 | 0.6857 |
| % Baetis tricaudatus (mayfly) by abundance | 3.196 | 2.381 | 3.774 | 4.323 | 14.8 | 0.362 | 0.6857 |
| % Ephemerellidae (mayfly) by abundance | 0 | 0.2165 | 0 | 0 | 0 | 0 | 0 |
| % Heptageniidae (mayfly) by abundance | 0.188 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Leptohyphidae (mayfly) by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Leptophlebiidae (mayfly) by abundance | 0.564 | 2.165 | 0 | 1.316 | 0 | 0 | 0.1714 |
| % Chloroperlidae (mayfly) by abundance | 0 | 0.4329 | 0 | 0 | 0 | 0 | 0 |
| % Nemouridae (stonefly) by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Perlidae (stonefly) by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| Waterbody | Battle Creek | Battle Creek | Clark Creek | Pringle Creek | Pringle Creek | Waln Creek | Waln Creek |
|---|---|---|---|---|---|---|---|
| Station | Lower | Upper | Upper | East Fork | Upper | Lower | Upper |
| Date | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 |
| % Perlodidae (stonefly) by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Peltoperlidae (stonefly) by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Pteronarcyidae (stonefly) by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Brachycentridae (caddisfly) by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Glossosomatidae (caddisfly) by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Hydropsychidae (caddisfly) by abundance | 0 | 0.2165 | 0 | 1.316 | 0.8916 | 0 | 0 |
| % Lepidostomatidae (caddisfly) by abundance | 1.128 | 2.381 | 5.66 | 0.7519 | 1.783 | 0 | 0.1714 |
| % Limnephilidae (caddisfly) by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Philopotamidae (caddisfly) by abundance | 0 | 0 | 0 | 1.504 | 0 | 0 | 0 |
| % Rhyacophilidae (caddisfly) by abundance | 0 | 0 | 0.1715 | 0 | 0 | 0 | 0 |
| % Uenoidae (caddisfly) by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Elmidae (riffle beetle) by abundance | 0.188 | 1.299 | 0 | 2.068 | 0 | 0 | 0 |
| % Empididae (dance fly) by abundance | 0.376 | 0.2165 | 0 | 0 | 0 | 0 | 0.1714 |
| % Athericidae (higher flies) by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Simuliidae (black fly) by abundance | 1.692 | 3.68 | 1.201 | 3.759 | 2.318 | 0.543 | 1.028 |
| % Tipulidae (crane fly) by abundance | 0.188 | 0.8658 | 0.1715 | 0 | 0.3567 | 0 | 0.3428 |
| % Chironomidae: Chironominae by abundance | 54.71 | 35.71 | 18.52 | 3.383 | 16.76 | 51.59 | 48.17 |
| % Tanytarsini by abundance | 31.39 | 8.009 | 8.062 | 3.008 | 2.853 | 44.71 | 4.8 |
| % Chironomidae: Diamesinae by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Chironomidae: Orthocladiinae by abundance | 13.72 | 11.9 | 17.15 | 9.962 | 2.853 | 24.07 | 9.428 |
| % Chironomidae: Prodiamesinae by abundance | 5.264 | 0 | 3.259 | 0 | 0.535 | 1.991 | 17.14 |
| % Chironomidae: Tanypodinae by abundance | 3.196 | 6.494 | 10.63 | 3.383 | 4.815 | 2.353 | 7.371 |
| % Cricotopus (Nostococladius) by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **FEEDING GROUPS** | | | | | | | |
| TAXA RICHNESS | | | | | | | |
| Predator taxa richness | 6 | 9 | 4 | 8 | 5 | 6 | 6 |
| Parasite taxa richness | 7 | 5 | 2 | 3 | 2 | 0 | 1 |
| Collector-gatherer taxa richness | 22 | 23 | 17 | 16 | 17 | 14 | 12 |
| Collector-filterer taxa richness | 4 | 4 | 3 | 6 | 4 | 3 | 2 |
| Collector (total) taxa richness | 26 | 27 | 20 | 22 | 21 | 17 | 14 |
| Piercer herbivore taxa richness | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Macrophyte herbivore taxa richness | 0 | 1 | 1 | 1 | 1 | 0 | 1 |
| Shredder taxa richness | 3 | 3 | 2 | 2 | 2 | 0 | 2 |
| Caddisfly shredder taxa richness | 2 | 1 | 1 | 1 | 1 | 0 | 1 |
| Stonefly shredder taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wood-eating taxa richness | 2 | 1 | 0 | 1 | 0 | 0 | 0 |
| Scraper taxa richness | 3 | 3 | 4 | 2 | 4 | 2 | 4 |
| Omnivore taxa richness | 2 | 2 | 1 | 2 | 2 | 1 | 2 |
| Unknown feeding group taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ABUNDANCE | | | | | | | |
| Predator abundance | 29.96 | 39 | 174.72 | 52 | 76.69 | 86.8 | 117.45 |
| Parasite abundance | 14.98 | 19 | 5.46 | 24 | 7.83 | 0 | 5.22 |
| Collector-gatherer abundance | 313.51 | 147 | 889.98 | 286 | 542.88 | 1638.78 | 866.52 |

| Waterbody | Battle Creek | Battle Creek | Clark Creek | Pringle Creek | Pringle Creek | Waln Creek | Waln Creek |
|---|---|---|---|---|---|---|---|
| Station | Lower | Upper | Upper | East Fork | Upper | Lower | Upper |
| Date | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 |
| Collector-filterer abundance | 60.99 | 26 | 199.29 | 124 | 125.28 | 553.41 | 99.18 |
| Collector (total) abundance | 374.5 | 173 | 1089.27 | 410 | 668.16 | 2192.19 | 965.7 |
| Piercer herbivore abundance | 0 | 0 | 0 | 0 | 10.44 | 0 | 0 |
| Macrophyte herbivore abundance | 0 | 13 | 10.92 | 2 | 31.32 | 0 | 5.22 |
| Shredder abundance | 7.49 | 19 | 92.82 | 12 | 31.32 | 0 | 7.83 |
| Caddisfly shredder abundance | 6.42 | 11 | 90.09 | 8 | 26.1 | 0 | 2.61 |
| Stonefly shredder abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wood-eating taxa abundance | 2.14 | 4 | 0 | 4 | 0 | 0 | 0 |
| Scraper abundance | 115.56 | 112 | 158.34 | 156 | 548.1 | 90.09 | 417.6 |
| Omnivore abundance | 26.68 | 87 | 60.06 | 408 | 89.74 | 1 | 3.61 |
| Unknown feeding group abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PERCENTAGE BY ABUNDANCE | | | | | | | |
| % Predator by abundance | 5.264 | 8.442 | 10.98 | 4.887 | 5.24 | 3.662 | 7.714 |
| % Parasite by abundance | 2.632 | 4.113 | 0.3431 | 2.256 | 0.535 | 0 | 0.3428 |
| % Collector-gatherer by abundance | 55.08 | 31.82 | 55.92 | 26.88 | 37.09 | 69.14 | 56.91 |
| % Collector-filterer by abundance | 10.72 | 5.628 | 12.52 | 11.65 | 8.56 | 23.35 | 6.514 |
| % Collector (total) by abundance | 65.8 | 37.45 | 68.44 | 38.53 | 45.65 | 92.49 | 63.42 |
| % Piercer herbivore by abundance | 0 | 0 | 0 | 0 | 0.7133 | 0 | 0 |
| % Macrophyte herbivore by abundance | 0 | 2.814 | 0.6861 | 0.188 | 2.14 | 0 | 0.3428 |
| % Shredder by abundance | 1.316 | 4.113 | 5.832 | 1.128 | 2.14 | 0 | 0.5142 |
| % Caddisfly shredder by abundance | 1.128 | 2.381 | 5.66 | 0.7519 | 1.783 | 0 | 0.1714 |
| % Stonefly shredder by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Wood-eating taxa by abundance | 0.376 | 0.8658 | 0 | 0.3759 | 0 | 0 | 0 |
| % Scraper by abundance | 20.3 | 24.24 | 9.949 | 14.66 | 37.45 | 3.801 | 27.43 |
| % Omnivore by abundance | 4.688 | 18.83 | 3.774 | 38.35 | 6.131 | 0.04219 | 0.2371 |
| % Unknown feeding group by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**HABIT**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| TAXA RICHNESS | | | | | | | |
| Skater taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Planktonic taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diver taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Swimmer taxa richness | 8 | 7 | 4 | 5 | 3 | 2 | 0 |
| Clinger taxa richness | 13 | 13 | 11 | 13 | 14 | 9 | 11 |
| Sprawler taxa richness | 14 | 21 | 9 | 14 | 12 | 8 | 10 |
| Climber taxa richness | 3 | 2 | 3 | 3 | 1 | 2 | 2 |
| Burrower taxa richness | 9 | 7 | 7 | 4 | 8 | 5 | 7 |
| Unknown habit taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ABUNDANCE | | | | | | | |
| Skater abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Planktonic abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diver abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Swimmer abundance | 18.19 | 24 | 193.83 | 32 | 104.4 | 55.77 | 0 |
| Clinger abundance | 381.99 | 276 | 439.53 | 734 | 984.97 | 1488.63 | 532.44 |

| Waterbody | Battle Creek | Battle Creek | Clark Creek | Pringle Creek | Pringle Creek | Waln Creek | Waln Creek |
|---|---|---|---|---|---|---|---|
| Station | Lower | Upper | Upper | East Fork | Upper | Lower | Upper |
| Date | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 |
| Sprawler abundance | 78.04 | 110 | 442.26 | 166 | 115.84 | 335.62 | 254.17 |
| Climber abundance | 7.49 | 15 | 95.55 | 18 | 26.1 | 5.29 | 5.22 |
| Burrower abundance | 83.46 | 37 | 420.42 | 114 | 232.29 | 484.77 | 730.8 |
| Unknown habit abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PERCENTAGE BY ABUNDANCE | | | | | | | |
| % Skater by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Planktonic by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Diver by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Swimmer by abundance | 3.196 | 5.195 | 12.18 | 3.008 | 7.133 | 2.353 | 0 |
| % Clinger by abundance | 67.11 | 59.74 | 27.62 | 68.98 | 67.3 | 62.81 | 34.97 |
| % Sprawler by abundance | 13.71 | 23.81 | 27.79 | 15.6 | 7.915 | 14.16 | 16.69 |
| % Climber by abundance | 1.316 | 3.247 | 6.003 | 1.692 | 1.783 | 0.2232 | 0.3428 |
| % Burrower by abundance | 14.66 | 8.009 | 26.42 | 10.71 | 15.87 | 20.45 | 48 |
| % Unknown habit by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **STATE OF CALIFORNIA DESIGNATIONS** | | | | | | | |
| CA % Sensitive EPT | 1.316 | 3.03 | 5.832 | 2.256 | 1.783 | 0 | 0.1714 |
| CA % Intolerant individuals | 2.444 | 5.411 | 6.518 | 1.504 | 1.783 | 0.905 | 0.1714 |
| CA % Tolerant individuals | 10.15 | 11.04 | 16.47 | 7.707 | 7.915 | 22.26 | 26.05 |
| CA weighted tolerance value | 6.38 | 6.21 | 5.75 | 6.2 | 6.03 | 6.9 | 6.54 |
| CA % Predators | 7.896 | 12.55 | 11.32 | 7.143 | 5.775 | 3.662 | 8.056 |
| CA % Collector-gatherers | 52.83 | 24.46 | 44.94 | 24.62 | 36.02 | 64.8 | 50.05 |
| CA % Filterers | 10.53 | 5.411 | 12.52 | 11.09 | 8.56 | 23.35 | 6.514 |
| CA % Scrapers | 24.82 | 42.64 | 13.72 | 52.82 | 43.51 | 3.801 | 27.6 |
| CA % Shredders | 3.008 | 9.091 | 14.58 | 1.88 | 3.032 | 0.362 | 5.828 |
| **BIOTIC CONDITION INDEX** | | | | | | | |
| CTQa- Community Tolerance Quotient actual | 97.4 | 98.26 | 99.53 | 98.41 | 102.79 | 103.85 | 98.17 |
| CTQd-Community Tolerance Quotient dominance | 102.62 | 97.66 | 100.85 | 97.13 | 101.31 | 106.53 | 103.19 |

# Benthic Invertebrate Index of Biological Integrity-BIBI (modified Karr 1998)

**OR: Pacific Habitat Services, Salem, OR area streams.**

Sampling method: qualitative dip net through multiple habitats, 500 micron mesh.

Subsampling: 500 organism minimum or entire sample. PNAMP level 2 standard taxonomic effort.

Abundances are relative, adjusted to a full sample basis.

| | Waterbody | Battle Creek | | Battle Creek | | Clark Creek | | Pringle Creek | |
|---|---|---|---|---|---|---|---|---|---|
| | Location | Lower | | Upper | | Upper | | East Fork | |
| | Date | 6/5/2017 | | 6/5/2017 | | 6/5/2017 | | 6/5/2017 | |
| | METRIC | Value | Score | Value | Score | Value | Score | Value | Score |
| D | Total number of taxa | 47 | 5 | 50 | 5 | 34 | 3 | 39 | 3 |
| D | Number Ephemeroptera taxa | 4 | 1 | 3 | 1 | 1 | 1 | 3 | 1 |
| D | Number Plecoptera taxa | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 |
| D | Number Trichoptera taxa | 2 | 1 | 2 | 1 | 2 | 1 | 3 | 1 |
| D | Number of long-lived taxa | 3 | 3 | 5 | 5 | 3 | 3 | 5 | 5 |
| D | Number of intolerant taxa | 2 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| I | % Tolerant taxa | 18 | 5 | 32 | 3 | 27 | 3 | 62 | 1 |
| D | % Predator | 5.3 | 1 | 8.4 | 1 | 11 | 3 | 4.9 | 1 |
| D | Number of clinger taxa | 13 | 3 | 13 | 3 | 11 | 3 | 13 | 3 |
| I | % Dominance (3 taxa) | 51 | 3 | 49 | 5 | 32 | 5 | 57 | 3 |
| | TOTAL SCORE | | 24 | | 26 | | 24 | | 20 |
| | BIOLOGICAL CONDITION CATEGORY | | | | | | | | |

Maximum score of 50. Each metric scored: 1=low, 3=moderate, 5=high

**OTHER COMMUNITY COMPOSITION METRICS THAT ARE INDICATIVE OF BIOLOGICAL CONDITION**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total abundance (m2) | 569 | | 462 | | 1592 | | 1064 | |
| D | EPT taxa richness | 6 | | 6 | | 3 | | 6 | |
| D | Predator richness | 6 | | 9 | | 4 | | 8 | |
| D | Scraper richness | 3 | | 3 | | 4 | | 2 | |
| D | Shredder richness | 3 | | 3 | | 2 | | 2 | |
| D | %Intolerant taxa | 6.8 | | 2.2 | | 3.2 | | 0 | |
| I | *% Baetis tricaudatus complex* | 3.2 | | 2.4 | | 3.8 | | 4.3 | |
| I | %Collector | 66 | | 38 | | 68 | | 39 | |
| I | %Parasite | 2.6 | | 4.1 | | 0.3 | | 2.3 | |
| I | %Oligochaeta | 2.1 | | 3.3 | | 8.4 | | 5.3 | |
| I | Number tolerant taxa | 16 | | 15 | | 12 | | 15 | |
| I | %Simuliidae | 1.7 | | 3.7 | | 1.2 | | 3.8 | |
| I | %Chironomidae | 78 | | 56 | | 51 | | 17 | |

L,M & H comparisons with a Pacific Northwest montane stream with high biological integrity.

I= Metric value generally increases with declining biological integrity.

D= Metric value generally decreases with declining biological integrity.

| | | |
|---|---|---|
| L= Low biological integrity. | | BIBI scores between 0-24. |
| M= Moderate biological integrity. | | BIBI scores between 25-39. |
| H= High biological integrity. | | BIBI scores >40. |

# Benthic Invertebrate Index of Biological Integrity-BIBI (modified Karr 1998)

**OR: Pacific Habitat Services, Salem, OR area streams.**

Sampling method: qualitative dip net through multiple habitats, 500 micron mesh.

Subsampling: 500 organism minimum or entire sample. PNAMP level 2 standard taxonomic effort.

Abundances are relative, adjusted to a full sample basis.

| | | | | |
|---|---|---|---|---|
| **Waterbody** | **Pringle Creek** | **Waln Creek** | **Waln Creek** | |
| **Location** | **Upper** | **Lower** | **Upper** | |
| **Date** | **6/5/2017** | **6/5/2017** | **6/5/2017** | |

| | **METRIC** | **Value** | **Score** | **Value** | **Score** | **Value** | **Score** | **Value** | **Score** |
|---|---|---|---|---|---|---|---|---|---|
| **D** | **Total number of taxa** | 38 | 3 | 26 | 3 | 30 | 3 | | |
| **D** | **Number Ephemeroptera taxa** | 1 | 1 | 1 | 1 | 2 | 1 | | |
| **D** | **Number Plecoptera taxa** | 0 | 1 | 0 | 1 | 0 | 1 | | |
| **D** | **Number Trichoptera taxa** | 3 | 1 | 0 | 1 | 1 | 1 | | |
| **D** | **Number of long-lived taxa** | 5 | 5 | 2 | 1 | 4 | 3 | | |
| **D** | **Number of intolerant taxa** | 0 | 1 | 0 | 1 | 0 | 1 | | |
| **I** | **% Tolerant taxa** | 59 | 1 | 18 | 5 | 23 | 3 | | |
| **D** | **% Predator** | 5.2 | 1 | 3.7 | 1 | 7.7 | 1 | | |
| **D** | **Number of clinger taxa** | 14 | 3 | 9 | 1 | 11 | 3 | | |
| **I** | **% Dominance (3 taxa)** | 52 | 3 | 57 | 3 | 60 | 3 | | |
| | **TOTAL SCORE** | | **20** | | **18** | | **20** | | **0** |
| | **BIOLOGICAL CONDITION CATEGORY** | | | | | | | | |

Maximum score of 50. Each metric scored: 1=low, 3=moderate, 5=high

**OTHER COMMUNITY COMPOSITION METRICS THAT ARE INDICATIVE OF BIOLOGICAL CONDITION**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Total abundance (m2)** | 1464 | | 2370 | | 1523 | | | |
| **D** | **EPT taxa richness** | 4 | | 1 | | 3 | | | |
| **D** | **Predator richness** | 5 | | 6 | | 6 | | | |
| **D** | **Scraper richness** | 4 | | 2 | | 4 | | | |
| **D** | **Shredder richness** | 2 | | 0 | | 2 | | | |
| **D** | **%Intolerant taxa** | 0.5 | | 2 | | 17.3 | | | |
| **I** | ***% Baetis tricaudatus*** | 14.8 | | 0.4 | | 0.7 | | | |
| **I** | **%Collector** | 46 | | 93 | | 63 | | | |
| **I** | **%Parasite** | 0.5 | | 0 | | 0.3 | | | |
| **I** | **%Oligochaeta** | 7.3 | | 2.2 | | 6.3 | | | |
| **I** | **Number tolerant taxa** | 16 | | 10 | | 9 | | | |
| **I** | **%Simuliidae** | 2.3 | | 0.5 | | 1 | | | |
| **I** | **%Chironomidae** | 27 | | 81 | | 84 | | | |

L,M & H comparisons with a Pacific Northwest montane stream with high biological integrity.

I= Metric value generally increases with declining biological integrity.

D= Metric value generally decreases with declining biological integrity.

| | | |
|---|---|---|
| L= Low biological integrity. | | BIBI scores between 0-24. |
| M= Moderate biological integrity. | | BIBI scores between 25-39. |
| H= High biological integrity. | | BIBI scores >40. |

**Abundances and biomass (mg) converted to a standard full sample (if subsampled) and one square meter basis.**

| | | | | | | | Waterbody | Battle Creek | Battle Creek | Clark Creek | Pringle Creek | Pringle Creek | Waln Creek | Waln Creek |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Station | Lower | Upper | Upper | East Fork | Upper | Lower | Upper |
| | | | | | | | Date | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 |
| Taxon | Stage | Insect? | Origin | Higher classification | Order | Family | Common name | Abundance | Abundance | Abundance | Abundance | Abundance | Abundance | Abundance |
| Trepaxonemata | U | non-insect | Aquatic | Turbellaria | miscellaneous non-insect | x | flat worms | | | | 2 | | 25.74 | |
| Nemata | U | non-insect | Aquatic | Nemata | miscellaneous non-insect | x | round worms | 1.07 | | 2.73 | | 2.61 | | 5.22 |
| Oligochaeta | U | non-insect | Aquatic | Annelida: Oligochaeta | miscellaneous non-insect | x | segmented worms | 11.77 | 15 | 133.77 | 56 | 107.01 | 51.48 | 96.57 |
| Erpobdella | U | non-insect | Aquatic | Annelida: Hirudinea | miscellaneous non-insect | Erpobdellidae | leeches | | | | | 1 | | |
| Fluminicola | U | non-insect | Aquatic | Mollusca: Gastropoda | x | Hydrobiidae | snails | | | 27.3 | 140 | 386.28 | | 2.61 |
| Ferrissia | U | non-insect | Aquatic | Mollusca: Gastropoda | x | Planorbidae | snails | | 1 | | | 2.61 | | 2.61 |
| Gyraulus | U | non-insect | Aquatic | Mollusca: Gastropoda | x | Planorbidae | snails | 1.07 | | | | | | |
| Menetus | U | non-insect | Aquatic | Mollusca: Gastropoda | x | Planorbidae | snails | | | 5.46 | | | | 13.05 |
| Promenetus | U | non-insect | Aquatic | Mollusca: Gastropoda | x | Planorbidae | snails | | | 2.73 | | 2.61 | 4.29 | |
| Juga | U | non-insect | Aquatic | Mollusca: Gastropoda | x | Pleuroceridae | snails | 25.68 | 85 | 60.06 | 404 | 88.74 | | 2.61 |
| Pisidium | U | non-insect | Aquatic | Mollusca: Bivalvia | x | Sphaeriidae | pea clams | 20.33 | 7 | 174.72 | 46 | 70.47 | 296.01 | 83.52 |
| Sphaerium | U | non-insect | Aquatic | Mollusca: Bivalvia | x | Sphaeriidae | pea clams | 1.07 | 1 | | 6 | | | |
| Ostracoda | U | non-insect | Aquatic | Crustacea: Ostracoda | x | x | seed shrimp | | | 5.46 | | 2.61 | | |
| Crangonyx | U | non-insect | Aquatic | Crustacea: Amphipoda | x | Crangonyctidae | scuds | 3.21 | 4 | 180.18 | | 96.57 | 34.32 | |
| Caecidotea | U | non-insect | Aquatic | Crustacea: Isopoda | x | Asellidae | aquatic sow bugs | 1.07 | 4 | 2.73 | 2 | | | |
| Pacifastacus | U | non-insect | Aquatic | Crustacea: Decapoda | x | Astacidae | crayfish | 1 | 2 | | 4 | 1 | 1 | 1 |
| Atractides | U | non-insect | Aquatic | Arachnida: Acari | x | x | mites | 3.21 | 12 | | | | | |
| Lebertia | U | non-insect | Aquatic | Arachnida: Acari | x | x | mites | 3.21 | 2 | | 2 | | | |
| Midea | U | non-insect | Aquatic | Arachnida: Acari | x | x | mites | 2.14 | | | 20 | | | |
| Oribatida | U | non-insect | Aquatic | Arachnida: Acari | x | x | mites | 1.07 | 1 | 2.73 | | | | |
| Sperchon | U | non-insect | Aquatic | Arachnida: Acari | x | x | mites | 1.07 | 2 | | | 5.22 | | |
| Sperchonopsis | U | non-insect | Aquatic | Arachnida: Acari | x | x | mites | 3.21 | 2 | | 2 | | | |
| Aeshna | L | insect | Aquatic | Arthropoda: Insecta | Odonata | Aeshnidae | dragonflies | | | | | | 1 | |
| Argia | L | insect | Aquatic | Arthropoda: Insecta | Odonata | Coenagrionidae | damselflies | | | 2.73 | 8 | | | |
| Coenagrion/Enallagma | L | insect | Aquatic | Arthropoda: Insecta | Odonata | Coenagrionidae | damselflies | | | | | | 4.29 | |
| Baetis tricaudatus complex | L | insect | Aquatic | Arthropoda: Insecta | Ephemeroptera | Baetidae | mayflies | 18.19 | 11 | 60.06 | 46 | 216.63 | 8.58 | 10.44 |
| Labiobaetis | L | insect | Aquatic | Arthropoda: Insecta | Ephemeroptera | Baetidae | mayflies | 1.07 | | | 16 | | | |
| Ephemerella tibialis | L | insect | Aquatic | Arthropoda: Insecta | Ephemeroptera | Ephemerellidae | mayflies | | 1 | | | | | |
| Cinygma | L | insect | Aquatic | Arthropoda: Insecta | Ephemeroptera | Heptageniidae | mayflies | 1.07 | | | | | | |
| Paraleptophlebia | L | insect | Aquatic | Arthropoda: Insecta | Ephemeroptera | Leptophlebiidae | mayflies | 3.21 | 10 | | 14 | | | 2.61 |
| Chloroperlidae | L | insect | Aquatic | Arthropoda: Insecta | Plecoptera | Chloroperlidae | stoneflies | | 2 | | | | | |
| Sialis | L | insect | Aquatic | Arthropoda: Insecta | Megaloptera | Sialidae | alderflies | | | | 2 | | | |
| Cheumatopsyche | L | insect | Aquatic | Arthropoda: Insecta | Trichoptera | Hydropsychidae | caddisflies | | | | 14 | 13.05 | | |
| Hydropsyche | L | insect | Aquatic | Arthropoda: Insecta | Trichoptera | Hydropsychidae | caddisflies | | 1 | | | | | |
| Hydroptila | L | insect | Aquatic | Arthropoda: Insecta | Trichoptera | Hydroptilidae | caddisflies | | | | | 10.44 | | |
| Lepidostoma-panel case larvae | L | insect | Aquatic | Arthropoda: Insecta | Trichoptera | Lepidostomatidae | caddisflies | 5.35 | 11 | 90.09 | 8 | 26.1 | | 2.61 |
| Lepidostoma-turret case larvae | L | insect | Aquatic | Arthropoda: Insecta | Trichoptera | Lepidostomatidae | caddisflies | 1.07 | | | | | | |
| Wormaldia | L | insect | Aquatic | Arthropoda: Insecta | Trichoptera | Philopotamidae | caddisflies | | | | 16 | | | |
| Rhyacophila brunnea/vemna group | L | insect | Aquatic | Arthropoda: Insecta | Trichoptera | Rhyacophilidae | caddisflies | | | 2.73 | | | | |
| Dytiscidae | A | insect | Aquatic | Arthropoda: Insecta | Coleoptera | Dytiscidae | predaceous diving beetles | 1.07 | | | | | | |
| Cleptelmis addenda | L | insect | Aquatic | Arthropoda: Insecta | Coleoptera | Elmidae | riffle beetles | | 1 | | | | | |
| Lara | L | insect | Aquatic | Arthropoda: Insecta | Coleoptera | Elmidae | riffle beetles | 1.07 | 4 | | 4 | | | |
| Optioservus | A | insect | Aquatic | Arthropoda: Insecta | Coleoptera | Elmidae | riffle beetles | | | | 2 | | | |
| Optioservus | L | insect | Aquatic | Arthropoda: Insecta | Coleoptera | Elmidae | riffle beetles | | 1 | | 16 | | | |
| Gyrinus | L | insect | Aquatic | Arthropoda: Insecta | Coleoptera | Gyrinidae | whirligig beetles | | | | | | | 2.61 |
| Ametor | L | insect | Aquatic | Arthropoda: Insecta | Coleoptera | Hydrophilidae | water scavenger beetles | | 1 | | | | | |
| Ceratopogoninae | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Ceratopogonidae | no-see-um midges | | 1 | | | 2.61 | | |
| Dixa | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Dixidae | dixid midges | | 1 | | 2 | | | |
| Dixella | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Dixidae | dixid midges | | | 5.46 | 6 | | 21.45 | |
| Empididae | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Empididae | dance flies | | 1 | | | | | |
| Empididae | P | insect | Aquatic | Arthropoda: Insecta | Diptera | Empididae | dance flies | 1.07 | | | | | | |
| Trichoclinocera | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Empididae | dance flies | 1.07 | | | | | | 2.61 |
| Muscidae | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Muscidae | higher flies | | | | 2 | | | |
| Simulium | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Simuliidae | black flies | 9.63 | 17 | 19.11 | 40 | 33.93 | 12.87 | 15.66 |
| Pedicia | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Tipulidae | crane flies | 1.07 | | | | | | |
| Tipula | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Tipulidae | crane flies | | 4 | 2.73 | | 5.22 | | 5.22 |
| Chironomidae | P | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae | midges | 6.42 | 7 | 21.84 | 6 | 23.49 | 12.87 | 23.49 |
| Ablabesmyia | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Tanypodinae | midges | | 1 | | | | | |
| Brillia | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | 9.63 | 23 | 139.23 | 8 | 13.05 | 8.58 | 80.91 |
| Chironomus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae | midges | 7.49 | | 32.76 | | 13.05 | 77.22 | 255.78 |
| Cladopelma | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae | midges | 4.28 | | | | | | |
| Corynoneura | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | | 3 | 32.76 | 4 | | 120.12 | 10.44 |
| Cricotopus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | 23.54 | | | | | 180.18 | 5.22 |
| Cricotopus bicinctus group | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | 11.77 | | | | | 111.54 | |
| Cricotopus trifascia group | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | | | | | 2.61 | | |
| Cryptochironomus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae | midges | 7.49 | 4 | | 2 | 2.61 | | |
| Eukiefferiella brehmi group | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | | | | 16 | | | |
| Eukiefferiella claripennis group | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | 4.28 | 12 | 35.49 | 4 | 2.61 | 94.38 | 23.49 |
| Heterotrissocladius marcidus group | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | 4.28 | 7 | | | | | |
| Limnophyes | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | 4.28 | 1 | 5.46 | | 10.44 | 55.77 | |
| Metriocnemus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | | | | | 2.61 | | |
| Micropsectra | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae: Tanytarsini | midges | 144.45 | 30 | 122.85 | 30 | 31.32 | 815.1 | 73.08 |
| Paramerina | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Tanypodinae | midges | | 11 | | 2 | | 30.03 | 10.44 |

| | | | | | | | Waterbody | Battle Creek | Battle Creek | Clark Creek | Pringle Creek | Pringle Creek | Waln Creek | Waln Creek |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Station | Lower | Upper | Upper | East Fork | Upper | Lower | Upper |
| | | | | | | | Date | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 |
| Taxon | Stage | Insect? | Origin | Higher classification | Order | Family | Common name | Abundance | Abundance | Abundance | Abundance | Abundance | Abundance | Abundance |
| Parametriocnemus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | 7.49 | 1 | 27.3 | 62 | 2.61 | | |
| Paraphaenocladius | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | 6.42 | | | | | | |
| Paratanytarsus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae: Tanytarsini | midges | 29.96 | | | 2 | | 244.53 | |
| Phaenopsectra | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae | midges | 113.42 | 110 | 122.85 | | 156.6 | 85.8 | 399.33 |
| Polypedilum | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae | midges | | 13 | 10.92 | 2 | 31.32 | | 5.22 |
| Procladius | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Tanypodinae | midges | | | 10.92 | 2 | 10.44 | | 23.49 |
| Prodiamesa | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Prodiamesinae | midges | 29.96 | | 51.87 | | 7.83 | 47.19 | 261 |
| Psectrotanypus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Tanypodinae | midges | | | | | | 8.58 | |
| Rheocricotopus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | 6.42 | 4 | 27.3 | | 2.61 | | 23.49 |
| Rheotanytarsus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae: Tanytarsini | midges | | | 5.46 | | 7.83 | | |
| Stempellina | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae: Tanytarsini | midges | 2.14 | 2 | | | | | |
| Stempellinella | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae: Tanytarsini | midges | 2.14 | 5 | | | 2.61 | | |
| Stenochironomus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae | midges | | 1 | | | | | |
| Synorthocladius | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | | 1 | 5.46 | | | | |
| Thienemanniella | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | | 1 | | | | | |
| Thienemannimyia complex | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Tanypodinae | midges | 18.19 | 15 | 158.34 | 32 | 60.03 | 17.16 | 67.86 |
| Tvetenia bavarica group | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | | 2 | | 12 | 5.22 | | |
| Zavrelimyia | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Tanypodinae | midges | | 3 | | | | | 10.44 |

**Abundances and biomass (mg) converted to a standard full sample (if subsampled) and one square meter basis.**

| | | | | | | | Waterbody | Battle Creek | Battle Creek | Clark Creek | Pringle Creek | Pringle Creek | Waln Creek | Waln Creek |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Station | Lower | Upper | Upper | East Fork | Upper | Lower | Upper |
| | | | | | | | Date | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 |
| Taxon | Stage | Insect? | Origin | Higher classification | Order | Family | Common name | % abundance | % abundance | % abundance | % abundance | % abundance | % abundance | % abundance |
| Trepaxonemata | U | non-insect | Aquatic | Turbellaria | miscellaneous non-insect | x | flat worms | | | | 0.188 | | 1.086 | |
| Nemata | U | non-insect | Aquatic | Nemata | miscellaneous non-insect | x | round worms | 0.188 | | 0.1715 | | 0.1783 | | 0.3428 |
| Oligochaeta | U | non-insect | Aquatic | Annelida: Oligochaeta | miscellaneous non-insect | x | segmented worms | 2.068 | 3.247 | 8.405 | 5.263 | 7.311 | 2.172 | 6.342 |
| Erpobdella | U | non-insect | Aquatic | Annelida: Hirudinea | miscellaneous non-insect | Erpobdellidae | leeches | | | | | 0.06832 | | |
| Fluminicola | U | non-insect | Aquatic | Mollusca: Gastropoda | x | Hydrobiidae | snails | | | 1.715 | 13.16 | 26.39 | | 0.1714 |
| Ferrissia | U | non-insect | Aquatic | Mollusca: Gastropoda | x | Planorbidae | snails | | 0.2165 | | | 0.1783 | | 0.1714 |
| Gyraulus | U | non-insect | Aquatic | Mollusca: Gastropoda | x | Planorbidae | snails | 0.188 | | | | | | |
| Menetus | U | non-insect | Aquatic | Mollusca: Gastropoda | x | Planorbidae | snails | | | 0.3431 | | | | 0.8571 |
| Promenetus | U | non-insect | Aquatic | Mollusca: Gastropoda | x | Planorbidae | snails | | | 0.1715 | | 0.1783 | 0.181 | |
| Juga | U | non-insect | Aquatic | Mollusca: Gastropoda | x | Pleuroceridae | snails | 4.512 | 18.4 | 3.774 | 37.97 | 6.063 | | 0.1714 |
| Pisidium | U | non-insect | Aquatic | Mollusca: Bivalvia | x | Sphaeriidae | pea clams | 3.572 | 1.515 | 10.98 | 4.323 | 4.815 | 12.49 | 5.485 |
| Sphaerium | U | non-insect | Aquatic | Mollusca: Bivalvia | x | Sphaeriidae | pea clams | 0.188 | 0.2165 | | 0.5639 | | | |
| Ostracoda | U | non-insect | Aquatic | Crustacea: Ostracoda | x | x | seed shrimp | | | 0.3431 | | 0.1783 | | |
| Crangonyx | U | non-insect | Aquatic | Crustacea: Amphipoda | x | Crangonyctidae | scuds | 0.564 | 0.8658 | 11.32 | | 6.598 | 1.448 | |
| Caecidotea | U | non-insect | Aquatic | Crustacea: Isopoda | x | Asellidae | aquatic sow bugs | 0.188 | 0.8658 | 0.1715 | 0.188 | | | |
| Pacifastacus | U | non-insect | Aquatic | Crustacea: Decapoda | x | Astacidae | crayfish | 0.1757 | 0.4329 | | 0.3759 | 0.06832 | 0.04219 | 0.06568 |
| Atractides | U | non-insect | Aquatic | Arachnida: Acari | x | x | mites | 0.564 | 2.597 | | | | | |
| Lebertia | U | non-insect | Aquatic | Arachnida: Acari | x | x | mites | 0.564 | 0.4329 | | 0.188 | | | |
| Midea | U | non-insect | Aquatic | Arachnida: Acari | x | x | mites | 0.376 | | | 1.88 | | | |
| Oribatida | U | non-insect | Aquatic | Arachnida: Acari | x | x | mites | 0.188 | 0.2165 | 0.1715 | | | | |
| Sperchon | U | non-insect | Aquatic | Arachnida: Acari | x | x | mites | 0.188 | 0.4329 | | | 0.3567 | | |
| Sperchonopsis | U | non-insect | Aquatic | Arachnida: Acari | x | x | mites | 0.564 | 0.4329 | | 0.188 | | | |
| Aeshna | L | insect | Aquatic | Arthropoda: Insecta | Odonata | Aeshnidae | dragonflies | | | | | | 0.04219 | |
| Argia | L | insect | Aquatic | Arthropoda: Insecta | Odonata | Coenagrionidae | damselflies | | | 0.1715 | 0.7519 | | | |
| Coenagrion/Enallagma | L | insect | Aquatic | Arthropoda: Insecta | Odonata | Coenagrionidae | damselflies | | | | | | 0.181 | |
| Baetis tricaudatus complex | L | insect | Aquatic | Arthropoda: Insecta | Ephemeroptera | Baetidae | mayflies | 3.196 | 2.381 | 3.774 | 4.323 | 14.8 | 0.362 | 0.6857 |
| Labiobaetis | L | insect | Aquatic | Arthropoda: Insecta | Ephemeroptera | Baetidae | mayflies | 0.188 | | | 1.504 | | | |
| Ephemerella tibialis | L | insect | Aquatic | Arthropoda: Insecta | Ephemeroptera | Ephemerellidae | mayflies | | 0.2165 | | | | | |
| Cinygma | L | insect | Aquatic | Arthropoda: Insecta | Ephemeroptera | Heptageniidae | mayflies | 0.188 | | | | | | |
| Paraleptophlebia | L | insect | Aquatic | Arthropoda: Insecta | Ephemeroptera | Leptophlebiidae | mayflies | 0.564 | 2.165 | | 1.316 | | | 0.1714 |
| Chloroperlidae | L | insect | Aquatic | Arthropoda: Insecta | Plecoptera | Chloroperlidae | stoneflies | | 0.4329 | | | | | |
| Sialis | L | insect | Aquatic | Arthropoda: Insecta | Megaloptera | Sialidae | alderflies | | | | 0.188 | | | |
| Cheumatopsyche | L | insect | Aquatic | Arthropoda: Insecta | Trichoptera | Hydropsychidae | caddisflies | | | | 1.316 | 0.8916 | | |
| Hydropsyche | L | insect | Aquatic | Arthropoda: Insecta | Trichoptera | Hydropsychidae | caddisflies | | 0.2165 | | | | | |
| Hydroptila | L | insect | Aquatic | Arthropoda: Insecta | Trichoptera | Hydroptilidae | caddisflies | | | | | 0.7133 | | |
| Lepidostoma-panel case larvae | L | insect | Aquatic | Arthropoda: Insecta | Trichoptera | Lepidostomatidae | caddisflies | 0.94 | 2.381 | 5.66 | 0.7519 | 1.783 | | 0.1714 |
| Lepidostoma-turret case larvae | L | insect | Aquatic | Arthropoda: Insecta | Trichoptera | Lepidostomatidae | caddisflies | 0.188 | | | | | | |
| Wormaldia | L | insect | Aquatic | Arthropoda: Insecta | Trichoptera | Philopotamidae | caddisflies | | | | 1.504 | | | |
| Rhyacophila brunnea/vemna group | L | insect | Aquatic | Arthropoda: Insecta | Trichoptera | Rhyacophilidae | caddisflies | | | 0.1715 | | | | |
| Dytiscidae | A | insect | Aquatic | Arthropoda: Insecta | Coleoptera | Dytiscidae | predaceous diving beetles | 0.188 | | | | | | |
| Cleptelmis addenda | L | insect | Aquatic | Arthropoda: Insecta | Coleoptera | Elmidae | riffle beetles | | 0.2165 | | | | | |
| Lara | L | insect | Aquatic | Arthropoda: Insecta | Coleoptera | Elmidae | riffle beetles | 0.188 | 0.8658 | | 0.3759 | | | |
| Optioservus | A | insect | Aquatic | Arthropoda: Insecta | Coleoptera | Elmidae | riffle beetles | | | | 0.188 | | | |
| Optioservus | L | insect | Aquatic | Arthropoda: Insecta | Coleoptera | Elmidae | riffle beetles | | 0.2165 | | 1.504 | | | |
| Gyrinus | L | insect | Aquatic | Arthropoda: Insecta | Coleoptera | Gyrinidae | whirligig beetles | | | | | | | 0.1714 |
| Ametor | L | insect | Aquatic | Arthropoda: Insecta | Coleoptera | Hydrophilidae | water scavenger beetles | | 0.2165 | | | | | |
| Ceratopogoninae | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Ceratopogonidae | no-see-um midges | | 0.2165 | | | 0.1783 | | |
| Dixa | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Dixidae | dixid midges | | 0.2165 | | 0.188 | | | |
| Dixella | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Dixidae | dixid midges | | | 0.3431 | 0.5639 | | 0.905 | |
| Empididae | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Empididae | dance flies | | 0.2165 | | | | | |
| Empididae | P | insect | Aquatic | Arthropoda: Insecta | Diptera | Empididae | dance flies | 0.188 | | | | | | |
| Trichoclinocera | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Empididae | dance flies | 0.188 | | | | | | 0.1714 |
| Muscidae | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Muscidae | higher flies | | | | 0.188 | | | |
| Simulium | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Simuliidae | black flies | 1.692 | 3.68 | 1.201 | 3.759 | 2.318 | 0.543 | 1.028 |
| Pedicia | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Tipulidae | crane flies | 0.188 | | | | | | |
| Tipula | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Tipulidae | crane flies | | 0.8658 | 0.1715 | | 0.3567 | | 0.3428 |
| Chironomidae | P | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae | midges | 1.128 | 1.515 | 1.372 | 0.5639 | 1.605 | 0.543 | 1.543 |
| Ablabesmyia | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Tanypodinae | midges | | 0.2165 | | | | | |
| Brillia | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | 1.692 | 4.978 | 8.748 | 0.7519 | 0.8916 | 0.362 | 5.314 |
| Chironomus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae | midges | 1.316 | | 2.058 | | 0.8916 | 3.258 | 16.8 |
| Cladopelma | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae | midges | 0.752 | | | | | | |
| Corynoneura | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | | 0.6494 | 2.058 | 0.3759 | | 5.068 | 0.6857 |
| Cricotopus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | 4.136 | | | | | 7.602 | 0.3428 |
| Cricotopus bicinctus group | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | 2.068 | | | | | 4.706 | |
| Cricotopus trifascia group | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | | | | | 0.1783 | | |
| Cryptochironomus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae | midges | 1.316 | 0.8658 | | 0.188 | 0.1783 | | |
| Eukiefferiella brehmi group | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | | | | 1.504 | | | |
| Eukiefferiella claripennis group | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | 0.752 | 2.597 | 2.23 | 0.3759 | 0.1783 | 3.982 | 1.543 |
| Heterotrissocladius marcidus group | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | 0.752 | 1.515 | | | | | |
| Limnophyes | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | 0.752 | 0.2165 | 0.3431 | | 0.7133 | 2.353 | |
| Metriocnemus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | | | | | 0.1783 | | |
| Micropsectra | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae: Tanytarsini | midges | 25.38 | 6.494 | 7.719 | 2.82 | 2.14 | 34.39 | 4.8 |
| Paramerina | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Tanypodinae | midges | | 2.381 | | 0.188 | | 1.267 | 0.6857 |
| Parametriocnemus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | 1.316 | 0.2165 | 1.715 | 5.827 | 0.1783 | | |
| Paraphaenocladius | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | 1.128 | | | | | | |
| Paratanytarsus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae: Tanytarsini | midges | 5.264 | | | 0.188 | | 10.32 | |

| | | | | | | | Waterbody | Battle Creek | Battle Creek | Clark Creek | Pringle Creek | Pringle Creek | Waln Creek | Waln Creek |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Station | Lower | Upper | Upper | East Fork | Upper | Lower | Upper |
| | | | | | | | Date | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 |
| Taxon | Stage | Insect? | Origin | Higher classification | Order | Family | Common name | % abundance | % abundance | % abundance | % abundance | % abundance | % abundance | % abundance |
| Phaenopsectra | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae | midges | 19.93 | 23.81 | 7.719 | | 10.7 | 3.62 | 26.23 |
| Polypedilum | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae | midges | | 2.814 | 0.6861 | 0.188 | 2.14 | | 0.3428 |
| Procladius | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Tanypodinae | midges | | | 0.6861 | 0.188 | 0.7133 | | 1.543 |
| Prodiamesa | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Prodiamesinae | midges | 5.264 | | 3.259 | | 0.535 | 1.991 | 17.14 |
| Psectrotanypus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Tanypodinae | midges | | | | | | 0.362 | |
| Rheocricotopus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | 1.128 | 0.8658 | 1.715 | | 0.1783 | | 1.543 |
| Rheotanytarsus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae: Tanytarsini | midges | | | 0.3431 | | 0.535 | | |
| Stempellina | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae: Tanytarsini | midges | 0.376 | 0.4329 | | | | | |
| Stempellinella | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae: Tanytarsini | midges | 0.376 | 1.082 | | | 0.1783 | | |
| Stenochironomus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae | midges | | 0.2165 | | | | | |
| Synorthocladius | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | | 0.2165 | 0.3431 | | | | |
| Thienemanniella | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | | 0.2165 | | | | | |
| Thienemannimyia complex | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Tanypodinae | midges | 3.196 | 3.247 | 9.949 | 3.008 | 4.102 | 0.724 | 4.457 |
| Tvetenia bavarica group | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | | 0.4329 | | 1.128 | 0.3567 | | |
| Zavrelimyia | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Tanypodinae | midges | | 0.6494 | | | | | 0.6857 |

APPENDIX B. CITY OF SALEM CAPITAL IMPROVEMENT PLAN FY 2017-2022 (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 2017-18 | FY 2018-19 | FY 2019-20 | FY 2020-21 | FY 2021-22 | Total |
|---|---|---|---|---|---|---|
| Utility Rates | 1,991,000 | 805,000 | 2,645,000 | 2,016,000 | 4,300,000 | 11,757,000 |
| Total: | $ 1,991,000 | $ 805,000 | $ 2,645,000 | $ 2,016,000 | $ 4,300,000 | $ 11,757,000 |

**Stormwater Project Details**

| | | | |
|---|---|---|---|
| Project Number: | 0000183 | Score: | 49.25 |
| Category: | Stormwater | Ward: | 1 |
| Neighborhood: | Highland Neighborhood Association | | |
| Title: | Broadway Street NE and Columbia Street NE - Stormwater Improvements | | |

| Funding Source | FY 2017-18 | FY 2018-19 | FY 2019-20 | FY 2020-21 | FY 2021-22 | Total |
|---|---|---|---|---|---|---|
| Utility Rates | 1,346,000 | - | - | - | - | 1,346,000 |
| Current CIP Total: | $ 1,346,000 | $ - | $ - | $ - | $ - | $ 1,346,000 |

| | |
|---|---|
| Amount Funded in Prior Years: | 320,000 |
| Total Estimated Project Cost: | $ 1,666,000 |

Design and construction for the replacement of 465 linear feet of undersized 8-inch pipe with 10-inch pipe on Broadway St NE from Academy St NE to Columbia Ave NE and replacement of 1,900 linear feet of undersized pipe on Columbia St NE between Broadway St NE and Water St NE.

| | | | | | | |
|---|---|---|---|---|---|---|
| Project Number: | 0000217 | | | | Score: | 48.25 |
| Category: | Stormwater | | | | Ward: | 2 |
| Neighborhood: | Southeast Mill Creek Association (SEMCA) | | | | | |
| Title: | Center Street Pipe Relocation Phase A and B | | | | | |

| **Funding Source** | **FY 2017-18** | **FY 2018-19** | **FY 2019-20** | **FY 2020-21** | **FY 2021-22** | **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: | 44.25 |
| Category: | Stormwater | | | | Ward: | 2 |
| Neighborhood: | South Central Association of Neighbors (SCAN) | | | | | |
| Title: | Cedar Way SE Stormwater Improvements | | | | | |

| **Funding Source** | **FY 2017-18** | **FY 2018-19** | **FY 2019-20** | **FY 2020-21** | **FY 2021-22** | **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 conveyance and infiltration facilities to address neighborhood drainage issues.

| | | | | | | |
|---|---|---|---|---|---|---|
| Project Number: | 0000219 | | | | Score: | 62.75 |
| Category: | Stormwater | | | | Ward: | 7 |
| Neighborhood: | Sunnyslope Neighborhood Association | | | | | |
| Title: | McKay Drive S Stormwater Improvements | | | | | |

| **Funding Source** | **FY 2017-18** | **FY 2018-19** | **FY 2019-20** | **FY 2020-21** | **FY 2021-22** | **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 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 2017-18** | **FY 2018-19** | **FY 2019-20** | **FY 2020-21** | **FY 2021-22** | **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 NE Storm Pipeline Replacement | | | | | |

| **Funding Source** | **FY 2017-18** | **FY 2018-19** | **FY 2019-20** | **FY 2020-21** | **FY 2021-22** | **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 pipe on Woodrow St NE between the Union Pacific railroad track and Fairgrounds Rd NE.

| | | | | | | |
|---|---|---|---|---|---|---|
| Project Number: | 0000506 | | | | Score: | 66.75 |
| Category: | Stormwater | | | | Ward: | All |
| Neighborhood: | City-Wide | | | | | |
| Title: | Implementation of DEQ Retrofit Plan | | | | | |

| **Funding Source** | **FY 2017-18** | **FY 2018-19** | **FY 2019-20** | **FY 2020-21** | **FY 2021-22** | **Total** |
|---|---|---|---|---|---|---|
| Utility Rates | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 | 500,000 |
| Current CIP Total: | $ 100,000 | $ 100,000 | $ 100,000 | $ 100,000 | $ 100,000 | $ 500,000 |

| | |
|---|---|
| Amount Funded in Prior Years: | 200,000 |
| Total Estimated Project Cost: | $ 700,000 |

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: | 66.75 |
| Category: | Stormwater | Ward: | 3 |
| Neighborhood: | Faye Wright Neighborhood Association | | |
| Title: | Total Maximum Daily Load (TMDL) Implementation Plan Projects | | |

| **Funding Source** | **FY 2017-18** | **FY 2018-19** | **FY 2019-20** | **FY 2020-21** | **FY 2021-22** | **Total** |
|---|---|---|---|---|---|---|
| Utility Rates | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 | 500,000 |
| Current CIP Total: | $ 100,000 | $ 100,000 | $ 100,000 | $ 100,000 | $ 100,000 | $ 500,000 |

| | |
|---|---|
| Amount Funded in Prior Years: | 100,000 |
| Total Estimated Project Cost: | $ 600,000 |

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 2017-18** | **FY 2018-19** | **FY 2019-20** | **FY 2020-21** | **FY 2021-22** | **Total** |
|---|---|---|---|---|---|---|
| Utility Rates | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 | 500,000 |
| Current CIP Total: | $ 100,000 | $ 100,000 | $ 100,000 | $ 100,000 | $ 100,000 | $ 500,000 |

| | |
|---|---|
| Amount Funded in Prior Years: | 140,000 |
| Total Estimated Project Cost: | $ 640,000 |

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: | 0000544 | Score: | 70.5 |
| Category: | Stormwater | Ward: | All |
| Neighborhood: | City-Wide | | |
| Title: | Battle Creek Stormwater Master Plan Improvements | | |

| **Funding Source** | **FY 2017-18** | **FY 2018-19** | **FY 2019-20** | **FY 2020-21** | **FY 2021-22** | **Total** |
|---|---|---|---|---|---|---|
| Utility Rates | - | - | 275,000 | 550,000 | 2,500,000 | 3,325,000 |
| Current CIP Total: | $ - | $ - | $ 275,000 | $ 550,000 | $ 2,500,000 | $ 3,325,000 |

| | |
|---|---|
| Amount Funded in Prior Years: | - |
| Total Estimated Project Cost: | $ 3,325,000 |

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 | | | | Score: | 70.5 |
| Category: | Stormwater | | | | Ward: | All |
| Neighborhood: | City-Wide | | | | | |
| Title: | Mill and Pringle Creeks Stormwater Master Plan Improvements | | | | | |

| **Funding Source** | **FY 2017-18** | **FY 2018-19** | **FY 2019-20** | **FY 2020-21** | **FY 2021-22** | **Total** |
|---|---|---|---|---|---|---|
| Utility Rates | - | - | 275,000 | 550,000 | 1,500,000 | 2,325,000 |
| Current CIP Total: | $ - | $ - | $ 275,000 | $ 550,000 | $ 1,500,000 | $ 2,325,000 |

| | |
|---|---|
| Amount Funded in Prior Years: | - |
| Total Estimated Project Cost: | $ 2,325,000 |

Design and construction of stormwater improvement projects as identified in the Stormwater Master Plan for the Mill Creek 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: | 0000557 | | | | | |
| Category: | Stormwater | | | | Ward: | 2 |
| Neighborhood: | South East Salem Neighborhood Association (SESNA) | | | | | |
| Title: | McGilchrist Street SE Corridor Improvements | | | | | |

| **Funding Source** | **FY 2017-18** | **FY 2018-19** | **FY 2019-20** | **FY 2020-21** | **FY 2021-22** | **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 |

Design, right-of-way acquisition, and construction funding for stormwater improvements associated with improving McGilchrist St SE to minor arterial standards. Work also includes replacing stream crossing structures at the east and west forks of Pringle Creek. This project will be designed and constructed in conjunction with CIP 0000554; McGilchrist Corridor Improvements.

# 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 2017/2018

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

**November 1, 2018**

## Table of Contents



## List of Figures

(All Figures follow text of this document)



## List of Tables

(All Tables follow Figures of this document)

# List of Attachments

# 1.0 Introduction

This document provides all monitoring data collected for the reporting year of July 1, 2017, to June 30, 2018 (RY 2017/18), 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 2017/18 is provided below, and all collected data are provided in the attached tables and figures.

# 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).

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 ($BOD_{stream}$)

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

- 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, PRI5 only)
- 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** – this year saw a decrease in the number of exceedances of the 406 MPN/100mL single sample criterion.
- **Dissolved Oxygen** – 19 of 24 sampling site dissolved oxygen medians were higher than the previous year.
- **Copper** – there were less exceedances of the water quality standard for Copper than last reporting year.
- **Lead** – no exceedances of the Lead water quality standard occurred this reporting year.
- **Zinc** – there were more exceedances of the Zinc water quality standard than last year.
- **Nitrate & Nitrite** – medians for RY 2017/18 were generally lower than last reporting year.
- **BOD** – 66% of sampling sites saw higher monthly median values than last year.
- **Specific Conductivity** – results were similar to last year.
- **pH** – results trended lower than last reporting year.
- **Turbidity** – for the second year in a row, turbidity saw a significant decrease in results overall.
- **Rainfall** – this reporting year saw less rainfall observed in the 24 hours prior to sample collection than last year, and only 3 of 11 of the sampling days had seen measurable rainfall in the preceding 24 hours.

## 2.2 Continuous Instream Monitoring

The City maintains a network of Continuous Instream water quality monitoring stations and stream gauging stations on seven different urban streams within the city. There are currently ten water quality and stream gauging stations and three stream gauge-only stations (SHE3, PRI4 and LPW1) within city limits. The City added two new stream gauge-only stations for reporting year 2017/18, and they will be operating for next reporting year. Figure 1 identifies the location of each of the existing stations.

The monitoring stations for this monitoring element are positioned in an upstream/downstream configuration. The upstream stations are adjacent to where the stream enters the City and the downstream stations 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.** 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.

## 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 2017/2018, staff captured two storm events.**

## 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.

**For reporting year 2017/2018, no storm events were captured.**

## 2.5 Pesticide Monitoring

Staff collected one sample for the pesticide monitoring element for RY 2017/2018 during the spring. 2,4-D (herbicide) and Triclopyr (herbicide) were detected at the residential land use site; Carbaryl (insecticide) was detected at the commercial land use site; and Propiconazole (fungicide), Tebuconazole (fungicide), DCPMU (algicide and herbicide), and Diuron (algicide and herbicide) were detected at the industrial land use site.

**The analytical lab report from Pacific Agricultural Laboratory is provided as Attachment B.**

## 2.6 Macroinvertebrate Monitoring

The City utilized a consultant, Pacific Habitat Services, to collect benthic macroinvertebrates samples, fish samples, and physical habitat data on Pringle Creek, East Fork Pringle Creek, and Clark Creek during late summer 2017.

**The technical memo of the results is provided as Attachment C.**

## 2.7 Priority Dry Weather Outfall/Manhole Screening

The RY 2017/2018 dry weather outfall screening effort included a total of 38 outfall inspections (outfall structures or the first available upstream manhole). In total, 22 structures (outfalls and manholes) received analytical sampling as part of this inspection program. Of these 22 structures:

- 16 had detections for total chlorine (7 of these detections had total chlorine concentrations above 0.05 mg/L),

- 5 had concentrations of fluoride exceeding the action level (0.1 mg/L),
- 1 had a specific conductivity exceeding the action limit (250 µS/cm), and
- 5 had E. coli concentrations exceeding the action limit (406 MPN/100mL).

In general, if total chlorine results were below 0.05 mg/L, fluoride, detergents/surfactants, ammonia, potassium, sodium, and E. coli parameters were not analyzed unless physical indicators presented evidence of a potentially illicit discharge. Fluoride was not collected at all locations where chlorine was detected because the City's drinking water treatment plant was not fluorinating water at the time of the inspection or the fluoride dosage was variable. Due to ongoing bacteria issues in Clark Creek, all flowing outfalls in the Clark Creek basin were sampled for E. coli regardless of analytical screening results.
Based upon outfall inspection results:

- 13 pipesheds were investigated based upon the results of outfall inspections,
- 3 pipesheds had outfalls that received analytical sampling, but were not investigated because the pipeshed is characterized as having allowable discharges, and
- 1 pipeshed was not completed due to arrival of wet weather.

As part of these pipeshed investigations, a total of 4 additional structures received analytical confirmation sampling to identify the origin of flow.
Observational data collected at outfalls and subsequent pipeshed investigations revealed 1 illicit discharge (OERS reporting number 2018-0355) from leaking sanitary sewer laterals at South Salem High School (laterals have since been repaired) and 3 water main leaks. A pipeshed investigation for outfall D42480223, draining to the Willamette River, revealed potential exfiltration/infiltration from a damaged sewer main into a storm main. While a dye test did not indicate a positive connection, the sewer main is being lined due to consistently elevated bacteria results at outfall D42480223. The outfall and repair location will continue to be monitored to evaluate the impact of the repair.
Field screening parameters for RY 2017/2018 included temperature (outfall and receiving water), pH, specific conductivity, turbidity, total chlorine, fluoride, detergents/surfactants, and ammonia and were analyzed using a multi-parameter colorimeter and multi-parameter data sonde. Laboratory parameters included Potassium, Sodium, and E. coli and were analyzed by the City's laboratory at the Willow Lake Waste Water Treatment Plant.
Of the 38 outfalls inspected, 33 were identified in the City of Salem's *Dry Weather Outfall and Illicit Discharge Screening Plan*. The additional outfalls were inspected based upon Stream Crew reports of dry-weather flow and 1 outfall was inspected opportunistically due to its proximity to 2 existing priority outfalls. Two outfalls listed in the City of Salem's *Dry Weather Outfall and Illicit Discharge Screening Plan* are no longer inspected, outfall D48486207, which was determined to be a culvert structure above an existing priority outfall and D42456216, which requires confined space entry.
In addition to the priority outfall inspections detailed above, the City's Stream Cleaning Crew utilized a custom GIS smart phone application to document physical inspections of outfalls with dry weather flow over the course of 47.83 stream miles that they inspected. The crew documented a total of 78 outfalls with dry weather flow. Of these 78 outfalls, 4 received follow-up inspections with analytical sampling (listed above). The other 74 outfalls will be reviewed for possible inclusion in the City of Salem's *Dry Weather Outfall and Illicit Discharge Screening Plan* and used as data inputs for selecting future priority outfalls. No outfalls had physical indicators of an illicit discharge.

**Data for this monitoring element are provided as an Attachment A at the end of this document.**

# 3.0 Conclusion

The City continues to meet all monitoring requirements of its administratively extended MS4 Permit. 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.

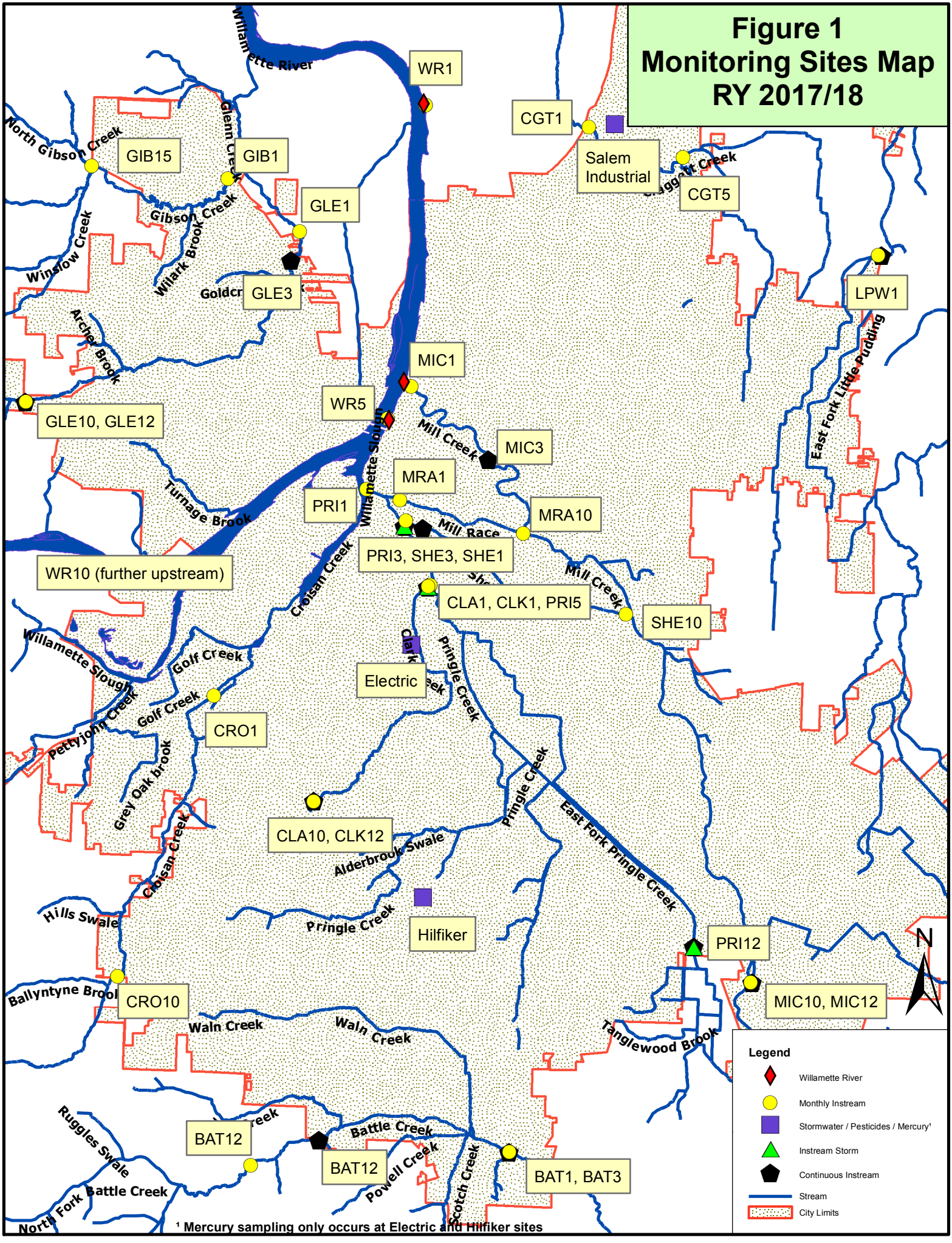
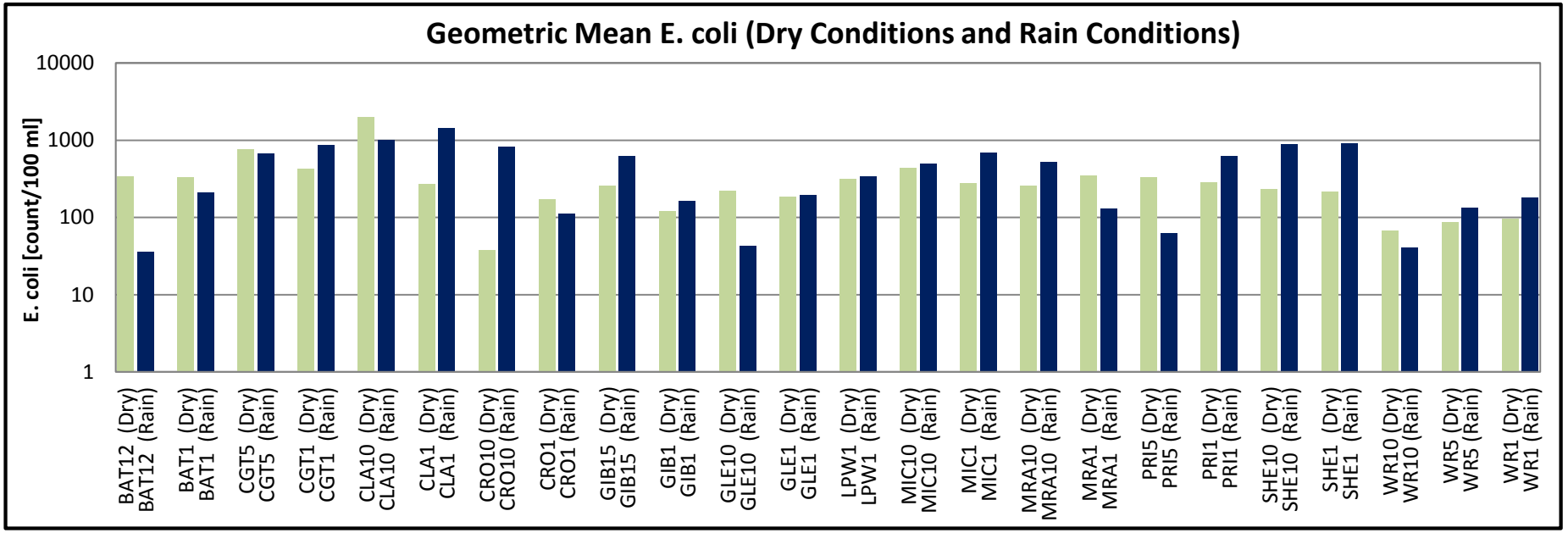
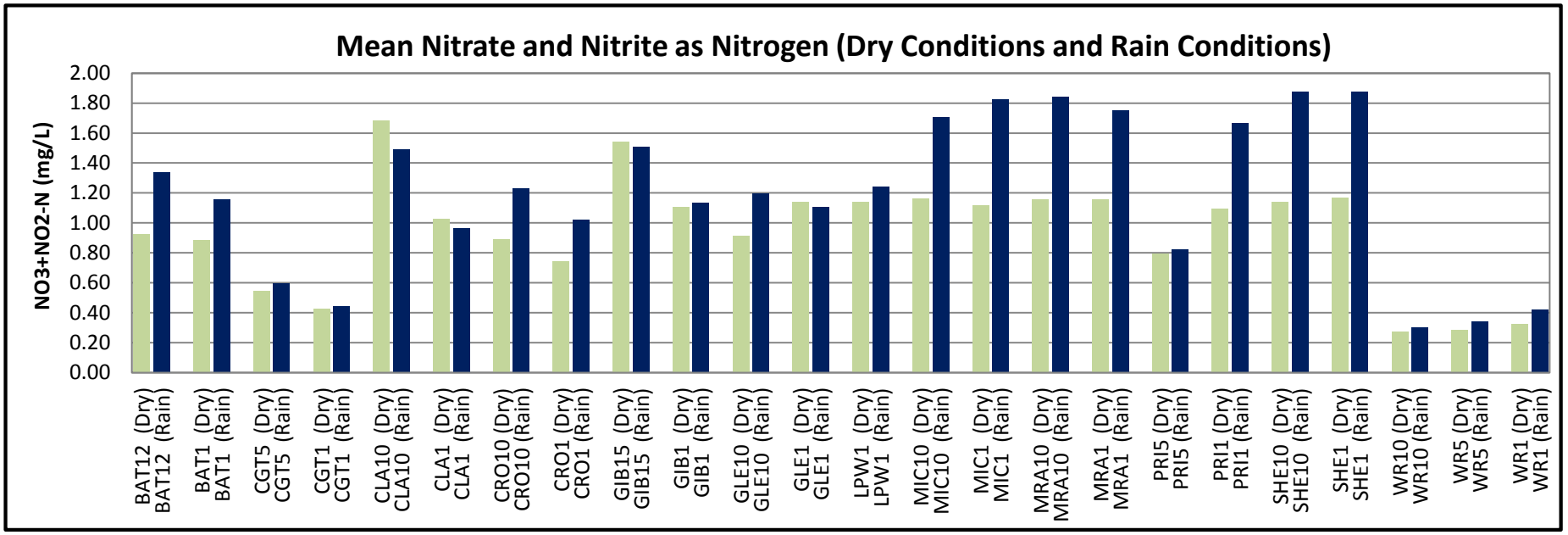


Figure 1
Monitoring Sites Map
RY 2017/18
Willamette River
WR1
CGT1
Salem Industrial
CGT5
GIB15
GIB1
GLE1
GLE3
LPW1
MIC1
WR5
MIC3
GLE10, GLE12
MRA1
PRI1
MRA10
PRI3, SHE3, SHE1
WR10 (further upstream)
CLA1, CLK1, PRI5
SHE10
Electric
CRO1
CLA10, CLK12
Hilfiker
PRI12
MIC10, MIC12
CRO10
BAT12
BAT12
BAT1, BAT3
North Gibson Creek
Gibson Creek
Glenn Creek
Winslow Creek
Wilark Brook
Archer Brook
Turnage Brook
Willamette Slough
Mill Creek
Mill Race
Croisan Creek
Pringle Creek
East Fork Little Pudding
Golf Creek
Pettyjohn Creek
Grey Oak brook
Alderbrook Swale
East Fork Pringle Creek
Hills Swale
Ballyntyne Brook
Waln Creek
Tanglewood Brook
Ruggles Swale
Battle Creek
Powell Creek
Scotch Creek
North Fork Battle Creek
N
Legend
Willamette River
Monthly Instream
Stormwater / Pesticides / Mercury¹
Instream Storm
Continuous Instream
Stream
City Limits
¹ Mercury sampling only occurs at Electric and Hilfiker sites

Figure 2

Monthly Instream Mean Value Comparison for Dry and Rain Conditions (Reporting Year 2017/2018)

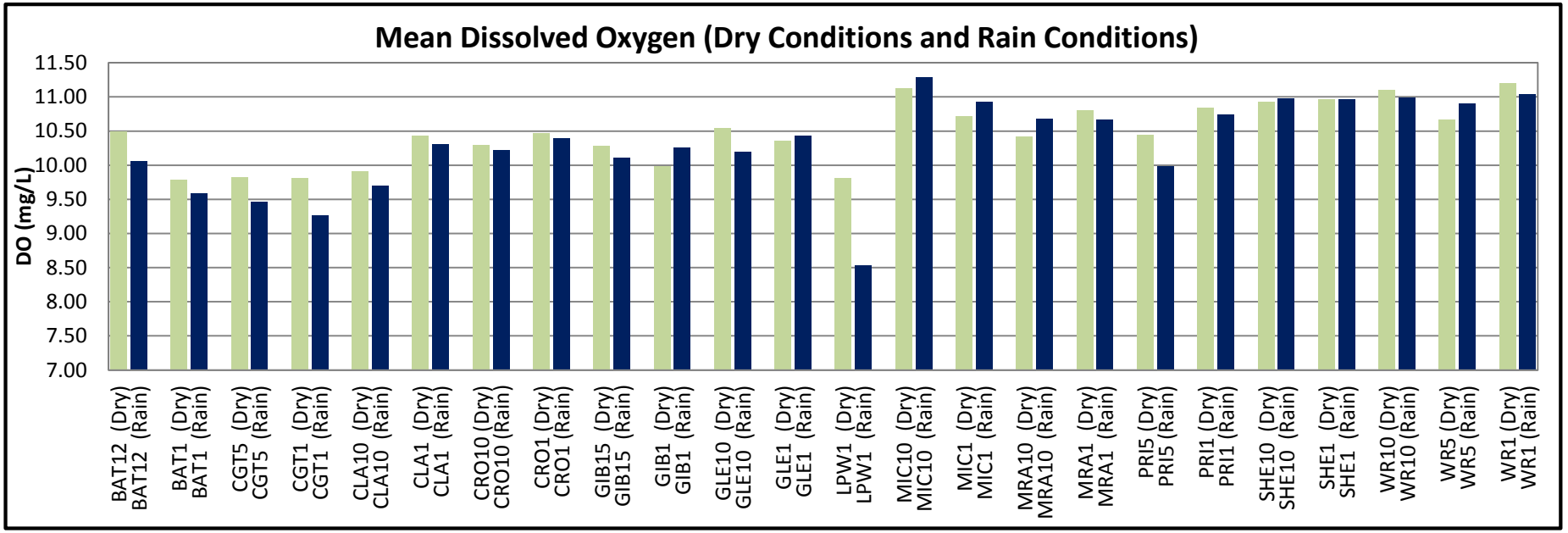


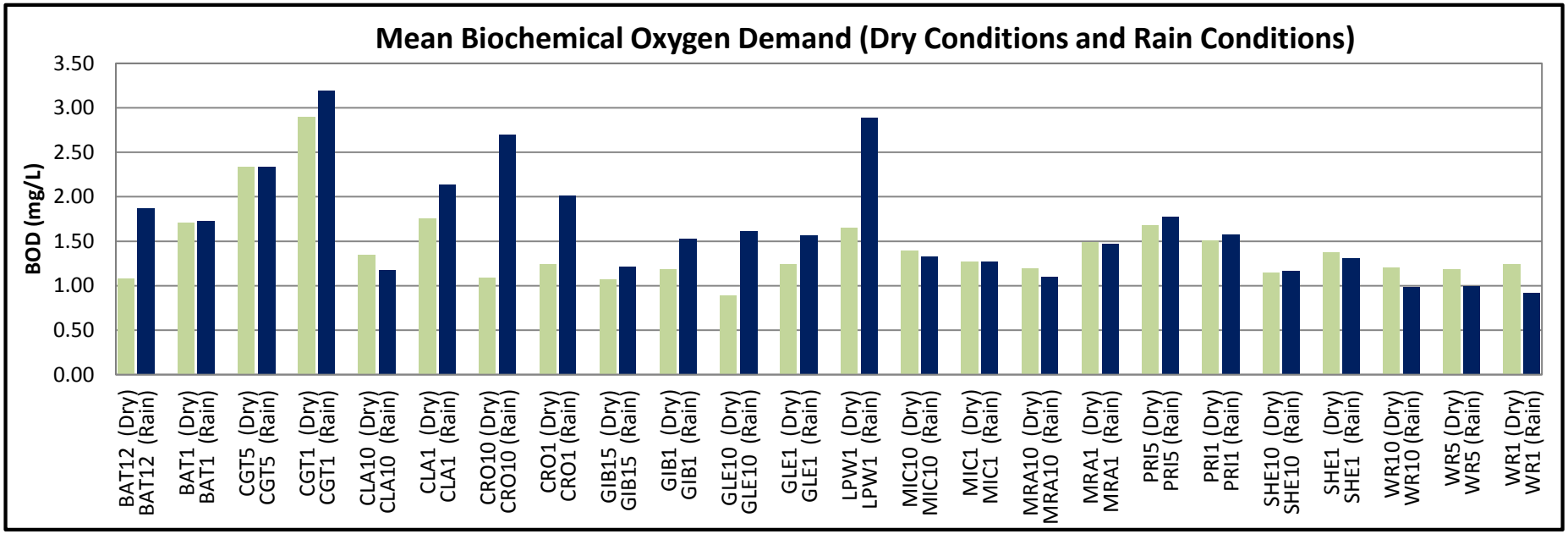




**Dry** conditions defined as less than 0.05 inches of rainfall in the 24 hours prior to sample collection; **rain** conditions defined as greater than or equal to 0.05 inches of rainfall in the 24 hours prior to sample collection.

Figure 2

Monthly Instream Mean Value Comparison for Dry and Rain Conditions (Reporting Year 2017/2018)

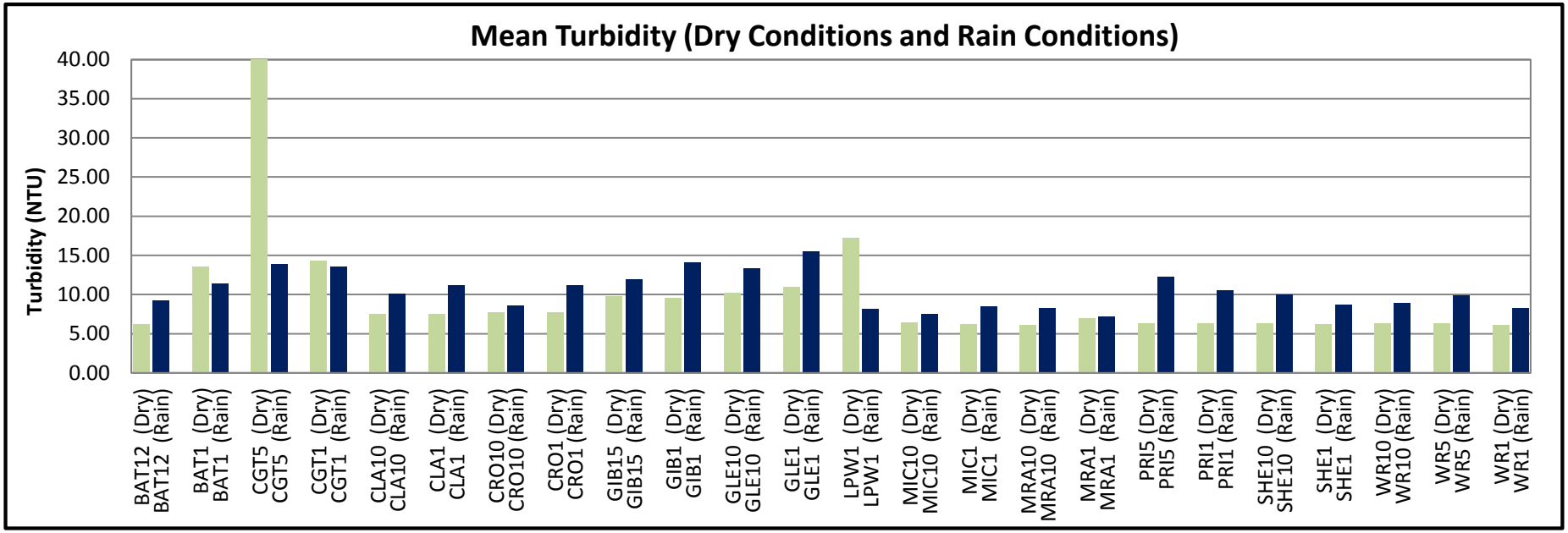


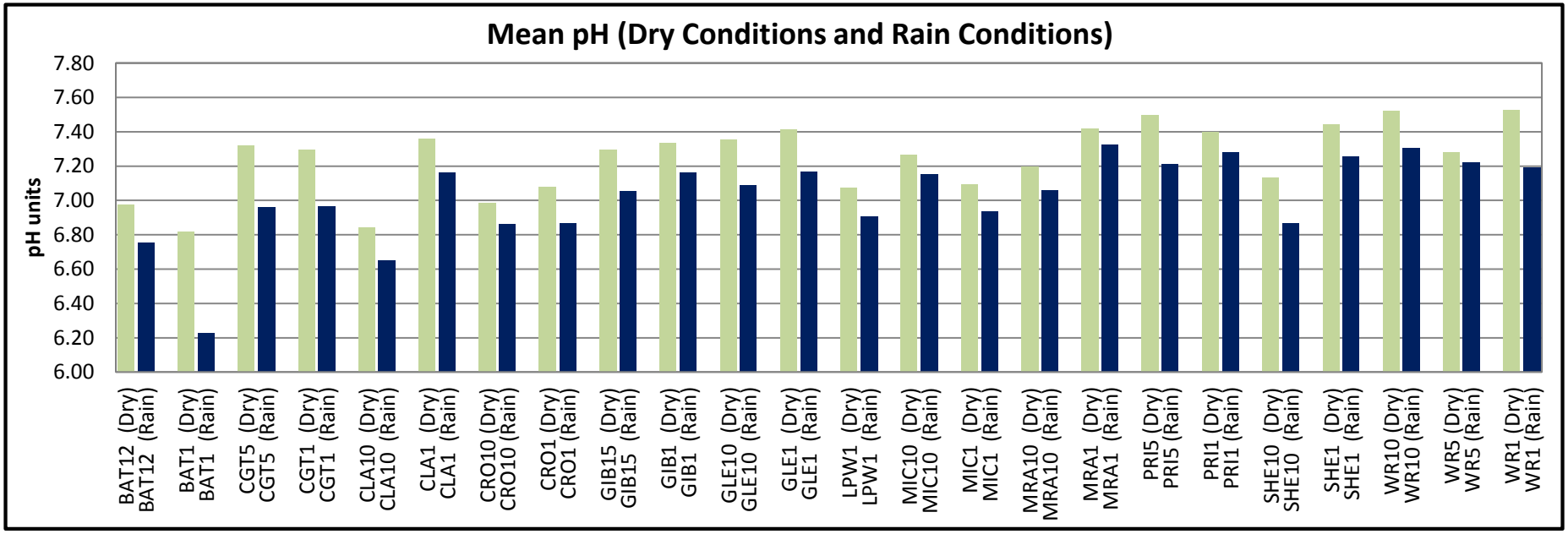




**Dry** conditions defined as less than 0.05 inches of rainfall in the 24 hours prior to sample collection; **rain** conditions defined as greater than or equal to 0.05 inches of rainfall in the 24 hours prior to sample collection.

Figure 2

Monthly Instream Mean Value Comparison for Dry and Rain Conditions (Reporting Year 2017/2018)

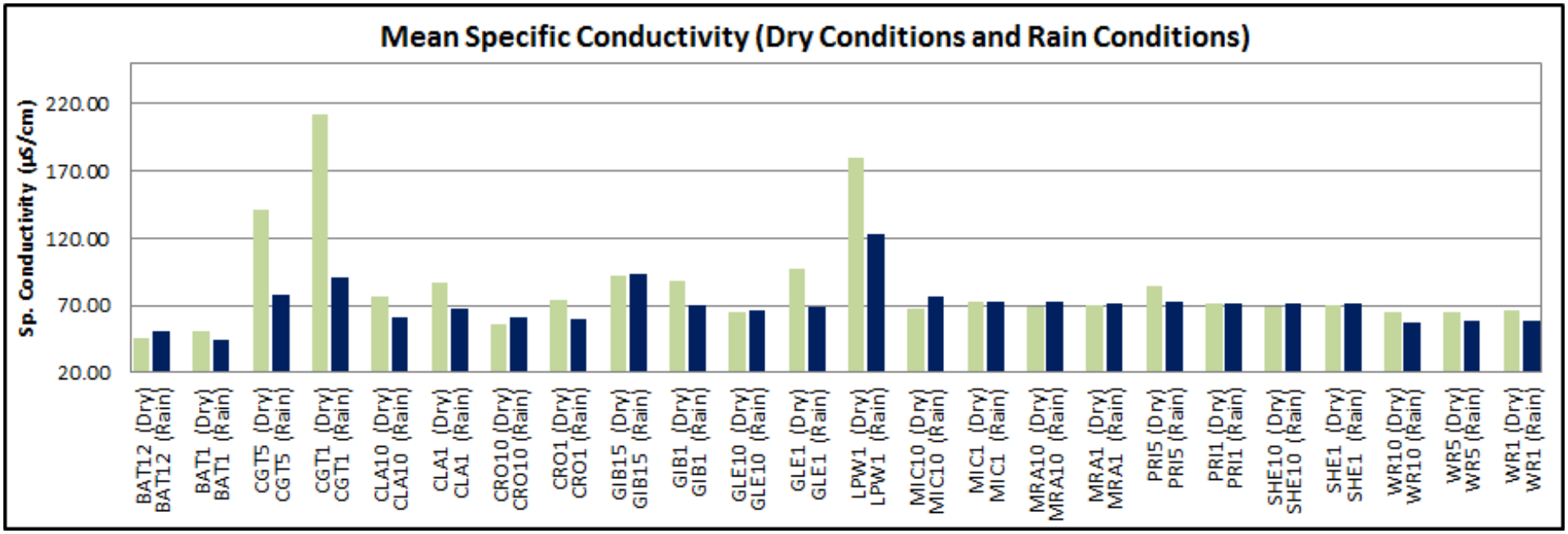



**Dry** conditions defined as less than 0.05 inches of rainfall in the 24 hours prior to sample collection; **rain** conditions defined as greater than or equal to 0.05 inches of rainfall in the 24 hours prior to sample collection.

Figure 2

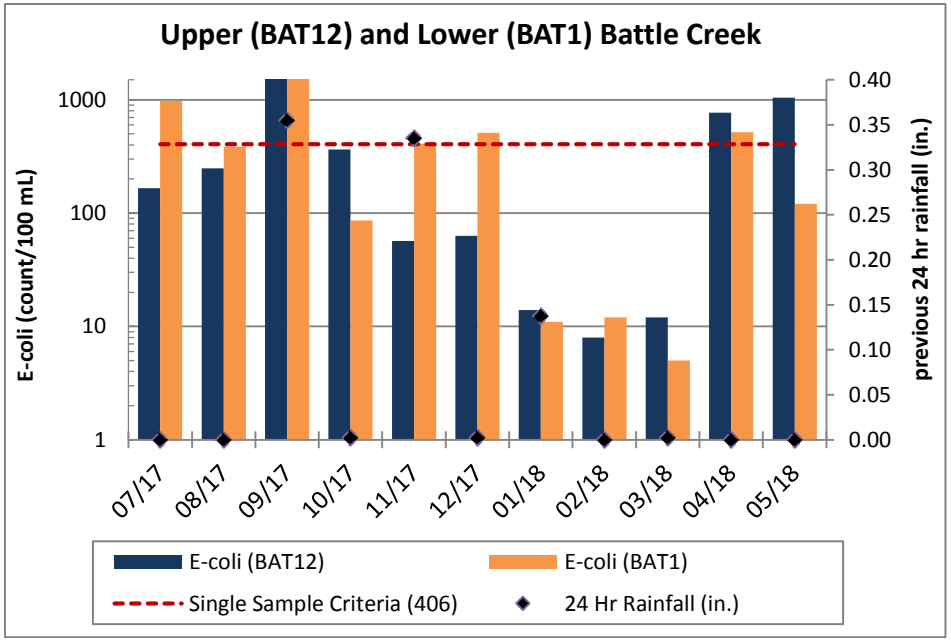
Monthly Instream Mean Value Comparison for Dry and Rain Conditions (Reporting Year 2017/2018)

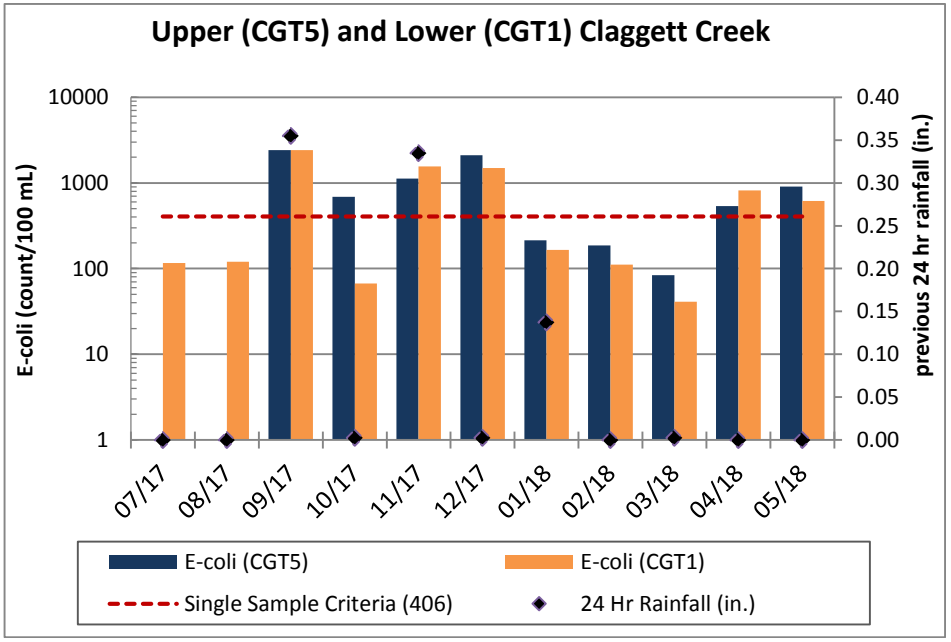


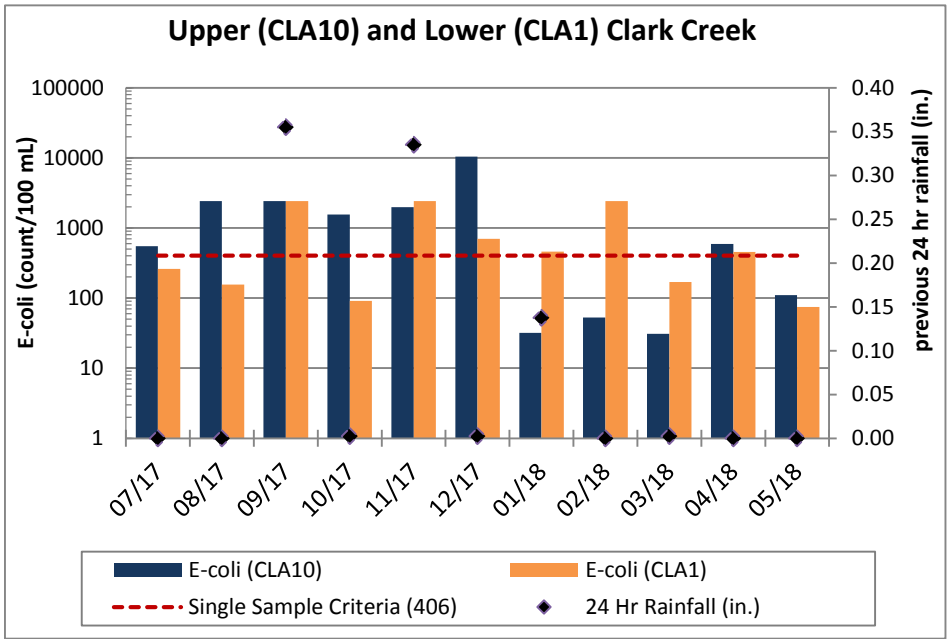

**Dry** conditions defined as less than 0.05 inches of rainfall in the 24 hours prior to sample collection; **rain** conditions defined as greater than or equal to 0.05 inches of rainfall in the 24 hours prior to sample collection.

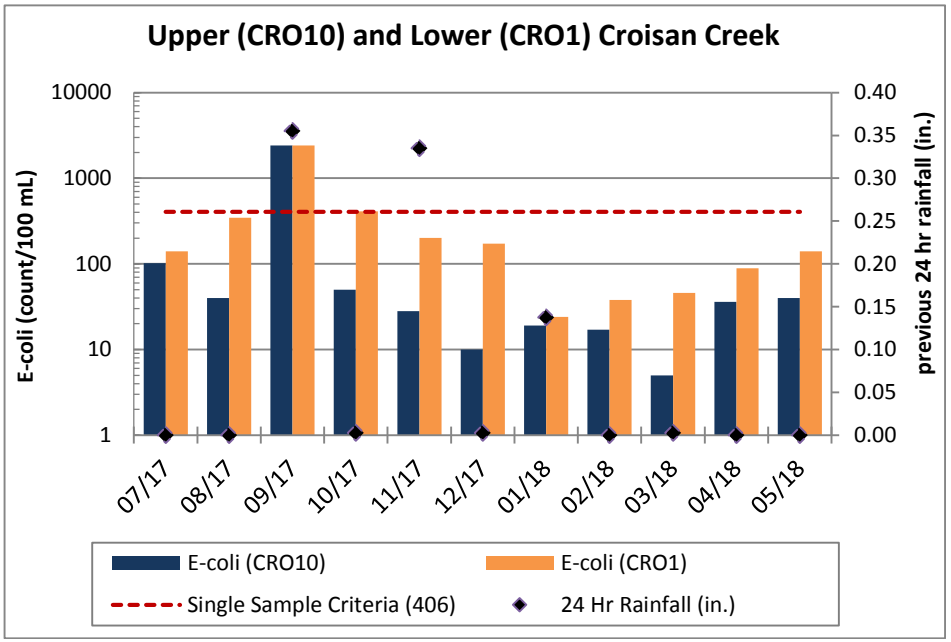
Figure 3

Monthly Instream E. Coli Upstream / Downstream Site Comparison (Reporting Year 2017/2018)



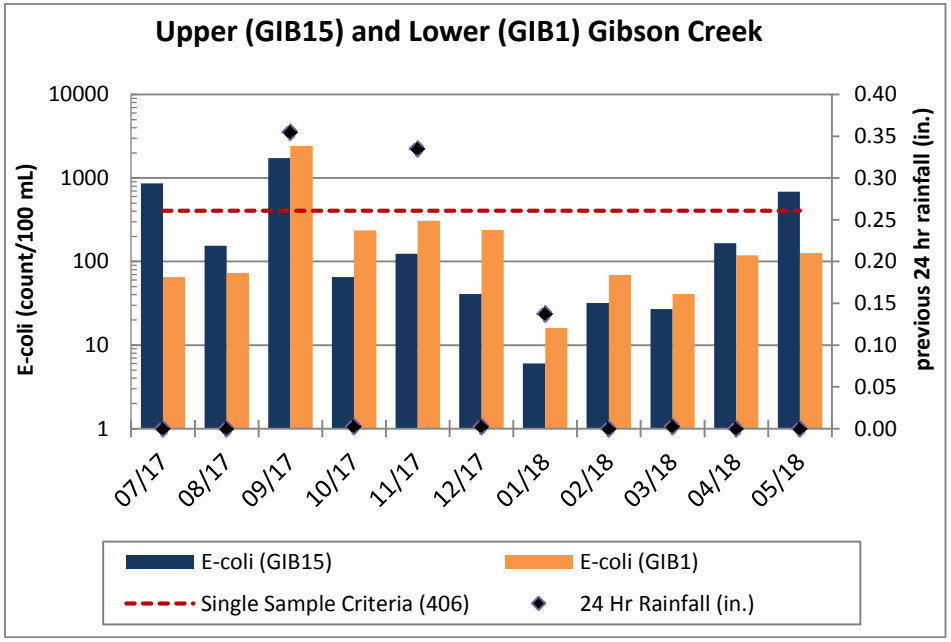



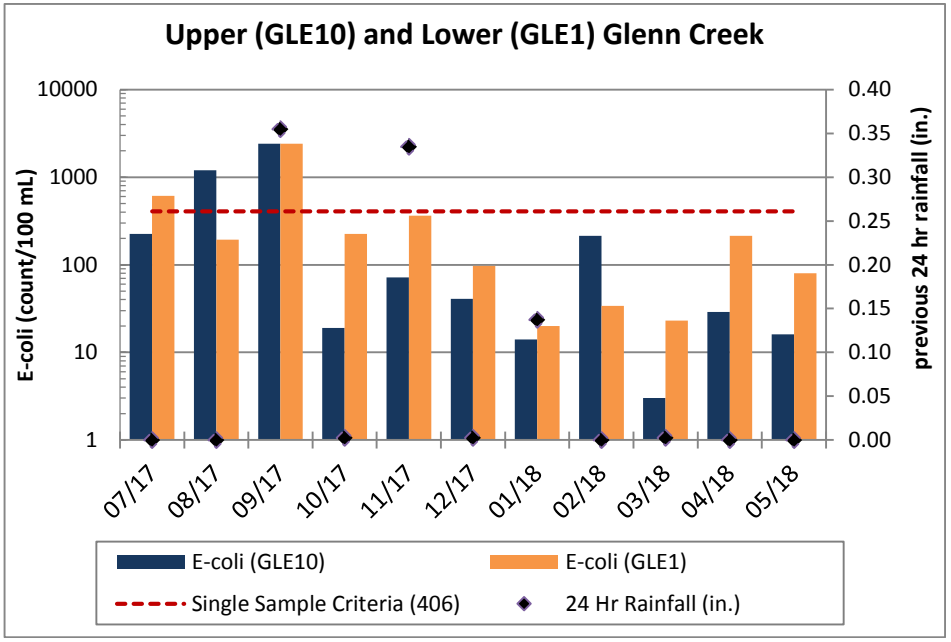



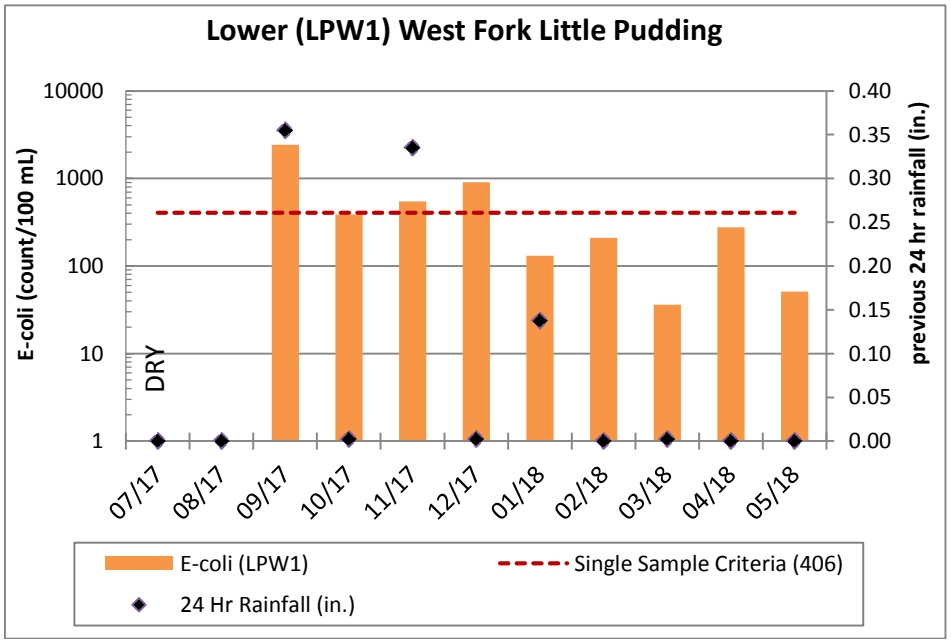

If 24 hour rainfall depth prior to sample collection differed between upstream and downstream sites, the average rainfall of the two sites was used.

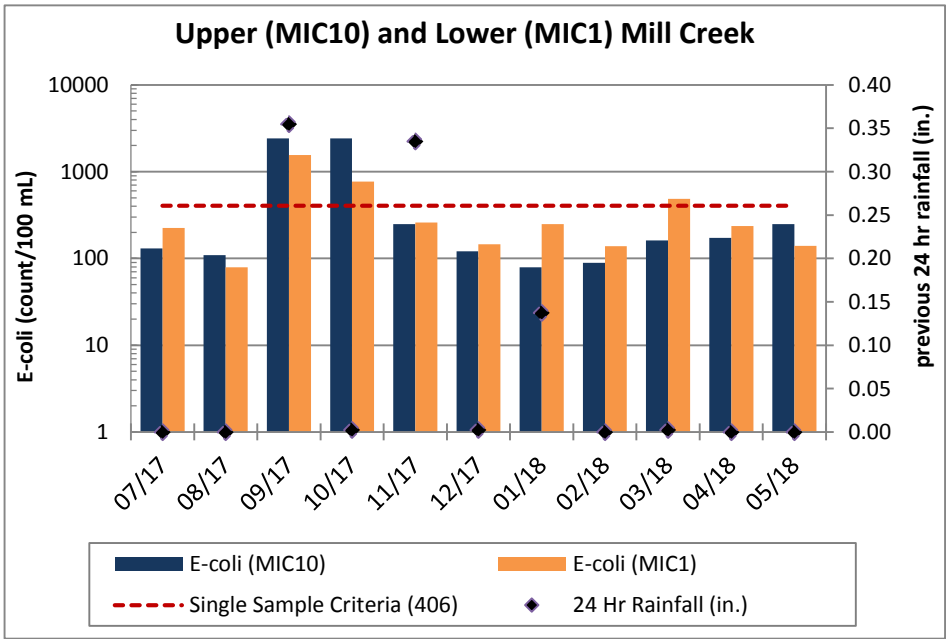
Figure 3

Monthly Instream E. Coli Upstream / Downstream Site Comparison (Reporting Year 2017/2018)



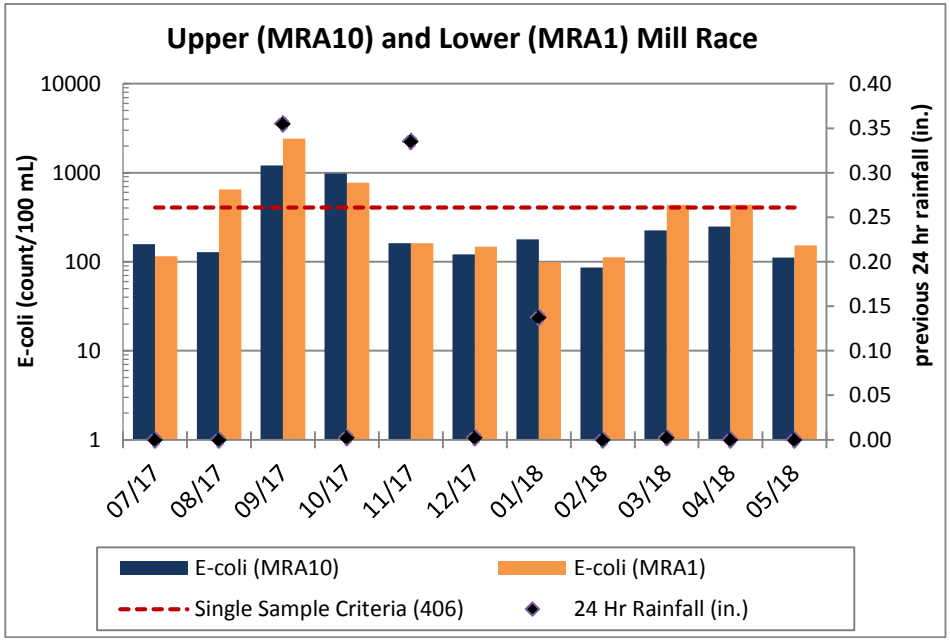



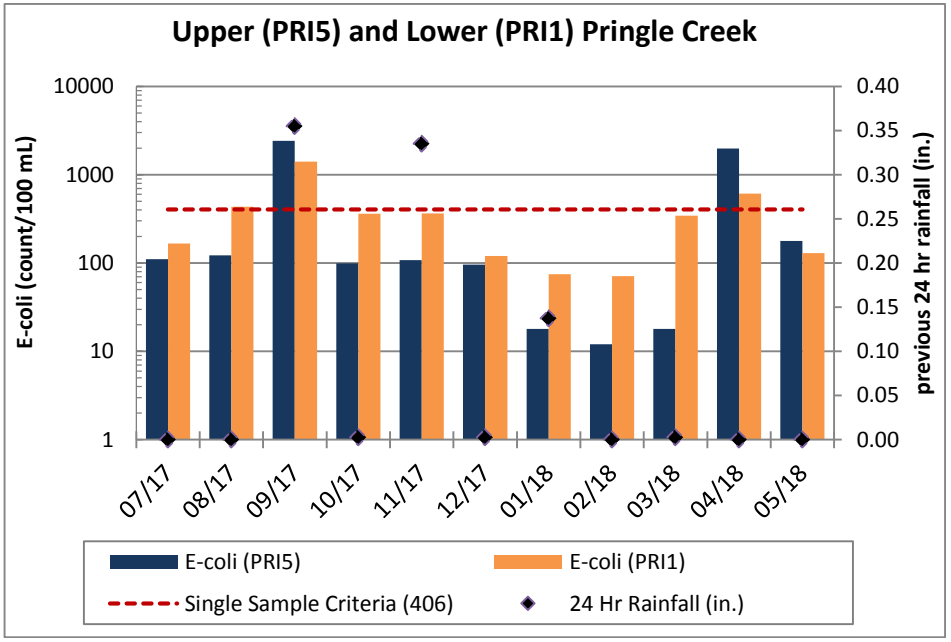



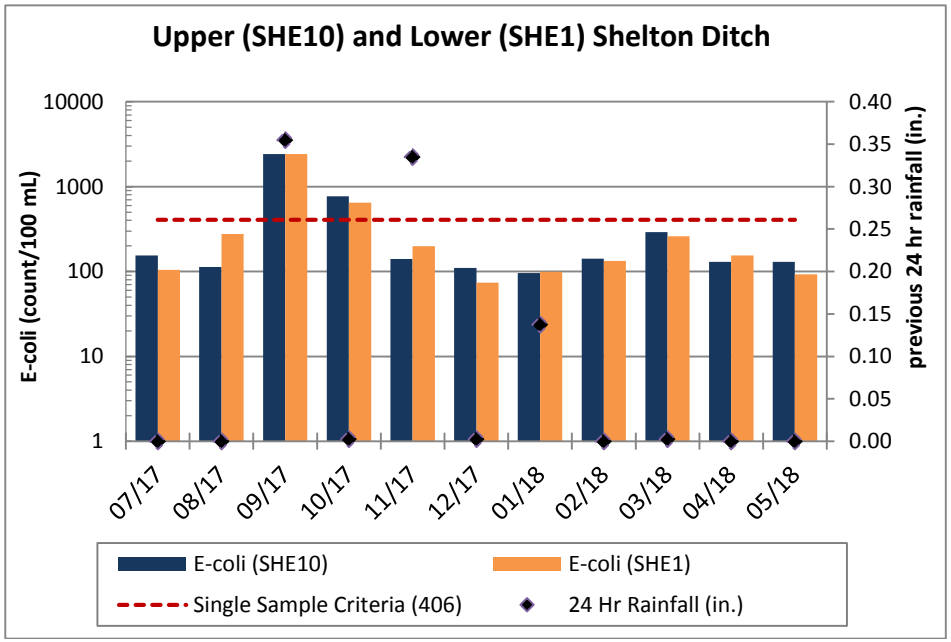

If 24 hour rainfall depth prior to sample collection differed between upstream and downstream sites, the average rainfall of the two sites was used.

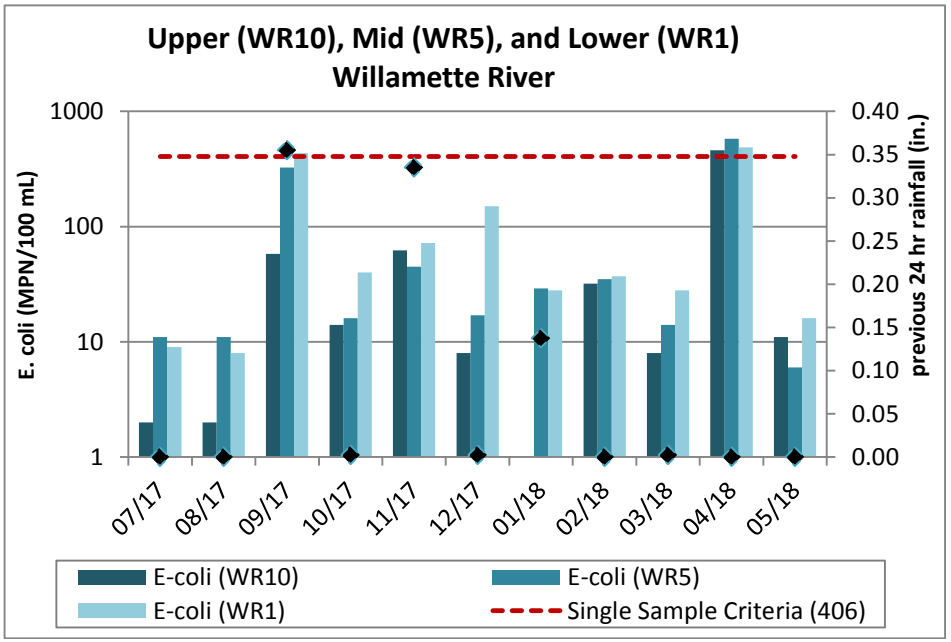
Figure 3

Monthly Instream E. Coli Upstream / Downstream Site Comparison (Reporting Year 2017/2018)



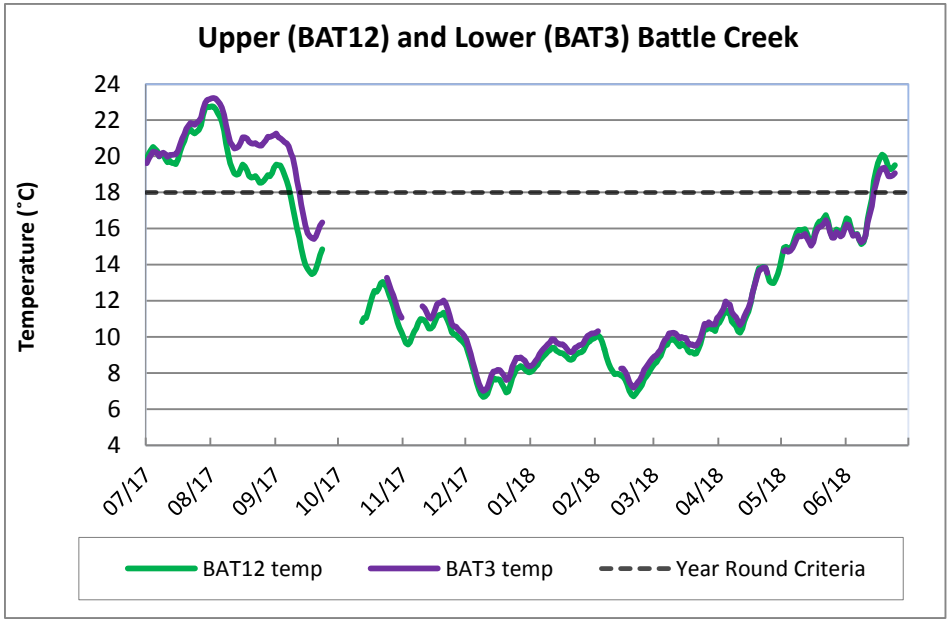



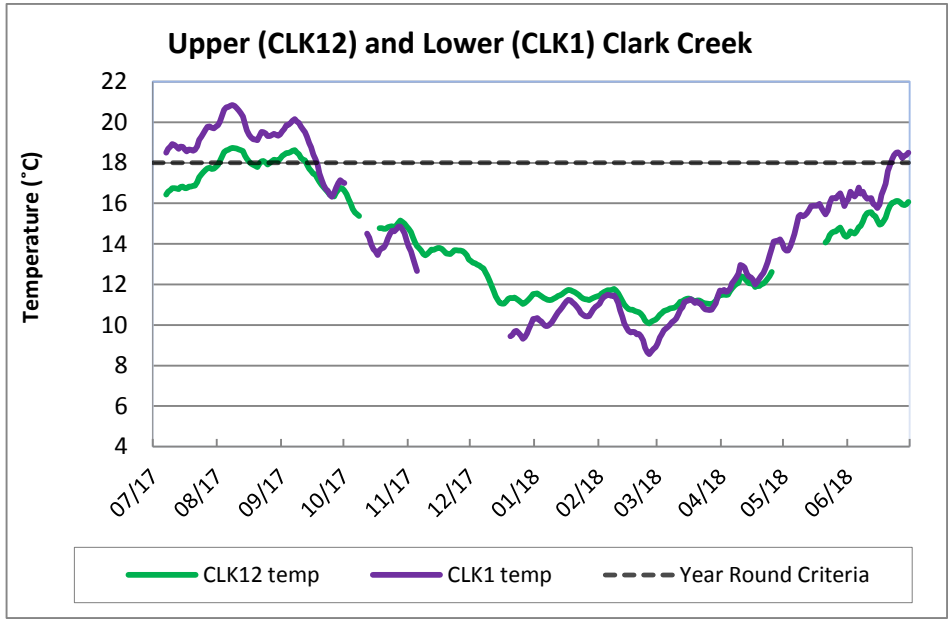



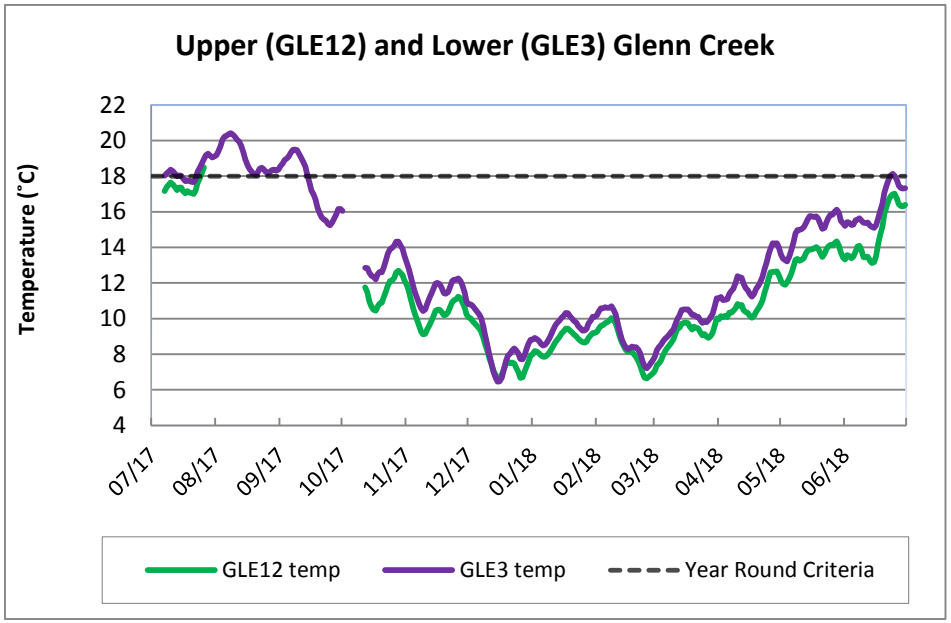

If 24 hour rainfall depth prior to sample collection differed between upstream and downstream sites, the average rainfall of the two sites was used.

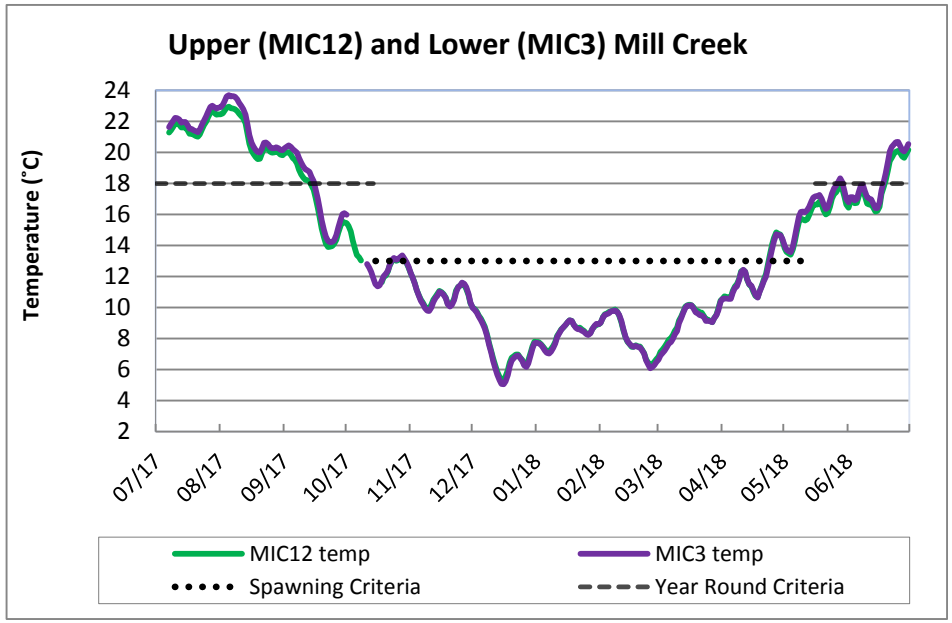
Figure 4

Continuous Instream Temperature 7-Day Moving Average Maximum (Reporting Year 2017/2018)



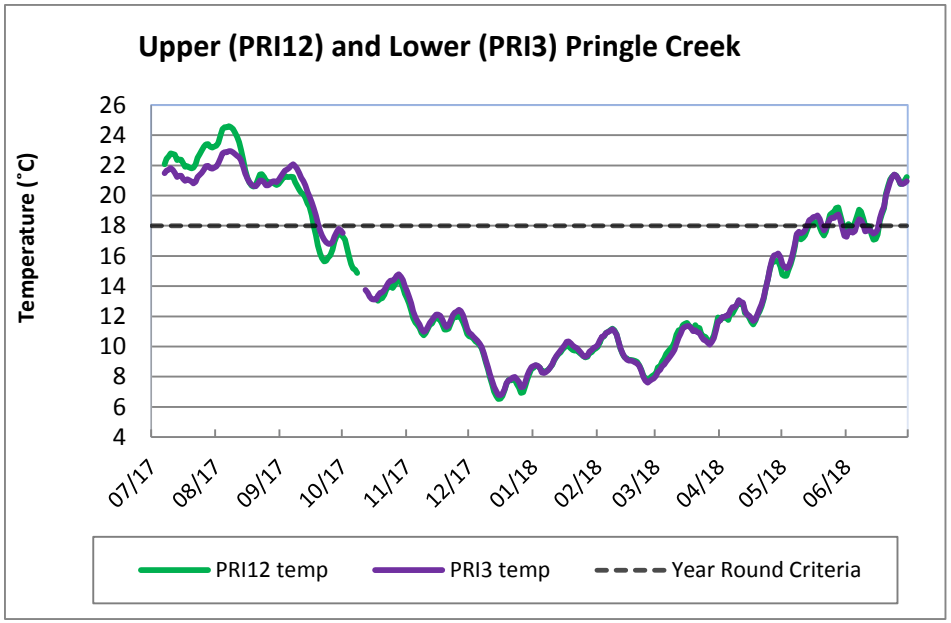




Presented temperature data consists of A grade data with greater than 80% of data points collected per day. Temperature criteria is defined in OAR 340--04100028 and OAR 340-0340, Tables 340A & B.

- 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

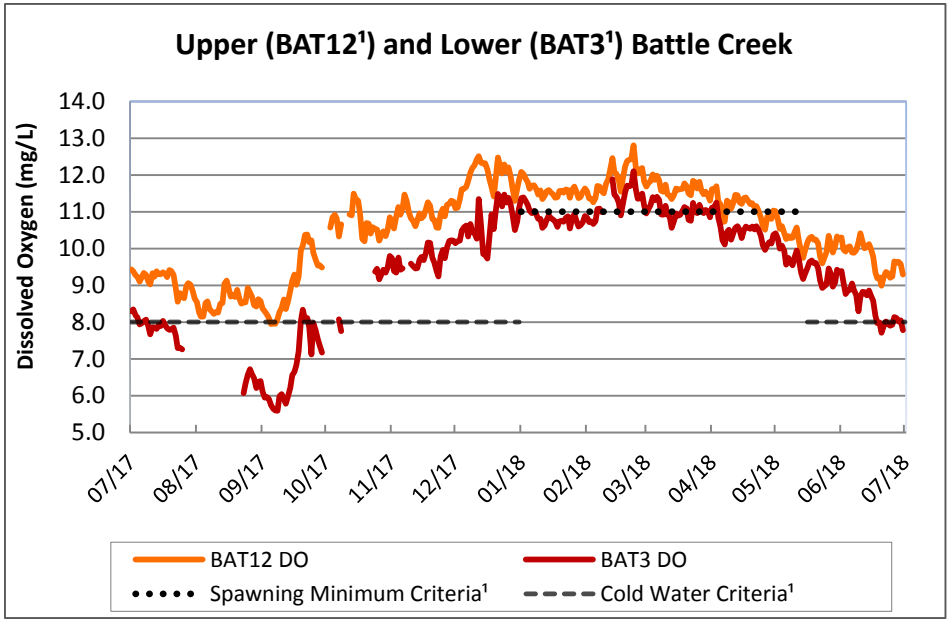
Continuous Instream Temperature 7-Day Moving Average Maximum (Reporting Year 2017/2018)

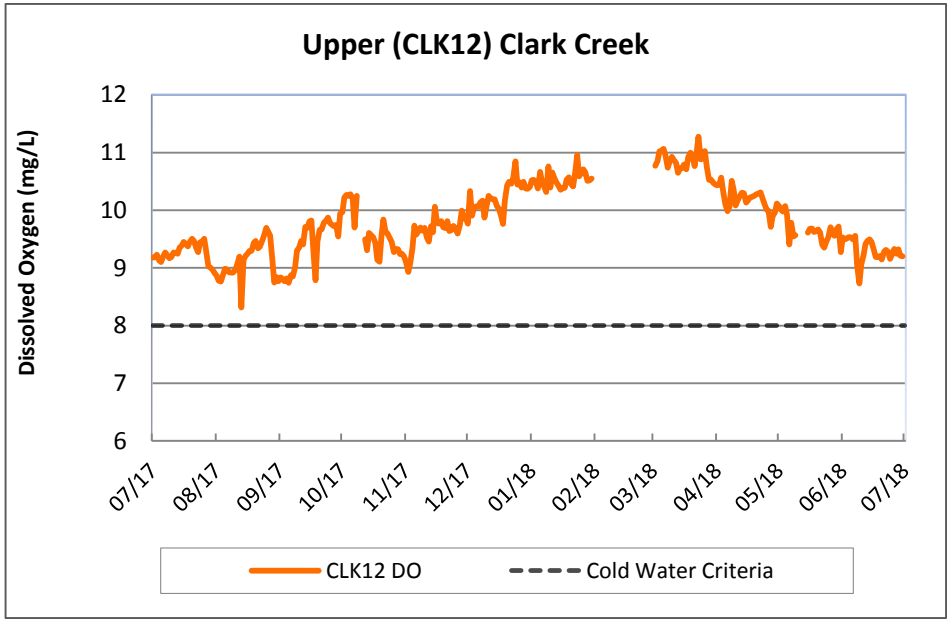


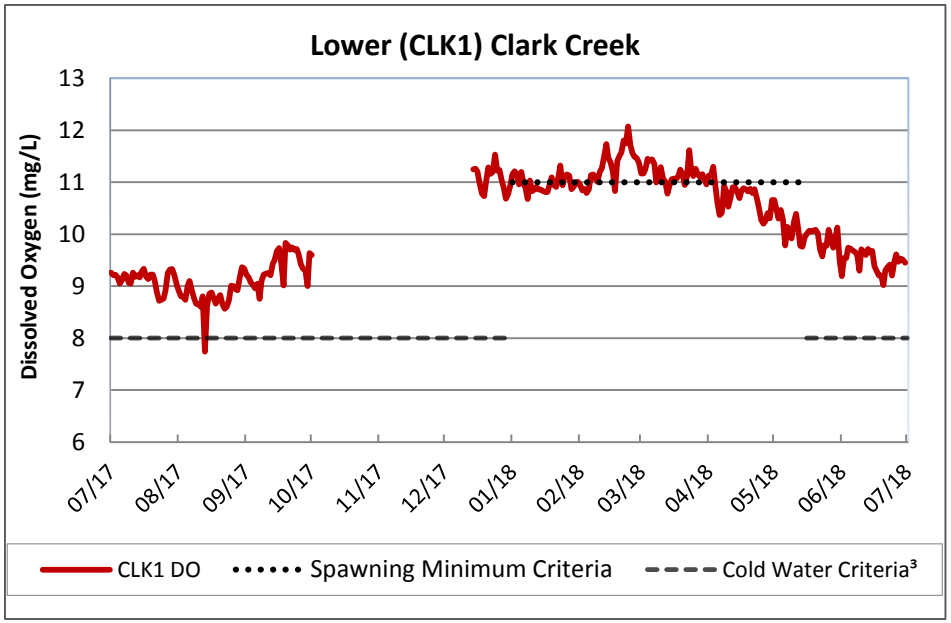

Presented temperature data consists of A grade data with greater than 80% of data points collected per day. Temperature criteria is defined in OAR 340--04100028 and OAR 340-0340, Tables 340A & B.

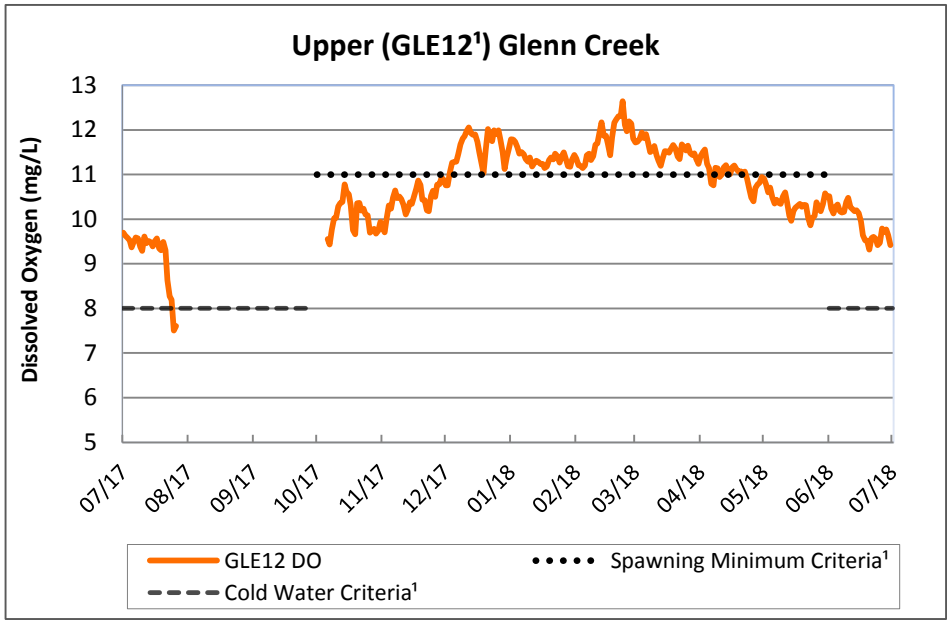
- Spawning Minimum Criteria for applicable streams may not exceed 7-day average maximum of 13 degrees C.
- Year Round Minimum Criteria may not exceed 7-day average maximum of 18 degrees C.

# Figure 5
## Continuous Instream Dissolved Oxygen Daily Mean (Reporting Year 2017/2018)



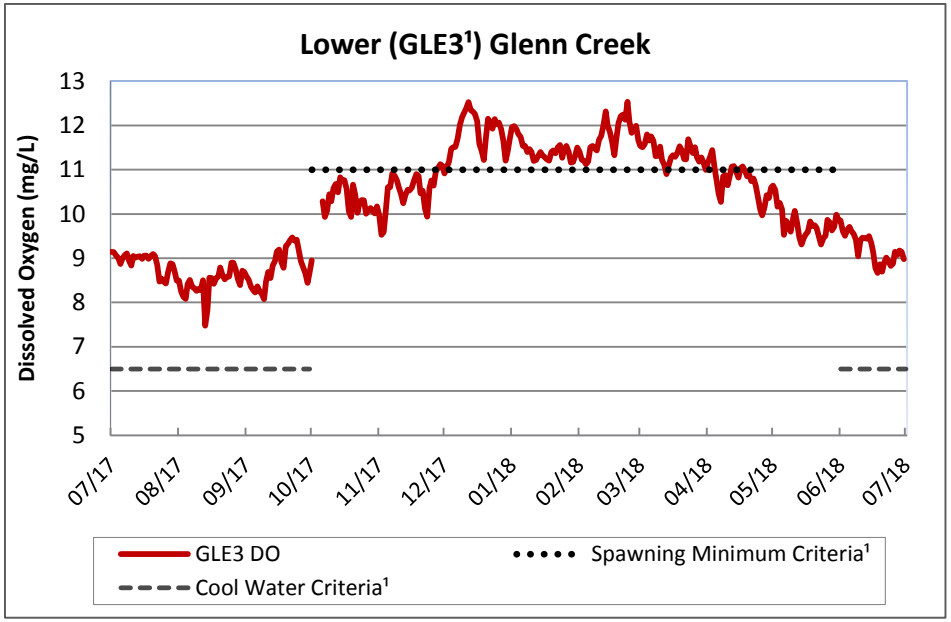

Presented DO data consists of A and B grade data with greater than or equal to 80% of data points collected per day. DO Criteria as defined in OAR 340-041-0016 and OAR 340-0340, Tables 340 A & B.

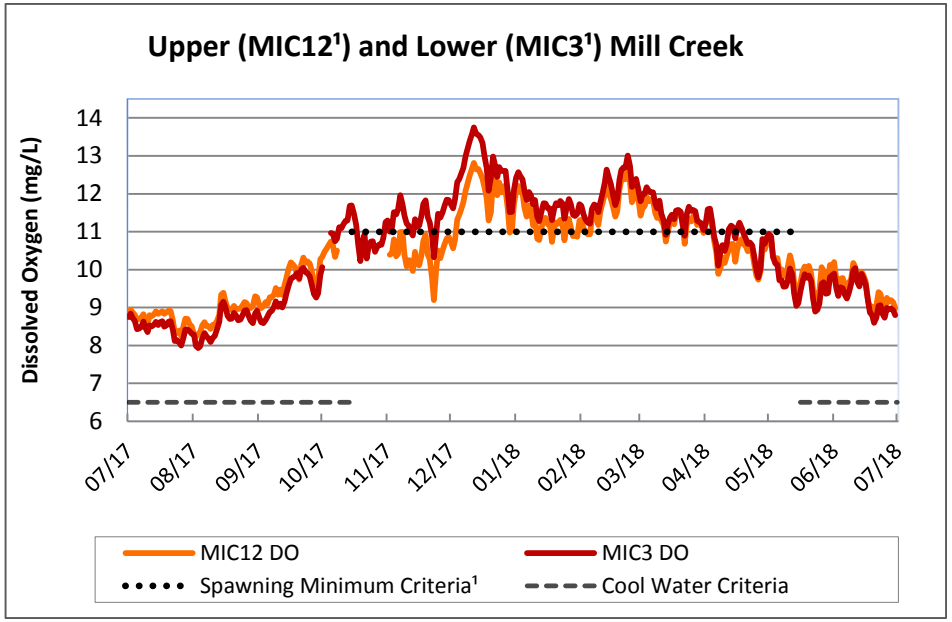
- Spawning Minimum Criteria for applicable streams may not be less than 11 mg/L.
- Oregon Cold Water Criteria for applicable streams may not be less than 8 mg/L.

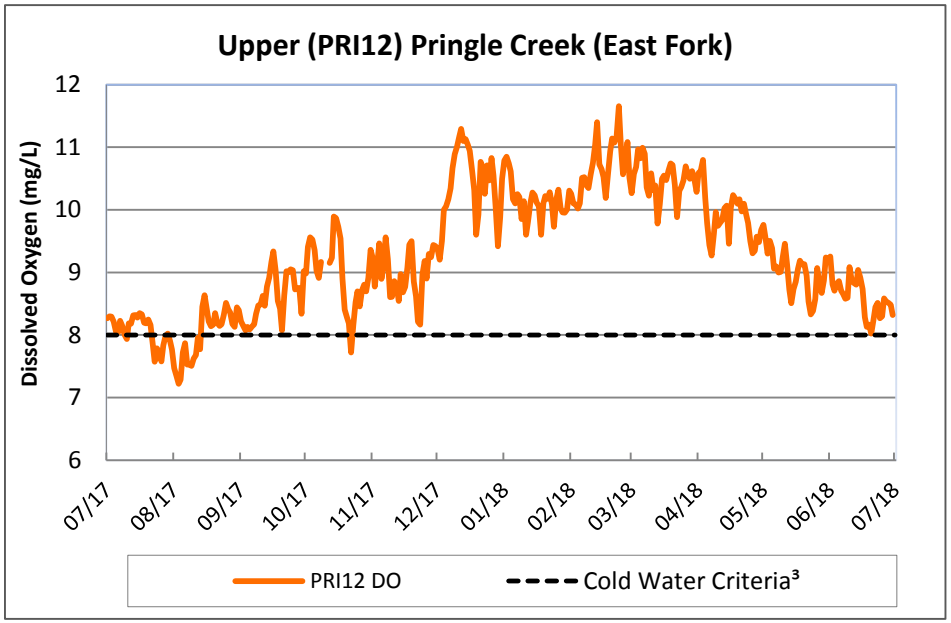
[1] Oregon's 2012 Integrated Report Section 303(d) listed.

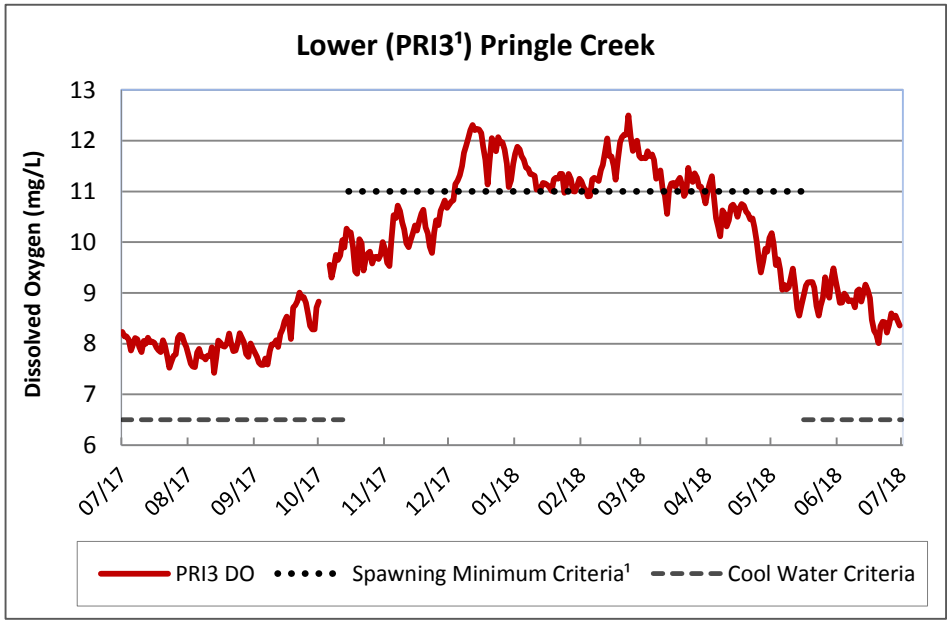
Figure 5

Continuous Instream Dissolved Oxygen Daily Mean (Reporting Year 2017/2018)



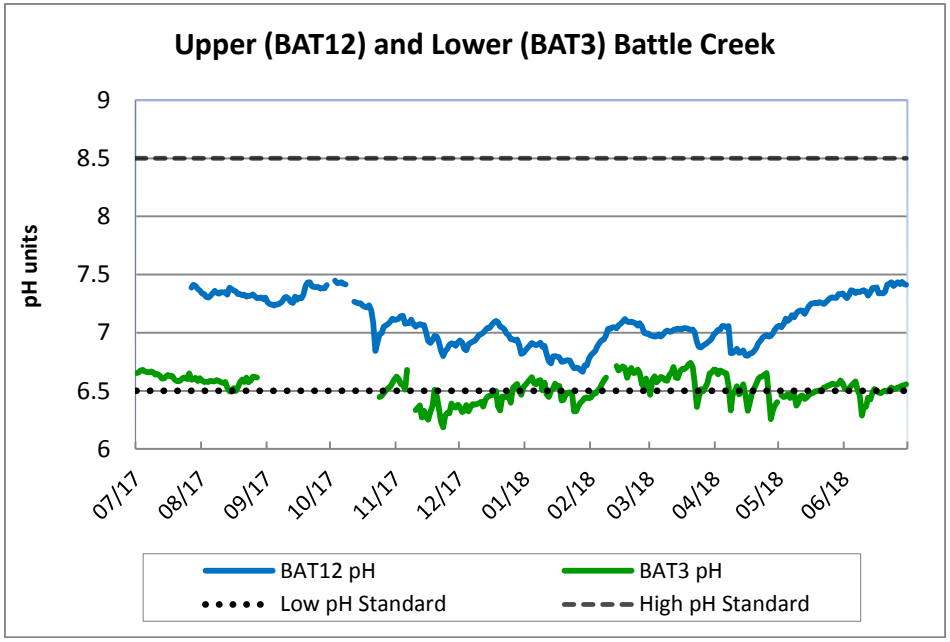

Presented DO data consists of A and B grade data with greater than or equal to 80% of data points collected per day. DO Criteria as defined in OAR 340-041-0016 and OAR 340-0340, Tables 340 A & B.

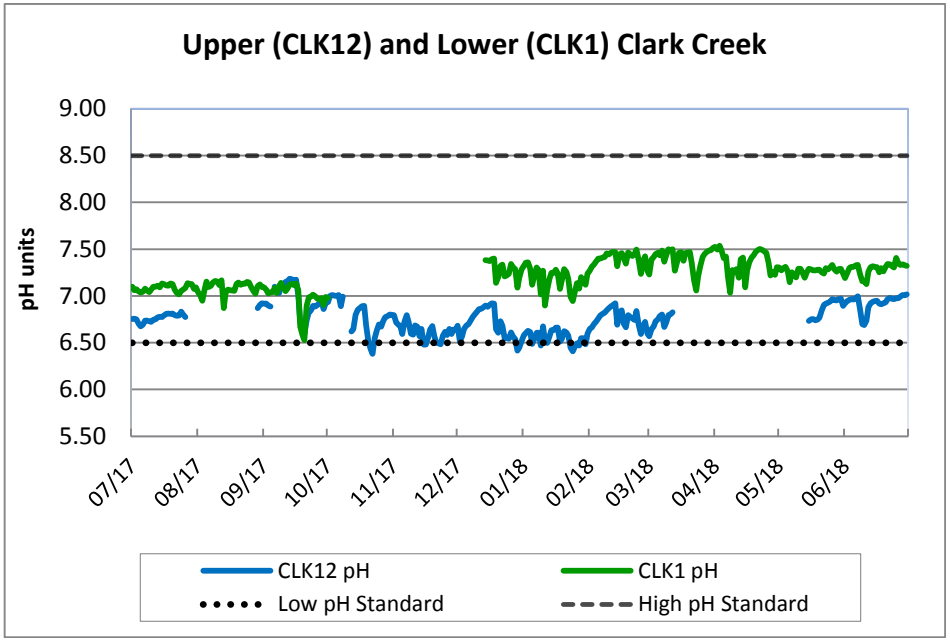
- Spawning Minimum Criteria for applicable streams may not be less than 11 mg/L.
- Oregon Cold Water Criteria for applicable streams may not be less than 8 mg/L.

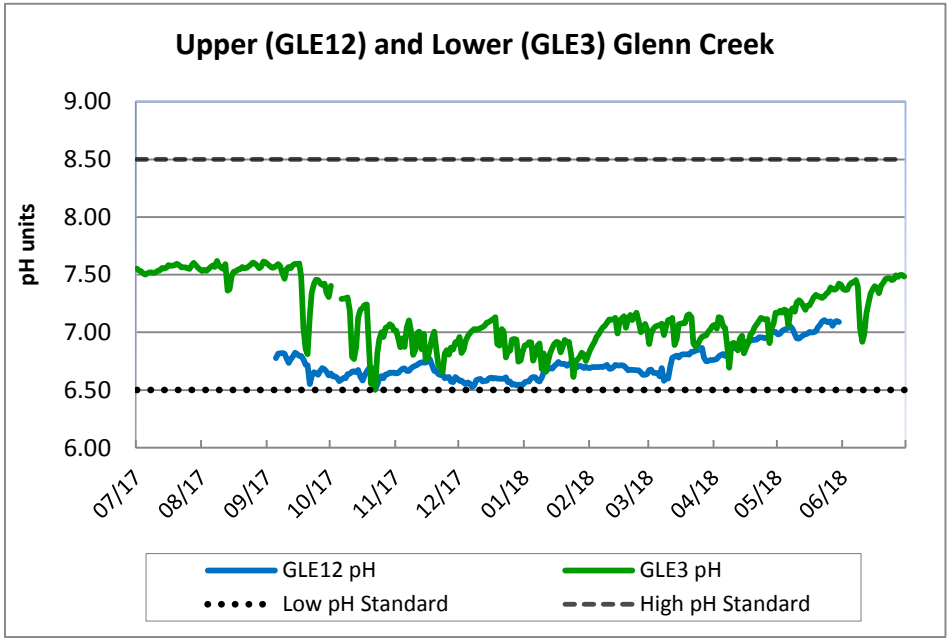
[1] Oregon's 2012 Integrated Report Section 303(d) listed.

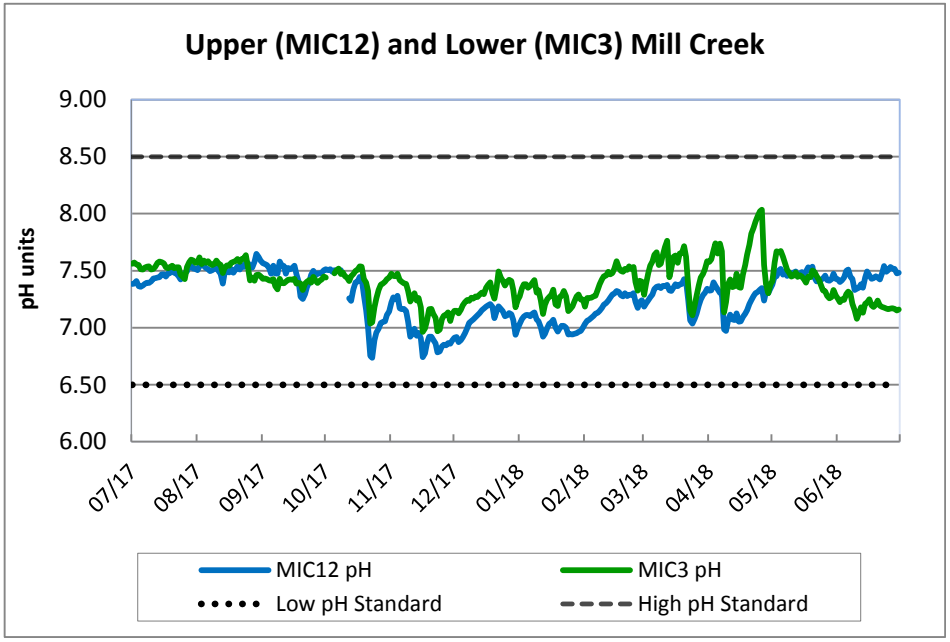
Figure 6

Continuous Instream pH Daily Mean (Reporting Year 2017/2018)



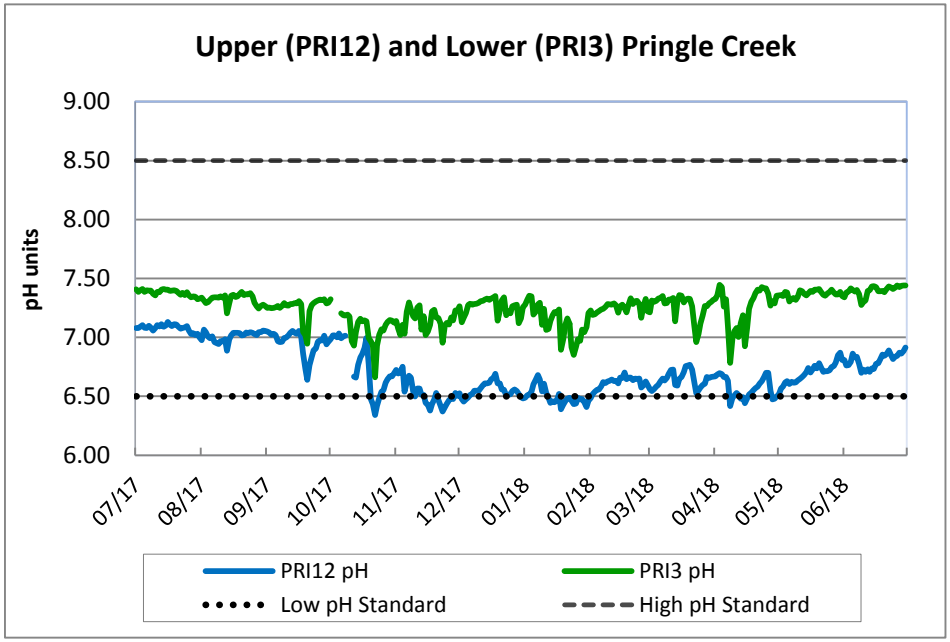




Presented pH data consist of A and B grade data with greater than or equal to 80% of data points collected per day.
As defined in OAR 341-041-0035 Water Quality Standards for the Willamette Basin, pH should not fall outside the ranges of 6.5 to 8.5 pH units.

Figure 6
Continuous Instream pH Daily Mean (Reporting Year 2017/2018)




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
Total Rainfall by Month Across Salem (Reporting Year 2017/2018)

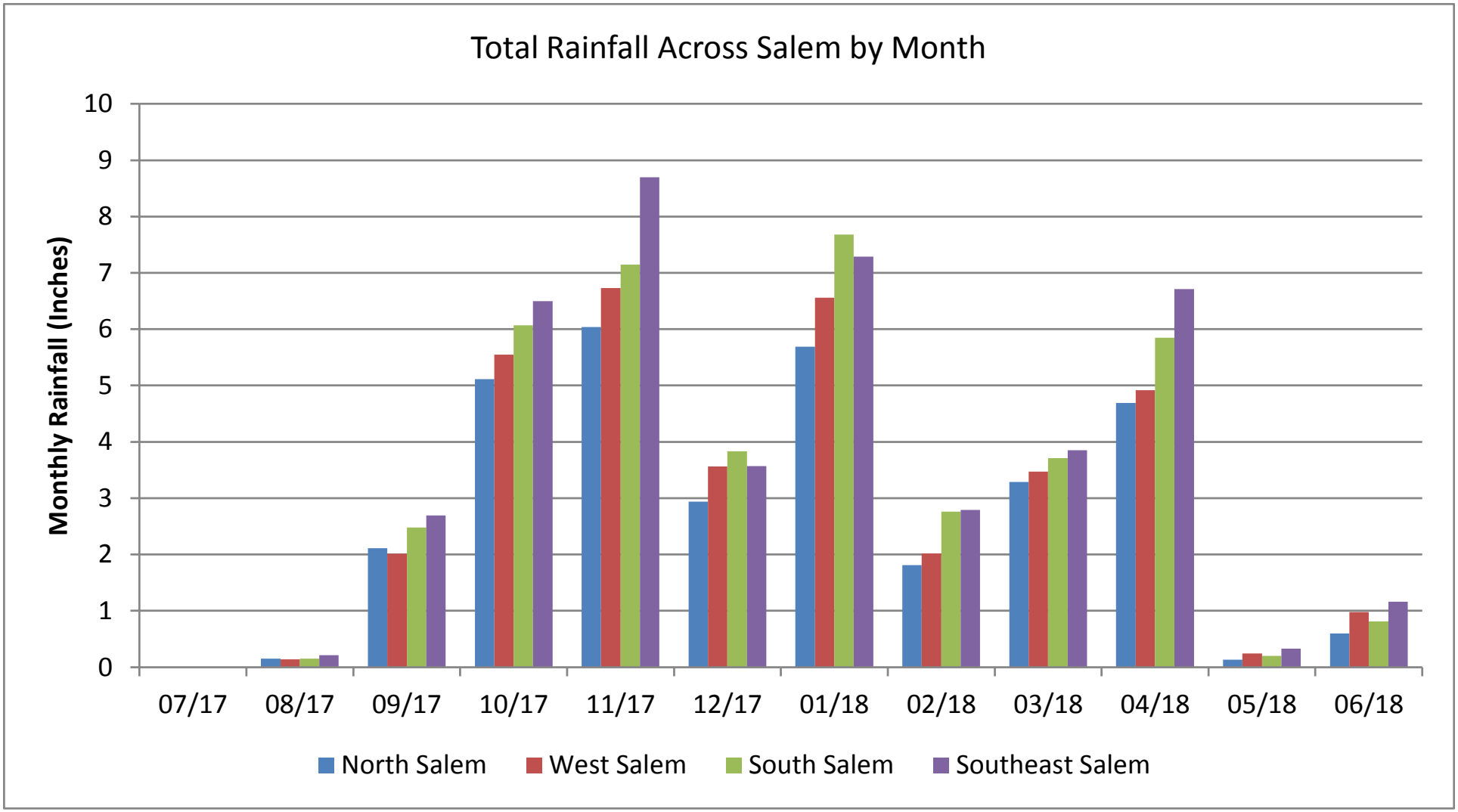


Table 1.
Completion of Table B-1 Environmental Monitoring Elements

| Monitoring Type | # of sites | Total "Events" Needed | 2011 / 2012 | 2012 / 2013 | 2013 / 2014 | 2014 / 2015 | 2015 / 2016 | 2016 / 2017 | 2017 / 2018 |
|---|---|---|---|---|---|---|---|---|---|
| Monthly Instream | 21 | 48 / site | 12[1] | 12[1] | 12[1] | 12[1] | 12[1] | 12[1] | 12[1] |
| Continuous Instream | 10 | On going | NA | NA | NA | NA | NA | NA | NA |
| Instream Storm | 3 | 25 / site | 6 | 6 | 5 | 4 | 4 | 1 | 2 |
| Stormwater (MS4) | 3 | 15 / site | 4 | 4 | 4 | 1 | 2 | 1 | 0 |
| Pesticides | 3 | 4 / site | 1 | 2 | 0 | 1 | 0 | 0 | 1 |
| Mercury | 2 | 2 / site / year | 2 | 1 | 1 | COMPLETE[2] | | | |
| Macroinvertebrates | 3 | 2 / site | 1 | 1 | 0 | 0 | 0 | 0 | 1 |

[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] 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*□ |
| | October 15 - May 15 | Spawning: Not less than 11.0 mg/L or 95% saturation | Mill Creek*, Pringle Creek*[1], Shelton Ditch*, Willamette River*[5] |
| | 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, Willamette River*[6] |
| **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*[3], 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*, Willamette River* |
| **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 2012 Integrated Report Section 303(d) listed.

□ Gibson Creek is referred as Gibson Gulch in Oregon's 2012 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.

[5] Applies to Willamette River from river mile 54.8 to 186.5

[6] Applies to Willamette River from river mile 50.6 to 186.5

Table 5.
Median Values for Monthly Instream Sites (RY 2017/18)

| 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 | 11 | 10.7 | 9.8 | 46.0 | 9.1 | 6.7 | 254.0 | 0.78 | 1.18 |
| BAT 12 | 11 | 9.7 | 10.8 | 43.0 | 6.6 | 6.9 | 114.5 | 1.17 | 1.05 |
| CGT 1 | 11 | 12.5 | 10.2 | 210.7 | 8.4 | 7.3 | 143.0 | 0.24 | 2.59 |
| CGT 5 | 9 | 10.5 | 10.0 | 134.5 | 16.6 | 7.3 | 668.0 | 0.39 | 1.95 |
| CLA 1 | 11 | 11.4 | 10.5 | 88.6 | 4.1 | 7.4 | 366.0 | 0.88 | 1.13 |
| CLA 10 | 11 | 11.2 | 10.1 | 71.4 | 3.9 | 6.8 | 571.0 | 1.71 | 0.97 |
| CRO 1 | 11 | 10.1 | 10.6 | 65.3 | 6.6 | 7.0 | 140.0 | 0.70 | 1.14 |
| CRO 10 | 11 | 9.8 | 10.3 | 50.0 | 6.6 | 7.0 | 36.0 | 1.04 | 1.07 |
| GIB 1 | 11 | 10.4 | 10.5 | 77.0 | 7.3 | 7.3 | 96.0 | 0.98 | 1.12 |
| GIB 15 | 11 | 10.3 | 10.5 | 84.5 | 8.1 | 7.3 | 345.0 | 1.84 | 0.96 |
| GLE 1 | 11 | 10.7 | 10.6 | 88.2 | 6.4 | 7.4 | 145.5 | 0.92 | 1.14 |
| GLE 10 | 11 | 9.7 | 10.5 | 57.0 | 9.3 | 7.3 | 35.0 | 0.98 | 0.90 |
| LPW 1 | 9 | 10.3 | 10.3 | 166.5 | 10.1 | 7.0 | 243.0 | 1.43 | 1.30 |
| MIC 1 | 11 | 10.4 | 10.9 | 81.9 | 5.7 | 7.1 | 236.0 | 1.62 | 1.30 |
| MIC 10 | 11 | 10.6 | 10.6 | 76.2 | 6.1 | 7.3 | 146.0 | 1.71 | 1.30 |
| MRA 1 | 11 | 10.4 | 10.6 | 80.4 | 6.7 | 7.4 | 157.0 | 1.82 | 1.43 |
| MRA 10 | 11 | 10.2 | 10.5 | 79.6 | 5.9 | 7.2 | 162.0 | 1.71 | 1.14 |
| PRI 1 | 11 | 10.5 | 10.8 | 79.6 | 6.2 | 7.4 | 345.0 | 1.70 | 1.47 |
| PRI 5 | 11 | 11.3 | 10.5 | 82.7 | 5.6 | 7.4 | 103.5 | 0.78 | 1.51 |
| SHE 1 | 11 | 10.4 | 10.9 | 78.9 | 5.8 | 7.4 | 155.0 | 1.77 | 1.33 |
| SHE 10 | 11 | 10.2 | 10.9 | 78.5 | 6.2 | 7.0 | 140.0 | 1.67 | 1.16 |
| WR1 | 11 | 10.0 | 10.9 | 62.7 | 5.3 | 7.3 | 37.0 | 0.39 | 1.13 |
| WR5 | 11 | 10.0 | 10.8 | 62.0 | 4.8 | 7.4 | 17.0 | 0.32 | 1.06 |
| WR10 | 11 | 9.7 | 11.0 | 61.6 | 4.9 | 7.4 | 11.0 | 0.28 | 1.15 |

Table 6.

Number of Water Quality Criteria Exceedances for Monthly Instream Sites (RY 2017/18)

| 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 | 11 | 4 | 4 | 5 | 3 | 2 | | | | | | |
| BAT 12 | 11 | 3 | 0 | 3 | 2 | 1 | | | | | | |
| CGT 1 | 11 | 5 | 0 | 5 | 3 | 2 | | | | | | |
| CGT 5[4] | 9 | 3 | 0 | 6 | 4 | 2 | | | | | | |
| CLA 1 | 11 | 3 | 0 | 6 | 3 | 3 | 1 | 0 | 0 | 0 | 1 | 1 |
| CLA 10 | 11 | 0 | 2 | 7 | 5 | 2 | 1 | 0 | 0 | 0 | 1 | 1 |
| CRO 1 | 11 | 1 | 0 | 2 | 1 | 1 | | | | | | |
| CRO 10 | 11 | 2 | 0 | 1 | 0 | 1 | | | | | | |
| GIB 1 | 11 | 5 | 0 | 1 | 0 | 1 | | | | | | |
| GIB 15 | 11 | 5 | 0 | 3 | 2 | 1 | | | | | | |
| GLE 1 | 11 | 2 | 0 | 2 | 1 | 1 | | | | | | |
| GLE 10[4] | 11 | 2 | 0 | 2 | 1 | 1 | | | | | | |
| LPW 1[4] | 9 | 4 | 1 | 3 | 1 | 2 | | | | | | |
| MIC 1 | 11 | 4 | 1 | 3 | 2 | 1 | | | | | | |
| MIC 10 | 11 | 3 | 0 | 2 | 1 | 1 | | | | | | |
| MRA 1 | 11 | NA | 0 | 5 | 4 | 1 | | | | | | |
| MRA 10 | 11 | NA | 0 | 2 | 1 | 1 | | | | | | |
| PRI 1 | 11 | 3 | 0 | 3 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| PRI 5 | 11 | 0 | 0 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| SHE 1 | 11 | 3 | 0 | 2 | 1 | 1 | | | | | | |
| SHE 10 | 11 | 3 | 0 | 2 | 1 | 1 | | | | | | |
| WR1 | 11 | 3 | 0 | 2 | 1 | 1 | | | | | | |
| WR5 | 11 | 3 | 1 | 1 | 1 | 0 | | | | | | |
| WR10 | 11 | 2 | 0 | 1 | 1 | 0 | | | | | | |

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 2017/18)

| 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 |
| 7/18/2017 11:33 | 17.5 | 8.09 | 53.6 | 9.12 | 6.96 | 980 | 0.52 | 1.18 | 0.00 |
| 8/15/2017 11:35 | 16.6 | 6.63 | 70 | 7.78 | 6.92 | 387 | 0.31 | 3.01 | 0.00 |
| 9/19/2017 11:15 | 13.3 | 8.25 | 44.2 | 17 | 5.8 | >2420 | 0.67 | 2.62 | 0.35 |
| 10/17/2017 11:23 | 10.7 | 9.51 | 56.3 | 9.58 | 6.64 | 86 | 0.44 | 1.13 | 0.00 |
| 11/21/2017 11:20 | 10.9 | 9.71 | 43.9 | 10.3 | 6.45 | 411 | 1.02 | 1.45 | 0.34 |
| 12/19/2017 13:00 | 9.2 | 10.25 | 39.6 | 52.3 | 7.13 | 512 | 0.48 | 4.12 | 0.00 |
| 1/16/2018 10:53 | 9 | 10.81 | 45.6 | 6.8 | 6.43 | 11 | 1.78 | 1.11 | 0.14 |
| 2/20/2018 10:42 | 5.8 | 11.78 | 46.3 | 4.5 | 6.8 | 12 | 1.42 | 1.21 | 0.00 |
| 3/20/2018 10:42 | 6.8 | 11.72 | 44.3 | 6.73 | 6.72 | 5 | 1.52 | 1.03 | 0.00 |
| 4/10/2018 11:00 | 10.3 | 10.45 | 46 | 12.9 | 6.46 | 517 | 1.61 | 0.95 | 0.00 |
| 5/15/2018 11:26 | 14 | 9.84 | 46.4 | 5.7 | 6.93 | 121 | 0.78 | 1.04 | 0.00 |
| **Median** | **10.70** | **9.84** | **46.00** | **9.12** | **6.72** | **254** | **0.78** | **1.18** | |

| 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 |
| 7/18/2017 11:18 | 17.1 | 8.93 | 49.6 | 8.45 | 7.26 | 166 | 0.19 | 0.92 | 0.00 |
| 8/15/2017 11:20 | 16.3 | 8.5 | 62.6 | 8.28 | 7.26 | 249 | 0.2 | 1.52 | 0.00 |
| 9/19/2017 10:58 | 13.2 | 9.15 | 66.2 | 15.5 | 7.09 | >2420 | 0.54 | 3.41 | 0.35 |
| 10/17/2017 11:10 | 9.7 | 10.82 | 49.4 | 6.62 | 6.83 | 365 | 0.17 | 1.19 | 0.00 |
| 11/21/2017 10:41 | 10.5 | 10.05 | 44.5 | 7.73 | 6.5 | 57 | 1.5 | 0.91 | 0.34 |
| 12/19/2017 11:40 | 8.7 | 10.81 | 42.9 | 5.15 | 7.33 | 63 | 1.17 | 1.05 | 0.00 |
| 1/16/2018 10:23 | 8.6 | 10.98 | 43 | 4.6 | 6.67 | 14 | 1.98 | 1.28 | 0.14 |
| 2/20/2018 10:25 | 5.4 | 12.09 | 42.6 | 2.39 | 6.85 | 8 | 1.55 | 1.05 | 0.00 |
| 3/20/2018 10:22 | 6.3 | 11.9 | 41.2 | 3.73 | 6.74 | 12 | 1.62 | 1 | 0.00 |
| 4/10/2018 10:45 | 9.7 | 10.76 | 41.1 | 10.5 | 6.51 | 770 | 1.75 | 0.91 | 0.00 |
| 5/15/2018 11:13 | 13.4 | 10.1 | 41.3 | 4.88 | 7.02 | 1046 | 0.77 | 1.01 | 0.00 |
| **Median** | **9.70** | **10.76** | **43.00** | **6.62** | **6.85** | **114.5** | **1.17** | **1.05** | |

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 2017/18)

| 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 |
| 7/18/2017 13:20 | 22.7 | 10.56 | 268.1 | 3.59 | 7.5 | 116 | 0.23 | 1.64 | 0.00 |
| 8/15/2017 13:12 | 21.7 | 9.68 | 258.8 | 1.71 | 7.29 | 120 | 0.09 | 2.36 | 0.00 |
| 9/19/2017 13:35 | 16.5 | 8.31 | 81.2 | 11.2 | 6.93 | >2420 | 0.36 | 3.59 | 0.35 |
| 10/17/2017 13:15 | 13.7 | 5.45 | 242.1 | 5.19 | 6.61 | 67 | 0.18 | 1.52 | 0.00 |
| 11/21/2017 13:10 | 10.4 | 9.33 | 41.9 | 21.2 | 6.84 | 1553 | 0.2 | 3.21 | 0.34 |
| 12/19/2017 14:00 | 9 | 10.16 | 72.5 | 70.5 | 7.22 | 1500 | 0.24 | 8.89 | 0.00 |
| 1/16/2018 12:50 | 9.6 | 10.15 | 148.9 | 8.4 | 7.13 | 166 | 0.77 | 2.79 | 0.14 |
| 2/20/2018 12:50 | 6.4 | 10.88 | 210.7 | 9.81 | 7.38 | 111 | 0.66 | 2.79 | 0.00 |
| 3/20/2018 12:38 | 9.5 | 11.07 | 219.5 | 7.94 | 7.37 | 41 | 0.64 | 1.63 | 0.00 |
| 4/10/2018 12:31 | 12.5 | 10.49 | 181.4 | 10.9 | 7.36 | 820 | 1.23 | 1.78 | 0.00 |
| 5/15/2018 12:38 | 19.9 | 10.2 | 245.5 | 4.9 | 7.62 | 616 | 0.15 | 2.59 | 0.00 |
| **Median** | **12.50** | **10.16** | **210.70** | **8.40** | **7.29** | **143** | **0.24** | **2.59** | |

| 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 |
| 7/18/2017 12:45 | No Flow | | | | | | | | 0.00 |
| 8/15/2017 12:45 | No Flow | | | | | | | | 0.00 |
| 9/19/2017 13:10 | 15 | 8.35 | 54 | 12.5 | 6.75 | >2420 | 0.39 | 3.51 | 0.35 |
| 10/17/2017 12:55 | 10.7 | 7.16 | 96.7 | 111 | 6.66 | 687 | 0.07 | 2.69 | 0.00 |
| 11/21/2017 12:25 | 10.5 | 9.71 | 44 | 16.6 | 6.84 | 1120 | 0.25 | 2.22 | 0.34 |
| 12/19/2017 14:08 | 8.7 | 10.9 | 37.3 | 187 | 7.36 | 2098 | 0.12 | 5.18 | 0.00 |
| 1/16/2018 12:33 | 9.5 | 10.31 | 134.5 | 12.5 | 7.29 | 214 | 1.15 | 1.28 | 0.14 |
| 2/20/2018 12:33 | 5.5 | 12.27 | 178.5 | 20.4 | 7.67 | 186 | 0.77 | 1.28 | 0.00 |
| 3/20/2018 12:13 | 8.5 | 11.65 | 196.8 | 17.8 | 7.66 | 84 | 0.82 | 1.07 | 0.00 |
| 4/10/2018 12:15 | 12.3 | 9.98 | 136.8 | 13.1 | 7.19 | 538 | 1.3 | 1.85 | 0.00 |
| 5/15/2018 12:26 | 15.4 | 6.99 | 198.2 | 14.8 | 7.38 | 909 | 0.21 | 1.95 | 0.00 |
| **Median** | **10.50** | **9.98** | **134.50** | **16.60** | **7.29** | **668** | **0.39** | **1.95** | |

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 2017/18)

| 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 |
| 7/18/2017 10:30 | 16.2 | 9.32 | 91.8 | 3.76 | 7.4 | 261 | 0.88 | 0.94 | 0.00 |
| 8/15/2017 10:50 | 16.6 | 9.15 | 91.6 | 3.17 | 7.41 | 156 | 0.72 | 1.31 | 0.00 |
| 9/19/2017 10:45 | 14.6 | 9.43 | 68.6 | 14.3 | 7.16 | >2420 | 0.74 | 2.81 | 0.35 |
| 10/17/2017 10:34 | 13.2 | 10.18 | 80.7 | 6.45 | 7.45 | 91 | 0.43 | 0.95 | 0.00 |
| 11/21/2017 10:35 | 10.8 | 10.55 | 42.5 | 15.4 | 6.95 | 2420 | 0.44 | 2.46 | 0.34 |
| 12/19/2017 10:15 | 9.9 | 10.62 | 80.3 | 24.3 | 7.38 | 703 | 0.61 | 4.53 | 0.00 |
| 1/16/2018 10:05 | 10.5 | 10.92 | 91.9 | 3.8 | 7.38 | 461 | 1.72 | 1.13 | 0.14 |
| 2/20/2018 10:00 | 7.5 | 11.93 | 89.7 | 2.57 | 7.53 | >2420 | 1.54 | 1.11 | 0.00 |
| 3/20/2018 9:30 | 8.2 | 11.52 | 93.2 | 4.1 | 7.31 | 169 | 1.57 | 0.98 | 0.00 |
| 4/10/2018 10:00 | 11.4 | 10.52 | 76.4 | 13.2 | 7.05 | 457 | 1.44 | 3.33 | 0.00 |
| 5/15/2018 9:55 | 13.6 | 10.17 | 88.6 | 2.39 | 7.35 | 75 | 1.05 | 0.91 | 0.00 |
| **Median** | **11.40** | **10.52** | **88.60** | **4.10** | **7.38** | **366** | **0.88** | **1.13** | |

| 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 |
| 7/18/2017 10:30 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0043 | 0.0026 | 30 |
| 8/15/2017 10:50 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0044 | <0.0025 | 30 |
| 9/19/2017 10:45 | 0.0035 | <0.0025 | 0.0008 | <0.001 | 0.0196 | 0.013 | 21 |
| 10/17/2017 10:34 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0044 | 0.0027 | 25 |
| 11/21/2017 10:35 | 0.0035 | 0.0026 | 0.001 | <0.0005 | 0.0218 | 0.0149 | 22 |
| 12/19/2017 10:15 | 0.0092 | 0.004 | 0.002 | <0.0005 | 0.1223 | 0.0667 | 22 |
| 1/16/2018 10:05 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0141 | 0.0116 | 32 |
| 2/20/2018 10:00 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0169 | 0.0141 | 30 |
| 3/20/2018 9:30 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0128 | 0.009 | 36 |
| 4/10/2018 10:00 | 0.0037 | <0.0025 | 0.0008 | <0.0005 | 0.0357 | 0.0267 | 25 |
| 5/15/2018 9:55 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0086 | 0.0065 | 27 |
| **Median** | **NA** | **NA** | **NA** | **NA** | **0.0141** | **0.0123** | **27** |

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 2017/18)

| 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 |
| 7/18/2017 10:15 | 15.6 | 9.08 | 71.2 | 2.96 | 6.86 | 548 | 1.71 | 0.81 | 0.00 |
| 8/15/2017 10:15 | 16.1 | 8.89 | 70.2 | 3.87 | 7.11 | 2420 | 1.53 | 1.22 | 0.00 |
| 9/19/2017 10:05 | 15.3 | 8.46 | 75.7 | 16.6 | 6.76 | >2420 | 1.52 | 1.55 | 0.35 |
| 10/17/2017 10:22 | 13.9 | 9.62 | 73.8 | 2.84 | 6.93 | 1553 | 1.34 | 0.85 | 0.00 |
| 11/21/2017 9:36 | 10.9 | 10.32 | 34.2 | 11.4 | 6.44 | 1986 | 0.57 | 0.97 | 0.34 |
| 12/19/2017 10:20 | 10.2 | 10.28 | 119.2 | 32.5 | 6.63 | 10460 | 0.69 | 4.45 | 0.00 |
| 1/16/2018 9:35 | 11.2 | 10.32 | 74 | 2.1 | 6.75 | 32 | 2.38 | 1 | 0.14 |
| 2/20/2018 9:35 | 9.4 | 10.77 | 72.1 | 4.04 | 6.89 | 53 | 2.21 | 0.81 | 0.00 |
| 3/20/2018 9:32 | 9.7 | 10.72 | 71.4 | 2.59 | 6.84 | 31 | 2.1 | 0.7 | 0.00 |
| 4/10/2018 10:00 | 11.2 | 10.13 | 69.9 | 7.74 | 6.4 | 594 | 2.01 | 1.19 | 0.00 |
| 5/15/2018 10:17 | 12.8 | 9.79 | 70.6 | 3.79 | 7.07 | 110 | 1.89 | 0.77 | 0.00 |
| **Median** | **11.20** | **10.13** | **71.40** | **3.87** | **6.84** | **571** | **1.71** | **0.97** | |

| 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 |
| 7/18/2017 10:15 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0044 | 0.0036 | 20 |
| 8/15/2017 10:15 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0059 | 0.0032 | 20 |
| 9/19/2017 10:05 | <0.0025 | <0.0025 | <0.0005 | <0.001 | 0.0282 | 0.0236 | 20 |
| 10/17/2017 10:22 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0067 | 0.0043 | 23 |
| 11/21/2017 9:36 | 0.0025 | <0.0025 | 0.0005 | <0.0005 | 0.0175 | 0.0139 | 16 |
| 12/19/2017 10:20 | 0.0096 | 0.005 | 0.0016 | <0.0005 | 9.705 | 9.46 | 40 |
| 1/16/2018 9:35 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0107 | 0.01 | 23 |
| 2/20/2018 9:35 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0445 | 0.0417 | 22 |
| 3/20/2018 9:32 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0154 | 0.0143 | 23 |
| 4/10/2018 10:00 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.015 | 0.0131 | 21 |
| 5/15/2018 10:17 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0101 | 0.0084 | 21 |
| **Median** | **NA** | **NA** | **NA** | **NA** | **0.0150** | **0.0131** | **21.00** |

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 2017/18)

| 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 |
| 7/18/2017 10:39 | 15 | 8.46 | 83.9 | 5.87 | 7.04 | 140 | 0.47 | 1.06 | 0.00 |
| 8/15/2017 10:45 | 14.6 | 8.06 | 99.5 | 3.87 | 7.11 | 345 | 0.33 | 1.42 | 0.00 |
| 9/19/2017 10:20 | 12.9 | 9.2 | 65.3 | 18 | 6.71 | >2420 | 0.53 | 3.56 | 0.35 |
| 10/17/2017 10:43 | 8.7 | 10.45 | 87 | 4.94 | 6.91 | 411 | 0.34 | 1.1 | 0.00 |
| 11/21/2017 9:55 | 10.1 | 10.62 | 54.5 | 9.03 | 6.99 | 201 | 0.83 | 1.4 | 0.34 |
| 12/19/2017 10:40 | 8.6 | 10.92 | 68.4 | 12.4 | 7.19 | 173 | 0.7 | 2.03 | 0.00 |
| 1/16/2018 9:53 | 8.6 | 11.36 | 59.3 | 6.6 | 6.9 | 24 | 1.7 | 1.08 | 0.14 |
| 2/20/2018 9:55 | 5.2 | 12.47 | 64.9 | 4.72 | 7.21 | 38 | 1.22 | 1.01 | 0.00 |
| 3/20/2018 9:52 | 5.7 | 12.38 | 59.4 | 7.07 | 7.13 | 46 | 1.2 | 0.96 | 0.00 |
| 4/10/2018 10:13 | 10.1 | 11.01 | 56.9 | 17.6 | 6.87 | 89 | 1.16 | 1.14 | 0.00 |
| 5/15/2018 10:32 | 12.9 | 10 | 68.5 | 5.48 | 7.18 | 140 | 0.55 | 1.21 | 0.00 |
| **Median** | **10.10** | **10.62** | **65.30** | **6.60** | **7.04** | **140** | **0.70** | **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 |
| 7/18/2017 10:55 | 14.9 | 8.79 | 61 | 9.56 | 7.01 | 102 | 0.6 | 0.99 | 0.00 |
| 8/15/2017 11:05 | 14.9 | 8.39 | 77.9 | 6.63 | 7.12 | 40 | 0.6 | 1.6 | 0.00 |
| 9/19/2017 10:40 | 12.4 | 9.23 | 84.7 | 14.8 | 7.03 | 2420 | 0.68 | 4.81 | 0.35 |
| 10/17/2017 10:55 | 9.5 | 10.09 | 63.8 | 8.35 | 6.71 | 50 | 0.24 | 1.15 | 0.00 |
| 11/21/2017 10:30 | 10.2 | 10.33 | 49.9 | 5.57 | 6.69 | 28 | 1.2 | 2.24 | 0.34 |
| 12/19/2017 11:10 | 8.2 | 10.63 | 50.4 | 6.31 | 7.24 | 10 | 1.04 | 1.05 | 0.00 |
| 1/16/2018 10:10 | 8.4 | 11.1 | 48.4 | 5.3 | 6.86 | 19 | 1.82 | 1.03 | 0.14 |
| 2/20/2018 10:10 | 5.8 | 11.81 | 48.4 | 4.8 | 6.85 | 17 | 1.31 | 0.96 | 0.00 |
| 3/20/2018 10:07 | 6.2 | 11.74 | 46.2 | 4.78 | 6.97 | 5 | 1.24 | 1.07 | 0.00 |
| 4/10/2018 10:28 | 9.8 | 10.88 | 45.5 | 14 | 6.83 | 36 | 1.37 | 0.8 | 0.00 |
| 5/15/2018 10:58 | 12.2 | 10.03 | 50 | 7.4 | 7.15 | 40 | 0.72 | 1.11 | 0.00 |
| **Median** | **9.80** | **10.33** | **50.00** | **6.63** | **6.97** | **36** | **1.04** | **1.07** | |

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 2017/18)

| 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 |
| 7/18/2017 11:40 | 18.3 | 8 | 101.3 | 6.31 | 7.4 | 65 | 0.57 | 1.07 | 0.00 |
| 8/15/2017 12:10 | 17.3 | 7.15 | 110.1 | 7.28 | 7.41 | 73 | 0.45 | 1.51 | 0.00 |
| 9/19/2017 11:35 | 14.3 | 8.94 | 66.8 | 16.9 | 7.14 | >2420 | 0.42 | 2.45 | 0.35 |
| 10/17/2017 12:00 | 10.3 | 9.87 | 104.9 | 7.17 | 7.36 | 236 | 0.47 | 1.16 | 0.00 |
| 11/21/2017 11:25 | 10.4 | 10.51 | 69.4 | 17.3 | 7.09 | 308 | 0.94 | 1.12 | 0.34 |
| 12/19/2017 10:55 | 8.7 | 10.84 | 74.1 | 18.9 | 7.31 | 238 | 0.98 | 1.79 | 0.00 |
| 1/16/2018 11:30 | 9 | 11.33 | 73.9 | 8 | 7.25 | 16 | 2.04 | 1.02 | 0.14 |
| 2/20/2018 11:16 | 5.3 | 12.39 | 80.6 | 6.8 | 7.44 | 69 | 1.68 | 1.12 | 0.00 |
| 3/20/2018 10:15 | 7 | 11.94 | 77 | 6.31 | 7.3 | 41 | 1.81 | 0.96 | 0.00 |
| 4/10/2018 10:50 | 11.1 | 10.58 | 71.9 | 18.6 | 7.16 | 119 | 1.69 | 0.82 | 0.00 |
| 5/15/2018 11:45 | 15.6 | 9.12 | 84.6 | 5.42 | 7.29 | 126 | 1.18 | 1.02 | 0.00 |
| **Median** | **10.40** | **10.51** | **77.00** | **7.28** | **7.30** | **96** | **0.98** | **1.12** | |

| 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 |
| 7/18/2017 12:00 | 18.1 | 8.55 | 103 | 10.9 | 7.38 | 866 | 0.96 | 0.87 | 0.00 |
| 8/15/2017 12:30 | 16.8 | 8.5 | 113.5 | 7.33 | 7.38 | 155 | 0.47 | 1.21 | 0.00 |
| 9/19/2017 11:50 | 14.5 | 9.08 | 116.5 | 7.68 | 7.09 | 1733 | 0.51 | 1.8 | 0.35 |
| 10/17/2017 12:10 | 9.3 | 10.46 | 109.4 | 5.73 | 7.38 | 65 | 0.78 | 1.28 | 0.00 |
| 11/21/2017 11:40 | 10.3 | 10.14 | 84.5 | 19.9 | 6.94 | 124 | 1.55 | 0.96 | 0.34 |
| 12/19/2017 11:05 | 8.8 | 10.83 | 83.3 | 13.8 | 7.4 | 41 | 1.84 | 1.38 | 0.00 |
| 1/16/2018 11:40 | 9.1 | 11.1 | 78.2 | 8.1 | 7.13 | 6 | 2.47 | 0.89 | 0.14 |
| 2/20/2018 11:22 | 6.2 | 12.02 | 83.8 | 7.15 | 7.3 | 32 | 2.24 | 1.39 | 0.00 |
| 3/20/2018 10:38 | 7.5 | 11.61 | 78 | 9.34 | 7.16 | 27 | 2.18 | 0.87 | 0.00 |
| 4/10/2018 11:07 | 10.7 | 10.72 | 74.4 | 16.4 | 7.1 | 166 | 1.92 | 0.64 | 0.00 |
| 5/15/2018 11:55 | 14.6 | 9.57 | 88.8 | 7.23 | 7.26 | 687 | 1.95 | 0.93 | 0.00 |
| **Median** | **10.30** | **10.46** | **84.50** | **8.10** | **7.26** | **345** | **1.84** | **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 - Glenn Creek (RY 2017/18)

| 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 |
| 7/18/2017 11:25 | 15.9 | 8.62 | 113.3 | 6.68 | 7.5 | 613 | 0.92 | 0.99 | 0.00 |
| 8/15/2017 11:55 | 15.7 | 8.26 | 118 | 5.01 | 7.46 | 194 | 0.85 | 1.35 | 0.00 |
| 9/19/2017 11:20 | 13.5 | 9.5 | 65.7 | 17.8 | 7.1 | >2420 | 0.53 | 2.3 | 0.35 |
| 10/17/2017 11:42 | 11 | 10.44 | 104.1 | 6.35 | 7.42 | 225 | 0.64 | 1.31 | 0.00 |
| 11/21/2017 11:10 | 10.6 | 10.55 | 61.7 | 22.5 | 7.05 | 365 | 0.81 | 1.54 | 0.34 |
| 12/19/2017 10:42 | 9.2 | 10.85 | 93.4 | 34.4 | 7.46 | 97 | 0.98 | 1.91 | 0.00 |
| 1/16/2018 11:15 | 9.5 | 11.22 | 81.2 | 6.2 | 7.35 | 20 | 1.97 | 0.84 | 0.14 |
| 2/20/2018 10:47 | 5.9 | 12.28 | 88.2 | 6.22 | 7.49 | 34 | 1.5 | 1.07 | 0.00 |
| 3/20/2018 9:58 | 7.1 | 11.9 | 86.2 | 5.94 | 7.4 | 23 | 1.62 | 1.14 | 0.00 |
| 4/10/2018 10:35 | 10.7 | 10.72 | 79.8 | 17.2 | 7.11 | 214 | 1.72 | 1.11 | 0.00 |
| 5/15/2018 11:30 | 14.7 | 9.76 | 94.9 | 5.63 | 7.49 | 80 | 0.91 | 1.08 | 0.00 |
| **Median** | **10.70** | **10.55** | **88.20** | **6.35** | **7.42** | **146** | **0.92** | **1.14** | |

| 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 |
| 7/18/2017 13:05 | 14.9 | 9.26 | 73.2 | 8.16 | 7.47 | 225 | 0.56 | 0.71 | 0.00 |
| 8/15/2017 12:50 | 14.9 | 8.23 | 90.7 | 7.93 | 7.29 | 1203 | 0.17 | 1.28 | 0.00 |
| 9/19/2017 12:00 | 13.7 | 8.8 | 81.5 | 15 | 6.95 | >2420 | 0.23 | 3.39 | 0.35 |
| 10/17/2017 12:22 | 10.2 | 10.48 | 80.6 | 2.6 | 7.43 | 19 | 0.16 | 0.91 | 0.00 |
| 11/21/2017 11:55 | 10.3 | 10.54 | 62.1 | 15.6 | 7.1 | 72 | 1.32 | 0.75 | 0.34 |
| 12/19/2017 11:23 | 8.4 | 10.95 | 55.3 | 11.6 | 7.51 | 41 | 0.98 | 1.23 | 0.00 |
| 1/16/2018 11:53 | 9.1 | 11.24 | 55.6 | 9.3 | 7.21 | 14 | 2.04 | 0.71 | 0.14 |
| 2/20/2018 11:40 | 5.6 | 12.31 | 53.4 | 8.23 | 7.41 | 214 | 1.37 | 0.92 | 0.00 |
| 3/20/2018 10:56 | 7.3 | 11.84 | 55.7 | 10.7 | 7.25 | 3 | 1.57 | 0.9 | 0.00 |
| 4/10/2018 11:25 | 10.2 | 10.93 | 54.2 | 24.2 | 7.13 | 29 | 1.68 | 0.53 | 0.00 |
| 5/15/2018 12:12 | 12.2 | 10.32 | 57 | 8.36 | 7.33 | 16 | 0.85 | 0.67 | 0.00 |
| **Median** | **9.65** | **10.54** | **57.00** | **9.30** | **7.29** | **35** | **0.98** | **0.90** | |

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 2017/18)

| 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 |
| 7/18/2017 12:15 | No Flow | | | | | | | | | |
| 8/15/2017 12:15 | No Flow | | | | | | | | | |
| 9/19/2017 12:28 | 14.8 | 6.25 | 125.6 | 6.01 | 6.74 | >2420 | 1.12 | 5.97 | 0.35 | 4.20 |
| 10/17/2017 12:01 | 10.6 | 2.91 | 112 | 11.6 | 6.45 | 387 | <0.05 | 1.93 | 0.00 | 9.3 |
| 11/21/2017 12:05 | 10.3 | 8.86 | 76.8 | 12.3 | 6.89 | 548 | 0.44 | 1.53 | 0.34 | 10.00 |
| 12/19/2017 13:45 | 8.5 | 10.34 | 65.3 | 56.7 | 7.32 | 908 | 0.35 | 3.35 | 0.00 | 151.00 |
| 1/16/2018 11:40 | 8.9 | 10.47 | 166.5 | 6 | 7.09 | 131 | 2.17 | 1.17 | 0.14 | 5.10 |
| 2/20/2018 12:07 | 5.8 | 14.47 | 216 | 12.6 | 7.61 | 210 | 1.74 | 1.06 | 0.00 | 15.60 |
| 3/20/2018 11:26 | 7.7 | 12.45 | 227.5 | 10.1 | 7.3 | 36 | 1.76 | 1.02 | 0.00 | 6.40 |
| 4/10/2018 12:00 | 12.2 | 11.32 | 168.4 | 8.06 | 7.03 | 276 | 1.76 | 1.24 | 0.00 | 4.00 |
| 5/15/2018 12:06 | 15.8 | 7.35 | 292.5 | 4.57 | 6.74 | 51 | 0.09 | 1.3 | 0.00 | 3.30 |

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 2017/18)

| 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 |
| 7/18/2017 9:08 | 18.4 | 9.04 | 56.7 | 4.38 | 7.07 | 225 | 0.24 | 1.08 | 0.00 |
| 8/15/2017 9:10 | 16.3 | 9.54 | 50.2 | 4.68 | 6.98 | 79 | 0.15 | 1.38 | 0.00 |
| 9/19/2017 9:07 | 12.6 | 10.31 | 46.6 | 6.61 | 6.64 | 1553 | 0.11 | 1.55 | 0.35 |
| 10/17/2017 9:30 | 10.4 | 10.9 | 76.2 | 4.27 | 6.36 | 770 | 0.42 | 1.65 | 0.00 |
| 11/21/2017 8:47 | 10.2 | 10.86 | 88.1 | 10.3 | 7.07 | 260 | 2.67 | 1.35 | 0.34 |
| 12/19/2017 9:25 | 8 | 11.46 | 84.1 | 5.68 | 7.39 | 146 | 1.68 | 1.65 | 0.00 |
| 1/16/2018 8:55 | 8.3 | 11.61 | 83.3 | 8.6 | 7.1 | 248 | 2.69 | 0.92 | 0.14 |
| 2/20/2018 8:55 | 4.9 | 12.71 | 84.6 | 5.56 | 7.32 | 138 | 1.97 | 1.2 | 0.00 |
| 3/20/2018 8:41 | 7.4 | 11.81 | 81.9 | 5.85 | 7.34 | 488 | 1.62 | 1.3 | 0.00 |
| 4/10/2018 9:20 | 10.8 | 10.77 | 81.9 | 14.9 | 7.05 | 236 | 2.29 | 1.1 | 0.00 |
| 5/15/2018 9:10 | 16.4 | 9.48 | 63.9 | 3.91 | 7.25 | 140 | 0.6 | 0.84 | 0.00 |
| **Median** | **10.40** | **10.86** | **81.90** | **5.68** | **7.07** | **236** | **1.62** | **1.30** | |

| 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 |
| 7/18/2017 11:58 | 18.1 | 9.82 | 53.4 | 6.67 | 7.6 | 131 | 0.27 | 1.32 | 0.00 |
| 8/15/2017 11:53 | 15.6 | 10.33 | 48.6 | 4.19 | 7.46 | 109 | 0.14 | 1.61 | 0.00 |
| 9/19/2017 12:07 | 12.3 | 10.16 | 54.2 | 11.9 | 7.25 | >2420 | 0.33 | 2.3 | 0.35 |
| 10/17/2017 11:45 | 10.6 | 11.45 | 75.5 | 5.61 | 6.85 | 2420 | 0.37 | 1.96 | 0.00 |
| 11/21/2017 11:40 | 10.2 | 10.18 | 89.6 | 11.5 | 7.01 | 248 | 3.06 | 1.09 | 0.34 |
| 12/19/2017 13:22 | 8.1 | 11.25 | 77 | 5.2 | 7.22 | 121 | 1.71 | 1.28 | 0.00 |
| 1/16/2018 11:20 | 8.3 | 11.23 | 79.3 | 8.2 | 7.03 | 79 | 2.79 | 1.23 | 0.14 |
| 2/20/2018 11:10 | 4.8 | 12.73 | 79.8 | 6.05 | 7.33 | 89 | 2.06 | 1.3 | 0.00 |
| 3/20/2018 11:05 | 6.9 | 12.41 | 76.2 | 5.37 | 7.36 | 161 | 1.76 | 1.22 | 0.00 |
| 4/10/2018 11:19 | 10.6 | 10.55 | 77.8 | 13.3 | 6.92 | 172 | 2.39 | 0.97 | 0.00 |
| 5/15/2018 11:46 | 15 | 10.42 | 57.4 | 5.5 | 7.37 | 249 | 0.6 | 1.48 | 0.00 |
| **Median** | **10.60** | **10.55** | **76.20** | **6.05** | **7.25** | **146** | **1.71** | **1.30** | |

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 2017/18)

| 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 |
| 7/18/2017 10:00 | 18.8 | 9.24 | 53.2 | 4.99 | 7.47 | 115 | 0.25 | 1.37 | 0.00 |
| 8/15/2017 10:18 | 16.3 | 9.77 | 48.3 | 6.69 | 7.42 | 649 | 0.12 | 1.53 | 0.00 |
| 9/19/2017 10:20 | 12.9 | 10.47 | 45.3 | 7.74 | 7.34 | >2420 | 0.1 | 1.8 | 0.35 |
| 10/17/2017 10:10 | 10.4 | 11.21 | 71.3 | 8.2 | 7.29 | 770 | 0.41 | 1.8 | 0.00 |
| 11/21/2017 9:50 | 10.1 | 10.62 | 85.2 | 8.7 | 7.25 | 162 | 2.58 | 1.4 | 0.34 |
| 12/19/2017 9:45 | 7.9 | 11.68 | 80.4 | 7.07 | 7.55 | 148 | 1.82 | 1.59 | 0.00 |
| 1/16/2018 9:27 | 7.9 | 10.91 | 84.5 | 5 | 7.39 | 99 | 2.58 | 1.21 | 0.14 |
| 2/20/2018 9:30 | 4.8 | 13.04 | 81.5 | 6.58 | 7.57 | 112 | 1.94 | 1.43 | 0.00 |
| 3/20/2018 9:08 | 7.3 | 11.9 | 82.1 | 5.71 | 7.42 | 435 | 1.86 | 1.68 | 0.00 |
| 4/10/2018 9:35 | 11 | 9.85 | 81.8 | 10.8 | 7.21 | 435 | 2.26 | 1.25 | 0.00 |
| 5/15/2018 9:25 | 16.3 | 9.72 | 60.3 | 5.51 | 7.44 | 152 | 0.6 | 1.29 | 0.00 |
| **Median** | **10.40** | **10.62** | **80.40** | **6.69** | **7.42** | **157** | **1.82** | **1.43** | |

| 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 |
| 7/18/2017 9:10 | 18.5 | 8.48 | 53.5 | 5.73 | 7.33 | 158 | 0.28 | 1.1 | 0.00 |
| 8/15/2017 9:15 | 15.9 | 9.32 | 48.5 | 4.99 | 7.11 | 128 | 0.11 | 1.38 | 0.00 |
| 9/19/2017 9:10 | 12.4 | 10.02 | 45.9 | 7.04 | 6.87 | 1203 | 0.1 | 1.36 | 0.35 |
| 10/17/2017 9:30 | 10.2 | 10.43 | 71.5 | 5.02 | 6.83 | 980 | 0.38 | 1.4 | 0.00 |
| 11/21/2017 8:55 | 10.1 | 10.65 | 88.8 | 10.3 | 7.11 | 162 | 2.77 | 0.93 | 0.34 |
| 12/19/2017 9:15 | 7.9 | 11.32 | 80.6 | 4.21 | 7.4 | 121 | 1.88 | 1.14 | 0.00 |
| 1/16/2018 9:00 | 8.1 | 11.37 | 82.8 | 7.3 | 7.2 | 179 | 2.66 | 1.01 | 0.14 |
| 2/20/2018 9:00 | 4.8 | 12.63 | 81.3 | 6.07 | 7.29 | 86 | 1.96 | 1.18 | 0.00 |
| 3/20/2018 8:39 | 7.1 | 11.48 | 79.6 | 5.86 | 7.26 | 225 | 1.71 | 1.24 | 0.00 |
| 4/10/2018 9:10 | 10.7 | 10.48 | 80.6 | 12.6 | 7.13 | 248 | 2.35 | 1.02 | 0.00 |
| 5/15/2018 8:55 | 16.1 | 9.16 | 60.2 | 4.5 | 7.23 | 111 | 0.6 | 1.14 | 0.00 |
| **Median** | **10.20** | **10.48** | **79.60** | **5.86** | **7.20** | **162** | **1.71** | **1.14** | |

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 2017/18)

| 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 |
| 7/18/2017 9:45 | 18.5 | 9.18 | 55.1 | 4.91 | 7.46 | 166 | 0.2 | 1.32 | 0.00 |
| 8/15/2017 9:50 | 16.6 | 9.68 | 45.8 | 4.8 | 7.41 | 435 | 0.13 | 1.57 | 0.00 |
| 9/19/2017 10:00 | 13.4 | 9.85 | 51.4 | 13.5 | 7.4 | 1414 | 0.18 | 2.09 | 0.35 |
| 10/17/2017 10:00 | 10.5 | 11.23 | 69.7 | 4.25 | 7.28 | 361 | 0.4 | 1.63 | 0.00 |
| 11/21/2017 9:15 | 10.2 | 10.8 | 82 | 9.98 | 7.18 | 365 | 2.3 | 1.46 | 0.34 |
| 12/19/2017 9:35 | 8.1 | 11.43 | 92.8 | 6.2 | 7.47 | 120 | 1.72 | 1.83 | 0.00 |
| 1/16/2018 9:17 | 8.3 | 11.57 | 82 | 8.2 | 7.26 | 75 | 2.52 | 1.18 | 0.14 |
| 2/20/2018 9:20 | 4.9 | 12.92 | 82 | 7.41 | 7.55 | 71 | 1.83 | 1.47 | 0.00 |
| 3/20/2018 8:55 | 7.1 | 12.03 | 80.5 | 4.79 | 7.4 | 345 | 1.7 | 1.62 | 0.00 |
| 4/10/2018 9:22 | 10.7 | 10.69 | 79.6 | 13.6 | 7.15 | 613 | 2.17 | 1.38 | 0.00 |
| 5/15/2018 9:15 | 16.4 | 9.57 | 61.8 | 5.05 | 7.48 | 130 | 0.6 | 1.26 | 0.00 |
| **Median** | **10.50** | **10.80** | **79.60** | **6.20** | **7.40** | **345** | **1.70** | **1.47** | |

| 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 |
| 7/18/2017 9:45 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | <0.0025 | <0.0025 | 21 |
| 8/15/2017 9:50 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | <0.0025 | <0.0025 | 19 |
| 9/19/2017 10:00 | <0.0025 | <0.0025 | 0.0006 | <0.0005 | 0.0128 | 0.0049 | 18 |
| 10/17/2017 10:00 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | <0.0025 | <0.0025 | 28 |
| 11/21/2017 9:15 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0082 | 0.0057 | 36 |
| 12/19/2017 9:35 | <0.0025 | <0.0025 | <0.001 | <0.0005 | 0.0171 | 0.0125 | 30 |
| 1/16/2018 9:17 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0051 | 0.0039 | 28 |
| 2/20/2018 9:20 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | <0.0025 | <0.0025 | 31 |
| 3/20/2018 8:55 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | <0.0025 | <0.0025 | 30 |
| 4/10/2018 9:22 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0066 | 0.0041 | 29 |
| 5/15/2018 9:15 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0025 | <0.0025 | 24 |
| **Median** | **NA** | **NA** | **NA** | **NA** | **NA** | **NA** | **28** |

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 2017/18)

| 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 |
| 7/18/2017 10:40 | 19.2 | 8.76 | 82.7 | 4.65 | 7.47 | 111 | 0.37 | 1.41 | 0.00 |
| 8/15/2017 10:55 | 18.7 | 8.7 | 85.7 | 4.95 | 7.43 | 122 | 0.26 | 2.23 | 0.00 |
| 9/19/2017 10:50 | 15.7 | 8.47 | 66.3 | 21.4 | 7.15 | >2420 | 0.24 | 2.77 | 0.35 |
| 10/17/2017 10:42 | 11.3 | 10.53 | 82.7 | 3.92 | 7.42 | 99 | 0.43 | 1.42 | 0.00 |
| 11/21/2017 10:40 | 10.8 | 10.25 | 72.1 | 9.8 | 7.09 | 108 | 0.77 | 1.51 | 0.34 |
| 12/19/2017 10:20 | 8.2 | 11.13 | 84.5 | 7.63 | 7.54 | 96 | 0.97 | 2.67 | 0.00 |
| 1/16/2018 10:19 | 9.2 | 11.23 | 81.8 | 5.6 | 7.39 | 18 | 1.46 | 1.05 | 0.14 |
| 2/20/2018 10:10 | 6.4 | 12.58 | 85.7 | 6.89 | 7.8 | 12 | 1.17 | 1.98 | 0.00 |
| 3/20/2018 9:37 | 7.6 | 11.99 | 88.4 | 3.31 | 7.53 | 18 | 1.15 | 1.24 | 0.00 |
| 4/10/2018 10:15 | 11.3 | 10.51 | 79.9 | 17 | 7.19 | 1986 | 1.22 | 1.52 | 0.00 |
| 5/15/2018 10:05 | 17 | 9.29 | 84.2 | 2.33 | 7.58 | 178 | 0.78 | 1 | 0.00 |
| **Median** | **11.30** | **10.51** | **82.70** | **5.60** | **7.43** | **103.5** | **0.78** | **1.51** | |

| 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 |
| 7/18/2017 10:40 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0041 | <0.0025 | 30 |
| 8/15/2017 10:55 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0043 | <0.0025 | 30 |
| 9/19/2017 10:50 | 0.0025 | <0.0025 | 0.0007 | <0.0005 | 0.0181 | 0.0075 | 24 |
| 10/17/2017 10:42 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0041 | <0.0025 | 33 |
| 11/21/2017 10:40 | 0.0026 | <0.0025 | <0.0005 | <0.0005 | 0.0186 | 0.0123 | 31 |
| 12/19/2017 10:20 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0171 | 0.0119 | 30 |
| 1/16/2018 10:19 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0177 | 0.015 | 29 |
| 2/20/2018 10:10 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0069 | 0.0037 | 33 |
| 3/20/2018 9:37 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.006 | 0.0038 | 33 |
| 4/10/2018 10:15 | <0.0025 | <0.0025 | 0.0013 | <0.0005 | 0.0125 | 0.0074 | 28 |
| 5/15/2018 10:05 | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0032 | <0.0025 | 30 |
| **Median** | **NA** | **NA** | **NA** | **NA** | **0.0069** | **0.0075** | **30.00** |

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 2017/18)

| 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 |
| 7/18/2017 10:10 | 18.5 | 9.37 | 54.3 | 4.67 | 7.51 | 105 | 0.28 | 1.1 | 0.00 |
| 8/15/2017 10:25 | 16.3 | 9.85 | 49.7 | 3.34 | 7.55 | 276 | 0.12 | 1.51 | 0.00 |
| 9/19/2017 10:30 | 12.7 | 10.32 | 47.9 | 8.07 | 7.25 | 2420 | 0.11 | 1.42 | 0.35 |
| 10/17/2017 10:20 | 10.4 | 11.16 | 72.4 | 4.75 | 7.31 | 649 | 0.41 | 1.63 | 0.00 |
| 11/21/2017 10:15 | 10.1 | 10.91 | 86.5 | 9.83 | 7.21 | 199 | 2.87 | 1.18 | 0.34 |
| 12/19/2017 9:53 | 8 | 11.54 | 84.7 | 4.74 | 7.54 | 74 | 1.82 | 1.55 | 0.00 |
| 1/16/2018 9:40 | 8.2 | 11.65 | 81.4 | 8.1 | 7.31 | 99 | 2.65 | 1.33 | 0.14 |
| 2/20/2018 9:40 | 4.8 | 13.09 | 80.5 | 7.13 | 7.58 | 133 | 1.95 | 1.27 | 0.00 |
| 3/20/2018 9:17 | 7 | 12.26 | 79.1 | 5.76 | 7.43 | 260 | 1.77 | 1.52 | 0.00 |
| 4/10/2018 9:44 | 10.6 | 10.8 | 78.9 | 15.5 | 7.15 | 155 | 2.37 | 1.19 | 0.00 |
| 5/15/2018 9:35 | 15.9 | 9.69 | 60.3 | 3.98 | 7.47 | 93 | 0.62 | 1.23 | 0.00 |
| **Median** | **10.40** | **10.91** | **78.90** | **5.76** | **7.43** | **155** | **1.77** | **1.33** | |

| 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 |
| 7/18/2017 9:00 | 18.1 | 9.32 | 52.9 | 5.33 | 7.22 | 155 | 0.28 | 1.16 | 0.00 |
| 8/15/2017 9:00 | 15.6 | 9.84 | 48.2 | 4.7 | 7.12 | 113 | 0.11 | 1.38 | 0.00 |
| 9/19/2017 8:45 | 12.3 | 10.42 | 45.7 | 11.7 | 6.7 | 2420 | 0.1 | 1.59 | 0.35 |
| 10/17/2017 9:12 | 10.2 | 11.04 | 72.3 | 4.43 | 6.84 | 770 | 0.41 | 1.33 | 0.00 |
| 11/21/2017 8:35 | 10.1 | 10.85 | 89 | 9.86 | 6.9 | 140 | 2.85 | 0.8 | 0.34 |
| 12/19/2017 9:05 | 7.9 | 11.56 | 79.4 | 3.98 | 7.37 | 110 | 1.75 | 0.97 | 0.00 |
| 1/16/2018 8:45 | 8.2 | 11.65 | 80.8 | 8.3 | 7 | 96 | 2.69 | 1.09 | 0.14 |
| 2/20/2018 8:50 | 4.8 | 12.84 | 80 | 6.29 | 7.2 | 142 | 1.97 | 1.11 | 0.00 |
| 3/20/2018 8:27 | 6.9 | 12.01 | 78.5 | 6.17 | 7.29 | 291 | 1.67 | 1.18 | 0.00 |
| 4/10/2018 8:40 | 10.5 | 10.75 | 78.8 | 14.5 | 7 | 130 | 2.35 | 0.83 | 0.00 |
| 5/15/2018 10:25 | 15.6 | 10.07 | 59 | 5.37 | 7.01 | 130 | 0.59 | 1.23 | 0.00 |
| **Median** | **10.20** | **10.85** | **78.50** | **6.17** | **7.01** | **140** | **1.67** | **1.16** | |

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 2017/18)

| 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 |
| 7/18/2017 13:45 | 21.2 | 10.33 | 71.1 | 1.29 | 7.98 | 9 | 0.19 | 1.02 | 0.00 |
| 8/15/2017 13:49 | 17.9 | 10.02 | 58.9 | 1.53 | 7.74 | 8 | 0.08 | 1.34 | 0.00 |
| 9/19/2017 13:51 | 15.3 | 10.71 | 60.3 | 3.14 | 7.05 | 435 | 0.13 | 1.13 | 0.35 |
| 10/17/2017 13:33 | 12.1 | 10.7 | 61.5 | 4.61 | 6.87 | 40 | 0.08 | 1.33 | 0.00 |
| 11/21/2017 13:40 | 9 | 10.94 | 53.3 | 13.8 | 7.22 | 72 | 0.46 | 0.7 | 0.34 |
| 12/19/2017 14:15 | 7.3 | 11.44 | 68.4 | 6 | 7.35 | 150 | 0.39 | 1.28 | 0.00 |
| 1/16/2018 13:10 | 7.8 | 11.45 | 62.7 | 7.9 | 7.31 | 28 | 0.68 | 0.93 | 0.14 |
| 2/20/2018 13:10 | 6 | 12.18 | 72.3 | 6.44 | 7.41 | 37 | 0.59 | 1.09 | 0.00 |
| 3/20/2018 13:05 | 8.7 | 12.04 | 70.8 | 5.26 | 7.33 | 28 | 0.54 | 1.13 | 0.00 |
| 4/10/2018 13:00 | 10 | 10.68 | 59.9 | 21.6 | 7.28 | 488 | 0.62 | 1.4 | 0.00 |
| 5/15/2018 13:05 | 16.4 | 12.21 | 65 | 2.11 | 8.24 | 16 | 0.13 | 1.35 | 0.00 |
| **Median** | **10.00** | **10.94** | **62.70** | **5.26** | **7.33** | **37** | **0.39** | **1.13** | |

| 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) |
| 29 | <0.05 | 0.036 | 59 | 61 | 2.3 |
| 27 | <0.05 | 0.033 | 57 | 62 | 4.6 |
| 28 | <0.05 | 0.026 | 52 | 57 | 4.6 |
| 26 | <0.05 | 0.029 | 58 | 64 | 6.4 |
| 22 | <0.05 | 0.061 | 52 | 69 | 17.5 |
| 30 | <0.05 | 0.05 | 60 | 70 | 9.8 |
| 24 | <0.05 | 0.051 | 63 | 72 | 8.9 |
| 29 | <0.05 | 0.038 | 63 | 67 | 4.4 |
| 30 | <0.05 | 0.036 | 64 | 68 | 4.4 |
| 25 | 0.141 | 0.082 | 58 | 83 | 25 |
| 27 | <0.05 | 0.03 | 59 | 62 | 3.2 |
| **27** | **NA** | **0.036** | **59** | **67** | **4.6** |

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 2017/18)

| 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 |
| 7/18/2017 9:35 | 19.6 | 8.85 | 71.7 | 1.47 | | 11 | 0.18 | 1.06 | 0.00 |
| 8/15/2017 9:40 | 17.1 | 9.31 | 59.1 | 1.99 | 7.39 | 11 | 0.09 | 1.2 | 0.00 |
| 9/19/2017 9:30 | 14.1 | 9.99 | 61.5 | 2.4 | 6.77 | 326 | 0.11 | 0.99 | 0.35 |
| 10/17/2017 9:55 | 11.7 | 10.57 | 59.9 | 4.75 | 6.46 | 16 | 0.09 | 1.04 | 0.00 |
| 11/21/2017 9:10 | 9 | 11.12 | 52.9 | 19.5 | 7.37 | 45 | 0.32 | 1.04 | 0.34 |
| 12/19/2017 9:45 | 7.4 | 11.78 | 67.2 | 4.69 | 7.57 | 17 | 0.32 | 1.06 | 0.00 |
| 1/16/2018 9:13 | 7.7 | 11.6 | 62 | 7.7 | 7.52 | 29 | 0.6 | 0.96 | 0.14 |
| 2/20/2018 9:12 | 5.6 | 12.26 | 69.6 | 6.49 | 7.43 | 35 | 0.47 | 1.32 | 0.00 |
| 3/20/2018 8:58 | 7.9 | 11.67 | 67.6 | 4.97 | 7.44 | 14 | 0.48 | 1.1 | 0.00 |
| 4/10/2018 9:33 | 10 | 10.82 | 59.5 | 23.7 | 7.16 | 579 | 0.52 | 1.43 | 0.00 |
| 5/15/2018 9:44 | 15.8 | 10.07 | 62.1 | 2.89 | 7.52 | 6 | 0.13 | 1.23 | 0.00 |
| **Median** | **10.00** | **10.82** | **62.00** | **4.75** | **7.41** | **17** | **0.32** | **1.06** | |

| 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) |
| 29 | <0.05 | 0.035 | 59 | 62 | 2.6 |
| 28 | <0.05 | 0.035 | 52 | 58 | 6 |
| 27 | <0.05 | 0.034 | 48 | 52 | 4 |
| 26 | <0.05 | 0.032 | 57 | 63 | 6.4 |
| 22 | <0.05 | 0.066 | 58 | 77 | 18.8 |
| 28 | <0.05 | 0.03 | 68 | 71 | 2.8 |
| 25 | <0.05 | 0.05 | 70 | 79 | 9.2 |
| 29 | <0.05 | 0.039 | 56 | 61 | 5.2 |
| 30 | <0.05 | 0.036 | 65 | 70 | 4.6 |
| 25 | 0.152 | 0.078 | 55 | 80 | 25 |
| 26 | <0.05 | 0.027 | 51 | 56 | 4.8 |
| **27** | **NA** | **0.035** | **57** | **63** | **5.2** |

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 2017/18)

| 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 |
| 7/18/2017 13:30 | 20.8 | 11.02 | 71.9 | 1.22 | 8.14 | 2 | 0.2 | 0.97 | 0.00 |
| 8/15/2017 13:25 | 17.9 | 9.83 | 59.8 | 4.85 | 7.54 | 2 | 0.11 | 1.3 | 0.00 |
| 9/19/2017 12:35 | 15.2 | 10.38 | 61.6 | 4.2 | 7.35 | 58 | 0.11 | 1.09 | 0.35 |
| 10/17/2017 12:45 | 12 | 10.61 | 59 | 4.81 | 7.57 | 14 | 0.08 | 1.15 | 0.00 |
| 11/21/2017 12:20 | 8.8 | 11.01 | 51.2 | 14.6 | 7.27 | 62 | 0.29 | 0.87 | 0.34 |
| 12/19/2017 12:05 | 7 | 11.63 | 67.3 | 3.68 | 7.45 | 8 | 0.28 | 1.16 | 0.00 |
| 1/16/2018 12:22 | 7.6 | 11.56 | 60.4 | 7.8 | 7.3 | 1 | 0.5 | 1 | 0.14 |
| 2/20/2018 12:05 | 5.7 | 12.23 | 68 | 6.92 | 7.42 | 32 | 0.48 | 1.19 | 0.00 |
| 3/20/2018 11:22 | 8.1 | 11.7 | 67.4 | 5.17 | 7.35 | 8 | 0.49 | 1.13 | 0.00 |
| 4/10/2018 11:57 | 9.7 | 10.75 | 57.1 | 20.9 | 7.21 | 461 | 0.42 | 1.48 | 0.00 |
| 5/15/2018 12:40 | 15.5 | 11.02 | 68.3 | 3.11 | 7.51 | 11 | 0.14 | 1.23 | 0.00 |
| **Median** | **9.70** | **11.02** | **61.60** | **4.85** | **7.42** | **11** | **0.28** | **1.15** | |

| 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) |
| 29 | <0.05 | 0.035 | 60 | 63 | 2.8 |
| 28 | <0.05 | 0.033 | 56 | 60 | 4.4 |
| 28 | <0.05 | 0.021 | 53 | 56 | 2.8 |
| 25 | <0.05 | 0.031 | 56 | 63 | 6.8 |
| 22 | <0.05 | 0.057 | 54 | 71 | 17.2 |
| 30 | <0.05 | 0.03 | 66 | 70 | 3.6 |
| 25 | <0.05 | 0.046 | 78 | 87 | 8.8 |
| 29 | <0.05 | 0.037 | 60 | 66 | 5.6 |
| 30 | <0.05 | 0.036 | 66 | 71 | 5.2 |
| 24 | 0.148 | 0.081 | 56 | 82 | 25.6 |
| 26 | <0.05 | 0.025 | 58 | 62 | 4 |
| **28** | **NA** | **0.035** | **58** | **66** | **5.2** |

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 2017/18)

| 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 | 07/18/2017 11:42 | 18.3 | 7.94 | 101.4 | 6.28 | 7.35 | 81 | 0.54 | 0.94 | | | | | | | | |
| GIB15 | 07/18/2017 12:05 | 18.1 | 8.55 | 103 | 10.3 | 7.4 | 816 | 0.94 | 0.76 | | | | | | | | |
| MIC10 | 07/18/2017 12:05 | 18.2 | 9.85 | 53.4 | 5.34 | 7.66 | 147 | 0.29 | 1.04 | | | | | | | | |
| GLE10 | 08/15/2017 12:55 | 14.4 | 8.06 | 89.7 | 6.95 | 7.24 | 980 | 0.16 | 1.2 | | | | | | | | |
| CGT1 | 08/15/2017 13:18 | 21.8 | 9.82 | 258.6 | 1.62 | 7.31 | 83 | 0.08 | 2.05 | | | | | | | | |
| SHE10 | 09/19/2017 08:50 | 12.3 | 10.42 | 45.7 | 10.7 | 6.7 | 2420 | 0.1 | 1.44 | | | | | | | | |
| MIC1 | 09/19/2017 09:10 | 12.6 | 10.32 | 46.5 | 7.19 | 6.58 | 1733 | 0.12 | 1.45 | | | | | | | | |
| MRA10 | 10/17/2017 09:35 | 10.2 | 10.43 | 71.5 | 4.65 | 6.88 | 727 | 0.37 | 1.45 | | | | | | | | |
| CLA10 | 10/17/2017 10:26 | 13.9 | 9.6 | 73.8 | 2.71 | 6.95 | 2420 | 1.3 | 0.89 | | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0051 | 0.0041 | 23 |
| PRI1 | 11/21/2017 09:20 | 10.2 | 10.81 | 81.9 | 10.1 | 7.18 | 238 | 2.27 | 1.1 | | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0088 | 0.0058 | 35 |
| MRA1 | 11/21/2017 09:55 | 20.1 | 10.62 | 85.1 | 8.57 | 7.25 | 167 | 2.52 | 1.16 | | | | | | | | |
| CRO1 | 11/21/2017 10:02 | 10.1 | 10.61 | 54.5 | 9.03 | 6.99 | 248 | 0.84 | 1.18 | | | | | | | | |
| SHE1 | 12/19/2017 09:56 | 8 | 11.53 | 84.6 | 5.26 | 7.51 | 135 | 1.89 | 1.43 | | | | | | | | |
| CRO10 | 12/19/2017 11:18 | 8.2 | 10.63 | 50.3 | 6.2 | 6.85 | 10 | 1.17 | 1.46 | | | | | | | | |
| BAT12 | 12/19/2017 11:50 | 8.7 | 10.79 | 42.8 | 6.82 | 6.89 | 85 | 1.18 | 1 | | | | | | | | |
| CLA1 | 01/16/2018 10:07 | 10.5 | 10.91 | 91.8 | 3.8 | 7.37 | 238 | 1.74 | 0.93 | | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0146 | 0.0111 | 28 |
| PRI5 | 01/16/2018 10:21 | 9.2 | 11.23 | 81.9 | 5.5 | 7.39 | 21 | 1.53 | 1.03 | | <0.0025 | <0.0025 | <0.0005 | <0.0005 | 0.0172 | 0.0143 | 29 |
| BAT1 | 01/16/2018 10:56 | 9 | 10.78 | 45.6 | 6.8 | 6.38 | 19 | 1.71 | 0.86 | | | | | | | | |
| GLE1 | 02/20/2018 10:49 | 5.9 | 12.28 | 88.2 | 5.98 | 7.49 | 36 | 1.55 | 0.96 | | | | | | | | |
| MIC10 | 02/20/2018 11:16 | 4.9 | 12.74 | 79.8 | 6.05 | 7.41 | 118 | 2.11 | 1.34 | | | | | | | | |
| LPW1 | 02/20/2018 12:12 | 5.8 | 14.52 | 216 | 12.1 | 7.63 | 124 | 1.76 | 1.38 | 14 | | | | | | | |
| GIB1 | 03/20/2018 10:16 | 7.1 | 11.88 | 76.8 | 6.53 | 7.24 | 37 | 1.77 | 0.96 | | | | | | | | |
| GIB15 | 03/20/2018 10:39 | 7.5 | 11.6 | 78 | 7.27 | 7.14 | 31 | 2.25 | 0.9 | | | | | | | | |
| CGT5 | 03/20/2018 12:19 | 8.6 | 11.65 | 196.7 | 21.4 | 7.69 | 135 | 0.86 | 1.1 | | | | | | | | |
| GLE10 | 04/10/2018 11:30 | 10.2 | 10.93 | 54.2 | 24.4 | 7.1 | 45 | 1.68 | 0.64 | | | | | | | | |
| CGT1 | 04/10/2018 12:32 | 12.5 | 10.52 | 181.3 | 10.9 | 7.37 | 1050 | 1.26 | 2.28 | | | | | | | | |
| MIC1 | 05/15/2018 09:15 | 16.4 | 9.48 | 63.9 | 3.84 | 7.25 | 161 | 0.6 | 1.2 | | | | | | | | |

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 2017/18)

| 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) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WR1 | 08/15/2017 13:57 | 17.9 | 10.03 | 59 | 1.95 | 7.69 | 8 | 0.08 | 1.22 | 27 | <0.05 | 0.035 | 52 | 57 | 4.8 |
| WR10 | 09/19/2017 12:40 | 15.2 | 10.38 | 61.5 | 3.58 | 7.37 | 59 | 0.12 | 0.95 | 29 | <0.05 | 0.019 | 47 | 49 | 2.4 |
| WR5 | 10/17/2017 09:58 | 11.7 | 10.55 | 60 | 4.83 | 6.51 | 26 | 0.09 | 1.1 | 26 | <0.05 | 0.034 | 58 | 63 | 5.2 |
| WR1 | 04/10/2018 13:03 | 10.1 | 10.68 | 60 | 19.9 | 7.21 | 517 | 0.62 | 1.32 | 25 | 0.139 | 0.083 | 54 | 79 | 24.6 |
| WR10 | 05/15/2018 12:45 | 15.5 | 11 | 66.5 | 2.21 | 7.49 | 6 | 0.15 | 1.08 | 26 | <0.05 | 0.029 | 55 | 59 | 3.6 |

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 2017/18)

| Monthly Medians for **Turbidity** at Continuous Instream Sites | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jul 2017 | Aug 2017 | Sep 2017 | Oct 2017 | Nov 2017 | Dec 2017 | Jan 2018 | Feb 2018 | Mar 2018 | Apr 2018 | May 2018 | Jun 2018 |
| 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 | 9.48 | 11.64 | 12.14 | NA | 9.11 | 6.85 | 9.76 | 6.30 | 6.42 | 7.86 | 5.89 | 6.84 |
| BAT12 | 3.92 | 2.85 | 3.40 | 3.53 | 4.20 | 2.83 | 6.21 | 1.81 | 2.57 | 3.73 | 3.57 | 3.93 |
| CLK1 | 2.70 | 2.50 | 2.10 | NA | NA | NA | 5.50 | 2.47 | 3.07 | 3.10 | 2.24 | 2.79 |
| CLK12 | 2.00 | 3.20 | 2.40 | 2.40 | 3.10 | 2.60 | 2.80 | 1.60 | 3.60 | 2.10 | NA | 3.00 |
| GLE3 | 7.10 | 6.00 | 7.90 | 7.70 | 9.40 | 5.70 | NA | 7.50 | 8.40 | 9.70 | 6.30 | 6.30 |
| GLE12 | 5.30 | NA | NA | 2.70 | 5.50 | 5.50 | 11.40 | 8.70 | 10.70 | 9.70 | 7.40 | 6.20 |
| MIC3 | 4.32 | 4.53 | 4.48 | 4.41 | 11.25 | 8.78 | 11.86 | 5.70 | 6.66 | 4.66 | 3.57 | 3.72 |
| MIC12 | 5.57 | NA | NA | NA | NA | NA | NA | 7.98 | NA | NA | NA | NA |
| PRI3 | 2.72 | 3.46 | 3.07 | 3.51 | 6.71 | 3.93 | 8.72 | 4.16 | 5.88 | NA | 1.55 | 2.16 |
| PRI12 | NA | 4.36 | NA | 9.94 | 6.15 | 2.95 | NA | 3.70 | 4.26 | 4.15 | 3.07 | 3.02 |

| Monthly Medians for **Specific Conductivity** at Continuous Instream Sites | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jul 2017 | Aug 2017 | Sep 2017 | Oct 2017 | Nov 2017 | Dec 2017 | Jan 2018 | Feb 2018 | Mar 2018 | Apr 2018 | May 2018 | Jun 2018 |
| 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 | 60.09 | 64.05 | NA | NA | 48.71 | 46.50 | 46.19 | 45.69 | 45.68 | 44.24 | 45.69 | 51.55 |
| BAT12 | 50.22 | 59.29 | 60.48 | NA | 47.99 | 47.00 | 45.06 | 43.79 | 43.24 | 42.90 | 42.86 | 46.78 |
| CLK1 | 94.00 | 93.00 | 95.00 | NA | NA | NA | 92.61 | 95.62 | 93.45 | 94.84 | 95.19 | 99.21 |
| CLK12 | 74.00 | 74.00 | 77.00 | 78.00 | 77.00 | 78.00 | 76.00 | 76.00 | 77.00 | NA | NA | 72.15 |
| GLE3 | 117.00 | 123.00 | 123.00 | 113.00 | 96.00 | 96.00 | 85.00 | 87.00 | 87.00 | 85.00 | 98.00 | 110.00 |
| GLE12 | 74.00 | NA | NA | 81.00 | 66.00 | 60.00 | 62.00 | 58.00 | NA | 56.00 | 59.00 | 72.00 |
| MIC3 | 55.30 | 50.36 | 47.23 | 67.33 | 93.44 | 89.57 | 85.19 | 83.30 | 81.66 | 78.79 | 60.81 | 57.01 |
| MIC12 | 60.37 | NA | NA | 93.92 | 92.81 | 87.10 | 85.26 | 83.92 | NA | 78.05 | 63.13 | 52.88 |
| PRI3 | 101.66 | 105.03 | 99.39 | 96.99 | 91.50 | 96.42 | 86.43 | 92.70 | 91.91 | 89.79 | 94.35 | 97.02 |
| PRI12 | NA | 63.35 | 57.63 | 92.76 | 87.64 | 86.23 | 79.60 | 83.18 | 81.48 | 76.40 | 74.94 | 71.05 |

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 2017/18)

| Monthly Medians for **Temperature** at Continuous Instream Sites | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jul 2017 | Aug 2017 | Sep 2017 | Oct 2017 | Nov 2017 | Dec 2017 | Jan 2018 | Feb 2018 | Mar 2018 | Apr 2018 | May 2018 | Jun 2018 |
| 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 | 18.40 | 19.41 | 16.64 | NA | 10.64 | 7.64 | 8.77 | 7.70 | 8.56 | 10.25 | 13.88 | 15.70 |
| BAT12 | 17.10 | 17.41 | 14.55 | 10.70 | 9.97 | 7.15 | 8.37 | 7.29 | 8.07 | 9.80 | 13.71 | 15.33 |
| CLK1 | 17.36 | 18.52 | 16.89 | 13.72 | NA | NA | 10.18 | 9.15 | 9.92 | 11.56 | 13.91 | 15.53 |
| CLK12 | 15.89 | 17.15 | 16.40 | 14.42 | 13.20 | 10.96 | 11.16 | 10.35 | 10.57 | 11.33 | NA | 14.54 |
| GLE3 | 17.06 | 17.97 | 15.92 | 12.50 | 10.71 | 7.67 | 9.08 | 7.87 | 8.98 | 10.95 | 14.13 | 15.14 |
| GLE12 | 15.71 | NA | NA | 10.94 | 9.80 | 7.00 | 8.35 | 7.21 | 7.97 | 9.76 | 12.34 | 13.43 |
| MIC3 | 20.49 | 19.97 | 16.10 | 12.05 | 9.84 | 6.12 | 7.97 | 6.96 | 8.60 | 10.97 | 15.29 | 17.34 |
| MIC12 | 19.91 | 19.36 | 15.28 | 11.92 | 9.89 | 6.37 | 7.96 | 7.04 | 8.41 | 10.70 | 14.69 | 16.67 |
| PRI3 | 19.65 | 20.19 | 17.77 | 13.27 | 10.97 | 7.39 | 9.07 | 8.15 | 9.42 | 11.67 | 16.10 | 17.78 |
| PRI12 | 19.14 | 19.21 | 16.18 | 12.37 | 10.50 | 7.05 | 8.70 | 7.78 | 8.73 | 10.77 | 14.93 | 16.86 |

| Monthly Medians for **pH** at Continuous Instream Sites | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jul 2017 | Aug 2017 | Sep 2017 | Oct 2017 | Nov 2017 | Dec 2017 | Jan 2018 | Feb 2018 | Mar 2018 | Apr 2018 | May 2018 | Jun 2018 |
| 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 | 6.63 | 6.58 | NA | NA | 6.36 | 6.42 | 6.50 | 6.62 | 6.62 | 6.53 | 6.49 | 6.50 |
| BAT12 | NA | 7.33 | 7.34 | 7.22 | 6.98 | 6.96 | 6.78 | 7.03 | 6.99 | 6.91 | 7.23 | 7.37 |
| CLK1 | 7.09 | 7.10 | 7.03 | NA | NA | NA | 7.22 | 7.42 | 7.44 | 7.39 | 7.28 | 7.31 |
| CLK12 | 6.76 | NA | 6.93 | 6.80 | 6.63 | 6.69 | 6.58 | 6.77 | NA | NA | NA | 6.95 |
| GLE3 | 7.55 | 7.56 | 7.51 | 7.06 | 6.90 | 6.98 | 6.85 | 7.08 | 7.04 | 7.02 | 7.27 | 7.41 |
| GLE12 | 7.07 | NA | NA | 6.74 | 6.63 | 6.67 | 6.58 | 6.69 | 6.69 | 6.78 | 6.91 | 7.02 |
| MIC3 | 7.52 | 7.51 | 7.38 | 7.42 | 7.19 | 7.29 | 7.27 | 7.38 | 7.40 | 7.52 | 7.38 | 7.14 |
| MIC12 | 7.36 | 7.41 | 7.38 | 7.25 | 6.91 | 7.09 | 7.01 | 7.22 | 7.28 | 7.20 | 7.41 | 7.37 |
| PRI3 | 7.38 | 7.32 | 7.27 | 7.11 | 7.15 | 7.28 | 7.15 | 7.24 | 7.26 | 7.28 | 7.36 | 7.39 |
| PRI12 | 7.06 | 6.99 | 6.96 | 6.76 | 6.50 | 6.54 | 6.49 | 6.60 | 6.62 | 6.57 | 6.68 | 6.80 |

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 2017/18)

| Monthly Medians for **Dissolved Oxygen** at Continuous Instream Sites | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jul 2017 | Aug 2017 | Sep 2017 | Oct 2017 | Nov 2017 | Dec 2017 | Jan 2018 | Feb 2018 | Mar 2018 | Apr 2018 | May 2018 | Jun 2018 |
| 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 | 7.82 | NA | 6.55 | NA | 9.72 | 10.65 | 10.81 | 11.28 | 11.02 | 10.46 | 9.53 | 8.43 |
| BAT12 | 9.15 | 8.50 | 9.02 | 10.64 | 10.94 | 11.99 | 11.56 | 11.91 | 11.66 | 11.21 | 10.21 | 9.76 |
| CLK1 | 9.14 | 8.82 | 9.38 | NA | NA | NA | 10.93 | 11.32 | 11.15 | 10.74 | 10.03 | 9.51 |
| CLK12 | 9.27 | 9.12 | 9.57 | 9.51 | 9.61 | 10.21 | 10.47 | NA | 10.84 | 10.21 | NA | 9.35 |
| GLE3 | 8.91 | 8.48 | 8.77 | 10.24 | 10.60 | 11.85 | 11.41 | 11.75 | 11.40 | 10.80 | 9.73 | 9.24 |
| GLE12 | 9.39 | NA | NA | 10.08 | 10.47 | 11.65 | 11.35 | 11.80 | 11.58 | 11.04 | 10.34 | 9.97 |
| MIC3 | 8.43 | 8.58 | 9.38 | 10.84 | 11.35 | 12.65 | 11.72 | 12.05 | 11.56 | 10.82 | 9.65 | 9.26 |
| MIC12 | 8.60 | 8.75 | 9.73 | NA | 10.39 | 11.99 | 11.21 | 11.74 | 11.35 | 10.49 | 9.89 | 9.48 |
| PRI3 | 7.95 | 7.84 | 8.23 | 9.71 | 10.32 | 11.75 | 11.23 | 11.64 | 11.25 | 10.51 | 9.16 | 8.68 |
| PRI12 | 8.01 | 8.05 | 8.58 | 8.95 | 8.98 | 10.48 | 10.09 | 10.60 | 10.38 | 9.79 | 8.94 | 8.54 |

| Monthly Medians for **Stage** at Continuous Instream Sites | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jul 2017 | Aug 2017 | Sep 2017 | Oct 2017 | Nov 2017 | Dec 2017 | Jan 2018 | Feb 2018 | Mar 2018 | Apr 2018 | May 2018 | Jun 2018 |
| 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 | 4.07 | 4.17 | 4.24 | 4.24 | 5.24 | 4.74 | 5.40 | 4.62 | 4.77 | 5.05 | 4.27 | 4.18 |
| BAT12 | 4.27 | 4.21 | 4.19 | 4.32 | 4.85 | 4.72 | 4.93 | 4.65 | 4.70 | 4.82 | 4.45 | 4.34 |
| CLK1 | 3.71 | 3.73 | 3.73 | 4.06 | 4.33 | 4.26 | 4.46 | 4.28 | 4.27 | 4.25 | 3.89 | 3.97 |
| CLK12 | NA | NA | NA | NA | NA | NA | 4.56 | 4.34 | 4.42 | 4.40 | 3.99 | 4.01 |
| GLE3 | 4.09 | 4.05 | 4.04 | 4.20 | 4.56 | 4.46 | 4.62 | 4.39 | 4.45 | 4.47 | 4.16 | 4.09 |
| GLE12 | NA | NA | NA | 0.82 | 1.01 | 1.05 | 1.13 | 0.99 | 1.03 | 1.08 | 0.90 | 0.82 |
| LPW1 | 0.00 | 0.00 | 0.00 | 0.00 | 1.76 | 1.67 | 1.99 | 1.76 | 1.97 | 2.21 | 1.45 | 0.00 |
| MIC3 | 5.40 | 5.63 | 5.79 | 5.46 | 6.69 | 6.24 | 6.74 | 6.00 | 6.14 | 6.34 | 5.65 | 5.62 |
| MIC12 | 7.11 | 7.11 | 7.15 | 7.04 | 8.20 | 7.82 | 8.33 | 7.64 | 7.71 | 7.82 | 7.25 | 7.20 |
| PRI3 | 4.26 | 4.25 | 4.25 | 4.44 | 4.88 | 4.65 | 4.97 | 4.55 | 4.69 | 4.66 | 4.39 | 4.35 |
| PRI4 | 7.34 | 7.32 | 7.34 | 7.52 | 8.09 | 7.86 | 8.19 | 7.72 | 7.84 | 7.85 | 7.50 | 7.46 |
| PRI12 | 4.27 | 4.24 | 4.21 | 4.13 | 4.57 | 4.37 | 4.68 | 4.36 | 4.44 | 4.49 | 4.32 | 4.32 |
| SHE3 | 6.19 | 6.07 | 6.08 | 6.17 | 6.94 | 6.65 | 7.03 | 6.51 | 6.55 | 6.64 | 6.24 | 6.20 |

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 2017/18)

| 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 |
| 10/19/2017 09:25 | 5172 | 9.31 | 7.6 | 14.28 | 68.6 | | | | | | | | | | | | | | |
| 10/19/2017 09:28 - DUP | 4611 | 9.27 | 7.61 | 14.33 | 68.5 | | | | | | | | | | | | | | |
| 10/20/2017 09:00 | | | | | | 30.8 | 0.0134 | 0.0031 | 0.0812 | 0.024 | 0.0079 | < 0.0005 | 47 | 0.075 | 0.3 | 0.037 | 0.283 | 5.6 | 108 |
| 03/21/2018 12:32 | >2420 | 10.66 | 6.92 | 10.1 | 67.2 | | | | | | | | | | | | | | |
| 03/21/2018 12:34 - DUP | >2420 | 10.66 | 6.92 | 10.1 | 66.4 | | | | | | | | | | | | | | |
| 03/22/2018 12:40 | | | | | | 37.2 | 0.0055 | < 0.0025 | 0.124 | 0.0809 | 0.0027 | < 0.0005 | 21 | < 0.050 | 0.83 | 0.02 | 0.115 | 1.9 | 42 |

| 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 |
| 10/19/2017 9:49 | 677 | 9.19* | 7.41 | 13.51 | 89.7 | | | | | | | | | | | | | | |
| 10/20/2017 09:35 | | | | | | 40.4 | 0.0092 | < 0.0025 | 0.0703 | 0.0202 | 0.0053 | < 0.0005 | 22 | < 0.050 | 0.26 | 0.018 | 0.239 | 4.1 | 106 |
| 3/21/2018 13:25 | 1414 | 11.4 | 7.38 | 9.9 | 81.5 | | | | | | | | | | | | | | |
| 3/22/2018 13:00 | | | | | | 42 | 0.0043 | < 0.0025 | 0.0547 | 0.0272 | 0.0019 | < 0.0005 | 25 | < 0.050 | 0.71 | 0.011 | 0.119 | 1.9 | 39 |

| 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 |
| 10/19/2017 10:12 | 216 | 8.57 | 7.3 | 12.81 | 103.4 | | | | | | | | | | | | | | |
| 10/20/2017 10:10 | | | | | | 71.2 | 0.0059 | < 0.0025 | 0.0229 | 0.0073 | 0.0017 | < 0.0005 | 34 | < 0.050 | 0.54 | 0.011 | 0.231 | 2.7 | 66.5 |
| 3/21/2018 12:59 | 66 | 11.38 | 6.87 | 8.7 | 78.2 | | | | | | | | | | | | | | |
| 3/22/2018 12:15 | | | | | | 50.1 | < 0.0025 | < 0.0025 | 0.0213 | 0.0126 | < 0.0005 | < 0.0005 | 27 | < 0.050 | 1.32 | 0.01 | 0.066 | < 1.00 | 15.8 |

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

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

Attachment A. Dry Weather Priority Outfall Screening Inspection Results (RY 2017/2018)

# Dry Weather Priority Out Fall Screening Inspection Results - RY 2017/2018

| Basin | Primary Outfall | Inspection Location | Asset Type | Date | Time | Flow? | Est. Flow (GPM) | Temp °C Receiving Water | Temp °C | pH S.U. | Sp Cond µS/cm | Turbidity NTU | Total Cl mg/L | Fl mg/L | Detergents mg/L | NH3 mg/L | K mg/L | NA mg/L | E. coli MPN/100 mL | Outfall Notes | Inspection Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Clark Creek | D39460252 | D39460252 | Outfall | 9/28/2017 | 11:40 | Yes | 10-15 | 16.8 | 16.8 | 7.35 | 72.1 | 1.20 | 0.01 | | | | | | 186 | Source of Clark Creek. Confirmed as ground water. | Pipeshed inspection for Liberty St portion of line requires coordination with traffic engineering and after hours work. |
| Clark Creek | D42466417 | D42466417 | Outfall | 9/28/2017 | 11:20 | Yes | 10-15 | 16.1 | 18.3 | 7.20 | 84.3 | 1.93 | 0.02 | | | | | | 727 | | Recommend deploying temperature logger and flow sensor next spring to narrow down time of day flow surges begin. |
| Clark Creek | D42468233 | D42468233 | Outfall | 9/28/2017 | 09:25 | Yes | 10-15 | 15.6 | 17.1 | 7.58 | 155.6 | 2.33 | 0.0 | 0.2 | | 0.13 | 2.1 | 10.7 | > 2420 | *Outfall previously listed as D42468PVT. | High E coli result prompted further investigation including dye testing at highschool and TV inspection. Investigation revealed leaking sewer lateral/s at South Salem High School. Dye test revealed effluent from school traveling subsurface into stormline. |
| Clark Creek | D42468244 | D42468244 | Outfall | 9/28/2017 | 11:00 | Yes | 10-15 | 16.2 | 17.7 | 7.8 | 113.2 | 1.9 | 0.03 | | | | | | 201 | | |
| East Bank Willamette | 42482230 | 42482230 | Outfall | 9/26/2017 | 10:30 | No | | | | | | | | | | | | | | | |
| East Bank Willamette | D42480205 | D42480205 | Outfall | 9/26/2017 | 12:41 | No | | | | | | | | | | | | | | | |
| East Bank Willamette | D42480215 | D42480215 | Outfall | 7/31/2017 | 14:16 | Yes | 20-30 | 22.4 | 19.8 | 7.72 | 80.3 | 3.1 | 0.10 | 0.0 | | | | | | | Waiting for leak detection |
| East Bank Willamette | D42480223 | D42480223 | Outfall | 7/31/2017 | 13:55 | Yes | 1-5 | 22.4 | 17.1 | 7.20 | 302.4 | 3.7 | | 0.18 | | 0.61 | 3.364 | 12.4 | 5172 | 10" sewer line above stormline in bad repair. Location near to report of I&I. Dye test performed, but was negative. Sewer main scheduled for slip lining. | Pipeshed performed by TV crew (SR 10000965). |
| East Bank Willamette | D42480223 | D45478209 | ManHole | 9/26/2017 | 13:50 | Yes | 5-10 | | | | | | 0.08 | 0.2 | | 0.76 | 2.3 | 11.5 | 2851 | | Manhole sampling based on pipeshed investigation. |
| East Bank Willamette | D42482212 | D42482212 | Outfall | 9/26/2017 | 11:37 | Yes | 15-20 | 15.1 | 16.0 | 7.32 | 61.3 | 1.1 | 0.09 | | 0.0 | 0.04 | 0.6 | 11.5 | < 10 | | |
| East Bank Willamette | D42482213 | D42482213 | Outfall | 2/26/2017 | 10:50 | No | | | | | | | | | | | | | | | |

| Basin | Primary Outfall | Inspection Location | Asset Type | Date | Time | Flow? | Est. Flow (GPM) | Temp °C Receiving Water | Temp °C | pH S.U. | Sp Cond µS/cm | Turbidity NTU | Total Cl mg/L | Fl mg/L | Detergents mg/L | NH3 mg/L | K mg/L | NA mg/L | E. coli MPN/100 mL | Outfall Notes | Inspection Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| East Bank Willamette | D42482223 | D42482223 | Outfall | 9/26/2017 | 12:45 | Yes | 10-15 | 15.1 | 17.1 | 7.66 | 197.0 | 1.5 | 0.03 | 0.20 | 0.0 | 0.03 | 1.5 | 8.688 | 2755 | | Need to identify location of water leak before determining location of any exfiltration from sewer. |
| East Bank Willamette River | D42476279 | D39476238 | ManHole | 8/24/2017 | 10:50 | No | | | | | | | | | | | | | | Outfall is under water in the Willamette. Inspection needs to take place at MH D39476238 | |
| Lower Claggett Creek | D51488203 | D51488203 | Outfall | 9/26/2017 | 10:30 | No | | | | | | | | | | | | | | | |
| Lower Claggett Creek | D51488236 | D51488236 | Outfall | 9/26/2017 | 10:23 | No | | | | | | | | | | | | | | | |
| Lower Claggett Creek | D54494201 | D54494201 | Outfall | 9/26/2017 | 09:45 | No | | | | | | | | | | | | | | | Checked 3 upstream manholes from 2 separate lines. All dry. |
| Mill Creek | D42476203 | D42476203 | Outfall | 8/24/2017 | 11:50 | No | | | | | | | | | | | | | | | |
| Mill Creek | D42478237 | D42478237 | Outfall | 7/31/2017 | 13:13 | No | 1 | 21.0 | 21.7 | | 50.3 | 14.7 | 0.77 | 0.1 | | | | | | | Reported to Leak Detection |
| Mill Creek | D45476207 | D45476207 | Outfall | 8/24/2017 | 12:00 | Yes | 100-200 | 18.2 | 17.9 | 7.28 | 173.0 | 10.8 | 0.39 | | | | | | | | Hydrant flush at Belmont and Cottage (due to main repair at Market & Winter) taking place at time of sample collection. |
| Mill Creek | D45476217 | D45476217 | Outfall | 8/24/2017 | 12:45 | Yes | 1-5 | 18.5 | 20.1 | 7.67 | 224 | 5.2 | 0.04 | | | | | | | | Smoke test confirmed infiltration of non-city irrigation water through Capitol Mall. |
| Mill Creek | D51470205 | D51470205 | Outfall | 8/23/2017 | 10:30 | Yes | 5-10 | | | | | | | | | | | | | Flow not discernable at first 6 manholes. At seventh manhole, which is inaccessible for sampling a splashing can be heard. Review of CCTV footage reveals one potential drinking water leak (Reported to Water Department) and one source of water from nearby | |
| Mill Creek | D54470205 | D54470205 | Outfall | 8/23/2017 | 09:50 | Yes | < 1 | | 18.5 | 6.80 | 94.17 | 14.2 | 0.11 | | 0.0 | 0.08 | | | | | Irrigation repairs taking place at time of inspection. Flow could be due to leaking sprinkler heads infilitrating to line below. |
| Pringle Creek | D39456229 | D39456229 | Outfall | 9/28/2017 | 12:30 | Yes | 10-15 | 16.5 | 16.8 | 7.21 | 79.4 | 0.76 | 0.0 | | | | | | | | |
| Pringle Creek | D42468235 | D42468235 | Outfall | 9/28/2017 | 09:15 | No | | | | | | | | | | | | | | | |

| Basin | Primary Outfall | Inspection Location | Asset Type | Date | Time | Flow? | Est. Flow (GPM) | Temp °C Receiving Water | Temp °C | pH S.U. | Sp Cond µS/cm | Turbidity NTU | Total Cl mg/L | Fl mg/L | Detergents mg/L | NH3 mg/L | K mg/L | NA mg/L | E. coli MPN/100 mL | Outfall Notes | Inspection Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pringle Creek | D45464207 | D42464206 | ManHole | 9/28/2017 | 13:10 | Yes | 1-5 | | 18.7 | 7.19 | 163.6 | 4.9 | 0.01 | | | | | | | | Flowing entering manhole from two directions. Results for each recorded seperately. This inspection is for flow from MH D45464205 to MH D45464206 |
| Pringle Creek | D45464207 | D45464206 | ManHole | 9/28/2017 | 13:00 | Yes | 5-10 | | 17.6 | 7.36 | 98 | 4.8 | | | | | | | | Outfall partially submerged. Inspction performed at first upstream manhole | Flowing entering manhole from two directions. Results for each recorded seperately. This inspection is for flow from MH D45464257 to MH D45464206 |
| Pringle Creek | D45466212 | D45466217 | ManHole | 8/24/2017 | 14:44 | No | | | | | | | | | | | | | | | Manhole wet. No flow. |
| Pringle Creek | D48460229 | D48460229 | Outfall | 9/28/2017 | 10:05 | No | | | | | | | | | | | | | | Beaver dam backing water up very far into the line. | |
| Pringle Creek | D48464203 | D48464203 | Outfall | 9/28/2017 | 11:15 | No | | | | | | | | | | | | | | | First manhole upstream is dry. |
| Pringle Creek | D48464249 | D48464249 | Outfall | 9/28/2017 | 11:15 | No | | | | | | | | | | | | | | | Pipe dries out after second manhole. |
| Shelton Ditch | D45468241 | D45468241 | Outfall | 9/28/2017 | 13:45 | Yes | 50-100 | 16.2 | 18.3 | 7.65 | 144.8 | 2.4 | 0.02 | | | | | | | Lines leading to outfall from from Mission St connect to ditch at north side of airport. Ditch has water in it year round. Water from outfall is from this perennial source. Lines leading from south are along course small stream that is noted on historica | |
| Upper Claggett Creek | D51486201 | D51486201 | Outfall | 9/26/2017 | 10:45 | Yes | | | | | | | | | | | | | | Outfall and storm main/ditch have backwater. | |
| Upper Claggett Creek | D51486216 | D51486216 | Outfall | 8/24/2017 | 13:30 | Yes | 1-5 | 16.9 | 17.2 | 7.74 | 83.3 | 3.2 | 0.04 | | | | | | | | |
| Upper Claggett Creek | D54486217 | D54482247 | Outfall | 8/23/2017 | 12:00 | Yes | 30-50 | 17.7 | 17.7 | 8.30 | 186.2 | 1.7 | 0.03 | | | | | | | Investigation for D54486217. Daylight of stream at Lansing Park | |
| Upper Claggett Creek | D54486217 | D54486217 | Outfall | 8/23/2017 | 11:35 | Yes | 30-50 | 18.8 | 18.8 | | | 2.1 | 0.05 | | | | | | | Outfall is really daylighting of piped stream. Multiple water leaks have been repaired upstream. | Source tracked to daylighting at Lansing Park (See results for OF D544822247). |
| Waln Creek | D36450241 | D36450241 | Outfall | 7/27/2017 | 10:00 | Yes | 5-10 | 14.2 | 15.5 | 5.81 | | 0.49 | 0.0 | 0.0 | | | | | | | |

| Basin | Primary Outfall | Inspection Location | Asset Type | Date | Time | Flow? | Est. Flow (GPM) | Temp °C Receiving Water | Temp °C | pH S.U. | Sp Cond µS/cm | Turbidity NTU | Total Cl mg/L | Fl mg/L | Detergents mg/L | NH3 mg/L | K mg/L | NA mg/L | E. coli MPN/100 mL | Outfall Notes | Inspection Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Willamette Bank | D30470203 | D30470203 | Outfall | 8/24/2017 | 09:30 | Yes | < 1 | | | | | | | | | | | | | Outfall becoming dangerous to access. Property owner is piling riprap to extend property. Slope is 20-30 feet and extremely unstable. Recommend removing from list. | Traced water to MH 205. Source of water is small seep. Unable to collect sample due to sediment. Ampule sucks in too much sediment. |
| Willamette Bank | D36472203 | D36474226 | ManHole | 8/24/2017 | 10:35 | No | | | | | | | | | | | | | | | Manhole is wet, but has no discernable flow. Need to TV line to confirm moisture due to high E coli results from previous year. |
| Willamette Slough | D39470220 | D39470220 | Outfall | 7/27/2017 | 12:15 | Yes | 50-100 | | 17.6 | 6.69 | 74.2 | 5.17 | 0.04 | 0.1 | 0.0 | 0.01 | | | 41 | Difficult access via Minto Brown. | |
| Willamette Slough | D39470220 | D39470236 | CleanOut | 8/31/2017 | 11:00 | Yes | 30-50 | | 19.4 | 7.85 | 50.5 | 2.5 | 0.43 | 0.20 | | < 0.050 | 0.499 | 5.140 | < 1 | | Large water leak at private service. Reported to water department. |
| Willamette Slough | D39478271 | D39478271 | Outfall | 8/24/2017 | 11:15 | Yes | 30-50 | | 18.9 | 6.72 | 99.4 | | 2.5 | | | | | | | Outfall is daylighting of piped stream visible on historical topo maps. | |

Attachment B. Analytical Report for Pesticide Screening - Pacific Agricultural Laboratory (March 28, 2018)

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Analytical Report

**Client Sample ID:** Electric
**Matrix:** water

**PAL Sample ID:** P180319-01
**Sample Date:** 3/13/18

**Method:** Modified EPA 8081B (GC-ECD)

| Extraction Date | Analysis Date | Analyte | Amount Detected | Limit of Quantitation | Notes |
|---|---|---|---|---|---|
| 3/16/18 | 3/27/18 | a-BHC | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Acetochlor | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Alachlor | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Aldrin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | b-BHC | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Benfluralin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Bifenthrin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Captafol | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Captan | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Chlordane | Not Detected | 0.60 ug/L | |
| 3/16/18 | 3/27/18 | Chlorobenzilate | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Chloroneb | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Chlorothalonil | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Chlorpyrifos | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Cyfluthrin | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Cyhalothrin | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Cypermethrin | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Dacthal | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | d-BHC | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Deltamethrin | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Dichlobenil | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Dicloran | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Dicofol | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Dieldrin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Dithiopyr | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Endosulfan I | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Endosulfan II | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Endosulfan sulfate | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Endrin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Endrin aldehyde | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Endrin ketone | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Esfenvalerate | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Ethalfluralin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Etridiazole | Not Detected | 0.12 ug/L | |

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Analytical Report

**Client Sample ID:** Electric
**Matrix:** water

**PAL Sample ID:** P180319-01
**Sample Date:** 3/13/18

| Extraction Date | Analysis Date | Analyte | Amount Detected | Limit of Quantitation | Notes |
|---|---|---|---|---|---|
| 3/16/18 | 3/27/18 | Fenarimol | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Fenvalerate | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Flutolanil | Not Detected | 1.2 ug/L | |
| 3/16/18 | 3/27/18 | Folpet | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | g-BHC | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Heptachlor | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Heptachlor epoxide | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Hexachlorobenzene | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Iprodione | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Methoxychlor | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Metolachlor | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Mirex | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Norflurazon | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Ovex | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Oxadiazon | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Oxyfluorfen | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | p,p'-DDD | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | p,p'-DDE | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | p,p'-DDT | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | PCNB | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Pendimethalin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Permethrin | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Prodiamine | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Pronamide | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Propachlor | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Propanil | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Propiconazole | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Terbacil | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Toxaphene | Not Detected | 6.0 ug/L | |
| 3/16/18 | 3/27/18 | Trifloxystrobin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Triflumizole | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Trifluralin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Vinclozalin | Not Detected | 0.12 ug/L | |

**Surrogate Recovery:** 96 %
**Surrogate Recovery Range:** 38-143
(DCBP used as Surrogate)

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Analytical Report

**Client Sample ID:** Electric
**Matrix:** water

**PAL Sample ID:** P180319-01
**Sample Date:** 3/13/18

**Method:** Modified EPA 8141B (GC-FPD)

| Extraction Date | Analysis Date | Analyte | Amount Detected | Limit of Quantitation | Notes |
|---|---|---|---|---|---|
| 3/16/18 | 3/22/18 | Aspon | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Azinphos-methyl | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Carbofenothion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Chlorfenvinphos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Chlorpyrifos-methyl | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Coumaphos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Demeton | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Diazinon | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Dichlorofenthion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Dichlorvos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Dicrotophos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Dimethoate | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Disulfoton | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | EPN | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Ethion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Ethoprop | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Famphur | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Fenamiphos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Fenitrothion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Fensulfothion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Fenthion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Malathion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Merphos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Methidathion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Mevinphos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Monocrotophos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Parathion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Parathion methyl | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Phorate | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Phosmet | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Phosphamidon | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Pirimiphos-methyl | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Ronnel | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Sulprofos | Not Detected | 0.30 ug/L | |

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Analytical Report

**Client Sample ID:** Electric
**Matrix:** water

**PAL Sample ID:** P180319-01
**Sample Date:** 3/13/18

| Extraction Date | Analysis Date | Analyte | Amount Detected | Limit of Quantitation | Notes |
|---|---|---|---|---|---|
| 3/16/18 | 3/22/18 | Terbufos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Tetrachlorvinphos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Tokuthion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Trichloronate | Not Detected | 0.30 ug/L | |

**Surrogate Recovery:** 99 %
**Surrogate Recovery Range:** 46-157
(TPP-d15 used as Surrogate)

**Method:** Modified EPA 8151A (GC-MS/MS)

| | | | | | |
|---|---|---|---|---|---|
| 3/19/18 | 3/26/18 | 2,4,5-T | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 2,4,5-TP | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 2,4-D | 0.24 ug/L | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 2,4-DB | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Acifluorfen | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Bentazon | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Clopyralid | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Dicamba | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Dichlorprop | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Dinoseb | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | MCPA | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | MCPP | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Picloram | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Quinclorac | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Triclopyr | 1.6 ug/L | 0.080 ug/L | |

**Surrogate Recovery:** 76 %
**Surrogate Recovery Range:** 64-139
(DCPAA used as Surrogate)

**Method:** Modified EPA 8270D (GC-MS/MS)

| | | | | | |
|---|---|---|---|---|---|
| 3/16/18 | 3/19/18 | Ametryn | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Amitraz | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/19/18 | Atrazine | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Bromopropylate | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Cyanazine | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/19/18 | Diclofop-methyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Dimethenamid | Not Detected | 0.060 ug/L | |

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Analytical Report

**Client Sample ID:** Electric
**Matrix:** water

**PAL Sample ID:** P180319-01
**Sample Date:** 3/13/18

| Extraction Date | Analysis Date | Analyte | Amount Detected | Limit of Quantitation | Notes |
|---|---|---|---|---|---|
| 3/16/18 | 3/19/18 | Diphenylamine | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Ethofumesate | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Fenbuconazole | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Fenoxaprop-ethyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Fipronil | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/19/18 | Fluazifop-p-butyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Fludioxonil | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Fluroxypyr-meptyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Hexazinone | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Mefenoxam | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Metalaxyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Metribuzin | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Myclobutanil | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Napropamide | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Pirimicarb | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Prometon | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Prometryn | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Propazine | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Pyridaben | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Simazine | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Simetryn | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Sulfentrazone | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Tebuconazole | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Tebuthiuron | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/19/18 | Triadimefon | Not Detected | 0.12 ug/L | |

**Surrogate Recovery:** 96 %
**Surrogate Recovery Range:** 29-130
(DCBP used as Surrogate)

**Method:** Modified EPA 8321B (LC-MS/MS)

| | | | | | |
|---|---|---|---|---|---|
| 3/16/18 | 3/22/18 | 3-Hydroxycarbofuran | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Aldicarb | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Aldicarb Sulfone | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Aldicarb Sulfoxide | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Azoxystrobin | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Bendiocarb | Not Detected | 0.060 ug/L | |

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Analytical Report

**Client Sample ID:** Electric
**Matrix:** water

**PAL Sample ID:** P180319-01
**Sample Date:** 3/13/18

| Extraction Date | Analysis Date | Analyte | Amount Detected | Limit of Quantitation | Notes |
|---|---|---|---|---|---|
| 3/16/18 | 3/23/18 | Bensulide | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Boscalid | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Bromacil | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Carbaryl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Carbofuran | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Carfentrazone-ethyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Clothianidin | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | DCPMU | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Diuron | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Fenobucarb | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Fenuron | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/23/18 | Flumioxazin | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Fluometuron | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Imidacloprid | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Isoxaben | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Linuron | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Methiocarb | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Methomyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Monuron | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Neburon | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Oxamyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Propargite | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/22/18 | Propoxur | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Pyraclostrobin | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Pyrimethanil | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Sethoxydim | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Siduron | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Thiabendazole | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Thiobencarb | Not Detected | 0.060 ug/L | |

**Surrogate Recovery:** 100 %
**Surrogate Recovery Range:** 60-140
(TPP-d15 used as Surrogate)

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Analytical Report

**Client Sample ID:** Hilfiker
**Matrix:** water

**PAL Sample ID:** P180319-02
**Sample Date:** 3/13/18

**Method:** Modified EPA 8081B (GC-ECD)

| Extraction Date | Analysis Date | Analyte | Amount Detected | Limit of Quantitation | Notes |
|---|---|---|---|---|---|
| 3/16/18 | 3/27/18 | a-BHC | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Acetochlor | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Alachlor | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Aldrin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | b-BHC | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Benfluralin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Bifenthrin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Captafol | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Captan | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Chlordane | Not Detected | 0.60 ug/L | |
| 3/16/18 | 3/27/18 | Chlorobenzilate | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Chloroneb | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Chlorothalonil | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Chlorpyrifos | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Cyfluthrin | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Cyhalothrin | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Cypermethrin | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Dacthal | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | d-BHC | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Deltamethrin | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Dichlobenil | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Dicloran | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Dicofol | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Dieldrin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Dithiopyr | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Endosulfan I | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Endosulfan II | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Endosulfan sulfate | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Endrin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Endrin aldehyde | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Endrin ketone | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Esfenvalerate | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Ethalfluralin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Etridiazole | Not Detected | 0.12 ug/L | |

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Analytical Report

**Client Sample ID:** Hilfiker
**Matrix:** water

**PAL Sample ID:** P180319-02
**Sample Date:** 3/13/18

| Extraction Date | Analysis Date | Analyte | Amount Detected | Limit of Quantitation | Notes |
|---|---|---|---|---|---|
| 3/16/18 | 3/27/18 | Fenarimol | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Fenvalerate | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Flutolanil | Not Detected | 1.2 ug/L | |
| 3/16/18 | 3/27/18 | Folpet | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | g-BHC | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Heptachlor | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Heptachlor epoxide | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Hexachlorobenzene | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Iprodione | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Methoxychlor | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Metolachlor | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Mirex | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Norflurazon | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Ovex | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Oxadiazon | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Oxyfluorfen | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | p,p'-DDD | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | p,p'-DDE | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | p,p'-DDT | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | PCNB | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Pendimethalin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Permethrin | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Prodiamine | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Pronamide | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Propachlor | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Propanil | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Propiconazole | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Terbacil | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Toxaphene | Not Detected | 6.0 ug/L | |
| 3/16/18 | 3/27/18 | Trifloxystrobin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Triflumizole | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Trifluralin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Vinclozalin | Not Detected | 0.12 ug/L | |

**Surrogate Recovery:** 87 %
**Surrogate Recovery Range:** 38-143
(DCBP used as Surrogate)

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Analytical Report

**Client Sample ID:** Hilfiker
**Matrix:** water

**PAL Sample ID:** P180319-02
**Sample Date:** 3/13/18

**Method:** Modified EPA 8141B (GC-FPD)

| Extraction Date | Analysis Date | Analyte | Amount Detected | Limit of Quantitation | Notes |
|---|---|---|---|---|---|
| 3/16/18 | 3/22/18 | Aspon | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Azinphos-methyl | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Carbofenothion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Chlorfenvinphos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Chlorpyrifos-methyl | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Coumaphos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Demeton | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Diazinon | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Dichlorofenthion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Dichlorvos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Dicrotophos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Dimethoate | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Disulfoton | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | EPN | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Ethion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Ethoprop | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Famphur | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Fenamiphos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Fenitrothion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Fensulfothion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Fenthion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Malathion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Merphos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Methidathion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Mevinphos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Monocrotophos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Parathion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Parathion methyl | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Phorate | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Phosmet | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Phosphamidon | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Pirimiphos-methyl | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Ronnel | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Sulprofos | Not Detected | 0.30 ug/L | |

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Analytical Report

**Client Sample ID:** Hilfiker
**Matrix:** water

**PAL Sample ID:** P180319-02
**Sample Date:** 3/13/18

| Extraction Date | Analysis Date | Analyte | Amount Detected | Limit of Quantitation | Notes |
|---|---|---|---|---|---|
| 3/16/18 | 3/22/18 | Terbufos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Tetrachlorvinphos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Tokuthion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Trichloronate | Not Detected | 0.30 ug/L | |

**Surrogate Recovery:** 99 %
**Surrogate Recovery Range:** 46-157
(TPP-d15 used as Surrogate)

**Method:** Modified EPA 8151A (GC-MS/MS)

| | | | | | |
|---|---|---|---|---|---|
| 3/19/18 | 3/26/18 | 2,4,5-T | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 2,4,5-TP | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 2,4-D | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 2,4-DB | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Acifluorfen | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Bentazon | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Clopyralid | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Dicamba | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Dichlorprop | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Dinoseb | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | MCPA | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | MCPP | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Picloram | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Quinclorac | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Triclopyr | Not Detected | 0.080 ug/L | |

**Surrogate Recovery:** 71 %
**Surrogate Recovery Range:** 64-139
(DCPAA used as Surrogate)

**Method:** Modified EPA 8270D (GC-MS/MS)

| | | | | | |
|---|---|---|---|---|---|
| 3/16/18 | 3/19/18 | Ametryn | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Amitraz | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/19/18 | Atrazine | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Bromopropylate | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Cyanazine | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/19/18 | Diclofop-methyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Dimethenamid | Not Detected | 0.060 ug/L | |

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Analytical Report

**Client Sample ID:** Hilfiker
**Matrix:** water

**PAL Sample ID:** P180319-02
**Sample Date:** 3/13/18

| Extraction Date | Analysis Date | Analyte | Amount Detected | Limit of Quantitation | Notes |
|---|---|---|---|---|---|
| 3/16/18 | 3/19/18 | Diphenylamine | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Ethofumesate | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Fenbuconazole | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Fenoxaprop-ethyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Fipronil | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/19/18 | Fluazifop-p-butyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Fludioxonil | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Fluroxypyr-meptyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Hexazinone | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Mefenoxam | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Metalaxyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Metribuzin | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Myclobutanil | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Napropamide | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Pirimicarb | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Prometon | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Prometryn | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Propazine | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Pyridaben | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Simazine | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Simetryn | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Sulfentrazone | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Tebuconazole | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Tebuthiuron | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/19/18 | Triadimefon | Not Detected | 0.12 ug/L | |

**Surrogate Recovery:** 85 %
**Surrogate Recovery Range:** 29-130
(DCBP used as Surrogate)

**Method:** Modified EPA 8321B (LC-MS/MS)

| | | | | | |
|---|---|---|---|---|---|
| 3/16/18 | 3/22/18 | 3-Hydroxycarbofuran | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Aldicarb | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Aldicarb Sulfone | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Aldicarb Sulfoxide | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Azoxystrobin | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Bendiocarb | Not Detected | 0.060 ug/L | |

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Analytical Report

**Client Sample ID:** Hilfiker
**Matrix:** water

**PAL Sample ID:** P180319-02
**Sample Date:** 3/13/18

| Extraction Date | Analysis Date | Analyte | Amount Detected | Limit of Quantitation | Notes |
|---|---|---|---|---|---|
| 3/16/18 | 3/23/18 | Bensulide | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Boscalid | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Bromacil | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Carbaryl | 0.16 ug/L | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Carbofuran | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Carfentrazone-ethyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Clothianidin | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | DCPMU | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Diuron | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Fenobucarb | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Fenuron | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/23/18 | Flumioxazin | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Fluometuron | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Imidacloprid | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Isoxaben | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Linuron | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Methiocarb | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Methomyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Monuron | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Neburon | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Oxamyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Propargite | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/22/18 | Propoxur | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Pyraclostrobin | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Pyrimethanil | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Sethoxydim | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Siduron | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Thiabendazole | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Thiobencarb | Not Detected | 0.060 ug/L | |

**Surrogate Recovery:** 96 %
**Surrogate Recovery Range:** 60-140
(TPP-d15 used as Surrogate)

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Analytical Report

**Client Sample ID:** Salem Industrial
**Matrix:** water

**PAL Sample ID:** P180319-03
**Sample Date:** 3/13/18

**Method:** Modified EPA 8081B (GC-ECD)

| Extraction Date | Analysis Date | Analyte | Amount Detected | Limit of Quantitation | Notes |
|---|---|---|---|---|---|
| 3/16/18 | 3/27/18 | a-BHC | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Acetochlor | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Alachlor | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Aldrin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | b-BHC | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Benfluralin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Bifenthrin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Captafol | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Captan | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Chlordane | Not Detected | 0.60 ug/L | |
| 3/16/18 | 3/27/18 | Chlorobenzilate | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Chloroneb | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Chlorothalonil | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Chlorpyrifos | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Cyfluthrin | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Cyhalothrin | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Cypermethrin | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Dacthal | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | d-BHC | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Deltamethrin | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Dichlobenil | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Dicloran | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Dicofol | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Dieldrin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Dithiopyr | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Endosulfan I | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Endosulfan II | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Endosulfan sulfate | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Endrin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Endrin aldehyde | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Endrin ketone | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Esfenvalerate | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Ethalfluralin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Etridiazole | Not Detected | 0.12 ug/L | |

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Analytical Report

**Client Sample ID:** Salem Industrial
**Matrix:** water

**PAL Sample ID:** P180319-03
**Sample Date:** 3/13/18

| Extraction Date | Analysis Date | Analyte | Amount Detected | Limit of Quantitation | Notes |
|---|---|---|---|---|---|
| 3/16/18 | 3/27/18 | Fenarimol | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Fenvalerate | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Flutolanil | Not Detected | 1.2 ug/L | |
| 3/16/18 | 3/27/18 | Folpet | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | g-BHC | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Heptachlor | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Heptachlor epoxide | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Hexachlorobenzene | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Iprodione | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Methoxychlor | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Metolachlor | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Mirex | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Norflurazon | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Ovex | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Oxadiazon | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Oxyfluorfen | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | p,p'-DDD | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | p,p'-DDE | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | p,p'-DDT | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | PCNB | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Pendimethalin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Permethrin | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Prodiamine | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Pronamide | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Propachlor | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Propanil | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Propiconazole | 0.88 ug/L | 0.30 ug/L | |
| 3/16/18 | 3/27/18 | Terbacil | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Toxaphene | Not Detected | 6.0 ug/L | |
| 3/16/18 | 3/27/18 | Trifloxystrobin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Triflumizole | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Trifluralin | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/27/18 | Vinclozalin | Not Detected | 0.12 ug/L | |

**Surrogate Recovery:** 88 %
**Surrogate Recovery Range:** 38-143
(DCBP used as Surrogate)

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Analytical Report

**Client Sample ID:** Salem Industrial
**Matrix:** water

**PAL Sample ID:** P180319-03
**Sample Date:** 3/13/18

**Method:** Modified EPA 8141B (GC-FPD)

| Extraction Date | Analysis Date | Analyte | Amount Detected | Limit of Quantitation | Notes |
|---|---|---|---|---|---|
| 3/16/18 | 3/26/18 | Aspon | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Azinphos-methyl | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Carbofenothion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Chlorfenvinphos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Chlorpyrifos-methyl | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Coumaphos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Demeton | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Diazinon | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Dichlorofenthion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Dichlorvos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Dicrotophos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Dimethoate | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Disulfoton | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | EPN | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Ethion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Ethoprop | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Famphur | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Fenamiphos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Fenitrothion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Fensulfothion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Fenthion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Malathion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Merphos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Methidathion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Mevinphos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Monocrotophos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Parathion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Parathion methyl | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Phorate | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Phosmet | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Phosphamidon | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Pirimiphos-methyl | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Ronnel | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Sulprofos | Not Detected | 0.30 ug/L | |

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Analytical Report

**Client Sample ID:** Salem Industrial
**Matrix:** water

**PAL Sample ID:** P180319-03
**Sample Date:** 3/13/18

| Extraction Date | Analysis Date | Analyte | Amount Detected | Limit of Quantitation | Notes |
|---|---|---|---|---|---|
| 3/16/18 | 3/26/18 | Terbufos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Tetrachlorvinphos | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Tokuthion | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/26/18 | Trichloronate | Not Detected | 0.30 ug/L | |

**Surrogate Recovery:** 83 %
**Surrogate Recovery Range:** 46-157
(TPP-d15 used as Surrogate)

**Method:** Modified EPA 8151A (GC-MS/MS)

| | | | | | |
|---|---|---|---|---|---|
| 3/19/18 | 3/26/18 | 2,4,5-T | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 2,4,5-TP | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 2,4-D | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 2,4-DB | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Acifluorfen | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Bentazon | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Clopyralid | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Dicamba | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Dichlorprop | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Dinoseb | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | MCPA | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | MCPP | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Picloram | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Quinclorac | Not Detected | 0.080 ug/L | |
| 3/19/18 | 3/26/18 | Triclopyr | Not Detected | 0.080 ug/L | |

**Surrogate Recovery:** 84 %
**Surrogate Recovery Range:** 64-139
(DCPAA used as Surrogate)

**Method:** Modified EPA 8270D (GC-MS/MS)

| | | | | | |
|---|---|---|---|---|---|
| 3/16/18 | 3/19/18 | Ametryn | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Amitraz | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/19/18 | Atrazine | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Bromopropylate | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Cyanazine | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/19/18 | Diclofop-methyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Dimethenamid | Not Detected | 0.060 ug/L | |

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Analytical Report

**Client Sample ID:** Salem Industrial
**Matrix:** water

**PAL Sample ID:** P180319-03
**Sample Date:** 3/13/18

| Extraction Date | Analysis Date | Analyte | Amount Detected | Limit of Quantitation | Notes |
|---|---|---|---|---|---|
| 3/16/18 | 3/19/18 | Diphenylamine | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Ethofumesate | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Fenbuconazole | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Fenoxaprop-ethyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Fipronil | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/19/18 | Fluazifop-p-butyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Fludioxonil | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Fluroxypyr-meptyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Hexazinone | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Mefenoxam | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Metalaxyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Metribuzin | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Myclobutanil | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Napropamide | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Pirimicarb | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Prometon | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Prometryn | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Propazine | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Pyridaben | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Simazine | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Simetryn | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Sulfentrazone | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Tebuconazole | 0.080 ug/L | 0.060 ug/L | |
| 3/16/18 | 3/19/18 | Tebuthiuron | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/19/18 | Triadimefon | Not Detected | 0.12 ug/L | |

**Surrogate Recovery:** 88 %
**Surrogate Recovery Range:** 29-130
(DCBP used as Surrogate)

**Method:** Modified EPA 8321B (LC-MS/MS)

| | | | | | |
|---|---|---|---|---|---|
| 3/16/18 | 3/22/18 | 3-Hydroxycarbofuran | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Aldicarb | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Aldicarb Sulfone | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Aldicarb Sulfoxide | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Azoxystrobin | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Bendiocarb | Not Detected | 0.060 ug/L | |

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Analytical Report

**Client Sample ID:** Salem Industrial
**Matrix:** water

**PAL Sample ID:** P180319-03
**Sample Date:** 3/13/18

| Extraction Date | Analysis Date | Analyte | Amount Detected | Limit of Quantitation | Notes |
|---|---|---|---|---|---|
| 3/16/18 | 3/23/18 | Bensulide | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Boscalid | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Bromacil | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Carbaryl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Carbofuran | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Carfentrazone-ethyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Clothianidin | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | DCPMU | 0.12 ug/L | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Diuron | 1.7 ug/L | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Fenobucarb | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Fenuron | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/23/18 | Flumioxazin | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Fluometuron | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Imidacloprid | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Isoxaben | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Linuron | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Methiocarb | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Methomyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Monuron | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Neburon | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Oxamyl | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Propargite | Not Detected | 0.12 ug/L | |
| 3/16/18 | 3/22/18 | Propoxur | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Pyraclostrobin | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Pyrimethanil | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Sethoxydim | Not Detected | 0.30 ug/L | |
| 3/16/18 | 3/22/18 | Siduron | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Thiabendazole | Not Detected | 0.060 ug/L | |
| 3/16/18 | 3/22/18 | Thiobencarb | Not Detected | 0.060 ug/L | |

**Surrogate Recovery:** 106 %
**Surrogate Recovery Range:** 60-140
(TPP-d15 used as Surrogate)

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

# Quality Assurance

**Method Blank Data** **Matrix:** water

| Extraction Date | Analysis Date | Batch QC Sample # | Analyte | % Recovery | Expected % Recovery | Notes |
|---|---|---|---|---|---|---|
| 3/16/18 | 3/22/18 | 8031601-BLK1 | 3-Hydroxycarbofuran | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | a-BHC | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Acetochlor | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Alachlor | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Aldicarb | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Aldicarb Sulfone | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Aldicarb Sulfoxide | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Aldrin | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Ametryn | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Amitraz | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Aspon | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Atrazine | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Azinphos-methyl | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Azoxystrobin | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | b-BHC | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Bendiocarb | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Benfluralin | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/23/18 | 8031601-BLK1 | Bensulide | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Bifenthrin | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Boscalid | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Bromacil | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Bromopropylate | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Captafol | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Captan | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Carbaryl | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Carbofenothion | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Carbofuran | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Carfentrazone-ethyl | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Chlordane | Not Detected | < 0.60 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Chlorfenvinphos | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Chlorobenzilate | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Chloroneb | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Chlorothalonil | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Chlorpyrifos | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Chlorpyrifos-methyl | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Clothianidin | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Coumaphos | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Cyanazine | Not Detected | < 0.12 ug/L | |

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

**Method Blank Data** **Matrix:** water

| Extraction Date | Analysis Date | Batch QC Sample # | Analyte | % Recovery | Expected % Recovery | Notes |
|---|---|---|---|---|---|---|
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Cyfluthrin | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Cyhalothrin | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Cypermethrin | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Dacthal | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | d-BHC | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | DCPMU | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Deltamethrin | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Demeton | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Diazinon | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Dichlobenil | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Dichlorofenthion | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Dichlorvos | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Diclofop-methyl | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Dicloran | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Dicofol | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Dicrotophos | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Dieldrin | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Dimethenamid | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Dimethoate | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Diphenylamine | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Disulfoton | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Dithiopyr | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Diuron | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Endosulfan I | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Endosulfan II | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Endosulfan sulfate | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Endrin | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Endrin aldehyde | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Endrin ketone | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | EPN | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Esfenvalerate | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Ethalfluralin | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Ethion | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Ethofumesate | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Ethoprop | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Etridiazole | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Famphur | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Fenamiphos | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Fenarimol | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Fenbuconazole | Not Detected | < 0.060 ug/L | |

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

**Method Blank Data** **Matrix:** water

| Extraction Date | Analysis Date | Batch QC Sample # | Analyte | % Recovery | Expected % Recovery | Notes |
|---|---|---|---|---|---|---|
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Fenitrothion | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Fenobucarb | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Fenoxaprop-ethyl | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Fensulfothion | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Fenthion | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Fenuron | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Fenvalerate | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Fipronil | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Fluazifop-p-butyl | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Fludioxonil | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/23/18 | 8031601-BLK1 | Flumioxazin | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Fluometuron | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Fluroxypyr-meptyl | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Flutolanil | Not Detected | < 1.2 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Folpet | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | g-BHC | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Heptachlor | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Heptachlor epoxide | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Hexachlorobenzene | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Hexazinone | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Imidacloprid | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Iprodione | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Isoxaben | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Linuron | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Malathion | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Mefenoxam | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Merphos | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Metalaxyl | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Methidathion | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Methiocarb | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Methomyl | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Methoxychlor | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Metolachlor | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Metribuzin | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Mevinphos | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Mirex | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Monocrotophos | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Monuron | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Myclobutanil | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Napropamide | Not Detected | < 0.060 ug/L | |

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

**Method Blank Data** **Matrix:** water

| Extraction Date | Analysis Date | Batch QC Sample # | Analyte | % Recovery | Expected % Recovery | Notes |
|---|---|---|---|---|---|---|
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Neburon | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Norflurazon | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Ovex | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Oxadiazon | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Oxamyl | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Oxyfluorfen | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | p,p'-DDD | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | p,p'-DDE | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | p,p'-DDT | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Parathion | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Parathion methyl | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | PCNB | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Pendimethalin | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Permethrin | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Phorate | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Phosmet | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Phosphamidon | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Pirimicarb | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Pirimiphos-methyl | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Prodiamine | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Prometon | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Prometryn | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Pronamide | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Propachlor | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Propanil | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Propargite | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Propazine | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Propiconazole | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Propoxur | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Pyraclostrobin | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Pyridaben | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Pyrimethanil | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Ronnel | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Sethoxydim | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Siduron | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Simazine | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Simetryn | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Sulfentrazone | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Sulprofos | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Tebuconazole | Not Detected | < 0.060 ug/L | |

Rick Jordan, Laboratory Manager

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

**Method Blank Data** **Matrix:** water

| Extraction Date | Analysis Date | Batch QC Sample # | Analyte | % Recovery | Expected % Recovery | Notes |
|---|---|---|---|---|---|---|
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Tebuthiuron | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Terbacil | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Terbufos | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Tetrachlorvinphos | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Thiabendazole | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Thiobencarb | Not Detected | < 0.060 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Tokuthion | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Toxaphene | Not Detected | < 6.0 ug/L | |
| 3/16/18 | 3/19/18 | 8031601-BLK1 | Triadimefon | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/22/18 | 8031601-BLK1 | Trichloronate | Not Detected | < 0.30 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Trifloxystrobin | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Triflumizole | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Trifluralin | Not Detected | < 0.12 ug/L | |
| 3/16/18 | 3/27/18 | 8031601-BLK1 | Vinclozalin | Not Detected | < 0.12 ug/L | |

**Method Blank Data** **Matrix:** water

| Extraction Date | Analysis Date | Batch QC Sample # | Analyte | % Recovery | Expected % Recovery | Notes |
|---|---|---|---|---|---|---|
| 3/19/18 | 3/26/18 | 8031904-BLK1 | 2,4,5-T | Not Detected | < 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 8031904-BLK1 | 2,4,5-TP | Not Detected | < 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 8031904-BLK1 | 2,4-D | Not Detected | < 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 8031904-BLK1 | 2,4-DB | Not Detected | < 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 8031904-BLK1 | Acifluorfen | Not Detected | < 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 8031904-BLK1 | Bentazon | Not Detected | < 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 8031904-BLK1 | Clopyralid | Not Detected | < 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 8031904-BLK1 | Dicamba | Not Detected | < 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 8031904-BLK1 | Dichlorprop | Not Detected | < 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 8031904-BLK1 | Dinoseb | Not Detected | < 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 8031904-BLK1 | MCPA | Not Detected | < 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 8031904-BLK1 | MCPP | Not Detected | < 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 8031904-BLK1 | Picloram | Not Detected | < 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 8031904-BLK1 | Quinclorac | Not Detected | < 0.080 ug/L | |
| 3/19/18 | 3/26/18 | 8031904-BLK1 | Triclopyr | Not Detected | < 0.080 ug/L | |

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

**Blank Spike Data** **Matrix:** water

| Extraction Date | Analysis Date | Batch QC Sample # | Analyte | % Recovery | Expected % Recovery | Notes |
|---|---|---|---|---|---|---|
| 3/16/18 | 3/19/18 | 8031601-BS1 | Atrazine | 82 | 79-125 | |
| 3/16/18 | 3/19/18 | 8031601-BSD1 | Atrazine | 84 | 79-125 | |
| 3/16/18 | 3/27/18 | 8031601-BS1 | Chlorpyrifos | 99 | 74-142 | |
| 3/16/18 | 3/27/18 | 8031601-BSD1 | Chlorpyrifos | 98 | 74-142 | |
| 3/16/18 | 3/22/18 | 8031601-BS1 | Diazinon | 92 | 66-124 | |
| 3/16/18 | 3/22/18 | 8031601-BSD1 | Diazinon | 87 | 66-124 | |
| 3/16/18 | 3/27/18 | 8031601-BS1 | Dieldrin | 105 | 53-131 | |
| 3/16/18 | 3/27/18 | 8031601-BSD1 | Dieldrin | 101 | 53-131 | |
| 3/16/18 | 3/22/18 | 8031601-BS1 | Diuron | 90 | 76-104 | |
| 3/16/18 | 3/22/18 | 8031601-BSD1 | Diuron | 97 | 76-104 | |
| 3/16/18 | 3/19/18 | 8031601-BS1 | Ethofumesate | 97 | 73-129 | |
| 3/16/18 | 3/19/18 | 8031601-BSD1 | Ethofumesate | 94 | 73-129 | |
| 3/16/18 | 3/22/18 | 8031601-BS1 | Fluometuron | 93 | 58-109 | |
| 3/16/18 | 3/22/18 | 8031601-BSD1 | Fluometuron | 93 | 58-109 | |
| 3/16/18 | 3/22/18 | 8031601-BS1 | Imidacloprid | 76 | 61-128 | |
| 3/16/18 | 3/22/18 | 8031601-BSD1 | Imidacloprid | 70 | 61-128 | |
| 3/16/18 | 3/19/18 | 8031601-BS1 | Napropamide | 100 | 64-112 | |
| 3/16/18 | 3/19/18 | 8031601-BSD1 | Napropamide | 98 | 64-112 | |
| 3/16/18 | 3/27/18 | 8031601-BS1 | Oxadiazon | 105 | 78-121 | |
| 3/16/18 | 3/27/18 | 8031601-BSD1 | Oxadiazon | 102 | 78-121 | |
| 3/16/18 | 3/22/18 | 8031601-BS1 | Parathion methyl | 89 | 72-128 | |
| 3/16/18 | 3/22/18 | 8031601-BSD1 | Parathion methyl | 86 | 72-128 | |
| 3/16/18 | 3/22/18 | 8031601-BS1 | Thiobencarb | 67 | 66-115 | |
| 3/16/18 | 3/22/18 | 8031601-BSD1 | Thiobencarb | 73 | 66-115 | |

**Blank Spike Data** **Matrix:** water

| Extraction Date | Analysis Date | Batch QC Sample # | Analyte | % Recovery | Expected % Recovery | Notes |
|---|---|---|---|---|---|---|
| 3/19/18 | 3/26/18 | 8031904-BS1 | 2,4-D | 66 | 22-136 | |
| 3/19/18 | 3/26/18 | 8031904-BSD1 | 2,4-D | 66 | 22-136 | |
| 3/19/18 | 3/26/18 | 8031904-BS1 | Dicamba | 82 | 67-127 | |
| 3/19/18 | 3/26/18 | 8031904-BSD1 | Dicamba | 86 | 67-127 | |
| 3/19/18 | 3/26/18 | 8031904-BS1 | Triclopyr | 78 | 48-138 | |
| 3/19/18 | 3/26/18 | 8031904-BSD1 | Triclopyr | 77 | 48-138 | |

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
21830 S.W. Alexander Ln. • Sherwood, OR 97140 • Ph 503.626.7943 • pacaglab.com

**City of Salem**
1410 20th St. SE Building 2
Salem, OR 97302

**Report Number:** P180319
**Report Date:** March 28, 2018
**Client Project ID:** [none]

## Analyte Information

Method: Modified EPA 8081B (GC-ECD)
Method: Modified EPA 8141B (GC-FPD)
Method: Modified EPA 8151A (GC-MS/MS)
Chlorinated acids were converted to free acids. Residues were quantitated as free acids.
Method: Modified EPA 8270D (GC-MS/MS)
Method: Modified EPA 8321B (LC-MS/MS)

Rick Jordan, Laboratory Manager

| | |
|---|---|
| Attachment C. | Results of Benthic Macroinvertebrate Sampling, Fish Sampling, and Physical Habitat Data - Pacific Habitat Services (October 24, 2017) |

# Results of
# Benthic Macroinvertebrate Sampling, Fish Sampling, and Physical Habitat Data Collection for
# Pringle Creek, Clark Creek, Battle Creek, and Waln Creek
# in Salem, Oregon

**Prepared for**

**City of Salem**
Attn: Anita Panko
Public Works Department
555 Liberty Street SE
Salem, Oregon 97301

**Prepared by**

Craig Tumer
Dale Groff
**Pacific Habitat Services, Inc.**
9450 SW Commerce Circle, Suite 180
Wilsonville, OR 97070
(503) 570-0800
(503) 570-0855 FAX

**PHS Project Number: 5244**

October 24, 2017

# TABLE OF CONTENTS

# 1.0 INTRODUCTION

This report describes the results of the benthic macroinvertebrate sampling, fish sampling, and physical habitat characterization conducted in May and June 2017 on reaches of Clark Creek, East Fork Pringle Creek, Pringle Creek, Battle Creek, and Waln Creek. Benthic macroinvertebrate sampling was conducted on May 8, 2017; fish sampling was conducted on June 29, 2017; and physical habitat characterization was conducted on various dates in May and June 2017. Benthic macroinvertebrates, fish and physical habitat parameters were collected along the same reaches and using the same methodology as in previous sampling conducted in 2011, 2012, and 2013. This memorandum provides the data from the 2017 sampling effort.

# 2.0 STUDY AREA AND SUMMARY OF PREVIOUS SAMPLING EFFORTS

In Fall 2011, PHS collected data on benthic macroinvertebrate communities, fish presence, and physical habitat characteristics on two reaches of Battle Creek and two reaches of Waln Creek to provide baseline information for assessing the success of the Waln Creek stream restoration activities. These data were collected on four sample reaches, as described below:

- Lower Waln Creek: Waln Creek, immediately upstream of its confluence with Battle Creek;
- Upper Waln Creek: Waln Creek, upstream of SE Wiltsey Road;
- Lower Battle Creek: Battle Creek, upstream from the culvert located near the eastern edge of the former Battle Creek Golf Course and downstream of the Waln Creek/Battle Creek confluence;
- Upper Battle Creek: Battle Creek, upstream of the Waln Creek/Battle Creek confluence and in the vicinity of previous City of Salem sampling efforts.

In the 2011, the Lower Waln Creek Reach consisted the reach of Waln Creek that was to be relocated to the east of its original location. This reach was sampled in order to provide baseline data against which data from the relocated stream channel could be compared. The Lower Waln Creek Reach sampled in 2017 consisted of the relocated stream channel, immediately upstream from Waln Creek's confluence with Battle Creek in subsequent sampling years.

The Upper Waln Creek reach is located approximately 1000 feet upstream of the Lower Waln Creek reach, upstream of Wiltsey Road. Data was collected along this portion of Waln Creek to document potential stream changes resulting from inputs occurring upstream of the project area. Between SE Madras Street and Wiltsey Road.

The Lower Battle Creek reach is located immediately downstream of the confluence of Waln Creek and Battle Creek. After it is relocated, Waln Creek will flow into Battle Creek near the upstream end of Lower Battle Creek. Data collected in this stream was collected to document changes that might occur in Battle Creek following the Waln Creek restoration project.

The Upper Battle Creek reach is located approximately 183 feet upstream of the confluence of Waln Creek and Battle Creek but still within the former Battle Creek Golf Course. Data was collected along this portion of Battle Creek to document potential stream changes resulting from

inputs to Battle Creek occurring upstream of the project area. The City has benthic macroinvertebrate data from pervious sampling efforts near the location of Upper Battle Creek. The data from this previous sampling effort may be used in conjunction with data collected during this study to evaluate pre-project conditions in Battle Creek.

In May and June 2013, PHS collected data on benthic macroinvertebrate communities, fish presence, and physical habitat characteristics at three sample reaches within the City of Salem. These reaches are the same reaches sampled by PHS in May and June 2012, and are in close proximity to a previous macroinvertebrate sampling effort that was conducted during 2000 and 2001 (Pringle Creek Watershed Bioassessment Project). General locations of each of the sampling reaches are as follows:

- East Fork Pringle Creek where the stream enters the City (2000/2001 sampling site PR00-15),
- Pringle Creek below the confluence with Clark Creek and upstream of confluence with Shelton Ditch (2000/2001 sampling site PR00-02), and
- Clark Creek in Gilmore Field (2000/2001 sampling site PR00-24).

The East Fork Pringle Creek sampling reach is located downstream (north) of Trelstad Avenue SE, near the Salem city limits. The upstream end of the reach begins just north of the riprap apron of the culverts that carry the stream under Trelstad Avenue and extends for 150 meters downstream. In this area, East Fork Pringle Creek has been channelized and straightened with a berm of discharged dredge material along the bank. A short concrete sluice is present near the downstream end of the reach. The substrate of the stream is generally dominated by fine gravel and smaller sediments.

The Pringle Creek sampling reach is located within Bush's Pasture Park, approximately 10 meters downstream of the confluence of Clark Creek and Pringle Creek, and extends for 292.5 meters downstream. Within this reach, Pringle Creek is gently meandering. The stream banks are generally low and gently to moderately sloped, though vertical and undercut, eroding banks are present in some areas. A vertical concrete wall is present along the right bank near the upstream limits of the sampling reach, where private residences occur in close proximity to the stream. Substrates within the channel are generally dominated by cobbles and coarse gravel.

The Clark Creek sampling reach is located within Gilmore Field, just south of Hoyt Street SE. The downstream end of the project reach begins upstream of the detention structure south of Hoyt Street SE and continues upstream for 150 meters along the west side of Gilmore Field. In general, the stream banks are steep and the stream channel is incised. Substrates within the channel are generally dominated by silt and fine gravel, with areas of exposed clay hardpan.

## 3.0 METHODOLOGY

As recommended in the "Technical Memorandum for the City of Salem's MS4 Permit Requirements for Benthic Macroinvertebrate Sampling and Hydromodification Assessment", dated March 21, 2011, PHS followed the Oregon Department of Environmental Quality's *Water Monitoring and Assessment Mode of Operations Manual* (*MOMs*) (June 2010) transect sampling

approach for collecting benthic macroinvertebrate samples and the methodologies found in the Environmental Protection Agency's *Environmental Monitoring and Assessment Program - Surface Waters: Western Pilot Study Field Operations Manual for Wadeable Streams* (EMAP-SW) for collecting physical habitat data within the project area. Both protocols require the collection of data at evenly spaced transects within the sampling reach. Therefore, prior to the initiation of sampling and data collection, PHS established permanent transects within each of the three sampling reaches.

Both the MOMs and EMAP-SW protocols specify that the length of the sampling reach is forty times the average wetted width of the channel or a minimum of 150 meters long, when the average wetted width is less than four meters. Because the average wetted widths of East Fork Pringle and Clark Creeks are less than four meters, PHS determined that the reach length for each of the reaches on these streams is 150 meters. PHS measured the wetted width of Pringle Creek at five representative locations and determined that the average wetted width is approximately 7.31 meters and the total reach length is 292.5 meters.

## 3.1 Benthic Macroinvertebrate Sampling

Benthic macroinvertebrates were sampled using a transect sampling approach, as described in the Oregon Department of Environmental Quality's *Water Monitoring and Assessment Mode of Operations Manual* (*MOMs*) (June 2010).

One kick-net sample was collected at each of the eleven transects on the reach beginning at Transect A, which is located at the downstream end of the reach. The Transect A sample was collected from the middle of the left one-third of the stream; the Transect B sample was collected from the middle of the center one-third of the stream; and the Transect C sample was collected from the middle of the right one-third. For transect D, the sample was collected from the left one-third, and the cycle was repeated for all 11 transects. Samples were not collected from the stream margins.

At each sampling location, a D-frame kick net with 500 µm mesh net was placed in the stream with the flat part of the hoop resting on the streambed and perpendicular to the stream flow. Substrate preventing the flat part of the kicknet from sitting flush with the bottom was removed, when necessary.

Macroinvertebrate samples were collected from a one-square-foot sample area immediately upstream of the net. Before disturbing the substrate, this area was inspected for large macroinvertebrates such as mussels, and any such organisms were picked by hand and placed directly into the sieve. Within the sample area, all substrate particles larger than approximately five centimeters were carefully rubbed by hand in front of the net to dislodge any clinging macroinvertebrates. After rubbing, the substrate materials were placed outside of the sample plot. After all large substrate materials within the sample area were scrubbed by hand and removed from the sample area, the remaining substrate in the sample area was disturbed with the hands or feet for one minute. When samples were collected in slow-moving water where the water current was not strong enough to carry any dislodged organisms into the net, the net was pulled through the water as the substrate is disturbed to capture suspended organisms. After the sample was collected and the net removed from the stream, large substrate was returned to the sample area. Following collection of each sample, the contents of the net were placed in a 500µm mesh sieve, and the

procedure was repeated at each transect, working from downstream (Transect A) to upstream (Transect K). The samples from each transect were composited into the sieve.

After the samples from all transects on the reach were completed and transferred to the sieve, large organic material and rocks were rinsed, carefully inspected for clinging macroinvertebrates, and removed. Fine sediment was washed away to the extent possible. The composite sample was placed in a jar labeled with the date and reach name and preserved with 95% denatured ethanol for transport to the lab for sorting and subsampling. A label with site information written in pencil on Rite in the Rain paper was placed inside the container. After all samples were collected, they were delivered to Aquatic Biology Associates, Inc. in Corvallis for sorting, subsampling, and data analysis.

## 3.2 Fish Sampling

An Oregon Scientific Take Permit (STP) must be obtained from the Oregon Department of Fish and Wildlife (ODFW) to conduct fish sampling within the State. Prior to conducting the fish sampling within the project area, PHS completed the online permit application (https://apps.nmfs.noaa.gov/) and obtained the necessary Oregon STP from ODFW. Due to the potential presence of salmonid species listed under the Endangered Species Act in the mainstem Pringle Creek reach, a permit from the National Marine Fisheries Service (NMFS) must also be obtained. Correspondence with NMFS personnel in 2012 indicated that such a permit would be difficult to obtain, and PHS did not pursue the permit from the NMFS. Therefore, fish sampling was not conducted on the mainstem Pringle Creek reach. Fish sampling was conducted on all other sampling reaches.

PHS conducted the fish sampling on June 29, 2017. Starting at the downstream end of the sampling reach and working upstream along the reach, fish sampling was conducted using a Smith-Root backpack electrofishing unit. A second person followed the operator of the electrofishing unit with a dip net to retrieve stunned fish. All retrieved fish were transferred to a five-gallon bucket equipped with an aerator for later processing. Following completion of electrofishing at the upstream end of the sampling reach, all captured fish were identified and counted before being returned to the stream.

Following completion of the fish sampling, PHS completed the follow-up reporting required by the Oregon STP.

## 3.3 Physical Habitat Characterization

The EMAP-SW protocol was used to collect physical habitat data for the three stream reaches. The habitat characterization portion of the EMAP-SW protocol includes five components: thalweg profile; woody debris tally; channel and riparian characterization; assessment of channel constraint, debris torrents, and major floods; and discharge. While the characterization of all of these components is not especially useful for a hydromodification assessment, collection of certain data prescribed by the protocol may be useful. The following additional data, as described by the EMAP-SW habitat characterization protocol, were collected for future hydromodification analysis:

- Water Depth - The water depth is determined along the thalweg profile at low flow for 10 uniformly spaced intervals between transects.
- Wetted Width - The wetted width is determined at the 11 transects also used for macroinvertebrate sampling and at the mid-points of the intervals between those transects for a total of 21 measurements. In addition, the stream substrate is assessed at each of these transects at 5 points: left and right edge of water, midpoint of channel, and the two points midway between center of channel and water's edge. The substrate at these 5 points is characterized by size as boulders (> 250 mm), cobbles (>64 to 250 mm), coarse gravel (>16 to 64 mm), fine gravel (>2 to 16 mm), sand (>0.06 to 2 mm), and fines (<2 mm). Indications of burial around substrate particles at each of the substrate locations within a radius of 5 cm are used to assess the embeddedness as a fraction of the sediment particles surrounded by sand or finer particles.
- Channel Morphology - The channel morphology is measured at the 11 transects also used for macroinvertebrate assays. The bank angles from the edge of water to the top of the stream bank are recorded. The distance of bank overhang (if occurring) is measured from the edge of water to the vertical projection of the edge of bank. The vertical distance from the water surface to the lowest floodplain terrace is recorded for each transect as well as the vertical distance to the bankfull elevation. The bankfull width is also recorded at each transect.

In addition to the information described above, PHS collected data related to riparian habitat condition. The methodologies used to collect the physical habitat data within the sampling reaches are described below. More detailed descriptions of the methodologies can be found in the EMAP-SW document.

## Thalweg Profile

Beginning at the downstream end of the reach, measurement stations were established at intervals between transects. As recommended by the EMAP-SW protocol procedures for streams with a wetted width less than 2.5 meters wide. Stations were numbered "0" through "14" at one-meter intervals beginning at the downstream end of the first transect (Transect "A") and measuring upstream to the next transect. The wetted width of the stream was measured to the nearest 0.1 m at stations "0" and "7". At station 7 the substrate particle size at the tip of the depth measuring rod was classified at the left wetted margin and at positions 25%, 50%, 75%, and 100% of the distance across the wetted width of the stream. Because the average wetted width of Pringle Creek is greater than 2.5 meters, stations numbered "0" through "9" were spaced at 2.9-meter intervals (one-tenth the distance between transects), as recommended by the EMAP-SW protocol procedures. The wetted width of the stream was measured at stations 0 and 5, and the substrate particle size was measured at station 5.

The procedure for determining substrate particle size at the mid-way station is identical to the substrate size evaluation procedure described for regular channel cross-sections A through K, except that for these mid-way supplemental cross-sections, substrate size is entered on the Thalweg Profile side of the field form.

At each thalweg profile station, a meter ruler was used to locate the deepest point (the "thalweg"), and the thalweg depth was measured to the nearest cm. The depth was read on the

side of the ruler to avoid inaccuracies due to the wave formed by the rod in moving water. At the point where the thalweg depth was measured, the presence or absence of “soft/small sediment” (defined as fine gravel, sand, silt, clay or muck readily apparent by "feeling" the bottom with the staff) was noted.

The channel unit code and pool forming element codes for the station were determined and recorded on the field data form using the standard codes provided on the form. According to the EMAP-SW protocol, the unit should be at least as long as the channel is wide to be recorded. The same measurements were recorded for all stations upstream to the next transect and for all stations to the upstream end of the sampling reach (Transect “K”).

## Large Woody Debris Tally

Large woody debris (LWD), defined by this methodology as woody material with a small end diameter of at least 10 cm and a length of at least 1.5 m, within the reach was tallied while working upstream to collect the thalweg profile data. All pieces of LWD that were at least partially in the baseflow channel, the "active channel" (flood channel up to bankfull stage), or spanning above the active channel were included in the tally. LWD in the active channel was tallied over the entire length of the reach, including the area between the channel cross-section transects. The procedure for tallying LWD is presented in more detail in Table 7-5 of the EMAP-SW methodology.

All pieces of LWD within the segment that are at least partially within the bankfull channel were tallied by class based on the diameter of the large end (0.1 m to < 0.3 m, 0.3 m to <0.6 m, 0.6 m to <0.8 m, or >0.8 m, and the class based on the length of the piece (1.5m to <5.0m, 5m to <15m, or >15m). A tally mark was placed in the appropriate box in the “Pieces All/Part In Bankfull Channel” section of the Thalweg Profile and Woody Debris Form.

All pieces of LWD within the segment that are not actually within the bankfull channel, but are at least partially spanning (bridging) the bankfull channel were tallied by class based on the diameter of the large end (0.1 m to < 0.3 m, 0.3 m to <0.6 m, 0.6 m to <0.8 m, or >0.8 m), and the length of the piece (1.5 m to <5.0 m, 5 m to <15 m, or >15 m). For each piece observed, a tally mark was placed in the appropriate box in the “Pieces Bridge Above Bankfull Channel” section of the Thalweg Profile and Woody Debris Form.

After all pieces within the segment were tallied and marked on the form, the total number of pieces for each class were written in the small box at the lower right-hand corner of each tally box.

## Substrate Size/Channel Dimensions

The wetted channel width was divided into four equal segments to locate substrate measurement points on the cross-section. The distances corresponding to 0% (Left), 25% (LCtr), 50% (Ctr), 75% (RCtr), and 100% (Right) of the measured wetted width were recorded in the “DistLB” fields of the form. The distance recorded for the right bank was the same as the wetted channel width. At each measurement point on the cross section, (Left, LCtr, Ctr, RCtr, Right), the depth of the water was recorded. Because the left and right measurement points were at the limits of the wetted width of the stream, the water depth at these points was recorded as “0”.

Substrate size and embeddedness were evaluated at each of the 11 cross-section transects. A substrate particle was picked up at each measuring point (unless the substrate was bedrock or consolidated hardpan material), and the size of the particle was visually estimated, according to the table on the Channel/Riparian Cross-section Form. The substrate embeddedness was also evaluated according to the guidelines on the form and in the EMAP-SW protocol and the value was recorded on the data form. By definition, sand and fine-grained sediments were considered 100 percent embedded; bedrock and hardpan were considered 0 percent embedded.

**Bank Characteristics**

Bank angle and bank undercut distance were determined on the left and right banks at each cross section transect. To measure bank angle, the surveyor's rod was laid against the bank, with one end at the water's edge. A clinometer was placed on the rod, and the bank angle in degrees was read from the external scale on the clinometer. The angle was recorded in the field for the left bank in the "Bank Measurement" section of the Channel/ Riparian Cross-section Form. If the bank was undercut, the horizontal distance of the undercutting (defined as the distance from the water's edge out to the point where a vertical plumb line from the bank would hit the water's surface) was measured to the nearest 0.01 m, and the distance was recorded on the field data form.

The incised height of the stream was measured by holding the surveyor's rod vertically, with its base at the water's edge. Using the surveyor's rod as a guide while examining both banks, the channel incision as the height up from the water surface to elevation of the first terrace of the valley floodplain was visually estimated, and the value was recorded in the "Incised Height" field of the bank measurement section on the field data form.

At each transect, both banks were examined to estimate and record the height of bankfull flow above the thalweg elevation. The EMAP-SW protocol calls for bankfull height to be measured relative to the water surface elevation at the time of sampling; however, recording bankfull height relative to the thalweg elevation allows for comparison from year to year without the need to account for differing flow conditions. Potential bankfull indicators looked for included the following:

- An obvious slope break that differentiates the channel from a relatively flat floodplain terrace higher than the channel;
- A transition from exposed stream sediments to terrestrial vegetation;
- Moss growth on the banks;
- Presence of drift material caught on overhanging vegetation; and/or
- Transition from flood- and scour-tolerant vegetation to that which is relatively intolerant of these conditions.

The procedure for obtaining bank and channel dimension measurements is presented in more detail in Table 7-8 of the EMAP-SW protocol.

## Canopy Cover

Canopy cover over the stream was determined at each of the 11 cross-section transects using a Convex Spherical Densiometer taped as shown in the procedures outlined in the EMAP-SW protocol. The EMAP-SW protocol recommends obtaining six measurements at each cross-section transect (four measurements in four directions at mid-channel and one at each bank). The mid-channel measurements are used to estimate canopy cover over the channel. The two bank measurements complement your visual estimates of vegetation structure and cover within the riparian zone itself, and are particularly important in wide streams, where riparian canopy may not be detected by the densiometer when standing midstream. Because the stream channels within the project area are relatively narrow, only the four mid-channel measurements were collected for this project.

Facing upstream at mid-channel at each cross-section transect and with the densitometer held level at 0.3 m (1 ft.) above the surface of the stream the number of grid intersection points covered by either a tree, a leaf, or a high branch were counted. The value (0 to 17) was recorded in the "CenUp" field of the canopy cover measurement section of the Channel/Riparian Cross-section and Thalweg Profile Form. Canopy cover values were then determined for the left bank, downstream, and right bank and recorded in the appropriate spaces of the field data form.

## Riparian Vegetation Structure

Riparian vegetation observations were made for a distance of 5 meters upstream and downstream of each of the 11 cross-section transects. The riparian vegetation observations were made for the visible area from the stream back a distance of 10m (30 ft.) shoreward from both the left and right banks, creating a 10 m × 10 m riparian plot on each side of the stream. The riparian plot dimensions were estimated and not measured.

Standing mid-channel at a cross-section transect, a 5-meter distance upstream and downstream was estimated for the purpose of assessing riparian vegetation cover. For one bank and then the other, a distance of 10 meters back into the riparian vegetation was estimated. Within this 10 m × 10 m area, the riparian vegetation was conceptually divided into three layers: a CANOPY LAYER (>5m high), an UNDERSTORY (0.5 to 5 m high), and a GROUND COVER layer (<0.5 m high), and the dominant vegetation type for the CANOPY LAYER (vegetation > 5 m high) was determined to be either Deciduous, Coniferous, broadleaf Evergreen, Mixed, or None.

The areal cover class of large trees (> 0.3 m [1 ft.] diameter at breast height [DBH]) and small trees (< 0.3 m DBH) within the canopy layer was determined separately, and the appropriate cover class was recorded on the field data form ("0"=absent: zero cover, "1"=sparse: <10%, "2"=moderate: 10-40%, "3"=heavy: 40-75%, or "4"=very heavy: >75%). Next, the dominant vegetation type for the understory layer was determined as described above for the canopy layer. The areal cover class for woody shrubs and saplings was determined separately from non-woody vegetation within the understory. Similarly, the areal cover class for woody shrubs and seedlings, non-woody vegetation, and the amount of bare ground present in the ground cover layer was determined as described above.

## In stream Fish Cover, Algae, and Aquatic Macrophysics

The areal cover of all of the fish cover and other listed features that are in the water and on the banks 5 meters upstream and downstream of the cross-section were recorded in the "Fish Cover/Other" section of the Channel /Riparian Cross-section Form.

Standing mid-channel at a cross-section transect, a 5-meter distance upstream and downstream (10 m total length) was estimated for the purpose of evaluating fish cover. The water and the banks within the 10-m segment of stream were examined for the following features and types of fish cover:

- filamentous algae - long streaming algae that often occur in slow moving waters;
- aquatic saprophytes - are water-loving plants, including mosses, in the stream that could provide cover for fish or macroinvertebrates;
- large woody debris – the larger pieces of wood that can influence cover and stream morphology (i.e., those pieces that would be included in the large woody debris tally);
- brush and small woody debris – smaller wood pieces that primarily affect cover but not morphology;
- in-channel live trees or roots - living trees that are within the channel -- estimate the areal cover provided by the parts of these trees or roots that are inundated;
- overhanging vegetation - includes tree branches, brush, twigs, or other small debris that is not in the water but is close to the stream (within 1 m of the surface) and provides potential cover;
- undercut banks;
- boulders - typically basketball- to car-sized particles; and
- artificial structures - include those designed for fish habitat enhancement, as well as in-channel structures discarded (e.g., cars or tires) or purposefully placed for diversion, impoundment, channel stabilization, or other purposes.

For each cover type, the areal cover was estimated as follows and recorded in the "FISH COVER/OTHER" section of the Channel/Riparian Cross-section Form. According to the EMAP-SW protocol the cover classes of in stream fish cover features were estimated as follows:

"0"=absent: zero cover,
"1"=sparse: <10%,
"2"=moderate: 10-40%,
"3"=heavy: 40-75%, or
"4"=very heavy: >75%.

## Human Influence

For the left and right banks at each of the 11 detailed Channel and Riparian Cross-Sections, the presence/absence and the proximity of 11 categories of human influences were evaluated.

Standing mid-channel at each cross-section transect, a 5-meter distance was estimated upstream and downstream (10 m total length), and a distance of 10 meters back into the riparian zone from

each bank was estimated to define a riparian plot area. The channel, bank and riparian plot area adjacent to the defined stream segment were examined for the following human influences:

(1) walls, dikes, revetments, riprap, and dams;
(2) buildings;
(3) pavement/cleared lot (e.g., paved, graveled, dirt parking lot, foundation);
(4) roads or railroads,
(5) inlet or outlet pipes;
(6) landfills or trash (e.g., cans, bottles, trash heaps);
(7) parks or maintained lawns;
(8) row crops;
(9) pastures, rangeland, hay fields, or evidence of livestock;
(10) logging; and
(11) mining (including gravel mining).

For each type of influence, its presence or absence and its proximity to the stream and riparian plot area was determined. The human disturbance items were considered to be present if they were visible from the cross-section transect. For each type of influence, the appropriate proximity class was recorded in the "Human Influence" part of the "Visual Riparian Estimates" section of the Channel/Riparian Cross-section Form. The proximity classes are defined by the EMAP-SW protocol as follows:

**B ("Bank") -** Present within the defined 10 m stream segment and located in the stream or on the stream bank.
**C ("Close") -** Present within the 10 × 10 m riparian plot area, but away from the bank.
**P ("Present") -** Present, but outside the riparian plot area.
**O ("Absent") -** Not present within or adjacent to the 10 m stream segment or the riparian plot area at the transect

A particular influence may be observed outside of more than one riparian observation plot (e.g., at both transects "D" and "E"). In such situations, the influence was recorded as present at every transect from which it was observed without having to site through another transect or its 10 m × 10 m riparian plot.

## Riparian "Legacy" Trees and Invasive Alien Plants

One tree was identified as a "legacy" tree at each transect, and at transect K, the legacy tree was identified as the largest tree within 4 channel widths upstream of the transect location. For each legacy tree, which was defined as the largest tree within sight of the transect, the following information was recorded:

- type of tree, and, the taxonomic group, as defined on the field data form and Table 7-13 of the EMAP-SW protocol;
- estimated height,
- diameter at breast height (dbh), and
- distance from the wetted margin of the stream.

At each transect, the presence of listed invasive plant species within the 10 m x 10 m riparian plots on either bank was recorded on the Riparian "Legacy" Trees and Invasive Alien Plants field form. In accordance with the EMAP-SW protocol, only the presence of plants which are targets in the state (as identified in the EMAP-SW protocol) were recorded, even though other invasive species may be present.

# 4.0 RESULTS AND DISCUSSION

## 4.1 Benthic Macroinvertebrate Sampling

Benthic macroinvertebrate sampling was originally conducted on May 8, 2017. Initial processing by Aquatic Biology Associates, Inc (ABA) showed that very few specimens were collected during the sampling effort – likely a result of the heavy rains and high stream flows in the weeks prior to sampling. Because of the low number of organisms collected, the initial samples were not analyzed. PHS re-sampled all of the stream reaches on June 5, 2017, after stream flows had receded, and the benthic macroinvertebrate samples were processed by ABA. Data and results from ABA's analysis are provided in Appendix B. A summary of the results of the analysis are present in the following sections.

### 4.1.1 Benthic Index of Biological Integrity

Each sample was scored according to the Benthic Index of Biological Integrity (BIBI), modified from Karr 1998, which is a quantitative method for determining and comparing the biological condition of streams. The BIBI scoring system is composed of the 10 metrics:

- Total number of taxa;
- Number of Ephemeroptera taxa;
- Number of Plecoptera taxa;
- Number of Trichoptera taxa;
- Number of long-lived taxa;
- Number of intolerant taxa;
- Percent tolerant taxa;
- Percent predators;

- Number of clinger taxa; and
- Percent dominant taxa.

Each individual metric is given a score of 1 through 5, with higher numbers given to conditions representative of streams unaltered by anthropogenic influence and exhibiting higher biological integrity. These metrics are then added together for the single, integrated overall BIBI score.

The results of the BIBI scoring for each of the sample reaches are summarized in Tables 1 and 2 and in the text below. The descriptions of metrics that follow are summarized from The Puget Sound Stream Benthos website (www.pugetsoundstreambenthos.org).

**Table 1. Benthic Invertebrate Index of Biological Integrity – BIBI (modified Karr 1998) for Clark Creek, East Fork Pringle Creek and Pringle Creek**

| Metric | Clark Creek | | East Fork Pringle Creek (PC1) | | Pringle Creek (PC2) | |
|---|---|---|---|---|---|---|
| | Value | Score[a] | Value | Score[a] | Value | Score[a] |
| Total Number of Taxa[b] | 34 | 3 | 39 | 3 | 38 | 3 |
| Number of Ephemeroptera Taxa[b] | 1 | 1 | 3 | 1 | 1 | 1 |
| Number of Plecoptera Taxa[b] | 0 | 1 | 0 | 1 | 0 | 1 |
| Number of Trichoptera Taxa[b] | 2 | 1 | 3 | 1 | 3 | 1 |
| Number of Long-lived Taxa[b] | 3 | 3 | 5 | 5 | 5 | 5 |
| Number of Intolerant Taxa[b] | 0 | 1 | 0 | 1 | 0 | 1 |
| Percent Tolerant Taxa[c] | 27 | 3 | 62 | 1 | 59 | 1 |
| Percent Predators[b] | 11 | 3 | 4.9 | 1 | 5.2 | 1 |
| Number of Clinger Taxa[b] | 11 | 3 | 13 | 3 | 14 | 3 |
| Percent Dominance (3 Taxa)[c] | 32 | 5 | 57 | 3 | 52 | 3 |
| **Total BIBI Score[d]:** | **n/a** | 24 | **n/a** | **20** | **n/a** | **20** |
| **Biological Condition:** | **Low** | | **Low** | | **Low** | |

Notes:
a. Each metric scored: 1 = Low; 3 = Moderate; 5 = High
b. Metric value generally decreases with declining biological integrity
c. Metric value general increases with declining biological integrity
d. Key to Total BIBI Scores:
BIBI scores 0 – 24 = Low biological integrity
BIBI scores 25 – 39 = Moderate biological integrity
BIBI scores 39 – 50 = High biological integrity

**Table 2. Benthic Invertebrate Index of Biological Integrity – BIBI (modified Karr 1998) for Battle Creek and Waln Creek**

| Metric | Lower Battle Creek | | Upper Battle Creek | | Lower Waln Creek | | Upper Waln Creek | |
|---|---|---|---|---|---|---|---|---|
| | Value | Score[a] | Value | Score[a] | Value | Score[a] | Value | Score[a] |
| Total Number of Taxa[b] | 47 | 5 | 50 | 5 | 26 | 3 | 30 | 3 |
| Number of Ephemeroptera Taxa[b] | 4 | 1 | 3 | 1 | 1 | 1 | 2 | 1 |
| Number of Plecoptera Taxa[b] | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 |
| Number of Trichoptera Taxa[b] | 2 | 1 | 2 | 1 | 0 | 1 | 1 | 1 |
| Number of Long-lived Taxa[b] | 3 | 3 | 5 | 5 | 2 | 1 | 4 | 3 |
| Number of Intolerant Taxa[b] | 2 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| Percent Tolerant Taxa[c] | 18 | 5 | 32 | 3 | 18 | 5 | 23 | 3 |
| Percent Predators[b] | 5.3 | 1 | 8.4 | 1 | 3.7 | 1 | 7.7 | 1 |
| Number of Clinger Taxa[b] | 13 | 3 | 13 | 3 | 9 | 1 | 11 | 3 |
| Percent Dominance (3 Taxa)[c] | 51 | 3 | 49 | 5 | 57 | 3 | 60 | 3 |
| **Total BIBI Score[d]:** | **n/a** | **24** | **n/a** | **26** | **n/a** | **18** | **n/a** | **20** |
| **Biological Condition:** | **Low** | | **Low** | | **Low** | | **Moderate** | |

Notes:
a. Each metric scored: 1 = Low; 3 = Moderate; 5 = High
b. Metric value generally decreases with declining biological integrity
c. Metric value general increases with declining biological integrity
d. Key to Total BIBI Scores:
BIBI scores 0 – 24 = Low biological integrity
BIBI scores 25 – 39 = Moderate biological integrity
BIBI scores 39 – 50 = High biological integrity

## Total Number of Taxa

The total number of taxa, or total taxa richness, is the total number of unique taxa identified within the sample. All types of invertebrates (mayflies, caddisflies, stoneflies, true flies, midges, clams, snails, and worms) collected from the sampling reach are included in this metric. The biodiversity of a stream declines as flow regimes are altered, habitat is lost, chemicals are introduced, energy cycles are disrupted, and alien taxa invade. The moderate scores given for total number of taxa in most of the sampling reaches indicates some level of disturbance within the assessment reaches.

## Number of Ephemeroptera Taxa

The number of Ephemeroptera taxa, or Ephemeroptera taxa richness, is the total number of unique mayfly (Family Ephemeroptera) taxa identified within the sample. Typically, the

diversity of mayflies declines in response to most types of human influence. The low numbers of mayfly taxa recorded in the sample reaches are indicative of disturbed systems.

### Number of Plecoptera Taxa

The number of Plecoptera taxa, or Plecoptera taxa richness, is the total number of unique stonefly (Family Plecoptera) taxa identified within the sample. In general, stoneflies are among the most sensitive benthic macroinvertebrates, and they are among the first macroinvertebrates to disappear from a stream as human disturbance increases. Many stoneflies are predators that stalk their prey and hide around and between rocks, and these hiding places are lost as sediment washes into a stream and the stream substrates become embedded. Like salmonids, most stoneflies require cool, well-oxygenated water, and increased stream temperatures adversely affect the stream's ability to support stoneflies. Stonefly larvae were recorded in only one sampling reach – Upper Battle Creek. The absence or low number of stonefly taxa recorded within the sampling reaches is indicative of disturbed systems.

### Number of Trichoptera Taxa

The number of Trichoptera taxa, or Trichoptera taxa richness, is the total number of unique caddisfly (Family Trichoptera) taxa identified within the sample. Caddisflies are a diverse family of insect. Various caddisfly taxa feed in a variety of ways: some spin nets to trap food, others collect or scrape food from the tops of exposed rocks. Many caddisflies build gravel or wood cases to protect them from predators, and others are predators themselves. Although caddisflies are a diverse family, taxa richness of caddisflies declines steadily as the variety and complexity of stream habitats decline. The low numbers of caddisfly taxa recorded within all of the sampling reaches are indicative of disturbed systems.

### Number of Long-Lived Taxa

The number of long-lived taxa is the total number of unique taxa that require more than one year to complete their life cycles. Because of their longer life cycles, these taxa are exposed to cumulatively more stream disturbances than taxa with shorter life cycles. If the stream is dry part of the year or subject to flooding, taxa with longer life cycles may disappear from the stream. Loss of long-lived taxa from a system may indicate an on-going problem that repeatedly interrupts their life cycles. The East Fork Pringle Creek, Pringle Creek, and Upper Battle Creek sampling reaches received high scores for the long-lived taxa metric. The moderate to low scores given for total number of long-lived taxa in the remaining sampling reaches indicate some level of disturbance within the assessment reaches.

### Number of Intolerant Taxa

The number of intolerant taxa is the total number of unique taxa that are intolerant of stream pollution. Chironomids are not included in this metric. Benthic macroinvertebrates identified as intolerant are the most sensitive taxa and represent approximately five to ten percent of the taxa present in the region. These taxa are the first to disappear as stream degradation increases. The low scores for the number of intolerant taxa in each of the sampling reaches indicate disturbance within the assessment reaches.

### Percent Tolerant Taxa

The percent tolerant taxa is the total number of individuals belonging to taxa tolerant to stream degradation, divided by the total number of individuals within the sample, multiplied by 100. Chironomids are not included in this metric. Tolerant taxa are present within most streams, but as disturbance increases, tolerant taxa represent an increasingly large percentage of the total macroinvertebrate community. The low scores for the percent tolerant taxa in the East Fork Pringle Creek and Pringle Creek sampling reaches suggest better water quality conditions compared to the other sampling reaches, which received moderate to high scores for this metric.

### Percent Predators

The percent predators metric is the total number of predator individuals identified within the sample, divided by the total number of individuals within the sample, multiplied by 100. Predator taxa represent the peak of the food web and depend on a reliable source of other invertebrates that they can eat. The percentage of animals that are obligate predators provides a measure of the trophic complexity supported by a site. Less disturbed sites generally support a greater diversity of prey items and, therefore, a larger diversity of predators to feed on them. The low to moderate scores for percent predators in each of the sampling reaches indicates some level of disturbance within the assessment reaches.

### Number of Clinger Taxa

This metric is the total number of unique clinger taxa within the sample. “Clingers” have physical adaptations that allow them to hold onto smooth substrates in fast water. These macroinvertebrates typically occupy the open areas between rocks and cobbles along the bottom of the stream; thus, they are particularly sensitive to fine sediments that fill these spaces and eliminate the variety and complexity of these small habitats. Sediment also prevents clingers from accessing the hyporheic zone of the stream bed. The moderate to low numbers of clinger taxa recorded within the assessment reaches are indicative of disturbed systems.

### Percent Dominance

Percent dominance is the sum of the individuals of the three most abundant taxa in the sample, divided by the total number of individuals in the sample, multiplied by 100. In general, as diversity declines, a fewer number of taxa make up a larger percentage of the total macroinvertebrate community. In contrast to most other metrics examined, the scores for percent dominance within all of the sample reaches were within the “moderate” or “high” categories.

### Total BIBI Score

Scores for all ten metrics are added together to arrive at a total BIBI score. The stream’s total BIBI score is a measure of the stream’s biological condition. Because there are ten metrics and each metric is scored 1 to 5, the total BIBI score can range from 10 to 50. A score closer to 50 indicates a high biotic condition similar to that found in a “natural” reference stream, which in the Willamette Valley Region is a relatively undisturbed Pacific Northwest montane stream. A score closer to 10 indicates a severely degraded stream with poor biological integrity. Total BIBI scores for the project area sampling reaches ranged from 18 to 26. Only the Upper Battle Creek sampling reach received a score in the moderate BIBI score range.

### 4.1.2 Other Stream Assessment Metrics

ABA provided scores for thirteen other metrics that may be useful in assessing the biological integrity of the project area streams. Values and biological integrity scores for each of these metrics are provided in Tables 3 and 4. For the first six metrics listed in Table 2 (total abundance, EPT taxa richness, predator richness, scraper richness, shredder richness, and percent intolerant taxa), the metric value generally decreases as biological integrity decreases. For the project-area sampling reaches, these metrics generally scored low overall, indicating low biological integrity for project area streams.

For the last seven metrics listed in Tables 3 and 4 (percent *Baetis tricaudatus*, percent collector, percent parasite, percent Oligochaeta, number of tolerant taxa, percent Simuliidae, and percent Chironomidae), the metric value generally increases as biological integrity decreases. Though scores for these metrics were variable for the project-area sampling reaches, approximately half of the scores were in the moderate to high range, indicating impaired biological integrity for project-area streams.

**Table 3. Other Community Composition Metrics that are Indicative of Biological Condition – Clark Creek, East Fork Pringle Creek, and Pringle Creek**

| Metric | Clark Creek | | East Fork Pringle Creek (PC1) | | Pringle Creek (PC2) | |
|---|---|---|---|---|---|---|
| | Value | Score[a] | Value | Score[a] | Value | Score[a] |
| Total Abundance[b] | 1592 | - | 1064 | - | 1464 | - |
| EPT Taxa Richness[b] | 3 | L | 6 | L | 4 | L |
| Predator Richness[b] | 4 | L | 8 | L | 5 | L |
| Scraper Richness[b] | 4 | L | 2 | L | 4 | L |
| Shredder Richness[b] | 2 | L | 2 | L | 2 | L |
| Percent Intolerant Taxa[b] | 3.2 | L | 0 | L | 0.5 | L |
| Percent *Baetis tricaudatus*[c] | 3.8 | H | 4.3 | H | 14.8 | M |
| Percent Collector[c] | 68 | L | 39 | M | 46 | M |
| Percent Parasite[c] | 0.3 | H | 2.3 | H | 0.5 | H |
| Percent Oligochaeta[c] | 8.4 | L | 5.3 | M | 7.3 | L |
| Number of Tolerant taxa[c] | 12 | L | 15 | L | 16 | L |
| Percent Simuliidae[c] | 1.2 | H | 3.8 | H | 2.3 | H |
| Percent Chironomidae | 51 | L | 17 | M | 27 | L |

Notes:
a. Low (L), moderate (M), and high (H) scores compared with a Pacific Northwest montane stream with high biological integrity.
b. Metric value generally decreases with declining biological integrity
c. Metric value generally increases with declining biological integrity

**Table 4. Other Community Composition Metrics that are Indicative of Biological Condition – Battle Creek and Waln Creek**

| Metric | Lower Battle Creek | | Upper Battle Creek | | Lower Waln Creek | | Upper Waln Creek | |
|---|---|---|---|---|---|---|---|---|
| | Value | Score[a] | Value | Score[a] | Value | Score[a] | Value | Score[a] |
| Total Abundance[b] | 569 | - | 462 | - | 2370 | - | 1523 | - |
| EPT Taxa Richness[b] | 6 | L | 6 | L | 1 | L | 3 | L |
| Predator Richness[b] | 6 | L | 9 | L | 6 | L | 6 | L |
| Scraper Richness[b] | 3 | L | 3 | L | 2 | L | 4 | L |
| Shredder Richness[b] | 3 | L | 3 | L | 0 | L | 2 | L |
| Percent Intolerant Taxa[b] | 6.8 | M | 2.2 | L | 2 | L | 17.3 | H |
| Percent *Baetis tricaudatus*[c] | 3.2 | H | 2.4 | H | 0.4 | H | 0.7 | H |
| Percent Collector[c] | 66 | L | 38 | M | 93 | L | 63 | L |
| Percent Parasite[c] | 2.6 | H | 4.1 | M | 0 | H | 0.3 | H |
| Percent Oligochaeta[c] | 2.1 | H | 3.3 | M | 2.2 | H | 6.3 | L |
| Number of Tolerant taxa[c] | 16 | L | 15 | L | 10 | L | 9 | M |
| Percent Simuliidae[c] | 1.7 | H | 3.7 | H | 0.5 | H | 1 | H |
| Percent Chironomidae | 78 | L | 56 | L | 81 | L | 84 | L |

Notes:
a. Low (L), moderate (M), and high (H) scores compared with a Pacific Northwest montane stream with high biological integrity.
b. Metric value generally decreases with declining biological integrity
c. Metric value generally increases with declining biological integrity

## 4.2 Fish Sampling

Table 5 summarizes the results of the fish sampling efforts within the project-sample reaches. As noted above, the purpose of this sampling was to document the types of fish inhabiting the project-area streams. The sampling effort was not designed to document the number of fish within the project-area reaches. As noted above, mainstem Pringle Creek was not sampled because it was not possible to get the necessary permits from the NMFS within the time constraints associated with this sampling effort.

Six fish taxa were identified within the reaches in which fish were surveyed. All fish collected at both reaches were native to the Willamette River watershed, and all appeared healthy. All cutthroat trout collected were juveniles, suggesting that breeding populations are present in East Fork Pringle Creek and Battle Creek.

**Table 5. Results of Fish Sampling for Project Area Sampling Reaches**

| Fish Species | Sampling Reach | | | | | |
|---|---|---|---|---|---|---|
| | Clark Creek | East Fork Pringle Creek | Lower Battle Creek | Upper Battle Creek | Lower Waln Creek | Upper Waln Creek |
| Cutthroat Trout | - | 2 | - | 1 | - | - |
| Redside Shiner | 16 | 74 | 13 | 57 | 61 | 113 |
| Dace sp. | 3 | 14 | - | - | 4 | 4 |
| Sculpin sp | 29 | 34 | 41 | 78 | 24 | 21 |
| Lamprey sp. | - | 1 | - | 1 | 3 | 1 |
| Longnose Sucker | 1 | - | - | 17 | 21 | 1 |
| **Total** | | | | | | |

## 4.3 Physical Habitat Characterization

As in previous monitoring efforts, PHS collected data related to thalweg profile, stream and riparian cross sections, substrate type, and presence of large woody debris for each of the sampling reaches. At the time of this monitoring effort, the entire Lower Waln Creek reach had been dammed by beavers and water three or more feet deep was present throughout the reach, and it was not possible to collect physical habitat data because of the depth of the water. The data are provided on data forms derived from those provided in the EMAP-SW protocol, and the data forms for each of the sampling reaches are in Appendices B - G. Comparison of the data contained in this report to data obtained in previous and future monitoring efforts can document changes in the streams over time. However, a comparison of data was beyond the scope of this project.

# 5.0 REFERENCES


Oregon Department of Environmental Quality. June 30, 2010. *Water Monitoring and Assessment Mode of Operations Manual* (*MOMs*), Version 3.3, DEQ03-LAB-0036-SOP, Laboratory and Environmental Assessment Division, Hillsboro, Oregon.

Peck, D.V., J.M. Lazorchak, and D.J. Klemm (editors). Unpublished draft. *Environmental Monitoring and Assessment Program -Surface Waters: Western Pilot Study Field Operations Manual for Wadeable Streams.* EPA/XXX/X-XX/XXXX. U.S. Environmental Protection Agency, Washington, D.C.

Pacific Habitat Services, Inc. March 21, 2011. *Technical Memorandum for the City of Salem's MS4 Permit Requirements for Benthic Macroinvertebrate Sampling and Hydromodification Assessment.*

Puget Sound Stream Benthos Website. www.pugetsoundstreambenthos.org. Accessed February 2012.

# Appendix A

## Benthic Macroinvertebrate Sampling Data

Aquatic Biology Associates, Inc
3490 NW Deer Run Street
Corvallis, OR 97330
aquaticbio.com

Robert Wisseman, Senior Scientist
541-740-1568
bob@aquaticbio.com

Date run:
'2017-07-09
Analysis program in developmental phase.

**Abundances and biomass (mg) converted to a standard full sample (if subsampled) and one square meter basis.**

Metrics most useful for tracking trends in biological integrity

| Waterbody | Battle Creek | Battle Creek | Clark Creek | Pringle Creek | Pringle Creek | Waln Creek | Waln Creek |
|---|---|---|---|---|---|---|---|
| Station | Lower | Upper | Upper | East Fork | Upper | Lower | Upper |
| Date | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 |
| Subsample count | 532 | 462 | 583 | 532 | 562 | 554 | 584 |
| Subsample correction factor to full sample | 1.07 | 1 | 2.73 | 2 | 2.61 | 4.29 | 2.61 |
| Area correction factor to square meter | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **SUMMARY METRICS** | | | | | | | |
| Total taxa richness | 47 | 50 | 34 | 39 | 38 | 26 | 30 |
| Total abundance | 569.17 | 462 | 1591.59 | 1064 | 1463.6 | 2370.08 | 1522.63 |
| EPT taxa richness | 6 | 6 | 3 | 6 | 4 | 1 | 3 |
| EPT abundance | 29.96 | 36 | 152.88 | 114 | 266.22 | 8.58 | 15.66 |
| Hilsenhoff Biotic Index (WY DEQ version) | 6.36 | 6.12 | 6.03 | 6.48 | 6.76 | 6.95 | 6.56 |
| **DOMINANCE AND DIVERSITY** | | | | | | | |
| % Dominant taxa | 25.38 | 23.81 | 11.32 | 37.97 | 26.39 | 34.39 | 26.23 |
| % Subdominant taxa | 19.93 | 18.4 | 10.98 | 13.16 | 14.8 | 12.49 | 17.14 |
| % Top 3 taxa | 50.57 | 48.7 | 32.25 | 56.95 | 51.89 | 57.2 | 60.17 |
| % Top 5 taxa | 60.35 | 57.36 | 49.4 | 66.54 | 65.8 | 69.87 | 71.99 |
| % Top 10 taxa | 76.51 | 71.86 | 78.04 | 82.33 | 85.24 | 87.79 | 89.65 |
| Shannon-Weaver Diversity (loge) | 2.79 | 2.91 | 2.88 | 2.48 | 2.57 | 2.35 | 2.37 |
| Shannon-Weaver Diversity (log2) | 4.02 | 4.19 | 4.16 | 3.57 | 3.71 | 3.39 | 3.42 |
| Shannon Evenness Index | 0.72 | 0.74 | 0.82 | 0.68 | 0.71 | 0.72 | 0.7 |
| **TOLERANT AND INTOLERANT TAXA** | | | | | | | |
| Total tolerant taxa richness | 16 | 15 | 12 | 15 | 16 | 10 | 9 |
| Total tolerant abundance | 83.46 | 135 | 371.28 | 614 | 650.89 | 412.84 | 336.69 |
| % Total tolerant by abundance | 14.66 | 29.22 | 23.33 | 57.71 | 44.47 | 17.42 | 22.11 |
| Baetis tricaudatus complex | 3.196 | 2.381 | 3.774 | 4.323 | 14.8 | 0.362 | 0.6857 |
| Adjusted % total tolerant | 17.856 | 31.601 | 27.104 | 62.033 | 59.27 | 17.782 | 22.7957 |
| Highly tolerant taxa richness | 3 | 1 | 3 | 3 | 3 | 2 | 2 |
| Highly tolerant abundance | 9.63 | 4 | 46.41 | 6 | 24.49 | 81.51 | 279.27 |
| % Highly tolerant by abundance | 1.692 | 0.8658 | 2.916 | 0.5639 | 1.673 | 3.439 | 18.34 |
| Moderately tolerant taxa richness | 13 | 14 | 9 | 12 | 13 | 8 | 7 |
| Moderately tolerant abundance | 73.83 | 131 | 324.87 | 608 | 626.4 | 331.33 | 57.42 |
| % Moderately tolerant by abundance | 12.97 | 28.35 | 20.41 | 57.14 | 42.8 | 13.98 | 3.771 |
| Total intolerant taxa richness | 5 | 3 | 1 | 0 | 1 | 1 | 2 |
| Total intolerant abundance | 38.52 | 10 | 51.87 | 0 | 7.83 | 47.19 | 263.61 |
| % Total intolerant by abundance | 6.768 | 2.165 | 3.259 | 0 | 0.535 | 1.991 | 17.31 |
| Highly intolerant taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Highly intolerant abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Highly intolerant by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Moderately intolerant taxa richness | 5 | 3 | 1 | 0 | 1 | 1 | 2 |
| Moderately intolerant abundance | 38.52 | 10 | 51.87 | 0 | 7.83 | 47.19 | 263.61 |
| % Moderately intolerant by abundance | 6.768 | 2.165 | 3.259 | 0 | 0.535 | 1.991 | 17.31 |

| Waterbody | Battle Creek | Battle Creek | Clark Creek | Pringle Creek | Pringle Creek | Waln Creek | Waln Creek |
|---|---|---|---|---|---|---|---|
| Station | Lower | Upper | Upper | East Fork | Upper | Lower | Upper |
| Date | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 |
| **VOLTINISM (length of life cycle)** | | | | | | | |
| TAXA RICHNESS | | | | | | | |
| Semivoltine (> 1 year life cycle) taxa richness | 6 | 9 | 5 | 8 | 6 | 3 | 5 |
| Univoltine (1 year life cycle) taxa richness | 9 | 8 | 4 | 6 | 4 | 3 | 6 |
| Multivoltine (< 1 year life cycle) taxa richness | 32 | 33 | 25 | 25 | 28 | 20 | 19 |
| ABUNDANCE | | | | | | | |
| Semivoltine (> 1 year life cycle) abundance | 50.22 | 106 | 267.54 | 624 | 552.71 | 298.01 | 94.96 |
| Univoltine (1 year life cycle) abundance | 26.75 | 42 | 229.32 | 90 | 138.33 | 81.51 | 112.23 |
| Multivoltine (< 1 year life cycle) abundance | 492.2 | 314 | 1094.73 | 350 | 772.56 | 1990.56 | 1315.44 |
| PERCENTAGE BY ABUNDANCE | | | | | | | |
| % Semivoltine (> 1 year life cycle) by abundance | 8.823 | 22.94 | 16.81 | 58.65 | 37.76 | 12.57 | 6.237 |
| % Univoltine (1 year life cycle) by abundance | 4.7 | 9.091 | 14.41 | 8.459 | 9.451 | 3.439 | 7.371 |
| % Multivoltine (< 1 year life cycle) by abundance | 86.48 | 67.97 | 68.78 | 32.89 | 52.78 | 83.99 | 86.39 |
| **GROWTH AND DEVELOPMENT** | | | | | | | |
| % Fast seasonal life cycle by abundance | 84.78 | 66.67 | 61.92 | 29.7 | 45.65 | 82.36 | 85.71 |
| % Slow seasonal life cycle by abundance | 10.9 | 29.65 | 27.1 | 60.15 | 48.57 | 5.11 | 8.742 |
| % Nonseasonal life cycle by abundance | 4.312 | 3.68 | 10.98 | 10.15 | 5.775 | 12.53 | 5.551 |
| **OCCURRENCE IN DRIFT** | | | | | | | |
| % Rare in drift by abundance | 13.71 | 31.17 | 43.57 | 67.29 | 54.35 | 17.64 | 14.46 |
| % Common in drift by abundance | 3.384 | 6.926 | 0.1715 | 6.579 | 1.962 | 0 | 0.1714 |
| % Abundant in drift by abundance | 82.9 | 61.9 | 56.26 | 26.13 | 43.69 | 82.36 | 85.36 |
| **SIZE AT MATURITY** | | | | | | | |
| TAXA RICHNESS | | | | | | | |
| Small size at maturity taxa richness | 31 | 35 | 24 | 27 | 27 | 19 | 21 |
| Medium size at maturity taxa richness | 13 | 12 | 7 | 9 | 7 | 5 | 6 |
| Large size at maturity taxa richness | 3 | 3 | 3 | 3 | 4 | 2 | 3 |
| ABUNDANCE | | | | | | | |
| Small size at maturity abundance | 503.97 | 325 | 1081.08 | 552 | 1106.64 | 2175.03 | 1148.4 |
| Medium size at maturity abundance | 37.45 | 46 | 444.99 | 102 | 261 | 193.05 | 365.4 |
| Large size at maturity abundance | 27.75 | 91 | 65.52 | 410 | 95.96 | 2 | 8.83 |
| PERCENTAGE BY ABUNDANCE | | | | | | | |
| % Small size at maturity by abundance | 88.54 | 70.35 | 67.92 | 51.88 | 75.61 | 91.77 | 75.42 |
| % Medium size at maturity by abundance | 6.58 | 9.957 | 27.96 | 9.586 | 17.83 | 8.145 | 24 |
| % Large size at maturity by abundance | 4.876 | 19.7 | 4.117 | 38.53 | 6.556 | 0.08439 | 0.5799 |
| **RHEOPHILY AND HABITAT AFFINITY** | | | | | | | |
| % Depositional only by abundance | 24.63 | 27.27 | 15.44 | 1.128 | 13.55 | 6.878 | 43.2 |
| % Depositional and erosional by abundance | 73.68 | 68.83 | 83.19 | 92.29 | 83.24 | 92.58 | 55.78 |
| % Erosional by abundance | 1.692 | 3.896 | 1.372 | 6.579 | 3.21 | 0.543 | 1.028 |
| **THERMAL PREFERENCE** | | | | | | | |
| % Cold stenothermal and cool eurythermal by abundance | 6.956 | 1.948 | 3.259 | 0 | 0.535 | 1.991 | 17.31 |
| % Cool/warm eurythermal by abundance | 92.86 | 98.05 | 96.4 | 99.44 | 99.47 | 96.92 | 82.69 |
| % Warm eurythermal by abundance | 0.188 | 0 | 0.3431 | 0.5639 | 0 | 1.086 | 0 |

| Waterbody | Battle Creek | Battle Creek | Clark Creek | Pringle Creek | Pringle Creek | Waln Creek | Waln Creek |
|---|---|---|---|---|---|---|---|
| Station | Lower | Upper | Upper | East Fork | Upper | Lower | Upper |
| Date | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 |
| **NON-INSECT AND INSECT ORDERS** | | | | | | | |
| TAXA RICHNESS | | | | | | | |
| Non-insect invertebrates taxa richness | 15 | 13 | 11 | 11 | 12 | 6 | 8 |
| Ephemeroptera (mayflies) taxa richness | 4 | 3 | 1 | 3 | 1 | 1 | 2 |
| Odonata (damsel- and dragonflies) taxa richness | 0 | 0 | 1 | 1 | 0 | 2 | 0 |
| Plecoptera (stoneflies) taxa richness | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Hemiptera (true bugs taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Megaloptera (alderflies and hellgramites) taxa richness | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Trichoptera (caddisflies) taxa richness | 2 | 2 | 2 | 3 | 3 | 0 | 1 |
| Lepidoptera (moths) taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Coleoptera (beetles) taxa richness | 2 | 4 | 0 | 2 | 0 | 0 | 1 |
| Diptera (total)(true flies) taxa richness | 24 | 27 | 19 | 18 | 22 | 17 | 18 |
| Chironomidae (midges) taxa richness | 20 | 22 | 16 | 14 | 19 | 15 | 15 |
| Chironomidae (midges -Nostoc midge) taxa richness | 20 | 22 | 16 | 14 | 19 | 15 | 15 |
| ABUNDANCE | | | | | | | |
| Non-insect invertebrates abundance | 80.18 | 138 | 597.87 | 684 | 766.73 | 412.84 | 207.19 |
| Ephemeroptera (mayflies) abundance | 23.54 | 22 | 60.06 | 76 | 216.63 | 8.58 | 13.05 |
| Odonata (damsel- and dragonflies) abundance | 0 | 0 | 2.73 | 8 | 0 | 5.29 | 0 |
| Plecoptera (stoneflies) abundance | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| Hemiptera (true bugs abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Megaloptera (alderflies and hellgramites) abundance | 0 | 0 | 0 | 2 | 0 | 0 | 0 |
| Trichoptera (caddisflies) abundance | 6.42 | 12 | 92.82 | 38 | 49.59 | 0 | 2.61 |
| Lepidoptera (moths) abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Coleoptera (beetles) abundance | 2.14 | 7 | 0 | 22 | 0 | 0 | 2.61 |
| Diptera (total)(true flies) abundance | 456.89 | 281 | 838.11 | 234 | 430.65 | 1943.37 | 1297.17 |
| Chironomidae (midges) abundance | 444.05 | 257 | 810.81 | 184 | 388.89 | 1909.05 | 1273.68 |
| Chironomidae (midges -Nostoc midge) abundance | 444.05 | 257 | 810.81 | 184 | 388.89 | 1909.05 | 1273.68 |
| PERCENTAGE BY ABUNDANCE | | | | | | | |
| % Non-insect invertebrates by abundance | 14.09 | 29.87 | 37.56 | 64.29 | 52.39 | 17.42 | 13.61 |
| % Ephemeroptera (mayflies) by abundance | 4.136 | 4.762 | 3.774 | 7.143 | 14.8 | 0.362 | 0.8571 |
| % Odonata (damsel- and dragonflies) by abundance | 0 | 0 | 0.1715 | 0.7519 | 0 | 0.2232 | 0 |
| % Plecoptera (stoneflies) by abundance | 0 | 0.4329 | 0 | 0 | 0 | 0 | 0 |
| % Hemiptera (true bugs by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Megaloptera (alderflies and hellgramites) by abundance | 0 | 0 | 0 | 0.188 | 0 | 0 | 0 |
| % Trichoptera (caddisflies) by abundance | 1.128 | 2.597 | 5.832 | 3.571 | 3.388 | 0 | 0.1714 |
| % Lepidoptera (moths) by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Coleoptera (beetles) by abundance | 0.376 | 1.515 | 0 | 2.068 | 0 | 0 | 0.1714 |
| % Diptera (total)(true flies) by abundance | 80.27 | 60.82 | 52.66 | 21.99 | 29.42 | 82 | 85.19 |
| % Chironomidae (midges) by abundance | 78.02 | 55.63 | 50.94 | 17.29 | 26.57 | 80.55 | 83.65 |
| % Chironomidae (midges -Nostoc midge) by abundance | 78.02 | 55.63 | 50.94 | 17.29 | 26.57 | 80.55 | 83.65 |
| **FAMILIES AND GROUPS** | | | | | | | |
| TAXA RICHNESS | | | | | | | |
| Oligochaeta (segmented worms) taxa richness | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

| Waterbody | Battle Creek | Battle Creek | Clark Creek | Pringle Creek | Pringle Creek | Waln Creek | Waln Creek |
|---|---|---|---|---|---|---|---|
| Station | Lower | Upper | Upper | East Fork | Upper | Lower | Upper |
| Date | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 |
| Mollusca (snails and bivalves) taxa richness | 4 | 4 | 5 | 4 | 5 | 2 | 5 |
| Crustacea taxa richness | 3 | 3 | 3 | 2 | 3 | 2 | 1 |
| Acari (mites) taxa richness | 6 | 5 | 1 | 3 | 1 | 0 | 0 |
| Baetidae (mayfly) taxa richness | 2 | 1 | 1 | 2 | 1 | 1 | 1 |
| Baetis tricaudatus (mayfly) taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ephemerellidae (mayfly) taxa richness | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Heptageniidae (mayfly) taxa richness | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Leptohyphidae (mayfly) taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Leptophlebiidae (mayfly) taxa richness | 1 | 1 | 0 | 1 | 0 | 0 | 1 |
| Chloroperlidae (mayfly) taxa richness | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Nemouridae (stonefly) taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Perlidae (stonefly) taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Perlodidae (stonefly) taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Peltoperlidae (stonefly) taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pteronarcyidae (stonefly) taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Brachycentridae (caddisfly) taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Glossosomatidae (caddisfly) taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hydropsychidae (caddisfly) taxa richness | 0 | 1 | 0 | 1 | 1 | 0 | 0 |
| Lepidostomatidae (caddisfly) taxa richness | 2 | 1 | 1 | 1 | 1 | 0 | 1 |
| Limnephilidae (caddisfly) taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Philopotamidae (caddisfly) taxa richness | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Rhyacophilidae (caddisfly) taxa richness | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Uenoidae (caddisfly) taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Elmidae (riffle beetle) taxa richness | 1 | 3 | 0 | 2 | 0 | 0 | 0 |
| Empididae (dance fly) taxa richness | 2 | 1 | 0 | 0 | 0 | 0 | 1 |
| Athericidae (higher flies) taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Simuliidae (black fly) taxa richness | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Tipulidae (crane fly) taxa richness | 1 | 1 | 1 | 0 | 1 | 0 | 1 |
| Chironomidae: Chironominae taxa richness | 8 | 7 | 5 | 4 | 7 | 4 | 4 |
| Tanytarsini taxa richness | 4 | 3 | 2 | 2 | 3 | 2 | 1 |
| Chironomidae: Diamesinae taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Chironomidae: Orthocladiinae taxa richness | 9 | 10 | 7 | 6 | 8 | 6 | 5 |
| Chironomidae: Prodiamesinae taxa richness | 1 | 0 | 1 | 0 | 1 | 1 | 1 |
| Chironomidae: Tanypodinae taxa richness | 1 | 4 | 2 | 3 | 2 | 3 | 4 |
| Cricotopus (Nostococladius) taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ABUNDANCE | | | | | | | |
| Oligochaeta (segmented worms) abundance | 11.77 | 15 | 133.77 | 56 | 107.01 | 51.48 | 96.57 |
| Mollusca (snails and bivalves) abundance | 48.15 | 94 | 270.27 | 596 | 550.71 | 300.3 | 104.4 |
| Crustacea abundance | 5.28 | 10 | 188.37 | 6 | 100.18 | 35.32 | 1 |
| Acari (mites) abundance | 13.91 | 19 | 2.73 | 24 | 5.22 | 0 | 0 |
| Baetidae (mayfly) abundance | 19.26 | 11 | 60.06 | 62 | 216.63 | 8.58 | 10.44 |
| Baetis tricaudatus (mayfly) abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ephemerellidae (mayfly) abundance | 0 | 1 | 0 | 0 | 0 | 0 | 0 |

| Waterbody | Battle Creek | Battle Creek | Clark Creek | Pringle Creek | Pringle Creek | Waln Creek | Waln Creek |
|---|---|---|---|---|---|---|---|
| Station | Lower | Upper | Upper | East Fork | Upper | Lower | Upper |
| Date | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 |
| Heptageniidae (mayfly) abundance | 1.07 | 0 | 0 | 0 | 0 | 0 | 0 |
| Leptohyphidae (mayfly) abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Leptophlebiidae (mayfly) abundance | 3.21 | 10 | 0 | 14 | 0 | 0 | 2.61 |
| Chloroperlidae (mayfly) abundance | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| Nemouridae (stonefly) abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Perlidae (stonefly) abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Perlodidae (stonefly) abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Peltoperlidae (stonefly) abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pteronarcyidae (stonefly) abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Brachycentridae (caddisfly) abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Glossosomatidae (caddisfly) abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hydropsychidae (caddisfly) abundance | 0 | 1 | 0 | 14 | 13.05 | 0 | 0 |
| Lepidostomatidae (caddisfly) abundance | 6.42 | 11 | 90.09 | 8 | 26.1 | 0 | 2.61 |
| Limnephilidae (caddisfly) abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Philopotamidae (caddisfly) abundance | 0 | 0 | 0 | 16 | 0 | 0 | 0 |
| Rhyacophilidae (caddisfly) abundance | 0 | 0 | 2.73 | 0 | 0 | 0 | 0 |
| Uenoidae (caddisfly) abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Elmidae (riffle beetle) abundance | 1.07 | 6 | 0 | 22 | 0 | 0 | 0 |
| Empididae (dance fly) abundance | 2.14 | 1 | 0 | 0 | 0 | 0 | 2.61 |
| Athericidae (higher flies) abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Simuliidae (black fly) abundance | 9.63 | 17 | 19.11 | 40 | 33.93 | 12.87 | 15.66 |
| Tipulidae (crane fly) abundance | 1.07 | 4 | 2.73 | 0 | 5.22 | 0 | 5.22 |
| Chironomidae: Chironominae abundance | 311.37 | 165 | 294.84 | 36 | 245.34 | 1222.65 | 733.41 |
| Tanytarsini abundance | 178.69 | 37 | 128.31 | 32 | 41.76 | 1059.63 | 73.08 |
| Chironomidae: Diamesinae abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Chironomidae: Orthocladiinae abundance | 78.11 | 55 | 273 | 106 | 41.76 | 570.57 | 143.55 |
| Chironomidae: Prodiamesinae abundance | 29.96 | 0 | 51.87 | 0 | 7.83 | 47.19 | 261 |
| Chironomidae: Tanypodinae abundance | 18.19 | 30 | 169.26 | 36 | 70.47 | 55.77 | 112.23 |
| Cricotopus (Nostococladius) abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PERCENTAGE BY ABUNDANCE | | | | | | | |
| % Oligochaeta (segmented worms) by abundance | 2.068 | 3.247 | 8.405 | 5.263 | 7.311 | 2.172 | 6.342 |
| % Mollusca (snails and bivalves) by abundance | 8.46 | 20.35 | 16.98 | 56.02 | 37.63 | 12.67 | 6.857 |
| % Crustacea by abundance | 0.9277 | 2.165 | 11.84 | 0.5639 | 6.845 | 1.49 | 0.06568 |
| % Acari (mites) by abundance | 2.444 | 4.113 | 0.1715 | 2.256 | 0.3567 | 0 | 0 |
| % Baetidae (mayfly) by abundance | 3.384 | 2.381 | 3.774 | 5.827 | 14.8 | 0.362 | 0.6857 |
| % Baetis tricaudatus (mayfly) by abundance | 3.196 | 2.381 | 3.774 | 4.323 | 14.8 | 0.362 | 0.6857 |
| % Ephemerellidae (mayfly) by abundance | 0 | 0.2165 | 0 | 0 | 0 | 0 | 0 |
| % Heptageniidae (mayfly) by abundance | 0.188 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Leptohyphidae (mayfly) by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Leptophlebiidae (mayfly) by abundance | 0.564 | 2.165 | 0 | 1.316 | 0 | 0 | 0.1714 |
| % Chloroperlidae (mayfly) by abundance | 0 | 0.4329 | 0 | 0 | 0 | 0 | 0 |
| % Nemouridae (stonefly) by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Perlidae (stonefly) by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| Waterbody | Battle Creek | Battle Creek | Clark Creek | Pringle Creek | Pringle Creek | Waln Creek | Waln Creek |
|---|---|---|---|---|---|---|---|
| Station | Lower | Upper | Upper | East Fork | Upper | Lower | Upper |
| Date | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 |
| % Perlodidae (stonefly) by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Peltoperlidae (stonefly) by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Pteronarcyidae (stonefly) by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Brachycentridae (caddisfly) by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Glossosomatidae (caddisfly) by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Hydropsychidae (caddisfly) by abundance | 0 | 0.2165 | 0 | 1.316 | 0.8916 | 0 | 0 |
| % Lepidostomatidae (caddisfly) by abundance | 1.128 | 2.381 | 5.66 | 0.7519 | 1.783 | 0 | 0.1714 |
| % Limnephilidae (caddisfly) by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Philopotamidae (caddisfly) by abundance | 0 | 0 | 0 | 1.504 | 0 | 0 | 0 |
| % Rhyacophilidae (caddisfly) by abundance | 0 | 0 | 0.1715 | 0 | 0 | 0 | 0 |
| % Uenoidae (caddisfly) by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Elmidae (riffle beetle) by abundance | 0.188 | 1.299 | 0 | 2.068 | 0 | 0 | 0 |
| % Empididae (dance fly) by abundance | 0.376 | 0.2165 | 0 | 0 | 0 | 0 | 0.1714 |
| % Athericidae (higher flies) by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Simuliidae (black fly) by abundance | 1.692 | 3.68 | 1.201 | 3.759 | 2.318 | 0.543 | 1.028 |
| % Tipulidae (crane fly) by abundance | 0.188 | 0.8658 | 0.1715 | 0 | 0.3567 | 0 | 0.3428 |
| % Chironomidae: Chironominae by abundance | 54.71 | 35.71 | 18.52 | 3.383 | 16.76 | 51.59 | 48.17 |
| % Tanytarsini by abundance | 31.39 | 8.009 | 8.062 | 3.008 | 2.853 | 44.71 | 4.8 |
| % Chironomidae: Diamesinae by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Chironomidae: Orthocladiinae by abundance | 13.72 | 11.9 | 17.15 | 9.962 | 2.853 | 24.07 | 9.428 |
| % Chironomidae: Prodiamesinae by abundance | 5.264 | 0 | 3.259 | 0 | 0.535 | 1.991 | 17.14 |
| % Chironomidae: Tanypodinae by abundance | 3.196 | 6.494 | 10.63 | 3.383 | 4.815 | 2.353 | 7.371 |
| % Cricotopus (Nostococladius) by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **FEEDING GROUPS** | | | | | | | |
| TAXA RICHNESS | | | | | | | |
| Predator taxa richness | 6 | 9 | 4 | 8 | 5 | 6 | 6 |
| Parasite taxa richness | 7 | 5 | 2 | 3 | 2 | 0 | 1 |
| Collector-gatherer taxa richness | 22 | 23 | 17 | 16 | 17 | 14 | 12 |
| Collector-filterer taxa richness | 4 | 4 | 3 | 6 | 4 | 3 | 2 |
| Collector (total) taxa richness | 26 | 27 | 20 | 22 | 21 | 17 | 14 |
| Piercer herbivore taxa richness | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Macrophyte herbivore taxa richness | 0 | 1 | 1 | 1 | 1 | 0 | 1 |
| Shredder taxa richness | 3 | 3 | 2 | 2 | 2 | 0 | 2 |
| Caddisfly shredder taxa richness | 2 | 1 | 1 | 1 | 1 | 0 | 1 |
| Stonefly shredder taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wood-eating taxa richness | 2 | 1 | 0 | 1 | 0 | 0 | 0 |
| Scraper taxa richness | 3 | 3 | 4 | 2 | 4 | 2 | 4 |
| Omnivore taxa richness | 2 | 2 | 1 | 2 | 2 | 1 | 2 |
| Unknown feeding group taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ABUNDANCE | | | | | | | |
| Predator abundance | 29.96 | 39 | 174.72 | 52 | 76.69 | 86.8 | 117.45 |
| Parasite abundance | 14.98 | 19 | 5.46 | 24 | 7.83 | 0 | 5.22 |
| Collector-gatherer abundance | 313.51 | 147 | 889.98 | 286 | 542.88 | 1638.78 | 866.52 |

| Waterbody | Battle Creek | Battle Creek | Clark Creek | Pringle Creek | Pringle Creek | Waln Creek | Waln Creek |
|---|---|---|---|---|---|---|---|
| Station | Lower | Upper | Upper | East Fork | Upper | Lower | Upper |
| Date | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 |
| Collector-filterer abundance | 60.99 | 26 | 199.29 | 124 | 125.28 | 553.41 | 99.18 |
| Collector (total) abundance | 374.5 | 173 | 1089.27 | 410 | 668.16 | 2192.19 | 965.7 |
| Piercer herbivore abundance | 0 | 0 | 0 | 0 | 10.44 | 0 | 0 |
| Macrophyte herbivore abundance | 0 | 13 | 10.92 | 2 | 31.32 | 0 | 5.22 |
| Shredder abundance | 7.49 | 19 | 92.82 | 12 | 31.32 | 0 | 7.83 |
| Caddisfly shredder abundance | 6.42 | 11 | 90.09 | 8 | 26.1 | 0 | 2.61 |
| Stonefly shredder abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wood-eating taxa abundance | 2.14 | 4 | 0 | 4 | 0 | 0 | 0 |
| Scraper abundance | 115.56 | 112 | 158.34 | 156 | 548.1 | 90.09 | 417.6 |
| Omnivore abundance | 26.68 | 87 | 60.06 | 408 | 89.74 | 1 | 3.61 |
| Unknown feeding group abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PERCENTAGE BY ABUNDANCE | | | | | | | |
| % Predator by abundance | 5.264 | 8.442 | 10.98 | 4.887 | 5.24 | 3.662 | 7.714 |
| % Parasite by abundance | 2.632 | 4.113 | 0.3431 | 2.256 | 0.535 | 0 | 0.3428 |
| % Collector-gatherer by abundance | 55.08 | 31.82 | 55.92 | 26.88 | 37.09 | 69.14 | 56.91 |
| % Collector-filterer by abundance | 10.72 | 5.628 | 12.52 | 11.65 | 8.56 | 23.35 | 6.514 |
| % Collector (total) by abundance | 65.8 | 37.45 | 68.44 | 38.53 | 45.65 | 92.49 | 63.42 |
| % Piercer herbivore by abundance | 0 | 0 | 0 | 0 | 0.7133 | 0 | 0 |
| % Macrophyte herbivore by abundance | 0 | 2.814 | 0.6861 | 0.188 | 2.14 | 0 | 0.3428 |
| % Shredder by abundance | 1.316 | 4.113 | 5.832 | 1.128 | 2.14 | 0 | 0.5142 |
| % Caddisfly shredder by abundance | 1.128 | 2.381 | 5.66 | 0.7519 | 1.783 | 0 | 0.1714 |
| % Stonefly shredder by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Wood-eating taxa by abundance | 0.376 | 0.8658 | 0 | 0.3759 | 0 | 0 | 0 |
| % Scraper by abundance | 20.3 | 24.24 | 9.949 | 14.66 | 37.45 | 3.801 | 27.43 |
| % Omnivore by abundance | 4.688 | 18.83 | 3.774 | 38.35 | 6.131 | 0.04219 | 0.2371 |
| % Unknown feeding group by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**HABIT**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| TAXA RICHNESS | | | | | | | |
| Skater taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Planktonic taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diver taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Swimmer taxa richness | 8 | 7 | 4 | 5 | 3 | 2 | 0 |
| Clinger taxa richness | 13 | 13 | 11 | 13 | 14 | 9 | 11 |
| Sprawler taxa richness | 14 | 21 | 9 | 14 | 12 | 8 | 10 |
| Climber taxa richness | 3 | 2 | 3 | 3 | 1 | 2 | 2 |
| Burrower taxa richness | 9 | 7 | 7 | 4 | 8 | 5 | 7 |
| Unknown habit taxa richness | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ABUNDANCE | | | | | | | |
| Skater abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Planktonic abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diver abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Swimmer abundance | 18.19 | 24 | 193.83 | 32 | 104.4 | 55.77 | 0 |
| Clinger abundance | 381.99 | 276 | 439.53 | 734 | 984.97 | 1488.63 | 532.44 |

| Waterbody | Battle Creek | Battle Creek | Clark Creek | Pringle Creek | Pringle Creek | Waln Creek | Waln Creek |
|---|---|---|---|---|---|---|---|
| Station | Lower | Upper | Upper | East Fork | Upper | Lower | Upper |
| Date | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 |
| Sprawler abundance | 78.04 | 110 | 442.26 | 166 | 115.84 | 335.62 | 254.17 |
| Climber abundance | 7.49 | 15 | 95.55 | 18 | 26.1 | 5.29 | 5.22 |
| Burrower abundance | 83.46 | 37 | 420.42 | 114 | 232.29 | 484.77 | 730.8 |
| Unknown habit abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PERCENTAGE BY ABUNDANCE | | | | | | | |
| % Skater by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Planktonic by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Diver by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| % Swimmer by abundance | 3.196 | 5.195 | 12.18 | 3.008 | 7.133 | 2.353 | 0 |
| % Clinger by abundance | 67.11 | 59.74 | 27.62 | 68.98 | 67.3 | 62.81 | 34.97 |
| % Sprawler by abundance | 13.71 | 23.81 | 27.79 | 15.6 | 7.915 | 14.16 | 16.69 |
| % Climber by abundance | 1.316 | 3.247 | 6.003 | 1.692 | 1.783 | 0.2232 | 0.3428 |
| % Burrower by abundance | 14.66 | 8.009 | 26.42 | 10.71 | 15.87 | 20.45 | 48 |
| % Unknown habit by abundance | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **STATE OF CALIFORNIA DESIGNATIONS** | | | | | | | |
| CA % Sensitive EPT | 1.316 | 3.03 | 5.832 | 2.256 | 1.783 | 0 | 0.1714 |
| CA % Intolerant individuals | 2.444 | 5.411 | 6.518 | 1.504 | 1.783 | 0.905 | 0.1714 |
| CA % Tolerant individuals | 10.15 | 11.04 | 16.47 | 7.707 | 7.915 | 22.26 | 26.05 |
| CA weighted tolerance value | 6.38 | 6.21 | 5.75 | 6.2 | 6.03 | 6.9 | 6.54 |
| CA % Predators | 7.896 | 12.55 | 11.32 | 7.143 | 5.775 | 3.662 | 8.056 |
| CA % Collector-gatherers | 52.83 | 24.46 | 44.94 | 24.62 | 36.02 | 64.8 | 50.05 |
| CA % Filterers | 10.53 | 5.411 | 12.52 | 11.09 | 8.56 | 23.35 | 6.514 |
| CA % Scrapers | 24.82 | 42.64 | 13.72 | 52.82 | 43.51 | 3.801 | 27.6 |
| CA % Shredders | 3.008 | 9.091 | 14.58 | 1.88 | 3.032 | 0.362 | 5.828 |
| **BIOTIC CONDITION INDEX** | | | | | | | |
| CTQa- Community Tolerance Quotient actual | 97.4 | 98.26 | 99.53 | 98.41 | 102.79 | 103.85 | 98.17 |
| CTQd-Community Tolerance Quotient dominance | 102.62 | 97.66 | 100.85 | 97.13 | 101.31 | 106.53 | 103.19 |

# Benthic Invertebrate Index of Biological Integrity-BIBI (modified Karr 1998)

**OR: Pacific Habitat Services, Salem, OR area streams.**

Sampling method: qualitative dip net through multiple habitats, 500 micron mesh.

Subsampling: 500 organism minimum or entire sample. PNAMP level 2 standard taxonomic effort.

Abundances are relative, adjusted to a full sample basis.

| | Waterbody | Battle Creek | | Battle Creek | | Clark Creek | | Pringle Creek | |
|---|---|---|---|---|---|---|---|---|---|
| | Location | Lower | | Upper | | Upper | | East Fork | |
| | Date | 6/5/2017 | | 6/5/2017 | | 6/5/2017 | | 6/5/2017 | |
| | METRIC | Value | Score | Value | Score | Value | Score | Value | Score |
| D | Total number of taxa | 47 | 5 | 50 | 5 | 34 | 3 | 39 | 3 |
| D | Number Ephemeroptera taxa | 4 | 1 | 3 | 1 | 1 | 1 | 3 | 1 |
| D | Number Plecoptera taxa | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 |
| D | Number Trichoptera taxa | 2 | 1 | 2 | 1 | 2 | 1 | 3 | 1 |
| D | Number of long-lived taxa | 3 | 3 | 5 | 5 | 3 | 3 | 5 | 5 |
| D | Number of intolerant taxa | 2 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| I | % Tolerant taxa | 18 | 5 | 32 | 3 | 27 | 3 | 62 | 1 |
| D | % Predator | 5.3 | 1 | 8.4 | 1 | 11 | 3 | 4.9 | 1 |
| D | Number of clinger taxa | 13 | 3 | 13 | 3 | 11 | 3 | 13 | 3 |
| I | % Dominance (3 taxa) | 51 | 3 | 49 | 5 | 32 | 5 | 57 | 3 |
| | TOTAL SCORE | | 24 | | 26 | | 24 | | 20 |
| | BIOLOGICAL CONDITION CATEGORY | | | | | | | | |

Maximum score of 50. Each metric scored: 1=low, 3=moderate, 5=high

**OTHER COMMUNITY COMPOSITION METRICS THAT ARE INDICATIVE OF BIOLOGICAL CONDITION**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total abundance (m2) | 569 | | 462 | | 1592 | | 1064 | |
| D | EPT taxa richness | 6 | | 6 | | 3 | | 6 | |
| D | Predator richness | 6 | | 9 | | 4 | | 8 | |
| D | Scraper richness | 3 | | 3 | | 4 | | 2 | |
| D | Shredder richness | 3 | | 3 | | 2 | | 2 | |
| D | %Intolerant taxa | 6.8 | | 2.2 | | 3.2 | | 0 | |
| I | *% Baetis tricaudatus complex* | 3.2 | | 2.4 | | 3.8 | | 4.3 | |
| I | %Collector | 66 | | 38 | | 68 | | 39 | |
| I | %Parasite | 2.6 | | 4.1 | | 0.3 | | 2.3 | |
| I | %Oligochaeta | 2.1 | | 3.3 | | 8.4 | | 5.3 | |
| I | Number tolerant taxa | 16 | | 15 | | 12 | | 15 | |
| I | %Simuliidae | 1.7 | | 3.7 | | 1.2 | | 3.8 | |
| I | %Chironomidae | 78 | | 56 | | 51 | | 17 | |

L,M & H comparisons with a Pacific Northwest montane stream with high biological integrity.

I= Metric value generally increases with declining biological integrity.

D= Metric value generally decreases with declining biological integrity.

| | | |
|---|---|---|
| L= Low biological integrity. | | BIBI scores between 0-24. |
| M= Moderate biological integrity. | | BIBI scores between 25-39. |
| H= High biological integrity. | | BIBI scores >40. |

# Benthic Invertebrate Index of Biological Integrity-BIBI (modified Karr 1998)

**OR: Pacific Habitat Services, Salem, OR area streams.**

Sampling method: qualitative dip net through multiple habitats, 500 micron mesh.

Subsampling: 500 organism minimum or entire sample. PNAMP level 2 standard taxonomic effort.

Abundances are relative, adjusted to a full sample basis.

| | | | | |
|---|---|---|---|---|
| **Waterbody** | **Pringle Creek** | **Waln Creek** | **Waln Creek** | |
| **Location** | **Upper** | **Lower** | **Upper** | |
| **Date** | **6/5/2017** | **6/5/2017** | **6/5/2017** | |

| | **METRIC** | **Value** | **Score** | **Value** | **Score** | **Value** | **Score** | **Value** | **Score** |
|---|---|---|---|---|---|---|---|---|---|
| **D** | **Total number of taxa** | 38 | 3 | 26 | 3 | 30 | 3 | | |
| **D** | **Number Ephemeroptera taxa** | 1 | 1 | 1 | 1 | 2 | 1 | | |
| **D** | **Number Plecoptera taxa** | 0 | 1 | 0 | 1 | 0 | 1 | | |
| **D** | **Number Trichoptera taxa** | 3 | 1 | 0 | 1 | 1 | 1 | | |
| **D** | **Number of long-lived taxa** | 5 | 5 | 2 | 1 | 4 | 3 | | |
| **D** | **Number of intolerant taxa** | 0 | 1 | 0 | 1 | 0 | 1 | | |
| **I** | **% Tolerant taxa** | 59 | 1 | 18 | 5 | 23 | 3 | | |
| **D** | **% Predator** | 5.2 | 1 | 3.7 | 1 | 7.7 | 1 | | |
| **D** | **Number of clinger taxa** | 14 | 3 | 9 | 1 | 11 | 3 | | |
| **I** | **% Dominance (3 taxa)** | 52 | 3 | 57 | 3 | 60 | 3 | | |
| | **TOTAL SCORE** | | **20** | | **18** | | **20** | | **0** |
| | **BIOLOGICAL CONDITION CATEGORY** | | | | | | | | |

Maximum score of 50. Each metric scored: 1=low, 3=moderate, 5=high

**OTHER COMMUNITY COMPOSITION METRICS THAT ARE INDICATIVE OF BIOLOGICAL CONDITION**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Total abundance (m2)** | 1464 | | 2370 | | 1523 | | | |
| **D** | **EPT taxa richness** | 4 | | 1 | | 3 | | | |
| **D** | **Predator richness** | 5 | | 6 | | 6 | | | |
| **D** | **Scraper richness** | 4 | | 2 | | 4 | | | |
| **D** | **Shredder richness** | 2 | | 0 | | 2 | | | |
| **D** | **%Intolerant taxa** | 0.5 | | 2 | | 17.3 | | | |
| **I** | ***% Baetis tricaudatus*** | 14.8 | | 0.4 | | 0.7 | | | |
| **I** | **%Collector** | 46 | | 93 | | 63 | | | |
| **I** | **%Parasite** | 0.5 | | 0 | | 0.3 | | | |
| **I** | **%Oligochaeta** | 7.3 | | 2.2 | | 6.3 | | | |
| **I** | **Number tolerant taxa** | 16 | | 10 | | 9 | | | |
| **I** | **%Simuliidae** | 2.3 | | 0.5 | | 1 | | | |
| **I** | **%Chironomidae** | 27 | | 81 | | 84 | | | |

L,M & H comparisons with a Pacific Northwest montane stream with high biological integrity.

I= Metric value generally increases with declining biological integrity.

D= Metric value generally decreases with declining biological integrity.

| | | |
|---|---|---|
| L= Low biological integrity. | | BIBI scores between 0-24. |
| M= Moderate biological integrity. | | BIBI scores between 25-39. |
| H= High biological integrity. | | BIBI scores >40. |

**Abundances and biomass (mg) converted to a standard full sample (if subsampled) and one square meter basis.**

| | | | | | | | Waterbody | Battle Creek | Battle Creek | Clark Creek | Pringle Creek | Pringle Creek | Waln Creek | Waln Creek |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Station | Lower | Upper | Upper | East Fork | Upper | Lower | Upper |
| | | | | | | | Date | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 |
| Taxon | Stage | Insect? | Origin | Higher classification | Order | Family | Common name | Abundance | Abundance | Abundance | Abundance | Abundance | Abundance | Abundance |
| Trepaxonemata | U | non-insect | Aquatic | Turbellaria | miscellaneous non-insect | x | flat worms | | | | 2 | | 25.74 | |
| Nemata | U | non-insect | Aquatic | Nemata | miscellaneous non-insect | x | round worms | 1.07 | | 2.73 | | 2.61 | | 5.22 |
| Oligochaeta | U | non-insect | Aquatic | Annelida: Oligochaeta | miscellaneous non-insect | x | segmented worms | 11.77 | 15 | 133.77 | 56 | 107.01 | 51.48 | 96.57 |
| Erpobdella | U | non-insect | Aquatic | Annelida: Hirudinea | miscellaneous non-insect | Erpobdellidae | leeches | | | | | 1 | | |
| Fluminicola | U | non-insect | Aquatic | Mollusca: Gastropoda | x | Hydrobiidae | snails | | | 27.3 | 140 | 386.28 | | 2.61 |
| Ferrissia | U | non-insect | Aquatic | Mollusca: Gastropoda | x | Planorbidae | snails | | 1 | | | 2.61 | | 2.61 |
| Gyraulus | U | non-insect | Aquatic | Mollusca: Gastropoda | x | Planorbidae | snails | 1.07 | | | | | | |
| Menetus | U | non-insect | Aquatic | Mollusca: Gastropoda | x | Planorbidae | snails | | | 5.46 | | | | 13.05 |
| Promenetus | U | non-insect | Aquatic | Mollusca: Gastropoda | x | Planorbidae | snails | | | 2.73 | | 2.61 | 4.29 | |
| Juga | U | non-insect | Aquatic | Mollusca: Gastropoda | x | Pleuroceridae | snails | 25.68 | 85 | 60.06 | 404 | 88.74 | | 2.61 |
| Pisidium | U | non-insect | Aquatic | Mollusca: Bivalvia | x | Sphaeriidae | pea clams | 20.33 | 7 | 174.72 | 46 | 70.47 | 296.01 | 83.52 |
| Sphaerium | U | non-insect | Aquatic | Mollusca: Bivalvia | x | Sphaeriidae | pea clams | 1.07 | 1 | | 6 | | | |
| Ostracoda | U | non-insect | Aquatic | Crustacea: Ostracoda | x | x | seed shrimp | | | 5.46 | | 2.61 | | |
| Crangonyx | U | non-insect | Aquatic | Crustacea: Amphipoda | x | Crangonyctidae | scuds | 3.21 | 4 | 180.18 | | 96.57 | 34.32 | |
| Caecidotea | U | non-insect | Aquatic | Crustacea: Isopoda | x | Asellidae | aquatic sow bugs | 1.07 | 4 | 2.73 | 2 | | | |
| Pacifastacus | U | non-insect | Aquatic | Crustacea: Decapoda | x | Astacidae | crayfish | 1 | 2 | | 4 | 1 | 1 | 1 |
| Atractides | U | non-insect | Aquatic | Arachnida: Acari | x | x | mites | 3.21 | 12 | | | | | |
| Lebertia | U | non-insect | Aquatic | Arachnida: Acari | x | x | mites | 3.21 | 2 | | 2 | | | |
| Midea | U | non-insect | Aquatic | Arachnida: Acari | x | x | mites | 2.14 | | | 20 | | | |
| Oribatida | U | non-insect | Aquatic | Arachnida: Acari | x | x | mites | 1.07 | 1 | 2.73 | | | | |
| Sperchon | U | non-insect | Aquatic | Arachnida: Acari | x | x | mites | 1.07 | 2 | | | 5.22 | | |
| Sperchonopsis | U | non-insect | Aquatic | Arachnida: Acari | x | x | mites | 3.21 | 2 | | 2 | | | |
| Aeshna | L | insect | Aquatic | Arthropoda: Insecta | Odonata | Aeshnidae | dragonflies | | | | | | 1 | |
| Argia | L | insect | Aquatic | Arthropoda: Insecta | Odonata | Coenagrionidae | damselflies | | | 2.73 | 8 | | | |
| Coenagrion/Enallagma | L | insect | Aquatic | Arthropoda: Insecta | Odonata | Coenagrionidae | damselflies | | | | | | 4.29 | |
| Baetis tricaudatus complex | L | insect | Aquatic | Arthropoda: Insecta | Ephemeroptera | Baetidae | mayflies | 18.19 | 11 | 60.06 | 46 | 216.63 | 8.58 | 10.44 |
| Labiobaetis | L | insect | Aquatic | Arthropoda: Insecta | Ephemeroptera | Baetidae | mayflies | 1.07 | | | 16 | | | |
| Ephemerella tibialis | L | insect | Aquatic | Arthropoda: Insecta | Ephemeroptera | Ephemerellidae | mayflies | | 1 | | | | | |
| Cinygma | L | insect | Aquatic | Arthropoda: Insecta | Ephemeroptera | Heptageniidae | mayflies | 1.07 | | | | | | |
| Paraleptophlebia | L | insect | Aquatic | Arthropoda: Insecta | Ephemeroptera | Leptophlebiidae | mayflies | 3.21 | 10 | | 14 | | | 2.61 |
| Chloroperlidae | L | insect | Aquatic | Arthropoda: Insecta | Plecoptera | Chloroperlidae | stoneflies | | 2 | | | | | |
| Sialis | L | insect | Aquatic | Arthropoda: Insecta | Megaloptera | Sialidae | alderflies | | | | 2 | | | |
| Cheumatopsyche | L | insect | Aquatic | Arthropoda: Insecta | Trichoptera | Hydropsychidae | caddisflies | | | | 14 | 13.05 | | |
| Hydropsyche | L | insect | Aquatic | Arthropoda: Insecta | Trichoptera | Hydropsychidae | caddisflies | | 1 | | | | | |
| Hydroptila | L | insect | Aquatic | Arthropoda: Insecta | Trichoptera | Hydroptilidae | caddisflies | | | | | 10.44 | | |
| Lepidostoma-panel case larvae | L | insect | Aquatic | Arthropoda: Insecta | Trichoptera | Lepidostomatidae | caddisflies | 5.35 | 11 | 90.09 | 8 | 26.1 | | 2.61 |
| Lepidostoma-turret case larvae | L | insect | Aquatic | Arthropoda: Insecta | Trichoptera | Lepidostomatidae | caddisflies | 1.07 | | | | | | |
| Wormaldia | L | insect | Aquatic | Arthropoda: Insecta | Trichoptera | Philopotamidae | caddisflies | | | | 16 | | | |
| Rhyacophila brunnea/vemna group | L | insect | Aquatic | Arthropoda: Insecta | Trichoptera | Rhyacophilidae | caddisflies | | | 2.73 | | | | |
| Dytiscidae | A | insect | Aquatic | Arthropoda: Insecta | Coleoptera | Dytiscidae | predaceous diving beetles | 1.07 | | | | | | |
| Cleptelmis addenda | L | insect | Aquatic | Arthropoda: Insecta | Coleoptera | Elmidae | riffle beetles | | 1 | | | | | |
| Lara | L | insect | Aquatic | Arthropoda: Insecta | Coleoptera | Elmidae | riffle beetles | 1.07 | 4 | | 4 | | | |
| Optioservus | A | insect | Aquatic | Arthropoda: Insecta | Coleoptera | Elmidae | riffle beetles | | | | 2 | | | |
| Optioservus | L | insect | Aquatic | Arthropoda: Insecta | Coleoptera | Elmidae | riffle beetles | | 1 | | 16 | | | |
| Gyrinus | L | insect | Aquatic | Arthropoda: Insecta | Coleoptera | Gyrinidae | whirligig beetles | | | | | | | 2.61 |
| Ametor | L | insect | Aquatic | Arthropoda: Insecta | Coleoptera | Hydrophilidae | water scavenger beetles | | 1 | | | | | |
| Ceratopogoninae | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Ceratopogonidae | no-see-um midges | | 1 | | | 2.61 | | |
| Dixa | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Dixidae | dixid midges | | 1 | | 2 | | | |
| Dixella | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Dixidae | dixid midges | | | 5.46 | 6 | | 21.45 | |
| Empididae | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Empididae | dance flies | | 1 | | | | | |
| Empididae | P | insect | Aquatic | Arthropoda: Insecta | Diptera | Empididae | dance flies | 1.07 | | | | | | |
| Trichoclinocera | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Empididae | dance flies | 1.07 | | | | | | 2.61 |
| Muscidae | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Muscidae | higher flies | | | | 2 | | | |
| Simulium | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Simuliidae | black flies | 9.63 | 17 | 19.11 | 40 | 33.93 | 12.87 | 15.66 |
| Pedicia | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Tipulidae | crane flies | 1.07 | | | | | | |
| Tipula | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Tipulidae | crane flies | | 4 | 2.73 | | 5.22 | | 5.22 |
| Chironomidae | P | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae | midges | 6.42 | 7 | 21.84 | 6 | 23.49 | 12.87 | 23.49 |
| Ablabesmyia | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Tanypodinae | midges | | 1 | | | | | |
| Brillia | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | 9.63 | 23 | 139.23 | 8 | 13.05 | 8.58 | 80.91 |
| Chironomus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae | midges | 7.49 | | 32.76 | | 13.05 | 77.22 | 255.78 |
| Cladopelma | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae | midges | 4.28 | | | | | | |
| Corynoneura | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | | 3 | 32.76 | 4 | | 120.12 | 10.44 |
| Cricotopus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | 23.54 | | | | | 180.18 | 5.22 |
| Cricotopus bicinctus group | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | 11.77 | | | | | 111.54 | |
| Cricotopus trifascia group | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | | | | | 2.61 | | |
| Cryptochironomus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae | midges | 7.49 | 4 | | 2 | 2.61 | | |
| Eukiefferiella brehmi group | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | | | | 16 | | | |
| Eukiefferiella claripennis group | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | 4.28 | 12 | 35.49 | 4 | 2.61 | 94.38 | 23.49 |
| Heterotrissocladius marcidus group | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | 4.28 | 7 | | | | | |
| Limnophyes | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | 4.28 | 1 | 5.46 | | 10.44 | 55.77 | |
| Metriocnemus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | | | | | 2.61 | | |
| Micropsectra | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae: Tanytarsini | midges | 144.45 | 30 | 122.85 | 30 | 31.32 | 815.1 | 73.08 |
| Paramerina | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Tanypodinae | midges | | 11 | | 2 | | 30.03 | 10.44 |

| | | | | | | | Waterbody | Battle Creek | Battle Creek | Clark Creek | Pringle Creek | Pringle Creek | Waln Creek | Waln Creek |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Station | Lower | Upper | Upper | East Fork | Upper | Lower | Upper |
| | | | | | | | Date | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 |
| Taxon | Stage | Insect? | Origin | Higher classification | Order | Family | Common name | Abundance | Abundance | Abundance | Abundance | Abundance | Abundance | Abundance |
| Parametriocnemus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | 7.49 | 1 | 27.3 | 62 | 2.61 | | |
| Paraphaenocladius | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | 6.42 | | | | | | |
| Paratanytarsus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae: Tanytarsini | midges | 29.96 | | | 2 | | 244.53 | |
| Phaenopsectra | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae | midges | 113.42 | 110 | 122.85 | | 156.6 | 85.8 | 399.33 |
| Polypedilum | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae | midges | | 13 | 10.92 | 2 | 31.32 | | 5.22 |
| Procladius | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Tanypodinae | midges | | | 10.92 | 2 | 10.44 | | 23.49 |
| Prodiamesa | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Prodiamesinae | midges | 29.96 | | 51.87 | | 7.83 | 47.19 | 261 |
| Psectrotanypus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Tanypodinae | midges | | | | | | 8.58 | |
| Rheocricotopus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | 6.42 | 4 | 27.3 | | 2.61 | | 23.49 |
| Rheotanytarsus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae: Tanytarsini | midges | | | 5.46 | | 7.83 | | |
| Stempellina | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae: Tanytarsini | midges | 2.14 | 2 | | | | | |
| Stempellinella | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae: Tanytarsini | midges | 2.14 | 5 | | | 2.61 | | |
| Stenochironomus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae | midges | | 1 | | | | | |
| Synorthocladius | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | | 1 | 5.46 | | | | |
| Thienemanniella | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | | 1 | | | | | |
| Thienemannimyia complex | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Tanypodinae | midges | 18.19 | 15 | 158.34 | 32 | 60.03 | 17.16 | 67.86 |
| Tvetenia bavarica group | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | | 2 | | 12 | 5.22 | | |
| Zavrelimyia | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Tanypodinae | midges | | 3 | | | | | 10.44 |

**Abundances and biomass (mg) converted to a standard full sample (if subsampled) and one square meter basis.**

| | | | | | | | Waterbody | Battle Creek | Battle Creek | Clark Creek | Pringle Creek | Pringle Creek | Waln Creek | Waln Creek |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Station | Lower | Upper | Upper | East Fork | Upper | Lower | Upper |
| | | | | | | | Date | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 |
| Taxon | Stage | Insect? | Origin | Higher classification | Order | Family | Common name | % abundance | % abundance | % abundance | % abundance | % abundance | % abundance | % abundance |
| Trepaxonemata | U | non-insect | Aquatic | Turbellaria | miscellaneous non-insect | x | flat worms | | | | 0.188 | | 1.086 | |
| Nemata | U | non-insect | Aquatic | Nemata | miscellaneous non-insect | x | round worms | 0.188 | | 0.1715 | | 0.1783 | | 0.3428 |
| Oligochaeta | U | non-insect | Aquatic | Annelida: Oligochaeta | miscellaneous non-insect | x | segmented worms | 2.068 | 3.247 | 8.405 | 5.263 | 7.311 | 2.172 | 6.342 |
| Erpobdella | U | non-insect | Aquatic | Annelida: Hirudinea | miscellaneous non-insect | Erpobdellidae | leeches | | | | | 0.06832 | | |
| Fluminicola | U | non-insect | Aquatic | Mollusca: Gastropoda | x | Hydrobiidae | snails | | | 1.715 | 13.16 | 26.39 | | 0.1714 |
| Ferrissia | U | non-insect | Aquatic | Mollusca: Gastropoda | x | Planorbidae | snails | | 0.2165 | | | 0.1783 | | 0.1714 |
| Gyraulus | U | non-insect | Aquatic | Mollusca: Gastropoda | x | Planorbidae | snails | 0.188 | | | | | | |
| Menetus | U | non-insect | Aquatic | Mollusca: Gastropoda | x | Planorbidae | snails | | | 0.3431 | | | | 0.8571 |
| Promenetus | U | non-insect | Aquatic | Mollusca: Gastropoda | x | Planorbidae | snails | | | 0.1715 | | 0.1783 | 0.181 | |
| Juga | U | non-insect | Aquatic | Mollusca: Gastropoda | x | Pleuroceridae | snails | 4.512 | 18.4 | 3.774 | 37.97 | 6.063 | | 0.1714 |
| Pisidium | U | non-insect | Aquatic | Mollusca: Bivalvia | x | Sphaeriidae | pea clams | 3.572 | 1.515 | 10.98 | 4.323 | 4.815 | 12.49 | 5.485 |
| Sphaerium | U | non-insect | Aquatic | Mollusca: Bivalvia | x | Sphaeriidae | pea clams | 0.188 | 0.2165 | | 0.5639 | | | |
| Ostracoda | U | non-insect | Aquatic | Crustacea: Ostracoda | x | x | seed shrimp | | | 0.3431 | | 0.1783 | | |
| Crangonyx | U | non-insect | Aquatic | Crustacea: Amphipoda | x | Crangonyctidae | scuds | 0.564 | 0.8658 | 11.32 | | 6.598 | 1.448 | |
| Caecidotea | U | non-insect | Aquatic | Crustacea: Isopoda | x | Asellidae | aquatic sow bugs | 0.188 | 0.8658 | 0.1715 | 0.188 | | | |
| Pacifastacus | U | non-insect | Aquatic | Crustacea: Decapoda | x | Astacidae | crayfish | 0.1757 | 0.4329 | | 0.3759 | 0.06832 | 0.04219 | 0.06568 |
| Atractides | U | non-insect | Aquatic | Arachnida: Acari | x | x | mites | 0.564 | 2.597 | | | | | |
| Lebertia | U | non-insect | Aquatic | Arachnida: Acari | x | x | mites | 0.564 | 0.4329 | | 0.188 | | | |
| Midea | U | non-insect | Aquatic | Arachnida: Acari | x | x | mites | 0.376 | | | 1.88 | | | |
| Oribatida | U | non-insect | Aquatic | Arachnida: Acari | x | x | mites | 0.188 | 0.2165 | 0.1715 | | | | |
| Sperchon | U | non-insect | Aquatic | Arachnida: Acari | x | x | mites | 0.188 | 0.4329 | | | 0.3567 | | |
| Sperchonopsis | U | non-insect | Aquatic | Arachnida: Acari | x | x | mites | 0.564 | 0.4329 | | 0.188 | | | |
| Aeshna | L | insect | Aquatic | Arthropoda: Insecta | Odonata | Aeshnidae | dragonflies | | | | | | 0.04219 | |
| Argia | L | insect | Aquatic | Arthropoda: Insecta | Odonata | Coenagrionidae | damselflies | | | 0.1715 | 0.7519 | | | |
| Coenagrion/Enallagma | L | insect | Aquatic | Arthropoda: Insecta | Odonata | Coenagrionidae | damselflies | | | | | | 0.181 | |
| Baetis tricaudatus complex | L | insect | Aquatic | Arthropoda: Insecta | Ephemeroptera | Baetidae | mayflies | 3.196 | 2.381 | 3.774 | 4.323 | 14.8 | 0.362 | 0.6857 |
| Labiobaetis | L | insect | Aquatic | Arthropoda: Insecta | Ephemeroptera | Baetidae | mayflies | 0.188 | | | 1.504 | | | |
| Ephemerella tibialis | L | insect | Aquatic | Arthropoda: Insecta | Ephemeroptera | Ephemerellidae | mayflies | | 0.2165 | | | | | |
| Cinygma | L | insect | Aquatic | Arthropoda: Insecta | Ephemeroptera | Heptageniidae | mayflies | 0.188 | | | | | | |
| Paraleptophlebia | L | insect | Aquatic | Arthropoda: Insecta | Ephemeroptera | Leptophlebiidae | mayflies | 0.564 | 2.165 | | 1.316 | | | 0.1714 |
| Chloroperlidae | L | insect | Aquatic | Arthropoda: Insecta | Plecoptera | Chloroperlidae | stoneflies | | 0.4329 | | | | | |
| Sialis | L | insect | Aquatic | Arthropoda: Insecta | Megaloptera | Sialidae | alderflies | | | | 0.188 | | | |
| Cheumatopsyche | L | insect | Aquatic | Arthropoda: Insecta | Trichoptera | Hydropsychidae | caddisflies | | | | 1.316 | 0.8916 | | |
| Hydropsyche | L | insect | Aquatic | Arthropoda: Insecta | Trichoptera | Hydropsychidae | caddisflies | | 0.2165 | | | | | |
| Hydroptila | L | insect | Aquatic | Arthropoda: Insecta | Trichoptera | Hydroptilidae | caddisflies | | | | | 0.7133 | | |
| Lepidostoma-panel case larvae | L | insect | Aquatic | Arthropoda: Insecta | Trichoptera | Lepidostomatidae | caddisflies | 0.94 | 2.381 | 5.66 | 0.7519 | 1.783 | | 0.1714 |
| Lepidostoma-turret case larvae | L | insect | Aquatic | Arthropoda: Insecta | Trichoptera | Lepidostomatidae | caddisflies | 0.188 | | | | | | |
| Wormaldia | L | insect | Aquatic | Arthropoda: Insecta | Trichoptera | Philopotamidae | caddisflies | | | | 1.504 | | | |
| Rhyacophila brunnea/vemna group | L | insect | Aquatic | Arthropoda: Insecta | Trichoptera | Rhyacophilidae | caddisflies | | | 0.1715 | | | | |
| Dytiscidae | A | insect | Aquatic | Arthropoda: Insecta | Coleoptera | Dytiscidae | predaceous diving beetles | 0.188 | | | | | | |
| Cleptelmis addenda | L | insect | Aquatic | Arthropoda: Insecta | Coleoptera | Elmidae | riffle beetles | | 0.2165 | | | | | |
| Lara | L | insect | Aquatic | Arthropoda: Insecta | Coleoptera | Elmidae | riffle beetles | 0.188 | 0.8658 | | 0.3759 | | | |
| Optioservus | A | insect | Aquatic | Arthropoda: Insecta | Coleoptera | Elmidae | riffle beetles | | | | 0.188 | | | |
| Optioservus | L | insect | Aquatic | Arthropoda: Insecta | Coleoptera | Elmidae | riffle beetles | | 0.2165 | | 1.504 | | | |
| Gyrinus | L | insect | Aquatic | Arthropoda: Insecta | Coleoptera | Gyrinidae | whirligig beetles | | | | | | | 0.1714 |
| Ametor | L | insect | Aquatic | Arthropoda: Insecta | Coleoptera | Hydrophilidae | water scavenger beetles | | 0.2165 | | | | | |
| Ceratopogoninae | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Ceratopogonidae | no-see-um midges | | 0.2165 | | | 0.1783 | | |
| Dixa | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Dixidae | dixid midges | | 0.2165 | | 0.188 | | | |
| Dixella | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Dixidae | dixid midges | | | 0.3431 | 0.5639 | | 0.905 | |
| Empididae | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Empididae | dance flies | | 0.2165 | | | | | |
| Empididae | P | insect | Aquatic | Arthropoda: Insecta | Diptera | Empididae | dance flies | 0.188 | | | | | | |
| Trichoclinocera | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Empididae | dance flies | 0.188 | | | | | | 0.1714 |
| Muscidae | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Muscidae | higher flies | | | | 0.188 | | | |
| Simulium | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Simuliidae | black flies | 1.692 | 3.68 | 1.201 | 3.759 | 2.318 | 0.543 | 1.028 |
| Pedicia | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Tipulidae | crane flies | 0.188 | | | | | | |
| Tipula | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Tipulidae | crane flies | | 0.8658 | 0.1715 | | 0.3567 | | 0.3428 |
| Chironomidae | P | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae | midges | 1.128 | 1.515 | 1.372 | 0.5639 | 1.605 | 0.543 | 1.543 |
| Ablabesmyia | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Tanypodinae | midges | | 0.2165 | | | | | |
| Brillia | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | 1.692 | 4.978 | 8.748 | 0.7519 | 0.8916 | 0.362 | 5.314 |
| Chironomus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae | midges | 1.316 | | 2.058 | | 0.8916 | 3.258 | 16.8 |
| Cladopelma | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae | midges | 0.752 | | | | | | |
| Corynoneura | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | | 0.6494 | 2.058 | 0.3759 | | 5.068 | 0.6857 |
| Cricotopus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | 4.136 | | | | | 7.602 | 0.3428 |
| Cricotopus bicinctus group | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | 2.068 | | | | | 4.706 | |
| Cricotopus trifascia group | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | | | | | 0.1783 | | |
| Cryptochironomus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae | midges | 1.316 | 0.8658 | | 0.188 | 0.1783 | | |
| Eukiefferiella brehmi group | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | | | | 1.504 | | | |
| Eukiefferiella claripennis group | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | 0.752 | 2.597 | 2.23 | 0.3759 | 0.1783 | 3.982 | 1.543 |
| Heterotrissocladius marcidus group | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | 0.752 | 1.515 | | | | | |
| Limnophyes | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | 0.752 | 0.2165 | 0.3431 | | 0.7133 | 2.353 | |
| Metriocnemus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | | | | | 0.1783 | | |
| Micropsectra | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae: Tanytarsini | midges | 25.38 | 6.494 | 7.719 | 2.82 | 2.14 | 34.39 | 4.8 |
| Paramerina | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Tanypodinae | midges | | 2.381 | | 0.188 | | 1.267 | 0.6857 |
| Parametriocnemus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | 1.316 | 0.2165 | 1.715 | 5.827 | 0.1783 | | |
| Paraphaenocladius | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | 1.128 | | | | | | |
| Paratanytarsus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae: Tanytarsini | midges | 5.264 | | | 0.188 | | 10.32 | |

| | | | | | | | Waterbody | Battle Creek | Battle Creek | Clark Creek | Pringle Creek | Pringle Creek | Waln Creek | Waln Creek |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Station | Lower | Upper | Upper | East Fork | Upper | Lower | Upper |
| | | | | | | | Date | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 | 2017-06-05 |
| Taxon | Stage | Insect? | Origin | Higher classification | Order | Family | Common name | % abundance | % abundance | % abundance | % abundance | % abundance | % abundance | % abundance |
| Phaenopsectra | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae | midges | 19.93 | 23.81 | 7.719 | | 10.7 | 3.62 | 26.23 |
| Polypedilum | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae | midges | | 2.814 | 0.6861 | 0.188 | 2.14 | | 0.3428 |
| Procladius | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Tanypodinae | midges | | | 0.6861 | 0.188 | 0.7133 | | 1.543 |
| Prodiamesa | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Prodiamesinae | midges | 5.264 | | 3.259 | | 0.535 | 1.991 | 17.14 |
| Psectrotanypus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Tanypodinae | midges | | | | | | 0.362 | |
| Rheocricotopus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | 1.128 | 0.8658 | 1.715 | | 0.1783 | | 1.543 |
| Rheotanytarsus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae: Tanytarsini | midges | | | 0.3431 | | 0.535 | | |
| Stempellina | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae: Tanytarsini | midges | 0.376 | 0.4329 | | | | | |
| Stempellinella | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae: Tanytarsini | midges | 0.376 | 1.082 | | | 0.1783 | | |
| Stenochironomus | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Chironominae | midges | | 0.2165 | | | | | |
| Synorthocladius | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | | 0.2165 | 0.3431 | | | | |
| Thienemanniella | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | | 0.2165 | | | | | |
| Thienemannimyia complex | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Tanypodinae | midges | 3.196 | 3.247 | 9.949 | 3.008 | 4.102 | 0.724 | 4.457 |
| Tvetenia bavarica group | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Orthocladiinae | midges | | 0.4329 | | 1.128 | 0.3567 | | |
| Zavrelimyia | L | insect | Aquatic | Arthropoda: Insecta | Diptera | Chironomidae: Tanypodinae | midges | | 0.6494 | | | | | 0.6857 |

APPENDIX B. CITY OF SALEM CAPITAL IMPROVEMENT PLAN FY 2017-2022 (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 2017-18 | FY 2018-19 | FY 2019-20 | FY 2020-21 | FY 2021-22 | Total |
|---|---|---|---|---|---|---|
| Utility Rates | 1,991,000 | 805,000 | 2,645,000 | 2,016,000 | 4,300,000 | 11,757,000 |
| Total: | $ 1,991,000 | $ 805,000 | $ 2,645,000 | $ 2,016,000 | $ 4,300,000 | $ 11,757,000 |

**Stormwater Project Details**

| | | | |
|---|---|---|---|
| Project Number: | 0000183 | Score: | 49.25 |
| Category: | Stormwater | Ward: | 1 |
| Neighborhood: | Highland Neighborhood Association | | |
| Title: | Broadway Street NE and Columbia Street NE - Stormwater Improvements | | |

| Funding Source | FY 2017-18 | FY 2018-19 | FY 2019-20 | FY 2020-21 | FY 2021-22 | Total |
|---|---|---|---|---|---|---|
| Utility Rates | 1,346,000 | - | - | - | - | 1,346,000 |
| Current CIP Total: | $ 1,346,000 | $ - | $ - | $ - | $ - | $ 1,346,000 |

| | |
|---|---|
| Amount Funded in Prior Years: | 320,000 |
| Total Estimated Project Cost: | $ 1,666,000 |

Design and construction for the replacement of 465 linear feet of undersized 8-inch pipe with 10-inch pipe on Broadway St NE from Academy St NE to Columbia Ave NE and replacement of 1,900 linear feet of undersized pipe on Columbia St NE between Broadway St NE and Water St NE.

| | | | | | | |
|---|---|---|---|---|---|---|
| Project Number: | 0000217 | | | | Score: | 48.25 |
| Category: | Stormwater | | | | Ward: | 2 |
| Neighborhood: | Southeast Mill Creek Association (SEMCA) | | | | | |
| Title: | Center Street Pipe Relocation Phase A and B | | | | | |

| **Funding Source** | **FY 2017-18** | **FY 2018-19** | **FY 2019-20** | **FY 2020-21** | **FY 2021-22** | **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: | 44.25 |
| Category: | Stormwater | | | | Ward: | 2 |
| Neighborhood: | South Central Association of Neighbors (SCAN) | | | | | |
| Title: | Cedar Way SE Stormwater Improvements | | | | | |

| **Funding Source** | **FY 2017-18** | **FY 2018-19** | **FY 2019-20** | **FY 2020-21** | **FY 2021-22** | **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 conveyance and infiltration facilities to address neighborhood drainage issues.

| | | | | | | |
|---|---|---|---|---|---|---|
| Project Number: | 0000219 | | | | Score: | 62.75 |
| Category: | Stormwater | | | | Ward: | 7 |
| Neighborhood: | Sunnyslope Neighborhood Association | | | | | |
| Title: | McKay Drive S Stormwater Improvements | | | | | |

| **Funding Source** | **FY 2017-18** | **FY 2018-19** | **FY 2019-20** | **FY 2020-21** | **FY 2021-22** | **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 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 2017-18** | **FY 2018-19** | **FY 2019-20** | **FY 2020-21** | **FY 2021-22** | **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 NE Storm Pipeline Replacement | | | | | |

| **Funding Source** | **FY 2017-18** | **FY 2018-19** | **FY 2019-20** | **FY 2020-21** | **FY 2021-22** | **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 pipe on Woodrow St NE between the Union Pacific railroad track and Fairgrounds Rd NE.

| | | | | | | |
|---|---|---|---|---|---|---|
| Project Number: | 0000506 | | | | Score: | 66.75 |
| Category: | Stormwater | | | | Ward: | All |
| Neighborhood: | City-Wide | | | | | |
| Title: | Implementation of DEQ Retrofit Plan | | | | | |

| **Funding Source** | **FY 2017-18** | **FY 2018-19** | **FY 2019-20** | **FY 2020-21** | **FY 2021-22** | **Total** |
|---|---|---|---|---|---|---|
| Utility Rates | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 | 500,000 |
| Current CIP Total: | $ 100,000 | $ 100,000 | $ 100,000 | $ 100,000 | $ 100,000 | $ 500,000 |

| | |
|---|---|
| Amount Funded in Prior Years: | 200,000 |
| Total Estimated Project Cost: | $ 700,000 |

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: | 66.75 |
| Category: | Stormwater | Ward: | 3 |
| Neighborhood: | Faye Wright Neighborhood Association | | |
| Title: | Total Maximum Daily Load (TMDL) Implementation Plan Projects | | |

| **Funding Source** | **FY 2017-18** | **FY 2018-19** | **FY 2019-20** | **FY 2020-21** | **FY 2021-22** | **Total** |
|---|---|---|---|---|---|---|
| Utility Rates | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 | 500,000 |
| Current CIP Total: | $ 100,000 | $ 100,000 | $ 100,000 | $ 100,000 | $ 100,000 | $ 500,000 |

| | |
|---|---|
| Amount Funded in Prior Years: | 100,000 |
| Total Estimated Project Cost: | $ 600,000 |

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 2017-18** | **FY 2018-19** | **FY 2019-20** | **FY 2020-21** | **FY 2021-22** | **Total** |
|---|---|---|---|---|---|---|
| Utility Rates | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 | 500,000 |
| Current CIP Total: | $ 100,000 | $ 100,000 | $ 100,000 | $ 100,000 | $ 100,000 | $ 500,000 |

| | |
|---|---|
| Amount Funded in Prior Years: | 140,000 |
| Total Estimated Project Cost: | $ 640,000 |

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: | 0000544 | Score: | 70.5 |
| Category: | Stormwater | Ward: | All |
| Neighborhood: | City-Wide | | |
| Title: | Battle Creek Stormwater Master Plan Improvements | | |

| **Funding Source** | **FY 2017-18** | **FY 2018-19** | **FY 2019-20** | **FY 2020-21** | **FY 2021-22** | **Total** |
|---|---|---|---|---|---|---|
| Utility Rates | - | - | 275,000 | 550,000 | 2,500,000 | 3,325,000 |
| Current CIP Total: | $ - | $ - | $ 275,000 | $ 550,000 | $ 2,500,000 | $ 3,325,000 |

| | |
|---|---|
| Amount Funded in Prior Years: | - |
| Total Estimated Project Cost: | $ 3,325,000 |

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 | | | | Score: | 70.5 |
| Category: | Stormwater | | | | Ward: | All |
| Neighborhood: | City-Wide | | | | | |
| Title: | Mill and Pringle Creeks Stormwater Master Plan Improvements | | | | | |

| **Funding Source** | **FY 2017-18** | **FY 2018-19** | **FY 2019-20** | **FY 2020-21** | **FY 2021-22** | **Total** |
|---|---|---|---|---|---|---|
| Utility Rates | - | - | 275,000 | 550,000 | 1,500,000 | 2,325,000 |
| Current CIP Total: | $ - | $ - | $ 275,000 | $ 550,000 | $ 1,500,000 | $ 2,325,000 |

| | |
|---|---|
| Amount Funded in Prior Years: | - |
| Total Estimated Project Cost: | $ 2,325,000 |

Design and construction of stormwater improvement projects as identified in the Stormwater Master Plan for the Mill Creek 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: | 0000557 | | | | | |
| Category: | Stormwater | | | | Ward: | 2 |
| Neighborhood: | South East Salem Neighborhood Association (SESNA) | | | | | |
| Title: | McGilchrist Street SE Corridor Improvements | | | | | |

| **Funding Source** | **FY 2017-18** | **FY 2018-19** | **FY 2019-20** | **FY 2020-21** | **FY 2021-22** | **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 |

Design, right-of-way acquisition, and construction funding for stormwater improvements associated with improving McGilchrist St SE to minor arterial standards. Work also includes replacing stream crossing structures at the east and west forks of Pringle Creek. This project will be designed and constructed in conjunction with CIP 0000554; McGilchrist Corridor Improvements.