



City of Wilsonville, Oregon

NPDES MS4 Permit and
Willamette River TMDL Implementation Plan
Annual Report

2018–2019 Reporting Year

Prepared for the
Oregon Department of Environmental Quality

November 1, 2019

CITY OF WILSONVILLE

**NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) and
TMDL IMPLEMENTATION PLAN
ANNUAL REPORT**

JULY 1, 2018 – JUNE 30, 2019

The undersigned hereby submits this National Pollutant Discharge Elimination System (NPDES) Municipal Stormwater System Annual Report in accordance with NPDES Permit Number 101348. 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.



Chris Neamtzu, AICP
Community Development Director

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1.0 INTRODUCTION

The Oregon Department of Environmental Quality (DEQ) regulates stormwater runoff from the City of Wilsonville (City) through a Municipal Separate Storm Sewer System (MS4) National Pollutant Discharge Elimination System (NPDES) Permit 101348, issued to Clackamas County and its co-permittees, and through the total maximum daily load (TMDL) program.

This annual report fulfills the reporting requirement under the City's Phase 1 NPDES MS4 permit and the City's Willamette River TMDL Implementation Plan (TMDL Plan) for the reporting period of July 1, 2018 to June 30, 2019. The City implements a Stormwater Management Plan (SWMP) to address specific regulatory obligations of its NPDES MS4 permit for point source pollutant parameters and the TMDL Plan to address elevated temperature in Willamette River tributaries (e.g., Boeckman Creek, Coffee Lake Creek).

1.1 Regulatory Background – NPDES MS4 Permit

The City's NPDES MS4 permit was originally issued in 1995 to Clackamas County co-permittees including the cities of Lake Oswego, Oregon City, West Linn, Milwaukie, Wilsonville, Happy Valley, Johnson City, and Rivergrove, the Oak Lodge Water Services District (formerly the Oak Lodge Sanitary District), and Clackamas County.

The City's MS4 NPDES permit was most recently reissued March 16, 2012, after a multi-year negotiation process with DEQ and an additional year-long delay related to an appeal. The permit expired March 1, 2017, and has been administratively extended, which still makes it the effective NPDES MS4 permit for the City.

During the 2016-2017 reporting period, the City prepared its NPDES MS4 permit renewal application, which required an evaluation of proposed program and SWMP changes, development of TMDL benchmarks, mapping, a maximum extent practical evaluation, updates to the City's monitoring program, and evaluation of service area expansions and associated pollutant loading. This significant effort was compiled into a report and submitted to DEQ on February 28, 2017. Although an updated SWMP was prepared and submitted as part of the NPDES MS4 permit renewal application, the City's 2012 SWMP remains the effective NPDES MS4 program document.

1.2 Regulatory Background – TMDL Implementation Plan

The City originally submitted its TMDL Plan to DEQ on March 31, 2008. Comments from DEQ were received and addressed by the City, and DEQ approved of the City's TMDL Plan in May of 2009. In August 2014, at the end of the 5-year implementation period, the City updated its TMDL Plan to include refined measurable goals, performance measures and milestones. This 2014 TMDL Plan is the effective plan for the City, and the 2018-2019 reporting year reflects its fifth year of implementation.

In February 2019, the City submitted an updated TMDL Plan to DEQ for approval. The City has not yet received confirmation from DEQ that this 2019 TMDL Plan is approved. Therefore, the City has not yet begun implementation of the 2019 TMDL Plan.

The City's TMDL Plan identifies and describes management strategies that the City will implement to address nonpoint sources of pollution generated in the Middle Willamette River subbasin in the Willamette Basin. The **non-point source** TMDL parameter of concern is temperature, and therefore, the TMDL Plan focuses on temperature management activities. The City's NPDES MS4 permit, as implemented through the SWMP, identifies practices the City will implement to address **point sources** of pollution. The point source TMDL parameters of concern are bacteria and mercury.

1.3 Document Organization

Table 1 outlines the organization of this annual report document, with respect to the annual reporting requirements outlined in Schedule B.5 of the City's NPDES MS4 permit. This report emphasizes efforts and activities associated with individual Best Management Practices (BMPs) from the City's 2012 SWMP, as summarized in Appendix A. Activities related to the City's TMDL Plan are reported in Appendix B.

Table 1. Summary of the NPDES MS4 Annual Report Requirements	
Annual reporting requirement	Location in document
a) Status of implementing SWMP elements, including progress in meeting measurable goals.	Appendix A
b) Status of any public education effectiveness evaluation conducted during the reporting year, and a summary of how results were used in adaptive management.	Appendix A
c) Summary of the adaptive management process implementation during the reporting year including new BMPs.	Section 2.0
d) Proposed changes to SWMP program elements to reduce TMDL pollutants to the MEP.	Section 2.0
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 3.0
f) A summary of monitoring program results, including monitoring data that is accumulated throughout the reporting year.	Section 5.0 and Appendix C
g) Any proposed modifications to the monitoring plan necessary to ensure that adequate data and information are collected to conduct stormwater program assessments.	Section 5.0
h) A summary describing the number and nature of enforcement actions, inspections, and public education programs ^a	Appendix A
i) An overview, as related to MS4 discharges, describing land use changes, UGB expansions, land annexations, and new development activities. The number of new post-construction permits issued and estimate of new and replaced impervious surface must also be included.	Section 4.0
j) A summary related to MS4 discharges describing concept planning or other activities in preparation of UGB expansions or land annexations.	Section 4.0

^a Enforcement actions, inspections, and public education programs are included in the City's SWMP as BMPs, and are reported along with the status of implementing all components of the SWMP in Appendix A.

2.0 ADAPTIVE MANAGEMENT PROCESS IMPLEMENTATION

The City submitted its adaptive management approach to DEQ on November 1, 2012. The City's approach includes two elements:

1. An **annual** process to determine if the City's stormwater program is being implemented in accordance with the SWMP, and to determine if progress towards measurable goals is being made. The annual process may include program adjustments, if needed.
2. A comprehensive process at the **end of the permit term** and submitted as part of the City's permit renewal package, to identify proposed program modifications including modification, addition, or removal of BMPs incorporated into the SWMP. Such program modifications are based on a more in-depth evaluation of submitted program documentation and studies.

The City conducted a comprehensive process to identify proposed program modifications as part of their NPDES MS4 permit renewal application, submitted February 2017. For the 2018-2019 reporting year, because the City's NPDES MS4 permit is in administrative extension, no major permit modifications, including major changes to the SWMP, can be made. Review of BMP implementation during the preparation of this annual report did not reveal the need for immediate adaptive management changes.

3.0 PROGRAM EXPENDITURES

The City's stormwater management program is funded through a combination of its stormwater utility, system development charges (SDCs) for new development, and additional fees associated with erosion control, natural resources, and stormwater plan reviews and inspections. A portion of the utility fee and all SDC revenue is placed in a fund dedicated for capital improvement project (CIP) development.

For the 2018-2019 reporting year, the stormwater utility rate was \$10.60 per equivalent residential unit (ERU). Over the next 2 years, this rate is proposed to increase by 6% percent annually. For 2019-2020, the stormwater utility rate is scheduled to be \$11.25.

A summary of the City's direct stormwater program expenditures for the 2018-2019 reporting year and anticipated stormwater program expenditures for the 2019-2020 reporting year are outlined below. The Natural Resources Program manages requirements for the NPDES permit, and costs are reflected under the Management Activities. The Public Works Department performs operations and maintenance activities, and costs are reflected under Maintenance Activities. Administrative support is funded separately.

Table 2. Stormwater Program Expenditures

	Management Activities	Maintenance Activities
Reporting Year 2018-2019		
Wages and benefits	\$239,602	\$194,456
Materials and services	\$96,200	\$495,028
Reporting Year 2019-2020 (projected)		
Wages and benefits	\$265,459	\$274,796
Materials and services	\$99,700	\$527,543

4.0 OVERVIEW OF PLANNING AND LAND USE CHANGES, UGB EXPANSION AND NEW DEVELOPMENT ACTIVITIES

The City has experienced rapid growth over the last two decades. When the initial NPDES MS4 permit was issued, the City’s population was approximately 9,300. The current (2018) population is approximately 25,250.

The following section outlines land use changes, Urban Growth Boundary (UGB) expansions, land annexations and new development activities that occurred during this reporting year. The City’s NPDES MS4 permit renewal application also included a comprehensive review of projected (by 2022) service area expansions and annexations. Figure 1 reflects the City’s current zoning and city limits.

4.1 Annexations and UGB Expansion

As of October 2019, the City’s NPDES MS4 permit area is approximately 4,999 acres.

In Wilsonville, annexations are typically applicant- and development-driven. The City and City Council do not typically initiate the annexation of property outside of the city limits. The City actively conducts development-based concept planning for large development areas to facilitate annexation. Past concept planning efforts include the following:

- **Villebois.** This 500-acre area is located along the City’s western boundary and prior to UGB expansion, this area was once the Dammasch State Hospital site, rural residential parcels and agricultural lands. The Villebois Village Master Plan was adopted in 2003 and incorporates sustainability practices and onsite stormwater management to minimize impacts of new development. Full build out assumes approximately 2,500 residential units within Villebois Village. To date, a total of 2,254 single and multi-family units have been constructed.
- **Frog Pond.** This 181-acre area is located adjacent to the City’s eastern boundary, north of Boeckman Road and west of Stafford Road. The Master Plan was adopted in spring 2017 and calls for the redevelopment of rural residential and agricultural lands to residential. A total of nearly 61 acres have been annexed within Frog Pond. To date, two subdivisions consisting of 80 single family homes have been approved for construction.

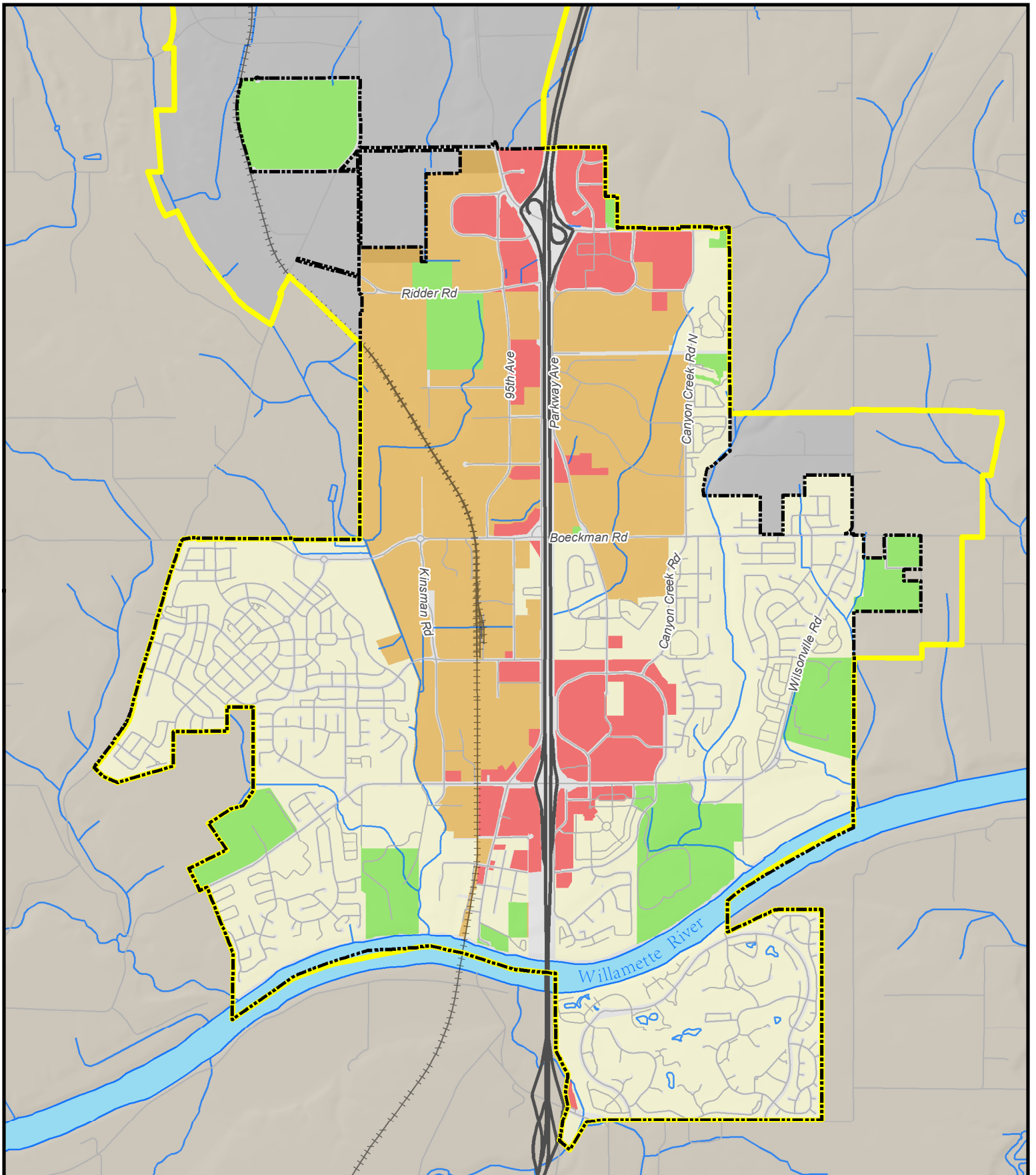
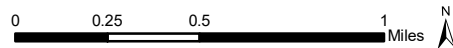











Figure 1

Zoning Types
The City of Wilsonville, Oregon



Legend

- | | | |
|---|---|---|
|  ROW |  PUB |  UGB |
|  COM |  RES |  Streams |
|  IND |  City Limits |  Roads |



- **Coffee Creek Industrial.** This 226-acre area is located adjacent to the City's northwestern boundary and is composed of industrial, residential, and agricultural land use. The Coffee Creek Master Plan was adopted in 2007. Annexation and redevelopment, in accordance with the Master Plan, will include regionally significant industrial land uses including warehouse, manufacturing, and office space. The City is currently constructing an industrial roadway along SW Garden Acres Road between Ridder Road and Day Road in order to promote development in this area.
- **Basalt Creek.** This area is located along the north and northwest boundary of the City, bound by Basalt Creek Parkway and Greenhill Lane to the north, Coffee Lake Creek on the west, and I-5 to the east. A Transportation Refinement Plan for the area was completed in August 2013, and the Basalt Creek Concept Plan was adopted in August 2018. The City updated the Urban Planning Area Agreement with Washington County and adopted Comprehensive Plan Amendments in Spring 2019. Annexation and development, in accordance with these plans and policies, will result in an attractive business district including high-tech and craft industries with office, manufacturing, and warehouse space. To date, no development approvals have been granted.

Metro approved a UGB expansion of 280 acres in December 2018. However, the expansion is awaiting final approval from the Department of Land Conservation and Development.

4.2 Land Use Changes and New Development Activities

In 2014, the City prepared updated stormwater design standards, as outlined in Section 3 of its Public Works Standards, to address post-construction stormwater control in accordance with the current NPDES MS4 permit requirements. The City requires structural stormwater controls for water quality and water quantity on all new and redevelopment projects that add or replace 5,000 square feet or more of impervious surface. The updated standards require the use of low impact development (LID) practices, stormwater facility sizing based on a flow duration standard, and inclusion of specific stormwater submittal requirements.

During the 2018-2019 reporting year, there were no zoning changes that would affect the types of development activities allowed or associated land usage.

During the 2018-2019 reporting year, the City issued twelve post-construction permits for development activities triggering stormwater management requirements. Development activities included five residential developments, three commercial sites, a City parking lot expansion, and three sites improving infrastructure in the right of way. Development activities from 129 housing units and two commercial sites resulted in 390,949 square feet of new and replaced impervious surface.

For additional information, please contact Kerry Rappold (503-570-1570) at the City of Wilsonville.

5.0 ENVIRONMENTAL MONITORING

The 2018-19 reporting year is the second year the City implemented the Coordinated Clackamas County Stormwater Monitoring Plan (CCCSMP). In 2016, the City opted to participate in the CCCSMP and discontinue implementation of the City's Monitoring Plan. The 2017 CCCSMP reflecting the City's participation was submitted to DEQ on December 16, 2016. No DEQ comments were received within 30 days. The City submitted its NPDES MS4 permit renewal application to include an updated monitoring objectives matrix and the 2017 CCCSMP as their environmental monitoring program.

Detail related to the environmental monitoring activities conducted during the 2018-2019 reporting year are outlined in Section 5.1. Monitoring results for 2018-2019, as well as a report summarizing analytical results and comparison to historic data collected is provided in Appendix C.

5.1 Summary of Monitoring Data

Under the City's Monitoring Plan, the City has two instream monitoring locations and one stormwater outfall monitoring location. Monitoring events are grouped into the dry season and wet season to maintain compliance with the permit. The City chose to collect three of the four instream sample events during the wet weather season. The sampling schedule was determined prior to the start of the sampling year. All instream sampling events occurred during dry weather conditions. Grab samples are collected during dry weather conditions and time-composited grab samples during rainfall events.

The City contracted stormwater and instream sample collection activities during the 2018-19 reporting year. Specific monitoring locations and frequencies are outlined in Table 3.

Table 3. Summary of Wilsonville Environmental Monitoring Activities				
Sampling type	Monitoring location	Waterbody name/ receiving water	Sampling frequency	Land use represented
Outfall (stormwater) monitoring	Library Detention Pond inlet at Memorial Park	Tributary to Boeckman Creek	3x/year	<ul style="list-style-type: none"> Mixed Use
Ambient (instream) monitoring	Boeckman Creek at the Boeckman Road crossing	Boeckman Creek (upstream)	4x/year (min. of 2 events during the wet season)	<ul style="list-style-type: none"> Agricultural (outside City limits) Commercial residential
Ambient (instream) monitoring	Boeckman Creek at the Rose Lane footbridge in Memorial Park	Boeckman Creek (downstream)	4x/year (min. of 2 events during the wet season)	<ul style="list-style-type: none"> Commercial Residential

The Monitoring Annual Report in Appendix C includes summary tables outlining parameters, methods, and results for each monitoring event. Monitoring events are grouped by season, and annual averages have been calculated for each parameter. Monthly rainfall totals for the 2018-19 reporting year are summarized in Table 4.

Table 4. Monthly Rainfall Totals (inches) 2018-19											
July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	March	April	May	June
0	0.02	0.57	2.76	3.26	5.56	3.49	3.97	1.54	4.24	1.32	0.84

Data retrieved from the National Weather Service <http://w2.weather.gov/climate/index.php?wfo=pqr>

Appendix A

SWMP Implementation Status

Appendix A. SWMP Implementation Status

Key to Pollutant Symbols: A full circle (●) indicates the BMP is expected to address the parameter. An empty circle (○) indicates the BMP may be expected to address the parameter. A blank cell indicates that the effect of the BMP is unknown at this time.

BMP Title	BMP Name	Program Element(s)	Addresses bacteria?	Addresses mercury?	Responsible City Department	Measurable goals (2012 SWMP)	Tracking measures (2012 SWMP)	Annual Report Information (Tracking Measure Status 2018-19)	Notes
CD1	Illicit Discharge Detection and Elimination	Illicit Discharge Detection and Elimination	○	○	Community Development Public Works	<ul style="list-style-type: none"> Conduct annual dry weather illicit discharge screening/inspections for all major (15 total) and priority minor outfalls (85 total). Continue to follow dry weather field screening procedures for all outfalls suspected of illicit discharges. Notify the Public Works Director of all positively identified illicit connections and take necessary actions to eliminate them. Revise procedures for conducting the illicit discharge elimination and investigation program in accordance with permit requirements by November 1, 2012. 	<ol style="list-style-type: none"> Track number of outfalls inspected annually. Summarize inspection results and indicate outfalls requiring monitoring (sampling) and/or investigations. Document the outcome and resolution of any investigation activities conducted. 	<ol style="list-style-type: none"> Six major outfalls identified as high priority sites were inspected on September 28, 2018 after 72 hrs of dry weather using the Dry Weather Field Screening Inspection Form. Throughout the reporting year, the Public Works Department inspected 61 outfalls as part of their routine maintenance program. Elevated specific conductivity readings were identified on Coffee Lake Creek. Elevated readings have occurred over the past few years, and source inspections have not identified a source within the city limits. See notes column. Two outfalls were found to need major maintenance and were repaired. Due to the elevated specific conductance readings routinely identified in Coffee Lake Creek, the City will periodically sample the two sites described in the notes column, in order to monitor the situation and look for trends. 	Routine field sampling conducted on September 28, 2018 on Coffee Lake Creek at the OREPAC Bridge found specific conductance readings to be three orders of magnitude higher than typical stormwater runoff values. Due to the high reading, an additional sample was taken upstream near where the creek enters the City limits within a large wetland complex. The upstream sample had a similar elevated concentration. This indicates that the source is likely outside of City limits.
PW/CD2	Spill Prevention, Training, and Response	Illicit Discharge Detection and Elimination Education and Outreach	○	○	Community Development Public Works	<ul style="list-style-type: none"> City staff to respond to non-hazardous material spills. Notify appropriate parties, including State and National Emergency Response Systems as necessary, of all known spills within the City. Train city staff to the OSHA First Responder Operations level. 	<ol style="list-style-type: none"> Track number of City employees attending OSHA spill-response training and/or refresher courses. Track the number of spills responded to by City staff. Track the type/source of pollutant discharges associated with each reported spill. 	<ol style="list-style-type: none"> 35 City employees attended OSHA spill-response training courses and/or refresher courses during the 2018-19 reporting year. City staff responded to 25 spills during the 2018-19 reporting year. Public Works cleaned 14 spills from the City's roads, catch basins, and manholes. The Stormwater Management Coordinator sent 15 letters to local businesses and residents requiring material to be removed from the ground or cleaned from catch basins on private property. The details related to the specific spill responses are listed in the Notes column. 	Three spills were reported to OERS that did not require response from City staff. The City addressed a fourth OERS report of sewage percolating to the ground. Additionally, City crews responded to 8 reports of gas, oils, or antifreeze spills related to vehicles and heavy equipment. Crews cleaned a catch basin in response to dry wall materials being washed into the public basin. The City contracted to have fire debris removed from manholes and stormwater ponds following a large fire in a residential development.
PW/CD3	Industrial and Commercial Facilities	Industrial and Commercial Facilities	○	○	Community Development Public Works	<ul style="list-style-type: none"> Review business license applications and SIC codes for new businesses to identify potential high source facilities. Obtain Environmental Survey from new businesses (i.e., non-residential sewer users) identified as a potential high pollutant source. Update facility information by sending the Environmental Survey to applicable, existing businesses every three years. Identify facilities needing NPDES 1200-Z permits and notify the facility and DEQ within 30 days. Annually inspect facilities identified as warranting inspection. Ensure illicit discharges are eliminated, if discovered. 	<ol style="list-style-type: none"> Track the number of facilities inspected annually. Track the number of existing and potential new NPDES 1200-Z permitted facilities identified annually. Track any enforcement actions associated with inspections. 	<ol style="list-style-type: none"> Seven facilities received a joint inspection by the City's Industrial Pretreatment and Stormwater Management Coordinators. Eleven NPDES 1200-Z facilities are currently in the City. During the 2018-19 reporting year, one additional facility has applied for a 1200-Z. Information pertaining to a GEN10 WPCF facility is in the Notes column. As a result of facility inspections, 11 letters were sent informing facilities of stormwater City code violations. All facilities cooperated with City staff and resolved their onsite issues in a timely manner. 	In November, concrete washout was found entering a stream and discharging to the Willamette through a failed berm at a facility containing a GEN10 WPCF permit (Wilsonville Concrete). The facility was responsive and fixed the issue immediately.

Appendix A. SWMP Implementation Status

Key to Pollutant Symbols: A full circle (●) indicates the BMP is expected to address the parameter. An empty circle (○) indicates the BMP may be expected to address the parameter. A blank cell indicates that the effect of the BMP is unknown at this time.

BMP Title	BMP Name	Program Element(s)	Addresses bacteria?	Addresses mercury?	Responsible City Department	Measurable goals (2012 SWMP)	Tracking measures (2012 SWMP)	Annual Report Information (Tracking Measure Status 2018-19)	Notes
CD4	Erosion Control and Construction Site Management	Construction Site Runoff Control Education and Outreach	●	●	Community Development	<ul style="list-style-type: none"> Require all new and redevelopment disturbing over 500 sf to submit an erosion and sediment control plan. Conduct weekly erosion control inspections on all construction sites disturbing over 500 sf. 	<ol style="list-style-type: none"> Track the number of erosion and sediment control plans approved. Track the number of 1200-CN and 1200-C permits issued. Track the number and frequency of erosion control inspections conducted. Track the number and type of enforcement actions taken by the City or DEQ. 	<ol style="list-style-type: none"> The City approved 16 erosion and sediment control plans encompassing 212 home sites during the 2018-19 reporting year. There are currently three 1200-CN and six 1200-C permits active in the City. Certified City inspectors performed a total of 626 erosion control inspections. Inspectors visit sites weekly during the wet months and monthly during dry months. Additional inspections occurred based on complaints or weather conditions. No formal enforcement actions occurred in the 2018-19 reporting year. Several residential construction sites were instructed to clean up sediment and fix or replace erosion control measures throughout the reporting year. 	
CD5	Public Education Participation	Education and Outreach Pollution Prevention for Municipal Operations Stormwater Management Facilities Operation and Maintenance Activities	○	○	Community Development	<ul style="list-style-type: none"> Publish stormwater related articles in the City newsletter and website. Organize public outreach programs such as Adopt-a-Road and volunteer monitoring of stream corridors. Label catch basins as necessary. Distribute door hangers as necessary in neighborhoods where non-stormwater discharges have been identified. Coordinate with other, local Phase I jurisdictions in providing/compiling information regarding public education effectiveness. Provide the results to DEQ by July 1, 2015. 	<ol style="list-style-type: none"> Track the number of educational articles published per year. Estimate public participation in City-sponsored volunteer events. Track the number of catch basins labeled. 	<ol style="list-style-type: none"> During the 2018-19 reporting year, nine educational/ informational articles were published in the City newsletter and eight posts were placed on City social media platforms. City-sponsored volunteer events conducted during the 2018-19 reporting year include the Adopt-a-Road program and the City's annual WERK Day. Estimated attendance is listed in the Notes column. Manhole lids over catch basins are stamped "Dump No Waste Drains to Stream". During this reporting year the City ordered new metal decals and identified a procedure to address the backlog of catch basins that need to be labeled with a decal. 	<ul style="list-style-type: none"> Adopt a Road Participants: 62 volunteers removed 42 bags of debris. City's WERK Day: 150 participants removed debris and invasive plants from Wilsonville's Memorial Park.

Appendix A. SWMP Implementation Status

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BMP Title	BMP Name	Program Element(s)	Addresses bacteria?	Addresses mercury?	Responsible City Department	Measurable goals (2012 SWMP)	Tracking measures (2012 SWMP)	Annual Report Information (Tracking Measure Status 2018-19)	Notes
CD6	Public Reporting for Spills, Illicit Discharges, and Dumping	Education and Outreach	○	○	Community Development	<ul style="list-style-type: none"> Continue to implement the “Citizen Concern” form for public reporting of spills, illicit discharges, and dumping. Include the phone number and website for reporting illicit discharges in a minimum of one published article each year. 	Track the number of citizen reports of spills, illicit discharges, and dumping received each year and follow-up actions resulting from the requests.	The City received seven complaints from citizens during the 2018-19 reporting year related to illicit discharges and dumping. Details are provided in the Notes column.	<ul style="list-style-type: none"> July 2018—Citizen reported soils and landscape materials being stored on the sidewalk and in the road. City staff spoke to homeowner who was temporarily storing the materials for a landscaping project. August 2018—Citizen witnessed paint being poured down a catch basin. City staff investigated and confirmed that paint was in the catch basin. Building owner was contacted and instructed to clean catch basin. Building owner complied. October 2018—Oil sheen on road reported in housing development. City staff responded and placed absorbent socks around catch basins. Spill was minor and appeared to be from leaking machinery or vehicles. December 2018—Citizen reported large deposits of sediment in roadway from a construction site blocking curb inlets. City verified the sediment issue and contacted the home builder to clean the streets, sidewalk and stabilize the hillside soils. Builder complied. January 2019—Citizen reported diesel spills in road near a construction project. City staff visited site and spoke to contractors. Spill was not verified. April 2019—Citizen witnessed resident blowing yard debris into street side stormwater swale. Letter was sent to address of resident. June 2019—Report of a car dripping oil near a catch basin. City staff responded and verified stains on pavement in road, no oils in catch basin.
PW/CD7	Municipal Staff Training for Stormwater Pollution Prevention	Education and Outreach Pollution Prevention for Municipal Operations			Community Development Public Works	<ul style="list-style-type: none"> Conduct municipal staff training related to stormwater pollution prevention as appropriate. Coordinate with other Clackamas County co-permittees regarding regional water quality efforts through scheduled co-permittee meetings. Attend applicable conferences and trainings as appropriate. 	<ol style="list-style-type: none"> Track the number of municipal staff training activities. Track number of conferences attended. Track any cost share or joint projects conducted annually with Clackamas County or other permitted agencies. 	<ol style="list-style-type: none"> City staff participated in an array of stormwater trainings this year including: spill prevention, pesticide application, Integrated Pest Management, and sediment & erosion control. Overall, 46 staff from the Engineering Division, Fleet Services, Parks and Recreation, and Public Works participated in stormwater pollution prevention training. Staff attended four conferences during the 2018-19 reporting year. The City currently coordinates with WES and the City of Oregon City in updates to the BMP Sizing Tool (used to address post-construction stormwater requirements). 	
CD8	Public Involvement and Participation	Public Involvement and Participation			Community Development	<ul style="list-style-type: none"> Provide for public review and comment with the monitoring plan, SWMP revisions, and pollutant load reduction benchmarks. 	N/A	N/A	<ul style="list-style-type: none"> The City retains the last four years of NPDES MS4 reports on their website for public review. The City posted their NPDES MS4 permit renewal application to DEQ on their website in September 2017.

Appendix A. SWMP Implementation Status

Key to Pollutant Symbols: A full circle (●) indicates the BMP is expected to address the parameter. An empty circle (○) indicates the BMP may be expected to address the parameter. A blank cell indicates that the effect of the BMP is unknown at this time.

BMP Title	BMP Name	Program Element(s)	Addresses bacteria?	Addresses mercury?	Responsible City Department	Measurable goals (2012 SWMP)	Tracking measures (2012 SWMP)	Annual Report Information (Tracking Measure Status 2018-19)	Notes
CD9	Planning and Development Review	Post-Construction Site Runoff Pollution Prevention for Municipal Operations	●	●	Community Development	<ul style="list-style-type: none"> Continue to require new and redevelopment projects that add or replace over 5,000 sf of impervious surface to install stormwater quality controls. Review all new and redevelopment plans that add or replace over 5,000 sf for compliance with stormwater control requirements. 	<ol style="list-style-type: none"> Track number of development applications reviewed for compliance with the City's stormwater requirements. Track the number and type of structural water quality and quantity facilities installed. Track the number of CIPs or retrofits proposed/initiated for water quality improvement. 	<ol style="list-style-type: none"> During the 2018-19 reporting year, 13 development applications were reviewed for compliance with the City's stormwater requirements, which pertain to development activities that add or replace 5,000 sf or more of impervious surface. During the 2018-19 reporting year, a total of 119 structural water quality and quantity facilities were installed. Detail related to the private facilities are provided in the Notes column. During the 2018-19 reporting year, three vegetated swales were installed as part of a public street improvement project and a rain garden was built with an expanded City parking lot. The City will be responsible for maintenance of these new facilities. 	<ul style="list-style-type: none"> Within the Villebois development, 25 bioretention facilities were installed during the reporting period. During the reporting period 54 vegetated swales and 40 rain gardens were installed throughout the City.
CD10	Review and Update Applicable Code and Development Standards Related to Stormwater Control	Post-Construction Site Runoff	○	○	Community Development	<ul style="list-style-type: none"> Review the City's current public works standards to minimize or eliminate identified barriers related to the use of low impact development and green infrastructure techniques. Review the City's current stormwater treatment and detention standards for compliance with new MS4 NPDES permit language (e.g., design storm, etc.). Update the City's post-construction stormwater design standards and code language by November 1, 2014. 	Track progress related to the review and update of the City's stormwater treatment and detention standards for compliance with the MS4 NPDES permit.	The City adopted updated Public Works Standards for stormwater in September 2014 to address NPDES MS4 requirements for treatment and flow control. The City's Standards were amended in December 2015 to address minor editorial and clarification items. No additional updates were made during the 2018-19 reporting year.	
PW11	Routine Road Maintenance	Pollution Prevention for Municipal Operations	●	●	Public Works	<ul style="list-style-type: none"> Sweep all curbed City streets monthly. Schedule and conduct street maintenance activities during dry weather conditions. Continue to sponsor Adopt-a-Road program. 	<ol style="list-style-type: none"> Track street sweeping frequency. Track length of roadway swept annually. Track volume of debris removed annually. 	<ol style="list-style-type: none"> During the 2018-19 reporting year, the City swept all curbed, public streets monthly. During the 2018-19 reporting year, a total of 2,986 miles of road were swept. During the 2018-19 reporting year, street sweeping resulted in removal of 1,122 CY of debris. 	
PW/CD12	Pest Management	Pollution Prevention for Municipal Operations			Community Development Public Works	<ul style="list-style-type: none"> Follow the Integrated Pest Management principles and Pest Management Program for public landscape maintenance. Require all staff and hired contractors applying chemicals within the City to be certified. 	<ol style="list-style-type: none"> Track amount of pesticides and fertilizers applied to public property and general area of application. Estimate number and area of sites where the planting of native vegetation was incorporated into the maintenance activities. 	<ol style="list-style-type: none"> During the 2018-19 reporting year, the City applied 8.0 gallons of pesticides to 4.7 acres and 3,700 pounds and 256 gallons of fertilizer to 60.4 acres of City Parks. The City applied 15.7 pounds of pesticides to 39.4 acres, and 460 pounds of fertilizer to 2.4 acres of other public, city-owned property. During the 2018-19 reporting year, 3 sites, reflecting approximately 3500 sf were planted by the Parks and Recreation Dept with native vegetation as part of normal maintenance activities. Additionally, two pollinator garden sites were installed with a total of 11,500 sf of native plants. 	The City coordinated Integrated Pest Management meetings with City staff in Public Works and Parks and Recreation. An IPM plan was completed during the 2018-19 reporting period.

Appendix A. SWMP Implementation Status

Key to Pollutant Symbols: A full circle (●) indicates the BMP is expected to address the parameter. An empty circle (○) indicates the BMP may be expected to address the parameter. A blank cell indicates that the effect of the BMP is unknown at this time.

BMP Title	BMP Name	Program Element(s)	Addresses bacteria?	Addresses mercury?	Responsible City Department	Measurable goals (2012 SWMP)	Tracking measures (2012 SWMP)	Annual Report Information (Tracking Measure Status 2018-19)	Notes
PW/CD13	Municipal Facility Stormwater Management	Pollution Prevention for Municipal Operations	○	○	Community Development Public Works	<ul style="list-style-type: none"> Inventory municipal facilities subject to this permit requirement. Identify and implement strategies to minimize discharges from identified municipal facilities by July 1, 2013. 	<ol style="list-style-type: none"> Inventory municipal facilities and develop strategies to reduce the impact of stormwater runoff from municipal facilities. 	<ol style="list-style-type: none"> The City adopted their Stormwater Pollution Prevention Strategy (SWPPS) for municipal facilities in 2013. Applicable municipal facilities include the Three Bay Facility, the SMART Operations & Fleet Facility, and the Memorial Park Maintenance Barn. For the 2018-19 reporting period, the oil water separator at the SMART Operations & Fleet Facility and a stormwater pretreatment vault at the SMART Bus station was serviced quarterly. 	
PW14	Conveyance System Cleaning	Stormwater Management Facilities Operation and Maintenance Activities	○	○	Public Works	<ul style="list-style-type: none"> Inspect public conveyance system annually for maintenance needs. Maintain and repair public conveyance system as needed based on inspections. 	<ol style="list-style-type: none"> Estimate the length of conveyance system serviced each year. Estimate type and volume of debris removed. 	<ol style="list-style-type: none"> During the 2018-19 reporting year, the City cleaned and maintained approximately 12,000 LF of the stormwater conveyance system (mains and laterals). During the 2018-19 reporting year, a total of 13 CY of debris was removed and reported in conjunction with conveyance system cleaning activities. 	
PW15	Catch Basin Cleaning	Stormwater Management Facilities Operation and Maintenance Activities	●	●	Public Works	<ul style="list-style-type: none"> Clean all high-priority public catch basins (approximately 25% of all public catch basins) annually and the remaining public catch basins over a 4-year period. Inspect catch basins for maintenance and repair needs during catch basin cleaning activities. Schedule catch basin repair activities as needed, based on inspections. 	<ol style="list-style-type: none"> Track percent of total catch basins cleaned each year. Track number of catch basin repair activities conducted each year. Estimate volume of debris removed annually. 	<ol style="list-style-type: none"> During the 2018-19 reporting year, the City cleaned 884 catch basins, reflecting 33% of all public catch basins in the City. During the 2018-19 reporting year, a total of two catch basins were repaired. During the 2018-19 reporting year, 145.4 CY of debris was removed from catchbasins. 	
PW/CD16	Structural Control Cleaning	Stormwater Management Facilities Operation and Maintenance Activities	●	●	Community Development Public Works	<ul style="list-style-type: none"> Inspect public structural controls annually and maintain and repair as needed. Ensure maintenance of new private structural stormwater facilities serving 5,000 sf of area or greater through the tracking of <i>Stormwater Maintenance and Access Easement</i> agreements. Maintain GIS "atlas" for both public and private water quality structural controls. 	<ol style="list-style-type: none"> Track number of public stormwater structural controls inspected. Track number of public stormwater structural controls maintained. Track covenant agreements on file and annual maintenance reports submitted for private stormwater structural control facilities. Track number of private stormwater structural controls inspected and maintained. 	<ol style="list-style-type: none"> The City has identified 90 structural controls at 29 sites. During the 2018-19 reporting year, the City inspected 89 public structural controls. During the 2018-19 reporting year, the City maintained 45 public structural controls. For the 2018-19 reporting year, there were 97 private stormwater maintenance agreements on file. Annual inspection and maintenance report requests were sent to 105 facility owners in March 2019, and 86 maintenance reports were returned. During FY 2018-19, the City inspected 77 properties that contained private stormwater facilities. Most of the parties responsible for private facility maintenance performed some type of maintenance over the course of the year. Follow up inspections by City staff found that eight facilities needed minor additional maintenance. 	

Appendix B

TMDL Implementation Plan Status

Appendix B. TMDL Implementation Plan Implementation Status

BMP or Activity	Commitment/ Implementation Strategy	Measurable Goal(s)	Implementation Tracking/ Performance Measure	Milestones	Lead Department/ Division	2018-19 Activities
Riparian Area Management	Enforce riparian buffers to protect existing vegetation and minimize impacts to surface waters due to development.	Continue to implement Wilsonville Municipal Code (WMC), Chapter 4 – Planning and Land Development, related to the following: <ul style="list-style-type: none"> Section 4.139 - Implementation of the Significant Resource Overlay Zone (SROZ). The SROZ reflects compliance with Title 3 and Title 13 requirements. Section 4.600 – Limitations on tree removal and tree cutting in the SROZ. 	Annually track WMC and Comprehensive Plan updates related to Title 3/ 13 compliance.	N/A – WMC is currently consistent with Title 3/13 compliance.	Community Development	<ul style="list-style-type: none"> City staff will continue to regulate the development of riparian areas through the Significant Resource Overlay Zone and other relevant parts of the development code. During the 2018-19 reporting year, there was one development application for a property that includes the SROZ. Only minor encroachments for stormwater management (i.e., outfall, piping) were proposed in the SROZ.
	Conduct targeted planting efforts to improve shade conditions throughout Wilsonville waterbodies	Refine the extent and scope of riparian planting and restoration capital improvement projects (CIPs) per the 2012 Wilsonville Stormwater Master Plan.	<ul style="list-style-type: none"> Over the implementation term, map riparian planting and restoration CIP coverage in conjunction with constraints and ownership characteristics documented on the Riparian Shade Zone maps. Over the implementation term, conduct ground truthing of riparian enhancement CIP coverage areas. Annually report on progress. Over the implementation term, refine the riparian enhancement CIP descriptions, coverage area, and cost estimates per ground truthing results and targeted plant densities defined in the 2008 TMDL Plan. 	<ul style="list-style-type: none"> By November 1, 2015, define existing CIPs with a shade or temperature management component. Prioritize CIPs in conjunction with the water quality retrofit strategy and 2015 Retrofit Plan (required per the NPDES MS4 permit). By November 1, 2017, conduct ground truthing activities for a minimum of one, high priority, water quality CIP that is scheduled for design/ construction in accordance with the City’s capital improvement program. By the end of the permit term, refine the overall description and cost estimates for high priority water quality CIPs. Incorporate updates into the Master Plan itself or capital improvement program. 	Community Development	<ul style="list-style-type: none"> Capital improvement projects have been prioritized in accordance with the water quality retrofit strategy and Retrofit Plan. Select projects include a planting and restoration component. In 2020, in conjunction with a street improvement project, a priority water quality CIP that includes riparian plantings is anticipated for construction. As the capital improvement program is implemented over subsequent years, planting shade on public and private properties will remain an important objective. Future updates to the Stormwater Master Plan or capital improvement program will include refinements to the descriptions and cost estimates for high priority water quality CIPs.
	Continue participation in opportunistic planting efforts with local and state agencies and organizations.		As applicable, document planting and vegetation enhancement efforts on public property and private property.	N/A – Implementation is ongoing.	Community Development	In partnership with Friends of Trees, over the past 17 years, eleven sites have been planted (see accompanying Figure B-1).
	Continue partnerships with Friends of Trees in support of riparian planting projects. Partnership may include in-kind staff participation on governing boards, technical/ permitting support for sponsored projects within the City, or financial contributions.		Annually document partnership efforts.	N/A – Implementation is ongoing.	Community Development	<ul style="list-style-type: none"> The City of Wilsonville has a strong partnership with Friends of Trees to enhance and restore native habitats in the community, including riparian areas. Friends of Trees worked within the City over the reporting year to perform maintenance activities and promote the volunteer plantings. Two sites were planted during the reporting year.
	Continue implementation of riparian planting and restoration CIPs and LID CIPs as documented in the 2012 Wilsonville Stormwater Master Plan.		Annually document completion of riparian planting and restoration and LID CIPs per the 2012 Wilsonville Stormwater Master Plan.	N/A – CIP implementation schedules are based on prioritization outlined in the Master Plan and Retrofit Plan.	Engineering	<ul style="list-style-type: none"> During the 2018-19 reporting year, LID facilities were installed as part of a public street improvement project and City parking lot project (see CD9 in Appendix A). In addition, riparian plantings were installed at various sites (see Figure B-1). City staff will continue to identify shade projects and CIPs to implement and document the progress in achieving the goals of the Retrofit Plan.

Appendix B. TMDL Implementation Plan Implementation Status

BMP or Activity	Commitment/ Implementation Strategy	Measurable Goal(s)	Implementation Tracking/ Performance Measure	Milestones	Lead Department/ Division	2018-19 Activities
Design Standards for New and Redevelopment	Implement design standards that promote infiltration.	Promote use of infiltration for stormwater management through updated stormwater design standards, facility details, and sizing tools.	<ul style="list-style-type: none"> Over the permit term, adopt and implement updated stormwater design standards that include additional guidance for stormwater treatment using infiltration practices. As applicable, document changes to stormwater design standards. 	<ul style="list-style-type: none"> By November 1, 2014, adopt updated stormwater design standards that include additional guidance for stormwater treatment using infiltration practices. By November 1, 2016, prepare a user manual for developers and engineers with standard details for recommended stormwater treatment facilities. 	Engineering	<ul style="list-style-type: none"> Updated stormwater design standards were adopted in September 2014, and subsequently revised in December 2015. These standards require the use of LID principles and practices. Developers have been asked to use the WES BMP Sizing Tool to demonstrate their stormwater treatment and control facilities are properly sized. A user manual was developed, and it is available on the City's website.
Public Education for Temperature Management	Continue to provide information regarding temperature related issues and shade preservation efforts to the public.	Using the City newsletter, annually distribute a minimum of one article related to temperature issues and management approaches.	<ul style="list-style-type: none"> Annually track the number and content of temperature – related articles distributed to City residents by the City. Annually document shade planting incentives (materials, trainings, etc.) provided to citizens. 	N/A – Ongoing implementation is addressed through implementation of the City's SWMP.	Community Development	<ul style="list-style-type: none"> One temperature related article was published during the 2018-19 reporting year. In 2015, the City of Wilsonville established an incentive program to provide native tree seedlings to private property owners. The incentive was advertised in the Boones Ferry Messenger one time during the reporting year. During the 2018-19 reporting year, 8 property owners planted 40 trees. Overall, the incentive program has provided 300 trees to 50 property owners.
		Promote regional programs targeted at improving habitat on private property. Continually distribute information regarding regional programs in City outlets.	Annually document the methods of information distribution conducted by the City.	N/A – Implementation is ongoing.		<ul style="list-style-type: none"> City staff routinely reviews the methods for providing information to the community. The City of Wilsonville coordinated with other Phase 1 permittees and submitted a public education effectiveness evaluation report to DEQ on July 1, 2015.
		Participate in student education and outreach activities in local schools, providing instruction on the importance of maintaining riparian buffers for shade and temperature management.	As applicable, document participation and activities conducted with local schools.	N/A – Implementation is ongoing.	Community Development	<ul style="list-style-type: none"> City staff works cooperatively with the West Linn - Wilsonville School District to provide educational opportunities regarding the importance of maintaining shade and temperature management. City staff routinely partner with the School District on projects and educational activities through the Student Watershed Research Project and the Center for Research in Environmental Sciences and Technologies.
Environmental Monitoring	Monitor surface water temperature to document status and evaluate trends with respect to water quality standards.	In conjunction with NPDES MS4 requirements, conduct sampling for temperature at required instream monitoring locations.	As applicable, annually report any modification to existing temperature monitoring activities.	By March 2017, update the City's Stormwater Monitoring Plan in conjunction with the NPDES MS4 permit renewal application.	Community Development	<ul style="list-style-type: none"> The City partners with other Clackamas co-permittees as part of the Coordinated Clackamas County Stormwater Monitoring Plan (CCCSMP). In addition, the City worked collaboratively with the U.S. Geological Survey (USGS) to research cold-water refuges in Wilsonville's tributaries (i.e., Boeckman Creek and Coffee Lake Creek) to the Willamette River. The research was part of a larger USGS study looking at cold water refugia in the Willamette River Basin. The USGS research surveyed temperature and dissolved oxygen to capture the spatial variability in these conditions at tributary mouths, potential groundwater seeps, and along the shoreline in Wilsonville. The survey was conducted May-July 2017 to coincide when migrating salmonids may be using cold-water refuges.

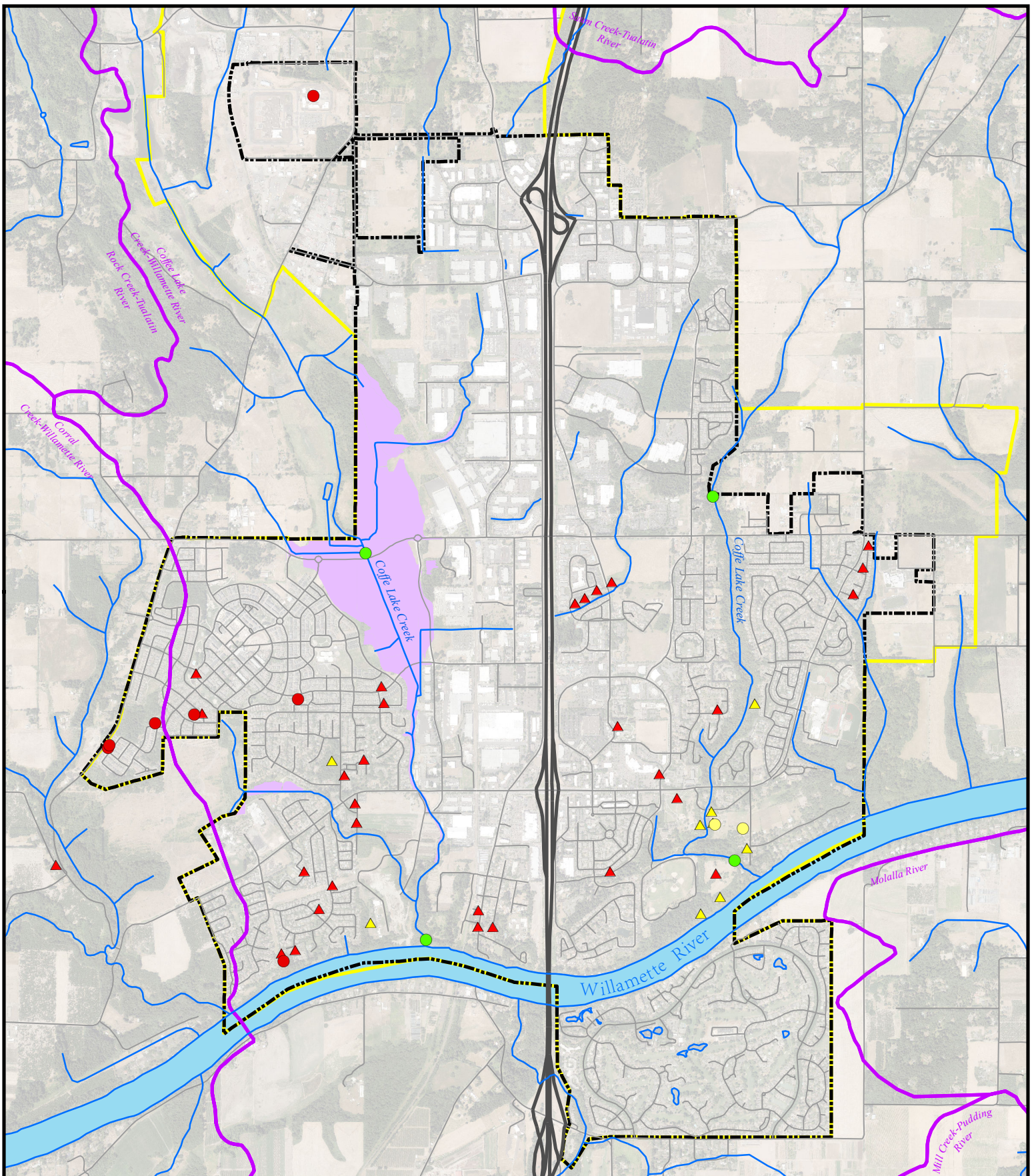


Figure B-1

Temperature Management Strategies The City of Wilsonville, Oregon

Legend

- ▲ Tree Planting, 2014-2017
- Tree Planting, 2018-2019
- ▲ Friends of Trees, 2014-2017
- Friends of Trees, 2018-2019
- Temp. Monitors
- Soft Constraints
- Watershed
- Streams
- City Limits
- UGB
- Rivers
- Roads



Appendix C

Environmental Monitoring Report
2018-2019

National Pollutant Discharge Elimination System (NPDES)
Municipal Separate Storm Sewer System (MS4) Discharge Permit No. 101348

ANNUAL MONITORING REPORT

Fiscal Year 2018-19
(July 1, 2018 – June 30, 2019)

Prepared for:

Oregon Department of Environmental Quality

Submitted by:

City of Wilsonville

Submitted on:

November 1, 2019

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1 Summary of Monitoring Activities

The following annual monitoring report describes environmental monitoring activities conducted by the City of Wilsonville (City) during the 2018-2019 reporting year to comply with their National Pollutant Discharge Elimination System (NPDES) municipal separate storm sewer (MS4) Permit requirements. The 2018-2019 reporting year extends from July 1, 2018, to June 30, 2019.

The following monitoring activities are summarized and discussed in this annual report:

1. Stormwater Monitoring (one outfall monitoring location)
2. Instream Monitoring (two fixed instream monitoring locations)

Monitoring results are summarized and graphed in Section 3 (Stormwater Monitoring) and Section 4 (Instream Monitoring). Exhibit A includes a tabulation of monitoring results, baseline statistics, and comparison to water quality standards or criteria (as applicable).

For detailed background on the City's monitoring program and obligations under their NPDES MS4 permit, refer to the Comprehensive Clackamas County NPDES MS4 Monitoring Plan (CCCSMP), dated January 2017. The 2017 CCCSMP was prepared following completion of monitoring activities associated with their effective NPDES MS4 Permit (issued in 2012) and includes reference to monitoring objectives, locations, methods and strategies. While this annual report includes only data collected on behalf of the City, the 2017 CCCSMP serves as an established agreement to conduct a coordinated monitoring effort. Data collected by other participating co-permittees' include the cities of Gladstone, Oregon City, West Linn, and Milwaukie, Oak Lodge Water Services District (OLWSD), and Clackamas County Water Environment Services (WES), on behalf of Clackamas County and the cities of Happy Valley and Rivergrove.

Monitoring objectives per the NPDES MS4 permit are listed below and are collectively addressed by monitoring activities in the CCCSMP. The City's monitoring activities applicable to each objective are described below. Please note that biological sampling was not conducted by the City during the 2018-19 reporting year.

1. *Evaluate the source(s) of the 2004/2006 303(d) listed pollutants applicable to the co-permittee's permit area;*

Stormwater Monitoring: One land use-based stormwater monitoring location is monitored by the City for 303(d) pollutants including metals, nutrients, and sediment (as a surrogate for organics). See Section 3.

2. *Evaluate the effectiveness of Best Management Practices (BMPs) in order to help determine BMP implementation priorities;*

Instream Monitoring: Paired instream sampling locations on Boeckman Creek are used to compare upstream and downstream water quality conditions and evaluate stormwater program effectiveness and BMP implementation, as observed by resulting water quality. See Section 4.

Stormwater Monitoring: One land use-based stormwater monitoring location is monitored by the City. Long term monitoring may inform BMP effectiveness for specific contributing drainage areas and parameters. See Section 3.

3. *Characterize stormwater based on land use type, seasonality, geography or other catchment characteristics;*

Stormwater Monitoring: Collectively, the CCCSMP includes 11 land use-based stormwater monitoring locations reflecting five land use categories. Results are used to characterize runoff quality based on land use type, seasonality, and geography. One land use-based stormwater monitoring location is monitored by the City.

4. *Evaluate status and long-term trends in receiving waters associated with MS4 discharges;*

Instream Monitoring: Two instream locations are monitored by the City, each with a long-term period of record. Trends are assessed every five years at a minimum and can be performed for both wet and dry weather conditions. See Section 4.

5. *Assess the chemical, biological, and physical effects of MS4 stormwater discharges on receiving waters; and,*

Instream Monitoring: Two instream locations are monitored by the City. Chemical effects of MS4 discharges may be assessed by comparing results reflecting wet and dry weather conditions. See Section 4. Biological effects are assessed with instream biological monitoring, which was conducted by the City during the 2018-19 reporting year. Biological monitoring results can be provided on request.

As part of the CCCSMP, WES conducts periodic physical condition monitoring to assess physical effects of MS4 discharges. Results are provided in WES' annual report as applicable to the reporting year.

Stormwater Monitoring: One land use-based stormwater monitoring location is monitored by the City. Chemical effects of MS4 discharges may be assessed by comparing stormwater monitoring results with instream monitoring results. See Section 3.

6. *Assess progress towards meeting TMDL pollutant load reduction benchmarks.*

Stormwater Monitoring: One land use-based stormwater monitoring location is monitored by the City. Historical land-use event mean concentration (EMC) data, used to develop TMDL benchmarks, is compared with current land use-based stormwater monitoring results to indicate whether programs are improving water quality. See Section 3.

1.1 Stormwater Monitoring

Number of sites: 1

Focus of data evaluation for this annual report:

- How do data compare with criteria values?
- How do data compare with historical land use-based EMCs?

Number of sampling events required per year: 3

Sampling method: Time-composite grab samples

Rain gauge: In-Plant Weather Station located at 9275 SW Tauchman St, Wilsonville

FY 2018-19 Sampling Summary – Library Pond at Memorial Park

Sampling Location	CCCSMP Sampling Location ID	Receiving Water	Land Use Type	Date (2019)	Time first sample was collected	Time last sample was collected	Rainfall total during the storm (in.)	Antecedent Rainfall Condition Met (Y/N)? <i>(as possible, ensure no rainfall 24 hours prior to sampling)</i>
Outfall–Library Pond at Memorial Park	10	Boeckman Creek	Mixed Use	Jan. 8	N/A	N/A	0.26	Y
Outfall–Library Pond at Memorial Park	10	Boeckman Creek	Mixed Use	May 14	8:38 a.m.	11:35 a.m.	0.06	Y
Outfall–Library Pond at Memorial Park	10	Boeckman Creek	Mixed Use	June 7	N/A	N/A	0.13	N

Parameters analyzed in the lab:	Parameters analyzed in the field:
<ul style="list-style-type: none"> • Total and dissolved copper • Total and dissolved lead • Total and dissolved zinc • Ammonia-nitrogen • Nitrate-nitrogen • Total phosphorus • Ortho-phosphorus • <i>E. coli</i> • Hardness • Total dissolved solids • Total suspended solids • Volatile solids 	<ul style="list-style-type: none"> • Dissolved oxygen • Specific conductivity • pH • Temperature

Summary of any noteworthy issues (e.g., missed samples, etc.)

- Based on tabulated data for the 2018-19 reporting year (Exhibit A, Table A-1), there is a potential QA/QC issue associated with the 5/14/19 sampling event. The Ammonia Nitrogen reading is at least one order of magnitude higher than all other Ammonia Nitrogen values in the period of record.
- Based on recorded rainfall totals, the storm event collected on 5/14/19 does not qualify as a viable storm event because the rainfall depth is less than 0.1". As such, the City will collect an extra stormwater sample during the 2019-20 reporting year.

Map of sampling sites

- The City’s stormwater monitoring location is shown in Exhibit B, Figure B-1, along with the other stormwater monitoring locations by CCCSMP participants.

1.2 Instream Monitoring

Number of sampling locations: 2

Focus of data evaluation for this annual report:

- How do data compare with instream water quality criteria?
- How do this year’s (2018-19) data compare with previously collected data?
- How do upstream and downstream sites on a water body compare with each other?

Number of sampling events required per year: 4

Sampling method: Routine Sample Collection (Grab)

Rain gauge: In-Plant Weather Station located at 9275 SW Tauchman St, Wilsonville

FY 2018-19 Summary of Sampling Locations

Sampling Location	CCCSMP Sampling Location ID	Receiving Water Body	Monitoring Data Range ¹	Upstream (US) or Downstream (DS)
Boeckman Creek at Boeckman Rd	21	Boeckman Creek	2013 – present	US
Boeckman Creek at Memorial Park	22	Boeckman Creek	1999 – present	DS

1. The date range on the monitoring data may vary by parameter.

FY 18-19 Summary of Sampling Events

Sampling Date	Locations Sampled	Wet or Dry Weather condition?	Rainfall total during the storm (in.), if applicable
7/18/18	Boeckman Creek US Boeckman Creek DS	Dry	NA
10/17/18	Boeckman Creek US Boeckman Creek DS	Dry	NA
1/16/19	Boeckman Creek US Boeckman Creek DS	Dry	NA
4/17/19	Boeckman Creek US Boeckman Creek DS	Dry	NA

Parameters analyzed in the lab:	Parameters analyzed in the field:
<ul style="list-style-type: none"> • Total and dissolved copper • Total and dissolved lead • Total and dissolved zinc • Ammonia-nitrogen • Nitrate-nitrogen • Total phosphorus • Ortho-phosphorus • <i>E. coli</i> • Hardness • Total dissolved solids • Total suspended solids • Volatile solids 	<ul style="list-style-type: none"> • Dissolved oxygen • Specific conductivity • pH • Temperature

Summary of any noteworthy issues (e.g., missed samples, etc.)

- Based on tabulated data for the 2018-19 reporting period (Exhibit A, Table A-2), there is a QA/QC issue associated with the 1/16/19 sampling event at the Upstream Boeckman Creek monitoring location (Boeckman Creek at Boeckman Road). The dissolved zinc reading is higher than the total zinc reading.
- Based on tabulated data for the 2018-19 reporting period (Exhibit A, Table A-2), there is a QA/QC issue associated with the 7/18/18, 10/17/18, and 1/16/19 sampling events at the Downstream Boeckman Creek monitoring location (Boeckman Creek at Memorial Park). For all three events the dissolved zinc reading is higher than the total zinc reading. The City's consultant contacted the laboratory analyzing the samples on 10/3/19 to inquire about the QA/QC issue. The laboratory had identified an issue with their filtration protocol and recommended that samples are filtered in the field to resolve the issue. The City will be following up with their sampling contractor and the laboratory to ensure appropriate QA/QC protocols are adhered to for future sample collection efforts.
- Based on tabulated data for the 2018-19 reporting period (Exhibit A, Table A-2), there is a QA/QC issue associated with the 1/16/19 sampling event at the Downstream Boeckman Creek monitoring location (Boeckman Creek at Memorial Park). The dissolved copper reading is higher than the total copper reading.

- Based on tabulated data for the 2018-19 reporting period (Exhibit A, Table A-2), there is a potential QA/QC issue associated with the 4/17/19 sampling event at both the upstream and downstream locations. The reported dissolved lead reading is below the detection limit.

Map of sampling sites

- The City's instream monitoring locations are shown in Exhibit B, Figure B-2, along with the other instream monitoring locations by CCCSMP participants.

2 Water Quality Criteria for Comparison

Instream and stormwater monitoring results presented in Sections 3 and 4 are compared to documented water quality criteria and benchmarks to assess results and impacts to overall watershed health (see Table 2.1).

Selecting appropriate comparison criteria can be challenging for various reasons. Local instream water quality data are best compared with Oregon Water Quality Standards, but these standards are only available for a limited number of pollutants. In addition, the water quality standards for some pollutants vary depending on the measurement of additional analytes. For example, some metals criteria are dependent on the hardness concentration of the water. The need to consider multiple variables to assess a single parameter further limits the ability to directly compare monitoring data to water quality standards. Finally, water quality standards apply only to data collected from directly instream and they do not apply to stormwater data collected from the municipal storm system.

NPDES MS4 permits do not contain numeric effluent limits for pollutants and instead are based on controlling pollution to the “maximum extent practicable” per federal regulations. The use of “criteria” in this report for stormwater monitoring results is intended only to aid in understanding the relative quality of the data. For the purposes of this report, stormwater comparison criteria from the most recently issued industrial stormwater permit (1200-Z) was used to provide a general guide for evaluating the data. However, it should be noted that the industrial stormwater benchmarks are used to regulate stormwater runoff from industrial sites with known pollutant generating activities and potentially elevated levels of pollutants. That land-use characteristic is not consistent with the stormwater monitoring location sampled for this report.

Table 2-1: Comparison Criteria Used for Data Evaluation Purposes

Parameter	Units	Instream		Parameter	Units	Stormwater	
		Criteria Value	Reference Source			Criteria Value	Reference Source
Copper (dissolved)	µg/L	Varies with hardness	.. 1	Copper (total)	µg/L	20	..4
Lead (dissolved)	µg/L	Varies with hardness	.. 1	Lead (total)	µg/L	15	..4
Zinc (dissolved)	µg/L	Varies with hardness	.. 1	Zinc (total)	µg/L	120	..4
Dissolved oxygen	mg/L	6.5	..2	Dissolved oxygen	mg/L	none	NA
E.coli	mpn/100 mL	406	.. 1	E.coli	mpn/100 mL	406	..4
Phosphorus (total)	mg/L	0.10	.. 3	Phosphorus (total)	mg/L	none	NA
TSS	mg/L	none	NA	TSS	mg/L	100	..4

1. OR Water Quality Criteria. Please note that the copper criteria are now based on the biotic ligand model (BLM) which requires additional parameters for evaluation. For purposes of this annual report, the copper criteria were calculated based on hardness instead of using the BLM.

2. Minimum target for cool water habitat.

3. Water quality criteria value of 0.1 mg/L based on EPA standard to control algal growth in flowing waterbodies.

4. 1200-Z Benchmark.

3 Stormwater Data Results

This section presents an evaluation of data results from the City’s stormwater monitoring efforts during the 2018-19 reporting year. The focus of the evaluation is to address the following questions:

- How do data compare with criteria values?
- How do data compare with historical land use-based EMCs?

3.1 Graphic Results

The following figures (Figure 3-1 to Figure 3-5) show stormwater data collected during the 2018-19 reporting year for the following parameters: total copper, lead and zinc; total suspended solids (TSS); and bacteria (E. coli). The data used to generate these plots, along with additional parameters evaluated during stormwater monitoring efforts are provided in Exhibit A, Table A-1.

Data were collected for three stormwater monitoring events at one monitoring location, representing mixed-use land use. Plots include data ranges reflecting historical land-use based event mean concentrations (EMCs). The historical land-use based EMCs reflect regional stormwater data collected from 1990-1996 and supplemented in 2008 as part of a larger Oregon Association of Clean Water Agencies (ACWA) study. These land-use-based EMCs were used to represent untreated stormwater runoff quality when TMDL pollutant load reduction benchmarks were developed as required under the City’s (effective) 2012 NPDES MS4 permit.

As the City’s monitoring location’s contributing land use was characterized as mixed-use, the commercial land use EMC was selected for comparison. Plots are provided to compare stormwater monitoring results for the select parameters against the historical land use EMC data. Comparison criteria values consistent with Table 2-1 are also reflected on the plots.

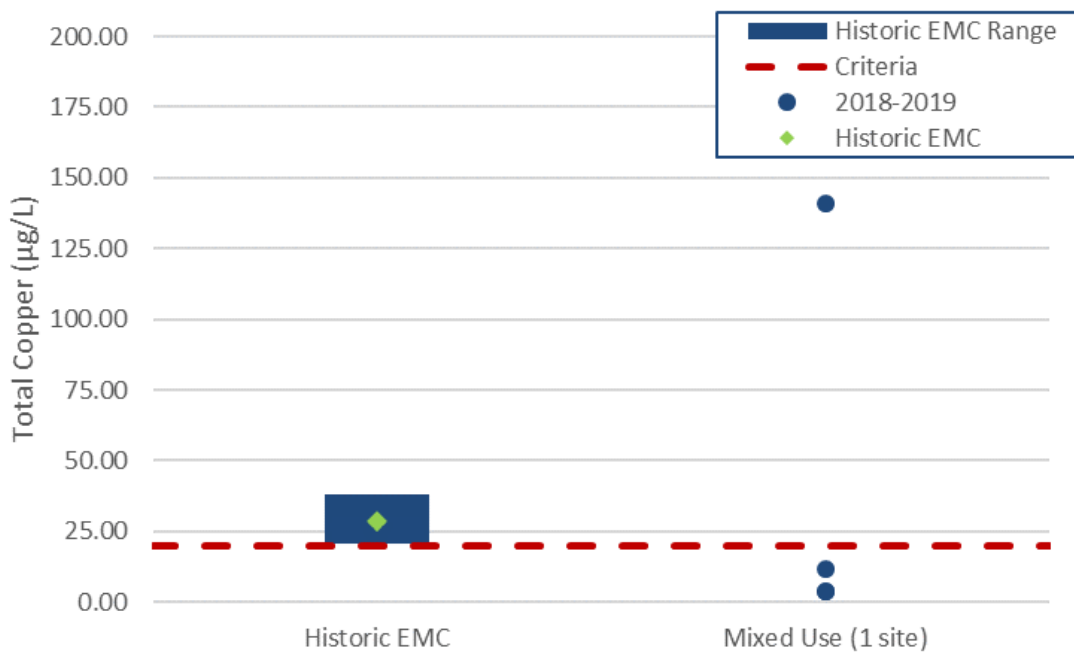


Figure 3-1: Stormwater Monitoring Comparison, Total Copper

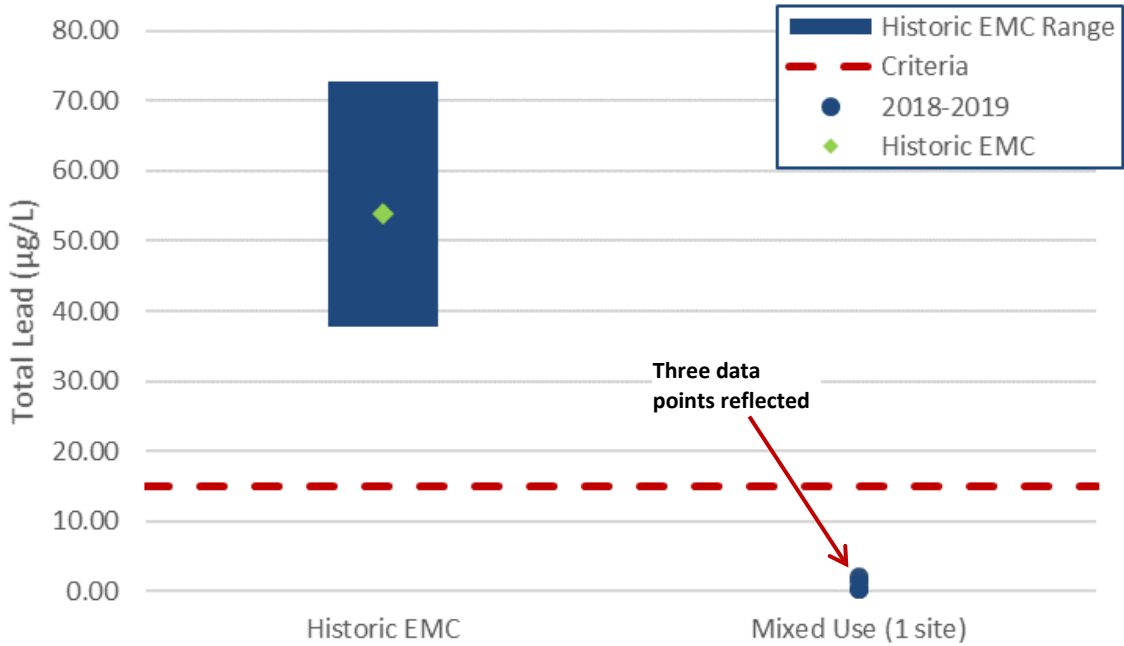


Figure 3-2: Stormwater Monitoring Comparison, Total Lead

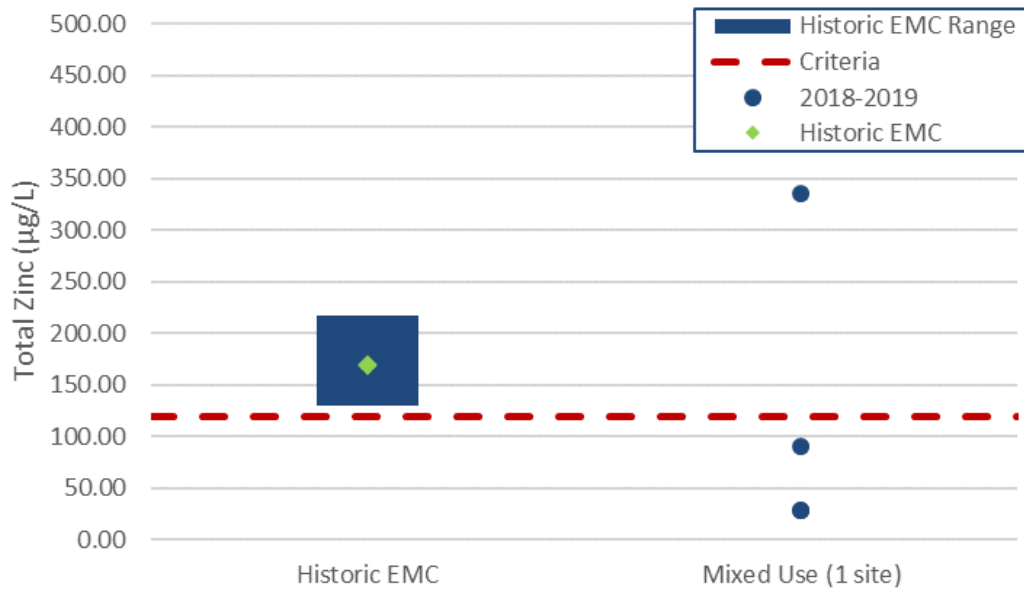


Figure 3-3: Stormwater Monitoring Comparison, Total Zinc

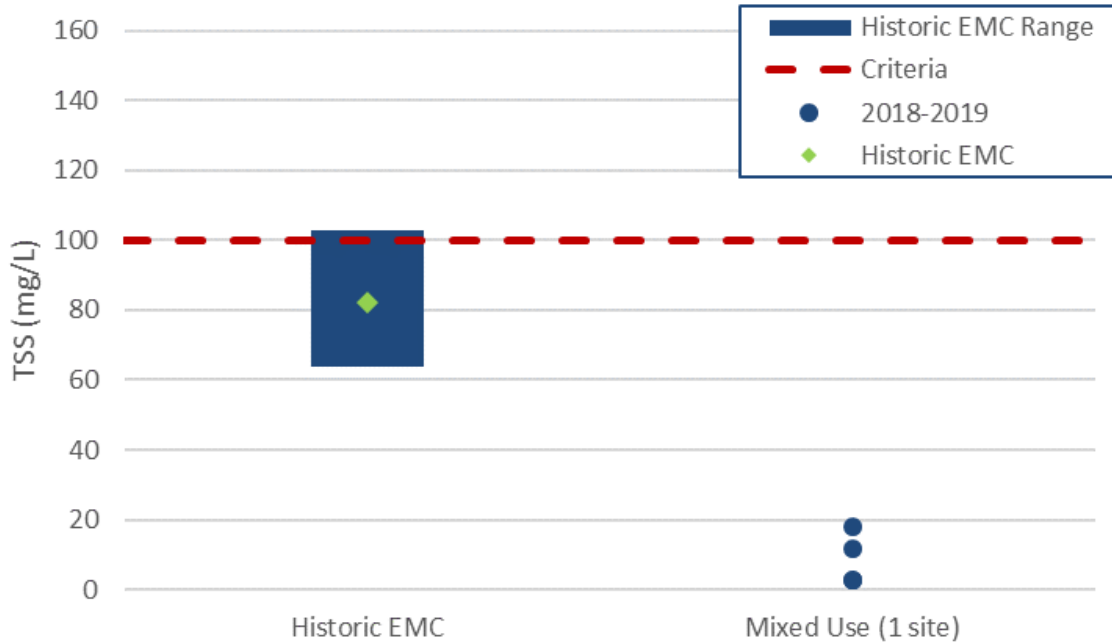


Figure 3-4: Stormwater Monitoring Comparison, Total Suspended Solids

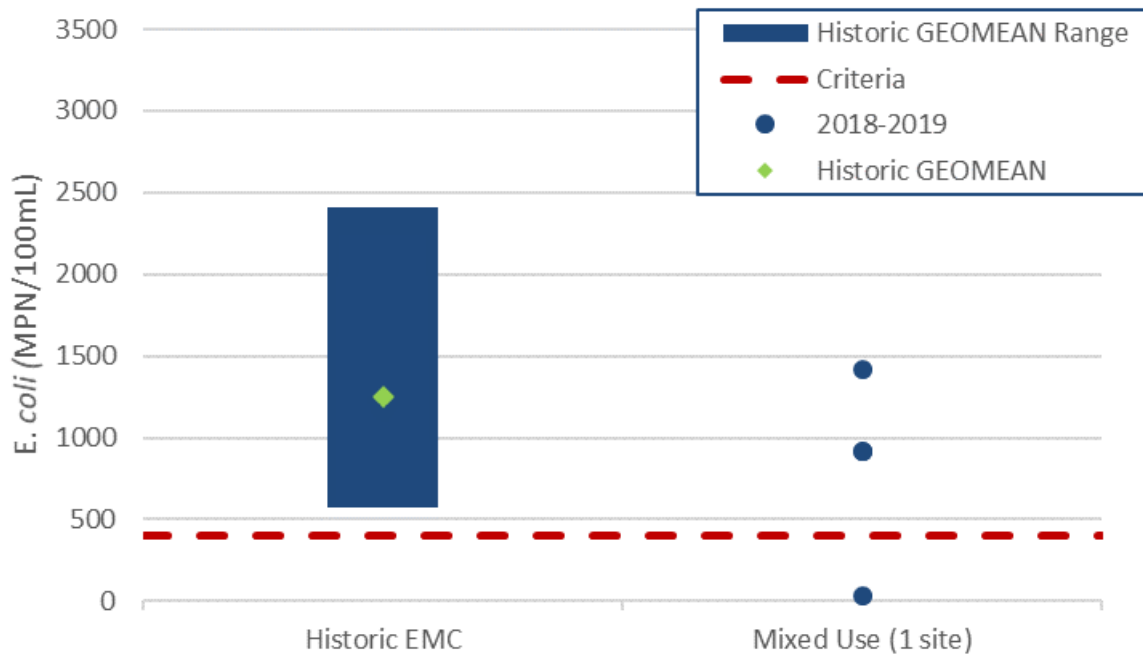


Figure 3-5: Stormwater Monitoring Comparison, Bacteria

3.2 Evaluation

Based on results presented in Figures 3-1 to 3-5, the following assessment of 2018-19 monitoring results was conducted to address the following questions.

How do data compare with criteria values?

- None of the 2018-19 monitoring data exceeded the water quality comparison criteria values for total lead or TSS.
- Water quality comparison criteria were exceeded during two of the three monitoring events for E. coli. Water quality comparison criteria were exceeded during one event for total copper and total zinc.
- The 5/14/19 monitoring event reflected the highest concentrations of total copper, total zinc, and total lead, and resulted in the water quality comparison criteria exceedances for both total copper and total zinc. The 5/14/19 storm event was also a non-qualifying storm event and followed an extended period of dry weather conditions. Monitoring results may reflect first-flush pollutant discharge conditions but should not be considered indicative of a qualified sampling event.

How do data compare with historical land-use-based EMCs?

- The 2018-19 monitoring data for total lead and TSS were consistently lower than the historical EMC.
- The 5/14/19 monitoring event exceeded the historic EMC for both total copper and total zinc.
- 2018-19 monitoring data for bacteria appear generally consistent with historical data.
- The compilation of stormwater monitoring data collected since 2013 could be used to further evaluate current runoff quality and determine whether more recent data reflects improvement over baseline or historic EMCs. Future TMDL benchmark efforts could then use updated land use EMCs, reflecting improvements and progress towards meeting TMDL wasteload allocations (WLAs).

4 Instream Data Results

This section presents an evaluation of data results from the City’s instream monitoring efforts during 2018-2019 reporting period. The focus of the evaluation is to address the following questions:

- How do data compare with instream water quality criteria and goals?
- How do this year’s (2018-19) data compare with previously collected data?
- How do upstream and downstream sites on a water body compare with each other?

Table 4-1 outlines the TMDL and 303(d) parameters by waterbody and has been included for reference.

Table 4-1: Summary of TMDL and 303(d) Parameters Applicable to Wilsonville Monitoring Locations

	Bacteria	Temperature	Biological Criteria	Ammonia	Phosphorus	pH/chlorophyll a	Mercury	PCBs	Dieldrin	PAHs	DDE/DDT	Pesticides	Dioxin	Iron	Lead	Copper	Manganese	Zinc
Willamette Basin TMDL (2006/2019)																		
Middle Willamette Subbasin	✓	✓					✓											
Middle Willamette Basin 303(d) list (2012)																		
Willamette River (direct and tributaries)			✓			✓		✓	✓		✓	✓	✓	✓	✓			

DDE = dichlorodiphenyldichloroethylene

DDT = dichlorophenyltrichloroethane

PAH = polycyclic aromatic hydrocarbon

PCB = polychlorinated biphenyl

TCE = trichloroethylene

4.1 Graphic Results

The following figures (Figure 4-1 to Figure 4-5) compare current and historical instream water quality data by monitoring location. For the purposes of this analysis, “current data” reflects instream monitoring data collected during the 2017 CCCSMP implementation period (2017-19), in order to develop a more robust data set with a limited number of sampling events collected each reporting year. A total of eight monitoring events (four events per reporting year) are reflected in the “current data”. Historical data reflects data collected prior to 2017 for the available period of record (see Section 1.2).

Box and whisker plots were developed for the following parameters: dissolved copper; *E. coli*; total suspended solids (TSS); total phosphorus and dissolved oxygen. Box and whisker plots graphically show the distribution of a data set including maximum and minimum values, median values, and the upper and lower quartiles. The upper and lower quartiles are calculated based on the medians of the upper and lower half of the data sets. The highest and lowest values in the data set represent the whiskers on the plot. Future efforts may include compilation and comparison of dry versus wet weather conditions to assess MS4 impacts on receiving waters.

Criteria values per Table 2-1 are also reflected in each figure. As instream water quality standards for dissolved copper is hardness dependent, chronic instream water quality comparison criteria values based on a hardness of both 50 mg/L and 100 mg/L are plotted for reference. Calculated chronic and acute criteria based on actual hardness for each monitoring event is provided in Exhibit A. Note that the water quality criteria for dissolved oxygen represents a target minimum value, thus values below the criteria are considered “exceedances”.

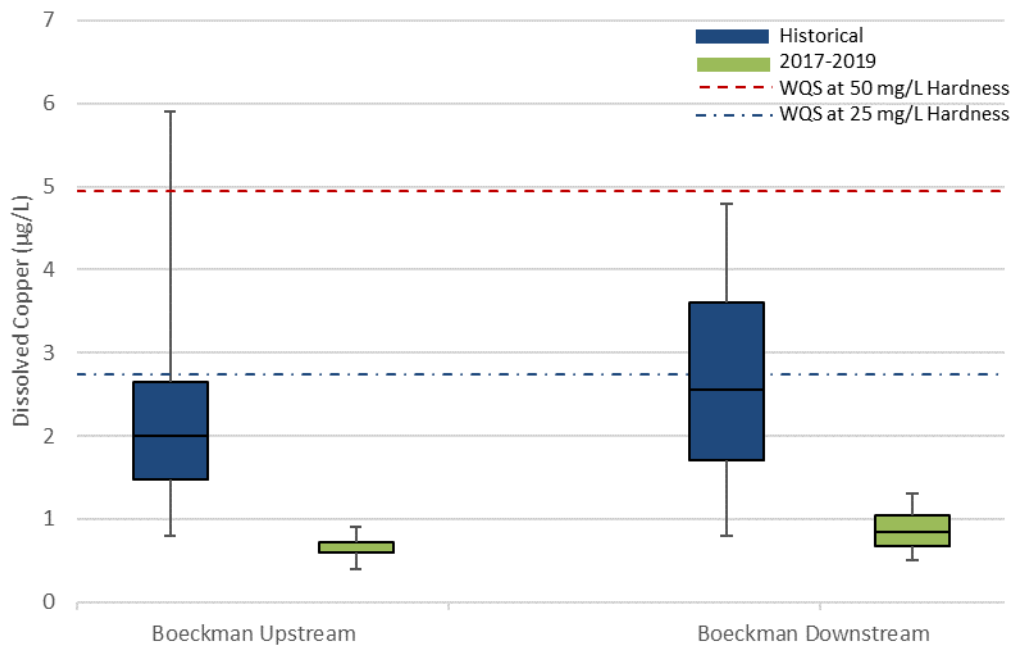


Figure 4-1: Instream Monitoring Historical Comparison, Dissolved Copper

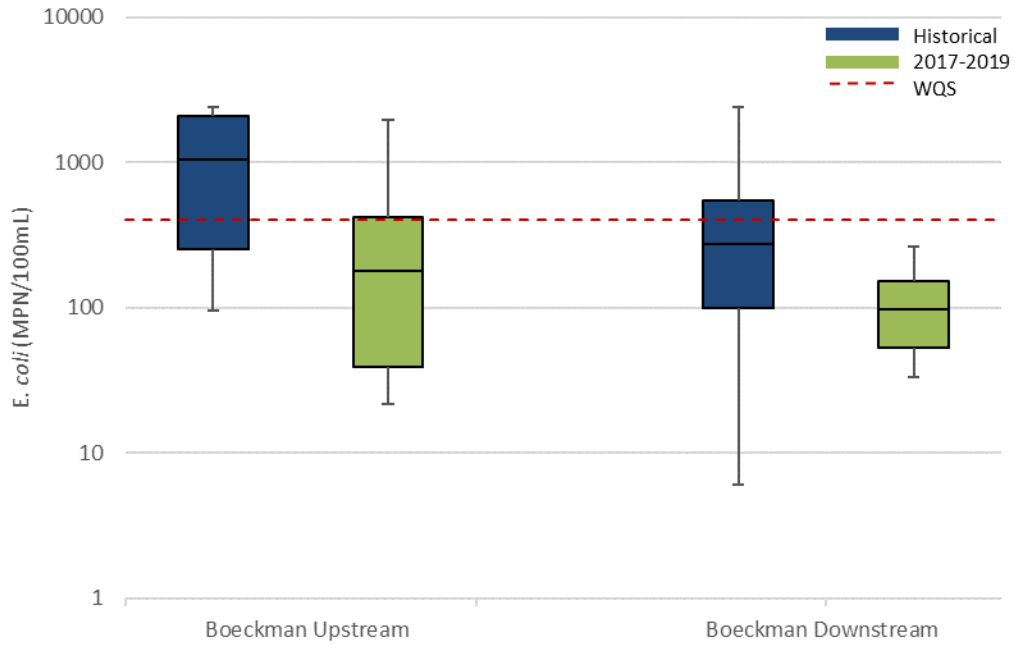


Figure 4-2: Instream Monitoring Historical Comparison, *E. coli*

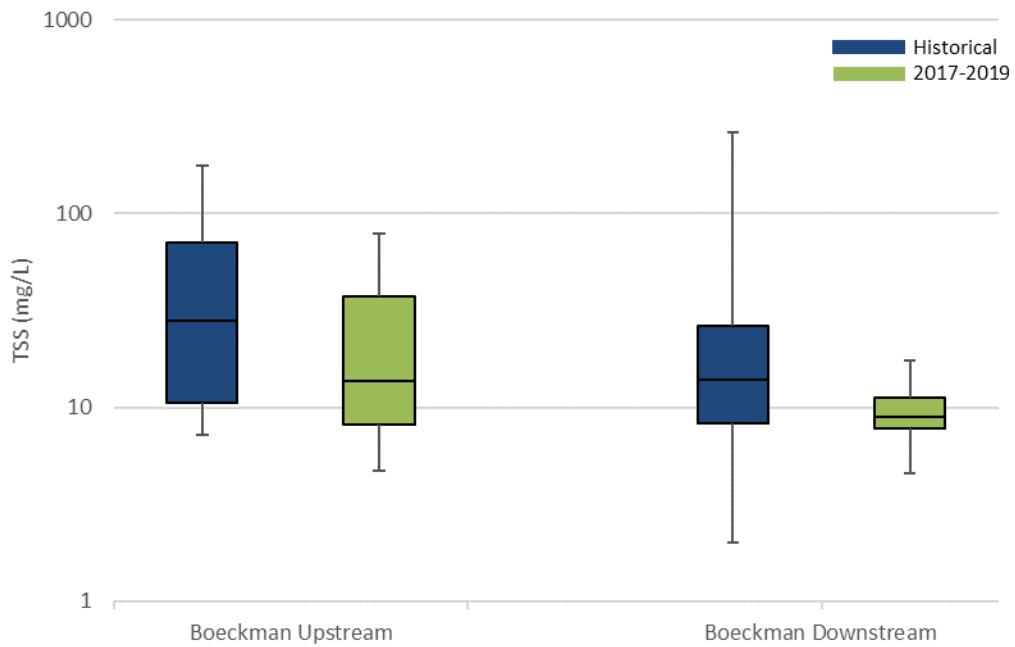


Figure 4-3: Instream Monitoring Historical Comparison, Total Suspended Solids (TSS)

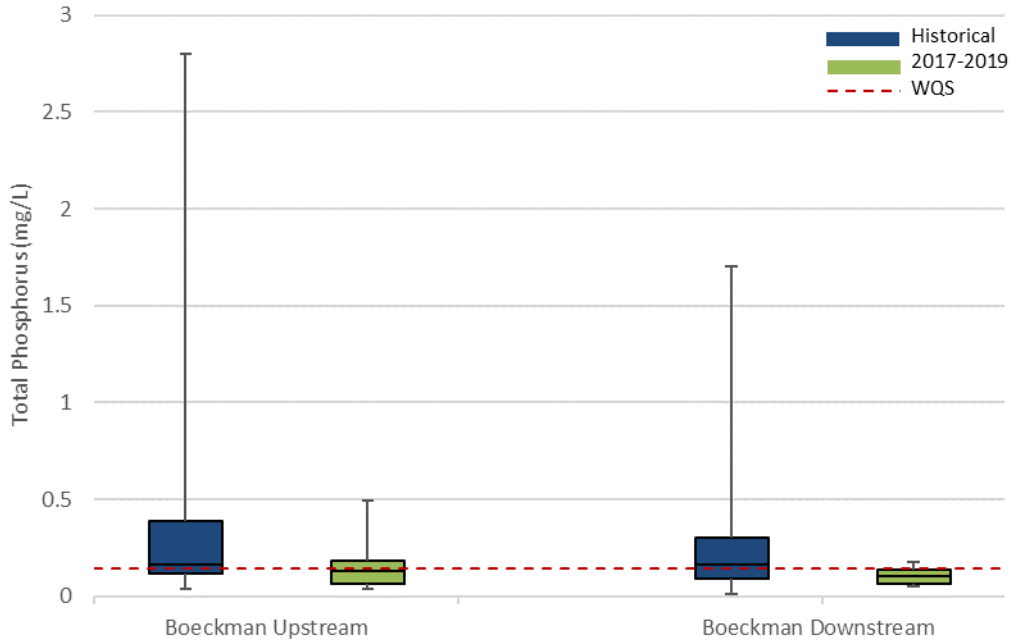


Figure 4-4: Instream Monitoring Historical Comparison, Total Phosphorus

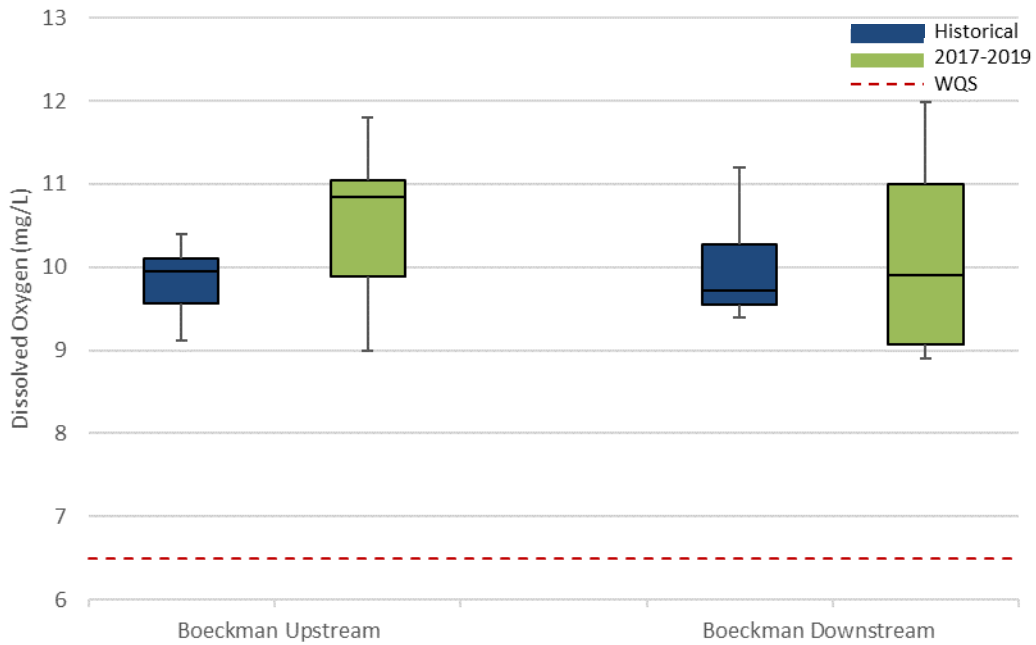


Figure 4-5: Instream Monitoring Comparison, Dissolved Oxygen

4.2 Evaluation

Table 4-2 summarizes the percentage of instream monitoring data from the 2018-19 reporting year that exceed instream water quality criteria. In general, exceedances vary by parameter and location, with both instream monitoring locations exceeding standards for a minimum of one parameter. The largest number of exceedances occurred for total phosphorous.

Table 4-2: Percentage of 2018-19 instream monitoring data exceeding water quality criteria¹

Waterbody	Dissolved Oxygen	E. coli	TSS ²	Copper, Dissolved		Total Phosphorus
				Chronic	Acute	
Boeckman Creek at Boeckman Road (US)	0	25%	N/A	0	0	75%
Boeckman Creek at Memorial Park (DS)	0	0	N/A	0	0	50%

1. Water quality exceedances for metals are based on actual monitored hardness values for each monitoring event.
2. No instream water quality criteria for TSS.

Based on results presented in Table 4-2 and Figures 4-1 to 4-5, the following assessment of instream monitoring results was conducted to address the following questions.

How do data compare with instream water quality comparison criteria?

- Per Table 4-2, 2018-19 data that exceeded the water quality comparison criteria were limited to bacteria and total phosphorus, with phosphorus exceedances most prevalent.
- Per Table 4-2, no 2018-19 data exceeded the water quality criteria for dissolved copper or dissolved oxygen.
- Per Figure 4-2, the current median bacteria values did not exceed the water quality criteria at either the upstream or downstream location. The median historical bacteria value did exceed the water quality criteria at the upstream location.
- Per Figure 4-4, the current median total phosphorous values did not exceed the water quality criteria for both the upstream and downstream location. This represents an improvement over historical median total phosphorous values, which exceeded the water quality criteria at both locations.
- Per Figure 4-5, current and historical dissolved oxygen values at both the upstream and downstream locations were consistently greater than the water quality criteria value.

How does the current data compare with historical data?

- The median of the current data set for dissolved copper, bacteria, and total suspended solids was lower than overall than historical data at both the upstream and downstream locations, indicating water quality improvement. The median of the current data set for total phosphorus was slightly lower than historical data at the downstream location, indicating a potential improvement.
- The median of the current data set for dissolved oxygen was higher than historical data at both the upstream and downstream locations, indicating overall improvement.
- Generally, the range of the current data for dissolved copper and bacteria was lower than historical data, indicating a marked improvement in instream water quality.

How do upstream and downstream sites on a water body compare with each other?

- For total suspended solids, bacteria, and total phosphorous, the median of the current and historical data sets at the downstream monitoring location is equal to or lower than the upstream location, indicating water quality improvements over time.
- For dissolved copper, the median of the current and historical data sets at the downstream location is higher than the upstream location, indicating the potential for deteriorating water quality.
- For dissolved oxygen, the current and historical data sets were generally consistent between upstream and downstream sampling locations. However, the median of the current and historical data sets at the downstream location are lower than the upstream location, indicating reduced water quality.

5 Adaptive Management Considerations

As required by the permit, documented approaches to adaptive management of stormwater programs were submitted by permittees to DEQ on November 1, 2012. The approach submitted by the City included two elements:

- An annual process to determine if the stormwater program is being implemented in accordance with the DEQ-approved Stormwater Management Plan (SWMP). The annual process may include program adjustments, if needed.
- A comprehensive process at the end of the permit term, submitted as part of the permit renewal package, to identify proposed program modifications including modification, addition, or removal of BMPs incorporated into the SWMP or modifications to the monitoring program. Such program modifications are based on a more in-depth evaluation of submitted program documentation and studies, including monitoring data.

Specific to the City's monitoring program, at the end of the permit term (in 2017), the City opted to discontinue its individual monitoring program and participate in the CCCSMP. The 2017 CCCSMP update reflected the results of previous monitoring activities by participating co-permittees under the premise of the 2012 NPDES MS4 permit. The following section outlines the future monitoring data analyses considerations and potential stormwater management program refinements considering the specific monitoring data presented herein. The 2018-19 reporting year is the second year implementing the 2017 CCCSMP.

5.1 Future Data Analyses

Data evaluation and results presented in Sections 3 and 4 provide insights into the water quality of municipal stormwater outfalls and receiving waters within the City's MS4-permitted area and help to identify additional evaluations that could be helpful in providing additional insights. Based on results and conclusions in this annual monitoring report, recommended future monitoring and data evaluation may include the following if feasible:

- Continued instream data review based on wet versus dry weather conditions. The current instream data analysis did not include comparison by weather conditions. Periodic review and analysis of wet versus dry weather conditions can continue to inform how/if MS4 sources are contributing to instream water quality conditions.
- Review of monitoring data based on a classification of instream locations by the degree impact from MS4 discharges.
- Expanded analysis of instream monitoring to include the additional continuous and field data collection efforts conducted on Coffee Creek. Elevated conductivity readings have been reported and follow up source identification activities are being conducted. Current analysis in this report is limited to instream locations listed in the 2017 CCCSMP.
- Comprehensive stormwater monitoring comparison with historic EMCs. Per Section 3, comparison of the current land use-based stormwater monitoring results with historic land use-based EMCs indicates that for select parameters, the historic EMCs may be overestimating the pollutant load generated from that land use. Compilation of additional stormwater data for the same monitoring

sites may indicate whether modifications to land use EMCs in future TMDL benchmark efforts is warranted.

- Identification of additional monitoring locations within the urban growth boundary. Review and analysis of instream or stormwater monitoring data can examine the effects of potential new development in Wilsonville.

5.2 Potential Program Revisions

Ongoing review of monitoring data can help identify future stormwater management program revisions and capital project needs. Once the administrative extension period has concluded and the Clackamas NPDES MS4 permit is reissued, program modifications will be considered and implemented through the adaptive management process and in consideration of results from the annual monitoring report.

Additional, interim quality control efforts may be necessary in conjunction with the ongoing implementation of the City's stormwater monitoring program and 2017 CCCSMP, to ensure quality of third-party sample collection and analytical efforts. If standard operating protocols are not adhered to and/or sampling results are questionable, follow up sampling may be required to ensure that the minimum number of qualified samples are collected.

Exhibit A

Data Tables

Table A-1. Wilsonville Stormwater Monitoring Results (2018-2019)

Library Pond Outfall at Memorial Park (Mixed Land Use)

WES ID and Location	Date	Rainfall (Y/N)	Water Quality Standard Comparison														Additional Parameters of Concern							Supporting Parameters								
			Temp (C)	WQ Std ¹ (C)	DO (mg/L)	WQ Std ² (mg/L)	Nitrate (mg/L)	WQ Std ³ (mg/L)	E. coli (MPN per 100ml)	WQ Std (MPN per 100ml)	Copper, Total (ug/L)	WQ Criteria (ug/L) ⁵	Lead, Total (ug/L)	WQ Criteria (ug/L) ⁵	Zinc, Total (ug/L)	WQ Criteria (ug/L) ⁵	Total Suspended Solids (mg/L)	WQ Criteria (ug/L) ⁵	Volatile Solids (mg/L)	Total Dissolved Solids (mg/L)	Ammonia (mg/L)	Total Phosphorus (mg/L)	Ortho-phosphate (mg/L)	Copper, Dissolved (ug/L)	Lead, Dissolved (ug/L)	Zinc, Dissolved (ug/L)	Hardness (mg/L)	pH	Conductivity (uS/cm)			
Library Pond Outfall	1/8/19	Y	9.4	18	11.2	6.5	0.27	10	920.8	406	4.0	20	0.3	15	28.0	120	2.8	100	1	66.7	<0.02	0.06	0.03	2.1	0.10	27.0	40.0	5.7	60.5			
Library Pond Outfall	5/14/19	Y	14.4	18	9.9	6.5	1.59	10	30.7	406	141.0	20	2.1	15	335.0	120	18.0	100	224	260.0	2.72	1.73	0.33	121.0	1.40	325.0	40.0	8.1	157.9			
Library Pond Outfall	6/7/19	Y	17.4	18	9.2	6.5	0.00045	10	1413.6	406	12.0	20	1.3	15	91.0	120	11.6	100	1	83.0	0.95	0.29	0.15	9.2	0.60	82.0	8.0	8.2	65.1			
Mean ^{4,6}			13.7		10.1		0.62		341.9		52.3		1.2		151.3		10.8		75	136.6	1.84	0.69	0.17	44.1	0.70	144.7	29.3	7.3	94.5			
Standard Deviation ⁴			4.0		1.0		0.85		700.9		76.9		0.9		162.1		7.6		128.7	107.2	1.25	0.90	0.15	66.7	0.66	158.6	18.5	1.4	55.0			
Maximum ⁴			17.4		11.2		1.59		1413.6		141.0		2.1		335.0		18.0		224	260.0	2.72	1.73	0.33	121.0	1.40	325.0	40.0	8.2	157.9			
Minimum ⁴			9.4		9.2		0.00045		30.7		4.0		0.3		28.0		2.8		1	66.7	0.01	0.06	0.03	2.1	0.10	27.0	8.0	5.7	60.5			
WQ Exceedance (number of samples)			0		0		0		2		1		0		1		0															
WQ Exceedance (% of total)			0%		0%		0%		67%		33%		0%		33%		0%															

Notes:

General: *Red font* indicates that the dissolved values are higher than the total. Potential QA/QC need.

1. WQ Standard of 18 C per DEQ's Temperature Water Quality Standard Implementation IMD 2008 for salmon and trout rearing and migration.
2. No DO TMDL for the Willamette River; 6.5 mg/L selected as target minimum DO concentration for cool water habitat.
3. Table 20 - Protection of human health for water and fish ingestion.
4. Non-detects were replaced with half the detection limit. Values listed below the detection limit were replaced with half the detection limit for statistical calculations.
5. Water quality criteria values based on current 1200-Z permit benchmarks.
6. Geometric mean used for E. coli.

Table A-2. Wilsonville Instream Water Quality Monitoring Results (2018-2019)

Boeckman Creek at Boeckman Road (Upstream)

WES ID and Location		Date	Rainfall (Y/N)	Water Quality Standard Comparison													Additional Parameters of Concern							Supporting Parameters								
				Temp (C)	WQ Std ¹ (C)	DO (mg/L)	WQ Std ² (mg/L)	Nitrate (mg/L)	WQ Std ³ (mg/L)	E. coli (MPN per 100ml)	WQ Std (MPN per 100ml)	Total Phosphorus (mg/L) ⁵	WQ Std (mg/L)	Copper, Dissolved (ug/L) ⁶	WQ Std (Chronic) (ug/L)	WQ Std (Acute) (ug/L)	Lead, Dissolved (ug/L) ⁶	WQ Std (Chronic) (ug/L)	WQ Std (Acute) (ug/L)	Zinc, Dissolved (ug/L) ⁶	WQ Std (Chronic) (ug/L)	WQ Std (Acute) (ug/L)	Volatile Solids (mg/L)	Total Suspended Solids (mg/L)	Total Dissolved Solids (mg/L)	Ammonia (mg/L)	Ortho-phosphate (mg/L)	Copper, Total (ug/L)	Lead, Total (ug/L)	Zinc, Total (ug/L)	Hardness (mg/L)	pH
Boeckman Creek at Boeckman Rd	7/18/18	N	17.3	18	9.0	6.5	0.56	10	517.2	406	0.17	0.1	0.7	6.76	9.86	0.03	1.76	45.08	3.6	89.44	88.71	100	41.4	66.7	0.03	0.05	2.1	0.4	10.0	72.0	6.6	168.2
Boeckman Creek at Boeckman Rd	10/17/18	N	9.4	18	11.0	6.5	0.35	10	307.6	406	0.23	0.1	0.8	7.08	10.38	0.03	1.86	47.84	6.1	93.63	92.87	146	78.6	120.0	<0.02	0.11	4.0	2.0	33.0	76.0	7.0	121.4
Boeckman Creek at Boeckman Rd	1/16/19	N	6.4	18	11.8	6.5	2.87	10	21.8	406	0.07	0.1	0.9	4.78	6.73	0.03	1.12	28.80	19.0	63.43	62.92	135	19.0	133.0	0.24	0.04	1.8	0.3	11.0	48.0	7.4	7.9
Boeckman Creek at Boeckman Rd	4/17/19	N	10.6	18	10.7	6.5	2.48	10	39.3	406	0.49	0.1	0.6	2.65	3.50	0.03	0.52	13.26	5.1	35.26	34.97	22	4.7	84.0	0.02	0.02	1.1	0.1	5.2	24.0	8.6	116.8
Mean ^{4,7}			10.9		10.6		1.57		108.0		0.24		0.8			0.03			8.5			101	35.9	100.9	0.08	0.06	2.3	0.7	14.8	55.0	7.4	103.6
Standard Deviation ⁴			4.6		1.2		1.29		236.6		0.18		0.1			0.00			7.1			49	32.2	30.8	0.11	0.04	1.2	0.9	12.4	24.1	0.9	67.9
Maximum ⁴			17.3		11.8		2.87		517.2		0.49		0.9			0.03			19.0			146	78.6	133.0	0.24	0.11	4.0	2.0	33.0	76.0	8.6	168.2
Minimum ⁴			6.4		9.0		0.35		21.8		0.07		0.6			0.03			3.6			22	4.7	66.7	0.01	0.02	1.1	0.1	5.2	24.0	6.6	7.9
Water Quality Exceedance (number of samples)			0		0		0		1		3			0	0		0	0		0	0											
Water Quality Exceedance (% of total)			0%		0%		0%		25%		75%			0	0		0	0		0	0											

Boeckman Creek at Memorial Park (Downstream)

WES ID and Location		Date	Rainfall (Y/N)	Water Quality Standard Comparison													Additional Parameters of Concern							Supporting Parameters								
				Temp (C)	WQ Std ¹ (C)	DO (mg/L)	WQ Std ² (mg/L)	Nitrate (mg/L)	WQ Std ³ (mg/L)	E. coli (MPN per 100ml)	Water Quality Std (MPN per 100ml)	Total Phosphorus (mg/L)	WQ Std (mg/L)	Copper, Dissolved (ug/L) ⁶	WQ Std (Chronic) (ug/L)	WQ Std (Acute) (ug/L)	Lead, Dissolved (ug/L) ⁶	WQ Std (Chronic) (ug/L)	WQ Std (Acute) (ug/L)	Zinc, Dissolved (ug/L) ⁶	WQ Std (Chronic) (ug/L)	WQ Std (Acute) (ug/L)	Volatile Solids (mg/L)	Total Suspended Solids (mg/L)	Total Dissolved Solids (mg/L)	Ammonia (mg/L)	Ortho-phosphate (mg/L)	Copper, Total (ug/L)	Lead, Total (ug/L)	Zinc, Total (ug/L)	Hardness (mg/L)	pH
Boeckman Creek at Memorial Park	7/18/18	N	16.0	18	9.0	6.5	0.62	10	93.3	406	0.14	0.1	0.7	9.26	13.95	0.03	2.63	67.40	10.0	122.13	121.14	194.6	4.6	166.7	<0.02	0.1	3.4	0.08	6.3	104.0	7.1	105.0
Boeckman Creek at Memorial Park	10/17/18	N	10.5	18	11.0	6.5	0.66	10	133.0	406	0.18	0.1	1.0	9.87	14.95	0.03	2.85	73.05	8.1	130.05	128.99	96.2	10.7	200.0	<0.02	0.09	1.4	0.14	6.1	112.0	6.6	207.4
Boeckman Creek at Memorial Park	1/16/19	N	5.8	18	12.0	6.5	2.46	10	261.3	406	0.07	0.1	1.3	5.79	8.31	0.03	1.44	36.88	20.0	76.63	76.01	67.7	8.0	66.6	0.11	0.08	0.7	0.14	7.9	60.0	7.3	9.3
Boeckman Creek at Memorial Park	4/17/19	N	10.5	18	10.2	6.5	2.11	10	100.8	406	0.07	0.1	1.2	4.44	6.20	0.03	1.02	26.14	6.4	58.92	58.45	23.0	17.5	98.0	0.04	0.06	1.8	0.23	7.7	44.0	8.4	136.7
Mean ^{4,7}			10.7		10.6		1.46		134.5		0.11		1.1			0.03			11.1			95.4	10.2	132.8	0.04	0.08	1.8	0.15	7.0	80.0	7.3	114.6
Standard Deviation ⁴			4.2		1.3		0.96		78.1		0.05		0.3			0.00			6.1			72.7	5.5	61.3	0.05	0.02	1.1	0.06	0.9	33.1	0.7	82.2
Maximum ⁴			16.0		12.0		2.46		261.3		0.18		1.3			0.03			20.0			194.6	17.5	200.0	0.11	0.10	3.4	0.23	7.9	112.0	8.4	207.4
Minimum ⁴			5.8		9.0		0.62		93.3		0.07		0.7			0.03			6.4			23.0	4.6	66.6	0.025	0.06	0.7	0.08	6.1	44.0	6.6	9.3
Water Quality Exceedance (number of samples)			0		0		0		0		2			0	0		0	0		0	0											
Water Quality Exceedance (% of total)			0%		0%		0%		0%		50%			0	0		0	0		0	0											

Notes:

General: **Red font** indicates that the dissolved values are higher than the total. Potential QA/QC need.

1. WQ Standard of 18 C per DEQ's Temperature Water Quality Standard Implementation IMD 2008 for salmon and trout rearing and migration.

2. No DO TMDL for the Willamette River; 6.5 mg/L selected as target minimum DO concentration for cool water habitat.

3. Table 20 - Protection of human health for water and fish ingestion.

4. Non-detects were replaced with half the detection limit. Where lab reports were not provided, detection limits were assumed based on the 10/17/18 sampling event. Values listed below the detection limit were replaced with half the detection limit for statistical calculations.

5. Water quality criteria value of 0.1 mg/L based on EPA standard to control algal growth in flowing waterbodies.

6. Acute and chronic water quality standards for metals based on hardness only. The current copper WQ standards now reflect use of the biotic ligand model (BLM), but was not evaluated for this report.

7. Geometric mean used for E. coli.

Exhibit B

Maps

Number	Jurisdiction	Site Description	Receiving Water	Associated Land Use	Sampling Frequency
1	CCSD #1	Outfall #19 at SE Webster Rd	Kellogg Creek	Residential	3 / Year
2	CCSD #1	Outfall #12 at Pheasant Ct	Mt. Scott Creek	Mixed Use	3 / Year
3	CCSD #1	Sunnyside Village Apartments	Sieben Creek	Multi-family Residential	3 / Year
4	CCSD #1	SE Oregon Trail Dr. near SE Sieben Park Way	Unnamed tributary to Sieben Creek	Commercial	3 / Year
5	Milwaukie	Outfall #23003 at Roswell Street	Johnson Creek	Residential	3 / Year
6	Oregon City	Oregon City Shopping Center	Clackamas River	Commercial	3 / Year
7	Oregon City	Clackamette Cove at Agnes Ave	Clackamas River	Industrial	3 / Year
8	SWMACC	Rivergrove Boat Ramp at SW Dogwood Dr	Tualatin River	Residential	3 / Year
9	West Linn	Summit St & Horton Rd	Barlow Creek	Residential	3 / Year
10	Wilsonville	Library Detention Pond Inlet at Memorial Park	Tributary to Boeckman Creek	Mixed Use	3 / Year
11	Oak Lodge	SE Naef Rd (Stringfield Park)	Boardman Creek	Mixed Use	3 / Year

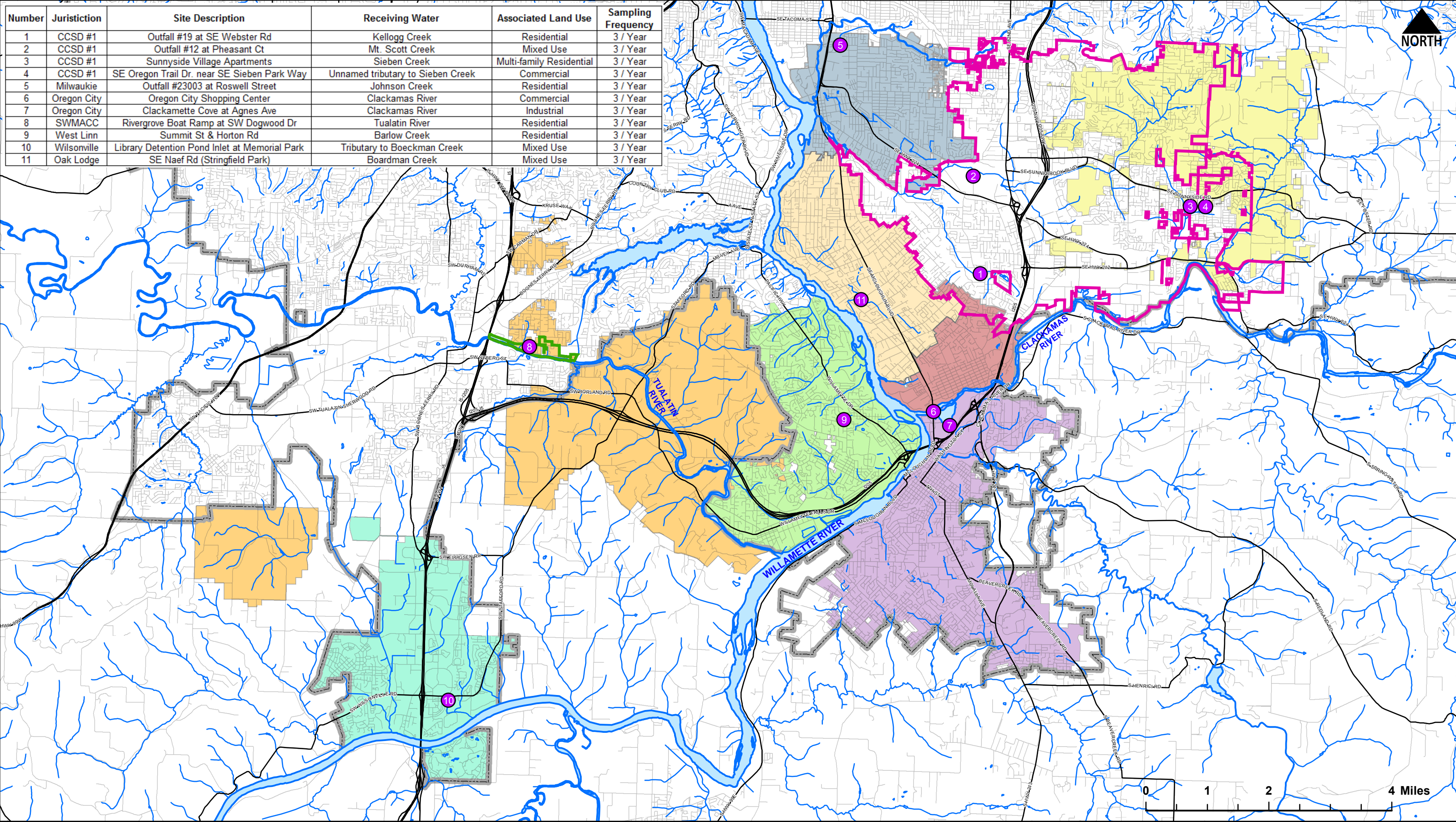


FIGURE B-1. CCCSMP OUTFALL MONITORING LOCATIONS



DECEMBER 2016

	Outfall Monitoring Locations		CCSD #1		Gladstone		Oregon City
	Urban Growth Boundary		Rivergrove		Happy Valley		West Linn
	Oak Lodge Sanitary District		SWMACC		Milwaukie		Wilsonville



Number	Jurisdiction	Sampling Method	Site Description	Stream Name
1	CCSD #1	Routine	SE 120th Ave and Carpenter Dr (manhole)	Carli Creek
2	CCSD #1	Routine	Hwy 212/224	Sieben Creek
3	CCSD #1	Routine	Hwy 212/224	Rock Creek
4	CCSD #1	Routine	SE 84th Ave	Phillips Creek
5	CCSD #1	Routine	Hwy 224	Mt. Scott Creek
6	CCSD #1	Routine	SE Rusk Rd	Kellogg Creek
7	CCSD #1	Routine	SE Last Rd	Cow Creek
8	CCSD #1	Routine	Rowe Middle School (SE Lake Rd)	Kellogg Creek
9	Milwaukie	Storm-Targeted	Box Culvert at SE Lake Rd	Minthorn Creek
10	Oregon City	Routine	17082 Holly Ln (Holly Ln Bridge)	Abernethy Creek
11	Oregon City	Routine	316 17th St (at railroad trestle)	Abernethy Creek
12	Oregon City	Routine	Behind 415 S McLoughlin Blvd	Coffee Creek
13	Oregon City	Routine	Behind 13530 Redland Rd	Park Place Creek
14	Oregon City	Routine	North end of Singer Creek Park	Singer Creek
15	Oregon City	Routine	502 7th St (manhole 37138 on Center St)	Singer Creek
16	West Linn	Storm-Targeted	Imperial Dr	Tanner Creek
17	West Linn	Storm-Targeted	Caloroga Rd	Trillium Creek
18	West Linn	Storm-Targeted	Johnson Rd at Ryan Ct	Unnamed Creek
19	Gladstone	Routine	Outfall at Risley Rd	Rinearson Creek
20	SWMACC	Routine	SW Mossy Brae Rd	Pecan Creek
21	Wilsonville	Routine	Boeckman Rd at Boeckman Creek Crossing	Boeckman Creek (upstream)
22	Wilsonville	Routine	Memorial Park at Rose Ln Footbridge	Boeckman Creek (downstream)
23	Oak Lodge	Storm-Targeted	15000 SE Fairoaks Ave	River Forest Creek
24	Oak Lodge	Storm-Targeted	3131 SE Walta Vista Ct	Boardman Creek
25	Oak Lodge	Storm-Targeted	12686 SE 28th Ave	Kellogg Creek

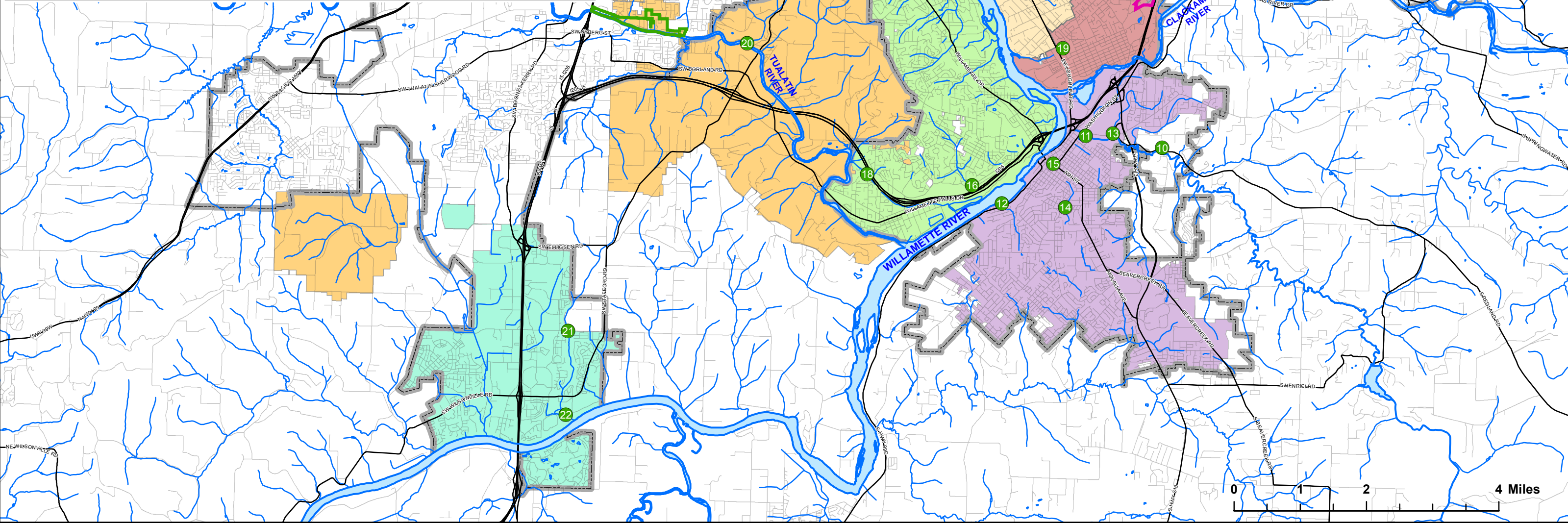


FIGURE B-2. CCCSMP INSTREAM MONITORING LOCATIONS

DECEMBER 2016

Instream Monitoring Locations	CCSD #1	Gladstone	Oregon City
Urban Growth Boundary	Rivergrove	Happy Valley	West Linn
Oak Lodge Sanitary District	SWMACC	Milwaukie	Wilsonville

