Annual Compliance Report No. 24

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

National Pollutant Discharge Elimination System (NPDES)
Municipal Separate Storm Sewer System (MS4)
Discharge Permit No. 101314

Prepared for:

Oregon Dept. of Environmental Quality

Submitted by:

City of Portland
Port of Portland

Date:

November 1, 2019

Portland, Oregon
National Pollutant Discharge Elimination System
Municipal Separate Storm Sewer System Discharge Permit
Permit Number: 101314

ANNUAL COMPLIANCE REPORT
Fiscal Year 2018–19
(July 1, 2018 – June 30, 2019)

We, the undersigned hereby submit this annual compliance report for the Municipal Separate Storm Sewer System Discharge Permit No. 101314, in accordance with Schedule B, Section 5 of that permit. We certify, as required by 40 CFR Section 122.22, under penalty of law, that this document was prepared under our direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on our 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 our knowledge and belief, true, accurate, and complete. We are aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Michael Jordan
Director, Bureau of Environmental Services
City of Portland

10/14/19
Date

Vincent Granato
Chief Operating Officer
Port of Portland

10/11/2019
Date

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ANNUAL COMPLIANCE REPORT NO. 24

Fiscal Year 2018–19

(July 1, 2018 – June 30, 2019)

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Executive Summary

Introduction

This 24th *Annual Compliance Report* is submitted to the Oregon Department of Environmental Quality (DEQ) to fulfill reporting requirements for the National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Discharge Permit #101314 (hereinafter referred to as the MS4 permit or permit) issued to the City of Portland and the Port of Portland (the co-permittees) by DEQ on January 31, 2011. The report provides information about activities that have been accomplished in accordance with the co-permittees' Stormwater Management Plans (SWMPs) during fiscal year (FY) 2018–19 (July 1, 2018, through June 30, 2019). It includes the following: (a) the City's Total Maximum Daily Load (TMDL) annual report, which refers to the MS4 annual report for topics related to stormwater and describes additional activities related to temperature (Part I, Appendix A), and (b) the monitoring report that summarizes sampling and monitoring activities conducted during FY 2018–19 (Part III).

Notable Accomplishments

The **City of Portland's** information is provided in **Part I** of the report. Notable accomplishments this year for the City included the following:

- ✓ Conducted various public involvement and education activities, which included providing water quality education, outreach, and curriculum resources for approximately 21,152 K–12 students; awarding 13 community stewardship grants amounting to $104,780; involving over 20,000 participants and 6,700 volunteers in community events; and providing educational materials and outreach through the City's website, newsletter, bill inserts, Facebook page, and green blogs.
- ✓ Conducted ongoing assessment, inspection, repair, and maintenance activities of MS4 components, including the cleaning of 5,170 green street facilities, 11,196 catch basins and inlets, 30,323 lineal feet of ditches, and 20,676 lineal feet of pipes and culverts. Also, the City swept major arterials four to six times during the year and continued to sweep residential streets approximately once per year.
- ✓ Administered 225 Industrial Stormwater NPDES Discharge Permits with requirements to maintain best management practices (BMPs) for stormwater runoff. Conducted 223 site inspections on Industrial Stormwater NPDES-permitted sites.
- ✓ Conducted 211 technical assistance site visits to Portland businesses to promote pollution prevention and environmental sustainability. Provided BMP information to aid businesses when conducting pollutant-generating activities, such as painting, catch basin maintenance, dewatering, material loading and unloading, and storage and waste disposal.
- ✓ Issued 27 enforcement actions against 19 responsible parties for prohibited discharges to the MS4, and conducted 202 inspections at 128 outfalls to identify illicit discharges.

- ✓ Managed 223 active public construction projects with erosion control components. Conducted 6,730 erosion control-related inspections of private construction sites and issued 2,058 associated enforcement actions, which includes stop work orders, correction notices, and notices of violation.
- ✓ Conducted 8,126 stormwater management permit reviews reflecting 1,563 projects with private stormwater management facilities and an additional 1,719 pollution source control measures at commercial and industrial properties.
- ✓ Conducted inspections at 1,262 properties (containing 2,613 associated private stormwater management facilities) for compliance with operations and maintenance requirements.
- ✓ Completed construction of various public water quality retrofit and green street projects treating a total drainage area of 210 acres.
- ✓ Supported 109 private property retrofit projects associated with the City's Private Property Retrofit Program, treating 4.4 acres of impervious area.
- ✓ Provided technical assistance, incentives, and grants as part of programs to encourage onsite retrofits and water quality improvements for existing private development. Under the Clean River Rewards utility discount program, the City received 103 new commercial site registrations and 1,711 new residential site registrations.
- ✓ Acquired more than 23 acres of land and planted 6,587 trees and 10,725 shrubs along 7,085 linear feet of streambank covering 28.7 acres. Also, in partnership with Friends of Trees and other community planting partners, planted 2,777 street trees and yard trees in City of Portland rights-of-way, on school properties, and in private yards.

The **Port of Portland's** information is presented in **Part II** of the report. Notable accomplishments this year for the Port included the following:

- ✓ Continues to conduct annual maintenance of the storm sewer system components and structural controls and conducts regular sweeping on specific Port-managed properties.
  - − These efforts included maintaining over 1,117 catch basins, inspecting and maintaining Port-owned water quality treatment facilities, cleaning 6,741 feet of storm line, and conducting 2,668 hours of street sweeping. Together, these tasks diverted approximately 877 tons of potential pollutants from Port-receiving waters.
- ✓ Continued to implement the Illicit Discharge Detection and Elimination Program. The program involves field screening of priority outfalls and investigation of potential illicit discharges.
  - − Dry-weather field screening inspections were conducted at 68 outfalls Port-wide. No potential illicit discharges were observed.
- ✓ Continued to implement the Industrial Facility Inspection Program, inspecting a total of 32 priority industrial facilities Port-wide in FY 2018–19. Staff provided technical assistance during these visits, while also setting timelines for correction of any deficiencies where appropriate.
- ✓ Trained Port operating area staff on a variety of stormwater-related subjects, including pesticide application (14 staff members), stormwater pollution prevention and spill

response (206 staff members), and erosion prevention (20 staff members). In addition, 53 new employees were trained on the importance of preventing pollutants from entering stormwater in the Port's new employee orientation program.

- ✓ Continued the support of organizations that work to promote watershed health, including the Columbia Slough Watershed Council, Lower Columbia Estuary Partnership, Intertwine Alliance, and Willamette Partnership. Other activities include financial sponsorship, membership, volunteer assistance at events, and in-kind services for the following stakeholder groups: Oregon Environmental Council, Oregon Association of Clean Water Agencies, Portland International Airport (PDX) Community Advisory Committee, and KOIN 6 Water… Do Your Part Clean Water Partners.
- ✓ Continues to coordinate with the City of Portland on monitoring and compliance with MS4 deliverables in addition to the annual report.
- ✓ Continues to implement their Stormwater Design Standards Manual (DSM), requiring treatment for post-construction stormwater runoff in areas where the Port's DSM applies. In all other areas within the Portland MS4 Urban Services Area, the Port complies with the City's Stormwater Management Manual.

A Monitoring Report that summarizes monitoring activities conducted through the year is provided in **Part III** of the report. The monitoring data is provided in Appendix B of Part III and will also be provided to DEQ electronically.

Permit Areas

The permit areas for the co-permittees are as follows:

City of Portland: Approximately 15,214 acres within the City of Portland's urban services boundary drain to the City's MS4.

Port of Portland: The Port owns approximately 5,487 acres within the City of Portland's urban services boundary. Much of this property drains to the Port's MS4 and is regulated by the MS4 permit. This acreage includes PDX, four marine terminals, several industrial parks occupied by commercial tenants, mitigation sites, and undeveloped land.

Permit History

DEQ issued the first MS4 permit to the City and other co-permittees within the Portland urban services boundary on September 7, 1995. DEQ renewed the permit for a second permit term in March 2004 and subsequently revised and reissued that permit on July 27, 2005. The co-permittees submitted a permit renewal package to DEQ on September 2, 2008, and DEQ subsequently issued the third-term permit on January 31, 2011. The co-permittees submitted a renewal package to DEQ on July 31, 2015, for the fourth permit-term. The 2011 permit expired on January 30, 2016, and has been administratively extended since that time.

Program Coordination

The City and Port share information about program development and implementation, BMP effectiveness, monitoring, and other issues related to the MS4 permit. This coordination avoids duplication and promotes cost-effective use of resources. To further ensure ongoing collaboration and efficiency, the City and Port have an Intergovernmental Agreement that allocates responsibilities and resources.

The City and Port also coordinate and address stormwater permit implementation issues with other jurisdictions in the state through the Oregon Association of Clean Water Agencies (ACWA). City and Port representatives participate in ACWA's water quality, stormwater, and groundwater committees.

Document Organization

The following table (Table E.1) outlines the organization of this annual report document, with respect to the NPDES MS4 annual reporting requirements per Schedule B(5) of the City and Port's NPDES MS4 permit.

The City has included their TMDL annual report for FY 2018–19 as Appendix A with their NPDES MS4 annual report (Volume I). The Port's NPDES MS4 annual report is included as Volume II. The collective monitoring annual report is included as Volume III.

Table E.1: NPDES MS4 Annual Reporting Requirements for Permit Year 24 (FY 2018–19)

	Location in Document	
	City of Portland	**Port of Portland**
a) Status of implementing SWMP elements, including progress in meeting measurable goals.	Part I, Section 2 through 13	Part II, Section 7.1.1 through 7.1.8
b) Status of any public education effectiveness evaluation conducted during the reporting year, and a summary of how results were used in adaptive management.	--[a]	--[a]
c) Summary of the adaptive management process implementation during the reporting year, including new BMPs.	Part I, Section 1	Part II, Section 8.0
d) Any proposed changes to SWMP program elements to reduce TMDL pollutants to the MEP.	NA	II-8.0
e) A summary of total stormwater program expenditures and funding sources over the reporting fiscal year, and those anticipated in the next fiscal year.	Part I, Section 1	Part II, Section 4.0
f) A summary of monitoring program results, including monitoring data that is accumulated throughout the reporting year.	Part III	Part III
g) Any proposed modifications to the monitoring plan necessary to ensure that adequate data and information are collected to conduct stormwater program assessments.	Part I, Section 1.2 and Part III	Part I, Section 1.2 and Part III
h) A summary describing the number and nature of enforcement actions, inspections, and public education programs.	--[b]	--[c]
i) An overview, as related to MS4 discharges, of concept planning, land use changes, and new development activities that occurred within the UGB expansion areas during the previous year, and those forecast for the following year. Include the construction permits issued, and an estimate of the total new and replaced impervious area related to new and redevelopment projects.	Part I, Section 1 and Part I, Section 10	Part I, Section 1 and Part I, Section 10
j) Additional submittals listed in Schedule B.5.j due November 1, 2014.	--[a]	--[a]

BMP = best management practice; MEP = maximum extent practicable; SWMP = Stormwater Management Plan; TMDL = Total Maximum Daily Load; UGB = Urban Growth Boundary.

a. These requirements were fulfilled in Permit Year 19 and are addressed in the Permit Year 19 annual report.

b. 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 Sections II-2 through II-13.

c. Enforcement actions, inspections, and public education programs are included in the Port's SWMP as BMPs and are reported along with the status of implementing all components of the SWMP in Sections II-7.1.1 through 7.1.8).

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Part I
CITY OF PORTLAND

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Abbreviations and Acronyms

ac	acre(s)
ACWA	(Oregon) Association of Clean Water Agencies
BES	Bureau of Environmental Services
BMP	best management practice
BPS	Bureau of Planning and Sustainability
City	City of Portland
CSO	Combined Sewer Overflow
CSWC	Columbia Slough Watershed Council
DEQ	(Oregon) Department of Environmental Quality
EDT	Ecosystem Diagnosis and Treatment
EPA	U.S. Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FOT	Friends of Trees
FY	fiscal year
GIS	geographic information system
IDDE	Illicit Discharge Detection and Elimination
IPM	integrated pest management
ISW	Industrial Stormwater Program
LA	load allocation
LID	low impact development
MIP	Maintenance Inspection Program
MS4	municipal separate storm sewer system
NEC	No Exposure Certification
NFIP	National Flood Insurance Program
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
ODOT	Oregon Department of Transportation
O&M	operations and maintenance
OLCA	Oregon Landscape Contractors Association
OMF	Office of Management and Finance
P2O	Pollution Prevention Outreach
PBOT	Portland Bureau of Transportation
PCB	polychlorinated biphenyl
PLRE	pollutant load reduction evaluation
PPRP	Private Property Retrofit Program
PP&R	Portland Parks and Recreation Department
PWB	Portland Water Bureau
ROW	right-of-way
SAW	Sustainability at Work
SCM	Source Control Manual
SDCs	system development charges
SMF	stormwater management facility
SPCR	Spill Protection and Citizen Response
SWMM	stormwater management manual
SWMP	stormwater management plan
SWNI	Southwest Neighborhoods, Inc.
TB-PAC	Tualatin Basin Public Awareness Committee
TIP	TMDL implementation plan
TIR	thermal infrared
TMDL	Total Maximum Daily Load
UIC	underground injection control
WLA	waste load allocation
WRC	Watershed Resource Center

Section 1
Introduction

This annual report fulfills reporting requirements of the City of Portland's National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Discharge Permit No. 101314. The City's NPDES MS4 Permit expired January 30, 2016, and the Permit has been administratively extended until a new permit is issued. Under the extended permit, the City is continuing with regular Stormwater Management Plan (SWMP) implementation, monitoring plan implementation, and annual report preparation. This annual report represents activities occurring during the 2018–19 fiscal year (July 1 through June 30) and the 24th year of the permit program. These terms both refer to the same time period and are abbreviated FY 2018–19 and PY 24.

Annual reporting requirements related to program authority, adaptive management, urban growth expansion, and stormwater expenditures/funding sources are described in Section 1. Program activities per the City's 2011 SWMP are detailed by each of the individual best management practice (BMP) categories in Sections 2 through 13. For each BMP category, the City's SWMP includes Measurable Goals. Measurable Goals are actions that the permittee has committed to undertake to implement the BMPs and include, where appropriate, the frequency, timeline, and/or locations where BMP actions will occur. For purposes of this annual report, the status of meeting measurable goals during PY 24 is collectively summarized for all BMPs in Section 13 under Program Management (PM-1).

Many of the strategies and BMPs outlined in the City's SWMP are also conducted to fulfill obligations under the 2006 Willamette Basin Total Maximum Daily Load (TMDL) and related TMDLs in effect for Portland area waterways. BMP activities outlined in the City's 2019 TMDL Implementation Plan and conducted during the permit year are identified in this MS4 annual report if they pertain to stormwater-related pollutants. The City's TMDL annual report describes additional activities related to temperature and is included with this report as Appendix A.

Monitoring activities relevant to the City's NPDES MS4 Permit are reported in Part III of this report.

1.1 Program Authorization

The Portland City Council passed a resolution supporting the City's NPDES MS4 permit application in June 1995. In that resolution, the Council designated the Bureau of Environmental Services (BES) as the lead for the City's implementation of the stormwater program. The City of Portland continues to maintain and update legal authority to implement the programs outlined in the SWMP, as demonstrated in Part 1 of the City's original 1991 NPDES MS4 permit application.

1.2 Adaptive Management

The City submitted its adaptive management approach to Oregon Department of Environmental Quality (DEQ) on November 1, 2011. 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, determine if measurable goals are being met or progress is being made toward meeting them (as applicable), and identify whether any program adjustments are needed; and (2) a more **comprehensive process** to identify proposed program modifications submitted as part of the City's permit renewal package, including the modification, addition, or removal of BMPs incorporated into the SWMP and associated measurable goals. The City provided its Permit Renewal Submittal to DEQ on July 31, 2015, that included a description of the adaptive management process that was conducted to assess the existing MS4 program and develop a proposed SWMP for the next permit term.

The City continues to implement an annual adaptive management process to improve overall implementation of key stormwater programs. No significant programmatic changes were implemented during the permit year as a result of the annual review process and because the permit is currently under administrative extension.

1.3 Urban Growth Boundary Expansion Areas

There were no changes to the Urban Growth Boundary within the City's MS4 area during the permit year.

1.4 Stormwater Funding Sources

The Portland City Council approves revised stormwater monthly user fees and stormwater system development charges (SDCs) at the start of each fiscal year. Rate adjustments are based upon cost-of-service principles, thereby ensuring equity by charging ratepayers and developers per the amount of sewer and drainage service they use.

1.4.1 Stormwater Monthly User Fees

Monthly user fees are adjusted to reflect operating, maintenance, and capital costs of the City's sanitary sewer and drainage system. Table 1.1 reports the monthly single-family stormwater management charge and the monthly stormwater rate per 1,000 square feet of impervious area over the current administratively extended permit term (2010–19). Table 1.1 also includes the anticipated monthly stormwater management charge and stormwater rate for the next permit year (2019–20).

1.4.2 Stormwater System Development Charges

SDCs are assessed for new development and significant redevelopment based on two components: (1) onsite runoff management — the charge for stormwater facilities that handle runoff from individual properties, and (2) public right-of-way (ROW) runoff management — the cost of stormwater facilities that handle runoff from public ROWs. Riparian properties that drain directly to

the Columbia Slough, Columbia River, or Willamette River are exempt from the onsite portion of the fee. The ROW portion of the fee is assessed based on the use of the transportation system, using road frontage and vehicle trips associated with the proposed development. Table 1.1 summarizes the actual and anticipated SDC fees based on both components. Discounts may be granted only for the "onsite" part of the charge for facilities constructed as part of new development. Discounts range from 80 percent for retention of the 100-year event to no discount for control of the 10-year storm.

Table 1.1: Stormwater Management and SDC Charges and Rates over the Permit Term

Stormwater Management Monthly Charges and Rates	**2010–11**	**2018–19**	**% Change**	**Adopted 2019–20***
Single-Family Residential Charge	$21.79	$29.68	36.2	$29.66
Residential Rate ($/1000 ft^2 imp. area)	$9.08	$12.36	36.1	$12.36
Nonresidential Rate ($/1000 ft^2 imp. area)	$9.66	$13.02	34.8	$13.02
SDC Charges and Rates	**2010–11**	**2018–19**	**% Change**	**Adopted 2019–20***
Onsite Portion ($/1,000 sf)	$154.00	$228.00	48.0	$242
ROW Portion ($/linear foot of frontage)	$4.78	$7.40	54.8	$7.69
ROW Portion ($/vehicle trips)	$2.51	$4.02	60.1	$4.21
** 2019–20 rates were adopted May 2019.*				

1.5 Stormwater Program Expenditures

The City of Portland has invested more than $1.72 billion in stormwater management services and facilities from initial permitting in 1994 through FY 2018–19 (PYs 1–24). Table 1.2 reflects the revenue requirements over the current administratively extended permit term. The revenue requirements for FY 2018–19 totaled approximately $130.2 million, allocated as shown in Table 1.2 below.

Table 1.2: Stormwater Program Expenditures

Major Program Category	**Revenue Requirements (millions)**		**% Change**
	2010–11	**2018–19**	
Enforcement and Development Review	$5.8	$12.5	115.0
Watershed Program and Habitat Restoration	$18.3	$22.4	22.6
Facilities Operations and Maintenance	$21.0	$28.9	37.5
Capital Improvements*	$45.8	$66.4	45.0
Total Expenditures	**$90.9**	**$130.2**	**43.2**
** Includes debt service, facilities planning and engineering, construction engineering, and construction contracts.*			

In FY 2019–20 (PY 25), the City plans to invest $142.8 million in stormwater management services and facilities. Direct monthly user fees will pay for 88 percent of these investments.

Section 2
Public Involvement 1 (PI-1)

BMP Summary

Implement public information, education, involvement, and stewardship activities that will raise awareness, foster community stewardship, and promote pollution prevention and stormwater management.

Measurable Goals

- Provide outreach to approximately 15,500 K–12 students annually (classroom programs, education field programs).
- Award at least $50,000 in community stewardship grants annually.
- Involve approximately 10,000 participants in community events, workshops, stewardship projects, and restoration events annually.
- By May 2011, develop and distribute a public education bill insert to over 200,000 water and sewer customers

2.1 Clean Rivers Education Programs

The City's Clean Rivers Education Program includes a variety of classroom and field study science programs provided free to kindergarten to college students in Portland. Students learn about watershed health, urban ecology, the causes and effects of water pollution, and what they can do to protect rivers, streams, and riparian areas. Examples of our Clean Rivers Education Programs include:

Watershed Awareness **Classroom Presentation.** Students examine a variety of Portland maps and create their own watershed map to help them understand the concept of a watershed. Educators use an EnviroScape® watershed model to demonstrate how water moves over land and how pollution can drain into rivers and streams. As students identify pollution sources, they discuss solutions to keep our rivers healthy.

Soak It Up **– Green Infrastructure Classroom Presentation**. Working with aerial maps of a model neighborhood, teams of students calculate area and impervious area coverages and determine quantities of stormwater runoff. Students then redesign their neighborhoods with green infrastructure solutions such as swales, ecoroofs, green streets, and stormwater planters that will soak up water and filter pollution. This lesson integrates math and science topics.

After the Flush **– The Wastewater Story Classroom Presentation**. Students learn about Portland's combined sewer system and brainstorm "ingredients" as they simulate sewage and stormwater. Students then clean up their wastewater, modeling the steps taken at the City's treatment plant. Students learn how they can help at home, like reducing the use of home and yard chemicals and preventing fats, oils, and grease from clogging sewer pipes. This presentation is sometimes followed by a tour of the Columbia Boulevard Wastewater Treatment Plant.

Green Infrastructure Tours. Students visit bioswales, ecoroofs, stormwater planters, green streets, rain gardens, and creative downspout disconnections. Students learn how these solutions allow stormwater to soak into the ground to reduce volume, while plants and soil filter pollutants and improve water quality. Educators work with schools to develop an itinerary based on their methods of transportation and location.

Water Pollution Control Laboratory Tours. Students tour the City's Water Pollution Control Laboratory to learn about key functions of the lab and careers related to pollution prevention. Students conduct basic water quality tests and learn about the green infrastructure features onsite, such as disconnected downspouts, bioswales, and a rain garden.

Watershed Investigation Field Studies. Students apply water quality concepts and new skills gained in the classroom to a field study. Students travel to a local stream, pond, or wetland to investigate water and the nearby habitat. Field study activities may include testing water quality, sampling for aquatic macroinvertebrates as biological indicators, exploring wildlife, and identifying native and non-native plants.

Storm Drain Curb Marking. School and community groups install permanent curb markers that remind residents that stormwater can carry pollutants to rivers and streams. Participants also deliver educational door hangers with pollution prevention messages and clean river tips.

Columbia Slough Watershed Canoe Tours. Students in the Columbia Slough Watershed who participate in Clean Rivers Education programs and complete watershed stewardship projects are invited to a canoe paddle along the Columbia Slough. Students view stormwater outfalls, test water quality, and view restoration projects from the water.

Career Awareness Field Trips. Select middle and high school classes visit sewer construction sites, the Water Pollution Control Laboratory, or a natural area to work alongside BES staff and learn about careers related to infrastructure, pollution prevention, and natural area restoration. Career field trips are preceded by classroom presentations.

Friends of Zenger Farm. In a BES-supported partnership on City-owned land, Zenger Farm provides classroom and field education lessons focused on stormwater management, watershed health, environmental stewardship, and sustainability. Zenger Farm serves thousands of youth and adults every year through classroom, field, and service-learning programs.

Table 2.1: Educational Programs and Student Participation (FY 2018–19)

Education Activity	Programs (#)	Student Contact (#)*
Clean Rivers Education Classroom Programs	283	6,551
Clean Rivers Education Field Programs	202	4,305
Friends of Zenger Farm	36	10,296
Total	**521**	**21,152**

** Some students participate in multiple programs or attend programs for multiple days, which would each be counted as a student contact.*

2.2 Community Stewardship Grants Program

BES's Community Watershed Stewardship Program grants, in place since 1995, provide up to $10,000 per project to citizens and organizations to encourage watershed protection. Projects must be within the City of Portland, promote citizen involvement in watershed stewardship, and benefit the public. Since 2018, additional community stewardship grants were made available through the Neighborhood to the River Program.

Table 2.2: Community Stewardship Grants Issued (FY 2018–19)

Grant Name/Description	Watershed	Amount ($)
Columbia Slough Watershed Council: Slough Bank Restoration	Columbia Slough	$9,760
Verde: Cully Rain Gardens	Columbia Slough	$9,991
Camp ELSO Adventurer's Program - Summer 2018	Tryon Creek, Columbia Slough, Willamette River, Columbia River	$10,000
Depave Project Enhancement and Education	Johnson Creek, Willamette River, Columbia River	$10,000
Lent School Watershed Studies Project	Johnson Creek	$7,400
Neighbors Helping Neighbors PDX	Willamette River and Columbia Slough	$10,000
Spring Mountain Academy Bike Tour and Restoration Project	Johnson Creek	$1,000
Friends of Tryon Creek Field Ecology Intern	Tryon Creek	$5,000
Wilshire NatureScape Project	Columbia River	$9,125
Zenger Farm School	Johnson Creek	$8,285
Tryon Creek Watershed Council Watershed 101 Mobile Training Program	Tryon Creek	$8,400
Johnson Creek Watershed Council 11th Annual Johnson Creek Clean Up	Johnson Creek	$5,819
Restoration of the PSU Native American Student and Community Center (NASCC) Rooftop Garden	Willamette River	$10,000
Total		**$104,780**

2.3 Stewardship Activities

The City's stewardship activities vary by watershed and include sponsorship, presentation, partnership, and public participation efforts. The City actively works with and co-sponsors activities with the Columbia Slough Watershed Council, Johnson Creek Watershed Council, Tryon Creek Watershed Council, Crystal Springs Partnership, Tualatin Basin Public Awareness Committee, Friends of Trees, and more.

Resident outreach is routinely conducted via presentations to neighborhood associations and other community groups, newsletters, open houses, and individual outreach to property owners. Topics

include invasive species and riparian restoration, watershed stewardship, green streets and stormwater facility installations, tree planting and community greening, and other pollution prevention efforts. Stewardship activities also include technical data collection and distribution efforts. BES often partners with multiple agencies and jurisdictions on monitoring activities, specifically water quality and macroinvertebrate monitoring.

Table 2.3: Stewardship Activities Conducted (FY 2018–19)

Watershed	Description	Events* (#)	Participants (#)	Volunteers (#)
Columbia Slough	Events coordinated with the Columbia Slough Watershed Council include Slough 101, Groundwater 101, Explorando El Columbia Slough, Canoe the Slough, Columbia Slough Regatta and more.	80	4,305	771
Willamette River	Willamette Watershed public events include the Big Float, outreach for Oaks Bottom restoration project, Multnomah Days, rain garden workshops, three Sunday Parkway events including the Green Loop, the Stormwater Stars restoration and education event series, meetings with neighborhood associations and community groups, and generalized stormwater education.	12	1,491	23
Johnson Creek	Events coordinated with the Johnson Creek Watershed Council and community partners include creek cleanup events, Coho spawning surveys, lamprey surveys, dragonfly surveys, Salmon Celebration/Sunday Parkways, student service-learning projects, Crystal Springs Partnership planting, and maintenance events.	46	1,986	2,300
Fanno Creek	Events and activities conducted in the Fanno Creek Watershed and in partnership with Southwest Neighborhoods, Inc., and the SW Watershed Resource Center include presentations, volunteer opportunities and tabling events, the Stormwater Stars restoration and education event series, generalized stormwater education, and site visits and technical assistance for property owners and residents.	8	140	36
Tryon Creek	Events and activities were conducted in the Tryon Creek Watershed, in partnership with the Southwest Neighborhoods, Inc., Westside Watershed Resource Center and Tryon Creek Watershed Council. Activities include a watershed-wide restoration event, presentations, volunteer opportunities and tabling events, the Stormwater Stars restoration and education event series, generalized stormwater education, and site visits and technical assistance for property owners and residents.	10	109	292

Watershed	Description	Events* (#)	Participants (#)	Volunteers (#)
City wide	Storm Drain Curb Marker Program	3	49	11
City wide	Natural area restoration field trips for K–college students in partnership with Portland Parks & Recreation. Activities include invasive removal and native plantings paired with field studies such as water quality monitoring and macroinvertebrate sampling.	85	1,880	248
City wide	Neighborhood to the River community events	48	2019	0
City wide	Green Street Steward Program recruits residents, businesses, and nonprofit organizations to become volunteers and look after our green infrastructure. The Program also provides education, training, and tours to low-income communities and communities of color.	47	721	38
City wide	Tree Program Community Events	102	7794	3025
Totals		**441**	**20,494**	**6,744**

**Event numbers include in-person public engagement events, not mailings, etc.*

2.4 Public Outreach

The City uses the BES annual newsletter (RiverViews), bill inserts, BES webpages, and various social media accounts to distribute information directly to the public regarding stormwater and water quality/water resources management. Outreach materials typically include information and suggestions on practices that residents and business owners can do to improve or prevent pollution of waterways and protect natural resources.

Table 2.4: Public Outreach (2018–19)

Mailings and Bill Inserts	**Materials Distributed (#) (FY 2018–19)**
Fall 2018 bill insert: Under construction for clean rivers	190,000
Winter 2018/19 bill insert: Wintry rains and flood information	190,000
Spring 2019 bill insert: Keep your pipes fat free	190,000
Summer 2019 bill insert: Big Pipe, Big Difference and weekly summer testing results	190,000
BES Website Activities, Top Hits	**Page Views (#) 2018–19**
Stormwater Discount Program https://www.portlandoregon.gov/bes/41976 or www.cleanriverrewards.com	38,338
Green Street Stewards Program https://www.portlandoregon.gov/bes/52501 or www.portlandoregon.gov/bes/GreenStreetStewards	23,699
Treebate Incentives for Planting Yard Trees https://www.portlandoregon.gov/bes/51399 or www.portlandoregon.gov/bes/treebate	31,495
BES Social Media	**Page Views (#) 2018–19**
City Green Blog	239,353
BES Facebook page (reported as reach versus page view)	32,467

2.5 Pet Waste Management

Portland Parks & Recreation (PP&R) continues to encourage compliance with leash and scoop laws through education, enforcement, and providing off-leash areas with waste bins. Specific programs include:

- Maintaining park signage to increase awareness and understanding of leash/scoop laws.
- Implementing Park Ranger patrols, which use park warnings and citations to increase leash and scoop law compliance.
- Participating in community and partner events like Doggie Dash and Arf in the Park at which education is about leash and scoop laws and impact minimization is shared.

2.6 Alternative Transportation

The Portland Bureau of Transportation (PBOT) promotes carpooling, public transportation, and alternative commuting strategies to reduce emissions with toxic pollutants and support climate action. Specific activities include the following:

- PBOT and Drive Less Connect continued to match carpooling partners and provide discounted carpool parking.

- PBOT sponsored International Walk + Bike to School day with 43 schools participating in October and 40 schools participating in May Walk + Roll Challenge Month.
- PBOT continued to provide the Bicycle Lunch and Learn series, Portland by Cycle rides and classes, and Bike and Walk maps covering Portland.
- PBOT coordinated the Safe Routes to School program, which included over 100 schools in the City of Portland.
- PBOT coordinated Sunday Parkways, a series of free events that this year allowed 125,000 participants to use nonmotorized modes of transportation along Portland streets.
- The Portland bike share system, BIKETOWN, launched in July 2016. The system is a large-scale bike share systems in the nation and consists of 1,000 SMART bicycles, 103 stations, and 47 community stations across the central city area. During 2018 to 2019 (January to June in 2019), users rode 1,112,088 miles – including 33,789 rides taken by 2,075 annual membership riders and 68,026 casual riders (day-pass riders and single-ride users). With a reduced fare and cash payment option, 726 Portlanders living on low incomes also became annual members through the BIKETOWN for All program.

2.7 Regional Education

The City continues to participate in education and outreach opportunities with other jurisdictions as a member of the Oregon ACWA and other opportunistic and seasonal campaigns.

Clean Rivers Coalition. The City has been participating in coordination activities for the newly developed statewide Clean Rivers Coalition (CRC). The CRC is pooling monies from participating jurisdictions to support the development and launching of a branded statewide clean water communications campaign. The initial campaign will primarily focus on pesticides and insecticides. The City's participation in FY 2018–19 included a $3,000 sponsorship contribution and participation in the identification of priority issues.

KPTV Campaign. The City participated in and contribute to the development of the *Clean Water - It's Our Future* campaign. The campaign comprised a series of public service announcements (PSAs) focusing on residential pesticide use and car washing. The PSAs are to be aired during KPTV news segments with complimentary information accessed on the KPTV Community webpages. The City contributed $5,000 in FY 2018–19 to be pooled with other jurisdictions monies. The City also participated in the selection and development of messages. The PSAs will air during summer 2019 (FY 2019–20) during news segments throughout the Portland metropolitan area.

Section 3
Operations and Maintenance 1 (OM-1)
City Storm and Drainage System

BMP Summary

Operate and maintain components of the MS4 to remove and prevent pollutants in discharges from the MS4.

Measurable Goals

- Develop a training handbook for PBOT Maintenance and Operations (PBOT-MO) staff during the permit term.
- Provide the following maintenance actions over the 5-year permit term:
  - Clean 31,000 lineal feet of culverts.
  - Repair 10,000 lineal feet of culverts.
  - Clean 250,000 lineal feet of ditches.
  - Clean 38,000 inlets and catch basins.
  - Repair 1,500 inlets and inlet leads.
  - Clean 135 major stormwater management facilities/pollution reduction facilities.
  - Repair 40 pollution reduction facilities.

3.1 Storm System Inventory

The City manages a highly varied inventory of stormwater assets that includes drainage conveyances, green streets, and other structural and nonstructural stormwater features. New features are constructed every year. The City maintains an asset inventory and maintenance database and continues to evaluate and implement improved maintenance practices to protect water quality. Key features of the City's MS4 infrastructure are listed in Table 3.1.

Table 3.1: Asset Inventory – Key Storm Drainage Components as of June 30, 2019

System Components	# of Assets
Storm sewer culverts and pipes*	441 (miles)
Stormwater conveyance ditches	95 (miles)
Storm inlets	55,284
Trash racks	328
Water Quality Facilities**	
Green streets	2,234
All other types***	404

**Previous reports included a class of pipe (force mains from POTW to outfall) that was determined to not meet the definition of an MS4. This year's reduction from last year's figure is due to the exclusion of those assets from this year's inventory.*

***Water quality facilities are not strictly confined to the City's MS4 areas. Some assets are located within the combined sewer area to provide volume reduction benefits, but the City prioritizes assets in MS4 areas for water quality purposes.*

****Includes manufactured stormwater treatment facilities, constructed treatment wetlands, dry ponds, spill ponds, wet ponds, vegetated swales, sand filters and sedimentation boxes.*

3.2 Storm System Operations and Maintenance

The BES Stormwater Operations and Maintenance (O&M) team evaluates maintenance needs of MS4 components and generates work orders to address those needs. The BES *Stormwater O&M Manual* provides guidance to City staff on important maintenance practices and schedules for the variety of infrastructure components.

The PBOT Maintenance and Operations workgroup also performs a variety of related maintenance tasks. Most routine maintenance is driven by inspections, condition assessments, and specific action triggers. The PBOT *Maintenance Environmental Handbook* is used as guidance for maintenance procedures, preferred seasonality of work, and materials management.

In general, BES groups stormwater system components into two broad categories: conveyance assets and water quality assets. As with the sanitary sewer, BES uses an asset management approach to storm system maintenance that considers the likelihood and consequences of failure to determine priorities. Water quality facilities generally need a more intense inspection and maintenance program to preserve water treatment functionality. As such, those facilities are inspected more frequently, and maintenance is prescribed based largely on inspection results, with the goal of keeping the assets functioning as designed. Specific to BES's Green Street Maintenance Program, inspections are conducted annually at a minimum, and maintenance is conducted by City contractors approximately 3 to 4 times per year. For all water quality facilities, urgent problems and needed repairs are remedied as soon as possible, and routine system maintenance is scheduled to optimize efficiency and facility function.

3.2.1 Inspection Activities

Inspection activities conducted during the permit year are included in Table 3.2. The length of sewer inspection reported significantly increased this permit year compared to previous years due to work associated with the Southwest Corridor project.

Table 3.2: Storm System O&M Inspection Activities

System Components	# of inspections (FY 2018–19)
Storm sewer culverts and pipes	45,339 (feet)
Trash racks	4,108
Water Quality Facilities*	
Green streets	2,430
All other types	404

** This number represents inspections of individual asset components. Many water quality facilities have multiple "treatment train" components that are inspected for their specific maintenance needs. Therefore, a single water quality feature may be associated with more than one inspection.*

3.2.2 Cleaning Activities

Cleaning activities conducted during the permit year are included in Table 3.3. The length of sewer cleaning reported significantly increased this year compared to previous years due to work associated with the Southwest Corridor project.

Table 3.3: Storm System Cleaning Activities

System Components	# of Cleanings (FY 2018–19)
Storm sewer culverts and pipes	20,676 feet
Stormwater conveyance ditches	30,323 feet
Storm inlets	11,196 inlets
Trash racks	4,108* cleanings
Water Quality Facilities	
Green streets	5,170 cleanings
All other types	154 cleanings
** Value represents the number of inspections. Trash racks are cleaned and cleared of debris at the time of inspection, if needed. The true cleaning number is likely much lower.*	

3.2.3 System Repair

Repairs that were made during the permit year are included in Table 3.4.

Table 3.4: Storm System Repairs

System Components	# Repaired (2018–19)
Storm sewer culverts and pipes	526 feet
Storm Inlets and inlet leads	231
Water Quality Facilities	7

Section 4
Operations and Maintenance 2 (OM-2)
City Roadways

BMP Summary

Operate and maintain components of public ROWs, including streets, to remove and prevent pollutants in discharges from the municipal separate storm sewer system.

Measurable Goals

- Sweep arterials six times per year.
- Develop a training handbook for PBOT-MO staff during the permit term.

4.1 Right-of-Way O&M

The City implements practices in and around ROWs to prevent and limit pollutant discharges to the MS4, including street sweeping, spill control, erosion control, material testing, and other BMPs related to the O&M of City roadways. PBOT is the primary bureau responsible for maintaining the City's roads, sidewalks, and other transportation and maintenance facilities and infrastructure. The PBOT *Maintenance Environmental Handbook* is a guide provided to PBOT-MO field crews to ensure they have easily accessible information on handling of wastes, erosion control measures, spill control and prevention practices, and vehicle washing.

The City's street cleaning program removes dirt and debris from City streets to provide a healthy, safe, and attractive environment for Portland residents and visitors. Regular removal of leaves and debris by members of the public as well as City crews is necessary to prevent stormwater drains from clogging, which can result in street flooding. Street cleaning protects water quality and minimizes the burden on the sewer system from surface debris. The street sweeping program sweeps over 4,000 lane miles of curbed streets in the City each year, including residential streets and major arterial streets. Table 4.1 details street sweeping and debris removal activities. Additional BMPs that the City uses for roadways include:

- Following the Oregon Department of Transportation (ODOT) *Routine Road Maintenance Water Quality and Habitat Guide.*
- Erosion control during all sediment-disturbing activities.
- Using low-disturbance sign installation methods to avoid or minimize digging.
- Using mild cleaners, with no solvents, to clean signs.
- Monitoring weather conditions during asphalt grinding to avoid runoff.
- Hand-applying asphalt where necessary to prevent these materials from entering the MS4.

Table 4.1: Roadway O&M Activities

Street Sweeping	**Frequency (2018–19)**
Major arterials	4–6 times/year
Residential streets	Once/year
Downtown core	5 times/week
Material Removed from City Roadways	**Amount (tons) (2018–19)**
Sediment and materials collected from street sweeping activities	2,029
Leaf material collected from Street Leaf Removal Program	9,587*
** Equivalent to 17,136 cubic yards.*	

The City routinely investigates the potential use of alternative products and practices with the purpose of reducing and preventing pollution associated with ROWs. For example, PBOT is now using a UV-protection and anti-graffiti coating on new street signs that will further reduce the need for chemical cleaners.

The City has a Street Leaf Removal Program to remove leaves from city streets during leaf season for traffic safety and water quality protection. The leaf removal service area includes streets that have high concentrations of mature street trees, where fallen leaves can clog catch basins, cause street flooding, and create slippery road conditions that can be hazardous to the traveling public. PBOT continues to implement the leaf removal program in 30 leaf service areas (areas that have streets lined with large, mature trees). Under the program, PBOT schedules and implements one or two leaf collection days per zone. Table 4.1 details leaf removal activities.

PBOT continues to utilize the cured-in-place pipe technology for rehabilitating existing sewer and stormwater pipe in the ROW. This practice reduces the size and number of asphalt cuts and amount of excavation and spoils to be disposed.

4.2 Winter Road Maintenance Activities

The City has established procedures to address the operational and safety challenges that arise from serious snow and ice events. The PBOT Winter Weather Salt Plan developed for FY 2017–18 remained in effect for FY 2018–19. Maintenance requiring the use of salt was implemented according to the Plan, and BMPs were identified in a collaboration between PBOT and BES to minimize risks to water quality and maintain compliance with the MS4 permit.

The City strives to ensure that deicing activities are conducted in a manner that prevents or minimizes risks to water quality. PBOT and BES coordinate on environmentally responsible practices for City use of anti-icers and deicers including road salt. The following details summarize the City's deicing activities during the 2018–19 winter season:

Table 4.2: Roadway Deicing Activities (2018–19 winter season)

Roadway Deicing Activities (by region)	**Southwest Portland**	**Northwest Portland**	**Southeast Portland**	**North/Northeast Portland**
Total lane miles*	44.1	39.1	51.0	25.3

**Typical maximum application rate for salt is 200 pounds per lane mile.*

The City continued the following activities related to its winter road maintenance practices:

- Integrating deicing procedures and BMPs into overall winter road maintenance activities, including adaptive management of priority route identification and evaluation of application rates.
- Coordinating between PBOT and BES to ensure potential water quality impacts from deicing are protective of sensitive habitats and listed species during the winter season.

4.3 Employee Training

The City continues to provide educational training to staff on O&M and construction practices to protect water quality. Specific training efforts related to roadway maintenance includes the following:

- PBOT provided training on the PBOT *Maintenance Environmental Handbook* for street maintenance crews. Training is given to all new employees and to specific work crews as needed.
- All crews directly responsible for winter maintenance activities receive training on BMPs of the Pacific NW Snowfighters Association prior to the start of the winter season in October.

Section 5
Operations and Maintenance 3 (OM-3) City Facilities

BMP Summary

Operate and maintain other City facilities and infrastructure (not included in OM-1 or OM-2) to remove and prevent pollutants in discharges from the MS4.

Measurable Goals

- Inspect and maintain, as necessary, all stormwater and stormwater containment and pollution prevention facilities in City maintenance yards annually.

5.1 Maintenance Facilities

The City operates several maintenance yards that receive, store, and transport municipal waste collected during routine maintenance activities and support additional City operations such as parks maintenance and fleet services. The City employs a variety of structural stormwater and nonstructural source controls at each site. Typical controls include use of covers, berms, and other containment strategies for waste and recyclables; sweeping and good housekeeping practices; installation of filtration and absorbent inlet inserts in catch basins; use of oil-water separators and other pollution prevention facilities.

In addition to maintaining the City's roadways and transportation facilities, PBOT operates critical city maintenance facilities. The PBOT Environmental Coordinator evaluates and tracks maintenance procedures, pilot tests new products and techniques, evaluates work processes including spill response, and monitors developments in related fields. PBOT is also a participating bureau in the City's Salmon-Safe Certification. PBOT employs significant management practices and programs that are innovative and consistent with Salmon-Safe Standards. PBOT's maintenance facilities consist of:

- **Albina Yard.** This maintenance facility serves as a centralized hub for storage and maintenance activities, including bulk material storage, dewatering of street sweeping sediments, equipment shops, and parking. The facility is in the City's combined sewer area.
- **Sunderland Yard.** The City composts more than 5,000 tons of leaves collected through the Street Leaf Removal Program every year at the 20-ac Sunderland facility (see OM-2). The facility also runs a crushing operation for asphalt and concrete that are removed as part of the City's sidewalk and roadway improvement projects. The City continues to implement BMPs at the Sunderland Yard and maintains the pollution prevention facilities regularly as conditions require.

Stormwater from the composting operation at Sunderland Yard is collected and treated before entering a detention pond, which discharges to the sanitary sewer.

Stormwater from the crushing operation at Sunderland Yard is collected in a sediment control and vault system that is discharged to a constructed wetland that has an overflow to the Columbia Slough. This facility was formerly covered by a General NPDES 1200-COLS Industrial Stormwater Discharge Permit, but the permit was terminated by the DEQ in 2012 because there is no stormwater discharge from the site's activity areas.

- **Stanton Yard.** This facility serves as the primary office location for PBOT employees but also includes some maintenance activities, such as small equipment repair, shops, and parking. Fueling of vehicles and equipment also occurs at this location under the City's fleet services operations. The Stanton Yard is in the combined sewer area.

PP&R consolidates its activities and materials from parks maintenance operations to prevent pollution and reduce impacts to the MS4.

- **Mount Tabor Yard.** This facility is located within the City's combined sewer area and functions as the central location for PP&R's equipment and vehicle washing. Recyclable and recoverable waste products are moved to the site, stored appropriately, and hauled offsite by specialized vendors and contract services. Used transportation maintenance wastes (oil, antifreeze, solvents, tires, dry cell batteries), paper and cardboard, scrap wood and metal, excess paint, and fluorescent lamps are managed at the site.

5.2 Parks Operations

PP&R oversees and maintains developed and natural area parks, public golf courses, and a variety of sports and athletic fields throughout the City. At the end of 2018, PP&R's portfolio of parks facilities included 146 developed parks (3,539 acres including developed parks, golf courses and PIR), 7,921 acres of natural areas, and 252 undeveloped acres.[1]

The bureau's strategic plan emphasizes development of an asset management program that integrates with operations, financial planning, and performance management. PP&R implements many BMPs that prevent or minimize the potential for pollutants in stormwater runoff from the City's diverse parks system. PP&R became the City's first bureau to achieve Salmon-Safe Certification in 2004. The certification was renewed in 2012 and again in 2018.

5.2.1 Integrated Pest Management

The mission of the PP&R Integrated Pest Management (IPM) program is to manage pests that are harmful to the health, function, or aesthetic value of park landscapes in an efficient, effective, and environmentally responsible manner, while paying careful attention to public and employee safety. A few examples of the City's IPM activities include:

- Utilizing plants with natural resistance to pests.
- Proper mowing and irrigation of park turf to increase vigor and reduce weed populations.
- Mulching of planting beds to reduce establishment of weeds.

[1] https://www.portlandoregon.gov/parks/article/422533

- Application of selected herbicides to control invasive weeds and prevent their spread.
- Release of natural biological control insects.

The City's IPM efforts also include reducing water and fertilizer inputs on park properties, restoring riparian and upland habitats, and using alternatives to pesticides. PP&R continued to follow IPM practices during the PY 24, tracking pesticide uses and developing related metrics.

5.2.2 Water Usage and Irrigation Management

PP&R implements responsible irrigation management principles to conserve water, minimize runoff and increase infiltration, and optimize fertilizer use. Over the past several years, PP&R has also been installing computerized equipment to monitor irrigation flow. Water usage BMPs used in the City's park system include:

- Aerating and overseeding athletic fields to reduce the need for fertilizers.
- Computerizing irrigation systems to reduce water usage.
- Prioritizing park areas that receive irrigation based on frequency and volumes.
- Reviewing park designs to minimize the amount of "open turf" acreage.
- PP&R continued to follow these BMPs throughout PY 24.

5.3 Non stormwater Discharge Management

Authorized non stormwater discharges from City facilities to the MS4 include discharges of potable water from hydrants, mains, and tank and reservoir drains. The Water Bureau continues to submit requests to BES for such discharges. Discharges are approved on a case-by-case basis with a letter of authorization that requires appropriate BMPs to manage flow and water quality and adherence to DEQ guidelines for chlorinated discharges. A report is required for each discharge event to track volume and respond to any complaints.

Table 5.3: Discharge Authorizations to MS4

Discharge Authorization Type	# Issued (FY 2018–19)
Hydrant Flows	50
Tank and Reservoir Drain Flows	14
Water Main Discharges	6
Uni-Directional Flushing	4
Total	**74**

5.4 Fire-Fighting Practices

Portland Fire & Rescue (PF&R) is Oregon's largest fire and emergency services provider that operates and maintains a network of fire station facilities and associated equipment to fulfill its mission. PF&R practices that are relevant to MS4 management involve equipment repair and washing, fire station maintenance, and training-related discharges.

- **Training**. Fire-fighting training activities are conducted at PF&R's training facility located at 4800 NE 122nd Ave. Discharges from nonemergency fire training activities are permanently routed to the sanitary sewer system.
- **Washing**. Equipment washing is generally conducted at all 31 fire stations. Per PF&R policy, all washing occurs inside station apparatus bays where the water is discharged to the sanitary sewer, typically through an oil/water separator. Fire stations were retrofitted between 1998 and 2008 during a large upgrade project that also facilitated environmental improvements.
- **Maintenance**. Equipment maintenance and repair is performed at PF&R's Logistics facility, located at 1135 SE Powell Blvd., which is in the combined sewer area. BMPs are followed, and the facility drains discharge to the sanitary sewer.

5.5 Salmon Safe Certification

The City of Portland was the first city in the world to achieve Salmon-Safe Certification for its work to improve water quality and restore salmon habitat. In 2016, Portland City Council formally adopted the findings of Salmon-Safe's assessment, which was the culmination of a years-long process. Portland's designation means that city operations have conditionally passed the organization's comprehensive science-based evaluation of land and water management practices. Salmon-Safe certification affects day-to-day City operations that potentially impact downstream water quality as well as the construction and maintenance of City-managed properties, including City-owned buildings and the City's fleet of vehicles and bureau maintenance yards. There are several participating bureaus that are specifically tasked with carrying out elements of the Salmon-Safe Certification: PP&R (certified since 2003), BES, PBOT, Water Bureau, PF&R, Office of Management and Finance, and Bureau of Planning and Sustainability (BPS). Facility managers are committing to additional actions to limit water pollution, conserve water use, and restore habitat over the next 5 years, at which time City operations will be inspected for Salmon-Safe recertification.

BES is required to meet four cross-bureau conditions, as well as eight bureau-specific conditions to maintain certification. Progress toward the completion of each condition must be documented in an annual report to Salmon Safe, due November 1st each year. The 2018 progress report, addressing November 2017 through October 2018, documented BES' completion of two of the seven remaining bureau-specific conditions, and two of the three remaining cross-bureau conditions.

5.6 Sustainable Procurement Program

The City engages in green purchasing BMPs to spend public funds on goods and services that minimize negative impacts on human health and the environment. The City's Sustainable Procurement Policy directs City bureaus to include environmentally preferable product and service specifications in City solicitations and contracts. Stormwater pollution prevention is addressed in construction and architectural/engineering design services, for example. Specifications reference BMPs like zero-sediment runoff at construction sites, onsite stormwater management (ecoroofs, rain gardens, etc.), restrictions on zinc or copper-containing exterior materials, and use of untreated wood for boardwalks and similar exterior wood features.

The City continues to incorporate electric and other low-carbon fuel vehicles into the City fleet as part of its Climate Action Plan and sustainability strategies. The City currently has 147 electric sedan vehicles, representing approximately 43 percent of the sedan vehicle feet to date.

Section 6
Industrial Stormwater Management 1 (IND-1)

BMP Summary

Implement the Industrial Stormwater Management Program to control the discharge of pollutants from industrial and commercial facilities (both existing and those undergoing changes in operations) to the MS4.

Measurable Goals

- Inspect all permitted (1200Z, 1200COLS) facilities once per year.
- Review each permitted facility's monitoring and annual report each year.
- Survey 100 percent of newly identified facilities to determine the need for NPDES permits.
- Every 5 years, inspect industries (individual sites) previously identified as having no exposure and not required to obtain a permit.
- Complete revision of Portland City Code Title 17.39 by 2012.

6.1 Industrial Stormwater Permitting

The Industrial Stormwater Program (ISW) administers General NPDES Industrial Stormwater Discharge Permits in Portland through an intergovernmental agreement with DEQ. Program staff conduct annual compliance inspections of permitted sites, provide technical assistance on BMP implementation, and issue enforcement referrals for instances of noncompliance. ISW also performs inspections of nonpermitted sites to assess the need for permit coverage, evaluates sites with No Exposure Certifications (NECs) to verify that the permit exemption is valid, and locates and maps private outfalls located throughout riparian areas that discharge directly to receiving streams and identifies the sources that drain to these outfalls.

During PY 2018–19, ISW issued 10 new General Industrial Stormwater Discharge Permits. ISW activities are detailed in Table 6.1.

Table 6.1: Industrial Stormwater Program Activities

Permitted Site Activities	**# (2018–19)**
Permits administered*	225
Permitted site inspections	223
Enforcement actions issued **	470
Nonpermitted Site Activities	**# (2018–19)**
Nonpermitted site inspections	75
Expiring NECs	38
NECs reissued***	22
New NECs Issued	8

** Administered permits include those that were issued and terminated midway through the permit year.*

*** Includes Portland City Code enforcement to permitted and NEC facilities.*

**** NECs may not be renewed for several reasons: The business may no longer be in operation, the business may be required to obtain permit coverage due to increased exposure, or the renewal approval is pending site controls.*

Section 7
Industrial Stormwater Management 2 (IND-2)

BMP Summary

Provide educational programs and materials and technical assistance to reduce industrial and commercial pollutant discharges to the MS4.

Measurable Goals

- Under the Eco-Logical Business Program, certify 10 additional auto shops and 20 additional landscape firms that provide services within the City of Portland by 2015.
- Evaluate one new business sector for implementation of the Eco-Logical Business Program.

7.1 Commercial and Industrial Web Outreach

Twenty BMP fact sheets are posted on BES's Industrial Stormwater Program website, which provides technical assistance information to the public, specifically targeting commercial and industrial site operators. The most-viewed BMP materials in FY 2018–19 are listed in Table 7.1 below. Other BMP materials include information on dewatering activities, loading and unloading materials, and outside container storage and waste disposal.

Table 7.1: Commercial and Industrial Web Outreach

BES Website Activities, Top Hits	Page Views (2018–19)
Catch basin maintenance	1,007
Sandblasting and painting operations	552
Preparing emergency response and spill cleanup plans	245

7.2 P2O Team and EcoBiz Outreach

The City is a member of the Regional Pollution Prevention Outreach Team (P2O Team) and the Eco-Logical Business Program (EcoBiz) to reduce pollutant discharges to the MS4 from commercial business operations. EcoBiz program members certify automotive and landscaping businesses in the Portland metropolitan region to ensure sustainable and environmental practices.

Additionally, the EcoBiz Team has partnered with DEQ to create a certification program for green dry cleaners. The criteria to be an EcoBiz dry cleaner was approved by DEQ and the Regional P2O Team in summer 2018, and implementation began in August 2018. Program development, including outreach, site visits and certifications for the dry cleaner program are currently conducted by the Pacific Northwest Pollution Prevention Center, an EcoBiz partner.

During the reporting period, the City funded a limited-term staff position to expand EcoBiz activities in the landscaping sector to address issues including pesticide use, erosion control and water conservation.

Table 7.2 summarizes the current number of certified landscapers and automotive businesses.

Table 7.2: EcoBiz Activities (FY 2018–19)

Category	Site Visits	Recertifications	New Certifications	Current Total
Landscapers	2	N/A	1	6
Automotive*	9	3	N/A	23
Total	**11**	**3**	**1**	**29**

** Includes repair service and car washing facilities. The EcoBiz program is voluntary. The number of participating businesses varies from year to year. Barriers to obtaining certification or recertification include business closure, ownership changes, financial impediments, and unsuitable site conditions.*

7.3 Sustainability at Work

The City's Sustainability at Work (SAW) program continued to assist Portland businesses with resources and information to promote pollution prevention and environmental sustainability. The program is administered by the City's Bureau of Planning and Sustainability in partnership with the Portland Water Bureau (PWB), Metro, and Energy Trust of Oregon. As part of SAW, the City conducts site visits to assist businesses on a broad range of topics, including water conservation, stormwater management, hazardous waste, energy efficiency, renewable power, alternative transportation, and waste prevention. The City also distributes monthly newsletters to over 3,500 customers and administers a certification program recognizing businesses that have taken measurable steps to conserve resources and reduce greenhouse gas emissions.

Table 7.3: Sustainability at Work Program Activities

Activity	Number (#) 2018–19
Technical assistance site visits	211
New SAW certifications and renewals	123
Total Number of SAW Certified Business to Date	**380**

7.4 Columbia South Shore Well Field Wellhead Protection

The City provides outreach and technical assistance to businesses and residents in the Columbia South Shore Well Field Wellhead Protection Area to help them comply with local drinking water source protection regulations, which are designed to prevent contamination of groundwater used as the drinking water source. Because much of the area is in the City's MS4 area, these activities are beneficial to protecting local surface water as well. Businesses in the area are required to

implement structural and operational BMPs to manage harmful chemicals, reduce the occurrence of spills, and minimize spill impacts. Activities in 2018–19 included the following:

- Made over 2,100 individual outreach contacts.
- Provided technical assistance to 32 businesses.
- Provided a groundwater protection workshop, including spill control basics, attended by roughly 40 businesses.
- Distributed 23 free spill kits, 24 signs, and 1 secondary containment pallet.
- Maintained the Columbia Corridor Association and City of Portland webpages on the Groundwater Protection Program with information for businesses and residents.
- Conducted 118 site inspections for compliance with the City's *Wellhead Protection Area Reference Manual.*

Section 8 Illicit Discharges (ILL-1)

BMP Summary

Identify, investigate, control, and/or eliminate illicit discharges (illicit connections, illegal dumping, and spills) to the MS4. Evaluate and, if appropriate, control non stormwater discharges to the MS4.

Measurable Goals

- Conduct dry weather sampling at all major City-owned outfalls at least once annually.
- Inspect the priority outfalls a minimum of three times per year.
- Expand the Illicit Discharge Detection and Elimination (IDDE) (formerly IDEP) program to include the combined sewer overflow (CSO) system below diversion structures, where the outfalls discharge stormwater only and should have no dry-weather flows. Currently, the program addresses all of the Westside outfalls and 25 percent of the Eastside outfalls. Expand the program to all Eastside outfalls by December 2013.
- Maintain the spill response hotline 24 hours a day.

8.1 Illicit Discharge Detection and Elimination Activities

The City implements several programs to address illicit discharges and spills to the MS4. BES's IDDE Program performs inspections of MS4 outfalls and priority locations to identify and eliminate illicit discharges or cross-connections to the system. The City's Spill Response Program operates a 24-hour spill response hotline and investigates pollution complaints that have the potential to impact the MS4.

The Industrial Stormwater Program (discussed in Section 6, the IND-1 section of this report) ensures that BMPs relating to spill prevention and reporting are properly implemented at industrial facilities covered by a General NPDES Industrial Stormwater Discharge Permit. During the reporting year, the program administered 225 permits with requirements to maintain spill prevention and response procedures.

The City also implements curbside collection services (residential garbage, recycling, yard debris, and food scrap collection) to help prevent illegal dumping. The City has a partnership with the Neighborhood Coalition Offices and Metro to administer community collection events. During the year, 43 community collection events took place throughout the city. BPS continued to support the implementation of Keep It Pretty Rose City, an anti-litter toolkit to help community groups organize litter pickup activities. More than 5,300 households removed bulky household waste from their homes with the assistance of over 1,100 community volunteers at the citywide events.

8.1.1 Dry-Weather Field Screening

BES inspects major outfalls during dry weather to identify and eliminate illicit or non-stormwater discharges of concern. Related activities during FY 2018–19 are described in Table 8.1 below.

Table 8.1: Dry-Weather Field Screening Activities

Dry-Weather Field Screening Activities	Number (#) (FY 2018–19)
IDDE outfalls inspected	128
Inspections performed	202
Outfalls with flow observed*	73
Illicit discharges identified	0
** Many City outfalls convey flow from background sources, such as hillside streams.*	

There were no illicit discharges and follow up actions to report on.

8.1.2 Pollution Complaint Response

The City's Spill Protection and Citizen Response (SPCR) Program investigates pollution complaints that have the potential to impact the MS4 and enforces prohibited discharge violations of Portland City Code Title 17.39. SPCR operates a 24-hour spill response hotline and administers a Duty Officer program that responds to pollution complaints 365 days a year. During the 2018–19 permit year, SPCR received and responded to roughly 2,090 calls regarding pollution complaints, spills, sewer overflows, dye tests, and other pollution-related inquiries.

SPCR also facilitates coordination related to spill response and participates on the Regional Spill Response Committee. The Regional Spill Response Committee includes representatives from different City bureaus and the DEQ, the U.S. Coast Guard, Clackamas Water Environment Services, Port of Portland, and the City of Gresham, among others. In 2016–17, BES identified a need for additional staff resources to better coordinate and facilitate the Regional Spill Response Committee. One new position (one full-time employee) was approved for funding for the 2018–19 fiscal year. In December 2018, the new position was filled and, in April 2019, SPCR organized another meeting of the Regional Spill Response Committee. The new SPCR position will be responsible for developing and organizing agendas for future meetings, with the aim to ramp up to a quarterly meeting schedule over the course of the next permit year.

8.1.3 Investigation and Enforcement

The IDDE, SPCR, and Industrial Stormwater Programs all inspect and investigate possible prohibited discharges to the MS4. If an inspection or an investigation determines that a prohibited discharge took place, and a responsible party can be determined, BES will pursue enforcement. See Table 8.2 for enforcement actions that were undertaken as a result of inspections and investigations.

The enforcement actions detailed in Table 8.2 include two sanitary cross connections from private property to the City's storm system that were discovered by field staff and corrected through enforcement actions.

Table 8.2: Illicit Discharge Enforcement Actions (FY 2018–19)

Enforcement Type	Enforcements Issued (#)	Responsible Parties (#)	Penalties and Costs ($)
Notice of violation	21	14	$31,300
Notice of assessment of costs	3	2	$11,606
Warning notice	0	N/A	N/A
Compliance order	3	3	N/A
Total	**27**	**19**	**$42,906**

8.2 Sewer Connections

During FY 2018–19, BES continued to implement the Portland City Code Title 17.33 (Required Public Sewer Connection), which mandates that properties using onsite wastewater disposal systems or nonconforming private sewer systems connect to an available public sewer. The following work was completed during this permit year:

- 32 properties converted from onsite sewage/septic disposal systems to the City's sanitary sewer.
- 438 properties successfully repaired existing faulty and/or nonconforming sewer lines.

8.3 Sanitary Sewer Repair

BES continues to identify and repair sanitary sewer problems that cause seepage to the MS4 and surface waters. Under the Stormwater System Plan effort and general planning conducted in the asset management program for the combined and sanitary system, BES conducted a risk analysis to identify areas in the city where existing sewerage collection systems may be in poor condition and have the potential to pose contamination threats to surface waters and groundwater. Along with the Sanitary Sewer Overflow Program, collective efforts help minimize sewage releases to the environment and receiving waters.

BES implements an inflow and infiltration program for the sanitary and combined sewer systems to help address sewer capacity problems. BES will continue to prioritize the repair, rehabilitation, or replacement of these systems in vulnerable areas. The following work related to the inflow and infiltration program was completed during the 2018–19 permit year:

- 0.78 million feet (147 miles) of sewer pipe were inspected, representing about 8 percent of the mainline sewer system.
- 1.25 million feet (236 miles) of sewer pipe were cleaned, representing about 12 percent of the mainline sewer system.
- 11,958 feet (2.26 miles) of mainline sewer pipe were repaired; 40 percent of the repairs were in response to collection system problems.
- 692 service laterals (or 8,849 feet of pipe) were repaired; 37 percent of the repairs were in response to discovered problems.

- 370,000 feet (69 miles) of sewer pipe were treated using chemical root foaming.
- 307 manholes considered to be at greatest risk of failure were inspected.
- 21 Capital Improvement Program projects related to repair, rehabilitation, and enhanced capacity of the sanitary and combined collection system were completed in the 2018 calendar year, resulting in an estimated risk reduction of $53.9 million.

Under the ongoing Citywide Sewer Extension Plan, BES identifies properties not currently connected to the sanitary sewer system and are likely served by an onsite septic system. This information is one criterion to prioritize sewer connection projects and evaluate related surface water quality impacts.

8.4 Portable Restrooms

PP&R continues to require large events to provide one portable restroom for every 125 people of estimated attendance.

Section 9
New Development Standards 1 (ND-1)

BMP Summary

Control erosion, sediment, and pollutant discharges from active construction sites.

Measurable Goals

- Evaluate the *Erosion and Sediment Control Manual* and update as needed (at least once during the 2011–16 permit cycle); conduct public involvement on updates.
- Inspect public sites with erosion control permits daily during construction.
- Inspect 100 percent of active private development construction sites subject to erosion control requirements. At a minimum, inspections will occur (1) after initial, temporary erosion control measures are installed and (2) near completion of development after permanent erosion control measures are in place. Conduct interim checks as part of routine building permit inspections.

9.1 Erosion Control Activities

The City has an erosion control program that applies to both public and private construction projects. Portland City Code Title 10 and the City's *Erosion and Sediment Control Manual* outlines requirements and provides technical guidance for temporary and permanent erosion prevention, sediment control, and control of other site development activities that can cause pollution during the construction process. The City's erosion control requirements apply to all ground-disturbing activities, regardless of whether a development permit is required, unless such activities are otherwise exempted by City Code. The City's erosion control regulations help achieve the following:

- Reduce sediment and pollutants in runoff from construction and development sites.
- Reduce the amount of sediment and pollutants entering storm drainage systems and surface waters from all ground disturbing activity.
- Reduce the potential for erosion from dirt and mud on public ROW and surrounding properties during construction and development activities.
- Reduce the amount of soil and dust released into the air from ground disturbing activity.

An Erosion, Sediment, and Pollutant Control Plan is required by the City for ground-disturbing activities that exceed 500 square feet or any development site that requires a City of Portland building, public works, or development permit (Portland City Code Title 10.40). The Plan must identify BMPs for use on a development site. Required and development-specific BMPs are identified in the *Erosion and Sediment Control Manual*.

The Bureau of Development Services (BDS) administers and enforces erosion control requirements for private development sites. Sites with qualifying ground disturbance areas are inspected for temporary and permanent erosion control measures at the beginning and near or at completion of the project. Interim checks are conducted during regular building inspections or as needed for

problem and complaint-related sites. City inspectors note deficiencies related to BMP implementation and require site operators to implement corrective action when needed.

The public works bureaus (Water, Environmental Services, Transportation, and Parks) manage erosion, sediment, and pollutant control activities and BMPs for their respective City infrastructure projects that involve public works permits. In general, public works projects are inspected daily during construction.

Table 9.1: Erosion Control Activities

Private Sites	**Number (#) (FY 2018–19)**
Permits issued with "ground disturbing activities"	2,847
Site inspections	6,730
Enforcement actions and correction notifications issued*	2,058
Complaints received	34
Public (City) Sites	**# (2018–19)**
PBOT projects	31
BES projects	93
Water Bureau projects	71
Parks projects	28
Total active public construction projects with erosion control	**223**
** Stop-work orders, correction notices, and notices of violation.*	

Additional erosion control activities and accomplishments include the following:

- The Erosion Control Technical Advisory Committee (BES and BDS) continued meeting throughout 2018–19.
- The City initiated an effort to evaluate updates to the City's *Erosion and Sediment Control Manual,* including a review of the existing manual's structure, BMPs, and usability.
- BDS held an "Erosion and Sediment Control Basics for Residential Permits" lunch-and-learn event which consisted of a 1-hour presentation, inspection checklist, and general erosion control guidance handouts. Fourteen people attended.
- The BDS Senior Site Development Inspector provided erosion control program and compliance guidance to permittees at four BDS Preconstruction Conferences.
- BDS hosted a "Fundamentals of Erosion and Sediment Control" event with the Pacific Northwest Chapter of International Erosion Control Association. The event included an in-class training session with an online training module and a field portion that include BMP demonstrations and discussions. Thirty people attended.
- PBOT construction managers provided erosion control program compliance and reporting at preconstruction conferences for 31 PBOT capital improvement projects.

- BDS held their annual Take Our Kids to Work Day. Twenty school-aged children attended and participated in the "Development and Our Environment" curriculum, which included an Enviroscape presentation (BDS), educational videos about the erosion process, geotechnical engineering (BDS), a tour of low-impact stormwater management facilities (BES), and an interactive erosion control inspection of an active job site using Skype.

9.2 Hillside and Slope Protection

Hillside development protection code is implemented to minimize erosion and soil mass-wasting. Portland City Code Title 24, as related to hillside and slope protection efforts, continues to be implemented during FY 2018–19. Specific applicable code provisions are as follows:

- Portland City Code Title 24.70.020 B requires a permit for all grading operations unless "there is no apparent danger, adverse drainage, or erosion effect on private/public property, or inspection is not necessary."
- Portland City Code Title 24.70.020 D states that "removal of trees six-inches and larger in diameter shall be reviewed with the clearing or grading permits as part of the Tree Plan review pursuant to Title 11. When removing five or more trees on a site with an average slope of at least 20 percent, applicants shall provide a geotechnical engineering report that assesses the stability of the site after tree felling and root grubbing operations."
- Portland City Code Title 10.30.030 includes additional requirements for slopes greater than 10 percent.

9.3 Employee Training

The City continues to provide educational training to staff on operation, maintenance, and construction practices to protect water quality. Specific training efforts include the following:

- Provided annual construction inspector training to BES inspection staff.
- One BDS staff attained a Certified Erosion Sediment and Stormwater Inspector certification training through Envirocert International.

Section 10
New Development Standards 2 (ND-2)

BMP Summary

Implement and refine stormwater management requirements for new development and redevelopment projects to minimize pollutant discharges and erosive stormwater flows.

Measurable Goals

- Inspect 1,500 private stormwater facilities or 450 properties annually. Use education and enforcement tools to ensure that stormwater management operations and maintenance plans are followed.
- Revise the Stormwater Management Manual (SWMM) during the 2011–16 permit term.
- Track number, type, size, drainage area[2], and location of private facilities constructed annually.

10.1 Stormwater Management Manual Developments

The Portland Stormwater Management Manual (SWMM) provides policy and design requirements for stormwater management throughout the City of Portland. The requirements in the manual and Portland City Code Title 17.38 apply to all development, redevelopment, and improvement projects within the City of Portland on private and public property and in the public ROW. Projects with 500 square feet or more of impervious area trigger stormwater management requirements, including volume and flow control and water quality control using specified treatment and green infrastructure facilities. In conjunction with requirements of the City's NPDES MS4 permit, onsite infiltration is required to the maximum extent feasible, and the 2016 SWMM includes a BMP hierarchy to promote infiltration-based and vegetated facility implementation. If onsite infiltration is not feasible, onsite stormwater management that overflows to an offsite discharge location is required.

BES revises the SWMM periodically to meet current regulatory requirements and to provide current technical standards. The City is currently implementing the 2016 SWMM, which became effective in August 2016. The latest update reinforced the stormwater management hierarchy, updated the user interface for the Presumptive Approach Calculator used to size BMPs, separated source control requirements into a new stand-alone manual and shifted from citywide flow control and pollution reduction requirements to system-specific (i.e., MS4, UIC, or CSO) requirements.

BES is in the process of revising the SWMM. Changes are focused on updating facility (BMP) details, reworking engineering assumptions used to size facilities, and increasing the use of orifice control for flow control. The new version of the manual is anticipated to become effective in early 2020.

[2] Drainage area is tracked for all private stormwater management facilities subject to Chapter 3 of the SWMM (O&M plan).

10.1.1 Monitoring and Evaluation

BES conducts monitoring, research, and evaluation projects related to the SWMM to continually adapt and improve the technical and policy specifications within the manual. During the 2018–19 permit year, BES conducted the following SWMM monitoring and evaluation activities:

- Continued monitoring of green streets and ecoroofs. The evaluated facilities are located throughout the City and represent a variety of facility types, configurations, ages, and land uses.
- Continued implementation and evaluation of the practice of using less imported soil media in green street facilities to improve and promote better plant health and drought tolerance.
- Continued monitoring of modified drain systems in stormwater planters (including orifices) for improved performance.
- Continued implementation and evaluation of soil blends using slightly more fines to improve water retention and plant health in vegetated stormwater management facilities and improve performance in lined facilities.
- Completed a multi-year monitoring project focused on performance of mature lined green streets.
- Completed construction for a group of green streets to test a modified underdrain system and different soil media blend. These facilities will be monitored for water quality, plant health, soil moisture, and infiltration performance.
- Pursued partnerships with projects to incorporate monitoring access during the design phase.

10.2 Stormwater Management Manual Implementation

BES has several teams tasked with SWMM implementation that includes reviewing development plans for public and private projects, providing technical assistance to developers early in the design process, inspecting the design and installation of stormwater management facilities (SMFs) and enforcing O&M requirements for SMFs in the long term.

Table 10.1: SWMM Implementation Activities

Development Planning	**Number (#) (2018–19)**
Land use reviews conducted	431
Early assistance request responses and pre-application conferences	375
Development Review and Construction	
Public works project permit approvals	31
SWMM permit reviews	8,126
Projects with stormwater management facilities (SMFs) constructed*	1,563
Impervious area managed by constructed SMFs	238 acres
O&M	
O&M agreements recorded	357
SMFs Covered by O&M agreements	755
Properties covered by O&M agreements	390
Impervious area managed under O&M agreements	161 acres
Properties inspected for O&M requirements	1,262
SMFs inspected for O&M requirements	2,613
Enforcement actions issued**	27
** Some permit projects have multiple SMFs constructed.*	
*** Warning notices, notices of violations, and voluntary compliance agreements.*	

10.3 Pollution Prevention and Source Control

BES's Pollution Prevention Plan Review team conducts land use and pollution source control reviews associated with commercial and industrial properties subject to requirements in the City's *Source Control Manual* (SCM). In 2016, BES separated Chapter 4 out of the SWMM into the stand-alone SCM. The SCM specifies pollution control requirements for development and post-development activities that are considered high-risk or pollutant-generating. The manual identifies structural, operational, and treatment BMPs designed to prevent or control conventional and toxic pollutants in stormwater, groundwater, and wastewater.

Table 10.2: SCM Activities

Case Reviews	Number (#) (2018–19)
Land-use reviews conducted	43
Contaminated site reviews	320
Total	**363**
Pollution Source Control Measures Required and Installed (by Activity Area)	
Trash and recycling areas	819
Loading docks	128
Fueling stations	66
Boilers and chillers	78
High-risk vehicle and equipment areas	21
Water reclaim/reuse	5
Wash racks	22
Liquid storage areas	121
Dewatering/subgrade structures	332
Covered parking	94
Water features	13
Exterior bulk storage	13
Tank farms	7
Total	**1,719**

10.4 Retrofit Funding Mechanisms

During 2018–19 permit year, through implementation of the SWMM, BES continued to evaluate development projects subject to the Special Circumstances provision. The process allows for payment in-lieu of stormwater management where projects cannot meet SWMM requirements. Payments help fund and offset costs of other stormwater management projects implemented through the "% for Green" program (see Section 11.5.1).

Additional information on this topic is presented in Section 11, Structural Controls (STR-1).

Section 11
Structural Controls (STR-1)

BMP Summary

Structurally modify components of the storm drainage system to reduce pollutant discharges. Implement structural improvements on existing development to reduce pollutants in discharges from the municipal separate storm sewer system.

Measurable Goals

- Construct the following public facilities to provide treatment for stormwater runoff from approximately 336 acres.
  - Construct the NE 148th Avenue stormwater management facility by FY 2014–15.
  - Construct stormwater management facilities in the NE 122nd Avenue subbasin by December 2012.
  - Convert 5,000 linear feet of roadside ditches to swales or porous shoulder during the permit term.
  - Construct stormwater management facilities along SW Beaverton-Hillsdale Highway and SW Barbur Boulevard and in commercial and multi-family residential areas during the permit term.
- Track the number, type, drainage area, and location of public facilities constructed annually.

11.1 Stormwater System Plan

The BES *Stormwater System Plan* is a comprehensive asset management approach that identifies major infrastructure improvement needs for the City's storm system and natural drainage operations. Development of the *Stormwater System Plan* is a multi-year process that includes a risk assessment and review of stormwater system capacity, condition, service needs, water quality and stream impacts. Activities conducted over FY 2018–19 include the following:

- Continued refinement of stormwater service categories using the best available data. Service categories assessed include:
  - Water quality degradation
  - Habitat degradation
  - Stormwater system deficiencies that impede community development
  - In-stream erosion due to development activities
  - Landslide hazards
  - Localized nuisance flooding
- Integrated stormwater system planning tools and approaches into broader BES stormwater and watershed planning, monitoring, analysis, and decision-making.
- Initiated an Asset Inventory and Condition Assessment program to gather information and data to evaluate risk and opportunities associated with the existing stormwater system.

11.2 Tracking and Mapping of Structural Storm System Facilities

The City maps and tracks structural MS4 components on an ongoing basis using a robust asset management system called Hansen. For structural controls and City BMP facilities, this includes tracking the location, type, drainage and other system components and maintenance details. This structural asset information is then used as needed in a more complex modeling process to generate information and estimates related to treated acreage, pollutant loading benchmarks, and other similar information. The City continued to inventory assets through the permit year as new structural components were designed and constructed.

11.3 Technical Assistance, Incentives, and Grants Programs for Property Retrofits

The City provides technical assistance, incentives, and grants as part of programs to encourage onsite retrofits and water quality improvements for existing development. Outreach is focused on private property and management of onsite stormwater to mitigate stormwater flow, pollutant discharge, and runoff volume. Key programs include the Green Building and Development Program, Private Property Retrofit Program, the Sustainable Stormwater Management program, the Clean River Rewards Program, and the Backyard Habitat Certification Program. These efforts are summarized in Table 11.1. The City's Community Watershed Stewardship Program is referenced in Section 2 under PI-1.

- **Green Building and Development Program.** Since 2000, the BPS Green Building and Development Program has worked with residents, businesses, and community partners to advance sustainable building practices, including stormwater management for new construction on private property. By request, BPS staff advise construction projects and provide green building presentations. If stormwater management-related questions are asked, BPS refers the public to relevant BES programs and incentives.
- **Stormwater System Program.** The former Sustainable Stormwater Management Program (now integrated into the Stormwater System Division and referenced as the Stormwater System Program) fields public requests for information and provides technical assistance on a variety of stormwater projects, programs, and policy, including green streets, ecoroofs, watersheds, the urban tree canopy program, and more.
- **Private Property Retrofits.** BES's Private Property Retrofit Program works with private property owners to manage onsite stormwater by helping with the installation of rain gardens, stormwater planters, swales, ecoroofs, and pervious pavement on sites that meet program criteria. The City provides substantial financial and technical assistance for project construction in targeted neighborhoods. Participation is voluntary, and the stormwater facilities installed are on private property and are maintained long-term under the administration of the Maintenance Inspection Program (see ND-2). Currently most of the program's work is focused in the City's combined sewer areas to address system capacity issues, but BES is beginning to expand the program to targeted MS4 areas.
- **Clean River Rewards.** Clean River Rewards is Portland's stormwater utility discount program. With Clean River Rewards, Portland ratepayers can save money and work for clean

rivers and healthy watersheds at the same time. Properties that manage onsite stormwater qualify for up to a 100 percent discount on their onsite stormwater management charges. The program rewards private property owners who conduct stormwater retrofits and help protect rivers, streams, and groundwater.

- **Backyard Habitat Certification Program.** As part of the City's invasive species program, the City entered into a $15,000 contract with the Columbia Land Trust, the fiscal agent for the Backyard Habitat Certification Program, for professional, technical, and expert services. The Backyard Habitat Certification Program focuses on reducing impervious area, managing private property stormwater, removing invasive species, and restoring native vegetation.

Table 11.1: Technical Assistance, Incentives, and Grants Programs for Private Retrofits

Green Building and Development Program	**Number (#) (2018–19)**
Projects/building construction	6
Outreach (presentations and tours)	11
Stormwater System Program	
Requests for green streets and other projects	7
Outreach (presentations, conferences, and tours)	56
Clean River Rewards	
New Registrations – Commercial Sites	103
New Registrations – Residential Sites	1,711
Total impervious area currently covered by the program	**3,896 (acres)**
Private Property Retrofit Program (BES)	
Number of private property retrofit projects through PPRP partnerships	109
Acres of impervious area managed in these projects	4.4 (acres)
Total impervious area managed through program to date	**14.9** (acres)
Backyard Habitat Certification Program	
Number of (new) households receiving funding	568
Acreage (new) managed	99
Plants provided	8,165

11.4 Storm System Retrofits and Green Streets

The City continues to implement retrofit projects to roadways and the existing storm drainage system to address water quality and stream health. These retrofits include construction of stand-alone treatment facilities or the conversion of existing drainage infrastructure to facilities that promote watershed health and treatment and/or infiltration of runoff (e.g., roadside ditches to swales or porous shoulders).

One method of system retrofitting is the construction of green streets. The City maintains an active program to identify potential green street opportunities and install green street features (e.g.,

roadside planters and curb bump outs), either as part of a subsequent utility improvement or roadway and sidewalk improvement project. The City currently has 2,234 green streets in their inventory.

Retrofit projects that were in design or construction phases during FY 2018–19 are listed in Table 11.2 at the end of this section.

11.5 Retrofit Funding Mechanisms

During the 2018–19 permit year, BES continued to implement the "% for Green" program to fund green street and water quality retrofit projects.

Under the % for Green program, BES supports construction of green street facilities by taking 1 percent of the construction costs from City infrastructure projects that do not trigger the SWMM and utilizes a selection process to fund green street projects that meet City/bureau goals. The payment-in-lieu funds described in Section 10, ND-2, are dispersed through the % for Green program. The following applicable % for Green projects were constructed:

- Halsey-Weidler Gateway East Triangle green streets.

During FY 2019–20, the criteria that is used to disperse funding for retrofit projects will be reevaluated to better meet system needs. The payment in-lieu is also described briefly in Section 10, ND-2, New Development Standards, due to its connection to implementation of the SWMM.

Table 11.2: Storm System Retrofits and Green Street Projects (FY 2018–19)

Watershed	Retrofit /Facility Type	Project Description	Project Location	Project Status	Job #	Area Treated (acres)	MS4 Outfall
Columbia Slough	TBD	Project to provide stormwater treatment for City ROWs.	North/Northeast Portland	Pre-Design	E10626	TBD	60, 62, 62A, 73A
Columbia Slough	TBD	Project to provide stormwater treatment for City ROWs.	North Portland	Pre-Design	E10690	TBD	58, 59, 61, 61A
Columbia Slough	TBD	Project to provide stormwater treatment for City ROWs.	Northeast Portland	Pre-Design	E10700	TBD	63, 64, 65, 65A
Columbia Slough	Green streets, UICs, catch-basin filters, and a filter vault	Combination of green streets and subsurface stormwater treatment facilities to treat stormwater runoff from City ROWs.	Portsmouth Neighborhood	Design - 30%	E10918	82	57
Columbia Slough	UIC and green streets	Subsurface stormwater treatment facilities and green streets to treat stormwater runoff from City ROWs.	Parkrose Neighborhood	Design - Final	E10689	15	100
Columbia Slough	Green streets	Over 50 green street facilities to treat stormwater runoff from roughly 30 acres of City ROWs.	South of NE Sandy Boulevard, between NE 122nd and NE 138th Avenues, Argay Neighborhood	Construction - Complete	E10625	200	104B
Columbia Slough	Green streets	Swale constructed with a PBOT interagency street improvement project to manage 52,000 sf of N Burgard Road.	Burgard/Lombard Street at N Time Oil Road	Construction - Complete	E10676	1.2	AAA287
Columbia Slough	Green streets	Green streets constructed with a PBOT interagency street improvement project to manage 25,800 sf of N Lombard Street.	N Lombard Street: N Ramsey to 1,500 ft North	Construction - Complete	E10968	0.6	AAA287
Fanno Creek	Stormwater conveyance and regional detention	Partner with PBOT and PWB on a project to enhance transportation infrastructure on the corridor, replace aging water pipes, and enhance stormwater management in the corridor and in adjacent stormwater drainage basins. Note the project area extends to the Tryon Creek watershed.	SW Capitol Highway between Multnomah Village and SW Barbur Boulevard	Design - 90%	E10939	102	Various
Fanno Creek	Stream restoration	Stream enhancement and pipe/pump house removal near Dickinson Park.	SW 57th Place and SW Huddleson Street	Construction - Complete	E10781	N.A.	ADF652
Fanno Creek	Catch-basin storm filters and green streets	Construction is underway on a project to improve stormwater management for water quality and stream health.	SW Shattuck Street at SW Beaverton-Hillsdale Highway	Construction - Complete	E08675	4	ANJ675 ACG027
Fanno Creek	Green streets	Three green streets to manage 2,300 sf of SW 18th Drive. Built by a private developer to meet development requirements.	SW 18th and Iowa	Construction - Complete	EP321	0.1	ACM514
Johnson Creek	Stormwater improvements	Stormwater basin and road improvements to treat 1.2 ac of impervious area that drains to a wetland adjacent to Johnson Creek.	SE Harney Street Between SE 45th and Johnson Creek	Construction - Complete	E08406	1.2	ARC949
Johnson Creek	Green street	Three green streets to manage 6,300 sf of SE 162nd Avenue and one regional swale to manage 72,800 sf of SE 160th Avenue, SE Spokane Court, and SE Tenino Court. Built by a private developer to meet development requirements.	SE 162nd Avenue and SE Spokane Court	Construction - Complete	EP118	1.8	ACV532
Johnson Creek	Stormwater improvements – UICs and green street	Combination of UICs and vegetated stormwater facilities to treat runoff from 1.2 mi of (currently gravel and proposed to be paved) streets.	Errol Heights Neighborhood	Design – 60%	E10917	1.2	ACZ290
Johnson Creek	Stream restoration	Repair eroding streambed and banks of Johnson Creek that were damaged following a FEMA-declared disaster flood event (December 2015).	South of SE Luther Road, east of SE 72nd	Construction – 50%	E10854	N.A.	N.A.
Johnson Creek	Stream restoration	Remove Works Progress Administration rock-wall channel lining, restore floodplain and habitat, and improve water quality.	West of SE Deardorff Road, north of SE Flavel Street (approximately River Mile 9.6 of Johnson Creek)	Design – 30%	E07518	N.A.	N.A.
Tryon Creek	Culvert replacement/bridge construction	Remove an undersized culvert and replace with a bridge to improve fish passage.	SW Boones Ferry Road at Arnold Street (confluence of Arnold and Tryon Creeks)	Design – 100%	E08682	0.6	near ANT403

Watershed	Retrofit /Facility Type	Project Description	Project Location	Project Status	Job #	Area Treated (acres)	MS4 Outfall
Willamette River	Stream enhancement	Three projects at the Stephens Creek Headwaters to manage stormwater flows and enhance water quality and habitat.	SW 26th and Texas Street, Custer Park, Stephens Nature Park	Design - 90%	E10911; E10912; E10596	TBD	ACS140 (Custer)
Willamette River	Trash rack restoration	Upgrade and repair Balch Creek trash rack.	Lower MacLeay Park	Design - 90%	E10583	N.A.	ABB702
Willamette River	Outfall repair	Repair three outfalls and improve a ditch in the Stephens Creek subwatershed.	SW Taylors Ferry Road, SW Boones Ferry Road	Design - 30%	E11186	N.A.	ACY343 ACY397 ACY401
Willamette River	Outfall repair	Repair three outfalls in the Stephens Creek subwatershed.	SW 2nd and Taylors Ferry Road; SW Custer and Canby	Construction - Complete	E10579	N.A.	ACT031 ACY349 (completed) ACY374, ACY378
Willamette River	Green street	One green street to treat roadway runoff prior to discharge in the headwaters of channel in Riverview Natural Area.	SW Palatine Hill at Corbett Lane	On Indefinite Hold	E10634	1.3	ADD991
Willamette River	Green street	Two green streets to manage 24,150 sf of NW Front Avenue. Built by a private developer to meet development requirements.	NW 17th and Front Avenue	Construction - Complete	EP209	0.6	OF13
Willamette River	Green street	One green street (Facility #7) to manage 7,300 sf of the SW Bond Avenue project.	SW Bond Avenue: Porter to River Parkway	Construction - Complete	E10773	0.2	OF07B
Willamette River	Stream restoration	Replacement of an undersized culvert with an open-bottom culvert to improve connectivity between the Refuge and the Willamette River.	Oaks Bottom Wildlife Refuge	Construction - Complete	E08576	75	N.A.

Section 12
Natural Systems (NS-1)

BMP Summary

Protect and enhance natural areas and vegetation that help prevent pollutants from entering into the MS4.

Measurable Goals

- Plant 20,000 trees and initiate revegetation work on 70 acres by the end of the permit cycle.
- Acquire 50 acres of land by the end of the permit cycle.
- Update the Portland Plan (an update to the City's Comprehensive Plan) by December 2013.

12.1 Land Acquisition and Protection

The City pursues opportunities for land acquisition to protect and restore watershed functions such as stormwater filtration, groundwater recharge, storage and retention of flood waters, sediment delivery, and nutrient recharge. Programs in place to acquire land include the Johnson Creek Willing Seller Program and Watershed Land Acquisition Program, and other acquisition and management efforts in conjunction with PP&R and Metro. Table 12.1 lists land acquisition by watershed.

Table 12.1: Land Acquisition and Protection

Watershed	2018–19 Acquisition Area (acres)
Johnson Creek	1.4
Fanno Creek	0.0
Tryon Creek	0.4
Willamette River (direct)	22.0
Total	**23.8**

12.2 Land Use Planning and Zoning Tools

The City develops and maintains various planning documents, codes, and ordinances related to the protection of natural resources. Comprehensive guidelines related to natural resource conservation and protection are addressed in the recently adopted 2035 Comprehensive Plan and the Central City 2035 Plan, which sets a 20-year vision for the central city that includes a range of policies related to climate change resilience, sustainable development, and management of the Willamette River and its adjacent uses. Both plans reflect significant public input and a future vision of planning and policies.

The City also implements and enforces tree and zoning codes (e.g., Title 11, Trees) and overlay zones (e.g., environmental protection and environmental conservation overlay zones), which further protect high-value natural resources and limit natural resource area disturbances. Five of the City's overlay zones protect or conserve resources, functional values, and/or significant wildlife

habitat.[3] Three of the City's overlay zones preserve and enhance the natural and scenic qualities of Portland's rivers while allowing for specific uses within the zones.[4] Additionally, City-approved Plan Districts, Natural Resource Management Plans, and Comprehensive Natural Resource Plans may contain environmental protection regulations that supersede or supplement the overlay zones described previously. Through the City's review of land division applications, important streams, seeps, and springs not already protected by environmental overlay zones are protected and maintained in their natural state within required platted tracts. Developers are required to adhere to setbacks from stream, wetlands, and overlay zones and limit tree removal in conjunction with development.

The City continued planning processes that include goals and policies focusing on watershed health and environmental quality. Work during FY 2018–19 included the following:

- Adopted and began implementation of the Central City 2035 Plan, which sets a 20-year vision for the central city and is a culmination of over 5 years of planning and public involvement. The plan includes a range of policies related to the climate change resilience, sustainable development, and management of the Willamette River and its adjacent uses. Among the strategies included in the plan are the establishment of a new Willamette River overlay zone (to replace greenway regulations in the central city), an ecoroof requirement in the central city, an expanded river setback requirement (from 25 feet to 50 feet), new bird-safe building guidelines, 20-year tree canopy targets, and others.
- Continued the effort focused on the south reach of the Willamette River that will update the City's *Willamette Greenway Plan*. The River Plan/South Reach Plan will update existing policies and codes for the area, establish a new urban design framework; include natural resources and scenic resources protection plans; and identify future strategies, actions, and potential investments for improving and increasing habitat. Building on the central reach changes in the Central City 2035 Plan, the River Plan/South Reach Plan will apply the new river overlay zones to properties in the Willamette south reach area. Key proposals include reducing the size of riverbank trees that are regulated in the area, application of the River Environmental overlay zone to both undeveloped and developed floodplains, a "beneficial gain" requirement for floodplain development within 170 feet of ordinary high water, and others.
- The Environmental Overlay Zone Map Correction Project is underway. The project will correct the location of the conservation and protection overlay zones to better align with the location of rivers, streams, wetlands, flood area, vegetation, steep slopes, and wildlife habitat. The project includes all areas of Portland subject to zoning code Chapter 33.430. Public hearings are anticipated in spring to fall 2020, with adoption likely in early 2021. Correcting the location of the overlay zones will better ensure that green infrastructure is protected and negative impacts to the natural resources are appropriately mitigated.

[3] Overlays include the Environmental Conservation (c), Environmental Protection (p), Greenway River Water Quality (q), Greenway River Natural (n), and Pleasant Valley Natural Resources (v).

[4] Overlays include the Greenway River Recreational (r), Greenway River General (g), and River Industrial (i).

- Continued evaluation of existing policies and development regulations in the floodplain to prepare for potential changes in the Federal Emergency Management Agency (FEMA) National Flood Insurance Program (NFIP) criteria resulting from the National Marine Fisheries Service Biological Opinion on the NFIP in Oregon. Changes proposed as a part of the River Plan/South Reach represent a first step toward updating floodplain development regulations throughout the city to avoid impacts on endangered and threatened species in the Willamette River and ensure continued compliance with FEMA's NFIP.
- Continued to conduct due diligence on establishing citywide mitigation banks to address multiple environmental impacts from private development, including water quality.
- Continued implementation of Title 11 (Trees), which includes tree preservation and planting requirements on development sites and standardization of the City's tree removal permit system. The tree code also applies to nondevelopment-related tree planting/pruning/removal on private property and in public ROW planting strips. These regulations help to preserve, expand, regenerate, and improve the quality of Portland's tree canopy. Expanding tree canopy will improve stormwater management throughout the city.
- BDS continued inspection and enforcement of Title 33 tree preservation, landscaping, and tree planting requirements.
- BDS began discussions with PP&R Urban Forestry concerning coordination of inspection and plan review efforts. Discussions have identified the need to improve plan review coordination, the need for designated "no-trench" BMPs, and the need for street tree planting notifications between workgroups.

12.2.1 Climate Change Planning

In 2015, Portland City Council adopted the 2015 Climate Action Plan, Portland's updated climate plan focused on reducing local carbon emissions and building resilience to the projected impacts of climate change. The Climate Action Plan provides a roadmap for the community to achieve an 80 percent reduction in carbon emissions by 2050, with an interim goal of a 40 percent reduction by 2030.

The City implements actions outlined in the Climate Change Preparation Strategy (adopted in 2014). The Strategy recognizes the critical role of the urban forest and natural systems in making the City more resilient to potential climate-related changes in summer air and water temperatures, urban heat islands, storm intensity and flooding patterns, and frequency of landslides and wildfires.

Work in PY 2018–19 included the following:

- BES continued development of a resiliency master plan for wastewater and stormwater infrastructure to better prepare City infrastructure for climate change impacts. Efforts included extrapolating the effect of range of climate projections on CSOs, assessing the sensitivity of a sewer basin to potential changes in rainfall intensity and volume, conducting a scenario planning exercise to identify adaptation strategies for a constructed wetland facility, and screening bureau facilities for vulnerability to river flooding.
- BES is coordinating with neighboring agencies to fund high-resolution regional climate models produced by the University of Washington Climate Impacts Group. Data from these

models will improve understanding of how global climate change will have local effects and will indicate how sub-daily rainfall intensity may change in the future.

- In partnership with the National Science Foundation (Urban Resilience to Extremes Sustainability Research Network), Portland was one of 10 cities selected for a grant to evaluate and respond to potential climate change impacts. As part of that project, Portland will be doing a scenarios workshop to develop decision-making and planning structures to advance natural disaster resilience and recovery and discuss how to best address extreme events like flooding and landslides, exacerbated by climate change.
- City bureaus completed collaborative projects with researchers at Portland State University, facilitated by the Institute for Sustainable Solutions. BPS pursued a project to evaluate potential flooding along the Willamette River under different climate change scenarios. BES and PWB were involved in a study of how climate change might shift the frequency of storm types that historically have caused challenges for the stormwater management system and the Bull Run watershed.
- The City participated in a flood risk analysis by the U.S. Army Corps of Engineers and U.S. Geological Survey for the Columbia River, Willamette River, and Columbia Slough under the Levee Ready Oregon Solutions project.
- The City's infrastructure bureaus (BES, PWB, PBOT, PP&R) have continued to meet regularly and have formed the Disaster Resilience and Recovery Action Group, which is coordinating and facilitating multi-bureau resilience planning.
- The PP&R Urban Forestry department is focusing efforts to increase tree canopy in areas with elevated urban heat island effects as well as neighborhoods with low-income residents and underrepresented communities, including communities of color. Increased tree canopy will help alleviate some potential impacts of climate change.
- The City is conducting ongoing work with Portland State University to further understand the implications of green infrastructure on temperature.

12.3 Watershed Revegetation Program

The Watershed Revegetation Program, along with public agencies, businesses, and landowners, participates in and helps fund revegetation projects on properties (see Table 12.2). The program works to improve water quality and native habitats by removing non-native invasive plants, reintroducing native vegetation, creating habitats, and reducing erosion and pollutant transport.

Table 12.2: Watershed Revegetation Program Activities (FY 2018–19)

Watershed	Trees Planted		Shrubs Planted	New Streambank (linear ft)	New Acreage
	Deciduous	Coniferous			
Willamette River	3,275	50	4,650	3,220	4.0
Columbia Slough	721	426	1,575	0	17.9
Johnson Creek	505	325	1,850	1,645	2.0
Tryon Creek	150	200	1,175	752	3.8
Fanno Creek	535	400	1,475	1,468	1.0
Total	**5,186**	**1,401**	**10,725**	**7,085**	**28.7**

12.4 Partnership Stream and Natural Area Restoration Activities

Through partnerships with nonprofits, community groups, and schools, the City actively enhances natural areas using volunteer support. Activities include invasive plant species removal, native plant installation, and community education. A number of these partnership planting and restoration activities (Table 12.3) are consistent with the volunteer outreach reported under PI-1.

Table 12.3: Partnership Restoration Activities (FY 2018–19)

Program/Watershed	Events	Streambank Restored (linear ft)	Trees Planted	Other/Natives Planted	Acres	
					Invasives Removed	Restored
SW Watershed Resource Center Partnership	5	NA	NA	842	0.15	0.15
Neighborhood to the River	33	530	NA	3,483	0.51	1.16
Johnson Creek Watershed Restoration Event	43	3,225	689	7,947	8.00	1.00
Community Watershed Stewardship Program and Native Mini Grants	93	36,960	NA	4,074	NA	1.95
Total	**174**	**40,715**	**689**	**16,346**	**8.66**	**4.26**

**Results presented should be considered estimates only, due to varying tracking methods between program coordinators.*

NA = Not reported or tracked.

12.5 Partnership Upland Tree-Planting Activities

Through partnerships with nonprofits, community members, businesses, and schools, the City actively enhances watershed health by planting trees in the upland, built environment using community engagement and volunteer support. Table 12.4 displays the number of trees planted through these partnerships. These upland trees expand the urban forest canopy, managing stormwater locally while improving habitat connectivity in the urban matrix between natural areas.

Table 12.4: Partnership Upland Tree−Planting Activities

Program	Trees Planted (FY 2018–19)
Friends of Trees partnership	2,304
Treebate program incentives	125
Community partner planting with contractors	348
Total	**2,777**

12.6 Portland Parks & Recreation Natural Area Activities

The PP&R City Nature Workgroup works with staff and volunteers to help restore natural areas to encourage native species regeneration, provide habitat to wildlife and insects, and provide safe trails to park visitors. PP&R does this through various planned and volunteer projects such as invasive species removal, native planting and plant maintenance, fence building, and trail work. PP&R hosts monthly volunteer events in natural areas throughout Portland.

PP&R's new Ecologically Sustainable Landscapes Program supports a multi-benefit approach to healthy urban nature. Nature Patch projects implemented through this program retrofit developed parks with natural landscapes to restore ecosystem services in the urban core. These spaces foster habitat, increase native plant diversity, enhance ecological value, capture stormwater, and reduce irrigation, as well as provide environmental education and stewardship opportunities to the public.

Table 12.5 provides a summary of the planting activities that PP&R implemented in both natural area parks and developed parks.

Table 12.5: Portland Parks & Recreation Planting Activities (FY 2018–19)

Number of Plantings	Natural Area Parks	Urban/Developed Parks
Native	30,661 trees/shrubs/other	11,136 trees/shrubs/other
Non-native	NA	7,746 trees/shrubs/other
Total	**30,661**	**18,882**

12.7 Invasive Plant Species Removal

BES and PP&R implement programs to target and remove invasive species to restore hydrologic and ecological functions to riparian and upland areas. Portland's Early Detection/Rapid Response Program focuses on controlling invasive plant infestations while their distribution is limited and patches are small. This approach increases the possibility of eradication and is much less expensive than trying to control well-established invasive species. PP&R addresses removal of invasive plants in natural areas through their Land Stewardship Division with annual work plans that specify locations and areas for treatment.

Table 12.6: Invasive Plant Species Removal

Program	Area Treated (FY 2018–19)
Early Detection/Rapid Response (BES)	180 acres
Land stewardship – natural areas (PP&R)	1,021 acres
Total	**1,201 acres**

12.8 Floodplain Protection

BDS continues to implement and enforce Portland City Code Chapter 24.50, Flood Hazard Areas. The purpose of the code is to protect public health, safety, and welfare by restricting or prohibiting uses that are dangerous to health, safety, or property in times of flood or that cause increased flood heights or velocities, and by requiring that uses and structures vulnerable to floods be protected from flood danger at the time of initial construction.

In addition, BDS and BES implement the City's SWMM, which is designed to protect receiving waters from increased flow rates and volumes due to development and to minimize impacts to properties downstream and upstream from development.

Finally, environmental resources are protected through by applying overlay zones (e.g., Environmental Conservation, Environmental Protection, and River Environmental), adopting Plan Districts and Natural Resource Management Plans, and enforcing related requirements during development review processes. Environmental overlay zones protect resources and functional values that have been identified by the City as providing benefits to the public.

Collectively, these environmental regulations encourage flexibility and innovation in site planning and provide for development that is carefully designed to be sensitive to the site's protected resources. These regulations also help meet other City goals, along with other regional, state, and federal goals and regulations. The environmental regulations also carry out Comprehensive Plan policies and objectives.

Section 13
Program Management (PM-1)

BMP Summary

Conduct program management, coordination, and reporting activities.

Measurable Goals

- Submit annual reports by November 1 of each year.

The City's MS4 Program Manager is responsible for overall project management, compliance reporting, policy development, and coordination within the City of Portland, as well as for co-permittee coordination. BES section managers and staff members serve as leads for the BMPs contained in the SWMP. Because the permit is citywide, many City staff members outside BES are also involved with stormwater program development, implementation, and reporting.

13.1 Measurable Goals

As defined in the MS4 permit, measurable goals are BMP objectives or targets used to identify progress of SWMP implementation. Table 13.1 provides the status of meeting the City's measurable goals for FY 2018–19.

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Table 13.1: MS4 Program Measurable Goals Evaluation and Summary

BMP	Measurable Goal	Description	Permit Year Status
PI-1	Provide outreach to approximately 15,500 K–12 students annually (classroom programs, education field programs).	Provided or supported outreach to approximately 21,152 students.	✓
	Award at least $50,000 in community stewardship grants annually.	Awarded 13 stewardship grants totaling $104,780.	✓
	Involve approximately 10,000 participants in community events, workshops, stewardship projects, and restoration events annually.	Involved approximately 20,494 participants in 441 events citywide.	✓
	By May 2011, develop and distribute a public education bill insert to over 200,000 water and sewer customers.	Completed as reported in FY 2010–11. In FY 2018–19, the City distributed four separate inserts in quarterly water/sewer bills to more than 190,000 ratepayer properties.	N.A.
OM-1	Develop a training handbook for PBOT-MO staff during the permit term.	Completed the PBOT *Maintenance Environmental Handbook* in 2011. It includes guidance for maintenance procedures, preferred seasonality of work, and materials management.	N.A.
	Provide the following maintenance actions over the 5-year permit cycle: • Clean 31,000 lineal feet of culverts. • Repair 10,000 lineal feet of culverts. • Clean 250,000 lineal feet of ditches. • Clean 38,000 inlets and catch basins. • Repair 1,500 inlets and inlet leads. • Clean 135 major stormwater management facilities/pollution reduction facilities. • Repair 40 pollution reduction facilities.	Maintenance actions completed for FY 2018–19: • Cleaned 1,515 lineal feet of culverts. Total to date over permit term: 143,368 feet. • Repaired 202 lineal feet of culverts. Total to date over permit term: 11,172 feet. • Cleaned 30,323 lineal feet of ditches. Total to date over permit term: 428,523 feet. • Cleaned 11,196 inlets and catch basins. Total to date over permit term: 109,562 assets. • Repaired 231 inlets and inlet leads. Total to date over permit term: 2,163 assets. • Cleaned 154 major stormwater management facilities/pollution reduction facilities. Total to date over permit term: 1,063 facilities. • Repaired 7 pollution reduction facilities. Total to date over permit term: 76 facilities.	✓
OM-2	Sweep arterials six times/year.	Swept arterials four to six times/year. The City strives to sweep larger arterial streets six times per year, but there are some circumstances that occasionally prevent crews from meeting that frequency, such as inclement weather, roadway conditions, and urgent street-cleaning issues that divert resources to higher priority areas. The City also sweeps residential streets approximately once per year and sweeps higher trafficked areas, such as the downtown core, with a much higher frequency. The City also targets roadway areas with debris and trash build-up more frequently in the interest of water quality and bike safety. Given the City's level of effort on arterial and other roadways and the prioritization of areas that pose a greater threat to safety and water quality, this measurable goal is considered met and no adaptive management changes are needed.	✓
	Develop a training handbook for PBOT-MO staff during the permit term.	Completed the PBOT *Maintenance Environmental Handbook* in 2011. It includes guidance for maintenance procedures, preferred seasonality of work, and materials management.	N.A.
OM-3	Inspect and maintain, as necessary, all stormwater and stormwater containment and pollution prevention facilities in City maintenance yards annually.	Completed.	✓
IND-1	Inspect all permitted (1200Z, 1200COLS) facilities once per year.	Completed.	✓
	Review each permitted facility's monitoring and annual reports each year.	Completed.	✓
	Survey 100% of newly identified facilities to determine the need for NPDES permits.	Completed.	✓
	Every 5 years, inspect industries (individual sites) previously identified as having no exposure and not required to obtain a permit.	Completed.	✓
	Complete revision of City Code Title 17.39 by 2012.	Completed. City Council adopted code revisions in September 2011.	N.A.
IND-2	Under the Eco-Logical Business Program, certify 10 additional auto shops and 20 additional landscape firms that provide services within the City of Portland by 2015.	During FY 2017–18, the City evaluated the effectiveness of the EcoBiz Program in meeting pollutant prevention goals. Results of this evaluation indicated that the EcoBiz program provides a positive community benefit. During FY 2018–19, the program was expanded to include dry cleaners. During the FY 2018–19, the City funded a limited-term staff position to expand EcoBiz activities in the landscaping sector to address issues including pesticide use, erosion control, and water conservation. Documentation of measurable goal status was described in FY 2016–17.	N.A.
	Evaluate one new business sector for implementation of the Eco-Logical Business Program.	Completed. Expanded the program to the car-washing sector as reported in FY 2010–11 and dry cleaners during FY 2018–19.	N.A.

Table 13.1: MS4 Program Measurable Goals Evaluation and Summary

BMP	Measurable Goal	Description	Permit Year Status
ILL-1	Conduct dry weather sampling at all major City-owned outfalls at least once annually.	Completed.	✓
	Inspect the priority outfalls a minimum of three times a year.	Completed.	✓
	Expand the IDDE (formerly IDEP) program to include the CSO system below diversion structures, where the outfalls discharge stormwater only and should have no dry-weather flows. Currently, the program addresses all westside outfalls and 25% of the Eastside outfalls. Expand the program to all Eastside outfalls by December 2013.	Completed as reported in FY 2013–14.	N.A.
	Maintain the spill response hotline 24 hours a day.	Completed.	✓
ND-1	Evaluate the *Erosion and Sediment Control Manual* and update as needed (at least once during the 2011–16 permit cycle); conduct public involvement on updates.	Initiated an effort to evaluate updates to the City's *Erosion and Sediment Control Manual*, including a review of the existing manual's structure, BMPs, and usability.	N.A.
	Inspect public sites with erosion control permits daily during construction.	Completed.	✓
	Inspect 100% of active private development construction sites subject to erosion control requirements. At a minimum, inspections will occur (1) after initial temporary erosion control measures are installed, and (2) near completion of development after permanent erosion control measures are in place. Conduct interim checks as part of routine building permit inspections.	100% of requested erosion control inspections for active private development construction sites were performed. Sites were inspected for temporary and permanent erosion control measures at the beginning and near completion of the project(s). Interim checks were conducted during regular building inspections.	✓
ND-2	Inspect 1,500 private stormwater facilities or 450 properties annually. Use education and enforcement tools to ensure that stormwater management O&M plans are followed.	Under the Maintenance Inspection Program (MIP), inspected 2,613 private stormwater facilities associated with 1,262 properties. Provided technical assistance, education, and enforcement to ensure facilities are sufficiently operated and maintained.	✓
	Revise the SWMM during the 2011–16 permit term.	Revision and adoption of the updated SWMM occurred in both 2014 and again in 2016.	N.A.
	Track number, type, size, drainage area, and location of private facilities constructed annually.	This information is tracked for all private stormwater management facilities subject to the SWMM under an O&M agreement.	✓
STR-1	Construct the following public facilities to provide treatment for stormwater runoff from approximately 336 acres: • Construct the NE 148th Avenue stormwater management facility by FY 2014–15. • Construct stormwater management facilities in the NE 122nd Avenue subbasin by December 2012 (Columbia Slough Watershed). • Convert 5,000 linear feet of roadside ditches to swales or porous shoulder (Tryon Creek and Fanno Creek watersheds) during the permit term. • Construct stormwater management facilities along SW Beaverton-Hillsdale Highway and SW Barber Boulevard and in commercial and multi-family residential areas (Tryon Creek and Fanno Creek watersheds) during the permit term.	Completed as reported in FY 2015–16.	N.A.
	Track the number, type, drainage area, and location of public facilities constructed annually.	Completed.	✓
NS-1	Plant 20,000 trees and initiate revegetation work on 70 acres by the end of the permit cycle.	Planted 6,587 trees (5,186 deciduous and 1,401 coniferous) on 28.7 acres. Total to date during this extended permit term: Planted 227,329 trees (162,528 deciduous and 64,801 coniferous) on 1,313.8 acres.	N.A.
	Acquire 50 acres of land by the end of the permit cycle.	Acquired 23.8 acres of land this permit year. The total amount of land acquired to date during this extended permit term is 676.9 acres.	N.A.
	Update the Portland Plan (an update to the City's Comprehensive Plan) by December 2013.	Completed. City Council adopted the Portland Plan on April 25, 2012.	N.A.
PM-1	Submit annual reports by November 1 of each year.	Submitted the FY 2017–18 report on October 30, 2018. Anticipate submittal of PY 24 (FY 2018–19) report on or by November 1, 2019.	✓

APPENDIX A

TMDL Implementation Plan Annual Report

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Appendix A

City of Portland, Oregon

Total Maximum Daily Load (TMDL) Implementation Plan

ANNUAL STATUS REPORT NO. 11

Fiscal Year 2018 –2019

(July 1, 2018 to June 30, 2019)

Prepared for:

Oregon Department of Environmental Quality

Submitted by:

City of Portland

Submitted on:

November 1, 2019

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Acronym List

BES	Bureau of Environmental Services
City	City of Portland
DEQ	Department of Environmental Quality
DMA	Designated Management Agency
EDT	Ecosystem Diagnosis and Treatment
FY	fiscal year
IPM	integrated pest management
LID	low impact development
MS4	municipal separate storm sewer system
NPDES	National Pollutant Discharge Elimination System
P2O	Pollution Prevention Outreach
SWMM	stormwater management manual
SWMP	stormwater management plan
TIP	TMDL Implementation Plan
TIR	thermal infrared
TMDL	Total Maximum Daily Load

Section 1
Introduction

This Total Maximum Daily Load (TMDL) annual status report (annual report) summarizes key activities and accomplishments in accordance with the City of Portland's 2019 *TMDL Implementation Plan* (TIP). This TMDL annual report summarizes the implementation status of the City of Portland's (City's) activities and management strategies to reduce TMDL pollutants in local water bodies during fiscal year (FY) 2018–19 (July 1, 2018, through June 30, 2019).

A multitude of environmental programs and activities are employed by the City to address both point and nonpoint sources of pollutants.[1] Therefore, many activities outlined in this TMDL annual report are also conducted to fulfill obligations under the City's National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Discharge Permit No. 101314 (MS4 permit). A separate annual report is submitted to the Oregon Department of Environmental Quality (DEQ) for compliance with the City's MS4 Permit and associated 2011 *Stormwater Management Plan* (SWMP). This annual report is included as an appendix to the City's MS4 annual report and refers to that report for stormwater-related topics and implementation of select management strategies identified in the TIP. Temperature-related strategies to specifically address load allocations are detailed in this annual report as well.

1.1 Background and Applicability

The City is a listed Designated Management Agency (DMA) in Portland-area TMDLs, developed by the DEQ and approved by the Environmental Protection Agency. DMAs are required to develop a TIP; report on implementation progress annually, provide a summary of overall progress every 5 years, and update the TIP as necessary.

The City's 2019 TIP identifies management strategies the City uses to reduce pollutants from nonpoint sources to restore and protect water quality in local waterways and the Willamette River. It reflects an update of the City's previous TIP (March 2014) following completion of DEQ's 5-year lookback survey, which reported on progress over the last 5 years. The survey provided an opportunity to identify improvements to management strategies. The City will implement strategies identified in the 2019 TIP within its jurisdiction during the next 5-year implementation plan cycle (March 1, 2019, to March 1, 2024).

[1] TMDLs divide a total allowable pollutant load into allocations to point sources (called "waste load allocations") and nonpoint sources (called "load allocations") and several other input factors. Waste load allocations established in TMDLs are implemented through NPDES permits.

1.2 Report Organization

This annual TMDL report covers implementation actions and accomplishments that occurred during FY 2018–19. The report is organized into the following sections:

- Section 2: Adaptive Management and Reporting
- Section 3: Management Strategies
- Section 4: Temperature Related Activities

Section 2
Adaptive Management and Reporting

The City uses an adaptive management approach to identify whether the TIP needs to be modified for improved effectiveness. This includes both an annual process and a more comprehensive longer-term process. Public involvement and reporting activities are conducted throughout the implementation period.

2.1 Adaptive Management

The City conducts an annual adaptive management process in conjunction with preparing its annual MS4 report and TMDL report. This annual review process is used to determine if the City's TMDL programs are being implemented in accordance with the TIP and to identify whether any adjustments are needed.

In addition, every 5 years, the DEQ requires DMAs to evaluate the implementation of management strategies contained in their TIPs. The resulting 5-year look-back report indicates whether the TIP is adequately meeting pollution reduction goals. As part of this process, the City reviews the TIP to assess its strategies and progress toward meeting goals and to propose changes as appropriate. Existing strategies are reviewed and refined to reflect progress made over the last 5 years, and the TIP is updated accordingly, if needed.

2.2 Public Involvement and Reporting

Annual reports are prepared and submitted to DEQ each year by November 1, outlining activities and accomplishments conducted to comply with identified strategies, performance monitoring metrics, and implementation timelines reflected in the TIP. The report summarizes implementation of strategies and identifies programmatic issues or modifications needed.

The City's 2019 TIP, annual reports, 5-year evaluations, and other relevant information are posted online and made publicly available. A contact number is provided for those who have questions or want to provide input on the City's plans, strategies and other environmental program activities.

Section 3
Management Strategies

Many management strategies listed in the City's 2019 TIP are conducted to comply with the City's NPDES MS4 permit and associated SWMP. It is the City's intent to maintain consistency between the SWMP and the TIP, as most of these programs are applied citywide regardless of regulatory applicability.

Table 3.1 summarizes management strategies identified in the 2019 TIP to reduce TMDL pollutants and improve water quality. Management strategies listed in Table 3.1 are generally applied citywide and reduce TMDL pollution from point and nonpoint sources.

Table 3.1 lists all management strategies and provides references to the relevant annual report locations (MS4 annual report, monitoring annual report, or TMDL annual report) where information can be obtained for each. Because many identified management strategies are related to the City's NPDES MS4 permit and SWMP, such **stormwater** management strategies are considered ongoing and will be implemented throughout and likely beyond the 5-year TIP cycle. **Temperature** management strategies are discussed in detail in Section 4.

Table 3.1: Management Strategies to Address TMDL Pollutants

ID	Management Strategy	Annual Report Reference (BMP and Section Number, as applicable)
EO1	Clean Rivers Education Programs. Provide water quality classroom and field science education programs for K–12 students.	MS4 Report: PI-1, Section 2.1
EO2	Outreach and Social Media. Educate the public about stormwater and surface water quality, pollution prevention, and riparian and wetland protection via the web, blogs, mailings, and social media.	MS4 Report: PI-1, Section 2.4
EO3	Watershed Education and Stewardship. Support and conduct watershed-specific public education and stewardship activities, events, workshops, and restoration projects.	MS4 Report: PI-1, Section 2.3
EO4	Citywide Education and Stewardship. Conduct public education and stewardship activities focused on urban trees, green streets and vegetation citywide.	MS4 Report: PI-1, Section 2.3
EO5	Pet Waste Management. Promote and facilitate proper disposal of pet waste in City parks and site dog parks away from waterways.	MS4 Report: PI-1, Section 2.5
EO6	Alternative Transportation. Promote carpooling, public transportation and alternative commuting strategies to reduce emissions with toxic pollutants and support climate action.	MS4 Report: PI-1, Section 2.6
EO7	Regional Education. Support and participate in education and outreach programs with regional partners and jurisdictions.	MS4 Report: PI-1, Section 2.7
EO8	Community Stewardship Grants Program. Distribute grant monies to citizens and organizations to engage watershed protection projects and promote public involvement.	MS4 Report: PI-1, Section 2.2
EO9	Public Involvement in TMDL Program. Post the TMDL Implementation Plan and annual reports on the City website.	TMDL Report: Adaptive Mgmt and Reporting, Section 2.2
OM1	City Stormwater System O&M. Conduct condition assessment activities and maintain and repair City stormwater collection, conveyance, and treatment systems.	MS4 Report: OM-1, Section 3.2
OM2	Stormwater O&M Practices. Review stormwater O&M practices, procedures and manual(s) and update as necessary.	N/A: Pending
OM3	City Stormwater System Inventory and Mapping. Maintain and update systems to track and map City stormwater conveyance and treatment assets.	MS4 Report: OM-1, STR-1, Section 3.1, 11.2
OM4	Stormwater System Planning. Implement a Stormwater System Plan to assess system risks related to capacity, condition, service needs, water quality and stream impacts.	MS4 Report: STR-1, Section 11.1
OM5	Private Stormwater Facilities O&M. Conduct inspection and technical assistance activities of privately-owned stormwater management and treatment facilities.	MS4 Report: ND-2, Section 10.2
OM6	Street Cleaning and Debris Removal. Implement cleaning and/or debris removal activities on City streets to reduce the discharge of pollutants in stormwater.	MS4 Report: OM-2, Section 4.1

Table 3.1: Management Strategies to Address TMDL Pollutants

ID	Management Strategy	Annual Report Reference (BMP and Section Number, as applicable)
OM7	Street Deicing. Implement City deicing practices that minimize environmental impacts as much as practicable during snow and ice events.	MS4 Report: OM-2, Section 4.2
OM8	Employee Training. Provide employee training on operation, maintenance and construction practices to protect water quality.	MS4 Report: OM-2, ND-1 Section 4.3, 9.3
OM9	Integrated Pest Management. Implement an Integrated Pest Management (IPM) program to minimize the use and application of fertilizers, herbicides, and pesticides in City parks and natural areas.	MS4 Report: OM-3, Section 5.2.1
OM10	Sustainable City Fleet. Incorporate electric, hybrid, and fuel-efficient vehicles into the City's transportation fleet to reduce emissions with toxic pollutants and support climate action.	MS4 Report: OM-3, Section 5.6
OM11	City Maintenance Facilities. Employ structural and nonstructural BMPs at City maintenance facilities.	MS4 Report: OM-3, Section 5.1
OM12	Salmon-Safe Certification. Engage City operations, maintenance and other property management practices to maintain citywide Salmon-Safe Certification.	MS4 Report: OM-3, Section 5.5
OM13	Water Conservation. Implement irrigation principles at City parks that conserve water, minimize runoff, increase infiltration, and optimize fertilizer use.	MS4 Report: OM-3, Section 5.2.2
IND1	Industrial and Commercial Stormwater. Implement a program to reduce and control pollutants in stormwater runoff from industrial and commercial facilities.	MS4 Report: IND-1, Section 6.1
IND2	Pollution Prevention Outreach (P2O). Support and participate in regional P2O efforts that promote business and public pollution prevention and mercury minimization practices.	MS4 Report: IND-2, Section 7.1, 7.2, 7.3
IND3	Wellhead Protection. Support and provide technical assistance to businesses in the Columbia South Shore Wellhead Protection area to implement BMPs and prevent harmful releases to the well field.	MS4 Report: IND-2, Section 7.4
IND4	Pollution Source Control. Impose pollution control requirements for "high-risk" or pollutant-generating development activities.	MS4 Report: ND-2, Section 10.3
ILL1	Sewer Connections. Require new development or properties with nonconforming sanitary sewers to connect to the City sanitary sewer system if available.	MS4 Report: ILL-1, Section 8.2
ILL2	Sanitary Sewer Repair. Identify and repair sanitary sewer problems that cause seepage to the MS4 and surface waters.	MS4 Report: ILL-1, Section 8.3
ILL3	Illicit Discharge Detection and Elimination. Identify, investigate, enforce and eliminate illicit connections and discharges to the MS4.	MS4 Report: OM-3, ILL-1, Section 5.3, 8.1, 8.1.2, 8.1.3
ILL4	Dry-Weather Field Screening. Conduct dry-weather field screening of MS4 outfall basins to identify and eliminate illicit discharges.	MS4 Report: ILL-1, Section 8.1.1
ILL5	Portable Restrooms. Place portable restrooms at City parks for public and sporting events where necessary and near homeless encampments where possible and appropriate.	MS4 Report: ILL-1, Section 8.4

Table 3.1: Management Strategies to Address TMDL Pollutants

ID	Management Strategy	Annual Report Reference (BMP and Section Number, as applicable)
ILL6	Curbside Collection Services. Implement solid waste and recycling programs to prevent illegal dumping of solid and liquid wastes.	MS4 Report: ILL-1, Section 8.1
ND1	Construction Runoff Control Program. Implement erosion and sediment control plan review, technical assistance and site inspections for ground-disturbing activities.	MS4 Report: ND-1, Section 9.1
ND2	Erosion Control Manual and Legal Authority. Maintain and update as needed the legal authority and guidance manual requiring erosion and sediment controls for active development construction sites.	MS4 Report: ND-1, Section 9.1
ND3	Hillside and Slope Protection. Implement a hillside development protection code to minimize erosion and soil mass-wasting.	MS4 Report: ND-1, Section 9.2
ND4	Post-Construction Runoff Control Program. Implement SWMM plan review, technical assistance and inspection activities for new and redevelopment projects to treat and control post development stormwater runoff.	MS4 Report: ND-2, Section 10.2
ND5	Onsite Stormwater Retention. Require stormwater management practices for new and redevelopment that optimize onsite retention and target natural surface and predevelopment functions as much as practicable.	MS4 Report: ND-2, Section 10.1
ND6	Low Impact Development. Prioritize and promote the use of LID and Green Infrastructure techniques for new and redevelopment.	MS4 Report: ND-2, Section 10.1
ND7	Green Streets. Promote and incorporate the use of green street facilities in public and private development.	MS4 Report: ND-1, STR-1, Section 10.1, 10.2, 11.4
ND8	Stormwater Management Manual and Legal Authority. Maintain and update as needed the legal authority and manual requiring post-construction runoff controls from new and re-development.	MS4 Report: ND-2, Section 10.1
ECO1	Floodplain Protection. Implement and maintain as needed the legal authority to protect floodways and floodplains.	MS4 Report: NS-1, Section 12.8 TMDL Report: Temperature Mgmt, Section 4
ECO2	Riparian and Wetland Protection. Implement programs to protect riparian buffers and corridors, headwaters, natural springs, wetlands, and native vegetation.	MS4 Report: NS-1, Section 12.2 TMDL Report: Temperature Mgmt, Section 4
ECO3	Riparian Revegetation. Restore riparian corridors by removing invasive species and planting native trees and shrubs.	MS4 Report: NS-1, Section 12.3, 12.4 TMDL Report: Temperature Mgmt, Section 4
ECO4	Invasive Species Management and Treatment. Implement invasive species assessment, removal, treatment and management programs to restore hydrologic and ecological functions to riparian and upland areas.	MS4 Report: NS-1, Section 12.4, 12.7 TMDL Report: Temperature Mgmt, Section 4

Table 3.1: Management Strategies to Address TMDL Pollutants

ID	Management Strategy	Annual Report Reference (BMP and Section Number, as applicable)
ECO5	Tree Protection. Implement and maintain as needed the legal authority for tree preservation to provide stormwater benefits and mitigate urban heat-island effects.	MS4 Report: NS-1, Section 12.2
ECO6	Upland Tree Planting. Implement and support upland and street tree planting programs to expand the City's urban forest canopy.	MS4 Report: NS-1, Section 12.5 TMDL Report: Temperature Mgmt, Section 4
ECO7	Restoration and Planting Partnerships. Support and coordinate with volunteers, nonprofits and community partners to engage tree planting and natural area restoration activities.	MS4 Report: NS-1, Section 12.4, 12.6 TMDL Report: Temperature Mgmt, Section 4
ECO8	Hydrologic Connectivity. Restore and protect hydrologic functions and floodplain connectivity through land-acquisition, culvert replacement, and supporting projects.	MS4 Report: STR-1, NS-1, Section 11.4, 12.1 TMDL Report: Temperature Mgmt, Section 4, Table 4.2
ECO9	Stream, Floodplain, and Wetland Restoration. Enhance watershed ecosystem functions through stream and wetland restoration projects.	MS4 Report: NS-1, Section 12.4 TMDL Report: Temperature Mgmt, Section 4, Table 4.2
ECO10	Cold Water Refugia. Identify and protect cold water refugia.	TMDL Report: Temperature Mgmt, Section 4, Table 4.1
ECO11	Natural Resource Inventory. Use and support updates to the NRI to protect riparian and wildlife corridors and inform zoning and planning activities.	N/A: Pending
ECO12	Climate Change Planning. Implement and maintain as needed the Climate Action Plan and supporting strategies to reduce local carbon emissions and build resilience to the projected impacts of climate change.	MS4 Report: NS-1, Section 12.2.1
RF1	City Stormwater System Retrofits. Design and construct treatment and green infrastructure retrofits to the City's storm drainage system.	MS4 Report: STR-1, Section 11.4
RF2	Stormwater System Planning Retrofit Priorities. Prioritize treatment and green infrastructure retrofit projects based on identified water quality risks and asset management planning.	MS4 Report: STR-1, Section 11.1, 11.4
RF3	Retrofit Funding Mechanisms. Implement "% for Green" and payment-in-lieu activities to fund green street and water quality retrofit projects.	MS4 Report: ND-2, STR-1, Section 10.4, 11.3, 11.5
RF4	Property Retrofits. Provide technical assistance, incentives, and grants to encourage onsite private property retrofits and water quality improvements for existing development.	MS4 Report: STR-1, Section 11.3
PM1	Annual Reporting. Develop an annual report by November 1 that summarizes the City's TMDL Implementation Plan activities and accomplishments.	TMDL Report: Adaptive Mgmt and Reporting, Section 2.2

Table 3.1: Management Strategies to Address TMDL Pollutants

ID	Management Strategy	Annual Report Reference (BMP and Section Number, as applicable)
MON1	Watershed Monitoring. Implement watershed monitoring activities to evaluate trends and assess progress toward meeting TMDLs.	Monitoring Report: Evaluation of Trends, Section 4
MON2	Effective Shade and Stream Habitat Assessment. Conduct effective shade evaluation and stream habitat surveys to inform current-state riparian conditions.	TMDL Report: Temperature Mgmt, Table 4.1
MON3	Ecosystem Diagnosis and Treatment Analysis. Develop a model to evaluate the availability of existing stream habitat and restoration project benefits to support endangered salmonids.	TMDL Report: Temperature Mgmt, Table 4.1
MON4	Watershed Restoration Effectiveness Monitoring. Collect data to evaluate restoration projects relative to site-specific and citywide restoration targets.	TMDL Report: Temperature Mgmt, Table 4.1
MON5	Time-Series Monitoring. Evaluate time-series data collected from Columbia Slough water quality data loggers to assess status and trends and to inform adaptive management of the monitoring effort.	N/A: Pending separate deliverable

Section 4
Temperature-Related Activities

The City conducts multiple activities to address elevated stream temperatures in local streams and rivers. Restoration and the protection of riparian vegetation are the primary methods for increasing stream shading and addressing nonpoint source load allocations to achieve system potential shade conditions.[2] The City uses a combination of these temperature strategies, ranging from planning, resource protection, land acquisition, active restoration and planting, monitoring, and public outreach.

As noted in Section 3, many of the City's key management strategies to reduce TMDL pollutants and improve water quality are conducted to address requirements of the City's NPDES MS4 Permit and associated SWMP. However, specific goals and targets identified in the TIP to assess progress toward meeting nonpoint source temperature load allocations are considered unaffiliated with stormwater or the MS4 permit and represent the focus of the TIP and TMDL annual report.

Temperature-related goals and targets are summarized below in Table 4.1. Each goal includes a timeline, performance metrics, interim milestones, and a description of implementation activities conducted during FY 2018–19 to meet the identified interim milestones or performance metrics. Specific projects to meet TIP Goal #14 (TIP-14) related to hydrologic conductivity and watershed restoration are referenced in Table 4.2.

[2] System potential vegetation for the Willamette subbasins, as defined in **Appendix C Chapter 2 –Potential Near-Stream Land Cover in the Willamette Basin for TMDLs**, is the potential near stream land cover condition. Potential near stream land cover is that which can grow and reproduce on a site, given: climate, elevation, soil properties, plant biology and hydrologic processes. System potential does not consider management or land use as limiting factors. **In essence, system potential is the design condition used for TMDL analysis that meets the temperature standard by minimizing human related warming.**

- System potential is an estimate of the condition where anthropogenic activities that cause stream warming are minimized.
- System potential is not an estimate of pre-settlement conditions. Although it is helpful to consider historic land cover patterns, channel conditions and hydrology. Many areas have been altered to the point that the historic condition is no longer attainable given drastic changes in stream location and hydrology (channel armoring, wetland draining, urbanization, etc.).

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Table 4.1: Goals and Targets for Temperature TMDL Strategies

Goal ID	Category	Target/Description	Timeline (Goal)	Performance Metrics	Interim Milestones and Timelines	2018–19 Reporting Activities
TIP-01	**Effective Shade Assessment**	Conduct a geospatial assessment of riparian conditions within Portland and progress toward meeting the TMDL nonpoint source load allocations.	Complete by 2021	Completed assessment	1. FY 2019–20: LiDAR acquisition. 2. FY 2019–20: Process LiDAR and GIS datasets and complete modeling. 3. FY 2020–21: Compile and report effective shade results.	1. Pending: LiDAR data acquisition scheduled and funded for summer 2019.
TIP-02	**Stream Habitat Assessment**	Conduct stream habitat surveys for all perennial streams identified as priorities in the Stormwater System Plan.	Complete by 2021	Completed surveys	1. FY 2018–19: Secure intergovernmental agreement with Oregon Department of Fish and Wildlife. 2. FY 2019–20: Complete surveys for 50% of identified stream reaches. 3. FY 2020–21: Complete surveys for remaining stream reaches.	1. Complete: Executed an Intergovernmental agreement with Oregon Department of Fish and Wildlife to conduct stream habitat surveys in the Portland area. 2. In Progress: Stream surveys started in June 2019.
TIP-03	**Ecosystem Diagnosis and Treatment Analysis**	Generate an Ecosystem Diagnosis and Treatment (EDT) model for the Columbia Slough, Johnson Creek, and Tryon Creek areas of interest.	Complete by 2020	Completed model	1. Implementation is scheduled for completion during FY 2019–20.	1. Complete: EDT models for the Columbia Slough, Johnson Creek, and Tryon Creek were developed and calibrated ahead of schedule. Results are available online: https://ecosystems.azurewebsites.net/EDT/Portland/Restoration
TIP-04	**Floodplain, Riparian, and Wetland Protection**	Complete the Environmental Overlay Zone Map Correction Project.	Anticipate public hearings in 2020 and adoption in 2021	Updated Overlay Zone Map	1. FY 2018–19: Release draft maps of the revised environmental overlay zones for Johnson Creek. 2. FY 2019–20: Release draft maps of the revised environmental overlay zones for East Buttes, Northwest Hills, Southwest Hills, and Columbia Slough/Columbia River. 3. FY 2020–21: Public hearings on the revised environmental overlay zones.	1. Complete: Released draft maps of the revised environmental overlay zones for Johnson Creek.
TIP-05	**Onsite Stormwater Retention and LID**	Revise and update the *Stormwater Management Manual* (SWMM).	Within the next MS4 permit term	Updated SWMM	N/A – Schedule is outlined in accordance with provisions of the SWMP and renewed Phase I NPDES MS4 permit.	
TIP-06	**Invasive Species Management and Treatment**	Perform management, assessment, and treatment of invasive species on 5,550 acres.	By the end of the TIP cycle	Acres managed, assessed, and treated	Perform management, assessment, and treatment of invasive species on 1,110 acres each year on average.	**Acres** / **2018–19** / **2019–20** / **2020–21** / **2021–22** / **2022–23** **Annual** 1,201 - - - - **Cumulative** 1,201 - - - - **% of Goal** 21.6% - - - - For more information, see MS4 Annual Report: NS-1, Section 12.7.
TIP-07	**Invasive Species Management and Treatment**	Survey the Lower Columbia Slough for invasive aquatic macrophytes and treat where identified. Total extent is 9.4 miles on center or 18.8 miles along left and right banks.	Annually for 80% or more of total extent	Linear miles surveyed	Survey the Lower Columbia Slough for invasive aquatic macrophytes and treat where identified. Work to cover 80% or more of the total extent: at least 7.5 miles on center or 15 miles at banks.	**Miles** / **2018–19** / **2019–20** / **2020–21** / **2021–22** / **2022–23** **On Center** 8.4 - - - - **At Banks** 16.9 - - - - **% of Goal** 112.7% - - - -
TIP-08	**Ecosystems**	Develop an inventory of watershed restoration projects and track information such as cost, location, project goals, and outcomes.	By the end of the TIP cycle	Completed inventory	1. FY 2018–19: Initiate effort internally with subject matter experts. 2. FY 2019–20: Complete an inventory of all active projects. 3. FY 2020–21: Populate the inventory with all recently completed projects.	Staff initiated an internal effort to develop and populate an inventory of restoration projects (Milestone 1).
TIP-09	**Riparian Revegetation**	Plant 100,000 native trees and shrubs in identified natural and riparian areas.	By the end of the TIP cycle	Plantings (#)	Plant 20,000 native trees and shrubs in identified natural and riparian areas each year on average.	**Plantings** / **2018-19** / **2019-20** / **2020-21** / **2021-22** / **2022-23** **Annual** 17,312 - - - - **Cumulative** 17,312 - - - - **% of Goal** 17.3% - - - - For more information, see MS4 Annual Report: NS-1, Section 12.3.

Table 4.1: Goals and Targets for Temperature TMDL Strategies

Goal ID	Category	Target/Description	Timeline (Goal)	Performance Metrics	Interim Milestones and Timelines	2018–19 Reporting Activities
TIP-10	**Land Acquisition**	Acquire 50 acres of land for strategic restoration and protection of watershed hydrology.*	By the end of the TIP cycle	Acres acquired (#)	Initiate the due diligence review process for 10 new acres of property each year to enable land acquisition.	**Acres** | **2018–19** | **2019–20** | **2020–21** | **2021–22** | **2022–23** **Annual** | 23.8 | - | - | - | - **Cumulative** | 23.8 | - | - | - | - **% of Goal** | 47.6% | - | - | - | - For more information, see MS4 Annual Report: NS-1, Section 12.1.
TIP-11	**Upland Tree Planting**	Plant 7,500 upland trees during the plan term through partnerships with nonprofits, community members, businesses, and schools.	By the end of the TIP cycle	Trees planted (#)	Plant an average of 1,500 upland trees each year during the plan term through partnerships with nonprofits, community members, businesses, and schools.	**Trees** | **2018–19** | **2019–20** | **2020–21** | **2021–22** | **2022–23** **Annual** | 2,777 | - | - | - | - **Cumulative** | 2,777 | - | - | - | - **% of Goal** | 37.0% | - | - | - | - For more information, see MS4 Annual Report: NS-1, Section 12.5.
TIP-12	**Watershed Restoration Effectiveness Monitoring**	Develop a comprehensive monitoring manual to support the City's stream and floodplain restoration projects.	Complete by 2021	Completed manual	1. FY 2018–19: Draft of the monitoring manual completed. 2. FY 2019–20: Internal review of the draft monitoring manual completed. 3. FY 2020–21: Monitoring manual finalized.	1. Completed: Draft project effectiveness monitoring manual
TIP-13	**Coldwater Refugia**	Evaluate and update an inventory and mapping of coldwater refugia in the Lower Willamette River.	By the end of the TIP cycle	Confirmation of program continuation and/or providing status updates	FY 2018–19: Participate in DEQ's expert panel. FY 2019–20: Continue to participate in DEQ's expert panel.	The City is collaborating with DEQ and other stakeholders to inform DEQ's Lower Willamette River Coldwater Refuge Plan to address a jeopardy decision of the 2015 National Marine Fisheries Service Biological Opinion on the approval of Oregon's 2003 water temperature standard. As part of the plan, DEQ is gathering and synthesizing readily available data on coldwater refugia in the lower Willamette River, which includes the identification and mapping of coldwater refugia in the lower river. As part of this effort, the City has provided DEQ with continuous and instantaneous water temperature data for sampling sites on the Willamette River and on tributaries of the Willamette. Additionally, the City has contributed information on fish distributions and abundance to help locate cold water refugia and characterize fish usage of refugia. BES staff are serving on DEQ's expert scientific and technical panel on coldwater refuge identification, use, and sufficiency in the lower Willamette River. DEQ will be finalizing the Lower Willamette River Coldwater Refuge Plan and submitting it to the National Marine Fisheries Service in November 2019. The City will continue to participate in the effort to identify and map coldwater refugia in the lower Willamette River and will update the inventory completed by DEQ with new data as they become available.
TIP-14	**Hydrologic Connectivity (Watershed Restoration)**	Implement five restoration projects: Canopy cover, enhancing refugia, heat source due to water impoundment, groundwater recharge, and/or protecting springs/coldwater sources.	By the end of the TIP cycle	Projects planned, designed, and/or constructed (#)	Advance one project per year to the next project phase.	See Table 4.2 below for a list of projects, including status and description for each.

**Feasibility of land acquisition depends on willing sellers and real estate markets, landowner permissions, availability of funding, and the permitting process.*

Table 4.2: Projects for Temperature Goal TIP-14 Hydrologic Connectivity (Watershed Restoration)

Project Name	Previous Report Year / Status* / Current Report Year	Description and Benefits
Oaks Bottom Habitat Enhancement Project *Willamette River*	Construction complete DESIGN → CONSTRUCTION	Restored 75 acres of wetland habitat in 2018 at the Oaks Bottom Wildlife Refuge. Replaced the existing undersized 5-foot culvert with a 16-foot box culvert (a.k.a. "The Salmon Subway"), allowing fish to pass between the Willamette River and the refuge. Improved Willamette River's tidal flow in and out of the refuge, providing fish with access to cold springs. Excavated tidal slough channels, installed large wood, and improved wetland habitats to provide resting and rearing habitat. Removed invasive vegetation, such as purple loosestrife, and revegetated with native species within the construction footprint. *Benefits: Cold water refugia, passage barrier removal, channel form, large wood, rearing habitat, riparian shading, invasive species management, native plantings.*
Luther Road Creek Restoration Project *Johnson Creek*	Construction planned for summer 2019 DESIGN → CONSTRUCTION	Erosion caused by large storm events in 2016 eroded the creek bed and banks, exposing part of the 76-inch-diameter Lents Interceptor sewer pipe that crosses Johnson Creek. Exposure increases the risk of pipe damage during high flows and blocked fish passage during low flows. Reburying pipe near SE 73rd Avenue and Luther Road will reduce risk of sewage releases, protecting public health and the environment. Includes the addition of large wood to enhance habitat and riparian plantings to increase shade. *Benefits: Sanitary sewer repair, passage barrier removal, large wood, instream cover, native plantings.*
Springwater Corridor Trail Bridge Replacement *Johnson Creek*	Construction planned for summer 2019 DESIGN → CONSTRUCTION	The Springwater Corridor Trail bridge over Johnson Creek near SE 45th Avenue and Johnson Creek Boulevard is the original wooden trestle bridge from the Springwater Division Line rail developed in the early 1900s, with footings in Johnson Creek. The project will replace the wooden bridge with a new bridge that will be constructed with steel and concrete and include footings that will allow for clearer passage of Johnson Creek. The new bridge design will reduce trash and debris accumulation and improve habitat for fish and wildlife. *Benefits: Enhanced instream habitat.*
Boones Ferry Culvert Replacement Project *Willamette Tributaries*	Construction planned for 2020 DESIGN → CONSTRUCTION	Removing one of two major fish passage barriers on the mainstem of Tryon Creek and restoring access upstream of SW Boones Ferry Road to Upper Tryon Creek and Arnold Creek. Replacing an undersized 60-inch, 140-foot-long corrugated metal pipe culvert with a single span bridge. Providing a safer crossing for pedestrians and wildlife. Includes habitat enhancements to Tryon and Arnold Creeks upstream of the project. *Benefits: Passage barrier removal, access to spawning and rearing habitat, native plantings.*
Cedar Crossing Floodplain Restoration Project *Johnson Creek*	Conceptual design DESIGN → CONSTRUCTION	Located near the covered bridge on SE Deardorff Road in East Portland. Reconnects Johnson Creek to its floodplain, allowing for overbank flows and restored ecosystem services of flood storage and added habitat for fish and wildlife. Includes the addition of large wood and native riparian plantings to increase shade. In the 1930s, the Works Progress Administration rock-lined the stream channel disconnecting the floodplain, straightening and hardening the banks to reduce local flooding, but the effort increased flooding downstream and eliminated floodplain habitats. The rock lining will be removed from the stream bed and banks as part of the project. *Benefits: Floodplain connectivity, channel form, large wood, instream cover, invasive species management, native plantings.*
West Lents Floodplain Restoration Project *Johnson Creek*	Conceptual design DESIGN → CONSTRUCTION	Reconnecting a straightened reach of Johnson Creek to its historic floodplain in Southeast Portland. Improving stream habitat complexity and hydraulics by returning the channel pattern to follow its historic meander and adding large wood. Includes invasive species treatment and riparian plantings. BES has already successfully purchased 13 private properties in the project area and removed the buildings in the floodplain. *Benefits: Floodplain connectivity, channel form, large wood, instream cover, invasive species management, native plantings.*
Eastbank Crescent *Willamette River*	Conceptual design DESIGN → CONSTRUCTION	The City is working with partners on the Eastbank Crescent project, a large riverbank restoration effort on the Willamette River near OMSI. The Eastbank Crescent Plan was approved by the City Council in June 2017, and the City is exploring funding the project as a mitigation bank. While the project does not have direct cold-water inputs, it will include large wood structures installed into a laid-back bank with native vegetation, creating micro-refugia and shaded riverbanks. The City's strategy is derived from sampling at Sellwood Park that found high densities of juvenile salmonids in areas of submerged vegetation, even when cold water inputs are absent. The project has potential as a pilot for how to create (versus enhance existing) cold water refugia, given its similarity to habitat conditions common throughout Portland. *Benefits: Cold water refugia, large wood.*
Crystal Springs *Johnson Creek*	Conceptual design DESIGN → CONSTRUCTION	The City is actively working with the U.S. Geological Survey to model temperatures in Crystal Springs Lake—a known heat source located at the headwaters of the creek. The City will be using the results of the lake temperature modeling to develop restoration scenarios to reduce heat loads to the stream and keep the entire 2.3 miles of Crystal Springs Creek below 18°C year-round. *Benefits: Cold water refugia, salmon sanctuary, removal of heat sources.*

* Design is typically comprised of four phases: Conceptual, 30%, 60%, and 90%.

Black arrows indicate status in the current report year. Gray markers indicate status in the previous report year.

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Part II
PORT OF PORTLAND

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PORT OF PORTLAND

National Pollutant Discharge Elimination System (NPDES)
Municipal Separate Storm Sewer System Permit
Permit Number 101314

ANNUAL REPORT NO. TWENTY-THREE

July 1, 2018 – June 30, 2019

Prepared for:
Oregon Department of Environmental Quality

November 1, 2019

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TABLE OF CONTENTS

LIST OF FIGURES AND TABLES

ACRONYMS

BMP – Best Management Practice
DEQ – Department of Environmental Quality
EMS – Environmental Management System
FOG – Fats, Oil, and Grease
HAZWOPER – Hazardous Waste Operations and Emergency Response
IDDE – Illicit Discharge Detection and Elimination
IGA – Intergovernmental Agreement
IPM – Integrated Pest Management
MEP – Maximum Extent Practicable
MFM – Marine Facilities Maintenance (Marine's general maintenance group)
MS4 – Municipal Separate Storm Sewer System
NOAA – National Oceanic and Atmospheric Administration
NPDES – National Pollutant Discharge Elimination System
PDX – Portland International Airport
PIC – Portland International Center
SPCC – Spill Prevention Control and Countermeasure
SWMP – Stormwater Management Plan
SWPCP – Stormwater Pollution Control Plan
TMDL – Total Maximum Daily Load
USB – Urban Services Boundary
USCG – United States Coast Guard

1.0 INTRODUCTION

The Oregon Department of Environmental Quality (DEQ) regulates stormwater runoff from Port of Portland (Port) property through the Municipal Separate Storm Sewer System Discharge Permit No. 101314 (MS4 permit) and other National Pollutant Discharge Elimination System (NPDES) stormwater permits, including the 1200-Z, 1200-CA and Individual permits. This annual report describes activities specifically related to implementation of the Port's MS4 permit.

The Port and City of Portland are co-permittees on MS4 permit #101314. As required under Schedule B.5 of the permit, each co-permittee must submit an annual report. This report documents activity from July 1, 2018 to June 30, 2019 related to the Port's stormwater management efforts under the permit and associated December 28, 2012 Stormwater Management Plan (SWMP). The report emphasizes efforts and activities associated with individual best management practices (BMPs) from the Port's SWMP (as summarized in Section 7.0). Schedule B.5.a-i of the permit states the specific annual reporting requirements. These requirements are addressed within the report as follows:

1. **Status of SWMP implementation:** Section 7.1.1 through 7.1.8
2. **Status of the public education evaluation:** Section 7.1.4
3. **Summary of the adaptive management process:** Section 8
4. **Proposed changes to the SWMP:** Section 8
5. **Summary of stormwater program expenditures:** Section 4.0
6. **Summary of monitoring results:** *See Section IV Monitoring Compliance Report of the combined report. Section 6.1 of this document explains the Port's monitoring coordination with the City.
7. **Proposed changes to the monitoring plan:** *See Section IV Monitoring Compliance Report of the combined report. Section 6.1 of this report explains the Port's monitoring coordination with the City.
8. **Summary describing Port's Illicit Discharge Program:** Section 7.1.1
9. **Overview of planning, land use changes, and new development:** Section 2.1

2.0 PORT OF PORTLAND PERMIT AREA AND RESPONSIBILITIES

The Port of Portland owns approximately 5,487 acres within the City of Portland (City) Urban Services Boundary (USB). Port property is divided into three primary Business Lines under the Operations Division: 1) Aviation, 2) Marine, and 3) Industrial Development. Within the City USB, the Aviation Business Line consists of Portland International Airport (PDX), the Marine Business Line includes Marine Terminals 2, 4, 5 and 6, and the Industrial Development Business Line consists of the following industrial parks: Swan Island, Mocks Landing, Rivergate, Cascade Station, and Portland International Center (PIC). Port property ownership, leased properties and facilities with Industrial Stormwater General Permits are shown in Figure 1 below.

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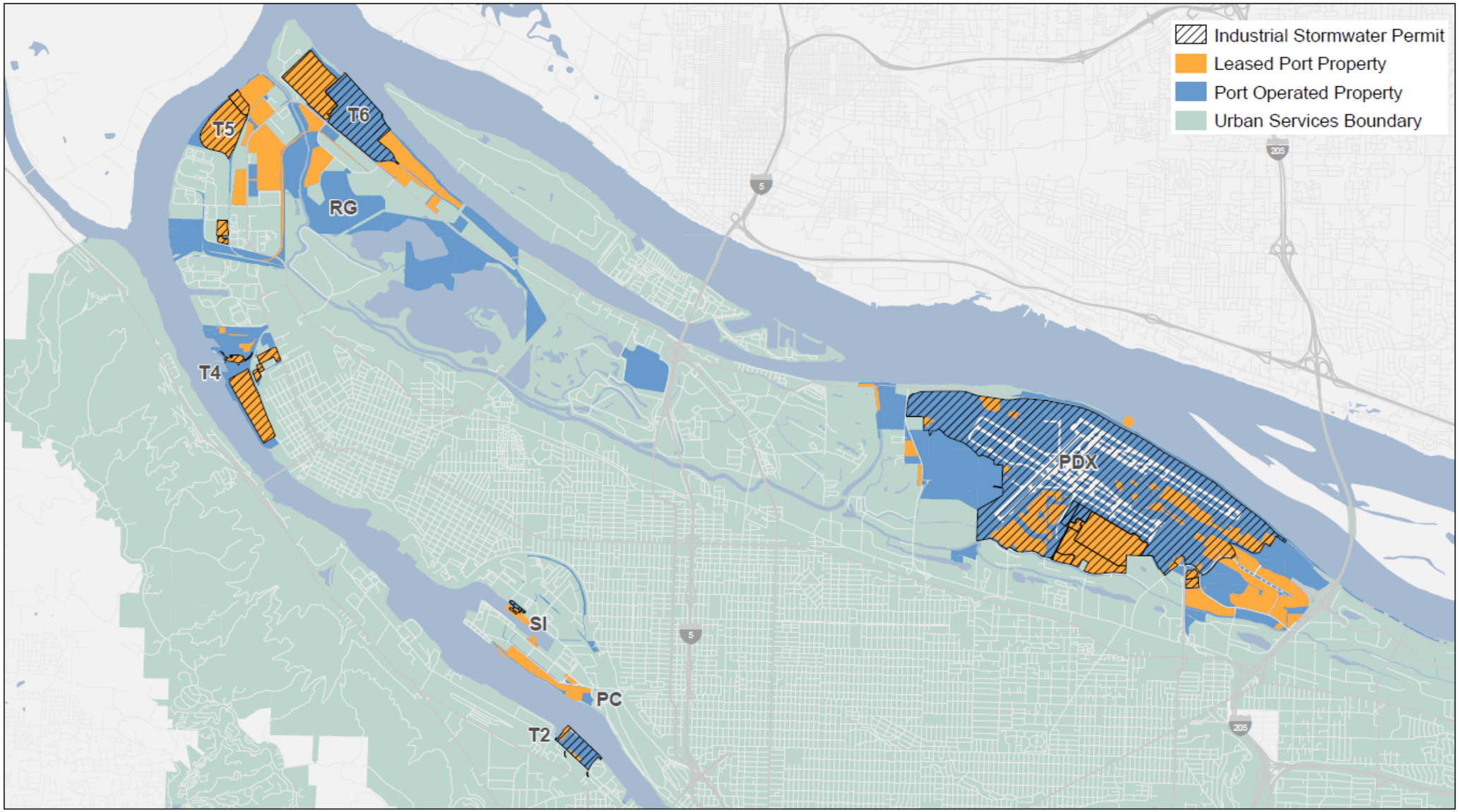
Figure 1 Port of Portland MS4 Permit Boundary Area



Port of Portland geospatial data is gathered, maintained and primarily used for internal reference and analysis, and is only updated as resources permit. Geospatial data refers to data and information referenced to a location on the Earth's surface such as maps, charts, air photos, satellite images, cadastre and land and water surveys, in digital or hard copy form. Geospatial data may be gathered and maintained by more than one person or department within the Port, and data distributed by one person or department may not reflect the most recent data available from the Port or from other sources. Port geospatial data is not intended for survey or engineering purposes or to describe the authoritative or precise location of boundaries, fixed human works, or the shape and contour of the earth. The Port makes no warranty of any kind, expressed or implied, including any warranty of merchantability, fitness for a particular purpose, or any other matter with respect to its geospatial data. The Port is not responsible for possible errors, omissions, misuse, or misrepresentation of its geospatial data. Port geospatial data is not intended as a final determination of such features as existing or proposed infrastructure, conservation areas, or the boundaries of regulated areas such as wetlands, all of which are subject to surveying or delineation and may change over time. No representation is made concerning the legal status of any apparent route of access identified in geospatial data.

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PORT OF PORTLAND
Portland, Oregon

0 0.5 1 2 miles

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Geographic Data Standards

Projected Coordinate System:
NAD 1983 HARN State Plane, Oregon North, Intl Feet
Map Projection Name:
Lambert Conformal Conic

Figure 1-1
Port of Portland MS4 Permit Area
Port Property within City of Portland
Urban Services Boundary

September 2019
Prepared for Danelle Peterson, Environmental Affairs

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The Port also owns several undeveloped properties within the USB including wetland mitigation sites, natural areas, and vacant tax lots. The Port is in a unique situation regarding the typical municipal planning, permitting, and land use modification processes. The City of Portland is responsible for these activities and the Port complies with its process. For the purposes of this report, all reporting on these activities contained in section B.5.i will be satisfied in the City's section. With respect to the impervious surface reporting requirement in B.5.i the Port estimates during the 2018-19 reporting period it had 2397 acres of impervious surface. This represents 44% of total Port property within the City of Portland USB.

PDX, the marine terminals, and the industrial parks are partially occupied by tenants. The Port manages those tenant properties through lease agreements. Leased property represents approximately 29% of Port property within the USB. A more detailed description of Port operating areas is included in Section 2.1.

Property owned by the Port is primarily zoned for commercial and industrial use. Many of these areas accommodate industrial activities that require DEQ-issued NPDES industrial stormwater general permits or individual permits addressing stormwater discharge. Within the USB, 54% of the Port's holdings are regulated under these permits. PDX and portions of Terminal 2, Terminal 6 and the Navigation Base at Swan Island are operated by the Port under DEQ-issued industrial stormwater discharge permits. In addition, some tenants occupying leased property on Terminals 2, 4, 5, 6, and the industrial parks also operate under NPDES stormwater permits. For Port operations within these areas, several of the MS4 permit requirements are satisfied through implementation of industrial stormwater permit requirements, addressed in their Stormwater Pollution Control Plans (SWPCPs). Section 2.2 addresses how these activities are coordinated with the Port's MS4 permit responsibilities.

2.1 MS4 Permit Area

2.1.1 Portland International Airport

PDX comprises an area of approximately 2,803 acres and is in Northeast Portland between the Columbia River and the Columbia Slough. The facility is owned and operated by the Port. However, numerous aviation-related tenants also conduct operations at PDX.

Stormwater runoff from PDX property discharges into the Columbia Slough through a series of pipes, open channels, and 9 major outfalls. These stormwater discharges are permitted under the PDX NPDES Individual permit issued and administered by DEQ. The stormwater permit is structured to specifically address Columbia Slough Total Maximum Daily Load (TMDL) parameters, including dissolved oxygen, pH, nutrients, bacteria, and toxics. Currently, the Oregon Air National Guard and Yoshida Foods international have their own 1200-Z permits. PDX tenants whose operations trigger the need for a stormwater permit and have comingled stormwater with other PDX airfield tenants are required to be a co-permittee under the PDX stormwater permit.

In addition to the individual NPDES permit, PDX also holds an NPDES a 1200-CA Construction Discharge Permit, a Water Pollution Control Facility (WPCF) 1700-B Wastewater Permit, and a pretreatment permit issued by the City of Portland for deicing discharges to the sanitary system.

2.1.2 Marine Terminals

The Port has four active shipping terminals that are managed by the Port's Marine Business Line. The terminals collectively occupy approximately 1009 acres along the Willamette River (Terminals 2, 4, and 5) and Columbia River/Slough (Terminal 6). They handle the shipping, receiving, and temporary storage of finished goods, agricultural products, and raw materials.

Terminal 6 discharges into the Columbia River and the Columbia Slough are covered by 1200-Z permits held by the Port and tenants. In the spring of 2017, the Port took over management of an area at Terminal 6 that was formally managed by ICTSI. The Port obtained a 1200-Z permit for that portion of T6 in August of 2017. The Port continues to hold a 1200-Z permit for the Port-managed area of Terminal 2. Several properties located at Terminals 2, 4, and 5 are also leased to tenants. Several of these tenants hold 1200-Z or individual permits that are issued by DEQ and administered by the City.

2.1.3 Industrial Parks

The Port's Industrial Development Business Line manages the Port-owned industrial parks, Swan Island, Rivergate, Cascade Station, and Portland International Center (PIC), totaling approximately 1,473 acres. Several industrial park tenants hold the 1200-Z permits issued by DEQ and administered by the City.

2.1.4 Undeveloped Properties

The Industrial Development Business Line also manages approximately 1,474 acres of undeveloped property within the City's USB. This does not include West Hayden Island, which is within the unincorporated USB and does not receive city services. Stormwater management activities for undeveloped properties discharging into the Port's MS4 are conducted under the MS4 permit.

2.2 MS4 Permit Responsibilities

Many of the requirements of the industrial stormwater general discharge permits overlap with requirements of the MS4 permit. A large proportion (54%) of the area included in the Port's MS4 permit area is also regulated under industrial stormwater permits, which have been issued to either the Port or its tenants.

The City regulates stormwater on a city-wide basis with some implementation overlapping the Port's MS4 area. The Port and City coordinate permit management activities through an intergovernmental agreement (IGA). The Permit Requirements and Responsibilities Table was developed to explain the complex relationship between the Port's and City's management of stormwater through the MS4 permit (see Table 1 below). The City has regulatory oversite of NPDES permits issued to Port tenants. For NPDES permits issued directly to the Port, DEQ provides the regulatory oversight.

The Permit Requirements and Responsibilities Table was included in the Port's 2012 SWMP to show specific program coverage for each MS4 permit requirement. Table 1 lists the SWMP requirements from the Port's MS4 permit along the left-hand column. Responsibility descriptions for each SWMP requirement are split according to the following two categories: (1) Port MS4

permit areas that do not have coverage under the NPDES industrial stormwater permit program, and (2) Port MS4 permit areas where the Port or its tenant has a general or individual NPDES industrial stormwater permit. The two responsibility categories are further split between tenants and Port operations. For some tenants and Port operating areas (Terminal 2, Terminal 6, Port Navigation Base and PDX) with an industrial stormwater permit, several of the MS4 permit requirements related to specific activities are addressed through implementation of the industrial stormwater permits. These requirements are shown shaded in gray on Table 1. Permit requirements within the Port's jurisdiction covered by the City's stormwater management activities are also shaded in gray on Table 1. Areas left unshaded on Table 1 are addressed by BMPs in the Port's 2012 SWMP. These unshaded areas list the specific BMPs that meet each corresponding permit requirement.

Section 7.0 outlines the BMPs listed in the Port's 2012 SWMP and specifies responsible parties for each BMP implementation task. Section 7.0 also describes the Port's SWMP implementation during the permit year to address tracking measures and progress toward meeting measurable goals under each BMP.

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Port of Portland MS4 Permit Requirements and Responsibilities (Areas shaded in gray are MS4 permit requirements that are not addressed by BMPs in the Port's SWMP because the requirements are either covered by the City of Portland, or are covered under an industrial stormwater permit. Unshaded Areas are covered by the Port's SWMP BMPs listed below in Table 1.)

Table 1. Port of Portland MS4 Permit Requirements and Responsibilities

MS4 Permit SWMP Requirements	MS4 Service Areas Not Covered Under Industrial Stormwater Permits		MS4 Service Areas With Industrial Stormwater Permits	
	Tenants	Port Operations	Tenants	Port Operations
Schedule A.4.a Illicit Discharge Detection and Elimination.				
i. Prohibit, through ordinance or other regulatory mechanism, illicit discharges	BMP: Implement the Illicit Discharge Detection and Elimination Program			
ii. Describe enforcement response procedures	BMP: Implement the Illicit Discharge Detection and Elimination Program			
iii. Develop pollutant parameter action levels	BMP: Conduct Dry-Weather Field Screening			
iv. Conduct annual dry weather inspection activities including field screening	BMP: Conduct Dry-Weather Field Screening			
v. Identify response procedures to investigate portions of the MS4 where relevant information indicates the likely presence of illicit discharges	BMP: Conduct Dry-Weather Field Screening			
vi. Maintain a system for documenting and procedures for responding to illicit discharges	BMP: Conduct Dry-Weather Field Screening			
vii. Appropriate action for illicit discharge removal	BMP: Implement the Illicit Discharge Detection and Elimination Program		Spill response activities address employee reporting and are covered under 1200-Z and 1200-COLS permits[1] BMP: Implement the Illicit Discharge Detection and Elimination Program	
viii. Spill prevention and response	BMP: Implement a Spill Response Program for Port Operated Property		Covered under 1200-Z and 1200-COLS permits[2]	
ix. Notify affected municipality of illicit discharge originating within the permittee's permit area	BMP: Implement the Illicit Discharge Detection and Elimination Program			
x. Notify responsible municipality of illicit discharge affecting the permittee, originating outside of the permittee's permit area	BMP: Implement the Illicit Discharge Detection and Elimination Program			
xi. Maintain maps showing major MS4 outfalls	BMP: Conduct Dry-Weather Field Screening			
xii. Unless identified as a significant source of pollutants, the following non-stormwater discharges are not considered illicit discharges (see Schedule A.4.a.xii)	BMP: Implement a Water Line Flushing Procedure			
Schedule A.4.b Industrial and Commercial Facilities				
i. Screen existing and new industrial facilities	BMP: Screen Existing and New Industrial Facilities		These areas are already covered by an industrial stormwater NPDES permit	
ii. Notify DEQ and facility if subject to an industrial NPDES permit	BMP: Screen Existing and New Industrial Facilities		These areas are already covered by an industrial stormwater NPDES permit	
iii. Inspection of industrial or commercial areas identified as significant sources of pollutants	BMP: Implement an Inspection Program for Significant Pollutant Source Areas			
Schedule A.4.c Construction Site Runoff Control				
i. Ordinance that requires erosion and sediment controls	Implemented through the City of Portland's erosion control ordinance; may also be covered under a 1200-C permit	Implemented through the Port's 1200-CA Permit, the City of Portland's erosion control program and related contract specifications.	Implemented through the City of Portland's erosion control ordinance; may also be covered under a 1200-C permit	Implemented through the Port's 1200-CA Permit and related contract specifications
ii. Require construction site operators to develop site plans and implement erosion and sediment control BMPs				
iii. Require construction site operators to prevent/ control non-stormwater waste				
iv. Erosion control site plan review				
v. Perform on-site inspections				
vi. Maintain enforcement response procedures				

MS4 Permit SWMP Requirements	MS4 Service Areas Not Covered Under Industrial Stormwater Permits		MS4 Service Areas With Industrial Stormwater Permits	
	Tenants	**Port Operations**	**Tenants**	**Port Operations**
Schedule A.4.d Education and Outreach				
i. Implement a documented public education and outreach strategy	BMP: Implement Public Education Measures to Protect Stormwater Quality.			
ii. Provide educational material to the community or conduct equivalent outreach activities	BMP: Implement a Tenant Stormwater BMP Program	N/A	BMP: Implement a Tenant Stormwater BMP Program	N/A
	BMP: Implement Public Education Measures to Protect Stormwater Quality			
iii. Provide public education on pesticide, herbicide, fertilizer, and other chemicals	BMP: Require Training and Licensing for Staff Conducting Pest Management Activities BMP: Implement a Tenant Stormwater BMP Program			
iv. Provide public education on proper operation and maintenance of privately-owned/ operated stormwater quality facilities	BMP: Implement a Tenant Stormwater BMP Program BMP: Implement a Program for the Tracking and Maintenance of Private Structural Controls			
v. Provide notice to construction site operators regarding training for erosion and sediment control	BMP: Provide Erosion Prevention and Sediment Control Training for Construction Inspectors			
vi. Conduct/ participate in a public education effectiveness evaluation	BMP: Participate in a Public Education Effectiveness Evaluation			
vii. Include training for municipal employees involved in MS4 activities	BMP: Implement a Spill Response Training Program. BMP: Implement a Municipal Staff Training Program for Stormwater Pollution Prevention BMP: Require Training and Licensing for Staff Conducting Pest Management Activities		Covered under 1200-Z and 1200-COLS permits[3]	
viii. Promote, publicize, and facilitate public reporting of illicit discharges	BMP: Implement the Illicit Discharge Detection and Elimination Program			
Schedule A.4.e Public Involvement and Participation				
e. Implement a public participation process for receiving and considering comments on the SWMP and TMDL benchmarks	BMP: Provide for Public Participation with SWMP and Benchmark Submittals			
e. Implement a public participation approach that provides opportunities for the public to effectively participate in the implementation of the co-permittee's stormwater management program	BMP: Implement a Public Participation Approach that Provides Opportunities for the Public to Effectively Participate in the Implementation of the Stormwater Management Program			
Schedule A.4.f Post-Construction Site Runoff				
i. Implement a post-construction stormwater pollutant and runoff control program	BMP: Develop, Adopt, and Implement New Port-Specific Post-Construction Runoff Control Standards			
ii. Identify, and where practicable, minimize or eliminate ordinance, code and development standard barriers	BMP: Develop, Adopt, and Implement New Port-Specific Post-Construction Runoff Control Standards			
iii. Develop or reference an enforceable post-construction stormwater management manual	BMP: Develop, Adopt, and Implement New Port-Specific Post-Construction Runoff Control Standards			
vi. Review, approve, and verify proper implementation of post-construction site plans	BMP: Develop, Adopt, and Implement New Port-Specific Post-Construction Runoff Control Standards			
v. Require off-site stormwater management for locations limited in their ability for on-site stormwater capture and treatment or flow reduction	BMP: Develop, Adopt, and Implement New Port-Specific Post-Construction Runoff Control Standards			
vi. Describe inspection and enforcement response procedures to address compliance issues with post-construction stormwater management performance standards	BMP: Develop, Adopt, and Implement New Port-Specific Post-Construction Runoff Control Standards			

MS4 Permit SWMP Requirements	MS4 Service Areas Not Covered Under Industrial Stormwater Permits		MS4 Service Areas With Industrial Stormwater Permits	
	Tenants	Port Operations	Tenants	Port Operations
Schedule A.4.g Pollution Prevention for Municipal Operations				
i. Operate and maintain public streets, roads, and highways	The City of Portland is responsible for operation and maintenance of the public right-of-way BMP: Implement a Street and Vehicle Maneuvering Area Cleaning and Maintenance Program			
ii. Implement a program to control the use and application of pesticides	BMP: Limit Landscape Maintenance Activities Impact on Stormwater BMP: Require Appropriate Training and Licensing for Pest Management Activities BMP: Implement a Tenant Stormwater BMP Program			
iii. Inventory, assess, and implement a strategy to reduce the impact of stormwater runoff from facilities that treat, store, or transport municipal waste, not already covered by a 1200 series permit	No tenant properties currently accommodate municipal facility waste	The Port does not operate any facilities that fall under this requirement and are not covered under a 1200 series permit.	N/A	N/A
iv. Implement controls to limit infiltration of seepage from the municipal sanitary system	BMP: Implement a Program to limit infiltration from Port-owned sanitary sewer system to the MS4			
v. Implement a strategy to prevent or control the pollutant discharge from firefighting training activities	The only firefighting training facility is located at PDX, which is covered by a 1200-COLS permit			
vi. Retrofitting flood control facilities	The City of Portland manages water quality improvements on a master planning level. Any potential flood control retrofits will be considered as part of the Retrofit Analysis			
Schedule A.4. h Structural Stormwater Controls Operations and Maintenance				
i. Implement a program to verify structural control facilities and controls are inventoried, mapped, inspected, operated and maintained Operate and maintain public streets, roads, and highways	BMP: Implement a Stormwater System Cleaning and Maintenance Program BMP: Implement a Program for Tracking and Maintenance of Private Structural Controls		Covered under 1200-Z and 1200-COLS permits[4]	Covered under 1200-Z and 1200-COLS permits[4]
ii. Develop and implement a plan or approach to guide the long-term maintenance and management of all publicly-owned and privately owned stormwater facilities	BMP: Implement a Stormwater System Cleaning and Maintenance Program BMP: Implement a Tenant Stormwater BMP Program.		Covered under 1200-Z and 1200-COLS permits[4]	Covered under 1200-Z and 1200-COLS permits[4]
Schedule A.6.c Stormwater Retrofit Project				
ii. Identify one stormwater quality improvement project, at a minimum, to be initiated constructed and/or implemented during the permit term	BMP: Develop, Adopt, and Implement New Port-Specific Post-Construction Runoff Control Standards			
Schedule B1-B4 Monitoring Component Requirements				
The Port must assist with monitoring efforts in conjunction with requirements as stated in Table B-1, Schedule B.1.b	Pursuant to an IGA, the Port of Portland and the City of Portland have a joint monitoring program conducted by the City to meet the requirements specified under Schedule B			

Table 1 Port MS4 Permit Requirements 1

Notes:

[1]The 1200-Z and the PDX Individual Permit cover this requirement in Schedule A under "Non-Stormwater Discharges."
[2]The 1200-Z and the PDX Individual Permit cover this requirement in Schedule A under "Spill Prevention and Response Procedure."
[3]The 1200-Z and the PDX Individual Permit cover this requirement in Schedule A under "Spill Prevention and Response Procedure" and "Employee Education."
[4]The 1200-Z and the PDX Individual Permit cover this requirement in Schedule A under "Preventative Maintenance", "Control Measures for Technology Based Effluent Limits" and "Required (SWPCP) Elements"

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3.0 PORT OF PORTLAND ORGANIZATIONAL STRUCTURE

The Port's Environmental Operations Department is responsible for administering the MS4 permit and the SWMP. The Water Quality Specialist serves as the MS4 permit manager. Staff from Environmental Operations and each of the three business lines (Aviation, Marine, and Industrial Development) is responsible for implementing Port environmental programs to ensure permit compliance. As a means of coordinating Port-wide programs and policies, environmental program managers regularly meet with cross-functional teams that include Port operating area staff. One means of coordination between Port staff is through the Water Resources Program Team. This Water Resources Program team includes staff from Environmental Operations, Legal, Aviation, Marine, Industrial Development, Public Affairs, and Engineering. The team meets periodically and is responsible for providing input on Port-wide stormwater policy issues, water quality, and permit implementation. The Senior Water and Land Resource Manager serves as the lead.

With respect to implementation of the Port's industrial stormwater discharge permits, Environmental Operations staff prepares, updates, and ensures implementation of the PDX SWPCP in coordination with the co-permittees as well as the SWPCP requirements for non-Port operators at Terminals 2 and 6. Tenants with industrial stormwater discharge permits are also required to prepare, maintain and implement SWPCPs. The City (DEQ's agent) coordinates directly with Port tenants holding these permits.

4.0 STORMWATER EXPENDITURES

The Port's state-mandated mission is to enhance the region's economy and quality of life by providing efficient cargo and air passenger access to global and national markets. In support of this mission, the Port annually undertakes budget and business planning to identify areas of focus and actions needed to address them.

The Port derives almost all revenue from business transactions with the users and tenants of Port facilities. A small proportion (approximately three to four percent) of the Port's overall revenue is from property tax. Business transactions generally occur between the Marine Business Line, the Aviation Business Line (Commercial Aviation and General Aviation), the Industrial Development Business Line, and associated users and tenants of those properties. Industrial Development Business Line revenue sources can also include sales of property. The Port also receives revenue from the U.S. Army Corps of Engineers for dredging services.

Commercial Aviation (PDX) resources are derived primarily from charges to airline passengers and air cargo customers, airport parking, rental car revenue, passenger facility charges, Federal grants, and tenant fees. PDX resources cannot be comingled with any other resources of the Port and are restricted for use at Aviation facilities by bond ordinances and Federal Aviation Administration (FAA) regulations.

The Port annually budgets resources to fund projects and programs identified in the Strategic and Business Line Plans. Program expenses are allocated among Business Lines and departments involved in implementation of the program. Specifically, stormwater resources are allocated across the following business lines, Information Technology (IT), Legal, Engineering, Marine and Industrial Development and Aviation. Stormwater program expenditures include the cost of staff salary (including fringe costs), permit fees, contractor and consultant fees, stormwater infrastructure, City of Portland stormwater fees, disposal of collected material, sample analysis, stormwater training, and outreach materials.

The estimated stormwater program expenditures are broken out by area and in total for fiscal year 2018-19 and the estimates for 2019-2020 in Table 2. Marine and Industrial Development Business Lines are shown together.

Table 2. Summary of Port Stormwater Expenditures

Business Line	Estimated 2018-19 Stormwater Expenditures	Projected 2019-20 Stormwater Expenditures
Marine, and Industrial Development	$1,266,911	$1,266,000
Aviation	$3,647,745	$3,600,000
Engineering	$3,398,424	$6,000,000
IT	$50,336	$50,000
Legal	$52,104	$52,000
Total	**$8,415,520**	**$10,968,000**

5.0 DEMONSTRATION OF CONTINUED LEGAL AUTHORITY TO IMPLEMENT THE PROGRAMS OUTLINED IN THE SWMP

The Port has authority to implement programs outlined in the SWMP through ordinance, permits, and contracts.

The Port has statutory authority to enact ordinances to regulate stormwater sewers that it owns, operates, maintains, or controls. The Port Commission adopted Ordinance No. 361 in 1992, which asserts the Port's regulatory authority over its stormwater system and discharges into that system. Section 3 prohibits any person from making, causing, or allowing an illicit discharge into a storm sewer owned or operated by the Port. Section 4 requires written permission from the Port to make a connection to a Port storm sewer. Section 5 authorizes the Port to inspect Port-owned property for violations of the Ordinance or applicable law that governs the conveyance or disposal of stormwater. In addition, the Ordinance provides the Port with authority to control the contribution of pollutants to storm sewers owned or operated by the Port; the quality of stormwater discharged from the sites of industrial activity on land owned by the Port; and the discharge to storm sewers owned or operated by the Port of pollutants from spills, dumping, or the disposal of materials other than stormwater.

In addition to the Ordinance, the Port has legal authority to control the contribution of pollutants to the municipal storm sewer through contracts with Port tenants. However, the Port has no contractual authority over stormwater runoff from private and public property that discharges stormwater into the Port's MS4 but is not owned by the Port. Lease and operating agreements require compliance with the Port's MS4 permit. Through these regulatory and contractual mechanisms, the Port works with tenants and users of Port facilities to implement BMPs that control the contribution of pollutants to Port storm sewers.

6.0 STORMWATER MONITORING

The Port's monitoring program consists of environmental and BMP monitoring elements. Activities within these groups are in place to meet Schedule B monitoring requirements, including the following MS4 monitoring objectives:

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

2. Evaluate the effectiveness of BMPs to help determine BMP implementation priorities;
3. Characterize stormwater based on land use type, seasonality, geography, or other catchment characteristics;
4. Evaluate long-term trends in receiving water quality associated with storm water discharges;
5. Assess the chemical, biological, and physical effects of MS4 runoff on receiving waters;
6. Assess progress towards meeting TMDL pollutant load reduction benchmarks.

A description of each monitoring program element is provided below.

6.1 Environmental Monitoring

The Port satisfies the MS4 environmental monitoring requirements through an IGA with the City of Portland. The IGA specifies the terms and conditions regarding how the Port shares costs with the City for environmental monitoring efforts. The City's Quality Assurance Monitoring Plan (QAMP) consists of in-stream (event), in-stream (continuous), stormwater, pesticide, mercury, and macroinvertebrate monitoring elements. The plan can be downloaded at https://www.portlandoregon.gov/bes/article/387705. A discussion of this program and its operations during FY2019 is included in City of Portland's Monitoring Compliance Report (Section IV of the Annual Report).

6.2 Best Management Practice (BMP) Monitoring

The Port's BMP monitoring activities are described as tracking measures and measurable goals in the most recently approved SWMP, submitted to DEQ on December 28, 2012. These monitoring activities are specific indicator metrics that help document the completion of tasks and assess the relative effectiveness of BMPs. The implementation tasks, tracking measures, and measurable goals associated with each Port BMP are provided in Sections 7.1.1 through 7.1.8.

6.3 Additional Elements

The following additional elements listed in Schedule B.5.j were submitted to the City separately for November 1, 2014 deadline:

- The TMDL Pollutant Load Reduction Evaluation,
- The Wasteload Allocation Attainment Assessment,
- The 303(d) evaluation and
- Stormwater Retrofit Strategy.

6.4 Additional Stormwater Monitoring Activities

The Port collects and submits additional stormwater monitoring data to DEQ as required by the Port's various NPDES Stormwater permits. Data collected for these permits is not included in the MS4 permit annual report however this data is available upon request.

This monitoring provides data about stormwater discharges from Port industrial properties. Information resulting from these sampling events has been used to manage the stormwater programs at these facilities and may continue to be useful for understanding water quality impacts from different types of industrial sources.

The Port submitted stormwater monitoring data to DEQ for the following industrial stormwater discharge permits in FY2019

- NPDES 1200-Z Industrial Stormwater Discharge Permit, DEQ File No. 114024 (Terminal 2)
- NPDES 1200-Z Industrial Stormwater Discharge Permit, DEQ File No. 125313 (Terminal 6)
- NPDES 1200-Z Industrial Stormwater Discharge Permit, DEQ File No. 125569 (Navigation Base)
- NPDES Individual Deicing and Stormwater Discharge Permit No. 101647

7.0 ACCOMPLISHMENTS FOR PERMIT YEAR TWENTY-FOUR (2018-2019)

7.1 SWMP Implementation

The annual report content and format is based on the SWMP submitted to DEQ on December 28th, 2012. The SWMP is structured into eight major elements. These elements contain the necessary BMPs to address MS4 permit requirements included in Schedule A (4) (a-h). Reporting on tracking measures and progress towards associated measurable goals are shown in italics for each BMP below. Reporting regarding any task not addressed by the corresponding tracking measures or measurable goal response is addressed in italics directly under the task.

7.1.1 Element #1: Illicit Discharge Detection and Elimination

BMP: Implement the Illicit Discharge Detection and Elimination (IDDE) Program

Implementation Tasks:

1. Continue to implement documented illicit discharge detection and elimination procedures (Responsibility: Operations Environmental).
2. Update the illicit discharge detection and elimination procedures by November 1, 2011 per provisions consistent with the MS4 NPDES permit language (Responsibility: Environmental Affairs).
3. Implement a reporting program for potential illicit discharges by maintaining spill notification signs throughout Port property (Responsibility: Operations Environmental, Marine Properties Maintenance, Marine Facilities Maintenance (MFM), and PDX Maintenance).
   - ✓ *Operations staff continues to be trained on spill notification annually. Notification signage is maintained on both Marine and Aviation properties.*

Tracking Measures:

1. Track the status of updating the illicit discharge detection and elimination procedures.
   - ✓ *Previously completed (FY2011).*
2. Track the number, type, location, and resolution of any illicit discharge investigations conducted.
   - ✓ *Aviation did not have any reportable illicit discharge investigations in FY2019. (*See summary under BMP: Conduct Dry-Weather Field Screening tracking measures.)*

- ✓ *Marine did not have any reportable illicit discharges investigations in FY2019. (*See summary under BMP: Conduct Dry-Weather Field Screening tracking measures.)*

Measurable Goals:

1. Update the illicit discharge detection and elimination procedures by November 1, 2011.
   - ✓ *Previously completed (FY2011)*

BMP: Conduct Dry-Weather Field Screening

Implementation Tasks:

1. Conduct annual dry-weather field screening activities at all priority outfall locations (Responsibility: Environmental Operations).
2. Annually, as necessary, update Port data files related to outfall locations, in accordance with dry-weather field screening activities (Responsibility: Environmental Operations).
3. Update the dry-weather field screening procedures by June 30, 2012 to be in accordance with MS4 permit requirements (Responsibility: Environmental Affairs).
   - ✓ *Previously completed (FY2012)*

Tracking Measures:

1. Track the number and location of priority outfalls inspected during dry-weather field screening activities.
   - ✓ *Aviation inspected 14 outfalls.*
   - ✓ *Marine inspected 54 outfalls.*
   - ✓ *The location of Port "Priority Outfalls" for dry-weather field screening is mapped in the Port's GIS system.*
2. Summarize dry-weather field screening inspection results and indicate outfalls requiring sampling or follow up activities.
   - ✓ *Aviation screening was conducted on 08/22/2018.*
     - ***Summary:** Fourteen outfalls were inspected; no visible discharge was observed.*
   - ✓ *Marine screening was conducted on August 16th, 20th and 21st 2018.*
     - ***Summary:** Fifty-four Port outfalls were inspected; no visible discharge was observed.*
3. Indicate the outcome and resolution of inspection activities conducted.
   - ✓ ***No visible discharges were observed.***

Measurable Goals:

1. Update dry-weather field screening procedures, in accordance with permit requirements by July 1, 2012.
   - ✓ *Previously completed (FY2011)*
2. Inspect priority outfalls annually.
   - ✓ *A total of 68 priority outfalls were inspected Port-wide as part of dry-weather field screening activities in 2018-2019.*

BMP: Implement a Spill Response Program for Port Operated Property

Implementation Tasks:

1. Implement the Port's spill response procedure and update as necessary (Responsibility: Environmental Operations).
2. Participate in the City's Spill Response Committee (Responsibility: Environmental Operations).

    ✓ *The City of Portland, the Regional Spill Committee resumed meeting this fiscal year. One meeting was held on April 23rd, 2019. Staff continues to participate in the Maritime Fire and Safety Association Oil Spill committee and is a member of Board. Staff participates in the Clean Rivers Cooperative annual drills and as well as with the EPA's Region 10 Regional Response Team.*

3. Ensure trained Port staff members are available for on-call spill response, in addition to ensuring current contracts with on-call spill response contractors (Responsibility: Environmental Operations).

Tracking Measures:

1. Track the number of spills of a reportable quantity in which a spill response was conducted.

    ✓ *No reportable spills were responded to at the Aviation facilities in FY 2018-2019.*

    ✓ *Five reportable spills were responded to at the Marine facilities in FY 2018-2019. All five reportable spills were fugitive sheens observed from the Navigation Base.*

Measurable Goals:

1. Implement the Port's Spill response procedures.

    ✓ *The Port continues to train appropriate employees to properly implement effective spill response procedures. Reportable quantity spill cleanup is conducted by on-call contractors trained and equipped to minimize discharges to the environment. Incidental spill response is performed by trained employees.*

BMP: Implement a Water Line Flushing Procedure

Implementation Tasks:

1. Implement a waterline flushing procedures to ensure appropriate disposal of chlorinated water (Responsibility: PDX Maintenance, MFM).

Measurable Goals:

1. Implement waterline flushing consistent with guidelines described in the BMP description included in the December 28, 2012 SWMP.

    ✓ *Marine and Aviation staff are aware of the requirements associated with this type of discharge and implement procedures to comply with the Port's work instruction ("Disposal of Chlorinated Water: Hydrant & Waterline Flushing") on the subject. This work instruction has been posted for operating area reference and is covered in stormwater pollution prevention training.*

7.1.2 Element #2: Industrial and Commercial Facilities

BMP: Screen Existing and New Industrial Facilities

Implementation Tasks:

1. Coordinate with the City of Portland over the permit term to develop a screening process for industrial facilities (Responsibility: Environmental Operations).

Tracking Measures:

1. Track leaseholds that have an individual or industrial stormwater permit.

   ✓ *The Port maintains a list of tenants who hold individual and general Industrial Stormwater Permits. These include: Yoshida Foods International Limited Partnership, International Container Terminal Services, Inc., Kinder Morgan Bulk Terminal 4, Toyota Logistics Services, Inc. Auto Warehousing Company (for Hyundai), Swan Island Batch Discharge Plant (Rinker), the Oregon Air National Guard, Con Global Industries, Millbank Materials and Northwest Cascade Honey Bucket.*

Measurable Goals:

1. Coordinate with the City of Portland on a process for screening industrial facilities over the permit term.

   ✓ *The Port has an IGA with the City which states that the City will cover the screening of Port tenants regarding the need for an industrial permit.*

BMP: Implement an Inspection Program for Significant Pollutant Source Areas

Implementation Tasks:

1. Conduct inspections of Priority Facilities annually, or more frequently if needed (Responsibility: Environmental Operations).
2. If inspections identify conditions needing improvements, coordinate with tenant and Port property manager to ensure appropriate control measures to minimize pollutant loading from priority facilities (Responsibility: Environmental Operations).

Tracking Measures:

1. Track the number of facilities inspected annually.

   ✓ *25 inspections of Aviation Priority Facilities were conducted.*

   ✓ *7 inspections of Marine Priority Facilities were conducted.*

2. Track improvements made to Priority Facilities resulting from inspections.

   ✓ *Inspection follow up letters are kept by Environmental Operations documenting any issues that require attention. The issues addressed included, maintaining spill and stormwater training documentation, updating Spill Prevention Control and Countermeasures plans, compliance with monthly inspection requirements, conducting required good housekeeping measures, documentation of catch basin cleaning, labeling hazardous material storage areas and proper storage of recycling dumpsters.*

Measurable Goals:

1. Conduct Annual Inspections at Priority Facilities.

   ✓ *Complete for FY2019. (See Tracking Measures response above).*

2. Document the procedure and rationale for selection of "Priority Facilities" by 11/1/2011.
    - ✓ *Previously completed and reported (FY2011).*

7.1.3 Element #3: Construction Site Runoff Control

Construction projects on Port property comply with the MS4 permit's runoff control requirements through compliance with the NPDES 1200-CA Permit (for Port operations), NPDES 1200-C permits (for tenant projects and some Port projects) as required by DEQ, or the City of Portland's erosion control ordinance (for smaller tenant projects). In addition, these requirements are incorporated into contracts to the extent construction site operators are performing work for the Port. Therefore, control of construction site runoff is addressed independently from the Port's SWMP. Coverage for Port operations and tenants is outlined in Table 1.

7.1.4 Element #4: Education and Outreach

BMP: Implement Public Education Measures to Protect Stormwater Quality

Implementation Tasks:

1. During inspections conducted under BMP – "Implement Inspections of Significant Pollutant Source Areas", and BMP – "Implement a Stormwater System Cleaning and Maintenance Program", identify catch basins where it would be relevant and appropriate to apply "Dump No Waste, Drains to Stream" decals and apply decals (Responsibility: MFM, PDX Maintenance).
2. Include stormwater education materials at Port sponsored outreach events (Responsibility: Public Affairs).

Tracking Measures:

1. Track the number of "Dump No Waste, Drains to Stream" decals applied to catch basins.
    - ✓ *The Port applied 107 decals in FY2019.*
2. Track events where stormwater educational materials were made available.
    - ✓ *Columbia Slough Regatta – August 11, 2018*
    - ✓ *Explorando with the Columbia Slough Watershed Council- June 22, 2019*

Measurable Goals:

1. "Dump No Waste, Drains to Stream" decals will be applied to catch basins associated with all new Port construction annually (except for FAA restricted areas).
    - ✓ **Completed in FY 2018, see the tracking measure response above.*
2. Provide stormwater education materials at outreach events.
    - ✓ *The Port continues to address stormwater issues in a broad variety of outreach events. The details are presented in the tracking measure response above. Moving forward, the Port intends to maintain some outreach to the public at events. However, our primary focus will be on outreach to industrial/commercial tenants since the Port's jurisdiction does not include any residential property. Education and outreach materials addressing target pollutants have been developed and posted to the Port's public website for this target audience.*

BMP: Implement a Tenant Stormwater BMP Program

Implementation Tasks:

1. Maintain an inventory of all tenants or lease holders (Responsibility: Properties Management)
2. Provide technical assistance to the tenants regarding structural and non-structural/ source control stormwater BMPs (Responsibility: Environmental Operations).
3. Maintain an active property management role by conducting inspections of property vacated by tenants to ensure proper disposal of waste materials (Responsibility: Environmental Operations, Aviation and Marine Properties Management).

Tracking Measures:

1. Compile/ update a leasehold inventory annually.
   - ✓ *Marine, Aviation, and Industrial Development Properties groups provide an updated list of leaseholders annually. Tenant information is also updated on its own GIS layer within PortGIS, through a separate process. However, many of these leaseholds do not have any significant exposure to stormwater. Operating area environmental staff are familiar with the circumstances and needs of specific leaseholders. This information is taken into consideration when selecting priority facilities for inspection.*
2. Provide technical information related to structural and non-structural/ source control BMPs to tenants over the permit term.
   - ✓ *In FY2019, this was done during the Port's Priority Facility Inspections. *See issues addressed under BMP: Implement an Inspection Program for Significant Pollutant Source Areas (pg. 20). The Port has developed stormwater BMP education and outreach materials targeting industrial properties. These will be used in conjunction with the industrial inspection program and distributed to a larger group of industrial/commercial entities within the Port's jurisdiction.*

Measurable Goals:

1. Verify the completion and/ or update of a leasehold inventory.
   - ✓ *Completed in FY2019, see tracking measure response above.*
2. Track technical assistance documentation provided to tenants.
   - ✓ *Completed in FY2019 see a list of issues under BMP: Implement an Inspection Program for Significant Pollutant Source Areas (pg. 20). Technical assistance was provided on all stormwater issues encountered during priority facility inspections.*
3. Describe property management activities for lease termination inspections.
   - ✓ *Inspections include several different areas including stormwater. The stormwater portion is focused on determining if the condition of the vacated property presents a source of potential stormwater contaminants. Any sources are identified and mitigated by the former tenant or by the Port and billed back to the responsible party. This means cessation of activities exposed to stormwater, such as outdoor storage. The stormwater system is surveyed, and the tenant is asked to clean the catch basins and storm lines if necessary. Sweeping or clean-up of surface staining can also be requested before a tenant is released from the lease.*

BMP: Require Training and Licensing for Staff Conducting Pest Management Activities

Implementation Tasks:

1. Require all pesticide applicators to obtain and maintain licenses issued by the Oregon Department of Agriculture (ODA) (Responsibility: PDX Maintenance, PDX Landscape, Marine Properties Maintenance, and MFM).

Tracking Measures:

1. Track the Port employees who are ODA-licensed pesticide applicators.

   ✓ *The following Port employees are ODA-licensed; Tim Cooper, Mark Griffith, Dustin Sandberg, Tim Mininger, Aaron Zest, Luis Guevara, Marco Guevara, Kevin Pack, Ryan Snow, Corrine Fritz, Shawn Groom, Tim Guymon, Andrew Glass and Michael Sands.*

Measurable Goals:

1. All pesticide applicators will be licensed by the ODA.

   ✓ *All pesticide applicators working on Port-operated properties are licensed by the ODA. This includes five groups within the Port operating areas who work with these materials (PDX Maintenance, PDX Landscape, Marine Facilities Maintenance (MFM), Marine Property Maintenance/Landscape and Environmental Operations Natural Resources).*

BMP: Provide Erosion Prevention and Sediment Control Training for Construction Inspectors

Implementation Tasks:

1. Provide annual erosion prevention and sediment control training for all Port construction inspectors (Responsibility: Environmental Operations).

Tracking Measures:

1. Track the number of employees receiving erosion and sediment control training.

   ✓ *The Port provided a one-hour training session to 20 staff members involved in construction inspection activities for Port projects. Staff trained through this process inspects projects regulated under the Port's 1200-CA permit. There are 10 Port staff members that have the Certification for Erosion and Sediment Control Lead (CESCL). Staff are recertified every three years.*

Measurable Goals:

1. Erosion prevention and sediment control training will be conducted annually for Port construction inspectors.

   ✓ *Completed in FY2019. *See the tracking measure response above.*

BMP: Participate in a Public Education Effectiveness Evaluation

Implementation Tasks:

1. Coordinate with other local, Phase I jurisdictions in providing/ compiling information regarding a public education effectiveness evaluation by November 1, 2014 (Responsibility: Environmental Operations).

Tracking Measures:

1. Track related efforts annually.

   ✓ *Completed in October 2014. The Port participated in a DEQ approved project with other Phase I jurisdictions to conduct a large-scale Public Education Effectiveness Evaluation. The effort was spearheaded by the Association of Clean Water Agencies (ACWA).*

Measurable Goals:

1. Coordinate with other local, Phase I jurisdictions regarding a public education effectiveness evaluation by November 1, 2014.

   ✓ *Completed in October 2014.*

BMP: Implement a Spill Response Training Program

Implementation Tasks:

1. Distribute updated emergency contact information and spill response procedures to employees responsible for responding to spills (Responsibility: Environmental Operations).
2. Conduct general spill response training annually for designated employees (Responsibility: Environmental Operations).

Tracking Measures:

1. Document spill response training activities.

   ✓ *Environmental Operations maintains documentation listing operations area personnel receiving annual spill response training. The criteria used to determine which employees receive training are explained under the second measurable goal below.*

Measurable Goals:

1. Annually train designated Port employees on spill response.

   ✓ *Spill response training was provided for 73 employees at Marine facilities*

   ✓ *Spill response training was provided for 133 employees at Aviation facilities*

2. Document the procedure to determine which employees will receive spill training by November 1, 2011.

   ✓ *Completed in FY2011.*

BMP: Implement a Staff Training Program for Stormwater Pollution Prevention

Implementation Tasks:

1. Continue to conduct training for new employees during their orientation (Responsibility: Environmental Operations).
2. Provide targeted annual stormwater pollution prevention training for specific staff that conducts activities relevant to stormwater (Responsibility: Environmental Operations).
3. Port staff to attend conferences and educational presentations (Responsibility: Environmental Operations).

Tracking Measures:

1. Document all staff training activities.
   - ✓ *Environmental Operations maintains documentation for all annual stormwater training provided to existing employees, as well as the new employee stormwater training provided during orientation. The Port provided stormwater pollution prevention training to 206 existing employees and 53 new employees.*
2. Document attendance at conferences.
   - ✓ *Environmental Operations collects documentation of stormwater-related conferences attended by environmental staff. These conferences ensure Port staff is up to speed on relevant implementation, technology, and regulatory issues (examples may include, Association of Clean Water Agencies annual conference, StormCon, NEBC Industrial Stormwater Conference, CASQA Stormwater Conference, Northwest Environmental Conference, and various stormwater related training courses).*

Measurable Goals:

1. Participate in water quality organizations and stakeholder groups annually.
   - ✓ *The Port continues to participate as a board member of the following organizations, Columbia Slough Watershed Council, Friends of Trees, Lower Columbia Estuary, The Intertwine Alliance, and Willamette Partnership. Other participation includes financial sponsorship, membership, volunteer assistance at events, and in-kind services for the following stakeholder groups, Oregon Environmental Council, Oregon Association of Clean Water Agencies, Sandy River Basin Council, Honoring Our Rivers, PDX Community Advisory Committee, KOIN 6 Water… Do Your Part Clean Water Partners and Columbia River Basin Restoration Working Group.*
2. Conduct annual training.
   - ✓ *Completed in FY2019, see the tracking measure response above.*
3. Conduct new employee training.
   - ✓ *Completed in FY2019, see the tracking measure response above.*

7.1.5 Element #5: Public Involvement and Participation:

BMP: Provide for Public Participation with SWMP and Benchmark Submittals

Implementation Tasks:

1. Provide opportunities for public comment on the SWMP and pollutant load reductions benchmarks for a minimum of 30 days prior to submittal of the permit renewal to DEQ (Responsibility: Environmental Operations and Public Affairs).

Tracking Measures:

1. Report annually on public participation in these areas.

   ✓ *Completed in FY2015. Port's Stormwater Management Plan and the Pollutant Load Reduction Benchmark Analysis report were updated as part of the MS4 permit renewal application and put on Public notice via the Portland website June 15 through July 15, 2015.*

Measurable Goals:

1. Provide for public participation on the SWMP revisions and pollutant load reduction benchmarks (developed for permit renewal).

   ✓ *Completed in FY2015, see the tracking measure response above.*

2. Provide public access to the Port's most current MS4 Annual Report via its public website.

   ✓ *The Port's annual reports are available on-line via a link (on the "Stormwater Management Page" of the Port's public website) to the City of Portland's website http://www.portlandonline.com/bes/index.cfm?c=50289 and are also posted on the Port's website, https://www.portofportland.com/Environment/StormwaterManagement*

BMP: Implement a Public Participation Approach that Provides Opportunities for the Public to Effectively Participate in the Implementation of the Stormwater Management Plan

Implementation Tasks:

1. Determine what projects are appropriate for public involvement (Responsibility: Environmental Operations, Public Affairs).
2. Make the public aware of the selected involvement opportunities via the Port's website, and the Columbia Slough Watershed Council (Responsibility: Environmental Operations and Public Affairs).

   ✓ *In FY2019, the public was made aware of involvement opportunities via communications from, Port's digital weekly update Portsmouth.*

3. Implement selected projects and document public involvement (Responsibility: Environmental Operations and Public Affairs).

Tracking Measures:

1. Describe any projects implemented where the public has opportunity to participate and the extent of public involvement for each.
   - ✓ *The following FY2019 events provided the opportunity for the public to participate in implementation of the Port's stormwater program:*
     - *Sponsor of 2019 Columbia Slough Regatta,*
     - *The Port funded 4 Friends of Trees planting projects for tree canopy and vegetation enhancements in areas impacted by airport operations. Volunteers planted 2,384 trees during events at Columbia Children's Arboretum (1/12/19), Argay, Parkrose, Russel and Wilkes (02/23/2019), Columbia Slough Natural Area (03/16/2019) Beaumont-Wilshire, Cully & Roseway (04/06/2019). Employees participated as planting volunteers.*
     - *The Port through the Airport Futures program provided funds for the NE 33rd riparian corridor enhancement project. The project restored 1.88 acres by removing Himalayan blackberry, planting 3,000 native shrubs.*
     - *Honoring Our Rivers – sponsorship and in-kind support of student anthology of writing and art works focusing on rivers; served as judge for student work.*

Measurable Goals:

1. Document what projects are identified as public involvement opportunities.
   - ✓ *The following have been identified as possibilities for next year:*
     - *The Port will continue to sponsor events that connect the public to stormwater and participate with organizations whose mission is to enhance water quality through public outreach.*

7.1.6 Element #6: Post-Construction Site Runoff Control

BMP: Develop, Adopt, and Implement New Port-Specific Post-Construction Runoff Control Standards

Implementation Tasks:

1. By January 1, 2014, adopt and implement Port-wide post-construction standards for development and redevelopment. Airport specific standards will be consistent with FAA and airport operations requirements (Responsibility: Environmental Operations)
2. By December 2012, update Intergovernmental Agreement (IGA) with the City of Portland to clarify responsibilities, so that one set of post-construction standards are applied to the Port's MS4, avoiding duplication and conflicting requirements (Responsibility: Environmental Affairs).
3. By end of permit term, design and initiate construction on a stormwater capital improvement retrofit to address at least one applicable TMDL pollutant of concern (Responsibility: Environmental Operations).

Tracking Measures:

1. Adopt Port-wide post-construction development/ redevelopment standards by January 1, 2014.
   - ✓ *The Port's Design Standards Manual (DSM) was completed November 2013.*
   - ✓ *The DSM allows for the use of regional structures to treat multiple capital projects.*
     - *The Port's DSM currently applies to the PDX airfield and certain designated properties surrounding the airfield.*
     - *The Port has developed an accounting system to track the number of acres treated and the total number of acres requiring treatment per calendar year.*
     - *The Port is in compliance with post-construction control standards in the DSM. Actual acres of treatment per project are verified as part of close-out and reconciled with the accounting system.*
2. Update IGA with the City of Portland by December 31, 2012.
   - ✓ *Completed in 2012.*
3. Design and initiate construction on a stormwater retrofit project to address a TMDL pollutant of concern.
   - ✓ *A pavement removal project at Terminal 4 was identified as the Port's required retrofit project and completed in FY2012. It removed 1.24 acres of impervious area, and six catch basins. Thereby, infiltrating an estimated 3.6-acre feet of stormwater annually and reducing potential bacterial loading to the Willamette River.*

Measurable Goals:

1. Document the design, construction, and rationale for the retrofit project addressing a TMDL pollutant of concern.
   - ✓ *Completed in 2012, see the third tracking measures response.*

7.1.7 Element #7: Pollution Prevention for Municipal Operations

BMP: Implement a Street and Vehicle Maneuvering Area Cleaning and Maintenance Program

Implementation Tasks:

1. Sweep the McCarthy Park (Swan Island) parking lot annually (Responsibility: Marine Properties Maintenance).
2. Sweep Port-managed areas of the marine terminals annually. If additional sweeping is needed, Environmental Operations will coordinate with MFM staff (Responsibility: Environmental Operations, MFM).
3. Sweep Airport Way, Frontage Road, and PDX employee parking lots twice per week in winter and once per week in summer (Responsibility: PDX Maintenance).
4. Maintain and repair roadway areas to minimize pollutant impacts to stormwater as needed (Responsibility: MFM, PDX Maintenance).
5. Follow manufacturer's recommendation for application of deicing products (Responsibility: MFM, PDX Maintenance, Marine Properties Maintenance).

- ✓ *Operating area personnel apply pavement deicing materials per the manufacturer's requirements. Application equipment is calibrated by weight and volume to apply the material at the suggested rate to avoid over application.*

6. As necessary, decant street sweeping wastes in covered, water-tight drop boxes (Decant Water Collection Boxes) that drain to an approved sanitary sewer discharge point (Responsibility: PDX Maintenance, MFM).
   - ✓ *Completed for FY2019.*

Tracking Measures:

1. Track sweeping frequency at McCarthy Park.
   - ✓ *MFM contracts sweeping for McCarthy Park. Sweeping was conducted twice per month during the summer and spring and was increased once per week in the fall and winter.*
2. Track sweeping frequency at the marine terminals.
   - ✓ *Sweeping was conducted during March 2019 at Terminal 2. Terminal 4 annual sweeping was conducted in October, December and April 2019, additional sweeping operations for the Kinder Morgan leased area were conducted in November 2018 and May 2019. The following T6 yards were swept through out the year: 601 yard and Auto West yard in June 2019, 605 in March 2019, 606 in October 2018, 607 in June 2019 and the intermodal yard in April 2019.*
   - ✓ *The Port performed 104-hours of sweeping at the marine terminals.*
3. Track sweeping frequency at Airport Way, Frontage Road, and the PDX employee parking lots.
   - ✓ *PDX Maintenance performs regular sweeping for these areas. Airport Way was swept three times per week, Frontage Road was swept twice per week, and the Employee parking lot was swept once per week.*
   - ✓ *PDX Maintenance also performs routine sweeping of the maintenance facility and the airfield.*
   - ✓ *The Port performed 2,564-hours of sweeping.*
4. Report the amount of materials removed. Materials will include those collected from catch basins and other structural devices.
   - ✓ *256.67 tons of material were removed from catch basins and sweeping combined at Aviation facilities. The PDX Basin 6 quiescent and detention ponds were cleaned, resulting in the removal of an additional 494.85 tons of sediment.*
   - ✓ *125.35 tons of material were removed from catch basins and sweeping combined at Marine facilities.*

Measurable Goals:

1. Sweep McCarthy Park parking lot annually.
   - ✓ *Completed in FY2019, see tracking measure response above.*
2. Sweep Port-managed, accessible areas of the marine terminals annually.
   - ✓ *Complete in FY2019, see tracking measure response above.*

3. Sweep Airport Way, Frontage Road, and the PDX employee parking lots a minimum of once per week.

   ✓ *Completed in FY2019, see tracking measure response above.*

BMP: Limit Landscape Maintenance Activities Impact on Stormwater

Implementation Tasks:

1. Apply pesticides and fertilizers, using an Integrated Pest Management approach to minimize impacts to stormwater (Responsibility: Marine Properties Maintenance, MFM, PDX Maintenance and Landscape).

   ✓ *Marine Properties Maintenance staff is responsible for the landscaping and maintenance of the Port's industrial parks, marine terminals, and mitigation sites. Staff continued to implement the IPM and Work Schedules Program for Port-owned mitigation sites. This program identifies problem plant species at each site, provides a profile for each species, recommends control methods, and outlines monitoring protocol and schedules.*

   Environmental Operations provides Port maintenance staff and Port-contracted workers with the Vegetation Management Plan. The plan gives information on the appropriate herbicides and use of those herbicides to control invasive plant species, and it identifies the locations where specific herbicides can be applied.

   MFM conducts weed control activities at marine parking areas, rail yards, and specific vegetated areas at Marine Terminals 2, 4, and 6 on an as-needed basis.

   PDX Landscape staff, responsible for landscaping at PDX facilities, continues to implement BMPs aimed at improving stormwater quality at the airport. Some of the issues they focused on included testing pesticide alternatives recommended by the Oregon Department of Agriculture, reducing the concentration of pesticides/herbicides/fertilizers applied where possible, and incorporating native plants into the landscaping to reduce water and chemical requirements.

   PDX Maintenance staff applies pesticides on the airfield to comply with FAA requirements. These requirements focus on safety, particularly with respect to reducing wildlife hazards. Staff continue to look for ways to reduce chemical usage where possible by working with different pesticide combinations to achieve required conditions.

2. Review the Port's program to control pesticides, herbicides and fertilizers annually, and update as appropriate (Responsibility: Environmental Operations, Marine Properties Maintenance, MFM, PDX Maintenance, PDX Landscape).

   ✓ *The Port groups applying pesticides documented new approaches for consideration. Some of the issues include: Making pesticides more effective by improving weed identification and life cycle analysis, use pre-emergent controls to minimize difficult invasive plants, finding replacements for glyphosate products Roundup and Ranger Pro, reviewing best management practices for safely storing and applying pesticides.*

3. Maintain an inventory of pesticides used on Port property and update annually (Responsibility: Environmental Operations, Marine Properties Maintenance, MFM, PDX Maintenance, PDX Landscape).

Tracking Measures:

1. Document the annual pesticide use update.
   - ✓ *The amounts of each pesticide/herbicide/fertilizer used are presented below for each of the groups listed above.*

Table 3 Pesticide/Herbicide/Fertilizer Use

PDX Landscape Maintenance	
Agristar Triclopyr 3A herbicide	3.5-gal
Aquastar aquatic herbicide	64-oz
Atrimmec Growth Regulator	6.5- gal
Blue Dye	2.5-gal
Dimension 2WE Pre m herbicide	11.5-gal
FreeHand 175G	26-lbs
Gallery 75DF pre m herbicide	49-lbs
Pendululm	27.5-gal
Q4 herbicide	1-gal
Ranger Pro Herbicide	9-gal
Reward lands and aquatic herbicide	22.05-oz
Ronstar G Herbicide	21-lbs
Sedgwhammer herbicide	2.7-oz
Simazine Pre. Em. herbicide	19-gal
Speedzone Herbicide	2.0-gal
PDX General Maintenance	
Alligare	294-lbs
Blue Dye	188-oz
Crossroads	307-gal
No Foam	48-oz
Ranger Pro	24-gal
ZP Oats (Vole bait)	15,600-lbs
Undeveloped Properties	
Milestone	110-oz
Rodeo	29.42-gal
Transline	110.5
Vastlan	14.1-gal

Marine Property Landscape Maintenance	
Dimension 270 G	34-lbs
Q-4	47.5-oz
Ranger Pro -glyphosphate	2,157-oz
Surflan Pro-oryzalin	309-oz
Sulfomet/Oust	1-oz
TriChlophr 3/A-chloropyridinyl	1553.5-oz
Marine Facility Maintenance	
Agri Star Triclopyr 3A	108.31-gal
Kicker - Fertilizer, Liquid	2.08
LI-700 Surfactant	16.94-gal
Ranger Pro	108.75-gal
Right on blue	41.16-gal
SFM 75	267.94-oz
Terminator II Defoamer	0.81-oz

Measurable Goals:

1. Annually update the Port's pesticide use inventory.
   - ✓ *Completed for FY2019, see Table 3.*

BMP: Require Training and Licensing for Staff Conducting Pest Management Activities (partial applicability)

*See section 7.1.4 for information on implementation of this BMP.

BMP: Implement a Tenant BMP Program (partial applicability)

* See section 7.1.4 for information on implementation of this BMP.

BMP: Implement a Program to Limit Infiltration from Port-Owned Sanitary Sewer System into the MS4

Implementation Tasks:

1. Monitor pump stations electronically to ensure proper function of Aviation pump stations (Responsibility: PDX Maintenance).
2. Monitor pump stations through weekly inspections and audible/visual alarms to ensure proper function of Marine pump stations (Responsibility: MFM).
   - ✓ *MFM staff documented monthly inspections. The MFM plumber and electricians contribute to meeting this requirement.*
3. Conduct annual pump station maintenance, including flushing, float and alarm testing, and debris removal for all pump stations (Responsibility: PDX Maintenance, MFM).
   - ✓ *Work orders were generated to ensure the completion of this work at PDX and Marine operated sanitary lift stations.*
4. Clean Port-owned grease interceptor vaults at PDX on an annual basis (Responsibility: Aviation Facilities Maintenance).
   - ✓ *PDX maintains two large grease interceptor vaults as a back-up to grease traps maintained by PDX concessions tenants under the FOG program. Documentation of this maintenance is provided to Environmental Operations.*
5. Continue to implement the tenant FOG (fats/oils/grease) program to ensure proper handling of these materials at PDX (Responsibility: PDX Business/Properties).

Tracking Measures:

1. Maintain a list of Port tenants implementing the FOG program.
   - ✓ *Environmental Operations maintains a list of tenants who are inspected as part of the effort to prevent fats, oil, and grease from clogging sanitary sewer lines. These are primarily concessions tenants located in the terminal. This relates to stormwater, as it prevents overflow in obstructed sanitary lines from entering the storm system.*

Measurable Goals:

1. Document completion of implementation tasks (2-4) associated with this BMP (with PDX Maintenance, Aviation Facilities Maintenance, MFM, and PDX Business/Properties)
   - ✓ *Completed for FY2019. Environmental Operations maintains documentation for the lift station inspections/maintenance, grease vault cleaning and grease trap inspections (FOG program).*

BMP: Implement a Stormwater System Cleaning and Maintenance Program (partial applicability)

* See section 7.1.8 for information on implementation of this BMP.

7.1.8 Element #8: Structural Stormwater Controls Operations and Maintenance

BMP: Implement a Stormwater System Cleaning and Maintenance Program

Implementation Tasks:

1. Continue to implement a stormwater system feature inspection and maintenance program (Responsibility: Environmental Operations, MFM, Marine Properties Maintenance).
2. Inspect and clean catch basins (as necessary) annually in Port-managed Marine Business Line areas (Responsibility: MFM).
3. Conduct litter pickup and vegetation management activities to ensure adequate access and performance of all stormwater system features as needed (Responsibility: MFM, Marine Properties Maintenance).
   - ✓ *Marine Properties Maintenance staff maintained landscaped areas within the industrial parks at Swan Island and Rivergate and at the marine terminals. Crews removed and disposed of vegetative debris, scrap metal, and garbage. They also cleared vegetation around stormwater outfalls and associated stormwater conveyance system infrastructure on Port-owned industrial park properties to provide better access for inspections and illicit discharge monitoring.*
4. Coordinate updates of storm sewer system maps to include updated stormwater conveyance system features and Port-owned and operated structural controls (Responsibility: Environmental Operations and Engineering).
5. By June 30, 2012, review and update the existing inspection and maintenance procedures for structural stormwater controls, in accordance with requirements outlined in the Port's MS4 NPDES permit (Responsibility: Environmental Operations and Maintenance)
   - ✓ *Previously completed in FY2011.*
6. As necessary, decant storm system and catch basin cleaning wastes in covered, water-tight drop boxes (Decant Water Collection Boxes) that drain to an approved sanitary sewer discharge point (Responsibility: MFM, PDX Maintenance).
   - ✓ *Completed for FY2018.*

Tracking Measures:

1. Track number of catch basins cleaned annually.
   - ✓ *658 catch basins and manholes were cleaned at Aviation facilities.*
   - ✓ *459 catch basins were cleaned at Marine facilities.*
2. Track cleaning frequency for the Port owned and operated structural stormwater controls by facility type.
   - ✓ *Marine-operated water quality treatment facilities are inspected at least on a quarterly basis and cleaned as needed to maintain proper operation. Catch basins in Marine-operated areas are scheduled to be inspected and cleaned (if necessary) on an annual basis.*
   - ✓ *Aviation-owned water quality treatment facilities (except for quiescent ponds) are cleaned on an annual basis. The ponds are cleaned on a three-year rotating basis. The drainage basin 6 quiescent pond was cleaned in FY2019, resulting in the removal of 495 tons of material.*

- ✓ *PDX has over 3,000 catch basins. PDX Maintenance inspects and cleans those associated with industrial activity on an annual basis. Many of these facilities also have catch basin inserts that are inspected and changed as needed monthly. The balance of PDX catch basins are cleaned on a 4-year rotating basis. If necessary, catch basins are moved to a more frequent cleaning schedule or fitted with an insert based on field observations.*

3. Track storm sewer system pipe cleaning activities annually.
   - ✓ *6,741 feet of storm line were cleaned at Aviation facilities.*
   - ✓ *0 feet of storm line were cleaned at Marine facilities.*
4. Track updates to the stormwater system features maps.
   - ✓ *All Port storm system maps are available to operations and administrative personnel through the PortGIS interphase located on Navigator (the Port's intranet). The PortGIS system is continuously updated.*
5. Report amount of materials removed. Materials will include those collected from catch basin cleaning and street sweeping.
   - ✓ **See BMP: Implement a Street and Vehicle Maneuvering Area Cleaning and Maintenance Program.*

Measurable Goals:

1. Inspect and clean all catch basins within the Port-managed areas not otherwise covered by a 1200-series industrial stormwater permit annually.
   - ✓ *PDX completed this work based on their schedule (listed above under tracking measure for this BMP).*
   - ✓ *MFM completed this work in FY2019.*
2. Inspect and maintain all Port-owned and operated structural controls within the Port-managed areas not otherwise covered by a 1200-series industrial stormwater permit annually.
   - ✓ *Completed in FY2019, see the Tracking Measure response above.*

BMP: Implement a Program for the Tracking and Maintenance of Private Structural Controls

Implementation Tasks:

1. Work with the City of Portland to establish and maintain an inventory of existing private structural control facilities on tenant properties by December 31, 2012 (Responsibility: MID Properties Management, and Environmental Operations).
2. Develop a program in conjunction with the City of Portland to track private structural control facilities on tenant properties over the permit term (Responsibility: Environmental Operations).
3. By June 30, 2012, develop an updated inspection and maintenance procedure for structural stormwater controls for distribution to owners of private structural control facilities (Responsibility: Environmental Operations).

Tracking Measures:

1. Track the number of existing and new private structural control facilities installed on Port-properties.
   - ✓ *The Port coordinated with the City of Portland to develop a complete list of water quality treatment facilities on Port property that includes tenant operated facilities.*

Measurable Goals:

1. Develop an inventory and mechanism for tracking of private structural controls on tenant properties.
   - ✓ *The Port's IGA with the City of Portland (completed in December 2012) addresses the tracking requirements. The City will cover all water quality treatment facility maintenance tracking for Port tenants outside of the PDX security fence through its Maintenance Inspection Program. The Port will track all remaining facilities on Port property.*

BMP: Implement a Tenant BMP Program (partial applicability)

* See section 7.1.4 for information on implementation of this BMP.

8.0 ADAPTIVE MANAGEMENT PROCESS IMPLEMENTATION AND PROPOSED SWMP CHANGES

As it has, since permit year one, the Port continues to use adaptive management to modify and improve BMPs and to implement practices that reduce pollutant loading to the maximum extent practicable. This process involves direct coordination with operating area personnel who provide suggested BMP modifications.

In permit year 24, an adaptive management process was used to ensure all ideas are heard, documented, and implemented, if viable. PDX and Marine MX have continued to refine data collection for cleaning and documenting maintenance of the storm sewer system. Based on monthly observations it was determined that the frequency of sweeping in the trash collection area under the PDX terminal building needed to be increased. We are currently working with the engineering and GIS groups to develop a mobile application that maintenance and survey staff can use in the field to make observation and corrections to the storm sewer system. Based on a stormwater facility performance monitoring study conducted by the Port, a revised preventive maintenance schedule was implemented for Baysaver Catch basin cartridges. The Port also implemented a new software program called Veoci to track spills.

The Port is not seeking SWMP revisions at this time.

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Part III
MONITORING REPORT

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City of Portland, Oregon

National Pollutant Discharge Elimination System (NPDES)

Municipal Separate Storm Sewer System (MS4) Discharge Permit No. 101314

MONITORING REPORT

Fiscal Year 2018-2019

(July 1, 2018 – June 30, 2019)

Prepared for:

Oregon Department of Environmental Quality

Submitted by:

City of Portland
Port of Portland

Submitted on:

November 1, 2019

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1 Introduction

The purpose of this annual Monitoring Report is to comply with Schedule B of Portland's National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Discharge Permit Number 101314. Schedule B of the MS4 permit (Table B-1) contains specific requirements on the monitoring types, locations, frequency, and parameters. This report summarizes monitoring activities conducted by the City of Portland (the City) during the 2018–19 permit year (July 1 to June 30) in accordance with Schedule B and discusses pertinent results.

The City's sampling activities and results are summarized in Sections 2 and 3, respectively. Section 4 includes an evaluation of long-term trends in water quality based on the City's stormwater sampling. A map of all monitoring locations is included in Appendix A. All monitoring data collected during the 2018–19 permit year are included in Appendix B and submitted electronically to the Oregon Department of Environmental Quality (DEQ).

2 Sampling Activities

The City conducts sampling and analysis of stormwater, instream, and biological (macroinvertebrates) parameters to fulfill MS4 permit requirements. The monitoring also supports and informs the City's actions in meeting Total Maximum Daily Load (TMDL) objectives related to receiving-water health. Detailed information on the City's monitoring strategy is described in the 2016 Monitoring Plan, including the methods used to collect samples, frequency of collection, and the number of sampling locations.

Table 1. Summary of monitoring activities conducted during the permit year and the commitments included in the monitoring plan. A range is provided when the frequency varied by site.

	Monitoring Plan		2018–19 Activities	
Monitoring Type	**Number of Sites**	**Frequency/Site**	**Number of Sites**	**Frequency/Site**
Probabilistic Stormwater	30	1 storm event	30	1 storm event
Historic Fixed Land Use	4	3 storm events	4	3 storm events
Fixed Instream	11	2 dry weather 2 storm events	11	4–9 dry weather 2–3 storm events
Probabilistic Instream (PAWMAP)	NA	Not included	20	4 dry weather 1 storm event
Continuous Instream (USGS)	7	Continuous: 30-minute interval maximum	7	Continuous: 30-minute interval maximum
Macroinvertebrates	14	1 sample	14	1 sample

During the 2018–19 permit year, the City completed all permit-required monitoring activities (Table 1). In addition to the activities required by the Monitoring Plan, the City also collected water quality samples from 20 perennial streams throughout Portland as part of the Portland Area Watershed Monitoring and Assessment Program (PAWMAP).[1] PAWMAP is a coordinated long-term monitoring effort designed to measure the City's current and changing ecological resources that began in 2010. The program is designed to systematically measure changes in habitat, water quality, and biological communities over time.

Throughout the permit year, City staff collected water quality samples from multiple storm events. Over the course of the permit year, City staff monitored weather conditions and conducted sampling to target storms with certain characteristics, as described in the Monitoring Plan.

2.1 Probabilistic Stormwater

The City implements a monitoring program to characterize the stormwater entering the City's underground injection control (UIC) system. The monitoring effort is used to comply with both UIC and MS4 permit requirements. The UIC monitoring program is based on a probabilistic approach that selects a subset of the UICs in the City to sample as part of an annually rotating panel of sites. This monitoring approach allows for the efficient characterization of the City's large UIC system (over 9,000 individual UICs) while maintaining statistical

[1] More information about PAWMAP is available here: https://www.portlandoregon.gov/bes/article/489038.

power. Each year, the City targets two panels that each consist of 15 UIC locations. Each UIC is investigated and field verified before the sampling panel is finalized.

During the 2018–19 permit year, the City successfully sampled 30 UIC locations. The samples were collected from six separate storm events (Table 2). At least 0.1 inches of rain were recorded for each of the sampled storm events.

Table 2. Summary of storm events sampled as part of the City's probabilistic stormwater monitoring during the permit year.

Sampling Date	Number of Sample Locations	Event Length Before Sample Collection (hours)	Event Total Before Sample Collection (inches)	24-Hour Antecedent Rainfall (inches)
2018-11-27	2	2.9–21.5	0.02–0.87	0.86–0.89
2018-11-28	12	5.4–10.1	0.18–0.33	0.20–0.34
2018-12-18	4	18.4–19.9	0.92–1.28	0.92–1.28
2018-12-20	1	4.4	0.10	0.10
2019-01-18	3	3.4–4.2	0.03–0.05	0.15–0.17
2019-02-11	8	10.1–20.7	0.21–0.76	0.39–0.76

Note: Recorded rainfall is based on the closest rain gage to each UIC monitoring location. The Event Length and Event Total columns represent the number of hours with measurable rainfall leading up to the sample collection time and the total rainfall measured during that period, respectively, for each UIC sampling location. The 24-hour antecedent rainfall is the total recorded rain during the full 24 hours prior to sample collection. Ranges are provided given the variability between sites and collection times.

2.2 Historic Fixed Land-Use Stormwater

During the 2016–17 permit year, the City resumed stormwater monitoring at four sites that were historically monitored between 1991 and 2011 to evaluate stormwater characteristics associated with different land uses. The City conducts flow-weighted composite sampling during rain events using methods that are consistent with the methods used to collect the previous historic data, allowing for direct comparison of results. Flow-weighted composite sampling characterizes the overall water quality concentrations as an event mean concentration for the total volume of runoff from that storm and captures the variability across the duration of a storm event.

City staff monitor weather forecasts to target storm events for sampling. Using real-time telemetered flow meters, monitoring staff can adjust sampling increments based on precipitation patterns and anticipated flow rates to ensure that a composite sample adequately represents runoff from the storm event.

Each year, the City targets sample collection for three storm events at each site. The City sampled three separate storm events at each of the four locations during the 2018–19 permit year (Table 3). Composite sampling was completed at all four sites during the permit year and all storm target criteria were met.

Table 3. Storm events sampled during the permit year at the four historic fixed land-use composite stormwater monitoring locations.

Site ID	Sample Dates	Sampling Period (hours)	24-Hour Antecedent Rainfall (inches)	Sample Collection Rainfall (inches)
M1 Columbia Slough *Mixed Land Use*	Dec 9-10, 2018	18.3 hours	0.07	0.55
	Mar 12, 2019	6.2 hours	0.29	0.26
	Apr 4-5, 2019	16.8 hours	0.13	0.38
OF19 Willamette River *Forest Park and Industrial Land Use*	Dec 8-10, 2018	32.3 hours	0.05	0.62
	Mar 11-12, 2019	3.2 hours	0.39	0.69
	Apr 4-5, 2019	16.8 hours	0.13	0.49
R1 Fanno Creek *Residential Land Use*	Dec 9-10, 2018	17.4 hours	0.13	0.57
	Mar 12, 2019	3.7 hours	0.32	0.39
	Apr 4-5, 2019	21.2 hours	0.18	0.37
R2 Columbia Slough *Residential Land Use*	Dec 9, 2018	17.8 hours	0.00	0.57
	Mar 12, 2019	4.9 hours	0.24	0.33
	Apr 4-5, 2019	16.1 hours	0.13	0.38

Note: The Sampling Period is the length of time between the first and last subsamples collected for the composite. The 24-Hour Antecedent Rainfall is the total recorded rain in the 24 hours prior to the collection of the first subsample. The Sample Collection Rainfall is the amount of rainfall recorded during the sampling period at the nearest rain gage.

2.3 Instream Water Quality

The City collects and analyzes water quality samples from multiple streams throughout Portland that receive MS4 discharges. The City currently conducts two instream ambient water quality monitoring efforts. The first is a comprehensive ambient monitoring program with 11 fixed sites that are sampled monthly or bi-monthly. Sites are located on the Columbia Slough, Fanno Creek, Johnson Creek, Tryon Creek, and the Willamette River. These sites have been monitored routinely since the early to mid-1990s, providing a long-term record of water quality conditions.

The City also collects water quality samples as part of PAWMAP. This program uses a probabilistic survey design to monitor the City's aquatic resources. PAWMAP includes 80 stream sites in multiple watersheds throughout the city. The sample sites are divided into four panels, with 20 perennial sites included in each panel that are sampled on a 4-year rotating basis. Seasonal (once per quarter) water quality samples are collected at each perennial site throughout the year, as well as one sample each during a storm event. Given the program design, the number of monitoring sites in each watershed will vary from year to year.

Table 4. Summary of the instream water quality monitoring locations and the number of samples collected at each site during the permit year for both the fixed and probabilistic (PAWMAP) locations.

	Fixed Locations				Probabilistic Locations			
Watershed	**Number of Sites**	**Dry Weather Samples/ Site**	**Wet Weather Samples/ Site**	**Subtotal of Samples**	**Number of Sites**	**Dry Weather Samples/ Site**	**Wet Weather Samples/ Site**	**Subtotal of Samples**
Columbia Slough	2	4-5	2-3	14	5	4	1	25
Johnson Creek	2	5	2	14	6	4	1	30
Tualatin River	1	9	3	12	4	4	1	20
Willamette River Tributaries	3	9	3	36	5	4	1	25
Willamette River	3	9	3	36	--	--	--	--
Totals	***11***			***112***	***20***			***100***

Note: The Tryon Creek fixed sites are included in the Willamette River Tributaries watershed.

During the 2018–19 permit year, the City collected water quality samples from all of the instream water quality monitoring sites (Table 4). The City collected all the planned samples from the fixed monitoring sites in the Columbia Slough, Fanno Creek, Johnson Creek, Tryon Creek, and Willamette River. The City met the sample requirement included in the monitoring plan during the 2018–19 permit year for the instream water quality sampling. The City also collected dry and wet weather samples from the 20 perennial PAWMAP sites.

2.4 Instream Flow and Temperature

Continuous instream flow and temperature monitoring provides a high-resolution dataset that can be used to evaluate the physical characteristics of streams that receive MS4 discharges. The U.S. Geological Survey (USGS) operates seven stream gages in the Portland area. The City provides partial funding for the monitoring sites through joint funding agreements. All seven of the gages record stream discharge, and four gages also record water temperature. The Willamette gage measures additional parameters, including chlorophyll-*a*, cyanobacteria, dissolved oxygen, nutrients, pH, specific conductance, and turbidity.

All seven gages were operational throughout the permit year, with the exception of Gage #14211820 on the Columbia Slough. An equipment failure occurred at the USGS gage on the Columbia Slough. As such, there is a 2-day period in April with an incomplete discharge record. The USGS makes the instantaneous flow and temperature data available prior to the completion of their full data review process. A portion of the data presented here are provisional at the time of reporting and may be subject to change after the USGS completes the full quality assessment.

2.5 Macroinvertebrates

Macroinvertebrate monitoring provides information on biological communities within water bodies that receive MS4 discharges. It is designed to evaluate whether, and to what degree, the biological conditions within a stream are changing. Macroinvertebrate monitoring is timed to occur during the low-flow period to facilitate sampling and capture conditions during the period of highest stress for many organisms. Results from macroinvertebrate monitoring may also indicate the effects of stressors and instream conditions that preceded

the sampling event by significant periods of time. Instream water quality samples are also collected at the same time.

The City collected benthic macroinvertebrates at 14 perennial stream sites during the summer and early fall of 2018. No sampling issues were encountered, and all of the wadeable, riffle-dominated sites were sampled. Macroinvertebrates were not collected at the non-wadeable perennial sites located in the Columbia Slough, per the Monitoring Plan.

2.6 Permit Year Precipitation Patterns

Precipitation patterns across the city of Portland are variable, delivering different amounts of rain to different parts of the city. The City operates a network of rain gages as part of the HYDRA Rainfall Network.[2] Each rain gage records rainfall amounts in 0.01-inch increments. For the purposes of summarizing the precipitation patterns observed during the permit year, data from eight gages located across the city were summarized (Figure 1). During the 2018–19 permit year, Portland received a total of approximately 32.4 inches of precipitation. Over the previous 20 years, the eight rain gages recorded a mean total annual rainfall amount of 40.2 inches.

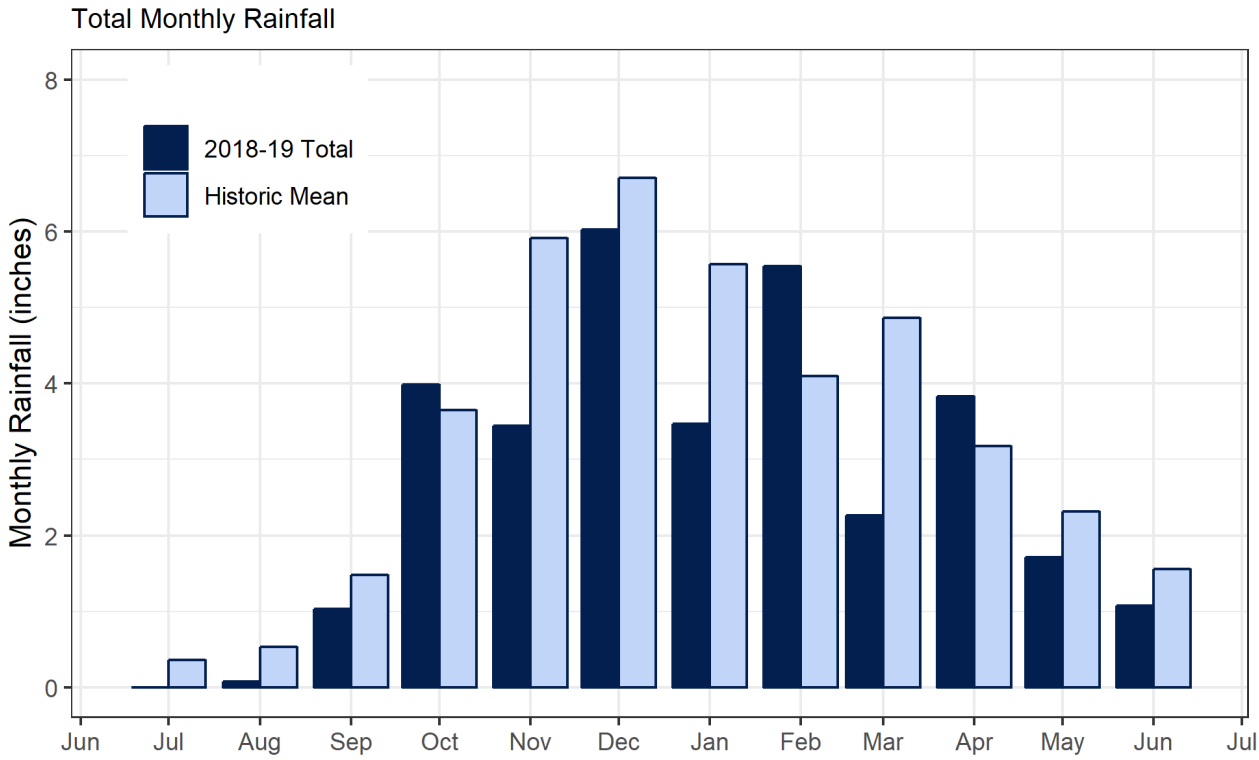


Figure 1: Mean total monthly rainfall recorded at eight stations across Portland from July 1, 2018, to June 30, 2019, compared to the mean monthly totals recorded over the previous 20 years (1998–2018).

Compared to previous years, Portland received less rain by approximately 7.8 inches during the 2018–19 permit year. Many months experienced lower- or higher-than-average rainfall amounts, with the largest deviations occurring in November, January, and March (Figure 1).

[2] More information about the HYDRA Rainfall Network is available here: https://or.water.usgs.gov/non-usgs/bes.

3 Monitoring Results

The following sections describe the results of the instream, stormwater, and biological monitoring conducted by the City during the 2018–19 permit year. Results are presented and summarized for each monitoring effort.

3.1 Stormwater Monitoring

As described previously, the City conducts two sampling efforts to monitor stormwater conditions in the city of Portland: (1) probabilistic stormwater sampling and (2) historic fixed land-use stormwater sampling. The following sections describe the results of these sampling efforts.

3.1.1 Probabilistic Stormwater

Over the course of the 2018–19 permit year, the City sampled two rotating panels of UIC sites during six storm events (Table 2). As described in Section 2.1, the UIC monitoring program is based on a probabilistic approach to characterize the stormwater runoff entering the City's UIC system. As such, the results presented in Table 5 represent population estimates for all of the City's UICs using the data collected during the 2018–19 permit year.[3] The water quality samples collected were analyzed for the full suite of required parameters, and the results are included in Appendix B.

Table 5. Summary of probabilistic stormwater monitoring results from permit year.

	Dissolved Copper (µg/L)	Dissolved Lead (µg/L)	Dissolved Zinc (µg/L)	Total Phosphorus (mg/L)	Total Suspended Solids (mg/L)
Number of Samples	30	30	30	30	30
Detections	100%	45%	100%	100%	84%
	100%–100%	*19%–71%*	*100%–100%*	*100%–100%*	*64%–100%*
Mean	2.15	0.15	13.8	0.15	36.3
	1.64–2.65	*0.11–0.2*	*5.95–21.66*	*0.08–0.22*	*10.8–61.7*
Median	2.09	0.11	9.51	0.10	18.1
	1.22–2.65	*0.11–0.17*	*6.87–11.91*	*0.06–0.18*	*6.0–30.9*
90th Percentile	3.42	0.26	18.06	0.43	116.8
	2.69–5.98	*0.15–0.63*	*12.16–88.4*	*0.16–0.88*	*28.9–294*

Note: The results presented below represent population estimates for all of Portland's UICs based on permit year sampling of 30 sites. The range of 95% confidence intervals from the sites is presented below each estimate.

[3] In past reports, the probabilistic stormwater results were presented based on two traffic categories: (1) average daily vehicle trips (ADTs) greater than 1,000, and (2) ADTs less than 1,000. The ADT statistic was originally used as the stratification variable in the design of the probabilistic monitoring program. ADT values were calculated by the Portland Bureau of Transportation and used in the design to ensure enough sites on high-traffic roads were included in the sample population. The ADT values have not been updated, and the distinction between the categories used in the original sample design no longer reflects current traffic patterns. As such, this report does not use the ADT distinction.

Total suspended solids (TSS), total phosphorus, dissolved copper, and dissolved zinc were consistently detected in the stormwater runoff entering the City's UICs (Table 5). Dissolved lead was frequently detected, but not in all samples. The mean concentration estimates for all of the parameters presented in Table 5 are higher than the median concentrations. This indicates that there are a small number of higher concentration results that increase the mean value, but do not occur frequently enough to increase the median concentrations.

Overall, the dissolved copper, lead, and zinc concentrations show low variability. TSS concentrations, however, were highly variable. The probabilistic stormwater results were not compared to any water quality standards because no criteria apply directly to stormwater runoff.

3.1.2 Historic Fixed Land-Use Stormwater

The City sampled stormwater during three storms at each of the four historic fixed land-use sites during the permit year. As described in Section 2.2, the samples were collected as flow-weighted composite samples and represent the range of conditions observed over the course of the sampled storm.

Table 6. Summary of water quality results from the permit year flow-weighted composite stormwater sampling at the four historic fixed land-use sites.

Analyte	Mean	Median	Minimum	Maximum	Detections/ Samples
E. coli (MPN/100 mL)	910	625	63	2,600	12/12
Hardness (mg $CaCO_3$/L)	29.0	31.0	7.4	48.5	12/12
Total organic carbon (mg/L)	5.1	4.9	3.9	6.9	12/12
Total suspended solids (mg/L)	66	43	8	285	12/12
Metals (µg/L)					
Copper	12.0	9.2	4.4	21.1	12/12
Copper, dissolved	3.7	3.3	2	6.3	12/12
Lead	5.7	4.1	0.6	14.3	12/12
Lead, dissolved	0.19	0.14	<0.11	0.44	8/12
Zinc	130.0	108.5	24	263	12/12
Zinc, dissolved	65.0	33.5	16	171	12/12
Nutrients (mg/L)					
Ammonia-nitrogen	0.12	0.11	0.02	0.25	12/12
Nitrate-nitrogen	0.60	0.26	<0.10	4.20	11/12
Orthophosphate	0.033	0.034	<0.02	0.06	8/12
Total phosphorus	0.19	0.18	0.063	0.48	12/12

All metals except for dissolved lead were detected during every storm event at all four sites (Table 6). The four non-detect dissolved lead samples were collected at the M1 and R2 sites in the Columbia Slough watershed. Ammonia and total phosphorus were consistently detected at all sites during each storm. Orthophosphate was frequently detected at all of the sites; however, concentrations were below detection during the mid-March storm sampled at all but the R1 site.

The Oregon Association of Clean Water Agencies (ACWA) sponsored a project to evaluate water quality data collected from land-use-based stormwater monitoring in Oregon.[4] The ACWA stormwater evaluation included the calculated mean concentrations for select pollutants based on the contributing land use (Table 7). The results from the ACWA stormwater evaluation provide a benchmark against which the composite stormwater sampling can be evaluated.

Table 7. Mean stormwater concentrations for select pollutants by dominant land use and mean values from the 2018–19 permit year.

Land Use	Total Suspended Solids (mg/L)	Total Copper (µg/L)	Total Zinc (µg/L)	Dissolved Copper (µg/L)	Total Phosphorus (mg/L)
Commercial	92	32	168	9	0.39
Industrial	194	53	629	9	0.63
Open	58	4	25	4	0.17
Residential	64	14	108	6	0.37
Transportation	169	35	236	8	0.38
2018–19 Fixed Land-Use Site Means for Comparison	*66*	*12*	*130*	*3.7*	*0.19*

Note: Values are from Table 3-2 (p. 3–6) of the 1997 ACWA stormwater report. The mean values from the 2018–19 permit year presented in Table 6 are included here for ease of comparison.

TSS concentrations collected during the 2018–19 permit year were consistently lowest at the residential R2 site (8–33 mg/L) and lower than the mean TSS concentration of 64 mg/L for residential land use found by the ACWA study (Table 7). While the dominant land use contributing to the R1 site is also residential, R1 is an instream sampling location on Fanno Creek. The ACWA study included stormwater samples from the R1 site and found that TSS concentrations from the instream site were significantly different from the other residential sampling locations. The 2018–19 range of TSS concentrations from the instream R1 site were substantially higher (26–285 mg/L) than those at R2, consistent with ACWA observations that differences in concentrations of water quality parameters may be explained by differences in conveyance systems and the physical processes at work.

[4] Strecker, Eric W., Binhong Wu, and Michael Iannelli (1997). Analysis of Oregon Urban Runoff Water Quality Monitoring Data Collected from 1990–1996. Prepared for the Oregon Association of Clean Water Agencies by Woodward-Clyde Consultant, Portland, OR.

The range of TSS concentrations (21–76 mg/L) observed during the 2018–19 permit year at the industrial site (OF19) were below the 194 mg/L mean TSS stormwater concentration for industrial land uses from the ACWA study. The observed ranges in metal concentrations were also lower than the industrial land use values reported in the ACWA study for total copper (7.8–21.1 µg/L), dissolved copper (3.1–6.3 µg/L), and total zinc (165–263 µg/L) at OF19. TSS concentrations from the mixed land-use site (M1) varied between storm events (16–117 mg/L) but were within the range of mean stormwater concentrations identified in the ACWA stormwater report, as were the measured concentrations of metals. The contributing area to M1 is dominated by commercial and residential land use, but also includes a small industrial area.

3.2 Instream Monitoring

The City operates or supports multiple sampling efforts to monitor water quality and biological conditions within the City's streams and watersheds. The following sections describe the results of these sampling efforts.

3.2.1 Instream Water Quality

As described in Section 2.3, the City operates two monitoring programs that collect instream water quality samples (fixed sites and probabilistic sites). Throughout the 2018–19 permit year, the City collected 212 water quality samples across a range of flow and seasonal conditions. The water quality samples collected were analyzed for the full suite of required parameters, and the results are included in Appendix B. The results presented here include the parameters with associated water quality criteria.

Table 8. Instream water quality results for dissolved copper from the permit year.

		Dissolved Copper (µg/L)				
Watershed	**Project**	**Detections /Samples**	**Median**	**Minimum**	**Maximum**	**Exceedance Percent**
Columbia Slough	Fixed	14/14	0.72	0.424	1.32	7
	Probabilistic	22/25	0.59	<0.211	2.40	0
Johnson Creek	Fixed	14/14	0.96	0.356	1.55	0
	Probabilistic	30/30	1.29	0.416	4.92	0
Tualatin River	Fixed	12/12	1.03	0.721	3.91	17
	Probabilistic	20/20	0.97	0.413	3.69	15
Willamette River	Fixed	36/36	0.46	0.293	0.99	11
Willamette Tributaries	Fixed	36/36	1.16	0.398	3.65	31
	Probabilistic	25/25	1.17	0.476	8.76	4

Note: The chronic criteria calculated using the Biotic Ligand Model ranged from 0.18–33.61 µg/L, with a mean of 4.01 µg/L. For the probabilistic samples, the exceedance percent represents an estimate of the probability of an exceedance occurring for the perennial streams in each watershed.

Dissolved copper was consistently detected during the permit year in all samples (Table 8). Median concentrations of dissolved copper did not vary substantially between watersheds; however, concentrations were typically lowest in the Columbia Slough and mainstem Willamette. Exceedances of the chronic dissolved criteria were observed in all watersheds except for Johnson Creek. The chronic and acute water quality criteria for dissolved copper are calculated using the Biotic Ligand Model and are based on the concentration of ions, alkalinity, organic carbon, pH, and temperature of the sample. As such, a different calculated criterion applies to each water quality sample. For the samples collected during the 2018–19 permit year, the chronic dissolved copper criteria were consistently lower than the acute criteria, ranging from 0.18 to 33.61 µg/L with a mean of 4.01 µg/L.

Table 9. Instream water quality results for dissolved lead from the permit year.

		Dissolved Lead (µg/L)				
Watershed	**Project**	**Detections /Samples**	**Median**	**Minimum**	**Maximum**	**Exceedance Percent**
Columbia Slough	Fixed	1/14	--	<0.1	0.13	0
	Probabilistic	1/25	--	<0.1	0.11	0
Johnson Creek	Fixed	1/14	--	<0.1	0.13	0
	Probabilistic	4/30	<0.1	<0.1	2.26	0
Tualatin River	Fixed	5/12	0.11	<0.1	0.30	0
	Probabilistic	6/20	<0.1	<0.1	0.44	0
Willamette River	Fixed	33/36	0.02	<0.01	0.05	0
Willamette Tributaries	Fixed	10/36	<0.1	<0.1	0.32	0
	Probabilistic	7/25	<0.1	<0.1	0.24	0

Note: The calculated chronic water quality criterion for dissolved lead is based on hardness in the water column, ranging from 12.5–133.9 µg/L with a mean of 52.6 µg/L. For the probabilistic samples, the exceedance percent represents an estimate of the probability of an exceedance occurring for the perennial streams in each watershed.

Dissolved lead concentrations in all of the watersheds, except for the mainstem Willamette, were frequently below the detection limit. The chronic water quality criterion for dissolved lead is based on hardness in the water column. Each water quality sample is analyzed for hardness in order to calculate the appropriate water quality criterion for the sample. The mean calculated chronic criterion for dissolved lead was 52.6 µg/L and ranged from 12.5 to 133.9 µg/L. No exceedances of the chronic dissolved lead criterion were observed during the 2018–19 permit year.

The analytical laboratory method used to analyze the mainstem Willamette River samples for dissolved lead differs from the method used for the other samples. The method used for the mainstem Willamette samples has a lower detection limit, which is reflected in Table 9 by the higher rate of detections for the Willamette River mainstem and the lower reported concentrations. The City uses the low-level analytical method for Willamette River samples, as total and dissolved lead concentrations are consistently lower and below the detection limit of the standard procedure in the mainstem.

Table 10. Instream water quality results for dissolved zinc from the permit year.

		Dissolved Zinc (µg/L)				
Watershed	**Project**	**Detections /Samples**	**Median**	**Minimum**	**Maximum**	**Exceedance Percent**
Columbia Slough	Fixed	8/14	0.75	<0.53	4.3	0
	Probabilistic	19/25	1.61	<0.53	8.1	0
Johnson Creek	Fixed	12/14	3.04	<0.53	13.5	0
	Probabilistic	29/30	3.92	<0.53	40.6	3
Tualatin River	Fixed	12/12	5.68	1.66	16.2	0
	Probabilistic	19/20	3.33	<0.53	14.9	0
Willamette River	Fixed	22/36	0.76	<0.53	1.2	0
Willamette Tributaries	Fixed	36/36	26.35	5.91	770.0	25
	Probabilistic	22/25	6.01	<0.53	51.7	16

Note: The calculated chronic water quality criterion for dissolved zinc is based on hardness in the water column, ranging from 12.5–168.9 µg/L with a mean of 58.4 µg/L. For the probabilistic samples, the exceedance percent represents an estimate of the probability of an exceedance occurring for the perennial streams in each watershed.

Dissolved zinc was frequently detected in all of the watersheds as part of both monitoring programs. The chronic water quality criterion for dissolved zinc is also based on hardness in the water column. As with dissolved lead, each water quality sample is analyzed for hardness in order to calculate the appropriate water quality criterion for the sample. The mean calculated criterion for dissolved zinc was 58.4 µg/L and ranged from 12.5 to 168.9 µg/L. Exceedances of the chronic dissolved zinc criterion were only observed in Johnson Creek and the Willamette River tributaries during the 2018–19 permit year (Table 10). The higher concentrations of dissolved zinc are associated with the fixed sampling program on the Willamette River tributaries. The 36 samples collected as part of this program are from three sampling locations on Tryon Creek.

Samples collected from the mainstem Willamette River consistently had lower concentrations of dissolved metals than samples from the other four watersheds (Table 8 to Table 10). For all three dissolved metals, the mainstem Willamette samples had the lowest median concentrations as well as the lowest maximum concentrations of all the watersheds.

Table 11. Instream water quality results for total phosphorus from the permit year.

		Total Phosphorus (mg/L)				
Watershed	**Project**	**Detections /Samples**	**Median**	**Minimum**	**Maximum**	**Exceedance Percent**
Columbia Slough	Fixed	14/14	0.10	0.049	0.17	7
	Probabilistic	25/25	0.13	0.065	0.46	32
Johnson Creek	Fixed	14/14	0.07	0.025	0.10	0
	Probabilistic	30/30	0.07	0.024	0.19	17
Tualatin River	Fixed	12/12	0.10	0.045	0.17	17
	Probabilistic	20/20	0.10	0.034	0.65	36
Willamette River	Fixed	36/36	0.05	0.033	0.17	3
Willamette Tributaries	Fixed	36/36	0.09	0.033	0.16	3
	Probabilistic	25/25	0.10	0.037	0.56	24

Note: The water quality criteria for total phosphorus vary by watershed. Samples from sites in the Tualatin watershed were evaluated using the appropriate TMDL limit, and all other sites were evaluated against the 0.155 mg/L criterion from the Columbia Slough TMDL. For the probabilistic samples, the exceedance percent represents an estimate of the probability of an exceedance occurring for the perennial streams in each watershed.

Total phosphorus (TP) was detected in all 212 samples collected during the 2018–19 permit year (Table 11). Oregon does not have a single water quality criterion for TP; however, two TMDLs for TP have been developed for two watersheds within the city: the Tualatin sub-basin (including Fanno Creek and Rock Creek) and the Columbia Slough. The maximum instream TP concentration set by the Columbia Slough TMDL is 0.155 mg/L. The Tualatin TP TMDL includes variable instream concentrations for each tributary, ranging from 0.04 to 0.19 mg/L. Sites within these two watersheds were assessed against the appropriate TP limit. For the purposes of evaluating TP concentrations in other parts of the City, the 0.155 mg/L load allocation from the Columbia Slough TMDL was used.

During the 2018–19 permit year, the highest median TP concentrations were observed in the Columbia Slough and Tualatin watersheds. Higher exceedance percentages were also recorded in these watersheds, with over 30% of the samples from the probabilistic sites in both the Columbia Slough and Tualatin watersheds exceeding the applicable criteria (0.155 mg/L and 0.13 mg/L respectively; Table 11).

Table 12. Instream water quality results for E. coli from the permit year.

			***E. coli* (MPN/100 mL)**			
Watershed	**Project**	**Detections /Samples**	**Median**	**Minimum**	**Maximum**	**Exceedance Percent**
Columbia Slough	Fixed	13/14	46	<10	200	0
	Probabilistic	22/25	74	<10	360	0
Johnson Creek	Fixed	14/14	150	20	570	14
	Probabilistic	29/30	190	<10	2,400	33
Tualatin River	Fixed	12/12	535	230	3,900	75
	Probabilistic	20/20	125	10	3,900	25
Willamette River	Fixed	36/36	20	4	1,100	8
Willamette Tributaries	Fixed	36/36	280	10	>24,000	42
	Probabilistic	25/25	110	10	2,300	12

Note: Results from the two instream monitoring programs (Fixed and Probabilistic programs) are included. All samples were evaluated against the chronic water quality criteria of 406 MPN/100 mL to determine exceedances. For the probabilistic samples, the exceedance percent represents an estimate of the probability of an exceedance occurring for the perennial streams in each watershed.

E. coli is used by DEQ as an indicator of human pathogens to protect recreational contact. The numeric bacteria criteria include two limits for freshwater contact: (1) a 90-day geometric mean of 126 *E. coli* organisms per 100 mL and (2) no single sample may exceed 406 *E. coli* organisms per 100 mL. The two instream sampling programs do not collect samples at a sufficient frequency to evaluate exceedances of the first criteria. As such, all of the instream *E. coli* samples were evaluated against the concentration of 406 organisms per 100 mL.

No exceedances of the *E. coli* criterion were observed in the Columbia Slough during the 2018–19 permit year (Table 12). The fixed site samples from the Tualatin watershed, which are located on the mainstem of Fanno Creek, frequently exceeded the single sample criterion of 406 organisms per 100 mL (75%; Table 12). A higher rate of exceedances (42%; Table 12) was also observed at the fixed sites on the Willamette River tributaries, which are all located along the mainstem of Tryon Creek. While the probabilistic sampling program includes sites on larger streams, multiple smaller tributaries were also sampled. Conversely, the fixed sites are all located on larger streams with large drainage areas, which may explain the higher concentrations of *E. coli* from the fixed sites along Fanno and Tryon Creeks.

The high *E. coli* sample of >24,000 MPN/100 mL was collected at the fixed Tryon Creek site (TC5) located at SW 26th Way and Barbur Boulevard on November 28, 2018. The City conducted a follow-up investigation of the area surrounding the sampling location to determine if there was a source of sewage to Tryon Creek. Additional *E. coli* samples were collected the following day (November 29) at points upstream and downstream of the site. The investigation samples were all below the single sample criterion and no source of sewage was found. The subsequent monthly *E. coli* sample collected in December 2018 was substantially lower at 120 MPN/100 mL.

3.2.2 Instream Flow and Temperature

Stream discharge was recorded at the seven USGS stream gages in the Portland area. Water temperature was recorded at four of the seven gages. The following sections present the results from the 2018–19 permit year.

3.2.2.1 Instream Flow

The effect of precipitation patterns during the permit year was observed in the stream discharge recorded at the USGS gages within the City. The effects of the drier-than-usual November (Figure 1) can be seen in the instream flow recorded at the five tributary gages. Flows in Fanno Creek fell below the historic 10th percentile in November, as did flows in Tryon Creek (Figure 2). Instream flows in Fanno and Tryon Creeks also responded to increased precipitation in April, with peak flows exceeding the 90th percentile for discharge in April.

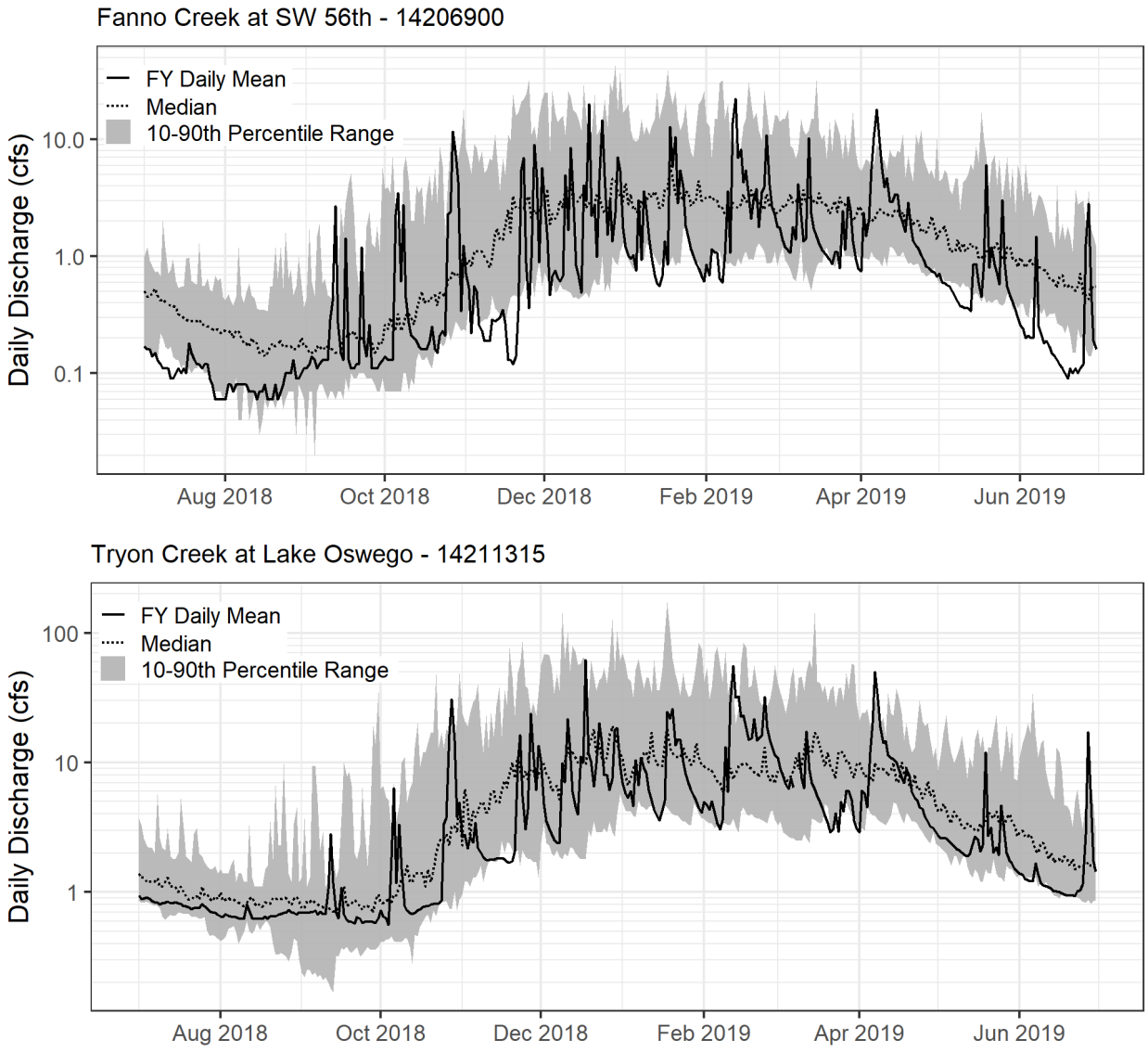


Figure 2: Daily discharge recorded at westside USGS gages #14206900 (Fanno) and #14211315 (Tryon) during the permit year. The mean daily discharge (solid line) is plotted along with the historic median (dotted line) and 10–90th percentile range (grey area) of observed flows from the available period of record (27 and 16 years, respectively).

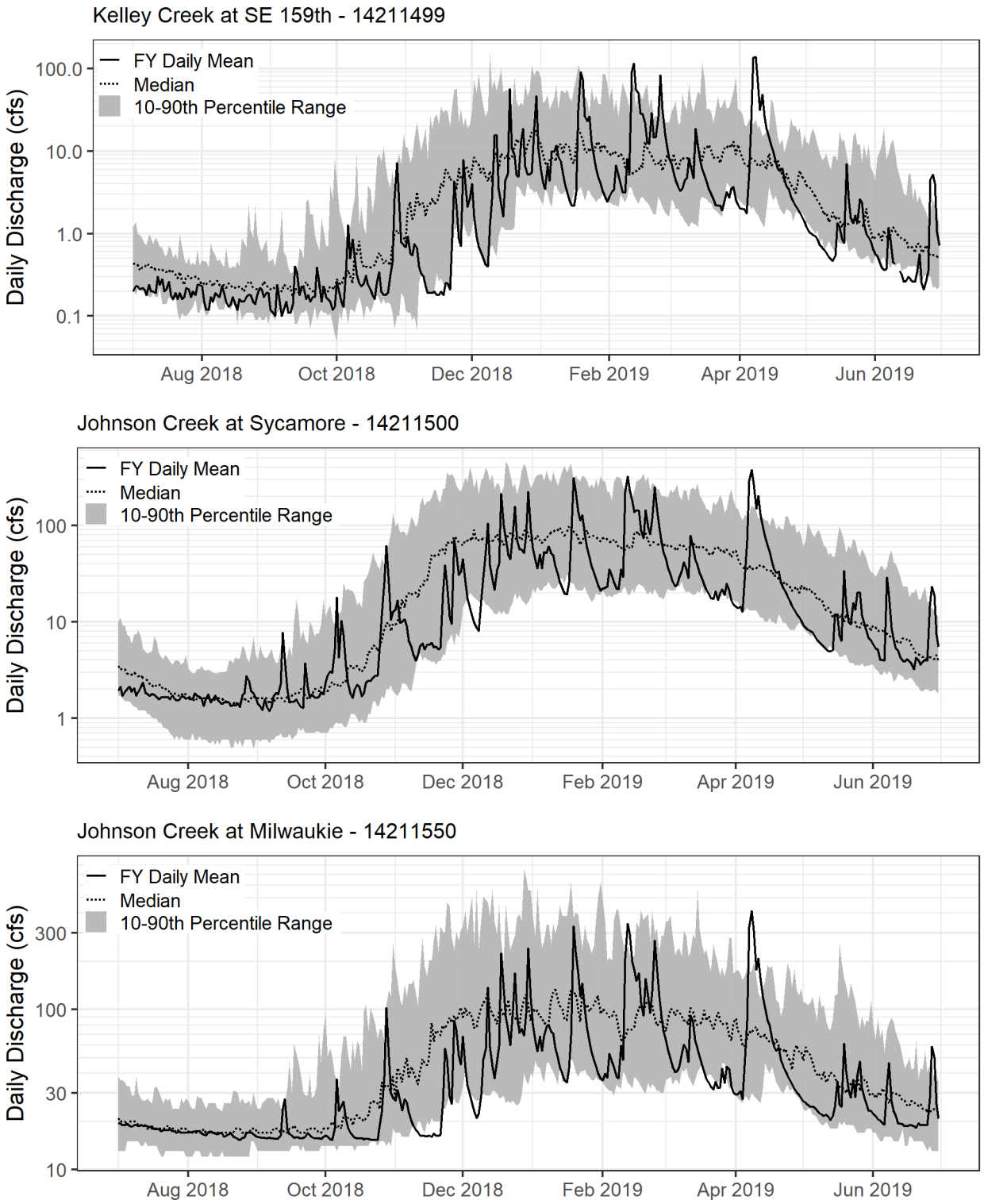


Figure 3: Daily discharge recorded at three eastside USGS gages (#14211499, #14211500, and #14211550) during the permit year. The mean daily discharge (solid line) is plotted along with the historic median (dotted line) and 10–90th percentile range (grey area) of observed flows from the available period of record (17, 77, and 28 years, respectively).

Flows in the Johnson Creek watershed also responded to the precipitation patterns observed during the permit year. Kelley and Johnson Creek discharges decreased during the period of dry weather in November, approaching or dipping below the 10th percentile low flows (Figure 3). Low flows in the summer remained within the historic 10–90th percentile range at all three sites, with the mainstem Johnson Creek flows very close to their historic median flows. The heavy precipitation in early April resulted in high flows throughout the Johnson Creek watershed; however, gage heights did not exceed flood stage—the maximum observed stages at the Sycamore and Milwaukie gages were 6.7 and 26.9 feet, respectively.[5]

The Columbia Slough is tidally influenced, and negative flows are routinely observed as a result of the tidal fluctuations. The substantial negative and positive flows in early and mid-April (Figure 4) corresponds to the period of elevated discharge in the Columbia River during the spring freshet. For a 2-day period in April, instantaneous discharge readings were not available due to an equipment malfunction. The missing records are reflected in Figure 4 as gap in the solid line that is preceded and followed by steep changes in discharge during the spring freshet.

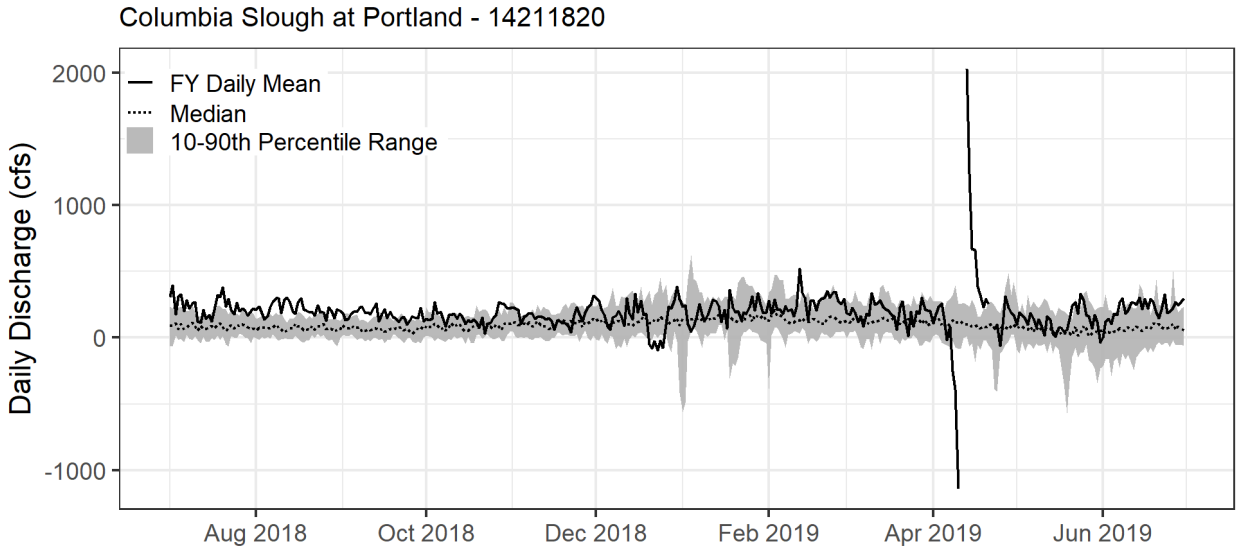


Figure 4: Columbia Slough daily discharge recorded at USGS gage #14211820 during the permit year. The mean daily discharge (solid line) is plotted along with the historic median (dotted line) and 10–90th percentile range (grey area) of observed flows from the available 28-year period of record (1990–2018). The Columbia Slough is tidally influenced, and the data presented have not been corrected.

Willamette River flows at Portland were lower than the historic median values and often dropped below the 10th percentile during the second half of 2018 (Figure 5)—particularly in November when flows dropped below 5,000 cfs. As seen at the other sites, an increase in Willamette River flows corresponded with the increase in precipitation in early April. The mean daily discharge peaked at 176,000 cfs on April 12. After the spring freshet, flows in the Willamette River decreased and remained below historic median flow for the remainder of the permit year.

[5] Flood stage at the Sycamore gage is 11 feet (gage datum is 228.47 feet above NGVD29) and 30.3 feet at the Milwaukie gage (gage datum is 0.0 feet above NGVD29).

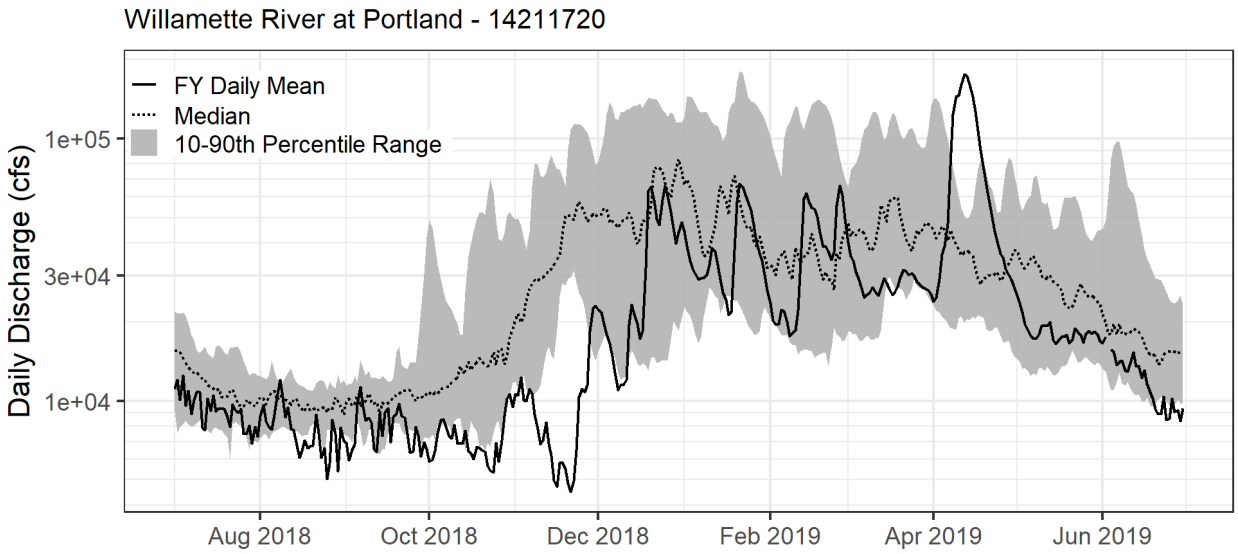


Figure 5: Willamette daily discharge at Portland recorded at USGS gage #14211720 during the permit year. The mean daily discharge (solid line) is plotted along with the historic median (dotted line) and 10–90th percentile range (grey area) of observed flows from the available 11-year period of record (2007–present). Discharge values have been corrected for tidal influences by USGS using the 2011 method for Processing and Publication of Discharge and Stage Data Collected in Tidally Influenced Areas.[6] Unfiltered discharge values are available from 1988 to present.

3.2.2.2 Temperature

Johnson Creek water temperatures at the Sycamore gage exceeded the 7-day average daily maximum (7DADM) temperature criterion for rearing and migration (18°C) from July 1 to mid-September in 2018 (Figure 6). In 2019, water temperatures exceeded the rearing and migration criterion periodically in late spring and early summer, with the 7DADM temperature consistently exceeding 18°C for most of June. Water temperatures at the Sycamore gage remained below the spawning criterion throughout all of the fall and winter. In the late spring, however, water temperatures increased, resulting in exceedances of the spawning criterion from late April to the end of the spawning window in mid-May.

[6] The 2011 USGS methodology is available at: https://water.usgs.gov/admin/memo/SW/sw10.08-final_tidal_policy_memo.pdf.

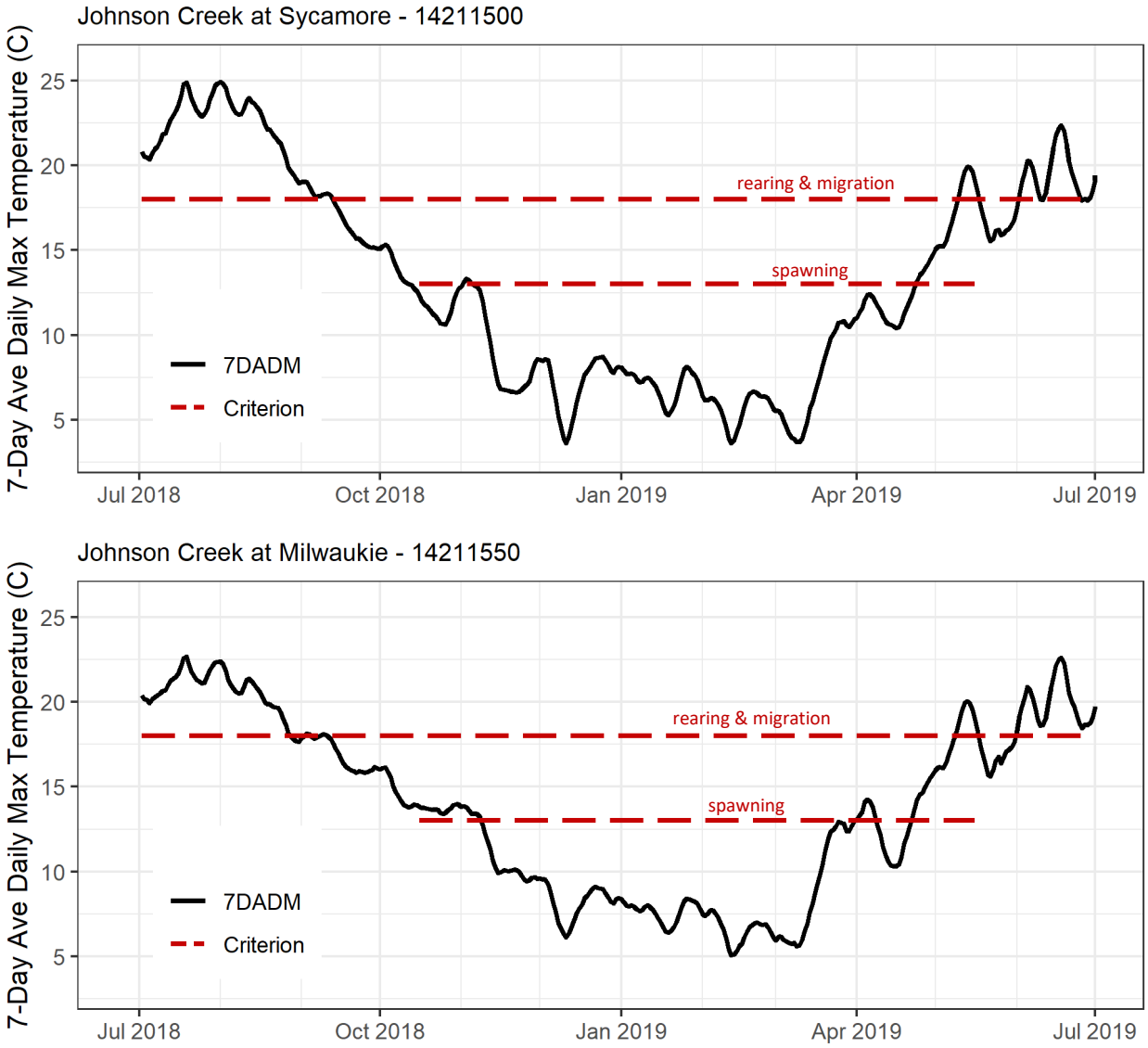


Figure 6: Seven-day average daily maximum mainstem Johnson Creek water temperatures recorded at USGS gage #14211500 at Sycamore and USGS gage #14211550 at Milwaukie during the permit year. The dashed red lines represent the applicable temperature criteria for salmonid spawning (13°C) and rearing and migration (18°C).

Johnson Creek water temperatures at the Milwaukie gage followed a similar pattern to those recorded at the upstream Sycamore gage. Summer temperatures exceeded the 7DADM temperature criterion for rearing and migration (18°C) from July 1 to late August 2018 (Figure 6), dipping below the criterion two weeks earlier than the Sycamore gage. Water temperatures exceeded the spawning temperature criterion until early November. The water temperatures above the spawning criterion in October and early November exceeded the criterion by less than 1°C. As with the Sycamore gage, water temperatures began increasing quickly in April and exceeded the spawning criterion for much of the remainder of the spawning window. In 2019, water temperatures exceeded the rearing and migration criterion periodically in late spring and early summer, with the 7DADM temperature consistently exceeding 18°C for much of June.

Johnson Creek water temperatures at the downstream gage at Milwaukie are consistently cooler than the upstream gage at Sycamore during the summer and early fall (Figure 6). The observed downstream cooling effect is likely due to multiple cold-water tributaries flowing into Johnson Creek between the two gages. One of the larger tributaries is Crystal Springs Creek, which flows into Johnson Creek approximately one mile upstream of the Milwaukie gage.

Consistent with the two other Johnson Creek gages, summertime temperatures in Kelley Creek remained above the rearing criterion throughout the summer of 2018 until late August. Kelley Creek water temperatures remained below the spawning criterion throughout the fall and winter. Beginning in late April, water temperatures started exceeding the spawning criterion and remained above the criterion for the final two weeks of the spawning window. While water temperatures in Kelley Creek followed a similar warming pattern to the two Johnson Creek gages in May 2019, the increase did not result in temperatures higher than the rearing criterion until the end of June.

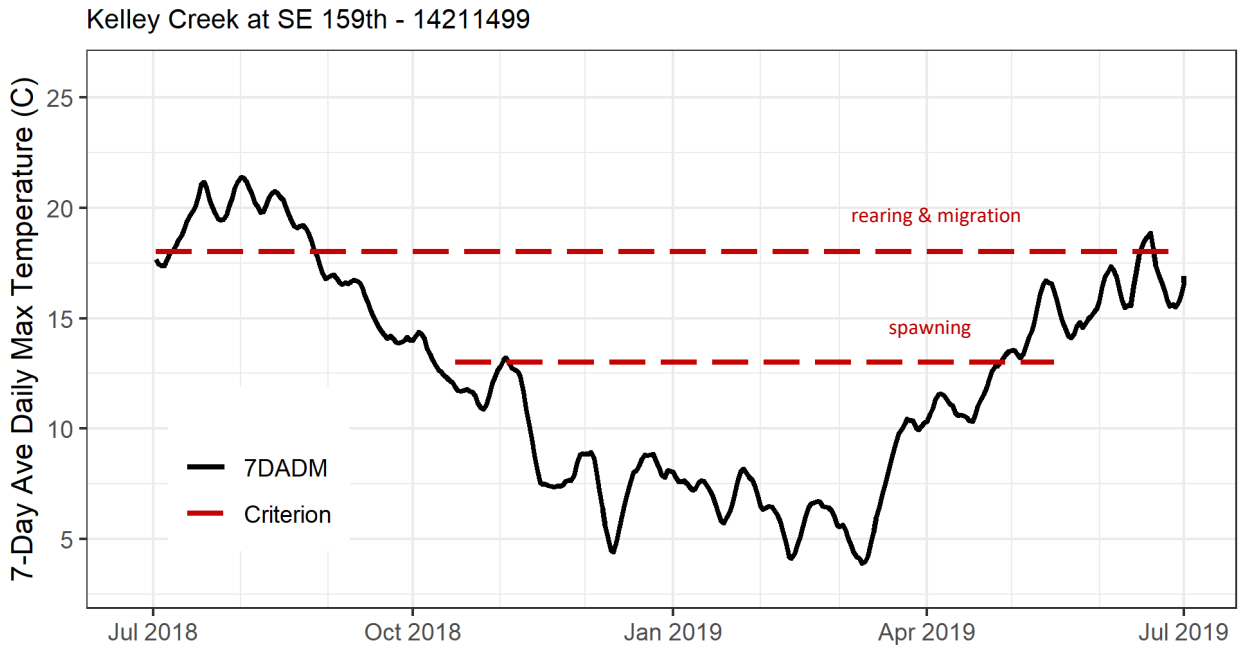


Figure 7: Seven-day average daily maximum Kelley Creek water temperatures recorded at USGS gage #14211499 at SE 159th Ave. during the permit year. The dashed red lines represent the applicable temperature criteria for salmonid spawning (13°C) and rearing and migration (18°C).

Like Crystal Springs, Kelley Creek provides relatively colder water to Johnson Creek. Kelley Creek flows into Johnson Creek approximately half a mile upstream of the Sycamore gage. The impact on Johnson Creek water temperatures, however, is smaller than the change seen at the Crystal Springs confluence. This is likely a result of lower instream flow from Kelley Creek. Summertime flows in Kelley Creek are low, typically less than 1 cfs (Figure 3) and represent only a small fraction of the total flow in Johnson Creek.

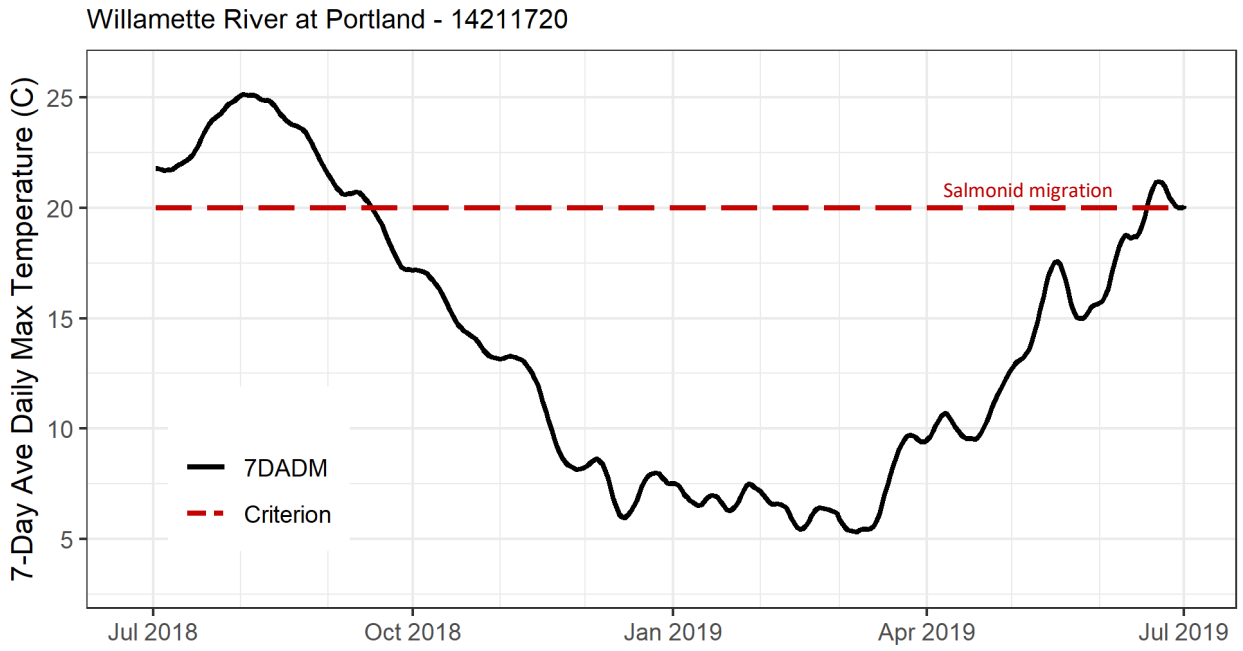


Figure 8: Seven-day average daily maximum Willamette River water temperatures recorded at USGS gage #14211720 at the Morrison Bridge during the permit year. The dashed red line represents the applicable temperature criterion for salmonid migration (20°C).

Unlike Johnson and Kelley Creeks, the Willamette River in Portland is designated a migration corridor for salmon and steelhead with no rearing or spawning uses. As such, a single temperature criterion applies for the entire year (20°C). Willamette River water temperatures exceeded the migration corridor temperature limit from July 1 to mid-September in 2018 (Figure 8). Temperatures declined quickly in late September and remained below the temperature criterion until the end of June. In the summer of 2019, the Willamette exceeded the migration corridor temperature criterion for the final two weeks of the permit year.

3.2.3 Macroinvertebrates

Aquatic macroinvertebrate samples were collected at 14 perennial sites during the 2018–19 permit year as part of the Portland Area Watershed Monitoring and Assessment Program (PAWMAP) monitoring program. Samples are not collected from stream sites in the Columbia Slough as these sites are not riffle-dominated wadeable systems. As described in Section 2.3, the probabilistic instream sampling included in PAWAMP is based on four rotating panels, with 20 perennial sites included in each panel. Each 4-year PAWMAP cycle includes the same 80 perennial monitoring sites. The macroinvertebrate results from prior PAWMAP sampling cycles are included in Table 13.

DEQ uses the PREDATOR model to evaluate the condition of macroinvertebrate communities. The PREDATOR model was developed by DEQ and can be used to evaluate the observed macroinvertebrate community compared to the expected macroinvertebrate community.[7] The model uses reference and site conditions to predict the expected community characteristics in the absence of human influences. The ratio between the sampled macroinvertebrate (observed) score to the predicted macroinvertebrate (expected) score provides an estimate of the level of impact. The PREDATOR model includes benchmarks to describe the biological conditions

[7] Hubler, S. (2008). PREDATOR: Development and use of RIVPACS-type macroinvertebrate models to assess the biotic condition of wadeable Oregon streams.

of a sample that are based on the distribution of Observed/Expected (O/E) ratios from reference sites. The benchmarks are based on the 10th and 25th percentiles of reference distribution. For the Marine Western Coastal Forest region, samples with O/E ratios above 0.91 are considered to be the "least impacted," and those between 0.85 and 0.91 are "minimally impacted."

Table 13. Median Observed/Expected (O/E) macroinvertebrate ratios.

	Macroinvertebrate O/E Ratio			
Watershed	**Cycle 1 Median (2010–2013)**	**Cycle 2 Median (2014–2017)**	**Permit Year Median**	**Permit Year Range**
Johnson Creek	0.49	0.39	0.44	0.34–0.48
Tualatin Tributaries	0.41	0.43	0.29	0.15–0.34
Willamette Tributaries	0.69	0.62	0.52	0.24–0.92

Note: Samples from the current permit year were collected in the fall of 2018. The "minimally impacted" benchmark value set by DEQ is an O/E ratio of 0.85 or higher.

O/E ratios varied substantially in the Willamette River tributaries. The highest O/E ratios during the 2018–19 permit year were observed on the sites on the Willamette River tributaries (Table 13), with the highest O/E ratio (0.92) observed on Balch Creek in Forest Park. This was the only site with an O/E ratio that would be considered "least impacted." In contrast, one of the lowest O/E ratios (0.24) for the permit year was from a Willamette River tributary site located on a tributary to Stephens Creek.

The Tualatin tributaries had the lowest median O/E ratio during the permit year—lower than the median ratio from the previous two PAWMAP sampling cycles. The median O/E ratio from Johnson Creek was consistent with the ratios observed during the earlier PAWMAP cycles. The O/E ratios indicate that the macroinvertebrate communities at all of the sampled sites in the Johnson Creek and Tualatin watersheds have been impacted by activities in the watersheds.

4 Evaluation of Trends

One of the objectives of the monitoring program is to evaluate long-term trends in receiving waters associated with MS4 stormwater discharges. Evaluating the biological and water quality data collected over a period of time provides insight into whether conditions in Portland's streams are changing. The following sections discuss some of the observed trends.

4.1 Probabilistic Stormwater Trends

The City's probabilistic stormwater monitoring program has included the collection of water quality data for over a decade, providing a long-term water quality dataset for stormwater runoff and insight into the year-to-year variability in water quality concentrations for multiple stormwater parameters. For all the sampled metals, the median concentrations (solid lines in Figure 9) were consistently lower than the mean concentrations (dashed lines in Figure 9). The difference in mean and median concentrations, as well as the large range between the 50th and 90th percentile concentrations, indicate that concentrations are typically lower and closer to the median value, with a small number of high concentration samples. These characteristics are seen consistently from year to year and across all parameters.

The results from the long-term probabilistic stormwater monitoring for TSS provide an example of the observed variability. The mean and median 2018–19 TSS results (Figure 9) initially suggest that there was an increase in the previous sampling year (2017–18); however, the confidence intervals for TSS are large and the subsequent results from this permit year (2018–19) are lower (Table 5). Outliers are observed across all the parameters, but overall, the concentration ranges are consistent. Any trends in concentrations fall within the calculated confidence intervals.

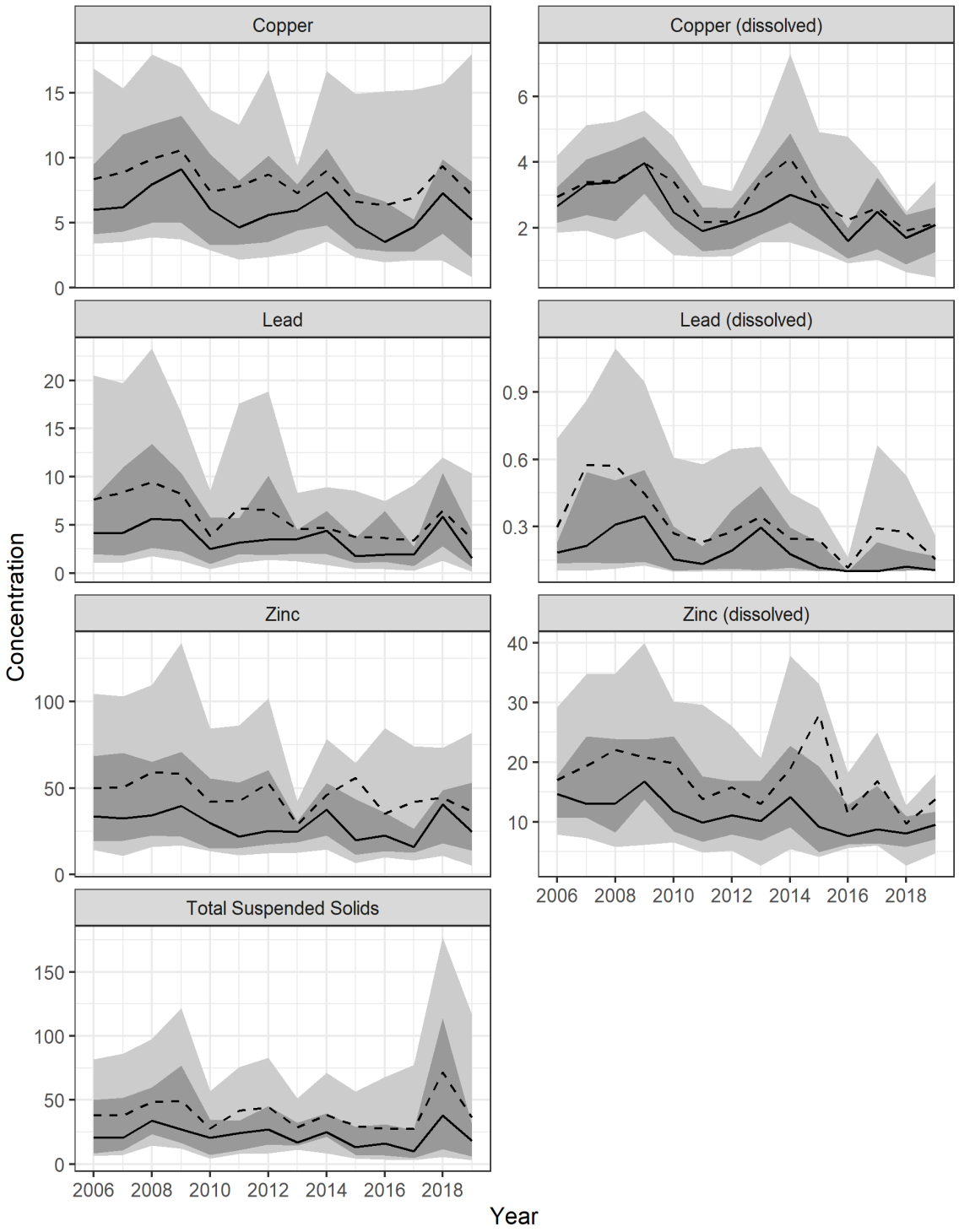


Figure 9: Trends in the probabilistic stormwater metal and total suspended solids concentrations. The solid line represents the median concentration, the dashed line represents the mean concentration, the dark grey shading represents the 25th to 75th percentiles, and the light gray represents the 10th to 90th percentiles. The metal concentration measurements units are µg/L and TSS units are mg/L.

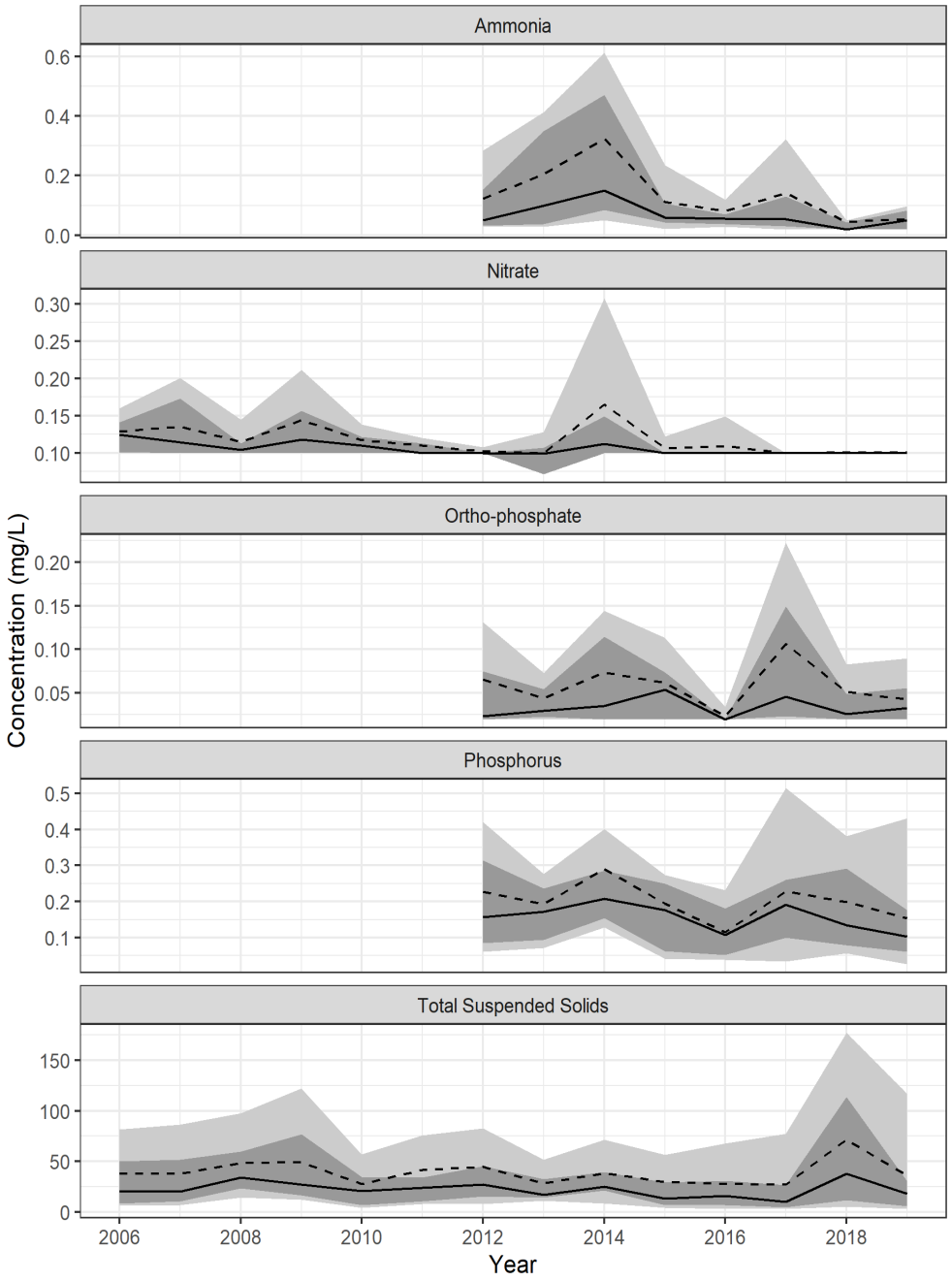


Figure 10: Trends in the probabilistic stormwater nutrient and total suspended solids concentrations. The solid line represents the median concentration, the dashed line represents the mean concentration, the dark grey shading represents the 25th to 75th percentiles, and the light gray represents the 10th to 90th percentiles.

As with metals, the annual range in nutrient concentrations is variable from year to year (Figure 10). Like metals, the median nutrient concentrations (solid lines in Figure 10) were consistently lower than the mean concentrations (dashed lines in Figure 10). The combination of the higher mean concentrations, as well as the large percentile ranges, highlights that concentrations are typically lower and closer to the median value, with a small number of high concentration samples. The probabilistic stormwater sampling of nutrients illustrates a high level of year-to-year variability, but no temporal trends in concentrations.

4.2 Historic Fixed Land-Use Stormwater Trends

As described in Section 2.2, the City resumed composite stormwater sampling at four of the fixed historic land-use sites during the 2016–17 permit year. Two of the four sites (R1 and R2) had long gaps (greater than 15 years) with no sampling prior to the renewed sampling in the 2016–17 permit year. Sites M1 and OF19 have longer records and more samples.

Generally, the copper concentrations measured during the 2018–19 permit year were consistent with the range of concentrations observed in previous years (Figures 11 and 12). Additionally, there does not appear to be a large amount of variability in both total (Figure 11) and dissolved copper (Figures 12) concentrations between the sites, except for the industrial site (OF19), which has the largest range in copper concentrations.

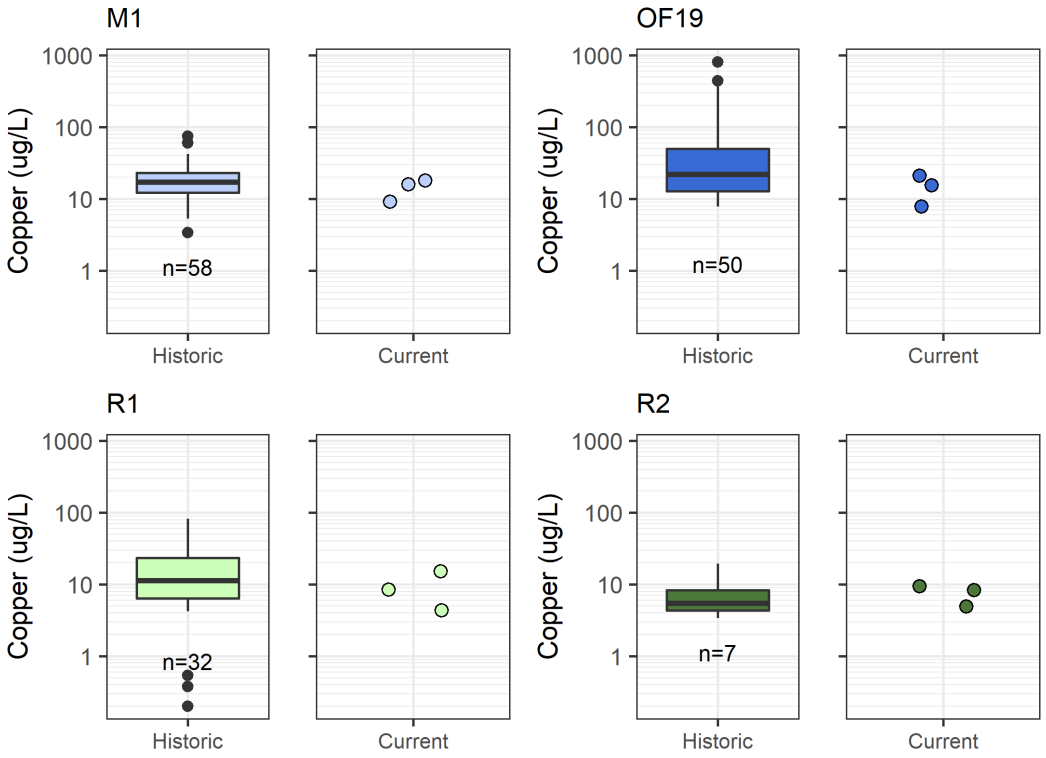


Figure 11: Distribution of total copper concentrations at the fixed historic land-use sites during the current permit year and for the previous period of record (Historic) for the four stations.

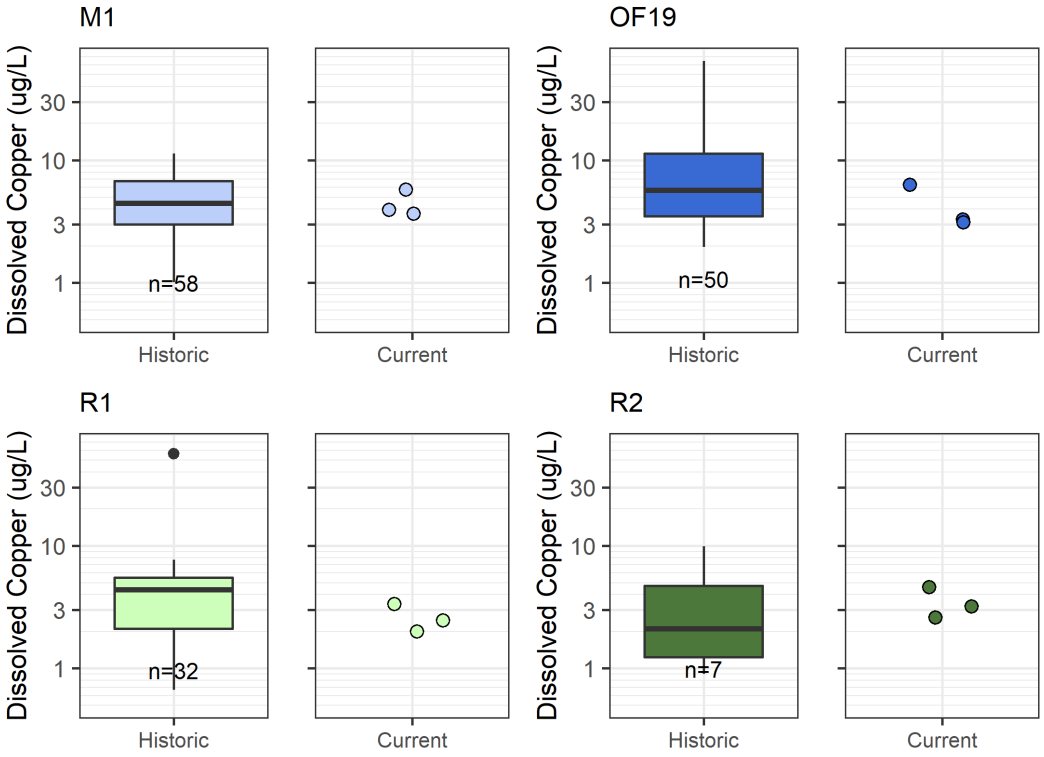


Figure 12: Distribution of dissolved copper concentrations at the fixed historic land-use sites during the current permit year and for the previous period of record (Historic) for the four stations.

Unlike copper, zinc concentrations are more variable from site to site. The range of both total and dissolved zinc concentrations are typically lower at the two residential land use sites (R1 and R2; Figures 13 and 14). Dissolved zinc concentrations have consistently been highest at the industrial site (OF19; Figure 14), and the samples from the 2018–19 permit year were consistent with this pattern, with the exception of the single elevated dissolved zinc sample collected at R2 on March 12, 2019 and the three dissolved zinc samples from R1 (Figure 14). The concentrations of dissolved zinc measured at R1 during the current permit year were higher than previous years; however, the measured total zinc concentrations were consistent with the prior sample range.

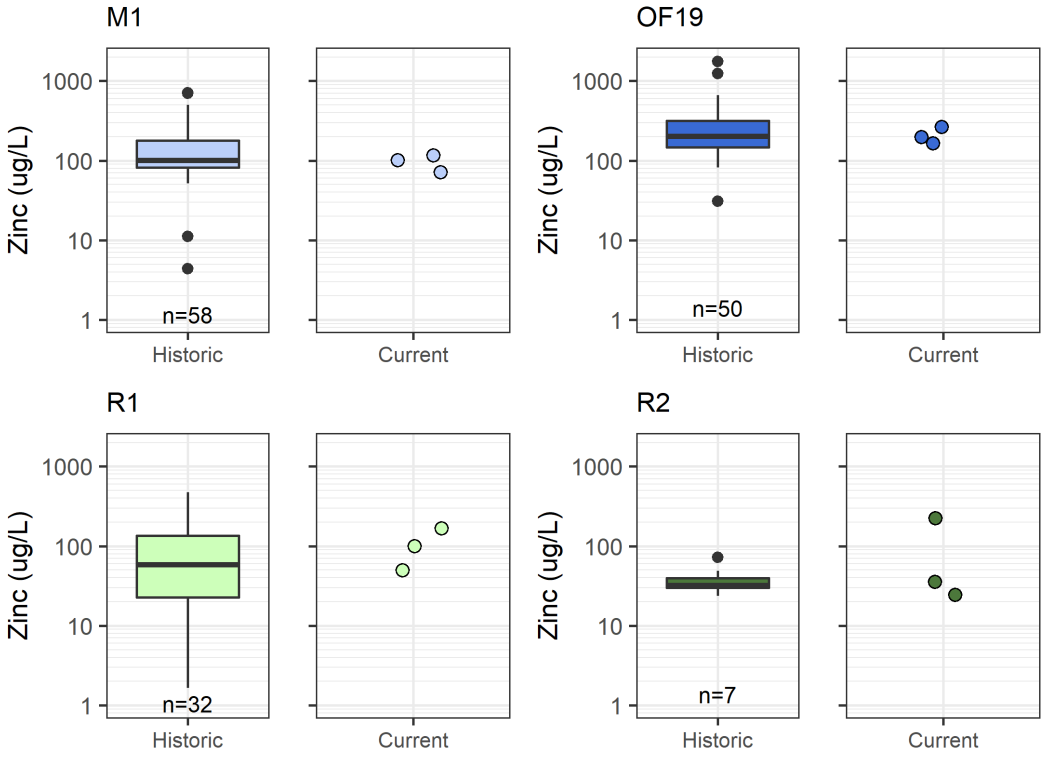


Figure 13: Distribution of total zinc concentrations at the fixed historic land-use sites during the current permit year and for the previous period of record (Historic) for the four stations.

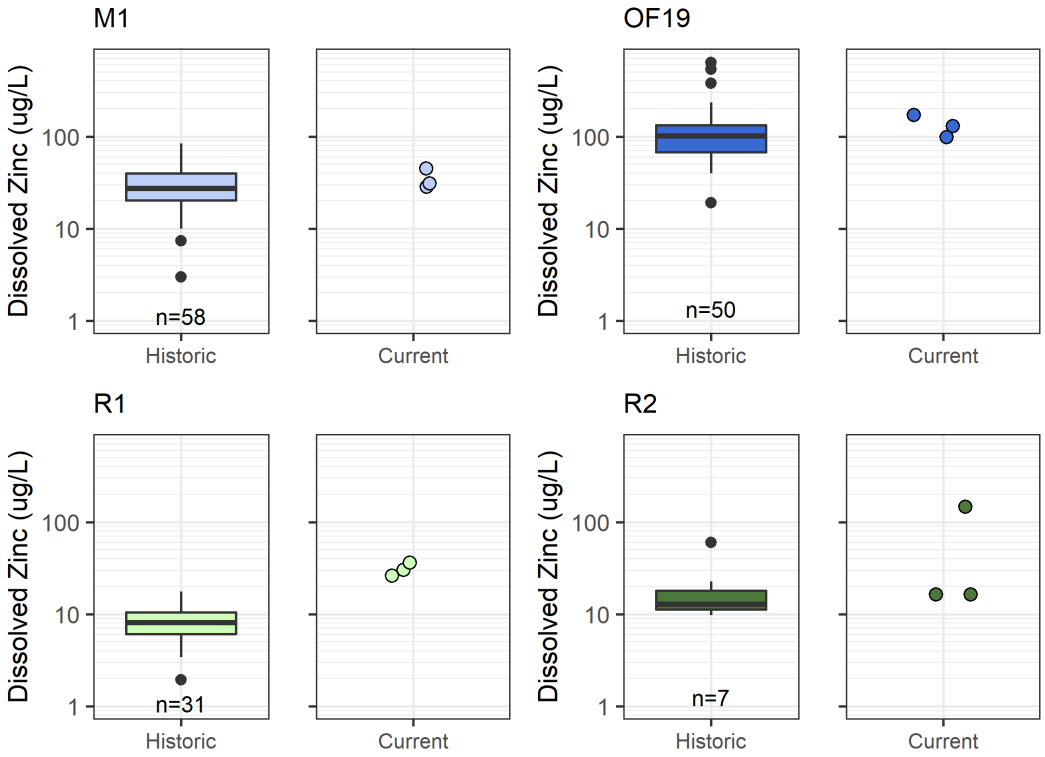


Figure 14: Distribution of dissolved zinc concentrations at the fixed historic land-use sites during the current permit year and for the previous period of record (Historic) for the four stations.

In comparison to the three other sites, historic stormwater composite TSS samples collected at R1 are highly variable (Figure 15), ranging from 1 to 1,460 mg/L. The high level of variability in TSS concentrations at R1 measured during the 2018–19 permit year is consistent with the historic observations from that site. Like the R2 site, the dominant land use contributing to the site is residential; however, R1 is an instream site located on Fanno Creek. The instream composite samples collected at R1 differ substantially from TSS concentrations of those reflecting only stormwater runoff (Figure 15).

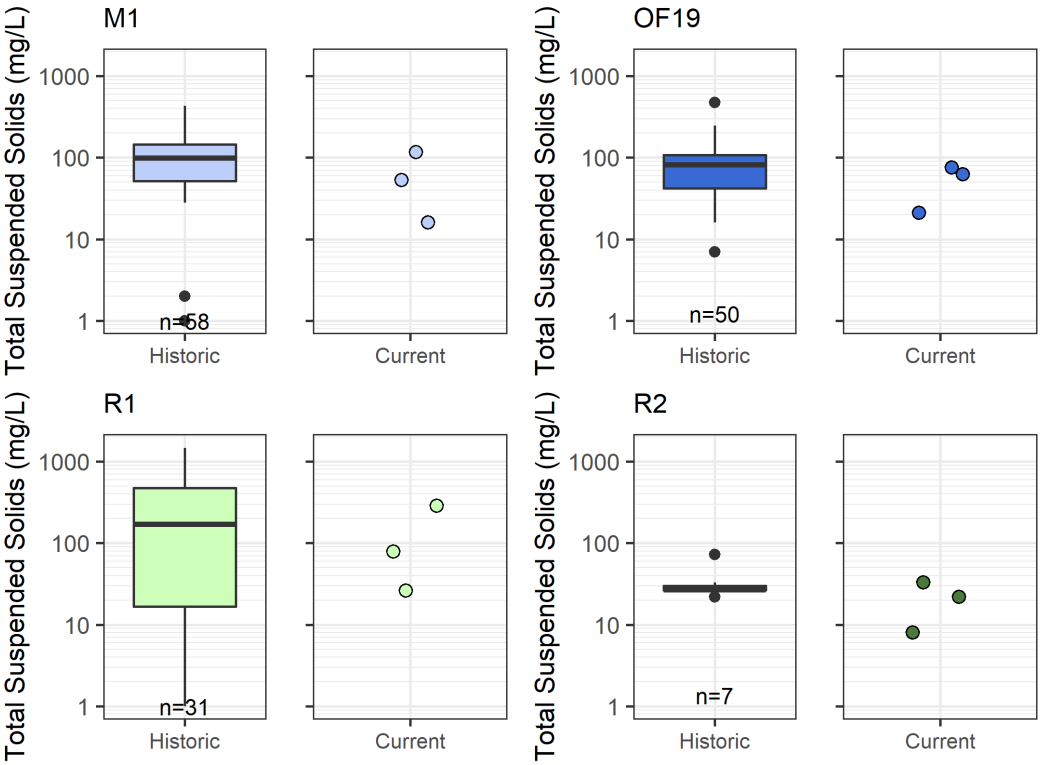


Figure 15: Distribution of total suspended solids concentrations at the fixed historic land-use sites during the current permit year and for the previous period of record (Historic) for the four stations.

5 Summary

The City completed all of the activities required by Schedule B of the City's NPDES MS4 discharge permit. The City's 2018–19 monitoring activities met all the specific requirements for monitoring types, locations, frequency, and parameters. All monitoring data collected during the 2018–19 permit year are included in Appendix B. Key findings from the 2018–19 permit year include the following:

- Water quality concentrations from probabilistic stormwater monitoring are not highly variable, and no long-term trends in concentrations have been identified.
- Flow-weighted composite stormwater concentrations in 2018–19 were similar to, or lower than, the corresponding mean concentrations identified by the 1997 ACWA study for the corresponding land uses.
- Dissolved metals in the Columbia Slough were consistently lower than the calculated criteria, with the exception of a single dissolved copper sample.
- Exceedances of the single-sample *E. coli* criterion were observed in all watersheds except for the Columbia Slough.
- Summer instream water temperatures typically exceed the water quality temperature criteria for rearing and migration at all four monitoring stations.
- Macroinvertebrate communities vary across watersheds, and all watersheds show signs of anthropogenic impacts.

Appendix A: Monitoring Locations for the 2018–19 Permit Year

FY 2018-19 Monitoring Locations
Stormwater & Instream Sites

City of Portland NPDES MS4 Permit

ENVIRONMENTAL SERVICES
CITY OF PORTLAND
working for clean rivers

Legend

Monitoring Locations

- Probabilistic Stormwater (UICs)
- Probabilistic Instream (PAWMAP)
- Fixed Instream
- Historic Fixed Land Use
- Continuous Instream (USGS)

Watersheds

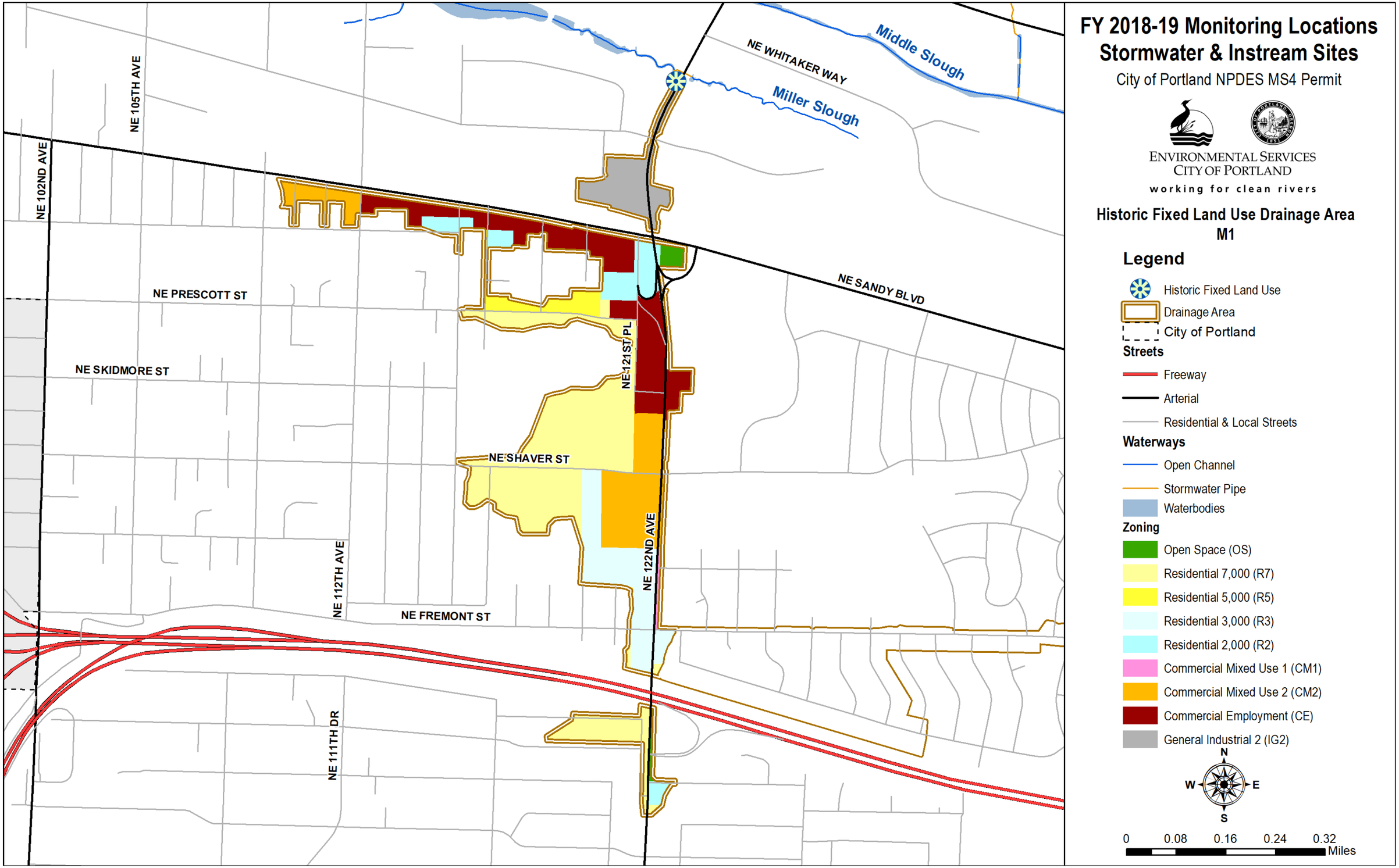
- Columbia Slough
- Fanno Creek
- Johnson Creek
- Tualatin River
- Tryon Creek
- Willamette River

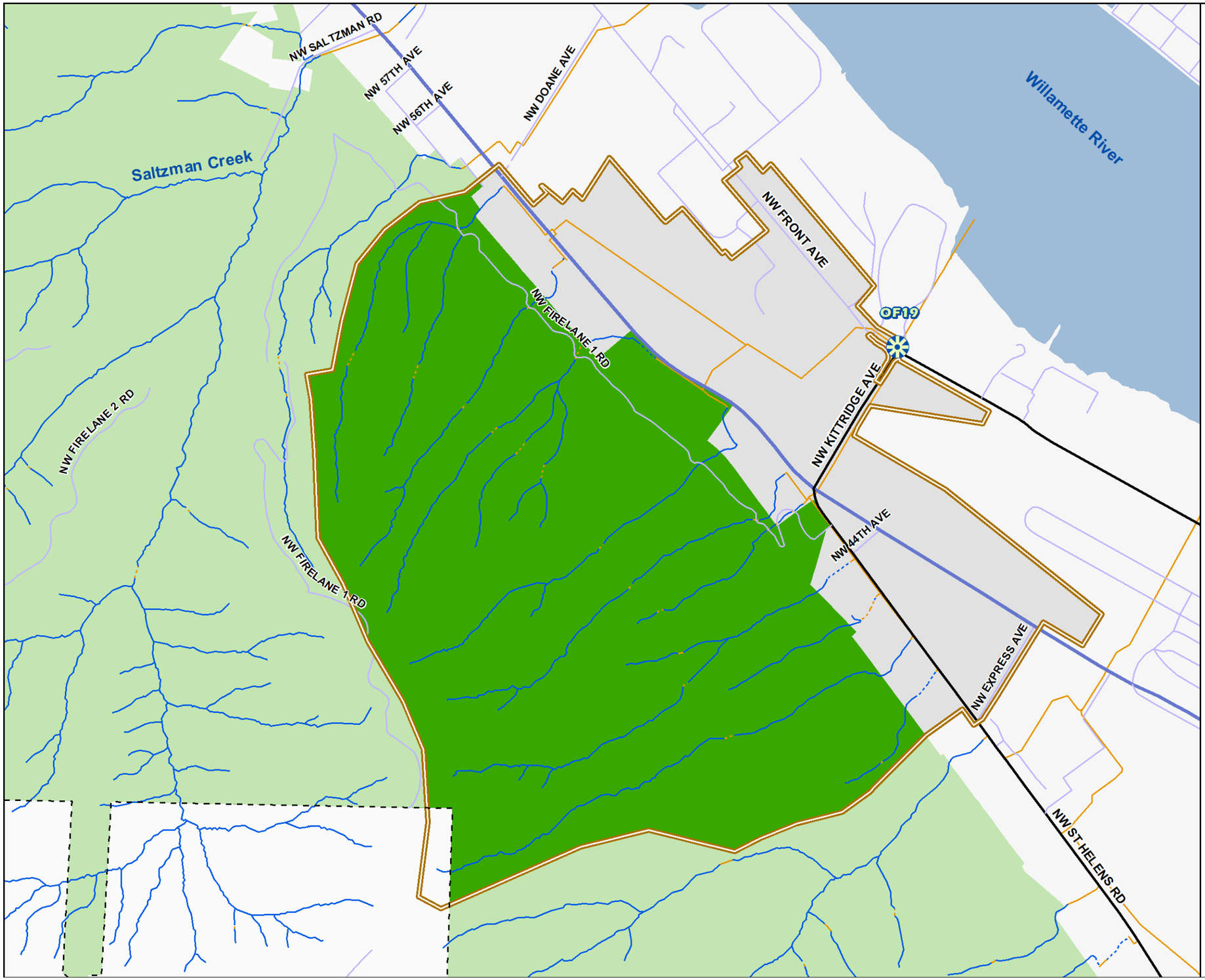
Other Features

- City of Portland
- Major City Streams
- Other Streams
- Waterbodies
- Major Highways & Freeways
- Local Highways & Arterials

N
W E
S

0 1 2 3 4 Miles


NE 105TH AVE
NE 102ND AVE
NE WHITAKER WAY
Middle Slough
Miller Slough
NE SANDY BLVD
NE PRESCOTT ST
NE SKIDMORE ST
NE 121ST PL
NE SHAVER ST
NE 122ND AVE
NE 112TH AVE
NE FREMONT ST
NE 111TH DR
FY 2018-19 Monitoring Locations
Stormwater & Instream Sites
City of Portland NPDES MS4 Permit
ENVIRONMENTAL SERVICES
CITY OF PORTLAND
working for clean rivers
Historic Fixed Land Use Drainage Area
M1
Legend
Historic Fixed Land Use
Drainage Area
City of Portland
Streets
Freeway
Arterial
Residential & Local Streets
Waterways
Open Channel
Stormwater Pipe
Waterbodies
Zoning
Open Space (OS)
Residential 7,000 (R7)
Residential 5,000 (R5)
Residential 3,000 (R3)
Residential 2,000 (R2)
Commercial Mixed Use 1 (CM1)
Commercial Mixed Use 2 (CM2)
Commercial Employment (CE)
General Industrial 2 (IG2)
N
W
E
S
0
0.08
0.16
0.24
0.32
Miles



FY 2018-19 Monitoring Locations
Stormwater & Instream Sites

City of Portland NPDES MS4 Permit

ENVIRONMENTAL SERVICES
CITY OF PORTLAND
working for clean rivers

Historic Fixed Land Use Drainage Area
OF19

Legend

- Historic Fixed Land Use
- Drainage Area
- City of Portland

Streets

- Freeway
- Local Highway
- Arterial
- Residential & Local Streets

Waterways

- Open Channel
- Ditch
- Stormwater Pipe
- Stormwater Culvert
- Combined Stormwater/Sewer Pipe
- Waterbodies

Zoning

- Open Space (OS)
- Heavy Industrial (IH)

N
W E
S

0 0.08 0.16 0.24 0.32 Miles

FY 2018-19 Monitoring Locations
Stormwater & Instream Sites

City of Portland NPDES MS4 Permit

ENVIRONMENTAL SERVICES
CITY OF PORTLAND
working for clean rivers

Historic Fixed Land Use Drainage Area
R1

Legend

- Historic Fixed Land Use
- Drainage Area
- City of Portland

Streets

- Freeway
- Local Highway
- Arterial
- Residential & Local Streets

Waterways

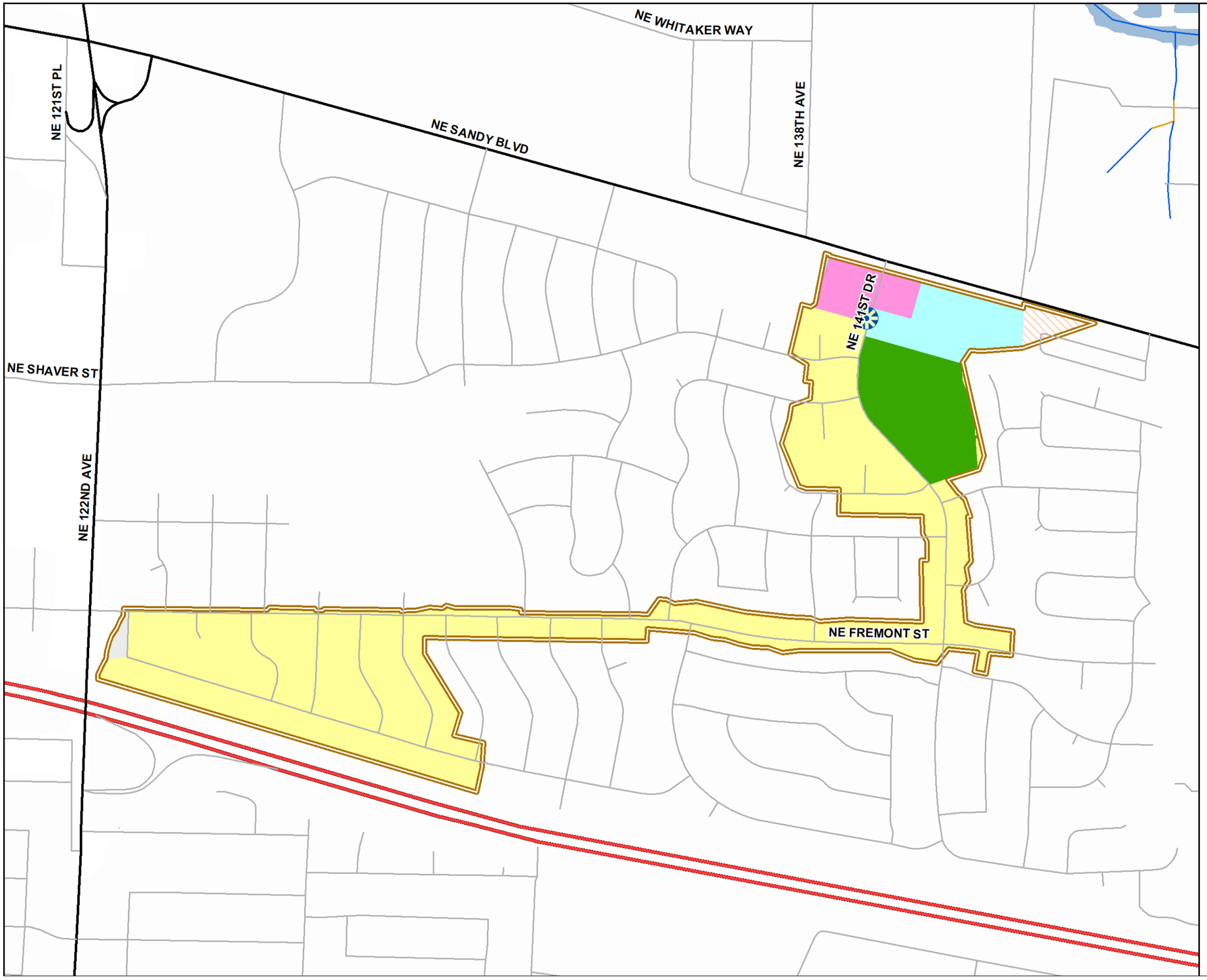
- Open Channel
- Stormwater Pipe
- Stormwater Culvert
- Waterbodies

Zoning

- Open Space (OS)
- Residential (R1-R20)
- Commercial Mixed Use 1 (CM1)
- Commercial Mixed Use 2 (CM2)
- Commercial Employment (CE)

N
W E
S

0 0.1 0.2 0.3 0.4 Miles



FY 2018-19 Monitoring Locations
Stormwater & Instream Sites

City of Portland NPDES MS4 Permit

ENVIRONMENTAL SERVICES
CITY OF PORTLAND
working for clean rivers

Historic Fixed Land Use Drainage Area
R2

Legend

- Historic Fixed Land Use
- Drainage Area
- City of Portland

Streets

- Freeway
- Local Highway
- Arterial
- Residential & Local Streets

Waterways

- Open Channel
- Stormwater Pipe
- Waterbodies

Zoning

- Open Space (OS)
- Residential 7,000 (R7)
- Residential 5,000 (R5)
- Residential 2,000 (R2)
- Residential Manufactured Dwelling (RMP)
- Commercial Mixed Use 1 (CM1)
- General Industrial 2 (IG2)

N
W E
S

0 0.06 0.12 0.18 0.24
Miles

Appendix B: Monitoring Data from 2018–19

Table B-1: Probabilistic Stormwater Data (30 sites)

Table B-2: Historic Fixed Land-Use Stormwater Data (4 sites)

Table B-3: Fixed Instream Data (11 sites)

Table B-4: Probabilistic Instream Data (20 sites)

Table B-5: Macroinvertebrate Data (14 sites)

Table B-1: Probabilistic Stormwater Data (2018–19 permit year)

Site ID	Location Description	Sample Date	Field Parameter				Conventional				Metals						Nutrients			
			Dissolved Oxygen (mg/L)	Conductivity (umhos/cm)	pH	Temperature (C)	*E. coli* (MPN/100mL)	Hardness (mg $CaCO_3$/L)	Total Organic Carbon (mg/L)	Total Suspended Solids (mg/L)	Total Copper (ug/L)	Dissolved Copper (ug/L)	Total Lead (ug/L)	Dissolved Lead (ug/L)	Total Zinc (ug/L)	Dissolved Zinc (ug/L)	Ammonia-Nitrogen (mg/L)	Nitrate-Nitrogen (mg/L)	Total Phosphorus (mg/L)	Ortho-phosphate (mg/L)
P4_1	4924 SE 113TH AVE (<1000)	2018-11-28	11.0	14	6.4	9.3	--	4.61	6.55	6	2.13	1.20	0.596	<0.106	10.8	6.79	0.026	<0.10	0.064	<0.020
P4_10	11228 SE PINE CT (<1000)	2018-11-28	9.6	17	6.7	9.9	--	6.58	7.72	18	5.25	2.16	1.10	<0.106	12.5	5.80	<0.020	<0.10	0.139	0.056
P4_11	5109 NE 11TH AVE (<1000)	2019-02-11	11.7	62	6.5	6.4	--	16.8	4.52	20	5.24	2.09	3.60	0.169	31.0	10.5	0.085	<0.10	0.102	<0.020
P4_12	7315 N DENVER AVE (>1000)	2019-02-11	12.1	22	6.7	6.2	--	9.70	3.11	34	8.31	2.26	5.63	0.141	54.2	12.9	0.092	<0.10	0.113	<0.020
P4_13	1305 SE CLATSOP ST (>1000)	2019-02-11	12.3	19	6.5	5.6	--	7.64	6.34	31	7.39	2.99	4.37	0.170	38.5	10.7	0.043	<0.10	0.195	0.051
P4_14	916 NE 153RD AVE (<1000)	2018-12-18	10.8	18	6.9	10.4	--	3.66	<1.00	<3	0.684	0.430	0.140	<0.106	2.99	2.23	<0.020	<0.10	0.016	<0.020
P4_15	5838 NE KILLINGSWORTH ST (>1000)	2018-12-18	11.3	21	6.0	10.7	--	16.9	6.44	173	18.7	2.05	14.2	<0.106	83.1	8.37	0.030	<0.10	0.518	0.095
P4_2	5903 N HOUGHTON ST (>1000)	2018-11-28	10.2	25	6.6	11.4	--	10.1	3.58	6	4.22	2.43	0.843	<0.106	98.9	88.4	0.027	<0.10	0.057	0.025
P4_3	6302 SE FOSTER PL (>1000)	2018-11-28	10.9	27	6.2	9.3	--	11.8	6.07	25	9.51	3.57	2.02	0.114	38.9	18.4	0.064	<0.10	0.096	<0.020
P4_4	3250 NE GOING ST (<1000)	2018-11-28	10.7	23	6.8	9.8	--	18.7	10.7	146	20.6	2.65	10.5	0.258	73.9	9.04	<0.020	<0.10	0.437	0.097
P4_5	6615 SE LAMBERT ST (<1000)	2018-12-18	9.9	28	6.2	9.9	--	11.2	1.90	<3	1.15	0.685	0.253	<0.106	14.0	10.7	0.099	<0.10	0.056	0.034
P4_6	14137 SE MILL ST (>1000)	2018-11-28	10.7	18	6.4	9.9	--	5.18	8.87	7	4.89	1.80	0.673	<0.106	14.8	7.99	0.059	<0.10	0.115	0.046
P4_7	4311 SE 51ST AVE (<1000)	2019-02-11	12.2	18	6.6	5.3	--	6.91	5.11	27	5.81	3.40	2.44	0.367	28.6	12.6	0.066	<0.10	0.189	0.059
P4_8	5945 NE 11TH AVE (>1000)	2019-02-11	12.1	22	6.7	6.5	--	10.0	8.12	63	15.3	4.20	9.74	0.154	70.0	17.0	0.102	<0.10	0.166	<0.020
P4_9	8330 SE RAMONA ST (<1000)	2018-11-28	10.5	14	6.9	10.0	--	5.01	4.42	6	2.92	1.63	1.17	<0.106	15.3	8.59	0.057	<0.10	0.094	0.054
SG-065	4745 SE 122nd Ave (>1000)	2019-01-18	11.8	47	6.2	8.8	--	23.1	29.0	98	34.0	5.98	11.1	0.257	281	42.1	0.266	0.36	0.305	<0.020
SG-066	8318 SE 78th Ave (<1000)	2018-12-18	11.1	45	6.4	10.0	--	22.5	2.19	16	3.13	1.09	3.97	0.138	12.5	2.20	<0.020	<0.10	0.128	0.055
SG-068	13250 SE Holgate Blvd (>1000)	2018-11-28	10.7	23	6.2	9.3	--	11.8	8.90	77	15.9	3.32	8.98	0.435	96.9	28.0	0.146	<0.10	0.204	<0.020
SG-069	12210 SE Ellis St (>1000)	2018-11-28	11.0	21	6.5	9.3	--	11.1	2.81	50	12.8	2.44	3.80	<0.106	59.3	14.2	0.078	<0.10	0.131	<0.020
SG-071	5404 SE 122nd Ave (>1000)	2018-11-28	11.2	28	6.6	9.4	--	32.3	6.14	64	16.7	3.09	5.90	0.169	99.1	18.0	0.260	0.11	0.426	<0.020
SG-073	4757 SE 122nd Ave (>1000)	2019-01-18	11.8	36	6.5	8.4	--	16.8	14.9	65	22.0	5.25	6.13	0.168	205	27.8	0.266	0.16	0.189	<0.020
SG-078	6547 NE 66th Ave (<1000)	2018-12-20	9.9	27	6.0	11.0	--	23.4	6.29	294	31.2	1.76	54.6	0.535	179	14.8	0.046	<0.10	0.883	0.083
SG-079	12204 SE Steele St (>1000)	2018-11-28	10.9	22	6.2	9.4	--	12.3	4.00	50	11.4	1.99	4.77	0.129	61.8	14.0	0.097	<0.10	0.147	<0.020
SG-080	5608 SE 99th Ave (<1000)	2019-02-11	12.8	50	6.3	4.2	--	5.99	4.32	6	3.07	1.68	0.894	<0.106	15.9	9.50	0.030	<0.10	0.089	0.043
SG-081	11080 SE Harold St (>1000)	2019-02-11	12.9	46	6.2	4.4	--	18.9	4.19	77	14.7	2.50	10.2	0.117	79.9	19.5	0.183	0.12	0.249	0.021
SG-083	10310 SE Ellis St (>1000)	2018-11-27	9.9	21	6.3	13.7	--	9.09	4.28	63	10.7	5.66	3.63	<0.106	82.0	25.9	0.082	<0.10	0.174	<0.020
SG-084	4100 E 133rd Ave (<1000)	2019-02-11	12.3	13	6.7	6.1	--	4.37	1.92	20	3.46	0.962	1.55	<0.106	13.8	3.61	<0.020	<0.10	0.065	<0.020
SG-085	12506 SE Reedway St (<1000)	2018-11-28	11.3	13	6.4	9.1	--	5.54	3.45	28	4.32	1.22	2.03	<0.106	17.2	4.39	0.041	<0.10	0.114	0.030
SG-087	5021 SE 122nd Ave (>1000)	2019-01-18	11.9	36	6.7	8.3	--	17.4	13.6	97	22.0	4.71	8.29	0.146	176	22.9	0.274	0.12	0.223	<0.020
SG-090	13250 SE Holgate St (>1000)	2018-11-27	10.2	27	6.2	11.5	--	10.3	5.50	31	9.39	4.96	8.72	0.628	48.9	16.0	0.139	<0.10	0.141	0.023

Table B-2: Historic Fixed Land-Use Stormwater Data (2018-19 permit year)

Site ID	Location Description	Sample Date	Field Parameter				Conventional				Metals						Nutrients			
			Dissolved Oxygen (mg/L)	Conductivity (umhos/cm)	pH	Temperature (C)	*E. coli* (MPN/100mL)	Hardness (mg $CaCO_3$/L)	Total Organic Carbon (mg/L)	Total Suspended Solids (mg/L)	Total Copper (ug/L)	Dissolved Copper (ug/L)	Total Lead (ug/L)	Dissolved Lead (ug/L)	Total Zinc (ug/L)	Dissolved Zinc (ug/L)	Ammonia-Nitrogen (mg/L)	Nitrate-Nitrogen (mg/L)	Total Phosphorus (mg/L)	Ortho-phosphate (mg/L)
M1	5241 NE 122nd Ave	2018-12-09	12.7	83	6.7	5.3	250	34.4	5.79	16	9.11	3.93	2.27	0.117	71.1	44.8	0.250	0.21	0.126	0.040
M1	5241 NE 122nd Ave	2019-03-12	12.2	89	6.6	6.8	86	27.4	6.87	117	18.1	3.66	10.1	<0.105	116	28.3	0.175	0.24	0.207	<0.020
M1	5241 NE 122nd Ave	2019-04-04	10.5	62	5.9	11.9	1800	21.0	5.25	53	16.0	5.77	5.86	0.191	101	30.9	0.107	0.28	0.297	0.025
OF19	4900 NW Kittridge Ave (OF19)	2018-12-08	12.7	88	6.3	5.7	110	44.0	4.31	21	7.81	3.29	2.97	0.173	165	130	0.208	0.41	0.191	0.048
OF19	4900 NW Kittridge Ave (OF19)	2019-03-11	11.8	110	6.7	6.8	63	27.5	5.99	76	15.5	3.11	8.86	0.129	196	97.8	0.133	0.20	0.164	<0.020
OF19	4900 NW Kittridge Ave (OF19)	2019-04-04	10.0	141	6.8	13.2	1900	48.5	4.46	62	21.1	6.29	12.5	0.396	263	171	0.112	4.2	0.217	0.036
R1	4916 SW 56th Ave	2018-12-09	12.1	137	7.2	4.7	1700	36.3	5.50	26	4.37	2.47	1.87	0.207	49.8	30.3	0.050	0.35	0.137	0.058
R1	4916 SW 56th Ave	2019-03-12	12.0	127	7.0	6.3	540	42.0	5.86	285	15.1	2.00	14.3	0.153	167	26.2	0.068	0.45	0.482	0.031
R1	4916 SW 56th Ave	2019-04-04	10.5	74	6.6	11.2	2600	36.9	4.31	79	8.48	3.36	5.19	0.439	98.9	36.0	0.024	0.47	0.198	0.040
R2	NE 141st Ave & Sandy Blvd	2018-12-09	12.9	21	7.0	6.1	710	7.41	4.22	8	4.88	2.59	0.592	<0.106	24.4	16.3	0.148	<0.10	0.063	0.036
R2	NE 141st Ave & Sandy Blvd	2019-03-12	12.3	23	6.9	7.2	86	8.87	3.90	33	9.36	3.19	1.83	<0.105	224	147	0.113	0.16	0.079	<0.020
R2	NE 141st Ave & Sandy Blvd	2019-04-04	10.6	16	6.5	12.4	1100	7.80	4.23	22	8.38	4.60	1.54	<0.105	35.3	16.3	0.048	0.14	0.074	<0.020

Table B-3. Fixed Instream Sites Results (2018–19 permit year)

Note: Biological oxygen demand (BOD) is only collected at the Columbia Slough fixed sites

Site ID	Location Description	Sample Date	Field Parameter				Conventional					Metals						Nutrients			
			Dissolved Oxygen (mg/L)	Conductivity (umhos/cm)	pH	Temp (C)	*E. coli* (MPN/100mL)	Hardness (mg $CaCO_3$/L)	BOD (mg/L)	Total Organic Carbon (mg/L)	Total Suspended Solids (mg/L)	Total Copper (ug/L)	Dissolved Copper (ug/L)	Total Lead (ug/L)	Dissolved Lead (ug/L)	Total Zinc (ug/L)	Dissolved Zinc (ug/L)	Ammonia-Nitrogen (mg/L)	Nitrate-Nitrogen (mg/L)	Total Phosphorus (mg/L)	Ortho-phosphate (mg/L)
Columbia Slough																					
AWB	NE Airport Way Bridge B, Main Channel	2018-07-27	3.5	180	7.6	22.1	62	83.4	<2	3.56	4	0.707	0.472	0.112	<0.105	0.844	<0.527	0.031	<0.10	0.073	0.031
AWB	NE Airport Way Bridge B, Main Channel	2018-09-10	7.4	202	8.3	20.3	30	78.2	<2	3.16	6	0.724	0.424	0.274	<0.105	1.73	<0.527	0.041	<0.10	0.057	0.044
AWB	NE Airport Way Bridge B, Main Channel	2018-11-29	9.4	128	7.4	7.2	41	50.0	<2	2.74	9	2.02	1.10	0.494	<0.106	7.17	2.46	0.149	0.44	0.087	0.032
AWB	NE Airport Way Bridge B, Main Channel	2019-01-14	14.4	146	7.4	3.4	200	60.1	<2	2.93	46	2.79	0.838	1.48	<0.105	11.9	1.35	0.072	0.87	0.107	0.028
AWB	NE Airport Way Bridge B, Main Channel	2019-03-18	11.3	184	7.7	9.1	31	70.4	3	3.41	39	1.99	0.533	1.05	<0.105	35.8	0.760	0.071	0.56	0.124	0.026
AWB	NE Airport Way Bridge B, Main Channel	2019-04-05	8.5	147	7.8	12.3	160	55.0	4	3.90	18	2.54	1.32	0.589	<0.105	11.5	4.25	0.043	0.26	0.119	<0.020
AWB	NE Airport Way Bridge B, Main Channel	2019-05-14	9.9	186	7.5	19.2	86	81.1	2	4.80	12	1.62	0.952	0.420	0.132	3.03	0.739	0.049	<0.10	0.137	0.054
SJB	St Johns Landfill Bridge, Main Channel	2018-07-27	12.3	127	8.1	22.5	52	59.4	<2	1.69	20	1.92	0.991	0.572	<0.105	5.76	<0.527	0.022	<0.10	0.049	<0.020
SJB	St Johns Landfill Bridge, Main Channel	2018-09-10	11.0	222	7.8	20.8	120	90.5	<2	1.95	27	1.73	0.616	1.02	<0.105	5.19	<0.527	0.109	1.7	0.094	0.045
SJB	St Johns Landfill Bridge, Main Channel	2018-11-29	11.6	129	7.6	8.6	84	42.7	<2	1.32	8	1.12	0.548	0.288	<0.106	3.74	1.61	0.101	0.62	0.074	0.048
SJB	St Johns Landfill Bridge, Main Channel	2019-01-14	12.4	159	6.8	6.0	41	53.6	<2	1.66	18	1.66	0.815	0.595	<0.105	5.71	1.59	0.098	1.5	0.089	0.049
SJB	St Johns Landfill Bridge, Main Channel	2019-03-18	12.7	224	7.5	11.5	<10	89.8	3	2.90	29	1.67	0.608	1.11	<0.105	6.79	1.10	<0.020	1.9	0.141	<0.020
SJB	St Johns Landfill Bridge, Main Channel	2019-04-05	15.3	163	8.1	13.0	10	60.3	4	2.51	32	1.98	0.609	1.22	<0.105	7.03	<0.527	<0.020	0.64	0.142	<0.020
SJB	St Johns Landfill Bridge, Main Channel	2019-05-14	13.4	211	8.1	21.1	10	89.5	5	3.40	28	2.21	1.21	1.02	<0.105	5.72	<0.527	0.037	0.83	0.171	<0.020
Johnson Creek																					
JC-6	SE 158th Ave Bridge (Main Channel)	2018-07-27	9.3	139	7.5	20.9	75	54.7	--	4.26	10	2.01	1.11	0.138	<0.105	3.44	1.44	0.036	0.19	0.075	0.051
JC-6	SE 158th Ave Bridge (Main Channel)	2018-09-10	9.0	159	7.7	18.2	570	54.1	--	4.90	5	1.56	1.21	0.177	<0.105	7.96	3.87	0.042	0.23	0.077	0.048
JC-6	SE 158th Ave Bridge (Main Channel)	2018-11-29	11.1	110	7.5	8.1	270	36.4	--	3.42	<3	2.74	1.55	0.600	0.131	20.9	13.5	0.034	3.7	0.085	0.030
JC-6	SE 158th Ave Bridge (Main Channel)	2019-01-14	14.5	91	7.4	4.4	63	30.2	--	1.51	<3	1.05	0.626	0.164	<0.105	5.37	3.26	<0.020	2.6	0.030	0.024
JC-6	SE 158th Ave Bridge (Main Channel)	2019-03-18	12.0	94	7.8	8.4	75	30.0	--	1.61	<3	0.735	0.525	0.152	<0.105	4.27	2.83	<0.020	1.8	0.025	<0.020
JC-6	SE 158th Ave Bridge (Main Channel)	2019-04-03	10.4	104	7.4	11.7	400	35.7	--	2.94	<3	1.37	1.10	0.160	<0.105	11.2	8.61	<0.020	1.0	0.033	<0.020
JC-6	SE 158th Ave Bridge (Main Channel)	2019-05-14	11.0	116	7.4	15.6	150	42.3	--	3.21	<3	1.30	1.37	0.142	<0.105	4.39	3.27	0.047	0.89	0.051	0.037
M2	SE Millport Road	2018-07-27	13.8	173	7.8	19.2	140	73.0	--	1.35	4	0.774	0.514	0.207	<0.105	2.14	0.916	<0.020	3.4	0.094	0.067
M2	SE Millport Road	2018-09-10	10.5	191	7.8	16.9	160	75.7	--	1.12	<3	0.566	0.356	0.154	<0.105	1.48	<0.527	<0.020	3.7	0.093	0.078
M2	SE Millport Road	2018-11-29	11.4	127	7.4	9.2	150	44.9	--	2.62	4	2.51	1.39	0.491	<0.106	9.15	4.07	<0.020	3.0	0.100	0.054
M2	SE Millport Road	2019-01-14	14.1	132	7.6	5.7	130	48.7	--	1.28	6	0.964	0.530	0.270	<0.105	3.71	1.55	<0.020	3.3	0.063	0.053
M2	SE Millport Road	2019-03-18	14.2	131	8.8	10.2	20	44.5	--	1.58	3	0.709	0.489	0.146	<0.105	2.04	<0.527	<0.020	2.4	0.052	0.033
M2	SE Millport Road	2019-04-03	12.0	150	7.7	13.3	150	52.8	--	2.32	4	1.27	0.827	0.303	<0.105	4.20	1.40	<0.020	2.1	0.067	0.044
M2	SE Millport Road	2019-05-14	11.3	168	7.2	15.5	490	64.4	--	5.00	8	1.82	1.33	0.342	<0.105	10.1	6.89	0.066	2.94	0.099	0.070

Table B-3. Fixed Instream Sites Results (2018–19 permit year) continued

Note: Biological oxygen demand (BOD) is only collected at the Columbia Slough fixed sites

Site ID	Location Description	Sample Date	Field Parameter				Conventional					Metals						Nutrients			
			Dissolved Oxygen (mg/L)	Conductivity (umhos/cm)	pH	Temp (C)	*E. coli* (MPN/100mL)	Hardness (mg $CaCO_3$/L)	BOD (mg/L)	Total Organic Carbon (mg/L)	Total Suspended Solids (mg/L)	Total Copper (ug/L)	Dissolved Copper (ug/L)	Total Lead (ug/L)	Dissolved Lead (ug/L)	Total Zinc (ug/L)	Dissolved Zinc (ug/L)	Ammonia-Nitrogen (mg/L)	Nitrate-Nitrogen (mg/L)	Total Phosphorus (mg/L)	Ortho-phosphate (mg/L)
Tryon Creek																					
TC4	10750 SW Boones Ferry Rd (Downstream of Culvert)	2018-07-26	9.1	189	7.7	17.9	160	75.6	--	2.02	<3	0.992	0.862	0.104	<0.105	7.68	5.91	<0.020	0.54	0.122	0.110
TC4	10750 SW Boones Ferry Rd (Downstream of Culvert)	2018-08-06	9.0	182	7.6	17.5	610	73.5	--	2.19	3	1.11	0.897	0.150	<0.106	8.11	7.11	<0.020	0.47	0.114	0.106
TC4	10750 SW Boones Ferry Rd (Downstream of Culvert)	2018-09-17	9.9	130	7.7	12.7	75	67.5	--	5.53	<3	2.83	2.53	0.172	<0.105	19.3	16.3	<0.020	0.57	0.094	0.090
TC4	10750 SW Boones Ferry Rd (Downstream of Culvert)	2018-10-03	10.2	197	7.5	11.3	110	77.9	--	2.54	<3	1.09	0.956	<0.100	<0.105	8.53	7.01	<0.020	0.43	0.107	0.111
TC4	10750 SW Boones Ferry Rd (Downstream of Culvert)	2018-11-28	11.2	104	6.8	9.9	2100	39.1	--	6.19	34	5.39	2.76	1.77	0.173	54.0	25.8	0.031	1.2	0.136	0.063
TC4	10750 SW Boones Ferry Rd (Downstream of Culvert)	2018-12-03	12.2	149	7.3	5.8	31	57.9	--	2.58	<3	1.61	1.38	0.128	<0.105	14.8	12.9	<0.020	1.4	0.068	0.060
TC4	10750 SW Boones Ferry Rd (Downstream of Culvert)	2019-01-10	11.8	124	7.4	8.3	170	47.6	--	2.71	<3	1.98	1.60	0.302	0.119	33.1	26.9	<0.020	1.25	0.061	0.043
TC4	10750 SW Boones Ferry Rd (Downstream of Culvert)	2019-02-07	14.4	168	NR	1.8	10	60.8	--	1.70	<3	0.912	0.784	<0.111	<0.105	21.1	18.4	<0.020	1.1	0.040	0.041
TC4	10750 SW Boones Ferry Rd (Downstream of Culvert)	2019-03-21	13.1	161	7.6	9.0	20	60.6	--	1.84	<3	0.956	0.636	0.135	<0.105	18.1	11.5	<0.020	1.0	0.036	0.027
TC4	10750 SW Boones Ferry Rd (Downstream of Culvert)	2019-04-03	11.0	138	7.7	11.2	500	47.7	--	3.48	6	2.58	1.83	0.751	0.147	31.3	20.0	<0.020	1.1	0.088	0.049
TC4	10750 SW Boones Ferry Rd (Downstream of Culvert)	2019-05-09	10.7	170	6.6	12.3	98	59.8	--	2.02	<3	1.01	0.845	0.115	<0.105	13.1	9.89	<0.020	1.04	0.067	0.057
TC4	10750 SW Boones Ferry Rd (Downstream of Culvert)	2019-06-03	10.5	173	7.9	13.3	280	65.4	--	2.11	<3	1.25	1.04	0.144	<0.105	11.4	8.12	<0.020	0.88	0.090	0.083
TC5	SW 26th Way & Barbur Blvd	2018-07-26	8.8	249	7.3	15.3	240	98.5	--	3.10	36	1.12	0.531	0.777	<0.105	13.1	8.62	0.145	0.46	0.133	0.249
TC5	SW 26th Way & Barbur Blvd	2018-08-06	8.6	233	7.1	15.4	340	108	--	3.87	6	0.691	0.398	0.111	<0.106	9.05	9.42	0.456	0.41	0.155	0.099
TC5	SW 26th Way & Barbur Blvd	2018-09-17	8.4	175	7.0	13.5	510	82.8	--	5.84	<3	2.68	1.94	0.208	<0.105	20.3	16.7	0.066	1.2	0.111	0.112
TC5	SW 26th Way & Barbur Blvd	2018-10-03	7.2	243	7.0	12.7	96	98.8	--	3.00	14	1.36	0.534	0.159	<0.105	12.8	10.6	0.274	0.58	0.137	0.105
TC5	SW 26th Way & Barbur Blvd	2018-11-28	10.4	65	6.8	10.1	>24000	23.3	--	6.30	14	4.93	2.94	1.65	0.209	56.7	44.5	0.037	0.57	0.122	0.072
TC5	SW 26th Way & Barbur Blvd	2018-12-03	10.2	185	7.1	9.1	120	67.5	--	3.07	<3	2.16	1.76	0.238	<0.105	49.0	47.1	0.041	1.7	0.054	0.056
TC5	SW 26th Way & Barbur Blvd	2019-01-10	10.8	140	7.1	9.1	420	54.6	--	3.19	<3	2.79	2.10	0.446	0.128	41.2	34.9	0.023	1.30	0.069	0.052
TC5	SW 26th Way & Barbur Blvd	2019-02-07	11.8	195	NR	5.3	180	69.2	--	2.08	<3	1.24	0.918	0.179	<0.105	32.9	29.3	0.050	1.4	0.048	0.054
TC5	SW 26th Way & Barbur Blvd	2019-03-21	11.0	212	7.0	9.5	280	75.0	--	2.69	<3	1.36	0.886	0.278	<0.105	65.2	54.9	0.052	1.6	0.059	0.052
TC5	SW 26th Way & Barbur Blvd	2019-04-03	10.3	152	7.3	10.9	6900	53.7	--	5.02	8	4.30	2.83	1.12	0.137	66.3	49.5	0.065	1.1	0.102	0.056
TC5	SW 26th Way & Barbur Blvd	2019-05-09	8.9	208	6.8	12.3	410	70.9	--	3.14	<3	2.19	1.44	0.251	<0.105	28.9	24.5	0.057	1.36	0.083	0.055
TC5	SW 26th Way & Barbur Blvd	2019-06-03	8.7	219	7.1	12.5	4900	83.7	--	2.57	<3	1.39	0.889	0.261	<0.105	21.8	16.2	0.072	0.97	0.101	0.092
TC6	9323 SW Lancaster Rd	2018-07-26	8.2	218	7.5	17.5	130	86.7	--	2.44	9	1.31	0.902	0.440	<0.105	114	83.2	0.024	0.46	0.091	0.055
TC6	9323 SW Lancaster Rd	2018-08-06	8.2	211	7.4	17.2	1500	86.4	--	2.67	<3	1.18	0.850	0.257	<0.106	89.7	92.1	<0.020	0.37	0.083	0.059
TC6	9323 SW Lancaster Rd	2018-09-17	8.6	161	7.4	13.0	560	79.1	--	7.11	<3	3.33	2.77	0.255	0.122	820	770	0.029	0.87	0.082	0.065
TC6	9323 SW Lancaster Rd	2018-10-03	8.0	236	7.3	11.1	280	95.5	--	4.09	6	3.04	1.14	2.03	<0.105	199	91.6	0.021	0.24	0.156	0.060
TC6	9323 SW Lancaster Rd	2018-11-28	10.9	60	6.8	9.9	3400	22.7	--	5.48	18	6.21	3.15	2.05	0.222	158	128	0.052	0.47	0.116	0.053
TC6	9323 SW Lancaster Rd	2018-12-03	11.0	185	7.4	8.0	86	68.4	--	2.83	<3	1.96	1.66	0.232	<0.105	73.1	71.1	0.036	1.5	0.051	0.034
TC6	9323 SW Lancaster Rd	2019-01-10	11.2	141	7.3	9.1	550	54.6	--	3.03	<3	2.91	2.02	0.432	0.136	64.6	54.4	0.025	1.28	0.055	0.039
TC6	9323 SW Lancaster Rd	2019-02-07	12.8	223	NR	4.2	63	81.7	--	1.93	14	1.66	0.935	0.956	<0.105	66.2	49.1	0.042	1.2	0.047	0.027
TC6	9323 SW Lancaster Rd	2019-03-21	11.8	207	7.4	9.6	130	79.5	--	1.97	<3	1.15	0.841	0.269	<0.105	50.8	44.7	<0.020	1.3	0.033	0.025

Table B-3. Fixed Instream Sites Results (2018–19 permit year) continued

Note: Biological oxygen demand (BOD) is only collected at the Columbia Slough fixed sites

Site ID	Location Description	Sample Date	Field Parameter				Conventional					Metals						Nutrients			
			Dissolved Oxygen (mg/L)	Conductivity (umhos/cm)	pH	Temp (C)	*E. coli* (MPN/100mL)	Hardness (mg $CaCO_3$/L)	BOD (mg/L)	Total Organic Carbon (mg/L)	Total Suspended Solids (mg/L)	Total Copper (ug/L)	Dissolved Copper (ug/L)	Total Lead (ug/L)	Dissolved Lead (ug/L)	Total Zinc (ug/L)	Dissolved Zinc (ug/L)	Ammonia-Nitrogen (mg/L)	Nitrate-Nitrogen (mg/L)	Total Phosphorus (mg/L)	Ortho-phosphate (mg/L)
TC6	9323 SW Lancaster Rd	2019-04-03	10.5	131	7.4	11.7	1600	42.8	--	5.80	21	8.07	3.65	5.21	0.320	109	62.4	0.106	0.82	0.129	0.037
TC6	9323 SW Lancaster Rd	2019-05-09	9.5	226	6.9	12.8	260	80.7	--	2.68	<3	1.46	1.17	0.168	<0.105	41.1	35.1	0.028	1.09	0.046	0.040
TC6	9323 SW Lancaster Rd	2019-06-03	9.3	228	7.7	13.3	460	86.6	--	2.57	<3	1.48	1.20	0.168	<0.105	32.1	25.0	0.024	0.97	0.062	0.043
Tualatin River																					
FC8	4916 SW 56th Ave (Main Channel)	2018-07-26	7.0	188	7.5	19.2	610	74.5	--	2.75	<3	1.55	0.868	0.682	<0.105	8.22	1.76	0.029	0.21	0.168	0.079
FC8	4916 SW 56th Ave (Main Channel)	2018-08-06	7.0	196	7.5	18.7	290	82.3	--	3.28	17	1.12	0.795	0.310	<0.106	3.71	1.66	0.026	0.16	0.146	0.094
FC8	4916 SW 56th Ave (Main Channel)	2018-09-17	7.4	110	7.4	13.2	630	57.6	--	8.93	5	5.03	3.91	1.07	0.297	10.3	5.04	0.034	0.37	0.141	0.082
FC8	4916 SW 56th Ave (Main Channel)	2018-10-03	7.3	216	7.4	11.7	1800	87.9	--	3.72	8	1.52	0.864	0.720	<0.105	7.12	2.16	<0.020	0.17	0.161	0.088
FC8	4916 SW 56th Ave (Main Channel)	2018-11-28	10.4	108	7.0	9.8	1000	40.0	--	5.74	16	4.62	2.63	1.66	0.252	29.5	16.2	0.043	0.60	0.144	0.059
FC8	4916 SW 56th Ave (Main Channel)	2018-12-03	10.8	153	7.3	6.6	230	58.9	--	3.38	<3	1.86	1.52	0.322	0.131	13.0	10.4	0.024	0.59	0.092	0.053
FC8	4916 SW 56th Ave (Main Channel)	2019-01-10	11.1	140	7.3	8.3	350	53.9	--	2.69	<3	2.00	1.48	0.596	0.164	15.0	10.5	0.021	0.735	0.074	0.035
FC8	4916 SW 56th Ave (Main Channel)	2019-02-07	13.6	207	NR	2.1	430	72.5	--	1.87	<3	0.946	0.721	0.170	<0.105	16.5	12.4	0.026	0.77	0.051	0.035
FC8	4916 SW 56th Ave (Main Channel)	2019-03-21	12.4	185	7.4	9.7	800	69.1	--	2.32	<3	1.03	0.786	0.171	<0.105	7.86	5.31	<0.020	0.72	0.045	0.034
FC8	4916 SW 56th Ave (Main Channel)	2019-04-03	10.6	139	7.3	11.4	3900	49.1	--	3.87	6	2.61	1.74	0.851	0.121	15.7	8.19	<0.020	0.49	0.087	0.042
FC8	4916 SW 56th Ave (Main Channel)	2019-05-09	9.0	198	7.0	13.9	460	70.2	--	2.99	6	1.25	0.996	0.327	<0.105	8.91	6.06	0.049	0.62	0.080	0.059
FC8	4916 SW 56th Ave (Main Channel)	2019-06-03	8.8	198	7.4	14.3	460	76.6	--	3.07	4	1.56	1.07	0.491	<0.105	7.32	2.79	0.024	0.50	0.118	0.082
Willamette River																					
BM	Morrison St Bridge - River Mile 12.7 Middle	2018-07-02	8.7	86	7.2	21.3	7	26.5	--	1.56	6	0.775	0.476	0.107	0.014	1.27	<0.527	0.067	0.32	0.050	0.040
BM	Morrison St Bridge - River Mile 12.7 Middle	2018-08-09	8.0	86	7.4	24.3	30	25.5	--	1.58	7	0.714	0.426	0.103	0.013	1.17	<0.527	0.084	0.33	0.063	0.041
BM	Morrison St Bridge - River Mile 12.7 Middle	2018-09-24	9.3	89	7.3	16.7	10	28.2	--	1.19	4	0.608	0.397	0.074	0.015	1.55	<0.527	0.108	0.31	0.053	0.040
BM	Morrison St Bridge - River Mile 12.7 Middle	2018-10-10	12.0	90	7.2	15.4	8	27.8	--	1.28	<3	0.686	0.531	0.078	0.028	1.48	0.805	0.115	0.40	0.064	0.043
BM	Morrison St Bridge - River Mile 12.7 Middle	2018-11-19	11.8	92	7.2	8.4	9	29.6	--	1.60	<3	0.628	0.333	0.051	0.015	1.58	1.05	0.133	0.39	0.070	0.058
BM	Morrison St Bridge - River Mile 12.7 Middle	2018-12-19	13.8	68	7.1	7.5	88	24.3	--	1.99	37	2.10	0.580	0.549	0.032	4.97	0.837	0.085	0.58	0.090	0.034
BM	Morrison St Bridge - River Mile 12.7 Middle	2019-01-09	13.0	73	6.9	6.6	16	25.1	--	1.46	5	0.881	0.455	0.125	0.024	1.97	0.786	0.095	0.75	0.051	0.033
BM	Morrison St Bridge - River Mile 12.7 Middle	2019-02-06	12.5	83	7.2	6.7	49	29.2	--	1.27	5	0.762	0.427	0.098	0.018	1.58	0.770	0.114	0.89	0.049	0.035
BM	Morrison St Bridge - River Mile 12.7 Middle	2019-03-14	13.4	88	7.0	7.1	10	31.1	--	2.11	8	1.04	0.614	0.142	0.030	2.08	0.929	0.091	1.0	0.051	0.040
BM	Morrison St Bridge - River Mile 12.7 Middle	2019-04-09	14.7	56	6.7	8.9	920	22.9	--	2.55	105	5.49	0.987	1.15	0.038	9.07	<0.527	0.065	0.71	0.154	0.029
BM	Morrison St Bridge - River Mile 12.7 Middle	2019-05-16	10.4	77	7.3	16.4	22	24.4	--	1.52	<3	1.54	0.361	0.128	<0.011	1.48	<0.527	0.052	0.34	0.036	0.024
BM	Morrison St Bridge - River Mile 12.7 Middle	2019-06-04	10.3	77	7.3	18.3	17	24.3	--	1.47	3	0.551	0.368	0.064	<0.011	0.847	<0.527	0.060	0.27	0.035	0.031
CM	St John's RR Bridge - River Mile 6.8 Middle	2018-07-02	8.7	91	7.2	21.4	4	28.6	--	1.48	8	0.822	0.520	0.118	0.017	1.20	<0.527	0.050	0.28	0.062	0.028
CM	St John's RR Bridge - River Mile 6.8 Middle	2018-08-09	7.6	99	7.0	24.8	13	27.1	--	1.60	7	0.997	0.518	0.141	0.014	1.76	<0.527	0.071	0.32	0.056	0.032
CM	St John's RR Bridge - River Mile 6.8 Middle	2018-09-24	9.8	93	7.2	17.7	10	28.5	--	1.26	4	0.761	0.447	0.103	0.014	1.22	<0.527	0.082	0.36	0.053	0.030
CM	St John's RR Bridge - River Mile 6.8 Middle	2018-10-10	11.8	88	7.2	15.7	19	26.6	--	1.22	<3	0.833	0.530	0.103	0.022	1.49	0.752	0.120	0.34	0.052	0.036
CM	St John's RR Bridge - River Mile 6.8 Middle	2018-11-19	11.1	90	7.2	9.1	120	28.4	--	1.65	4	1.49	0.790	0.109	0.022	1.94	0.929	0.123	0.40	0.071	0.058

Table B-3. Fixed Instream Sites Results (2018–19 permit year) continued

Note: Biological oxygen demand (BOD) is only collected at the Columbia Slough fixed sites

Site ID	Location Description	Sample Date	Field Parameter				Conventional					Metals						Nutrients			
			Dissolved Oxygen (mg/L)	Conductivity (umhos/cm)	pH	Temp (C)	*E. coli* (MPN/100mL)	Hardness (mg $CaCO_3$/L)	BOD (mg/L)	Total Organic Carbon (mg/L)	Total Suspended Solids (mg/L)	Total Copper (ug/L)	Dissolved Copper (ug/L)	Total Lead (ug/L)	Dissolved Lead (ug/L)	Total Zinc (ug/L)	Dissolved Zinc (ug/L)	Ammonia-Nitrogen (mg/L)	Nitrate-Nitrogen (mg/L)	Total Phosphorus (mg/L)	Ortho-phosphate (mg/L)
CM	St John's RR Bridge - River Mile 6.8 Middle	2018-12-19	13.6	71	7.2	7.1	71	24.3	--	1.60	10	1.05	0.495	0.245	0.033	2.57	1.02	0.073	0.52	0.059	0.037
CM	St John's RR Bridge - River Mile 6.8 Middle	2019-01-09	13.4	72	7.0	6.7	30	25.2	--	1.32	4	0.785	0.445	0.097	0.018	1.62	0.762	0.087	0.71	0.047	0.036
CM	St John's RR Bridge - River Mile 6.8 Middle	2019-02-06	12.4	83	7.3	6.7	34	29.4	--	1.68	3	0.640	0.403	0.082	0.018	1.48	0.841	0.117	0.87	0.045	0.035
CM	St John's RR Bridge - River Mile 6.8 Middle	2019-03-14	13.3	90	7.1	6.9	7	31.9	--	2.21	6	1.12	0.661	0.143	0.027	2.19	0.933	0.091	1.0	0.052	0.034
CM	St John's RR Bridge - River Mile 6.8 Middle	2019-04-09	14.6	56	6.7	8.9	820	20.6	--	2.78	46	3.86	0.987	0.743	0.038	5.56	<0.527	0.069	0.73	0.099	0.027
CM	St John's RR Bridge - River Mile 6.8 Middle	2019-05-16	10.2	87	7.3	17.3	20	25.9	--	1.49	3	0.728	0.520	0.064	0.016	1.13	0.660	0.041	0.38	0.034	0.024
CM	St John's RR Bridge - River Mile 6.8 Middle	2019-06-04	11.4	76	7.5	17.4	8	24.5	--	1.54	<3	0.585	0.386	0.074	0.013	0.885	<0.527	0.032	0.28	0.034	0.025
FM	Waverly Country Club - River Mile 17.4 Middle	2018-07-02	8.7	85	7.2	21.3	20	26.2	--	1.42	<3	0.643	0.458	0.068	0.021	1.01	0.544	0.080	0.31	0.057	0.045
FM	Waverly Country Club - River Mile 17.4 Middle	2018-08-09	8.1	83	7.0	23.7	19	24.6	--	1.40	3	0.530	0.357	0.053	0.013	0.886	<0.527	0.066	0.32	0.057	0.042
FM	Waverly Country Club - River Mile 17.4 Middle	2018-09-24	10.1	86	7.2	16.6	6	27.1	--	1.17	<3	0.651	0.355	0.078	0.015	1.05	<0.527	0.112	0.29	0.057	0.042
FM	Waverly Country Club - River Mile 17.4 Middle	2018-10-10	12.2	88	7.5	14.7	86	28.2	--	1.27	<3	0.683	0.446	0.085	0.027	1.29	0.850	0.107	0.34	0.056	0.047
FM	Waverly Country Club - River Mile 17.4 Middle	2018-11-19	12.0	92	7.3	7.9	17	27.5	--	1.51	<3	0.553	0.293	0.060	0.013	1.58	1.16	0.115	0.39	0.070	0.064
FM	Waverly Country Club - River Mile 17.4 Middle	2018-12-19	13.9	71	7.0	7.6	110	25.5	--	2.11	33	2.39	0.683	0.572	0.042	5.16	1.11	0.085	0.67	0.096	0.036
FM	Waverly Country Club - River Mile 17.4 Middle	2019-01-09	13.4	73	6.4	6.6	23	25.1	--	1.38	6	0.899	0.425	0.120	0.019	1.66	0.707	0.091	0.76	0.050	0.033
FM	Waverly Country Club - River Mile 17.4 Middle	2019-02-06	12.4	83	7.1	6.7	23	29.3	--	1.41	4	0.752	0.426	0.108	0.018	1.72	0.825	0.097	0.92	0.051	0.043
FM	Waverly Country Club - River Mile 17.4 Middle	2019-03-14	13.8	88	6.7	7.4	12	30.2	--	2.13	6	1.01	0.588	0.142	0.029	1.97	1.02	0.107	1.0	0.053	0.035
FM	Waverly Country Club - River Mile 17.4 Middle	2019-04-09	14.7	56	6.9	8.9	1100	24.6	--	2.75	105	6.41	0.979	1.33	0.052	10.9	0.854	0.073	0.73	0.173	0.029
FM	Waverly Country Club - River Mile 17.4 Middle	2019-05-16	10.7	76	7.2	16.1	55	24.5	--	1.35	<3	0.573	0.542	0.052	0.025	1.20	0.924	0.045	0.35	0.033	0.027
FM	Waverly Country Club - River Mile 17.4 Middle	2019-06-04	10.5	76	7.1	18.6	6	24.5	--	1.45	<3	0.513	0.345	0.049	<0.011	0.793	<0.527	0.076	0.25	0.038	0.032

Table B-4. Probabilistic Instream Sites Results (2018–19 permit year)

Site ID	Location Description	Sample Date	Field Parameter				Conventional				Metals						Nutrients			
			Dissolved Oxygen (mg/L)	Conductivity (umhos/cm)	pH	Temperature (C)	*E. coli* (MPN/100mL)	Hardness (mg $CaCO_3$/L)	Total Organic Carbon (mg/L)	Total Suspended Solids (mg/L)	Total Copper (ug/L)	Dissolved Copper (ug/L)	Total Lead (ug/L)	Dissolved Lead (ug/L)	Total Zinc (ug/L)	Dissolved Zinc (ug/L)	Ammonia-Nitrogen (mg/L)	Nitrate-Nitrogen (mg/L)	Total Phosphorus (mg/L)	Ortho-phosphate (mg/L)
Columbia Slough																				
0017	Peninsula Drainage Canal - 9111 NE Sunderland Ave	2018-08-06	6.1	412	7.5	21.1	41	132	10.4	23	0.702	<0.212	0.158	<0.106	1.80	<0.530	0.030	<0.10	0.305	0.058
0017	Peninsula Drainage Canal - 9111 NE Sunderland Ave	2018-10-16	6.2	283	7.0	12.0	160	117	6.57	12	0.894	0.362	0.292	<0.105	3.58	0.843	0.931	<0.10	0.177	0.037
0017	Peninsula Drainage Canal - 9111 NE Sunderland Ave	2019-02-27	10.6	198	6.8	3.3	98	86.3	3.62	9	1.91	0.957	0.330	<0.106	4.13	1.61	0.292	0.44	0.194	0.041
0017	Peninsula Drainage Canal - 9111 NE Sunderland Ave	2019-04-08	5.7	188	7.0	11.6	360	77.1	5.13	8	4.53	2.40	1.05	<0.105	9.98	4.19	0.259	0.35	0.244	0.041
0017	Peninsula Drainage Canal - 9111 NE Sunderland Ave	2019-06-19	5.6	281	7.3	19.0	190	128	7.64	4	0.510	0.331	<0.100	<0.105	0.865	<0.527	0.065	<0.10	0.115	0.042
0080	Upper Slough - N of 18008 NE Airport Way	2018-07-30	3.8	227	7.4	22.9	85	89.9	4.82	6	0.549	0.329	<0.100	<0.105	0.970	<0.527	0.056	<0.10	0.129	0.038
0080	Upper Slough - N of 18008 NE Airport Way	2018-10-16	7.4	198	7.1	10.7	10	79.0	6.04	7	1.11	0.767	0.275	<0.105	1.99	0.554	0.041	<0.10	0.111	0.034
0080	Upper Slough - N of 18008 NE Airport Way	2018-12-12	11.0	118	7.3	5.8	250	94.1	2.45	94	11.3	1.07	5.25	<0.106	56.0	2.34	0.128	0.52	0.457	0.030
0080	Upper Slough - N of 18008 NE Airport Way	2019-01-25	10.8	120	7.3	7.7	140	50.3	2.15	14	1.74	0.926	0.520	0.113	6.93	2.62	0.032	0.64	0.065	0.024
0080	Upper Slough - N of 18008 NE Airport Way	2019-05-22	7.7	185	7.2	16.3	63	71.4	4.54	6	1.21	0.807	0.256	<0.105	2.83	1.03	0.047	<0.10	0.092	0.037
0129	Upper Slough - 14912 NE Airport Way	2018-07-31	0.8	205	6.8	20.0	110	84.3	2.81	<3	0.364	<0.211	<0.100	<0.105	0.653	0.610	0.058	0.41	0.072	0.031
0129	Upper Slough - 14912 NE Airport Way	2018-10-16	5.5	193	7.1	12.6	30	76.1	5.06	4	0.813	0.618	0.191	<0.105	2.15	0.597	0.043	0.29	0.088	0.038
0129	Upper Slough - 14912 NE Airport Way	2018-12-12	8.7	118	7.3	6.8	140	81.0	2.16	12	3.47	1.09	0.881	<0.106	24.3	8.09	0.142	0.72	0.157	0.042
0129	Upper Slough - 14912 NE Airport Way	2019-01-25	10.6	125	7.1	8.4	52	51.6	2.15	7	1.48	0.952	0.372	<0.105	6.90	4.11	0.044	0.80	0.070	0.031
0129	Upper Slough - 14912 NE Airport Way	2019-05-22	8.9	168	7.1	16.4	74	65.1	4.08	3	1.13	0.756	0.236	<0.105	4.20	2.38	0.058	0.34	0.093	0.039
0273	Whitaker Slough - 6455 NE Columbia Blvd	2018-08-02	11.4	226	6.9	18.0	63	88.3	2.02	4	0.449	0.261	<0.100	<0.105	<0.500	<0.527	0.052	2.4	0.105	0.062
0273	Whitaker Slough - 6455 NE Columbia Blvd	2018-10-16	9.5	226	6.8	13.0	10	91.7	1.00	4	0.295	<0.211	0.078	<0.105	1.46	0.842	0.150	2.9	0.154	0.134
0273	Whitaker Slough - 6455 NE Columbia Blvd	2018-12-12	9.6	215	7.0	10.5	<10	154	<1.00	4	1.87	0.586	0.850	<0.106	5.68	2.38	0.073	3.6	0.266	0.128
0273	Whitaker Slough - 6455 NE Columbia Blvd	2019-02-22	12.2	220	6.4	8.8	<10	90.8	<1.00	<3	0.524	0.301	0.174	<0.106	3.01	2.15	0.052	3.0	0.144	0.103
0273	Whitaker Slough - 6455 NE Columbia Blvd	2019-05-23	13.9	213	7.2	18.1	20	81.7	1.91	4	0.797	0.466	0.230	<0.105	3.11	1.97	0.052	2.28	0.097	0.056
0329	Lower Slough - 3841 N Columbia Blvd	2018-08-08	14.2	229	8.4	23.1	220	92.1	2.19	16	1.00	0.414	0.824	<0.105	3.61	<0.527	0.027	1.5	0.114	0.026
0329	Lower Slough - 3841 N Columbia Blvd	2018-10-16	10.1	250	7.1	14.6	160	103	2.77	16	1.62	0.884	1.34	<0.105	8.84	2.18	0.251	2.4	0.141	0.045
0329	Lower Slough - 3841 N Columbia Blvd	2019-01-29	14.4	197	6.8	7.6	52	86.1	1.33	19	2.05	0.568	1.55	<0.105	11.5	2.85	0.074	2.4	0.164	0.067
0329	Lower Slough - 3841 N Columbia Blvd	2019-04-08	12.4	189	7.3	12.9	75	78.1	3.72	16	2.07	1.05	0.674	<0.105	10.3	3.84	<0.020	1.0	0.119	<0.020
0329	Lower Slough - 3841 N Columbia Blvd	2019-06-19	8.5	244	7.3	20.3	<10	96.6	2.50	30	2.04	0.533	1.73	<0.105	8.93	<0.527	0.182	1.57	0.138	0.028
Johnson Creek																				
0016	Kelley Creek - 17601 SE Foster Rd	2018-09-19	9.5	197	7.6	10.9	300	84.7	3.46	<3	0.754	0.521	<0.111	<0.105	1.74	<0.527	0.021	0.32	0.120	0.092
0016	Kelley Creek - 17601 SE Foster Rd	2018-10-10	9.7	169	7.3	12.1	63	69.8	4.59	<3	1.38	1.09	0.116	<0.105	2.43	1.23	0.029	0.44	0.093	0.084
0016	Kelley Creek - 17601 SE Foster Rd	2019-01-28	11.9	100	6.6	5.9	41	35.6	1.65	<3	0.723	0.531	0.111	<0.105	2.99	2.33	0.043	1.4	0.030	0.021
0016	Kelley Creek - 17601 SE Foster Rd	2019-04-08	11.3	66	6.7	9.6	1100	23.0	4.39	42	3.33	1.56	1.18	<0.105	13.2	4.08	0.028	0.96	0.165	0.057
0016	Kelley Creek - 17601 SE Foster Rd	2019-06-24	7.8	167	7.5	14.6	160	62.7	5.48	4	0.635	0.416	0.118	<0.105	1.49	0.862	0.050	0.11	0.087	0.069
0060	Veterans Creek - S of 10200 SE Mt Scott Blvd	2018-09-27	10.1	141	7.5	13.1	31	56.7	1.65	12	1.48	0.679	0.438	<0.105	8.66	1.95	<0.020	0.48	0.042	0.042
0060	Veterans Creek - S of 10200 SE Mt Scott Blvd	2018-10-15	10.8	129	7.3	10.9	<10	52.6	1.82	6	0.915	0.663	0.132	<0.105	4.17	2.18	<0.020	0.44	0.040	0.037
0060	Veterans Creek - S of 10200 SE Mt Scott Blvd	2019-02-27	13.3	110	7.1	3.4	63	38.9	1.60	<3	1.10	0.727	0.240	<0.106	10.6	7.22	<0.020	0.98	0.027	<0.020

Table B-4. Probabilistic Instream Sites Results (2018–19 permit year) continued

Site ID	Location Description	Sample Date	Field Parameter				Conventional				Metals						Nutrients			
			Dissolved Oxygen (mg/L)	Conductivity (umhos/cm)	pH	Temperature (C)	*E. coli* (MPN/100mL)	Hardness (mg $CaCO_3$/L)	Total Organic Carbon (mg/L)	Total Suspended Solids (mg/L)	Total Copper (ug/L)	Dissolved Copper (ug/L)	Total Lead (ug/L)	Dissolved Lead (ug/L)	Total Zinc (ug/L)	Dissolved Zinc (ug/L)	Ammonia-Nitrogen (mg/L)	Nitrate-Nitrogen (mg/L)	Total Phosphorus (mg/L)	Ortho-phosphate (mg/L)
0060	Veterans Creek - S of 10200 SE Mt Scott Blvd	2019-04-08	11.4	86	7.4	9.7	460	32.9	3.47	22	2.60	1.31	0.889	0.181	48.1	23.8	<0.020	0.71	0.061	0.022
0060	Veterans Creek - S of 10200 SE Mt Scott Blvd	2019-05-23	10.5	103	7.4	12.7	10	37.1	2.24	<3	1.28	0.874	0.166	<0.105	11.8	7.03	<0.020	0.63	0.037	0.021
0124	Johnson Creek - 6538 SE Barbara Welch Drive	2018-09-19	7.6	140	7.4	12.9	160	52.1	5.06	4	1.80	1.45	0.224	<0.105	6.84	4.47	0.048	0.33	0.082	0.064
0124	Johnson Creek - 6538 SE Barbara Welch Drive	2018-10-10	8.2	105	7.1	12.5	230	37.2	5.98	<3	2.49	2.17	0.192	<0.105	7.29	5.81	0.037	0.36	0.067	0.045
0124	Johnson Creek - 6538 SE Barbara Welch Drive	2019-01-28	12.6	88	7.0	6.0	86	29.8	1.41	<3	0.816	0.593	0.170	<0.105	4.51	3.20	<0.020	2.5	0.028	<0.020
0124	Johnson Creek - 6538 SE Barbara Welch Drive	2019-04-08	10.9	64	7.6	9.5	1100	24.0	3.26	106	4.57	1.46	2.44	0.111	28.3	5.54	0.027	1.3	0.165	0.031
0124	Johnson Creek - 6538 SE Barbara Welch Drive	2019-05-23	9.5	103	7.1	14.8	340	35.3	3.92	<3	2.13	1.38	0.256	<0.105	9.84	5.45	0.040	0.95	0.061	0.038
0188	Johnson Creek - SE 110th Ave Bridge	2018-09-06	6.8	162	7.1	17.6	210	55.8	5.12	4	1.55	1.21	0.179	<0.105	3.87	2.21	0.058	0.23	0.069	0.048
0188	Johnson Creek - SE 110th Ave Bridge	2018-10-10	9.5	108	7.3	12.7	74	38.9	6.15	<3	2.47	2.28	0.195	<0.105	4.65	3.09	0.024	0.37	0.076	0.049
0188	Johnson Creek - SE 110th Ave Bridge	2019-01-28	12.6	88	7.1	6.0	120	30.4	1.45	7	1.04	0.601	0.357	<0.105	6.26	2.41	<0.020	2.4	0.038	<0.020
0188	Johnson Creek - SE 110th Ave Bridge	2019-04-08	10.9	65	7.1	9.4	1400	25.5	3.23	103	4.74	1.32	2.48	<0.105	30.3	4.96	0.025	1.2	0.168	0.031
0188	Johnson Creek - SE 110th Ave Bridge	2019-05-23	9.6	99	7.2	15.0	600	33.0	4.09	4	2.18	1.60	0.288	<0.105	7.17	3.76	0.032	0.97	0.058	0.042
0272	Johnson Creek - 4950 SE 174th Ave	2018-09-05	7.8	157	7.3	15.9	150	53.1	4.02	9	1.52	1.06	0.270	<0.105	25.2	15.1	0.038	<0.10	0.075	0.038
0272	Johnson Creek - 4950 SE 174th Ave	2018-10-10	7.9	102	7.2	12.9	2400	37.5	6.52	3	3.07	2.55	0.287	<0.105	13.0	9.63	0.072	0.35	0.072	0.048
0272	Johnson Creek - 4950 SE 174th Ave	2019-01-28	12.5	82	6.9	5.7	130	27.7	1.26	<3	0.757	0.517	0.175	<0.105	4.63	3.15	<0.020	2.7	0.024	<0.020
0272	Johnson Creek - 4950 SE 174th Ave	2019-04-08	13.6	62	7.0	9.7	1400	23.8	3.06	158	5.57	1.27	3.24	<0.105	34.7	5.26	0.029	1.4	0.190	0.027
0272	Johnson Creek - 4950 SE 174th Ave	2019-05-23	9.0	95	7.0	14.8	330	32.1	4.12	5	2.37	1.63	0.359	<0.105	11.6	6.98	0.048	1.11	0.061	0.028
0352	Johnson Creek - 5840 SE Morris St	2018-09-11	7.9	184	6.9	15.9	1400	60.2	11.4	12	8.94	4.92	6.01	2.26	66.1	40.6	0.520	1.1	0.142	0.090
0352	Johnson Creek - 5840 SE Morris St	2018-10-10	10.6	131	7.2	12.9	170	41.4	5.64	<3	2.51	2.14	0.237	<0.105	4.39	2.63	<0.020	0.48	0.061	0.046
0352	Johnson Creek - 5840 SE Morris St	2019-01-28	12.9	90	7.3	6.3	41	30.9	1.50	<3	0.929	0.637	0.219	<0.105	4.04	2.18	<0.020	2.4	0.032	<0.020
0352	Johnson Creek - 5840 SE Morris St	2019-04-08	11.1	69	7.4	10.1	1100	25.9	3.41	94	5.07	1.50	2.73	0.112	30.2	4.73	0.022	1.2	0.168	0.031
0352	Johnson Creek - 5840 SE Morris St	2019-05-23	10.4	113	7.8	16.4	640	38.9	3.86	9	2.11	1.35	0.429	<0.105	7.44	2.45	0.021	1.13	0.072	0.045
Tualatin River																				
0058	Woods Creek - 8721 SW 47th Ave	2018-08-21	9.2	293	7.8	16.9	190	121	3.60	6	1.86	1.16	0.477	<0.105	5.07	2.61	<0.020	0.91	0.098	0.050
0058	Woods Creek - 8721 SW 47th Ave	2018-10-10	10.6	230	7.5	11.3	130	93.7	3.77	10	1.73	1.35	0.292	<0.105	4.23	2.33	<0.020	1.1	0.080	0.055
0058	Woods Creek - 8721 SW 47th Ave	2019-01-29	12.4	180	7.7	5.9	20	71.0	1.73	<3	1.01	0.805	0.289	<0.105	4.34	2.71	<0.020	1.6	0.046	0.038
0058	Woods Creek - 8721 SW 47th Ave	2019-02-12	12.5	69	6.8	5.4	3100	26.7	5.26	120	11.4	2.79	6.70	0.268	64.1	11.5	0.056	0.81	0.227	0.049
0058	Woods Creek - 8721 SW 47th Ave	2019-06-06	10.2	214	7.6	12.8	1500	95.2	2.54	26	2.00	0.903	1.24	<0.105	8.81	1.51	<0.020	1.25	0.111	0.055
0122	Golf Creek - SW Barnes Rd near W Burnside	2018-07-11	8.4	274	7.7	14.0	10	113	2.39	21	1.24	0.475	1.29	<0.105	9.53	1.54	0.635	1.1	0.146	0.066
0122	Golf Creek - SW Barnes Rd near W Burnside	2018-10-10	9.7	274	7.7	12.4	98	110	3.07	<3	1.03	0.727	0.383	<0.105	3.69	1.04	0.062	1.3	0.072	0.043
0122	Golf Creek - SW Barnes Rd near W Burnside	2019-02-13	11.6	247	6.4	6.9	20	88.9	1.91	10	1.89	1.13	1.25	0.331	19.7	14.2	0.037	0.47	0.055	0.028
0122	Golf Creek - SW Barnes Rd near W Burnside	2019-03-05	12.1	242	7.6	5.4	86	97.4	1.31	28	0.671	0.413	0.343	<0.105	5.37	3.05	0.090	0.54	0.034	0.023
0122	Golf Creek - SW Barnes Rd near W Burnside	2019-06-06	10.7	267	7.2	10.9	3900	101	2.54	22	1.15	0.705	0.612	<0.105	4.82	1.02	0.055	1.34	0.077	0.035
0298	Cedar Mill Creek - NW Mill Pond Rd at Cedar Creek	2018-08-28	8.3	203	7.5	18.2	340	81.0	4.63	18	1.45	0.646	0.246	<0.105	4.58	<0.527	0.073	0.14	0.141	0.052
0298	Cedar Mill Creek - NW Mill Pond Rd at Cedar Creek	2018-10-10	8.9	154	7.3	13.2	160	62.6	4.92	78	8.41	2.94	1.38	0.113	44.9	7.35	0.121	0.38	0.247	0.063
0298	Cedar Mill Creek - NW Mill Pond Rd at Cedar Creek	2019-02-12	12.6	72	6.5	5.3	930	35.5	8.93	259	13.5	3.69	5.19	0.445	65.8	14.9	0.033	0.65	0.347	0.062

Table B-4. Probabilistic Instream Sites Results (2018–19 permit year) continued

Site ID	Location Description	Sample Date	Field Parameter				Conventional				Metals						Nutrients			
			Dissolved Oxygen (mg/L)	Conductivity (umhos/cm)	pH	Temperature (C)	*E. coli* (MPN/100mL)	Hardness (mg $CaCO_3$/L)	Total Organic Carbon (mg/L)	Total Suspended Solids (mg/L)	Total Copper (ug/L)	Dissolved Copper (ug/L)	Total Lead (ug/L)	Dissolved Lead (ug/L)	Total Zinc (ug/L)	Dissolved Zinc (ug/L)	Ammonia-Nitrogen (mg/L)	Nitrate-Nitrogen (mg/L)	Total Phosphorus (mg/L)	Ortho-phosphate (mg/L)
0298	Cedar Mill Creek - NW Mill Pond Rd at Cedar Creek	2019-03-05	14.3	182	7.0	1.7	20	64.7	2.13	3	1.35	0.821	0.242	<0.105	8.02	3.94	0.027	0.81	0.058	0.028
0298	Cedar Mill Creek - NW Mill Pond Rd at Cedar Creek	2019-06-06	9.3	198	7.0	15.7	120	67.8	3.57	<3	1.63	1.22	0.137	<0.105	7.20	3.60	0.061	0.40	0.092	0.062
0314	Fanno Creek - 3455 SW Beaverton-Hillsdale Hwy	2018-09-10	5.6	183	6.7	17.1	63	65.0	2.67	17	2.94	0.605	3.29	<0.105	16.4	2.25	0.314	<0.10	0.496	0.363
0314	Fanno Creek - 3455 SW Beaverton-Hillsdale Hwy	2018-10-10	6.8	171	7.6	12.9	86	57.9	5.61	8	2.76	1.79	1.02	0.230	11.8	7.55	0.250	0.23	0.265	0.217
0314	Fanno Creek - 3455 SW Beaverton-Hillsdale Hwy	2019-01-29	11.4	183	7.2	5.5	86	71.9	2.07	8	1.65	0.801	0.793	<0.105	15.5	7.90	0.072	1.2	0.077	0.044
0314	Fanno Creek - 3455 SW Beaverton-Hillsdale Hwy	2019-02-12	12.2	57	6.8	5.5	1700	32.6	9.42	517	23.4	2.15	24.1	0.202	177	11.9	0.064	0.46	0.648	0.056
0314	Fanno Creek - 3455 SW Beaverton-Hillsdale Hwy	2019-06-06	8.3	201	7.1	14.8	230	78.2	3.61	13	1.86	1.04	1.07	<0.105	11.7	4.63	0.128	0.52	0.170	0.076
Willamette Tributaries																				
0012	Stephens Creek Tributary - SW Brier & Custer	2018-08-16	9.5	214	7.9	16.4	140	84.3	1.94	77	6.35	1.52	5.42	<0.105	34.3	4.75	<0.020	0.38	0.158	0.080
0012	Stephens Creek Tributary - SW Brier & Custer	2018-10-10	10.2	219	7.7	12.0	20	82.5	4.52	<3	9.68	8.76	0.133	<0.105	25.7	23.8	<0.020	2.1	0.083	0.043
0012	Stephens Creek Tributary - SW Brier & Custer	2019-01-29	12.2	229	7.6	6.6	10	93.4	1.93	<3	4.13	3.37	0.317	0.224	52.9	44.1	<0.020	3.0	0.037	0.041
0012	Stephens Creek Tributary - SW Brier & Custer	2019-02-12	12.4	94	7.3	6.1	250	38.5	4.55	237	57.2	6.86	10.2	0.160	321	51.7	0.500	0.28	0.353	0.022
0012	Stephens Creek Tributary - SW Brier & Custer	2019-06-06	8.4	236	7.2	12.2	30	91.9	1.98	<3	2.18	1.40	0.321	<0.105	14.5	11.5	0.082	1.19	0.095	0.086
0144	Nettle Creek - 1260 Hideaway Lane, Lake Oswego	2018-07-24	9.6	179	7.7	16.0	130	71.7	2.95	24	2.32	0.887	0.718	<0.105	13.9	1.91	<0.020	0.46	0.162	0.093
0144	Nettle Creek - 1260 Hideaway Lane, Lake Oswego	2018-10-10	10.7	165	7.6	11.4	280	60.0	4.13	<3	1.56	1.23	0.234	<0.105	4.35	2.37	<0.020	0.51	0.107	0.077
0144	Nettle Creek - 1260 Hideaway Lane, Lake Oswego	2019-01-29	12.6	156	7.8	6.0	180	55.8	1.84	<3	0.770	0.672	<0.111	<0.105	8.25	6.79	<0.020	1.2	0.041	0.032
0144	Nettle Creek - 1260 Hideaway Lane, Lake Oswego	2019-02-12	12.4	81	7.2	6.2	720	30.2	4.60	60	5.96	2.06	2.15	0.128	62.2	20.8	0.021	0.67	0.164	0.047
0144	Nettle Creek - 1260 Hideaway Lane, Lake Oswego	2019-06-06	10.6	177	7.2	12.4	180	66.5	2.40	4	0.910	0.606	0.175	<0.105	9.17	4.79	<0.020	0.68	0.089	0.067
0208	Tryon Creek - Tryon Creek State Park	2018-07-10	9.3	185	7.6	15.6	300	76.2	2.26	4	1.14	0.768	0.225	<0.105	10.3	6.01	<0.020	0.61	0.104	0.074
0208	Tryon Creek - Tryon Creek State Park	2018-10-10	10.3	162	7.6	11.3	110	60.6	3.66	6	2.30	1.68	0.322	<0.105	15.9	10.4	<0.020	0.67	0.116	0.075
0208	Tryon Creek - Tryon Creek State Park	2019-01-29	12.6	148	7.7	5.5	41	56.2	1.61	<3	0.913	0.718	0.121	<0.105	12.5	10.3	<0.020	1.4	0.047	0.041
0208	Tryon Creek - Tryon Creek State Park	2019-02-12	12.5	79	7.1	5.9	840	29.3	3.59	59	6.44	2.53	3.11	0.213	62.0	20.4	<0.020	1.0	0.151	0.058
0208	Tryon Creek - Tryon Creek State Park	2019-06-19	10.0	170	7.2	13.5	150	61.3	2.12	7	1.03	0.763	0.167	<0.105	8.91	6.18	0.020	0.60	0.088	0.080
0250	Balch Creek - Lower Macleay Park	2018-07-23	9.4	186	7.7	16.1	52	72.4	1.93	3	0.832	0.645	<0.100	<0.105	0.871	<0.527	<0.020	0.34	0.119	0.098
0250	Balch Creek - Lower Macleay Park	2018-10-15	11.8	188	7.8	7.7	41	76.8	1.98	<3	0.658	0.476	0.106	<0.105	0.999	<0.527	<0.020	0.34	0.100	0.090
0250	Balch Creek - Lower Macleay Park	2019-02-12	12.9	77	6.9	5.3	250	43.1	10.7	586	17.1	1.76	11.7	0.146	58.3	1.56	0.023	2.0	0.558	0.045
0250	Balch Creek - Lower Macleay Park	2019-02-27	13.8	108	7.3	2.6	63	37.1	2.50	<3	1.48	0.953	0.462	0.227	3.21	1.62	<0.020	1.8	0.064	0.037
0250	Balch Creek - Lower Macleay Park	2019-06-06	12.0	176	7.7	12.5	84	63.3	2.11	6	0.890	0.543	0.275	<0.105	1.52	<0.527	<0.020	0.47	0.089	0.085
0524	Stephens Creek - 7720 SW Macadam	2018-07-17	8.5	232	7.5	17.4	86	94.2	2.27	5	1.56	1.17	0.379	<0.105	5.22	3.02	<0.020	0.58	0.108	0.104
0524	Stephens Creek - 7720 SW Macadam	2018-10-10	10.0	199	7.8	12.2	31	86.5	2.70	<3	2.21	1.77	0.214	<0.105	4.69	3.32	<0.020	0.55	0.087	0.082
0524	Stephens Creek - 7720 SW Macadam	2019-01-29	12.5	202	7.9	5.8	52	83.0	1.90	<3	1.13	0.952	0.166	<0.105	7.86	6.25	<0.020	0.97	0.048	0.048
0524	Stephens Creek - 7720 SW Macadam	2019-02-12	12.5	94	7.3	6.4	2300	33.5	3.52	61	8.65	3.18	4.20	0.239	87.5	38.5	0.054	0.74	0.164	0.053
0524	Stephens Creek - 7720 SW Macadam	2019-06-06	10.0	227	7.5	12.9	110	94.8	2.17	<3	1.44	0.990	0.424	<0.105	7.61	3.58	<0.020	0.75	0.096	0.081

Table B-5. Macroinvertebrate Results (2018–19 permit year)

Sample Information			Raw Metrics										Standardized Scores										
Site ID	Collection Date	Fraction Sorted	Richness	Mayfly Richness	Stonefly Richness	Caddisfly Richness	Number Sensitive Taxa	# Sediment Sensitive Taxa	Modified HBI	% Tolerant Taxa	% Sediment Tolerant Taxa	% Dominant	Richness	Mayfly Richness	Stonefly Richness	Caddisfly Richness	Number Sensitive Taxa	# Sediment Sensitive Taxa	Modified HBI	% Tolerant Taxa	% Sediment Tolerant Taxa	% Dominant	TOTAL SCORE
0208	7/10/2018	6.25/30	25	3	1	4	1	0	5.0	15.0	5.6	15.5	3	1	1	3	1	1	3	5	5	5	28
0122	7/11/2018	3.5/30	22	2	3	1	3	0	6.1	13.7	4.3	28.9	3	1	3	1	3	1	1	5	5	3	26
0524	7/17/2018	17/30	19	1	0	2	1	0	5.8	21.3	11.4	44.1	3	1	1	1	1	1	1	3	3	1	16
0250	7/23/2018	19/30	37	7	4	6	2	0	4.0	12.5	3.3	25.1	5	3	3	3	3	1	3	5	5	3	34
0144	7/24/2018	13/30	27	3	1	3	2	0	4.5	16.3	3.4	20.8	3	1	1	1	3	1	3	3	5	3	24
0012	8/16/2018	22/30	16	0	0	1	1	0	6.3	16.5	14.3	34.7	1	1	1	1	1	1	1	3	3	3	16
0058	8/21/2018	27/30	17	3	0	2	1	0	4.7	7.4	7.2	54.7	1	1	1	1	1	1	3	5	5	1	20
0298	8/28/2018	4.75/30	19	1	0	2	1	0	6.1	18.5	7.4	36.6	3	1	1	1	1	1	1	3	5	3	20
0272	9/5/2018	21/30	23	4	0	2	1	1	5.8	64.4	46.5	45.5	3	3	1	1	1	3	1	1	1	1	16
0188	9/6/2018	27/30	24	4	0	1	1	0	6.0	62.5	46.4	37.0	3	3	1	1	1	1	1	1	1	3	16
0352	9/11/2018	7.5/30	29	6	0	5	1	1	5.4	58.7	26.4	19.6	3	3	1	3	1	3	1	1	1	5	22
0124	9/19/2018	30/30	15	1	0	1	1	0	5.9	79.1	73.9	72.9	1	1	1	1	1	1	1	1	1	1	10
0060	9/27/2018	6.5/30	27	4	3	1	3	0	4.5	41.1	12.4	29.1	3	3	3	1	3	1	3	3	3	3	26
0314	9/10/2028	8/30	12	1	0	0	1	0	6.3	41.9	4.4	34.5	1	1	1	1	1	1	1	3	5	3	18

Table B-5. Macroinvertebrate Results (2018–19 permit year) continued

Sample Information			Functional Feeding Composition										Density	Taxonomic Composition							
Site ID	Collection Date	Fraction Sorted	Collector-Filterers	Collector-Gatherers	Macrophyte-Herbivore	Omnivores	Parasites	Piercing Herbivores	Predators	Scrapers	Shredders	Unknown	TOTAL DENSITY (#/m_2)	EPT Taxa Richness	Predator Richness	Scraper Richness	% Intolerant Taxa	Number Tolerant Taxa	% Oligochaeta	% Simuliidae	% Chironomidae
0208	7/10/2018	6.25/30	10%	48%	0%	13%	2%	0%	7%	3%	17%	0%	3449	8	6	3	0.0	8	5.1	3.4	46.6
0122	7/11/2018	3.5/30	0%	48%	0%	31%	0%	0%	18%	0%	2%	1%	6389	6	6	2	0.4	2	3.2	0.0	77.3
0524	7/17/2018	17/30	5%	79%	0%	5%	0%	0%	6%	0%	5%	0%	1249	3	6	1	0.0	5	10.6	3.6	22.1
0250	7/23/2018	19/30	10%	54%	2%	3%	0%	0%	8%	7%	16%	0%	1090	17	13	5	4.7	8	1.6	0.2	20.1
0144	7/24/2018	13/30	11%	50%	0%	10%	1%	0%	4%	3%	22%	0%	1565	7	9	3	0.2	4	2.6	3.8	43.3
0012	8/16/2018	22/30	1%	40%	0%	2%	0%	0%	35%	19%	2%	0%	947	1	7	1	0.0	3	13.8	0.0	81.4
0058	8/21/2018	27/30	2%	90%	0%	3%	0%	0%	5%	0%	0%	0%	785	5	4	0	0.0	2	7.2	0.2	19.0
0298	8/28/2018	4.75/30	32%	23%	0%	31%	2%	0%	7%	4%	0%	1%	4691	3	5	1	0.0	3	7.4	13.8	51.4
0272	9/5/2018	21/30	24%	64%	0%	1%	0%	0%	8%	2%	0%	0%	976	6	6	4	0.0	7	45.5	0.6	28.3
0188	9/6/2018	27/30	27%	50%	0%	3%	1%	0%	5%	5%	0%	10%	809	5	6	5	0.0	10	37.0	0.0	24.4
0352	9/11/2018	7.5/30	18%	46%	0%	1%	1%	1%	3%	24%	0%	6%	2917	11	6	6	0.0	14	19.6	0.4	35.6
0124	9/19/2018	30/30	2%	81%	0%	4%	4%	0%	5%	3%	0%	2%	412	2	3	4	0.0	6	72.9	0.0	12.7
0060	9/27/2018	6.5/30	1%	64%	0%	1%	0%	0%	2%	22%	9%	1%	3353	8	3	2	20.7	3	10.2	0.0	5.7
0314	9/10/2028	8/30	11%	65%	0%	0%	0%	0%	22%	0%	0%	2%	2780	1	6	1	0.0	5	4.0	0.0	57.0

Part IV
CONTACT INFORMATION

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