Annual Compliance Report No. 27

Fiscal Year 2021–2022
(July 1, 2021, to June 30, 2022)

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, 2022

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

ANNUAL COMPLIANCE REPORT
Fiscal Year 2021–2022
(July 1, 2021 – June 30, 2022)

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.

Dawn Uchiyama
Digitally signed by Dawn Uchiyama
Date: 2022.10.24 17:34:25 -07'00'

Dawn Uchiyama
Director, Bureau of Environmental Services
City of Portland

10/24/2022
Date

Dan Pippenger
Chief Operating Officer
Port of Portland

10/5/2022
Date

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ANNUAL COMPLIANCE REPORT NO. 27

Fiscal Year 2021–22

(July 1, 2021 – June 30, 2022)

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Executive Summary

Introduction

This 27th *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 Number 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 September 15, 2021, and effective on October 1, 2021.

This report provides information about activities that have been accomplished in accordance with the co-permittees' 2011 Stormwater Management Plans (SWMPs) during fiscal year (FY) 2021–22, from July 1 through June 30. It also 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), (b) the City's Mercury Minimization Assessment (Part I, Appendix B), and (c) the Monitoring Report that summarizes sampling and monitoring activities conducted during FY 2021–22 (Part III). Updated SWMPs, adhering to program requirements outlined in the reissued 2021 NPDES MS4 permit, were submitted to DEQ November 1, 2022, by the co-permittees independently. Future annual reports will be based on the updated SWMPs, pending approval by DEQ.

The City of Portland continued implementation of all stormwater program elements in its 2011 SWMP through FY 2021-22. However, some program activities were curtailed due to the COVID-19 pandemic as City staff observed mandated public health and safety measures. As a result, a small number of the City's Measurable Goal targets for the year were not met; specifically, those associated with education and outreach that normally depend on in-person service delivery. Details of the City's missed targets are described in Part I, Section 13, of this report. The City notified DEQ of "anticipated noncompliance" at the onset of the pandemic.[1] The Port of Portland also notified DEQ of potential noncompliance (Part II, Section 1.1) but has been able to meet all its SWMP targets. Since the COVID-19 pandemic continues with severe ongoing impacts to social, educational, staff retention, and financial activities, the City and Port's "anticipated noncompliance" disclosures remain in effect. However, both entities continue to innovate and learn from these extraordinary circumstances and are fully committed to the ongoing implementation of the stormwater programs.

Notable Accomplishments

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

- ✓ Conducted various public involvement and education activities, which included providing in-person water quality education, outreach, and curriculum resources for approximately

[1] Letter from Loren Shelley (City of Portland BES) to Pablo Martos (Oregon DEQ), dated March 30, 2020.

11,525 K–12 students; awarding 9 community stewardship grants amounting to $113,140; involving over 5,000 participants and 3,600 volunteers in community events; and providing educational materials and outreach through the City's website, newsletter, bill inserts, Facebook page, and green blogs.

- ✓ Expanded online classes and other digital outreach and resources for students as part of the Clean Rivers Education Program including development of new materials for the distance learning webpage, facilitation of virtual field trips and field experiences, and digital lessons for families and teachers as part of the Virtual Children's Clean Water Festival.
- ✓ Conducted ongoing assessment, inspection, repair, and maintenance activities of MS4 components, including the cleaning of 7,993 green street facilities, 8,824 catch basins and inlets, 67,614 linear feet of ditches, and 17,525 lineal feet of pipes and culverts. Also, the City swept major arterials six times during the year and continued to sweep residential streets approximately once per year.
- ✓ Administered 235 Industrial Stormwater NPDES Discharge Permits with requirements to maintain best management practices (BMPs) for stormwater runoff. Conducted 235 site inspections on Industrial Stormwater NPDES-permitted sites.
- ✓ Promoted pollution prevention and environmental sustainability to Portland businesses by providing 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 58 enforcement actions against 36 responsible parties for prohibited discharges to the MS4 and conducted 143 inspections at 128 outfalls to identify illicit discharges.
- ✓ Managed 214 active public construction projects with erosion control components. Conducted 4,616 erosion control-related inspections of private construction sites and issued 1,807 associated enforcement actions, which includes stop work orders, correction notices, and notices of violation.
- ✓ Conducted stormwater management permit reviews reflecting 2,198 projects with private stormwater management facilities and an additional 656 pollution source control measures at commercial and industrial properties.
- ✓ Conducted inspections at 800 properties (containing 1,947 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 25.3 acres.
- ✓ Supported 69 private property retrofit projects associated with the City's Private Property Retrofit Program, treating a total of 20.1 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 31 new commercial site registrations and 1,964 new residential site registrations.
- ✓ Acquired 1.7 acres of land and planted 4,491 trees and 24,154 shrubs along 8,600 linear feet of streambank covering 8.8 acres. Also, in partnership with Friends of Trees and other

community planting partners, planted 1,782 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 include the following:

- ✓ Continued to conduct annual maintenance of storm sewer system components and structural controls and conducted regular sweeping on specific Port-managed properties.
  - These efforts included maintaining over 992 catch basins; inspecting and maintaining Port-owned water quality treatment facilities; cleaning 1,100 feet of storm line; and conducting 2,339.5 hours of street sweeping.
  - Together, these tasks (listed above) diverted approximately 301.2 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 69 outfalls within the Port's MS4 area. No potential illicit discharges were observed at any Port facilities.
- ✓ Continued to implement the Industrial Facility Inspection Program, inspecting a total of 27 priority industrial facilities in FY 2021–22. 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 stormwater pollution prevention and spill response (229 staff members) and erosion prevention. In addition, 75 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 and the Invasive Species Council Advisory Committee. 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 (ACWA), Oregon Association of Recyclers, Portland International Airport (PDX) Community Advisory Committee, and The Climate Registry.
- ✓ Continued to coordinate with the City of Portland on monitoring and compliance with MS4 deliverables in addition to the annual report.
- ✓ Continued 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.
- ✓ Prepared a Mercury Minimization Assessment (Attachment A of the Port's Annual Report).
- ✓ Tracked winter maintenance activities, including tracking winter events and applied deicing chemicals.

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 15,229 acres within the City of Portland's urban services boundary drain to the City's MS4.

Port of Portland: The Port owns approximately 5,466 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. Port property is divided into three primary Business Lines under the Operations Division: (1) Aviation, (2) Marine, and (3) Industrial Development, and Port property also includes Undeveloped Property.[2]

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 was administratively extended until the fourth term permit was reissued September 15, 2021, with an effective date of October 1, 2021.

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 ACWA. City and Port representatives participate in ACWA's water quality, stormwater, and groundwater committees.

[2] The Port's undeveloped properties within the USB include wetland and grassland mitigation sites, natural areas, and vacant tax lots.

Document Organization

The following table (Table E.1) outlines the organization of this annual report document, with respect to the 2021 NPDES MS4 annual reporting requirements per Schedule B(3) of the City and Port's NPDES MS4 permit.

The City has included the TMDL annual report for FY 2021–22 as Appendix A and Mercury Minimization Assessment as Appendix B with the 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 27 (FY 2021–22)

	Location in Document	
	City of Portland	**Port of Portland**
a) Status of implementing SWMP elements, including progress in meeting Measurable Goals and program tracking and assessment metrics.	Part I, Section 2 through 13	Part II, Section 7.1.1 through 7.1.8
b) Summary of the adaptive management implementation and any changes or updates to programs made during the reporting year, including new BMPs.	Part I, Section 1	Part II, Section 8.0
c) Any proposed changes to SWMP program elements to reduce TMDL pollutants to the MEP.	NA	II-8.0
d) A summary of education and outreach and public involvement activities, progress toward or achievement of measurable goals, and any relevant assessment of those activities.	Part I, Section 2	Part II, Section 7.1.6
e) A summary of the number and nature of enforcement actions, inspections, and public education programs, including results of ongoing field screening and follow-up activities related to illicit discharges.	–[a]	–[b]
f) A list of entities referred to DEQ for possible 1200-Z NPDES general permit coverage based on co-permittee screening activities, a list of categories of facilities inspected, and an overview of the results of inspections of commercial and industrial facilities.	Part I, Section 6	Part II, Section 1.0
g) 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
h) A summary of monitoring program results, including monitoring data that is accumulated throughout the reporting year submitted in the DEQ-approved Data Submission Template and any assessments or evaluations of that data completed by the co-permittees or an authorized third party.	Part III	Part III

	Location in Document	
	City of Portland	**Port of Portland**
i) Any proposed modifications to the Monitoring Plan necessary to ensure that adequate data and information are collected to conduct stormwater program assessments.	An updated Monitoring Plan was submitted to DEQ prior to November 1, 2022, in accordance with compliance dates outlined in the 2021 NPDES MS4 permit.	
j) 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, where such data is available.	Part I, Section 1, and Part I, Section 10	Part I, Section 1, and Part I, Section 10
k) The details of all corrective actions implemented associated with Schedule A.1.b.iii during the reporting year.	N/A	Part II, Section 9.0
l) Additional submittals listed in Schedule B.5.j that are due November 1, 2022. • Winter maintenance activities • Mercury Minimization Assessment	–[c]	–[d]

BMP = best management practice; DEQ = Oregon Department of Environmental Quality; MEP = maximum extent practicable; MS4 = Municipal Separate Storm Sewer System; NA = not applicable; NPDES = National Pollutant Discharge Elimination System; SWMP = Stormwater Management Plan; TMDL = Total Maximum Daily Load; UGB = Urban Growth Boundary.

a. Enforcement actions, inspections, and public education programs are included in the City's SWMP as BMPs and are reported along with the status of implementing all components of the SWMP in Part I, Sections 2 through 13.

b. 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 II-7.1.8).

c. Winter maintenance activities are reported in Part I, Section 4, of this annual report for the City. The Mercury Minimization Assessment is reflected in Part I, Appendix B, of this annual report for the City.

d. Winter maintenance activities are reported in Part II, Section 9.0, of this annual report for the Port. The Mercury Minimization Assessment is reflected in Part II, Attachment A, of this annual report for the Port.

PART I
CITY OF PORTLAND

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List of Tables

Abbreviations and Acronyms

BDS	Bureau of Development Services
BES	Bureau of Environmental Services
BMP	best management practice
BPS	Bureau of Planning and Sustainability
City	City of Portland
CMOM	Capacity, Management, Operation, and Maintenance
CSO	combined sewer overflow
CSSWF	Columbia South Shore Well Field Wellhead Protection Area
DEQ	(Oregon) Department of Environmental Quality
FEMA	Federal Emergency Management Agency
FY	fiscal year
IDDE	Illicit Discharge Detection and Elimination
IPM	integrated pest management
ISW	Industrial Stormwater Program
MIP	Maintenance Inspection Program
MS4	municipal separate storm sewer system
NEC	No Exposure Certification
NFIP	National Flood Insurance Program
NPDES	National Pollutant Discharge Elimination System
O&M	operations and maintenance
P2O	Pollution Prevention Outreach
PBOT	Portland Bureau of Transportation
PBOT-MO	PBOT Maintenance and Operations
PF&R	Portland Fire and Rescue
PP&R	Portland Parks and Recreation Department
PPRP	Private Property Retrofit Program
PWB	Portland Water Bureau
ROW	right-of-way
SAW	Sustainability at Work
SCM	*Source Control Manual*
SDC	system development charge
SMF	stormwater management facility
SPCR	Spill Protection and Citizen Response
SWMM	*Stormwater Management Manual*
SWMP	Stormwater Management Plan
TIP	TMDL implementation plan
TMDL	Total Maximum Daily Load
UIC	underground injection control

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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 Number 101314. This annual report represents activities occurring during the 2021-22 fiscal year (FY) from July 1 through June 30 and abbreviated as FY 2021–22.

The City received a reissued NPDES MS4 permit on September 15, 2021, listed as effective on October 1, 2021. However, reporting activities for FY 2021–22 were conducted based on the City's previous (2011) Stormwater Management Plan (SWMP) implementation and monitoring plan implementation in accordance with the administratively extended permit. An updated SWMP reflecting the new NPDES MS4 permit requirements and updated reporting schedule was submitted to the Oregon Department of Environmental Quality (DEQ) on November 1, 2022.

Annual reporting requirements related to program authority, adaptive management, urban growth expansion, and stormwater expenditures/funding sources are described here 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 2011 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 FY 2021–22 is collectively summarized for all BMPs in Section 13 under Program Management (PM-1).

The City of Portland continued implementation of all stormwater program elements in its SWMP through FY 2021–22. However, some program activities continue to be curtailed due to the COVID-19 pandemic as City staff observe public health and safety measures. As a result, a small number of the City's Measurable Goal targets for the year were not met; specifically, those associated with education and outreach that normally depend on in-person service delivery. Details of the City's missed targets are described in Section 13 of this report. The City notified the DEQ of "anticipated noncompliance" at the onset of the pandemic.[3] Since the COVID-19 pandemic is causing ongoing impacts to social, educational, and financial activities, the City's "anticipated noncompliance" disclosures remain in effect. However, the City continues to innovate and learn from these extraordinary circumstances and is fully committed to the ongoing implementation of its stormwater programs.

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 new 2022 TMDL Implementation Plan[4] and conducted during the permit year are identified in this MS4 annual r

[3] Letter from Loren Shelley (City of Portland BES) to Pablo Martos (Oregon DEQ), dated March 30, 2020.

[4] Submitted to DEQ on August 31, 2022, and pending approval.

eport 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 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, if Measurable Goals are being met or progress is being made toward meeting them (as applicable), and 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. The City provided its Permit Renewal Submittal to DEQ on July 31, 2015, which 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. As stated previously, an updated SWMP reflecting the 2021 NPDES MS4 permit requirements is being submitted to DEQ concurrent with this annual report on November 1, 2022.

The City continues to implement an annual adaptive management process to improve the overall implementation of key stormwater programs. No significant programmatic changes were implemented during the permit year as a result of the annual review process. However, the City anticipates adaptive management changes associated with the new MS4 permit issuance and 2022 SWMP.

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 according to 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 0.1 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 (2010–21). Table 0.1 also includes the anticipated monthly stormwater management charge and stormwater rate for the next permit year (2022–23).

1.4.2 Stormwater System Development Charges

Portland's 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 eligible for 100% credit for 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% for retention of the 100-year event to no discount for control of the 10-year storm.

Table 0.1: Stormwater Management and SDC Charges and Rates over the Permit Term

Stormwater Management Monthly Charges and Rates	2010–11	2021–22	% Change	Adopted 2022–23*
Single-Family Residential Charge	$21.79	$30.43	39.7	$31.20
Residential Rate ($/1,000 ft^2 impervious area)	$9.08	$12.68	39.6	$13.00
Nonresidential Rate ($/1,000 ft^2 impervious area)	$9.66	$13.10	35.6	$13.46
SDC Charges and Rates	**2010–11**	**2021–22**	**% Change**	**Adopted 2022–23***
Onsite Portion ($/1,000 ft^2 of impervious area)	$154.00	$263	70.8	$259.00
ROW Portion ($/linear foot of frontage)	$4.78	$7.84	64.0	$8.36
ROW Portion ($/vehicle trips)	$2.51	$4.36	73.7	$4.67

ft^2 = square feet; ROW = right-of-way; SDC = system development charge.
** 2022–23 rates were adopted May 2022.*

1.5 Stormwater Program Expenditures

The City of Portland has invested more than $2 billion in stormwater management services and facilities from initial permitting in 1994 through FY 2021–22. The revenue requirements for FY 2021–22 totaled approximately $181.0 million.

At the beginning of FY 2021-22, the City reorganized BES and altered the financial structure of the bureau. As such, the previous reporting methodology for revenue requirements by a major program category can no longer be replicated. The former structure no longer fully represents stormwater program expenditures. Additionally, the City is conducting a consultant-led cost-of-service study for sewer and stormwater revenues. Thus far, the cost-of-service study has identified higher expenditures on stormwater than had been identified in earlier cost-of-service studies. Next year, the City intends to replace the historical major program category structure with one available in the new financial structure.

In FY 2022–23, the City plans to invest $181.0 million in stormwater management services and facilities, which reflects the updated cost-of-service results. Direct monthly user fees will pay for 75% of these investments. Direct monthly user fees are lower than prior years because the cost-of-service study will influence utility rates in FY 2023-24.

1.6 Mercury Minimization Assessment

The City conducted a Mercury Minimization Assessment as required by the permit, which is included in this report as Appendix B.

Specific management strategies for Phase I NPDES MS4 permittees are included in Schedule D.3.b of the permit. Per Schedule D.3.b.i, the City must:

> Develop and submit a mercury minimization assessment with the annual report due November 1, 2022, that documents the current actions, such as BMPs implemented, that reduce the amount of solids discharged into and from the permitted MS4 system (similar to the actions currently required in Schedule A). If the assessment indicates that mercury and sediment reducing BMPs are fully incorporated into the SWMP Document, a report documenting the results as such is sufficient.

Based on the City's comprehensive MS4 program evaluation, and update as per the 2021 permit, BES has determined that **effective sediment and mercury reducing BMPs are fully incorporated into the City's new/proposed 2022 SWMP**. Table 3 in the proposed SWMP provides a cross-reference of each strategy to potential pollutants, including the TMDL parameters sediment and mercury.

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; causes and effects of water pollution; and what they can do to protect rivers, streams, and riparian areas. Examples of Clean Rivers Education Programs include the following.

***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 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 wastewater, modeling the steps taken at the City's treatment plant. Students learn how they can help at home, such as 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.

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.

Career awareness field trips. Select middle and high school students and high school summer interns visit sewer construction sites, the BES 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 field education programs that focus on stormwater management, watershed health, environmental stewardship, and sustainability. During FY 2021-22, Zenger Farms continued to offer open farm days for families and individuals to attend and provided educational activities.

Program adaptation and innovation during COVID-19 disruptions. Schools continued to be impacted by COVID-19 in FY 2021-22. Educators had limited classroom instruction through the fall and winter, and field trips weren't approved until March 2022. Additionally, field trips were limited due to bus driver shortages**.** Clean Rivers Education continued to offer expanded digital resources, including the following:

- The Clean Rivers Resources for Educators website added new content including curated videos, articles, and activities. The website received more than **6,622** external hits in FY 2021-22.
- A virtual field trip to Whitaker Ponds Nature Park. The field trip focused on riparian habitats and watershed health. All second- and third-grade Portland Public School students watched the video and completed related assignments. To date, the video has received more than **511** additional public views on YouTube.
- Produced a new video on wastewater treatment, "After the Flush: Recovering Energy and Nutrients in Portland's Wastewater." The video was created and filmed in FY 2021-22 and released at the beginning of FY 2022-23.
- Contributions to the Virtual Children's Clean Water Festival. The Virtual Children's Clean Water Festival is a series of water-related lessons designed to support fourth-grade students in their exploration and understanding of local water resources and systems. This year, the festival committee updated lessons and provided language translation for Spanish, Russian, Vietnamese, and Chinese. Lessons and resources were sent to more than 500 fourth- and fifth-grade teachers in the region.

- Support for Portland State University's *Science Inquiry in the Outdoor Classroom* capstone classes to update and enhance virtual field experiences for Errol Heights Park, Marshall Park, Oaks Bottom Wildlife Refuge, and Whitaker Ponds Nature Park.

Table 2.1: Educational Programs and Student Participation (FY 2021–22)

Educational Activity	Programs (#)	Student Contacts (#)*
Clean Rivers Education Classroom Programs	129	2,784
Clean Rivers Education Field Programs	77	1,453
Friends of Zenger Farm	199	7,288
Total	405	11,525**

** Some students participate in multiple programs or attend programs for multiple days, which would each be counted as one student contact. Only direct student participation is counted. Comprehensive digital participation data is not available.*

***Measurable Goal not met due to COVID-19-related disruptions preventing in-person classroom work. Refer to "Program adaptations and innovation during COVID-19 disruptions" described above and to Section 13 for more details.*

2.2 Community Stewardship Grants Program

BES's Community Watershed Stewardship Program grants, in place since 1995, provide up to $12,000 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 BES *Neighborhood to the River* Program.

Table 2.2: Community Stewardship Grants Issued (FY 2021–22)

Grant Name/Description	Watershed	Amount
Friends of Tryon Creek	Tryon Creek	$9,349
NAYA Family Center	Columbia Slough	$8,644
Historic Parkrose	Columbia Slough	$9,591
Friends of Pier Park	Columbia Slough	$11,995
Lloyd EcoDistrict	Willamette	$11,982
Camp ELSO Wayfinders Program and Tappin' Roots Internships	Willamette River and tributaries	$12,025
Tryon Creek Watershed Council Watershed 101 Mobile Training Program	Tryon Creek	$11,156
Portland Audubon Green Leaders Project	Columbia Slough	$18,835
Verde Urban Habitat Project	Columbia Slough	$19,563
Total		**$113,140**

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 Portland Parks and Recreation (PP&R), 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 educational monitoring activities related to outreach, specifically water quality and macroinvertebrate monitoring as immersive ways to explore the technical aspects of environmental stewardship.

Table 2.3: Stewardship Activities Conducted (FY 2021–22)

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.	70	1262	170
Willamette River	Willamette Watershed events conducted in partnership with Neighbors West-Northwest and the Westside Watershed Resource Center include Multnomah Days, the Stormwater Stars restoration and education event series, meetings with neighborhood associations and community groups, and generalized stormwater education.	13	746	125
Johnson Creek	Events coordinated with the Johnson Creek Watershed Council and community partners include creek cleanup events, a macroinvertebrate survey, Coho spawning surveys, lamprey surveys, beaver surveys, dragonfly surveys, Salmon Celebration/Sunday Parkways, student service-learning projects, Crystal Springs Partnership planting, and maintenance events. BES outreach for a capital stream restoration project (Crystal Springs Lake) was also conducted.	68	86	986
Fanno Creek	Events and activities conducted in the Fanno Creek Watershed and in partnership with Neighbors West-Northwest and the Westside 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.	6	20	265
Tryon Creek	Events and activities were conducted in the Tryon Creek Watershed, in partnership with the Neighbors West-Northwest, the 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.	9	185	353

Watershed	Description	Events* (#)	Participants (#)	Volunteers (#)
City wide	Natural area restoration field trips for K–college students were conducted in partnership with Portland Parks and Recreation. Activities include invasive plant removal and native plantings paired with field studies such as water quality monitoring and macroinvertebrate sampling.	19	364	13
City wide	Activities include outreach, education, and community engagement through the *Neighborhood to the River* Program.	29	292	228
City wide	The Green Street Steward Program recruits residents, businesses, and nonprofit organizations to volunteer and look after green infrastructure. The program also provides education, training, and tours to low-income communities, communities of color, and new bureau employees.	02	109	41
City wide	The City conducts outreach to the community and Portland State University students to apply for Community Watershed Stewardship Program grants.	27	649	68
City wide	Tree Program Community events are held.	26	1306	1430
Total**		**269**	**5,019**	**3,679**

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

*** The Measurable Goal was not met due to COVID-19-related disruptions. Refer to Section 13 for more details.*

2.4 Public Outreach

The City uses customer newsletters sent with bills, BES websites, and various social media accounts to distribute information directly to the public regarding stormwater, water quality, and water resources management. Outreach materials typically include information and suggestions on what residents and business owners can do to improve or prevent pollution of waterways and to protect natural resources.

The City's *RiverViews* newsletter was planned and designed during FY 2021–22. Development and production were delayed by COVID-19 disruptions. The City published *RiverViews* online in September 2021 in five languages. The print version in English was mailed to customers in Fall 2021.

Table 2.4: Public Outreach

Mailings and Bill Inserts	Materials Printed in FY 2021–22 (#)
Summer 2021 (June to Sept 2021) City of Portland Utilities Customer Newsletter • Main story: Feeling overwhelmed by your bill? Let's talk. (Financial assistance programs) • Other stories: Construction zone safety awareness; water conservation tips for summer; "Check the Rec" – water quality information for recreation on the Willamette River.	150,000; Link included in electronically sent bills
Fall 2021 (Sept to Dec 2021) City of Portland Utilities Customer Newsletter • Main story: Building for our future. Today's projects, large and small, help ensure all Portlanders have safe, healthy, and reliable sewer, stormwater, and water services now and into the future. • Other stories: Financial assistance programs; tree planting for healthy rivers; how to request administrative review for billing issues; How the WIFIA loan program is helping keep costs down on water infrastructure projects.	150,000; Link included in electronically sent bills
Winter 2021-22 (Dec 2021 to March 2022) City of Portland Utilities Customer Newsletter • Main story: How can financial assistance work for you? (Financial assistance programs) • Other stories: Hot tips for a cold winter — how to protect home plumbing and home maintenance to prepare for winter rains; construction of new facilities to improve treatment of lead in drinking water; "Do you live or work in a floodplain?" — guidance on how to prepare for floodplain emergencies.	150,000; Link included in electronically sent bills
Spring 2022 (March to June 2022) City of Portland Utilities Customer Newsletter • Main story: Improved Corrosion Control Treatment facility comes online to improve treatment for lead in drinking water. • Other stories: Do you safely contain the rain — promotional article for the Clean River Rewards program; "Need more time to pay your bill?" — financial assistance programs; "Yay! Spring" — tips for spring cleaning to help protect rivers and streams and conserve water.	150,000; Link included in electronically sent bills
BES Website Activities, Top Hits	**Page Views in FY 2021–22 (#)**
Stormwater Discount Program (Clean River Rewards) https://www.portland.gov/bes/grants-incentives/clean-river-rewards	6,862
Green Street Stewards Program https://www.portland.gov/bes/green-street-stewards/green-street-stewards	2,289
Treebate Incentives for Planting Yard Trees https://www.portland.gov/bes/grants-incentives/about-treebate	4,143
BES Social Media	**Page Views in FY 2021–22 (#)**
BES Facebook page (reported as reach versus page view)	11,479

2.5 Pet Waste Management

PP&R continues to encourage compliance with leash and scoop laws through education, enforcement, and provision of off-leash areas with waste bins. Specific programs include the following:

- 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.
- Tabling at parks by Leave No Trace Park Ranger educators with Leave No Trace materials for visitors to ensure leash and scoop compliance.

2.6 Alternative Transportation

The Portland Bureau of Transportation (PBOT) promotes carpooling, public transportation, and alternative commuting strategies to reduce emissions of toxic pollutants and to support climate action. Due to COVID-19, various activities occurred in different forms than they did in previous years. Activities conducted in FY 2021–22 include the following:

- PBOT continued to provide Bike and Walk maps covering Portland, including providing new bilingual English/Spanish editions of the Northwest/Downtown and Southeast Bike/Walk Maps and a mobile-friendly online version at PortlandBikeMap.com.
- The 2022 Portland By Cycle series kicked off in February with an Illuminated Ride where 350+ people rode in the downtown and Central Eastside areas. This effort was co-marketed with the Portland Winter Lights Festival. In addition, a Juneteenth Ride and an APANO[5]-led BIKETOWN ride were also held as part of Portland By Cycle outreach.
- PBOT hosted three Neighborhood Bike Fairs during June 2022 to facilitate and enhance the participation of black, indigenous, and people of color (BIPOC) communities during the summer biking season. Bike Fairs precede a neighborhood's annual Sunday Parkways event by 2 weeks and were held at REACH CDC affordable community housing, Rigler Elementary, and Lincoln Park Elementary. Events loaned bikes and most featured free tune-ups, learn-to-ride activities for children and adults, and bike safety activities. In total, 190 people participated.
- PBOT coordinated the Safe Routes to School program, which included over 100 schools in the City of Portland.
- Over 18,000 attendees and 150 volunteers participated in the return of Sunday Parkways in the Northeast Cully neighborhood, celebrating the program's 15th anniversary. The Sunday Parkways team partnered with Kaiser Permanente for a second year to host a Sticker Hunt; a citywide scavenger hunt encouraging people visits to parks and community spaces along the way by biking, rolling, scooting, or walking.

[5] *APANO: Asian Pacific American Network of Oregon*

- A Go By Greenways campaign ran in the Centennial neighborhood of East Portland. The intent of this campaign was to inform community members about the completion of neighborhood greenways and SE 136th Avenue walking and biking improvements. This campaign was promoted through 16 community-based organizations, 10 schools, and 3 businesses. Overall, through social media, mailers, email, and website visits, the program garnered 122,000 total impressions. Four local events promoted the campaign with a total of 72 attendees.
- BIKETOWN, Portland's bike-share system, continues to adapt to a dramatically changing transportation landscape, growing the service area by 28% in September 2021. The total trips for FY 2021–22 was 428,800 and reflect pre-pandemic ridership levels. Through June 2022, BIKETOWN trips increased year over year by 66%. BIKETOWN and staff held over 50 community-based outreach events with a focus on people living on low incomes, BIPOC communities and youth. Active user memberships grew from 200 to over 1600 since September 2020.
- Shared e-scooters in FY 2021-22 saw a 49% increase in ridership, with approximately 1,016,800 trips recorded.
- The Transportation Wallet Program is implemented in two parking districts (Northwest Parking District and Central Eastside Parking District). The program provides passes and credits for use on transit, the streetcar, and bike and scooter share programs. It is an effective, low-cost strategy to reduce parking demand and congestion by incentivizing trips taken on transit or by walking, biking, and scooting. People that live or work in either of the parking districts can get a Transportation Wallet by purchasing it (at a subsidized rate) or by foregoing an Area Parking Permit. In 2021, staff distributed 1,229 Transportation Wallets in the two parking districts. Staff offered 289 frontline workers Transportation Wallets in the Northwest Parking District Free in response to the ongoing COVID-19 pandemic.
- Phase 2 of the Transportation Wallet for Residents of Affordable Housing pilot program was launched in FY 2021-22, which offers a package of free transportation options, including transit passes, bike or e-scooter-share credit, and rideshare (Uber/Lyft) or taxi ride credits. The Phase 2 pilot sent out 383 Transportation Wallets to people and families at affordable housing sites across the city.

2.7 Regional Education

The City continues to participate in education and outreach opportunities with other jurisdictions as a member of the Oregon Association of Clean Water Agencies and other regional, opportunistic, and seasonal campaigns. Regional education programs include the following.

- **Clean Rivers Coalition.** The City participates in coordination activities for the statewide Clean Rivers Coalition. The coalition uses funds from participating jurisdictions to support the development and launch of branded, statewide clean water communications campaigns and campaign materials. The initial campaign focus is on pesticides and insecticides. The City's participation in FY 2021–22 included a $5,000 sponsorship contribution supporting marketing campaign development, community feedback, and participation in the identification of priority issues.

- **Regional Coalition for Clean Rivers and Streams.** The City participates in clean water education programming in the Portland metropolitan area. This coalition seeks to help residents make informed home and automobile care decisions that reduce stormwater pollution and improve watershed health through "The River Starts Here" campaign. The City's participation in FY 2021–22 included a $1,000 sponsorship to support awards for a high school student clean rivers practices video contest.
- **KPTV Campaign.** The City participates and contributes to the development and delivery of the "Clean Water — It's Our Future" campaign with a group of regional clean water partners. The campaign comprises a series of public service announcements (PSAs), social media posts, and website content focusing on practical advice for implementing clean water practices such as alternatives to herbicide use. The PSAs air during KPTV news segments, and complementary information is posted on the KPTV Community webpages and shared via Facebook posts. The City contributed $5,000 to this campaign in FY 2021–22 that was pooled with other jurisdictions' monies. The City also participated in the selection and development of messages. The PSAs aired throughout the year in 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, 2021

System Components	Assets (#)
Storm sewer culverts and pipes	445 miles
Stormwater conveyance ditches	95 miles
Storm inlets	55,897
Trash racks	328
Water Quality Facilities*	**Assets (#)**
Green streets	2,447
All other types**	432

**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.

PBOT Maintenance and Operations (PBOT-MO) 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 sanitary sewers, BES uses an asset management approach to stormwater 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, condition inspections are conducted annually at a minimum, and maintenance is conducted by City contractors or City staff approximately three to four 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.

Table 3.2: Storm System O&M Inspection Activities

System Components	Inspections in FY 2021-22
Storm sewer culverts and pipes	26,365 (feet)
Trash racks	3,217
Water Quality Facilities*	
Green streets	3,028
All other types	436*

**These numbers represent 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.

Table 3.3: Storm System Cleaning Activities

System Components	Cleanings in FY 2021-22 (#)
Storm sewer culverts and pipes	17,525 feet
Stormwater conveyance ditches	67,614 feet
Storm inlets	8,824 inlets
Trash racks	3,217 cleanings*
Water Quality Facilities	
Green streets	7,993 cleanings
All other types	153 cleanings

** This 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	Repairs in 2021-22 (#)
Storm sewer culverts and pipes	98 feet
Storm inlets and inlet leads	132
Water quality facilities	6

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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 the following:

- Following the Oregon Department of Transportation *Routine Road Maintenance Water Quality and Habitat Guide.*
- Controlling erosion during all sediment-disturbing activities.
- Using low-disturbance sign installation to prevent 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 materials from entering the MS4.

Table 4.1: Roadway O&M Activities

Street Sweeping	**Frequency (FY 2021-22)**
Major arterials	6 times/year
Residential streets	Once a year
Downtown core	3 times/week
Material Removed from City Roadways	**Amount (Tons) (FY 2021-22)**
Sediment and materials collected from street sweeping activities	3,527
Leaf material collected from the Street Leaf Removal Program	6,828*
** Equivalent to 12,155 cubic yards.*	

The City routinely investigates the potential use of alternative products and practices for 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 2021–22. 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 NPDES 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. Last season, PBOT used approximately 440 cubic yards of salt throughout the city in response to snow and ice events. Due to COVID-19 and technical constraints/staffing limitations for crews, salt use and application by region (e.g., Southwest Portland, Northwest Portland, Southeast Portland, North/Northeast Portland) were not tracked as previously reported.

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 that potential water quality impacts from deicing are minimized to protect 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 include 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 associated with the Pacific Northwest Snow Fighters Association prior to the start of the winter season in October.

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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; and 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 the following:

- **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 9,100 tons of leaves collected through the Street Leaf Removal Program every year at the 20-acre 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 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 1200COLS Industrial Stormwater Discharge Permit, but the permit was terminated by 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. 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, and 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. As of 2021, PP&R's portfolio of parks facilities included 154 developed parks (3,637 acres including developed parks, golf courses, and the Portland International Raceway), 7,890 acres of natural areas, and 142 undeveloped acres.[6] PP&R'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 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 the following:

- 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

[6] https://www.portland.gov/parks/park-system-numbers

- 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 FY 2021–22.

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 the following:

- Aerating and overseeding athletic fields to reduce the need for fertilizers
- Using central control irrigation systems to reduce water usage
- Prioritizing park areas that receive irrigation based on frequency and volumes
- Review irrigation plans to minimize maintenance and water usage

PP&R continued to follow these BMPs throughout FY 2021–22.

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 Portland Water Bureau (PWB) continues to submit requests to BES for such discharges. Discharges are approved on a case-by-case basis with a letter of authorization requiring appropriate BMPs that 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. The following table summarizes the City's discharge authorizations to the MS4.

Table 5.1: Discharge Authorizations to MS4

Discharge Authorization Type	Issued in FY 2021-22
Hydrant and water main discharges*	29
Tank and reservoir discharges	8
Uni-directional flushing discharges	22
Total	**59**

** The number of authorizations for hydrants and main drains was combined for FY 2021–22 because some water main drains will use hydrants instead of blow-off valves. This tracking avoids potential double counting.*

5.4 Fire-Fighting Practices

Portland Fire and 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 training-related discharges, equipment repair and washing, and fire station maintenance.

- **Training**. Fire-fighting training activities are conducted at PF&R's training facility located at 4800 NE 122nd Avenue. 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 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 are performed at PF&R's Logistics facility, located at 1135 SE Powell Boulevard, 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 due to 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, PWB, PF&R, and the Office of Management and Finance. Facility managers have committed to additional actions to limit water pollution, conserve water use, and restore habitat through 2021, at which time City operations met all requirements and were eligible for Salmon-Safe recertification.

Not all Salmon-Safe-certified bureaus shared interest in getting recertified. In light of this, BES and PP&R will partner on the park bureau's 2023 recertification to help improve stormwater and salmon habitat throughout their shared assets portfolios. BES is also coordinating with the Bureau of Planning and Sustainability (BPS) to strengthen the City's salmon recovery efforts through more landscape-level and zoning code improvements. Environmental and floodplain zoning code updates will protect critical habitat function in the City and require stricter environmental mitigation regulations on E-, P-, and C-zoned parcels slated for development.

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 such BMPs as 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 152 electric or plug-in hybrid sedan vehicles, representing approximately 41% of the sedan vehicle fleet to date (excluding police vehicles).

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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% 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 performs inspections of nonpermitted sites to assess the need for permit coverage, as well as evaluates sites with No Exposure Certifications (NECs) to verify that the permit exemption is valid. Finally, ISW 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 FY 2021–22, ISW issued five new General Industrial Stormwater Discharge Permits. ISW activities are detailed in Table 6.1.

Table 6.1: Industrial Stormwater Program Activities

Permitted Site Activities	Amount (FY 2021-22)
Permits administered*	235
Permitted site inspections	235
Enforcement actions issued**	327
Nonpermitted Site Activities	**Amount (FY 2021-22)**
Nonpermitted site inspections	112
Expiring NECs	35
NECs reissued***	35
New NECs issued	12

NEC = No Exposure Certification.

** 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 stormwater permit coverage due to changes in operations, 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 operators. The most-viewed BMP materials in FY 2021–22 are listed in Table 7.1. 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 in FY 2021-22
Catch basin maintenance	1,142
Sandblasting and painting operations	501
Emergency response and spill cleanup plans	216

7.2 P2O Team and EcoBiz Outreach

The City is a member of the Regional Pollution Prevention Outreach Team (P2O Team), which hosts the Eco-Logical Business Program (EcoBiz) to reduce pollutant discharges to the MS4 from commercial business operations. EcoBiz is a voluntary green business certification program for automotive repair shops, car washing businesses, and landscaping businesses in the State of Oregon to ensure sustainable and adequate environmental practices.

For a portion of the reporting period, the City funded a limited-term staff position to conduct outreach for EcoBiz awareness and participation by businesses; however, due to ongoing COVID 19 concerns, activities continued to be curtailed, and business interest was limited. Barriers to obtaining certification or recertification include business closure, ownership changes, financial impediments, and unsuitable site conditions. Additionally, the City of Portland was working to

broaden equity considerations in the EcoBiz landscaping checklist for much of the reporting period, so outreach was paused for this business sector.

Table 7.2 summarizes the status of landscaping and automotive businesses in the City's EcoBiz Program. Businesses identified as "in-progress" have shown interest in initiating certification, completed the certification checklist, are working on recommendations, and/or are ready for final inspection. For reporting purposes, they are included as a certified site under the EcoBiz program.

Table 7.2: EcoBiz Activities (FY 2021–22)

Category	Site Visits	In-Progress Certifications	Recertifications	New Certifications	Current Total*
Landscapers	0	0	0	0	6
Automotive	60	9	2	0	18
Total	60	9	2	0	24
* Total sites currently certified under the EcoBiz Program.					

7.3 Sustainability at Work

While BPS no longer offers certification or broad sustainability assessments, BPS staff will continue to provide in-depth assistance related to recycling, compost, and waste reduction to all Portland businesses. In accordance with Metro's Food Scraps Policy, which requires the largest food service businesses across the region to separate their food scraps from other garbage, BPS's business outreach team will be assisting restaurants, grocers, schools, and others to establish composting programs beginning in March 2022 and be fully completed by January 2025. In addition, BPS will continue to refer businesses to BES with stormwater management concerns.

7.4 Columbia South Shore Well Field Wellhead Protection Area

The City provides outreach and technical assistance to businesses and residents in the Columbia South Shore Well Field Wellhead Protection Area (CSSWF) 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 FY 2021–22 included the following:

- Maintained a multi-lingual, website version of the Aquifer Adventure environmental education event to continue delivering water protection messaging despite the infeasibility of in-person events.
- Provided technical assistance to businesses in the CSSWF on request.
- Provided a virtual groundwater protection workshop, including spill control basics, for businesses regulated under the CSSWF Protection Program.

- Distributed free spill kits, spill containment pallets, and spill response signs to assist businesses with pollution prevention.
- Maintained the Columbia Corridor Association and City of Portland webpages on the Groundwater Protection Program with information for businesses and residents.
- Conducted 154 site inspections for compliance with the City's *Wellhead Protection Area Reference Manual*

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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% 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 Illicit Discharge Detection and Elimination (IDDE) program performs inspections of 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 235 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 implemented a series of community collection events focused on low-income multifamily properties during the spring and summer of 2022. This work included 20 different events in partnership with 7 different community partners, including Rose CDC, Sabin CDC, Trash for Peace, Home Forward, and the African American Alliance for Homeownership. Over 54 tons of bulky waste and difficult-to-dispose items were either sent to the landfill or recycled, and more than 354 households were served.

The City also provided a grant of $750,000 to SOLVE, a statewide non-profit organization that works directly with the City of Portland to help clean up parks, neighborhoods, and business districts. During FY 2021-22, SOLVE organized 611 cleanup events and removed 826,000 pounds of trash. Litter cleanup events may be scheduled by community members, or residents can join an existing cleanup event online.

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 2021–22 are described in Table 8.1.

Table 8.1: Dry-Weather Field Screening Activities

Dry-Weather Field Screening Activities	Number (#) (FY 2021-22)
Major outfalls inspected	128
Inspections performed	143
Outfalls with flow observed*	54
Illicit discharges identified	0
** Many City outfalls convey flow from background sources, such as hillside streams.*	

There were no illicit discharge determinations nor follow-up actions to report related to the dry-weather screening.

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 FY 2021–22, SPCR received and responded to 1,846 calls and emails regarding pollution complaints, spills, sewer overflows, dye tests, and other pollution-related inquiries.

SPCR also facilitates spill-response coordination and participates on the Regional Spill Response Committee. The Regional Spill Response Committee typically includes representatives from different City bureaus and the DEQ, U.S. Coast Guard, Clackamas Water Environment Services, Port of Portland, and City of Gresham. During FY 2021-22, the Regional Spill Response Committee did not convene due to the ongoing COVID-19 pandemic and SPCR's prioritization of backlogged enforcement actions.

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. During FY 2021-22, BES implemented a hardship waiver program for small businesses, residents, and minority-owned businesses in accordance with the COVID-19 pandemic. See Table 8.2 for cases where inspections and investigations resulted in enforcement actions.

Table 8.2: Illicit Discharge Enforcement Actions (FY 2021–22)

Enforcement Type	Enforcements Issued (#)	Responsible Parties (#)	Penalties and Costs ($)
Notice of violation	50	36	$41,150
Notice of assessment of costs	7	7	$18,102
Warning notice	0	0	$0
Voluntary compliance order	1	1	$0
Compliance order	0	0	$0
Total	58	36	$59,252

8.2 Sewer Connections

During FY 2021–22, BES continued to implement Portland City Code Title 17.33 (Required Public Sewer Connection), which mandates properties using onsite wastewater disposal systems or nonconforming private sewer systems to connect to an available public sewer. The following work was completed during FY 2021-22:

- Seven properties were converted from onsite sewage/septic disposal systems to the City's sanitary sewer.
- Four hundred and five properties successfully resolved their existing, nonconforming sewer lines.

8.3 Sanitary Sewer Repair

BES continues to identify and repair sanitary sewer problems that may cause seepage to the MS4 and surface waters. Under the CSO and Capacity, Management, Operation, and Maintenance (CMOM) Programs, as well as general planning conducted in the Asset Risk and Operations and Maintenance programs for combined and sanitary systems, BES performed risk analyses and preventative maintenance activities. These activities help identify areas in the city where the existing collection systems may be in poor condition and have the potential to threaten surface waters and groundwater.

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.

CMOM program accomplishments during FY 2021–22 include the following:

- Inspected 0.97 million feet (183 miles) of sewer pipe, representing about 9.5% of the mainline sewer system.
- Cleaned 1.25 million feet (236 miles) of sewer pipe, or about 12.3% of the mainline sewer system.
- Repaired 6,538 feet (1.24 miles) of mainline sewer pipe; 52% of the repairs were in response to collection system problems.
- Repaired 549 service laterals (or 6,0 feet of pipe); 57% of the repairs were in response to discovered problems.
- Treated 307,806 feet (58 miles) of sewer pipe using chemical foaming.
- Inspected 25 manholes considered to be at greatest risk of failure.
- Completed 10 capital improvement program projects related to the repair, rehabilitation, and enhanced capacity of the sanitary and combined collection system in the 2022 calendar year, resulting in an estimated risk reduction of $16.7 million. Maintenance activities on mainlines and service laterals also resulted in an estimated risk reduction of $4.6 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. PP&R also places many portable restrooms in other parks to support sports programming.

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% 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 the 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 require a City building, public works, or development permit (Portland City Code Title 10.40) and when the disturbance area exceeds 500 square feet or the site meets the criteria for a special site (Portland City Code Title 10.30.030.A). BMP requirements are identified in the *City of Portland 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 as needed for problem and complaint-related sites. City

inspectors note deficiencies related to BMP implementation, effectiveness, and maintenance and require site operators to implement corrective action when needed.

The public works bureaus (PWB, BES, PBOT, and PP&R) 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	**Amount in FY 2021-22**
Permits issued with "ground-disturbing activities"	2,198
Site inspections	4,616
Enforcement actions and correction notifications issued*	1,807
Complaints received	56
Public (City) Sites	**Amount in FY 2021-22**
PBOT projects	50
BES projects	67
PWB projects	85
PP&R projects	12
Total active public construction projects with erosion control	214

BES = Bureau of Environmental Services; PBOT = Portland Bureau of Transportation; PP&R = Portland Parks and Recreation; PWB = Portland Water Bureau.

** Stop-work orders, correction notices, and notices of violation.*

The continuing COVID-19 pandemic resulted in reduced public education and outreach activities related to this BMP. Activities such as lunch-and-learns and the annual Take Our Kids to Work Day did not occur as conducted in previous years. Additional erosion control activities and accomplishments conducted during FY 2021–22 include the following:

- The City continued efforts to evaluate and conduct a major update the City's *Erosion and Sediment Control Manual,* including a review of the existing manual's structure, BMPs, and usability. Presentation to the Development Review Advisory Committee occurred on September 16, 2021. The manual's first draft and associated ordinance were released for public review on October 1, 2021 (FY 2021-22).
- PBOT construction managers provided erosion control program compliance and reporting at preconstruction conferences for 39 PBOT capital improvement projects.

9.2 Hillside and Slope Protection

The 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, continued to be implemented during FY 2021–22. 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%, 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 gives City bureaus the authority to require additional erosion control measures for sites with slopes greater than 10%.
- Portland City Code Title 10.30.020.B.4.e prohibits ground-disturbing activity taking place on sites located in the Balch Creek Subdistrict of the Northwest Hills Plan District between October 1 and April 30. The prohibition is not subject to Alternate Methods review per Section 10.40.040. (See Chapter 33.563 of the City of Portland Zoning Code.)

9.3 Employee Training

The City continues to provide educational training to staff on O&M and construction practices to protect water quality. The COVID-19 pandemic resulted in cancellation of the annual construction inspector training for BES staff. BDS staff continue to pursue continuing education credits for current erosion control certifications.

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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 O&M plans are followed.
- Revise the Stormwater Management Manual (SWMM) during the 2011–16 permit term.
- Track number, type, size, drainage area,[7] 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 retention, flow control, and water quality treatment using green infrastructure as well as gray stormwater management facilities. In conjunction with requirements of the City's NPDES MS4 permit, onsite infiltration is required to the maximum extent feasible, and the 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.

10.1.1 Monitoring and Evaluation

BES revises the SWMM periodically to meet current regulatory requirements and to provide current technical standards. The City completed an update to the SWMM that became effective in December 2020. The 2020 SWMM revision was comprehensive and included clarifications around triggers and exemptions, adding more detailed guidance on geotechnical investigations, updating facility (BMP) details, reworking engineering assumptions used to size facilities, and increasing the applications of orifice controls to manage stormwater runoff volumes and reduce potential hydromodification impacts.

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

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 FY 2021–22, 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 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.
- Continued monitoring of a group of green streets to test a modified underdrain system and different soil media blend. These facilities are being monitored for water quality, plant health, soil moisture, and infiltration performance.
- Continued soil moisture and plant health monitoring for new and retrofitted green streets to test different underdrain configurations and soil blends for improved performance for moisture retention and plant health.
- 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.

Due to the COVID-19 pandemic and other related factors, during FY 2021-22 there was a reduction in development activities including new permit issuance and recorded O&M agreements. Table 10.1 reflects O&M agreements recorded only for finalized permits, reflecting as-built conditions, and not permits that are still in process (for which on-the-ground conditions can change between initial O&M submission and construction).

Table 10.1: SWMM Implementation Activities

Development Planning	Amount in FY 2021-22
Land use reviews conducted	352
Early assistance request responses and pre-application conferences	261
Development Review and Construction*	**Amount in FY 2021-22**
Public works project permit approvals	13
Projects with SMFs constructed**	58
Impervious area managed by constructed SMFs	10 acres
O&M	**Amount in FY 2021-22**
O&M agreements recorded with finalized permits	139
SMFs covered by O&M agreements	286
Properties covered by O&M agreements	171
Impervious area managed under O&M agreements	164 acres
Properties inspected for O&M requirements	800
SMFs inspected for O&M requirements	1947
Enforcement actions issued***	8

O&M = operations and maintenance; SMF = stormwater management facility; SWMM = Stormwater Management Manual.

** Counts of SWMM permit reviews are no longer reported. Data systems do not support the ability to distinguish between SWMM-related permit reviews and other non-SWMM-related business processes. Existing data reports capture a range of permit-related activities that do not exclusively target permit reviews and are combined with assessment of fees that do not necessarily involve SWMM implementation.*

*** The total is presented for projects in the MS4 area with a permit status = "Final." In previous years, the total was for citywide results for projects with a variety of permit statuses. Projects with SMFs constructed are counted by property, sometimes with multiple facilities and/or permits per property. Using the same criteria, the FY 21 total was 34 projects with 6 acres of impervious area managed in the MS4 area.*

**** Warning notices, notices of violations, and voluntary compliance agreements.*

10.3 Pollution Prevention and Source Control

BES's Development Planning and Pollution Prevention Plan Review teams conduct land use and pollution source control permit reviews associated with commercial and industrial properties subject to requirements in the City's *Source Control Manual* (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 pollutants in stormwater, groundwater, and wastewater.

BES revised and updated the SCM in December 2020, and it has been in effect since March 2021. Notable revisions include added requirements for secondary containment of liquids in waste storage areas, food cart pods, motorized vehicle storage and repair facilities, and additional requirements for contaminated sites. Table 10.2 reflects source control BMP applications specific to land use reviews conducted in FY 2021-22.

Table 10.2: Source Control Management Activities

Case Reviews	Amount in FY 2021-22
Land use reviews conducted*	352
Contaminated site reviews	148
Total	**500**
Pollution Source Control Measures Required and Installed (by Activity Area)	**Amount in FY 2021-22**
Trash and recycling areas	331
Loading docks	24
Fueling stations	18
Boilers and chillers	6
High-risk vehicle and equipment areas	2
Water reclaim/reuse	2
Wash racks	9
Liquid storage areas	56
Dewatering/subgrade structures	177
Covered parking	22
Water features	1
Exterior bulk storage	5
Tank farms	3
Total	**656**

SCM = Source Control Manual.

** The number of land use reviews does not reflect the number of projects with SCM requirements.*

10.4 Retrofit Funding Mechanisms

During FY 2021–22, through SWMM implementation, BES continued to evaluate development projects subject to the Special Circumstances provision. The process allows for payment in lieu of providing onsite stormwater management for qualifying projects. Payments help fund and offset costs of other stormwater management projects implemented through the "% for Green" program (https://www.portland.gov/bes/grants-incentives/percent-green [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 during FY 2021–22 include the following:

- Updates to the stormwater service categories using the best available data. Service categories assessed included:
  - Water quality degradation
  - Habitat degradation
  - Stormwater system deficiencies that impede community development
  - Instream erosion due to development activities
  - Landslide hazards
  - Localized nuisance flooding
- Development of integrated stormwater system planning tools and approaches to support broader BES stormwater and watershed planning, monitoring, analysis, and decision-making.
- Coordination with the Asset Inventory and Condition Assessment program to gather information and data to evaluate risks and opportunities associated with the existing stormwater system.

- Continued coordination with the Oregon Department of Fish and Wildlife to update the 2000 Stream Habitat Surveys, including geolocating of culverts and outfalls in surveyed streams.
- Initiated hydromodification studies to support stormwater system planning.

11.2 Tracking and Mapping of Structural Storm System Facilities

The City maps and tracks structural MS4 components on an ongoing basis using a combination of a robust asset management system (Infor Public Sector) and ESRI GIS products. 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 continually updates the asset inventory as new structural components are 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 Private Property Retrofit Program, the Clean River Rewards Program, and the Backyard Habitat Certification Program. The City's Green Building and Development Program recently shifted to an internal, bureau-focus program and now applies only to City-owned and managed assets instead of having a community-based focus.

Efforts are summarized in Table 11.1. The City's Community Watershed Stewardship Program is referenced in Section 2, PI-1, of this report.

- **Green Building and Development Program.** From 2000 to 2018, the BPS Green Building and Development Program worked with residents, businesses, and community partners to advance sustainable building practices, including stormwater management for new construction on private property. However, the program is no longer operating. If stormwater management-related questions are asked, BPS refers people to relevant BES programs and incentives.
- **Stormwater Technical Assistance.** BES employs multiple subject matter experts who field public requests for information and provide technical assistance on 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 (PPRP) partners with private property owners to manage stormwater onsite by helping with the installation of rain gardens, stormwater planters, swales, drywells, and pervious pavement on properties that meet program criteria. City project managers design and install new stormwater systems in targeted neighborhoods at no cost to the property owner. In turn, property owners agree to keep and maintain the new stormwater facilities. O&M agreements are recorded with Multnomah County to ensure the facility is properly maintained and remains in place post-construction.

Participation is voluntary, and the stormwater facilities are inspected long-term under the administration of the Maintenance Inspection Program (see Section 10, ND-2, of this report).

- Most of PPRP's work occurs in the City's combined sewer areas to address system capacity issues. During FY 2021-22, 69 projects were implemented in the City's Eastside Combined Sewer area to manage approximately 1.8 acres of impervious area. In addition, PPRP has begun outreach efforts in support of retrofit projects at the Greater Portland Bible Church in the Stephen's Creek watershed, which are slated for construction in Fall 2022.
- During FY 2021-22, PPRP developed a protocol for program implementation in industrial areas that contribute stormwater runoff to MS4 outfalls to the Columbia Slough, in support of the Bureau's Columbia Slough Sediment Program. The first target basin is Outfall 65 (OF65) with outreach beginning in the summer of 2022. Expansion of PPRP projects and partnerships along the Columbia Slough is planned to support water quality goals in priority outfall basins.
- PPRP also manages the drainage inquiry hotline and email, providing stormwater technical assistance to ratepayers and citizens throughout the city. Basement water intrusion issues, drainage problems, and stormwater retrofit advice are the most common inquiries. This past year, PPRP responded to 180 inquiries, 64 resulting in onsite technical assistance site visits. The public can access this service by calling 503-823-5858 or via email at drainage.inquiries@portlandoregon.gov.

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% 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 maintains a contract with the Columbia Land Trust, the fiscal agent for the Backyard Habitat Certification Program, for professional, technical, and expert services. The current contract is for 3 years: FY 2021 through 2023, with a 1-year extension through FY 2024. The Backyard Habitat Certification Program focuses on reducing impervious areas, managing private property stormwater, removing invasive species, and restoring native vegetation.

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

Stormwater System Program	**Number in FY2021-22**
Requests for green streets and other projects	3
Outreach (presentations, conferences, and tours)	3
Clean River Rewards	**Number in FY2021-22**
New registrations – Commercial sites	31
New registrations – Residential sites	1,964
Total impervious area currently covered by the program	**3,828 (acres)**
Private Property Retrofit Program	**Number in FY2021-22**
Number of private property retrofit projects through program partnerships	69
Acres of impervious area managed in these projects	1.8 (acres)
Total impervious area managed through program to date	**20.1 (acres)**
Backyard Habitat Certification Program	**Number in FY2021-22**
Number of (new) households receiving funding	174
Acreage (new) managed	770
Plants provided	37,122+

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 approximately 2,700 green streets. Roughly 640 are in the MS4 area.

Retrofit projects that were in design or construction phases during FY 2021–22 are listed in **Error! Reference source not found.** at the end of this section.

11.5 Retrofit Funding Mechanisms

During FY 2021–22, BES continued to implement the "% for Green" program to fund green street and water quality retrofit projects. The program expanded in January 2021 to fund stormwater improvements on private property.

Under the % for Green program, BES supports construction of stormwater facilities by taking 1% of the construction costs from City infrastructure projects that do not trigger the SWMM and utilizes a selection process to fund stormwater 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 completed:

- SW 50th Avenue stormwater improvements
- N Argyle green street
- N Willamette Boulevard depave and green street

During FY 2021–22, the program coordinated with the Community Watershed Stewardship Program to reach more people and fund more projects.

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Table 11.2: Storm System Retrofits and Green Street Projects

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 outfall basins and watershed improvement opportunities.	North Portland	Project Development	E10690	TBD	59, 60, 61, 61A
Columbia Slough	TBD	Project to provide stormwater treatment for City outfall basins and watershed improvement opportunities.	Northeast Portland	Project Development	E10700	TBD	62, 62A, 63, 64, 65A
Columbia Slough	TBD	Project to provide stormwater treatment for City ROWs.	North Portland	Design - 30%	E11279	TBD	58
Columbia Slough	TBD	Project to provide stormwater treatment for City ROWs. Coordination with PBOT's Columbia/ Lombard Mobility Corridor Plan.	Northeast Portland	Design - 30%	E11304	TBD	65
Columbia Slough	TBD	Project to provide stormwater treatment for City ROWs.	Northeast Portland	Design - 30%	E10626	TBD	73A
Columbia Slough	Green street	Interagency project with PBOT to provide stormwater treatment for improved City ROWs. Includes the installation of 26 green street facilities.	Northeast Portland NE 47th Avenue, between NE Columbia Boulevard and NE Cornfoot Road	Construction - Complete	E10853	2.1	AAL542 AAL552 ANF554
Columbia Slough	Green streets, UICs, and filter vaults	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	Wetland enhancement	Enhance wetland to improve water quality and habitat. Partnership with Portland State University's Indigenous Nations Studies Program.	East Columbia neighborhood	Construction - 50%	E11223	NA	NA
Columbia Slough	UIC and green streets	Subsurface stormwater treatment facilities and green streets to treat stormwater runoff from City ROWs.	Parkrose neighborhood	Construction - Complete	E10689	22	100
Columbia Slough	Green street	City ROW project including the installation of two green streets to manage street runoff.	N Argyle Way, north of N Argyle Street	Construction - Complete	TH0818	0.3	60
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 Taylors Ferry Road	Construction - 50%	E10939	102	Various
Fanno Creek	Green street	Interagency project with PBOT to provide stormwater treatment for a LID to improve the City ROW. Includes the installation of two green street facilities.	Southwest Portland SW 47th Avenue, N of SW Luradel Street	Construction – Complete	E10950	0.3	AQB886
Johnson Creek	Stream restoration	Remove Works Progress Administration levee and reconnect and restore floodplain, restore instream habitat in Johnson and Errol Creeks, and improve fish passage through the existing fish ladder.	Johnson Creek mainstem, just west of the intersection of SE Harney Street and SE 45th Avenue	Design – 30%	E08406	NA	NA
Johnson Creek	Stream and wetland restoration	Retrofit an existing in-line pond to improve water quality (specifically, reduce temperature).	West of SE 110th Avenue, south of Foster Road	Project Development	E11260	NA	NA
Johnson Creek	Stream and wetland restoration	Restore wetland and floodplain habitat.	North of SE Jenne Road, west of SE Circle Avenue	Design – 30%	E08247	NA	NA
Johnson Creek	Wetland restoration	Restore wetlands to improve water quality, flood storage, and habitat.	Between SE Foster Road and SE Harold Street, between SE 104th and SE 120th Avenues	Design – 90%	E07383	NA	NA
Johnson Creek	Stream restoration	Remove Works Progress Administration rock-wall channel lining and restore floodplain, wetlands, and instream habitat.	Johnson Creek mainstem, south of SE Flavel Street, west of SE 92nd Avenue	Design - 60%	E10993	NA	NA
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)	Construction - 10%	E07518	NA	NA

Table 11.2: Storm System Retrofits and Green Street Projects

Watershed	Retrofit/Facility Type	Project Description	Project Location	Project Status	Job #	Area Treated (acres)	MS4 Outfall
Tryon Creek	Culvert replacement/bridge construction	Remove an undersized culvert and replace with a bridge to improve fish passage.	SW Boones Ferry Road at SW Arnold Street (confluence of Arnold and Tryon Creeks)	Construction - Complete	E08682	0.6	Near ANT403
Willamette River	Stream enhancement	Third of three projects at the Stephens Creek headwaters to manage stormwater flows and enhance water quality and habitat.	Stephens Nature Park (on hold due to technical issues)	Design - 60%	E10596	TBD	ACS140 (Custer)
Willamette River	Outfall repair	Repair three outfalls and improve a ditch in the Stephens Creek watershed.	SW Taylors Ferry Road, SW Boones Ferry Road	Design - 30%	E11186	NA	ACY343 ACY397 ACY401
Willamette River	Stream enhancement	Two of three projects at the Stephens Creek headwaters to manage stormwater flows and enhance water quality and habitat.	Custer Park (project abandoned)	Design - Final	E10912	TBD	ACS140 (Custer)
Willamette River	Trash rack restoration	Upgrade and repair the Balch Creek trash rack.	Lower MacLeay Park	Construction - Complete	E10583	NA	ABB702
Willamette River	Stream enhancement	One of three projects at the Stephens Creek headwaters to manage stormwater flows and enhance water quality and habitat.	SW 26th Avenue and Texas Street	Construction - Complete	E10911	TBD	ACS140 (Custer)
Willamette River	Green street	City ROW project including the installation of two green streets to manage street runoff.	SW 4th Avenue and Montgomery Street, and SW 3rd Avenue and Harrison Street	Construction - Complete	TH0251	0.1	OF08
Willamette River	Green street	One green street to treat roadway runoff prior to discharge in the headwaters of channel in the Riverview Natural Area.	SW Palatine Hill at Corbett Lane	On indefinite hold	E10634	1.3	ADD991

FEMA = Federal Emergency Management Agency; LID = low impact development; A = not applicable; PBOT = Portland Bureau of Transportation; PWB = Portland Water Bureau; ROW = right-of-way; TBD = to be determined; UIC = underground injection control facility.

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, Watershed Land Acquisition Program, and other acquisition and management efforts in conjunction with Metro and other partners. Table 12.1 lists land acquisition by watershed.

Table 12.1: Land Acquisition and Protection

Watershed	Acquisition Area in FY 2021–22 (Acres)
Johnson Creek	1.7
Fanno Creek	none
Tryon Creek	none
Willamette River (direct)	none
Total	**1.7**

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 2035 Comprehensive Plan, the Central City 2035 Plan, and the River Plan/South Reach. These plans establish a citywide framework for future development, climate change preparation, and preservation of natural resources and 20-year visions for the Central City and southern stretch of the Willamette River. All three plans reflect significant public input and a future vision of planning and policies related to climate change resilience, sustainable development, and management of rivers and streams in Portland.

The City also implements and enforces its Tree Code (Title 11, Trees) and Zoning Code , which includes overlay zones (e.g., Environmental Protection and Environmental Conservation overlay zones), that protect high-value natural resources and limit natural resource area disturbances. Six of the City's overlay zones protect or conserve resources, functional values, and/or significant wildlife habitat.[8] Five of the City's overlay zones preserve and enhance the natural and scenic qualities of Portland-area rivers while allowing for specific uses within the zones.[9] 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, springs, and wetlands 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 rivers, streams, and wetlands and limit tree removal in conjunction with development, especially in the overlay zones.

The City continued planning processes that include goals and policies focusing on watershed health and environmental quality. Work during FY 2021–22 included the following:

- Continued efforts to update the City's Willamette Greenway Plan through a series of plans for each of three major reaches of the river within Portland's jurisdiction. The River Plan/South Reach was adopted in December 2020. It provides new policies and codes for the area and establishes a new urban design framework. It also includes natural resources and scenic resources protection plans, applies new floodplain protections, and identifies future strategies, actions, and potential investments for improving and increasing habitat. The River Plan/South Reach Plan replaces the Greenway overlay zones with the new River overlay zones on Willamette River south reach area properties. Key elements include expanding the range of riverbank and upland trees that are subject to the regulations, applying the River Environmental overlay zone to undeveloped floodplains, establishing a "beneficial gain" requirement for floodplain development within 170 feet of ordinary high water (known as the "riparian buffer area"), allowing the use of mitigation banks as an alternative to onsite mitigation, and other requirements.
- Completed the Environmental Overlay Zone Map Correction Project, which updates environmental protections for most of the natural resources within the City's zoning authority. Areas within the (primarily) industrial Columbia Corridor, including land along the Columbia River and Columbia Slough, were not part of this phase of the work. This project corrected 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 improved wetland data from the BES Wetland Inventory Project. The City Council voted to adopt the Environmental Overlay Zone Map Correction Project changes on May 27, 2022. Changes take effect on October 1, 2022. Correcting the location of the overlay zones will prevent or mitigate negative impacts to the natural resources that provide green infrastructure

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

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

functions. A second phase of this work, the Columbia Corridor/Industrial Lands Ezone Project, will update the Environmental overlay zones for the lands along the Columbia Slough and Columbia River as well as industrial zones in other parts of the city. A timeline for that project has not been established yet. Public outreach on this effort will begin in Fall 2022 with site visits to confirm the location and characteristics of natural resources in the area.

- Continued evaluation of existing policies and development regulations in the floodplain to prepare for expected 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 to the City's floodplain regulations that were implemented as a part of the River Plan/South Reach represent the first step toward updated floodplain development regulations in the city to avoid impacts on endangered and threatened species in the Willamette River and continued compliance with the FEMA NFIP. The updated policies and regulations are also intended to preserve tree canopy, flood storage, and stormwater infiltration within the floodplain.
- The Floodplain Resilience Plan is underway and focuses on the areas subject to the zoning code in Chapter 33.430, Environmental Overlay Zones, and 33.475, River Overlay Zones. The plan will update floodplain development regulations in many parts of the city to be consistent with the NFIP guidance for the National Marine Fisheries Service Biological Opinion. Portland's Planning and Sustainability Commission will hold public hearings on the proposed code changes in Fall 2022, with City Council adoption expected to follow in Spring 2023.
- Updates to the Building Code to increase flood storage mitigation (i.e., compensatory excavation, or "cut") required to offset floodplain development have been initiated. This effort incorporates the outcomes of a new Lower Willamette River hydrologic model that was completed in FY 2021-22 by the U.S. Army Corps of Engineers in partnership with the City of Portland. Using this model, City staff developed a new model of the inundation area of a flood event like that in February 1996, accounting for current development, topography, river bathymetry, and other characteristics. This new model provides a better estimate of flood risk than the City's existing flood maps and will result in better protections for the Willamette River under future conditions. New flood storage mitigation requirements will apply in select areas. Additionally, updates to the City's regulations will allow for the use of flood storage mitigation banks to offset floodplain development. This work is expected to be complete by the end of 2023.
- Continued involvement in the development of land use plans, zoning regulations, and design requirements for development to ensure that future development is served by green, gray, and natural infrastructure, and that all land use requirements support appropriate stormwater management. Relevant efforts completed or currently under way during FY 2021–22 include the following:
  - The West Portland Town Center Plan calls for Zoning Code requirements and bonuses to support green infrastructure and for phasing future zoning of the area to correspond to infrastructure improvements. The Planning and Sustainability Commission voted to recommend the proposed plan to the City Council. The council's public hearings on the plan are anticipated for fall 2022, with adoption to follow.

  - The Montgomery Park to Hollywood Transit Land Use Development Strategy is exploring how to establish streetcar connections between Northwest Portland and the Hollywood District in Northeast Portland. This planning effort is also exploring potential Zoning Code changes to support the transformation of an industrial area into a mixed-use area. While the project focuses primarily on transit, economic development, and housing issues (especially affordable housing), it also includes urban green strategies to support stormwater management goals related to flow attenuation and water quality.

- Established a Mitigation Banking finance working group to develop a finance plan for environmental mitigation banking and address environmental impacts from private development, including water quality, flood storage capacity, floodplain function, habitat, and vegetation. As part of this effort, BES maintained partnerships with the Portland Harbor Trustees to develop a system where developers can meet their Building Code (Title 24) flood storage requirements at Portland Harbor Natural Resource Damages approved restoration banks.
- Continued implementation of Title 11 (Trees), which includes tree preservation and planting requirements on development sites and standardizes the City's tree removal permit system. The tree code also applies to nondevelopment-related tree planting/pruning/removal on private property and in the public ROW. These regulations help to preserve, expand, regenerate, and improve the quality of Portland's tree canopy. Expanding the tree canopy will improve stormwater management throughout the city. Future amendments (under consideration) to Title 11 (Trees) include application of application of tree preservation and planting requirements on lands that are zoned as Heavy Industrial (IH). The IH zone is the only remaining zone that is exempt from Title 11 requirements.
- A Tree Canopy Monitoring Report published by PP&R in March 2022 found that overall tree canopy area in Portland declined between 2015 and 2020, decreasing from 30.7% to 29.8%. To address this canopy loss, PP&R will continue to care for and maintain Portland's trees and to plant more trees citywide. With the passage of the Parks Local Option Levy in late 2020, PP&R will be able to better protect Portland's 1.2 million park trees by performing proactive maintenance, safety checks, hazard removal, and new tree planting in parks and natural areas. Portland's Urban Forest Management Plan is also scheduled to be updated in coming years, providing an opportunity for revising tree canopy goals and using new information on areas of potential growth to set realistic targets.
- BDS continued inspection and enforcement of Title 33 tree preservation, landscaping, and tree planting requirements and continued discussions with the PP&R Urban Forestry department concerning coordination of inspection and plan review efforts for implementation of Title 11.

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 against the projected impacts of climate change. The Climate Action Plan provides a roadmap for the community to achieve an 80% reduction in carbon emissions by 2050, with an interim goal of a 40% 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.

City Council's adoption of the Climate Emergency Declaration in July 2020 acknowledges the Portland metro area faces a human-made climate emergency, with frontline communities being the least responsible for, but most impacted by, climate change. With the Climate Emergency Declaration, the City of Portland has committed to using a new climate justice and equity-focused approach that centers Black, Indigenous, other communities of color and youth from those communities in the next chapter of climate action planning and implementation. A progress report on the Climate Emergency Declaration was provided to the City Council in July 2021, followed by a Draft Climate Emergency Workplan in Spring 2022 that focuses on mitigation and adaptation priorities. The Climate Emergency Workplan replaced the 2015 Climate Action Plan by Council resolution in August 2022.

Every 10 years, the City convenes a Charter Commission to review and recommend changes to the Portland City Charter. The current effort includes two phases:

1. 2021-22: The Charter Commission was convened in 2021 and in 2022 made recommendations regarding the form of government and elections, which will appear on the November 2022 ballot, concluding Phase I of the Charter Commission.
2. 2022-23: The Charter Commission is prioritizing charter changes focus on climate change and environmental justice. The results are expected for inclusion on the May 2023 ballot.

Relevant climate change planning work conducted during FY 2021–22 includes the following:

- BES is advancing recommendations from the Resiliency Master Plan (2019) for wastewater and stormwater infrastructure to better prepare City infrastructure and its watersheds for climate change impacts. The plan includes application of a sensitivity analysis, scenario planning, and programmatic changes for natural systems services. Efforts include extrapolating the effect of a 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. The plan contains recommendations for both mitigation and adaptation measures.
- BES is advancing the application of high-resolution regional climate models produced by the University of Washington Climate Impacts Group. The projected precipitation data was made available in March 2021 and shared with City and regional partners. Data from these models will improve the understanding of how global climate change will have local effects and indicate how sub-daily rainfall intensity may change in the future.
- The City partnered with the U.S. Army Corps of Engineers and FEMA to update the flood model for the Lower Willamette River from Willamette Falls to the confluence with the Columbia River, as well as the Lower Columbia Slough. The updated hydraulic model was completed in June 2022 and is currently under review by FEMA. The U.S. Army Corps of Engineers is preparing to update the hydrology components of the model in federal FY 2023, including climate change scenarios and new 100-year flood flows. Local communities along the Willamette River are

coordinating their use of this new information. When both the hydrologic and hydraulic components are complete, and the U.S.-Canada negotiations on the Columbia River Treaty have concluded, these communities are expected to request FEMA to formally update the flood insurance maps.

- The City's infrastructure bureaus (BES, PWB, PBOT, and PP&R) meet regularly and have formed the Disaster Resilience and Recovery Action Group, which is coordinating and facilitating multi-bureau resilience planning. This group facilitated a community-resilience visioning project through Portland State University's Master of Urban Regional Planning program focused on the East Portland Community Center and the surrounding communities as a "Resilience Hub" that can serve community needs during and after various extreme climate events. The group's bureau members are also members of the Citywide Climate Preparation Implementation Team along with BPS, Portland Bureau of Environmental Management, BDS, and other City bureaus. The Citywide Climate Preparation Implementation Team collaborated to develop a list of climate adaptation priority projects that was shared with the Office of Government Relations for funding support. This list was then used to develop the Draft Climate Emergency Workplan.
- The City, led by the Bureau of Emergency Management, drafted an update to the Natural Hazard Mitigation Action Plan that is expected to be adopted in 2022. Multiple bureaus identified more than 50 mitigation and adaptation actions that include projects, planning studies, and programs to develop resilience to climate hazards, including flooding, wildfire and smoke, landslide, extreme heat, drought, winter storms, and wind storms. One of the BES floodplain resilience projects identified in the Natural Hazard Mitigation Action Plan submitted a funding application to FEMA exceeding $7M that passed the first round of the process.
- The PP&R Urban Forestry department and BES tree team are 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.
- BES continues its participation and membership in the Green Infrastructure Leadership Exchange's Climate Change committee and the C40 Urban Flood Network to continue its understanding of best practices for green infrastructure use. BES also became a member of the Water Utility Climate Alliance to learn from peers across the country on strategies to advance utility resilience to climate change.
- Columbia Levee: Every year, there is a significant chance the Portland metropolitan area will experience a major flood on the Columbia River, and that probability is expected to increase with climate change. For more than 100 years, Portland has been protected on its northern border by a system of levees and related infrastructure along the Columbia River, today known as the Portland Metropolitan Levee System. This 27-mile levee system helps reduce the risk of flooding along the Columbia River from North Portland through Gresham, Fairview, and Troutdale. In addition to levees, critical flood-fighting infrastructure like pump stations and floodwalls require upgrades to meet current federal levee safety standards. The Columbia Levee and its critical infrastructure no longer meet FEMA's requirements, and an effort is underway by the U.S. Army Corps of Engineers in partnership with the drainage districts to modernize the levee system to meet these new requirements. To address and support the critical infrastructure needs of the levee system, the City, the four drainage districts responsible for

managing the levees in the Columbia Corridor, and regional partners successfully pursued a legislative solution (now found in ORS Chapter 550) creating a new special district with a sustainable funding structure and expanded mission including water quality and watershed health, named the Urban Flood Safety and Water Quality District. The work of setting up this new district is underway and will continue for 3 more years. The City plays a critical supporting role in this effort and continues to work directly with the four drainage districts and the U.S. Army Corps of Engineers toward recertification and accreditation of the existing levee system.

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 2021–22)

Watershed	Trees Planted		Shrubs Planted	New Streambank (Linear Ft)	New Acreage
	Deciduous	Coniferous			
Willamette River	200	525	3,950	7,176	0.5
Columbia Slough	634	74	8,855	0	0
Johnson Creek	2,177	170	8,567	425	7.35
Tryon Creek	128	75	716	425	0
Fanno Creek	183	325	2,066	574	1
Total	**3,322**	**1,169**	**24,154**	**8,600**	**8.85**

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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 2021–22)

Program/Watershed	Events	Streambank Restored (Linear Ft)	Trees Planted	Other/Natives Planted	Acres	
					Invasives Removed	Restored
Westside Watersheds habitat enhancement*	28	0	0	2,249	1.11	0.75
Neighborhood to the River	36	0	0	886	0	0.44
Community Watershed Stewardship Program and Native Mini Grants**	39	200	1,461	70	0	1.50
Johnson Creek habitat enhancement***	61	57,466	1,575	11,162	8.61	35.24
Total**	**164**	**57,666**	**3,036**	**14,367**	**9.72**	**37.93**

** Efforts include partner support for the Westside Watershed Resource Center and Tryon Creek Watershed Council.*

*** Figures represent only Native Mini Grants.*

**** Efforts include those at the Leach Botanical Garden, Tideman Johnson, Mitchell Creek (Portland future annexation area), and general plantings along the streambanks.*

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

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 in FY 2021-22
Friends of Trees partnership	950
Treebate program incentives	183
Community partner planting with contractors	649
Total	**1,782**

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 staff 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.

COVID-19 challenges prevented PP&R from reporting on the number of planting activities for FY 2021–22.

Table 12.5: Portland Parks and Recreation Planting Activities (FY 2021–221)

Number of Plantings	Natural Area Parks	Urban/Developed Parks
Native	32,221	23,111
Non-native	0	6,184
Total	**32,221**	**29,295**

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 plants 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 12.5: Invasive Plant Species Removal

Program	Area Treated in FY 2021–22
Early Detection/Rapid Response (BES)*	169 acres
Land stewardship – natural areas (PP&R)	875 acres
Total	**1,044 acres**
** Total includes estimates for some locations/plant types, as data for Spring 2021 was not available at the end of the field season (October 2021).*	

12.8 Floodplain Protection

BDS continues to implement and enforce Portland City Code Title 24, 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 flooding or that cause increased flood heights or velocities. It also requires that uses and structures vulnerable to floods are protected from flood danger at the time of initial construction and when existing buildings undergo substantial improvement or substantial damage.

In response to the Biological Opinion on the NFIP, a Floodplain Management Core Team was established in 2016 and developed a 5-year work plan (2019 to 2024). The work plan was approved by eight bureau directors and identifies needed regulatory updates to Title 33 and Title 24 and improvements to the City's restoration program to ensure that the City's floodplain management efforts are protective of endangered species. The City is proposing to update key sections of the land use code in Title 33 and the Flood Hazard code in Title 24 in response to the Biological Opinion to address protection and mitigation of floodplain functions, such as flood storage, water quality protection, and habitat for threatened and endangered salmon and steelhead (see Section 12.2).

In addition, BES implements 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 by applying overlay zones (e.g., Environmental Conservation, Environmental Protection, and River Environmental zones), 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. The Title 33 Land Division regulations also restrict new lots being created in the floodplain in single-dwelling zoned areas and require that impacts be evaluated in other areas. The City adopted the River Plan/South Reach in December of 2020 and is moving ahead with the Floodplain Resilience Plan code changes. Together, these updates will improve floodplain protections throughout the city, as described in Section 12.2.
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 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 team 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.

The City of Portland continued implementation of all stormwater program elements in its SWMP through FY 2021–22. While the implementation of some program activities continues to be affected by the COVID-19 pandemic, the City has also found ways to adapt to these circumstances with innovative solutions.

A small number of the City's Measurable Goal targets for the year were not met; specifically, those associated with public education and industrial (EcoBiz) program implementation. Details of the City's missed targets are described in this section of the report. The City notified DEQ of "anticipated noncompliance" at the onset of the pandemic.[10] Since the COVID-19 pandemic continues with severe ongoing impacts to social, educational, and financial activities, the City's "anticipated noncompliance" disclosures remain in effect. However, the City will continue to innovate and learn from these extraordinary circumstances and is fully committed to the ongoing implementation of its stormwater programs.

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 2021–22. Measurable goals have been met where the status shows a checkmark in the box (☑). If the goal was not met, the marker shows an "X" in the status box (☒).

[10] Letter from Loren Shelley (City of Portland BES) to Pablo Martos (Oregon DEQ), dated March 30, 2020.

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Table 13.1: MS4 Program Measurable Goals Evaluation and Summary

☑ **Indicates the Measurable Goal was met for FY 2021–22.** ☒ **Indicates the Measurable Goal was not met for FY 2021–22.**

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 in-person outreach to approximately 11,525 students. This Measurable Goal was not met due to the COVID-19-related disruptions preventing in-person classroom work. As a result, the City's educational outreach in schools was curtailed as staff followed state-mandated public health and safety measures. However, the City has instituted a variety of innovative engagement methods to continue its environmental education services to students including various digital outreach forums (see Section 2.1).	☒
	Award at least $50,000 in community stewardship grants annually.	Awarded 9 stewardship grants totaling $113,140.	☑
	Involve approximately 10,000 participants in community events, workshops, stewardship projects, and restoration events annually.	Involved approximately 5,019 participants in 269 events citywide. This Measurable Goal was not met due to the COVID-19-related disruptions. Event-based stewardship activities were significantly reduced from previous years due to social distancing and mandated limitations on social gatherings. However, alternative outreach methods were conducted (see Section 2.1).	☒
	By May 2011, develop and distribute a public education bill insert to more than 200,000 water and sewer customers.	Completed as reported in FY 2010–11. The City's "RiverViews" newsletter was planned and designed during FY 2021-22. Development and production were delayed by COVID-19 disruptions. The City published RiverViews online in September 2021 in five languages. The print version in English was mailed to customers in Fall 2021. The City distributed four customer newsletters in quarterly water/sewer bills to more than 150,000 ratepayer properties.	☑
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.	☑
	Provide the following maintenance actions over the 5-year permit cycle: Clean 31,000 lf of culverts. Repair 10,000 lf of culverts. Clean 250,000 lf 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 2021–22: Cleaned 1,589 lineal ft of culverts. Total to date over the SWMP implementation period and administratively extended permit term: 146,823 ft. Repaired 38 lineal ft of culverts. Total to date over the SWMP implementation period and administratively extended permit term: 11,600 ft. Cleaned 67,614 lineal ft of ditches. Total to date over the SWMP implementation period and administratively extended permit term: 580,555 ft. Cleaned 8,824 inlets and catch basins. Total to date over the SWMP implementation period and administratively extended permit term: 135,419 assets. Repaired 132 inlets and inlet leads. Total to date over the SWMP implementation period and administratively extended permit term: 2,701 assets. Cleaned 153 major stormwater management facilities/pollution reduction facilities. Total to date over the SWMP implementation period and administratively extended permit term: 1,388 facilities. Repaired 6 pollution reduction facilities. Total to date over the SWMP implementation period and administratively extended permit term: 93 facilities.	☑
OM-2	Sweep arterials six times/year.	Swept arterials six times per year. Inclement weather, roadway conditions, and incident response can sometimes impact the City's ability to meet the targeted frequency. The City 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.	☑
	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.	☑
OM-3	Inspect and maintain, as necessary, all stormwater and stormwater containment and pollution prevention facilities in City maintenance yards annually.	Completed.	☑

Table 13.1: MS4 Program Measurable Goals Evaluation and Summary

☑ **Indicates the Measurable Goal was met for FY 2021–22.** ☒ **Indicates the Measurable Goal was not met for FY 2021–22.**

BMP	Measurable Goal	Description	Permit Year Status
IND-1	Inspect all permitted (1200Z, 1200COLS, 1200A) facilities once per year.	Inspected all the 235 permitted facilities. Note that 1200COLS permits were consolidated into 1200Z permits in 2017.	☑
	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 Portland City Code Title 17.39 by 2012.	Completed. City Council adopted code revisions in September 2011.	☑
IND-2	Under the Eco-Logical Business Program (EcoBiz), certify 10 additional auto shops and 20 additional landscape firms that provide services within the City of Portland by 2015.	Documentation of this Measurable Goal status was described in the FY 2016–17 report, showing that the City successfully implemented the program, but tracking methodologies made it difficult to confirm whether the timing and numeric requirements were fully met. 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, and the City funded a limited-term staff position to expand EcoBiz activities in the landscaping sector. The City maintained funding of the limited-term staff position during FY 2021–22, but business certification and recertification efforts continued to be disrupted due to the COVID-19 pandemic and related health and safety measures to protect City staff and the public.	☒
	Evaluate one new business sector for EcoBiz implementation.	Completed. Expanded the program to the car-washing sector as reported in FY 2010–11 and dry cleaners during FY 2018–19.	☑
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 eastside outfalls. Expand the program to all eastside outfalls by December 2013.	Completed as reported in FY 2013–14.	☑
	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.	Finalizing a major update to the City's *Erosion and Sediment Control Manual*, including a review of the existing manual's structure, BMPs, and usability. The manual's first draft and associated ordinance were released for public review on October 1, 2021 (FY 2021-22).	☑
	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.	☑

Table 13.1: MS4 Program Measurable Goals Evaluation and Summary

☑ **Indicates the Measurable Goal was met for FY 2021–22.** ☒ **Indicates the Measurable Goal was not met for FY 2021–22.**

BMP	Measurable Goal	Description	Permit Year Status
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, inspected 1,947 private stormwater facilities associated with 800 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 2014, 2016, and 2020.	☑
	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 lf 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.	☑
	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 4,491 trees (3,322 deciduous and 1,169 coniferous) on 8.85 acres. Total to date during this extended SWMP implementation period and administratively extended permit term: Planted 251,716 trees (182,785 deciduous and 68,931 coniferous) on 1,356.6 acres.	☑
	Acquire 50 acres of land by the end of the permit cycle.	Acquired 1.7 acres of land this permit year. The total amount of land acquired to date during this extended SWMP implementation period and administratively extended permit term is 689.5 acres.	☑
	Update the Portland Plan (an update to the City's Comprehensive Plan) by December 2013.	Completed. City Council adopted the original Portland Plan on April 25, 2012. An update in the form of the City's new 2035 Comprehensive Plan was adopted in 2020.	☑
PM-1	Submit annual reports by November 1 of each year.	Submitted the FY 2020–21 report on October 29, 2021. Anticipate submittal of the FY 2021–22 report on or by November 1, 2022.	☑

BMP = best management practice; CSO = combined sewer overflow; IDDE = Illicit Discharge and Detection Elimination; lf = linear feet; O&M = operations and maintenance; PBOT-MO= Portland Bureau of Transportation Maintenance and Operations; SWMM = Stormwater Management Manual.

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APPENDIX A
TMDL Implementation Plan Annual Report

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City of Portland, Oregon

Total Maximum Daily Load (TMDL) Implementation Plan

ANNUAL STATUS REPORT NO. 13

Fiscal Year 2021-2022

(July 1, 2021, to June 30, 2022)

Prepared for:

Oregon Department of Environmental Quality

Submitted by:

City of Portland

Submitted on:

November 1, 2022

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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) 2021–22 (July 1, 2021, through June 30, 2022).

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 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 U.S. Environmental Protection Agency (EPA). 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.

In accordance with the EPA's approval of the Revised Willamette Basin Mercury TMDL in February 2021, the City updated the 2019 TIP and submitted it to DEQ in August 2022. The updated (2022) TIP meets the new requirements in the revised TMDL and Water Quality Management Plan, developed by DEQ, but the management strategies and the implementation plan cycle remain consistent with the 2019 TIP.

[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.

Pending DEQ approval, the City will implement strategies identified in the 2022 TIP within its jurisdiction during the 5-year implementation plan cycle (March 1, 2019, to December 31, 2023) of the original 2019 TIP.

1.2 Report Organization

This annual TMDL report covers implementation actions and accomplishments that occurred during FY 2021–22. 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 its annual MS4 report and TMDL report preparation. 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, 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, the 2022 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.

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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 associated 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.

For this reporting year, the City is implementing its 2011 SWMP to comply with its NPDES MS4 permit. However, the City is updating and resubmitting its SWMP to DEQ in November 2022, in accordance with the compliance schedule in the reissued (2021) NPDES MS4 permit. As such, updates to the SWMP may result in future adjustments of Table 3.1 in future TMDL annual reports.

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 Management 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.	MS4 Report: OM-1, Section 3.2
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

Table 3.1: Management Strategies to Address TMDL Pollutants

ID	Management Strategy	Annual Report Reference (BMP and Section Number, as applicable)
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
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 (LID). 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-Related Activities, 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-Related Activities, 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-Related Activities, Section 4

Table 3.1: Management Strategies to Address TMDL Pollutants

ID	Management Strategy	Annual Report Reference (BMP and Section Number, as applicable)
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-Related Activities, Section 4
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-Related Activities, 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-Related Activities, 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-Related Activities, 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-Related Activities, Section 4, Table 4.2
ECO10	Cold Water Refugia. Identify and protect cold water refugia.	TMDL Report: Temperature-Related Activities, Section 4, Table 4.1
ECO11	Natural Resource Inventory (NRI). 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

Table 3.1: Management Strategies to Address TMDL Pollutants

ID	Management Strategy	Annual Report Reference (BMP and Section Number, as applicable)
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 Management and Reporting, Section 2.2
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 Management, 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 Management, 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 Management, 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.[1] 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 2021–22 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.

[1] System potential vegetation for the Willamette River 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 can grow and reproduce on a site given proper 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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Appendix A: TMDL Implementation Plan Status Report for FY 2021-22

Table 4.1: Goals and Targets for Temperature TMDL Strategies

Goal ID	Category	Target/Description	Timeline (Goal)	Performance Metrics	Interim Milestones and Timelines	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 effective shade results. 4. FY 2021-22: Report effective shade results.	1. Completed FY 2019–20: Preliminary geospatial assessment of riparian conditions using historic LiDAR data. 2. Completed FY 2020–21: 2019 LiDAR delivery occurred at the end of FY 2020-21. Initial refinements of the preliminary geospatial assessment of riparian conditions were conducted using the 2019 dataset. 3. Completed FY 2021-22: Final report and effective shade results were shared with DEQ in Spring 2022 to assist with DEQ's development of the Willamette temperature TMDL.
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 additional stream reaches. 4. FY 2021-22: Complete surveys for remaining stream reaches.	1. Completed FY 2018–19: Executed an Intergovernmental agreement with Oregon Department of Fish and Wildlife to conduct stream habitat surveys in the Portland area. 2. Completed FY 2019–20: 71 stream miles surveyed (63%). 3. Completed FY 2020–21: 21 stream miles surveyed (cumulative total 82%). 4. Completed FY 2021–22: 20 stream miles surveyed (cumulative total 100%)
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. Completed FY 2018–19: 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. 4. FY 2021-22: Complete the Environmental Overlay Zone Map Correction Project.	1. Completed FY 2018–19: Draft maps of the revised environmental overlay zones for Johnson Creek. 2. Completed FY 2019–20: Released draft maps of the revised environmental overlay zones for East Buttes, Northwest Hills, and Southwest Hills. The Columbia Slough/Columbia River requires additional analysis. 3. Completed FY 2020–21: Conducted public hearings on the revised environmental overlay zones. The first public hearing was conducted in July 2020. 4. Completed FY 2021-22: Completed the Environmental Overlay Zone Map Correction Project. City Council voted to adopt the Project zone changes on May 27, 2022; the changes went into effect on October 1, 2022.
TIP-05	**Onsite Stormwater Retention and Low Impact Development (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.	N/A
TIP-06	**Invasive Species Management and Treatment**	Perform management, assessment, and treatment of invasive species on 5,550 acres.	By the end of the TMDL Implementation Plan (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 / 1,363 / 1,015 / 1,044 / - **Cumulative** / 1,201 / 2,564 / 3,579 / 4,623 / - **% of Goal** / 21.6% / 46.2% / 64.5% / 83.3% / - 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 / 8.5 / 8.3 / 8.1 / - **At Banks** / 16.9 / 18.6 / 18.4 / 15.4 / - **% of Goal** / 112.7% / 124% / 123% / 106%- / -

Appendix A: TMDL Implementation Plan Status Report for FY 2021-22

Table 4.1: Goals and Targets for Temperature TMDL Strategies

Goal ID	Category	Target/Description	Timeline (Goal)	Performance Metrics	Interim Milestones and Timelines	Reporting Activities
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.	1. Completed FY 2018–19: Internal effort to develop and populate an inventory of restoration projects. 2. Completed FY 2019–20: Completed the inventory of all active projects and developed an interactive web tool to share the inventory content. 3. Completed FY 2020–21: Populated the inventory with all recently completed projects and launched a public-facing web tool for sharing the inventory content: https://pdx.maps.arcgis.com/apps/webappviewer/index.html?id=807ed51bb0314f9cbd31815c73ff9b6e. 4. Completed FY 2021-22: Maintained the inventory, including the addition of newly completed projects.
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 37,297 55,913 28,645 - **Cumulative** 17,312 54,609 110,522 139,167 - **% of Goal** 17.3% 54.6% 110.5% 139.2% - For more information, see MS4 Annual Report: NS-1, Section 12.3.
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 9.6 1.3 1.7 - **Cumulative** 23.8 33.4 34.7 36.4 - **% of Goal** 47.6% 66.8% 69.4% 72.8% - 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 2,915 2,615 1,782 - **Cumulative** 2,777 5,692 8,307 10,089 - **% of Goal** 37.0% 75.9% 110.8% 134.5% - 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 FY 2018–19: Draft project effectiveness monitoring manual. 2. Completed FY 2019–20: Internal review of draft monitoring manual. 3. Completed FY 2019–20: Finalized monitoring manual.
TIP-13	**Cold Water Refugia**	Evaluate and update an inventory and mapping of cold water refugia in the Lower Willamette River.	By the end of the TIP cycle	Confirmation of program continuation and/or providing status updates	1. FY 2018–19: Participate in DEQ's expert panel. 2. FY 2019–20: Continue to participate in DEQ's expert panel.	Completed FY 2020–21: DEQ finalized the Lower Willamette River Coldwater Refuge Plan and submitted it to the National Marine Fisheries Service in March 2020.
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/cold water 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.

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

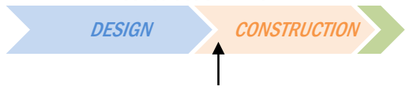
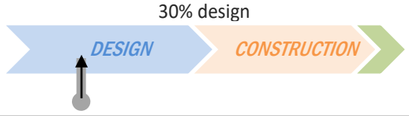
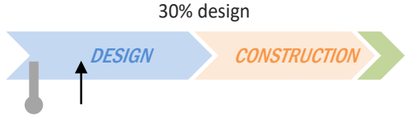
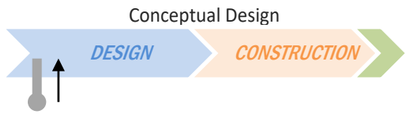
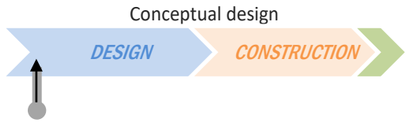
Project Name	Previous Report Year — Status* — Current Report Year	Description and Benefits
Oaks Bottom Habitat Enhancement Project *Willamette River*	Construction complete in 2018 	Restored 75 acres of wetland habitat in 2018 at the Oaks Bottom Wildlife Refuge. Replaced the existing undersized 5-foot 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 complete in 2019 	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 reduces 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 complete in 2019 	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 reduces trash and debris accumulation and improve habitat for fish and wildlife. *Benefits: Enhanced instream habitat.*
Boones Ferry Culvert Replacement Project *Willamette Tributaries*	Construction complete in 2020 	Removed 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. Replaced an undersized 60-inch, 140-foot-long corrugated metal pipe culvert with a single span bridge. Provided 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*	Construction in 2022 	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 that disconnected 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*	30% design 	Reconnecting a straightened reach of Johnson Creek to its historic floodplain in Southeast Portland. The project will improve 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.*
Johnson Creek Oxbow Restoration Project *Johnson Creek*	30% design 	The Johnson Creek Oxbow Restoration Project is part of a broad City effort to improve habitat conditions and reduce the impacts of flooding along Johnson Creek. It will build upon four previous restoration projects in the area: Tideman-Johnson (2006), Errol Heights Wetlands (2007), Errol Creek Confluence (2009), and the Johnson Creek Oxbow Scour Repair (2019). These efforts to restore Johnson Creek focus on returning it to a more natural state by removing the Works Progress Administration levee to reconnect and restore the surrounding floodplains, restore instream habitat in Johnson and Errol Creeks, and improve fish passage through the existing fish ladder. *Benefits: Floodplain connectivity, channel form, large wood, instream cover, invasive species management, native plantings, fish passage.*
Brookside Wetland Retrofit Project *Johnson Creek*	Conceptual Design 	Located along SE Foster Road near the intersection with SE 110th Avenue, the existing Brookside Wetland includes a relatively shallow inline pond that contributes warm water to Johnson Creek. A sediment bar has formed across the mouth of the pond exacerbates the warming by impounding creek flow and creating stagnant open water conditions. This project will improve summertime temperature conditions in Johnson Creek, as well as high-flow conditions to protect against erosion and remove safety risks associated with nuisance camping in flood-prone areas. *Benefits: Floodplain connectivity, large wood, instream cover, invasive species management, native plantings, reduced stream temperature.*
Eastbank Crescent *Willamette River*	Conceptual design 	The City is working with partners on the Eastbank Crescent project, a large riverbank restoration effort on the Willamette River near the Oregon Museum of Science and Industry. 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.*

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
Crystal Springs Lake *Johnson Creek*	Conceptual design 	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 Crystal Springs 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%.

Gray markers indicate status in the previous report year.

Black arrows indicate status in the current report year.

APPENDIX B
Mercury Minimization Assessment

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Mercury Minimization Assessment for the City of Portland

A Total Maximum Daily Load (TMDL) is a calculation of the maximum amount of a pollutant that a water body can receive and still meet applicable water quality standards. TMDLs assign wasteload allocations (WLAs) to point sources of pollutants, and load allocations (LAs) to nonpoint sources of pollutants. The Oregon Department of Environmental Quality (DEQ) has the regulatory authority to implement TMDL programs in Oregon with responsibility for: (1) requiring and reviewing TMDL Implementation Plans for nonpoint sources and (2) incorporating TMDL related requirements for point sources in National Pollutant Discharge Elimination System (NPDES) permits. Therefore, with respect to municipal stormwater discharges regulated under an NPDES MS4 permit, DEQ includes TMDL requirements directly within those permits.

As stated in DEQ's Permit Evaluation Report (PER) for the 2021 Portland NPDES MS4 Permit:

> DEQ has determined that implementation of the permit conditions, BMPs identified in the SWMP Document, and the adaptive management process will meet TMDL WLAs for municipal stormwater (PER, pp. 35).

The City of Portland's NPDES MS4 permit identifies applicable TMDLs and associated WLAs. Schedule D, *Special Conditions,* of the permit, lists specific conditions for addressing those TMDLs. These permit conditions include requirements to conduct a TMDL pollutant load reduction evaluation in comparison to assigned WLAs for stormwater and to develop pollutant load reduction benchmarks targeting achievement of WLAs for specified TMDL pollutants over time. DEQ included TMDL requirements in the 2005, 2011, and the recently issued 2021 NPDES MS4 permits for Phase I permittees.

The City has complied with permit requirements to conduct pollutant load reduction evaluations and establish TMDL pollutant load reduction benchmarks. However, WLAs were not established for mercury until 2021. Therefore, mercury was neither required nor included in the City's prior TMDL analyses.[13] The 2021 Revised Willamette Basin TMDL for mercury includes a Water Quality Management Plan developed by DEQ that outlines management strategies for both point and nonpoint sources of mercury. Specific management strategies for Phase I NPDES MS4 permittees are outlined in Section 13.3.2.2 of the revised TMDL (Appendix A) and were subsequently included in Schedule D.3.b of the City's NPDES MS4 permit. Per Schedule D.3.b, requirements specific for mercury are detailed below:

i. Develop and submit a mercury minimization assessment with the annual report due November 1, 2022, that documents the current actions, such as BMPs implemented, that reduce the amount of solids discharged into and from the permitted MS4 system (similar to the actions currently required in Schedule A). If the assessment indicates that mercury and

[13] Mercury was originally included in the 2006 Willamette River TMDL, but WLAs were deferred due to lack of data. On November 22, 2019, DEQ issued a revised Willamette Basin TMDL for mercury. The U.S. Environmental Protection Agency (EPA) disapproved DEQ's TMDL on December 30, 2019, and EPA issued the final TMDL on February 4, 2021.

sediment reducing BMPs are fully incorporated into the SWMP Document, a report documenting the results as such is sufficient.

ii. *Continued implementation of the BMPs and other actions described in the mercury minimization assessment that are effective for mercury reduction, along with documentation of implementation in each subsequent annual report.*

iii. *An analysis of the effectiveness of the best management practices and any other actions taken and qualitative pollutant load reductions achieved in the MS4 Permit Renewal Application Package. Due to data limitations, mercury benchmarks are not applicable in the first permit cycle after the TMDL is finalized.*

iv. *Collection of paired total mercury and total suspended solids samples, as described in Schedule B.*

v. *Submittal of paired mercury and total suspended solids monitoring data in the appropriate DEQ data submission template. Given the lack of sufficient mercury data, pollutant load reduction evaluations, benchmarks, and waste load allocation attainment analyses for mercury will not be required in this permit cycle.*

The purpose of this Mercury Minimization Assessment, included with the City's 2022 MS4 Annual Compliance Report, is to address the requirement outlined in bullet *i.* above.

Chapter 4 of EPA's 2021 *TMDL for Mercury in the Willamette Basin* includes summary information regarding mercury sources. Atmospheric deposition of mercury from global sources is presented as the dominant source of mercury in the Willamette River Basin. Additional sources identified include nonpoint sources such as runoff from forestry and agriculture land management practices that can transport sediment and mercury to streams; background/anthropogenic sources that include mercury in groundwater due to local geology, and naturally occurring sediment-bound mercury that is eroded and transported to streams. Other sources include point sources such as municipal waste discharges, industrial discharges, suction dredge mining, and stormwater. Mercury loads in urban stormwater are believed to be predominantly associated with atmospheric deposition and active erosion or transport of sediment that is carried in runoff to downstream water bodies. As a result, stormwater best management practices (BMPs) implemented by NPDES MS4 permittees are focused on reducing the discharge of sediment as the primary method to reduce discharges of mercury.

The prevention and reduction of sediment in runoff has been a focus of the City's stormwater management program since the first MS4 permit-required Stormwater Management Plan (SWMP) was developed in the early 1990s. The City uses an adaptive management approach to continually improve upon existing stormwater BMPs over time as new knowledge is gained regarding the effectiveness and efficiency of these practices. The City submitted the results of its adaptive management process every year in annual reports since the original SWMP became effective. The City has also conducted detailed quantitative and qualitative adaptive management analyses as part of each NPDES MS4 permit renewal. The City's NPDES MS4 Annual Compliance Report for FY 2021-22, due to DEQ on November 1, 2022, provides the latest summary of BMP implementation

according to the 2011 SWMP. A new SWMP that meets the conditions of the recently issued 2021 NPDES MS4 permit is also being submitted to DEQ for approval on November 1, 2022.

Based on the City's long-term ongoing adaptive management process, a review of the current/approved 2011 SWMP, and a comprehensive MS4 program evaluation and update as per the 2021 permit, BES determined that **effective sediment- and mercury-reducing BMPs are fully incorporated into the City's new/proposed 2022 SWMP**. Table 3 in the proposed SWMP provides a cross-reference of each strategy to potential pollutants, including the TMDL parameters sediment and mercury. To meet the NPDES MS4 permit standard, these BMPs have been developed as part of an overall program to reduce pollutants to the maximum extent practicable.

In summary, the City's BMPs, or Stormwater Program Management Control Measures as called in the 2022 SWMP, include the following major strategies and activities that prevent sediment and mercury in stormwater discharges:

- Public Education & Outreach Strategy (Section 2.1)
- Public Involvement & Participation Strategy (Section 2.2)
- Illicit Discharge Detection & Elimination Strategy (Section 2.3)
- Construction Site Runoff Strategy (Section 2.4)
- Post-Construction Site Runoff Strategy for New & Re-Development (Section 2.5)
- Pollution Prevention & Good Housekeeping for Municipal Operations (Section 2.6)
- Industrial & Commercial Facilities Strategy (Section 2.7)

The 2022 SWMP includes detailed descriptions of each major MS4 strategy and associated program activity, including procedures, key performance indicators, and tracking mechanisms. As noted in Table 3 of the 2022 SWMP, every strategy and nearly all program activities support the prevention and reduction of mercury and sediment. Further, the City submitted an up-to-date TMDL Implementation Plan to DEQ in August 2022 that addresses requirements of the 2021 Revised Willamette Basin TMDL for Mercury for nonpoint sources of mercury in Portland.

As a result of this Mercury Minimization Assessment, the City finds that sediment and mercury reducing BMPs are fully incorporated into the SWMP.

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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-SEVEN

July 1, 2021– June 30, 2022

Prepared for:
Oregon Department of Environmental Quality

November 1, 2022

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ACRONYMS AND ABBREVIATIONS

ARFF	Aircraft Rescue Fire Fighting
ATC	Airtrans Center
BMP	Best Management Practice
CAS	Cascade Station
City	City of Portland
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
IT	Information Technology
MEP	Maximum Extent Practicable
MFM	Marine Facilities Maintenance (Marine's general maintenance group)
MS4	Municipal Separate Storm Sewer System
MS4 Permit	NPDES Phase I MS4 Permit
MX	Maintenance
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
PC	Port Center
PDX	Portland International Airport
PIC	Portland International Center
Port	Port of Portland
RG	Rivergate
SI	Swan Island
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
WPCF	Water Pollution Control Facility

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 (City) are co-permittees on MS4 Permit #101314. As required under Schedule B.3 of the permit (2021 MS4 Permit), each co-permittee must submit an annual report. This report documents activity from July 1, 2021 to June 30, 2022 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.3[1] of the 2021 MS4 Permit states the specific annual reporting requirements. These requirements are addressed within the report as follows:

a. **Status of SWMP implementation:** Section 7.1.1 through 7.1.8
b. **Summary of the adaptive management process:** Section 8.0
c. **Proposed changes to the SWMP to reduce TMDL pollutants:** Section 8.0
d. **Summary of education & outreach and public involvement activities**: Section 7.1.4
e. **Summary describing the results of the dry weather field screening and IDDE follow up activities**: Section 7.1.1
f. **A list of entities referred to DEQ for 1200-Z permit coverage**: See City of Portland's Annual Report Section 2.
g. **Summary of stormwater program expenditures:** Section 4.0
h. **Summary of monitoring results:** *See Section IV Monitoring Compliance Report of this combined annual report. Section 6.1 of this document explains the Port's monitoring coordination with the City.
i. **Proposed changes to the monitoring plan:** *See Section IV Monitoring Compliance Report of this combined annual report. Section 6.1 of this report explains the Port's monitoring coordination with the City.
j. **Overview of concept planning, land use changes, and new development:** Section 2.1 and Section 9.0.
k. **Details of any corrective actions implemented:** Section 9.0.
l. **Additional Annual Report requirements for 2022:** Mercury Minimalization Assessment: Attachment A, and winter maintenance information Section 9.0.

As mentioned above, this report is based on the Port's 2012 SWMP. Per the 2021 Permit requirements, the Port is submitting a new 2022 SWMP to DEQ for approval in conjunction with the submittal of this annual report (November 1, 2022). We anticipate that next year's annual report will reflect implementation of the Port's 2022 SWMP.

[1] The Stormwater Management Plan approved by DEQ under the previous iteration of the permit shall provide the framework, measurable goals, tracking measures, and reporting metrics for annual reporting until the SWMP Document required by this permit is approved by DEQ (2021 Permit, Schedule B.3).

2.0 PORT OF PORTLAND PERMIT AREA AND RESPONSIBILITIES

The Port of Portland owns approximately 5,466 acres within the City Urban Services Boundary (USB). Port property is divided into three primary Business Lines under the Operations Division, plus a fourth area that is comprised of undeveloped area:

1) Aviation
2) Marine
3) Industrial Development
4) Undeveloped Property[2]

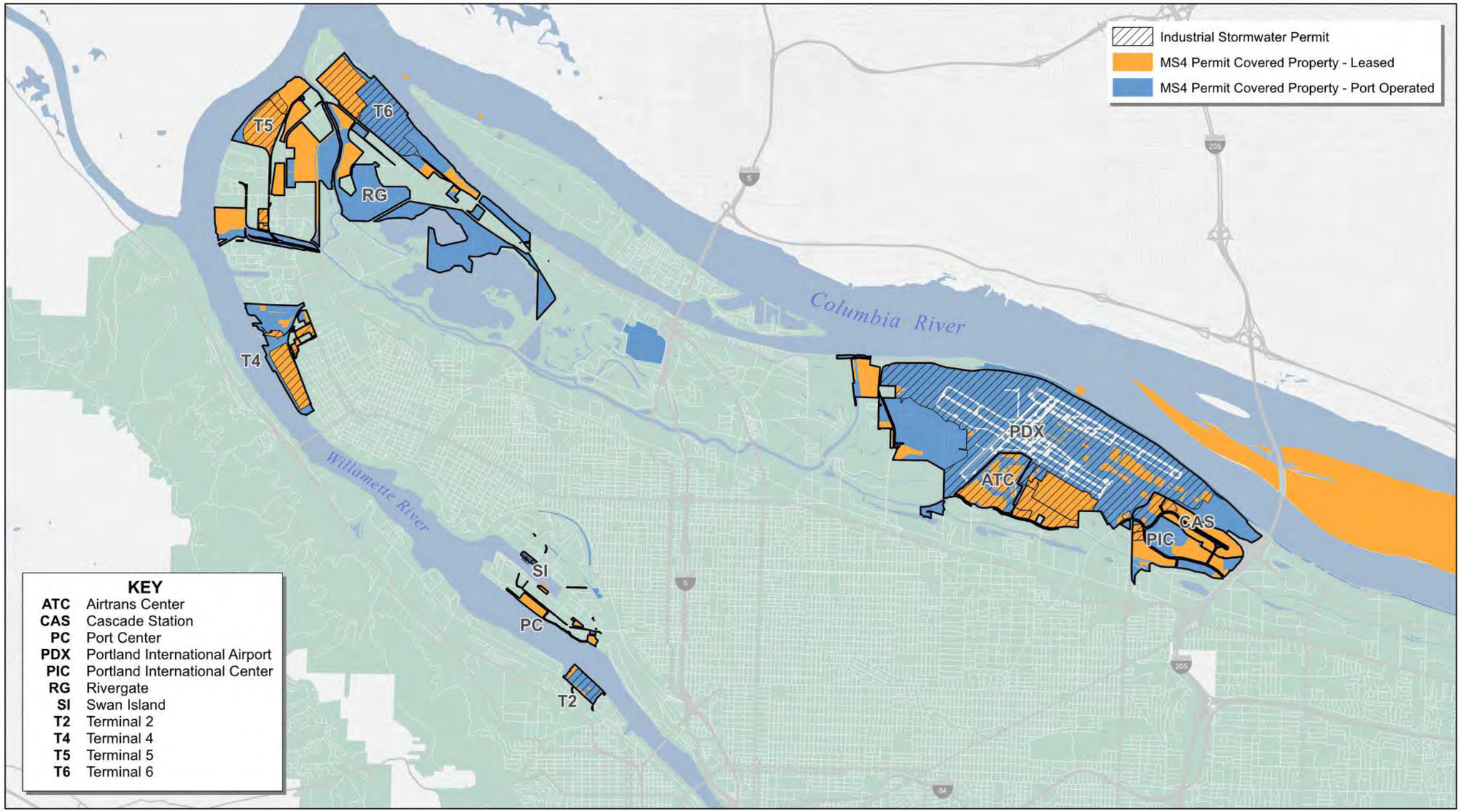
Within the City USB, the Aviation Business Line consists of Portland International Airport (PDX), the Marine Business Line includes Marine Terminals 4, 5 and 6 (T4, T5, and T6). The Industrial Development Business Line consists of Terminal 2 (T2) and the following industrial parks:

1) Swan Island (SI)
2) Port Center (PC)
3) Rivergate (RG)
4) Cascade Station (CAS)
5) Portland International Center (PIC)
6) Airtrans Center (ATC)

Figure 1 illustrates the location of Port property covered by the MS4 Permit. It further delineates those properties leased to tenants and additionally covered by a Port or tenant-managed Industrial Stormwater Permit (i.e., a DEQ-issued 1200-Z or Individual NPDES Stormwater Permit). There were no new industrial permits issued in FY2022.

[2] The Port's undeveloped properties within the USB include wetland and grassland mitigation sites, natural areas, and vacant tax lots.

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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Not acting as a typical city government, the Port is in a unique situation regarding permit compliance with regards to the more typical municipal planning, permitting, and land use modification processes. With the exception of the Port's stormwater design standards that are applied to port operated areas at PDX and T6, the City is responsible for these activities and the Port complies with the City's process. For the purposes of this report, applicable reporting on these activities contained in Section B.3 (2021 MS4 Permit) are satisfied in the City's section of this annual report.

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 28% 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. Portions of PDX, 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 at PDX, Terminals 2, 4, 5, 6, and the industrial parks also operate under NPDES industrial stormwater permits. For Port operations within these areas, several of the MS4 Permit requirements are satisfied through implementation of industrial stormwater permit requirements as addressed in the facility's 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 Aviation-Portland International Airport (PDX)

PDX comprises an area of approximately 2,803 acres and is located 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 nine major outfalls. These stormwater discharges are permitted under the Individual PDX NPDES Waste and Stormwater Discharge Permit #101647 (Individual NPDES permit) issued and administered by DEQ. This Individual NPDES permit is structured to specifically address the Columbia Slough Total Maximum Daily Load (TMDL) parameters which include dissolved oxygen, pH, nutrients, bacteria, and toxics. Stormwater can also be pumped to the Columbia River through a de-icing treatment system. These discharges are also covered under the Port's Individual NPDES permit.

Currently, the Oregon Air National Guard and Yoshida Foods international have their own 1200-Z permits for their operations at PDX. Other PDX tenants whose operations trigger the need for a stormwater permit are co-permittees with the Port on the Port's Individual NPDES permit.

In addition to the Individual NPDES permit, PDX is also covered by an NPDES 1200-CA (Construction Discharge) Permit, a Water Pollution Control Facility (WPCF) 1700-B Wastewater Permit, and a Pretreatment permit issued by the City for discharges to the sanitary system. The pretreatment permit covers the following areas:

- Heating, ventilation, and air conditioning waste streams,
- Firefighting activities,
- Maintenance activities,
- Wash water generated by the Quick Turn-around Facility (a high-volume vehicle wash facility), and
- De-icing discharges.

2.1.2 Marine Facilities

The Port has three marine terminals (T4, T5, and T6) that are managed by the Port's Marine Business Line and one marine terminal managed by the Port's Industrial Development Business Line (T2). The terminals collectively occupy approximately 1,009 acres along the Willamette River (T 2, T4, and T5) and Columbia River/Slough (T6). These terminals handle the shipping, receiving, and temporary storage of finished goods, agricultural products, and raw materials.

Stormwater runoff from T6 discharges into the Columbia River and the Columbia Slough and is covered by 1200-Z permits held by both the Port and individual tenants. The Port obtained a 1200-Z permit for the Port operated area of T6 in August of 2017. The Port continues to hold a 1200-Z permit for T2, a portion of which is leased to tenants. Multiple properties located at T4, and T5 are also leased to tenants and several of these tenants hold their own 1200-Z or Individual NPDES permits that are issued by DEQ and administered by the City.

The Navigation facility is managed by the Ports Navigation Department and is located on Swan Island adjacent to the Willamette River. The facility is used to support dredging operations including storage and maintenance of equipment used for dredging. Stormwater runoff from the Navigation facility discharges directly to the Willamette River or indirectly via a conveyance system comprised of catch basins and pipes to the City's MS4. The Navigation facility is covered by the 1200-Z permit, obtained in 2017. In addition, the marine terminals are also covered by the Port's NPDES 1200-CA (Construction Discharge) Permit.

2.1.3 Industrial Parks

As listed previously, the Port's Industrial Development Business Line manages six Port-owned industrial parks, Swan Island, Rivergate, Cascade Station, Portland Center, Airtrans Center, and the Portland International Center, totaling approximately 1,475 acres. Several industrial park tenants hold the 1200-Z or Individual NPDES permits issued by DEQ and administered by the City. In addition, the industrial parks are also covered by the Port's NPDES 1200-CA (Construction Discharge) Permit.

2.1.4 Undeveloped Properties

The Industrial Development Business Line also manages approximately 1,858 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 Summary of Port Permit Responsibility and Coordination with Co-Permittees

The Port's MS4 Permit (Schedule A.2.) responsibility is influenced primarily by the following two factors:

First, the City is a co-permittee on the MS4 Permit. The City generally conducts MS4 Permit related activities on a city-wide basis with some activities overlapping with the Port's MS4 service area. As a result, the Port and City coordinate on meeting select MS4 Permit requirements through an Intergovernmental Agreement (IGA) to avoid duplication of effort. Specifically, planning and implementation of controls for new development, stormwater facility inspections, and stormwater monitoring are generally conducted by the City on behalf of the Port within the Port's MS4 service area. An exception would be related to the implementation of controls for new development where the Port applies their own Design Standards Manual at PDX and Terminal 6 Port operated areas.

Second, the Port is unique in that its land use is primarily industrial, with no residential areas, and with large-scale parcels located throughout select areas of the City. As described in Section 2.2, some of the Port's operating areas (marine terminals, airport facilities, and/or industrial parks) are also regulated under 1200-Z or Individual NPDES permits and their associated Stormwater Pollution Control Plans (SWPCPs). In addition, DEQ regulates stormwater discharges associated with the Port's capital improvement construction activities performed on Port property pursuant to the Port's 1200-CA permit.

Many of the requirements outlined in DEQ-issued 1200-Z and Individual NPDES permits, and the respective best management practices (BMPs) required pursuant to the associated SWPCPs, are similar to requirements outlined in Schedule A.3 of the 2021 MS4 Permit, specifically for activities related to operations and maintenance, certain illicit discharge elimination activities, spill response, and industrial monitoring. Therefore, operating areas with 1200-Z or Individual NPDES permits already meet many of the MS4 Permit requirements related to the above activities. In addition, some of the requirements in the Port's 1200-CA permit overlap with MS4 Permit requirements for erosion control.

Table 2-1 lists the previous 2011 MS4 Permit requirements and responsibilities[3] and describes how each requirement is met by the 2012 SWMP. Responsibility descriptions for each MS4 Permit requirement are divided into two categories:

- Port MS4 Permit service areas that do not have 1200-Z or Individual NPDES permits, and
- Port MS4 Permit service areas where the Port, or its tenants, have 1200-Z or Individual NPDES permits.

Areas where MS4 Permit requirements are covered and addressed by 1200-CA, 1200-Z or Individual NPDES permit requirements are shaded gray in the table. The table was developed to clarify the complex relationship between the Port's management of stormwater BMPs within the City's USB, the City's overlapping stormwater management activities, and DEQ's regulation of stormwater on Port properties through industrial or construction NPDES permits.

[3] This Table has been updated in the Port's 2022 SWMP and will be reflected in the FY2023 Annual Report, after DEQ's approval of the 2022 SWMP.

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.

Port of Portland 2011 MS4 Permit Requirements and Responsibilities (Areas shaded in gray are 2011 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 2011 MS4 Permit Requirements and Responsibilities

2011 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 individual 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 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				

2011 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 individual 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			

2011 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 an individual 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-Zand individual permits[4]	Covered under 1200-Z and individual 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 individual permits[4]	Covered under 1200-Z and individual 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 2011 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 Environmental Land and Water Manager serves as the MS4 Permit manager.

Environmental Operations is the lead group responsible for planning, tracking, and overall implementation of the Port's SWMP. The following departments/groups also participate in stormwater program implementation:

- Aircraft Rescue Fire Fighting (ARFF)
- Engineering
- Construction Services
- Marine Facilities Maintenance (MFM)
- PDX Maintenance (MX)
- Properties

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 internal teams such as the Stormwater Asset Management Team and the Water Resources Program Team. These teams include staff from Environmental, Aviation and Marine Operations, Asset Management, Planning, Public Affairs, and Engineering. Teams meet periodically and are responsible for providing input on Port-wide projects, policies, water quality issues, and permit implementation. The MS4 Permit Manager is a key team member and actively participates.

With respect to implementation of the Port's industrial stormwater discharge permits, Environmental Operations staff prepares, updates, and ensures implementation of SWPCPs in coordination with co-permittees and non-Port operators where applicable. 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 required actions.

The majority of Port revenue is derived 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 source also includes the sale of property. The Port is reimbursed by the U.S. Army Corps of Engineers for costs incurred providing dredging services.

Commercial Aviation (PDX) funds are derived primarily from fees related to passenger and cargo airline operators, airport parking, rental car revenue, passenger facility charges, Federal grants, and other tenant fees. PDX revenue cannot be comingled with other operating area revenue and are restricted for use at Aviation facilities only 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 and capital improvement projects identified in stormwater master 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 and projected stormwater program expenditures are broken out by area and presented in Table 2. Marine and Industrial Development Business Lines are shown together.

Table 2. Summary of Port Stormwater Expenditures

Business Line	**2021-22 Stormwater Expenditures**	**Projected 2022-2023 Stormwater Expenditures**
Marine and Industrial Development	$1,689,248	$ 1,739,925
Aviation (includes Deicing)	$3,684,882	$ 3,795,428
Engineering	$3,244,553	$ 3,341,890
IT	$76,076	$ 78,358
Legal	$52,299	$ 53,868
Total	**$8,747,058**	**$9,009,469**

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. On March 11, 1992, the Port Commission adopted Ordinance No. 361, which provided the Port with legal authority over specific activities conducted by persons occupying land owned by the Port (e.g., tenants, vendors, contractors). Section 4 of Ordinance 361 requires written permission from the Port before connecting to a Port storm sewer.

Section 5 of Ordinance 361 authorizes the Port to perform the following activities:

- Inspect the land and storm sewers for violations of the ordinance or applicable law that governs the conveyance or disposal of stormwater.
- Control the contribution of pollutants to storm sewers owned or operated by the Port.

- Control the quality of stormwater discharged from the sites of industrial activity on land owned by the Port.
- Control 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, in Ordinance 361 the Port has legal authority to control the contribution of pollutants to the municipal storm sewer through contracts with its tenants. The lease agreements require the lessee to comply with the Port's MS4 Permit. Some properties also have industrial stormwater permits and lease agreements also include requirements to comply with these permit conditions. Through these regulatory and contractual mechanisms, the Port is working with tenants and users of Port facilities to implement and evaluate BMPs that control the contribution of pollutants to the Port's MS4.

6.0 STORMWATER MONITORING

The Port's monitoring program consists of both environmental and BMP monitoring elements. These monitoring elements have been conducted over the years for the purposes of addressing the following monitoring objectives:

1. Evaluate the source(s) of 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 data summarized in this annual report was collected according to the City's 2016 Monitoring Plan which consists of in-stream (event), in-stream (continuous), stormwater, and macroinvertebrate monitoring elements. A discussion of this program and its operations during FY2022 is included in City of Portland's Monitoring Compliance Report (Section IV of this Annual Report). The joint 2022 Monitoring Plan was updated this year for implementation this 2022/2023 fiscal year. This joint Monitoring Plan is also being submitted to DEQ for approval in conjunction with the submittal of this annual report (November 1, 2022).

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.

6.4 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 FY2022:

- 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 (PDX)

7.0 ACCOMPLISHMENTS FOR PERMIT YEAR TWENTY-SEVEN (2021-2022)

7.1 SWMP Implementation

The annual report content in Section 7.0 and format is based on the SWMP submitted to DEQ on December 28, 2012. The SWMP is structured into eight major elements. These elements contain the necessary BMPs to address 2011 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: Environmental Operations).
2. Update the illicit discharge detection and elimination procedures by November 1, 2011 per provisions consistent with the MS4 NPDES permit language (Responsibility: Environmental Operations).
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 FY2022. (*See summary under BMP: Conduct Dry-Weather Field Screening tracking measures.)*
    - ✓ *Marine did not have any reportable illicit discharges investigations in FY2022. (*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)*
2. Track CIPs needed or implemented associated with the IDDE Program (2021 MS4 Permit, Schedule A.3.c.vii).
    - ✓ *No CIPs were needed or implemented for the IDDE Program (FY2022)*

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 16 outfalls.*
   - ✓ *Marine inspected 53 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 8/19/2022.*
     ***Summary:** Sixteen outfalls were inspected; no visible illicit discharges were observed.*
   - ✓ *Marine screening was conducted on 8/15/2022, 8/16/2022, 8/22/2022, 8/24/2022, and 8/31/2022.*
     ***Summary**: Fifty-three Port outfalls were inspected; no visible illicit discharges were observed.*
3. Indicate the outcome and resolution of inspection activities conducted.
   - ✓ *No visible illicit discharges were observed.*

Measurable Goals:

1. Update dry-weather field screening procedures, in accordance with permit requirements by June 30, 2012.
   - ✓ *Previously completed (FY2012)*
2. Inspect priority outfalls annually.
   - ✓ *A total of 69 priority outfalls were inspected Port-wide as part of dry-weather field screening activities in 2021-2022.*

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, Regional Spill Committee did not hold any coordination meetings this fiscal year. Staff continues to participate in the Maritime Fire and Safety Association Oil Spill committee meetings. Staff also participates in the Clean Rivers Cooperative annual drills as well EPA's Region 10 Response Team drills. Due to COVID-19 impacts, drills were not offered to outside participants in FY2022.*

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 spills of a reportable quantity were responded to at the Aviation facilities in FY2022.*

    ✓ *No spill of a reportable quantity was responded to at the Marine facilities in FY 2022.*

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 procedure to ensure appropriate disposal of chlorinated water (Responsibility: PDX Maintenance, Marine Facility Maintenance).

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 Ltd, Toyota Logistics Services, Inc., Auto Warehousing Company (for Hyundai and Ford), the Oregon Air National Guard, Con Global Industries, Millbank Materials, Northwest Cascade Honey Bucket, Kinder Morgan Bulk Terminals, Inc,. SSA Pacific Inc., Cadman Materials, Inc. and Amazon.com Services, Inc.*

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.

   ✓ *20 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 required 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 FY2022. (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) 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 eight decals in FY2022. MFM painted 131 decals in FY2022.*
2. Track events where stormwater educational materials were made available.
   - ✓ *The Port of Portland participated in the KPTV Clean Waters Campaign in FY2022. The premise of the campaign is to educate and engage viewers with helpful water conservation and healthy water tips. The campaign has many elements including promo's produced by KPTV and fronted by KPTV's Chief Meteorologist.*

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 2022, see the tracking measure response above.*
2. Provide stormwater education materials at outreach events.
   - ✓ *In FY2022, the Port's cooperative efforts with other groups or agencies included the Columbia Slough Watershed Council (CSWC) and the Oregon Environmental Council. Port staff serve on the board of the CSWC and currently provides an annual monetary sponsorship.*

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 FY2022, 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. 22/23). The Port has developed stormwater BMP education and outreach materials targeting industrial properties. These were 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 FY2022, see tracking measure response above.*
2. Track technical assistance documentation provided to tenants.
   - ✓ *Completed in FY2022 see a list of issues under BMP: Implement an Inspection Program for Significant Pollutant Source Areas (pg. 22/23). 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.

- ✓ *In FY2022, the Port conducted one lease termination inspection. In addition, the Port conducted inspections at the following:*
  - *UPS Ramp Management; an inspection was conducted in preparation for lease renewal.*
  - *West Hayden Island; an inspection was conducted as an environmental baseline for project work and eventually sale of the property.*
  - *T2; inspection was conducted in preparation for new potential tenants.*

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; Mark Griffith, Dustin Sandberg, Tim Mininger, Mario Chagoya and Justin Coons.*

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 fourteen construction Port staff involved in construction inspection activities for Port projects. Staff trained through this process inspects projects regulated under the Port's 1200-CA permit. Staff receive training every year.*

Measurable Goals:

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

   ✓ *Completed in FY2022. *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 40 employees at Marine facilities and 38 employees at the Navigation facility.*

    ✓ *Spill response training was provided for 151 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 environmental awareness training (includes stormwater pollution prevention training) to 138 existing employees, two non-employee construction staff, and 75 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 be engaged with various organizations including the Oregon Association of Clean Water Agencies, Columbia Slough Watershed Council, Invasive Species Council Advisory Committee. 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 Recyclers, Portland International Airport (PDX) Community Advisory Committee, and The Climate Registry.*
2. Conduct annual training.
   - ✓ *Completed in FY2022, see the tracking measure response above.*
3. Conduct new employee training.
   - ✓ *Completed in FY2022, 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).
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 FY2022 events provided the opportunity for the public to participate in implementation of the Port's stormwater program:*

   - *Port staff visited a middle school to engage the public on the Port's SWMP.*
   - *The Port of Portland participated in the KPTV Clean Waters Campaign in FY2022.*

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, T6, 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 FY2022.*

Tracking Measures:

1. Track sweeping frequency at McCarthy Park.

   ✓ *In FY2022, McCarthy Park was sold except for a small piece of land (now fenced) that is used for access. No sweeping occurred in FY2022.*

2. Track sweeping frequency at the marine terminals.

   ✓ *Sweeping was conducted periodically throughout the year for the marine navigation environmental sweeping, Terminal 4 and Terminal 6. No street sweeping occurred at Terminal 2 in FY2022.*

   ✓ *The Port performed 239.50-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.*

   ✓ *PDX Maintenance also performs routine sweeping of the maintenance facility and the airfield.*

- ✓ *The PDX Maintenance performed was approximately 2,100 hours of sweeping.*

4. Report the amount of materials removed. Materials will include those collected from catch basins and other structural devices.
   - ✓ *25.98 tons of material were removed from catch basins and sweeping combined at Marine facilities.*
   - ✓ *275.22 tons of material were removed from catch basins and sweeping combined at Aviation facilities.*

Measurable Goals:

1. Sweep McCarthy Park parking lot annually.
   - ✓ *Completed in FY2022, see tracking measure response above.*
2. Sweep Port-managed, accessible areas of the marine terminals annually.
   - ✓ *Complete in FY2022, 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 FY2022, 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 rotating chemical applied, maximizing effectiveness by knowing the pH of water being mixed with chemical, reviewing products that are bee friendly, reviewing replacements for glyphosate products Roundup and Ranger Pro.*

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 in Tables 3 – 7.*

Table 3. Herbicide Use from July 1, 2021 to June 30, 2022

MS4 herbicide use reporting – Port of Portland Mitigation and Enhancement Sites			
Year	**Trade Name**	**EPA registration number**	**Amount of herbicide used (oz)**
2021-22 fiscal year	Rodeo	62719-324	1,473
	Aquaneat	228-365	936
	Bronc Max	524-341	154
	Imitator aquatic	19713-623	632
	Poast	7969-58	92
	Select Max	59639-132	256
	Transline	62719-259	375
	Vastlan	62719-687	2,787
	Vaquero	2935-459	914
Total amount of herbicide used in the 2021-22 fiscal year			7,619

Table 4. MFM Pesticides/Herbicides/Fertilizer from July 1, 2021 to June 30, 2022

Item Name	**Amount of used**
Agri Star Triclopyr 3A	16.58 gallons
Ranger Pro, Herbicide	54.01 gallons
Right on Blue	36.80 gallons
Herbicide (Sulfomet Alternative)	102.10 oz
SPRAY-007 Surfactant/Penetrant	6.14 gallons
Terminator II Defoamer (Qt)	0.06 gallons

Table 5. PDX General Maintenance Pesticide Use from July 1, 2021 to June 30, 2022

Pesticide Name	Amount of pesticide used
Sureguard	4.2 gallons
Crossroads	339 gallons
Ranger Pro	22.5 gallons
ZP	8,450 lbs
Dimlin 2L	1.6 gallons

Table 6. PDX Landscape Maintenance Herbicide Use from July 1, 2021 to June 30, 2022

Herbicide Name	Amount of pesticide used
AgriStar Triclopry	12 gal
Atrimmec Planter regulator	7 gal
Gallery 75 DF pre-m	45 lbs
Dimension 2EW	7 gal
Ranger Pro	12 gal
Pendulum Aqua Cap	22 gal
Game on herbicide	60 oz
Crossroads	9 gal

Table 7. Marine Landscape Maintenance Herbicide Use from July 1, 2021 to June 30, 2022

Name	Amount used
Ranger Pro	464.5 oz
Triclophry 3A Herbicide	1,948.25 oz
Surflan	272.25 oz
Envy	1,947.25 oz
Specticle	18 oz
Gallery 75	3 lbs
Dimension	77.5 lbs
Gly-Star Plus	344.5 oz

Measurable Goals:

1. Annually update the Port's pesticide use inventory.
   - ✓ *Completed for FY2022, 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 has a Fats, Oil, Grease (FOG) system to manage oils produced by restaurants in the terminal food court and concourses. Fry grease produced by restaurant tenants is temporarily transported via heat traced pipes to aboveground double-walled liquid grease tanks where they are stored before being pumped out and transported for recycling by Terra Hydr. The aboveground grease tanks are located on pedestals outside of the terminal building either under cover or have double-walled containment near the restaurants. There are five underground interceptor tanks that collect FOGs from concessions that do not produce fry oil (i.e. coffee shops). The underground interceptor tanks are also owned and maintained by the Port and cleaned out regularly by Terra Hydr. There are multiple grease tanks indoors owned and maintained by tenants. The Port also maintains a communal grease/oil collection vat located adjacent to the main terminal food court.*
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 FY2022. 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 FY2022.*

Tracking Measures:

1. Track number of catch basins cleaned annually.
   - ✓ *822 catch basins were cleaned at Aviation facilities.*
   - ✓ *170 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 4 quiescent ponds were last cleaned in FY2021.*
- ✓ *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.
   - ✓ *1,100 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 FY2022.*
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 FY2022, 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.

   ✓ *Previously Completed. In FY2022, 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, new IGA is pending and should be approved in November 2022) 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 MS4 reporting year 2022, an adaptive management process was used to ensure all ideas are heard, documented, and implemented, if viable. PDX and Marine Maintenance have continued to refine data collection for cleaning and documenting maintenance of the storm sewer system. In 2019 the Port installed a 333-cartridge stormwater treatment vault system at PDX in drainage basin 7. The vault did not appear to function as originally designed, so a study was initiated. As a result, the pump logic and rain gauges were reconfigured, enhancing the system's treatment capacity. The Port also continues to monitor the performance of Baysaver stormwater treatment cartridges installed at PDX in drainage basin 5, and a study is planned for the 2023 reporting year to further refine the capacity and function of the treatment system. In reporting year 2021, the Port constructed a stormwater treatment system at T4 and the Navigation Facility, and performance monitoring of these systems continued through the 2022 reporting year. Construction of a vegetated infiltration basin at T6 was completed in 2022. This facility at T6 treats stormwater runoff from approximately 20 impervious acres in basin K and 60 impervious acres in basin L. The Port added T6 to their DSM in 2021 and plans to expand this area in 2023.

The Port did not make any 2012 SWMP revisions during FY2022 that would effect Section 7.0 of this annual report. The Port did prepare the draft 2022 SWMP to reflect the 2021 MS4 Permit requirements (effective October 1, 2021). The Draft 2022 SWMP was open for public comment for 30 days in September/October 2022. The 2022 SWMP is dated November 1, 2022 and is pending DEQ approval.

9.0 2021 MS4 PERMIT ADDITIONAL ELEMENTS

Schedule B.3.l of the 2021 MS4 Permit requires the Port to track and report on additional elements that are found in specified sections of the permit. A summary of those elements for 2022 reporting is included here:

- **Schedule A.1.b.iii:** Schedule A.1.b.iii requires co-permittees to submit the details of all corrective actions implemented associated with this section of the permit (Water Quality Standards). The Port has no corrective actions to report for FY2022.
- **Schedule A.3.c.vii**: Schedule A.3.c.vii requires co-permittees to include updates in the annual report regarding any capital improvements needed or implemented associated with the IDDE program. In FY2022, there were no CIPs needed or implemented associated with the IDDE Program.
- **Schedule A.3.f.v.(C)**: Schedule A.3.f.(C) requires co-permittees to document winter maintenance activities for streets and roads in the annual report beginning November 1, 2022. The information is required to include a list of materials used, number of winter weather events where winter maintenance materials are used, quantities and general location of each material used in relation to distance (e.g., pounds per mile). The Port had eight days in FY2022 where winter events occurred, and winter maintenance was conducted. The Port applied 6,260 gallons of potassium acetate over 38.28 miles and 10 tons of sodium acetate (solid) over 12 miles. Deicers were applied during winter events along Airport Way, Frontage Rd, Airtrans Way, Air Cargo Rd., Courier Ct., Airway Cir. and NE 82nd.
- **Schedule B.3.j**: The Port issued no post-construction permits in FY2022.
- **Schedule D.3.b:** Schedule D.3.b. requires co-permitttees to develop and submit a mercury minimization assessment that documents the Port's current actions, such as BMPs implemented, that reduce the amount of solids discharged into and from the permitted MS4 system (similar to the actions currently required by 2021 Permit Schedule A). The Port's Mercury Minimization Assessment can be found in Attachment A of the Port's section of this annual report.

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ATTACHMENT A
MERCURY MINIMIZATION ASSESSMENT
FOR
THE PORT OF PORTLAND

A Total Maximum Daily Load (TMDL) is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet applicable water quality standards. TMDLs assign wasteload allocations (WLAs) to point sources of pollutants, and load allocations (LAs) to nonpoint sources of pollutants. The Oregon Department of Environmental Quality (DEQ) has the regulatory authority to implement TMDL programs in Oregon with responsibility for:

1) requiring and reviewing TMDL Implementation Plans for nonpoint sources; and,

2) incorporating TMDL related requirements for point sources in NPDES permits. Therefore, with respect to municipal stormwater discharges regulated under an NPDES MS4 permit, DEQ includes TMDL requirements directly within those permits.

As stated in DEQ's Permit Evaluation Report (PER) for the 2021 Portland NPDES MS4 Permit,

> "*DEQ has determined that implementation of the permit conditions, BMPs identified in the SWMP Document, and the adaptive management process will meet TMDL WLAs for municipal stormwater* (PER, pp 35)."

The Port of Portland's NPDES MS4 permit identifies applicable TMDLs and associated WLAs. Schedule D, *Special Conditions* of the permit lists specific conditions for addressing those TMDLs. These permit conditions include requirements to conduct a TMDL pollutant load reduction evaluation in comparison to assigned WLAs for stormwater, and to develop pollutant load reduction benchmarks targeting achievement of WLAs for specified TMDL pollutants over time. DEQ included TMDL requirements in the 2005, 2011, and the recently issued 2021 NPDES MS4 permits for Phase I permittees.

The Port of Portland has complied with permit requirements to conduct pollutant load reduction evaluations and establish TMDL pollutant load reduction benchmarks. However, WLAs were not established for mercury until 2021 and, therefore, mercury was neither required nor included in the Port's prior TMDL analyses.[1] The 2021 mercury TMDL includes a water quality management plan (WQMP) developed by DEQ, that outlines management strategies for both point and nonpoint sources of mercury. Specific management strategies for Phase I NPDES MS4 permittees are outlined in Section 13.3.2.2 of the revised TMDL (Appendix A) and were subsequently included in Schedule D.3.b of the Port's NPDES MS4 permit. Per Schedule D.3.b, requirements specific for mercury are detailed below:

i. Develop and submit a mercury minimization assessment with the annual report due November 1, 2022, that documents the current actions, such as BMPs implemented, that reduce the amount of solids discharged into and from the permitted MS4 system (similar to the actions currently required in Schedule A). If the assessment indicates that mercury and sediment reducing BMPs are fully incorporated into the SWMP Document, a report documenting the results as such is sufficient.

ii. Continued implementation of the BMPs and other actions described in the mercury minimization assessment that are effective for mercury reduction, along with documentation of implementation in each subsequent annual report.

[1] Mercury was originally included in the 2006 Willamette River TMDL, but establishment of WLAs was deferred due to litigation. On November 22, 2019, DEQ issued a revised Willamette River TMDL for mercury. The United States Environmental Protection Agency (EPA) disapproved DEQ's TMDL on December 30th, 2019 and issued their final TMDL on February 4, 2021.

iii. An analysis of the effectiveness of the best management practices and any other actions taken and qualitative pollutant load reductions achieved in the MS4 Permit Renewal Application Package. Due to data limitations, mercury benchmarks are not applicable in the first permit cycle after the TMDL is finalized.

iv. Collection of paired total mercury and total suspended solids samples, as described in Schedule B.

v. Submittal of paired mercury and total suspended solids monitoring data in the appropriate DEQ data submission template. Given the lack of sufficient mercury data, pollutant load reduction evaluations, benchmarks, and waste load allocation attainment analyses for mercury will not be required in this permit cycle.

The purpose of this Mercury Minimization Assessment, included with the Port's 2022 MS4 Annual Compliance Report is to address the requirement outlined in bullet *i.* above.

Chapter 4 of EPA's 2021 *TMDL for Mercury in the Willamette Basin* includes summary information regarding mercury sources. Atmospheric deposition of mercury from global sources is presented as the dominant source of mercury in the Willamette River Basin. Additional sources identified include: nonpoint sources such as runoff from forestry and agriculture land management practices that can transport sediment and mercury to streams; background/anthropogenic sources that include mercury in groundwater due to local geology, and naturally occurring sediment-bound mercury that is eroded and transported to streams; and point sources such as municipal waste discharges, industrial discharges, suction dredge mining and stormwater. Mercury loads in urban stormwater are believed to be predominantly associated with atmospheric deposition and active erosion or transport of sediment that is carried in runoff to downstream water bodies. As a result, stormwater best management practices (BMPs) implemented by NPDES MS4 permittees are focused on reducing the discharge of sediment as the primary method to reduce discharges of mercury.

The prevention and reduction of sediment in runoff has been a focus of the Port's stormwater management program since the first MS4 permit-required Stormwater Management Plan (SWMP) was developed in the early 1990's. The Port uses an adaptive management approach to continually improve upon existing stormwater BMPs over time as new knowledge is gained regarding the effectiveness and efficiency of these practices. The Port has submitted the results of its adaptive management process as applicable every year in annual reports since the original SWMP became effective. The Port has also conducted detailed quantitative and qualitative adaptive management analyses as part of each NPDES MS4 permit renewal. The Port's 2022 MS4 Annual Compliance Report, due to DEQ on November 1, 2022, provides the latest summary of BMP implementation according to the pre-existing 2011 SWMP. A new SWMP that meets the conditions of the recently issued 2021 NPDES MS4 permit is also being submitted to DEQ for approval on November 1, 2022.

Based on the Port's long-term ongoing adaptive management process, a review of the current/approved 2011 SWMP, and a comprehensive MS4 program evaluation and update as per the 2021 permit, we have determined that **effective sediment and mercury reducing BMPs are fully incorporated into the Port's new/proposed 2022 SWMP Document**. BMP tables in Section 3 of the Port's proposed SWMP provide a cross-reference to the TMDL parameters that each BMP has the potential to address, including sediment (TSS) and mercury. To meet the NPDES MS4 permit standard, these BMPs have been developed as part of an overall program to reduce pollutants to the maximum extent practicable (MEP).

In summary, the Port's BMPs, or Control Measures as described in Section 3 of the 2022 SWMP, include the following categories of BMPs that prevent sediment and mercury in stormwater discharges:

- Public Education & Outreach (Element #1)
- Public Involvement & Participation (Element #2)
- Illicit Discharge Detection & Elimination (Element #3)
- Construction Site Runoff Control (Element #4)
- Post-Construction Site Runoff (Element #5)
- Pollution Prevention & Good Housekeeping for Municipal Operations (Element #6)
- Industrial & Commercial Facilities (Element #7)
- Infrastructure Retrofit and Hydromodification Assessment (Element #8)
- MS4 Training 9 (Element #9)

The 2022 SWMP includes detailed descriptions of each BMP, including implementation tasks, measurable goals, and tracking measures. BMPs in Section 3 support the prevention and reduction of sediment (TSS) and mercury as noted.

Further, in August, 2022, the Port submitted an updated TMDL Implementation Plan that addresses requirements of the 2021 *TMDL for Mercury in the Willamette Basin* for the Port's nonpoint sources of mercury.

As a result of this Mercury Minimization Assessment, the Port finds that effective sediment and mercury reducing BMPs are fully incorporated into the SWMP Document.

PART III
MONITORING REPORT

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1 Introduction

This annual Monitoring Report is submitted in compliance with Schedule B of the City and Port of Portland's National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Discharge Permit Number 101314. Schedule B of the 2011 MS4 permit (Table B-1[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 2020–21 permit year (July 1 to June 30) in accordance with Schedule B and the 2016 Monitoring Plan and discusses pertinent results.

The Oregon Department of Environmental Quality (DEQ) renewed the City's MS4 permit on September 15, 2021. The new permit, which became effective on October 1, 2021, contains new Schedule B monitoring requirements, including the submittal of an updated Monitoring Plan by November 1, 2022. The City has developed a new Monitoring Plan to meet the new Schedule B requirements and will begin implementing the new monitoring effort in the 2022–23 permit year. This annual report will be the final report submitted to DEQ describing monitoring conducted under the City's 2016 Monitoring Plan.

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 2021–22 permit year are included in Appendix B and data were submitted electronically to DEQ via DEQ's Phase I MS4 Monitoring Data Submission website using the DEQ submission templates.[2]

[1] The monitoring requirements are included in Table B-1 in the 2011 MS4 permit. In the 2021 MS4 permit, the monitoring requirements are included in Table 2.

[2] Data were submitted to DEQ via the Phase I MS4 Monitoring Data Submission 2022 website: https://www.oregon.gov/deq/wq/wqpermits/Pages/MS4submission.aspx

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 provided 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.

	2016 Monitoring Plan		2021–22 Activities	
Monitoring Type	**Number of Sites**	**Frequency/Site**	**Number of Sites**	**Frequency/Site**
Probabilistic Stormwater	15	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	3-8 dry weather 2-5 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 2021–22 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).[3] 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 2016 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

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

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 (more than 9,000 individual UICs) while maintaining statistical power. Each UIC is investigated and field verified before the sampling panel is finalized.

During the 2021–22 permit year, the City successfully sampled 30 UIC locations. The samples were collected from six separate storm events (Table 2).

Table 2. Summary of storm events sampled as part of the City's probabilistic stormwater monitoring during the permit year. Less than 0.1 inch of rain was recorded during the 24-hour period prior to the start of each storm event.

Sampling Date	Number of Sample Locations	Event Length Before Sample Collection (Hours)	24-Hour Antecedent Rainfall (Inches)
2021-11-04	6	5.5–8.0	0.42–0.53
2021-11-15	3	2.8–4.0	0.10–0.14
2021-12-06	5	11.6–14.4	0.45–0.58
2021-12-15	6	5.2–8.7	0.13–0.34
2022-01-03	3	18.3–19.8	1.79–1.79
2022-02-28	4	13.3–15.6	1.47–1.65
2022-03-21	3	12.9–14.1	0.38–0.40

Note: Recorded rainfall is based on the rain gauge closest to each UIC monitoring location. The Event Length represents the number of hours with measurable rainfall leading up to the sample collection time. The 24-hour antecedent rainfall is the total recorded rain during the 24 hours prior to sample collection. Ranges are provided given the variability between sites.

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 flowmeters, 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 2021–22 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. Less than 0.1 inch of rain was recorded during the 24-hour period prior to the start of each storm event.

Site ID	Sample Dates	Sampling Period (Hours)	24-Hour Antecedent Rainfall (Inches)	Sample Collection Rainfall (Inches)
M1 Columbia Slough *Mixed Land Use*	Oct 21-22, 2021	5.8 hours	0.23	0.86
	Feb 26-28, 2022	37.8 hours	0.12	1.80
	Apr 3-4, 2022	11.1 hours	0.00	0.64
OF19 Willamette River *Forest Park and Industrial Land Use*	Oct 21-22, 2021	11.8 hours	0.05	0.74
	Feb 26-28, 2022	50.2 hours	0.09	2.30
	Apr 10-12, 2022	47.9 hours	0.09	2.00
R1 Fanno Creek *Residential Land Use*	Oct 21-22, 2021	10.8 hours	0.19	0.63
	Feb 26-28, 2022	43.7 hours	0.19	1.90
	Apr 3-4, 2022	19.4 hours	0.00	0.93
R2 Columbia Slough *Residential Land Use*	Oct 21, 2021	1.8 hours	0.39	0.31
	Feb 27-28, 2022	33.8 hours	0.22	1.70
	Apr 3-4, 2022	7.3 hours	0.13	0.51

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 gauge.

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.

During the 2021–22 permit year, the City collected water quality samples from all of the fixed and 20 instream water quality monitoring sites (Table 4).

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	3-4	2-3	12	6	4	1	30
Johnson Creek	2	4	2	12	5	4	1	25
Tualatin River	1	8	4	12	4	4	1	20
Willamette River Tributaries	3	5-7	2-5	31	5	4	1	25
Willamette River	3	8	4	36	N/A	N/A	N/A	N/A
Totals	**11**			**103**	**20**			**100**

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

The City collected all the planned samples from the fixed monitoring sites in the Columbia Slough, Fanno Creek, Johnson Creek, Tryon Creek, and mainstem Willamette River. 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 gauges in the Portland area. The City provides partial funding for the monitoring sites through joint funding agreements.[4] All seven of the gauges record stream discharge, and four gauges also record water temperature. The Willamette gauge measures additional parameters, including chlorophyll-*a*, cyanobacteria, dissolved oxygen, nutrients, pH, specific conductance, and turbidity.

All seven gauges were operational throughout the permit year, with the exception of Gauge #14211720 on the Willamette River and Gauge #14211820 on the Columbia Slough. Equipment failures occurred at the two USGS gauges. As such, there are periods with incomplete discharge records at both stations. 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 is provisional at the time of reporting and may be subject to change after the USGS completes the full quality assessment.

[4] U.S. Department of the Interior, U.S. Geological Survey 2019 Joint Funding Agreement for Water Resource Investigations, https://efiles.portlandoregon.gov/Record/13152687.

2.5 Macroinvertebrates

Macroinvertebrate monitoring provides information on biological communities within water bodies that receive MS4 discharges. This monitoring 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 2021. All wadeable, riffle-dominated sites were sampled in accordance with the 2016 Monitoring Plan. No sampling problems were encountered.

2.6 Permit Year Precipitation Patterns

Precipitation patterns across Portland are variable, delivering different amounts of rain to different parts of the city. The City operates a network of rain gauges as part of the HYDRA Rainfall Network.[5] Each rain gauge records rainfall amounts in 0.01-inch increments. For the purposes of summarizing the precipitation patterns observed during the permit year, data from eight gauges located across the City were summarized (Figure 1). During the 2021–22 permit year, Portland received a total of approximately 53.6 inches of precipitation. During the previous 20 years, the eight rain gauges recorded a mean total annual rainfall amount of 41.1 inches.

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

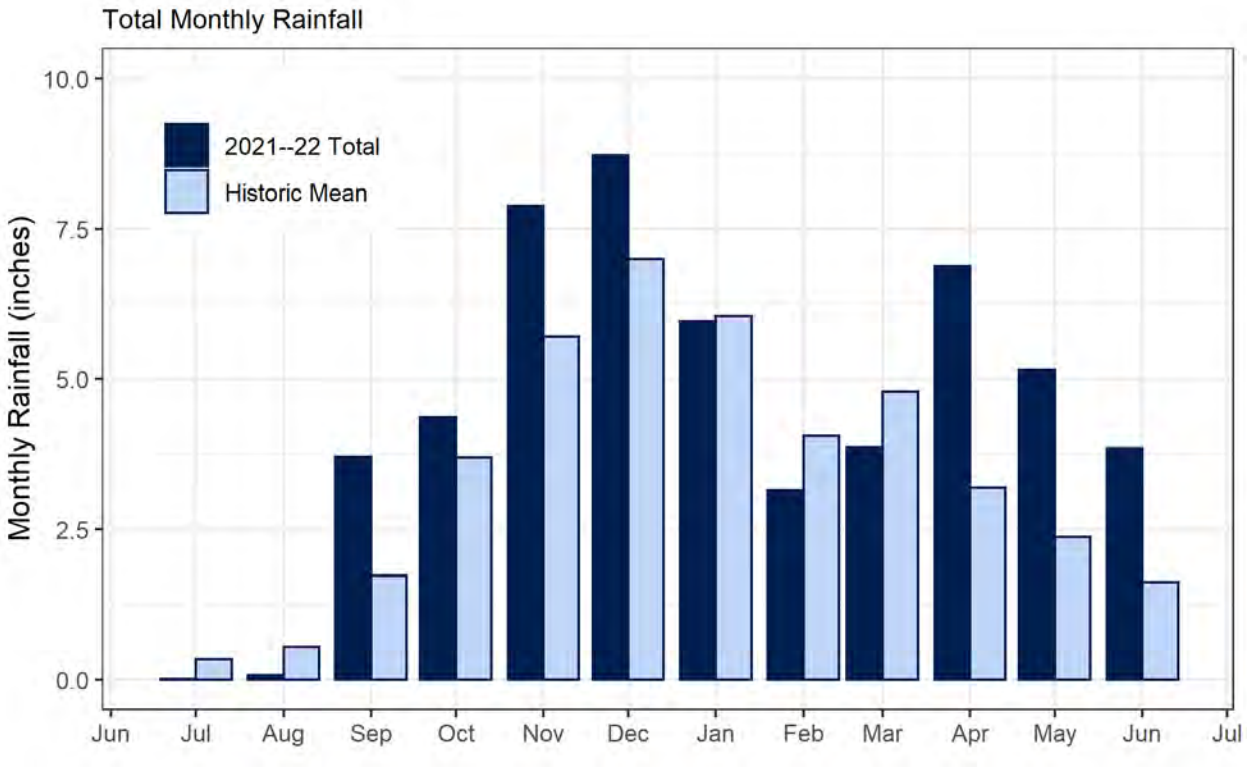


Figure 1. Mean total monthly rainfall recorded at eight stations across Portland from July 1, 2021, to June 30, 2022, compared to the mean monthly totals recorded from the previous 20 years (2001–2021).

Compared to previous years, Portland received more rain by approximately 12.5 inches during the 2021–22 permit year. During many months higher-than-average rainfall amounts were recorded, with the largest deviations occurring in the fall and spring (Figure 1).

3 Monitoring Results

The following sections describe the results of instream, stormwater, and biological monitoring conducted by the City during the 2021–22 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 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 2021–22 permit year, the City sampled two rotating panels of UIC sites during seven 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 below represent population estimates for all of the City's UICs using the data collected during the 2021–22 permit year.[6] 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%	47%	100%	100%	100%
Mean	1.62	0.17	13.78	0.14	25.7
	1.25–2.00	*0.1–0.25*	*9.29–18.26*	*0.08–0.19*	*9.1–42.3*
Median	1.52	0.11	9.06	0.12	10.0
	0.93–2.08	*0.11–0.34*	*7.65–16.18*	*0.05–0.19*	*4.0–50.8*
90th Percentile	2.47	0.40	23.56	0.23	59.1
	2.1–3.25	*0.11–0.57*	*16.95–58.36*	*0.12–0.46*	*28.4–179.3*

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

[6] In past monitoring 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 traffic statistic was originally used as the stratification variable in the sample design of the probabilistic monitoring program. ADT values were calculated by the Portland Bureau of Transportation and used in the program design to ensure that a sufficient number of sites on high-traffic roads were included in the sample population. The ADT values have not been updated, and the distinction between the two categories used in the original sample design no longer reflects current traffic patterns. As such, this report does not use the ADT distinction to present the probabilistic stormwater results.

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

Overall, the dissolved copper, lead, and zinc concentrations show low variability. TSS concentrations, however, were more variable. The probabilistic stormwater results were not compared to any water quality standards as 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. All metals except for dissolved lead were detected during every storm event at all four sites (Table 6). The non-detect dissolved lead samples were collected at one of the residential land use sites (R2). Nutrients were regularly detected at all sites during each 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)	2,700	495	41	20,000	14/14
Hardness (mg $CaCO_3$/L)	24.0	24.1	6.2	46.6	12/12
Total organic carbon (mg/L)	7.1	6.7	3.9	11.4	12/12
Total suspended solids (mg/L)	150	59	14	558	12/12
Metals (µg/L)					
Copper	14.0	13.3	4.6	23.3	12/12
Copper, dissolved	2.7	2.8	2.0	3.3	12/12
Lead	13.0	9.8	0.9	45.8	12/12
Lead, dissolved	0.2	0.2	<0.11	0.4	9/12
Zinc	110.0	103.3	41.0	232.0	12/12
Zinc, dissolved	23.0	22.8	10.0	40.2	12/12
Nutrients (mg/L)					
Ammonia-nitrogen	0.08	0.08	<0.02	0.19	11/12
Nitrate-nitrogen	0.33	0.32	<0.10	0.76	10/12
Orthophosphate	0.04	0.05	0.02	0.09	12/12
Total phosphorus	0.36	0.26	0.10	0.84	12/12

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.[7] 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 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

Note: Values are from Table 3-2 (p. 3-6) of the 1997 ACWA stormwater report.

The TSS samples collected from the R2 residential site during the 2021–22 permit year (28–49 mg/L) were consistently lower than the mean TSS concentration of 64 mg/L for residential land use found by the ACWA study (Table 7). Conversely, the highest observed TSS concentrations were observed at R1. While the dominant land use contributing to the R1 site is 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 elevated TSS concentrations observed at R1 are consistent with the ACWA observations that differences in concentrations of water quality parameters may be explained by differences in conveyance systems and the physical processes at work.

Two of the three TSS samples observed during the 2021–22 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 (8.4–21.2 µg/L), dissolved copper (2.3–2.8 µg/L), and total zinc (83–149 µg/L). TSS concentrations from the mixed land use site (M1) varied little between storm events (36–86 mg/L) and 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 sites, 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 Portland's streams and watersheds. The following sections describe the results of these sampling efforts.

[7] 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.

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 2021–22 permit year, the City collected 203 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.

Dissolved copper was consistently detected during the permit year in all but four of the 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 copper criteria were observed in all but the Tualatin watersheds. 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 2021–22 permit year, the chronic dissolved copper criteria were consistently lower than the acute criteria, ranging from 0.37 to 32.81 µg/L, with a mean of 3.76 µg/L.

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	11/12	0.82	<0.211	1.32	17
	Probabilistic	27/30	0.63	<0.211	1.95	0
Johnson Creek	Fixed	12/12	0.99	0.441	1.43	42
	Probabilistic	25/25	0.81	0.286	1.97	0
Tualatin River	Fixed	12/12	0.95	0.555	1.91	0
	Probabilistic	20/20	0.73	0.399	3.11	0
Willamette River	Fixed	36/36	0.40	0.322	1.33	14
Willamette Tributaries	Fixed	31/31	1.13	0.686	3.66	6
	Probabilistic	25/25	0.59	0.272	1.86	0

Note: Biotic Ligand Model chronic criteria ranged from 0.37 to 32.81 µg/L, with a mean of 3.76 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 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 1.35 µg/L, and ranged from 0.35 to 4.15 µg/L. No exceedances of the chronic dissolved lead criterion were observed during the 2021–22 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 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	1/12	-	<0.11	0.12	0
	Probabilistic	0/30	-	<0.11	<0.11	0
Johnson Creek	Fixed	1/12	-	<0.11	0.12	0
	Probabilistic	8/25	<0.11	<0.11	0.26	0
Tualatin River	Fixed	4/12	<0.11	<0.11	0.31	0
	Probabilistic	4/20	<0.11	<0.11	0.41	0
Willamette River	Fixed	9/36	<0.02	<0.02	0.16	0
Willamette Tributaries	Fixed	10/31	<0.11	<0.11	0.20	0
	Probabilistic	9/25	<0.11	<0.11	0.28	0

Note: The calculated chronic water quality criterion for dissolved lead is based on hardness in the water column, ranging from 0.35–4.15 µg/L with a mean of 1.35 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 71.5 µg/L and ranged from 26.3 to 175.0 µg/L. Exceedances of the chronic dissolved zinc criterion were only observed in the Willamette River tributaries during the 2021–22 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 (Tables 8-10). For all three dissolved metals, the mainstem Willamette samples had the lowest median concentration of all the watersheds.

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	9/12	1.54	<0.53	11.0	0
	Probabilistic	26/30	2.19	<0.53	13.9	0
Johnson Creek	Fixed	11/12	3.42	<0.53	7.6	0
	Probabilistic	25/25	2.83	0.7	10.1	0
Tualatin River	Fixed	12/12	8.04	1.56	23.3	0
	Probabilistic	20/20	7.28	1.16	67.2	0
Willamette River	Fixed	23/36	0.63	<0.53	1.8	0
Willamette Tributaries	Fixed	31/31	16.1	3.14	62.5	3
	Probabilistic	20/25	0.86	<0.53	3.5	0

Note: The calculated chronic water quality criterion for dissolved zinc is based on hardness in the water column, ranging from 26.3–175.0 µg/L with a mean of 71.5 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.

TP was detected in all 203 samples collected during the 2021–22 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 part of the City, the 0.155 mg/L load allocation from the Columbia Slough TMDL was used. During the 2021–22 permit year, the highest median TP concentrations were observed in the Columbia Slough and Tualatin watersheds. Higher percentages above the TMDL target allocations were also recorded in these 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**	**Percent Above TMDL Allocation**
Columbia Slough	Fixed	12/12	0.11	0.07	0.15	0
	Probabilistic	30/30	0.12	0.06	0.25	20
Johnson Creek	Fixed	12/12	0.07	0.03	0.10	0
	Probabilistic	25/25	0.04	0.02	0.28	20
Tualatin River	Fixed	12/12	0.10	0.05	0.18	25
	Probabilistic	20/20	0.07	0.04	0.18	5
Willamette River	Fixed	36/36	0.06	0.03	0.11	0
Willamette Tributaries	Fixed	31/31	0.08	0.04	0.18	3
	Probabilistic	25/25	0.08	0.04	0.30	12

Note: There are no instream freshwater water quality criteria for total phosphorus in Oregon; however, some TMDLs include load or waste load allocations for phosphorus that vary by watershed. Samples from sites in the Tualatin watershed were evaluated and compared to the appropriate TMDL load allocation, and all other sites were evaluated against the 0.155 mg/L maximum instream concentration from the Columbia Slough TMDL. For the probabilistic samples, the Percent Above TMDL Limit represents an estimate of the probability of a concentration above these limits 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 the Columbia Slough during the 2021–22 permit year (Table 12). The fixed site samples from the Johnson Creek, Tualatin, and Willamette Tributaries watersheds, which are mainstem sites, periodically exceeded the single sample criterion of 406 organisms per 100 mL (Table 12). 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, Johnson, and Tryon creeks.

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	12/12	31	10	330	0
	Probabilistic	27/30	46	<10	360	0
Johnson Creek	Fixed	12/12	200	41	520	17
	Probabilistic	25/25	150	10	2,100	24
Tualatin River	Fixed	12/12	385	75	740	50
	Probabilistic	18/20	46	<10	700	5
Willamette River	Fixed	36/36	20	1	440	3
Willamette Tributaries	Fixed	31/31	190	10	7,300	35
	Probabilistic	15/25	10	<10	560	4

Note: Results from the two instream monitoring programs (Fixed and Probabilistic programs) are included. All samples were evaluated against the chronic water quality criterion 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.

3.2.2 Instream Flow and Temperature

Stream discharge was recorded at the seven USGS stream gauges in the Portland area. Water temperature was recorded at four of the seven gauges. The following sections present the results from the 2021–22 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 gauges within the city. The effects of the drier than usual February and March (Figure 1) can be seen in the instream flow recorded at the five tributary gauges. Flows in Fanno Creek fell below the historic 10th percentile in February, as did flows in Tryon Creek (Figure 2). Due to an equipment malfunction, the USGS gauge did not record stream flow for three days in mid-February at the Tryon Creek station.

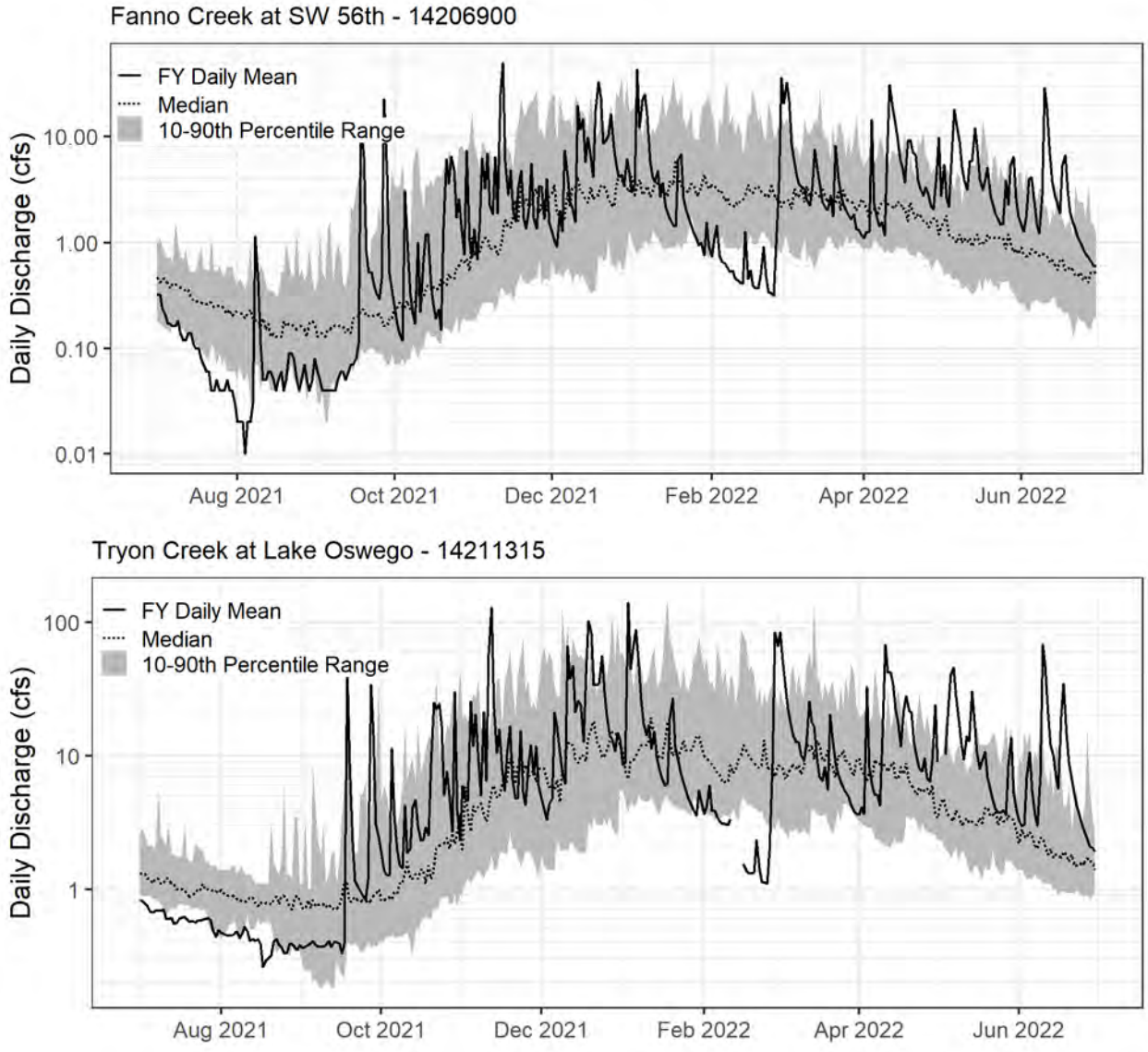


Figure 2. Daily discharge recorded at westside USGS gauges #14206900 (Fanno Creek) and #14211315 (Tryon Creek) during the permit year. The mean daily discharge (solid line) is plotted along with the historic median (dotted line) and 10th to 90th percentile range (gray area) of observed flows from the available period of record (29 and 18 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 the winter, approaching or dipping below the 10th percentile low flows (Figure 3). Low flows in the summer remained within, or close to the historic 10th-90th percentile range at all three sites.

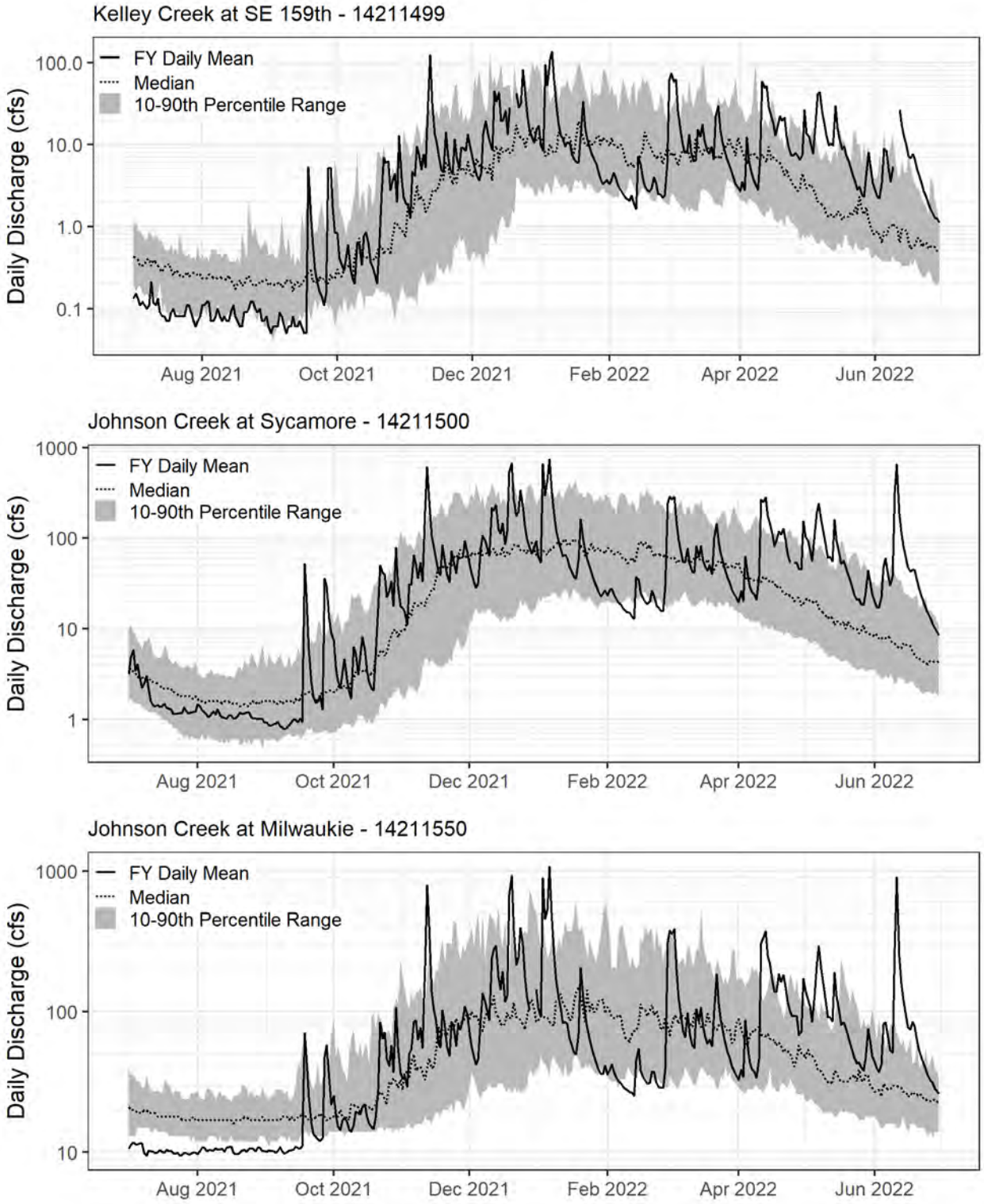


Figure 3. Daily discharge recorded at three eastside USGS gauges (#14211499, #14211500, and #14211550) during the permit year. The mean daily discharge (solid line) is plotted along with the historic median (dotted line) and 10th–90th percentile range (gray area) of observed flows from the available period of record (20, 80, and 31 years, respectively).

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 June (Figure 4) corresponds to the period of elevated discharge in the Columbia River during the spring. Due to an equipment malfunction, the USGS gauge did not record stream flow from mid-March to mid-April.

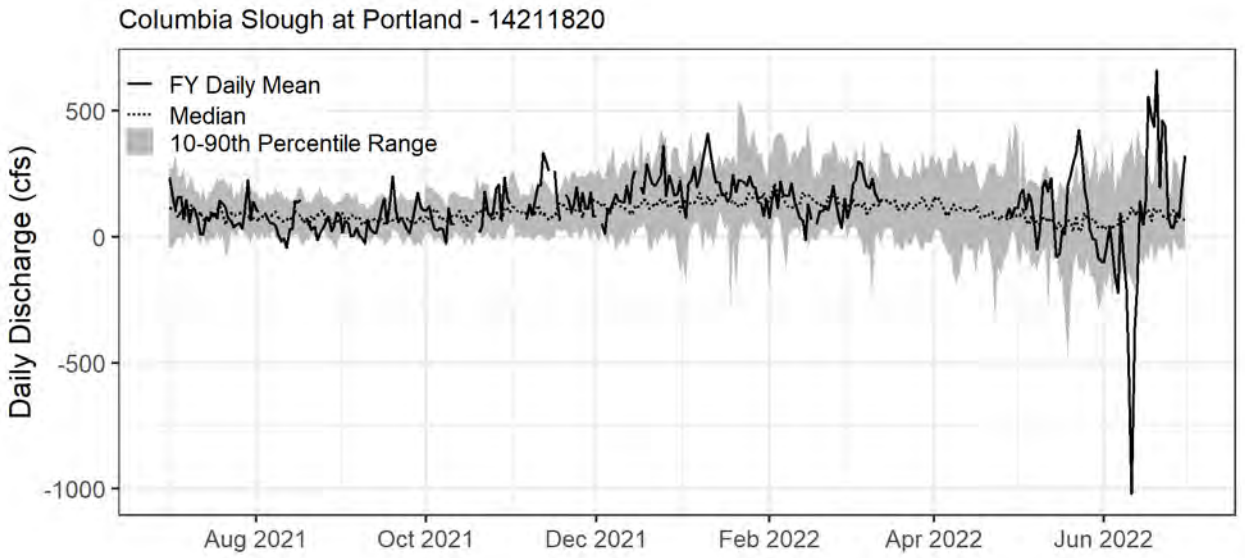


Figure 4. Columbia Slough daily discharge recorded at USGS gauge #14211820 during the permit year. The mean daily discharge (solid line) is plotted along with the historic median (dotted line) and 10–90th percentile range (gray area) of observed flows from the available 31-year period of record. The 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 periodically dropped below the 10th percentile during the permit year (Figure 5)—particularly in the summer 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 the winter. The mean daily discharge peaked at 146,000 cfs on January 8. In January, flows in the Willamette River began decreasing and remained below historic median flow until March.

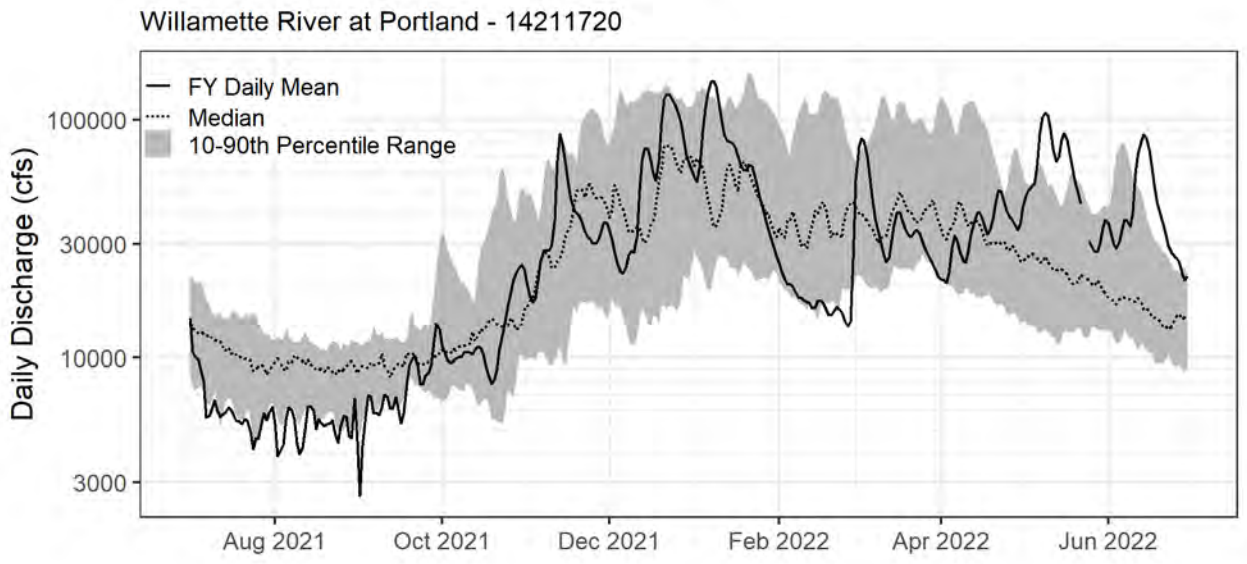


Figure 5. Willamette River daily discharge at Portland recorded at USGS gauge #14211720 during the permit year. The mean daily discharge (solid line) is plotted along with the historic median (dotted line) and 10th to 90th percentile range (grey area) of observed flows from the available 14-year period of record (2007 to 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.[8] *Unfiltered discharge values are available from 1988 to present.*

3.2.2.2 Temperature

Johnson Creek water temperatures at the Sycamore gauge exceeded the 7-day average daily maximum (7DADM) temperature criterion for salmonid rearing and migration (18°C) from July 1 to mid-September in 2021 (Figure 6). In 2022, water temperatures did not exceed the rearing and migration criterion until June, with the 7DADM temperature consistently exceeding 18°C for the final week of June. Water temperatures at the Sycamore gauge did not exceed the spawning criterion during the 2021–22 permit year.

Johnson Creek water temperatures at the Milwaukie gauge followed a similar pattern to those recorded at the upstream Sycamore gauge. Summer temperatures exceeded the 7DADM temperature criterion for rearing and migration (18°C) from July 1 to mid-September in 2021 (Figure 6). Water temperatures exceeded the spawning temperature criterion briefly in the fall. As with the Sycamore gauge, water temperatures began increasing in April and exceeded the spawning criterion for short periods of the spawning window. In 2022, water temperatures exceeded the rearing and migration criterion periodically in early summer, with the 7DADM temperature consistently exceeding 18°C in late June.

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

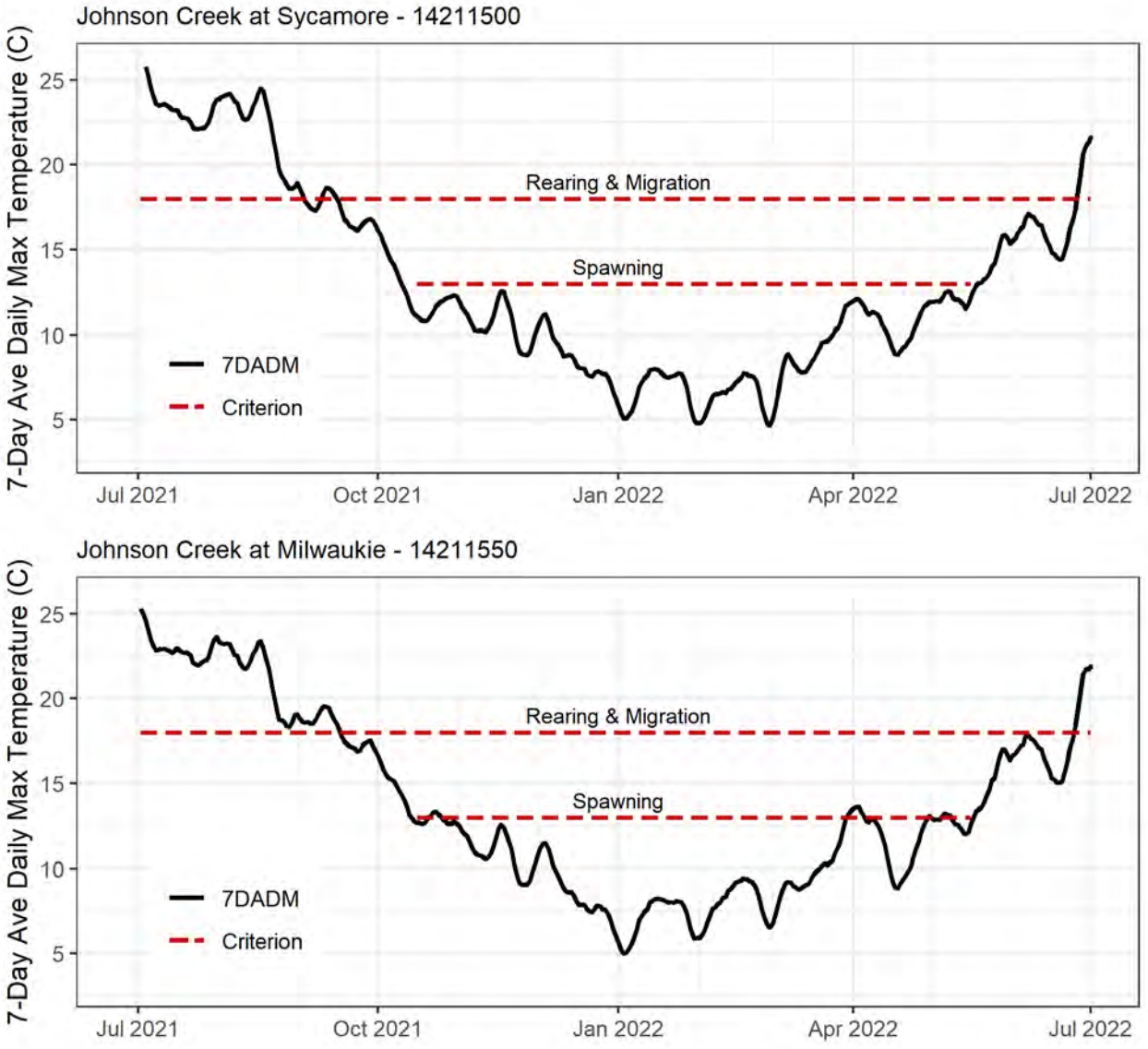


Figure 6.Seven-day average daily maximum mainstem Johnson Creek water temperatures recorded at USGS gauge #14211500 at Sycamore and USGS gauge #14211550 at Milwaukie during the permit year. The dashed red lines represent the applicable temperature criteria for salmonid spawning (13°C) and rearing and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

Consistent with the two other Johnson Creek gauges, summertime temperatures in Kelley Creek remained above the rearing and migration criterion throughout the summer of 2021 until September. Kelley Creek water temperatures remained below the spawning criterion throughout the fall, winter, and spring. While water temperatures in Kelley Creek followed a similar warming pattern to the two Johnson Creek gauges in May 2022, the increase did not result in temperatures higher than the rearing criterion until the end of June.

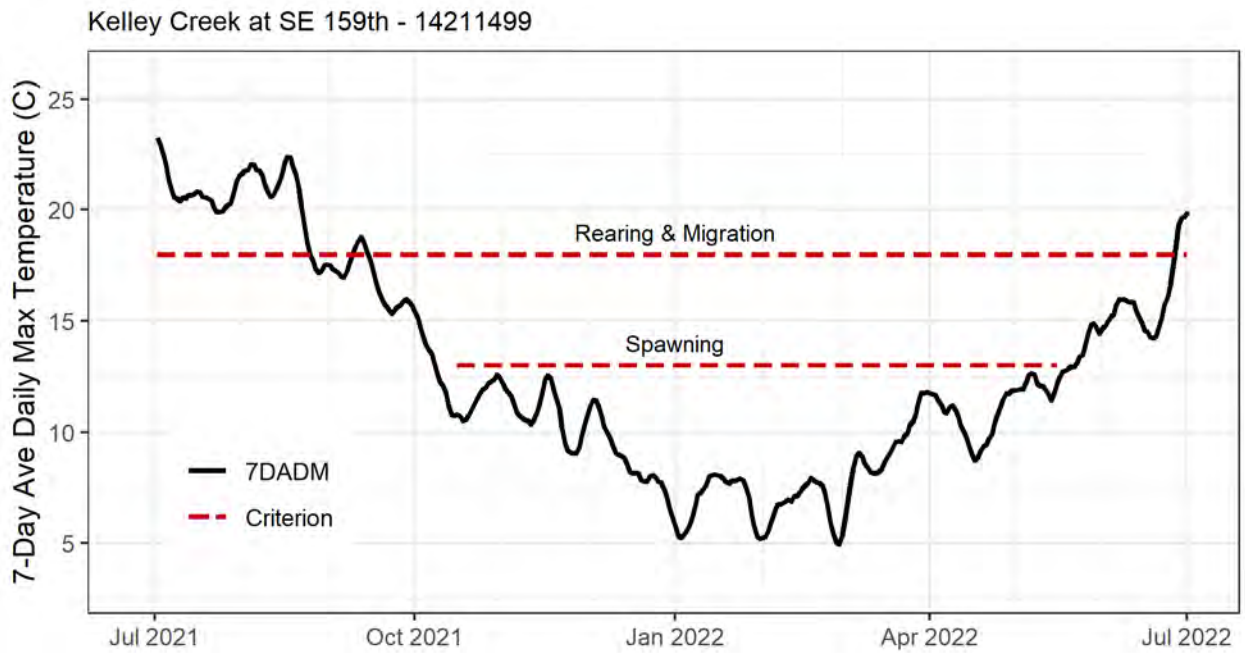


Figure 7. Seven-day average daily maximum Kelley Creek water temperatures recorded at USGS gauge #14211499 at SE 159th Avenue during the permit year. The dashed red lines represent the applicable temperature criteria for salmonid spawning (13°C) and rearing and migration (18°C).

Kelley Creek provides comparatively cooler water to Johnson Creek. Kelley Creek flows into Johnson Creek approximately half a mile upstream of the Sycamore gauge. 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 cubic feet per second (Figure 3) and represent only a small fraction of the total flow in Johnson Creek.

Unlike Johnson and Kelley creeks, the Willamette River in Portland is designated as 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). By the start of the reporting period (July 1), Willamette River water temperatures already exceeded the migration corridor temperature limit and continued to do so to mid-September 2021 (Figure 8). Temperatures declined quickly in late September and remained below the temperature criterion for the remainder of the permit year.

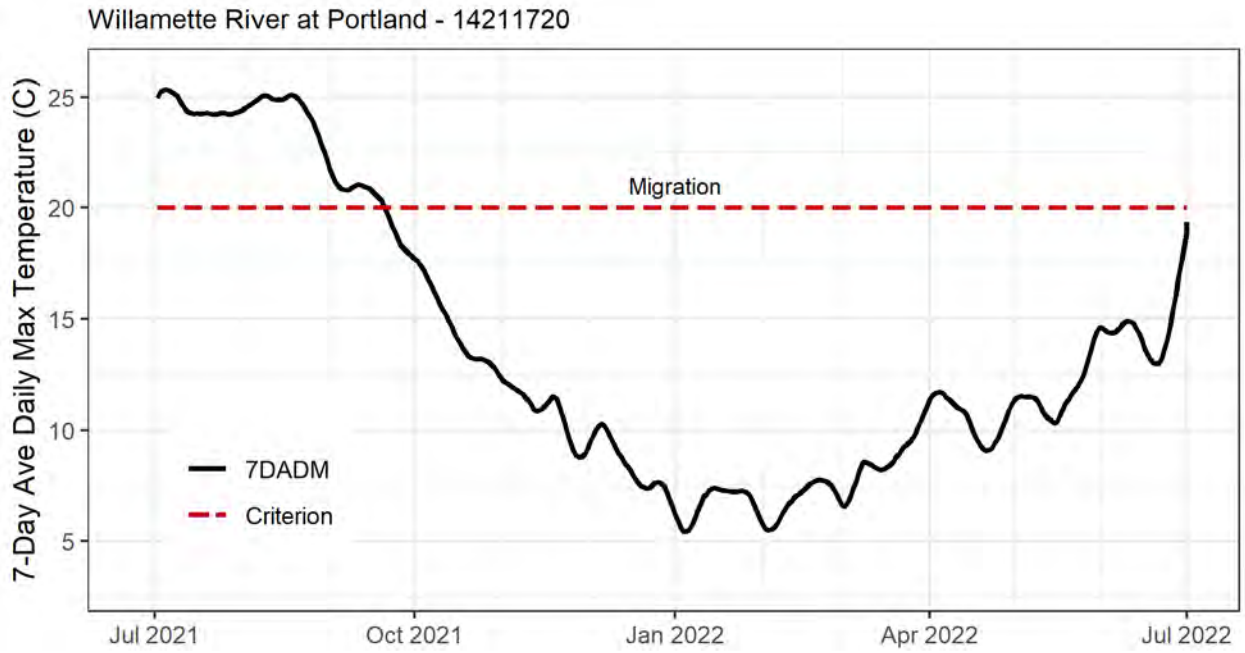


Figure 8. Seven-day average daily maximum Willamette River water temperatures recorded at USGS gauge #14211720 at the Morrison Bridge during the permit year. The dashed red line represents the applicable temperature criterion for salmonid migration (20°C).

3.2.3 Macroinvertebrates

Aquatic macroinvertebrate samples were collected at 14 perennial sites during the 2021–22 permit year as part of the 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 PAWMAP 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.[9] 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 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."

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

Table 13. Median observed/expected (O/E) macroinvertebrate ratios.

	Macroinvertebrate Observed/Expected Ratio				
Watershed	**Cycle 1 Median (2010–2013)**	**Cycle 2 Median (2014–2017)**	**Cycle 3 Median (2018–2021)**	**Permit Year Median**	**Permit Year Range**
Johnson Creek	0.49	0.39	0.44	0.48	0.39–0.68
Tualatin River Tributaries	0.41	0.43	0.34	0.44	0.34–0.54
Willamette River Tributaries	0.69	0.62	0.55	0.55	0.39–0.88

Note: Samples from the current permit year were collected in the fall of 2021. The "minimally impacted" benchmark value set by DEQ is an O/E ratio of 0.85 or higher.

O/E ratios varied across the three watersheds, with the greatest variability observed between the Willamette River tributaries. The highest O/E ratios during the 2021–22 permit year were observed on the sites on the Willamette River tributaries (Table 13), with the highest O/E ratio (0.88) observed on Balch Creek.

The Tualatin River tributaries had the lowest median O/E ratio during the permit year but were consistent with 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. All of the samples except for the one Balch Creek sample were below the 0.85 threshold for "minimally impacted" sites.

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 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.

Results from the long-term probabilistic stormwater monitoring for TSS provide an example of the observed variability. Over the past 15 years, TSS concentrations have remained relatively constant, with only a small amount of year-to-year variability. In 2018, however, there was a large deviation from the historic pattern with a substantial increase in the both the mean and median TSS concentration (Figure 9). This increase in TSS also had large confidence intervals associated with that year (Figure 9). Sampling in the subsequent years found TSS levels returning to the previously observed pattern—generally low concentrations with a few high-concentration outliers. Any trends in concentrations fell within the calculated confidence intervals.

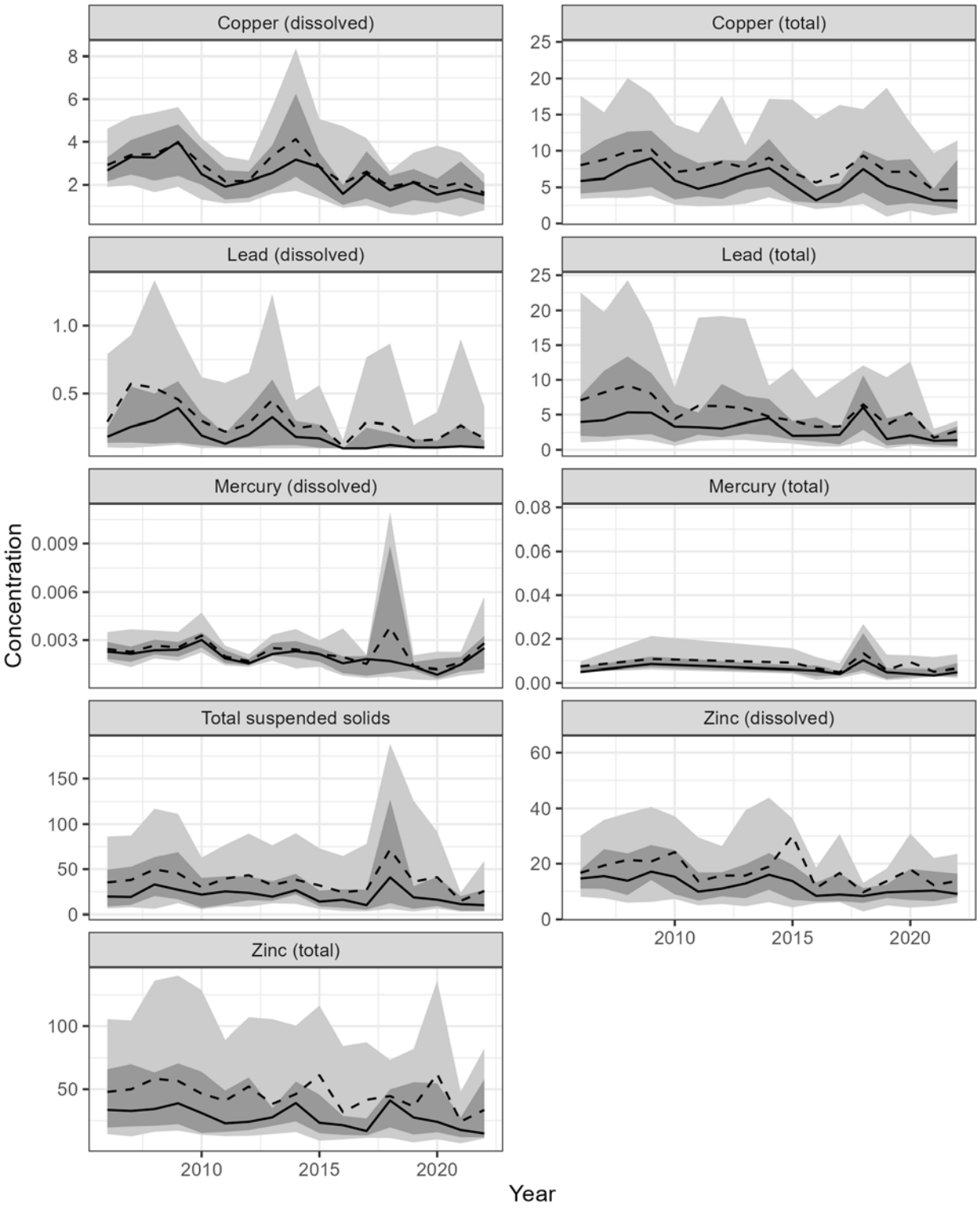


Figure 9. Trends in the probabilistic stormwater metal and total suspended solids concentrations. The solid line represents the median concentration, the dashed line represents the mean concentration, the dark grey shading represents the 25th to 75th percentiles, and the light gray represents the 10th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

As with metals, the annual range in nutrient concentrations is variable from year to year (Figure 10). 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.

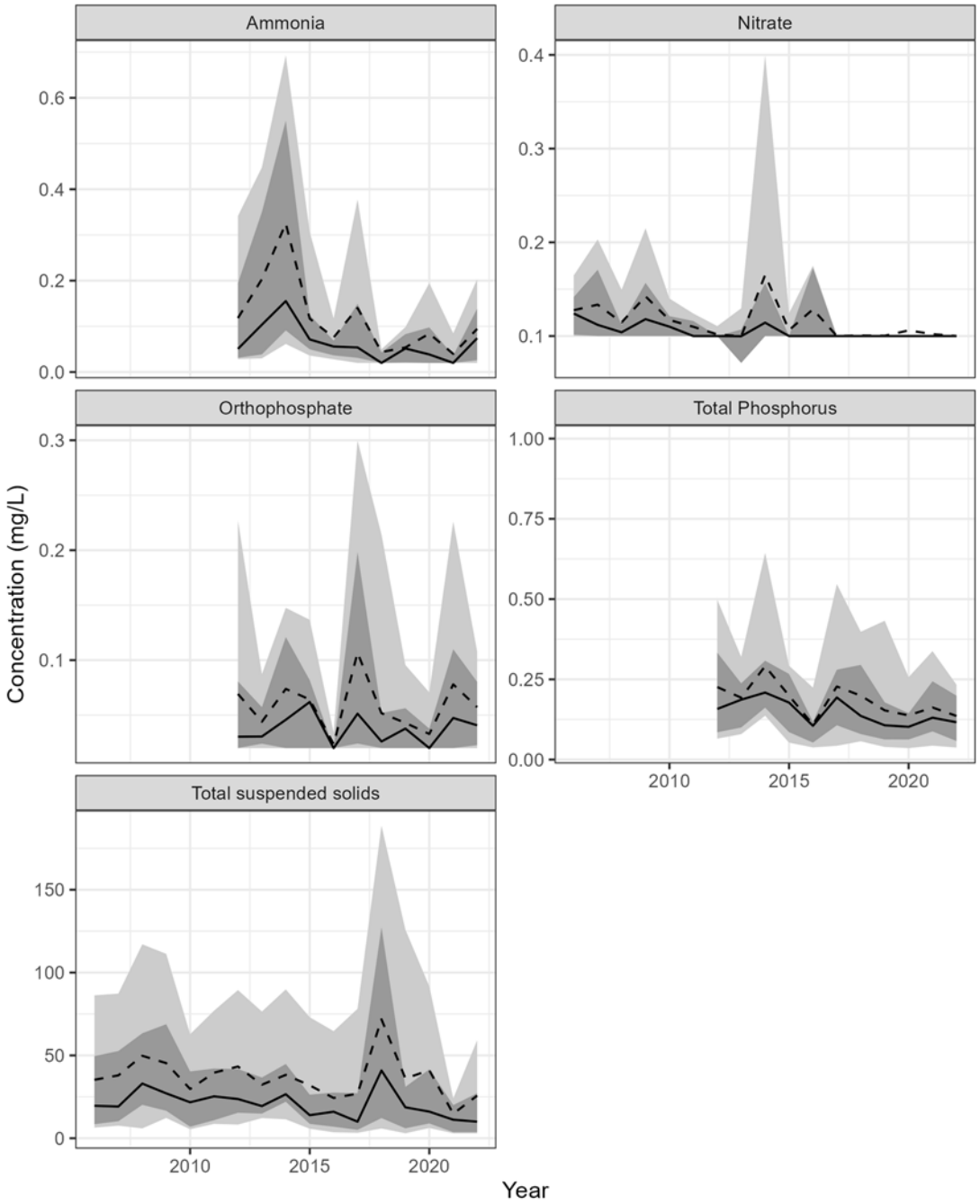


Figure 10. Trends in the probabilistic stormwater nutrient and total suspended solids concentrations. The solid line represents the median concentration, the dashed line represents the mean concentration, the dark grey shading represents the 25th to 75th percentiles, and the light gray represents the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

4.2 Historic Fixed Land-Use Stormwater Trends

As described in Section 2.2, the City resumed composite stormwater sampling at four of the historic fixed land-use sites during the 2016–17 permit year. Long-term trends in water quality concentrations were evaluated for all four sites. No significant trends in water quality were observed over the 20-year period at the M1, R1, and R2 sites for any of the parameters. Decreasing trends in water quality concentrations were identified at the OF19 site (Figure 11). The strongest observed decreasing trend was in dissolved copper concentrations, with a slightly smaller decreasing trend also observed for total copper at OF19 (Figure 11). Decreasing trends for both total and dissolved lead at OF19 were also observed (Figure 11). No trends for total or dissolved zinc were observed.

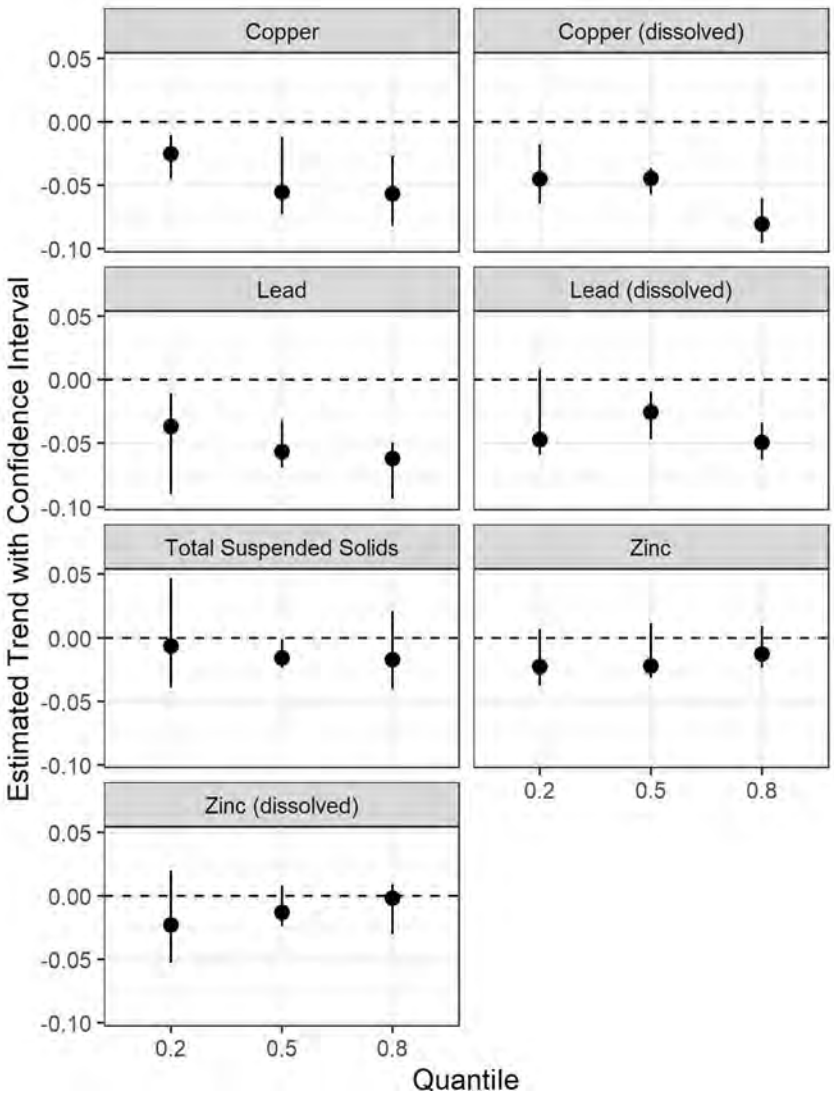


Figure 11. Fixed historic land-use stormwater trends and associated confidence intervals at the OF19 site for metals and total suspended solids. Trends were evaluated for the 20th, 50th, and 80th percentiles of analyte concentrations observed in the flow-weighted composite samples from January 2000 through 2021 at OF19.

The decreasing trend in copper and lead concentrations at OF19 is likely not a result of changes in TSS, as no trend for TSS concentrations was observed during the period (Figures 11 and 12). Consequently, the changes may be a result of land-use changes or the implementation of improved stormwater management techniques within the site's drainage area. The City's Industrial Stormwater program inspects industrial sites routinely in this

basin to determine compliance with the 1200-Z permit and provides technical assistance on the implementation of best management practices to address water quality issues associated with stormwater runoff.

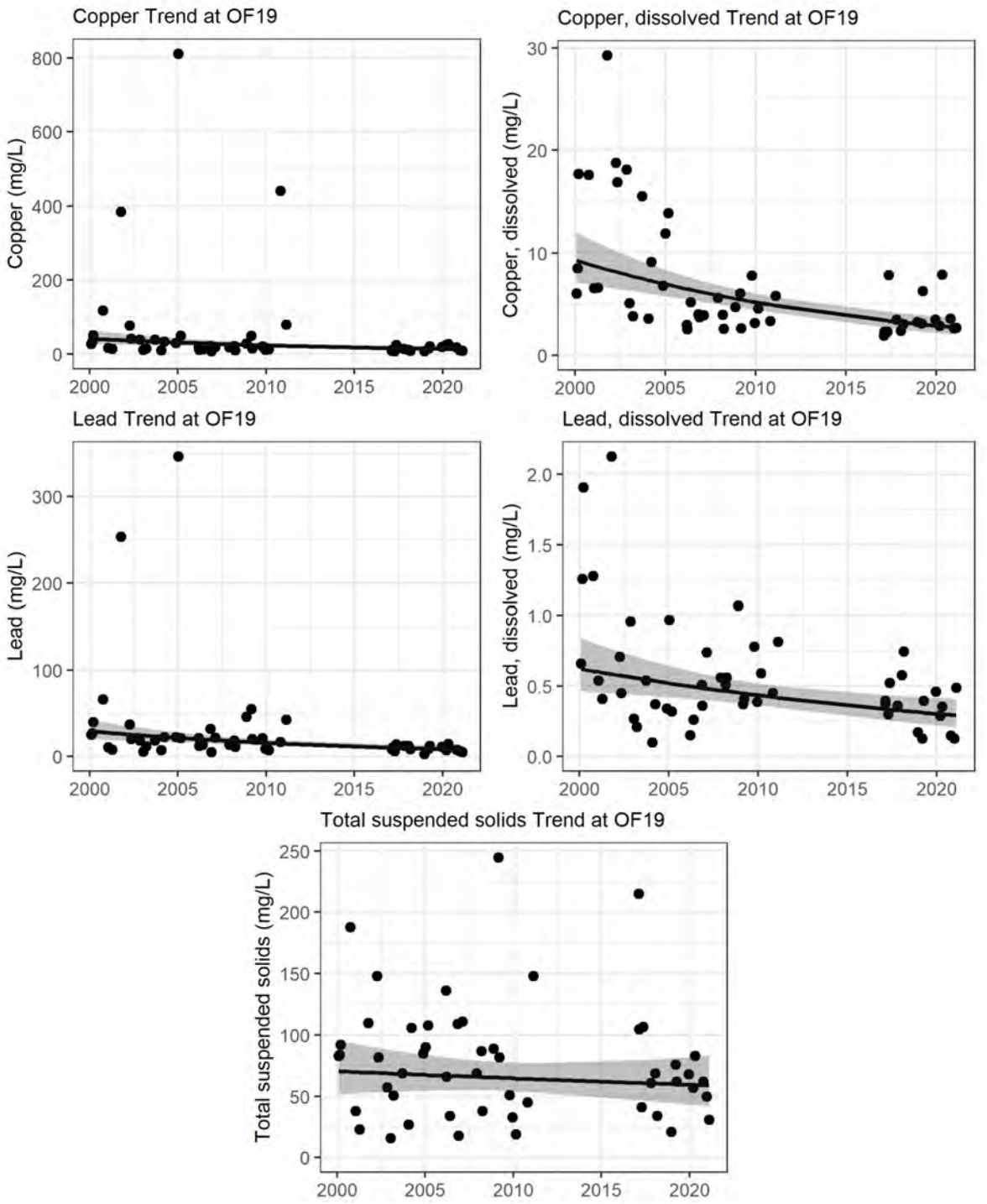


Figure 12. Total copper, dissolved copper, total lead, dissolved lead, and total suspended solids concentrations observed at the OF19 site since the year 2000 and the decreasing trend line for each analyte. The shaded area represents the 95 percent confidence interval of the trend line.

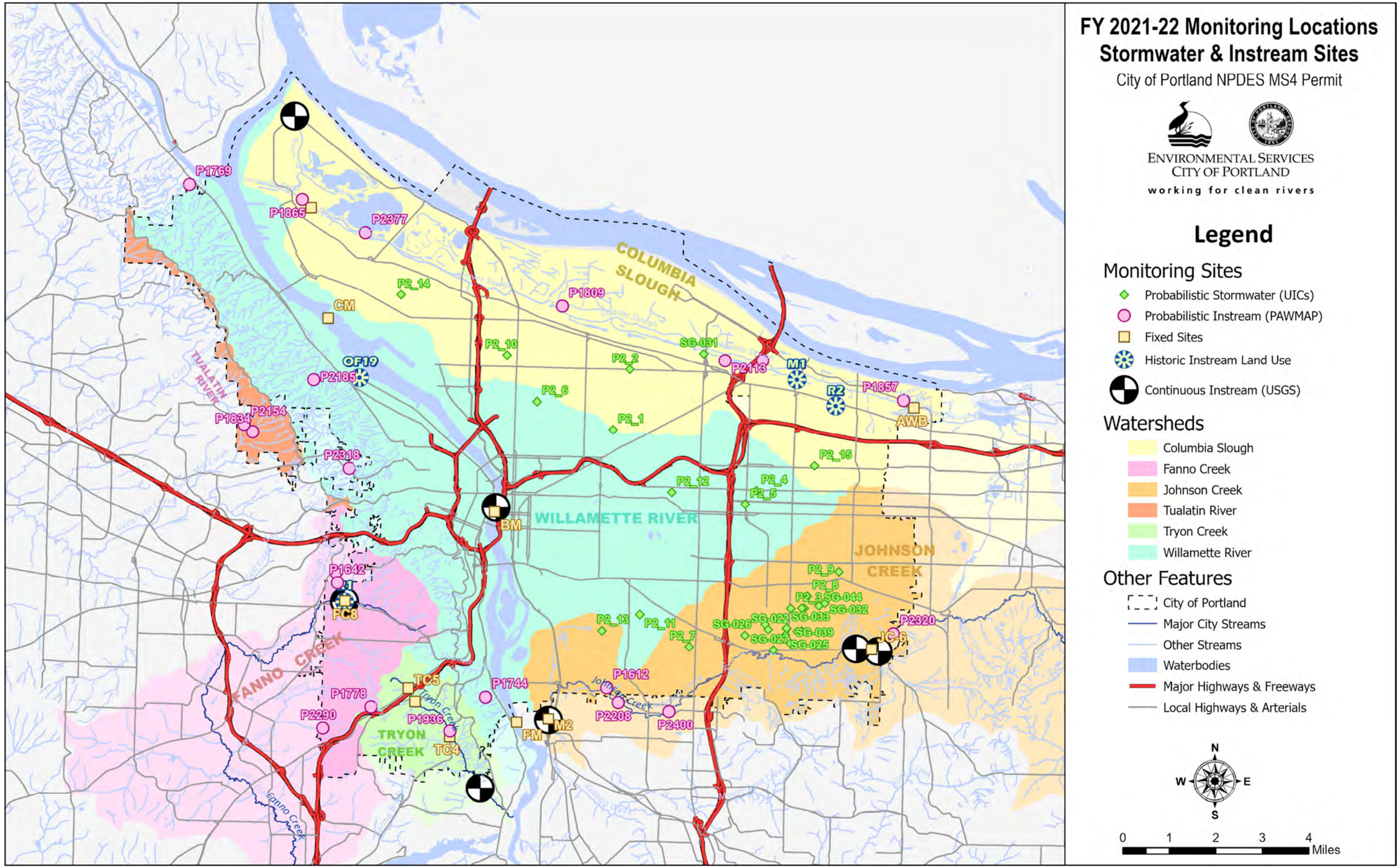
5 Summary

The City completed all activities outlined in the 2016 Monitoring Plan as required by Schedule B of the City's 2011 NPDES MS4 discharge permit. During the spring of 2020, the City implemented a number of new protocols to address safety concerns related to COVID-19. With these protocols in place, City staff were able to successfully collect and analyze all of the required samples.

The City's 2021–22 monitoring activities met all the specific requirements for monitoring types, locations, frequency, and parameters. All monitoring data collected during the 2021–22 permit year are included in Appendix B and were submitted to DEQ electronically. Key findings from the 2021–22 permit year include the following:

- Water quality concentrations from probabilistic stormwater monitoring do not vary substantially from year-to-year, and no long-term trends in concentrations have been identified.
- Flow-weighted composite stormwater concentrations in 2021–22 were consistent with the corresponding mean concentrations identified by the 1997 ACWA study for the corresponding land uses, with the exception of the instream sampling location (R1).
- Decreasing trends in copper and lead concentrations at the industrial site (OF19) were identified.
- Concentrations of dissolved metals in the mainstem Willamette River were consistently low and few exceedances of the applicable water quality criteria were observed.
- 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 salmonid 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 2021–22 Permit Year



FY 2021-22 Monitoring Locations
Stormwater & Instream Sites

City of Portland NPDES MS4 Permit

ENVIRONMENTAL SERVICES
CITY OF PORTLAND
working for clean rivers

Legend

Monitoring Sites

- Probabilistic Stormwater (UICs)
- Probabilistic Instream (PAWMAP)
- Fixed Sites
- Historic Instream 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

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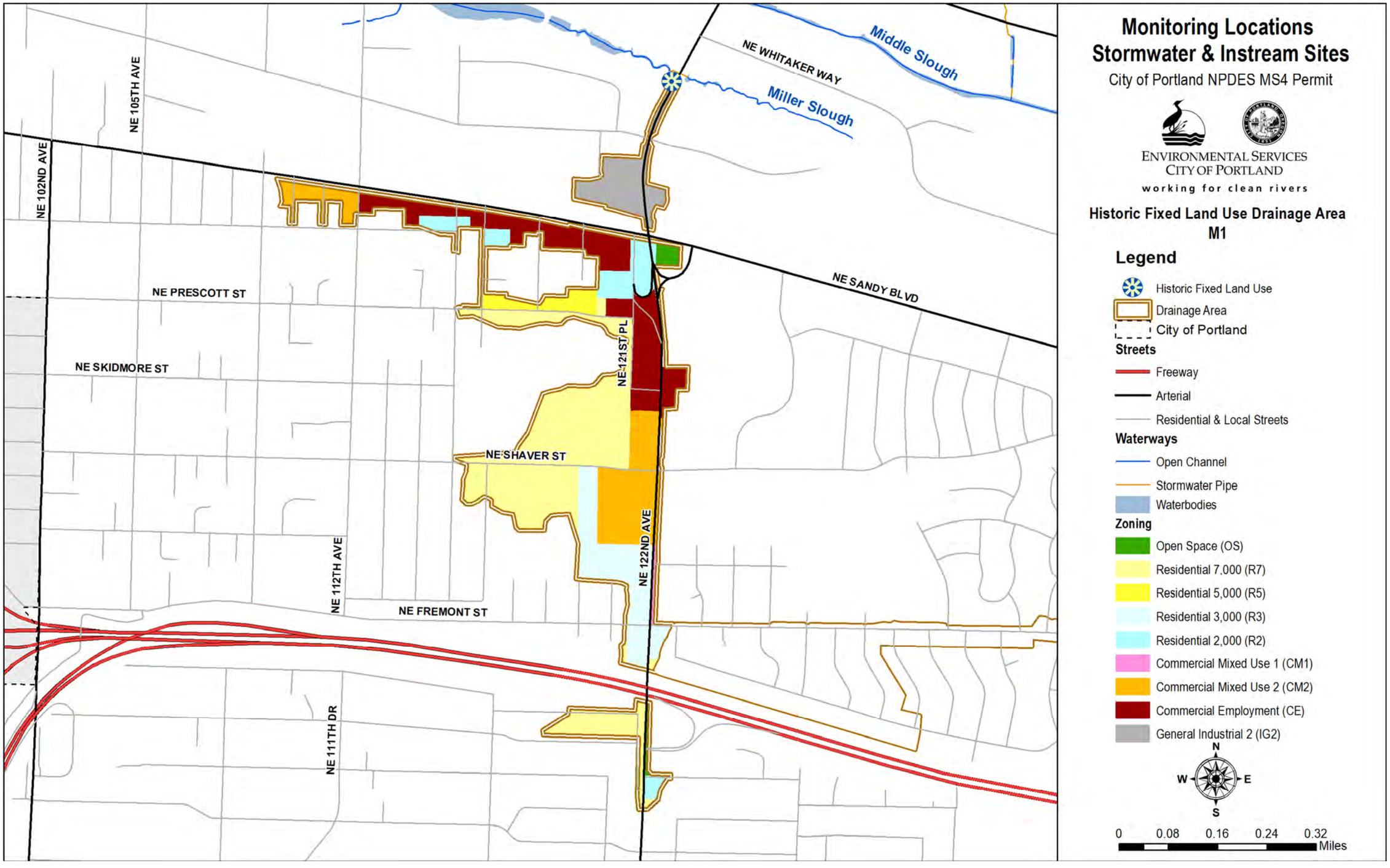
NE 105TH AVE
NE 102ND AVE
NE WHITAKER WAY
Middle Slough
Miller Slough
NE SANDY BLVD
NE PRESCOTT ST
NE SKIDMORE ST
NE 121ST PL
NE SHAVER ST
NE 122ND AVE
NE 112TH AVE
NE FREMONT ST
NE 111TH DR
Monitoring Locations
Stormwater & Instream Sites
City of Portland NPDES MS4 Permit
ENVIRONMENTAL SERVICES
CITY 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)
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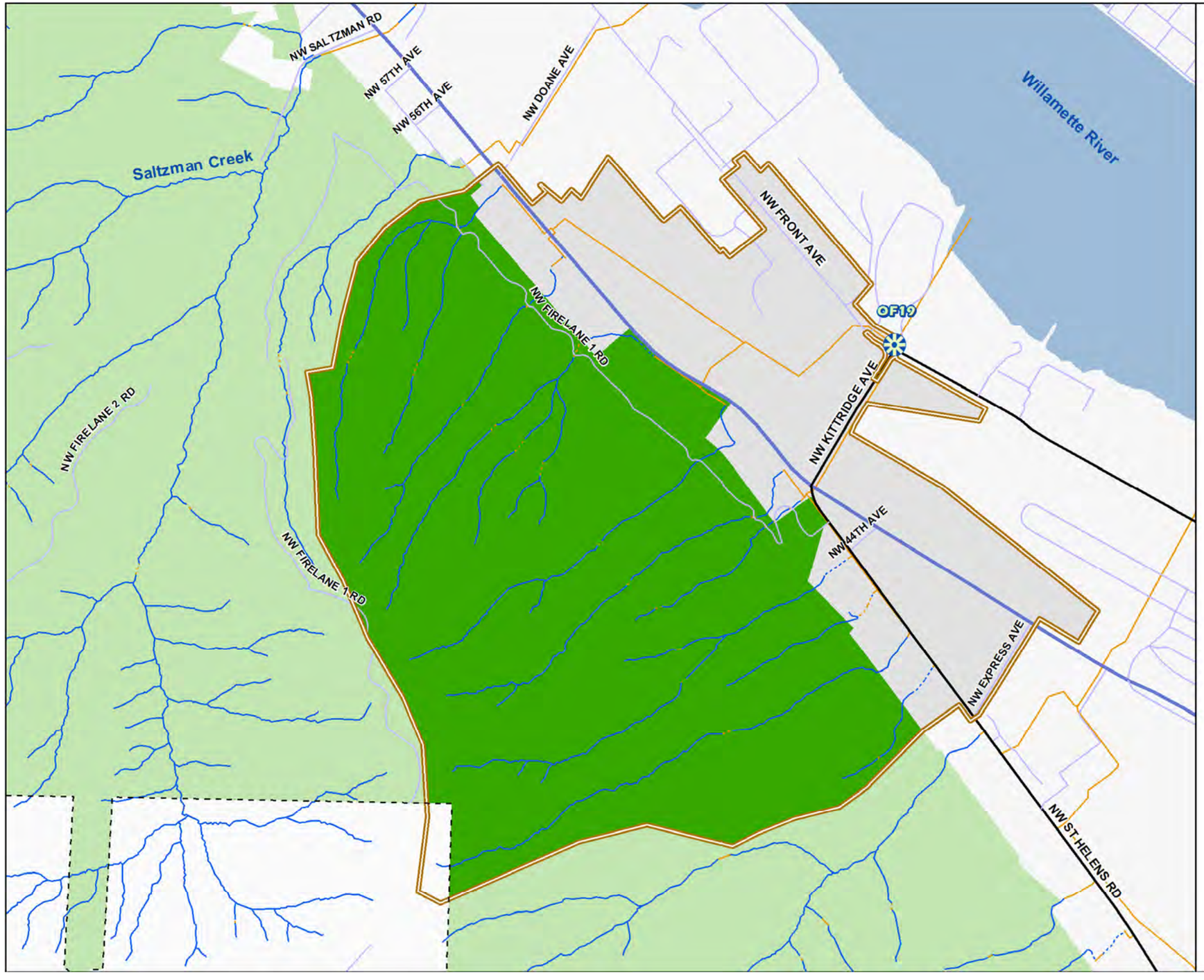

Monitoring Locations
Stormwater & Instream Sites

City of Portland NPDES MS4 Permit

ENVIRONMENTAL SERVICES
CITY OF PORTLAND
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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)

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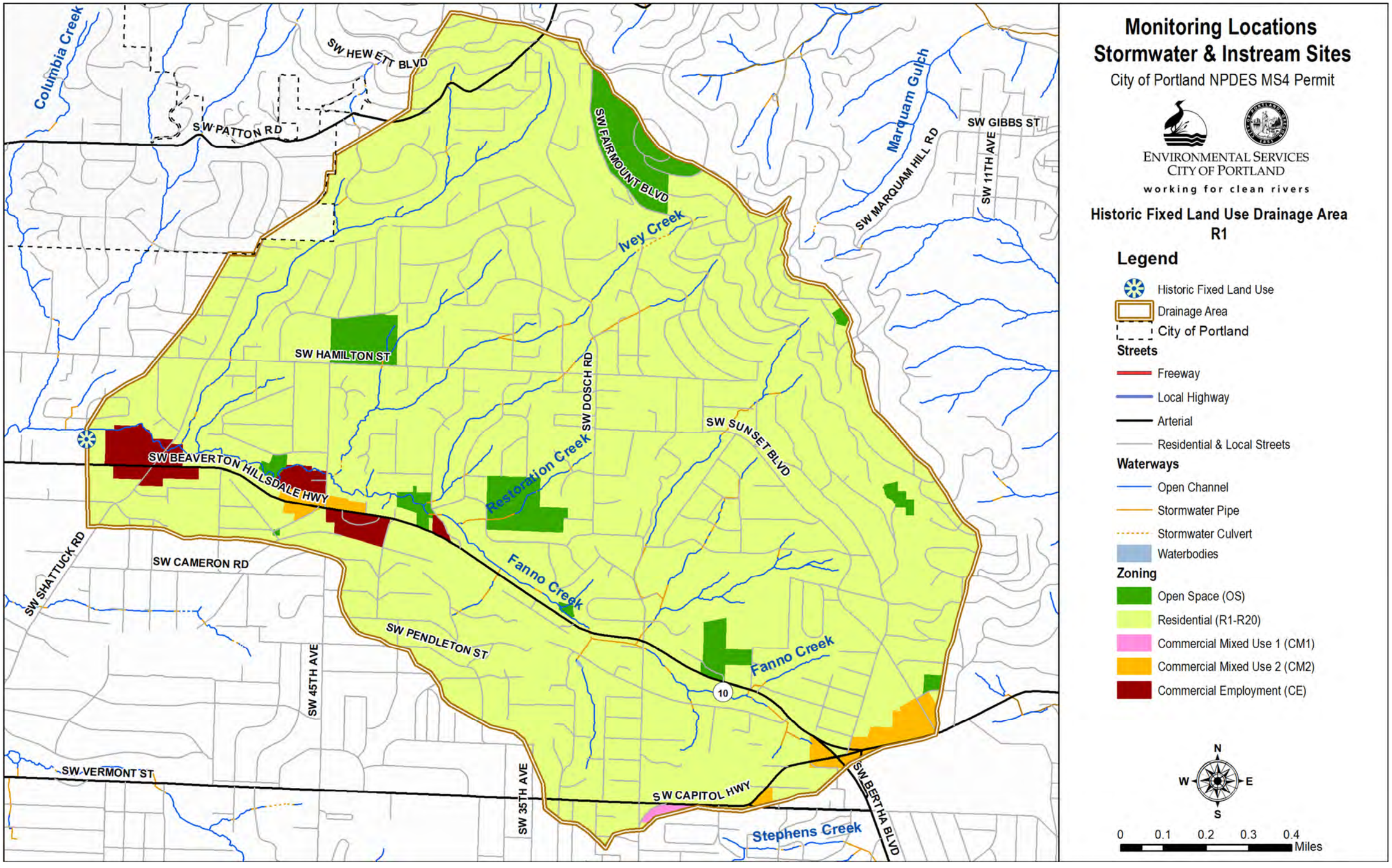
0 0.08 0.16 0.24 0.32 Miles


Columbia Creek
SW HEWETT BLVD
SW PATTON RD
SW FAIRMOUNT BLVD
Marquam Gulch
SW GIBBS ST
SW MARQUAM HILL RD
SW 11TH AVE
Ivey Creek
SW HAMILTON ST
SW DOSCH RD
SW SUNSET BLVD
Restoration Creek
SW BEAVERTON HILLSDALE HWY
SW SHATTUCK RD
SW CAMERON RD
Fanno Creek
SW PENDLETON ST
SW 45TH AVE
10
SW VERMONT ST
SW 35TH AVE
SW CAPITOL HWY
SW BERTHA BLVD
Stephens Creek
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)
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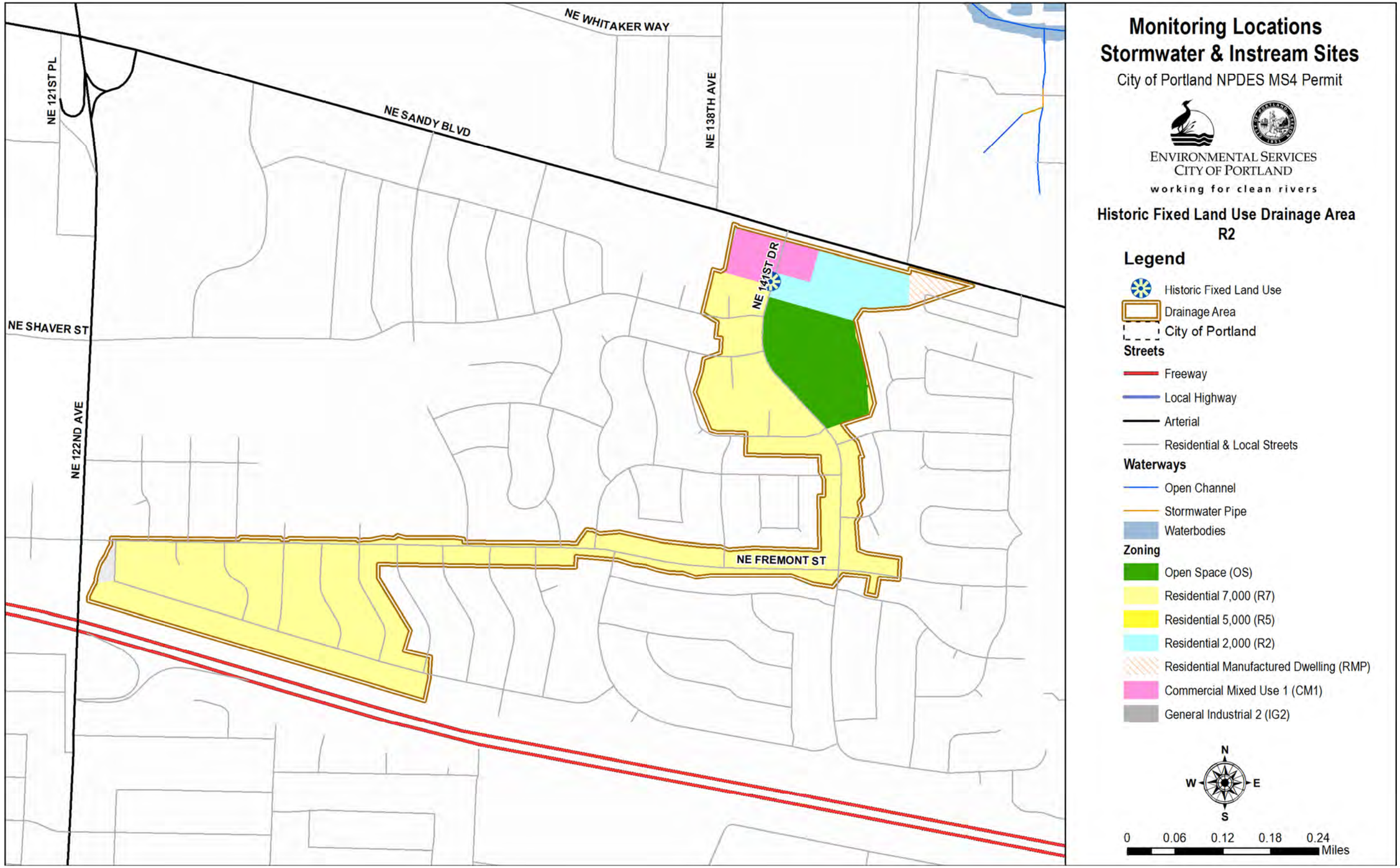
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NE 121ST PL
NE SANDY BLVD
NE 138TH AVE
NE 141ST DR
NE SHAVER ST
NE 122ND AVE
NE FREMONT ST
Monitoring Locations
Stormwater & Instream Sites
City of Portland NPDES MS4 Permit
ENVIRONMENTAL SERVICES
CITY OF PORTLAND
working for clean rivers
Historic 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)
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Miles

Appendix B: Monitoring Data from the 2021–22 Permit Year

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

Table B-2: Historical 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 (2021-22 Permit Year)

			Field Parameter				Conventional				Metals						Nutrients			
Site ID	Location Description	Sample Date	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)
P2_1	4335 NE ALAMEDA ST	2021-12-06	12.1	14	6.4	6.4	NA	6.02	8.00	10	2.78	1.36	2.16	0.360	15.6	8.05	0.022	<0.10	0.081	0.023
P2_10	5934 NE CLEVELAND AVE	2021-12-06	11.9	26	5.9	6.0	NA	9.96	10.5	9	3.38	1.93	2.67	0.574	25.0	16.8	0.046	<0.10	0.154	0.088
P2_11	5003 SE 58TH AVE	2022-03-21	9.9	12	5.6	8.5	NA	4.81	2.92	4	1.43	1.14	0.599	<0.106	10.9	9.19	0.107	<0.10	0.052	0.030
P2_12	7003 NE EVERETT ST	2022-01-03	12.8	19	5.7	4.5	NA	4.26	1.33	3	1.56	0.556	0.783	<0.106	13.2	8.11	0.026	<0.10	0.019	<0.020
P2_13	4107 SE REEDWAY ST	2022-03-21	11.3	13	5.7	8.7	NA	5.76	5.30	7	3.94	2.85	0.859	<0.106	14.5	8.17	0.076	<0.10	0.104	0.042
P2_14	8409 N WOOLSEY AVE	2021-12-06	12.3	12	5.9	6.5	NA	4.81	4.08	5	1.96	1.26	1.01	0.114	11.6	7.07	0.053	<0.10	0.054	0.029
P2_15	13075 NE WEIDLER ST	2022-02-28	10.7	14	6.8	12.3	NA	5.03	4.32	3	2.15	1.54	0.245	<0.106	10.6	7.90	0.208	<0.10	0.117	0.068
P2_2	5015 NE KILLINGSWORTH ST	2021-12-06	12.2	16	6.4	6.3	NA	7.61	4.66	15	3.84	1.15	1.81	0.107	24.8	9.81	0.078	<0.10	0.065	<0.020
P2_3	12220 SE HOLGATE BLVD	2021-12-15	11.6	73	6.8	4.9	NA	26.7	21.3	93	14.8	2.21	8.48	0.156	149	51.8	0.231	<0.10	0.189	<0.020
P2_4	490 NE 106TH AVE	2022-01-03	12.7	32	5.9	4.2	NA	9.37	5.56	28	11.0	3.25	3.37	0.108	83.5	34.7	0.191	<0.10	0.078	<0.020
P2_5	10150 SE ANKENY ST	2022-01-03	12.5	21	5.7	4.1	NA	8.81	4.85	46	9.04	2.09	3.44	<0.106	58.0	19.1	0.138	<0.10	0.113	0.024
P2_6	1337 NE SHAVER ST	2021-12-06	10.7	33	6.1	8.7	NA	13.1	13.5	18	4.48	1.90	2.94	0.413	22.7	12.2	<0.020	0.10	0.234	0.148
P2_7	7930 SE HENRY ST	2021-11-15	8.8	20	6.2	13.9	NA	11.1	8.66	57	8.98	2.42	3.79	<0.106	61.8	21.9	0.139	<0.10	0.216	0.058
P2_8	3938 SE 130TH AVE	2021-12-15	12.0	19	6.7	4.9	NA	15.0	24.7	175	16.6	1.59	21.3	0.185	108	15.3	0.043	<0.10	0.456	0.040
P2_9	2905 SE 143RD AVE	2022-02-28	10.5	11	6.8	12.4	NA	4.22	3.95	10	2.03	0.944	0.475	<0.106	11.7	5.56	0.058	<0.10	0.149	0.096
SG-022	11246 SE Harold St	2021-12-15	11.3	39	7.0	6.4	NA	22.0	10.2	44	8.67	1.42	5.22	0.118	63.6	9.68	0.077	<0.10	0.170	<0.020
SG-024	12830 SE Holgate Blvd	2022-02-28	10.4	18	6.4	12.4	NA	7.66	8.08	215	5.49	1.21	3.47	<0.106	40.2	5.14	0.126	<0.10	0.132	<0.020
SG-025	12010 SE Reedway St	2021-11-15	9.9	32	6.8	13.4	NA	16.3	9.67	30	4.74	2.22	1.63	<0.106	26.6	10.4	0.026	<0.10	0.119	0.036
SG-026	5712 SE 103rd Ave	2021-12-15	11.8	35	7.4	6.1	NA	19.3	9.97	62	7.78	1.64	5.37	<0.106	40.1	4.56	0.037	<0.10	0.229	0.042
SG-027	11501 SE Foster Rd	2021-11-04	9.6	48	7.0	12.8	NA	19.8	22.6	29	12.5	6.42	2.43	0.438	54.8	25.8	0.188	<0.10	0.230	0.103
SG-029	5500 SE 121st Ave	2021-11-04	5.6	44	7.1	13.2	NA	16.6	22.7	19	5.35	3.15	1.74	0.473	34.4	20.0	<0.020	<0.10	0.187	0.056
SG-031	8111 NE Holman St	2022-02-28	10.5	9	6.2	11.8	NA	11.3	5.43	22	13.8	0.873	6.55	<0.106	80.3	7.56	0.022	<0.10	0.195	<0.020
SG-032	13658 SE Cora St	2022-03-21	10.2	19	5.5	8.2	NA	7.87	2.86	4	1.83	1.26	0.413	<0.106	9.05	5.90	0.090	<0.10	0.041	<0.020
SG-033	5423 SE 121st Ave	2021-11-04	9.2	34	7.3	12.4	NA	12.9	18.6	20	4.91	2.63	1.38	0.126	21.5	9.42	<0.020	<0.10	0.155	0.068
SG-036	5544 SE 128th Ave	2021-11-04	9.4	43	7.9	12.4	NA	17.2	28.2	25	6.70	4.43	1.38	0.363	27.1	15.0	<0.020	<0.10	0.178	0.058
SG-038	11134 SE Steels St	2021-11-04	9.8	13	7.2	13.1	NA	4.34	5.92	7	3.65	1.66	0.341	<0.106	10.8	6.91	<0.020	<0.10	0.069	0.032
SG-039	5918 SE 122nd Ave	2021-12-15	11.5	448	6.6	5.6	NA	196	12.2	33	8.39	2.77	4.21	<0.106	150	113	0.273	0.10	0.101	<0.020
SG-040	12920 SE Holgate Blvd	2021-12-15	12.1	31	6.7	5.1	NA	15.5	15.1	47	8.27	2.52	3.46	0.117	57.7	17.6	0.130	<0.10	0.185	0.040
SG-044	4406 SE 135th Ave	2021-11-04	9.1	29	7.6	12.5	NA	8.51	9.90	12	4.90	2.86	0.814	<0.106	13.2	7.21	<0.020	<0.10	0.235	0.164
SG-045	12532 SE Ellis St	2021-11-15	9.8	15	6.3	13.3	NA	5.55	11.6	12	3.12	2.08	0.866	<0.106	13.6	8.36	<0.020	<0.10	0.148	0.079

Table B-2: Historic Fixed Land Use Stormwater Data (2021-22 Permit Year)

			Field Parameter				Conventional				Metals						Nutrients			
Site ID	Location Description	Sample Date	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 (M1)	2021-10-21	10.0	20	6.7	15.0	6500	19.7	6.54	36	18.7	3.09	45.8	0.206	149	22.8	0.098	0.19	0.615	0.049
M1	5241 NE 122nd Ave (M1)	2022-02-26						23.6	6.14	86	17.7	2.92	14.0	0.130	132	28.3	0.128	0.17	0.253	0.022
M1	5241 NE 122nd Ave (M1)	2022-02-28	10.9	23	6.0	12.4	260													
M1	5241 NE 122nd Ave (M1)	2022-03-19	10.4	54	6.1	11.6	200													
M1	5241 NE 122nd Ave (M1)	2022-04-03						13.1	6.76	67	11.2	3.28	6.24	0.135	87.0	22.7	0.186	0.27	0.181	0.031
R2	NE 141st Ave & Sandy Blvd (R2)	2021-10-21	9.7	21	7.0	16.3	480	6.16	4.79	14	4.65	2.58	0.925	<0.107	52.1	38.2	0.062	<0.10	0.102	0.049
R2	NE 141st Ave & Sandy Blvd (R2)	2022-02-27						8.39	3.86	46	7.48	1.96	2.66	<0.106	46.3	11.8	0.051	0.10	0.112	0.022
R2	NE 141st Ave & Sandy Blvd (R2)	2022-02-28	11.0	14	6.2	12.0	160													
R2	NE 141st Ave & Sandy Blvd (R2)	2022-03-19	11.2	18	6.9	11.1	41													
R2	NE 141st Ave & Sandy Blvd (R2)	2022-04-03						8.61	4.95	34	8.09	2.99	2.14	<0.106	40.6	12.0	0.084	<0.10	0.115	0.021
R1	Fanno Creek at SW 56th Ave Bridge	2021-10-21	9.1	108	8.0	13.5	20000	31.0	9.30	236	13.1	3.23	11.7	0.267	114	11.1	<0.020	0.39	0.549	0.092
R1	Fanno Creek at SW 56th Ave Bridge	2022-02-26						46.6	11.4	558	23.3	2.48	25.8	0.204	232	13.8	0.056	0.62	0.840	0.052
R1	Fanno Creek at SW 56th Ave Bridge	2022-02-28	10.8	46	6.5	10.7	4400													
R1	Fanno Creek at SW 56th Ave Bridge	2022-03-19	10.4	155	6.6	9.4	230													
R1	Fanno Creek at SW 56th Ave Bridge	2022-04-03						42.2	10.2	408	21.0	2.75	21.4	0.178	178	10.1	0.072	0.48	0.659	0.050
R1	Fanno Creek at SW 56th Ave Bridge	2022-04-04	10.5	74	6.6	9.3	1900													
OF19	4900 NW Front Ave (OF19)	2021-10-21	9.9	34	8.8	15.0	640	27.7	6.84	50	13.5	2.77	7.92	0.245	92.6	27.0	0.089	0.37	0.260	0.057
OF19	4900 NW Front Ave (OF19)	2022-02-26						38.1	9.80	241	21.2	2.54	14.9	0.314	149	32.5	0.082	0.76	0.467	0.050
OF19	4900 NW Front Ave (OF19)	2022-02-28	11.0	65	6.3	11.5	510													
OF19	4900 NW Front Ave (OF19)	2022-03-19	10.6	124	6.6	10.0	290													
OF19	4900 NW Front Ave (OF19)	2022-04-10						24.5	5.21	46	8.41	2.32	5.57	0.368	83.2	40.2	0.050	0.42	0.188	0.032
OF19	4900 NW Front Ave (OF19)	2022-04-11	12.7	23	5.8	4.2	1700													

Table B-3. Fixed Instream Sites Results (2021-22 Permit Year)

Note: Biological oxygen demand (BOD_5) is collected only at the Columbia Slough fixed sites.

			Field Parameter				Conventional					Metals						Nutrients			
Site ID	Location Description	Sample Date	Dissolved Oxygen (mg/L)	Conductivity (umhos/cm)	pH	Temperature (C)	E. coli (MPN/100 mL)	Hardness (mg $CaCO_3$/L)	BOD_5 (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 of Columbia Slough	2021-07-15	3.1	210	7.4	20.5	20	86.0	<2	5.00	6	0.467	<0.211	0.240	<0.106	3.25	<0.529	0.037	<0.10	0.088	0.039
AWB	NE Airport Way Bridge B, Main Channel of Columbia Slough	2021-09-08	1.9	209	7.5	20.5	37	83.9	2	3.96	6	0.971	0.374	0.311	<0.106	4.02	<0.529	0.060	<0.10	0.149	0.043
AWB	NE Airport Way Bridge B, Main Channel of Columbia Slough	2021-11-02	8.1	141	6.8	8.6	31	57.5	<2	5.64	10	1.52	1.12	0.420	<0.106	5.74	2.89	0.089	0.34	0.099	0.030
AWB	NE Airport Way Bridge B, Main Channel of Columbia Slough	2022-01-05	11.8	118	6.7	4.7	220	41.3	<2	3.72	38	3.69	1.32	1.46	<0.106	31.4	11.0	0.091	0.76	0.110	0.040
AWB	NE Airport Way Bridge B, Main Channel of Columbia Slough	2022-03-08	10.8	158	7.1	9.3	20	54.3	3	2.89	14	1.22	0.749	0.368	<0.106	5.03	2.11	<0.020	0.70	0.065	<0.020
AWB	NE Airport Way Bridge B, Main Channel of Columbia Slough	2022-05-12	8.4	147	7.0	13.8	20	61.7	3	3.10	17	1.44	0.687	0.372	<0.106	6.40	2.32	0.094	0.39	0.102	0.030
SJB	St Johns Landfill Bridge, Main Channel of Columbia Slough	2021-07-15	11.0	204	8.4	23.7	330	82.2	3	3.02	29	1.67	0.715	1.38	<0.106	5.63	<0.529	0.027	0.47	0.112	0.035
SJB	St Johns Landfill Bridge, Main Channel of Columbia Slough	2021-09-08	9.0	180	7.9	21.7	88	71.8	2	2.07	28	1.62	0.590	1.05	<0.106	7.48	0.624	0.062	0.36	0.093	0.026
SJB	St Johns Landfill Bridge, Main Channel of Columbia Slough	2021-11-02	9.0	183	6.9	10.0	31	75.2	2	4.13	17	1.80	0.896	1.06	0.125	6.32	1.70	0.085	1.48	0.138	0.039
SJB	St Johns Landfill Bridge, Main Channel of Columbia Slough	2022-01-05	10.6	201	7.0	4.7	190	74.0	<2	3.17	18	2.89	1.29	1.48	<0.106	16.8	9.20	0.110	1.65	0.114	0.044
SJB	St Johns Landfill Bridge, Main Channel of Columbia Slough	2022-03-08	14.3	204	7.1	9.6	10	73.7	4	3.36	28	2.45	1.02	1.34	<0.106	9.64	1.39	<0.020	1.33	0.134	0.021
SJB	St Johns Landfill Bridge, Main Channel of Columbia Slough	2022-05-12	16.7	171	7.6	14.4	20	75.3	6	5.22	21	2.16	0.953	0.727	<0.106	7.65	1.11	0.032	0.62	0.107	0.020
Johnson Creek																					
JC6	SE 158th Ave Bridge (Main Channel)	2021-07-15	8.5	149	7.4	21.2	63	53.1	--	4.84	<3	1.51	1.13	0.121	<0.106	3.24	1.81	0.071	0.26	0.078	0.068
JC6	SE 158th Ave Bridge (Main Channel)	2021-09-08	6.7	170	7.2	17.8	110	63.1	--	4.33	23	2.14	1.14	0.653	<0.106	17.9	2.58	0.071	0.23	0.105	0.043
JC6	SE 158th Ave Bridge (Main Channel)	2021-11-02	10.9	102	6.8	9.5	41	34.9	--	5.27	<3	1.83	1.43	0.235	<0.106	9.82	6.77	<0.020	1.77	0.052	0.028
JC6	SE 158th Ave Bridge (Main Channel)	2022-01-05	12.0	67	6.3	6.6	440	22.7	--	3.52	38	2.42	1.04	0.972	<0.106	14.7	6.77	0.031	1.57	0.072	0.026
JC6	SE 158th Ave Bridge (Main Channel)	2022-03-08	12.2	88	6.9	7.2	520	25.8	--	1.58	<3	0.854	0.646	0.183	<0.106	5.12	4.27	0.023	1.71	0.025	<0.020

			Field Parameter				Conventional					Metals						Nutrients			
Site ID	Location Description	Sample Date	Dissolved Oxygen (mg/L)	Conductivity (umhos/cm)	pH	Temperature (C)	E. coli (MPN/100 mL)	Hardness (mg $CaCO_3$/L)	BOD_5 (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)
JC6	SE 158th Ave Bridge (Main Channel)	2022-05-12	10.9	80	6.9	10.8	260	28.2	--	2.07	6	1.61	1.15	0.291	<0.106	10.7	7.62	0.034	1.28	0.046	0.023
M2	SE Millport Road	2021-07-15	10.9	182	8.1	21.8	200	68.3	--	2.22	6	1.04	0.491	0.422	<0.106	2.86	<0.529	0.051	2.80	0.103	0.077
M2	SE Millport Road	2021-09-08	10.4	186	7.7	19.7	83	71.5	--	1.56	4	0.817	0.441	0.308	<0.106	5.07	1.44	0.042	3.21	0.102	0.080
M2	SE Millport Road	2021-11-02	11.3	143	7.0	10.3	130	52.3	--	3.81	<3	1.29	0.948	0.235	<0.106	3.58	2.11	0.029	2.74	0.082	0.063
M2	SE Millport Road	2022-01-05	12.3	80	6.6	6.8	200	27.4	--	3.59	20	4.33	1.37	1.14	0.116	17.9	7.62	0.032	1.59	0.077	0.032
M2	SE Millport Road	2022-03-08	12.8	114	7.3	7.9	280	35.5	--	1.61	<3	0.871	0.624	0.156	<0.106	3.11	1.93	0.022	2.05	0.040	0.033
M2	SE Millport Road	2022-05-12	11.3	103	7.3	11.6	330	38.1	--	2.48	22	1.83	0.891	0.352	<0.106	7.78	4.26	<0.020	1.51	0.054	0.032
Tryon Creek																					
TC-23	Tryon Creek at 10930 SW Boones Ferry Rd bridge	2021-07-06	9.9	18	7.8	20.2	250	66.8	--	2.95	<3	1.09	0.918	0.201	<0.106	6.29	3.83	0.028	0.33	0.127	0.109
TC-23	Tryon Creek at 10930 SW Boones Ferry Rd bridge	2021-08-24	9.9	191	7.6	15.3	84	76.7	--	3.01	<3	1.01	0.761	0.129	<0.106	5.50	3.67	0.030	0.29	0.111	0.097
TC-23	Tryon Creek at 10930 SW Boones Ferry Rd bridge	2021-09-07	9.6	187	7.2	16.8	110	77.3	--	2.39	<3	1.08	0.705	0.236	<0.106	7.14	3.14	<0.020	0.29	0.126	0.100
TC-23	Tryon Creek at 10930 SW Boones Ferry Rd bridge	2021-10-13	11.5	111	7.5	9.6	470	42.7	--	3.87	<3	2.13	1.92	0.200	<0.106	8.31	6.60	<0.020	0.43	0.080	0.071
TC-23	Tryon Creek at 10930 SW Boones Ferry Rd bridge	2021-11-03	11.1	133	9.6	10.3	20	60.1	--	4.32	<3	2.22	1.39	0.585	<0.106	14.8	6.86	<0.020	0.59	0.099	0.065
TC-23	Tryon Creek at 10930 SW Boones Ferry Rd bridge	2021-12-16	11.9	139	7.8	8.0	510	50.1	--	4.05	<3	1.97	1.56	0.421	0.146	31.5	24.3	0.022	1.66	0.073	0.048
TC-23	Tryon Creek at 10930 SW Boones Ferry Rd bridge	2022-01-04	12.1	122	7.7	7.1	550	43.5	--	4.48	6	2.70	1.68	0.673	0.204	27.2	21.0	0.020	1.39	0.074	0.048
TC-23	Tryon Creek at 10930 SW Boones Ferry Rd bridge	2022-02-01	12.9	153	8.1	5.5	75	59.9	--	2.07	<3	1.32	0.871	0.131	<0.106	17.7	16.1	<0.020	1.29	0.050	0.042
TC-23	Tryon Creek at 10930 SW Boones Ferry Rd bridge	2022-03-09	12.1	136	8.0	7.7	190	46.2	--	2.42	<3	1.29	1.08	0.256	<0.106	14.6	12.1	<0.020	1.32	0.048	0.046
TC-23	Tryon Creek at 10930 SW Boones Ferry Rd bridge	2022-04-06	12.7	148	7.7	8.2	75	55.0	--	2.18	<3	1.34	0.851	0.153	<0.106	11.5	7.88	<0.020	1.04	0.043	0.035
TC-23	Tryon Creek at 10930 SW Boones Ferry Rd bridge	2022-05-05	11.0	131	7.8	10.2	1200	52.0	--	4.80	67	6.02	2.46	3.37	0.122	80.3	28.9	0.030	0.93	0.181	0.054
TC-23	Tryon Creek at 10930 SW Boones Ferry Rd bridge	2022-06-02	10.0	155	7.8	14.8	120	60.0	--	2.32	3	1.30	0.770	0.298	<0.106	17.4	11.8	0.027	1.02	0.075	0.050
TC-5	Tryon Creek at SW 26th Way & Barbur Blvd	2021-07-06	8.1	218	6.9	15.1	7300	85.7	--	3.67	4	0.944	0.716	0.229	<0.106	17.7	15.1	0.090	0.68	0.127	0.097
TC-5	Tryon Creek at SW 26th Way & Barbur Blvd	2021-08-24	8.4	229	7.1	14.2	860	95.7	--	3.75	4	1.46	0.898	0.529	<0.106	25.2	14.3	0.129	0.80	0.125	0.072
TC-5	Tryon Creek at SW 26th Way & Barbur Blvd	2021-09-07	8.2	221	6.7	14.7	98	94.1	--	2.74	4	1.13	0.686	0.228	<0.106	12.7	8.26	0.131	0.74	0.094	0.080

			Field Parameter				Conventional					Metals						Nutrients			
Site ID	Location Description	Sample Date	Dissolved Oxygen (mg/L)	Conductivity (umhos/cm)	pH	Temperature (C)	E. coli (MPN/100 mL)	Hardness (mg $CaCO_3$/L)	BOD_5 (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)
TC-5	Tryon Creek at SW 26th Way & Barbur Blvd	2021-10-13	9.2	157	6.9	11.5	470	60.6	--	5.49	<3	2.48	2.07	0.247	0.119	25.4	23.2	0.058	0.63	0.107	0.092
TC-5	Tryon Creek at SW 26th Way & Barbur Blvd	2021-11-03	8.5	162	7.9	12.0	52	72.4	--	4.66	4	2.51	1.66	0.427	<0.106	56.0	50.0	0.051	0.72	0.100	0.071
TC-5	Tryon Creek at SW 26th Way & Barbur Blvd	2021-12-16	10.3	171	7.3	9.2	880	62.9	--	4.69	<3	2.88	2.17	0.519	0.160	43.7	31.8	0.028	2.11	0.081	0.057
TC-5	Tryon Creek at SW 26th Way & Barbur Blvd	2022-06-02	8.7	194	7.6	13.3	250	75.5	--	2.65	<3	2.13	0.953	0.227	<0.106	19.4	16.1	0.060	1.29	0.082	0.062
TC-6	Tryon Creek at 9323 SW Lancaster Rd	2021-07-06	7.9	225	7.4	16.8	580	86.6	--	3.00	<3	1.08	0.833	0.361	<0.106	21.0	16.0	0.033	0.61	0.086	0.051
TC-6	Tryon Creek at 9323 SW Lancaster Rd	2021-08-24	8.0	221	7.3	14.6	270	86.9	--	3.50	<3	1.89	1.66	0.129	<0.106	16.7	13.7	0.034	0.45	0.084	0.055
TC-6	Tryon Creek at 9323 SW Lancaster Rd	2021-09-07	7.5	229	7.1	15.8	140	91.8	--	2.86	<3	1.09	0.811	0.208	<0.106	16.2	11.9	0.024	0.38	0.082	0.055
TC-6	Tryon Creek at 9323 SW Lancaster Rd	2021-10-13	9.8	134	7.3	12.1	10	48.5	--	4.66	<3	2.93	2.43	0.408	0.132	28.7	23.6	0.090	0.84	0.066	0.045
TC-6	Tryon Creek at 9323 SW Lancaster Rd	2021-11-03	9.3	161	8.4	11.6	63	73.5	--	4.16	<3	1.92	1.56	0.151	<0.106	29.9	26.6	0.025	0.81	0.060	0.035
TC-6	Tryon Creek at 9323 SW Lancaster Rd	2021-12-16	11.2	181	7.6	8.9	52	65.0	--	4.16	<3	2.42	2.02	0.507	0.171	43.3	35.0	0.033	1.87	0.067	0.040
TC-6	Tryon Creek at 9323 SW Lancaster Rd	2022-01-04	11.6	206	7.6	7.3	98	71.8	--	4.29	6	3.06	1.97	0.780	0.190	44.5	36.0	0.033	1.72	0.070	0.042
TC-6	Tryon Creek at 9323 SW Lancaster Rd	2022-02-01	11.7	203	8.0	7.0	51	79.6	--	2.51	<3	1.76	1.11	0.426	<0.106	53.7	48.0	0.028	1.45	0.048	0.029
TC-6	Tryon Creek at 9323 SW Lancaster Rd	2022-03-09	11.2	177	7.8	8.8	120	60.9	--	2.58	<3	1.65	1.41	0.301	<0.106	60.8	62.2	0.021	1.50	0.036	0.034
TC-6	Tryon Creek at 9323 SW Lancaster Rd	2022-04-06	11.1	193	7.3	9.9	200	71.6	--	2.49	<3	1.98	1.13	0.274	0.118	33.6	26.9	0.037	1.24	0.040	0.028
TC-6	Tryon Creek at 9323 SW Lancaster Rd	2022-05-05	10.6	66	7.5	10.1	2200	26.0	--	6.42	40	8.10	3.66	3.72	0.147	103	62.5	0.102	0.36	0.153	0.047
TC-6	Tryon Creek at 9323 SW Lancaster Rd	2022-06-02	9.4	202	7.9	13.6	1000	78.6	--	2.56	<3	1.68	0.897	0.297	<0.106	26.6	21.8	0.041	1.15	0.061	0.034
Tualatin River																					
FC-8	Fanno Creek at SW 56th Ave Bridge, upstream	2021-07-06	6.6	217	7.3	19.0	410	84.6	--	3.75	29	1.37	0.777	0.925	<0.106	10.6	2.31	0.043	0.22	0.184	0.074
FC-8	Fanno Creek at SW 56th Ave Bridge, upstream	2021-08-24	7.2	224	7.4	15.7	430	94.9	--	3.18	<3	0.848	0.555	0.349	<0.106	4.77	1.56	0.033	0.15	0.136	0.060
FC-8	Fanno Creek at SW 56th Ave Bridge, upstream	2021-09-07	6.1	221	7.3	17.2	740	93.9	--	3.17	14	1.32	0.592	0.450	<0.106	6.40	2.15	0.027	0.14	0.126	0.056

			Field Parameter				Conventional					Metals						Nutrients			
Site ID	Location Description	Sample Date	Dissolved Oxygen (mg/L)	Conductivity (umhos/cm)	pH	Temperature (C)	E. coli (MPN/100 mL)	Hardness (mg $CaCO_3$/L)	BOD_5 (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)
FC-8	Fanno Creek at SW 56th Ave Bridge, upstream	2021-10-13	9.6	149	7.2	9.8	700	56.6	--	5.47	3	2.40	1.74	0.728	0.214	14.1	9.08	0.032	0.35	0.116	0.041
FC-8	Fanno Creek at SW 56th Ave Bridge, upstream	2021-11-03	8.8	139	7.8	10.6	75	62.7	--	4.75	<3	1.84	1.46	0.225	<0.106	6.91	5.55	0.022	0.19	0.100	0.054
FC-8	Fanno Creek at SW 56th Ave Bridge, upstream	2021-12-16	11.1	164	7.5	8.1	190	59.7	--	4.47	<3	2.16	1.64	0.656	0.259	18.8	12.7	0.035	1.27	0.082	0.038
FC-8	Fanno Creek at SW 56th Ave Bridge, upstream	2022-01-04	11.6	134	7.8	6.8	330	50.3	--	5.14	13	3.63	1.84	1.38	0.312	30.2	20.4	0.031	1.15	0.097	0.043
FC-8	Fanno Creek at SW 56th Ave Bridge, upstream	2022-02-01	11.9	110	8.1	5.7	360	68.7	--	2.58	6	1.56	0.809	0.639	<0.106	34.3	23.3	<0.020	1.00	0.074	0.028
FC-8	Fanno Creek at SW 56th Ave Bridge, upstream	2022-03-09	11.3	176	7.8	7.9	300	60.5	--	2.56	4	1.34	0.983	0.498	<0.106	11.6	8.11	0.026	1.11	0.050	0.040
FC-8	Fanno Creek at SW 56th Ave Bridge, upstream	2022-04-06	11.3	180	7.3	8.8	330	68.2	--	2.54	<3	1.33	0.915	0.289	<0.106	7.76	5.61	0.038	0.78	0.057	0.035
FC-8	Fanno Creek at SW 56th Ave Bridge, upstream	2022-05-05	9.8	115	7.9	10.7	620	60.5	--	4.31	37	4.39	1.91	3.30	0.202	45.2	22.6	0.060	0.70	0.150	0.054
FC-8	Fanno Creek at SW 56th Ave Bridge, upstream	2022-06-02	9.1	182	7.9	14.4	640	70.3	--	2.93	8	1.58	0.826	0.683	<0.106	14.3	7.97	0.043	0.73	0.108	0.054
Willamette River																					
BM	Morrison St Bridge - River Mile 12.7 Middle	2021-07-01	8.0	79	6.9	24.8	8	23.7	--	1.84	<3	0.562	0.368	0.065	<0.021	0.868	<0.530	0.099	0.29	0.061	0.046
BM	Morrison St Bridge - River Mile 12.7 Middle	2021-08-04	8.6	97	7.1	24.6	7	28.3	--	1.80	5	0.620	0.403	0.074	<0.021	1.01	0.537	0.061	0.35	0.070	0.052
BM	Morrison St Bridge - River Mile 12.7 Middle	2021-09-01	10.0	94	7.2	20.2	6	27.0	--	1.77	<3	0.549	0.346	0.063	<0.021	0.919	<0.529	0.091	0.31	0.056	0.044
BM	Morrison St Bridge - River Mile 12.7 Middle	2021-10-05	11.9	81	6.8	15.5	14	25.9	--	1.96	<3	0.827	0.414	0.058	<0.021	1.01	0.657	0.103	0.48	0.056	0.049
BM	Morrison St Bridge - River Mile 12.7 Middle	2021-11-02	11.6	73	7.0	11.8	10	23.9	--	2.97	4	0.804	0.549	0.132	0.028	1.43	0.645	0.072	0.51	0.050	0.038
BM	Morrison St Bridge - River Mile 12.7 Middle	2021-12-01	--	70	7.2	10.6	26	23.3	--	3.01	6	0.818	0.484	0.119	<0.021	1.29	<0.529	0.072	0.70	0.042	0.031
BM	Morrison St Bridge - River Mile 12.7 Middle	2022-01-06	15.3	71	6.5	6.9	230	26.7	--	3.99	45	3.60	0.986	0.919	0.064	7.09	1.15	0.050	1.28	0.113	0.035
BM	Morrison St Bridge - River Mile 12.7 Middle	2022-02-02	15.0	82	7.5	5.4	18	29.1	--	1.58	<3	0.563	0.345	0.076	<0.021	1.35	0.686	0.089	0.78	0.044	0.038
BM	Morrison St Bridge - River Mile 12.7 Middle	2022-03-03	13.6	71	6.7	8.7	180	24.3	--	3.49	42	3.54	0.984	0.699	0.048	6.68	0.871	0.070	0.97	0.100	0.035
BM	Morrison St Bridge - River Mile 12.7 Middle	2022-04-05	11.6	79	7.8	10.8	29	27.0	--	1.37	3	0.910	0.322	0.080	<0.021	<0.556	<0.530	0.064	0.51	0.038	0.030

			Field Parameter				Conventional					Metals						Nutrients			
Site ID	Location Description	Sample Date	Dissolved Oxygen (mg/L)	Conductivity (umhos/cm)	pH	Temperature (C)	E. coli (MPN/100 mL)	Hardness (mg $CaCO_3$/L)	BOD_5 (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)
BM	Morrison St Bridge - River Mile 12.7 Middle	2022-05-04	13.0	66	6.6	11.1	49	22.4	--	1.84	7	0.873	0.328	0.141	<0.021	1.60, 1.29	<0.530	0.053	0.37	0.037	0.022
BM	Morrison St Bridge - River Mile 12.7 Middle	2022-06-01	11.3	64	7.1	13.7	64	23.1	--	2.15	3	0.821	0.385	0.067	<0.021	0.730	0.661	0.045	0.31	0.031	0.025
CM	St John's RR Bridge - River Mile 6.8 Middle	2021-07-01	8.2	82	6.9	24.5	6	24.1	--	1.88	3	0.622	0.370	0.067	<0.021	0.697	<0.530	0.071	0.29	0.061	0.038
CM	St John's RR Bridge - River Mile 6.8 Middle	2021-08-04	7.7	96	7.0	24.5	12	28.0	--	2.08	8	1.05	0.477	0.171	<0.021	1.56	<0.529	0.088	0.38	0.079	0.049
CM	St John's RR Bridge - River Mile 6.8 Middle	2021-09-01	9.9	97	7.1	20.8	5	27.8	--	1.84	4	0.723	0.439	0.085	<0.021	1.28	<0.529	0.049	0.36	0.058	0.042
CM	St John's RR Bridge - River Mile 6.8 Middle	2021-10-05	11.7	94	6.9	16.1	31	28.3	--	1.88	<3	1.22	0.507	0.084	<0.021	1.35	0.728	0.110	0.46	0.062	0.052
CM	St John's RR Bridge - River Mile 6.8 Middle	2021-11-02	11.9	81	6.9	11.8	22	24.6	--	2.86	4	0.862	0.638	0.134	0.031	1.52	0.697	0.078	0.54	0.054	0.037
CM	St John's RR Bridge - River Mile 6.8 Middle	2021-12-01	--	71	7.1	10.4	72	23.8	--	2.54	6	0.868	0.508	0.122	<0.021	1.50	0.645	0.069	0.71	0.044	0.037
CM	St John's RR Bridge - River Mile 6.8 Middle	2022-01-06	15.2	72	6.4	6.9	440	26.4	--	4.41	34	3.52	1.05	0.707	0.062	6.11	1.19	0.034	1.30	0.104	0.036
CM	St John's RR Bridge - River Mile 6.8 Middle	2022-02-02	15.3	80	7.3	5.3	18	29.1	--	1.67	<3	0.929	0.340	0.096	<0.021	1.50	0.797	0.112	0.74	0.045	0.037
CM	St John's RR Bridge - River Mile 6.8 Middle	2022-03-03	13.9	71	6.7	8.7	260	23.3	--	3.68	29	2.97	1.08	0.569	0.049	5.33	1.20	0.072	0.97	0.083	0.036
CM	St John's RR Bridge - River Mile 6.8 Middle	2022-04-05	11.4	81	7.7	11.3	14	27.8	--	1.44	<3	0.562	0.370	0.074	<0.021	<0.556	<0.530	0.077	0.54	0.044	0.031
CM	St John's RR Bridge - River Mile 6.8 Middle	2022-05-04	13.0	64	6.7	11.5	41	22.3	--	1.90	4	0.786	0.399	0.128	<0.021	1.23, 1.52	<0.530	0.052	0.36	0.034	<0.020
CM	St John's RR Bridge - River Mile 6.8 Middle	2022-06-01	11.1	70	6.9	13.6	23	24.8	--	2.11	<3	0.876	0.370	0.069	<0.021	0.900	<0.530	0.056	0.37	0.030	0.028
FM	Waverly Country Club - River Mile 17.4 Middle	2021-07-01	7.9	80	6.9	25.1	12	24.0	--	1.83	<3	0.517	0.350	0.052	<0.021	0.779	0.632	0.113	0.30	0.063	0.048
FM	Waverly Country Club - River Mile 17.4 Middle	2021-08-04	8.6	98	7.1	24.9	12	27.9	--	1.87	<3	0.506	0.366	0.080	<0.021	0.936	0.583	0.068	0.39	0.069	0.051
FM	Waverly Country Club - River Mile 17.4 Middle	2021-09-01	10.1	93	7.0	20.3	1	27.5	--	1.74	<3	0.470	0.354	0.034	<0.021	0.783	<0.529	0.124	0.33	0.058	0.051
FM	Waverly Country Club - River Mile 17.4 Middle	2021-10-05	11.9	82	6.9	15.4	9	26.5	--	1.99	<3	0.699	0.391	0.061	<0.021	0.977	0.631	0.107	0.44	0.056	0.051
FM	Waverly Country Club - River Mile 17.4 Middle	2021-11-02	10.9	72	7.1	11.6	16	23.2	--	2.96	3	0.772	0.546	0.115	0.030	1.35	0.636	0.078	0.50	0.048	0.034
FM	Waverly Country Club - River Mile 17.4 Middle	2021-12-01	--	70	7.5	10.5	16	23.5	--	2.57	7	0.869	0.432	0.135	<0.021	1.45	<0.529	0.077	0.70	0.046	0.036

			Field Parameter				Conventional					Metals						Nutrients			
Site ID	Location Description	Sample Date	Dissolved Oxygen (mg/L)	Conductivity (umhos/cm)	pH	Temperature (C)	E. coli (MPN/100 mL)	Hardness (mg $CaCO_3$/L)	BOD_5 (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)
FM	Waverly Country Club - River Mile 17.4 Middle	2022-01-06	15.9	71	6.9	6.5	290	26.2	--	3.92	46	3.71	1.33	0.783	0.160	6.32	1.81	0.048	1.26	0.106	0.039
FM	Waverly Country Club - River Mile 17.4 Middle	2022-02-02	14.0	83	7.7	5.6	3	30.3	--	1.62	3	0.552	0.360	0.073	<0.021	1.21	0.708	0.086	0.80	0.043	0.037
FM	Waverly Country Club - River Mile 17.4 Middle	2022-03-03	13.3	72	6.5	8.7	140	23.8	--	3.12	37	3.24	0.983	0.654	0.053	5.95	1.49	0.070	0.98	0.090	0.034
FM	Waverly Country Club - River Mile 17.4 Middle	2022-04-05	11.7	78	7.5	10.3	51	26.6	--	1.55	3	0.597	0.374	0.076	<0.021	0.753, 1.91	0.788	0.061	0.50	0.037	0.031
FM	Waverly Country Club - River Mile 17.4 Middle	2022-05-04	13.1	63	6.7	10.9	52	22.5	--	1.81	6	0.786	0.375	0.137	<0.021	1.50, 1.29	0.530	0.054	0.37	0.039	0.023
FM	Waverly Country Club - River Mile 17.4 Middle	2022-06-01	11.2	62	6.9	13.2	36	21.9	--	2.06	4	0.588	0.354	0.069	<0.021	0.979	0.697	0.052	0.28	0.031	0.023

Table B-4. Probabilistic Instream Sites Results (2021-22 Permit Year)

			Field Parameter				Conventional				Metals						Nutrients			
Site ID	Location Description	Sample Date	Dissolved Oxygen (mg/L)	Conductivity (umhos/cm)	pH	Temperature (C)	E. coli (MPN/100 mL)	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																				
P1793	Middle Columbia Slough upstream of NE Holman St	2021-10-13	7.1	169	6.8	11.8	41	68.3	3.51	4	0.844	0.684	0.164	<0.106	4.31	3.22	0.068	1.22	0.116	0.076
P1793	Middle Columbia Slough upstream of NE Holman St	2021-11-30	6.4	153	6.8	12.0	63	59.6	2.22	4	0.923	0.606	0.301	<0.106	6.08	3.94	0.119	1.50	0.117	0.071
P1793	Middle Columbia Slough upstream of NE Holman St	2021-12-12	8.5	119	6.7	8.4	170	47.9	2.37	6	1.47	0.910	0.482	<0.106	17.8	13.9	0.105	1.03	0.100	0.052
P1793	Middle Columbia Slough upstream of NE Holman St	2022-02-17	9.1	190	6.6	10.6	10	74.6	1.91	7	0.756	0.337	0.342	<0.106	8.56	5.57	0.068	2.09	0.115	0.067
P1793	Middle Columbia Slough upstream of NE Holman St	2022-05-24	9.0	175	6.6	15.7	63	72.4	2.81	<3	1.12	0.457	0.123	<0.106	2.77	2.20	0.112	1.52	0.107	0.071
P1809	Elrod Slough downstream of NE 21st Ave	2021-09-08	9.0	302	7.7	19.1	80	141	6.95	7	0.664	0.346	<0.111	<0.106	1.63	<0.529	0.029	<0.10	0.145	<0.020
P1809	Elrod Slough downstream of NE 21st Ave	2021-11-30	4.4	237	6.9	12.0	20	108	7.50	39	1.19	0.882	0.194	<0.106	3.90	2.18	0.218	0.18	0.187	0.033
P1809	Elrod Slough downstream of NE 21st Ave	2021-12-12	6.8	222	6.9	8.7	52	74.1	4.30	3	2.42	1.95	0.299	<0.106	7.49	6.03	0.160	0.54	0.098	0.034
P1809	Elrod Slough downstream of NE 21st Ave	2022-01-25	6.9	277	6.7	6.2	10	159	9.14	4	2.73	1.88	0.321	<0.106	9.05	7.01	0.373	0.22	0.214	0.057
P1809	Elrod Slough downstream of NE 21st Ave	2022-05-24	4.4	283	6.7	16.9	63	127	7.28	10	0.941	0.621	0.174	<0.106	2.71	1.73	0.586	0.19	0.179	0.030
P1857	Upper Columbia Slough downstream of Big Four Corners	2021-09-22	2.2	153	7.1	17.0	260	62.4	9.47	4	2.28	1.65	0.253	<0.106	5.34	3.18	0.045	<0.10	0.249	0.117
P1857	Upper Columbia Slough downstream of Big Four Corners	2021-11-30	7.0	124	7.1	11.5	31	48.4	2.86	4	1.12	0.846	0.229	<0.106	6.05	4.16	0.090	0.54	0.091	0.044
P1857	Upper Columbia Slough downstream of Big Four Corners	2021-12-12	9.4	77	6.9	8.0	360	30.6	2.99	6	1.76	1.16	0.401	<0.106	15.9	11.9	0.096	0.35	0.063	0.032
P1857	Upper Columbia Slough downstream of Big Four Corners	2022-01-25	11.2	170	7.2	4.5	52	66.4	2.62	7	0.912	0.539	0.306	<0.106	5.10	2.68	0.053	1.19	0.065	0.030
P1857	Upper Columbia Slough downstream of Big Four Corners	2022-05-24	9.3	165	6.8	18.4	20	69.4	4.08	5	1.00	0.762	0.116	<0.106	2.23	1.26	0.064	<0.10	0.102	0.034
P1865	Lower Columbia Slough downstream of St. Johns Landfill Bridge	2021-07-07	8.7	181	7.6	24.1	230	67.6	3.57	33	2.11	0.636	1.52	<0.106	6.26	<0.530	0.054	0.15	0.137	0.030
P1865	Lower Columbia Slough downstream of St. Johns Landfill Bridge	2021-10-18	9.5	195	7.3	13.3	52	82.6	2.82	20	1.47	0.567	1.09	<0.106	5.06	0.707	0.148	1.59	0.103	0.036
P1865	Lower Columbia Slough downstream of St. Johns Landfill Bridge	2022-01-04	11.0	218	7.0	4.3	130	81.7	2.96	12	2.69	1.07	1.07	<0.106	14.0	7.65	0.113	1.75	0.111	0.038

			Field Parameter				Conventional				Metals						Nutrients			
Site ID	Location Description	Sample Date	Dissolved Oxygen (mg/L)	Conductivity (umhos/cm)	pH	Temperature (C)	E. coli (MPN/100 mL)	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)
P1865	Lower Columbia Slough downstream of St. Johns Landfill Bridge	2022-02-17	12.8	223	7.1	10.0	20	94.2	3.26	38	1.85	0.454	1.74	<0.106	8.63	1.03	0.020	2.32	0.162	0.024
P1865	Lower Columbia Slough downstream of St. Johns Landfill Bridge	2022-05-23	16.8	196	7.7	17.7	<10	82.7	3.56	10	1.25	0.716	0.497	<0.106	3.12	0.939	0.047	0.74	0.077	<0.020
P2113	Middle Columbia Slough downstream of NE 92nd Dr	2021-09-21	13.8	205	8.0	17.6	31	87.8	2.35	7	0.676	0.427	0.356	<0.106	3.09	1.08	0.089	1.71	0.142	0.025
P2113	Middle Columbia Slough downstream of NE 92nd Dr	2021-10-18	12.2	204	6.7	13.2	10	83.1	1.97	5	0.264	<0.211	<0.111	<0.106	0.969	<0.529	0.162	2.12	0.147	0.083
P2113	Middle Columbia Slough downstream of NE 92nd Dr	2021-12-12	11.1	196	6.8	8.1	31	77.7	1.59	10	0.649	0.253	0.529	<0.106	6.97	3.09	0.110	2.52	0.133	0.078
P2113	Middle Columbia Slough downstream of NE 92nd Dr	2022-01-25	16.7	217	6.9	6.9	<10	82.3	2.78	9	0.320	<0.212	0.148	<0.106	2.05	0.663	<0.020	2.62	0.118	0.041
P2113	Middle Columbia Slough downstream of NE 92nd Dr	2022-05-24	16.5	202	7.9	18.5	31	83.0	3.21	7	0.354	<0.211	<0.111	<0.106	1.23	<0.529	0.141	1.13	0.082	0.027
P2377	Lower Columbia Slough downstream of N. Portland Rd	2021-07-14	10.5	202	8.2	24.1	260	84.4	2.93	31	1.88	0.648	1.12	<0.106	4.98	0.612	0.037	0.53	0.123	0.033
P2377	Lower Columbia Slough downstream of N. Portland Rd	2021-10-18	9.6	199	7.3	13.8	98	85.0	2.56	38	3.34	0.497	2.82	<0.106	14.5	0.760	0.150	1.79	0.177	0.039
P2377	Lower Columbia Slough downstream of N. Portland Rd	2022-01-04	10.8	202	7.1	4.6	220	76.7	2.96	10	3.09	1.20	1.48	<0.106	16.9	9.60	0.124	1.71	0.122	0.042
P2377	Lower Columbia Slough downstream of N. Portland Rd	2022-02-17	11.5	230	6.9	9.8	20	97.4	3.49	30	1.62	0.424	1.46	<0.106	9.57	2.36	0.020	2.38	0.152	0.022
P2377	Lower Columbia Slough downstream of N. Portland Rd	2022-05-23	17.9	199	7.8	18.0	<10	86.6	3.52	8	0.991	0.644	0.224	<0.106	2.17	0.583	0.025	0.85	0.066	<0.020
Fanno Creek																				
P1194	Columbia Creek downstream of SW Patton Rd	2021-09-30	9.9	217	7.1	13.7	400	89.5	4.75	<3	2.27	1.31	0.389	<0.106	4.81	2.14	0.020	0.39	0.093	0.063
P1194	Columbia Creek downstream of SW Patton Rd	2021-11-03	10.0	236	7.3	11.0	31	101	4.56	31	2.48	1.02	0.738	<0.106	6.72	1.16	0.022	0.17	0.101	0.044
P1194	Columbia Creek downstream of SW Patton Rd	2021-12-20	12.0	101	7.3	7.3	190	37.9	7.87	42	6.14	3.11	2.21	0.353	30.2	12.7	0.030	0.53	0.180	0.080
P1194	Columbia Creek downstream of SW Patton Rd	2022-02-02	12.2	241	7.2	6.7	10	94.8	3.50	5	1.69	0.971	0.378	<0.106	14.9	8.73	0.023	0.57	0.065	0.031
P1194	Columbia Creek downstream of SW Patton Rd	2022-05-17	11.0	176	7.6	10.5	10	67.1	2.61	6	1.42	0.758	0.435	<0.106	5.61	2.18	0.032	0.81	0.071	0.039
P1778	Woods Creek downstream of SW Taylors Ferry Rd	2021-10-12	10.9	329	7.2	9.5	110	142	2.89	<3	0.867	0.719	0.135	<0.106	10.2	7.30	0.067	1.44	0.042	0.028
P1778	Woods Creek downstream of SW Taylors Ferry Rd	2021-11-22	10.8	261	7.6	10.0	20	98.8	2.67	<3	7.41	0.813	0.883	<0.106	15.4	7.26	0.108	2.12	0.046	0.027

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P1778	Woods Creek downstream of SW Taylors Ferry Rd	2022-01-20	11.0	221	7.1	10.1	20	75.7	4.01	4	2.54	1.73	1.29	0.406	79.1	67.2	0.036	1.68	0.066	<0.050
P1778	Woods Creek downstream of SW Taylors Ferry Rd	2022-01-24	11.5	261	7.5	8.4	<10	97.9	2.81	<3	1.02	0.698	0.406	<0.106	16.9	12.5	0.089	1.94	0.048	0.024
P1778	Woods Creek downstream of SW Taylors Ferry Rd	2022-05-17	10.7	234	7.5	11.3	31	90.4	2.46	<3	1.14	0.716	0.613	<0.106	9.97	6.04	0.075	1.72	0.055	0.026
P2290	Ash Creek at 10537 SW 64th Dr	2021-10-07	10.1	260	7.0	10.8	700	123	1.81	4	0.828	0.486	0.586	<0.106	6.61	3.57	<0.020	0.74	0.098	0.090
P2290	Ash Creek at 10537 SW 64th Dr	2021-11-22	10.9	235	7.5	8.4	150	100	2.14	<3	0.801	0.686	0.295	<0.106	5.68	4.40	0.022	0.96	0.061	0.055
P2290	Ash Creek at 10537 SW 64th Dr	2021-12-12	10.9	177	7.2	9.1	230	71.5	4.42	4	2.35	1.82	1.04	0.311	19.2	14.7	<0.020	1.71	0.077	0.047
P2290	Ash Creek at 10537 SW 64th Dr	2022-01-24	11.9	210	7.4	7.2	41	84.9	2.51	<3	0.888	0.607	0.460	<0.106	16.7	13.5	0.020	1.13	0.056	0.037
P2290	Ash Creek at 10537 SW 64th Dr	2022-05-17	10.6	198	7.5	11.3	84	81.0	2.46	5	1.22	0.669	0.805	<0.106	15.2	8.77	0.027	0.96	0.068	0.038
Johnson Creek																				
P1612	Johnson Creek near Errol Creek confluence	2021-08-19	8.4	204	7.7	17.4	710	72.8	3.46	<3	1.19	0.970	0.175	<0.106	2.23	1.20	0.045	1.96	0.070	0.060
P1612	Johnson Creek near Errol Creek confluence	2021-11-12	9.9	75	6.6	13.3	2100	29.0	7.60	170	8.38	1.96	5.55	0.159	54.8	5.23	0.037	1.89	0.259	0.042
P1612	Johnson Creek near Errol Creek confluence	2021-11-17	11.5	100	7.1	9.1	150	34.9	2.96	3	1.38	0.994	0.242	<0.106	4.60	2.83	0.022	2.60	0.043	0.024
P1612	Johnson Creek near Errol Creek confluence	2022-02-02	13.0	108	7.0	5.9	200	39.8	2.43	<3	1.38	0.775	0.206	<0.106	4.66	3.20	<0.020	1.68	0.035	0.020
P1612	Johnson Creek near Errol Creek confluence	2022-05-04	11.8	9	7.7	11.5	110	31.8	2.31	4	1.00	0.611	0.261	<0.106	3.58	1.44	0.023	1.08	0.036	<0.020
P2208	Johnson Creek at Brookside Apartments	2021-08-05	9.3	185	7.4	20.0	190	69.4	3.86	<3	1.37	1.19	0.126	<0.106	2.76	1.68	0.023	1.56	0.075	0.056
P2208	Johnson Creek at Brookside Apartments	2021-11-12	9.9	75	6.7	13.3	2100	28.0	7.14	165	7.95	1.97	5.40	0.154	52.2	4.97	0.033	1.89	0.262	0.042
P2208	Johnson Creek at Brookside Apartments	2021-11-17	11.5	100	7.1	9.1	75	34.6	2.70	12	1.36	0.982	0.240	<0.106	4.48	2.75	0.023	2.60	0.042	0.028
P2208	Johnson Creek at Brookside Apartments	2022-02-02	13.0	108	6.9	5.9	220	37.0	2.46	<3	1.21	0.765	0.186	<0.106	4.77	3.45	<0.020	1.67	0.031	<0.020
P2208	Johnson Creek at Brookside Apartments	2022-05-04	11.8	9	7.7	11.6	72	31.7	2.72	3	1.05	0.714	0.278	<0.106	3.78	1.88	<0.020	1.08	0.040	<0.020
P2320	Johnson Creek downstream of SE Jenne Rd (SE 174th Ave)	2021-07-22	8.5	155	7.3	17.3	160	55.0	5.89	8	1.31	0.967	0.196	<0.106	3.18	1.01	0.047	0.17	0.095	0.039
P2320	Johnson Creek downstream of SE Jenne Rd (SE 174th Ave)	2021-11-12	9.6	74	6.4	13.0	1700	28.3	6.95	221	8.11	1.55	5.12	0.123	57.6	4.82	0.033	2.33	0.279	0.030
P2320	Johnson Creek downstream of SE Jenne Rd (SE 174th Ave)	2021-11-17	11.2	94	6.9	8.6	63	29.9	2.43	5	1.26	0.812	0.245	<0.106	5.53	3.77	0.026	2.83	0.036	0.022
P2320	Johnson Creek downstream of SE Jenne Rd (SE 174th Ave)	2022-01-26	12.7	87	7.0	4.3	10	28.5	2.00	8	0.628	0.449	0.173	<0.106	3.81	2.82	<0.020	2.14	0.027	<0.020

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P2320	Johnson Creek downstream of SE Jenne Rd (SE 174th Ave)	2022-05-04	11.1	82	6.7	10.1	74	29.2	2.36	3	1.25	0.599	0.230	<0.106	4.28	2.82	0.026	1.30	0.031	<0.020
P2400	Johnson Creek upstream of SE Bell Ave	2021-09-16	9.5	168	7.0	13.2	170	63.0	4.54	<3	1.37	0.957	0.218	<0.106	2.63	1.13	0.048	0.15	0.057	0.046
P2400	Johnson Creek upstream of SE Bell Ave	2021-11-12	9.7	60	6.5	13.2	2100	28.0	7.11	130	7.62	1.96	4.40	0.152	51.6	5.78	0.033	1.91	0.228	0.040
P2400	Johnson Creek upstream of SE Bell Ave	2021-11-17	11.5	102	7.0	9.1	98	33.6	2.77	<3	1.39	0.880	0.258	<0.106	4.91	2.69	0.023	2.56	0.042	0.024
P2400	Johnson Creek upstream of SE Bell Ave	2022-02-02	12.8	105	6.9	5.8	180	35.4	2.48	<3	1.28	0.722	0.184	<0.106	5.34	3.45	<0.020	1.58	0.030	0.020
P2400	Johnson Creek upstream of SE Bell Ave	2022-05-04	11.9	87	7.5	11.2	97	30.6	2.82	4	0.973	0.731	0.254	<0.106	3.72	1.79	<0.020	1.06	0.033	0.021
P2524	Mitchell Creek downstream of SE 156th Ave	2021-08-10	8.9	171	7.3	15.9	140	72.0	2.36	9	1.31	0.703	0.431	<0.106	3.63	0.699	<0.020	0.57	0.024	<0.020
P2524	Mitchell Creek downstream of SE 156th Ave	2021-11-12	10.4	112	6.6	12.9	1200	41.7	7.23	134	6.28	1.94	5.59	0.251	43.8	10.1	<0.020	1.51	0.190	0.036
P2524	Mitchell Creek downstream of SE 156th Ave	2021-11-17	11.2	166	6.9	8.6	31	63.9	2.63	<3	1.25	0.720	0.603	0.264	8.13	5.88	0.072	1.27	0.028	0.027
P2524	Mitchell Creek downstream of SE 156th Ave	2022-01-26	12.0	110	7.2	6.8	10	40.7	1.89	<3	0.500	0.286	0.376	0.154	4.36	2.87	0.037	0.76	0.023	0.027
P2524	Mitchell Creek downstream of SE 156th Ave	2022-05-04	11.1	106	7.1	9.4	10	41.1	1.68	10	0.739	0.476	0.392	0.125	4.98	3.47	0.038	0.52	0.022	<0.020
Tryon Creek																				
P1936	Tributary to Arnold Creek at Boones Ferry Rd	2021-08-26	10.0	156	7.6	14.4	250	60.3	2.18	4	0.707	0.449	0.227	<0.106	1.56	0.679	<0.020	0.76	0.096	0.087
P1936	Tributary to Arnold Creek at Boones Ferry Rd	2021-11-22	12.0	144	7.6	7.0	<10	51.8	2.12	<3	0.895	0.732	0.218	<0.106	1.48	0.902	<0.020	1.31	0.068	0.060
P1936	Tributary to Arnold Creek at Boones Ferry Rd	2021-12-12	11.4	129	7.3	9.0	41	48.5	4.30	6	2.46	1.86	0.770	0.276	6.47	3.50	<0.020	1.48	0.087	0.057
P1936	Tributary to Arnold Creek at Boones Ferry Rd	2022-01-24	12.1	150	7.6	7.5	<10	52.5	1.86	<3	0.718	0.432	0.269	<0.106	2.50	1.24	<0.020	2.04	0.048	0.043
P1936	Tributary to Arnold Creek at Boones Ferry Rd	2022-05-17	11.1	146	7.4	10.6	20	52.5	1.44	6	0.986	0.517	0.366	<0.106	2.96	1.28	<0.020	1.66	0.062	0.047
Tualatin Streams																				
P1834	Tributary to Cedar Mill Creek upstream of NW Miller Rd at Bartholomew Rd	2021-07-08	10.1	199	7.6	13.5	230	83.7	1.50	4	0.716	0.399	0.137	<0.106	6.56	2.74	0.022	0.38	0.130	0.120
P1834	Tributary to Cedar Mill Creek upstream of NW Miller Rd at Bartholomew Rd	2021-11-03	10.7	171	7.1	10.6	<10	69.5	2.39	<3	1.06	0.620	<0.111	<0.106	12.8	10.1	<0.020	0.21	0.094	0.091

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P1834	Tributary to Cedar Mill Creek upstream of NW Miller Rd at Bartholomew Rd	2022-01-03	12.3	96	7.2	5.9	200	36.4	6.65	88	5.03	1.91	1.75	0.237	22.6	6.66	<0.020	0.46	0.164	0.055
P1834	Tributary to Cedar Mill Creek upstream of NW Miller Rd at Bartholomew Rd	2022-02-09	11.7	162	7.4	8.5	52	67.5	2.17	<3	0.707	0.477	0.129	<0.106	6.05	3.94	<0.020	0.41	0.086	0.065
P1834	Tributary to Cedar Mill Creek upstream of NW Miller Rd at Bartholomew Rd	2022-05-17	10.9	134	7.5	11.2	30	49.6	2.82	6	1.26	0.737	0.305	<0.106	13.2	8.00	0.026	0.40	0.083	0.052
Willamette Streams																				
P1744	Riverview Tributary to Willamette River South of Riverview Cemetery	2021-09-02	10.1	158	7.1	14.0	560	60.2	3.37	6	0.937	0.560	0.356	<0.106	2.95	0.627	<0.020	0.27	0.143	0.125
P1744	Riverview Tributary to Willamette River South of Riverview Cemetery	2021-11-22	12.2	144	7.6	6.8	10	51.8	2.30	42	1.55	0.551	1.07	<0.106	6.57	0.765	<0.020	1.18	0.113	0.064
P1744	Riverview Tributary to Willamette River South of Riverview Cemetery	2021-12-12	11.6	124	7.5	8.3	20	45.9	3.63	14	1.60	0.922	0.778	0.177	5.65	1.77	<0.020	1.03	0.108	0.056
P1744	Riverview Tributary to Willamette River South of Riverview Cemetery	2022-01-24	12.3	141	7.5	6.8	<10	64.6	2.29	40	4.23	0.272	2.23	<0.106	46.7	0.535	<0.020	1.55	0.157	0.045
P1744	Riverview Tributary to Willamette River South of Riverview Cemetery	2022-05-17	11.2	138	7.3	10.3	160	50.1	2.22	31	1.57	0.316	1.18	<0.106	11.7	2.07	<0.020	1.14	0.106	0.054
P1769	Miller Creek upstream of HWY 30	2021-07-27	8.6	113	6.9	15.3	10	39.8	2.27	16	0.694	0.400	0.190	<0.106	0.999	<0.529	<0.020	0.58	0.065	0.064
P1769	Miller Creek upstream of HWY 30	2021-11-03	11.0	109	6.7	9.4	<10	35.4	4.02	<3	1.06	0.560	<0.111	<0.106	<0.556	<0.530	<0.020	2.43	0.041	0.046
P1769	Miller Creek upstream of HWY 30	2022-01-03	12.6	48	8.0	5.5	52	17.0	6.85	92	3.25	1.09	1.79	0.218	11.4	2.08	<0.020	1.51	0.135	0.026
P1769	Miller Creek upstream of HWY 30	2022-02-15	12.7	72	7.2	5.5	<10	22.4	2.47	<3	0.669	0.411	0.177	<0.106	1.10	0.644	<0.020	1.44	0.040	0.026
P1769	Miller Creek upstream of HWY 30	2022-05-26	10.7	71	7.1	12.0	10	22.8	2.83	10	0.929	0.481	0.360	<0.106	2.50	0.884	<0.020	1.01	0.060	0.032
P2185	Rocking Chair Creek downstream of Leif Erikson Dr	2021-07-20	8.8	137	7.2	14.4	<10	49.2	2.80	<3	0.625	0.528	<0.111	<0.106	<0.556	<0.530	0.027	0.32	0.074	0.078
P2185	Rocking Chair Creek downstream of Leif Erikson Dr	2021-11-22	12.0	97	7.3	6.9	<10	34.6	4.35	<3	1.48	0.989	0.517	0.123	2.19	0.669	<0.020	0.92	0.079	0.054
P2185	Rocking Chair Creek downstream of Leif Erikson Dr	2022-01-03	12.7	49	7.6	5.5	51	19.9	9.80	140	5.50	1.51	3.11	0.253	15.5	1.89	<0.020	0.97	0.212	0.040
P2185	Rocking Chair Creek downstream of Leif Erikson Dr	2022-02-09	12.7	87	7.1	5.7	<10	32.3	3.05	<3	0.847	0.610	0.253	<0.106	1.39	0.598	<0.020	0.73	0.059	0.044

			Field Parameter				Conventional				Metals						Nutrients			
Site ID	Location Description	Sample Date	Dissolved Oxygen (mg/L)	Conductivity (umhos/cm)	pH	Temperature (C)	E. coli (MPN/100 mL)	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)
P2185	Rocking Chair Creek downstream of Leif Erikson Dr	2022-05-26	10.9	87	7.1	10.9	<10	30.6	2.67	8	1.03	0.639	0.341	0.107	1.96	0.858	<0.020	0.60	0.070	0.046
P2318	Upper Balch Creek at NW Cornell Rd and 53rd Ave	2021-08-31	9.9	206	7.4	13.2	31	75.9	2.50	<3	0.906	0.594	<0.111	<0.106	0.810	<0.529	<0.020	0.33	0.102	0.096
P2318	Upper Balch Creek at NW Cornell Rd and 53rd Ave	2021-11-03	11.1	165	7.1	9.1	<10	62.6	4.79	<3	1.54	1.08	0.142	<0.106	0.701	<0.530	<0.020	0.43	0.073	0.066
P2318	Upper Balch Creek at NW Cornell Rd and 53rd Ave	2022-01-03	12.5	69	7.8	5.2	140	28.8	8.04	197	7.77	1.74	4.76	0.282	25.2	2.63	<0.020	1.28	0.297	0.038
P2318	Upper Balch Creek at NW Cornell Rd and 53rd Ave	2022-02-09	12.3	116	7.0	6.4	20	43.0	3.16	<3	1.26	0.798	0.385	0.149	2.90	1.11	<0.020	1.04	0.065	0.028
P2318	Upper Balch Creek at NW Cornell Rd and 53rd Ave	2022-05-17	11.1	95	7.3	10.6	31	32.5	3.34	10	1.89	0.945	0.788	0.202	4.89	1.57	<0.020	0.84	0.080	0.037

Table B-5. Macroinvertebrate Results (2021–22 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
P1194	9/30/2021	30/30	19	4	1	0	1	0	4.9	22.2	15.3	36.9	3	3	1	1	1	1	3	3	3	3	22
P1612	8/19/2021	19/30	20	6	0	1	0	0	5.9	24.9	15.0	37.9	3	3	1	1	1	1	1	3	3	3	20
P1744	9/2/2021	30/30	25	5	4	1	3	0	4.5	3.9	3.9	16.3	3	3	3	1	3	1	3	5	5	5	32
P1769	7/27/2021	10/30	34	6	4	7	3	2	3.9	1.3	0.4	67.9	3	3	3	3	3	5	5	5	5	1	36
P1778	10/12/2021	30/30	12	1	0	1	0	0	5.2	47.6	47.6	47.6	1	1	1	1	1	1	1	1	1	1	10
P1834	7/8/2021	9/30	21	2	0	2	0	0	5.3	21.2	21.5	24.7	3	1	1	1	1	1	1	3	3	3	18
P1936	8/26/2021	30/30	20	3	3	2	2	0	5.0	17.8	5.9	22.6	3	1	3	1	3	1	1	3	5	3	24
P2185	7/20/2021	12/30	29	4	4	5	3	2	3.9	0.5	0.5	65.5	3	3	3	3	3	5	5	5	5	1	36
P2208	8/5/2021	26/30	29	6	1	4	0	1	5.3	43.6	7.5	17.4	3	3	1	3	1	3	1	3	5	5	28
P2290	10/7/2021	19/30	16	4	0	1	2	1	4.8	3.8	3.8	31.2	1	3	1	1	3	3	3	5	5	3	28
P2318	8/31/2021	12/30	41	5	4	6	1	1	3.5	12.7	3.7	20.5	5	3	3	3	1	3	5	5	5	3	36
P2320	7/22/2021	30/30	18	5	1	1	0	0	5.7	28.3	17.0	24.0	1	3	1	1	1	1	1	3	3	3	18
P2400	9/16/2021	30/30	21	4	0	3	0	0	5.7	59.1	41.7	37.1	3	3	1	1	1	1	1	1	1	3	16
P2524	8/10/2021	30/30	33	3	5	5	2	1	4.5	3.1	7.1	19.2	3	1	3	3	3	3	3	5	5	5	34

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
P1194	9/30/2021	30/30	1%	83%	0%	2%	0%	0%	5%	3%	4%	1%	237	5	6	1	9.7	3.0	15.3	0.0	14.8
P1612	8/19/2021	19/30	14%	47%	0%	4%	1%	0%	15%	14%	0%	5%	1077	7	6	2	2.8	3.0	14.8	0.0	66.5
P1744	9/2/2021	30/30	1%	58%	0%	7%	0%	0%	9%	10%	11%	3%	206	10	5	2	17.6	3.0	3.9	1.3	34.6
P1769	7/27/2021	10/30	2%	79%	0%	0%	0%	0%	5%	7%	6%	1%	2200	17	13	6	68.3	5.0	0.2	0.0	7.3
P1778	10/12/2021	30/30	0%	83%	0%	2%	0%	0%	10%	2%	3%	0%	85	2	4	1	4.8	1.0	47.6	0.0	14.3
P1834	7/8/2021	9/30	5%	73%	0%	11%	2%	0%	6%	2%	1%	0%	2435	4	4	1	28.9	3.0	19.2	2.9	41.6
P1936	8/26/2021	30/30	22%	31%	0%	3%	0%	0%	19%	5%	20%	1%	363	8	3	2	4.8	6.0	5.9	0.0	50.7
P2185	7/20/2021	12/30	0%	73%	0%	1%	0%	0%	6%	5%	13%	1%	1880	13	9	3	66.0	6.0	0.4	0.0	11.3
P2208	8/5/2021	26/30	25%	47%	0%	2%	1%	1%	10%	5%	0%	10%	872	11	8	4	5.7	6.0	5.9	0.0	41.3
P2290	10/7/2021	19/30	5%	89%	0%	1%	0%	0%	1%	3%	1%	0%	1130	5	3	1	24.6	4.0	3.8	4.7	1.9
P2318	8/31/2021	12/30	3%	33%	0%	0%	0%	0%	12%	27%	21%	3%	1803	15	11	9	31.2	8.0	0.4	0.4	8.0
P2320	7/22/2021	30/30	25%	35%	0%	15%	2%	0%	12%	4%	0%	7%	381	7	5	3	8.8	3.0	14.8	0.0	58.0
P2400	9/16/2021	30/30	14%	65%	0%	0%	0%	0%	4%	16%	0%	1%	471	7	3	5	3.1	3.0	37.1	0.0	37.7
P2524	8/10/2021	30/30	2%	35%	1%	2%	7%	0%	25%	2%	24%	1%	435	13	13	2	19.5	6.0	0.6	0.0	30.7

PART IV
CONTACT INFORMATION

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