Stormwater Annual Report








Submitted to

Oregon Department of Environmental Quality

November 2024

Clean Water Services

STORMWATER ANNUAL REPORT

Submitted to:

Oregon Department of Environmental Quality

Submitted by:

Clean Water Services

Co-implementers:

Clean Water Services, Washington County, and the cities of Banks, Beaverton, Cornelius, Durham, Forest Grove, Hillsboro, King City, North Plains, Sherwood, Tigard, and Tualatin

Submitted in accordance with the requirements of Integrated, Municipal National Pollutant Discharge Elimination System (NPDES) Permit Numbers 101141, 101142, 101143, 101144, and MS4 File Number 108014 issued on April 22, 2016, and reissued on January 1, 2023.

November 1, 2024

Permit Holder Information

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Clean Water Services

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
MUNICIPAL SEPARATE STORM SEWER SYSTEM ANNUAL REPORT

November 2024

Clean Water Services hereby submits this NPDES Municipal Separate Storm Sewer System Annual Report in accordance with NPDES Permit Numbers 101141, 101142, 101143, 101144, and MS4 File Number 108014. I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for the gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Diane Taniguchi-Dennis
Chief Executive Officer

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Executive Summary

This stormwater annual report includes a summary of the activities and accomplishments for the period July 1, 2023, through June 30, 2024, performed under the Clean Water Services (CWS) Stormwater Management Plan (SWMP). The SWMP was incorporated into CWS' watershed-based NPDES permit (Permit) issued April 22, 2016. The SWMP and the Permit, which was reissued December 8, 2022, and effective January 1, 2023, constitute the Maximum Extent Practicable (MEP) requirement that CWS must meet in reducing the discharge of pollutants from the Municipal Separate Storm Sewer System (MS4). This report covers the period from June 30, 2023, to July 1, 2024, and meets the reporting requirements of the 2023 Permit relating to CWS' MS4.

CWS and its 12 co-implementers are committed to continuing the efforts and programs that are in place to ensure compliance with the requirements of the SWMP and the Permit. Each Best Management Practice (BMP) fact sheet in this annual report includes the program elements, goals, and tracking measures contained in the SWMP.

A FEW HIGHLIGHTS OF THIS YEAR'S ACTIVITIES AND ACCOMPLISHMENTS

- Performed 25,901 erosion control inspections.
- Swept 40,797 miles of streets, removing more than 6,880 cubic yards of material.
- Inspected and maintained 2,097 vegetated stormwater treatment facilities.
- Responded to 35 reported illicit discharges.
- Performed compliance inspections at 17 of 71 industrial stormwater 1200-Z permit facilities, conducted 31 site verifications at facilities with No Exposure Certifications (NECs), and identified 20 sites to be evaluated for an NEC.
- Presented the Tualatin River Rangers program to 1,599 elementary school students at 29 schools. Provided virtual program materials that were developed during distance learning to more than 500 additional teachers.
- Marked 461 storm drains with "Dump No Waste, Drains to Stream."
- Completed four outfall or water quality retrofits, providing treatment to 29.44 acres, with one additional retrofit project in planning, design, or under construction.
- Completed retrofitting 114 catch basins with water quality sumps to improve water quality.
- Completed annual dry weather inspection of 55 priority outfalls for illicit discharges.

Annual Report

INTRODUCTION

In February 2004, DEQ issued CWS a watershed-based NPDES permit, which was reissued as modified on July 27, 2005. The Permit integrated and consolidated the MS4 requirements with the four CWS municipal wastewater treatment NPDES discharge permits in the watershed. The Permit was renewed on December 8, 2022, and became effective on January 1, 2023. CWS submitted an updated SWMP to DEQ by April 1, 2024, to reflect new requirements in the 2023 Permit; that SWMP has not yet been approved by DEQ. CWS will continue to operate under the previous SWMP that was approved by DEQ with the 2023 Permit until the 2024 SWMP is approved.

Each BMP fact sheet includes the program elements, goals, and tracking measures from the SWMP. In addition to CWS, the co-implementers of the SWMP are Washington County, and the cities of Banks, Beaverton, Cornelius, Durham, Forest Grove, Hillsboro, King City, North Plains, Sherwood, Tigard, and Tualatin. Together these parties implement the applicable provisions of the SWMP. Figure 1 shows the CWS MS4 boundary.

ANNUAL REPORT REQUIREMENTS

As required by Schedule B, section 16, of the 2023 Permit, CWS must submit an annual report of its MS4 activities for the period July 1 through June 30 to DEQ by November 1 of each year. This annual report documents CWS and co-implementers' stormwater management activities from July 1, 2023, to June 30, 2024. The Permit specifies the information that the annual report must contain. The required elements and the activities that were conducted to satisfy each element are described below. In addition, the Total Maximum Daily Load (TMDL) Annual Report, which contains information on water quality conditions relative to the Tualatin Basin TMDLs, is included as Appendix D.

1. The status of implementing the stormwater management program and each SWMP program element, including progress in meeting the measurable goals identified in the SWMP.

The SWMP contains eight categories of BMPs that CWS and co-implementers employ to implement the MS4 program. A summary of each BMP category is listed below. Complete descriptions, including goals and tracking measures that document the status of implementation, are included in the BMP fact sheets in Appendix A.

a. Illicit Discharge Detection and Elimination. CWS and co-implementers implement an Illicit Discharge Detection and Elimination (IDDE) program to prevent, detect, and eliminate illicit discharges to the MS4. The IDDE program includes an ordinance prohibiting illicit discharges, a written enforcement response plan, a dry-weather field screening program, an information tracking system, and spill prevention and response actions. The IDDE program covers community complaints, accidental and intentional discharges of wastes to the MS4, sanitary-to-storm cross connections, and discharges from industrial facilities and construction sites.

b. Industrial and Commercial Facilities. CWS administers the industrial stormwater program (1200-Z NPDES general permit) under a Memorandum of Agreement with DEQ

for the entire MS4 service area. In implementing this BMP category, CWS identifies facilities that require an industrial stormwater permit, reviews permit application materials such as a stormwater pollution control plan, conducts inspections, reviews discharge monitoring reports, solicits voluntary compliance from permittees on low-risk issues, and escalates enforcement to DEQ for compliance cases that require formal enforcement. CWS also responds to site-specific information that may indicate that an industrial or commercial facility may have the potential to contribute a significant pollutant load to the MS4.

c. Construction Site Runoff Control. CWS and co-implementers carry out a construction site stormwater program that includes permitting, education, outreach, inspection, and enforcement. CWS or city staff review erosion prevention and sediment control plans to ensure that appropriate BMPs are included and perform regular site inspections to confirm that the BMPs and other measures are being implemented. Inspectors follow an escalating enforcement response procedure to bring sites into compliance. CWS provides annual training to inspectors.

d. Education and Outreach. CWS and co-implementers employ a public education and outreach program that informs and educates the public, business and industry representatives, and government staff about the causes of stormwater pollution, the effects on local streams and rivers, and the need for stormwater management. These BMP elements encourage appropriate behaviors to protect water quality, reduce discharges of pollutants from the MS4, and promote the health of the Tualatin River watershed. CWS and co-implementers train their employees involved in MS4-related activities such as illicit discharge response, construction site inspection, and water quality facility design.

e. Public Involvement and Participation. CWS provides opportunities for the public to effectively participate in the development, implementation, and modification of CWS' stormwater management program. The Clean Water Services Advisory Commission meets regularly to provide input from stakeholders on CWS policies and programs. CWS and co-implementers provide many options for public engagement, such as web-based portals and social media, to contact staff regarding complaints or to learn more about stormwater programs.

f. Post-Construction Site Runoff and Retrofit Programs. CWS and co-implementers carry out a program to control the quality and quantity of stormwater runoff from developed sites. Through its *Design and Construction Standards*, CWS imposes requirements on development projects to treat stormwater runoff and control flow. CWS' retrofit program addresses stormwater runoff from previously developed sites.

g. Pollution Prevention for Municipal Operations. CWS and co-implementers reduce the discharge of pollutants to the MS4 from municipal operations by sweeping urban streets, implementing an integrated pest management program, managing their municipal yards, limiting infiltration from the sanitary sewers, controlling releases from firefighting training activities, and retrofitting outfalls and catch basins to remove pollutants.

h. Stormwater Management Facilities Operations and Maintenance Activities. CWS and co-implementers carry out a comprehensive operation and maintenance program that

includes catch basin and water quality manhole cleaning, vegetated and proprietary water quality facility maintenance, and private water quality facility inspection.

2. A summary of the adaptive management process implementation during the reporting year, including any proposed changes to the stormwater management program (e.g., new BMPs) identified through implementation of the adaptive management process.

Throughout fiscal year 2023-2024, CWS staff met to review the 2022-23 Stormwater Annual Report. Staff identified the following issues and proposed changes:

- In 2022-23, CWS did not fully document how many copies of the *Gardening with Native Plants* brochure were distributed. The goal was 500 (Education and Outreach BMP, Goal 2.b). The brochure is usually distributed in mailings to new customers, in response to email and phone requests, and at public events. The Communications & Community Engagement group coordinated with other CWS groups and external partners to distribute the brochures to the public, but tracking measures were not adjusted. The brochure also was available as a download from the CWS website, but downloads were not included in the total reported. This year, Native Plant poster distribution was tracked through community events, mailings, and providing the poster to partners. Native plant distribution events were tracked this year as well.
- The City of Tigard's sweeping contractor fell shy of sweeping their streets 12 times during the year. CWS requested a summary of how the city plans to address this shortfall going forward. The City of Tigard will reach out to its sweeping contractor to express the importance of sweeping all curbed streets in Tigard each month and monitor the progress toward that goal. The City will include language in its sweeping contract requiring the contractor to notify the City by the 20th of each month on their progress toward meeting the sweeping goal and will include monetary penalties for not meeting the goal. The City has also reached an agreement with another company to complete the sweeping if the primary sweeping contractor notifies the City that it will not meet the goal for the month.
- CWS and City of Tigard did not meet the annual maintenance frequency of 95% for catch basins in 2022-23 as a result of significant staffing shortages and increased time for fleet vendors to repair mechanical breakdowns and perform routine maintenance. CWS is developing a compliance and staffing plan to manage staffing shortages and tactics to counter the additional vehicle downtime. The City of Tigard is hiring additional staff, has purchased additional fleet vehicles, and will share resources internally to anticipate staffing and vehicle needs next year. Adopting adaptive performance standards for cleaning will help reflect the good work that does get done.
- CWS discussed trends in zinc, copper, and *E. coli* in stormwater. Any trends need to be understood as part of an adaptive management approach, which may require changes to sampling. The Permit requires documentation of follow-up strategies for investigating elevated levels of parameters in stormwater that show the potential to cause or contribute to an exceedance of water quality standards. CWS discussed its strategic approach to respond to stormwater values that appear relatively elevated in the absence of concurrent ambient monitoring, including short-term IDDE or water quality investigations, or long-term programmatic changes. CWS' Environmental

Services staff members perform source control investigations, and Communications & Community Engagement staff conduct targeted outreach in sub-watersheds noted as having elevated contaminate levels. CWS staff have conducted local source identification inspections and are continuing the inspections when monitoring results indicate elevated contaminant levels. Documentation of CWS' follow-up strategies for parameters with elevated concentrations are included in Appendix B.

The issues identified above were addressed within the scope of existing BMPs and therefore did not require revising the BMPs in the SWMP.

The 2023 Permit requires CWS to update the SWMP by April 1, 2024, to reflect new Permit requirements. Until DEQ approves the updated SWMP, CWS will implement the SWMP that was approved when the 2023 Permit was issued. CWS will be working collaboratively with co-implementers on a second, more comprehensive, review and update of the SWMP to incorporate adaptive management elements and adjust metrics and tracking measures to better reflect the scope and scale of the stormwater program.

3. Any proposed changes to SWMP program elements that are designed to reduce TMDL pollutants to the MEP.

The 2023 Permit includes a condition to update the SWMP by April 1, 2024, a condition CWS met with a document referred to as SWMP 1.0. The updated SWMP was only a minor update to ensure metrics met the 2023 Permit requirements; there are no proposed changes to the SWMP program elements that are designed to reduce the discharge of TMDL pollutants. CWS will be working with the co-implementers to evaluate the goals and tracking measures during an adaptive management update of the SWMP (referred to as SWMP 2.0) over the next several years.

4. A summary of total stormwater program expenditures and funding sources over the reporting fiscal year, and those anticipated in the next fiscal year.

For Fiscal Year 2023-24 (July 1, 2023 – June 30, 2024) CWS and co-implementers had estimated total expenditures of $82.7 million for stormwater and related watershed operations and capital project investments. CWS and co-implementers had estimated total stormwater funding sources of $169.9 million for the period, including beginning balance, operating reserves, and capital reserves. Available funding exceeds expenditures in part to maintain operating reserves. The expenditures and funding amounts are based on budget estimates and preliminary data because final auditable actuals were not available by the due date for this report. Final actuals will be available on request at a later date.

For Fiscal Year 2024-25 (July 1, 2024 – June 30, 2025) it is estimated that CWS and co-implementers will have expenditures of $83 million for stormwater and related watershed operations and capital project investments. It is estimated that CWS and co-implementers will have stormwater funding sources of $155.4 million for the period, including beginning balance, operating reserves, and capital reserves.

5. A summary of monitoring program results, including monitoring data that are accumulated throughout the reporting year and any assessments or evaluations conducted.

CWS conducted stormwater and ambient monitoring and data analysis as described below.

Stormwater Monitoring

The Permit requires land-use-based stormwater monitoring at five locations at least three times per year. CWS sampled five land-use-based monitoring sites during multiple storm events between July 1, 2023 – June 30, 2024. The following parameters were analyzed per the requirements of Table B26 in the 2023 Permit.

Temperature	Ortho-phosphorus as P
Specific conductance	Ammonia (as N)
Turbidity	Nitrite + nitrate as N
E. coli	Copper
Hardness	Lead
Total organic carbon	Zinc
Total suspended solids	Mercury
Total phosphorus as P	

The following pesticides were collected on March 27, 2024, per the requirements of Table B26 in the 2023 Permit:

Herbicides	Insecticides
Atrazine	Bifenthrin
Simazine	Chlorpyrifos
Sulfometuron methyl	Imidacloprid
Diuron	Fipronil
2,4-D	
Glyphosate and degradate (AMPA)	
2,6-dichlorobenzamide (dichlobenil degradate)	

The metals were analyzed as total recoverable and dissolved. The sample dates, data, and other relevant information on stormwater monitoring are presented in Appendix B.

Ambient Monitoring

CWS conducted ambient monitoring in the Tualatin Basin at the minimum 15 sites on the Tualatin River and tributaries, as required by Table B24 in the 2023 Permit. Due to ongoing safety improvements, CWS used alternative sites when needed while still maintaining the minimum number of monitoring sites required by the Permit. The alternate site on Gales Creek was changed to an alternate site on Rock Creek due to safety concerns and the value of the water quality data collected.

The Tualatin River was sampled at the following sites, located at the given river mile (RM):

Boones Ferry Road (RM 8.7)	Hwy 219 Bridge (RM 45.0)
Jurgens Park (RM 10.6)	Golf Course Road (RM 52.8)

Hwy 210 Bridge (Scholls) (RM 27.1)	Fernhill Road (RM 56.9)	
Rood Bridge Road (RM 39.1)		

The following tributaries were sampled:

Scoggins Creek	McKay Creek	Chicken Creek
Gales Creek	Rock Creek (two sites)	Beaverton Creek
Dairy Creek	Dawson Creek	Fanno Creek

Samples from the sites were analyzed for the following parameters to meet the requirements of Table B24 in the 2023 Permit:

Dissolved oxygen	Phosphorus as P	pH
Orthophosphorus as P	Temperature	Ammonia as N
Specific conductance	Nitrite + Nitrate as N	Turbidity
Copper	*E. coli*	Lead
Hardness	Zinc	Total organic carbon
Mercury	Total suspended solids	

The metals were analyzed as total recoverable and dissolved. Each site was monitored for non-metal parameters between six and 22 times between July 2023 and June 2024; copper, lead, and zinc were monitored at least quarterly, and mercury was monitored twice yearly. All sites were monitored three or more times each in the wet and dry season.

A description of the ambient monitoring activities and statistical summaries of the data are in Appendices B and C. Ambient monitoring data conform to DEQ's Electronic Data Delivery format and will be submitted in the MS4 Grab Sample Submission Excel workbook version 1.06 through the "Phase I MS4 Monitoring Data Submission – 2022" website.

TMDL Assessment

CWS presented information about the pollutants regulated under a Tualatin subbasin TMDL — phosphorus, chlorophyll a, dissolved oxygen, temperature, bacteria, and mercury. Appendix D provides general information on Tualatin River mainstem and tributary conditions during 2023.

6. Any proposed modifications to the monitoring plan that are necessary to ensure that adequate data and information are collected to conduct stormwater program assessments.

CWS is not proposing any modifications to the Stormwater Monitoring Plan.

7. A summary describing the number and nature of enforcement actions, inspections and public education programs, including, but not limited to, the results of ongoing field screening and follow-up activities related to illicit discharges.

In implementing the MS4 program, CWS and co-implementers undertake a range of enforcement actions, conduct numerous inspections, and provide a variety of public

education programs. These actions are part of programs for construction site stormwater, industrial stormwater, and public education.

Construction Site Stormwater

To ensure compliance with erosion control permits and rules, CWS and co-implementers issued 322 Deficiency Notices and 42 Stop Work Orders to operators of site developments, single lot developments, and unpermitted sites during the reporting year. For each Deficiency Notice and Stop Work Order issued, direct and immediate corrective actions were taken by the operator and no civil citations were issued. These enforcement actions were taken as a result of 2,595 initial inspections, 20,856 regular inspections, and 2,450 final inspections of construction sites. In addition, 937 wet-weather notices were sent to developers, contractors, engineers, and owners before the wet-weather period in fall 2023. Details on these actions are included in the BMP Fact Sheet: Construction Site Runoff Control, in Appendix A.

Industrial Stormwater

CWS uses technical and compliance assistance to achieve voluntary compliance. When noncompliance cannot be resolved through voluntary means, CWS refers the matter to DEQ for formal enforcement action. CWS follows DEQ's *Enforcement Guidance for Field Staff* to evaluate compliance issues and select appropriate responses. During the reporting year, CWS continued implementing an accepted change to the SWMP that allows prioritizing annual compliance inspections. Public education elements are incorporated into the Industrial Stormwater program by providing technical assistance to permittees as needed.

CWS inspected 17 of the 71 facilities permitted under the 1200-Z industrial stormwater general permit over the reporting year and referred eight cases to DEQ for formal enforcement.

Commercial Stormwater

EcoBiz Program

CWS continues to participate with Oregon DEQ in the Eco-Logical Business program (EcoBiz). CWS helped found EcoBiz in 1999 to provide technical assistance on pollution prevention to commercial facilities with high potential to discharge pollutants to CWS' MS4. CWS has contracted with Pacific Northwest Pollution Prevention Resource Center (PPRC), a nonprofit organization that provides pollution prevention information. PPRC has provided outreach and technical support for EcoBiz for automotive services and landscaping services in Washington County since November 2008. The EcoBiz program certifies commercial facilities that meet statewide standards set by the Pollution Prevention Outreach Team (P2O Team), which includes members from DEQ, Metro, and Oregon municipalities. Commercial facilities must comply with environmental laws and implement BMPs to reduce the environmental impact of their operations.

Currently, EcoBiz is supported by Oregon DEQ. CWS staff support final certification of EcoBiz businesses in the CWS service area. CWS remains an active participant in the P2O team and supports outreach to engage in cross-jurisdictional collaboration surrounding pollution prevention. In collaboration with the City of Eugene, CWS is

coordinating information such as sampling data and outreach materials to support the City's PFAS work and EcoBiz program.

The following tasks were accomplished this reporting year:

- PPRC re-certified one automotive business and three local government fleets. Outreach and technical assistance led to the following actions:
    - Four businesses and agencies received recommendation reports outlining specific steps needed to gain certification and reduce environmental impacts.

There are 27 EcoBiz-certified facilities within the CWS service district, including 25 auto repair and body shops and two landscaping companies.

Private Water Quality Facilities Management Program

CWS and co-implementers carry out the Private Water Quality Facilities Management program under the CWS SWMP. The program includes inspection of all facilities maintained by private property owners, including residential, commercial, industrial, 1200-Z, NEC, and facilities with wash water permits.

CWS and co-implementer inspectors rate water quality facilities on a scale of 1 (excellent) through 5 (very poor). Facilities rated 1 through 3 are considered to require continued routine maintenance; facilities rated 4 and 5 are considered to require increased maintenance or work beyond maintenance. When the inspection is complete, the inspector provides the owner with the results of the inspection, including a description of suggested improvements for facilities that require increased maintenance or other work. CWS or a co-implementer then contacts the owners of those facilities to determine whether the work has been done. The goal is to ensure that the facilities are maintained and operated appropriately. CWS and co-implementers have a performance standard to inspect 25% of the private water quality facilities within their respective areas of responsibility each year. During this reporting year, CWS and co-implementers exceeded the performance standard, inspecting 1,551 private water quality facilities, or 42% of the total. Details on the program are included in BMP Fact Sheet: Stormwater Management Facilities Operations and Maintenance Activities in Appendix A.

Public Education

CWS and co-implementers provided public education programs and materials to foster water quality protection, including the *Gardening with Native Plants* poster and the Tualatin River Rangers program. CWS' programs and materials teach proper disposal of hazardous wastes, water-friendly and chemical-free gardening and car washing, pet waste cleanup, and riparian protection. In addition, CWS provided storm drain markers to volunteers to deter illicit discharges and published information about littering, illegal dumping, and water quality on its website, in billing inserts, and the *Clean Water Connection* electronic newsletter and city newsletters. Additional information regarding CWS' public education activities is included in the BMP Fact Sheet: Education and Outreach in Appendix A.

CWS continued to promote a slow-release fertilizer, Clean Water Grow®, for retail purchase as a stream-friendly alternative to fast-release fertilizers. The fertilizer contains phosphorus recovered at the CWS' water resource recovery facilities.

Ongoing Field Screening of Illicit Discharges

CWS follows the protocol outlined in the *Illicit Discharge Detection and Elimination Program Description* in inspecting stormwater outfalls for illicit discharges during dry weather. All inspections are performed by CWS Field Operations, generally in July, August, and September when groundwater levels are lowest. Inspectors make visual observations, noting flow, turbidity, oil sheen, trash, and other indicators of non-stormwater discharges. If observations suggest the presence of an illicit discharge and the source is unknown, staff from CWS Environmental Services investigate further. This year, Field Operations inspected 57 stormwater outfalls and found no suspected illicit discharges. Of the 57 outfalls, 32 were dry. There were no physical indicators at the 25 that had base groundwater flow, so they were not deemed to be illicit discharges.

8. A summary, as it relates to MS4 discharges, describing land use changes, Urban Growth Boundary (UGB) expansion, and land annexations.

During this reporting period, the City of Sherwood requested a UGB expansion, however, the decision will not be made by Metro until December 2024. If approved, this expansion will encompass the area known as Sherwood West, which is generally to the west of Highway 99W, south of Scholls-Sherwood Road, north of Chapman Road, and east of Eastview Road. The City of Sherwood submitted its application and concept plan in April 2024. If approved, the City of Sherwood will begin approximately two years of more detailed planning for the expansion area including among other things, utility needs and locations, stormwater management, and land-use planning. The current UGB is included in Figure 1 of the Executive Summary and Figure E-2, Clean Water Services MS4 Boundary with Urban Reserves and UGB Expansion, in Appendix E.

Six annexations, totaling just over 291 acres, were made to CWS' service area during the reporting period. There were no de-annexations. These are detailed in Appendix E, Table E-2, Details of Clean Water Services Annexations, and shown in Figure E-3, Clean Water Services FY 2023-24 Annexations, in Appendix E. These annexations allowed properties to be served by urban sanitary sewer and stormwater drainage systems.

9. A summary, as related to MS4 discharges, describing concept planning or other activities conducted in preparation of UGB expansion or land annexation, if anticipated for the following year.

During the reporting year, several cities continued their local planning efforts. The City of Beaverton made progress on the Cooper Mountain Comprehensive Land Use and Master Plans, which are expected to be completed by the end of 2024. The City of Tigard had not initiated comprehensive planning for the River Terrace South and West areas during this reporting year but is expected to begin this process before the end of 2024. King City annexed multiple parcels within the Kingston Terrace expansion area and processed its first land-use applications in relation to those annexations.

CWS continued supporting each city as they planned and developed. CWS also continued working on a comprehensive strategy for stormwater management in the Kingston Terrace and River Terrace South areas. Upon completion, the strategy will help guide stormwater management more thoroughly in these areas.

Details of planning activities related to expansion activities are included in Table E-1, Co-Implementer Long-Range Planning Activities for Expansion Areas, and Figure E-2, Clean Water Services MS4 Boundary with Urban Reserves and UGB Expansion, in Appendix E.

10. A summary of the new development/redevelopment projects and related stormwater management activities that occurred within the MS4 jurisdictional area during the reporting year. The number of new post-construction permits issued and an estimate of the total new and replaced impervious surface area related to development projects that commenced during the reporting year must also be included.

Development and redevelopment projects in CWS' jurisdiction are subject to CWS' *Design and Construction Standards,* which impose requirements for permitting, stormwater conveyance system design and construction, erosion prevention, sediment control and pollutant discharge during construction, and post-construction stormwater runoff treatment and flow control. Development continued throughout CWS' service area, with several large residential subdivisions and other major construction projects underway. Stormwater management activities related to development and redevelopment projects included review and approval of development plans (including erosion control and post-construction), inspection during construction of stormwater treatment and flow management facilities and conveyance systems, and inspection of runoff control during construction. Details on these activities can be found in the BMP fact sheets on Construction Site Runoff Control and Post-Construction Site Runoff and Retrofit Programs in Appendix A. Table AR-1 provides the number of construction permits issued during the reporting year that included requirements for post-construction stormwater management approaches and an estimate of the impervious area that was permitted for addition or replacement.

Table AR-1: Post-construction Permits and Impervious Area Added and Replaced

Jurisdiction	*New Post-Construction Permits Issued*	*New Impervious Area, Acres*	*Replaced Impervious Area, Acres*
Clean Water Services	63	19.24	0.51
Beaverton	14	9.49	3.80
Cornelius	2	5.45	6.24
Forest Grove	11	18.60	2.60
Hillsboro	31	145.8	3.40
Sherwood	6	43.96	0.55
Tigard	4	18.80	5.90
Tualatin	10	48.40	1.20
TOTAL	**141**	**309.74**	**24.19**

11. Status or results, or both, of any public education program effectiveness evaluation conducted during the reporting year and summary of how the results were or will be used for adaptive management.

CWS generally conducts a Customer Awareness and Satisfaction survey every other year to track service-area customer expectations, values, and CWS performance against those values. The last survey was conducted July 27-August 3, 2023. Relevant results and potential adaptive management are reported in BMP Fact Sheet: Education and Outreach in Appendix A.

CWS applied the Logic Model to the Tualatin River Rangers program this year. In-person River Ranger presentations continued for the 2023-24 school year, and CWS continued to provide virtual resources produced during distance learning. Detailed results of the Logic Model application and the potential for using those results in adaptive management are included in the BMP Fact Sheet: Education and Outreach in Appendix A.

ADDITIONAL REPORTING REQUIREMENT

The 2020 SWMP includes language requiring CWS to include a summary report of the status of the retrofit program in each annual report. On April 22, 2019, CWS submitted its Stormwater Retrofit Program Plan. As required by the 2023 Permit, CWS will submit an update of the Stormwater Retrofit Program Plan to DEQ as part of the Stormwater Annual Report by November 1, 2025. CWS continues to implement the retrofit program, following identified priorities to guide project selection. As described in the BMP Fact Sheet: Pollution Prevention for Municipal Operations, in Appendix A, the City of Tualatin completed two outfall retrofit projects and the cities of Hillsboro and Tigard each completed one outfall retrofit project. The City of Hillsboro also has one additional retrofit project in the design phase. To date, five outfall retrofits have been completed during the 2023 Permit term (January 1, 2023 through November 30, 2027). In addition, CWS and co-implementers retrofitted or reconstructed 114 catch basins for water quality in fiscal year 2023-24. To date, 224 catch basins have been retrofitted during the 2023 Permit term.

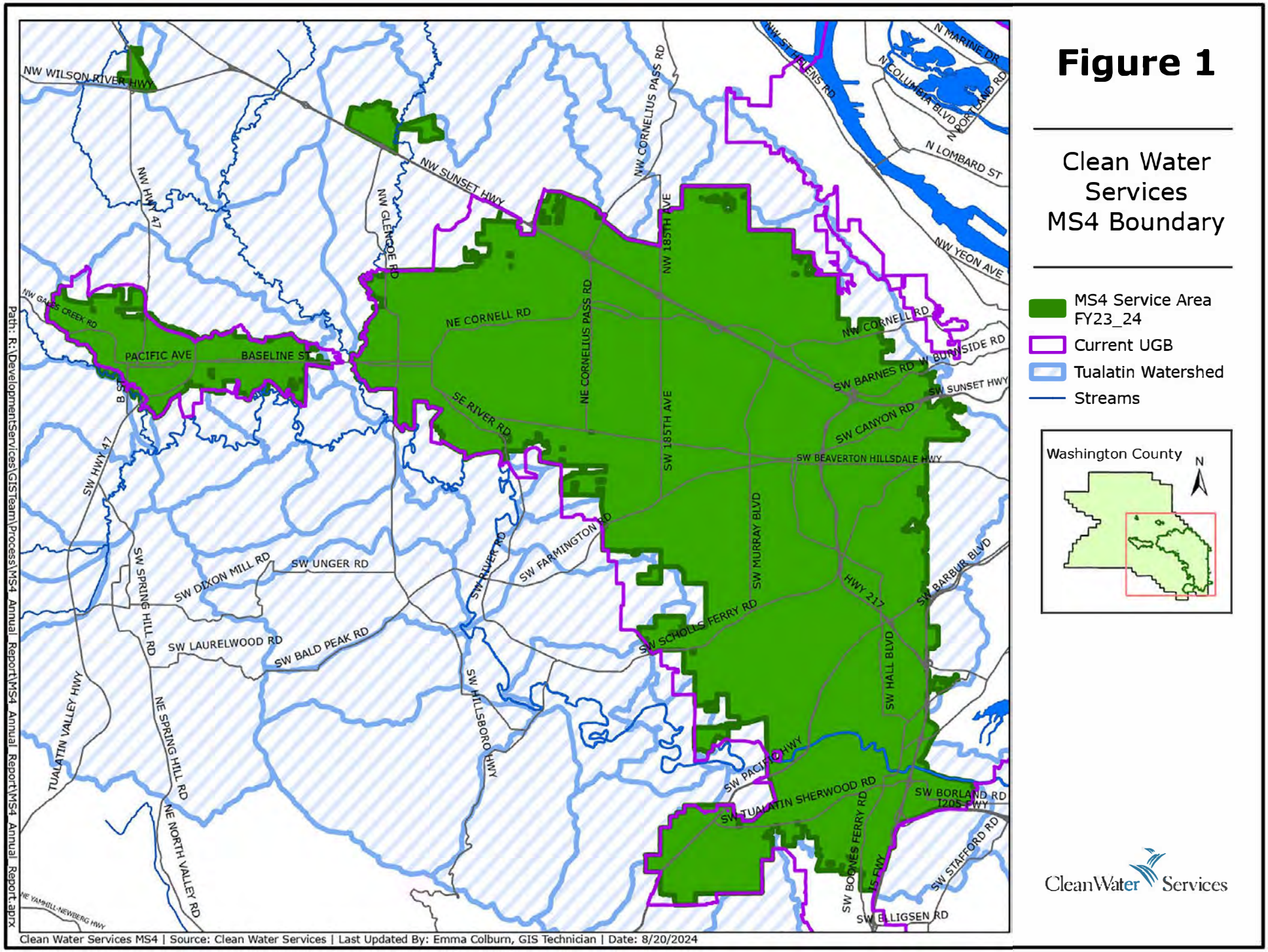
Figure 1
Clean Water Services MS4 Boundary
MS4 Service Area FY23_24
Current UGB
Tualatin Watershed
Streams
Washington County
N
Clean Water Services
NW WILSON RIVER HWY
NW SUNSET HWY
NW GLENCOE RD
NW CORNELIUS PASS RD
NW ST HELENS RD
N MARINE DR
N COLUMBIA BLVD
N PORTLAND RD
N LOMBARD ST
NW YEON AVE
NW HWY 47
NW GALES CREEK RD
PACIFIC AVE
BASELINE ST
B ST
NE CORNELL RD
NE CORNELIUS PASS RD
NW 185TH AVE
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SW BARNES RD
SW SUNSET HWY
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SW LAUREL WOOD RD
SW BALD PEAK RD
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SW PACIFIC HWY
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SW BORLAND RD
I205 FWY
SW BOONES FERRY RD
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SW STAFFORD RD
NE NORTH VALLEY RD
NE YAMHILL-NEWBERG HWY
SW ELLIGSEN RD
Path: R:\DevelopmentServices\GISTeam\Process\MS4_Annual_Report\MS4_Annual_Report\MS4_Annual_Report.aprx
Clean Water Services MS4 | Source: Clean Water Services | Last Updated By: Emma Colburn, GIS Technician | Date: 8/20/2024

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Appendix A: BMP Fact Sheets

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BMP Fact Sheet: Illicit Discharge Detection and Elimination

INTRODUCTION

The CWS Illicit Discharge Detection and Elimination (IDDE) program includes activities to prevent, detect, characterize, trace, and eliminate unpermitted discharges of pollutants to the MS4. These activities include inspecting permitted industrial facilities and construction sites, making observations during routine maintenance of MS4 facilities, annually inspecting dry weather outfalls, facilitating public reporting of spills and illicit discharges, and taking action to eliminate reported illicit discharges.

MEASURABLE GOALS AND TRACKING MEASURES

1. Illicit Discharges, Including Sanitary Cross Connections and Accidental Spills

a. Goal: Respond to reports of illicit discharges. Abate identified illicit discharges.

- Tracking measure: Annual number of illicit discharges reported to CWS/co-implementers by the public and illicit discharges identified through routine MS4 work.
- Tracking measure: Annual number of CWS/co-implementer field investigations and other follow-up actions in response to reports.
- Tracking measure: Number of ongoing illicit discharges identified and number abated by the CWS/co-implementers.
- Tracking measure: Number of cross connections identified and number abated.

These tracking measures are reported in Table IDDE-1a(1) and Table IDDE-1a(2). Data from the one sanitary-to-storm cross connection is included in both tables. The majority of illicit discharges were one-time events, including accidental spills and illegal disposal, rather than continuous or recurring discharges. In addition to the discharges reported in the tables, CWS and co-implementers had seven sanitary sewer overflows (SSOs) that reached the MS4 during the reporting year. Response to these SSOs was consistent with CWS' *Sanitary Sewer Overflow Response Plan* and the Permit requirements for telephone and written reporting to DEQ. The discharges reported in Table IDDE-1a(1) include those at construction sites.

Table IDDE-1a(1): Illicit Discharge (ID) Reports and Response					
Jurisdiction	*IDs Reported by the Public*	*IDs Identified During Routine MS4 Work or Referred by Other Agencies*	*Field Investigation or Other Response Actions*	*Recurring or Continuous IDs Found*	*Recurring or Continuous IDs Abated*
CWS	22	7	29	14	14
Beaverton	2	0	8	0	0
Cornelius	0	0	1	0	0
Forest Grove	4	0	7	3	3
Hillsboro	6	2	14	3	3
Sherwood	0	0	0	0	0
Tigard	3	0	8	8	8
Tualatin	2	0	2	2	2
Total	**39**	**9**	**69**	**30**	**30**

Table IDDE-1a(2): Cross Connections Found and Abated		
Jurisdiction	*Cross Connections Found*	*Cross Connections Abated*
CWS	2	2
Beaverton	0	0
Cornelius	0	0
Forest Grove	0	0
Hillsboro	0	0
Sherwood	0	0
Tigard	0	0
Tualatin	0	0
Total	**2**	**2**

b. **Goal:** Take enforcement actions according to the CWS IDDE program in response to illicit discharges.

- Tracking measure: Number and type of enforcement actions taken to abate illicit discharges.

Table IDDE-1b: Illicit Discharge Enforcement Actions

Type of Enforcement Action	*Number*
Education (includes informal direction to cease a discharge)	25
Warning letter	8
Abatement order	1
Referral to Code Enforcement	15
Referral to DEQ	2
Referral to county health department	0
Referral to CWS (by a city)	9[1]

[1] CWS also receives referrals for illicit discharge investigations by DEQ.

In some cases where no individual enforcement action can be taken because the responsible party is not identified (such as unobserved disposal to a catch basin), educational materials on proper waste discharge are distributed in the neighborhood. No enforcement action is taken in cases of accidental spills that are not due to negligence. Some incidents required multiple types of enforcement actions.

2. Dry Weather Field Screening

a. **Goal:** Conduct annual dry weather illicit discharge inspections at 55 identified priority locations.

- Tracking measure: Number of priority locations inspected annually.

b. **Goal:** Conduct investigations of suspected illicit discharges. Abate illicit discharges identified through dry weather screening.

- Tracking measure: Number of suspected illicit discharges identified through dry weather screening and follow-up investigations conducted.
- Tracking measure: Number of illicit discharges confirmed and abated through dry weather screening.

Table IDDE-2: Dry Weather Field Screening

Action	*Number*
Priority locations inspected	57
Suspected illicit discharges identified	0
Follow-up investigations	0
Illicit discharges confirmed	0
Illicit discharges abated	0

c. **Goal:** Annually review and maintain a map of priority locations for dry weather field screening.

- Tracking measure: Changes, and rationale for changes, to priority locations.

CWS continues to inspect significant outfalls at least once per five-year permit cycle. In 2016, CWS reviewed the priority locations for dry weather inspections and updated the focus for significant outfalls receiving multiple inspections. Outfalls for multiple inspections were selected based on indicators of a greater risk of an illicit discharge being present. One indicator is older areas that lack stormwater treatment. The untreated areas do not have sumped catch basins or water quality manholes, they do not receive the same level of scrutiny as other areas during maintenance when illicit discharges may be detected during routine inspection. Additionally, an illicit discharge in an untreated area has a greater potential for environmental impact due to the lack of water quality treatment. There may be greater potential to observe an illicit discharge from these outfalls. Several years of dry weather inspections at significant outfalls uncovered only one illicit discharge, which had previously been uncovered and addressed through the Fats, Oils, and Grease program. CWS generated a list of 200 priority outfalls to be inspected from the set of outfalls in untreated areas. The list was divided into five groups by geographic area for ease of inspection during the permit term. During the summer of 2023, CWS continued to work through the list of priority outfalls. The locations of these priority outfalls are maintained in CWS' GIS database. In 2024, CWS reviewed the prioritization criteria for dry weather outfall field screening and included updates to those criteria in its *IDDE Program Description* document.

3. Report and Response Tracking System

a. **Goal:** Within one year of permit issuance have in place a system or approach meeting permit requirements.

- Tracking measure: Submit report on system status with the first MS4 Annual Report.

CWS developed and implemented a web-based system for tracking information on illicit discharges within its jurisdiction, as reported in the 2016-17 Stormwater Annual Report. The system uses the proprietary Lucity asset management system and is integrated with CWS' GIS. Data tracked include complaints, referrals, investigation activities, actions taken to eliminate the discharge, and resolution, including dates.

4. Annual Training

a. **Goal:** Provide annual training for all co-implementer staff who clean and inspect MS4 components where signs of illicit discharges and connections could be observed. The training will cover identification of illicit discharges and connections and proper responses for reporting and responding to them.

- Tracking measure: Number of co-implementer staff attending annual training.

CWS provided training in illicit discharge recognition, response, and reporting as part of the annual wet weather training for CWS and co-implementer staff members who are involved in various aspects of stormwater management. The recorded training was offered on demand online.

RELATIONSHIP TO TMDLs

Bacteria: This BMP will reduce the human-related sources of bacteria by identifying and removing any cross-connections or other illicit discharges of bacteria-contaminated water into the MS4.

Phosphorus: This BMP will reduce the discharge of organic matter into the MS4, which will result in the reduction of phosphorus.

Settleable Volatile Solids: This BMP will reduce the discharge of organic matter into the MS4 and into the streams directly, which will result in the reduction of sediment oxygen demand.

Mercury: This BMP will reduce the number of illicit discharges that may contain sources of mercury contamination from the MS4 system. This BMP includes accidental and intentional discharges of wastes to the MS4, sanitary-to-storm cross connections, and discharges from industrial facilities and construction sites.

RELATED DOCUMENTS

- IDDE Program Description (2024)
- CWS Sanitary Sewer Overflow Response Plan (2010)

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BMP Fact Sheet: Industrial and Commercial Facilities

INTRODUCTION

The purpose of this BMP category is to reduce the discharge of pollutants from the MS4 by regulating select industrial and commercial facilities that discharge to the MS4. CWS' industrial stormwater program operates under a Memorandum of Agreement with DEQ to regulate facilities requiring the 1200-Z stormwater general permit. This BMP is accomplished by identifying facilities subject to industrial permitting requirements, reviewing permit applications and stormwater pollution control plans, conducting inspections, reviewing discharge monitoring data, providing technical assistance, and coordinating with DEQ on enforcement matters. In addition, CWS responds to site-specific information on commercial and industrial facilities that may discharge a significant pollutant load to the MS4.

MEASURABLE GOALS AND TRACKING MEASURES

1.a. **Goal:** Identify industrial facilities that need a 1200-Z stormwater general permit.

- Tracking measure: Number of newly permitted 1200-Z facilities in the service area.

  CWS is beginning to phase out the use of the Sewer Use Information Card system to survey its service area for new 1200-Z facilities and is now primarily using a New Industrial Users Questionnaire form that is on CWS' public website. There were 71 1200-Z permitted facilities at the end of the reporting year. Four new facilities obtained a 1200-Z permit during the reporting year.

  CWS also responds to site-specific information regarding the discharge of pollutants from industrial and commercial sites.

b.(1) **Goal:** Conduct all of the 1200-Z facility inspections scheduled for the reporting year in the service area.

- Tracking measure: Number of 1200-Z permitted facility inspections scheduled for the reporting year; number of scheduled 1200-Z facility inspections conducted during the reporting year.

  CWS inspected 17 of 71 unique facilities this year, exceeding the target of inspecting 20 percent of permitted facilities each year, regardless of risk or priority. This total included four facilities identified through the use of a prioritization matrix as having a relatively higher risk of discharges of pollutants or compliance issues. Two of the 17 facilities triggered Tier II at the time of this report.

b.(2) **Goal:** Inspect all 1200-Z permitted facilities in the service area at least once during the permit term.

- Tracking measure: Annually report progress toward this goal and confirm final compliance in the 2020-21 Annual Report.

  Final compliance with achieving the goal of inspecting all 1200-Z permitted facilities in the service area at least once during the 1200-Z permit term was reported in the 2020-21 Stormwater Annual Report. DEQ reissued the 1200-Z permit effective July 1, 2021. In the first three years of the new permit term, 58 percent of the current 1200-Z permitted facilities have been inspected. Final compliance with achieving the

goal of inspecting all 1200-Z permitted facilities at least once in the permit term will be reported in the 2025-26 Stormwater Annual Report.

c. **Goal:** Provide technical assistance if requested by owner/operator of a facility.

- Tracking measure: Number of technical assistance inspections performed in response to owner/operator requests.

  CWS performed one technical assistance inspection during the reporting period.

d. **Goal:** Issue "No Exposure" certifications to facilities that meet DEQ qualifying criteria.

- Tracking measure: Number of "No Exposure" certifications issued.

  No Exposure Certifications (NECs) are issued to facilities that would otherwise require a 1200-Z permit but are requesting conditional exclusion by demonstrating that stormwater is not exposed to pollutants from industrial processes at the facility.

  - Total NECs in service area 168
  - NECs reissued (five-year issuance period) 31
  - NEC reissuance denied 3
  - Newly issued NECs 2
  - Identified sites to be evaluated for a NEC 20
  - Former 1200-Z facilities that converted to NEC 0

e. **Goal:** Review monitoring reports from all 1200-Z facilities.

- Tracking measure: Number of monitoring reports submitted and number reviewed.

  On July 1, 2021, DEQ reissued the 1200-Z permit, which requires quarterly monitoring reporting. CWS received and reviewed 278 quarterly Discharge Monitoring Reports for the 2023-24 reporting year. CWS reviewed all reports submitted by permittees. Eleven permittees failed to submit reports on time. Nine of the 11 permittees received warning letters and the other two were forwarded to DEQ for formal enforcement.

f. **Goal:** Identify facilities subject to section 313 of SARA Title III and not already covered by 1200-Z or other stormwater discharge permit and determine their potential to contribute a substantial pollutant loading to the MS4.

- Tracking measure: Number of unpermitted facilities identified through the annual review of the toxic release inventory (TRI).
- Tracking measure: Number of unpermitted facilities identified through the TRI review that were inspected, number determined to have potential to discharge a substantial pollutant loading, action taken.

  The most recent TRI data available are from the 2022 reporting year. CWS reviewed the TRI on August 21, 2024. Of the facilities listed in Washington County, 33 industries are located within the CWS MS4 service area. Two of the sites on the list were identified as needing to be evaluated for potential stormwater discharges. Of the remaining 31 industries, 12 have 1200-Z permits, one has a 1200-A permit, 15 have

No Exposure Certifications, two do not discharge stormwater off-site, and one is a state Superfund site under DEQ oversight.

g. **Goal:** Reduce pollutants in stormwater discharges from facilities other than those with SIC codes requiring 1200-Z general permit coverage.

- Tracking measure: Number of facilities (other than those with 1200-Z-qualifying SIC codes) in our MS4 service area where site-specific information leads to a facility inspection, number of facilities determined to be contributing a significant pollutant load to the MS4, action taken.

  DEQ referred one facility suspected of discharging process wastewater to the MS4 to CWS. An inspection by CWS determined that the facility should be covered by a DEQ permit. DEQ requested that CWS manage the facility under CWS' integrated watershed-based NPDES permit. Any discharge from the facility to the MS4 will be considered an illicit discharge and managed under CWS' IDDE program.

RELATIONSHIP TO TMDLs

Implementing this BMP and the 1200-Z permitting program reduces the potential discharge of all of the TMDL parameters.

RELATED DOCUMENTS

- Memorandum of Agreement with DEQ to implement the 1200-Z program (2009)

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BMP Fact Sheet: Construction Site Runoff Control

INTRODUCTION

This BMP category requires the use of erosion prevention and sediment control BMPs and the prevention or control of the discharge of construction-related nonstormwater waste to reduce the discharge of pollutants to the MS4 from construction activities. CWS acts as DEQ's agent for the administration of the 1200-CN and 1200-C general permits and implements its own local program.

MEASURABLE GOALS AND TRACKING MEASURES

1. Erosion Prevention and Sediment Control (EPSC) Inspection and Enforcement

a. Goal: Conduct initial, regular, and final inspections for all active site development projects.

- Tracking measure: Annual number of site development inspections – initial, regular, and final.

Table CSRC-1a: Annual Number of Site Development Inspections

Jurisdiction	*Initial Inspections*	*Regular Inspections*	*Final Inspections*	*Total Inspections*
Clean Water Services	45	2,623	52	2,720
Beaverton	12	1,350	23	1,385
Cornelius	6	356	7	369
Forest Grove	9	564	9	582
Hillsboro	48	3,119	49	3,216
Sherwood	3	788	7	798
Tigard	21	1,244	38	1,303
Tualatin	18	502	14	534
Total	**162**	**10,546**	**199**	**10,907**

b. **Goal:** Conduct initial, regular, and final inspections for all active single lot construction sites.

- Tracking measure: Annual number of single lot construction inspections – initial, regular, and final.

Table CSRC-1b: Annual Number of Single Lot Construction Inspections

Jurisdiction	*Initial Inspections*	*Regular Inspections*	*Final Inspections*	*Total Inspections*
Clean Water Services	614	4,268	627	5,509
Beaverton	566	916	526	2,008
Cornelius	86	297	92	475
Forest Grove	41	223	76	340
Hillsboro	520	1,843	440	2,803
Sherwood	78	365	72	515
Tigard	407	2,054	342	2,803
Tualatin	121	344	76	541
Total	**2,433**	**10,310**	**2,251**	**14,994**

c. **Goal:** Implement an escalating enforcement system, which may include written warnings (e.g., Deficiency Notices or similar action), Stop Work Orders, and Civil Citations.

- Tracking measure: Annual number of enforcement actions – written warnings (e.g., Deficiency Notices or similar action), Stop Work Orders, and Civil Citations.

Table CSRC-1c: Annual Number of Enforcement Actions

Jurisdiction	*Deficiency Notices*	*Stop Work Orders*	*Civil Citations*
Site Development			
Clean Water Services	22	3	0
Beaverton	3	1	0
Cornelius	0	1	0
Forest Grove	5	1	0
Hillsboro	22	0	0
Sherwood	26	2	0
Tigard	48	12	0
Tualatin	0	0	0
Subtotal Site Development	**126**	**20**	**0**
Single Lot			
Clean Water Services	60	3	0
Beaverton	37	6	0
Cornelius	0	0	0
Forest Grove	2	1	0
Hillsboro	1	0	0
Sherwood	2	2	0
Tigard	94	10	0
Tualatin	0	0	0
Subtotal Single Lot	**196**	**22**	**0**
Total Enforcement Actions	**322**	**42**	**0**

2. Training and Outreach

a. **Goal:** Provide annual inspector training on erosion control techniques and enforcement measures for continuing education. Except for inspectors who have active EPSC certification that includes a continuing education requirement, require all erosion control inspectors to attend annual training on erosion control techniques.

- Tracking measure: Number of noncertified inspectors and number attending annual EPSC training.
- Tracking measure: Number of inspectors with active EPSC certification.

Table CSRC-2a: EPSC Training for Inspectors

Jurisdiction	*Noncertified Inspectors*	*Noncertified Inspectors Attending EPSC Training*	*Certified Inspectors**
Clean Water Services	0	0	9
Beaverton	0	0	5
Cornelius	0	0	1
Forest Grove	4	4	3
Hillsboro	1	1	4
Sherwood	1	1	2
Tigard**	0	2	0
Tualatin**	0	0	0
Total	**6**	**8**	**24**

Note: Certified inspectors have professional training requirements and do not require annual EPSC training.
* The number of inspectors in this column is the number at the beginning of the reporting year.
** Clean Water Services performs erosion control inspections in Tigard and Tualatin, therefore those cities' inspectors are not required to attend training.

- Tracking measure: List of annual training sessions conducted and participating agencies.

  Annual erosion control training was held June 4, 2024; 24 people from CWS and co-implementers attended. Some inspectors attended who were interested in a refresher class on the CWS local erosion control regulation; others were required to attend because they didn't have a certification.

b. **Goal:** Provide annual notification of wet-weather requirements to active site development (i.e., not single family home construction) permit holders.

- Tracking measure: Number of site development permits active at the time when wet-weather notices are issued; annual number of wet-weather notices issued.

As shown in Table CSRC-2b, CWS and co-implementers notify multiple parties associated with each active site development permit (owner, developer, engineer, contractors). Each co-implementer determines which parties to notify, resulting in different numbers of notices being sent per site.

Table CSRC-2b: Annual Number of Wet-Weather Notices Issued

Jurisdiction	*Active Site Development Permits*	*Wet-Weather Notices Issued*
Clean Water Services / Washington County	63	146
Beaverton	36	71
Cornelius	6	9
Forest Grove	12	30
Hillsboro	83	431
Sherwood	19	100
Tigard	21	42
Tualatin	38	108
Total	**278**	**937**

RELATIONSHIP TO TMDLs

Phosphorus: CWS' Construction Site Runoff Control program was established under the Tualatin Basin Rule (OAR 340-041-0345(4)) to meet the phosphorus allocations in the 1988 Tualatin TMDL.

Settleable Volatile Solids: Erosion prevention and sediment control BMPs significantly reduce the discharge of organic matter associated with soil erosion. Organic matter can result in increased sediment oxygen demand in the receiving waters.

Mercury: Erosion prevention and sediment control BMPs can significantly reduce the discharge of sediments or spills that could transport sources of mercury contamination into receiving waters.

RELATED DOCUMENTS

- Design and Construction Standards for Sanitary Sewer and Surface Water Management, Chapter 6 (2019)
- Erosion Prevention and Sediment Control Planning and Design Manual (2020)
- Construction Site Runoff Inspection Guidance (2023)

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BMP Fact Sheet: Education and Outreach

INTRODUCTION

The purpose of the Education and Outreach BMP category is to inform and educate the public, businesses, industries, and government about the causes of stormwater pollution, the effects on local streams and rivers, and to promote stream-healthy behavior. These BMPs encourage behavior change and participation that will reduce the discharge of pollutants from the MS4.

MEASURABLE GOALS AND TRACKING MEASURES

1. Education and Outreach Strategy

a. **Goal:** Following the CWS *Strategic Communications Plan,* educate the public on stormwater quality issues including the impacts of stormwater discharges and the actions the public can take to reduce pollutants in stormwater, the proper use and disposal of pesticides, and information for reporting illicit discharges. CWS will publish 12 monthly electronic newsletters per year and place inserts in customer bills five times per year covering one or more of these topics.

- Tracking measure: Summarize activities and participation on an annual basis, including the number of electronic newsletters published and billing inserts mailed during the year.

  CWS emailed and mailed six *Water Words* billing inserts to nearly 58,600 customers and *Clean Water Words* billing inserts to approximately 13,000 customers during the reporting year. The inserts contained articles on watershed protection and enhancement, proper disposal practices, and reporting information for illicit discharges and water quality impacts.

  CWS sent 12 monthly *Clean Water Connection* e-newsletters to 3,795 subscribers. The e-newsletters contained articles on watershed protection and enhancement, proper disposal practices, and reporting information for illicit discharges and water quality impacts.

b. **Goal:** Following the CWS *Strategic Communications Plan,* carry out campaigns designed to change the behavior of the intended audience relevant to reducing stormwater pollution.

- Tracking measure: Annually track outreach campaigns being conducted and the intended audiences and behaviors targeted through those campaigns.

  The Regional Coalition for Clean Rivers and Streams (Coalition) has been working since the late 1990s to provide coordinated messaging about water health and residential behaviors linked to stormwater pollution from across the Portland metropolitan region in Washington, Multnomah, and Clackamas counties.

  The Coalition focuses its efforts to improve watershed health by changing household behaviors to reduce polluted runoff and connecting people with their local waterways. The Coalition focuses on changing behaviors from residential sources linked to stormwater pollution prevention. Information and messages used by the Coalition are intended to reach those making purchasing and management decisions about yard care, pets, and auto maintenance activities – some of the most likely sources of

stormwater pollution from residents. Coalition activities address a range of surface water contaminants, including nutrients and toxics from fast-releasing synthetic fertilizers and pesticides applied to yards and lawns, pollutant loads from car washing soaps, metals, and other toxics from vehicles, E. coli from pet waste, turbidity from eroded soils, and other contaminants from illicit discharges.

Representatives of member agencies promoted Coalition messages using Facebook, Instagram, and YouTube primarily in spring and summer when residents have an increased interest in yard and garden activities relevant to surface water quality. The Coalition used social media to promote outreach activities including 32 in-person events with local watershed councils and community organizations, including river cleanups, plantings, educational workshops, and outdoor celebrations.

In prior years, the Coalition hosted a Student Video Contest (SVC). In lieu of hosting the SVC this year, the Coalition chose to encourage youth in the tri-county area to participate in the Honoring Our Rivers Student Anthology hosted by Clearing Magazine. The Honoring Our Rivers Student Anthology of Art and Creative Writing program is an annual student art and poetry program celebrating pacific northwest rivers and watersheds. The Coalition has been promoting their work since the 2022-2023 Fiscal Year and continues to conduct in kind social media outreach, as well as paid ads, about the program to catalyze participation.

2. Pesticides/Herbicides/Fertilizers

a. **Goal:** Educate the public on the use of alternatives to pesticides, herbicides, and fertilizers through the annual public awareness campaign.

- Tracking measure: Summarize awareness campaign activities and participation regarding the use of alternatives to pesticides, herbicides, and fertilizers on an annual basis.

  CWS' outreach campaign included the following elements:

  - Website, cleanwatergrow.com, promoting the use of Clean Water Grow®, a stream-friendly slow-release fertilizer.
  - Product and retailer promotion to more than 600,000 residents and businesses in the CWS service area through billing inserts.
  - Donations to local fundraisers and gardening clubs
  - Shelf talkers and rack cards distributed with sample packets at public events.
  - Web and social media sharing GROW photos, gardening tips, and information on its positive environmental impact.
  - Retailer support including product displays, social media marketing, and sale of product at four regional retail locations.
  - Environmental industry and civic promotion through customer billing inserts and newsletters.

b. **Goal:** Educate the public on the use of native plants by distributing 500 copies of the *Gardening with Native Plants* brochure.

- Tracking measure: Summarize outreach efforts and participation regarding the use of native plants on an annual basis, including the number of *Gardening with Native Plants* brochures distributed.

  CWS mailed 100 copies of the *Gardening with Native Plants* brochure to new customers and in response to email and phone requests. The brochure is also available as a download from the CWS website. CWS distributed 300 brochures at in-person community events and at the Fernhill Visitor Station.

  CWS distributed *Water Words* and *Clean Water Word*s billing inserts to 71,600 customers and *Clean Water Connection* e-newsletters to 3,795 subscribers throughout the reporting year and conducted public education programs including the Tualatin River Rangers program. These programs and materials teach watershed protection and enhancement, proper disposal practices, and reporting information for illicit discharges and water quality impacts, including the use of native plants.

3. Effectiveness Evaluation and Adaptive Management

a. **Goal:** Assess and improve the effectiveness of CWS' *Strategic Communications Plan* by collecting data on program effectiveness, analyzing the data to determine the effectiveness of CWS' educational and behavioral change efforts, identifying programmatic changes to improve outcomes, and implementing those improvements. Conduct a customer survey every two years. Annually use the Logic Model (or other appropriate process) to evaluate the effectiveness of at least one program in CWS' *Strategic Communications Plan.* Identify and implement needed revisions.

- Tracking measure: Report on status of biannual customer survey and the application of the Logic Model.
- Tracking measure: Track changes made to the public education program as a result of customer surveys and the Logic Model.

  Customer Awareness and Satisfaction Survey: The survey examines the demographics of the service district; customer expectations, needs, and values; and how CWS performs against those values to help CWS understand its community and create more effective and inclusive messaging, education, and outreach strategies. CWS last conducted a Customer Awareness and Satisfaction survey from July 27-August 3, 2023. Findings were presented to CWS employees, the Clean Water Services Advisory Commission, CWS executive team, and the public.

Application of the Logic Model: This year CWS applied the Logic Model to its River Rangers program. CWS continued in-person River Ranger presentations during the 2023-24 school year but also provided virtual resources produced during distance learning. CWS continued to collect pre- and post-instruction student evaluations for the River Rangers program to better understand if students learn new information from the presentation and are inspired to make changes to support a healthy watershed. A summary of the process, results, and steps for adaptive management are below.

River Rangers, Classroom Program	
Evaluation	• Pre-instruction evaluation • Post-instruction evaluation
Notes	In-person River Ranger presentations continued in the 2023-24 school year. Virtual River Ranger program materials developed during distance learning (lesson plan, video presentations, and extension lessons) were shared with 500+ teachers via the virtual Children's Clean Water Festival website and email outreach.
Results	1,599 students from 29 schools participated in in-person River Ranger classroom presentations. 387 students took the pre-assessment before the presentation while 275 students took the post-assessment after the presentation. Awareness of the Tualatin River and storm drains flowing to the river improved by 52% and 47%, respectively, after presentations. Knowledge before presentations was relatively low, and repetition of key concepts remains important to long-term understanding.
Recommendations for adaptive management	• Continue to utilize digital content developed during distance learning as pre/post-lesson extension. • Continue to email teacher the day before the presentation and the day of the presentation to remind of pre- and post-assessment. • Continue to focus content on the Tualatin River and the fact that storm drains lead to the Tualatin River. • Seek additional opportunities to engage students who have participated in River Rangers in other field and classroom programs to reinforce key concepts. • Seek additional opportunities to extend messages and concepts through student participation in partner delivered education programming.

Adaptive Management Plan			
Step	*Description*	*Capacity Needed*	*Time Frame*
1	Review River Ranger assessment results to meet learning goals	Staff – 2 hours	Summer 2024
2	Adapt River Ranger program content as necessary	Staff – 4 hours	Summer/Fall 2024
3	Refine teacher communication	Staff – 1 hour	Fall 2024
4	Train staff on content adaptation and assessment delivery	Staff – 3 hours	Fall 2024
5	Collect student assessment and teacher program evaluation	Staff – 10 hours	2024-25 school year
6	Review results, adapt program	Staff – 6 hours	Annually

4. Employee Training

a. **Goal:** Conduct training for CWS and co-implementer employees associated with stormwater management.

b. **Goal:** Include training in recognition and reporting of illicit discharges.

c. **Goal:** Conduct annual training session for CWS and co-implementer personnel on water quality facility design.

- Tracking measure: List of annual training sessions on stormwater management, recognizing and reporting illicit discharges, and design of water quality facilities, participating agencies, and number of staff attending training sessions.

  CWS provided training in illicit discharge recognition, response, and reporting as part of the annual wet weather training for CWS and co-implementer staff members involved in various aspects of stormwater management. In 2023, online training was offered on demand.

  On May 29, 2024, CWS held a virtual training on inspection, assessment, and proper maintenance of water quality facilities; 19 CWS and co-implementer staff members attended. On June 5, 2024, 28 CWS and co-implementer staff members participated in a training on the design of stormwater management facilities.

5. Education Regarding Illicit Discharges

a. **Goal:** Ensure that CWS and co-implementer websites facilitate public reporting of illicit discharges and water quality problems.

- Tracking measure: Summarize annual progress on developing user-friendly web-based methods for facilitating public reporting of illicit discharges and water quality problems.

  The "Report a Problem" page on the CWS website had 1,331 unique views. CWS and other co-implementers' websites facilitate public reporting of illicit discharges by providing telephone numbers and email addresses for the public to use to report illicit discharges. Below is a list of reporting mechanisms on each co-implementer city's website.

  Beaverton
  - Report a Problem (on homepage as major link under "How Do I…" menu header)
  - A number of questions on their FAQs point to the number to call

  Hillsboro
  - Contact Us – Sewer and Streets (link within Public Works section)
  - "How Do I…" link on all pages can be used
  - "Report a Stormwater System concern" link on storm sewer page

  Tigard
  - Public Works Service Request (link on Public Works page)

Tualatin

- Contact information on sidebar of Public Works and Contact Us pages
- Contact information on "Sewer Maintenance" page

Cornelius

- Public Works page provides contact number
- Storm Drains page provides contact number
- Email form for reporting concerns

Forest Grove

- Report a Concern page
- Public Works contact information

Banks

- Contact Us/Report a Complaint form
- Public Works emergency contact on sidebar

Durham

- Contact information link on homepage

Sherwood

- Public Works contact info on Public Works page
- Submit a concern under "Online Services"

North Plains

- Report a Problem linked on Public Works page and Streets and Drainage page
- Contact info on Public Works page

King City

- Citizen Problem Reporter
- Contact info on Public Works page

b. **Goal:** Use a variety of outreach tools (i.e., print, electronic, and other media) to promote proper disposal of oil, household hazardous waste, litter, and yard debris in billing inserts, print and electronic newsletters, and websites.

- Tracking measure: Summarize outreach related to disposal activities on an annual basis.

  CWS sent *Water Words* and *Clean Water Word*s billing inserts to 71,600 customers every other month. Issues contained articles on proper disposal of oil, household hazardous waste, litter, and yard debris.

  CWS sent *Clean Water Connection* e-newsletters to 3,795 subscribers each month. Each issue contained articles on proper disposal of oil, household hazardous waste, litter, and yard debris.

  CWS' website gets an average of 26,000 views from approximately 9,400 unique visitors per month and contains information on proper disposal of oil, household hazardous waste, litter, and yard debris.

c. **Goal:** Conduct the storm drain marking program and distribute educational door hangers regarding the proper disposal of yard debris and toxic materials.

- Tracking measure: Number of drains marked and door hangers distributed.

  Thirty-one volunteers placed 461 storm drain markers and 1,873 door hangers in Hillsboro, Forest Grove, Beaverton, Tigard, and Tualatin.

RELATIONSHIP TO TMDLS

Phosphorus: Public education regarding how to use products containing phosphorus is critical to the overall reduction in phosphorus in the watershed.

Bacteria: Public education about pet waste management and feeding waterfowl, such as ducks and geese, and other wildlife is important to reducing the concentration of bacteria in stormwater discharges. CWS' strategy to reduce bacteria is greatly dependent on this BMP.

Settleable Volatile Solids: Public education and awareness activities are very important to reducing the loading of settleable volatile solids from the MS4. These include education about the proper use of landscaping materials, leaf disposal, etc.

Mercury: This BMP is used to inform and educate the public, business, and industry representatives, and government staff about the proper use, control, disposal, and impacts of mercury use to limit discharges to the MS4 system.

RELATED DOCUMENTS

- Strategic Communications Plan (Clean Water Services, 2015)

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BMP Fact Sheet: Public Involvement and Participation

INTRODUCTION

The purpose of this BMP category is to provide the public the opportunity to participate in the development, implementation, and modification of the MS4 program. In place of measurable goals and tracking measures for this BMP, the annual report describes CWS' public involvement activities during the reporting year.

CWS uses a documented stakeholder engagement process (STEP) to ensure that CWS project and policy decisions are made with appropriate input from stakeholders. STEP is required for complex or controversial projects and policy decisions. Including stakeholders throughout the decision-making process builds credibility and saves CWS resources. Supervisors are responsible for ensuring appropriate staff members are trained to use STEP and that it is used as required.

PUBLIC INVOLVEMENT DURING THE REPORTING YEAR

CWS posted its 2023 Stormwater Annual Report to its public website.

CWS receives input and guidance on its policies and programs from the Washington County Board of Commissioners serving as the CWS Board of Directors (Board). Staff also provides in-depth updates and education to the Board in periodic training sessions. In FY 2023-24, staff shared information about the regulatory compliance strategy and intergovernmental agreements (IGAs) with the partner cities in the CWS service area and Washington County.

In 2021, CWS initiated discussions with the co-implementers to update the IGAs to better reflect CWS and the co-implementers' roles and responsibilities in the operation and maintenance of the public sanitary sewer and stormwater system. The IGAs describe new relationships between CWS and the co-implementers, with certain co-implementers taking on more responsibility to implement some programs and CWS providing oversight and technical assistance when needed, and ensuring permit compliance. In FY 2023-24, CWS completed the update of the Hillsboro IGA and made progress on the IGAs with Washington County and the cities of Beaverton and Cornelius.

CWS receives public input on its policies and programs from the Clean Water Services Advisory Commission (CWAC), which holds monthly meetings that are open to the public. The Board appoints the 15 members of the commission to represent neighborhood, business, development, environmental, and agricultural interests. In FY 2023-24, staff shared information about the regulatory compliance strategy and Climate Action Roadmap. The regulatory compliance strategy and Climate Action Roadmap include strategies and actions CWS is implementing to adaptively manage the stormwater program, including evaluating sites included in the stormwater monitoring program, enhancing the commercial stormwater program to include targeting pollutants of emerging concern such as PFAS and 6PPD-quinone, and implementing stream restoration actions in conjunction with upland controls for stormwater management at select sites.

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BMP Fact Sheet: Post-Construction Site Runoff and Retrofit Programs

INTRODUCTION

The purpose of this BMP category is to reduce the discharge of pollutants from the MS4 by developing and applying appropriate design and construction standards for development and by constructing capital improvements in previously developed areas.

MEASURABLE GOALS AND TRACKING MEASURES

1. Development Services

a. **Goal:** Implement Design and Construction Standards that require water quality facilities to be built as part of new development and redevelopment with a goal to provide treatment for 100 percent of impervious areas from new and redevelopment areas (that meet impervious area thresholds) with the exception of the fee-in-lieu projects.

- Tracking measure: New development area (in acres) added annually within the service area.
- Tracking measure: New redevelopment area (in acres) added annually within the service area.
- Tracking measure: New development area (in acres) added annually with structural controls within the service area.
- Tracking measure: New redevelopment area (in acres) added annually with structural controls within the service area.

Table PCSRR-1a(1): Developed and Redeveloped* Area Added with Structural Controls

Jurisdiction	*Developed and Redeveloped Area Added (acres)*	*Developed and Redeveloped Area Added with Structural Controls (acres)*
Clean Water Services	81.7	81.7
Beaverton	41.3	36.5**
Cornelius	33.1	33.1
Forest Grove	31.2	17.6**
Hillsboro	498.5	498.5
Sherwood	56.0	55.1**
Tigard	41.5	41.5
Tualatin	34.0	34.0
TOTAL	**817.3**	**798****

* CWS' Design and Construction Standards do not distinguish between development and redevelopment projects, so they are not tracked separately.

** The difference between area added and area with structural controls represent fee-in-lieu.

- Tracking measure: Percentage of the service area served by structural controls.
- Tracking measure: Percentage of all areas developed or redeveloped annually that is served by structural controls.

Table PCSRR-1a(2): Structural Controls	
Service area, in acres*	80,202
Total area served by structural controls, in acres	29,250
Percentage of service area* served by structural controls	36%
Developed and redeveloped area added annually, in acres	817
Percentage of developed and redeveloped areas added annually served by structural controls	98%**

* The total MS4 area, which includes undeveloped areas.

** Areas added that were not served by structural controls met treatment requirements through payment of a fee-in-lieu.

The "Total Area Served by Structural Controls" above represents the acreage served by public and private structural controls (i.e., water quality facilities). There are over 5,500 public and private water quality facilities in the CWS service area. To conduct the Waste Load Allocation Attainment Assessment and TMDL Pollutant Load Evaluation, it was necessary to have data regarding the attributes of the water quality facilities (location, type, and acreage served). These data were available for many water quality facilities and were used in conducting the waste load allocation attainment assessment. However, because of the age of the CWS structural control program, which began in 1991 and predates the MS4 program, and the number of jurisdictions that administer it, comprehensive data regarding water quality facilities in the service area is not available.

CWS continues to work with the co-implementers to improve the quality of the data associated with water quality facilities. Additionally, CWS implements a program to inspect private water quality facilities to ensure they are operated and maintained properly. As part of this program, CWS gathers data including location, type, and acreage served by the private water quality facility. CWS anticipates that the future waste load allocation attainment assessments will include improved water quality facilities data and will provide a better assessment of the scope of structural controls implemented in the service area and their effectiveness.

- Tracking measure: Track all structural controls implemented annually by location, type, and drainage area served.

  The co-implementers track structural controls that are implemented through development, redevelopment, and retrofits using GIS or other mapping systems that record the location, type, and area treated by structural controls.

2. Low Impact Development Approaches (LIDA)

a. **Goal:** Increase the use of LIDA through entering into two public/private partnerships on LIDA projects each year, including one under the School LIDA program. (CWS seeks to complete one project each year through the School LIDA program. Since a school or school district must decide to participate in the program, the goal for this program is to actively seek and develop appropriate projects rather than complete a specified number.)

- Tracking measure: Annual number of LIDA facilities implemented and the type of facility.

Table PCSRR-2a(1): LIDA Sites

Jurisdiction	*Type of Controls*	*Number of LIDA Sites*
Clean Water Services	Extended dry basin, vegetated swale, LIDA swale, rain garden, flow-through planter	12
Beaverton	Extended dry basin, infiltration planter, flow-through planter, LIDA swale	8
Cornelius	Vegetated swale	2
Forest Grove	Extended dry basin, vegetated swale, flow-through planter, filter strip, rain garden	10
Hillsboro	Extended dry basin, vegetated filter strip, green roof, vegetated swale, LIDA swale, infiltration planter, flow-through planter, constructed water quality wetland	19
Sherwood	Extended dry basin, vegetated swale	3
Tigard	Extended dry basin, vegetated swale, flow-through planter, rain garden	7
Tualatin	Extended dry basin, vegetated swale, flow-through planter, infiltration planter, infiltration trench	8
Total LIDA Sites Added		**69**

- Tracking measure: Annual number of public/private partnerships formed to perform LIDA projects.

  As noted in the 2020 Stormwater Annual Report, CWS ended the School LIDA and LIDA public/private partnership initiatives. These programs were instituted to encourage the use of LIDA at a time when LIDA was a novel innovation that needed to be promoted; it was not required by the CWS Design and Construction Standards. Since that time, the use of LIDA has matured and is now prioritized in the Design and Construction Standards.

- Tracking measure: Description of School LIDA outreach and project development efforts during the year.

  As noted above, CWS ended the School LIDA initiative. CWS will continue the Tualatin River Rangers program that educates students on stormwater issues and will work with schools that wish to create LIDA facilities on their grounds as opportunities arise.

b. **Goal:** Provide technical assistance through the LIDA Guidance Manual.

- Tracking measure: Revision of the LIDA Guidance Manual within two years of permit issuance.

  CWS revised its Low Impact Development Approaches Handbook in June 2021.

RELATIONSHIP TO TMDLs

Phosphorus: The CWS Design and Construction Standards for water quality facilities are designed for phosphorus removal from 100 percent of the impervious area from newly constructed impervious surfaces that meet the thresholds for requiring treatment.

Settleable Volatile Solids: Structural controls can reduce the discharge of settleable volatile solids through various detention and retention processes.

Mercury: The CWS Design and Construction Standards designed for phosphorus calculations depend on TSS removal, which will influence the transport and removal of mercury.

RELATED DOCUMENTS

- Design and Construction Standards for Sanitary Sewer and Surface Water Management (2019)
- Low Impact Development Approaches Handbook (2021)

BMP Fact Sheet: Pollution Prevention for Municipal Operations

INTRODUCTION

The purpose of this BMP category is to reduce the discharge of pollutants to the MS4 from a variety of municipal operations.

MEASURABLE GOALS AND TRACKING MEASURES

1. Street Sweeping

a. Goal: Sweep public curbed streets 12 times per year.

- Tracking measure: Curbed street miles swept and total number of curbed street miles; and amount of material collected.

Table PPMO-1: Street Sweeping

Jurisdiction	*Curbed Street Miles*	*Curbed Street Miles Swept*	*Amount of Material Collected, Cubic Yards*
Clean Water Services	952	11,424	1,500
Beaverton	450	5,400	749
Cornelius	82	984	144
Forest Grove	136	1,632	855
Hillsboro	512	6,144	663
Sherwood	120	1,440	10
Tigard	313	3,610 [1]	1,803
Tualatin	159	1,908	1,156
Total	**2,724**	**32,542**	**6,880**

[1] The contractor that the City of Tigard uses to sweep streets fell slightly short of the required frequency. City of Tigard staff will update its sweeping contract to require their contractor to notify City of Tigard by the 20th of each month on their progress toward meeting the required sweeping frequency. City of Tigard will also assess a monetary penalty if the contractor does not meet the required sweeping frequency. City of Tigard has also signed an agreement with another company to conduct the missed street sweeping if the contractor does not meet the required frequency for the month.

2. Integrated Pest Management (IPM)

a. **Goal:** Conduct one annual training session related to the CWS Integrated Pest Management program.

- Tracking measure: Report date of IPM training

  CWS provided in-person training on the CWS Integrated Pest Management program as outlined in Table PPMO-2a.

Table PPMO-2a: IPM Training

Date	*Location*	*Attendees*	*Audience*	*Type*
3/19/2024	Hillsboro	10	CWS staff	Weed Watcher Workshop training
5/8/2024	Hillsboro	8	Public	Weed Watcher Workshop training
5/29/2024	PCC – Rock Creek	15	CWS staff	Weed Watcher Workshop training
6/27/2024	CWS Field Operations	24	CWS staff	Plant identification
Total		**57**		

b. **Goal:** All pesticide applicators employed by co-implementers in positions potentially impacting the MS4 will be licensed as required.

- Tracking measure: Report number of state-licensed applicators employed by each co-implementer. See Table PPMO-2b.

Table PPMO-2b: Licensed Pesticide Applicators

Jurisdiction	*Number of State-Licensed Applicators Employed*
Clean Water Services [1]	3
Beaverton	12
Cornelius	3
Forest Grove	10
Hillsboro	26
Sherwood	6
Tigard	8
Tualatin	10
Washington County	3
Total	81

[1] Clean Water Services also uses contractors for pesticide application

c. **Goal:** Keep the CWS IPM program current by annually evaluating pesticides and surfactants for efficacy and potential ecological effects and evaluating pests and pest control measures.

- Tracking measure: Documentation of annual evaluation.

  In Fiscal Year 2023-24, CWS reviewed new herbicides, surfactants, and other adjuvants in use by CWS or CWS contractors and made the following changes to the Integrated Pest Management Plan :

  Additions to Table 3: Invasive Insects.

  - Mediterranean Oak Borer (Xyleborus monographus). WQF, RA, WQSA. EDRR priority. Destructive to white and red oaks.

    * (Key to abbreviations: WQF = water quality facility. RA = riparian area. WQSA = water quality sensitive area. EDRR = early detection and rapid response)

  Additions to Table 4: Priority EDRR Plants for the Tualatin Basin and Clean Water Services:

  - Puncturevine (*Tribulus terrestris*). R, U. 4-County CWMA EDRR species. Toxic to livestock. Spiny burs can pop tires and are extremely painful if stepped on.
  - Brazillian elodea (*Egeria densa*). A. EDRR species. Aggressively invades aquatic environments, altering the dynamics of aquatic ecosystems. Impedes flows in waterways clogging pumps, boat propellers, and recreation areas.

    * (Key to abbreviations: R = Riparian. U = Upland. A= Aquatic. W= Wetland. 4-County CWMA = 4-County Cooperative Weed Management Area. EDRR = early detection and rapid response)

  The IPM is located on the CWS public website at cleanwaterservices.org/documents/.

  Annual Pest Review: CWS reviews its pest lists every year to identify new noxious weeds, insect pests, or other organisms that pose a threat to the watershed's health. In 2024, one plant pest was added to the CWS Invasive Insects table in the Integrated Pest Management Plan as noted above.

  CWS continued in 2024 to collaborate in local emerald ash borer (EAB) management by participating in the EAB statewide task force and leading a local EAB response effort, which includes Metro, the Tualatin Soil and Water Conservation District, Tualatin Hills Park & Recreation District, City of Hillsboro, and the Oregon Department of Forestry. CWS is proactively assessing the impacts of the loss of Oregon ash due to the EAB to ensure regulatory compliance and expects minimal loss of shade at riparian planting projects enrolled in CWS' water quality credit trading program. CWS continues to interplant at existing sites to maintain diversity and function.

  Annual Pesticide Review: As part of the annual review, CWS updates new pesticides using information supplied by CWS staff, other partner organizations engaged in similar activities, and contracted professional applicators. As mentioned above, CWS updated its Integrated Pest Management Plan in 2024.

3. Stormwater Management at Municipal Facilities

a. **Goal:** Within one year of the permit issuance date, develop an inventory of municipal facilities that treat, store, or transport municipal waste.

b. **Goal:** Within two years of the permit issuance date, develop a strategy to reduce the impact of stormwater runoff from these facilities.

- Tracking measure: Status of the municipal facility inventory and stormwater management strategy development.

  There are no municipal facilities in the CWS service area dedicated to the treatment, storage, or transport of municipal wastes; the treatment, storage, and transport of municipal waste from residential, commercial, and industrial sources is handled by private contractors. Solid wastes generated during the maintenance of public facilities such as parks and open spaces may be temporarily stored at municipal yards managed by co-implementers. These yards have Stormwater Pollution Control Plans that include BMPs to reduce the discharge of pollutants in stormwater.

  Because there are no municipal facilities in the CWS service area that treat, store, or transport municipal wastes, there is no need to develop a strategy to manage their stormwater. The incidental, temporary storage of wastes at municipal yards is subject to existing Stormwater Pollution Control Plans.

4. Firefighting Training

a. **Goal:** Within one year of permit issuance develop a list of fire department contacts, make initial contact, establish working groups, and identify firefighting training facilities and practices with the potential to discharge pollutants to the MS4.

b. **Goal:** Within two years of permit issuance, in collaboration with fire department personnel, develop best practices to reduce the discharge of pollutants from firefighting training and develop a plan for implementing these practices, including methods to confirm their implementation.

c. **Goal:** Within three years of permit issuance, implement the identified best practices.

- Tracking measure: Annual update of the status of firefighting training pollutant reduction strategy.

  In the 2018-19 reporting year CWS worked with Michael Kinkade, Fire Chief for Forest Grove and Cornelius and Chief of the Washington County Fire Defense Board, to develop BMPs applicable to firefighting training practices. This approach allowed CWS to efficiently reach out to all fire department decision-makers through an existing forum, rather than working with individual fire departments. The Fire Defense Board approved a list of BMPs on March 15, 2018, that was included in firefighting training materials.

  The Tualatin Valley Fire & Rescue North Operating Center at 209th and Blanton in Aloha, identified in the 2017 MS4 Annual Report as having the potential to discharge pollutants to the MS4, ceased training operations.

In 2023, the City of Hillsboro began operating a Hillsboro Public Safety Training facility within its city limit that discharges to CWS' MS4. The city's firefighting training facility employs BMPs to prevent and control the release of materials related to the training activities.

5. Outfall Retrofits

a. Goal: Complete five outfall retrofit projects during the five-year permit term.

- Tracking measure: Identify the number of outfall retrofit projects in planning, design, construction, or completed; the phase of each project during the year; and the treatment BMP used, including locations and area treated by the retrofit. Report the cumulative number completed during the permit term.

Table PPMO-5a(1): Outfall Retrofit Projects, Details [1]

Project Name	*Treatment BMP Used*	*Project Stage*	*Area Treated With Retrofit, Acre [2,3]*
Hillsboro: 2 Outfall Retrofit Projects			
NE 12th Avenue Storm System Improvement	Proprietary treatment system	Complete	5.9
Minter Bridge Storm Sewer Regional WQ Facility and Outfall	Extended dry pond	Design	0
Tualatin: 2 Outfall Retrofit Projects			
Sandalwood Swale	Vegetated swale	Complete	19.49
Herman Road Expansion	LIDA swales	Complete	1.65
Tigard: 1 Outfall Retrofit Project			
Commercial Street/Main Street Green Street Phase 2	Stormfilter catch basins / stormfilter planters	Complete	2.4
Total area treated by retrofits in 2023-24, acres: 29.44			

[1] Clean Water Services, Beaverton, Forest Grove, Cornelius, and Sherwood did not work on any outfall retrofit projects this year.

[2] "Area treated" represents the area treated after the retrofit, including the area previously treated and new.

[3] A "0" in this column indicates projects in planning, design, or construction phases and not complete at the end of the reporting year. Area treated will be added in future reports when the project is complete.

Table PPMO-5a(2): Outfall Retrofit Projects, Summary	
Total area treated with retrofits in 2023-2024, acres	29.44
Total retrofit projects in process in 2023-2024	5
Total retrofit projects completed in 2023-2024	4
Total cumulative retrofit projects completed during permit term [1]	5

[1] The current permit term is Jan. 1, 2023, through Nov. 30, 2027. Totals for 2022-23 cover the stormwater year July 1, 2022, through June 30, 2023, which includes six months outside the permit term.

6. Catch Basin Retrofits

a. **Goal:** Retrofit or reconstruct 375 existing catch basins during the five-year permit term to include improvements for water quality.

- Tracking measure: Number of existing catch basins that were retrofitted or reconstructed to include improvements for water quality during the year and cumulatively during the permit term.

Table PPMO-6a(1): Catch Basins Retrofitted or Reconstructed for Water Quality	
Jurisdiction	*Catch Basins Retrofitted*
Clean Water Services	31
Beaverton	35
Cornelius	18
Forest Grove	0
Hillsboro	0
Sherwood	7
Tigard	8
Tualatin	15
Total 2023-2024	**114**
Total 2024-2025	-
Total 2025-2026	-
Total 2026-2027	-
Total 2022-2023	110
Total cumulative retrofitted catch basins during permit term[1]	**224**

[1] The current permit term is Jan. 1, 2023, through Nov. 30, 2027. Totals for 2022-23 cover the stormwater year July 1, 2022, through June 30, 2023, which includes six months outside the permit term.

In addition to the outfall and catch basin retrofits listed above, several water quality manholes were also retrofitted this year, as shown in Table PPMO-6a(2).

Table PPMO-6a(2):
Water Quality Manholes Retrofitted or Reconstructed for Water Quality

Jurisdiction	*Manholes Retrofitted*	Area Treated With Retrofit, Acres
Clean Water Services	0	0
Beaverton	0	0
Cornelius	0	0
Forest Grove	0	0
Hillsboro	1	5.9
Sherwood	0	0
Tigard	0	0
Tualatin	0	0
Total 2023-2024	**1**	**5.9**

7. Winter Operations and Maintenance Program

a. Goal: Limit impacts to water quality to the degree practicable from winter operations and maintenance activities of public roadways.

- Tracking measure: 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), and any other actions taken to protect waters of the state for areas where that data is available or becomes available during the permit term.

Table PPMO-7: Winter Operations and Maintenance

Jurisdiction	*Winter Weather Events* [1]	*Sand (Tons)*	*Magnesium Chloride (Gallons)*	*Salt (Pounds)*
Clean Water Services [2]	N/A	N/A	N/A	N/A
Beaverton	1	253	500	0
Cornelius	0	0	0	0
Forest Grove	1	34	440	0
Hillsboro	2	33	2,010	0
Sherwood	2	65	1,625	0
Tigard	1	50	2,500	0
Tualatin	4	60	5,500	0
Washington County	3	1,075	3,367	2,000
Total	**14**	**1,570**	**15,942**	**2,000**

[1] Number of winter storms where co-implementers chose to apply winter weather maintenance materials to public roadways.

[2] CWS is not responsible for maintaining public roadways. No tracking measures to report.

Co-implementers take additional precautions to protect waters of the state by applying best management practices for routine road maintenance, sweeping before winter storms, sweeping soon after winter storms where sand is applied, and not applying magnesium chloride to wet roads or when rain is forecasted.

RELATIONSHIP TO TMDLS

Phosphorus: Street sweeping, outfall retrofits, and catch basin retrofits remove phosphorus-bearing sediments.

Bacteria: Addressing discharges from municipal yards through Stormwater Pollution Control Plans reduces the discharge of bacteria from these sites.

Settleable Volatile Solids: Street sweeping, outfall retrofit, and catch basin retrofits will reduce the discharge of settleable volatile solids.

Mercury: The CWS Design and Construction Standards designed for phosphorus calculations depend on TSS removal, which will influence the transport and removal of mercury.

RELATED DOCUMENTS

- Sanitary Sewer and Surface Water Management Work Programs, Performance Standards, Priorities, and Policies (R&O 07-46 and as amended by RO 08-21, RO 09-21, RO 10-13, RO 11-7, RO 17-6, and RO 18-11) (2018)
- Integrated Pest Management Plan (2024)

BMP Fact Sheet: Stormwater Management Facilities Operations and Maintenance Activities

INTRODUCTION

The purpose of this BMP category is to reduce the discharge of pollutants from the MS4 by implementing appropriate operations and maintenance practices for both public and private stormwater management facilities.

MEASURABLE GOALS AND TRACKING MEASURES

1. Public Water Quality Facility Inspections and Maintenance

a. **Goal:** Maintain public vegetated water quality facilities to ensure functionality of facilities through an average of four annual maintenance visits per facility.

- Tracking measure: Number of water quality facility maintenance visits, total number of water quality facilities, total maintenance hours spent.

  As provided in the SWMP, this Goal and Tracking Measure were replaced beginning in the third annual reporting period (July 1, 2018), with Goal 1.b.iii and Tracking Measure 1.b.ii.

b. **Goal:** Ensure the continued efficient maintenance of the functionality of public vegetated water quality facilities by developing and implementing an outcome-based performance standard.

i. By the end of the first complete annual reporting period (June 30, 2017), evaluate all public water quality facilities to determine their need for routine or nonroutine maintenance.

ii. By the end of the second annual reporting period (June 30, 2018), complete development of an outcome-based performance standard for inspecting and maintaining public water quality facilities. The performance standard will include criteria and methods for evaluating the status of public water quality facilities and will require facilities to be characterized as needing either continued routine maintenance or requiring nonroutine maintenance. The performance standard will require facilities needing nonroutine maintenance to be assessed for their specific needs, prioritized and scheduled for corrective measures.

iii. Begin implementing the performance standard in the third annual reporting period (July 1, 2018).

- Tracking measures:

i. Report the status of program development and implementation.

  Program status: As reported in the 2017 Stormwater Annual Report, Goal 1.b.i was met through CWS and co-implementers assessing the maintenance needs of their public vegetated water quality facilities. As reported in the 2018 Stormwater Annual Report, Goal 1.b.ii was met on May 22, 2018, when CWS' Board of Directors formally amended the Sanitary, Storm, and Surface Water Management Performance and Reporting Standards to incorporate the outcome-based performance standard by

adopting Resolution and Order 18-11. CWS began implementing the new performance standard on July 1, 2018. Pursuant to the SWMP, beginning with the third annual reporting period (July 1, 2018), Goal 1.a. was replaced by Goal 1.b.iii and Tracking Measure 1.a was replaced by Tracking Measure 1.b.ii.

ii. Number of public water quality facilities, number of public water quality facilities assessed for maintenance needs, number found to need nonroutine maintenance.

CWS and co-implementers assessed their public vegetated water quality facilities for maintenance needs during the reporting year, as documented in Table O&M-1b.

Table O&M-1b: Assessment of Public Vegetated Water Quality Facilities

Jurisdiction	*Public Water Quality Facilities*	*Public Water Quality Facility Assessments*[1]	*Public Water Quality Facilities Needing Nonroutine Maintenance*
Clean Water Services	1,045	1,048	17
Beaverton	241	241	5
Cornelius	33	66	0
Forest Grove	41	41	0
Hillsboro	294	946	8
Sherwood	129	129	9
Tigard	213	213	42
Tualatin	100	100	31
Washington County	1	1	0
Total	**2,097**	**2,785**	**112**

[1] Assessments above the number of facilities indicate multiple visits to the same facility.

c. **Goal:** Inspect and maintain all public proprietary water quality facilities once per year per manufacturer's specifications to ensure functionality.

- Tracking measure: Total number of public proprietary water quality facility maintenance visits and the total number of public proprietary water quality facilities within the service area.

Data on the tracking measure for Goal 1.c are in Table O&M-1.

d. **Goal:** Replace filters in proprietary filter treatment systems as needed.

- Tracking measure: Number of systems renewed.

Data on the tracking measure for Goal 1.d are in Table O&M-1.

e. **Goal:** Clean all public water quality manholes twice per year.

- Tracking measure: Number of public water quality manholes cleaned, and total number of public water quality manholes within the service area.

Data on the tracking measure for Goal 1.e are in Table O&M-1. With two exceptions, all co-implementers met or exceeded the annual cleaning target of twice per year.

CWS cleaned its public water quality manholes at a rate of 1.7 per year due to staffing shortages and increased time for fleet vehicles to repair mechanical breakdowns and perform routine maintenance. The vendor repair and maintenance problems reduced the availability of necessary equipment. CWS attempted to overcome these challenges by hiring temporary staff, authorizing overtime for existing staff, hiring contractors to supplement CWS staff, and renting replacement equipment. Despite these actions, resource limitations at critical periods resulted in CWS not meeting the twice-per-year cleaning target. CWS is developing a compliance and staffing plan to manage staffing shortages and anticipated timely repair of fleet equipment by vendors. CWS also will include additional mitigation measures by hiring contractors to perform work as needed.

City of Tigard cleaned its water quality manholes at a rate of 1.9 per year due to equipment breakdown issues. The City has purchased additional fleet vehicles and will share resources internally to anticipate vehicle needs next year.

f. **Goal:** Clean 95 percent of public sumped catch basins per year.

- Tracking measure: Number of sumped catch basins cleaned, and total number of sumped catch basins within the service area.

Data on the tracking measure for Goal 1.f are in Table O&M-1; some of the totals reflect multiple visits to the same facility. All co-implementers except CWS and City of Tigard met the annual cleaning target.

CWS cleaned 81.5 percent of the sumped catch basins this year, short of the 95 percent goal, because of staffing shortages and increased time for fleet vendors to repair mechanical breakdowns and perform routine maintenance. City of Tigard cleaned 81.3 percent of the sumped catch basins this year, short of the 95 percent goal, because of staffing and equipment issues.

The steps CWS and City of Tigard took to address the challenges associated with Goal e (cleaning public water quality manholes twice per year) apply to the challenges associated with Goal f (cleaning public sumped catch basins).

CWS and the City of Tigard will establish interim quarterly goals to help ensure timely actions will be taken if progress toward the annual goal is insufficient.

2. Private Structural Water Quality Facility Maintenance

a. Goal: Annually inspect 25 percent of privately maintained structural water quality facilities to ensure system functionality.

- Tracking measure: Total number of facilities and number of facilities inspected.

Table O&M-2a: Inspection of Private Water Quality Facilities (PWQFs)

Jurisdiction	*Number of PWQFs in Service Area*[1]	*Number of PWQF Inspections*	*Percent of PWQFs Inspected*
CWS Service Delivery Planning	1,067	376	35%
CWS Environmental Services	61	20	33%
Beaverton	616	158	26%
Cornelius	82	24	29%
Forest Grove	112	51	46%
Hillsboro	827	574	69%
Sherwood	138	130	94%
Tigard	324	95	29%
Tualatin	478	123	26%
Total	**3,705**	**1,551**	**42%**

[1] Number is the inventory at the beginning of the reporting year, July 1, 2023.

b. Goal: Conduct annual training for CWS and co-implementer inspection staff on proper water quality facility maintenance:

- Tracking measure: Training sessions conducted and staff/co-implementer attendance.

  On May 29, 2024, CWS held a virtual training on inspection, assessment, and proper maintenance of water quality facilities; 23 CWS and co-implementer staff attended.

RELATIONSHIP TO TMDLs

Phosphorus: The CWS Design and Construction Standards are developed to remove phosphorus. Efficiency is contingent on maintaining the constructed systems to operate as designed.

Bacteria: Through appropriate maintenance and inspection of the sanitary and storm sewer systems, cross connections, and other illicit sources of bacterial contamination will be identified and corrected. This will result in lower bacteria concentrations in stormwater.

Settleable Volatile Solids: Adequate maintenance of the stormwater system will reduce the discharge of settleable volatile solids that accumulate in the system.

Mercury: The Willamette Basin mercury TMDL determined that air deposition (wet and dry) was a predominant source of mercury in the basin and that mercury likely is transported with suspended solids. These BMPs are designed to capture and retain suspended solids and will therefore act to limit mercury transport.

RELATED DOCUMENTS

- Private Water Quality Facilities Management Program (referenced in CWS' 2020 Stormwater Management Plan)
- Performance Standards (2018)

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Table O&M-1
Public Water Quality Facility Inspections and Maintenance Tracking Measures - FY 2023-24

Activity	Units	Frequency Standard	CWS		Beaverton		Cornelius		Forest Grove		Hillsboro		Sherwood		Tigard		Tualatin		Washington County		Total	
			Inventory	Production	Inventory	Production	Inventory	Production	Inventory	Production	Inventory	Production	Inventory	Production	Inventory	Production	Inventory	Production	Inventory	Production	Inventory	Production
1. Public Proprietary Water Quality Facility Maintenance																						
A. Proprietary facility maintenance visits	Visits	1x per year	6	6	123	123	0	0	18	18	46	47	7	7	78	87	9	9	7	7	294	304
B. Filter cartridge replacement	Cartridges replaced	As needed		0		548		0		10		5		11		87		9		0		670
2. Public Water Quality Manhole Cleaning																						
A. Manholes cleaned	Each	2x Per Year	984	1,698	421	857	36	72	77	154	296	594	91	184	138	258	92	191	0	0	2,135	4,008
3. Sumped Catch Basin Cleaning																						
A. Sumped catch basins cleaned	Each	95% Per Year	11,344	9,246	3,440	3,849	1,160	1,160	1,587	1,579	7,572	7,480	1,831	1,821	3,047	2,479	1,334	1,323	0	0	31,315	28,937

Appendix B: Stormwater Monitoring Data

This appendix describes the activities of the Clean Water Services (CWS) stormwater monitoring program and presents the results of these activities. The CWS watershed-based NPDES permit requires land-use-based stormwater monitoring at five locations at least three times per year during characteristic storm events. CWS reviews stormwater data within one month of the data becoming available in CWS' data repository. Since January 1, 2023, when the reissued permit became effective, CWS also reviews the stormwater monitoring data for the potential to cause or contribute to a water quality exceedance in the receiving waterbody within five days of becoming aware of the data.

Stormwater Sampling Activities

CWS' five stormwater sampling sites used in 2023-24 are presented in Table B-1 and in Figure B-1. The sampling procedures used in 2023-24 are consistent with CWS' updated Stormwater Monitoring Plan submitted with the NPDES permit renewal application and approved with the reissued permit on December 8, 2022. The Stormwater Monitoring Plan was updated in May 2023 to include new elements from the reissued permit. One goal of the Stormwater Monitoring Plan is to obtain complete sample sets with results from all analytes at all five sites for each storm event. If the storm event results are incomplete, CWS will take additional samples from individual sites or subsets of analytes from all five sites. In addition, data from monitoring at MS4 sites as part of special projects that met reporting criteria are included here. CWS' Water Quality Laboratory and Environmental Services staff obtained and analyzed at least three samples from each sampling location listed in Table B-1.

Table B-1: NPDES Stormwater Sampling Sites

Station Name	*Station ID*	*Catchment Area (Acres)*	*Subbasin*	*Major Land Use*
MS4 at 209th	7301001	37	Cross Creek	High density
MS4 at Paddington	7301004	22	Bronson Creek	Post-1990 residential
MS4 at 39th Loop	7301005	15	Rock Creek	Industrial
MS4 at Amberglen	7301006	198	Rock Creek	Residential/commercial
MS4 at Maple	7301007	70	Jackson Bottom	Pre-1990 residential

Figure B-1: Map of Five Stormwater Sampling Sites

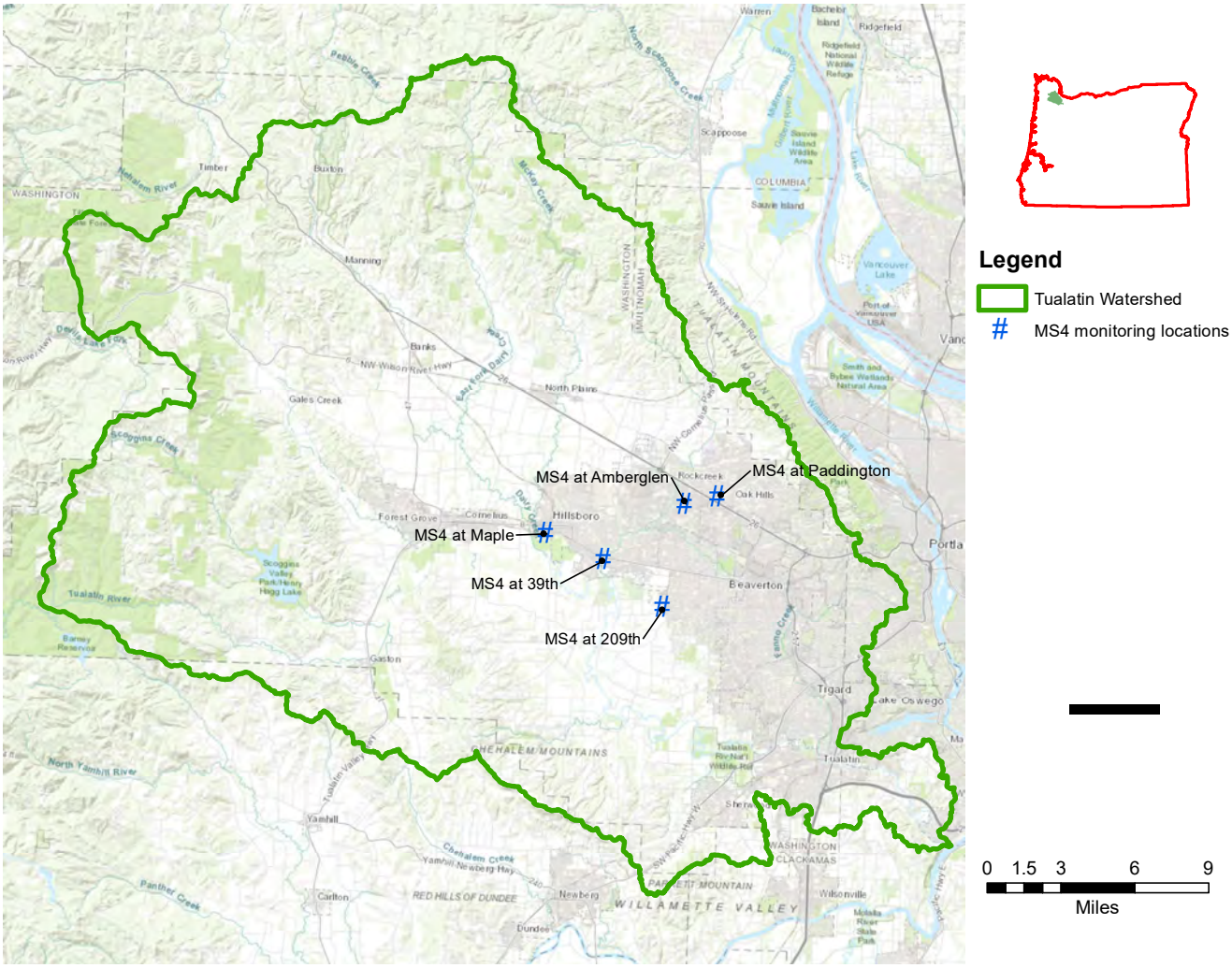


Table B-2 displays the analysis name, sample type, unit, Method Reporting Limit (MRL), and analytical method reference for samples collected and analyzed under the stormwater monitoring program for stormwater sampling sites during the 2023-24 monitoring year.

Table B-2: Method Reporting Limits and Laboratory Methods for Stormwater Samples				
Analysis Name	*Sample Type*	*Unit*	*MRL*	*Method Reference**
Ammonia-N, Dissolved	Composite	mg/L	0.010	SM 4500-NH3 G
Conductivity, Field	Field	µS/cm	1	SM 2510 B
Copper, Dissolved	Composite	µg/L	0.4	EPA 200.8
Copper, Total Recoverable	Composite	µg/L	0.4	EPA 200.8
E. coli, Most Probable Number	Grab	MPN/100 mL	1	SM 9223 B
Hardness, Total	Composite	mg/L	0.50	EPA 200.8
Lead, Dissolved	Composite	µg/L	0.1	EPA 200.8
Lead, Total Recoverable	Composite	µg/L	0.1	EPA 200.8
Mercury by Purge & Trap, Dissolved	Grab	ng/L	0.2	EPA 1631E
Mercury by Purge & Trap, Total	Grab	ng/L	0.2	EPA 1631E
Nitrate/Nitrite-N, Dissolved	Composite	mg/L	0.02	EPA 300.0
Organic Carbon, Total Non-purgeable	Composite	mg/L	0.5	SM 5310 B
Ortho-Phosphate-P, Dissolved	Composite	mg/L	0.005	SM 4500-P F
Temperature	Field	°C	0.1	SM 2550 B
Total Phosphorus-P	Composite	mg/L	0.025	EPA 365.1
Total Suspended Solids	Grab	mg/L	0.5	SM 2540 D
Total Suspended Solids	Composite	mg/L	0.5	SM 2540 D
Turbidity, Field	Field	FNU	0.1	SM 2130 B
Zinc, Dissolved	Composite	µg/L	2.5	EPA 200.8
Zinc, Total Recoverable	Composite	µg/L	2.5	EPA 200.8
Pesticides (Required once per permit cycle)				
Insecticides				
Bifenthrin	Grab	µg/L	0.06	Modified EPA 8270D
Chlorpyrifos	Grab	µg/L	0.06	Modified EPA 8270D
Fipronil	Grab	µg/L	0.06	Modified EPA 8321B
Imidacloprid	Grab	µg/L	0.06	Modified EPA 8270D
Herbicides				
2,4-Dichlorophenoxyacetic Acid (2,4-D)	Grab	µg/L	0.08	Modified EPA 8151A
2,6-dichlorobenzamide (dichlobenil degradate)	Grab	µg/L	0.06	Modified EPA 8270D
Aminomethylphosphonic Acid (AMPA - Glyphosate degradate)	Grab	µg/L	10	Modified EPA 547
Atrazine	Grab	µg/L	0.06	Modified EPA 8321B
Diuron	Grab	µg/L	0.06	Modified EPA 8321B
Glyphosate	Grab	µg/L	10	Modified EPA 547
Simazine	Grab	µg/L	0.06	Modified EPA 8321B
Sulfometuron methyl	Grab	µg/L	0.008	DuPont Method

* SM = Standard Methods

The stormwater monitoring period begins July 1 and ends June 30 of the following year. For the reporting period ending on June 30, 2024, four storm events were monitored at CWS' MS4

monitoring sites for the pollutants listed in Table B-2. Table B-3 displays a summary of rainfall data collected at the CWS rain gauge site called Sunset (Fire Station at 185 and Highway 26), which corresponds to the sampling events at the MS4 monitoring sites. The rainfall data used to determine the storm magnitude in 24 hours and rainfall in the antecedent period of 12 hours is displayed in Table B-3. When the permit was renewed in December 2022, the antecedent dry period requirement changed from 24 hours to 12 hours, when possible. An antecedent dry period has less than 0.1 inches of precipitation. CWS uses a flow-weighted composite method for stormwater event sampling. The TSS samples were taken as composite samples in the previous permit. The reissued permit requires TSS samples to be taken concurrently with mercury samples, which are required to be taken as grab samples; therefore CWS now takes composite and grab TSS samples.

Table B-3: Rainfall Data Summary

Sample Date(s)	*Rainfall Preceding 12 Hours (Inches)*	*Storm Magnitude (Inches in 24 hours)*
8/31/2023	0.00	0.64
10/10/2023	0.00	0.65
10/24-25/2023	0.00	0.70
11/30/2023	0.00	0.28
3/27/2024	0.09	0.49

Stormwater Monitoring Results

Table B-4 explains the qualifier codes used to describe the stormwater monitoring data.

Table B-4: Qualifier Codes and Description

Qualifier/Flag	*Description*
<	Less than the specified value (generally the Method Reporting Limit)
>	Greater than the specified value (generally the Method Reporting Limit)
E	Qualitatively estimated value due to *minor* suspected sampling or analytical anomalies
Q	Questionable value due to suspected significant sampling or analytical anomalies

Stormwater monitoring data for this reporting period are presented in Table B-5. The samples from the locations listed in Table B-1 were analyzed for the water quality parameters listed in Table B-2.

Table B-5: Stormwater Monitoring Data					
MS4 at 209th (7301001)					
		Sample Date			
Analyte	*Unit*	*8/31/2023*	*10/10/2023*	*11/30/2023*	*3/27/2024*
Ammonia-N, Dissolved	mg/L	0.012	<0.01	0.143	0.091
Conductivity, Field	µS/cm	46.3	40.8	65.6	30.7
Copper, Dissolved	µg/L	20.9	2.95	3.59	1.71
Copper, Total Recoverable	µg/L	29.8	17.9	5.57	3.11
E. coli, Most Probable Number	MPN/100 mL	2990	770	72	236
Hardness, Total	mg/L	47.4	19.7	16.9	13.5
Lead, Dissolved	µg/L	<0.1015	<0.1015	<0.1015	<0.1015
Lead, Total Recoverable	µg/L	0.99	2.92	0.307	0.241
Mercury by Purge & Trap, Dissolved	ng/L	6.06	2.8	5.19	2.05
Mercury by Purge & Trap, Total	ng/L	4.36	2.21	4.08	1.79
Nitrate/Nitrite-N, Dissolved	mg/L	0.197	<0.1	0.32	<0.1
Organic Carbon, Total Non-purgeable	mg/L	83.8	33.2	24.8	20.2
Orthophosphate-P, Dissolved	mg/L	0.013	<0.005	0.086	<0.005
Temperature	°C	18.177	17.279	8.365	10.244
Total Phosphorus-P	mg/L	0.418	0.364	0.14	0.046
Total Suspended Solids	mg/L	15.3	1.33	8.8	2.4
Turbidity, Field	FNU	6.21	1.13	4.39	1.86
Zinc, Dissolved	µg/L	1010	297	729	264
Zinc, Total Recoverable	µg/L	1240	662	788	313

Table B-5: Stormwater Monitoring Data (cont.)					
MS4 at Paddington (7301004)					
		Sample Date			
Analyte	*Unit*	*8/31/2023*	*10/10/2023*	*11/30/2023*	*3/27/2024*
Ammonia-N, Dissolved	mg/L	<0.01	0.056	0.045	0.057
Conductivity, Field	µS/cm	31.1	66.4	32.8	24.3
Copper, Dissolved	µg/L	76.2	5.44	7.9	7.23
Copper, Total Recoverable	µg/L	95.4	77.6	19.4	15.6
E. coli, Most Probable Number	MPN/100 mL	3790	770	130	1730
Hardness, Total	mg/L	18.2	14.7	15	21.6
Lead, Dissolved	µg/L	<0.1015	<0.1015	<0.1015	<0.1015
Lead, Total Recoverable	µg/L	0.621	3.98	0.492	1.01
Mercury by Purge & Trap, Dissolved	ng/L	3.77	2.54	3.29	1.68
Mercury by Purge & Trap, Total	ng/L	3.14	1.82	2.39	0.989
Nitrate/Nitrite-N, Dissolved	mg/L	0.328	0.163	0.18	0.289
Organic Carbon, Total Non-purgeable	mg/L	16.9	5.81	6.19	6.17
Orthophosphate-P, Dissolved	mg/L	0.032	0.055	0.061	0.027
Temperature	°C	18.497	16.642	6.732	10.259
Total Phosphorus-P	mg/L	0.201	0.381	0.116	0.115
Total Suspended Solids	mg/L	9	1.2	5	5.2
Turbidity, Field	FNU	5	1.91	3.76	5.3
Zinc, Dissolved	µg/L	132	49.9	59.1	58.3
Zinc, Total Recoverable	µg/L	177	351	105	103

Table B-5: Stormwater Monitoring Data (cont.)					
MS4 at 39th Loop (7301005)					
		Sample Date			
Analyte	*Unit*	*8/31/2023*	*10/24/2023-10/25/2023*	*11/30/2023*	*3/27/2024*
Ammonia-N, Dissolved	mg/L	0.252	0.063	0.157	0.041
Conductivity, Field	µS/cm	17	9.2	5.3	4.2
Copper, Dissolved	µg/L	13.9	4.48	3.62	4.98
Copper, Total Recoverable	µg/L	16.6	5.92	6.33	7.03
E. coli, Most Probable Number	MPN/100 mL	<100	125	71	138
Hardness, Total	mg/L	5.04	2.48	2.69	3.2
Lead, Dissolved	µg/L	<0.1015	<0.1015	<0.1015	<0.1015
Lead, Total Recoverable	µg/L	0.731	0.474	0.719	0.419
Mercury by Purge & Trap, Dissolved	ng/L	3.32	0.544	1.17	1.14
Mercury by Purge & Trap, Total	ng/L	3.93	0.904	1.95	1.36
Nitrate/Nitrite-N, Dissolved	mg/L	0.264	0.047	0.1	<0.1
Organic Carbon, Total Non-purgeable	mg/L	7.51	2.52	2.48	2.71
Orthophosphate-P, Dissolved	mg/L	0.05	0.027	0.021	0.023
Temperature	°C	19.183	10.453	5.226	10.395
Total Phosphorus-P	mg/L	0.106	0.048	0.09	0.048
Total Suspended Solids	mg/L	13.0	2.8	12.0	4.0
Turbidity, Field	FNU	11.98	4.97	4.91	2.84
Zinc, Dissolved	µg/L	183	144	95.5	78.3
Zinc, Total Recoverable	µg/L	196	152	124	83.9

Table B-5: Stormwater Monitoring Data (cont.)							
	MS4 at Maple (7301007)						
		Sample Date					
Analyte	*Unit*	*8/31/2023*	*10/10/2023*	*11/30/2023*	*2/15/2024*	*3/27/2024*	*4/25/2024*
Ammonia-N, Dissolved	mg/L	4.21	0.926	0.662	--	0.161	--
Conductivity, Field	µS/cm	55.5	49.6	53.7	--	20.7	--
Copper, Dissolved	µg/L	14	3.94	5.23	--	3.2	--
Copper, Total Recoverable	µg/L	51.7	11.1	10.2	--	10.2	--
E. coli, Most Probable Number	MPN/100 mL	81,600	72,700	25	3,410	2,430	1,730
Hardness, Total	mg/L	26.2	13	13.5	--	12.5	--
Lead, Dissolved	µg/L	0.339	0.163	0.107	--	<0.1015	--
Lead, Total Recoverable	µg/L	8.99	2.31	1.68	--	2.81	--
Mercury by Purge & Trap, Dissolved	ng/L	3.65	1.96	3.16	--	1.7	--
Mercury by Purge & Trap, Total	ng/L	6.46	1.58	30.2	--	2.28	--
Nitrate/Nitrite-N, Dissolved	mg/L	<0.1	0.262	0.294	--	0.173	--
Organic Carbon, Total Non-purgeable	mg/L	38.6	8.61	8.97	--	4.5	--
Orthophosphate-P, Dissolved	mg/L	0.026	0.033	0.077	--	0.006	--
Temperature	°C	19.03	15.818	9.001	--	10.104	--
Total Phosphorus-P	mg/L	0.85	0.207	0.195	--	0.162	--
Total Suspended Solids	mg/L	54.0	24.5	390	--	23.2	--
Turbidity, Field	FNU	27.65	27.31	39.4	--	23.04	--
Zinc, Dissolved	µg/L	295	139	217	--	117	--
Zinc, Total Recoverable	µg/L	805	239	280	--	202	--

Table B-5: Stormwater Monitoring Data (cont.)				
	MS4 at Amberglen (7301006)			
		Sample Date		
Analyte	*Unit*	*8/31/2023*	*10/10/2023*	*11/30/2023*
Ammonia-N, Dissolved	mg/L	<0.010	0.053	0.226
Conductivity, Field	µS/cm	48.1	109.7	138.6
Copper, Dissolved	µg/L	7.63	3.06	5.37
Copper, Total Recoverable	µg/L	37.4	35.9	9.68
E. coli, Most Probable Number	MPN/100 mL	4280	18,600	1410
Hardness, Total	mg/L	65.1	39.2	43.3
Lead, Dissolved	µg/L	<0.102	<0.102	0.212
Lead, Total Recoverable	µg/L	3.12	8.8	1.07
Mercury by Purge & Trap, Dissolved	ng/L	1.35	0.538	1.89
Mercury by Purge & Trap, Total	ng/L	3.27	2.16	4.00
Nitrate/Nitrite-N, Dissolved	mg/L	<0.100	0.176	0.253
Organic Carbon, Total Non-purgeable	mg/L	23.4	6.84	8.58
Orthophosphate-P, Dissolved	mg/L	0.017	0.081	0.076
Temperature	°C	18.961	16.226	6.329
Total Phosphorus-P	mg/L	0.953	1.07	0.158
Total Suspended Solids	mg/L	10.0	16.4	24.0
Turbidity, Field	FNU	11.44	8.21	18.82
Zinc, Dissolved	µg/L	148	173	154
Zinc, Total Recoverable	µg/L	663	2,070	218

Table B-5: Stormwater Monitoring Data (cont.)						
	Pesticides, Insecticides, and Herbicides Sample Date: 3/27/2024					
		Sample Location				
Analyte	*Unit*	*MS4 at 209th*	*MS4 at 39th Loop*	*MS4 at Amberglen*	*MS4 at Maple*	*MS4 at Paddington*
Insecticides						
Bifenthrin	µg/L	<0.06	<0.06	<0.06	<0.06	<0.06
Chlorpyrifos	µg/L	<0.06	<0.06	<0.06	<0.06	<0.06
Fipronil	µg/L	<0.06	<0.06	<0.06	<0.06	<0.06
Imidacloprid	µg/L	<0.06	<0.06	<0.06	<0.06	<0.06
Herbicides						
2,4-Dichlorophenoxyacetic Acid (2,4-D)	µg/L	<0.08	<0.08	<0.08	0.17	0.16
2,6-dichlorobenzamide (dichlobenil degradate)	µg/L	<0.06	<0.06	<0.06	<0.06	<0.06
Aminomethylphosphonic Acid (AMPA - Glyphosate degradate)	µg/L	<10	<10	<10	<10	<10
Atrazine	µg/L	<0.06	<0.06	<0.06	<0.06	<0.06
Diuron	µg/L	<0.06	<0.06	<0.06	<0.06	<0.06
Glyphosate	µg/L	<10	<10	<10	<10	<10
Simazine	µg/L	<0.06	<0.06	0.54	<0.06	<0.06
Sulfometuron methyl	µg/L	<0.008	<0.008	<0.008	<0.008	<0.008

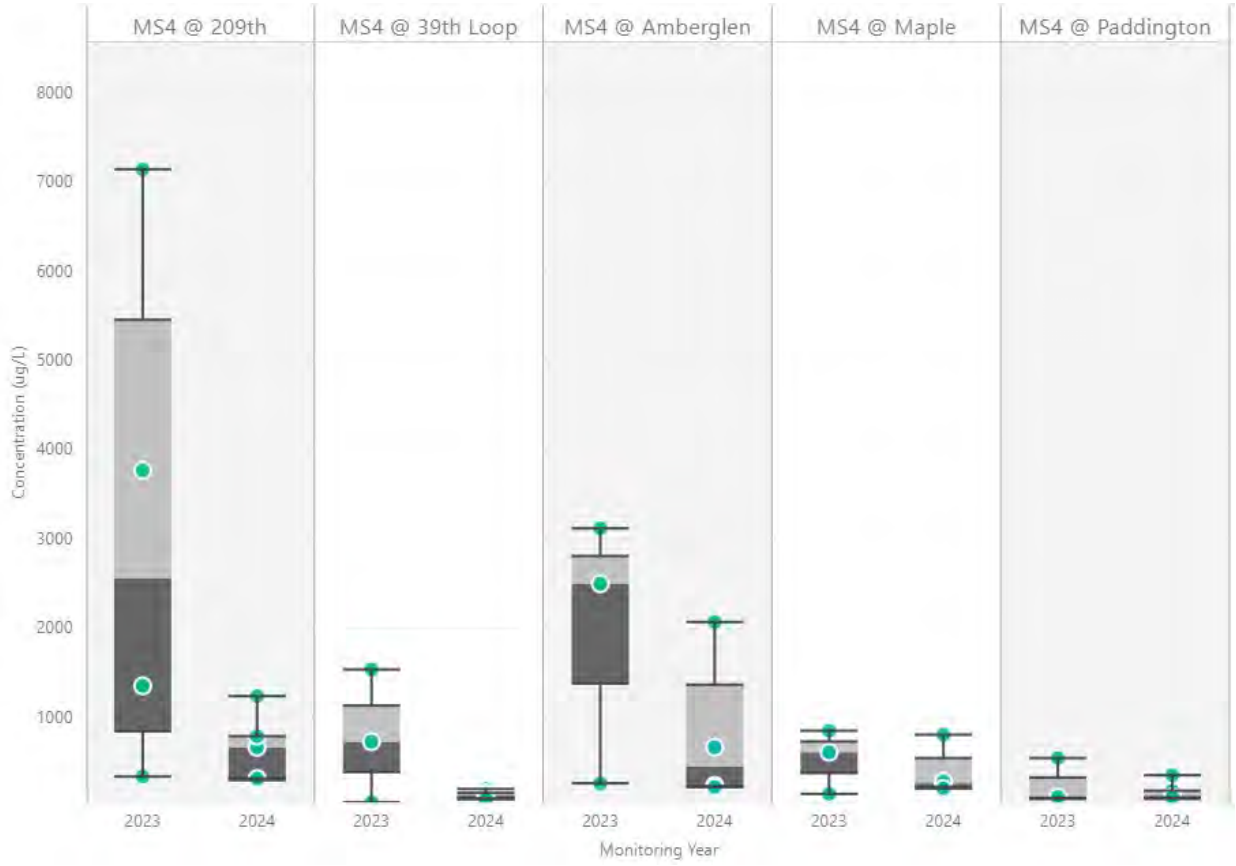
The pesticide sampling is required to be completed once during the permit cycle. During this permit cycle's pesticide sampling, there were three detections: Simazine at MS4 at Amberglen, 2,4-D at MS4 at Maple, and MS4 at Paddington. The last pesticide sampling was conducted in 2018. During that event, there was one detection of 2,4-D at MS4 at Maple (0.17 µg/L).

Discussion of Stormwater Monitoring Results

CWS staff followed internal cause and contribute assessment protocols to promptly review the MS4 data. There were no MS4 samples that showed reasonable potential to cause or contribute to a water quality standard exceedance.

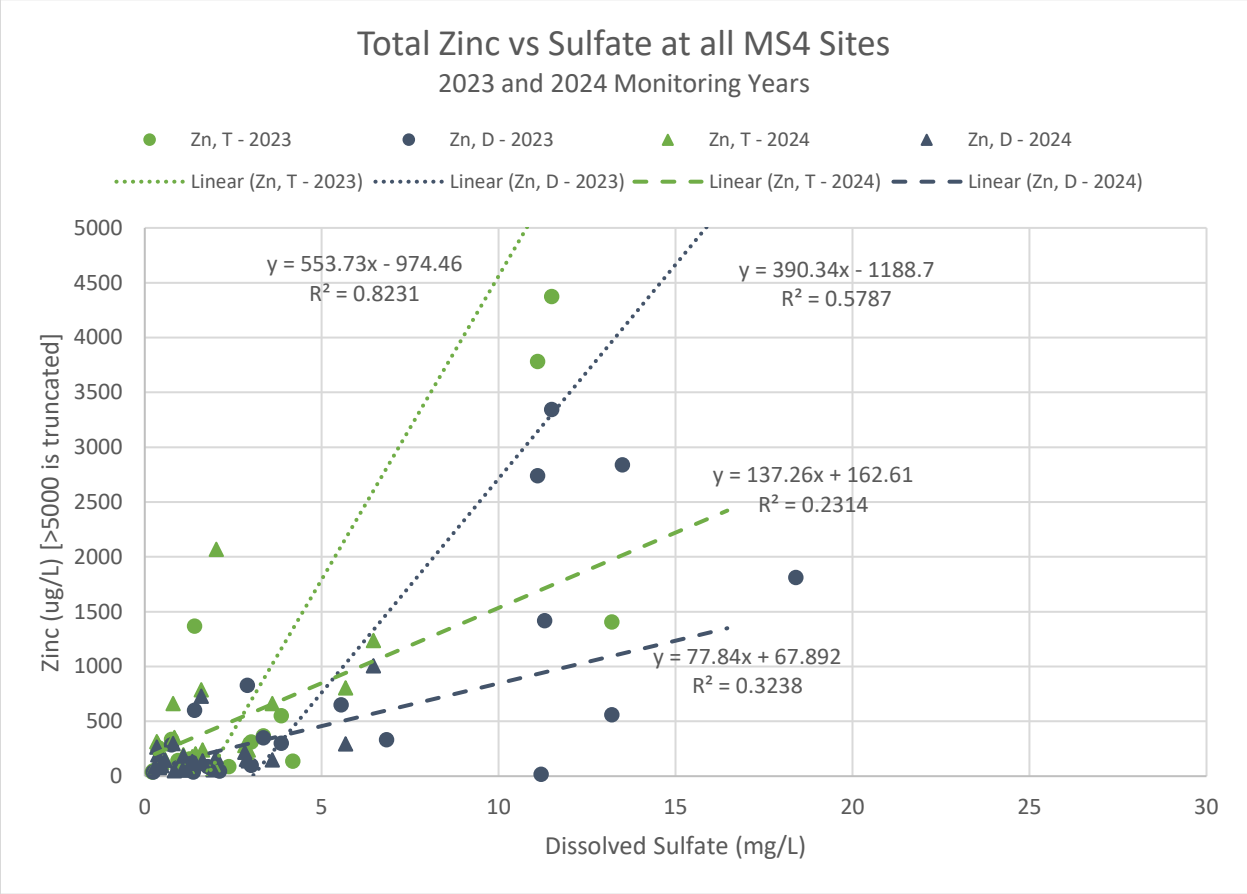
During the 2023-2024 monitoring period, zinc concentrations during stormwater sampling events decreased from previous years. The maximum total zinc concentration in 2022-2023 was 17,300 ug/L; in 2023-2024 the maximum total zinc concentration was 2,070 ug/L. Figure B-2 shows the reduction of zinc across MS4 sampling locations during the 2023 and 2024 monitoring periods.

Figure B-2: Total Zinc at MS4 Sampling Locations



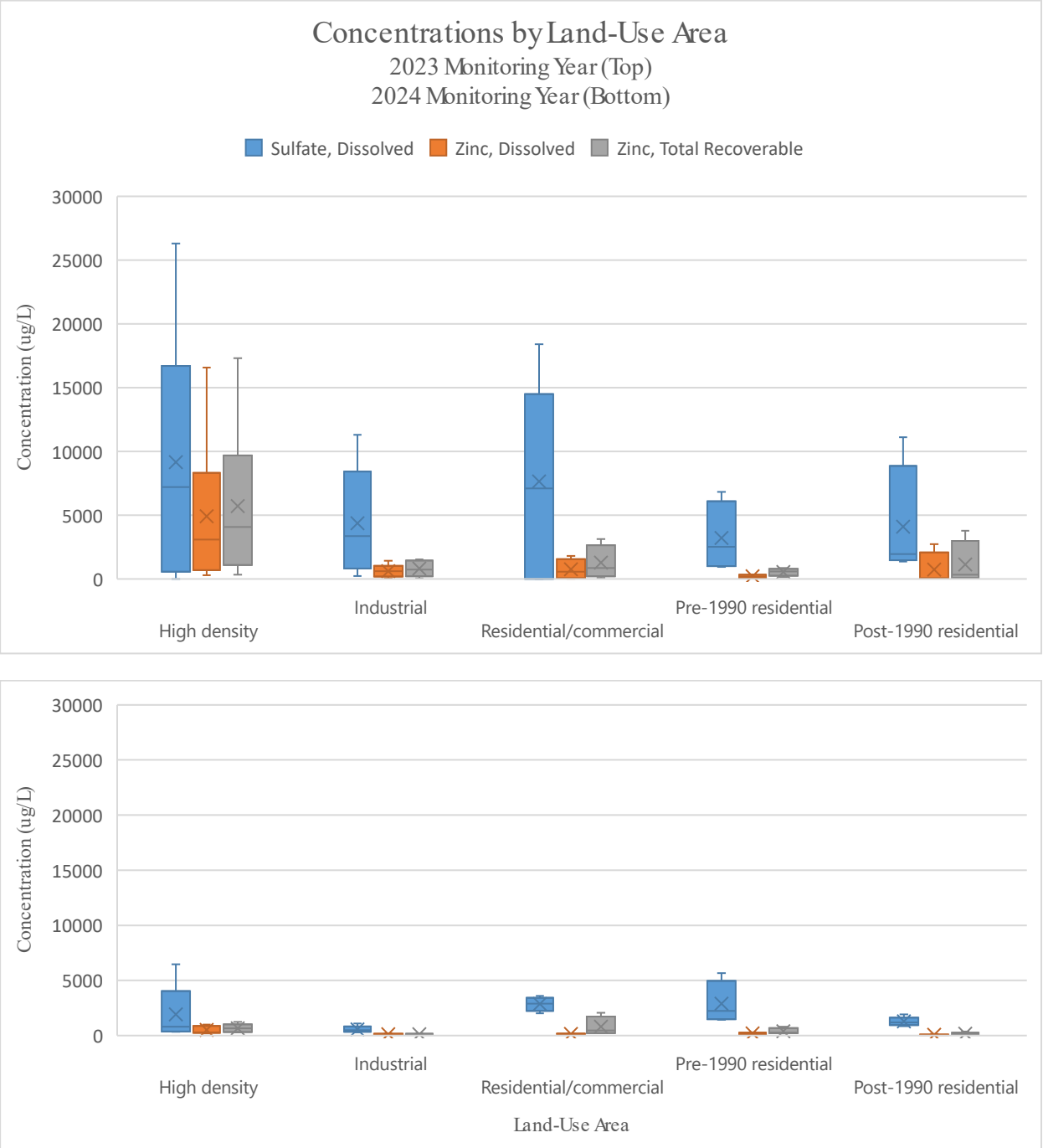
The correlations between concentrations of dissolved sulfate with both total and dissolved zinc have decreased since last year, showing a weakening in evidence of zinc sulfate contamination.

Figure B-3: Correlation Between Dissolved Sulfate and Zinc



CWS' Environmental Services staff investigated the 209th sample site subwatershed four times and did not find obvious point sources of zinc. Observations on the correlation between zinc and sulfate indicate the most likely source of zinc sulfate is runoff from moss inhibitors commonly used to treat roofs, driveways, and lawns. The Environmental Services team coordinated with the Oregon Department of Agriculture to contact neighborhood groups and educate homeowners on the appropriate application of moss inhibitors and concerns about aquatic toxicity. Staff will resume investigations if monitoring results indicate elevated levels. Homeowner association communication, a newsletter article, and social media outreach (Figure B-7) were sent to neighborhood residents; a poster with the same information was posted in community areas around the neighborhood. CWS will continue to provide outreach and education this year.

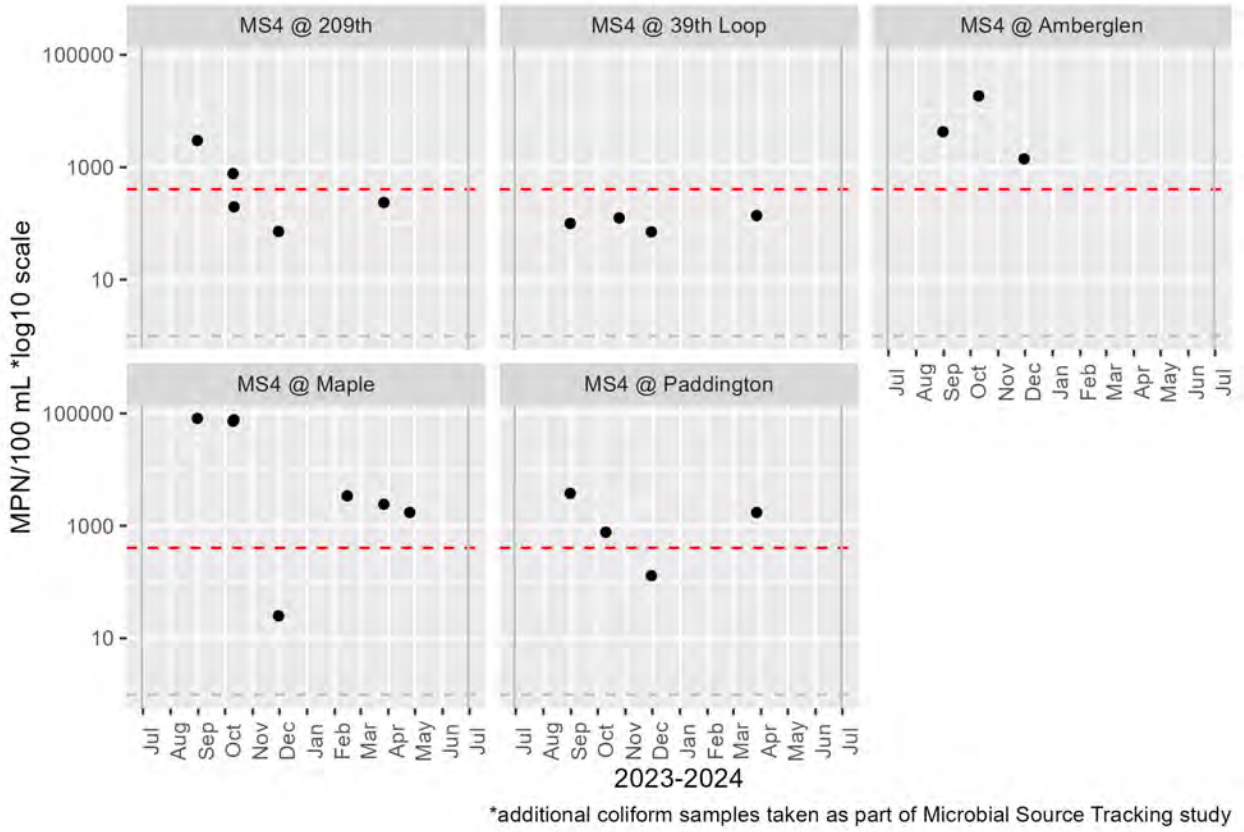
Figure B-4: Concentrations by Land-Use Area



The overall decreases in total and dissolved zinc and the weakening correlations with dissolved sulfate likely reflect the CWS outreach and education actions over the past years, however there may be other sources of zinc that have not yet been identified. CWS is doing additional work to better determine the zinc and sulfate sources in urban residential areas.

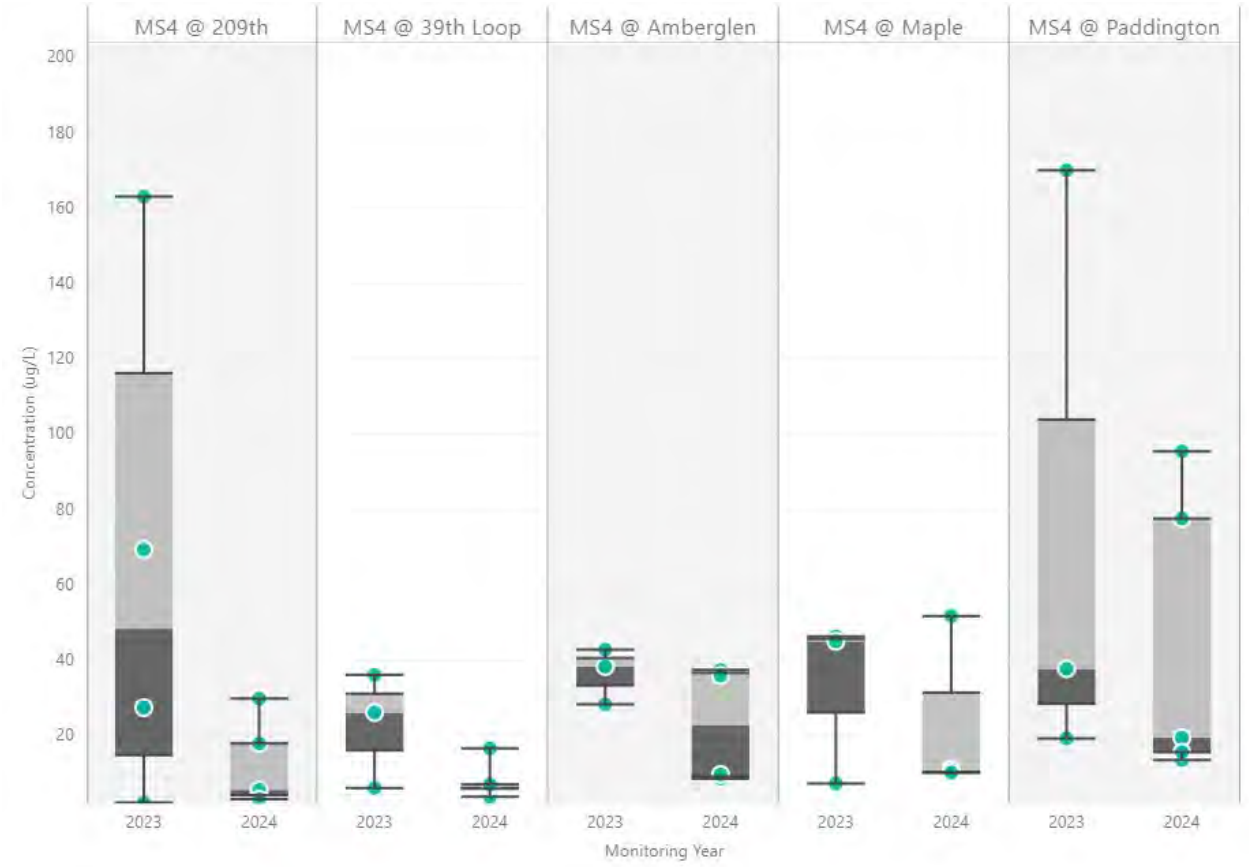
At four of the five MS4 monitoring sites, CWS observed concentrations of *E. coli* greater than the water quality standard of 406 MPN/100 mL (red line in Figure B-5). In addition to collecting data according to the Stormwater Monitoring Plan, CWS is conducting a Microbial Source Tracking (MST) study using the protocol outlined in The California Microbial Source Identification Manual: A Tiered Approach to Identifying Fecal Pollution Sources to Beaches (Griffith, et al. 2013). The monitoring protocol calls for escalating sampling intensity. CWS will continue the MST study in the 2024-2025 stormwater year. In addition to the MST study, the City of Hillsboro investigated cross-connections and CWS' Environmental Services staff investigated four sites in the subwatershed. The investigations did not reveal any conclusive sources of *E. coli*.

Figure B-5: E. coli at MS4 Sampling Locations



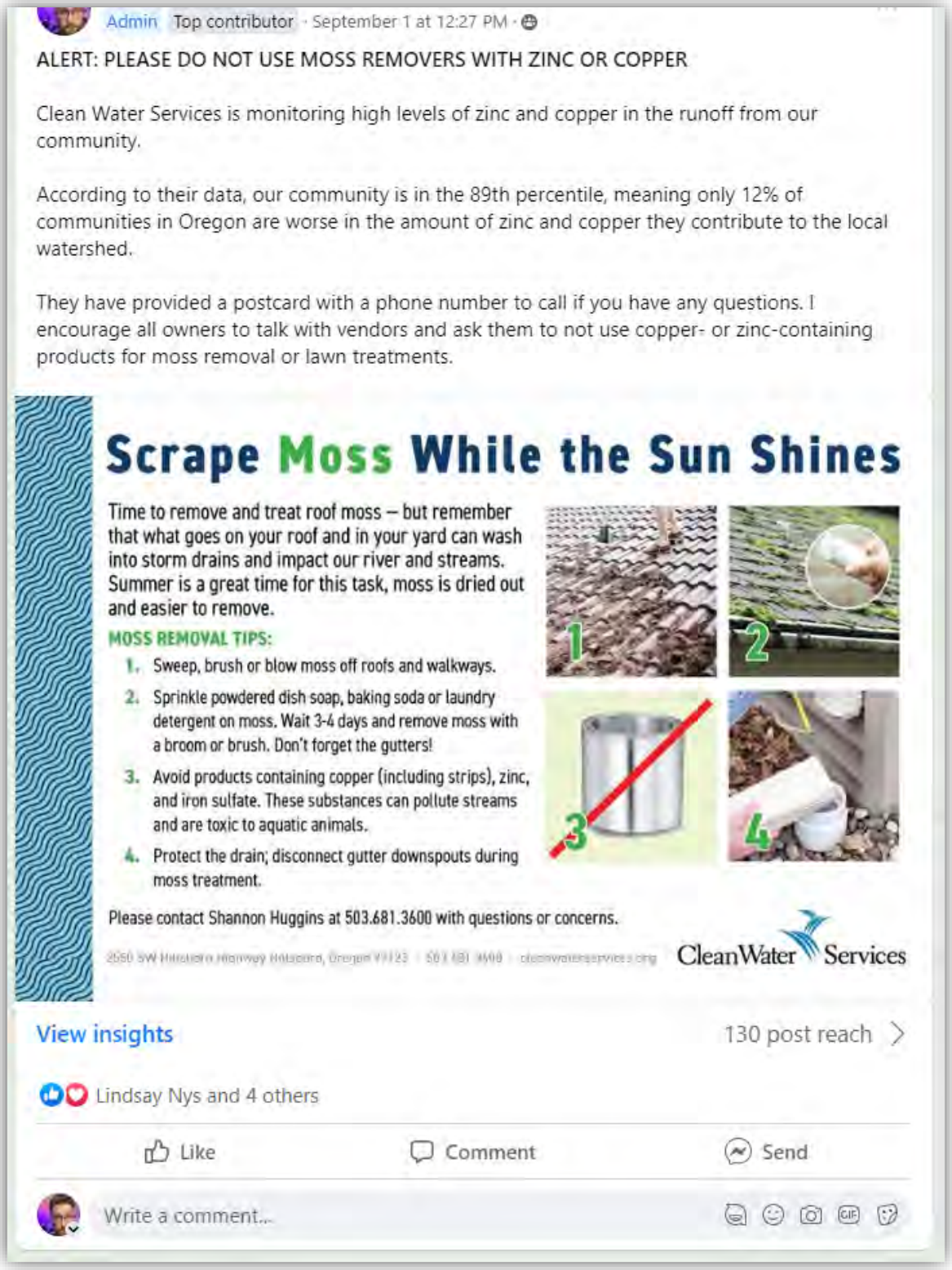
During the 2023-2024 monitoring period, concentrations of copper during stormwater sampling events decreased from previous years. The maximum total concentration of copper in 2022 was 225 ug/L, compared with the 2023 maximum concentration of 95.4 ug/L. The box plots in Figure B-6 show the reduction of copper across MS4 sampling locations in the 2023 and 2024 monitoring periods. CWS' Environmental Services staff investigated five sites at the 209th and Paddington subwatersheds. A small copper accent roof was identified in the Paddington subwatershed. Research shows that the concentration in stormwater runoff from copper roofing materials declines as the roof ages. Investigations will continue as monitoring results dictate.

Figure B-6: Total Copper at MS4 Sampling Locations



The intermittent nature of stormwater discharges, the size of the drainage area, the land uses they encompass, the diffuse nature of potential sources, the voluntary, outreach-based approach in dealing with unregulated residential and commercial sources, and resource limitations make it difficult to identify specific sources and management actions. Despite these challenges, CWS saw improvements in stormwater runoff water quality last year.

Figure B-7: Moss Control Social Media Outreach



Appendix C: Ambient Monitoring Program

This appendix provides an overview of the ambient monitoring plan and the data specifically required by Table B-1 of the CWS watershed-based NPDES permit. Table B-1 of the Permit requires annual reporting on ambient monitoring that CWS conducts at 15 locations, including the upper and lower portions of the Tualatin River and its tributaries. CWS collects samples at 17 monitoring locations to ensure compliance with this requirement. Monitoring at the Gales Creek at Stringtown location was suspended during the 2023-2024 monitoring period due to ongoing concerns of site access safety, and the Rock Creek at Quatama monitoring location was added in substitution. The sites used during this period are summarized in Table C.1.

Discrete samples are collected and analyzed by the CWS Water Quality Laboratory. In addition, CWS funds the collection of continuous flow and temperature data for many of the ambient sites with continuous monitors. CWS also participates in a cooperative study with the United States Geological Survey (USGS). As part of the study, the USGS collects continuous water quality monitoring data at selected sites in the Tualatin River and its tributaries. Data from these monitoring programs are used to identify trends, calibrate and verify models, and assess the effectiveness of co-implementers' activities.

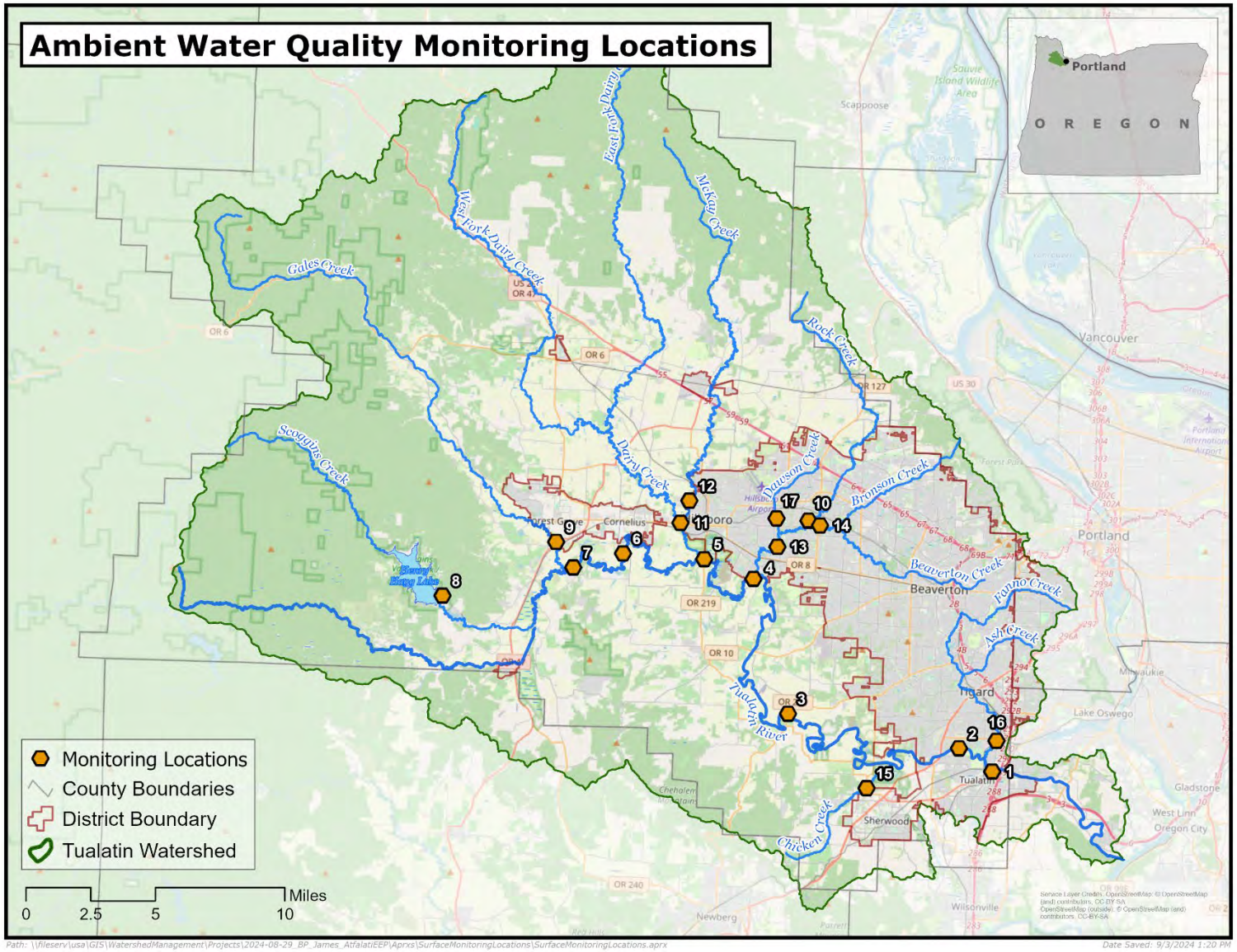
SAMPLING

Monitoring and sample analysis are conducted in accordance with the CWS Stormwater Monitoring Plan and Quality Assurance/Quality Control Program Document. Table C-1 presents the monitoring locations that were sampled in accordance with Permit requirements. Monitoring categories reflect the type of tributary monitoring station. Figure C-1 is a map displaying the ambient water quality monitoring locations. This map indicates the monitoring sites with symbols and associated map identification numbers that are included in Table C-1 to allow the reader to associate the monitoring table station name and location code with locations on the map.

Table C-1: Monitoring Sites						
Tualatin River Station Name	*Map ID*	*LOCCOD*	*Tributary Station Name*	*Map ID*	*LOCCOD*	*Category*
Boones Ferry Road	1	3701087	Scoggins Creek below Hagg Lake	8	3805050	Source Water
Jurgens Park	2	3701106	Gales Creek at New Hwy 47	9	3810015	Mouth
Hwy 210 Bridge (Scholls)	3	3701271	Rock Creek at Quatama	10	3820047	Mouth
Rood Bridge Road	4	3701391	Dairy Creek at Hwy 8	11	3815021	Mouth
Hwy 219 Bridge[1]	5	3701450	McKay Creek at Padgett	12	3816010	Boundary
Golf Course Road	6	3701528	Rock Creek at Brookwood	13	3820022	Mouth
Fern Hill Road[2]	7	3701569	Beaverton Creek near Orenco	14	3821012	Urban
			Chicken Creek at Scholls-Sherwood	15	3835020	Mouth
			Fanno Creek at Durham Road	16	3840012	Mouth
			Dawson Creek at Brookwood	17	3850006	Urban

[1] Field parameters are obtained from the USGS continuous gauge at the time and date most similar to the grab sample.
[2] Alternate site for this location is Tualatin River at the Springhill Water Plant, at river mile 58.0.

Figure C-1: Ambient Monitoring Locations



PARAMETERS

Table C-2 displays a summary of the routine monitoring parameters. These are the parameters specified by Permit Table B-24.

Table C-2: Water Quality Parameters	
Field	*Method Reporting Limits*
Dissolved Oxygen	-- mg/L
pH	-- S.U.
Temperature	-- °C
Conductivity	-- µS/cm
Turbidity	-- FNU
Conventional/Nutrients	
E. coli	1 MPN/100 mL
Hardness	0.5 mg/L
Total Organic Carbon (NPOC)	0.25 mg/L
Total Suspended Solids	0.5 mg/L
Total Phosphorus	0.025 mg/L
Soluble Ortho-Phosphorus	0.005 mg/L
Ammonia-Nitrogen	0.01 mg/L
Nitrite + Nitrate Nitrogen	0.01 mg/L
Metals (Total and Dissolved)	
Copper, dissolved	0.406 µg/L
Copper, total	0.406 µg/L
Lead, dissolved	0.1015 µg/L
Lead, total	0.1015 µg/L
Zinc, dissolved	2.5375 µg/L
Zinc, total	2.5375 µg/L
Mercury, dissolved	0.2 ng/L
Mercury, total	0.2 ng/L

RESULTS

The qualifier codes were described in Table B-4 in Appendix B.

Tables C-3 to C-19 present summary statistics of the ambient monitoring data from 17 monitoring sites for July 1, 2023 to June 30, 2024. CWS is including the monitoring results at two additional ambient monitoring sites (Tualatin River at Golf Course Road and Rock Creek at Quatama). These sites were monitored for the full complement of water quality parameters specified in the Permit. All sites were sampled three or more times between May 1 – October 31 and three or more times between November 1 – April 30, quarterly for metals, and semiannually for mercury. The monitoring site located at Tualatin River at Highway 219 Bridge was not used for watershed monitoring when the Hillsboro WRRF was not directly discharging to the Tualatin River. The backup site at Tualatin River at Golf Course Road was used in its place. The Gales Creek at Stringtown site was permanently removed and replaced with the Rock Creek at Quatama location due to safety concerns and the value of the data. Monitoring at Chicken Creek at Scholls-Sherwood resumed this monitoring year.

Tables C-3 to C-19 display the minimum, median, maximum, and selected percentiles of the data. The MRL values were used in the calculation of summary statistics for cases where the result was less than the MRL (nondetects). For example, if the result was <2, the value 2 was used in the statistical calculations.

Table C-3: Ambient Monitoring Data Statistical Summary for Tualatin River at Boones Ferry Road									
Analysis Name	*Unit*	*n*	*MIN*	*10th Percentile*	*25th Percentile*	*Median*	*75th Percentile*	*90th Percentile*	*MAX*
Ammonia-N, Dissolved	mg/L	21	0.016	0.031	0.059	0.074	0.128	0.166	0.307
Conductivity, Field	µS/cm	22	90.6	99.05	110.2	182.25	263.55	289.4	290.7
Copper, Dissolved	µg/L	12	0.808	0.857	0.902	1.2	1.375	1.651	2.06
Copper, Total Recoverable	µg/L	15	1.24	1.42	1.495	1.62	2.41	2.64	2.96
Dissolved Oxygen	mg/L	22	5.42	5.941	6.695	8.23	9.64	10.462	10.72
E. coli, Most Probable Number	MPN/100 mL	21	4	9	18	27	76	167	548
Hardness, Total	mg/L	20	32.9	35.16	39.975	63.6	72.25	76.03	80
Lead, Dissolved	µg/L	12	0.102	0.102	0.102	0.102	0.102	0.102	0.102
Lead, Total Recoverable	µg/L	15	0.106	0.1574	0.166	0.214	0.349	0.563	0.731
Mercury by Purge & Trap, Dissolved	ng/L	2	0.3	0.368	0.47	0.64	0.81	0.912	0.98
Mercury by Purge & Trap, Total	ng/L	2	0.704	1.0376	1.538	2.372	3.206	3.7064	4.04
Nitrate/Nitrite-N, Dissolved	mg/L	22	0.593	1.102	1.44	1.805	2.98	3.31	3.97
Organic Carbon, Total Non-purgeable	mg/L	22	1.42	1.721	2.1875	2.8	3.345	3.972	5.07
Orthophosphate-P, Dissolved	mg/L	21	0.025	0.032	0.045	0.049	0.069	0.186	0.371
pH, Field	S.U.	22	6.97	7.012	7.07	7.11	7.13	7.219	7.29
Temperature	°C	22	6.266	7.4664	8.665	14.354	19.465	22.6516	23.162
Total Phosphorus-P	mg/L	22	0.074	0.078	0.084	0.108	0.14	0.2313	0.322
Total Suspended Solids	mg/L	22	2.6	3.22	4.9	7.165	10.4	22.8	26.8
Turbidity, Field	NTU	22	2.23	3.208	3.5125	4.735	11.93	17.84	24.3
Zinc, Dissolved	µg/L	11	3.08	4.54	5.155	5.94	7.43	10.8	16.8
Zinc, Total Recoverable	µg/L	15	6.54	6.896	7.53	10.7	14	20.72	26.2

Table C-4: Ambient Monitoring Data Statistical Summary for Tualatin River at Jurgens Park									
Analysis Name	*Unit*	*n*	*MIN*	*10th Percentile*	*25th Percentile*	*Median*	*75th Percentile*	*90th Percentile*	*MAX*
Ammonia-N, Dissolved	mg/L	21	0.01	0.016	0.054	0.087	0.117	0.15	0.196
Conductivity, Field	µS/cm	22	86.4	94.76	103.75	167.35	233.975	255.79	260.7
Copper, Dissolved	µg/L	12	0.775	0.7897	0.841	1.0495	1.2375	1.368	1.99
Copper, Total Recoverable	µg/L	15	1.16	1.27	1.445	1.6	2.05	2.476	2.86
Dissolved Oxygen	mg/L	22	5.69	6.083	6.375	8.26	9.65	10.478	10.69
E. coli, Most Probable Number	MPN/100 mL	21	10	12	19	41	86	162	313
Hardness, Total	mg/L	20	31.8	33.88	38.1	59.6	64.95	69.57	72.2
Lead, Dissolved	µg/L	12	0.102	0.102	0.102	0.102	0.102	0.102	0.102
Lead, Total Recoverable	µg/L	15	0.102	0.102	0.106	0.137	0.294	0.4818	0.558
Mercury by Purge & Trap, Dissolved	ng/L	2	0.243	0.3089	0.40775	0.5725	0.73725	0.8361	0.902
Mercury by Purge & Trap, Total	ng/L	2	0.626	0.8914	1.2895	1.953	2.6165	3.0146	3.28
Nitrate/Nitrite-N, Dissolved	mg/L	22	0.431	0.9295	1.1625	1.655	2.3125	2.522	3.05
Organic Carbon, Total Non-purgeable	mg/L	22	1.34	1.682	1.9775	2.55	3.045	3.304	5.1
Orthophosphate-P, Dissolved	mg/L	21	0.021	0.029	0.033	0.039	0.047	0.114	0.301
pH, Field	S.U.	22	6.94	6.975	7.0525	7.095	7.165	7.257	7.37
Temperature	°C	22	5.97	7.2801	8.4805	14.0225	19.25975	22.9833	23.586
Total Phosphorus-P	mg/L	22	0.066	0.074	0.07625	0.085	0.1115	0.1605	0.368
Total Suspended Solids	mg/L	22	2	2.84	4.5325	6	10.65	19.38	22
Turbidity, Field	NTU	22	1.89	2.607	3.3275	4.62	11.715	17.214	23.05
Zinc, Dissolved	µg/L	11	2.54	2.54	2.82	3.25	5.545	12.2	14.3
Zinc, Total Recoverable	µg/L	15	4.28	4.604	5.085	5.74	8.12	12.26	12.9

Table C-5: Ambient Monitoring Data Statistical Summary for Tualatin River at Highway 210 Bridge (Scholls)									
Analysis Name	*Unit*	*n*	*MIN*	*10th Percentile*	*25th Percentile*	*Median*	*75th Percentile*	*90th Percentile*	*MAX*
Ammonia-N, Dissolved	mg/L	21	0.034	0.05	0.074	0.1	0.187	0.227	0.281
Conductivity, Field	µS/cm	22	87.7	96.61	108.4	170.7	244.325	272.45	322.3
Copper, Dissolved	µg/L	4	0.88	0.8827	0.88675	1.0095	1.265	1.508	1.67
Copper, Total Recoverable	µg/L	9	1.57	1.65	1.68	1.82	2.44	2.464	2.52
Dissolved Oxygen	mg/L	22	6.88	6.973	7.5625	8.435	9.9575	10.225	10.61
E. coli, Most Probable Number	MPN/100 mL	21	16	31	35	75	96	194	1120
Hardness, Total	mg/L	13	38.6	41.54	60	64.2	69.4	76.72	86.6
Lead, Dissolved	µg/L	4	0.102	0.102	0.102	0.102	0.102	0.102	0.102
Lead, Total Recoverable	µg/L	9	0.154	0.178	0.191	0.215	0.271	0.3244	0.51
Mercury by Purge & Trap, Dissolved	ng/L	2	0.348	0.3961	0.46825	0.5885	0.70875	0.7809	0.829
Mercury by Purge & Trap, Total	ng/L	2	0.857	1.0513	1.34275	1.8285	2.31425	2.6057	2.8
Nitrate/Nitrite-N, Dissolved	mg/L	22	0.639	1.025	1.22	1.705	2.3525	3.518	4.12
Organic Carbon, Total Non-purgeable	mg/L	22	1.35	1.631	2.0375	2.555	3.0475	4.08	4.89
Orthophosphate-P, Dissolved	mg/L	21	0.029	0.03	0.034	0.041	0.063	0.158	0.186
pH, Field	S.U.	22	6.75	6.911	7.02	7.16	7.24	7.259	7.31
Temperature	°C	22	6.077	7.5128	8.41925	14.024	18.453	20.6045	21.327
Total Phosphorus-P	mg/L	22	0.071	0.0754	0.08225	0.0915	0.12125	0.2094	0.321
Total Suspended Solids	mg/L	22	5.2	5.616	6.85	9.9	12.65	16.86	41.4
Turbidity, Field	NTU	22	3.53	4.614	5.0825	7.395	12.01	19.384	24.23
Zinc, Dissolved	µg/L	4	2.54	2.78	3.14	5.725	10.5325	14.893	17.8
Zinc, Total Recoverable	µg/L	9	5.55	7.398	8.81	9.73	10.7	13.06	20.9

Table C-6: Ambient Monitoring Data Statistical Summary for Tualatin River at Rood Bridge Road									
Analysis Name	*Unit*	*n*	*MIN*	*10th Percentile*	*25th Percentile*	*Median*	*75th Percentile*	*90th Percentile*	*MAX*
Ammonia-N, Dissolved	mg/L	21	0.014	0.016	0.021	0.024	0.029	0.038	0.115
Conductivity, Field	µS/cm	22	76.7	80.29	87.1	96.45	104.325	108.34	117.3
Copper, Dissolved	µg/L	12	0.661	0.688	0.6895	0.8395	0.92325	0.9618	1.38
Copper, Total Recoverable	µg/L	15	1.21	1.358	1.43	1.54	2	2.318	2.94
Dissolved Oxygen	mg/L	22	8.18	8.354	8.5825	8.965	10.1275	10.465	10.69
E. coli, Most Probable Number	MPN/100 mL	21	19	33	43	66	108	248	1410
Hardness, Total	mg/L	20	28.9	29.86	33.325	36.5	41.225	43.31	47.5
Lead, Dissolved	µg/L	12	0.102	0.102	0.102	0.102	0.102	0.102	0.102
Lead, Total Recoverable	µg/L	15	0.105	0.1212	0.1275	0.159	0.283	0.399	0.429
Mercury by Purge & Trap, Dissolved	ng/L	2	0.297	0.3389	0.40175	0.5065	0.61125	0.6741	0.716
Mercury by Purge & Trap, Total	ng/L	2	0.866	1.0174	1.2445	1.623	2.0015	2.2286	2.38
Nitrate/Nitrite-N, Dissolved	mg/L	22	0.111	0.1338	0.2475	0.518	1.0265	1.549	1.85
Organic Carbon, Total Non-purgeable	mg/L	22	1.17	1.43	1.5425	1.765	1.98	2.895	4.72
Orthophosphate-P, Dissolved	mg/L	21	0.012	0.021	0.024	0.029	0.032	0.041	0.045
pH, Field	S.U.	22	6.74	6.763	6.8275	7.075	7.355	7.41	7.57
Temperature	°C	22	5.88	7.2775	8.08825	12.7	17.08475	18.1138	18.741
Total Phosphorus-P	mg/L	22	0.052	0.0611	0.06625	0.071	0.0855	0.096	0.207
Total Suspended Solids	mg/L	22	5.2	6.44	7.05	7.7	15.85	17.29	52.4
Turbidity, Field	NTU	22	4.39	4.83	5.5925	7.77	12.205	17.732	40.34
Zinc, Dissolved	µg/L	11	2.54	2.54	2.54	2.54	2.875	3.28	11
Zinc, Total Recoverable	µg/L	15	2.54	2.54	2.915	3.65	5.595	6.162	9.33

Table C-7: Ambient Monitoring Data Statistical Summary for Tualatin River at Hwy 219 Bridge									
Analysis Name	*Unit*	*n*	*MIN*	*10th Percentile*	*25th Percentile*	*Median*	*75th Percentile*	*90th Percentile*	*MAX*
Ammonia-N, Dissolved	mg/L	14	0.013	0.0133	0.017	0.022	0.02375	0.0397	0.053
Conductivity, Field	µS/cm	16	74.6	76.5	83.25	94	102.25	107.5	114
Copper, Dissolved	µg/L	7	0.7	0.7156	0.765	0.841	0.8735	1.045	1.3
Copper, Total Recoverable	µg/L	7	1.37	1.508	1.61	1.62	1.995	2.216	2.39
Dissolved Oxygen	mg/L	16	8.71	8.78	9.05	9.8	10.6	11.1	11.4
E. coli, Most Probable Number	MPN/100 mL	13	24	34	54	82	178	211	291
Hardness, Total	mg/L	10	28.6	29.23	31.075	34.8	39.025	40.36	45.4
Lead, Dissolved	µg/L	7	0.102	0.102	0.102	0.102	0.102	0.102	0.102
Lead, Total Recoverable	µg/L	7	0.164	0.1886	0.218	0.257	0.3225	0.3962	0.491
Mercury by Purge & Trap, Dissolved	ng/L	2	0.278	0.3294	0.4065	0.535	0.6635	0.7406	0.792
Mercury by Purge & Trap, Total	ng/L	2	0.814	0.9966	1.2705	1.727	2.1835	2.4574	2.64
Nitrate/Nitrite-N, Dissolved	mg/L	14	0.098	0.1267	0.25525	0.7365	1.22025	1.431	1.94
Organic Carbon, Total Non-purgeable	mg/L	14	1.32	1.35	1.44	1.685	2.155	2.708	2.88
Orthophosphate-P, Dissolved	mg/L	14	0.017	0.0182	0.02125	0.024	0.02775	0.0304	0.034
pH, Field	S.U.	16	6.75	6.9	7	7.1	7.3	7.4	7.46
Temperature	°C	16	6.1	6.7	7.775	10.75	14.675	16.7435	17
Total Phosphorus-P	mg/L	14	0.056	0.058	0.06	0.0645	0.07525	0.0941	0.101
Total Suspended Solids	mg/L	16	4.8	5.71	7.2	9.9	15.7	17.5	21.2
Turbidity, Field	NTU	15	3.5	4.58	5.695	8.6	14.2	19.65	22.7
Zinc, Dissolved	µg/L	7	2.54	2.54	2.54	2.54	2.645	3.714	5.16
Zinc, Total Recoverable	µg/L	7	3.02	3.038	3.7	4.38	5.555	6.568	7.09

Table C-8: Ambient Monitoring Data Statistical Summary for Tualatin River at Golf Course Road									
Analysis Name	*Unit*	*n*	*MIN*	*10th Percentile*	*25th Percentile*	*Median*	*75th Percentile*	*90th Percentile*	*MAX*
Ammonia-N, Dissolved	mg/L	21	0.01	0.01	0.01	0.012	0.015	0.019	0.12
Conductivity, Field	µS/cm	22	67.3	74.51	79.925	83.8	95.875	103.79	107
Copper, Dissolved	µg/L	4	0.708	0.726	0.753	0.8005	0.88725	0.9849	1.05
Copper, Total Recoverable	µg/L	4	1.21	1.609	2.2075	3.55	4.8525	5.379	5.73
Dissolved Oxygen	mg/L	22	9.1	9.184	9.55	9.875	10.3775	10.806	10.97
E. coli, Most Probable Number	MPN/100 mL	21	12	23	73	135	185	387	1550
Hardness, Total	mg/L	4	32	32.3	32.75	33.95	35.775	37.35	38.4
Lead, Dissolved	µg/L	4	0.102	0.102	0.102	0.102	0.102	0.102	0.102
Lead, Total Recoverable	µg/L	4	0.102	0.1455	0.21075	0.3225	0.4685	0.5954	0.68
Mercury by Purge & Trap, Dissolved	ng/L	2	0.222	0.2777	0.36125	0.5005	0.63975	0.7233	0.779
Mercury by Purge & Trap, Total	ng/L	2	0.748	1.0732	1.561	2.374	3.187	3.6748	4
Nitrate/Nitrite-N, Dissolved	mg/L	22	0.036	0.1239	0.146	0.341	0.6545	0.7166	0.964
Organic Carbon, Total Non-purgeable	mg/L	22	0.918	1.051	1.1925	1.41	1.89	2.158	3.78
Orthophosphate-P, Dissolved	mg/L	21	0.008	0.008	0.012	0.013	0.022	0.025	0.043
pH, Field	S.U.	22	6.7	6.89	6.9325	7.175	7.3675	7.439	7.48
Temperature	°C	22	6.018	7.0855	8.035	11.933	13.36775	15.2701	16.332
Total Phosphorus-P	mg/L	22	0.03	0.0331	0.03575	0.055	0.0715	0.1022	0.136
Total Suspended Solids	mg/L	22	3.54	4.84	7	12.6	17.275	23.16	62.8
Turbidity, Field	NTU	21	2.29	4.39	5.81	8.17	12.28	28.17	36.81
Zinc, Dissolved	µg/L	4	2.54	2.54	2.54	3.745	4.9775	5.027	5.06
Zinc, Total Recoverable	µg/L	4	2.56	3.235	4.2475	5.98	8.1375	9.915	11.1

Table C-9: Ambient Monitoring Data Statistical Summary for Tualatin River at Fern Hill Road									
Analysis Name	*Unit*	*n*	*MIN*	*10th Percentile*	*25th Percentile*	*Median*	*75th Percentile*	*90th Percentile*	*MAX*
Ammonia-N, Dissolved	mg/L	21	0.01	0.01	0.01	0.012	0.013	0.018	0.085
Conductivity, Field	µS/cm	22	64.4	67.27	70.725	76.5	88.6	95.97	100
Copper, Dissolved	µg/L	12	0.644	0.6488	0.677	0.7435	0.8325	0.9294	1.24
Copper, Total Recoverable	µg/L	12	1.37	1.512	1.68	1.95	2.4525	3.348	7.44
Dissolved Oxygen	mg/L	22	9.06	9.343	9.57	10.13	10.5575	10.892	10.97
E. coli, Most Probable Number	MPN/100 mL	20	12	22.4	54.75	97.5	186	638.3	1550
Hardness, Total	mg/L	17	26.6	27.74	28.6	31.8	36.1	38.4	39.1
Lead, Dissolved	µg/L	12	0.102	0.102	0.102	0.102	0.102	0.102	0.102
Lead, Total Recoverable	µg/L	12	0.108	0.1276	0.15325	0.241	0.31075	0.7732	1.73
Mercury by Purge & Trap, Dissolved	ng/L	2	0.222	0.2907	0.39375	0.5655	0.73725	0.8403	0.909
Mercury by Purge & Trap, Total	ng/L	2	0.654	1.0486	1.6405	2.627	3.6135	4.2054	4.6
Nitrate/Nitrite-N, Dissolved	mg/L	22	0.032	0.0947	0.1215	0.191	0.59025	0.6557	1
Organic Carbon, Total Non-purgeable	mg/L	22	0.877	1.004	1.1025	1.255	1.83	2.09	3.58
Orthophosphate-P, Dissolved	mg/L	21	0.005	0.005	0.008	0.011	0.02	0.025	0.04
pH, Field	S.U.	22	6.78	6.946	7.0425	7.205	7.3475	7.38	7.42
Temperature	°C	22	5.948	7.2911	7.9585	11.093	12.9325	15.1587	16.178
Total Phosphorus-P	mg/L	22	0.025	0.025	0.0285	0.0435	0.0625	0.1023	0.163
Total Suspended Solids	mg/L	22	4.4	5.64	6.4	11.9	15.6	36.52	88
Turbidity, Field	NTU	22	2.56	4.028	4.2875	6.62	12.58	24.708	47.66
Zinc, Dissolved	µg/L	12	2.54	2.54	2.54	2.54	3.725	5.84	7.44
Zinc, Total Recoverable	µg/L	12	2.61	2.764	3.4	4.455	7.4375	9.137	55.4

Table C-10: Ambient Monitoring Data Statistical Summary for Scoggins Creek below Hagg Lake									
Analysis Name	*Unit*	*n*	*MIN*	*10th Percentile*	*25th Percentile*	*Median*	*75th Percentile*	*90th Percentile*	*MAX*
Ammonia-N, Dissolved	mg/L	20	0.01	0.01	0.01	0.01	0.01725	0.0285	0.07
Conductivity, Field	µS/cm	21	58.9	59.4	60.6	61.6	64.5	69.9	71.1
Copper, Dissolved	µg/L	4	0.573	0.5844	0.6015	0.6245	0.6595	0.6982	0.724
Copper, Total Recoverable	µg/L	4	0.801	0.8052	0.8115	0.9425	1.115	1.196	1.25
Dissolved Oxygen	mg/L	21	10.18	10.58	11.77	12.6	13.06	13.34	13.48
E. coli, Most Probable Number	MPN/100 mL	21	1	1	1	1	2	3	20
Hardness, Total	mg/L	4	22.8	23.22	23.85	24.5	25.575	26.97	27.9
Lead, Dissolved	µg/L	4	0.102	0.102	0.102	0.102	0.102	0.102	0.102
Lead, Total Recoverable	µg/L	4	0.102	0.102	0.102	0.102	0.102	0.102	0.102
Mercury by Purge & Trap, Dissolved	ng/L	3	0.223	0.263	0.323	0.423	0.4485	0.4638	0.474
Mercury by Purge & Trap, Total	ng/L	2	0.535	0.5665	0.61375	0.6925	0.77125	0.8185	0.85
Nitrate/Nitrite-N, Dissolved	mg/L	21	0.011	0.017	0.123	0.15	0.166	0.175	0.201
Organic Carbon, Total Non-purgeable	mg/L	21	0.864	0.909	0.949	1.07	1.2	1.37	1.55
Orthophosphate-P, Dissolved	mg/L	20	0.005	0.005	0.005	0.005	0.005	0.0051	0.025
pH, Field	S.U.	21	6.86	6.98	7.04	7.29	7.46	7.63	7.77
Temperature	°C	21	5.83	6.088	7.156	7.965	8.83	15.501	18.386
Total Phosphorus-P	mg/L	21	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Total Suspended Solids	mg/L	21	0.5	0.5	0.8	1.2	2	2.4	4.4
Turbidity, Field	NTU	21	1.32	2.04	2.2	3.3	4.17	4.59	4.94
Zinc, Dissolved	µg/L	4	2.54	2.54	2.54	2.54	2.7375	3.093	3.33
Zinc, Total Recoverable	µg/L	4	2.54	2.636	2.78	3.2	3.6775	3.925	4.09

Table C-11: Ambient Monitoring Data Statistical Summary for Gales Creek at New Highway 47									
Analysis Name	*Unit*	*n*	*MIN*	*10th Percentile*	*25th Percentile*	*Median*	*75th Percentile*	*90th Percentile*	*MAX*
Ammonia-N, Dissolved	mg/L	20	0.01	0.01	0.01	0.011	0.01525	0.025	0.085
Conductivity, Field	µS/cm	21	61.7	76	80.7	111.1	128.4	137.1	142.1
Copper, Dissolved	µg/L	4	0.452	0.488	0.542	0.699	0.8845	0.9898	1.06
Copper, Total Recoverable	µg/L	4	1.28	1.304	1.34	1.46	2.5625	4.367	5.57
Dissolved Oxygen	mg/L	21	6.53	7.55	8.22	10.51	10.98	11.06	11.81
E. coli, Most Probable Number	MPN/100 mL	21	15	20	45	91	140	291	387
Hardness, Total	mg/L	4	29.4	30.63	32.475	42.2	51.1	51.46	51.7
Lead, Dissolved	µg/L	4	0.102	0.102	0.102	0.102	0.102	0.102	0.102
Lead, Total Recoverable	µg/L	4	0.102	0.1068	0.114	0.1185	0.249	0.483	0.639
Mercury by Purge & Trap, Dissolved	ng/L	2	0.216	0.2571	0.31875	0.4215	0.52425	0.5859	0.627
Mercury by Purge & Trap, Total	ng/L	2	0.467	0.7883	1.27025	2.0735	2.87675	3.3587	3.68
Nitrate/Nitrite-N, Dissolved	mg/L	21	0.045	0.083	0.092	0.126	0.404	0.466	0.585
Organic Carbon, Total Non-purgeable	mg/L	21	0.585	0.708	0.889	1.11	1.46	1.52	3.19
Orthophosphate-P, Dissolved	mg/L	20	0.01	0.013	0.014	0.017	0.02275	0.0251	0.03
pH, Field	S.U.	21	7.02	7.15	7.2	7.32	7.41	7.47	7.58
Temperature	°C	21	5.548	7.299	8.113	9.727	17.137	20.164	23.322
Total Phosphorus-P	mg/L	21	0.025	0.029	0.032	0.044	0.054	0.067	0.138
Total Suspended Solids	mg/L	21	1.4	2.2	3	5	14	24.8	76
Turbidity, Field	NTU	21	1.89	2.11	2.79	4.6	7.81	12.38	39.43
Zinc, Dissolved	µg/L	4	2.54	2.54	2.54	2.54	2.965	3.73	4.24
Zinc, Total Recoverable	µg/L	4	2.54	2.858	3.335	4.975	7.7375	10.235	11.9

Table C-12: Ambient Monitoring Data Statistical Summary for Rock Creek at Quatama									
Analysis Name	*Unit*	*n*	*MIN*	*10th Percentile*	*25th Percentile*	*Median*	*75th Percentile*	*90th Percentile*	*MAX*
Ammonia-N, Dissolved	mg/L	20	0.012	0.0174	0.019	0.0275	0.047	0.0783	0.378
Conductivity, Field	µS/cm	21	90.1	108.2	129.1	178.5	293.5	357.6	366.1
Copper, Dissolved	µg/L	4	0.471	0.5115	0.57225	0.953	1.4475	1.713	1.89
Copper, Total Recoverable	µg/L	4	1.02	1.053	1.1025	1.68	2.2725	2.349	2.4
Dissolved Oxygen	mg/L	21	3.29	3.9	5.03	8.26	10.06	10.28	11.18
E. coli, Most Probable Number	MPN/100 mL	21	21	49	55	91	147	435	1550
Hardness, Total	mg/L	4	32.9	41.36	54.05	62.15	88.15	133.06	163
Lead, Dissolved	µg/L	4	0.102	0.102	0.102	0.102	0.102	0.102	0.102
Lead, Total Recoverable	µg/L	4	0.214	0.2233	0.23725	0.2835	0.419	0.5936	0.71
Mercury by Purge & Trap, Dissolved	ng/L	2	0.323	0.5057	0.77975	1.2365	1.69325	1.9673	2.15
Mercury by Purge & Trap, Total	ng/L	2	0.644	1.0956	1.773	2.902	4.031	4.7084	5.16
Nitrate/Nitrite-N, Dissolved	mg/L	21	0.052	0.112	0.148	0.209	1.13	1.22	1.83
Organic Carbon, Total Non-purgeable	mg/L	21	2.28	2.49	3.06	4.2	5.53	6.04	6.97
Orthophosphate-P, Dissolved	mg/L	20	0.021	0.0257	0.0285	0.053	0.07025	0.0902	0.12
pH, Field	S.U.	21	6.83	7.03	7.13	7.21	7.38	7.43	7.52
Temperature	°C	21	5.615	7.691	8.557	11.638	17.316	18.64	21.317
Total Phosphorus-P	mg/L	21	0.074	0.078	0.084	0.112	0.169	0.178	0.205
Total Suspended Solids	mg/L	21	0.5	1	2.4	6	9.6	12.8	14.4
Turbidity, Field	NTU	21	3.91	4.07	4.61	6.04	10.14	12.55	25.17
Zinc, Dissolved	µg/L	4	2.54	3.428	4.76	7.44	9.635	10.094	10.4
Zinc, Total Recoverable	µg/L	4	7.44	7.473	7.5225	11.625	16.075	16.75	17.2

Table C-13: Ambient Monitoring Data Statistical Summary for Dairy Creek at Highway 8									
Analysis Name	*Unit*	*n*	*MIN*	*10th Percentile*	*25th Percentile*	*Median*	*75th Percentile*	*90th Percentile*	*MAX*
Ammonia-N, Dissolved	mg/L	20	0.01	0.0164	0.02225	0.0275	0.0385	0.0446	0.165
Conductivity, Field	µS/cm	21	72.7	81.6	87.9	96.9	121.2	125.3	136.8
Copper, Dissolved	µg/L	4	0.638	0.6677	0.71225	0.749	0.77025	0.7869	0.798
Copper, Total Recoverable	µg/L	4	0.942	0.9624	0.993	1.155	1.41	1.608	1.74
Dissolved Oxygen	mg/L	21	5.47	6.86	7.81	8.77	9.94	10.01	10.75
E. coli, Most Probable Number	MPN/100 mL	21	19	50	61	105	210	387	687
Hardness, Total	mg/L	4	32.6	32.96	33.5	41.05	50.225	53.69	56
Lead, Dissolved	µg/L	4	0.102	0.102	0.102	0.102	0.103	0.1048	0.106
Lead, Total Recoverable	µg/L	4	0.176	0.1904	0.212	0.2655	0.395	0.5534	0.659
Mercury by Purge & Trap, Dissolved	ng/L	2	0.447	0.5223	0.63525	0.8235	1.01175	1.1247	1.2
Mercury by Purge & Trap, Total	ng/L	2	0.899	1.1751	1.58925	2.2795	2.96975	3.3839	3.66
Nitrate/Nitrite-N, Dissolved	mg/L	21	0.135	0.303	0.407	0.596	1.53	2.22	3.66
Organic Carbon, Total Non-purgeable	mg/L	21	1.4	1.58	1.71	2.28	3.01	4.46	5.49
Orthophosphate-P, Dissolved	mg/L	20	0.014	0.0187	0.02375	0.034	0.06	0.0648	0.075
pH, Field	S.U.	21	6.69	6.89	6.93	7.16	7.28	7.3	7.31
Temperature	°C	21	5.904	7.322	8.382	11.675	16.931	19.402	22.531
Total Phosphorus-P	mg/L	21	0.065	0.068	0.076	0.091	0.118	0.172	0.199
Total Suspended Solids	mg/L	21	2.4	3.6	7.2	9.6	14	16.8	22
Turbidity, Field	NTU	21	3.41	4.71	5.32	8.06	11.32	15.12	26.91
Zinc, Dissolved	µg/L	4	2.54	2.54	2.54	3.475	5.6	7.742	9.17
Zinc, Total Recoverable	µg/L	4	2.72	2.855	3.0575	5.06	7.27	7.846	8.23

Table C-14: Ambient Monitoring Data Statistical Summary for McKay Creek at Padgett									
Analysis Name	*Unit*	*n*	*MIN*	*10th Percentile*	*25th Percentile*	*Median*	*75th Percentile*	*90th Percentile*	*MAX*
Ammonia-N, Dissolved	mg/L	20	0.01	0.01	0.01275	0.0175	0.03125	0.0402	0.09
Conductivity, Field	µS/cm	21	73	96	109.5	139	152.6	157.5	173.5
Copper, Dissolved	µg/L	4	0.406	0.4324	0.472	0.684	0.89525	0.9335	0.959
Copper, Total Recoverable	µg/L	5	0.477	0.5594	0.683	0.683	0.96	1.482	1.83
Dissolved Oxygen	mg/L	21	4.97	6.38	6.77	9.06	9.88	10.27	11.64
E. coli, Most Probable Number	MPN/100 mL	21	15	29	42	121	228	299	461
Hardness, Total	mg/L	5	38.2	40.6	44.2	63.8	67	71.8	75
Lead, Dissolved	µg/L	5	0.102	0.102	0.102	0.102	0.102	0.102	0.102
Lead, Total Recoverable	µg/L	5	0.102	0.11	0.122	0.139	0.215	0.5204	0.724
Mercury by Purge & Trap, Dissolved	ng/L	2	0.46	0.552	0.69	0.92	1.15	1.288	1.38
Mercury by Purge & Trap, Total	ng/L	2	0.721	1.0279	1.48825	2.2555	3.02275	3.4831	3.79
Nitrate/Nitrite-N, Dissolved	mg/L	21	0.112	0.141	0.25	0.55	1.76	2.12	2.85
Organic Carbon, Total Non-purgeable	mg/L	21	1.24	1.33	1.7	2.46	3.28	3.69	6.24
Orthophosphate-P, Dissolved	mg/L	20	0.015	0.0178	0.02775	0.035	0.0565	0.0679	0.08
pH, Field	S.U.	21	6.66	7	7.13	7.23	7.29	7.38	7.53
Temperature	°C	21	6.202	7.571	8.203	11.01	17.004	19.713	22.881
Total Phosphorus-P	mg/L	21	0.036	0.049	0.054	0.076	0.128	0.148	0.211
Total Suspended Solids	mg/L	21	0.5	2	2	2.8	3.6	4.8	16.4
Turbidity, Field	NTU	21	2.63	3.06	3.85	4.2	6.44	7.7	32.69
Zinc, Dissolved	µg/L	4	2.54	2.54	2.54	2.94	4.065	5.37	6.24
Zinc, Total Recoverable	µg/L	5	2.54	2.54	2.54	5.11	6.89	7.622	8.11

Table C-15: Ambient Monitoring Data Statistical Summary for Rock Creek at Brookwood									
Analysis Name	*Unit*	*n*	*MIN*	*10th Percentile*	*25th Percentile*	*Median*	*75th Percentile*	*90th Percentile*	*MAX*
Ammonia-N, Dissolved	mg/L	19	0.017	0.021	0.024	0.029	0.0365	0.0528	0.09
Conductivity, Field	µS/cm	20	100.8	131.3	151	211.35	278.65	338.02	475.6
Copper, Dissolved	µg/L	4	0.667	0.7879	0.96925	1.385	1.93	2.344	2.62
Copper, Total Recoverable	µg/L	4	1.5	1.713	2.0325	2.515	3.1075	3.625	3.97
Dissolved Oxygen	mg/L	20	4.65	5.967	6.255	8.435	9.795	10.13	10.82
E. coli, Most Probable Number	MPN/100 mL	20	37	47.8	86	154.5	289	665.7	980
Hardness, Total	mg/L	4	38.4	42.69	49.125	68.6	99.375	126.15	144
Lead, Dissolved	µg/L	4	0.102	0.102	0.102	0.102	0.11425	0.1363	0.151
Lead, Total Recoverable	µg/L	4	0.423	0.5148	0.6525	0.7595	0.7915	0.7942	0.796
Mercury by Purge & Trap, Dissolved	ng/L	2	0.273	0.4087	0.61225	0.9515	1.29075	1.4943	1.63
Mercury by Purge & Trap, Total	ng/L	2	0.736	1.1074	1.6645	2.593	3.5215	4.0786	4.45
Nitrate/Nitrite-N, Dissolved	mg/L	20	0.117	0.1822	0.22025	0.2785	0.83275	1.016	1.43
Organic Carbon, Total Non-purgeable	mg/L	20	2.42	2.747	3.265	4.155	5.0275	5.652	7.12
Orthophosphate-P, Dissolved	mg/L	19	0.031	0.0358	0.048	0.077	0.1215	0.1454	0.175
pH, Field	S.U.	20	6.98	7.138	7.1975	7.32	7.5125	7.553	7.6
Temperature	°C	20	6.205	7.7937	8.58425	14.1005	17.94525	19.9551	23.422
Total Phosphorus-P	mg/L	20	0.09	0.1047	0.11325	0.155	0.21475	0.2505	0.275
Total Suspended Solids	mg/L	20	4	4.4	6.4	7.4	11.2	14.64	25.2
Turbidity, Field	NTU	20	4.83	4.935	5.68	7.565	11.455	18.253	21.38
Zinc, Dissolved	µg/L	4	2.54	2.807	3.2075	8.465	15.025	17.77	19.6
Zinc, Total Recoverable	µg/L	4	7.48	10.036	13.87	19.7	25.2	28.44	30.6

Table C-16: Ambient Monitoring Data Statistical Summary for Beaverton Creek near Orenco									
Analysis Name	*Unit*	*n*	*MIN*	*10th Percentile*	*25th Percentile*	*Median*	*75th Percentile*	*90th Percentile*	*MAX*
Ammonia-N, Dissolved	mg/L	20	0.015	0.0229	0.026	0.033	0.03875	0.0576	0.11
Conductivity, Field	µS/cm	21	100	135.3	166.9	223.9	245.7	276.7	284.4
Copper, Dissolved	µg/L	4	0.632	0.8744	1.238	1.67	2.165	2.642	2.96
Copper, Total Recoverable	µg/L	4	2.25	2.25	2.25	2.8	3.7025	4.337	4.76
Dissolved Oxygen	mg/L	21	4.33	5.28	6	8.34	9.84	10.12	11.09
E. coli, Most Probable Number	MPN/100 mL	21	40	75	166	248	365	816	1300
Hardness, Total	mg/L	4	37.9	39.28	41.35	66.4	96.225	106.89	114
Lead, Dissolved	µg/L	4	0.102	0.102	0.102	0.102	0.11425	0.1363	0.151
Lead, Total Recoverable	µg/L	4	0.607	0.6232	0.6475	0.826	1.01825	1.0673	1.1
Mercury by Purge & Trap, Dissolved	ng/L	2	0.32	0.42	0.57	0.82	1.07	1.22	1.32
Mercury by Purge & Trap, Total	ng/L	2	1.01	1.312	1.765	2.52	3.275	3.728	4.03
Nitrate/Nitrite-N, Dissolved	mg/L	21	0.135	0.191	0.224	0.303	0.678	0.902	1.18
Organic Carbon, Total Non-purgeable	mg/L	21	2.57	2.89	3.22	4.08	5.54	6.07	7.37
Orthophosphate-P, Dissolved	mg/L	20	0.029	0.0375	0.04875	0.0745	0.1345	0.1613	0.185
pH, Field	S.U.	21	6.97	7.16	7.25	7.36	7.48	7.5	7.54
Temperature	°C	21	5.91	7.922	8.956	13.456	18.627	20.107	23.18
Total Phosphorus-P	mg/L	21	0.11	0.118	0.128	0.156	0.225	0.286	0.309
Total Suspended Solids	mg/L	21	2.4	4	5.6	8.8	12.8	23.6	35
Turbidity, Field	NTU	21	4.97	5.62	6.4	7.92	14.29	16.36	20.27
Zinc, Dissolved	µg/L	4	2.54	3.275	4.3775	10.295	17.675	21.41	23.9
Zinc, Total Recoverable	µg/L	4	10.6	12.34	14.95	21.85	29.925	34.65	37.8

Table C-17: Ambient Monitoring Data Statistical Summary for Chicken Creek at Scholls-Sherwood									
Analysis Name	*Unit*	*n*	*MIN*	*10th Percentile*	*25th Percentile*	*Median*	*75th Percentile*	*90th Percentile*	*MAX*
Ammonia-N, Dissolved	mg/L	18	0.013	0.0174	0.021	0.03	0.042	0.056	0.1
Conductivity, Field	µS/cm	18	64.6	74.63	85.825	108.4	129.55	162.63	169.1
Copper, Dissolved	µg/L	4	0.406	0.4147	0.42775	0.607	0.88925	1.0877	1.22
Copper, Total Recoverable	µg/L	4	0.848	0.8618	0.8825	1.227	1.6075	1.693	1.75
Dissolved Oxygen	mg/L	18	5.96	6.98	7.96	9.34	10.0925	10.316	11.25
E. coli, Most Probable Number	MPN/100 mL	19	36	50.4	97.5	201	299.5	826	921
Hardness, Total	mg/L	4	21.8	25.79	31.775	41.05	51.875	60.65	66.5
Lead, Dissolved	µg/L	4	0.102	0.102	0.102	0.102	0.102	0.102	0.102
Lead, Total Recoverable	µg/L	4	0.218	0.2324	0.254	0.2925	0.40525	0.5605	0.664
Mercury by Purge & Trap, Dissolved	ng/L	2	0.502	0.5918	0.7265	0.951	1.1755	1.3102	1.4
Mercury by Purge & Trap, Total	ng/L	2	1.62	1.975	2.5075	3.395	4.2825	4.815	5.17
Nitrate/Nitrite-N, Dissolved	mg/L	19	0.307	0.3358	0.4215	0.647	1.245	1.63	2.01
Organic Carbon, Total Non-purgeable	mg/L	19	0.801	1.162	1.475	2.19	2.95	3.708	6.16
Orthophosphate-P, Dissolved	mg/L	18	0.014	0.0157	0.01825	0.033	0.03725	0.0429	0.051
pH, Field	S.U.	18	6.75	6.812	6.9625	7.05	7.135	7.189	7.24
Temperature	°C	18	6.588	7.6619	8.746	10.749	14.77125	17.0233	20.713
Total Phosphorus-P	mg/L	19	0.05	0.0528	0.06	0.096	0.1245	0.1352	0.152
Total Suspended Solids	mg/L	19	1.2	3.44	4.8	5.6	9.6	14.08	24.4
Turbidity, Field	NTU	18	4.4	5.356	6.6575	7.61	8.85	11.185	22.42
Zinc, Dissolved	µg/L	4	2.54	3.005	3.7025	4.5	5.02	5.218	5.35
Zinc, Total Recoverable	µg/L	4	7.91	8.417	9.1775	9.775	10.7125	12.085	13

Table C-18: Ambient Monitoring Data Statistical Summary for Fanno Creek at Durham									
Analysis Name	*Unit*	*n*	*MIN*	*10th Percentile*	*25th Percentile*	*Median*	*75th Percentile*	*90th Percentile*	*MAX*
Ammonia-N, Dissolved	mg/L	21	0.01	0.015	0.022	0.033	0.044	0.052	0.115
Conductivity, Field	µS/cm	22	97.1	129.53	179.4	222.35	369.575	408.54	611
Copper, Dissolved	µg/L	4	0.867	0.9159	0.98925	1.355	1.72	1.792	1.84
Copper, Total Recoverable	µg/L	7	1.34	1.418	1.51	1.59	3.015	3.832	4.54
Dissolved Oxygen	mg/L	22	6.25	7.524	8.4675	9.74	10.5125	11.257	12.14
E. coli, Most Probable Number	MPN/100 mL	21	34	66	91	140	308	687	2420
Hardness, Total	mg/L	7	39.4	49.42	69.8	84.2	97.45	123	150
Lead, Dissolved	µg/L	4	0.102	0.102	0.102	0.102	0.10375	0.1069	0.109
Lead, Total Recoverable	µg/L	7	0.198	0.201	0.2165	0.316	1.0265	1.484	2.12
Mercury by Purge & Trap, Dissolved	ng/L	2	0.3	0.356	0.44	0.58	0.72	0.804	0.86
Mercury by Purge & Trap, Total	ng/L	2	0.854	1.3906	2.1955	3.537	4.8785	5.6834	6.22
Nitrate/Nitrite-N, Dissolved	mg/L	25	0.05	0.1028	0.247	0.376	0.599	0.8426	1.17
Organic Carbon, Total Non-purgeable	mg/L	22	2.39	2.576	3.35	3.855	4.3925	5.626	7.06
Orthophosphate-P, Dissolved	mg/L	21	0.026	0.03	0.035	0.042	0.058	0.065	0.08
pH, Field	S.U.	22	7.02	7.109	7.335	7.405	7.5725	7.6	7.95
Temperature	°C	22	7.026	7.9362	8.8995	14.31	18.87775	21.8494	22.737
Total Phosphorus-P	mg/L	22	0.075	0.0831	0.09075	0.105	0.12675	0.1625	0.17
Total Suspended Solids	mg/L	23	0.8	2	2.6	4.8	9.665	28.72	62.4
Turbidity, Field	NTU	22	1.96	2.538	3.285	5.78	10.3675	21.073	31.93
Zinc, Dissolved	µg/L	4	3.58	3.826	4.195	10.85	17.8	18.7	19.3
Zinc, Total Recoverable	µg/L	7	5.76	5.994	7.23	11.5	35.4	48.74	54.8

Table C-19: Ambient Monitoring Data Statistical Summary for Dawson Creek at Brookwood									
Analysis Name	*Unit*	*n*	*MIN*	*10th Percentile*	*25th Percentile*	*Median*	*75th Percentile*	*90th Percentile*	*MAX*
Ammonia-N, Dissolved	mg/L	20	0.017	0.0228	0.0255	0.039	0.06175	0.0773	0.105
Conductivity, Field	µS/cm	20	141.9	208.46	237.975	312.5	338.75	699.6	945
Copper, Dissolved	µg/L	4	0.622	0.6565	0.70825	0.792	0.98025	1.2201	1.38
Copper, Total Recoverable	µg/L	4	0.793	0.8062	0.826	0.9185	1.2175	1.609	1.87
Dissolved Oxygen	mg/L	20	4.25	5.732	6.4775	8.325	9.98	10.481	11.48
E. coli, Most Probable Number	MPN/100 mL	21	28	37	86	228	387	980	1730
Hardness, Total	mg/L	4	62.7	71.52	84.75	122.05	158.5	170.2	178
Lead, Dissolved	µg/L	4	0.102	0.102	0.102	0.11	0.1335	0.1614	0.18
Lead, Total Recoverable	µg/L	4	0.125	0.1304	0.1385	0.1815	0.30525	0.4587	0.561
Mercury by Purge & Trap, Dissolved	ng/L	3	0.2	0.2238	0.2595	0.319	0.4725	0.5646	0.626
Mercury by Purge & Trap, Total	ng/L	2	0.274	0.3424	0.445	0.616	0.787	0.8896	0.958
Nitrate/Nitrite-N, Dissolved	mg/L	21	0.03	0.124	0.175	0.226	0.531	0.782	1.09
Organic Carbon, Total Non-purgeable	mg/L	21	1.78	2.2	2.52	3.16	4.38	4.89	5.67
Orthophosphate-P, Dissolved	mg/L	20	0.037	0.0444	0.049	0.064	0.08725	0.0911	0.106
pH, Field	S.U.	20	7.23	7.27	7.3175	7.445	7.495	7.533	7.59
Temperature	°C	20	6.636	8.0062	9.2965	13.977	18.80275	20.7503	21.605
Total Phosphorus-P	mg/L	21	0.082	0.093	0.103	0.136	0.161	0.171	0.194
Total Suspended Solids	mg/L	22	0.5	1.4	2.25	3.6	5.9	7.84	15
Turbidity, Field	NTU	20	1.76	2.238	2.43	3.975	6.2425	7.856	22.21
Zinc, Dissolved	µg/L	4	2.54	3.134	4.025	4.555	9.4175	18.107	23.9
Zinc, Total Recoverable	µg/L	4	3.63	4.647	6.1725	7.335	10.4625	15.525	18.9

Appendix D: Water Quality Status Report

This appendix presents information and data about the pollutants regulated under a Tualatin subbasin Total Maximum Daily Load (TMDL). The August 2001 TMDL modified previous TMDLs for phosphorus and ammonia and added new TMDLs for temperature, bacteria, and volatile solids (to address sediment oxygen demand impacts on dissolved oxygen in the tributaries). A TMDL update in August 2012 includes phosphorus and ammonia allocations for all four of CWS' water resource recovery facilities. The Willamette Basin Mercury TMDL was approved in February 2021.

The TMDL parameters include:

- Total phosphorus target concentrations designed to limit nuisance algal growth and achieve the instream pH criterion.
- Ammonia allocations designed to achieve the dissolved oxygen criterion in the Tualatin River.
- Settleable volatile solids allocations designed to achieve the dissolved oxygen criterion in the Tualatin River and its tributaries.
- Temperature and bacteria allocations designed to achieve ambient water quality standards in the basin.
- Mercury allocations designed to meet criteria for human health throughout the Willamette Basin including the Tualatin subbasin.

This summary provides general information on the Tualatin River mainstem and tributary conditions during 2023. This information does not assess compliance with permit conditions or TMDL requirements. Compliance is addressed through a separate mechanism which, for the NPDES permit, includes monthly discharge monitoring reports. Different statistics and reporting periods are used to report for permit compliance than are used for this annual summary.

The primary monitoring period for most of the Tualatin subbasin TMDLs is the dry season, May 1 to October 31. For ammonia, the monitoring period is May 1 to November 15. For bacteria, the monitoring period is the entire year. Mercury data is collected throughout the year. This report covers the 2023 monitoring year.

Total Phosphorus TMDL

The phosphorus TMDL was developed to protect the beneficial uses of aesthetics, indicated by chlorophyll a, and aquatic life, indicated by pH. The 2001 Tualatin TMDL established river and tributary loading capacities for total phosphorus expressed as concentrations (mg/L). Table D-1 shows the loading capacities and the data for the key sites for the most recent monitoring year, as well as other monitoring years selected from the period the TMDLs have been in effect.

Table D-1: History of Total Phosphorus Summer Medians (mg/L) May 1 – October 31						
Location	*2001 TMDL Loading Capacity*	*1990*	*2000*	*2010*	*2015*	*2023*
Tualatin River at Weiss Br	**0.10**	0.22	0.08	0.09	0.08	0.113
Tualatin River at Stafford Rd	**0.10**	0.23	0.08	0.10	0.09	0.104
Tualatin River at Boones Ferry Rd	**0.11**	0.23	0.08	0.10	0.09	0.108
Tualatin River at Hwy 210 Bridge	**0.10**	0.15	0.08	0.10	0.08	0.092
Tualatin River at Rood Bridge Road	**0.09**	0.10	0.06	0.08	0.06	0.071
Tualatin River at Hwy 219 Bridge	**0.04**	-	0.05	0.07	0.06	0.065
Tualatin River at Golf Course Rd	**0.04**	0.05	0.03	0.04	0.03	0.055
Tualatin River at Cherry Grove	**0.04**	-	< 0.025	< 0.025	< 0.025	<0.025
Scoggins Creek at Old Hwy 47[1]	**0.04**	0.43	< 0.025	< 0.025	< 0.025	<0.025
Gales Creek at New Hwy 47	**0.04**	0.06	0.04	0.04	0.05	0.044
Dairy Creek at Hwy 8	**0.09**	0.13	0.11	0.11	0.12	0.091
Rock Creek at Brookwood	**0.19**	-	-	0.16	0.22	0.155
Chicken Cr on Scholls-Sherwood	**0.14**	0.23	0.11	0.11	0.11	0.096
Fanno Creek at Durham Rd	**0.13**	0.15	0.15	0.13	0.16	0.105

[1] Monitoring location changed to Scoggins below Hagg Lake in 2013.

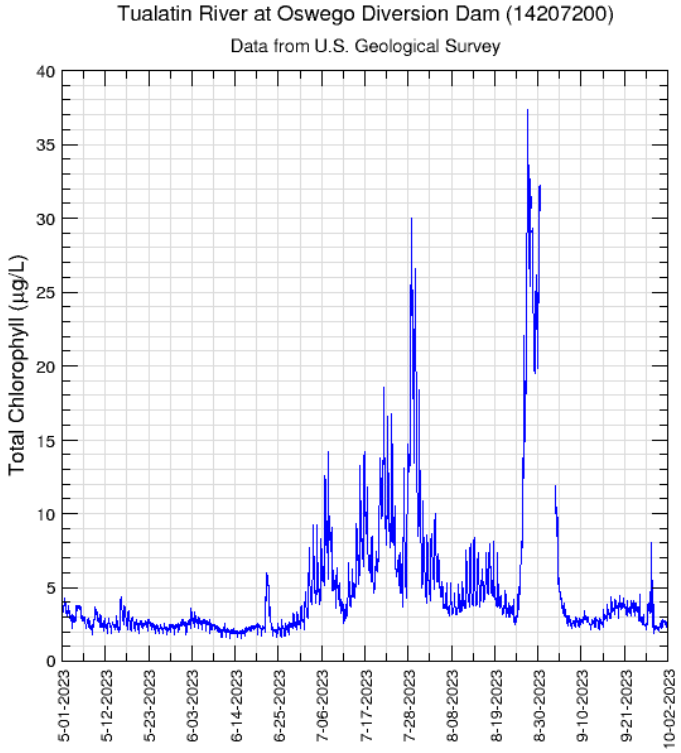
Since 1988, the Tualatin River has had a phosphorus TMDL for the mainstem Tualatin River and its tributaries. Total phosphorus has the potential to impact beneficial uses in the reservoir-like section of the river where nuisance algal growth historically occurred and elevated pH levels were observed. CWS upgraded its water resource recovery facilities and has used a combination of biological phosphorus removal and alum (aluminum sulfate) addition in the tertiary process to meet the phosphorus wasteload allocations in the TMDL for more than two decades.

Since the development of the original TMDL in 1988, the river has changed dramatically in terms of operations, flows, and water quality. Water quality modeling suggests that the Tualatin River is not as sensitive to phosphorus inputs as it once was in part because of the reduced residence time of water in the lower river than when the TMDL wasteload allocations were originally established. Reduced residence time is due to higher flows from managed flows, increased water resource recovery facility flows, and flashboards no longer being used on the lower river diversion dam that would increase the depth of the lower river. Moreover, DEQ has recently promulgated a new aluminum aquatic life toxicity standard in Oregon that will make it uncertain if it is practicable to continue to use alum in the tertiary process at current application rates.

CWS entered into an agreement with Oregon DEQ to study the effectiveness of biological processes in removing phosphorus at the water resource recovery facilities while balancing and optimizing the use of alum and the effects of the higher phosphorus concentrations in the

Tualatin River. As expected, the phosphorus concentrations in the lower Tualatin River in 2023 were higher than in previous years; however, there were no indications of nuisance algae or concerns with pH. In 2023, chlorophyll-a was measured in the Tualatin River at the Oswego Diversion Dam starting on April 20. All rolling 90-day averages between July 17 and October 1, 2023, were greater than 15 ug/L (Figure D-1). For the two July peaks in chlorophyll-a with concentrations greater than 15 ug/L, there were no corresponding increases in other indicators of photosynthesis associated with algae blooms (i.e., dissolved oxygen and pH). In August, a matrix of duckweed, green algae, and probably cyanobacteria had sloughed from the watershed and lodged in front of the chlorophyll-a sensor. The data likely were not representative of the channel cross-section during that time. Accordingly, CWS believes that the pH and dissolved oxygen data at the same time should also be further examined, as pH and dissolved oxygen would also be highly impacted by the algae matrix. The corrected data show a smaller spike of chlorophyll-a, which correspond closely with the peak in pH and dissolved oxygen.

Figure D-1: Chlorophyll-a Concentrations in the Tualatin River at the Oswego Diversion Dam



Results indicate that the water resource recovery facilities can effectively reduce total phosphorus using biological processes with no or little additional alum in the tertiary process without negatively impacting water quality in the river. CWS is continuing the study in 2025.

Dissolved Oxygen TMDL

The ammonia TMDL is designed to achieve the dissolved oxygen criteria in the reservoir-like section of the Tualatin River, in part by ensuring that discharges from CWS' water resource recovery facilities do not measurably reduce dissolved oxygen due to ammonia discharge. The TMDL allows higher loads of ammonia in the spring and early summer when river conditions

are favorable for the assimilation of ammonia, and lower ammonia loads in the fall when sediment oxygen demand consumes more oxygen, leaving less assimilative capacity.

The reservoir-like section of the Tualatin River is designated cold water habitat and has the following dissolved oxygen criteria:

- Grab samples: > 6.5 mg/L
- Continuous monitoring:
    - 30-day average of daily means > 6.5 mg/L
    - 7-day average of daily minimums > 5.0 mg/L
    - Daily minimum > 4.0 mg/L

CWS and the United States Geological Survey (USGS) are partners in a study where the USGS maintains continuous monitoring stations throughout the Tualatin Basin. Two of these stations are in the reservoir section of the river:

1) Near Scholls (river mile 24.5), downstream of the Rock Creek Water Resource Recovery Facility (river mile 37.7).
2) At the Oswego Diversion Dam (river mile 3.4), downstream of the Durham Water Resource Recovery Facility (river mile 9.2).

Graphs of the dissolved oxygen concentrations at these two locations are presented in Figure D-2 (RM 24.5) and Figure D-3 (RM 3.4). Dissolved oxygen levels fell below 6.5 mg/L throughout the summer, which is typical at this location. The August chlorophyll-a slug discussed above coincided with a local increase in dissolved oxygen indicating the positive ecological value of some level of photosynthesis and algae growth for the river. On August 31, after the seasons's first flush rain event, dissolved oxygen decreased with a characteristic double dip. The first decrease is caused by rainfall runoff from Fanno Creek, and the second decrease occurs after a travel time lag from the upper watershed tributaries. This is consistent with occasional occurrences of significant rainfall events before river flows increase in winter.

Figure D-2

Tualatin River at River Mile 24.5 (14206694)

Data from U.S. Geological Survey

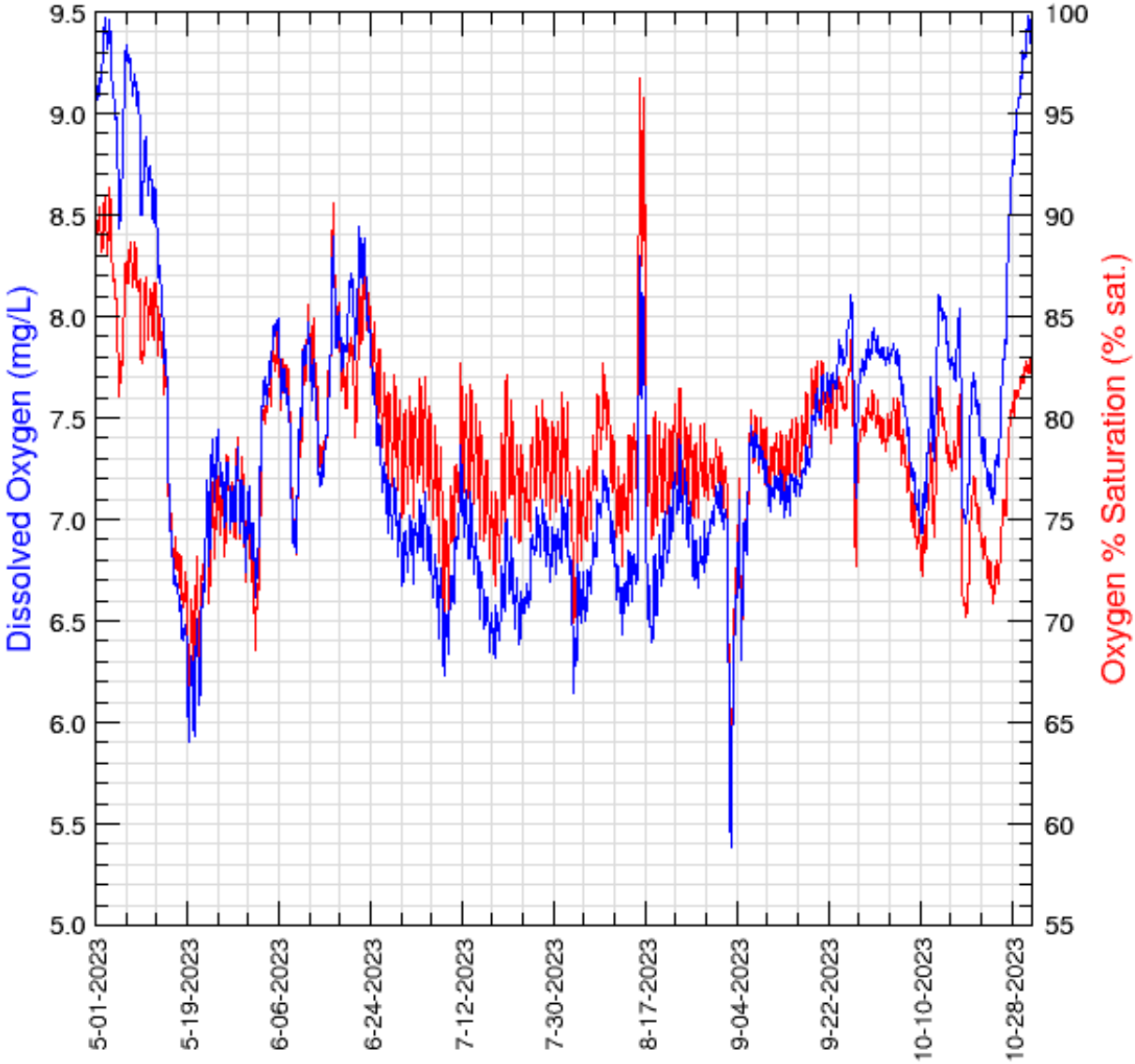
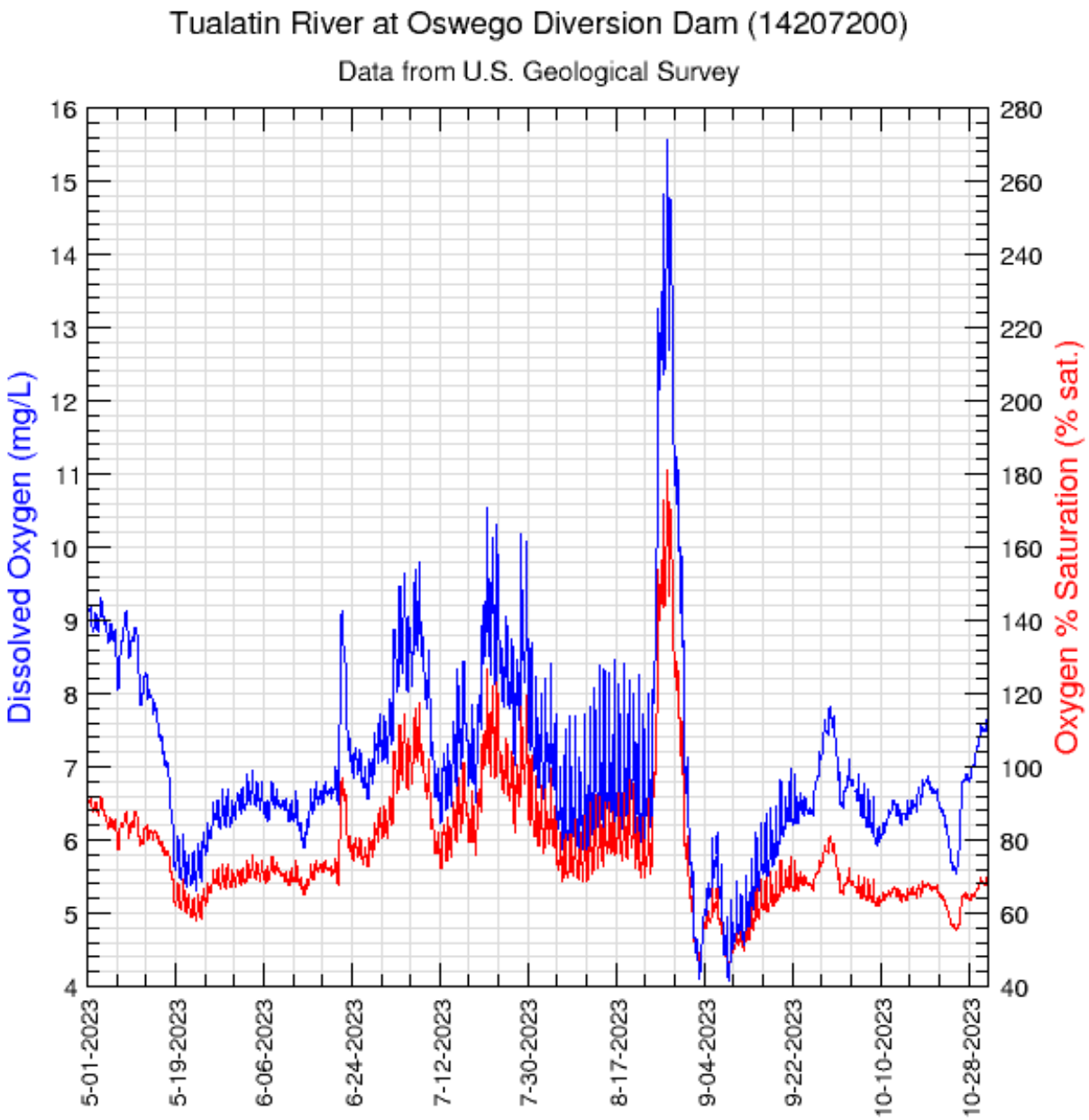


Figure D-3


Tualatin River at Oswego Diversion Dam (14207200)
Data from U.S. Geological Survey
Dissolved Oxygen (mg/L)
Oxygen % Saturation (% sat.)
16
15
14
13
12
11
10
9
8
7
6
5
4
280
260
240
220
200
180
160
140
120
100
80
60
40
5-01-2023
5-19-2023
6-06-2023
6-24-2023
7-12-2023
7-30-2023
8-17-2023
9-04-2023
9-22-2023
10-10-2023
10-28-2023

Tributary Dissolved Oxygen TMDL

The 2001 Tualatin TMDL contained requirements for reductions in settleable volatile solids loads to reduce tributary sediment oxygen demand and achieve dissolved oxygen criteria in the tributaries. Figures D-4 to D-7 show the summer dissolved oxygen levels in the tributaries. Some stream segments in the Tualatin Basin are subject to the cold water habitat dissolved oxygen criteria given above, and some are subject to the following cold water habitat dissolved oxygen criteria:

- Grab samples: > 8.0 mg/L
- Continuous monitoring:
  - 30-day average of daily means > 8.0 mg/L
  - 7-day average of daily minimums > 6.5 mg/L
  - Daily minimum > 6.0 mg/L

Note that Fish and Aquatic Life Uses were updated in Oregon Administrative Rules in December 2023.

Figure D-4

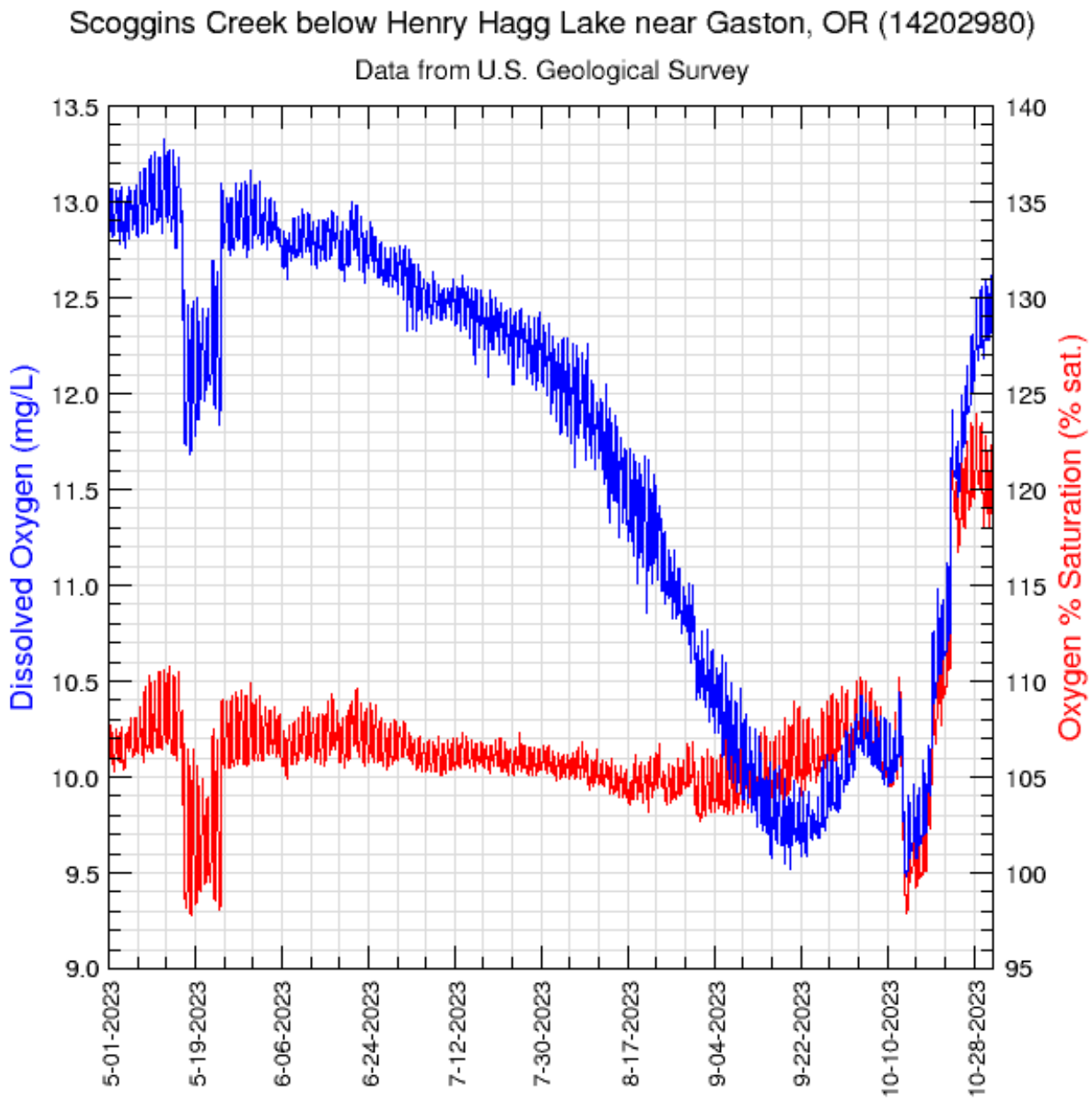

Scoggins Creek below Henry Hagg Lake near Gaston, OR (14202980)
Data from U.S. Geological Survey
Dissolved Oxygen (mg/L)
Oxygen % Saturation (% sat.)
13.5
13.0
12.5
12.0
11.5
11.0
10.5
10.0
9.5
9.0
140
135
130
125
120
115
110
105
100
95
5-01-2023
5-19-2023
6-06-2023
6-24-2023
7-12-2023
7-30-2023
8-17-2023
9-04-2023
9-22-2023
10-10-2023
10-28-2023

Figure D-5

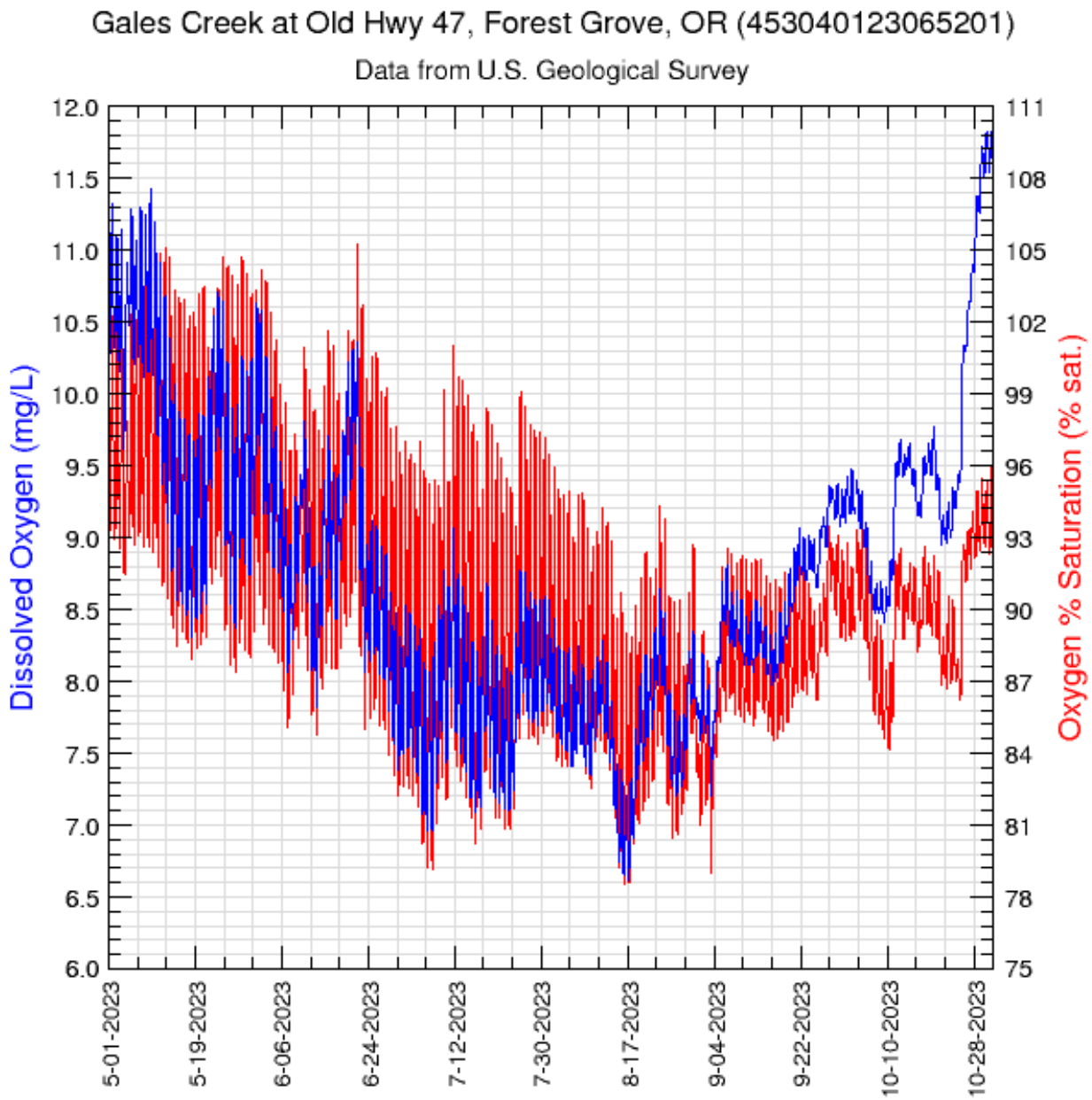

Gales Creek at Old Hwy 47, Forest Grove, OR (453040123065201)
Data from U.S. Geological Survey
Dissolved Oxygen (mg/L)
Oxygen % Saturation (% sat.)
12.0
11.5
11.0
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
111
108
105
102
99
96
93
90
87
84
81
78
75
5-01-2023
5-19-2023
6-06-2023
6-24-2023
7-12-2023
7-30-2023
8-17-2023
9-04-2023
9-22-2023
10-10-2023
10-28-2023

Figure D-6

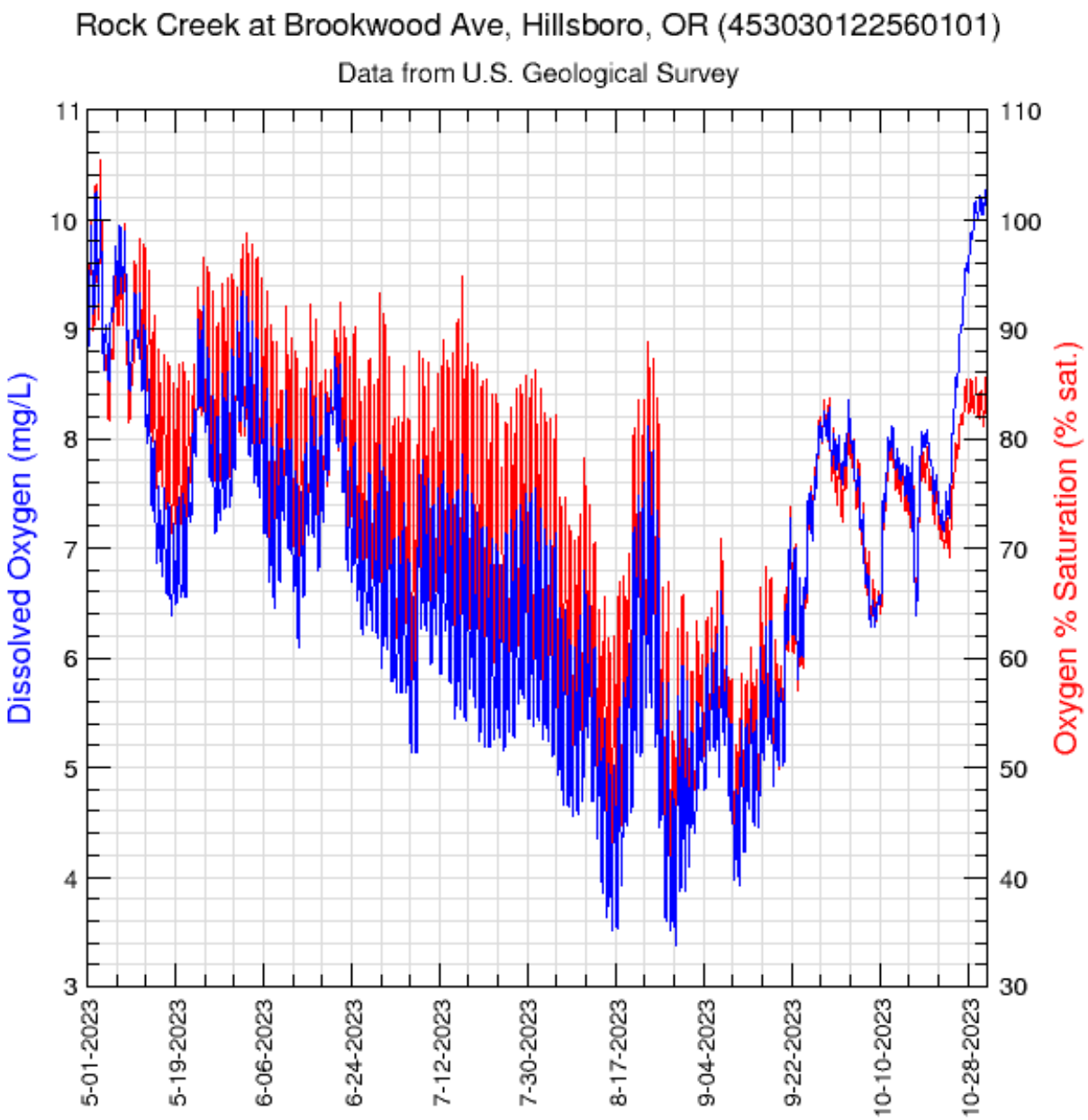
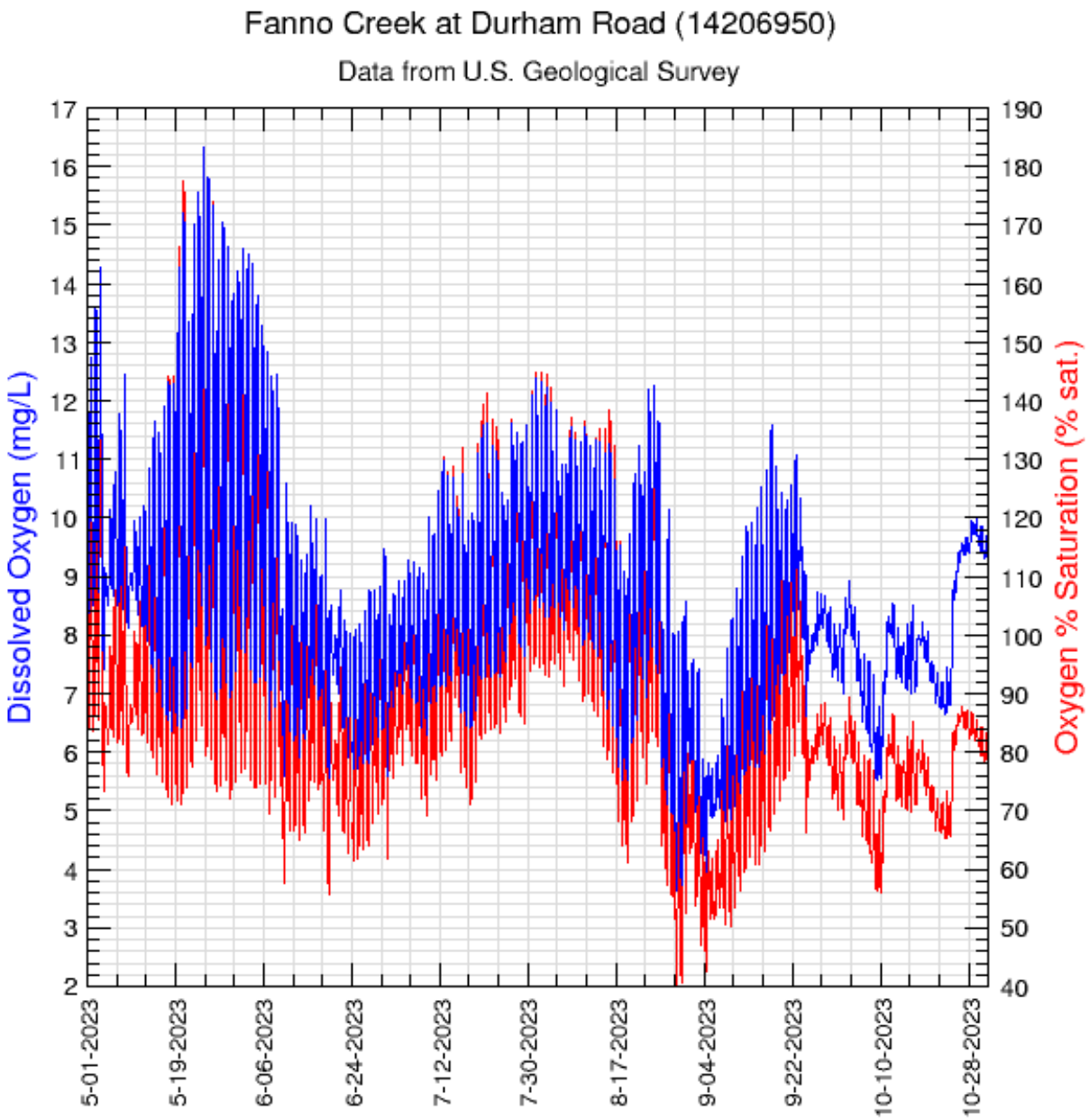

Rock Creek at Brookwood Ave, Hillsboro, OR (453030122560101)
Data from U.S. Geological Survey
Dissolved Oxygen (mg/L)
Oxygen % Saturation (% sat.)
11
10
9
8
7
6
5
4
3
110
100
90
80
70
60
50
40
30
5-01-2023
5-19-2023
6-06-2023
6-24-2023
7-12-2023
7-30-2023
8-17-2023
9-04-2023
9-22-2023
10-10-2023
10-28-2023

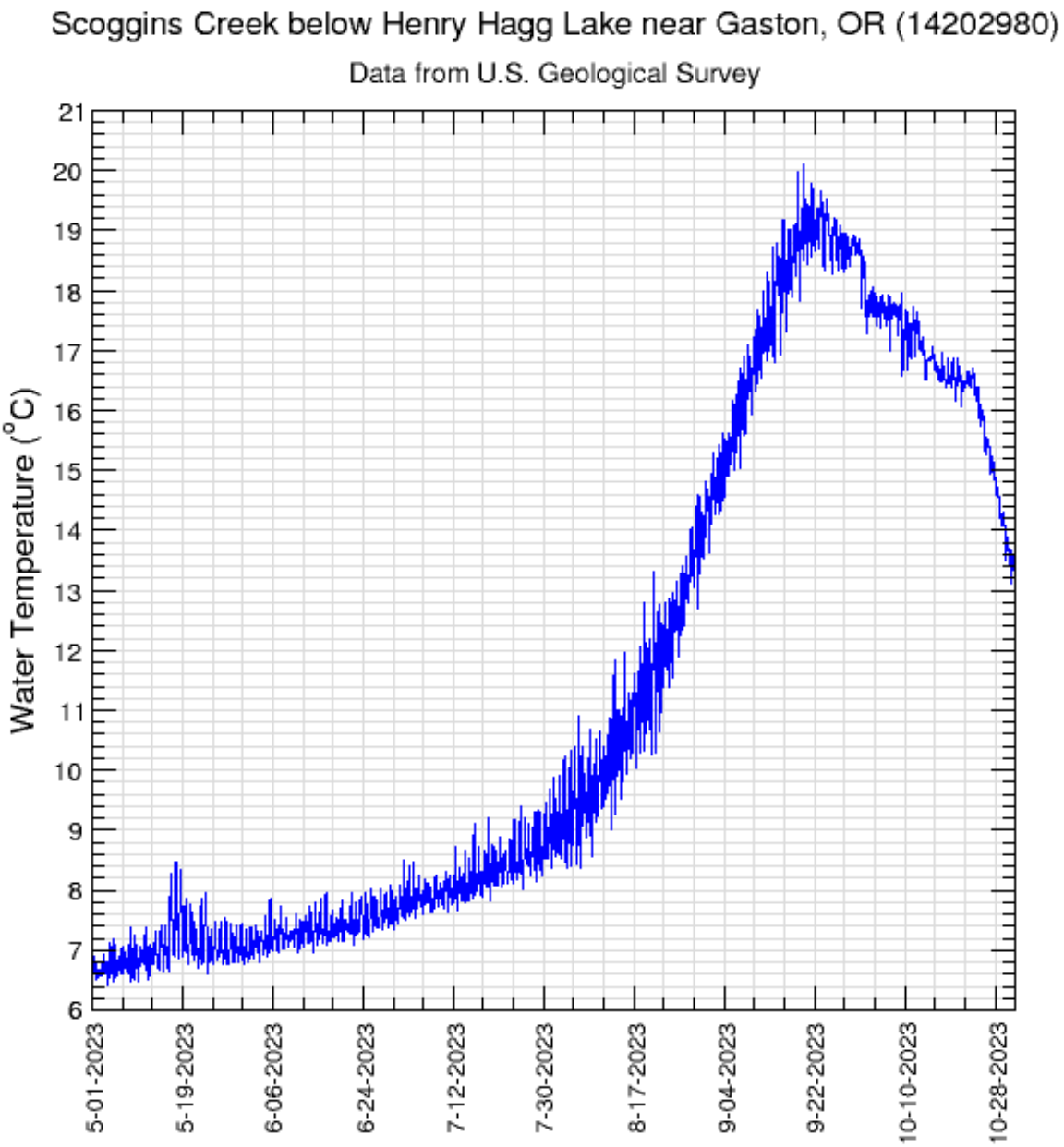
Figure D-7


Fanno Creek at Durham Road (14206950)
Data from U.S. Geological Survey
Dissolved Oxygen (mg/L)
Oxygen % Saturation (% sat.)
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
5-01-2023
5-19-2023
6-06-2023
6-24-2023
7-12-2023
7-30-2023
8-17-2023
9-04-2023
9-22-2023
10-10-2023
10-28-2023

Temperature TMDL

The temperature TMDL applies to both the mainstem and the tributaries. The TMDL is based on percent effective shade with the environmental goal of meeting the water quality temperature criteria. Most of the Tualatin Basin is subject to the salmonid fish rearing beneficial use, which has the criterion of 18 degrees C throughout the year. The temperature TMDL was developed as a basin-scale TMDL in response to the water quality limited status of selected tributaries and the lower mainstem of the river as indicated by the data from the Farmington Road gauging station. There are sites and times in the upper Tualatin Basin where the applicable beneficial use is salmonid spawning, which has a criterion of 13 degrees C. Figures D-8 to D-13 display graphs of summer temperatures at selected sites with continuous monitors.

Figure D-8



**Note: As seen in previous reporting years, the water temperature at Scoggins Creek slowly increases during the summer months and then drops off in the early fall. Hagg Lake reservoir reaches its full capacity between May-June depending on the water year. Stored water is released from Hagg Lake from the bottom of the reservoir. During the summer, as water is discharged from the reservoir, the temperature of the reservoir increases until the lake turnover effect occurs when colder, denser water at the bottom of the reservoir mixes with the warmer, lighter water at the surface of the reservoir. We see this annual pattern in the temperature graph above. Although the water temperature increases during the summer, the overall peak temperature of Scoggins Creek is 4-6 degrees C cooler than other locations monitored along the Tualatin River, as shown in the following charts.

Figure D-9

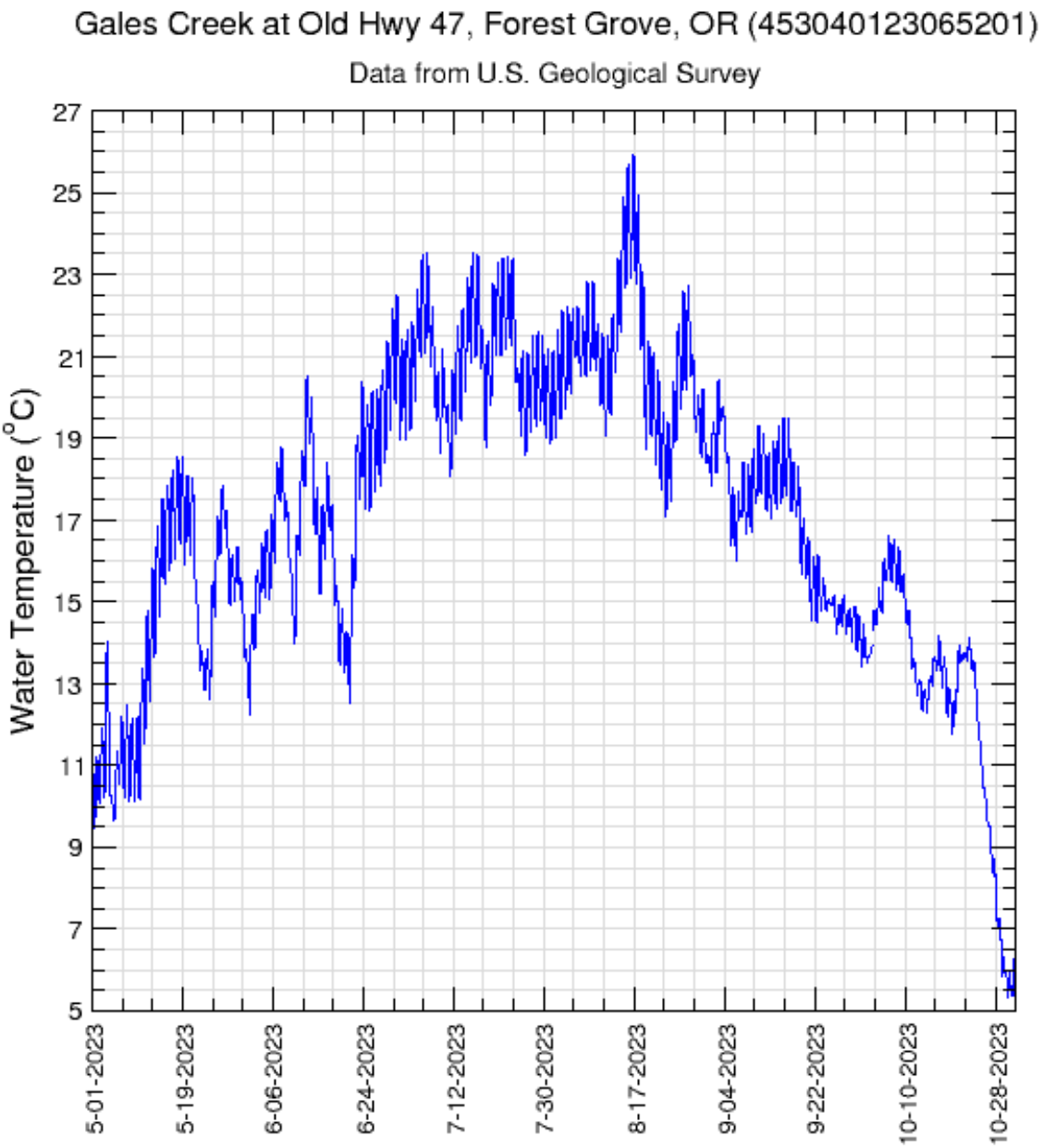

Gales Creek at Old Hwy 47, Forest Grove, OR (453040123065201)
Data from U.S. Geological Survey
Water Temperature (°C)
27
25
23
21
19
17
15
13
11
9
7
5
5-01-2023
5-19-2023
6-06-2023
6-24-2023
7-12-2023
7-30-2023
8-17-2023
9-04-2023
9-22-2023
10-10-2023
10-28-2023

Figure D-10

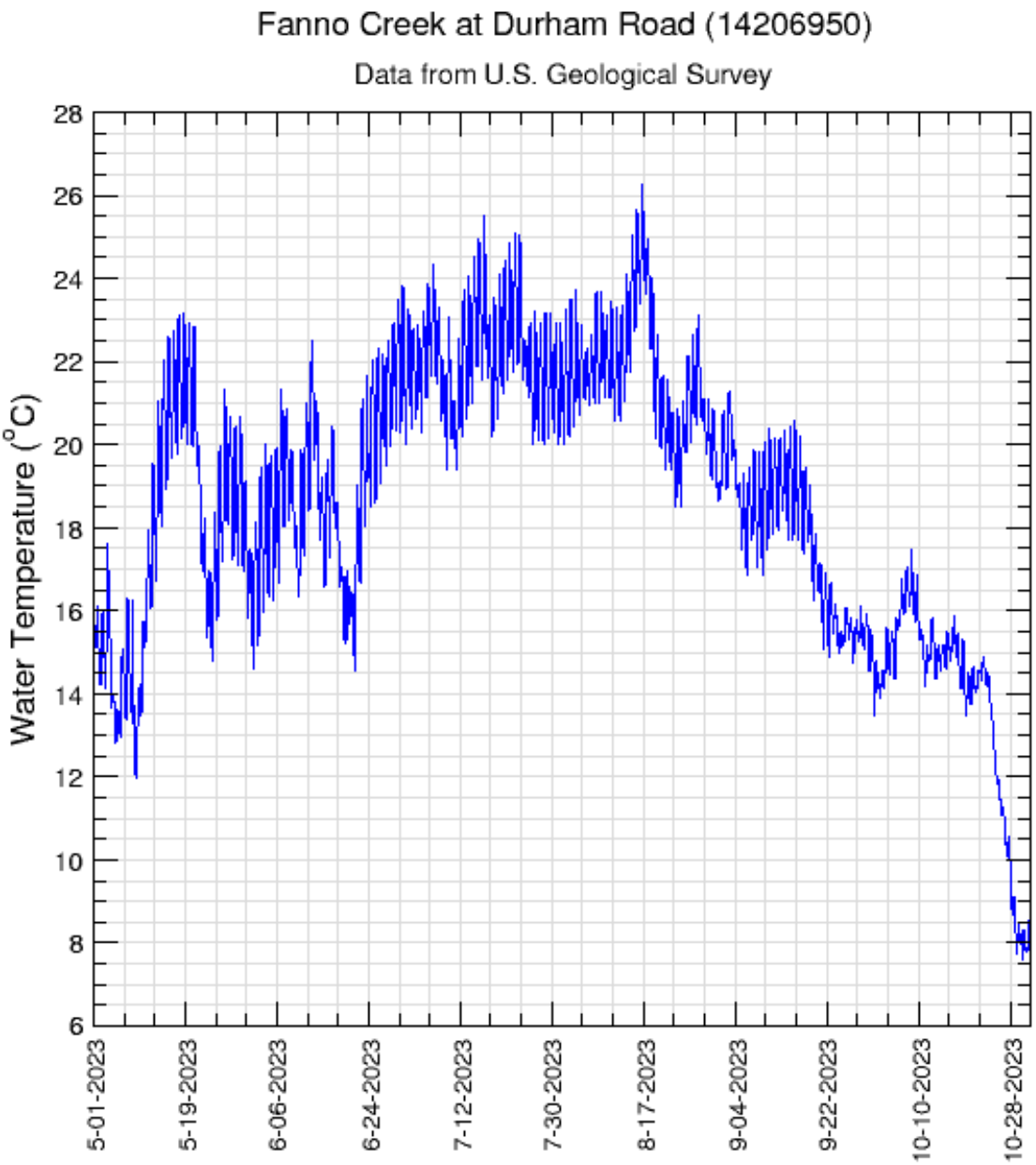

Fanno Creek at Durham Road (14206950)
Data from U.S. Geological Survey
Water Temperature (°C)
28
26
24
22
20
18
16
14
12
10
8
6
5-01-2023
5-19-2023
6-06-2023
6-24-2023
7-12-2023
7-30-2023
8-17-2023
9-04-2023
9-22-2023
10-10-2023
10-28-2023

Figure D-11

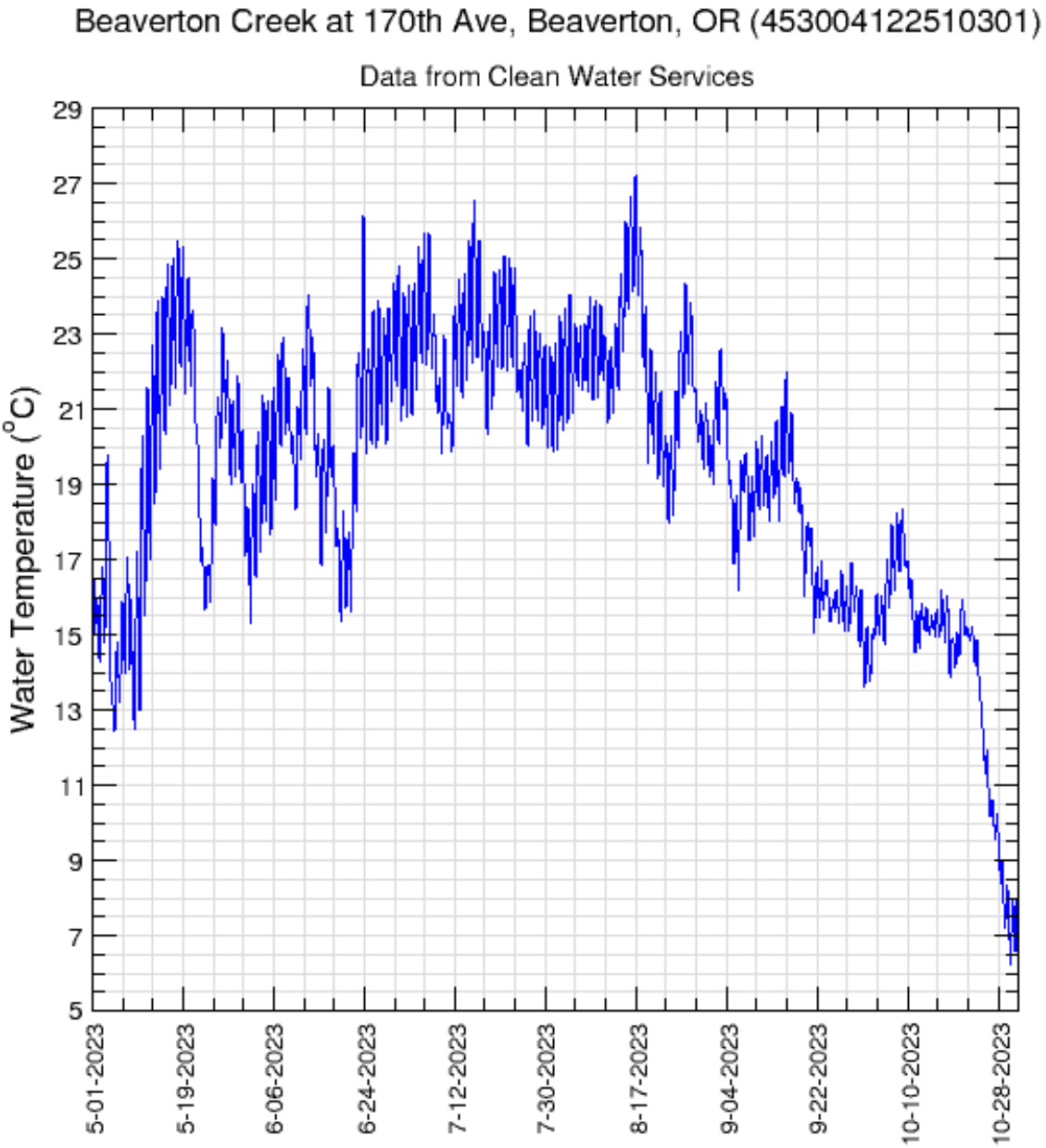

Beaverton Creek at 170th Ave, Beaverton, OR (453004122510301)
Data from Clean Water Services
Water Temperature (°C)
29
27
25
23
21
19
17
15
13
11
9
7
5
5-01-2023
5-19-2023
6-06-2023
6-24-2023
7-12-2023
7-30-2023
8-17-2023
9-04-2023
9-22-2023
10-10-2023
10-28-2023

Figure D-12

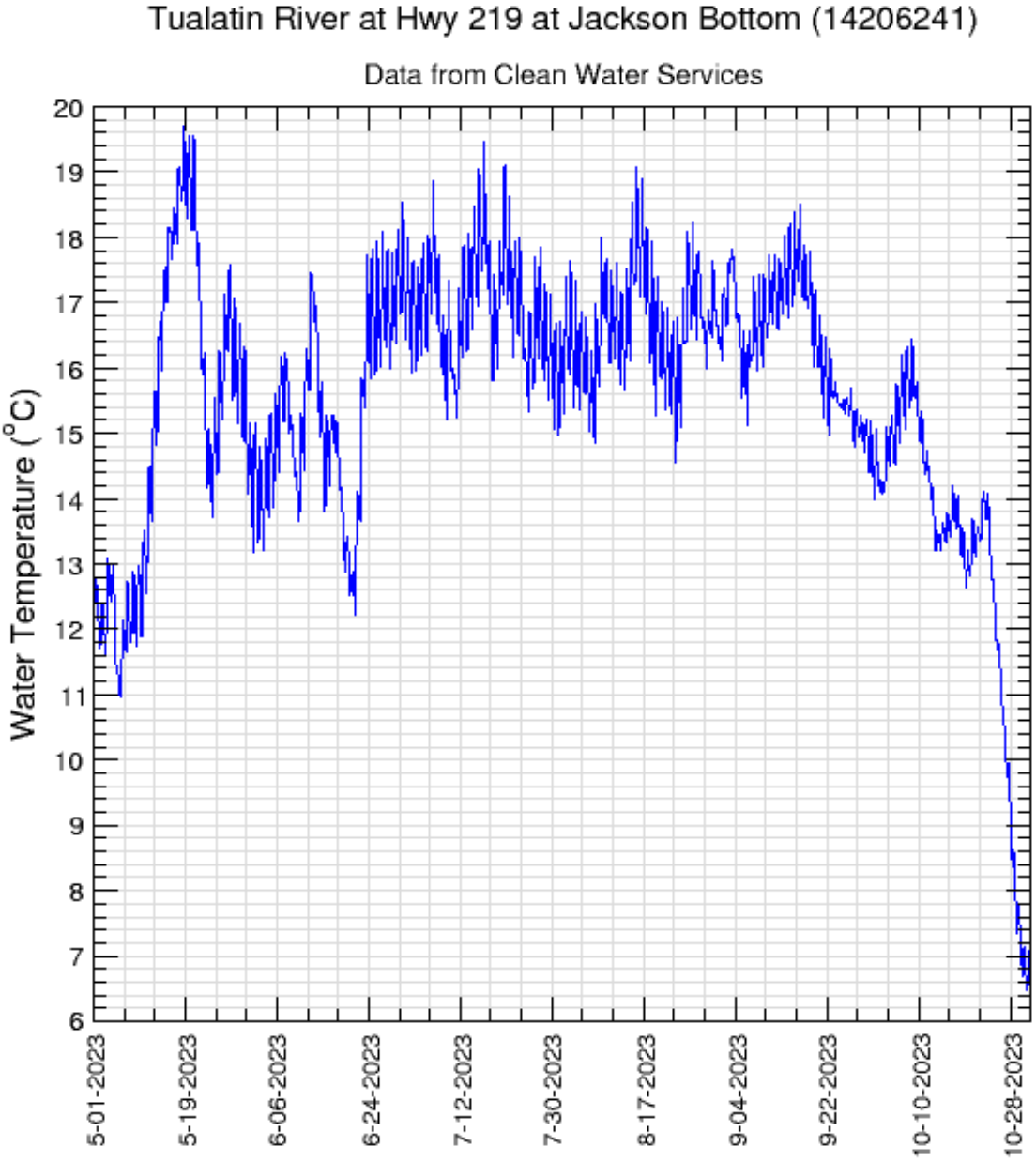
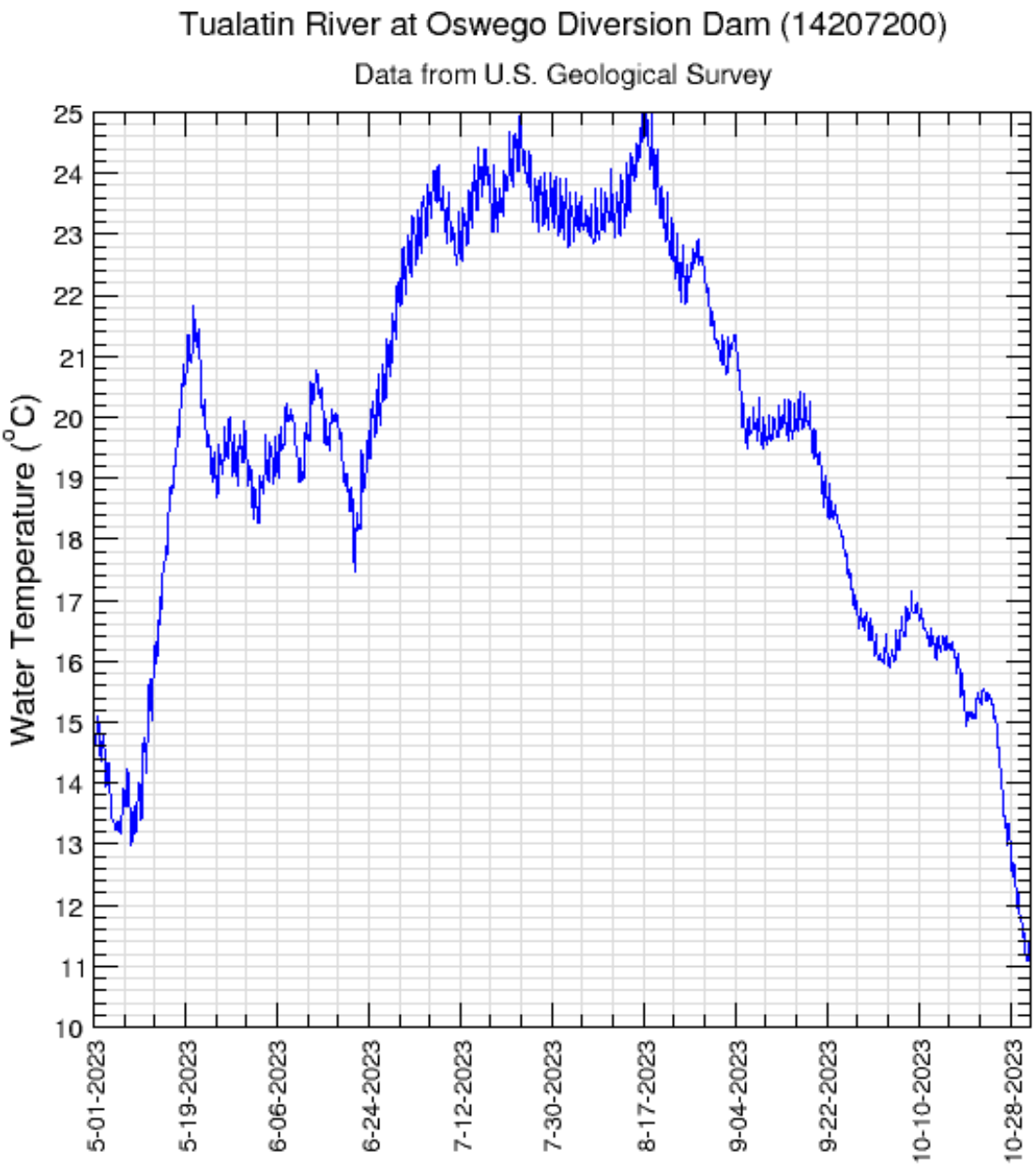

Tualatin River at Hwy 219 at Jackson Bottom (14206241)
Data from Clean Water Services
Water Temperature (°C)
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5-01-2023
5-19-2023
6-06-2023
6-24-2023
7-12-2023
7-30-2023
8-17-2023
9-04-2023
9-22-2023
10-10-2023
10-28-2023

Figure D-13


Tualatin River at Oswego Diversion Dam (14207200)
Data from U.S. Geological Survey
Water Temperature (°C)
25
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
5-01-2023
5-19-2023
6-06-2023
6-24-2023
7-12-2023
7-30-2023
8-17-2023
9-04-2023
9-22-2023
10-10-2023
10-28-2023

Bacteria TMDL

The bacteria TMDL is designed to protect the most sensitive designated use of water contact recreation. This TMDL applies to both the Tualatin River and its tributaries. Unlike the other TMDLs on the Tualatin, it has both a summer and a winter component. The bacteria test used is Standard Methods 9223B (Most Probable Number/100 m/L).

CWS conducts several activities to reduce the bacteria levels in the Tualatin River and its tributaries. At CWS' water resource recovery facilities, the effluent is disinfected before discharge to the river. To reduce the amount of bacteria entering streams via stormwater, CWS employs BMPs designed to help prevent contamination of stormwater by bacteria and other pollutants. These BMPs include addressing and preventing illicit discharges such as cross connections; implementing proper operations and maintenance by detecting cross connections and preventing overflows; and public education and outreach, including education to prevent bacterial contamination from pet and wildlife waste.

CWS has implemented a robust monitoring program to track the concentration of bacteria in the Tualatin River and its tributaries. In addition to collecting data according to the Stormwater Monitoring Plan, CWS is conducting a Microbial Source Tracking (MST) study using the protocol outlined in The California Microbial Source Identification Manual: A Tiered Approach to Identifying Fecal Pollution Sources to Beaches (Griffith, et al. 2013). The monitoring protocol calls for escalating sampling intensity. Figure D-14 displays the data from monitoring locations on the river and on the major tributaries near their confluences with the river.

Figure D-14: E.coli Concentrations in Ambient Monitoring Sites

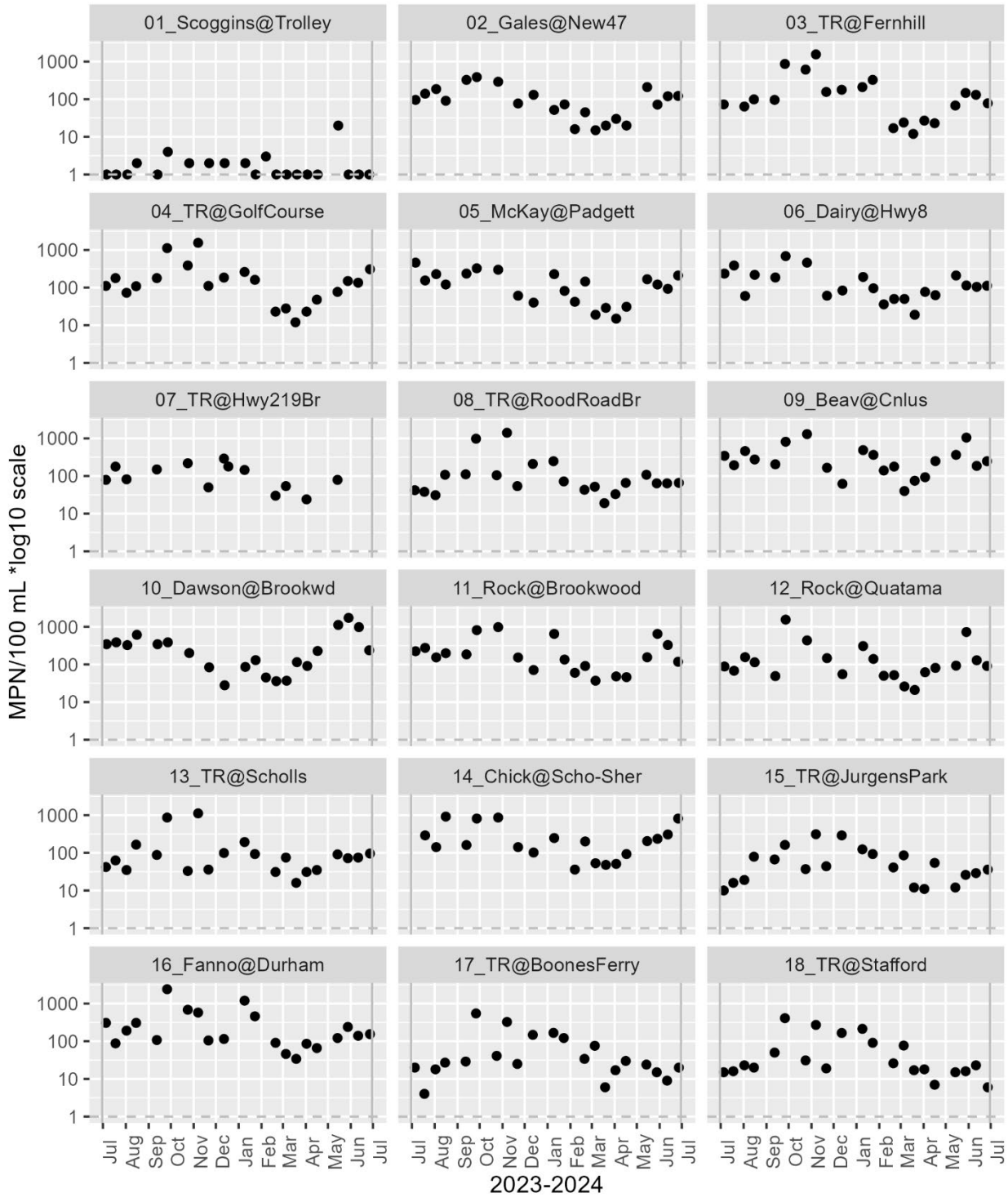


Table D-2 presents monitoring locations in the Tualatin River and the corresponding river miles.

Table D-2: Tualatin Basin Sample Locations		
ID	*Location*	*River Mile**
01	Scoggins Creek below Hagg Lake at Trolley	
02	Gales Creek at New Highway 47	
03	Tualatin River at Fernhill Road	56.9
04	Tualatin River at Golf Course Road	52.8
05	McKay Creek at Padgett Rd	
06	Dairy Creek at Highway 8	
07	Tualatin River at Hwy 219 Bridge	45.0
08	Tualatin River at Rood Bridge Road	39.1
09	Beaverton Creek at Cornelius near Orenco	
10	Dawson Creek at Brookwood	
11	Rock Creek at Brookwood	
12	Rock Creek at Quatama	
13	Tualatin River at Hwy 210 Bridge	27.1
14	Chicken Creek on Scholls-Sherwood	
15	Tualatin River at Jurgens Park	10.6
16	Fanno Creek at Durham	
17	Tualatin River at Boones Ferry Road	8.7
18	Tualatin River at Stafford Road	5.0

*River miles are shown for the Tualatin River only

Willamette Basin Mercury TMDL Annual Report (Schedule D.14.c.iii)

This annual report documents the continued implementation of BMPs and other actions that CWS is implementing to decrease sediment as a surrogate for mercury.

On February 4, 2021, the EPA issued a Willamette Basin mercury TMDL, which notes that the primary source of mercury in the basin is from atmospheric deposition. The mercury in the air originates from national and global sources. Once it's deposited on the landscape, the major pathways to streams are erosion of sediment-bound mercury and surface runoff. The TMDL notes that management practices on various land uses (forestry, agriculture, and urban) influence the amount of mercury that reaches streams and rivers in the Willamette Basin.

The TMDL includes measures that are to be undertaken by point source discharges and nonpoint sources to reduce mercury levels. TMDL provisions for point source discharges will be implemented through the NPDES permit. On March 3, 2021, DEQ notified Designated Management Agencies (DMAs), including CWS and the cities in Washington County, of their obligations under the TMDL. DMAs were required to submit a TMDL implementation plan by September 3, 2022. CWS developed and submitted the Willamette Basin Mercury TMDL Implementation Plan on behalf of itself and the co-implementers in 2022. The Willamette Basin Mercury TMDL Implementation Plan is a single, comprehensive TMDL implementation plan and includes the cities as co-implementers. The scope of the TMDL implementation plan includes the work being done in the MS4 program and in natural areas in the Tualatin River watershed. The TMDL implementation plan is discussed further in the Willamette Basin Mercury TMDL: Mercury Minimization Assessment, submitted separately alongside the 2024 Stormwater Annual Report.

CWS has a history of implementing mercury reduction activities dating to the early 2000s. More recently, CWS developed a Mercury Minimization Plan (MMP) in 2015 and updated it in 2021. The MMP identifies programs and activities that CWS implements to reduce the levels of mercury conveyed to the water resource recovery facilities. Key elements of CWS' MMP include screening significant industrial users for mercury; requiring specific industrial users to develop mercury minimization plans; implementing a dental amalgam program to control mercury discharges from dental offices; and targeting outreach to medical establishments, schools, and commercial laboratories. Actions taken to implement the MMP are documented in the CWS Pretreatment Annual Report.

CWS and the co-implementers conduct a comprehensive stormwater management program in urban Washington County. The best management practices implemented by CWS and the co-implementers are effective in reducing sediment discharges to receiving streams. Since the major pathway of mercury delivery to streams is through erosion of sediment-bound mercury and surface runoff, these best management practices are also effective at reducing mercury discharges. Best management practices and programs that are effective at reducing sediment discharges — and thereby mercury — include the illicit discharge detection and elimination program, industrial and commercial facilities stormwater programs, construction site runoff control, public education and outreach, post-construction site runoff and retrofit programs, pollution prevention for municipal operations, and stormwater management facilities operation and maintenance activities. Actions taken to implement these best management practices and programs are documented in this Stormwater Annual Report.

CWS implements an extensive mercury monitoring program. Figure D-15 presents total mercury at five MS4 sampling sites based on data from 2017-2024. Figure D-16 presents total mercury at 16 ambient sampling sites based on data from 2017-2024. The elevated February 2017 total mercury result at the Gales Creek ambient sampling location coincided with a winter storm resulting in high streamflows and correlated with an elevated TSS concentration at that site. CWS has instituted paired sampling for total and dissolved mercury with total suspended soilds. Mercury and TSS data from the stormwater and ambient monitoring sites are submitted electronically with the Stormwater Annual Report.

Figure D-15: Total Mercury Concentrations at MS4 Sampling Locations

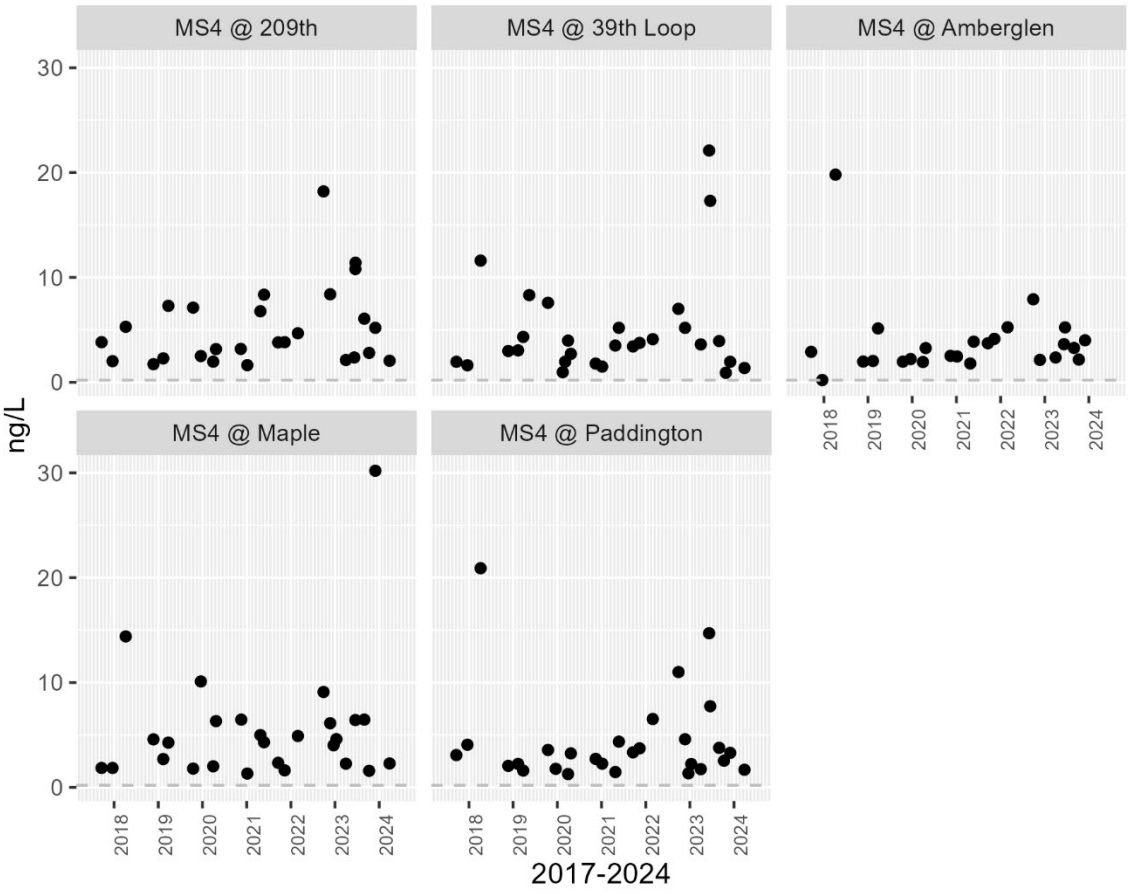
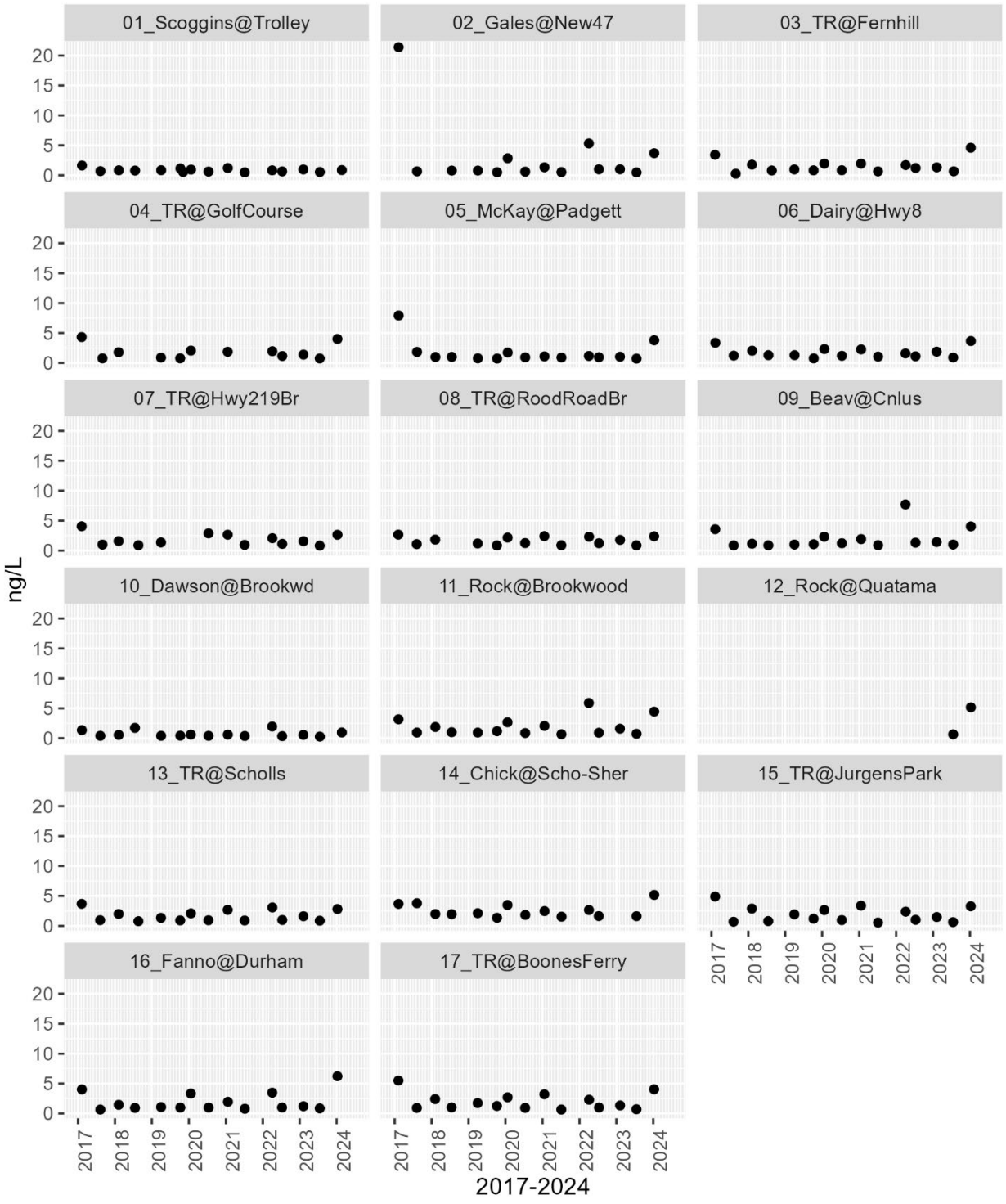


Figure D-16: Total Mercury Concentrations at Ambient Sampling Locations



Appendix E: Planning and Land Use Changes

CWS is responsible for providing sanitary sewer service and stormwater management throughout urban Washington County. CWS meets these responsibilities by, among other things, reviewing and issuing permits for construction and modification of, or connection to, the public sanitary and stormwater management systems and for erosion control.

The co-implementers other than CWS are responsible for adopting local land use regulations that implement statewide planning and land use goals to protect water quality and fish and wildlife habitat. Land use planning is the responsibility of Metro, an elected regional government serving more than 1.5 million residents in Clackamas, Multnomah, and Washington counties. By working in partnership with Metro, Clackamas, Multnomah, and Washington counties, CWS can anticipate where growth may or may not occur under existing plans. CWS and the co-implementers coordinate their water quality, quantity, and habitat management efforts via intergovernmental agreements and day-to-day cooperation. CWS is currently working with the co-implementers to update the intergovernmental agreements by November 1, 2026.

Work on several ongoing concept plans aimed at planning development patterns either was continued or completed as noted in Table E-1. Figure E-1 shows CWS' service area with the applicable zoning.

Table E-1: Co-Implementer Long-Range Planning Activities for Expansion Areas

Lead Co-Implementer	*Referenced Plan*	*Status*	*Plan Type / UGB Status*
Sherwood	Sherwood West	▪ Updating previous concept plan. ▪ The concept plan was completed and submitted to Metro for consideration during the reporting year. Metro will make its final decision regarding expansion in Dec 2024.	▪ Concept / Outside UGB
Tigard	River Terrace South and West	▪ The city worked to secure funding and consultant services for the next planning phase. ▪ CWS continues to provide planning support for sanitary sewer and stormwater for the area.	▪ Concept to comprehensive / Inside UGB
King City	Kingston Terrace Master Plan	▪ The master plan was adopted by council after the reporting year ended in July 2023. ▪ The first series of annexations and land-use applications occurred during the reporting year. ▪ CWS is providing planning services and support for sanitary sewer and stormwater for the area.	▪ Comprehensive planning / Inside UGB
Beaverton	Cooper Mountain	▪ The city continued its planning efforts, focusing on utility services and natural resource protection. ▪ Planning is expected to be completed in the next reporting year. ▪ CWS continues to provide planning support related to resilient streams.	▪ Comprehensive & master utility planning / Inside UGB

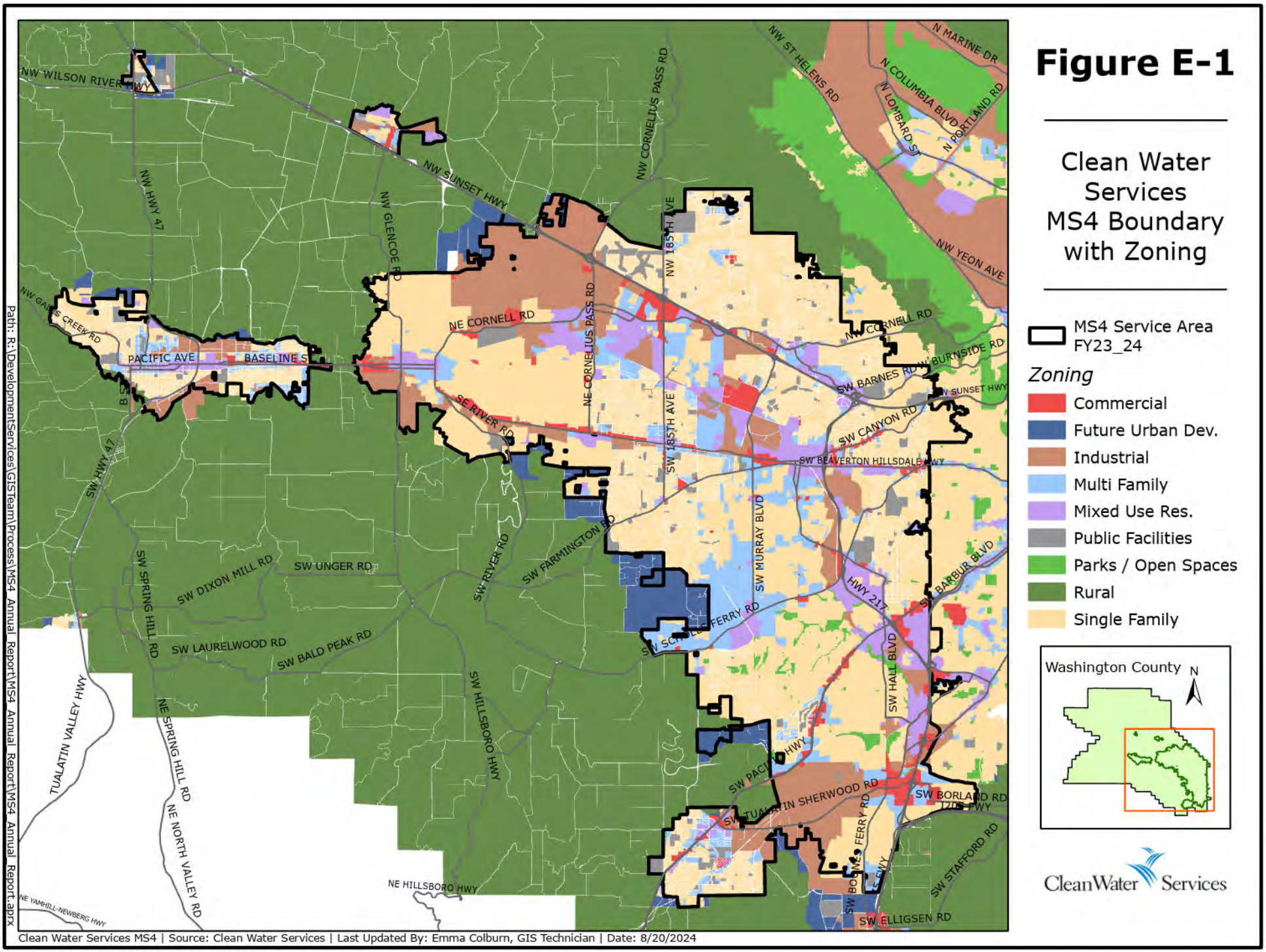
No other significant land use changes or expansion of the Urban Growth Boundary occurred during this reporting period. Figure E-2 shows CWS' service area with urban reserves. Figure E-3 shows properties annexed to CWS and deannexed in Fiscal Year 2023-2024.

A number of areas were annexed to the CWS service area from within the Urban Growth Boundary. These are now served by the urban sanitary sewer and stormwater management system. Details are provided in Table E-2 and in Figure E-3.

Table E-2: Details of Clean Water Services Annexations

Metro Proposal Number	*Location*	*Annexation Date*	*Area Annexed, acres*
WA4023	The property is west of SW 150th Avenue and south of SW Huntwood Street.	9/19/2023	4.9
WA4123	The property is west of SW 175th Avenue and south of SW Cooper Mountain Lane.	10/16/2023	27.8
WA4623	The properties are west of NW Sewell Road, east of NW 273rd Avenue, and north of Evergreen Road.	12/1/2023	25.3
WA0224	The property is east of NW Martin Road and north of 24th Avenue.	1/8/2024	17.2
WA0424	The public right of way on south Webb Road.	3/19/2024	0.45
WA0724	The properties are east of SW Roy Rogers Road and south of SW Beef Bend Road.	3/26/2024	215.9
Total			**291.55**

In Fiscal Year 2023-2024, there were no deannexations from the CWS service area. Details are provided in Figure E-3.



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Clean Water Services MS4 | Source: Clean Water Services | Last Updated By: Emma Colburn, GIS Technician | Date: 8/20/2024

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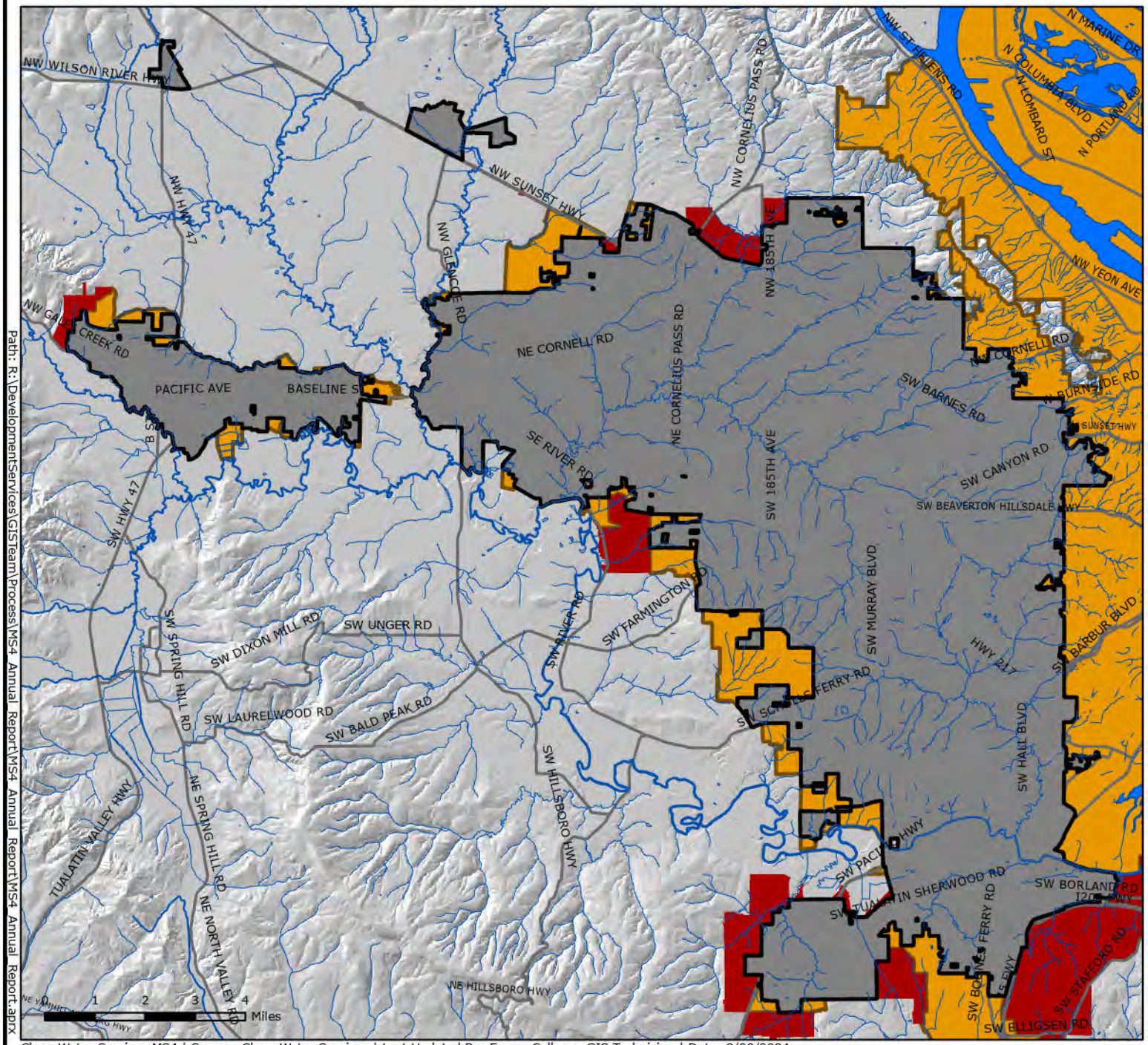

Figure E-2

Clean Water Services
MS4 Boundary
Urban Reserves
UGB Expansion

- Urban Reserves
- Current UGB End of Reporting Period
- MS4 Service Area FY23_24

Note: Areas that are not within the CWS MS4 Service boundary but are within the UGB boundary are areas yet to be annexed into CWS Service area.

Clean Water Services

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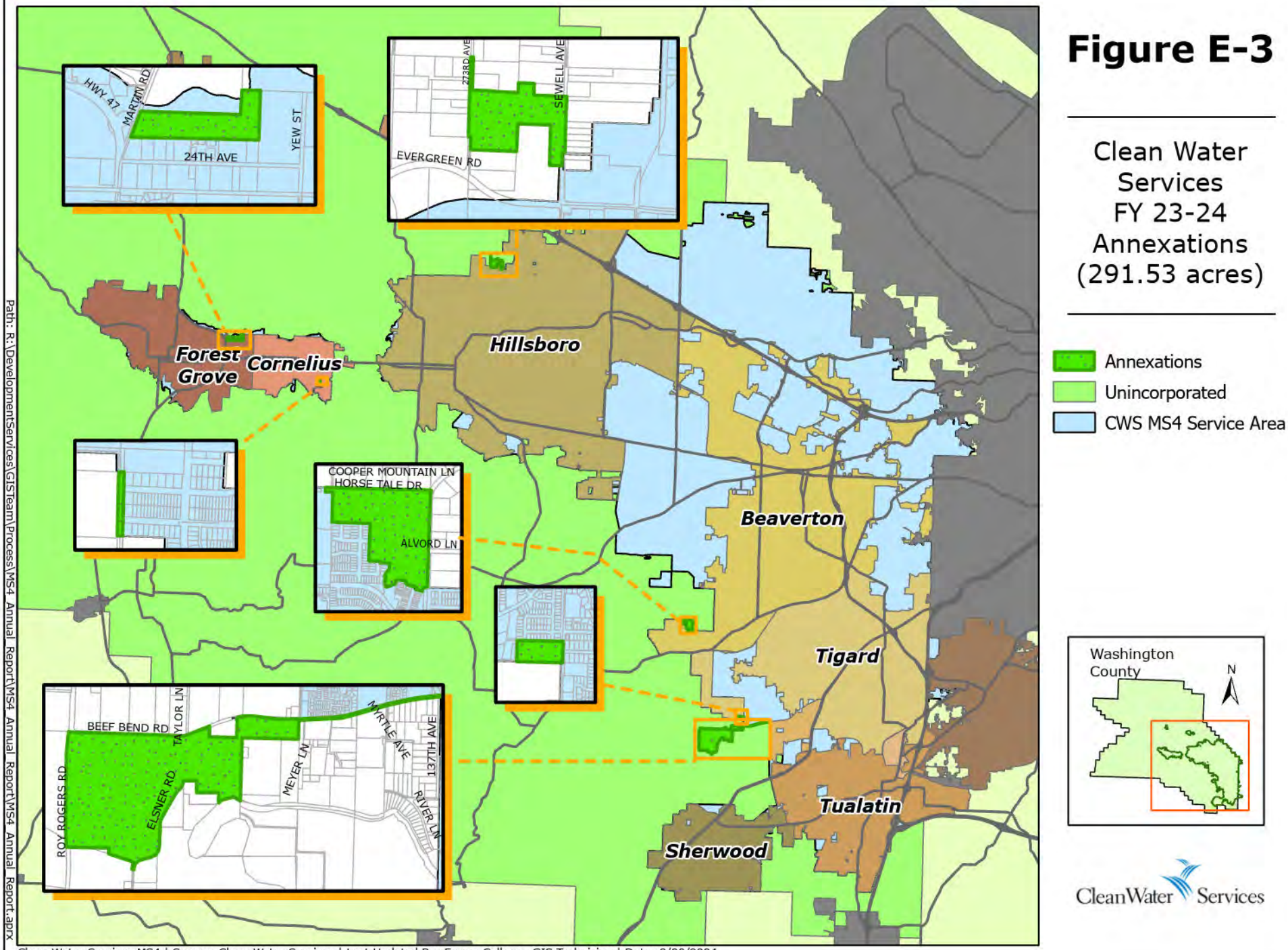
Figure E-3
Clean Water Services FY 23-24 Annexations (291.53 acres)
Annexations
Unincorporated
CWS MS4 Service Area
Washington County
N
Clean Water Services
Hillsboro
Forest Grove
Cornelius
Beaverton
Tigard
Tualatin
Sherwood
HWY 47
MARTIN RD
24TH AVE
YEW ST
EVERGREEN RD
273RD AVE
SEWELL AVE
COOPER MOUNTAIN LN
HORSE TALE DR
ALVORD LN
BEEF BEND RD
TAYLOR LN
ROY ROGERS RD
ELSNER RD
MEYER LN
MYRTLE AVE
137TH AVE
RIVER LN
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Clean Water Services MS4 | Source: Clean Water Services | Last Updated By: Emma Colburn, GIS Technician | Date: 8/20/2024

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