CLACKAMAS
WATER ENVIRONMENT SERVICES

GREGORY L. GEIST | DIRECTOR

Water Quality Protection
Surface Water Management
Wastewater Collection & Treatment

December 1, 2024

Pablo Martos
MS4 Program Coordinator and Senior MS4 Permit Writer
Oregon Department of Environmental Quality
700 NE Multnomah St. Ste 600
Portland, OR 97232
PabloMartos@deq.oregon.gov

RE: **Clackamas Water Environment Services, Clackamas County, and the Cities of Happy Valley and Rivergrove NPDES MS4 Permit 2023-24 Annual Report and Permit Compliance Documents Due December 1, 2024**

Dear Mr. Martos:

Here is the 2023-24 MS4 Annual Report for WES, Clackamas County, and the Cities of Happy Valley and Rivergrove as required by our NPDES Municipal Separate Storm Sewer System Discharge Permit.

This is the document of record. A hardcopy is forthcoming.

Also included, as appendices, are several permit-compliance documents due December 1 of this year. They are:

- Appendix B: LID/GI Barriers Evaluation
- Appendix C: NSRR Equivalency Evaluation

For your convenience, we have also forwarded an electronic copy to Andrea Matzke, Lower Willamette Basin Coordinator/Watersheds Team Lead.

We look forward to your comments. Please call if you have any questions or need additional information at (503) 742-4581.

Best regards,

Ronald E Wierenga

Ron Wierenga
Deputy Director
Clackamas Water Environment Services

Cc: Greg Geist, Director, Clackamas Water Environment Services
Dan Johnson, Director, Dept. of Transportation and Development
Jason Tuck, City Manager, City of Happy Valley
Analeis Weidlich, City Manager, City of Rivergrove
Andrea Matzke, Lower Willamette Basin Coordinator/Watersheds Team Lead

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NPDES MS4 PERMIT

ANNUAL REPORT

JULY 1, 2023, THOUGH JUNE 30, 2024

For Clackamas County, Water Environment Services, and the Cities of Happy Valley and Rivergrove

December 1, 2024

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December 1, 2024

Water Environment Services, Clackamas County, and the Cities of Happy Valley and Rivergrove

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) PHASE I PERMIT No. 101348

We, the undersigned, hereby submit this National Pollutant Discharge Elimination System (NPDES) Municipal Stormwater System Annual Report in accordance with NPDES Permit Number 101348. We certify under penalty of law that this document and all attachments were prepared under our direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on our inquiry of the person, or persons, who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of our knowledge and belief, true, accurate and complete. We are aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Greg Geist Greg Geist (Nov 26, 2024 13:15 PST)	Nov 26, 2024	Dan Johnson Dan Johnson (Nov 26, 2024 15:17 PST)	Nov 26, 2024
Gregory L. Geist, Director Water Environment Services	Date	Dan Johnson, Director Clackamas County Dept. of Transportation and Development	Date
Jason Tuck Jason Tuck (Nov 27, 2024 08:23 PST)	Nov 27, 2024	Analeis Weidlich Analeis Weidlich (Nov 27, 2024 09:26 PST)	Nov 27, 2024
Jason Tuck, City Manager City of Happy Valley	Date	Analeis Weidlich, City Manager City of Rivergrove	Date

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Section 1 MS4 Permit requirements for annual reporting

This annual report summarizes MS4 Permit program implementation activities that Water Environment Services (WES), Clackamas County, and the Cities of Rivergrove and Happy Valley conducted from July 1, 2023, to June 30, 2024, under the 2022 Stormwater Management Program document approved by DEQ in February 2023.

WES is a municipal partnership formed under ORS 190 by Clackamas County Service District No. 1 (CCSD#1), the Surface Water Management Agency of Clackamas County (SWMACC) and the Tri-City Service District – all governed by the Board of County Commissioners serving as a legally distinct entity from Clackamas County. WES administers MS4 activities within its service area as defined by the underlying boundaries of SWMACC and CCSD#1. On July 1, 2017, SWMACC transferred its assets and permit obligations to WES. CCSD#1 joined the municipal partnership on July 1, 2018.

WES works closely within its service area with Clackamas County; Clackamas County's Department of Transportation and Development (DTD) represents Clackamas County in its capacity as a MS4 Permit Co-Permittee.

The Compliance Evaluation required in the 2021-2026 MS4 Permit's Schedule B(2) was conducted and our progress was evaluated in implementing Stormwater Management Program (SWMP) control measures in Schedule A, and additional requirements in Schedules B and D. This annual report is the product of this evaluation.

Table 1 includes submittal requirements for the 2023-24 MS4 Permit annual report in accordance with Schedule B.3 and the location in this document with the applicable program implementation information and data.

Table 1: MS4 Permit Annual Report Requirement Locations in Document

Summary of Schedule B(3) Requirements for 2023-24	Section Where Annual Report Requirement is Met:
a. Status of implementing the stormwater management program and each control measure program element in Schedule A.3 including progress in meeting measurable goals and program tracking and assessment metrics identified in the SWMP as well as additional annual reporting requirements identified in each section, or, prior to DEQ's SWMP approval, measurable goals and tracking metrics approved under the previous permit's approved stormwater management plan.	Section 1.1

Summary of Schedule B(3) Requirements for 2023-24	Section Where Annual Report Requirement is Met:
b. Summary of adaptive management implementation and changes or updates to programs made during the reporting year, including rationales for any proposed changes to the stormwater management program (e.g., new BMPs), and review new and historical monitoring data. Include discussion of the implications of or any findings related to recent years' adaptive management and/or changes made to the SWMP, based on data from tracking measures, measurable goals, and/or any monitoring relating to the change.	Section 1.2
c. Any proposed changes to SWMP program elements designed to reduce TMDL pollutants	Section 1.3
d. Summary of education & outreach and public involvement activities, progress toward or achievement of measurable goals, and any relevant assessment of those activities. This should include planned adaptive management or other program enhancements to occur in the following years.	Section 1.4
e. Summary describing the number and nature of enforcement actions, inspections, and public education programs, including the results of ongoing field screening and follow-up activities related to illicit discharges.	Section 1.5
f. List of entities referred to DEQ for possible 1200-Z NPDES general permit coverage based on co-permittee screening activities, a list of categories of facilities inspected, and an overview of the results of inspections of commercial and industrial facilities.	Section 1.6
g. Summary of total stormwater program expenditures and funding sources over the reporting fiscal year, and those anticipated in the next fiscal year.	Section 1.7
h. Summary of monitoring program results, including monitoring data that are accumulated throughout the reporting year submitted in the DEQ-approved Submission Template, and any assessments or evaluations of that data completed by the co-permittees or an authorized third party.	Section 1.8
i. Any proposed modifications to the monitoring plan that are necessary to ensure that adequate data and information are collected to conduct stormwater program assessments.	Section 1.9
j. An overview, as it relates to MS4 discharges, of concept planning, land use changes and new development activities (including the number of new post-construction permit issues) that occurred in	Section 1.10

Summary of Schedule B(3) Requirements for 2023-24		Section Where Annual Report Requirement is Met:
	the Urban Growth Boundary (UGB) expansion areas during the reporting year, and those forecast for the following year, where such data is available.	
k.	Details of all corrective actions implemented associated with Schedule A.1.b.iii (for instream WQ exceedances) during the reporting year.	Section 1.11
l.	Compliance with annual reporting requirements found in the following sections:	Section 1.12
	• Schedule A.3.c.vii – Illicit Discharge Detection and Elimination	1.12.a
	• Schedule A.3.d.vii – Construction Site Runoff Control	1.12.b
	• Schedule A.3.e.viii – Post-Construction Site Runoff Program	1.12.c
	• Schedule A.3.f.v.c – Winter Maintenance	1.12.d
	• Schedule A.3.h.i – Hydro-modification Assessment and Stormwater Retrofit Strategy Updates	1.12.e
	• Schedule D.3.b – Mercury Minimization Assessment	1.12.f

1.1 Schedule B.3.a. -- Status of implementing the stormwater management program and each control measure program element in Schedule A.3 including progress in meeting measurable goals and program tracking and assessment metrics identified in the SWMP Document as well as additional annual reporting requirements identified in each section, or, prior to DEQ's SWMP Document approval, measurable goals and tracking metrics approved under the previous permit's approved stormwater management plans.

Water Environment Services, Clackamas County, the City of Happy Valley, and the City of Rivergrove are submitting this annual report to comply with the current NPDES MS4 Phase I Individual Permit issued to them, which has been in effect since October 1, 2021.

On Feb. 6, 2023, DEQ approved the 2022 Shared MS4 Permit Stormwater Management Program Document (the 2022 Shared SWMP Document), which was originally submitted in 2017. To comply with the 2021 MS4 NPDES Phase I Permit, specifically, Schedule A.2.c (SWMP Document) and Schedule A.3.b (Public Involvement and Participation), the co-permittees updated the SWMP. We resubmitted the SWMP in November 2022 and began implementing the DEQ-approved 2022 Shared SWMP Document in 2023-24.

Appendix A of this annual report presents much of the data and information in this annual report. This appendix includes the Tracking Measures and Measurable Goals status from Best Management Practices (BMPs) in the 2022 Shared SWMP Document.

Appendix B (Prioritization of Low Impact Development / Green Infrastructure Program, Schedule A.3.e.ii.), and Appendix C (Post-Construction Stormwater Management Requirements, Schedule A.3.e.iii) are permit requirements due December 1st.

The remaining appendices, Appendix D (List of RiverHealth Stewardship Program 2023-24 Grant Awards) and Appendix E (List of Trainings to Ensure Staff Implements the 2022 Shared SWMP Document in accordance with the 2021 NPDES MS4 Permit), are also 2022 Shared SWMP Document requirements.

1.2 Schedule B.3.b. -- Summary of adaptive management implementation and changes or updates to programs made during the reporting year, including rationales for any proposed changes to the stormwater management program (e.g., new BMPs), and review new and historical monitoring data. Include discussion of the implications of or any findings related to recent years' adaptive management and/or changes made to the SWMP Document, based on data from tracking measures, measurable goals, and/or any monitoring relating to the change.

Eleven years ago, our October 2012 "Outline for Adaptive Management Approach" reviewed BMP implementation and analyzed environmental monitoring data, and that adaptive management approach guided how we implemented the MS4 Permit Program back then.

Six years later, WES and its co-permittees submitted the Shared MS4 Permit SWMP Document with its MS4 Permit renewal application package in February 2017. During the 2023-24 MS4 permit year, Clackamas County, WES, and the Cities of Rivergrove and Happy Valley implemented the 2022 Shared SWMP Document.

To improve coordination and overall program effectiveness, WES and its co-permittees created the Shared MS4 Permit 2022 Shared SWMP Document (the 2022 Shared SWMP Document). To integrate the three separate 2012 SWMPs into the 2022 Shared SWMP Document, WES led and adopted an extensive adaptive management-based process that fully complies with our 2021 NPDES MS4 Permit.

A substantial number of modifications were made to various BMPs during the process of integrating the three existing SWMPs into the 2022 Shared SWMP Document, which has many BMPs with new, improved measurable goals and tracking measures.

This process included a project kickoff meeting and many workshops and meetings to receive input and direction from attendees, which was subsequently used to determine the depth and breadth of the program described in the 2022 Shared SWMP Document. Attendees at the Workshops and meetings included numerous staff from WES, Clackamas County's DTD and Business and Community Services (BCS), the City of Happy Valley and the City of Rivergrove.

DEQ approved the 2022 Shared SWMP Document in February 2023, and WES and its co-permittees began implementing the 2022 Shared SWMP Document on July 1, 2023.

During the 2023-24 MS4 Permit year, the 2022 Shared SWMP Document was revised into the 2023 Shared SWMP Document – which we began to implement on July 1, 2024. The 2023 Shared SWMP Document is very similar to the 2022 Shared SWMP Document, but differs in some ways, including, but not limited to, the following:

- IDDE-4 ("Dry Weather Illicit Discharge Inspections") was re-written to describe new a system for identifying the priority locations in the MS4 which shall be monitored.
- Comm-1 ("Identify Industrial NPDES Permit Facilities" which is about 1200-Z Permits) was revised. One change which was made clarifies that DEQ doesn't approve or decline the "No Exposure Certification" waiver forms which are submitted to DEQ.
- Comm-2 ("Industrial/Commercial Stormwater Pollutant Prevention) was revised to update the section about the updated inspection and enforcement strategy, which has already been created and submitted to DEQ.
- PREV-7 ("Fire Fighting Training) was revised to clarify that WES will verify once per MS4 Permit term that the sanitary-storm sewer system valve is being used correctly at the Clackamas Fire District #1 Training Center on SE 130th Avenue in Clackamas (97015).

Another example of adaptive management activity which occurred during the 2023-24 MS4 Permit year is for implementation of BMP MAINT-4. In section 4.2, which is titled "Regulated Storm System Inspection and Enforcement" the list of high prioritized sites to inspect changes each year as WES inspects more commercial/industrial sites in the WES SWM service area for the first time. There are many other inspections that we conduct that are identified as low and medium risk sites and are not necessarily a prioritized site. Last reporting year, we inspected 139 sites in total (45 high priority and 94 low/medium) as found in Sec. 1.6 and in the BMPs for Industrial and Commercial Facilities in Appendix A.

1.3 Schedule B.3.c.–- Any proposed changes to SWMP program elements designed to reduce TMDL pollutants

As noted above, the 2022 Shared SWMP Document was approved by DEQ in February 2023 and was subsequently revised in the 2023-24 regulatory year, see section 1.2 of this report. The SWMP itself is designed to reduce the impact of municipal stormwater discharges on receiving waters, including the reduction of pollutants. As a result, most of the changes to SWMP BMPs result reduced pollution. An example of a new element in the 2023 Shared SWMP Document is a revised BMP IDDE-4, titled "Dry Weather Illicit Discharge Inspections". It describes new a system, which began to be implemented on July 1, 2024, for identifying the priority locations in the MS4 which shall be monitored. The BMP's Measurable Goal is to inspect 100 percent of priority locations in the WES SWM Service Area that are identified in the most recent list. If this measurable goal is attained each year for 10 years, then each MS4 storm sewer system will receive one inspection during the 10-year period. If at least several illicit discharges are located and removed from the MS4 during this 10-year period, some of these discharges are expected to contain TMDL pollutants such as mercury and E. coli (both of which are found in sewage, for example).

WES and its partners have implemented the 2023 Shared SWMP since the start of the current permit year 2024-25. There are no proposed changes to the 2023 SWMP document that the co-permittees are currently implementing.

1.4 Schedule B.3.d. -- Summary of education & outreach and public involvement activities, progress toward or achievement of measurable goals, and any relevant assessment of those activities. This should include planned adaptive management or other program enhancements to occur in the following years.

The 2022 Shared SWMP Document has enabled WES and its co-permittees to:

- Assess the public education / involvement portion of our program
- Make improvements to our existing program which are now codified in the 2023 Shared SWMP Document.

See Appendix A for information about progress toward or achievement of measurable goals and tracking measures in 2023-24. Generally speaking, WES and its partners are striving to change behavior to protect the environment in several ways.

First, **WES and our partners are using electronic means to improve education and outreach.** WES continued its effective use of social media and other digital means such as Zoom to provide a wide variety of educational messages for students, customers, and other stakeholders. WES has approximately 30,000 followers Clackamas County has on its Facebook page, nearly 18,700 followers on its Twitter account, approximately 72,000 members on NextDoor, and 4,130 email subscribers for updates via Constant Contact. With its *Clean Water Exchange* initiative, WES gathered insightful information via surveys of customers and other stakeholders to learn about their preferred channels for receiving educational information from WES. Our 2023 Clean Water Exchange Survey sought this and other types of information to strengthen our understanding of what customers and stakeholders value the most.

Secondly, **WES and our partners employed a more precise measuring tool to gauge the effectiveness of its educational messages and articles on social media** and, therefore, on our Public Education and Outreach management strategy. The difference from years past is that we can now report well beyond the name of the article and the size of the net cast on Facebook, NextDoor, and Twitter. Articles addressing certain BMPs (*Alternatives to Pesticide, Herbicides, and Fertilizers* and the *Reporting of Illicit Discharges and Spills and Other Types of Improper Disposal of Materials*) can be measured against three ascending levels of impact when collaborating with the public to protect our rivers and streams. They include:

- Impressions – The number of times public education content addressing those BMPs is displayed to users. In 2023-24, there were 18 social media posts and 43,776 impressions.
- Reach – The total number of unique users who see social media content about those BMPs. During the same period, 43,264 community members read our social media regarding alternatives to chemical use and the reporting of illicit discharges and spills.
- Engagement – This last level of content impact offers insight to the highest form of reader interaction and involvement where the reader engages with the article by

"liking" it, "sharing" it with others, or commenting on the content. That deeper level of engagement occurred 1,210 times in 2023-24.

From Engagement, we learn how effective we have been in reaching our target audiences and garnering support. It reveals adjustments to the delivery of messages and method used that ensure maximum community engagement and support with the goal of keeping our rivers clean now and well into the future; as a result, we can now quantify, measure often and adjust our messages to targeted audiences where we could not before.

Finally, **WES and our partners are implementing our 2022-2025 Communication and Engagement Roadmap (the Roadmap) to guide our education and community engagement over the next two years.** Through carefully constructed actions and clear objectives and by leveraging a variety of communication tools and outreach platforms, the Roadmap connects stakeholders, communities, and people, including multigenerational and underserved audiences, to the work that we provide. Equally important is that the Roadmap tells us where, how, and when to invest our resources.

Four strategic initiatives belonging to the Roadmap has brought about general change. Here are those initiatives:

1. **Developed additional educational materials that are visually engaging, easy-to-understand, and accessible for diverse audiences.** We identified a lack of materials for our youngest audiences and have since developed a Youth Education Activity, which is a poster-sized piece with activities for young children to learn about watershed health. We have distributed these through others' programs (such as the Environmental Learning Center preschool aged program) and at numerous educational or community events. We also co-branded the ACWA IDDE fact sheets with the WES logo and have posted those online and sought out opportunities to distribute them to our customers.
2. **Established innovative partnerships that leverage the strength of the community to achieve shared goals and deliver common messages.** We continue to partner with community groups such as our 4 local watershed councils, schools, SOLVE, and other environmental organizations. For example, we partnered with The Wetlands Conservancy to monitor amphibian egg masses in wetlands near Mt Scott Creek to bring awareness to the value of wetlands and water quality to wildlife. We participated in a new event, Watershed Discovery Day, with the Johnson Creek Watershed Council and other environmental groups and hosted the first event at our Kellogg facility.
3. **Were responsible environmental and fiscal stewards by investing in innovative initiatives** that communicate safe, reliable, and affordable services.
4. **Invested in community-driven solutions and cultivated a generation of diverse watershed leaders.** The Watershed Discovery Day event was aimed at the lower income neighborhoods in our Districts. The second year this was held at Mill Park, in tandem with a cleanup along the Springwater Corridor Trail, located in the Overlook Park neighborhood, in attempt to draw in more students and families in this area.

1.5 Schedule B.3.e. -- Summary describing the number and nature of enforcement actions, inspections, and public education programs, including the results of ongoing field screening and follow-up activities related to illicit discharges.

In Appendix A, see Section 1.4 for more information about our IDDE Public Education work and BMP IDDE-2.1 through IDDE-4.1 for more information about our IDDE program's "ongoing field screening" work.

Table 2: Illicit Discharge Events

Report Date	Inspection Date	Incident Description, including follow-up activity	Enforcement action taken? (Yes or No)
Discharges			
8/1/2023	8/1/2023	County DTD notified WES of concrete waste being discharged onto street and into MS4 from residential home on SE Brightwood Ave near the City of Milwaukie. A site visit was conducted the same day. Written notice was issued to clean up within 24 hours. Clean up was completed 8/2/2023.	Yes, RP did abate illicit discharge
9/18/2023	9/18/2023	WES staff responded to a warehouse fire on SE Otty Rd in an unincorporated area near the City of Happy Valley. Excess fire suppression flows entered nearby catch basins and Phillips Creek. WES staff placed absorbent booms around several catch basins and in creek. OERS #2023-2323. Excess fire suppression flows are not illicit discharges by themselves; other pollutants from the fire may be present in the fire suppression flow.	No
11/1/2023	11/1/2023	WES received a report of a concrete truck accident on SE Sunnyside Rd in Clackamas. The cement truck spilled product near the sidewalk. One public MS4 catch basin was impacted by automotive fluids but did not reach waters of the state. Absorbent booms were deployed to prevent contamination downstream. Environmental service provider performed cleanup as needed.	No
2/9/2024	2/9/2024	WES received a report of a hydraulic line break on garbage truck with a release of one cup of oil into a catch basin located in Clackamas. The impacted catch basin and road was cleaned by responsible party. OERS #2024-0397	No
4/8/2024	4/8/2024	WES staff found evidence of a cross-connection of a house on SE 172nd Ave in Happy Valley discharging to the MS4 and waters of the state. Connected on 7/01/2021. Cross connection discovered on 4/08/2024. Repaired on 4/10/2024. City of Happy	No

Report Date	Inspection Date	Incident Description, including follow-up activity	Enforcement action taken? (Yes or No)
		Valley Building Department was notified. WES staff performed the initial cleaning if the impacted storm system to limit the release. OERS #2024-0865.	
4/22/2024	4/22/2024	WES staff found evidence of a cross-connection of a house on SE Nightingale Ave in Happy Valley. Connected on 7/31/2019. Cross connection discovered on 4/22/2024. Repaired on 4/25/2024. City of Happy Valley Building Department was notified. WES notified the property owner of the plumbing issue. The homeowner worked with the City of Happy Valley and the developer to begin resolving issue. OERS #2024-0968.	No
6/12/2024	6/13/2024	WES received an incident notice that 55-gallons of used cooking oil spilled and entered the public MS4 catch basin on SE Elon St in Clackamas. The responsible party was notified to immediately clean the impacted road, storm system, and vegetated area. Clean up was complete 6/13/2024. A citation of violation was issued to responsible party. OERS #2024-1422.	Yes RP resolved the discharge

1.6 Schedule B.3.f -- A List of entities referred to DEQ for possible 1200-Z NPDES general permit coverage based on co-permittee screening activities, a list of categories of facilities inspected, and an overview of the results of inspections of commercial and industrial facilities.

Screening for possible 1200-Z permit coverage

WES, operating under the two DEQ-approved SWMPs from the previous MS4 permit (2012-2017), screened existing industrial facilities for the possibility to be subject to a 1200-Z Industrial Stormwater permit. As of July 1, 2023, WES is screening existing industrial facilities for possible 1200-Z permit coverage on an annual basis. Additionally, WES staff annually reviews development applications for new industrial sites that may be subject to 1200-Z permit coverage. During the 2023-24 reporting year, WES referred 4 facilities to DEQ for possible 1200-Z permit coverage. They included:

1. Precision Truss & Lumber
2. Universal Recycling Technologies
3. Boydstun Manufacturing
4. Oregon Beverage Recycling Cooperative

Further information on these facilities is available upon request.

Categories Inspected

Categories of industrial and commercial facilities that WES inspected during the 2023-24 reporting year included: Shopping Centers, Business Parks, Industrial Manufacturers, Car Washes, Freight Hubs, Medical Offices, Restaurants, Auto Services, General Commercial/Retail, Recyclers, and Apartment Complexes. In last year's annual report, WES included the updated Industrial Stormwater Screen Strategy, outlining how WES prioritizes facilities for inspection based on risk factors. By June 30, 2024, WES had identified 144 facilities that meet the criteria to be included on the priority list. As WES staff continue inspecting new industrial and commercial facilities in the service area for the first time, the list of prioritized facilities will change.

Overview of Inspection Results

During the 2023-24 reporting year, WES inspected a total of 139 industrial and commercial facilities in the WES service area. WES performed 45 of those inspections at priority industrial and commercial facilities. Of the 45 priority facilities inspected, 23 were found to be in compliance with WES Rules and Regulations and required no further action. In addition to inspecting priority facilities, WES completed 94 inspections at other facilities with privately owned stormwater systems. Of the 94 other facilities inspected, 61 were found to be in compliance with WES Rules and Regulations and required no further action. The facilities that were found not in compliance with WES Rules and Regulations were issued written Notices to Correct and a timeline for required actions. Notices were issued for a range of issues, from routine maintenance of catch basins to extensive restoration of stormwater management ponds and other pollution control structures. Correction periods ranged from 30 days to 24 months for the facility to achieve compliance and avoid further enforcement. Please see COMM-1.1 and COMM-1.2 in Appendix A of this annual report for more information.

1.7 Schedule B.3.g -- Summary of total stormwater program expenditures and funding sources over the reporting fiscal year, and those anticipated in the next fiscal year.

WES, Clackamas County, and the Cities of Happy Valley and Rivergrove dedicated sufficient resources to implement the Stormwater Management Program in 2023-24. WES dedicated over 22,000 employee hours or the equivalent of 12.8 full-time employees (FTEs) to the MS4 Permit program, to our Underground Injection Control WPCF Permit program, to our Willamette/Tualatin TMDL non-point source pollution programs, and to our flooding reduction/drainage improvement programs – all of which make up WES' Surface Water Program.

The City of Happy Valley has four and a half FTEs in the Public Works Department who, in part, perform MS4 duties and three FTEs in the Engineering Division. In addition, WES is the service provider in the City of Rivergrove and, as a result, the City dedicates a sufficient but limited amount of staff time to implement the MS4 SWMP; therefore, Rivergrove's expenditures are not worth tracking or reporting in this section.

WES' Operating and Construction Funds and Stormwater System Development Charge Fund resources, including Fund Balances, budgeted in the recent past, during the reporting period and in the current fiscal year, are in Table 2.

Table 3: Stormwater Resources and Requirements for WES

WES	2021-22 Actual	2022-23 Actual	2023-24 Amended Budget	2023-24 Estimate[1]	2024-25 Adopted
Resources	24,312,086	25,154,022	27,327,841	27,612,617	30,303,989
Materials & Services	4,694,975	4,508,085	5,908,081	4,714,628	6,121,400
Capital Outlay	755,936	1,264,390	2,333,400	1,057,540	4,359,500
Transfers	3,000,000	2,132,500	2,000,000	2,000,000	2,082,600
Contingency			2,151,700	0	2,109,875
Ending Fund Balance	15,861,175	17,249,047	14,934,660	19,840,449	15,630,614
Total Requirements	24,312,086	25,154,022	27,327,841	27,612,617	30,303,989

[1] "Estimated" year-end expenditures are not shown as "Actual" until the fiscal year closes.

Annual funding for the Stormwater Management Program for WES in FY 2023-24 came from four sources (unaudited numbers):

Monthly Stormwater Utility Fees	$ 6,049,517
Maintenance Fees, paid Monthly	$ 390,736
Systems Development Charges (SDCs)	$ 150,481
Stormwater and Erosion Control Permit Fees	$ 272,512

In 2023-24, customers in the North Clackamas unit of Rate Zone 2 (CCSD#1) paid a monthly program fee of $8.65 per Equivalent Service Unit (ESU) and customers in Rate Zone 3 (SWMACC) paid a monthly fee of $5.20 per ESU. An ESU is a single-family residence or 2,500 square feet of impervious surface for nonresidential customers. Fees were increased to $9.10 per ESU in Rate Zone 2 and $5.45 per ESU in Rate Zone 3, respectively, soon after this reporting period ended on June 30, 2024.

Most newly constructed single-family residential properties in Rate Zone 2, since 1998, also paid a monthly maintenance agreement fee of $3.00 per ESU which is dedicated for maintenance of local subdivision stormwater conveyance, detention and retention, treatment, and infiltration facilities.

WES collects System Development Charges from new development and dedicates those revenues to planning, design, and construction of additional stormwater infrastructure capacity needed to accommodate growth. The current SDC rate is $240 per Equivalent Dwelling Unit and that rate increased to $246.50 soon after this reporting period ended on June 30, 2024.

Clackamas County Department of Transportation and Development

The primary funding source for DTD activities related to this permit is the Clackamas County Road Fund. Most of the County's road system is outside the Urban Growth Boundary. None of the budget expenses include overhead charges or projections. Total program expense exceeds budgeted expense as materials and equipment capitalized in previous years are expended in implementation of the activity.

Table 4: DTD's Program Expenditures and Funding Sources for MS4 Permit

Program	2023-24 Total Expenditures[1]	2023-24 Expenditures within the MS4 Permit Area[2]	2024-25 Anticipated Expenditures within the MS4 Permitted Area[3]
Storm Sewers	$499,711	$102,783	$105,866
Ditch Maintenance	$249,048	$17,765	$18,298
Hydroseeding	$2,780	$0	$0
Street Sweeping	$350,351	$246,868	$254,274
Water Quality Facilities	$0	$0	$0
Grand Total	**$1,101,890**	**$367,416**	**$378,438**

Source: Clackamas County Road Fund, Updated 10/27/2024

[1] Data source is the DTD Job Cost System and does not include overhead charges.

[2] Derived from the DTD Job Cost System and Clackamas County's MS4 Permitted Area boundary in ArcGIS. It does not include overhead charges.

[3] 3% increase added to 2023-24 expenditures in MS4 Permitted Area.

Explanation of DTD's MS4 Activity:

- Storm Sewers: maintenance and cleaning of catch basins and storm systems.
- Ditch Maintenance: maintenance and erosion control of roadside ditches.
- Street Sweeping: preventative maintenance sweeping of curbed streets to improve water quality.
- Hydroseeding: planting of seed and mulch on road shoulder for erosion control.
- Water Quality Facilities: maintenance of water quality facilities such as detention ponds, rain gardens, and swales.

City of Happy Valley

MS4 Permit Program Funding Sources:

- **Permit fees for development** of land (plan review and inspection) are based upon the construction value of the project. In 2023-24, the City generated $458,654 in fees from 16 land development permits. Only a portion of these fees were spent on the implementation of the MS4 Permit Program.

- Eleven Engineering **Erosion Control Permits** yielded $15,790 in revenue in 2023-24. The City expects to receive a range from $15,000 to $20,000 in Erosion Control Permit revenue in 2024-25. The $15,790 of MS4 permit program revenue is in addition to the land development permit fees of $458,654.
- The Building Division collected $79,200 in Erosion Control Permit fees to cover the cost of their erosion control inspections for 198 building permits.
- $137,280 from the **Streets Maintenance** portion of the budget for street sweeping. Street sweeping is also conducted to improve road safety and for aesthetic reasons. An undefined portion of the $137,280 was spent to improve stormwater quality.
- Approximately $6,470 from the City of Happy Valley's **General Operating Budget** was spent by the City of Happy Valley during 2023-24 to administer the overall MS4 Permit Program (e.g., attendance at monthly Watershed Protection Program meetings, compiling data for this annual report). The City of Happy Valley expects to dedicate a similar amount of money from this portion of this budget during 2024-25 for administration of the overall MS4 Permit Program.

MS4 Permit Program Expenditures:

- **Street Sweeping Program:** The City of Happy Valley spent $137,280 on their street sweeping program in 2023-24. The City expects to spend a similar amount of money on street sweeping in 2024-25.
- **Erosion Control Program**: The City of Happy Valley funds this Program with Erosion Control Permit fee revenue. The City spent approximately $95,000 to administer this program in 2023-24 and the City expects to spend a similar amount in 2024-25.
- **MS4 Permit Program Administration:** The City of Happy Valley spent approximately $6,470 in 2023-24 to administer the overall MS4 Permit Program (e.g., attendance at monthly Watershed Protection Program meetings and compiling data for this annual report). The City of Happy Valley expects to spend a similar amount of money during 2024-25 for administration of the overall MS4 Permit Program.

1.8 Schedule B.3.h. -- Summary of monitoring program results, including monitoring data that are accumulated throughout the reporting year submitted in the DEQ-approved Data Submission Template, and any assessments or evaluations of that data completed by the co-permittees or an authorized third party.

The co-permittees' MS4 Permit program 2023-2024 creek water quality and stormwater quality data was submitted to DEQ on the approved template in November 2024 by email using this website:
https://www.oregon.gov/deq/wq/wqpermits/Pages/MS4submission.aspx#formMessage
No assessments or evaluations of these results were conducted in 2023-24.

1.9 Schedule B.3.i. -- Any proposed modifications to the monitoring plan that are necessary to ensure that adequate data and information are collected to conduct stormwater program assessments

No additional modifications to the monitoring plan are proposed. WES, on behalf of Clackamas County, and the Cities of Rivergrove and Happy Valley, implements a combined DEQ-approved Comprehensive Clackamas County NPDES MS4 Stormwater Monitoring Plan (Monitoring Plan). Other co-implementers of this Monitoring Plan include, but are not limited to, the Cities of Milwaukie and Oregon City. This Monitoring Plan was revised most recently in May 2023 and was implemented on July 1, 2023 and continues to be implemented at this time. The Monitoring Plan was revised in order to comply with numerous new requirements in the 2021-2026 MS4 Permit, which was modified by DEQ in May 2023 to include new pesticide monitoring requirements in stormwater runoff.

1.10 Schedule B.3.j. -- An overview, as it relates to MS4 discharges, of concept planning, land use changes and new development activities (including the number of new post-construction permits issued) that occurred in the Urban Growth Boundary (UGB) expansion areas during the reporting year, and those forecast for the following year, where such data is available.

Land Use Changes

- Number of zone changes approved in Happy Valley: 3
- Number of new residential building lots approved by partition, subdivision, and planned unit development in Happy Valley: 5
- Number of Approved Zone Changes in Clackamas County[1]: 2
- Number of New Land Partitions[2]: 1
- Number of New Land Subdivisions[3]: 3

UGB Expansion

- The UGB was not expanded in or near the Cities of Happy Valley or Rivergrove, or any other portion of WES' and the County's MS4-permitted service area in 2023-24.

Land Annexations

- Acreage annexed into WES' SWM service area: 61.7
- Acreage de-annexed from WES' SWM service area: None
- Acreage annexed into the City of Happy Valley: 11.64

[1] These land use statistics capture the entire unincorporated area of Clackamas County regulated by the MS4 permit, which is primarily comprised of lands in the Oak Lodge Water Services district and in the WES service area.

[2] Ibid.

[3] Ibid.

The Number of New Post-Construction Permits Issued and related information

- Number of development permits reviewed by Clackamas County[4]: 10
- Number of building division permits in Happy Valley: 198
- Number of engineering division development permits in Happy Valley: 16
- Total number of plans reviewed and approved by WES: 20
- Number of building division site plan reviews in Happy Valley: 198
- Number of engineering division site plan reviews in Happy Valley: 24
- Number of new units of multi-family housing approved in Happy Valley: 0
- Square feet of new commercial/office development approved in Happy Valley: 0

Estimated total new and replaced impervious surface area related to development projects

- 24.1 acres

When the lands described here were developed, post-construction stormwater management program requirements implemented by the City of Happy Valley, Clackamas County, and/or WES reduced storm sewer system pollution levels to the maximum extent practicable. For more information, see the post-construction program-related sections of this annual report.

City of Happy Valley

As discussed above, no UGB expansion occurred in the City of Happy Valley in 2023-24 and the UGB is not expected to be expanded in 2024-25. There were 11.64 acres annexed into the City of Happy Valley in 2023-24. With respect to annexations anticipated for 2024-25, the City has adopted the Pleasant Valley North Carver Comprehensive Plan, which is approximately 2,700-acre plan area. When these lands are eventually urbanized, regulations are expected to be applied by the City of Happy Valley and WES as properties are developed (to construct stormwater management systems, for example) which will reduce pollution levels to the maximum extent practicable.

Clackamas County

No UGB expansion occurred in 2023-24 in or near the WES-Rivergrove-Happy Valley MS4 Permit area, or in any other place where the MS4 Permit regulates Clackamas County, nor is it expected to occur in any of these places in 2024-25. The County did not conduct concept planning.

[4] Ibid.

1.11 Schedule B.3.k. -- Details of all corrective actions implemented associated with Schedule A.1.b.iii (for Water Quality Standards) during the reporting year.

No corrective actions were implemented in 2023-24.

1.12 Schedule B.3.l. -- Compliance with annual reporting requirements found in the following sections:

- Schedule A.3.c.vii – IDDE
- Schedule A.3.d.vii – Construction Site Runoff Control
- Schedule A.3.e.viii – Post-Construction Site Runoff Program
- Schedule A.3.f.v.c – Winter Maintenance
- Schedule A.3.h.i – Hydro-modification Assessment and Stormwater Retrofit Strategy Updates
- Schedule D.3.b – Mercury Minimization Assessment

WES and its co-permittees are required to summarize metrics to track and assess their progress with the Stormwater Management Program Control Measures. These other requirements in permit schedule B.3.I are found in Table 4 and include the following:

Table 5: Other Compliance Requirements

Citation	Description	2023-24 Update
A.3.c.vii – IDDE	Tracking and Assessment: Track implementation of IDDE program requirements. In each corresponding Annual Report, co-permittees must summarize or report on metrics or tracking measures related to implementation of the program. The report should include updates regarding any capital improvements needed or implemented associated with the IDDE program.	See Appendix A for more information.
A.3.d.vii – Construction Site Runoff Control	Tracking and Assessment: Routinely or continuously track all construction sites that result in a total land disturbance of equal to or greater than 1,000 square feet. The	WES tracks this information in its database software. For additional information, see Appendix A.

Citation	Description	2023-24 Update
	inventory must include relevant contact information for each project (name, address, phone, etcetera), the size of the project including area and/or volume of disturbance, the date the co-permittees approved the ESCP in accordance with Schedule A.4.d.iii or in accordance with coverage under the 1200-CN permit as applicable, and whether any complaints have been received or inspections made. Co-permittees must also track implementation of all activities required by the Construction Site Runoff program. In each corresponding annual report, co-permittees must summarize metrics or tracking measures related to implementation of the program, which may include but is not limited to number of regulated construction projects, number of inspections, and number of enforcement actions.	
A.3.e.viii – Post-Construction Site Runoff Program	Tracking and Assessment: Co-permittees must maintain records for activities conducted to meet the requirements of the Post-Construction Site Runoff program and include a summary of their activities and report on metrics or tracking measures related to implementation of the program in the corresponding annual report.	See Appendix A for details on implementation.
A.3.f.v.C – Winter Maintenance	Tracking and Reporting: Winter Maintenance activities for streets and roads must be included as an element of the annual report	<u>City of Happy Valley</u> During winter/ice events, the City applies Magnesium Chloride for de-

Citation	Description	2023-24 Update
	beginning in the annual report due December 1, 2022 or no later than upon DEQ's approval of the 2017 SWMP. Each year, the information needs to include but not limited to the following: a list of materials used, the number of winter weather events where maintenance materials are used, quantities and general location of each material used in relation to distance (for example, pounds per mile), and any other actions taken to protect waters of the state for areas that data is available or becomes available during the permit term.	icing and sand for traction. Excess sand is removed within 10 days. During the 2023-24 winter season, the City responded to two snow/ice events by applying 24 gallons per land mile for magnesium chloride on designated snow map and 1.5 yards of sand per lane mile on designated snow map (see Appendix F). Following these events, the City promptly removed 150 cubic yards of sand within the target 10-day timeframe. <u>Clackamas County</u> **Winter/Ice Event Response** During winter/ice events, Clackamas County prioritizes the application of traction and anti-icing materials to critical areas, including intersections, steep grades, curves, and bridges. Additional areas may be treated based on real-time assessments of road conditions. **Materials and Cleanup** • **De-icing:** Magnesium Chloride • **Traction:** Sand • **Cleanup:** Residual sand is removed from roads and bike lanes as soon as feasible following the event, prioritizing areas with the highest impact. Cleanup operations may take several weeks, depending on the severity of the storm. **2023-24 Winter Season** • **Snow / Ice Event:** ○ 1 event • **Material Application:**

Citation	Description	2023-24 Update
		○ 819.7 gallons of Magnesium Chloride (25 gallons/lane mile) ○ 535.31 tons of sand (500-750 lbs./lane mile) • **Cleanup:** 56 yards of sand removed. See Appendix A for more detail on winter maintenance activity.
A.3.h.i – Hydro-modification Assessment and Stormwater Retrofit Strategy Updates	Co-Permittee are required to include in the third annual report (due Dec. 1, 2023) of this permit term, an assessment of any outcomes related to the Hydro-modification Assessment and Stormwater Retrofit Strategy reports.	The report was submitted in last year's 2022-23 MS4 Annual Report.
Schedule D.3.b – Mercury Minimization Assessment	The following requirement is found in the 2021-2026 MS4 Permit's Schedule D(3)(b): Develop and submit a mercury minimization assessment with the annual report due December 1, 2022, that documents the current actions, such as BMPs implemented, that reduce the amount of solids discharged into and from the permitted MS4 system (similar to the actions currently required in Schedule A). If the assessment indicates that mercury and sediment reducing BMPs are fully incorporated into the SWMP Document, a report documenting the results as such is sufficient.	The revised Willamette River watershed Mercury Total Maximum Daily Load (TMDL) took effect in February 2021. This revised TMDL includes updated sub-basin-specific Waste Load Allocations (WLAs) for mercury in Municipal Separate Storm Sewer Systems (MS4) permitted discharges. For instance, the WLAs for the Clackamas River and Tualatin River sub-basins require a 75% reduction in mercury discharges over time, compared to a baseline period. Since its implementation on July 1, 2023, the 2022 Shared SWMP Document has incorporated numerous Best Management Practices (BMPs) to reduce solids and mercury discharges into and from the permitted MS4

Citation	Description	2023-24 Update
		system. One notable example is the Construction Site Runoff Control BMPs, which focus on erosion and sediment control. The 2022 Shared SWMP Document was specifically designed to minimize mercury discharges into and from the MS4. For more detailed information on these BMPs, please refer to the 2022 Shared SWMP Document. Based on this assessment, it is evident that effective mercury and sediment reduction BMPs have been fully integrated into the 2022 Shared SWMP Document.

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Appendix A: Best Management Practices

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2023-24 Measurable Goals and Tracking Measures
BMPs for Public Education and Outreach Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
ED-1.1	Implement the Stormwater Public Education and Outreach Strategy	17	ED-1.1-a	During the MS4 Permit term, include educational goals targeting audiences and topics in the Strategy.	Running total of target audiences included in the Public Education and Outreach Strategy.	Annual	8	Annual	Audience targets include: 1. General public (renters, homeowners, homeowner associations, others) 2. Students/youth 3. Local land use planners, engineers, developers, local elected officials and WES employees responsible for implementing the SWMP 4. Construction site operators 5. Businesses (including industrial and commercial facilities) and City/County municipal property operators with a potential to spill hazardous substances 6. Business services (landscape maintenance, mobile business, etc.) 7. Key personnel from Happy Valley, Rivergrove, WES and

2023-24 Measurable Goals and Tracking Measures
BMPs for Public Education and Outreach Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
									Clackamas County who maintain landscaping 8. Operators of private water quality facilities responsible for maintaining those facilities.
ED-1.1	Implement the Stormwater Public Education and Outreach Strategy	17	ED-1.1-b	Each year complete at least 80% of planned written communication outputs (e.g., newsletters, websites, and pamphlets) described in the Strategy.	Annual number of written communication outputs completed.	Annual	31	Annual	
ED-1.1	Implement the Stormwater Public Education and Outreach Strategy	17	ED-1.1-b	Each year complete at least 80% of planned written communication outputs (e.g., newsletters, websites, and pamphlets) described in the Strategy.	Annual percentage of written communication outputs completed.	Annual	103%	Annual	

2023-24 Measurable Goals and Tracking Measures
BMPs for Public Education and Outreach Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
ED-1.1	Implement the Stormwater Public Education and Outreach Strategy	17	ED-1.1-c	Each year hold or co-sponsor at least three in-person public education opportunities (e.g., training, seminars, and kids' programs).	Annual number of in-person education opportunities.	Annual	434	Annual	Educational sessions offered lessons, field trips, or other. Included conducting treatment plant tours, participating in clean water festivals, funding contractors to conduct education in the schools, and funding grantees to hold educational events through our RiverHealth Stewardship Program grants.
ED-1.2	Update the Stormwater Public Education and Outreach Strategy	17	ED-1.2	Update the Strategy as needed. Add educational goals, address and prioritize target audiences and required pollution reduction topics, and assign respons. to each co-permittee who are affected.	Date(s) the plan was updated.	As-needed	Jun 2024	Annual	WES reviewed its Public Education and Outreach Strategy in 2023-24. Another update is scheduled for February 2025.
ED-2.1	Erosion Control Outreach	21	ED-2.1	Annually update erosion trainings on website.	Date of website update with trainings.	Annual	To be done.	Annual	No website update for erosion control trainings

2023-24 Measurable Goals and Tracking Measures
BMPs for Public Education and Outreach Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
ED-2.2	Private Stormwater Facility Operations and Maintenance Outreach	21	ED-2.2-a	Create private stormwater facility maintenance handouts during the MS4 Permit term.	Date handouts created.	One-time	To be done.	9/30/2026	Co-permittees have facility maintenance handouts in draft form and will be complete by end of Permit term.
ED-2.2	Private Stormwater Facility Operations and Maintenance Outreach	21	ED-2.2-b	Hold one maintenance workshop during the MS4 Permit term.	Date of workshop.	One-time	To be done.	9/30/2026	
ED-2.2	Private Stormwater Facility Operations and Maintenance Outreach	21	ED-2.2-b	Hold one maintenance workshop during the MS4 Permit term.	Number of owner/operators invited to workshop.	One-time	To be done.	9/30/2026	
ED-2.2	Private Stormwater Facility Operations and Maintenance Outreach	21	ED-2.2-b	Hold one maintenance workshop during the MS4 Permit term.	Number of attendees at workshop.	One-time	To be done.	9/30/2026	

2023-24 Measurable Goals and Tracking Measures
BMPs for Public Education and Outreach Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
ED-2.3	Source Control Outreach and Technical Assistance	21	ED-2.3	Incorporate spill prevention outreach to businesses into DTD Resource Conservation & Solid Waste (RCSW) certification.	Date spill prevention language incorporated into RCSW certification	One-time	To be done.	9/30/2026	
ED-2.4	Pesticide, Herbicide, and Fertilizer Technical Assistance and Training	21	ED-2.4	Hold one IPM check-in meeting for SWMP Document Participant staff during the MS4 Permit term.	Date of meeting.	One-time	To be done.	9/30/2026	
ED-3.1	Evaluation of Education and Outreach Activities	22	ED-3.1	Evaluate the SWMP Document Participants' Education and Outreach activities by April 3, 2026.	Date evaluation results included in permit renewal package.	One-time	To be done.	4/3/2026	Evaluation of our Public Education and Outreach activities will be completed and submitted with our renewal application.

2023-24 Measurable Goals and Tracking Measures
BMPs for Public Participation Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
PP-1.1	Publicly accessible website	25	PP-1.1-a	Post MS4 Permit renewal documents to WES website by April 3, 2026.	Date documents posted.	One-time	To be done.	4/3/2026	
PP-1.1	Publicly accessible website	25	PP-1.1-b	Post MS4 Annual Report to each SWMP Document Participant's website by Dec. 5 each year.	Date(s) MS4 Annual Report posted to each SWMP Document Participant's website each year.	Annual	12/5/2023	Annual	
PP-1.1	Publicly accessible website	25	PP-1.1-f	Annual review of website for current information and accuracy.	Date of completed review.	Annual	11/30/2023	Annual	
PP-1.2	Facilitate Illicit Discharge Reporting	25	PP-1.2	Conduct at least one IDDE reporting publicity campaign during the MS4 Permit term.	Running total of IDDE reporting publicity campaigns to date.	One-time	3	9/30/2026	
PP-2.1	Public Stewardship	27	PP-2.1-a	Each year budget for and award stewardship grants to community groups, businesses, and property owners to improve the health of watersheds in the Permit area.	Annual number of and value of grants awarded.	Annual	12	Annual	WES awarded a total of 12 RiverHealth Stewardship grants for a total of $300,000 to groups to conduct riparian restoration and watershed health

2023-24 Measurable Goals and Tracking Measures
BMPs for Public Participation Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
									education activities. See details in Appendix D.
PP-2.1	Public Stewardship	27	PP-2.1-b	Each year hold or co-sponsor at least one volunteer activity with an education component.	Annual number of volunteer activities with an education component.	Annualfs	434	Annual	WES either participated in or funded a total of 434 lessons, field trips, or sessions with an educational component.

2023-24 Measurable Goals and Tracking Measures

BMPs for Illicit Discharge Detection and Elimination Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
IDDE-1.1	Review and Update Legal Authority	30	IDDE-1.1-a	Review and update legal authority as necessary to prohibit illicit discharges to County ROW by Dec. 1, 2024.	Date legal authority reviewed.	One-time	7/31/2024	12/1/2024	
IDDE-1.1	Review and Update Legal Authority	30	IDDE-1.1-a	Review and update legal authority as necessary to prohibit illicit discharges to County ROW by Dec. 1, 2024.	Date legal authority updated, if necessary.	One-time	To be done.	12/1/2024	Clackamas County DTD currently maintains legal authority to prohibit illicit discharges to County right-of-way in all areas of the County. This legal authority has historically been maintained and is currently maintained through the Clackamas County Sheriff's Office. To improve upon this authority, Clackamas County legal counsel is currently revising County Code language to provide additional enforcement authority to Code Enforcement staff.

2023-24 Measurable Goals and Tracking Measures

BMPs for Illicit Discharge Detection and Elimination Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
IDDE-1.1	Review and Update Legal Authority	30	IDDE-1.1-b	Review and update legal authority as necessary to prohibit illicit discharges to MS4s in WES by Dec. 1, 2024.	Date legal authority reviewed.	One-time	5/4/2023	12/1/2024	The WES Board of Directors adopted updated stormwater rules and regulations and standards in May 2023. They took effect on July 1, 2023.
IDDE-1.1	Review and Update Legal Authority	30	IDDE-1.1-b	Review and update legal authority as necessary to prohibit illicit discharges to MS4s in WES by Dec. 1, 2024.	Date legal authority updated, if necessary.	One-time	5/4/2023	12/1/2024	The WES Board of Directors adopted updated stormwater rules and regulations and standards in May 2023. They took effect on July 1, 2023.
IDDE-2.1	Respond to Illicit Discharges (including Spills)	34	IDDE-2.1-a	Each year investigate and confirm 100% of reports of suspected illicit discharges within 24 hours.	Annual number of illicit discharges investigated within 24 hours.	Annual	7	Annual	
IDDE-2.1	Respond to Illicit Discharges (including Spills)	34	IDDE-2.1-a	Each year investigate and confirm 100% of reports of suspected illicit discharges within 24 hours.	Annual percentage of illicit discharges investigated	Annual	100%	Annual	

2023-24 Measurable Goals and Tracking Measures

BMPs for Illicit Discharge Detection and Elimination Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
					within 24 hours.				
IDDE-2.1	Respond to Illicit Discharges (including Spills)	34	IDDE-2.1-b	Each year evaluate removal of 100% confirmed illicit discharges within five working days of determining the source of the discharge.	Annual number of illicit discharges evaluated for removal within five working days.	Annual	7	Annual	
IDDE-2.1	Respond to Illicit Discharges (including Spills)	34	IDDE-2.1-b	Each year evaluate removal of 100% confirmed illicit discharges within five working days of determining the source of the discharge.	Annual percentage of illicit discharges evaluated for removal within five working days.	Annual	100%	Annual	
IDDE-2.1	Respond to Illicit Discharges (including Spills)	34	IDDE-2.1-c	Each year halt 100% of illicit discharges within 15 working days after the source has been confirmed.	Annual number of illicit discharges removed within 15 working days.	Annual	7	Annual	

2023-24 Measurable Goals and Tracking Measures

BMPs for Illicit Discharge Detection and Elimination Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
IDDE-2.1	Respond to Illicit Discharges (including Spills)	34	IDDE-2.1-c	Each year halt 100% of illicit discharges within 15 working days after the source has been confirmed.	Annual percentage of illicit discharges removed within 15 working days.	Annual	100%	Annual	
IDDE-2.1	Respond to Illicit Discharges (including Spills)	34	IDDE-2.1-d	Each year report 100% of reportable spills on public roadways or in the MS4 to state and federal authorities within required reporting timelines.	Annual number of reportable spills on public roadways or in the MS4 reported within required timelines.	Annual	5	Annual	In 2023-24, DTD had no spills that met the reportable OERS criteria in the MS4. DTD, however, did respond to and participated in the cleanup of 5 reportable spills in the MS4. Three of those spills were reported to OERS, by others. The other 2 did not meet the OERS criteria.
IDDE-2.1	Respond to Illicit Discharges (including Spills)	34	IDDE-2.1-d	Each year report 100% of reportable spills on public roadways or in the MS4 to state and federal authorities within required reporting timelines.	Annual percentage of reportable spills on public roadways or in the MS4 reported within	Annual	100%	Annual	

2023-24 Measurable Goals and Tracking Measures

BMPs for Illicit Discharge Detection and Elimination Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
					required timelines.				
IDDE-3.1	Implement Illicit Discharge Enforcement Procedures	37	IDDE-3.1	Track 100% of enforcement actions initiated in that MS4 Permit year and their resolution.	Annual number of enforcement actions initiated in that MS4 Permit year that were resolved by the discharger.	Annual	2	Annual	
IDDE-3.1	Implement Illicit Discharge Enforcement Procedures	37	IDDE-3.1	Track 100% of enforcement actions initiated in that MS4 Permit year and their resolution.	Annual number of enforcement actions initiated in that MS4 Permit year that were abated by a SWMP	Annual	0	Annual	None of the MS4 enforcement actions required a paid civil penalty. Two civil penalties were issued, however, for non-MS4 illicit discharges to privately owned storm systems that discharged either to private drywell or

2023-24 Measurable Goals and Tracking Measures

BMPs for Illicit Discharge Detection and Elimination Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
					Document Participant.				directly to waters of the state.
IDDE-3.1	Implement Illicit Discharge Enforcement Procedures	37	IDDE-3.1	Track 100% of enforcement actions initiated in that MS4 Permit year and their resolution.	Annual number of enforcement actions initiated in that MS4 Permit year that paid a civil penalty.	Annual	0	Annual	
IDDE-3.1	Implement Illicit Discharge Enforcement Procedures	37	IDDE-3.1	Track 100% of enforcement actions initiated in that MS4 Permit year and their resolution.	Annual number of enforcement actions.	Annual	2	Annual	
IDDE-4.1	Maintain and Update List of Priority Locations	39	IDDE-4.1	Review and update of prioritization criteria for dry weather screening Priority Locations by December 1, 2023.	Date prioritization criteria submitted with Annual Report.	One-time	11/20/2023	12/1/2023	WES' Industrial Stormwater Screening Strategy submitted 11/20/2023. A priority location scheme is no longer used. The new IDDE strategy inspects a rolling subset (approximately 10 percent) of all known outfalls each

2023-24 Measurable Goals and Tracking Measures

BMPs for Illicit Discharge Detection and Elimination Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
									year, reaching every known outfall within 10 years.
IDDE-4.1	Maintain and Update List of Priority Locations	39	IDDE-4.1	Review and update of prioritization criteria for dry weather screening Priority Locations by December 1, 2023.	Date MS4 Map updated with new locations.	One-time	11/20/2023	12/1/2023	Per the submitted strategy the MS4 Map is updated periodically with data collected from inspections.
IDDE-4.2	Inspections and Analysis	39	IDDE-4.2-a	Each year inspect 100% of priority locations as identified in the most recent list.	Annual number of priority locations inspected.	Annual	36	Annual	
IDDE-4.2	Inspections and Analysis	39	IDDE-4.2-a	Each year inspect 100% of priority locations as identified in the most recent list.	Annual percentage of priority locations inspected.	Annual	100%	Annual	
IDDE-4.2	Inspections and Analysis	40	IDDE-4.2-b	Each year refer 100% of confirmed (and unconfirmed) illicit discharges discovered through dry-weather inspection to WES Field Operations	Annual number of confirmed and unconfirmed illicit discharges referred to	Annual	0	Annual	No illicit discharges found during dry-weather inspections.

2023-24 Measurable Goals and Tracking Measures

BMPs for Illicit Discharge Detection and Elimination Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
				within one working day.	WES Field Operations within one working day.				
IDDE-4.2	Inspections and Analysis	40	IDDE-4.2-b	Each year refer 100% of confirmed (and unconfirmed) illicit discharges discovered through dry-weather inspection to WES Field Operations within one working day.	Annual percentage of confirmed and unconfirmed illicit discharges referred to WES Field Operations within one working day.	Annual	0%	Annual	No illicit discharges found during dry-weather inspections.
IDDE-5.1	Determine Training Needs	41	IDDE-5.1	Evaluate and document training and education needs (for staff responsible for investigating and eliminating illicit discharges and illicit connections to the MS4) one time during the MS4 Permit term.	Date staff training and education strategy published.	One-time	To be done.	9/30/2026	WES, Clackamas County, and the City of Happy Valley continue to train new and current employees to ensure that staff are well-prepared to identify and address illegal discharges and connections to the stormwater system.

2023-24 Measurable Goals and Tracking Measures

BMPs for Illicit Discharge Detection and Elimination Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
IDDE-5.2	Conduct Staff Training	41	IDDE-5.2	Provide training documented in the staff training and education strategy.	Number of employees who receive training and education and type received.	As identified in staff training evaluation in IDDE-5.1 and as-needed	To be done.	9/30/2026	See response to IDDE-5.1. In total, 64 employees received surface water training, including IDDE training, in 21 conferences and seminars. In narrative, see Appendix E for list of employees and trainings.
IDDE-6.1	Evaluation of IDDE Activities	42	IDDE-6.1	Evaluate IDDE activities by April 3, 2026.	Date evaluation results included in permit renewal package.	One-time	To be done.	4/3/2026	Evaluation of our Illicit Discharge Detection and Elimination activities will be completed and submitted with our renewal application.

2023-24 Measurable Goals and Tracking Measures
BMPs for Mapping Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
MAP-2.1	Update Inventory and Map Existing Infrastructure	47	MAP-2.1-a	MS4 Map and Digital Inventory submitted to DEQ by December 1, 2022.	Date MS4 Map and Digital Inventory submitted	One-time	Ongoing	12/1/2022	WES continues to map and maintain a stormwater asset inventory. April of 2024, WES staff resolved a question from DEQ regarding whether WES manages an online public facing map. WES currently does not present a comprehensive online map publically, but offered to submit an electronic map or digital inventory to DEQ. DEQ preferred to reach out in the future if they have a specific mapping need.
MAP-2.1	Update Inventory and Map Existing Infrastructure	47	MAP-2.1-a	100% of existing public stormwater conveyances and stormwater facilities mapped by December 1, 2022	Number of in-service public stormwater assets mapped by December 1, 2022	One-time	39116	12/1/2022	
MAP-2.1	Update Inventory and Map Existing Infrastructure	47	MAP-2.1-a	100% of existing public stormwater conveyances and stormwater facilities mapped by December 1, 2022	Percentage of in-service public stormwater assets mapped by December 1, 2022	One-time	100%	12/1/2022	

2023-24 Measurable Goals and Tracking Measures
BMPs for Mapping Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
MAP-2.1	Update Inventory and Map Existing Infrastructure	47	MAP-2.1-b	25% of existing private stormwater facilities mapped by December 1, 2022	Number of existing private stormwater facilities mapped by December 1, 2022	One-time	2983	12/1/2022	
MAP-2.1	Update Inventory and Map Existing Infrastructure	47	MAP-2.1-b	25% of existing private stormwater facilities mapped by December 1, 2022	Percentage of existing private stormwater facilities mapped by December 1, 2022	One-time	100%	12/1/2022	
MAP-2.1	Update Inventory and Map Existing Infrastructure	48	MAP-2.1-c	100% of existing private stormwater facilities mapped by end of permit term.	Number of existing private stormwater facilities mapped by December 1, 2023	One-time	228	12/1/2023	
MAP-2.1	Update Inventory and Map Existing Infrastructure	48	MAP-2.1-c	100% of existing private stormwater facilities mapped by end of permit term.	Percentage of existing private stormwater facilities mapped by December 1, 2023	One-time	100%	12/1/2023	

2023-24 Measurable Goals and Tracking Measures
BMPs for Mapping Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
MAP-2.2	Inventory and Map New Stormwater Conveyance and Management Facilities	48	MAP-2.2	100% of new public stormwater conveyances and public and private stormwater facilities are mapped within 3 months of public acceptance and private final construction approval (see POST-4)	Number of new public stormwater conveyances and stormwater facilities mapped within three months of acceptance.	Annual	1610	Annual	
MAP-2.2	Inventory and Map New Stormwater Conveyance and Management Facilities	48	MAP-2.2	100% of new public stormwater conveyances and public and private stormwater facilities are mapped within 3 months of public acceptance and private final construction approval (see POST-4)	Percentage of new public stormwater conveyances mapped within three months of acceptance.	Annual	100%	Annual	
MAP-2.2	Inventory and Map New Stormwater Conveyance and	48	MAP-2.2	100% of new public stormwater conveyances and public and private stormwater facilities are mapped within 3	Number of new private stormwater facilities mapped within three months of	Annual	321	Annual	

2023-24 Measurable Goals and Tracking Measures
BMPs for Mapping Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
	Management Facilities			months of public acceptance and private final construction approval (see POST-4)	final construction approvals.				
MAP-2.2	Inventory and Map New Stormwater Conveyance and Management Facilities	48	MAP-2.2	100% of new public stormwater conveyances and public and private stormwater facilities are mapped within 3 months of public acceptance and private final construction approval (see POST-4)	Percentage of new private stormwater facilities mapped within three months of final construction approval.	Annual	100%	Annual	
MAP-2.3	Map Priority Locations for IDDE Field Screening	48	MAP-2.3	100% of IDDE Priority Locations mapped by December 1, 2023.	Number of Priority Locations mapped by December 1, 2023	One-time	37	Annual	
MAP-2.3	Map Priority Locations for IDDE Field Screening	48	MAP-2.3	100% of IDDE Priority Locations mapped by December 1, 2023.	Percentage of Priority Locations mapped by	One-time	100%	12/1/2023	

2023-24 Measurable Goals and Tracking Measures
BMPs for Mapping Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
					December 1, 2023				
MAP-3.1	Map Chronic Illicit Discharges	49	MAP-3.1	MS4 Map and Digital Inventory submitted or access provided to DEQ by December 1, 2022.	Date MS4 Map and Digital Inventory submitted or access provided	Annual	Ongoing	Annual	WES continues to map and maintain a stormwater asset inventory. April of 2024, WES staff resolved a question from DEQ regarding whether WES manages an online public facing map. WES currently does not present a comprehensive online map publicly but offered to submit an electronic map or digital inventory to DEQ. DEQ preferred to reach out in the future if they have a specific mapping need.
MAP-4.1	Evaluation of MS4 Mapping Activities	50	MAP-4.1	Evaluate the MS4 mapping activities by April 3, 2026.	Date evaluation results included in permit renewal package.	One-time	To be done.	4/3/2026	Evaluation of our MS4 Mapping activities will be completed and submitted in our MS4 Permit renewal package.

2023-24 Measurable Goals and Tracking Measures
BMPs for Construction Site Runoff Control Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
EPSC-1.1	Construction Site Runoff Legal Authority	54	EPSC-1.1-a	Review, and update, if necessary, DTD's boilerplate contract terms to ensure EPSC plans are required in construction contracts by Dec. 1, 2024.	Date legal authority reviewed.	One-time	Jun 2023	12/1/2024	Review period: Jan 2023 to Jun 2023
EPSC-1.1	Construction Site Runoff Legal Authority	54	EPSC-1.1-a	Review, and update, if necessary, DTD's boilerplate contract terms to ensure EPSC plans are required in construction contracts by Dec. 1, 2024.	Date legal authority updated, if necessary.	One-time	7/7/2023	12/1/2024	ODOT reviews its Oregon Standard Specifications for Construction every three years on behalf of all municipalities, including DTD, who adhere to the most current version of the construction specification book. DTD received approval from ODOT to use the 2024 version in 2023-24. The 2024 edition updated and improved EPSC language where all EPSC plans are required for all DTD capital construction contracts.
EPSC-1.1	Construction Site Runoff Legal Authority	54	EPSC-1.1-b	Review, and update, if necessary, Happy Valley code to ensure alignment	Date legal authority reviewed.	One-time	8/30/2023	12/1/2024	

2023-24 Measurable Goals and Tracking Measures
BMPs for Construction Site Runoff Control Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
				with the MS4 Permit Schedule A.4.c by Dec. 1, 2024.					
EPSC-1.1	Construction Site Runoff Legal Authority	54	EPSC-1.1-b	Review, and update, if necessary, Happy Valley code to ensure alignment with the MS4 Permit Schedule A.4.c by Dec. 1, 2024.	Date legal authority updated, if necessary.	One-time	NA	12/1/2024	No update required per review on 8/30/2023
EPSC-1.1	Construction Site Runoff Legal Authority	54	EPSC-1.1-c	Review, and update, if necessary, WES Rules and Regulations to ensure alignment with MS4 Permit Schedule A.4.c by Dec. 1, 2024.	Date legal authority reviewed.	One-time	5/4/2023	12/1/2024	The WES Board of Directors adopted its revised stormwater rules and regulations and standards in May 2023. They took effect on July 1, 2023.

2023-24 Measurable Goals and Tracking Measures
BMPs for Construction Site Runoff Control Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
EPSC-1.1	Construction Site Runoff Legal Authority	54	EPSC-1.1-c	Review, and update, if necessary, WES Rules and Regulations to ensure alignment with MS4 Permit Schedule A.4.c by Dec. 1, 2024.	Date legal authority updated, if necessary.	One-time	5/4/2023	12/1/2024	The WES Board of Directors adopted its revised stormwater rules and regulations and standards in May 2023. They took effect on July 1, 2023.
EPSC-1.1	Construction Site Runoff Legal Authority	54	EPSC-1.1-d	Review, and update, if necessary, Clackamas County Code and Building and Development Ordinance to ensure alignment with MS4 Permit Schedule A.4.c by Dec. 1, 2024.	Date legal authority reviewed.	One-time	August 2022	12/1/2024	

2023-24 Measurable Goals and Tracking Measures
BMPs for Construction Site Runoff Control Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
EPSC-1.1	Construction Site Runoff Legal Authority	54	EPSC-1.1-d	Review, and update, if necessary, Clackamas County Code and Building and Development Ordinance to ensure alignment with MS4 Permit Schedule A.4.c by Dec. 1, 2024.	Date legal authority updated, if necessary.	One-time	To be done.	12/1/2024	Within the MS4, construction site runoff authority is generally referred to the City and/or District which the project is taking place in. Clackamas County is currently developing a County-wide erosion control permitting, inspection and enforcement program. These changes are to be updated in the Clackamas County Code and will be presented to the Board of County Commissioners for their consideration no later than September 3, 2025.
EPSC-1.2	Erosion and Sediment Control Plan Standards	54	EPSC-1.2	Review, and update, if necessary, Erosion Prevention Planning and Design Manual once during the MS4 Permit Term.	Date manual reviewed.	One-time	To be done.	9/30/2026	A review of the 2020 Erosion Prevention and Sediment Control Planning and Design Manual will be completed and, if necessary, updated by September 30, 2026. The 2020 Erosion Prevention and Sediment Control Planning and Design Manual was developed in partnership with Clean Water Services, Oak Lodge Water Service District and the cities of Gladstone, Happy Valley, Lake Oswego, Milwaukie, West Linn and Wilsonville. The manual provides a regional and comprehensive approach towards controlling construction site runoff. See https://www.clackamas.us/wes/erosion.html

2023-24 Measurable Goals and Tracking Measures
BMPs for Construction Site Runoff Control Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
EPSC-1.2	Erosion and Sediment Control Plan Standards	54	EPSC-1.2	Review, and update, if necessary, Erosion Prevention Planning and Design Manual once during the MS4 Permit Term.	Date manual updated, if necessary.	One-time	To be done.	9/30/2026	
EPSC-2.1	EPSC Review of County CIPs	58	EPSC-2.1	Internally review the EPSC plan of 100% of County CIPs going to construction in the Permitted Area each year. (DTD)	Annual number of County CIP EPSC plans reviewed by DTD.	Annual	1	Annual	
EPSC-2.1	EPSC Review of County CIPs	58	EPSC-2.1	Internally review the EPSC plan of 100% of County CIPs going to construction in the Permitted	Annual percentage of County CIP EPSC plans reviewed by DTD.	Annual	100%	Annual	

2023-24 Measurable Goals and Tracking Measures
BMPs for Construction Site Runoff Control Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
				Area each year. (DTD)					
EPSC-2.2	EPSC Review in Happy Valley	58	EPSC-2.2	Review EPSC plan of 100% of land use and building permit applications meeting threshold for erosion prevention and sedimentation control in Happy Valley each year. (Happy Valley)	Annual number of EPSC reviews conducted by Happy Valley.	Annual	214	Annual	
EPSC-2.2	EPSC Review in Happy Valley	58	EPSC-2.2	Review EPSC plan of 100% of land use and building permit applications meeting threshold for erosion prevention and sedimentation control in	Annual percentage of EPSC reviews conducted by Happy Valley.	Annual	100%	Annual	

2023-24 Measurable Goals and Tracking Measures
BMPs for Construction Site Runoff Control Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
				Happy Valley each year. (Happy Valley)					
EPSC-2.3	EPSC Review in WES' SWM Service Area	58	EPSC-2.3-a	Review EPSC plan of 100% of land use reviews and building permit applications meeting threshold for erosion prevention and sediment control in WES Service Areas.	Annual number of EPSC reviews conducted by WES.	Annual	94	Annual	
EPSC-2.3	EPSC Review in WES' SWM Service Area	58	EPSC-2.3-a	Review EPSC plan of 100% of land use reviews and building permit applications meeting threshold for erosion prevention and sediment	Annual percentage of EPSC reviews conducted by WES.	Annual	100%	Annual	

2023-24 Measurable Goals and Tracking Measures
BMPs for Construction Site Runoff Control Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
				control in WES Service Areas.					
EPSC-2.3	EPSC Review in WES' SWM Service Area	58	EPSC-2.3-a	Review EPSC plan of 100% of land use reviews and building permit applications meeting threshold for erosion prevention and sediment control in WES Service Areas.	Annual number of pre-construction meetings attended by WES.	Annual	8	Annual	
EPSC-2.3	EPSC Review in WES' SWM Service Area	58	EPSC-2.3-b	Attend 80% of pre-construction meetings for projects meeting threshold for erosion prevention and sediment control in WES Service Areas.	Annual percentage of pre-construction meetings attended by WES.	Annual	100%	Annual	

2023-24 Measurable Goals and Tracking Measures
BMPs for Construction Site Runoff Control Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
EPSC-3.1	County CIP Inspection and Enforcement	64	EPSC-3.1	Conduct at least three EPSC inspections over the life of the project at 100% of County CIP construction sites within the Permitted Area that require EPSC review.	Annual number of County CIP projects in the Permitted Area that completed construction and that DTD inspected for EPSC at least three times over the life of the project.	Annual	0	Annual	In 2023-24, there were no closed DTD capital stormwater projects in the MS4. DTD does, however, have one active MS4 stormwater project and has met the requirement of being EPSC inspected at least three times.
EPSC-3.1	County CIP Inspection and Enforcement	64	EPSC-3.1	Conduct at least three EPSC inspections over the life of the project at 100% of County CIP construction sites within the Permitted Area that require EPSC review.	Annual percentage of County CIP projects that DTD inspected for EPSC at least three times.	Annual	0%	Annual	

2023-24 Measurable Goals and Tracking Measures
BMPs for Construction Site Runoff Control Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
EPSC-3.1	County CIP Inspection and Enforcement	64	EPSC-3.1	Conduct at least three EPSC inspections over the life of the project at 100% of County CIP construction sites within the Permitted Area that require EPSC review.	Number of EPSC complaints received per project.	Annual	0%	Annual	DTD hasn't received any complaints about the CIP project located in the MS4
EPSC-3.2	Happy Valley Inspection and Enforcement	64	EPSC-3.2-a	Each year conduct the initial EPSC inspection prior to construction at 100% of EPSC permitted sites in Happy Valley.	Annual number of EPSC permitted sites that received an initial EPSC inspection by Happy Valley prior to construction.	Annual	209	Annual	
EPSC-3.2	Happy Valley Inspection and Enforcement	64	EPSC-3.2-a	Each year conduct the initial EPSC inspection prior to construction	Annual percentage of EPSC permitted sites that received an	Annual	100%	Annual	

2023-24 Measurable Goals and Tracking Measures
BMPs for Construction Site Runoff Control Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
				at 100% of EPSC permitted sites in Happy Valley.	initial EPSC inspection by Happy Valley prior to construction.				
EPSC-3.2	Happy Valley Inspection and Enforcement	64	EPSC-3.2-a	Each year conduct the initial EPSC inspection prior to construction at 100% of EPSC permitted sites in Happy Valley.	Number of EPSC complaints received per permitted site.	Annual	4.3%	Annual	9 complaints received out of 209 permitted sites = 4.3 percent
EPSC-3.2	Happy Valley Inspection and Enforcement	64	EPSC-3.2-b	Inspect 90% of EPSC permitted sites in Happy Valley at least three times over the life of the project.	Annual number of EPSC permitted sites that completed construction in Happy Valley and received at least three EPSC inspections over the life	As needed	269	Annual	

2023-24 Measurable Goals and Tracking Measures
BMPs for Construction Site Runoff Control Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
					of the project.				
EPSC-3.2	Happy Valley Inspection and Enforcement	64	EPSC-3.2-b	Inspect 90% of EPSC permitted sites in Happy Valley at least three times over the life of the project.	Annual percentage of EPSC permitted sites in Happy Valley that received at least three EPSC inspections.	As needed	100%	Annual	
EPSC-3.2	Happy Valley Inspection and Enforcement	64	EPSC-3.2-c	Inspect 100% of EPSC permitted sites in Happy Valley at least twice over the life of the project.	Annual number of EPSC permitted sites that received at least two EPSC inspections by Happy Valley over the life of the project.	As needed	269	Annual	
EPSC-3.2	Happy Valley Inspection	64	EPSC-3.2-c	Inspect 100% of EPSC permitted sites in Happy	Annual number of EPSC permitted	As needed	269	Annual	

2023-24 Measurable Goals and Tracking Measures
BMPs for Construction Site Runoff Control Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
	and Enforcement			Valley at least twice over the life of the project.	sites that completed construction in Happy Valley.				
EPSC-3.2	Happy Valley Inspection and Enforcement	64	EPSC-3.2-c	Inspect 100% of EPSC permitted sites in Happy Valley at least twice over the life of the project.	Annual percentage of EPSC permitted sites in Happy Valley that received at least two EPSC inspections.	As needed	100%	Annual	
EPSC-3.2	Happy Valley Inspection and Enforcement	64	EPSC-3.2-c	Inspect 100% of EPSC permitted sites in Happy Valley at least twice over the life of the project.	Number of EPSC complaints received per project.	As needed	0.5%	Annual	1 complaint received out of 209 permitted sites = 0.5%
EPSC-3.3	WES Inspection and Enforcement	64	EPSC-3.3-a	Each year conduct the initial EPSC site inspection prior to construction at 100% of	Annual number of EPSC permitted sites that received an initial EPSC	Annual	94	Annual	

2023-24 Measurable Goals and Tracking Measures
BMPs for Construction Site Runoff Control Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
				EPSC permitted sites in WES.	inspection by WES prior to construction.				
EPSC-3.3	WES Inspection and Enforcement	64	EPSC-3.3-a	Each year conduct the initial EPSC site inspection prior to construction at 100% of EPSC permitted sites in WES.	Annual percentage of EPSC permitted sites that received an initial EPSC inspection by WES prior to construction.	Annual	100%	Annual	
EPSC-3.3	WES Inspection and Enforcement	64	EPSC-3.3-a	Each year conduct the initial EPSC site inspection prior to construction at 100% of EPSC permitted sites in WES.	Number of EPSC complaints received per permitted site.	Annual	2.13%	Annual	2 complaints out of the 94 EPSC projects received = 2.13%
EPSC-3.3	WES Inspection and Enforcement	65	EPSC-3.3-b	Inspect 90% of EPSC permitted sites in WES at least three times over the	Annual number of EPSC permitted sites that received at least three	As needed	95	Annual	

2023-24 Measurable Goals and Tracking Measures
BMPs for Construction Site Runoff Control Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
				life of the project.	EPSC inspections by WES over the life of the project.				
EPSC-3.3	WES Inspection and Enforcement	65	EPSC-3.3-b	Inspect 90% of EPSC permitted sites in WES at least three times over the life of the project.	Annual percentage of EPSC permitted sites in WES that received at least three EPSC inspections.	As needed	100%	Annual	
EPSC-3.3	WES Inspection and Enforcement	65	EPSC-3.3-b	Inspect 90% of EPSC permitted sites in WES at least three times over the life of the project.	Number of EPSC complaints received per project.	As needed	2.11%	Annual	2 complaints out of the 95 EPSC projects received = 2.11%

2023-24 Measurable Goals and Tracking Measures
BMPs for Construction Site Runoff Control Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
EPSC-3.4	Adopt Construction Site Enforcement Procedures	65	EPSC-3.4	Adopt construction site enforcement procedures by December 1, 2023 (WES, DTD, Happy Valley).	Date construction site enforcement procedures adopted for each jurisdiction.	One-time	WES - May 7, 2024. DTD - To be done Happy Valley - To be done	12/1/2023	WES - Enforcement Response Plan that addresses Construction Site enforcement procedures submitted to DEQ on May 7, 2024. DTD - Relies on City / Special District where erosion control violation occurs. Has enforcement procedures in place for locations outside the MS4. Happy Valley - Offcial adoption expected February 2025. Unoffical procedures have been followed since Aug 30, 2023.
EPSC-4.1	Determine Training Needs	66	EPSC-4.1	Evaluate and document training needs (for staff responsible for reviewing ESCP and inspecting construction sites) one time during the MS4 Permit term.	Date staff training and education strategy published.	One-time	To be done.	9/30/2026	WES, Clackamas County, and the City of Happy Valley continue to train new and current employees to ensure that staff are well-prepared to review ESCP and construction sites.

2023-24 Measurable Goals and Tracking Measures
BMPs for Construction Site Runoff Control Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
EPSC-4.2	Conduct Staff Training	66	EPSC-4.2	Conduct or procure training documented in the staff training and education strategy.	Number of employees who receive training and type training received.	As identified in staff training evaluation in EPSC-4.1 and as-needed	To be done.	Annual	In total, 64 employees received Surface Water training, including EPSC training, in 21 conferences and seminars. In narrative, see Appendix E for list of employees and trainings.
EPSC-5.1	Evaluation of Construction Site Runoff Control Activities	67	EPSC-5.1	Happy Valley and WES will both evaluate their construction site runoff control activities by April 3, 2026.	Date evaluation results included in permit renewal package.	One-time	To be done.	4/3/2026	Evaluation of our Construction Site Runoff Control activities will be included in our MS4 Permit renewal package.

2023-24 Measurable Goals and Tracking Measures
BMPs for Post-Construction Site Runoff Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
POST-1.1	Maintain Current Post-Construction Legal Authority	72	POST-1.1-a	Review, and update, if necessary, Happy Valley code to ensure alignment with the MS4 Permit Schedule A.3.e by December 1, 2024.	Date legal authority reviewed.	One-time	8/30/2023	12/1/2024	
POST-1.1	Maintain Current Post-Construction Legal Authority	72	POST-1.1-a	Review, and update, if necessary, Happy Valley code to ensure alignment with the MS4 Permit Schedule A.3.e by December 1, 2024.	Date legal authority updated, if necessary.	One-time	NA	12/1/2024	No update required per review on 8/30/2023
POST-1.1	Maintain Current Post-Construction Legal Authority	72	POST-1.1-b	Review, and update, if necessary, WES Rules and Regulations to ensure alignment with MS4 Permit Schedule A.3.e by December 1, 2024.	Date legal authority reviewed.	One-time	5/4/2023	12/1/2024	The WES Board of Directors adopted revised stormwater rules and regulations and standards in May 2023. They took effect on July 1, 2023.
POST-1.1	Maintain Current Post-Construction Legal Authority	72	POST-1.1-b	Review, and update, if necessary, WES Rules and	Date legal authority	One-time	5/4/2023	12/1/2024	The WES Board of Directors adopted revised stormwater rules

2023-24 Measurable Goals and Tracking Measures
BMPs for Post-Construction Site Runoff Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
				Regulations to ensure alignment with MS4 Permit Schedule A.3.e by December 1, 2024.	updated, if necessary.				and regulations and standards in May 2023. They took effect on July 1, 2023.
POST-2.1	Require Low Impact Development/Green Infrastructure for Development And Redevelopment Projects	73	POST-2.1	By Dec. 1, 2023, review and update or develop and begin a LID/GI strategy.	Date LID/GI strategy update or adoption and adopted, if necessary.	One-time	5/4/2023	12/1/2023	The WES Board of Directors adopted revised stormwater rules and regulations and standards in May 2023. They took effect on July 1, 2023.
POST-2.2	Update Stormwater Standards Design Manual	73	POST-2.2	Update the stormwater design manual (currently WES Stormwater Standards) by Dec. 1, 2024.	Date stormwater design manual was updated.	One-time	5/4/2023	12/1/2024	The WES Board of Directors adopted revised stormwater rules and regulations and standards in May 2023. They took effect on July 1, 2023.
POST-3.1	Stormwater Management Plan (SWM Plan) Review of Permittee CIPs	79	POST-3.1	Review 100% of CIP SWM Plans that meet the minimum impervious surface threshold each year.	Annual number of CIP SWM Plans reviewed and approved.	Annual	1	Annual	

2023-24 Measurable Goals and Tracking Measures
BMPs for Post-Construction Site Runoff Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
POST-3.1	Stormwater Management Plan (SWM Plan) Review of Permittee CIPs	79	POST-3.1	Review 100% of CIP SWM Plans that meet the minimum impervious surface threshold each year.	Annual percentage of CIP SWM Plans reviewed and approved where the project met the minimum impervious surface threshold.	Annual	100%	Annual	
POST-3.2	SWM Plan Review for Single-Family (SFR) Building Permits	79	POST-3.2	Review 100% of SFR SWM Plans received prior to signing off on building permit each year. (WES)	Annual number of SFR SWM Plans reviewed by WES prior to signing off on building permit.	Annual	6	Annual	
POST-3.2	SWM Plan Review for Single-Family (SFR) Building Permits	79	POST-3.2	Review 100% of SFR SWM Plans received prior to signing off on building permit each year. (WES)	Annual percentage of SFR SWM Plans reviewed by WES prior to signing off on building permit.	Annual	2.3%	Annual	
POST-3.3	SWM Plan Review for Land Use Applications	79	POST-3.3-a	Attend 100% of pre-application meetings (WES) for land use applications (DTD/Happy Valley).	Annual number of pre-application meetings attended by WES.	Annual	46	Annual	

2023-24 Measurable Goals and Tracking Measures
BMPs for Post-Construction Site Runoff Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
POST-3.3	SWM Plan Review for Land Use Applications	79	POST-3.3-a	Attend 100% of pre-application meetings (WES) for land use applications (DTD/Happy Valley).	Annual percentage of pre-application meetings attended by WES.	Annual	100%	Annual	
POST-3.3	SWM Plan Review for Land Use Applications	79	POST-3.3-b	Review and approve 100% of non-SFR SWM Plans for projects that meet the minimum impervious threshold each year. (WES)	Annual number of non-SFR SWM Plans approved by WES.	Annual	11	Annual	
POST-3.3	SWM Plan Review for Land Use Applications	79	POST-3.3-b	Review and approve 100% of non-SFR SWM Plans for projects that meet the minimum impervious threshold each year. (WES)	Annual percentage of non-SFR SWM Plans approved by WES.	Annual	100%	Annual	
POST-4.1	Verify Single-Family Residential Building Site Stormwater Systems	84	POST-4.1	Perform final SWM construction site inspection on 100% of residential development sites each year.	Annual number of final SWM construction site inspections performed on residential	Annual	12	Annual	

2023-24 Measurable Goals and Tracking Measures
BMPs for Post-Construction Site Runoff Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
					development sites.				
POST-4.1	Verify Single-Family Residential Building Site Stormwater Systems	84	POST-4.1	Perform final SWM construction site inspection on 100% of residential development sites each year.	Annual percentage of final SWM construction site inspections performed residential development sites.	Annual	100%	Annual	
POST-4.2	Verify Subdivision/Partition Stormwater Systems	84	POST-4.2	Perform final SWM construction site inspection on 100% of subdivision and partition sites each year.	Annual number of final SWM construction site inspections performed on subdivision and partition development sites.	Annual	8	Annual	
POST-4.2	Verify Subdivision/Partition Stormwater Systems	84	POST-4.2	Perform final SWM construction site inspection on 100% of subdivision and partition sites each year.	Annual percentage of final SWM construction site inspections performed on subdivision and partition development sites.	Annual	100%	Annual	

2023-24 Measurable Goals and Tracking Measures
BMPs for Post-Construction Site Runoff Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
POST-4.3	Verify Commercial Development Stormwater Systems	84	POST-4.3	Perform final SWM construction site inspection on 100% of commercial development sites each year.	Annual number of final SWM construction site inspections performed on commercial development sites.	Annual	8	Annual	
POST-4.3	Verify Commercial Development Stormwater Systems	84	POST-4.3	Perform final SWM construction site inspection on 100% of commercial development sites each year.	Annual percentage of final SWM construction site inspections performed on commercial development sites.	Annual	100%	Annual	
POST-4.4	Verify SWMP Document Participant CIP Stormwater Systems	85	POST-4.4	Inspect 100% of stormwater facilities for new County CIPs and new Happy Valley CIPs in the districts each year. (WES)	Annual number of stormwater facility inspections of new County and Happy Valley CIPs performed by WES.	Annual	0	Annual	
POST-4.4	Verify SWMP Document Participant CIP Stormwater Systems	85	POST-4.4	Inspect 100% of stormwater facilities for new County CIPs and new Happy Valley	Annual number of County CIPs completing construction.	Annual	0	Annual	

2023-24 Measurable Goals and Tracking Measures
BMPs for Post-Construction Site Runoff Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
				CIPs in the districts each year. (WES)					
POST-4.4	Verify SWMP Document Participant CIP Stormwater Systems	85	POST-4.4	Inspect 100% of stormwater facilities for new County CIPs and new Happy Valley CIPs in the districts each year. (WES)	Annual percentage of stormwater facility inspections of new County and Happy Valley CIPs.	Annual	0%	Annual	
POST-5.1	Determine Training Needs	86	POST-5.1	Evaluate and document training needs (for staff responsible for reviewing structural stormwater control plans and ensuring facilities are inspected) one time during the MS4 Permit term.	Date staff training and education strategy published.	One-time	To be done.	9/30/2026	WES, Clackamas County, and the City of Happy Valley continue to train new and current employees to ensure staff are well-prepared to review structural stormwater control plans and ensure facilities are inspected.
POST-5.2	Conduct Staff Training	86	POST-5.2	Conduct or procure training documented in the staff training and education strategy.	Number of employees who receive training and type of training received.	As identified in staff training evaluation in POST-5.1 and as-needed	To be done.	9/30/2026	In total, 64 employees received Surface Water training, including Post-Construction Site Runoff training, in

2023-24 Measurable Goals and Tracking Measures
BMPs for Post-Construction Site Runoff Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
									21 conferences and seminars. In narrative, see Appendix E for list of employees and trainings.
POST-6.1	Evaluation of POST-Construction Site Runoff Activities	87	POST-6.1	Evaluate the SWMP Document Participants post-construction site runoff activities by April 3, 2026.	Date evaluation results included in permit renewal package.	One-time	To be done.	4/3/2026	Evaluation of our Post-Construction Site Runoff activities will be completed and submitted in our renewal application.

2023-24 Measurable Goals and Tracking Measures
BMPs for Pollution Prevention for Municipal Operations Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
PREV-1.1	Street Sweeping	90	PREV-1.1-a	Sweep curbed arterials four times per year (Happy Valley).	Annual arterial curb miles swept in Happy Valley.	Annual	602.4	Annual	Average of 22.1 times per year. See total miles below.
PREV-1.1	Street Sweeping	90	PREV-1.1-a	Sweep curbed arterials four times per year (Happy Valley).	Total curb miles of Happy Valley arterial roadways.	Annual	27.2	Annual	
PREV-1.1	Street Sweeping	90	PREV-1.1-b	Sweep a minimum of 50% of County maintained curbed road and bike lane miles four times per year (DTD).	Annual curbed road and bike lane miles of County-maintained ROW in the Permitted Area that have been swept.	Annual	1655	Annual	Average of 4.6 times per year. See total miles below.
PREV-1.1	Street Sweeping	90	PREV-1.1-b	Sweep a minimum of 50% of County maintained curbed road and bike lane miles four times per year (DTD).	Percentage of curbed road and bike lane miles of County-maintained ROW in the Permitted Area which were swept.	Annual	458%	Annual	

2023-24 Measurable Goals and Tracking Measures
BMPs for Pollution Prevention for Municipal Operations Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
PREV-1.2	Continue to Conduct Pollution Prevention Activities Related to Road Operations	90	PREV-1.2	Remove 90% of solid waste dumps in SWMP Document Participants' ROW within six weeks of notification or discovery.	Annual number of solid waste dumps removed within six weeks.	Annual	26	Annual	
PREV-1.2	Continue to Conduct Pollution Prevention Activities Related to Road Operations	90	PREV-1.2	Remove 90% of solid waste dumps in SWMP Document Participants' ROW within six weeks of notification or discovery.	Annual percentage of solid waste dumps removed within six weeks.	Annual	100%	Annual	
PREV-2.1	Winter Materials Management	92	PREV-2.1	Maintain winter materials stockpile	List of types of materials stored and/or used in the Permitted Area per MS4 Permit year.	Annual	Happy Valley stores 200 yards of 1/4"-#10 sand and 6900 gallons of magnesium chloride at the Public Works yard.	Annual	
PREV-2.2	Winter Maintenance Strategy	92	PREV-2.2	Implement winter operations and maintenance activities if snow	Number of winter weather events where winter maintenance materials are	Annual	2	Annual	

2023-24 Measurable Goals and Tracking Measures
BMPs for Pollution Prevention for Municipal Operations Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
				and/or ice events occur.	used in the Permitted Area per MS4 Permit year.				
PREV-2.2	Winter Maintenance Strategy	92	PREV-2.2	Implement winter operations and maintenance activities if snow and/or ice events occur.	Quantities and general location of each material used in relation to distance (e.g., pounds per mile) in the Permitted Area per MS4 Permit year.	Annual	Happy Valley applied 24 gallons per land mile for magnesium chloride on designated snow map and 1.5 yards of sand per lane mile on designated snow map (see attached snow map) The County applied 819.7 gallons of Magnesium Chloride (at a rate of 25 gallons per lane mile) and applied 535.31 tons of sand (at a rate of 500-750 lbs. per lane mile.	Annual	
PREV-2.2	Winter Maintenance Strategy	92	PREV-2.2	Implement winter operations and maintenance activities if snow and/or ice events occur.	Any other actions taken to protect waters of the state in the Permitted Area per MS4 Permit year	Annual	All materials used in winter operations is per manufacture recommendations or industry standards	Annual	

2023-24 Measurable Goals and Tracking Measures
BMPs for Pollution Prevention for Municipal Operations Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
PREV-3.1	Continue to Conduct Pollution Prevention Activities Related to Landscape Maintenance and Vegetation Control	94	PREV-3.1	Adopt and implement the most recent ODOT Guide or an approved alternative for vegetation maintenance in County-maintained ROW during the permit term.	Date manual adopted.	One-time	7/27/2007	9/30/2026	On July 27, 2007 the Clackamas County Board of Commissioners approved the adoption of ODOT's Routine Road Maintenance BMPs, which applies to DTD's Tranportation Maintenance. DTD has continued to follow each revised version, with the latest being published in 2020.
PREV-4.1	Implement Litter Control Methods	96	PREV-4.1-a	Encourage event organizers to implement recycling at events.	Number of events each year where recycling containers were lent out.	Annual	49	Annual	DTD did not track the number of events from the 49 groups, and each group received from 2 to 110 recycling containers per event. The groups included schools who used them for sporting and other events throughout the year and cities which used them for concerts in the park. In 2024-25,

2023-24 Measurable Goals and Tracking Measures
BMPs for Pollution Prevention for Municipal Operations Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
									this data will be included.
PREV-4.1	Implement Litter Control Methods	96	PREV-4.1-b	Respond to 100% of roadway litter reports each year.	Number of reports resolved	Annual	42	Annual	HV - 10 DTD - 32
PREV-4.1	Implement Litter Control Methods	96	PREV-4.1-b	Respond to 100% of roadway litter reports each year.	Percentage of roadway litter reports resolved	Annual	100%	Annual	
PREV-5.1	Continue to Conduct Pollution Prevention Activities Related to Municipal Waste Facilities	98	PREV-5.1-a	Each year, inspect 100% of municipal waste facilities at least once.	Annual number of municipal waste facilities inspected.	Annual	3	Annual	Happy Valley, 12 - monthly inspections performed at 13910 SE Ridgecrest Rd (12 annually). 4 cleaning processed based on those inspections. DTD, 1 - one inspection performed at new facility. WES, 52 - inspected its decant facility weekly
PREV-5.1	Continue to Conduct Pollution Prevention Activities	98	PREV-5.1-a	Each year, inspect 100% of municipal waste	Annual percentage of municipal	Annual	100%	Annual	

2023-24 Measurable Goals and Tracking Measures
BMPs for Pollution Prevention for Municipal Operations Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
	Related to Municipal Waste Facilities			facilities at least once.	waste facilities inspected.				
PREV-5.1	Continue to Conduct Pollution Prevention Activities Related to Municipal Waste Facilities	98	PREV-5.1-b	Each year, document the number of emergency overflow events to the dry pond. (WES)	Date of each emergency overflow event to the dry pond.	Annual	NA	Annual	There were no emergency overflow events to the dry pond.
PREV-6.1	Inspect Sanitary Sewer Lines	100	PREV-6.1-a	Each year complete 100% of scheduled TV inspections of the public sanitary sewer system.	Annual length (linear feet) of public sanitary sewer pipe TV inspected.	Annual	131,498	Annual	
PREV-6.1	Inspect Sanitary Sewer Lines	100	PREV-6.1-a	Each year complete 100% of scheduled TV inspections of the public sanitary sewer system.	Annual percentage of scheduled TV inspections of public sanitary sewer system completed.	Annual	83%	Annual	
PREV-6.1	Inspect Sanitary Sewer Lines	100	PREV-6.1-b	Eliminate 100% of sanitary sewer discharges to the MS4 public within five days	Annual number of discharges to the MS4 resulting from cracked or	Annual	0	Annual	

2023-24 Measurable Goals and Tracking Measures
BMPs for Pollution Prevention for Municipal Operations Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
				of discovery each year.	broken public sanitary sewer lines that were eliminated within five days of discovery.				
PREV-6.1	Inspect Sanitary Sewer Lines	100	PREV-6.1-b	Eliminate 100% of sanitary sewer discharges to the MS4 public within five days of discovery each year.	Annual percentage of discharges to the MS4 resulting from cracked or broken public sanitary sewer lines that were eliminated within five days of discovery.	Annual	0%	Annual	
PREV-7.1	Pollution Prevention in Fire-Fighting Training	102	PREV-7.1	Once during the MS4 Permit term, perform one unscheduled site visit to CFD#1 training center to review position of diversion valve and offer verbal guidance.	Date(s) of unscheduled site visits.	One-time	To be done.	9/30/2026	

2023-24 Measurable Goals and Tracking Measures
BMPs for Pollution Prevention for Municipal Operations Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
PREV-8.1	Determine Training Needs	103	PREV-8.1	Evaluate and document training needs (for staff responsible for operations and maintenance of facilities) one time during the MS4 Permit term.	Date staff training and education strategy published.	One-time	To be done.	9/30/2026	WES, Clackamas County, and the City of Happy Valley continue to train new and existing employeees to ensure that staff are well-prepared to operate and maintain facilities.
PREV-8.2	Conduct Staff Training	103	PREV-8.2	Conduct or procure training documented in the staff training and education strategy.	Number of employees who receive training and type training received.	As identified in staff training evaluation in PREV-8.1	To be done.	9/30/2026	In total, 64 employees received Surface Water training, including Pollution Prevention for Municipal Operators training, in 21 conferences and seminars. In narrative, see Appendix E for list of employees and trainings.
PREV-9.1	Evaluation of Pollution Prevention for Municipal Operations Activities	104	PREV-9.1	Evaluate the SWMP Document Participants pollution prevention for municipal operations	Date evaluation results included in permit renewal package.	One-time	To be done.	4/3/2026	Evaluation of our Pollution Prevention for Municipal Operations activities will be completed and will be submitted

2023-24 Measurable Goals and Tracking Measures
BMPs for Pollution Prevention for Municipal Operations Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
				activities by April 3, 2026.					with our renewal application.

2023-24 Measurable Goals and Tracking Measures
BMPs for Industrial and Commercial Facilities Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
COMM-1.1	Identify New Industrial Facilities Requiring NPDES Permits	106	COMM-1.1-a	Review new industrial development applications for applicability of 1200-Z permit a minimum of one time each year.	Date(s) new development applications were reviewed.	Annual	NA	Annual	Co-permittees did not review any industrial development plans for applicability of a 1200-Z permit.
COMM-1.1	Identify New Industrial Facilities Requiring NPDES Permits	107	COMM-1.1-b	Each year notify facility operator and DEQ of 100% of facilities newly identified as potentially needing a 1200-Z permit within 30 days of discovery.	Annual number and list of facilities and where operator and DEQ were notified within 30 days of discovery.	Annual	0	Annual	
COMM-1.1	Identify New Industrial Facilities Requiring NPDES Permits	107	COMM-1.1-b	Each year notify facility operator and DEQ of 100% of facilities newly identified as potentially needing a 1200-Z permit within 30 days of discovery.	Annual percentage of facilities where operator and DEQ were notified within 30 days of discovery.	Annual	0 percent	Annual	
COMM-1.2	Identify Existing Industrial Facilities Requiring NPDES Permits	107	COMM-1.2-a	Survey existing industrial facilities for 1200-Z permit applicability a minimum of one time each year.	Date(s) survey sent via U.S. mail.	Annual	4/10/2024 4/11/2024 4/14/2024 5/10/2024 6/3/2024 6/4/2024	Annual	Total of 48 surveys sent

2023-24 Measurable Goals and Tracking Measures
BMPs for Industrial and Commercial Facilities Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
COMM-1.2	Identify Existing Industrial Facilities Requiring NPDES Permits	107	COMM-1.2-b	Each year notify facility operator and DEQ of 100% of facilities newly identified as potentially needing a 1200-Z permit within 30 days of discovery.	Annual number and list of facilities and where operator and DEQ were notified within 30 days of discovery.	Annual	4	Annual	
COMM-1.2	Identify Existing Industrial Facilities Requiring NPDES Permits	107	COMM-1.2-b	Each year notify facility operator and DEQ of 100% of facilities newly identified as potentially needing a 1200-Z permit within 30 days of discovery.	Annual percentage of facilities where operator and DEQ were notified within 30 days of discovery.	Annual	100%	Annual	
COMM-2.1	Review and Update the Industrial/Commercial Facilities Strategy	109	COMM-2.1	Update Industrial/Commercial Facilities Strategy by December 1, 2023.	Date Industrial/Commercial Facilities Strategy updated.	One-time	11/20/2023	12/1/2023	WES' Industrial Stormwater Screening Strategy submitted to DEQ on 11/20/2023.
COMM-2.2	Implement the Industrial/Commercial Facilities Strategy	109	COMM-2.2	Each year, inspect 100% of sites referred through complaint or referral within ten business days	Annual number of sites inspected within ten business days based on complaint or referral.	Annual	10	Annual	

2023-24 Measurable Goals and Tracking Measures
BMPs for Industrial and Commercial Facilities Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
COMM-2.2	Implement the Industrial/Commercial Facilities Strategy	109	COMM-2.2	Each year, inspect 100% of sites referred through complaint or referral within ten business days	Annual percentage of sites inspected with ten business days based on complaint or referral.	Annual	100%	Annual	
COMM-2.2	Implement the Industrial/Commercial Facilities Strategy	109	COMM-2.2	Each year, inspect 100% of sites referred through complaint or referral within ten business days	List of SIC categories of facilities inspected	Annual	• 7519 (Utility Trailer and Recreational Vehicle Rental) • 5812 (Eating Places) • 651202 (Property Operation, retail establishment) • 50330201(Fiberglass building materials) • 3273 (Ready-Mixed Concrete) • 5511 (Motor Vehicle Dealers New and Used) • 3365 (Aluminum Foundries) • 6513 (Operators of Apartment Buildings)	Annual	
COMM-2.2	Implement the Industrial/Co	109	COMM-2.2	Each year, inspect 100% of sites referred through	Overview of results from inspections	Annual	• 4 Notices to Correct	Annual	

2023-24 Measurable Goals and Tracking Measures
BMPs for Industrial and Commercial Facilities Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
	mmercial Facilities Strategy			complaint or referral within ten business days			• 2 Notices of Violation • 2 non-MS4 Civil Penalty Assessments		
COMM-3.1	Determine Training Needs	110	COMM-3.1	Evaluate and document training needs (for staff responsible for inspecting and evaluating commercial and industrial facilities) one time during the MS4 Permit term.	Date staff training and education strategy published.	One-time	To be done.	9/30/2026	WES continues to train new and current employees to ensure that staff can inspect and evaluate commercial and industrial facilities.
COMM-3.2	Conduct Staff Training	110	COMM-3.2	Conduct or procure training documented in the staff training and education strategy.	Number of employees who receive training and type training received.	As identified in staff training evaluation in COMM-3.1 and as-needed	To be done.	9/30/2026	In total, 64 employees received Surface Water training, including Industrial and Commercial Facility training, in 21 conferences and seminars. In narrative, see Appendix E for list of

2023-24 Measurable Goals and Tracking Measures
BMPs for Industrial and Commercial Facilities Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
									employees and trainings.
COMM-4.1	Evaluation of Industrial and Commercial Facilities Activities	111	COMM-4.1	Evaluate the SWMP Document Participants industrial and commercial facilities activities by April 3, 2026.	Date evaluation results included in permit renewal package.	One-time	To be done.	4/3/2026	Evaluation of our Industrial and Commercial Facilities activities will be completed and submitted with our Permit renewal application.

2023-24 Measurable Goals and Tracking Measures
BMPs for Stormwater System Operations and Maintenance Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
MAINT-1.1	Review Operation and Maintenance Legal Authority	113	MAINT-1.1	Review, and update, if necessary, legal authority in WES to require maintenance and inspect private storm systems (once during the MS4 Permit term) by Dec. 1, 2024.	Date legal authority verified.	One-time	5/4/2023	12/1/2024	The WES Board of Directors adopted revised stormwater rules and regulations and standards in May 2023. They took effect on July 1, 2023.
MAINT-1.1	Review Operation and Maintenance Legal Authority	113	MAINT-1.1	Review, and update, if necessary, legal authority in WES to require maintenance and inspect private storm systems (once during the MS4 Permit term) by Dec. 1, 2024.	Date legal authority updated, if necessary.	One-time	5/4/2023	12/1/2024	The WES Board of Directors adopted revised stormwater rules and regulations and standards in May 2023. They took effect on July 1, 2023.
MAINT-2.1	Ongoing Facility Maintenance	118	MAINT-2.1-a	Each year inspect the stormwater systems in 70% of subdivisions and other participants enrolled in WES' Residential	Annual number of Residential Maintenance Agreement subdivisions and other	Annual	203	Annual	

2023-24 Measurable Goals and Tracking Measures
BMPs for Stormwater System Operations and Maintenance Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
				Maintenance Agreement Program.	participants inspected.				
MAINT-2.1	Ongoing Facility Maintenance	118	MAINT-2.1-a	Each year inspect the stormwater systems in 70% of subdivisions and other participants enrolled in WES' Residential Maintenance Agreement Program.	Annual percentage of Residential Maintenance Agreement subdivisions and other participants inspected.	Annual	56%	Annual	
MAINT-2.1	Ongoing Facility Maintenance	118	MAINT-2.1-b	Correct 100% of maintenance deficiencies discovered during a WES Residential Maintenance Agreement inspection within two years.	Running total of deficiencies found during Residential Maintenance Agreement inspections that were corrected within two years.	Annual	4	Annual	
MAINT-2.1	Ongoing Facility Maintenance	118	MAINT-2.1-b	Correct 100% of maintenance deficiencies discovered during a WES Residential Maintenance	Percentage of deficiencies corrected within two years to date.	Annual	100%	Annual	

2023-24 Measurable Goals and Tracking Measures
BMPs for Stormwater System Operations and Maintenance Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
				Agreement inspection within two years.					
MAINT-2.1	Ongoing Facility Maintenance	118	MAINT-2.1-c	Each year mow and/or cut brush and weeds from stormwater facilities within 100% of subdivisions and other participants enrolled in WES' Residential Maintenance Agreement Program.	Annual number of subdivisions and other participants where stormwater facilities were mowed/brushed.	Annual	147	Annual	
MAINT-2.1	Ongoing Facility Maintenance	118	MAINT-2.1-c	Each year mow and/or cut brush and weeds from stormwater facilities within 100% of subdivisions and other participants enrolled in WES' Residential Maintenance Agreement Program.	Annual percentage of Residential Maintenance Agreement subdivisions and other participants where stormwater facilities were mowed/brushed.	Annual	41%	Annual	Not all Residential Maintenance Agreement subdivisions have vegetated facilities. Of the 173 subdivisions with vegetated facilities, WES maintained 85 percent.

2023-24 Measurable Goals and Tracking Measures
BMPs for Stormwater System Operations and Maintenance Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
MAINT-2.1	Ongoing Facility Maintenance	118	MAINT-2.1-d	Each year remove sediment and trash from 20% of underground public water quality facilities operated by WES.	Annual number of underground water quality facilities where WES removed sediment and trash.	Annual	34	Annual	
MAINT-2.1	Ongoing Facility Maintenance	118	MAINT-2.1-d	Each year remove sediment and trash from 20% of underground public water quality facilities operated by WES.	Annual percentage of underground water quality facilities where WES removed sediment and trash.	Annual	9%	Annual	The majority of this work was done in the summer / fall of 2024 after the reporting period. WES is on track to meet this goal next reporting year.
MAINT-2.1	Ongoing Facility Maintenance	118	MAINT-2.1-d	Each year remove sediment and trash from 20% of underground public water quality facilities operated by WES.	Estimated volume of debris removed as a total or by category or type of activity, if known.	Annual	34	Annual	Cubic yards
MAINT-2.1	Ongoing Facility Maintenance	118	MAINT-2.1-e	Each year respond to 100% of non-emergency	Annual number of non-emergency complaints and	Annual	76	Annual	

2023-24 Measurable Goals and Tracking Measures
BMPs for Stormwater System Operations and Maintenance Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
				complaints and referrals for facility maintenance within 72 hours. (WES)	referrals for facility maintenance responded to within 72 hours.				
MAINT-2.1	Ongoing Facility Maintenance	118	MAINT-2.1-e	Each year respond to 100% of non-emergency complaints and referrals for facility maintenance within 72 hours. (WES)	Annual percentage of non-emergency complaints and referrals for facility maintenance responded to within 72 hours.	Annual	93%	Annual	
MAINT-2.1	Ongoing Facility Maintenance	118	MAINT-2.1-f	Each year replace proprietary components in 100% of stormwater management structures operated by DTD in which a proprietary component needs replacement. (DTD)	Annual number of structures with proprietary components that need replacement that were replaced by DTD.	Annual	0	Annual	

2023-24 Measurable Goals and Tracking Measures
BMPs for Stormwater System Operations and Maintenance Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
MAINT-2.1	Ongoing Facility Maintenance	118	MAINT-2.1-f	Each year replace proprietary components in 100% of stormwater management structures operated by DTD in which a proprietary component needs replacement. (DTD)	Annual percentage of structures with proprietary components that have been replaced.	Annual	0%	Annual	
MAINT-2.1	Ongoing Facility Maintenance	119	MAINT-2.1-g	Each year respond to 100% of non-emergency complaints and referrals for facility maintenance (catch basins) within 72 hours. (DTD)	Annual number of non-emergency complaints and referrals for facility maintenance responded to within 72 hours.	Annual	195	Annual	
MAINT-2.1	Ongoing Facility Maintenance	119	MAINT-2.1-g	Each year respond to 100% of non-emergency complaints and referrals for	Annual percentage of non-emergency complaints and referrals for facility	Annual	89%	Annual	

2023-24 Measurable Goals and Tracking Measures
BMPs for Stormwater System Operations and Maintenance Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
				facility maintenance (catch basins) within 72 hours. (DTD)	maintenance responded to within 72 hours.				
MAINT-2.2	Routine Catch Basin Cleaning	119	MAINT-2.2-a	Clean 20% of catch basins and inlets (with sumps) under WES responsibility each year.	Annual number of catch basins and inlets cleaned.	Annual	960	Annual	WES inspected an additional 1,304 inlets that either did not have sumps or did not need cleaning.
MAINT-2.2	Routine Catch Basin Cleaning	119	MAINT-2.2-a	Clean 20% of catch basins and inlets (with sumps) under WES responsibility each year.	Annual percentage of catch basins and inlets (with sumps) cleaned.	Annual	9.8%	Annual	The response measures against all catch basins and inlets not just those with sumps. WES inspected an additional 1,304 inlets that either did not have sumps or did not need cleaning.
MAINT-2.2	Routine Catch Basin Cleaning	119	MAINT-2.2-b	Clean 20% of catch basins and inlets (with sumps) under DTD responsibility each year.	Annual number of catch basins and inlets cleaned.	Annual	45	Annual	
MAINT-2.2	Routine Catch Basin Cleaning	119	MAINT-2.2-b	Clean 20% of catch basins and inlets (with sumps) under	Annual percentage of catch basins and	Annual	0.6%	Annual	The response measures against all catch basins and inlets not just those with sumps.

2023-24 Measurable Goals and Tracking Measures
BMPs for Stormwater System Operations and Maintenance Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
				DTD responsibility each year.	inlets (with sumps) cleaned.				
MAINT-3.1	Public Conveyance Cleaning and Maintenance	120	MAINT-3.1	Complete 100% of scheduled conveyance system cleaning maintenance activities each year (WES, DTD, Happy Valley).	Annual number of conveyance system work orders completed each year.	Annual	112	Annual	
MAINT-3.1	Public Conveyance Cleaning and Maintenance	120	MAINT-3.1	Complete 100% of scheduled conveyance system cleaning maintenance activities each year (WES, DTD, Happy Valley).	Annual percentage of conveyance system work orders completed every year.	Annual	100%	Annual	
MAINT-4.1	Storm Drain Cleaning Assistance Program	123	MAINT-4.1	Each year, implement SCAP.	Number of participants	Annual	99	Annual	In 2023, 62 businesses signed up for the Stormwater Control Assistance Program (SCAP) through WES. The SCAP vendor performed maintenance at 99 businesses within WES' MS4 service area.
MAINT-4.1	Storm Drain Cleaning	123	MAINT-4.1	Each year, implement SCAP.	Number and type of facilities	Annual	• Cleaned 485 catch basins	Annual	In 2023, the SCAP vendor performed the following maintenance:

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BMPs for Stormwater System Operations and Maintenance Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
	Assistance Program				cleaned and maintained		• Cleaned 6 water quality manhole • Serviced 1 oil-water separator		• Cleaned 485 catch basins • Cleaned 6 water quality manholes • Serviced 1 oil-water separator Additionally, 119 businesses submitted annual reports detailing the inspection and maintenance of their privately owned stormwater systems. This maintenance included: • Cleaning 827 catch basins • Cleaning 118 water quality manholes • Servicing 8 hydrodynamic separators • Servicing 24 oil-water separators • Cleaning 14 cartridge filters • Maintaining 37 vegetated water quality facilities
MAINT-4.2	Regulated Storm System Inspection and Enforcement	123	MAINT-4.2-a	Inspect 20% of prioritized regulated private storm systems in WES each year.	Annual number of prioritized regulated private storm systems inspected at least one time.	Annual	45	Annual	

2023-24 Measurable Goals and Tracking Measures
BMPs for Stormwater System Operations and Maintenance Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
MAINT-4.2	Regulated Storm System Inspection and Enforcement	123	MAINT-4.2-a	Inspect 20% of prioritized regulated private storm systems in WES each year.	Annual percentage of prioritized regulated private storm systems inspected.	Annual	31%	Annual	
MAINT-4.2	Regulated Storm System Inspection and Enforcement	124	MAINT-4.2-b	50% of prioritized regulated private storm systems pass initial inspection each year.	Annual number of prioritized regulated private storm systems that passed initial inspection.	Annual	23	Annual	
MAINT-4.2	Regulated Storm System Inspection and Enforcement	124	MAINT-4.2-b	50% of prioritized regulated private storm systems pass initial inspection each year.	Annual percentage of prioritized regulated private storm systems that passed initial inspection.	Annual	51%	Annual	
MAINT-4.2	Regulated Storm System Inspection and Enforcement	124	MAINT-4.2-c	Provide technical assistance to 90% of prioritized regulated private storm systems found to have a maintenance	Running total of prioritized regulated private storm systems that received technical assistance within one year	Annual	22	Annual	

2023-24 Measurable Goals and Tracking Measures
BMPs for Stormwater System Operations and Maintenance Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
				deficiency within one year.	of an inspection that discovered a maintenance deficiency.				
MAINT-4.2	Regulated Storm System Inspection and Enforcement	124	MAINT-4.2-c	Provide technical assistance to 90% of prioritized regulated private storm systems found to have a maintenance deficiency within one year.	Percentage of prioritized regulated private storm systems that received technical assistance within one year to date.	Annual	100%	Annual	
MAINT-6.1	Infrastructure Retrofit and Hydromodification Assessment Update	127	MAINT-6.1	Assessment of outcomes related to the Hydromodification Assessment and Stormwater Retrofit Strategy reports by December 1, 2023.	Progress or completion of projects identified in Retrofit Strategy.	One-time	Completed	12/1/2023	Carli Creek Water Quality Retrofit Project was completed, and WES fulfilled its permit obligations as of October 5, 2022. See https://www.clackamas.us/wes/carlicreek.html for more information.
MAINT-6.1	Infrastructure Retrofit and Hydromodification Assessment Update	127	MAINT-6.1	Assessment of outcomes related to the Hydromodification Assessment and Stormwater Retrofit Strategy	Dates Hydromodification Assessment and Stormwater Retrofit Strategy assessed and, if	One-time	12/1/2023	12/1/2023	Hydromodification Assessment and Stormwater Retrofit Strategy was submitted with last year's 2022-23 MS4 Annual Report.

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
				reports by December 1, 2023.	needed, updated.				
MAINT-7.1	Determine Training Needs	128	MAINT-7.1	Evaluate and document training needs (for staff responsible for inspecting, operating, and maintaining stormwater facilities as well as inspecting and ensuring regulated private stormwater facilities are operated and maintained to appropriate standards) one time during the MS4 Permit term.	Date staff training and education strategy published.	One-time	To be done.	9/30/2026	WES, Clackamas County, and the City of Happy Valley continue to train new and current employees to ensure that staff are well-prepared to inspect, operate, and maintain stormwater facilities as well as inspect and ensure regulated private stormwater facilities are operated and maintained to appropriate standards.
MAINT-7.2	Conduct Staff Training	128	MAINT-7.2	Conduct or procure training documented in the staff training and education strategy.	Number of employees who receive training and type training received.	As identified in staff training evaluation in MAINT-	To be done.	Per MAINT-7.1 and as-needed	In total, 64 employees received Surface Water training, including SW System Operations and Maintenance training, in 21 conferences and seminars. In

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BMPs for Stormwater System Operations and Maintenance Management Strategy

BMP Activity #	BMP Activity	SWMP Pg. #	Measurable Goal #	Measurable Goal	Tracking Measure	Frequency	Response	Key Deadline	Comment
						7.1 and as-needed			narrative, see Appendix E for list of employees and trainings.
MAINT-8.1	Evaluation of Stormwater System Maintenance Activities	129	MAINT- 8.1	Evaluate the SWMP Document Participants O/M activities by April 3, 2026.	Date evaluation results included in permit renewal package.	One-time	To be done.	4/3/2026	Evaluation of our Stormwater System Operations and Maintenance activities will be completed and submitted in our MS4 Permit renewal application.

Appendix B: Prioritization of Low Impact Development / Green Infrastructure Program, Schedule A.3.e.ii.

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Technical Memorandum

Prepared for: Clackamas Water Environment Services

Project Title: Clackamas Water Environment Services NPDES 2023-24 Support

Project No.: 186261

Technical Memorandum

Subject: LID-GI Barriers Evaluation Summary

Date: August 16, 2024 (draft)

October 24, 2024 (final)

To: Leah Johanson, P.E., Water Environment Services

From: Angela Wieland, P.E., Project Manager

Prepared by: Melissa Jannusch, PE

Reviewed by: Angela Wieland, PE

Table of Contents

Section 1: Introduction

Brown and Caldwell (BC) conducted an evaluation for potential barriers related to the use of low impact development (LID) approaches and green infrastructure (GI) for Clackamas Water Environment Services (WES), the city of Happy Valley (Happy Valley), and Clackamas County Department of Transportation and Development (CCDTD). The evaluation included a review of each jurisdiction's respective development code, municipal code, and/or stormwater standards. The requirement to review ordinance and development code barriers related to the use of LID-GI is driven by requirements of the Clackamas County National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer Systems (MS4) Phase I permit (Permit) and, more specifically, WES' LID-GI Strategy, submitted to the Oregon Department of Environmental Quality (DEQ) on December 1, 2023.

WES, Happy Valley, and CCDTD have overlapping boundaries and responsibilities for implementing the requirements of their Permit. WES is responsible for the engineering review for stormwater management facilities (SMFs) for Happy Valley and Clackamas County within WES' jurisdictional area. All jurisdictions refer to WES' Stormwater Standards (WES-SS, dated April 2023) for guidelines related to the sizing and design of SMFs including GI. However, each jurisdiction implements site planning and LID approaches differently in accordance with their respective planning departments. By December 1, 2024, each jurisdiction is required to develop and implement enforceable post-construction stormwater management requirements that prioritize onsite retention of stormwater and pollutant removal.

This evaluation is intended to serve as a guide to WES, Happy Valley, and CCDTD to identify any needed or recommended code or standards changes to eliminate or minimize barriers related to the use of LID practices and GI ahead of the required implementation date.

Section 2: Methods of Analysis

This evaluation of LID and GI barriers focused on the following question:

> *If a project applicant would like to use LID or GI approaches for site design or stormwater management, do applicable codes or standards significantly limit their options or prevent use of an industry standard approach?*

BC's approach is described below. Results of the analysis are presented in a matrix for each jurisdiction (see Attachments A, B, and C). A summary of the results of the analysis and recommendations are included in Section 3.

2.1 Identifying Barriers

Happy Valley and CCDTD maintain comprehensive code documents related to land use planning, site development, and site design, as well as refer to WES-SS. For WES, stormwater requirements are documented in their Rules and Regulations (WES-RR), as well as the WES-SS.

To focus this evaluation, BC first developed a list of common barriers that have been found to inhibit design and implementation of LID techniques and GI design in other jurisdictions based on references provided by United States Environmental Protection Agency (EPA) guidance. These barriers were identified by reviewing documents which included the following:

- Low Impact Development Code update and Integration Toolkit by the State of Washington Department of Ecology, 2014
- Tackling Barriers to Green Infrastructure: An Audit of Local Codes and Ordinances by the Wisconsin's Sea Grant, 2017

Potential barriers included in this analysis are those that prevent or restrict developers from implementing industry standard LID approaches to development. They also include potential barriers that unnecessarily limit the options or restrict opportunities for incorporating GI facilities into site plans. The evaluation focused on barriers related to the following four principals of LID:

- Reduction of impervious surfaces
- Reduction of stormwater runoff from a site
- Retention of stormwater onsite through LID and GI that incorporate infiltration
- Protection of native soils and vegetation (typically through clustering and site design)

Barriers to LID and GI were organized according to three subcategories: green infrastructure, land use, and streetscapes/parking lots. Barriers that overlap multiple categories were generally listed in only one category to prevent repetition.

2.2 Document Review

After developing the list of common LID barriers, BC reviewed each jurisdictions existing ordinances, codes, and standards to determine whether any of the listed barriers exist. The evaluation focused on the following documents:

- WES
  - WES Rules and Regulations (WES-RR)
  - WES Stormwater Standards (WES-SS)
- Happy Valley
  - Happy Valley Engineering Design and Standard Details Manual (HVEDM, dated 2023)
  - Happy Valley Municipal Code (HVMC):
    - Chapter 12.04, Road Standards
    - Chapter 12.05, Utility Facilities in Public Right of Way
    - Chapter 15.12, Infill and Grading
    - Chapter 16,42, Landscaping, Street Trees, Fences and Walls, Recreation Areas
    - Chapter 16.43, Parking and Loading
    - Chapter 16.50, Public Facilities
    - Chapter 16.71, Variances
- CCDTD
  - Clackamas County Roadway Standards (CCRS, dated 2020)
  - Clackamas County Zoning Code (CZDO, Title 12):
    - Section 315 Urban Low Density Residential
    - Section 510 Neighborhood Commercial (NC)
    - Section 602 Business Park, Light Industrial, and General
    - Section 702 Open Space Management District (OSM)
    - Section 709 Water Quality Resource Area District
    - Section 903 Setback Exceptions
    - Section 1005 Site and Building Design
    - Section 1006 Utilities, Street Lights, Water Supply, Sewage Disposal, Surface Water Management, and Erosion Control

- Section 1007 Roads and Connectivity Industrial Districts (BP, LI and GI)
- Section 1009 Landscaping
- Section 1012 Lot Size and Density
- Section 1013 Planned Unit Developments
- Section 1015 Parking and Loading

Based on the review of current codes and standards, each potential barrier was ranked according to the rating key listed in Table 1; results are documented in the matrices included as Attachments A, B, and C. Specific barriers recommended for code revisions are discussed in Section 3. If a specific barrier was not found in the respective jurisdiction's documents (e.g., "grey" category), the lack of barrier is identified in the matrices but not discussed in the narrative of this technical memorandum (TM). The narrative in this TM focuses on summarizing the main/major limitations/barriers and does not provide an in-depth analysis on all limiting or ambiguous code language found during the review.

Table 1. LID Barrier Rating Key

Color	Rating
Green	No barrier found in reviewed code
Yellow	Limitations or ambiguous language found in reviewed code
Red	Barrier found in reviewed code
Grey	No reference found allowing or disallowing policy

2.3 Barriers Meetings

In February 2024, a workshop was held with staff representing Happy Valley, CCDTD, and WES to discuss how LID and GI are currently used in each jurisdiction, what challenges the jurisdictions face with respect to the use of LID/GI, and cross agency coordination of shared responsibilities. A follow up workshop was conducted in May 2024 to review BC's initial findings and potential recommendations for addressing the barriers in the "red" category. Feedback received during these workshops was incorporated into the matrices as well as final recommendation.

A primary focus of the initial workshop was review of the responsibilities and coordination activities of each jurisdiction as related to stormwater plan review and SMF design. Table 2 provides a summary of activities and responsibilities in implementing LID practices and GI during the planning and design process.

Several barriers have been identified related to challenges associated with cross agency coordination. In areas of Clackamas County outside of WES' jurisdiction, the process varies and CCDTD has responsibility for providing requirements and reviewing feasibility of the stormwater design associated with the development application.

Table 2. Stormwater Planning and Review Process		
Stage	WES Development Review Team Role	CCDTD or Happy Valley Planning/Engineering Teams
1	NA	Schedule preapplication meetings.
2	Attend pre-application meetings and provide stormwater design requirements (GI).	Attend pre-application meetings and identify additional stormwater design requirements (GI).
3	Review feasibility of stormwater proposal. Issue service provider letter (SPL).	Review feasibility of stormwater proposal. CCDTD issues a statement of feasibility in areas outside of WES or Oak Lodge Water Service (OLWS') jurisdiction.
4	NA	Receive land use applications and route for comments and conditions.
5	Review land use applications and recommend stormwater conditions of approval to the respective planning agencies.	Review land use applications and recommend stormwater conditions of approval.
6	NA	Planning Authority approves or denies land use application and sets final conditions of approval.
7	Review and approve/deny SWM construction plans for areas inside and outside of the ROW.	Outside of WES' jurisdiction, CCDTD reviews and approve/deny SWM construction plans for areas inside of the ROW.
8	• Sign off commercial building permit applications. • Post construction verification and acceptance (commercial and subdivision).	
9	NA	• Building authority conducts building permit application intake for single-family (SF) residential and routes to WES if in WES' jurisdiction. • Issue SF building permits if approved by WES. • Inspects connection to public or private storm system.

Additional correspondence in response to the draft barrier evaluation matrices was provided by Happy Valley and Clackamas County in June 2024, giving additional clarification on agency specific procedures.

Section 3: Results and Recommendations

Detailed findings and recommended actions from the barriers evaluation are presented in Attachments A, B, and C. Major "red" and/or "yellow" category barriers are summarized in Table 3. These recommendations should guide the agencies in making changes to ordinances, development codes, and design standards to prioritize the use of LID and GI throughout each jurisdiction.

Table 3. Summary of Barriers and Recommendations		
Applicable Jurisdiction	**Barrier**	**Recommendation**
Green Infrastructure		
WES (WES-SS) Happy Valley Clackamas County	• Tables 5 and 6 in the WES-SS indicate pervious pavements and infiltration trenches are not permitted in the public street/ROW; tables state pervious pavement constructed within the Public ROW requires the approval of the local roadway authority. • CCDTD appears to allow for pervious pavements as an alternative design and Happy Valley does allow pervious pavements on private streets and driveways.	• Review the prohibition of pervious pavement and certain types of GI in the public street/ROW and determine if they could be allowed in some capacity. This may require review of maintenance responsibilities and expansion of maintenance agreements, as maintenance constraints have been identified as a limitation in use of pervious pavements. • Review the process for allowing pervious pavements and/or infiltration trenches between the CCRS, CDZO, Happy Valley, and WES-SS. Update as required for consistency.
WES (WES-SS, WES-RR) Happy Valley (HVMC, HVEDM) Clackamas County (CZDO,CCRS)	• Rainwater harvesting or cisterns are not referenced in the WES-SS or WES-RR. • Happy Valley's Building Department is responsible for authorizing rainwater harvesting on private property. Clackamas County allows rainwater harvesting at the director's discretion but does not provide regulation in relation to use of stormwater harvesting as a GI facility or LID planning practice. • The lack of clarity on design and siting requirements may present and a barrier to use of rainwater harvesting for LID or as a GI facility.	• Review if rainwater harvest, rain barrels, or cisterns are acceptable for use as an LID site planning strategy and ensure alignment between the WES-SS , CZDO, HVEDM, HVMC, and relevant building codes related to rainwater harvesting requirements and/or limitations. • Determine if design specification and review by WES would be required for use of rain barrels or cisterns as an LID planning technique or GI facility, as neither the CCDTD nor HV provide oversite for rainwater harvesting as an SMF.
Clackamas County (CZDO)	• Green roofs are allowable for meeting landscaped requirements. The landscaping requirements allow for flexibility, but do not specifically mention if other vegetated SMFs including GI are counted towards landscaping requirements.	Reference vegetated SMFs by name as allowable for meeting landscaping requirements for additional clarity.
WES (WES-SS, WES-RR) Happy Valley (HVMC) Clackamas County (CZDO)	Definitions for LID and GI are not consistently referenced in the WES-SS, WES-RR, Clackamas Zoning and Development Ordinance (CZDO), or Happy Valley Municipal Code (HVMC) in accordance with definitions in the NPDES MS4 permit.	It is recommended that these terms be defined in conjunction with the definitions currently included in the 2022 Stormwater Management Program Document and referenced in the related text.
WES (WES-SS) Happy Valley Clackamas County	• The WES-SS specifies that sites with infiltration rates of 0.5 in/hr are infiltration limited, but the infiltration rates specified in the SMF-specific design criteria are inconsistent with the 0.5 in/hr limitation. • This wording may create a barrier as it implies that sites with infiltration rates less than 0.5 in/hr cannot use SMFs that achieve partial infiltration (e.g., GI). • In addition, a rate of 0.5 in/hr is inconsistent with SMF-specific infiltration requirements outlined in Section 6.5 of the WES-SS which may lead to confusion for designers and developers.	Clarify infiltration rate requirements or use and reference to the BMP Sizing Tool for water quality and flow control SMF sizing. This will provide consistency of required infiltration rates, site planning, and design requirements.
WES Happy Valley Clackamas County	• WES conducts SMF inspections and maintenance in the ROW within their jurisdiction. • Allowable SMFs outside of WES' jurisdiction and in the ROW may be limited based on the ability of Happy Valley and/or CCDTD to provide maintenance. This may lead to inconsistency throughout Clackamas County for allowable SMFs.	Review maintenance requirements for specific, infiltration-based SMFs (e.g., GI) to determine if maintenance is feasible by HV and CCDTD or explore expansion of maintenance agreement with WES to allow for infiltration-based SMFs to be installed in more remote locations and be held to the same maintenance standards.

Table 3. Summary of Barriers and Recommendations		
Applicable Jurisdiction	**Barrier**	**Recommendation**
Land Use		
WES Happy Valley Clackamas County	• Land use review and approval is under the authority of the respective planning agency. • Specific site planning and/or impervious area minimization/ reduction techniques (e.g., LID strategies), such as preservation of existing trees, retaining vegetation and open space, clustering buildings, disconnecting residential downspouts, etc. to help mitigate stormwater runoff and reduce the size of the required SMFs are not listed in the WES-SS or required to be incorporated/included in the Stormwater Report submittal to obtain the SPL or statement of feasibility (specific to CCDTD-only jurisdiction).	• Clarify and formalize responsibilities around site planning measures between Clackamas County and/or Happy Valley planning and WES to mitigate this process barrier. • Ensure that in order to receive the SPL or statement of feasibility (specific to CCDTD-only jurisdiction), that the Stormwater Management Plan and Drainage Report require site layout and onsite stormwater controls that help reduce runoff. • If implementing the BMP sizing tool, reflect the BMP sizing tool site layout requirements in the WES-SS and reference the BMP sizing tool in the standards.
Happy Valley (HVMC) Clackamas County (CZDO)	It is not clear if SMFs are allowable in open space tracts or for use a passive recreation for development. This may present a barrier in meeting both the open space and stormwater management objectives for development.	• Review open space code to determine if and when SMFs can be considered as open space and/or passive recreation. Determine if there should be limitations provided on use as recreational areas (such as excluding areas that are fenced or inaccessible to the public). • CCDTD and Happy Valley plan to review related open space code during the next code updates.
Streetscape/Parking		
WES (WES-SS) Happy Valley (CCRS, CZDO) Clackamas County (HVEDM, HVMC)	• SMFs located in the public ROW are not permitted to include trees per the WES-SS. • This may limit the ability to use GI in the public ROW. This would also prohibit the use of stormwater tree cells as a potential SMF. • Stormwater tree cells are not mentioned in the WES-SS, CCRS, CZDO, HVEDM, or HVMC.	• Review the WES-SS to determine if there is an opportunity to incorporate trees into SMFs located in the public ROW. • Determine if use of stormwater tree cells may provide stormwater management while also meeting tree requirements.

Section 4: Conclusion

These recommended revisions to the identified potential barriers to LID and GI should be further evaluated by WES, Happy Valley, and Clackamas County to guide updates to ordinances, codes, and standards. Consideration should be given to identifying code and standards adjustments that can serve multiple purposes while accomplishing barrier removal or minimization. Some of the barriers may be possible to address by each individual jurisdiction, but some of the barriers will require additional interagency coordination to address gaps related procedural issues or maintenance.

References

Clackamas County Code Title 12 Zoning and Development Ordinance, Section 315 Urban Low Density Residential, Clackamas County, Oregon.

Clackamas County Code Title 12 Zoning and Development Ordinance, Section 510 Neighborhood Commercial (NC), Clackamas County, Oregon.

Clackamas County Code Title 12 Zoning and Development Ordinance, Section 602 Business Park, Light Industrial, and General Title 12 Zoning and Development Ordinance, Section 702 Open Space Management District (OSM, Clackamas County, Oregon.

Clackamas County Code Title 12, Zoning and Development Ordinance, Section 709, Water Quality Resource Area District, Clackamas County, Oregon.

Clackamas County Code Title 12 Zoning and Development Ordinance, Section 903 Setback Exceptions, Clackamas County, Oregon.

Clackamas County Code Title 12 Zoning and Development Ordinance, Section 1005 Site and Building Design, Clackamas County, Oregon.

Clackamas County Code Title 12, Zoning and Development Ordinance, Section 1006, Utilities, Street Lights, Water Supply, Sewage Disposal, Surface Water Management, and Erosion Control , Clackamas County, Oregon.

Clackamas County Code Title 12, Zoning and Development Ordinance, Section 1007, Roads and Connectivity Industrial Districts (BP, LI and GI), Clackamas County, Oregon.

Clackamas County Code Title 12 Zoning and Development Ordinance, Section 1009 Landscaping, Clackamas County, Oregon.

Clackamas County Code Title 12 Zoning and Development Ordinance, Section 1012 Lot Size and Density, Clackamas County, Oregon.

Clackamas County Code Title 12 Zoning and Development Ordinance, Section 1013 Planned Unit Developments, Clackamas County, Oregon.

Clackamas County Code Title 12, Zoning and Development Ordinance, Section 1015, Parking and Loading, Clackamas County, Oregon.

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Engineering Design and Standards Details Manual, City of Happy Valley, 2023.

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Happy Valley Municipal Code Title 16 Land Development Code, Section 16.43 PARKING AND LOADING, Happy Valley, Oregon.

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Attachment A: WES Barrier Evaluation Matrix

Attachment A

LID Code Barriers Evaluation Matrix-WES

The matrix provided below was developed by comparing the current code and standards against common barriers that inhibit design and implementation of techniques for LID/GI design. The four main LID/GI principles include reduction of impervious surfaces, reduction of stormwater runoff from a site, retention of stormwater onsite through LID and GI type facilities that incorporate infiltration, and protection of native soils and vegetation (typically through clustering and site design). The barriers included in this analysis are those that discourage, prevent or restrict developers wanting to implement LID approaches from using those types of techniques.

Table A-1 shows the color-coded rating key applied to the evaluations presented in Table A-3. Table A-2 provides the list of abbreviations used for the regulatory documents referenced.

Table A-1. Rating Key

Color	Description
Green	No barrier found in reviewed code
Yellow	Limitations or ambiguous language found in reviewed code
Red	Barrier found in reviewed code
Grey	No reference found allowing or disallowing policy

Table A-2. Reference Key

Abbreviation	Title
WES-SS	WES Stormwater Standards April 2023
WES-RR	WES Rules and Regulations April 2023
CZDO	Clackamas County Zoning and Development Ordinance
HVEDM	Happy Valley Engineering Design Manual
HVMC	Happy Valley Municipal Code

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Table A-3. LID Code Barriers Evaluation Matrix

	Typical Barrier	Responsible Party	Code Reference	Evaluation of Barrier	Recommended Modification
Green Infrastructure					
	Policies disallowing stormwater facilities in residential privately owned areas such as yards. Restrictions to stormwater facility placement may limit the opportunity to install GI facilities to retain stormwater onsite.	WES Development review	1) WES-SS Table 6 2) WES-SS 9.3 Privately Owned and Maintained Facilities 3) WES-RR 1.1 Words and Terms	Privately owned and maintained stormwater management facilities (SMFs) are allowable and require recorded on-site maintenance agreements for access and maintenance. (1) (2) SMFs can be privately or publicly owned and maintained. (3)	No modification recommended.
	Policies disallowing rainwater harvesting for residential privately owned areas. Many jurisdictions are still developing standards and guidelines for rainwater reuse. In the interim, restrictions on rainwater harvesting are seen as one barrier to the use of LID.	WES Development review	1) CZDO 1006.03 Water Supply 2) HVMC 16.12.030. Definitions. 3) HVMC–Table 16.34.075-2 Habitat-Friendly Development Practices	No reference found related to rainwater harvesting or rain barrels in the WES-SS or WES-RR. The CZDO does not regulate rainwater harvest or the use of cistern/grey water in the context of stormwater. Rainwater harvest and/or the use of cisterns and grey water use are allowed at the planning directors discretion in groundwater limited areas for well development but is not referenced in relation to stormwater site planning. (1) Rainwater harvesting is also not mentioned in the HVEDM. The HVMC does mention retaining rooftop runoff in rain barrels as a Habitat-Friendly Development Practice, so it does appear to be allowed if proposed, but there is no specifics about siting requirements or design. Grey water, rainwater harvesting, and cisterns are also not mentioned. (2)(3) Rainwater harvesting or cisterns are not referenced in the WES-SS or WES-RR which may present and a barrier to use as a site planning technique.	• Review if rainwater harvest, rain barrels, or cisterns are acceptable for use as an LID site planning strategy and ensure alignment between the WES-SS, CZDO, HVEDM, and HVMC related to rainwater harvesting requirements and/or limitations. • Determine if design specification and review by WES would be required for use of rain barrels or cisterns as a site planning technique or GI facility, as neither the CCDTD nor HV provide oversite for rainwater harvesting.
	Policies disallowing green roofs or green/living walls for commercial or residential buildings. Green roofs are becoming more common, and many jurisdictions have design standards and guidelines for installing green roofs on new buildings. Restrictions to green roofs are one barrier to the use of LID.	WES Development review	1) WES-SS 6.5.13 Green Roofs	Green roofs are allowed and may be designed to meet flow control and water quality performance standards. Specific design requirements are provided in the Stormwater Standards.(1)	No modification recommended. May clarify that green roofs represent an impervious area reduction technique (similar to pervious pavement).
			2) WES-SS Chapter 6 Table 5	Green roofs are not currently allowed on publicly maintained SMFs (2) Restricting opportunities for green roofs on publicly maintained SMFs may limit the ability to incorporate LID/GI principles to certain types of development.	Review the prohibition of green roofs on publicity-maintained SMFs to determine if green roofs could be allowable for some or all publicly maintained SMFs.
	Policies disallowing or restricting primary types of green infrastructure practices (e.g., infiltration, bioretention/rain gardens, permeable pavements, swales, bioretention). Restrictions on GI facilities limit the options to reduce impervious surfaces, reduce stormwater runoff, and retain stormwater onsite.	WES Development review	1) WES-SS 6.2.1	Currently infiltration is not required for sites the meet a minimum infiltration rate. Prioritizing vegetated SMFs (i.e., GI) or infiltration-based SMFs is not required, rather it is not allowed when infiltration rates do not meet the minimum threshold. Presumably proprietary systems (with the exception of hydrodynamic separators) may be used to meet water quality performance standards alone. (1) This may be a barrier to incorporation of LID/GI into development design because use of SMFs with infiltration components is preferred but not required. Development could opt to use proprietary systems rather than GI/LID.	Clarify use and reference to the BMP Sizing Tool for water quality and flow control SMF sizing. This will provide consistency of required infiltration rates, site planning, and design requirements.
			2) WES-SS 6.5.12 Pervious Pavement 3) WES-SS Chapter 6 Table 5 4) WES-SS Chapter 6 Table 6	Pervious pavement can be used impervious area reduction technique and specific design requirements are provided in the WES-SS. It is noted that pavers are generally suitable for pedestrian areas and low traffic parking areas. Structural thicknesses are provided for private and public roads.(2) Table 5 in the WES-SS indicates that pervious pavements and infiltration trenches are not permitted in the public street/ROW and notes that pervious pavement constructed within the public ROW requires the approval of the local roadway authority. (3) Constructed wetlands, detention or infiltration ponds, and green roofs are also listed as not permitted in the public street/ROW, but this is assumed to be due to space constrains and feasibility rather than an issue with the SMF type. Table 6 in the WES-SS reflects that HV and DTD do not allow use of pervious pavement or infiltration galleries/trenches as a publicly maintained SMF in the ROW. Both are allowed in WES' jurisdiction as a publicly maintained SMF. (4) Restricting opportunities for green infrastructure on public street/ROW may limit the ability to incorporate LID/GI principles to certain types of development.	• Determine if incorporation of pervious pavements in the public street/ROW could be allowable in some capacity. • It is a suggestion to review the process for allowing pervious pavements and/or infiltration trenches for between the CCRS, CDZO, Happy Valley, and WES-SS to provide continuity.
			NA	Stormwater tree cells are not mentioned in the WES-SS. Tree infiltration wells may provide the ability to meet tree and green infrastructure goals.	Consider inclusion of tree infiltration wells to allow for additional LID/GI opportunities for development and streetscapes.

Table A-3. LID Code Barriers Evaluation Matrix

	Typical Barrier	Responsible Party	Code Reference	Evaluation of Barrier	Recommended Modification
	Policies disallowing or restricting primary types of green infrastructure practices (e.g., infiltration, bioretention/rain gardens, permeable pavements, swales, bioretention). Restrictions on GI facilities limit the options to reduce impervious surfaces, reduce stormwater runoff, and retain stormwater onsite.		5) WES-SS Section 6.2.1 6) WES-SS Section 6.5	WES-SS require infiltration testing to determine site suitability for onsite infiltration and require that SMFs be designed with an infiltration component unless stipulated otherwise by a design professional (5) An infiltration rate of 0.5 in/hr is considered a site where infiltration may be limiting, requiring applicants to document the infiltration limitation and design SMFs that do not use infiltration. (5) Infiltration rates specified in the SMF-specific design standards are not consistent with the 0.5 in/hr limitation. (6) This wording may create a barrier as it implies that infiltration rates less than 0.5 in/hr would prevent the use of SMFs that achieve partial infiltration (i.e., unlined, vegetated SMFs with an underdrain). In addition, a rate of 0.5 in/hr is inconsistent with SMF-specific infiltration requirements outlined in Section 6.5 which may lead to confusion for designers and developers. Finally, infiltration rate references are unclear whether the infiltration rate reflects a measured infiltration rate or a design infiltration rate (incorporating a factor of safety into measured infiltration rate).	Clarify infiltration rate requirements or use and reference to the BMP Sizing Tool for water quality and flow control SMF sizing. This will provide consistency of required infiltration rates and application to site planning and design.
	Disallowing GI in retrofit projects and only allowing replace in kind. This may limit the ability to retain stormwater onsite.	WES Development review	NA	No reference found allowing or disallowing policy.	No recommended modification.
	No variance process in place to allow for new or innovative approaches to LID or GI. This may limit the ability to reduce impervious surfaces, limit the ability to reduce stormwater runoff, and limit the ability to retain stormwater onsite.	WES Development review CCDTD Planning Happy Valley Planning	1) WES-SS 2.4 Variance 2) WES-SS Appendix A Permitting and Submittal Requirements 3) WES-RR 1.1	The WES-SS specifies a variance process to allow for alternative materials and variances to the standard. WES processes variance requests which are required to be submitted in writing to WES. The planning authority conducts land use application approvals therefore variance requests after the land use approvals are completed there is little, if any, flexibility in the set requirements. (1)(2) WES-RR defines a variance as a discretionary decision to permit modification of the terms of any part of the WES-RR based on a demonstration of unusual hardship or exceptional circumstance unique to a specific property but does not have a detailed variance processes outlined in the document. (3) This may be a barrier if designers are attempting to meet requirements and may need a variance to meet stormwater requirements. This may also be a barrier if variances to development code are approved without the technical input of the responsible stormwater authority.	• No modifications recommended. • CCDTD and HV are provided a Service provider letter (SPL) from WES during the planning process to provide comments on the feasibility of the design as is relates to stormwater requirements. This should help alleviate the need for variance request to comply with stormwater requirements. (2)
Land Use					
	Policies to implement site planning procedures that require projects to consider site layout options that optimize retention of stormwater.	WES Development Review CCDTD Planning Happy Valley Planning	1) WES-SS and WES-RR	Specific site planning and/or impervious area minimization/reduction techniques (i.e., LID Strategies), such as preservation of existing trees, retaining vegetation and open space, clustering buildings, disconnecting residential downspouts, and constructing pervious pavement and green roofs (as impervious area reduction techniques), to help mitigate stormwater runoff and reduce the size of the required SMF are not listed in the WES-SS or the WES-RR or required to be incorporated/included in the SPL or Stormwater Report submittal. (1) Land use review and approval is under the authority of the respective planning agency. However, the pre-application process provides opportunity for all applicable parties to review and identify conditions of approval. (1) There appears to be inconsistencies between the site design requirements of the planning agencies and LID site design as specified by the permit requirements. This could be a barrier to the implementation of LID/GI as there appear to be gaps in site planning requirements between WES, DTD, and HV and the respective planning and design review processes.	• Clarify and formalize responsibilities around site planning measures between WES, Happy Valley, and Clackamas County to mitigate this process barrier. • Ensure that the SPL and/or Preliminary Stormwater Management Plan and Drainage Report require site planning principals reflected with site layout and onsite stormwater controls to help reduce runoff and optimize retention of stormwater. Require that site design measures to reduce the amount of runoff be documented in the SPL submittal. • If implementing the BMP sizing tool, reflect the BMP sizing tool site layout requirements in the WES-SS and reference the BMP sizing tool in the standards.
		WES Board of County Commissioners of Clackamas County	2) WES-RR 5.9.3 Mitigation Reduction Factor	WES may provide an equivalent service unit (ESU) credit(s) against stormwater charges to recognize the benefit of SMFs that provide on-site retention and/or water quality treatment mitigation in excess of WES' minimum Stormwater Standards. (2)	• No modification recommended. • Providing ESU credits encourages the use of on-site infiltration.
		WES Development Review	3) WES-SS 1.1 Words and Terms 4) WES-RR 1.1 Words and Terms	The WES-SS and the WES-RR do not include definitions of LID or GI in accordance with definitions in the NPDES MS4 permit (there is no definition of LID at all). (3)(4) This could be a barrier to implementation as LID and the connection between vegetated SMFs and GI may not be clear to developers.	It is recommended that these terms be defined in conjunction with the definitions currently included in the 2022 Stormwater Management Program Document.
	Minimum lot dimensions, setback requirements, roadway lengths, building requirements, or frontage that do not allow flexibility for clustering and other techniques to reduce impervious area in subdivisions. Stringent lot dimensions may limit an applicant's options to reduce impervious surfaces and provide open spaces that protect native soils and vegetation.	CCDTD Planning Happy Valley Planning	NA	Land use review and approval is under the authority of the respective planning agency. Specific site planning and/or impervious area minimization/reduction techniques (i.e., LID Strategies), related to lot dimensions, open space, and landscaping are regulated by the respective planning agency therefore no reference was found related to these barriers. See Clackamas County Barrier Evaluation (Attachment B) and Happy Valley Evaluation (Attachment C) for potential barriers related to these topics.	
	Policies disallowing stormwater facilities in open space, landscape buffers/islands, or green space. Restrictions on stormwater facility placement may limit the opportunity retain stormwater onsite.				

Table A-3. LID Code Barriers Evaluation Matrix

	Typical Barrier	Responsible Party	Code Reference	Evaluation of Barrier	Recommended Modification
	Policies that do not count landscaped stormwater facilities toward minimum development landscaping requirements. This creates a disincentive for an applicant to install a GI or LID stormwater facility and may limit the opportunity to retain stormwater onsite.				
	Policies disallowing alternative landscape options (xeriscaping, native plants, clover/thyme ground cover) and limiting landscaping to turf in yards. Native landscaping and alternative groundcovers are often better equipped to retain stormwater onsite, when compared to a compacted turf yard. Protecting native soils and vegetation is a key principle of LID.				
Streetscape/Parking Lot					
	Policies that require parking ratios above Urban Land Institute or Institute of Transportation Engineers recommended rates. Minimum parking ratios increase the land cover requirements, which often increases impervious surface coverage, unless the zoning code allows for pervious pavements and alternative surface parking areas.	CCDTD Planning Happy Valley Planning	NA	Land use review and approval is under the authority of the respective planning agency. Specific site planning and/or impervious area minimization/reduction techniques (i.e., LID Strategies), related to road widths, parking requirements, and shared parking are regulated by the respective planning agency therefore no reference was found related to these barriers. See Clackamas County Barrier Evaluation (Attachment B) and Happy Valley Evaluation (Attachment C) for potential barriers related to these topics.	
	Policies requiring road widths wider than those required for emergency or fire access or disallowing hammerheads. Policies requiring sidewalk widths larger than required for safety. This may limit the opportunity to reduce impervious surfaces and limit the ability to protect native soils and vegetation.				
	Policies limiting or disallowing shared parking or parking garages. Shared parking is one method to reduce impervious surfaces and protect native soils and vegetation.				
	Policies disallowing multi-use pathways for pedestrian and bikes. Required separation for each type of use results in increased impervious surface requirements.				
	Policies disallowing permeable pavements for use in alleys, streets, driveways, parking lots, and bike lanes, etc. Pervious pavements are becoming a common design approach to retain stormwater at the source. Requiring traditional asphalt and concrete surfaces limits an applicant's opportunity to reduce impervious surfaces, reduce stormwater runoff, and retain stormwater onsite.	WES Development Review	1) WES-SS Table 5 2) WES-SS Table 6 3) Direct Correspondence May 16, 2024	Table 5 in the WES-SS reflects that pervious pavements are allowed in WES' jurisdiction for use in publicly maintained SMFs. Table 5 in the WES-SS also indicates that pervious pavements are not permitted in the public street/ROW and notes that pervious pavement constructed within the public ROW requires the approval of the local roadway authority. (1) Table 6 in the WES-SS reflects that CCDTD and Happy Valley do not allow use of pervious pavement for publicly maintained SMFs or in the public street/ROW. CCDTD appears to allow for pervious pavements as an alternative design and Happy Valley does allow pervious pavements on private streets and driveways. (2) Limitations on maintenance support prevents use pervious pavements that would be maintained by Happy Valley. (3)(2) Restricting opportunities for green infrastructure in the public street/ROW may limit the ability to incorporate LID/GI designs into certain types of development. This may create an implementation barrier to use of pervious pavements in publicly maintained SMFs and in the public street/ROW as the WES-SS, CZDO, CCRS, and Happy Valley regulations seem to conflict.	• Review the allowable SMFs in the CCRS, CZDO, Happy Valley and the WES-SS to ensure alignment. • Explore potential expansion of maintenance practices and/or agreements with private vendors for pervious pavement sweeping, as maintenance constraints have been identified as a limitation in use of pervious pavements in the public ROW.
	Stringent requirements for vegetation or trees within the right-of-way (ROW). Significant tree requirements can result in limiting the space available to install GI within the planting strip, median, or other parts of the ROW. This reduces the types of stormwater facilities that can be installed, which may limit the opportunity to reduce stormwater runoff, retain stormwater onsite, or protect native soils and vegetation.	WES Development Review	1) WES-SS 6.4.5 Planting and Irrigation	SMFs located in the public ROW are not permitted to include trees. (1) This may limit the ability to incorporate GI and meet street tree requirements in the public ROW. This would also prohibit the use of stormwater tree cells.	• Review the WES-SS and coordinate with CCDTD to determine if there is an opportunity to incorporate certain types of trees into SMFs located in the public ROW. • Determine if proprietary or traditional SMFs in public ROW that incorporate trees can be approvable as a SMF configuration. Standardizing use of tree cells or another SMF configuration may be one option.
	Streetscape standards that disallow use of GI such as stormwater tree cells, bioretention, curb bump outs, pavers, or curb cuts. Those restrictions would be a direct barrier to the use of LID.	WES Development Review	1) WES-SS Table 5 2) WES-SS 6.4.5 Planting and Irrigation	Table 5 in the WES-SS indicates that pervious pavements are not permitted in the public street/ROW and notes that pervious pavement constructed within the public ROW requires the approval of the local roadway authority. Constructed wetlands, detention or infiltration ponds, and green roofs are also listed as not permitted in the public street/ROW, but this is assumed to be due to space constrains and feasibility rather than an issue with the SMF type. (1) The WES-SS does not include reference to stormwater tree cells. (2) This may create an implementation barrier related to the use of some GI facilities in the ROW.	• Review the allowable SMFs in the WES-SS, CZDO, and Happy Valley regulations to ensure alignment. • Determine if incorporation of pervious pavements in the public street/ROW could be allowable in some capacity. • Consider inclusion of stormwater tree cells to allow for additional LID/GI opportunities for development and streetscapes.

Attachment B: Clackamas County Barrier Evaluation Matrix

Attachment B

LID Code Barriers Evaluation Matrix- Clackamas County

The matrix provided below was developed by comparing the current code and standards against common barriers that inhibit design and implementation of techniques for LID/GI design. The four main LID/GI principles include reduction of impervious surfaces, reduction of stormwater runoff from a site, retention of stormwater onsite through LID and GI type facilities that incorporate infiltration, and protection of native soils and vegetation (typically through clustering and site design). The barriers included in this analysis are those that discourage, prevent, or restrict developers wanting to implement LID approaches from using those types of techniques.

Table B-1 shows the color-coded rating key applied to the evaluations presented in Table B-3. Table B-2 provides the list of abbreviations used for the regulatory documents used.

Table B-1. Rating Key

Color	Description
Green	No barrier found in reviewed code
Yellow	Limitations or ambiguous language found in reviewed code
Red	Barrier found in reviewed code
Grey	No reference found allowing or disallowing policy

Table B-2. Reference Key

Abbreviation	Title
CCRS	Clackamas County Roadway Standards
CZDO	Clackamas County Zoning and Development Ordinance
WES-SS	WES Stormwater Standards April 2023
WES-RR	WES Rules and Regulations April 2023
CCDTD	Clackamas County Department of Transportation and Development

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Table B-3. LID Code Barriers Evaluation Matrix

	Typical Barrier	Responsible Party	Code Reference	Evaluation of Barrier	Recommended Modification
Green Infrastructure					
	Policies disallowing stormwater facilities in residential privately owned areas such as yards. Restrictions to stormwater facility placement may limit the opportunity to install GI facilities to retain stormwater onsite.	CC Engineering CC Planning	1) CCRS 410.1Reulatory Authority 2) CCRS 410.2 Engineering Regulations 3) CCRS 410 General, 420 Exceptions to WES Standards, 460 Water Quality 4) CZDO709.10 Water Quality resource Area Development Permits 5) WES-SS Chapter 6 Table 6 6) WES-SS 9.3 Privately Owned and Maintained Facilities 7) Barriers Meeting #1	CCDTD Engineering is responsible for drainage review for development outside of WES service district and has adopted WES stormwater standards, with some exceptions. (1) (2) Private improvements in rural areas may work with CCDTD to provide a simplified approach to stormwater management that utilizes vegetation and infiltration. (3) Stormwater management facilities (SMFs) may encroach a maximum of 25' into the outside boundary of a water quality resources area of a primary protected water resource and 5' into a secondary protected water resource. Allowing flexibility in placing private SMFs. (4) Privately owned and maintained SMFs are allowable and require recorded on-site maintenance agreements for access and maintenance. (5) (6) WES provides SMF inspections for privately owned SMFs within WES' jurisdiction. (7) This may be a process barrier to the use of GI for private land development or private SMFs that are outside of WES' jurisdiction as it is not clear if private development is required to adhere to the WES-SS preference for infiltration SMFs. It is also unclear how private facility inspections and maintenance requirements are tracked outside of the WES' jurisdiction.	• Ensure that private development improvements in areas outside of city limits and service districts (e.g., WES, OLWS) adhere to the same stormwater hierarchy as WES-SS (requiring retention and infiltration first). • Continue to work with WES and OLWS to improve mapping, enforcement, and inspection procedures to ensure consistency across agencies and ownership where dual regulations apply. • Review inspection procedures for privately owned SMFs and/or explore expansion of inspection agreement with WES to allow for SMF inspections to occur in more remote locations and be held to the same maintenance standards.
	Policies disallowing rainwater harvesting for residential privately owned areas. Many jurisdictions are still developing standards and guidelines for rainwater reuse. In the interim, restrictions on rainwater harvesting are seen as one barrier to the use of LID.	CC Engineering CC Planning	1) CCRS 420 Exceptions to WES Standards 2) CZDO 1006.03 Water Supply 3) CZDO 903.04 Rear and Side Setback Exemptions	Private improvements in rural areas may work with CCDTD to provide a simplified approach to stormwater management that utilizes vegetation and infiltration. (1) Rainwater harvest and/or the use of cisterns and grey water use (more specific to water supply) are allowed at the planning director's discretion. (2) Rainwater collection facilities are allowed to be placed in the rear and side setbacks provided they are less than 6 ft above finished grade. (3) Rainwater harvesting or cisterns are not referenced in the WES-SS or WES-RR which may present a barrier to use as a GI facility or site planning technique. Only allowing rainwater harvesting (in the context of water supply) at the planning director's discretion rather than as a standard stormwater retention practice may also pose a barrier to use.	• Review if rainwater harvest, rain barrels, or cisterns are acceptable for use as an LID site planning strategy and ensure alignment between the CZDO and WES-SS. Determine if design specification and review is required for use. • Determine if rainwater harvesting could be included as a GI facility in CCDTD jurisdictional areas.
	Policies disallowing green roofs or green/living walls for commercial or residential buildings. Green roofs are becoming more common, and many jurisdictions have design standards and guidelines for installing green roofs on new buildings. Restrictions to green roofs are one barrier to the use of LID.	CC Engineering CC Building CC Planning	1) WES-SS Chapter 6 Table 6 2) WES-SS 6.5.13 Green Roofs 3) CZDO 1009 Landscaping 4) CZDO1005.01 Purpose	Green roofs are not currently allowed on publicly maintained SMFs (for WES or CC) but are allowed if privately maintained per the WES-SS. (1) Green roofs may be designed to meet flow control and water quality performance standards. Specific design requirements are provided in the WES-SS. (2) Green roofs can account for up to 25% of landscaping requirements. Use of green building technologies and green site development practices are encouraged. (3)(4) Restricting opportunities for green roofs on publicly maintained SMFs may limit the ability to incorporate LID/GI principles to certain types of development.	• Review the prohibition of green roofs on publicity-maintained SMFs per the WES-SS to determine if green roofs could be allowable for some or all publicly maintained SMFs. There is a current discrepancy between the WES-SS and CZDO, as the CZDO encourages green building technologies, regardless of whether they are public or private. May clarify that green roofs represent an impervious area reduction technique (similar to pervious pavement). • Suggestion to provide clear wording in the CZDO on if and where green roofs are permitted and if any additional review or approvals are required.
	Policies disallowing or restricting primary types of green infrastructure practices (e.g., infiltration, bioretention/rain gardens, permeable pavements, swales, bioretention). Restrictions on GI facilities limit the options to reduce impervious surfaces, reduce stormwater runoff, and retain stormwater onsite.		NA	Stormwater tree cells are not mentioned in the WES-SS, CCRS, or CZDO. Stormwater tree cells may provide the ability to meet tree and green infrastructure goals.	Consider inclusion of stormwater tree cells to allow for additional LID/GI opportunities for development and streetscapes.
		CC Engineering CC Planning	1) WES-SS Chapter 6 Table 6 2) WES-SS Chapter 6 Table 5 3) CCRS Section 420.4 Underground Injection Control (UIC) Devices	Table 6 in the WES-SS reflects that DTD does not allow use of pervious pavement or infiltration galleries/trenches for publicly maintained SMFs. Both are allowed in WES' jurisdiction for publicly maintained SMFs. (1) Table 6 in the WES-SS also indicates pervious pavements are not permitted in the public street/ROW. Constructed wetlands, detention or infiltration ponds, and green roofs are also listed as not permitted in the public street/ROW, but this is assumed to be due to space constrains and feasibility rather than an issue with the SMF type. (1) **Within WES' service district, pervious pavement constructed within the public ROW requires the approval of the local roadway authority (e.g., CCDTD). (2)** UICs are only permitted in CCDTD ROW when registered with DEQ and maintained by an established stormwater district (WES), unless otherwise approved by CCDTD (Transportation Maintenance). UICs appear to be more readily allowed in WES' service area in accordance with their WPCF permit. (3) These may be considered a barrier to LID/ GI from an implementation perspective. Specific to UIC installation in the County ROW, although allowed, additional approvals need to be obtained with maintenance agreements in place. In areas where O&M is required by the County, it appears that UICs would not be permissible, as maintenance is not provided by an established stormwater district. Restricting opportunities for green infrastructure for publicly maintained SMFs and public streets/ROW may limit the ability to incorporate LID/GI principles to certain types of development.	• Review the prohibition of certain types of green infrastructure for publicly maintained SMFs and/or ROW applications and determine if they could be allowed for some or all publicly maintained SMFs and in the ROW. • Is there a streamlined approval for use of UICs within WES' service district? • It is suggested to review the process for allowing pervious pavements and/or infiltration trenches between the CCRS, CDZO, and WES-SS to provide continuity.

Table B-3. LID Code Barriers Evaluation Matrix

	Typical Barrier	Responsible Party	Code Reference	Evaluation of Barrier	Recommended Modification
	Disallowing GI in retrofit projects and only allowing replace in kind. This may limit the ability to retain stormwater onsite.	CC Engineering	NA	No reference found allowing or disallowing policy.	No recommended modification.
	No variance process in place to allow for new or innovative approaches to LID or GI. This may limit the ability to reduce impervious surfaces, limit the ability to reduce stormwater runoff, and limit the ability to retain stormwater onsite.	CC Planning CC Engineering	1) CZDO 1005.06 Modifications 2) WES-SS 2.4.1 Variance Request 3) Plan Review Process Meeting (February 22, 2024)	Modification of any standard identified in 1005.02 (General Site Design standards) and 1005.03 (Building Design) may be approved as part of design review if the proposed modification will result in a development that achieves the purposes stated in Subsection 1005.01 (Purpose) as well or better than the requirement listed. The WES-SS specifies a variance process which requires requests for variances to the stormwater standard to be submitted in writing to WES. Variance requests are allowed to be submitted at any time during the process, but since WES is not responsible for the land use approvals or associated conditions there may be limited flexibility in variance approvals. (2) This may be a process barrier if designers need a variance after land use is approved to meet stormwater requirements or to use innovative GI facilities. This may also be a barrier if variances to development code are approved without the technical input of the responsible stormwater authority.	• A Service provider letter (SPL) from WES is provided during the land use, which requires determination on the feasibility of the design as it relates to stormwater requirements. • For area outside of WES or OLWS service districts, CCDTD issues a statement of feasibility during land use, but determination on the feasibility of SMF selection and design is not readily reflected. Requiring more information on the statement of feasibility could help alleviate the need for variance request to comply with stormwater requirements. (3) Consider issuance of a statement of feasibility or similar in conjunction with OLWS when no SPL is issued to close this process gap/barrier.
Land Use					
	Policies to implement site planning procedures that require projects to consider site layout options that optimize retention of stormwater.	CC Planning	1) CZDO 1005.02 General Site Design Standards 2) WES-SS 3) Barriers Meeting #1	Land use review and approval is conducted by CCDTD within WES' service area, and WES is responsible for the technical aspects of SMF design and location. The pre-application and land use process provides opportunity for all applicable parties to review and identify conditions of approval. Specific site planning and/or impervious area minimization/ reduction techniques (e.g., LID Strategies), such as preservation of existing trees, retaining vegetation and open space, clustering buildings, disconnecting residential downspouts, and constructing pervious pavement and green roofs (as impervious area reduction techniques), to help mitigate stormwater runoff and reduce the size of the required SMF are not listed in the WES-SS or required to be incorporated/included in the SPL, statement of feasibility, or Stormwater Report submittal. (1)(2)(3) Land use review and approval is conducted by CCDTD individually for area outside of WES or OLWS' service district. General site design standards in 1005.02 describe clustering buildings and retaining vegetation. However, site planning and/or other impervious area minimization/reduction techniques (LID strategies) are not confirmed during land use review and approval, and not required to be captured when issuing the statement of feasibility. These process-related items may be a barrier to the implementation of LID/GI as there appear to be gaps in the pre-application requirements and implementation of site planning requirements between WES, CCDTD, and HV and the respective planning and design review processes. There also appears to be inconsistencies between the site design requirements of the planning agencies and LID site design as specified by the permit requirements. The SPL or statement of feasibility also does not require applicants to provide comprehensive site planning.	• Clarify and formalize responsibilities around site planning measures between CCDTD (Planning), WES, and OLWS to mitigate this process barrier. • Ensure that the SPL, statement of feasibility, and/or Preliminary Stormwater Management Plan and Drainage Report require site planning principals to be reflected with site layout and onsite stormwater controls to help reduce runoff and optimize retention of stormwater. Require that site design measures to reduce the amount of runoff be documented in the Preliminary Stormwater Management Plan and Drainage Report submittal. • If implementing the BMP sizing tool, reflect the BMP sizing tool site layout requirements in the WES-SS and reference the BMP sizing tool in the standards.
			4) 140.1.4 Engineering Regulations 5) CCRS 130.4.5 Stormwater Review 6) CCRS 252.1 Subgrade Evaluation	Stormwater reviews for work in ROW or on private property that is outside of WES are conducted by CCDTD (Engineering). (4) When CCDTD is the surface water management regulatory authority the surface water management requirements of the CCRS apply. (5) The CCRS specifies that a geotechnical or soils report is required for roadway design. The soils report is required to address subgrade drainage with consideration for percolation data in areas of proposed dry wells or French drains. (6) Requiring soils reports for only dry wells and French drains for ROW project appears to exclude infiltration testing required for other SMFs per the WES-SS. This would also be inconsistent with the allowable SMFs provided in the WES-SS for ROW applications and the WES-SS preference for infiltration SMFs. It is not clear if infiltration testing procedures and allowable infiltrations rates are consistent with the WES-SS infiltration rate requirements.	• Clarify if projects outside of the WES service district that do not obtain a SPL are still required to provide infiltration testing to obtain a statement of feasibility. • Clarify that infiltration rate requirements and allowable SMFs are consistent with the WES-SS. This will provide consistency of required infiltration rates and application to site planning and design. • Ensure that all projects under CCDTD (Engineering) review adhere to the same stormwater hierarchy as WES-SS (requiring retention and infiltration first).
			7) CZDO 202 Definitions	The CZDO Title 12 does not include reference to or definitions for LID or GI specifically. (7) This could be a barrier to implementation as LID and the connection between the LID related strategies in the CZDO and/or vegetated SMFs and GI provided in the WES-SS may not be clear.	It is recommended that GI and LID terms be referenced in the CZDO text and defined in conjunction with the definitions currently included in the 2022 Stormwater Management Program Document and be consistent between the CZDO, CCRS, and WES-SS.

Table B-3. LID Code Barriers Evaluation Matrix

	Typical Barrier	Responsible Party	Code Reference	Evaluation of Barrier	Recommended Modification
	Minimum lot dimensions, setback requirements, roadway lengths, building requirements, or frontage that do not allow flexibility for clustering and other techniques to reduce impervious area in subdivisions. Stringent lot dimensions may limit an applicant's options to reduce impervious surfaces and provide open spaces that protect native soils and vegetation.	CC Planning	1) CZDO 1012.02 Minimum Lot Size Exceptions 2) CZDO 1012.03 Maximum Lot Size 3) CZDO 602 Table 602-2	Zoning requirements specify minimum densities and minimum lot sizes along with maximum densities and maximum lot sizes. (1)(2) Minimum lot sizes are also provided for business park, light industrial and general industrial districts with allowances for reductions based on design review approval. Maximum and minimum front setbacks are provided, and 0-ft setbacks are allowed for the rear and sides unless adjacent to a commercial zoning district or a natural resource or residential district. (3) Stringent lot dimensions could impact flexibility in clustering and reduce options for applying LID approaches to site planning.	• No modification recommended. • The Site and Building Design Purpose (1005.01) and General Site Design Standards (1005.02) encourage clustering, increasing density, and protecting vegetation. The zoning requirements also provide a range of lot sizes which will promote clustering and preservation of open spaces.
	Policies disallowing stormwater facilities in open space, landscape buffers/islands, or green space. Restrictions on stormwater facility placement may limit the opportunity retain stormwater onsite.	CC Planning	1) CZDO 702 Open Space Management District 2) CZDO 1013.03 Dimensional and Development Standards 3) CZDO 1009.08 Recreational Areas and Facilities 4) WES-SS 6.4.6 Pond Embankment, Retaining Walls, Fencing, Gates and Handrails	Surface water retention and detention facilities, flood storage areas, and wetland mitigation SMFs are considered primary uses for areas in the open space management district. (1) **Planned unit developments are required to have a minimum of 20% of the site reserved for open space tracts. The allowed uses for the open space tracts do not prohibit SMFs, but also do not explicitly state SMFs as an allowed use. (2)** Outdoor recreational areas required for developments of duplexes, triplexes, quadplexes, or multifamily dwellings may be designed for passive or active recreation, including edible gardening. (3) A minimum 6-foot-high fence is required to be constructed around the perimeter of all publicly maintained SMFs with a designed water depth greater than 3 ft. (4) It is not clear if SMFs are allowable in open space tracts or for use as passive recreation to meet open space requirements for development. This may present a barrier in meeting both the open space and stormwater objectives for development.	• It is suggested that SMFs be mentioned by name as an allowable use in open space tracts and/or passive recreation with limitations provided on use if needed (such as excluding areas that are fenced or inaccessible to the public). • CCDTD plans to review related open space code during the next code updates.
	Policies that do not count landscaped stormwater toward minimum development landscaping requirements. This creates a disincentive for an applicant to install a GI or LID stormwater facility and may limit the opportunity to retain stormwater onsite.	CC Planning	1) CZDO 1009.02 Minimum Area Standards 2) Direct Correspondence May 24, 2024	Green roofs may comprise a maximum of 25% of the minimum landscaped area. (1) Procedurally, vegetated SMFs are counted toward landscaping requirements as they meet the definition of landscaping. (2) Green roofs are mentioned as allowable for meeting landscaped requirements. The landscaping requirements allow for flexibility, but do not specially mention if other vegetated SMFs are counted towards landscaping requirements.	It is suggested that vegetated SMFs be mentioned by name as allowable for meeting landscaping requirements for additional clarity.
	Policies disallowing alternative landscape options (xeriscaping, native plants, clover/thyme ground cover) and limiting landscaping to turf in yards. Native landscaping and alternative groundcovers are often better equipped to retain stormwater onsite, when compared to a compacted turf yard. Protecting native soils and vegetation is a key principle of LID.	CC Planning	1) CZDO 1009.01 General Provisions 2) CZDO 1009.02 Minimum Area Standards	The landscaping code promotes use of a variety of plants intermixed throughout landscaped areas and prohibits the planting and require removal of invasive non-native or noxious vegetation. (1) Turf lawn may comprise a maximum of 10% of the minimum landscaped area. (2)	No modification recommended. While xeriscaping is not explicitly mentioned, the policies of the CZDO 1009 would allow for flexibility in implementing the landscaping requirements while encouraging native plants and limiting landscaping of turf. There also were no prohibitions against alternative ground cover found in the code.
Streetscape/Parking Lot					
	Policies that require parking ratios above Urban Land Institute or Institute of Transportation Engineers recommended rates. Minimum parking ratios increase the land cover requirements, which often increases impervious surface coverage, unless the zoning code allows for pervious pavements and alternative surface parking areas.	CC Planning	1) CZDO 1015.02 Motor Vehicle Parking Area Standards 2) CZDO 1005.05 Additional Requirements	Parking space minimum numbers and dimensions are required and specified for various land uses. Parking maximums are also provided within the Urban Growth Boundary (UGB). (1) One option in the additional requirements section of the CZDO is to provide no more than the minimum number of surface parking spaces. (2)	No modification recommended. Parking maximums and the additional requirements encourages clustering and minimization of parking spots.
	Policies requiring road widths wider than those required for emergency or fire access or disallowing hammerheads. Policies requiring sidewalk widths larger than required for safety. This may limit the opportunity to reduce impervious surfaces and limit the ability to protect native soils and vegetation.	CC Planning	1) CZDO 1007 Roads and Connectivity 2) CZDO 1007.01 General Provisions	Specifications for minimum road widths are provided based on the type and land use of the area. (1)(2) Minimum road widths are based on traffic safety and fire access.	No modification recommended. Minimum widths are based on safety and functionality.
			1) CZDO TABLE 1007-1 Minimum Sidewalk and Pedestrian Pathway Width	Minimum sidewalk widths range from 5-8 ft depending on the type of street and land use classification. (3) Some sidewalk widths are wider than the minimum industry standard of 5-ft as specified by the National Association of City Transportation Officials (NACTO).	• No modification recommended. • The increased sidewalk widths for commercial, institutions and arterial sidewalks are limited to areas of high pedestrian volumes or areas with high traffic volumes (arterials). Areas with lower pedestrian volumes have minimum sidewalk widths of 5 ft. Minimum widths are based on safety and functionality.
	Policies limiting or disallowing shared parking or parking garages. Shared parking is one method to reduce impervious surfaces and protect native soils and vegetation.	CC Planning	1) CZDO 1015.02 Motor Vehicle Parking Area Standards	Shared driveways are encouraged: "Where feasible, shared driveway entrances, shared parking and maneuvering areas, and interior driveways between adjacent parking lots shall be required. (1)	No modification recommended.

Table B-3. LID Code Barriers Evaluation Matrix

	Typical Barrier	Responsible Party	Code Reference	Evaluation of Barrier	Recommended Modification
	Policies disallowing permeable pavements for use in alleys, streets, driveways, parking lots, and bike lanes, etc. Pervious pavements are becoming a common design approach to retain stormwater at the source. Requiring traditional asphalt and concrete surfaces limits an applicant's opportunity to reduce impervious surfaces, reduce stormwater runoff, and retain stormwater onsite.	CC Planning CC Engineering	1) CZDO 1015.01 General Standards 2) CZDO 1005.05 Additional Requirements 3) CZDO 1007.02 Public And Private Roadways 4) CCRS 252 Structural Section 5) WES-SS Table 6 6) WES-SS 6.5.12 Pervious Pavement	The CZDO allows for use of permeable surfaces for parking areas in the UGB when a permeable surface is required for surface water management. (1) The CZDO also includes use of porous pavements for walking paths and parking areas as an option for meeting the additional requirements for planned unit developments. (2) Public and County roads provide allowance for standards to deviate when safe and efficient alternate designs would better accommodate sustainable development such as "green streets". Sustainable surface water management solutions such as low infiltration planters and basins, swales, ponds, rain gardens, trees, porous pavement, and minimal disruption to natural drainage systems, preservation of natural terrain and other natural landscape features and/or preservation of existing significant trees and native vegetation. (3) The CCRS state that, "roadways shall be constructed, reconstructed and repaired with asphaltic concrete over a crushed rock base or Portland Cement Concrete over a crushed rock base." (4) Tables 6 in the WES-SS reflects that DTD does not allow use of pervious pavement for publicly maintained facilities. Pervious pavements are allowed in WES' jurisdiction for use in publicly maintained facilities. Table 6 in the WES-SS also indicates that pervious pavements are not permitted in the public street/ROW. (5) WES-SS contains site and design specifications for pervious pavements. (6) Restricting opportunities for green infrastructure on publicly maintained facilities and for public streets/ROW may limit the ability to incorporate LID/GI design for certain types of development. This may create an implementation barrier related to use pervious pavements in publicly maintained facilities and in the public street/ROW as the CZDO, CCRS, and WES-SS seem to conflict. It may also create a barrier as incorporation of LID/GI or "green street" designs are permitted as a deviation rather than as a standard road/streetscape design.	• Review the allowable facilities in the CCRS, CZDO, and the WES-SS to ensure alignment and determine if incorporation of the pervious pavements in public street/ROW could be included as a standard practice rather than only allowed as an alternative design. CCDTD plans to review related pervious pavement applications during the next code updates. • Review the WES-SS pervious pavement design requirements to determine if they could be adopted for CCDTD use. Consider input from regional agencies (e.g., Federal Way, City of Gresham) in confirming that the design details and specifications for firetruck load can be accommodated. Consider inclusion of the structural design in the CCRS or references to the WES-SS.
	Policies disallowing multi-use pathways for pedestrian and bikes. Required separation for each type of use results in increased impervious surface requirements.	CC Planning	1) CZDO 1005.02 General Site Design Standards	The CZDO encourages pathway sharing. "Where feasible, cluster buildings within single and adjacent developments for efficient sharing of walkways, on-site vehicular circulation, connections to adjoining sites, parking, loading, transit-related facilities, plazas, recreation areas, and similar amenities." (1) No specific reference was found to disallowing installation of multi-use pathways.	No modification recommended. Consider reviewing if the allowance of shared pathways should be explicitly stated with width or other requirements.
	Stringent requirements for vegetation or trees within the right-of-way. Significant tree requirements can result in limiting the space available to install GI within the planting strip, median, or other parts of the right-of-way. This reduces the types of stormwater facilities that can be installed, which may limit the opportunity to reduce stormwater runoff, retain stormwater onsite, or protect native soils and vegetation.	CC Planning	1) CDZO1007.06 Street Trees 2) CZDO 1009.01 General Provisions 3) CZDO 1009.04 Screening and Buffering	Street trees are generally required with the UGB (with some exceptions as listed in CZDO 1007.06). The CZDO provides flexibility in the location and spacing of street trees based on site topography, steep terrain, soil conditions, existing trees and vegetation, preservation of desirable views, and solar access. Partial or complete exemptions from the requirement to plant street trees may be granted on a case-by-case basis. Planting of street trees shall be coordinated with other uses which may occur within the street right-of-way, such as bikeways, pedestrian paths, storm drains, utilities, streetlights, shelters, and bus stops. (1) In the Business Park District, street trees are required at 30- to 40-foot intervals along periphery and internal circulation roads, except where significant trees already exist. (1) Landscaping requirements allow use of a variety of plants providing flexibility with the planting requirements. (2) For areas that require buffering a 15-ft landscaping strip requires a minimum of one row of deciduous and evergreen trees staggered and spaced a maximum of 30 ft apart and a 5-ft landscaping strip requires evergreen vines, evergreen trees, or evergreen shrubs, any of which shall be spaced not more than 5 ft apart. (3) The 5-ft landscaping requirements may make incorporation of SMFs challenging.	• No modification recommended. • The street tree requirements provide flexibility in spacing and separation distances to allow incorporation of SMFs and compliance with the street tree requirements. • Consider reviewing whether stormwater infiltration tree cells would allow for meeting tree requirements while providing additional stormwater management especially in 5ft landscape buffer areas where it may be difficult to incorporate SMFs and planting requirements.
			4) WES-SS 6.4.5 Planting and Irrigation	SMFs located in the Public ROW are not permitted to include trees. (4) This may limit the ability to incorporate GI and meet street tree requirements in the public ROW. This would also prohibit the use of stormwater tree cells.	Review the WES-SS and coordinate with DTD to determine if there is an opportunity to incorporate certain types of trees into SMFs located in the public ROW.

Table B-3. LID Code Barriers Evaluation Matrix

	Typical Barrier	Responsible Party	Code Reference	Evaluation of Barrier	Recommended Modification
	Streetscape standards that disallow use of GI such as stormwater tree cells, bioretention, curb bump outs, pavers, or curb cuts. Those restrictions would be a direct barrier to the use of LID.	CC Planning CC Engineering	1) CZDO 1007.02 Public and Private Roadways 2) WES-SS Chapter 6 Table 6 3) WES-SS Chapter 6 Table 5	County public roads standards may be deviated from when safe and efficient alternate designs would better accommodate sustainable development such as "green streets", sustainable surface water management solutions such as low infiltration planters and basins, swales, ponds, rain gardens, trees, porous pavement, and minimal disruption to natural drainage systems, preservation of natural terrain and other natural landscape features and/or preservation of existing significant trees and native vegetation. (1) Tables 6 in the WES-SS reflects that CCDTD does not allow use of pervious pavement or infiltration galleries/ trenches for publicly maintained facilities. Both are allowed in WES' jurisdiction for publicly maintained facilities. Table 6 in the WES-SS also indicates that pervious pavements are not permitted in the public street/ROW. Constructed wetlands, detention or infiltration ponds, and green roofs are also listed as not permitted in the public street/ROW, but this is assumed to be due to space constrains and feasibility rather than an issue with the SMF type. **Within WES' service district, pervious pavement constructed within the Public ROW requires the approval of the local roadway authority (e.g., CCDTD). (3)** The WES-SS does not include reference to stormwater tree cells. This may create an implementation barrier related to the use of some GI facilities in the ROW, as the WES-SS and CZDO seem to conflict. It may also create a barrier as incorporation of LID/GI or "green street" designs are permitted as a deviation rather than as a standard road/streetscape design.	• Review the allowable facilities in the WES-SS and CZDO to ensure alignment. • Determine if incorporation of the additional LID/GI in public street/ROW could be included as a standard practice rather than only allowed as an alternative design. • Consider inclusion of stormwater tree cells to allow for additional LID/GI opportunities for development and streetscapes.
			4) Barriers Meeting #1	WES provides inspections and maintenance for SMFs in the ROW within their service district. (4) SMFs in the ROW but outside of WES's jurisdiction may not be maintained by DTD consistently. This may lead to inconsistency throughout the CCDTD for allowable SMFs.	Review maintenance requirements for specific green infrastructure to determine if maintenance is feasible in areas outside of WES' jurisdiction. Confirm whether alternative maintenance procedures should be adhered to and/or explore expansion of maintenance agreement with WES to ensure SMFs installed in more remote locations are held to the same maintenance standards.

Attachment C: Happy Valley Barrier Evaluation Matrix

Attachment C

LID Code Barriers Evaluation Matrix-Happy Valley

The matrix provided below was developed by comparing the current code and standards against common barriers that inhibit design and implementation of techniques for LID/GI design. The four main LID/GI principles include reduction of impervious surfaces, reduction of stormwater runoff from a site, retention of stormwater onsite through LID and GI type facilities that incorporate infiltration, and protection of native soils and vegetation (typically through clustering and site design). The barriers included in this analysis are those that discourage, prevent or restrict developers wanting to implement LID approaches from using those types of techniques.

Table C-1 shows the color-coded rating key applied to the evaluations presented in Table C-3. Table C-2 provides the list of abbreviations used for the regulatory documents referenced.

Table C-1. Rating Key

Color	Description
Green	No barrier found in reviewed code
Yellow	Limitations or ambiguous language found in reviewed code
Red	Barrier found in reviewed code
Grey	No reference found allowing or disallowing policy

Table C-2. Reference Key

Abbreviation	Title
HVMC	Happy Valley Municipal Code
HVEDM	Happy Valley Engineering Design and Standard Details Manual
WES-SS	WES Stormwater Standards April 2023

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Table C-3. LID Code Barriers Evaluation Matrix

	Typical Barrier	Responsible Party	Code Reference	Evaluation of Barrier	Recommended Modification
Green Infrastructure					
	Policies disallowing stormwater facilities in residential privately owned areas such as yards. Restrictions to stormwater facility placement may limit the opportunity to install GI facilities to retain stormwater onsite.	HV Engineering HV Planning	1) WES-SS Chapter 6. Table 6 2) WES-SS 9.3 Privately-Owned and Maintained Facilities 3) HVEDM Chapter 5.6. Site Drainage 4) Barriers Meeting #1	Privately owned and maintained stormwater management facilities (SMFs) are allowable and require recorded on-site maintenance agreements for access and maintenance. (1) (2) All private storm infrastructure shall be permitted and inspected through the City's Building Division. Onsite surface water management facilities shall be reviewed and approved through Water Environment Services. (3) WES provides water quality SMF inspections for privately owned facilities within Happy Valley with the exception of properties that have not been annexed into the city. (4)	• No modification recommended. • Continue to work with WES to improve mapping, enforcement, and inspection procedures, and tracking of private SMF inspections to ensure consistency across agencies and ownership.
	Policies disallowing rainwater harvesting for residential privately owned areas. Many jurisdictions are still developing standards and guidelines for rainwater reuse. In the interim, restrictions on rainwater harvesting are seen as one barrier to the use of LID.	HV Engineering HV Planning	1) HVMC Table 16.34.075-2 Habitat-Friendly Development Practices 2) Direct Correspondence May 16, 2024	Rainwater harvesting is not mentioned in the HVEDM. The HVMC does mention retaining rooftop runoff in a rain barrel as a Habitat-Friendly Development Practice, so it does appear to be allowed if proposed, but there are no specifics about siting requirements or design. Grey water, rainwater harvesting, and cisterns are also not mentioned. (1) Procedurally the City's Building Department would have to authorize rainwater harvesting on private property. (2) The specific requirements for rainwater harvesting or reuse are unclear in the HVMC and are not referenced in the HVEDM or WES-SS, which may present and a barrier to use as a site planning technique.	• Determine if design specification and review by WES and/or the City's building department would be required for use of rain barrels or cisterns as a site planning technique. • Suggestion to provide clear wording on when rainwater harvesting is permitted in the context of use for an GI facility and if any additional review or approvals are required. • Review Happy Valley Building Code to determine if barriers exist and to ensure consistency between Building Code, the HVEDM and WES-SS.
	Policies disallowing green roofs or green/living walls for commercial or residential buildings. Green roofs are becoming more common, and many jurisdictions have design standards and guidelines for installing green roofs on new buildings. Restrictions to green roofs are one barrier to the use of LID.	HV Engineering HV Public Works HV Planning	1) WES-SS Chapter 6. Table 6 2) WES-SS 6.5.13 Green Roofs 3) HVMC Table 16.34.075-2 Habitat-Friendly Development Practices 4) Direct Correspondence May 16, 2024	Green roofs are not currently allowed on publicly maintained facilities (in HV) but are allowed if privately maintained per the WES-SS. (1) Green roofs may be designed to meet flow control and water quality performance standards. Specific design requirements are provided in the WES-SS. (2) Green roofs are not mentioned in the HVEDM. The HVMC does mention green roofs as a Habitat-Friendly Development Practice, so it does appear to be allowed if proposed, but there are no specifics on what type of development they are permitted on, which conflicts with the WES-SS. (3) Green roof structural requirements would be regulated by Building Code and would need to be maintained privately. (4) Restricting opportunities for green roofs on publicly maintained facilities may limit the ability to incorporate LID/GI principles to certain types of development. This may be considered a barrier to LID/ GI from an implementation perspective as the HVMC and WES-SS seem to conflict.	• Review the prohibition of green roofs on publicity-maintained facilities per the WES-SS to determine if green roofs could be allowable for some or all publicly maintained facilities. • Suggestion to review the process for allowing green roofs and reviewing associated design components between the HVMC, HVEDM, WES-SS, and the Happy Valley Building Code to provide continuity. • Suggestion to provide clear wording in the HVEDM on if and where green roofs are permitted, as well as maintenance responsibility. Reference the Building Code for the specific structural design requirements. The HVMC could be clarified to show that green roofs represent an impervious area reduction technique (similar to pervious pavement).
	Policies disallowing or restricting primary types of green infrastructure practices (e.g., infiltration, bioretention/rain gardens, permeable pavements, swales, bioretention). Restrictions on GI facilities limit the options to reduce impervious surfaces, reduce stormwater runoff, and retain stormwater onsite.	HV Engineering HV Public Works HV Planning	NA	Stormwater tree cells are not mentioned in the WES-SS, HVEDM, or HVMC. Stormwater tree cells may provide the ability to meet tree and green infrastructure goals.	Consider inclusion of stormwater tree cells to allow for additional LID/GI opportunities for development and streetscapes.
			1) WES-SS Chapter 6. Table 6 2) WES-SS Chapter 6. Table 5	Tables 6 in the WES-SS reflects that HV does not allow use of pervious pavement or infiltration galleries/trenches for publicly maintained facilities. Both are allowed in WES' jurisdiction for publicly maintained facilities. Table 6 in the WES-SS also indicates that pervious pavements are not permitted in the public street/right-of-way (ROW). Constructed wetlands, detention or infiltration ponds, and green roofs are also listed as not permitted in the public street/ROW, but this is assumed to be due to space constrains and feasibility rather than an issue with the SMF type. (1) Within WES' service district, pervious pavement constructed within the public ROW requires the approval of the local roadway authority. (2) Restricting opportunities for green infrastructure for publicly maintained facilities and public streets/ROW may limit the ability to incorporate LID/GI principles to certain types of development.	Suggestion to review the process for allowing pervious pavements and/or infiltration trenches between the HVEDM, HVMC, and WES-SS to provide continuity.
	Disallowing GI in retrofit projects and only allowing replace in kind. This may limit the ability to retain stormwater onsite.	HV Engineering HV Public Works	NA	No reference found allowing or disallowing policy.	No recommended modification.
	No variance process in place to allow for new or innovative approaches to LID or GI. This may limit the ability to reduce impervious surfaces, limit the ability to reduce stormwater runoff, and limit the ability to retain stormwater onsite.	HV Engineering HV Public Works HV Planning	1) WES-SS 2.4.1 Variance Request 2) HVMC Chapter 16.71 Variances	The WES-SS specifies a variance process which requires requests for variances to the stormwater standard to be submitted in writing to WES Variance requests are allowed to be submitted at any time during the process, but since WES is not responsible for the land use approvals or associated conditions there may be limited flexibility in variance approvals. (1) WES provides a Service Provider Letter during the land use process to verify the feasibility for surface water management for the project. The HVMC provides a comprehensive variance process that includes variances for various land development requirements with approval criteria specified. (2) This may be a process barrier if designers need a variance after land use is approved to meet stormwater requirements or to use innovative GI facilities. This may also be a barrier if variances to development code are approved without the technical input of the responsible stormwater authority.	• No modifications recommended. • A Service provider letter (SPL) from WES is now being provided in HV, which requires determination on the feasibility of the design as is relates to stormwater requirements. This should help alleviate the frequency of variance requests to comply with stormwater requirements.

Table C-3. LID Code Barriers Evaluation Matrix

	Typical Barrier	Responsible Party	Code Reference	Evaluation of Barrier	Recommended Modification
Land Use					
	Policies to implement site planning procedures that require projects to consider site layout options that optimize retention of stormwater.	HV Planning	1) WES-SS 2) HVMC 3) HVEDM 4) Barriers Meeting #1 5) HVMC Table 16.34.075-2 Habitat-Friendly Development Practices	Land use review and approval is conducted by Happy Valley and WES is responsible for the technical aspects of SMF design and location. The pre-application and land use process provides opportunity for all applicable parties to review and identify conditions of approval. Specific site planning and/or impervious area minimization/ reduction techniques (e.g., LID Strategies), such as preservation of existing trees, retaining vegetation and open space, clustering buildings, disconnecting residential downspouts, and constructing pervious pavement and green roofs (as impervious area reduction techniques), to help mitigate stormwater runoff and reduce the size of the required SMF are not listed in the HVMC, HVEDM, or WES-SS or required to be incorporated/included in the SPL or Stormwater Report submittal. (1)(2)(3)(4) The HVMC does include a table with habitat-friendly development practices, but there is no mechanism to require incorporation of these techniques. However, site planning and/or other impervious area minimization/reduction techniques (LID strategies) are not confirmed during land use review and approval. (5) These process-related items could be a barrier to the implementation of LID/GI as there appear to be gaps in the pre-application requirements and implementation of site planning requirements between WES and HV and the respective planning and design review processes. There also appears to be inconsistencies between the site design requirements of the planning agencies and LID site design as specified by the permit requirements.	• Clarify and formalize responsibilities around site planning measures between Happy Valley and WES to mitigate this process barrier. • Ensure that the SPL and/or Preliminary Stormwater Management Plan and Drainage Report require site planning principals reflected with site layout and onsite stormwater controls to help reduce runoff and optimize retention of stormwater. Require that site design measures to reduce the amount of runoff be documented in the Preliminary Stormwater Management Plan and Drainage Report submittal. • If implementing the BMP sizing tool, reflect the BMP sizing tool site layout requirements in the WES-SS and reference the BMP sizing tool in the standards.
			6) HVMC 16.12.030. Definitions	The HVMC does not include definitions for GI. It does have a definition for low impact development and for habitat-friendly development which incorporates various GI strategies but is not fully in accordance with the definition of GI in the NPDES MS4 permit. (6) This could be a barrier to implementation as the GI and the connection between habitat friendly development and LID/GI may not be clear to developers.	It is recommended that GI and/or SMFs be defined in conjunction with the definitions currently included in the 2022 Stormwater Management Program Document and be consistent between the HVEDM, HVMC, and WES-SS.
	Minimum lot dimensions, setback requirements, roadway lengths, building requirements, or frontage that do not allow flexibility for clustering and other techniques to reduce impervious area in subdivisions. Stringent lot dimensions may limit an applicant's options to reduce impervious surfaces and provide open spaces that protect native soils and vegetation.	HV Planning	1) HVMC Chapter 16.22 Residential Land Use Districts 2) HVMC Chapter 16.71 Variances	Zoning requirements specify minimum densities and minimum lot sizes along with maximum densities and maximum lot sizes for specific zoning and land uses. (1) Variances to densities and lot setbacks/coverage can be applied for through the variance process. (2) Minimum lot dimensions could impact flexibility in clustering and reduce options for applying LID approaches to site planning.	• No modification recommended. • Clustering, increasing density, and protecting vegetation are encouraged. The zoning requirements provide a range of lot sizes for several land uses which will promote clustering and preservation of open spaces.
	Policies disallowing stormwater facilities in open space, landscape buffers/islands, or green space. Restrictions on stormwater facility placement may limit the opportunity retain stormwater onsite.	HV Planning	1) HVMC 16.42.080 Shared Outdoor Recreation Areas 2) HVMC Section 16.44.010.B.9 Design Standards for Multifamily Housing 3) HVMC Section 16.63.130.H.2.d. Planned Unit Development 4) WES-SS 6.4.6 5) HVMC 16.42.060.B.5 6) Barriers Meeting #1 7) HVMC 16.42.030 Landscaping Requirements	SMFs are not allowed to qualify as active recreational areas. SMFs may qualify as passive recreation areas for some development, but the code is not explicit on when stormwater ponds (or other facilities) meet the criteria of a passive recreation areas. (1)(2)(3) The WES-SS requires that a minimum 6-foot-high fence is to be constructed around the perimeter of all publicly maintained SMFs with a designed water depth greater than 3 ft. (4) The HVMC specifies that fencing along stormwater detention facilities shall be six-foot-tall, black, vinyl-coated chain link. (5) Happy Valley policy is to not allow areas that are fenced to be included as open space or recreation areas. Stormwater ponds may be considered as passive recreation areas if a trail and/or other amenities such as benches or tables are incorporated into the design. This may limit the use of ponds deeper than 3-ft but would potentially allow for other types of GI (swales, bioretention facilities) to be credited towards open space and landscaped areas. (6) Landscaped areas may include stormwater detention facilities. The exposed area developed with such features shall not exceed 25% of the required landscaped area. (7) It is not clear if and/or what types of SMFs are allowable as passive recreation for development and if fences fully preclude stormwater ponds from being included as an option for a passive recreation area. This may present a barrier in meeting both the open space and stormwater objectives for development.	• It is suggested that SMFs be mentioned by name as an allowable use in passive recreation areas with limitations provided if needed (such as excluding areas that are fenced or inaccessible to the public or requiring the installation of trails or benches). • Happy Valley plans to review the relevant code during future code updates.
	Policies that do not count landscaped stormwater facilities toward minimum development landscaping requirements. This creates a disincentive for an applicant to install a GI or LID stormwater facility and may limit the opportunity to retain stormwater onsite.	HV Planning	1) HVMC 16.42.030. Landscaping Standards	Landscaped areas may include stormwater detention facilities. The exposed area developed with such features shall not exceed 25% of the required landscaped area. (1)	No modification recommended.
	Policies disallowing alternative landscape options (xeriscaping, native plants, clover/thyme ground cover) and limiting landscaping to turf in yards. Native landscaping and alternative groundcovers are often better equipped to retain stormwater onsite, when compared to a compacted turf yard. Protecting native soils and vegetation is a key principle of LID.	HV Planning	1) HVMC 16.42.030. Landscaping Standards	Landscaping shall be irrigated, or a xeriscaping landscape plan based on drought tolerant plantings is required to be submitted for review and approval of the Planning Official and/or Design Review Board. (1) Vegetated groundcovers shall be fully rooted and shall be well branched or leafed. If used in lieu of turf in whole or in part, groundcovers shall be planted in such a manner as to provide complete coverage in 2 years. (1)	No modification recommended.

Table C-3. LID Code Barriers Evaluation Matrix

	Typical Barrier	Responsible Party	Code Reference	Evaluation of Barrier	Recommended Modification
Streetscape/Parking Lot					
	Policies that require parking ratios above Urban Land Institute or Institute of Transportation Engineers recommended rates. Minimum parking ratios increase the land cover requirements, which often increases impervious surface coverage, unless the zoning code allows for pervious pavements and alternative surface parking areas.	HV Planning	1) HVDEM 16.43.030. Automobile Parking Standards 2) HVMC Table 16.43.030-1	Parking space minimum numbers and dimensions are required and specified for various land uses. Parking maximums are also provided for specific land uses. (1)(2) If the applicant demonstrates that too many or too few parking spaces are required, applicant may seek a variance from the minimum or maximum by providing evidence that the particular use needs more or less than the amount required. (1)	No modification recommended. Parking maximums and the additional requirements encourage clustering and minimization of parking spots.
	Policies requiring road widths wider than those required for emergency or fire access or disallowing hammerheads. Policies requiring sidewalk widths larger than required for safety. This may limit the opportunity to reduce impervious surfaces and limit the ability to protect native soils and vegetation.	HV Engineering HV Public Works HV Planning	1) HVMC 16.50.030 H. Sidewalks and Bikeways	Sidewalks must be constructed free of impediments within a minimum width of at least five ft. Specific widths were not provided for other sidewalk minimums. (1)	No modification recommended. The minimum industry standard for sidewalks is 5-ft as specified by the National Association of City Transportation Officials (NACTO).
			2) HVMC 16.50.030. Transportation Standards 3) HVMC 16.50.030.B. Street and Road Standards	Specifications for minimum road widths are provided based on the type and land use of the area. (2) Street Design Variations. Alternate design variations from the standards may be considered for approval by the City Engineer for various unusual circumstances including topography and green street design elements. (3)	• No modification recommended. • Minimum widths are based on safety and functionality and variations are permitted per the City Engineer.
	Policies limiting or disallowing shared parking or parking garages. Shared parking is one method to reduce impervious surfaces and protect native soils and vegetation.	HV Planning	1) HVEDM 10 Driveways 2) HVMC 16.44.120. Design Standards for Single-family Detached, Townhomes, Duplexes, Triplexes, Quadplexes, and Cottage Clusters 3) Direct Correspondence May 16, 2024	One driveway per lot is the City standard. Design exceptions may be made, per the City's Driveway Policy, if approved by the City Engineer through a Design Exception Request. (1) Procedurally this code is used to limit multiple driveways to a single lot not to limit the ability to have a shared driveway. (3) Two adjacent properties may share one driveway. When a driveway serves more than one lot, an access and maintenance easement/agreement to benefit each lot shall be recorded prior to building permit issuance. (2) Limiting the use of shared driveways could limit the ability for clustering and preservation of open spaces. It may also create a barrier as shared driveways are considered a design exception rather than a standard alternative. The wording of the HVEDM and the HVMC appears to conflict in the requirements related to the number of lots or properties served by a driveway. Procedurally shared driveways are allowed.	Consider clarifying wording in the HVEDM to indicate that no more than one driveway per lot is the City Standard to reduce confusion for developers related to use and applications of shared driveways.
			4) HVEDM 16.43.030. Automobile Parking Standards	In the case of mixed uses, shared parking between uses is encouraged. Except for residential uses, required parking facilities may be located on an adjacent parcel of land or separated by a maximum of 200 ft (measured as a direct pedestrian route). (4)	No modification recommended.
	Policies disallowing multi-use pathways for pedestrian and bikes. Required separation for each type of use results in increased impervious surface requirements.	HV Engineering HV Public Works HV Planning	1) HVMC 16.12.030 Definitions 2) HVMC 16.50.030. Transportation Standards	Multi-use paths are defined as "an eight to 10 foot wide improved, all-weather surface pathway that is utilized for pedestrian and bicycle traffic" and are referenced in the transportation standards. (1)(2)	No modification recommended.
	Policies disallowing permeable pavements for use in alleys, streets, driveways, parking lots, and bike lanes, etc. Pervious pavements are becoming a common design approach to retain stormwater at the source. Requiring traditional asphalt and concrete surfaces limits an applicant's opportunity to reduce impervious surfaces, reduce stormwater runoff, and retain stormwater onsite.	HV Engineering HV Public Works HV Planning	1) WES-SS Chapter 6, Table 6 2) WES-SS 6.5.12 Pervious Pavement 3) WES-SS Chapter 6 Table 5 4) Direct Correspondence May 16, 2024	Tables 6 in the WES-SS reflects that HV does not allow use of pervious pavement for publicly maintained facilities. Pervious pavements are allowed in WES' jurisdiction for use in publicly maintained facilities. Table 6 in the WES-SS also indicates that pervious pavements are not permitted in the public street/ROW. (1) WES-SS contains site and design specifications for pervious pavements. (2) Within WES' service district, pervious pavement constructed within the public ROW requires the approval of the local roadway authority. (3) Happy Valley does allow pervious pavements on private streets and driveways. Limitations on maintenance support limit the ability to use pervious pavements on facilities that would be maintained by Happy Valley. (4) Restricting opportunities for green infrastructure on publicly maintained facilities and for public streets/ROW may limit the ability to incorporate LID/GI design for certain types of development.	• Review the allowable facilities in the HV and the WES-SS to ensure alignment and determine if incorporation of the pervious pavements in public street/ROW could be included as a standard practice rather than only allowed as an alternative design. • Review the WES-SS pervious pavement design requirements to determine if they could be adopted for HV use. Consider input from regional agencies (e.g., City of Tacoma, City of Gresham) in confirming that the design details and specifications for firetruck load can be accommodated. Consider inclusion of the structural design in the HVEDM or references to the WES-SS. • Review City maintenance capabilities and responsibilities and explore potential expansion of maintenance practices and/or agreements with private vendors for pervious pavement sweeping, as maintenance constraints have been identified as a limitation in use of pervious pavements in the public ROW.
	Policies disallowing permeable pavements for use in alleys, streets, driveways, parking lots, and bike lanes, etc. Pervious pavements are becoming a common design approach to retain stormwater at the source.		5) Direct Correspondence May 16, 2024 6) HVEDM 10 Driveways 7) HVMC 16.41.030	Procedurally, pervious pavements are allowed on driveways. (5) All driveways shall be paved with asphalt or concrete. Any alternative to this shall be approved by the City Engineer. (6)(7) This may be a barrier to use of pervious pavements for driveways, as alternatives are only permitted as a deviation rather than as a standard practice on private road/streetscape design (as currently referenced in the WES-SS).	Clarify that pervious pavements for are acceptable for driveways in HVEDM, as confirmed through direct correspondence.

Table C-3. LID Code Barriers Evaluation Matrix

	Typical Barrier	Responsible Party	Code Reference	Evaluation of Barrier	Recommended Modification
	Requiring traditional asphalt and concrete surfaces limits an applicant's opportunity to reduce impervious surfaces, reduce stormwater runoff, and retain stormwater onsite.		8) HVMC 16.50.030 H. Sidewalks and Bikeways	Sidewalks shall be constructed of concrete in accordance with the City's Engineering Design and Standard Details Manual. Other materials must be specifically approved by the City Engineer. (8) A standard detail for pervious concrete sidewalks is provided with the HVEDM, but it is not mentioned in the HVEDM text. Noting that sidewalks are to be constructed of concreate and the lack of reference to the pervious concrete sidewalk detail may lead to confusion for designers.	• No modification recommended. • Consider adding description or reference to pervious concrete detail in the HVEDM.
			9) HVMC 16.43.030. Automobile parking standards. F Parking Area Design, Size, Layout and Access 10) HVMC 16.50.030. Transportation Standards	All areas used for parking and maneuvering of cars shall be surfaced with asphalt, concrete or other approved impervious, permeable, or semi-permeable surface, and shall provide for suitable drainage. (9) Parking areas, driveways, aisles and turnarounds shall be paved with concrete, asphalt or comparable surfacing, constructed to City standards for off-street vehicle areas. (9) Sections utilizing other methods of construction than shown in the standard drawings (e.g., lime or cement treated subgrade, or Portland cement or asphaltic cement treated base, etc.) may be submitted for review and approval by the City Engineer. (10) Pervious pavements for parking lots appear to be allowed per the HVMC, but the HVEDM does not contain a detail for pervious pavement parking or road sections, so it may be unclear if WES-SS pervious pavement design requirements are considered "other approved impervious, permeable, or semi-permeable surface".	• No modification recommended. • Although not a full barrier, consider clarifying allowance and design requirements for pervious pavements for parking lots.
			11) HVMC 16.50.030.B. Street and Road Standards	Alternate design variations from the street design standards may be considered for approval by the City Engineer for various unusual circumstances including topography and green street design elements. (11) This may create a barrier as incorporation of LID/GI or "green street" designs are permitted as a deviation rather than as a standard road/streetscape design.	Determine if incorporation of the pervious pavements and other green street features (e.g., GI) in public street/ROW could be included as a standard practice rather than only allowed as an alternative design.
	Stringent requirements for vegetation or trees within the ROW. Significant tree requirements can result in limiting the space available to install GI within the planting strip, median, or other parts of the ROW. This reduces the types of stormwater facilities that can be installed, which may limit the opportunity to reduce stormwater runoff, retain stormwater onsite, or protect native soils and vegetation.	HV Planning	1) HVMC 16.42.030 Landscaping Standards 2) HVMC 16.42.040 Street Trees and Planter Strips	Planting of street trees is required for all public street frontages. Planting of street trees along private roadways is at the discretion of the developer, builder or property owner. (1) Street trees in parking strips shall be placed at a maximum of 30 ft on center and located in accordance with the requirements contained in this chapter. Street trees in center medians shall be placed at a maximum of 15 ft on center. Trees planted in the center medians shall be staggered with the trees planted in the parking strips. Special plantings shall be allowed with prior approval by the City Manager. (2) Specific spacing requirements may limit ability to incorporate SMFs.	• No modification recommended. • The street tree requirements for public street frontages do not include specific spacing requirements, which allows for flexibility for the incorporation of SMFs and compliance with the street tree requirements. Variation can be approved by the City Manager. • Consider reviewing weather stormwater infiltration tree cells would allow for meeting tree requirements while providing additional stormwater management.
			1) WES-SS 6.4.5 Planting and Irrigation 2) HVMC16.452.040	SMFs located in the public ROW are not permitted to include trees. (1) An approved street tree list is provided with specifics for poor drainage, drought tolerance and placement. (2) This may limit the ability to incorporate GI and meet street tree requirements in the public ROW. This would also prohibit the use of stormwater tree cells.	Review the WES-SS and coordinate with DTD to determine if there is an opportunity to incorporate certain types of trees into SMFs located in the public ROW.
	Streetscape standards that disallow use of GI such as stormwater tree cells, bioretention, curb bump outs, pavers, or curb cuts. Those restrictions would be a direct barrier to the use of LID.	HV Engineering HV Public Works HV Planning	1) WES-SS Table 6 2) HVMC 16.50.030.B. Street and Road Standards 3) Direct Correspondence (May 16, 2024)	Table 6 in the WES-SS reflects that HV does not allow use of pervious pavement or infiltration galleries/ trenches for publicly maintained facilities. Both are allowed in WES' jurisdiction for publicly maintained facilities. Table 6 in the WES-SS also indicates that pervious pavements are not permitted in the public street/ROW. (1) Constructed wetlands, detention or infiltration ponds, and green roofs are also listed as not permitted in the public street/ROW, but this is assumed to be due to space constrains and feasibility rather than an issue with the facility type. The WES-SS does not include reference to stormwater tree cells. (1) Pervious pavement constructed within the public ROW requires the approval of the local roadway authority. (1) Street Design Variations. Alternate design variations from the standards may be considered for approval by the City Engineer for various unusual circumstances including topography and green street design elements. (2) Happy Valley has limited ability to maintain pervious pavement and/or other GSI related to streetscapes. Maintenance would need to be conducted by a private owner or by WES if applied in the public ROW. (3) This may be a barrier as incorporation of LID/GI or "green street" designs are permitted as a deviation rather than as a standard road/streetscape design.	• Review the allowable facilities in the WES-SS and HV to ensure alignment. • Determine if incorporation of the pervious pavements and green street features (e.g., GI) in public street/ROW could be included as a standard practice rather than only allowed as an alternative design. • Consider inclusion of stormwater tree cells to allow for additional LID/GI opportunities for development and streetscapes.
			4) Barriers Meeting #1	WES provides water quality facility inspections and maintenance for facilities in the ROW within their service district. (4) The SMFs outside of WES' jurisdiction in the ROW may be limited by the ability for Happy Valley and/or CCDTD to provide maintenance. This may lead to inconsistency throughout the Clackamas County for allowable facilities.	Review maintenance requirements for specific green infrastructure to determine if maintenance is feasible by HV and CCDTD in areas outside of WES' jurisdiction and/or explore expansion of maintenance agreement with WES to allow for SMFs to be installed in more remote locations are held to the same maintenance standards.

Appendix C: Post-Construction Stormwater Management Requirements, Schedule A.3.e.iii

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Memorandum

To:	Leah Johanson
From:	Trista Kobluskie, Joe Brascher, Roger Tiffany, PE, Kevin Timmins, PE
Copies:	Ron Wierenga, File
Date:	October 28, 2024
Subject:	WES Post-Construction Stormwater Alternative Site Performance Standard (ASPS) and Numeric Site Retention Requirement (NSRR) Equivalency Report
Project No.:	021656.000

Introduction

Water Environment Services (WES) is an intergovernmental entity in Clackamas County, Oregon which provides wastewater and surface water systems to protect public health and the environment. As a stormwater service provider in urban Clackamas County, WES is a co-permittee of the Clackamas County Phase I National Pollutant Discharge Elimination System (NPDES) municipal separate storm sewer system (MS4) Permit (Permit).

Schedule A.3.e.iii of the Permit requires co-permittees to develop and implement post-construction stormwater management requirements that prioritize onsite retention of stormwater and removal of pollutants. The Permit gives two options for meeting the requirements. Option A, the Numeric Stormwater Retention Requirement Site Performance & Treatment Standards, requires co-permittees to establish a numeric stormwater retention requirement (NSRR), such as a volume, or a storm event percentile, or a percentage of annual average runoff that must be retained before sites may discharge runoff offsite. Option A requires additional methods of stormwater treatment and control for flows that discharge offsite.

Option B, the Alternative Site Performance Standard, allows co-permittees to comply with Schedule A.3.e.iii without establishing a NSRR. Option B requires co-permittees to demonstrate how their alternative site performance standard (ASPS) prioritizes infiltration, low impact development (LID), and green infrastructure (GI), includes pollutant removal goals, targets natural surface or pre-development site hydrology, and reduces the discharge of pollutants from new or replaced impervious surfaces. Option B requires co-permittees to establish and enforce the following procedures and standards:

- Requirements for site layout plans and a minimum set of specific onsite stormwater controls (collectively “site design measures”) based on the GI approach of emphasizing infiltration, evapotranspiration, and/or harvesting/reuse of stormwater. Site design measures shall be used to reduce the amount of runoff, comparable to the NSRR, to the extent technically feasible and not prohibited by other constraints such as land use regulations or other state or federal regulations. Site planning procedures shall require projects to consider site layout options that optimize retention of stormwater.

- At sites where retention is infeasible due to technical and/or site constraints, at least 80 percent of average annual runoff from new and/or replaced impervious surfaces must be treated with an extended filtration stormwater control prior to discharge, to target removal of TSS.
- Stormwater discharged offsite must target natural surface or predevelopment hydrology (as measured by rate, duration, and/or volume of discharge) to minimize the potential for hydromodification impacts, except in circumstances where the co-permittees can demonstrate that the risk of hydromodification impacts is negligible, (e.g., large tidally influenced waterways or flow-managed waterways).

WES's existing Stormwater Standards do not meet the definition of a Numeric Site Retention Requirement, Site Performance, and Treatment Standards (Permit Schedule A.3.e.iii(A)) because they do not establish a numeric metric for retention using any of the listed methodologies, which are the following: volume-based method, storm event percentile-based method, or annual average runoff-based method. Rather, they establish numeric requirements using a flow duration-based method for flow control and an average annual runoff-based method for runoff treatment.

Therefore, WES hired Otak, Inc. to investigate whether WES's existing Stormwater Standards meet the requirements of Permit Schedule A.3.e.iii(B). After conducting a modeling study and policy analysis, Otak has concluded that WES's existing Rules and Regulations, Buffer Standards, Stormwater Standards, stormwater guidance, and review procedures together generate water quality benefits comparable to the NSRR approach for new development and redevelopment and result in significant retention in the post-developed landscape. This memorandum demonstrates how WES's existing Rules and Regulations and suite of standards meet the requirements of Permit Schedule A.3.e.iii(B).

Rules, Standards, and Processes

This section references and summarizes the suite of existing Rules and Regulations, Buffer Standards, Stormwater Standards, stormwater guidance, and review procedures which together perform as WES's ASPS.

WES Rules and Regulations

WES updated its Rules and Regulations in April 2023. The Rules and Regulations apply to WES's three Rate Zones. WES provides surface water services in Rates Zones #2[1], which covers Happy Valley and adjacent unincorporated urbanized areas as well as Boring and Hoodland, and #3, which covers Rivergrove and unincorporated areas that drain to the Tualatin River. The Rules and Regulations include Surface Water Rules in section 7 and Natural Resource and Vegetated Buffers Rules in section 8.

Surface Water Rules (Section 7)

The purpose of the Surface Water Rules is to:

- Provide for the effective management of surface water, stormwater, and drainage.
- Maintain and improve water quality in the public surface water system and protect beneficial uses of waters of the state.

[1] In Rate Zone #2, Boring and Hoodland are outside of the Permit coverage area. For the purposes of this memorandum, subsequent references to Rate Zone #2 include only those areas with the Permit coverage area as of fall of 2024. This area can loosely be described as the City of Happy Valley and environs.

- Control hydromodification for the purpose of protecting in-stream physical habitat.
- Establish minimum stormwater management requirements to protect water quality of receiving waters and protect downstream parties from the effect of changes in runoff duration and quality due to development activities.
- Implement the requirements of the CWA, the Oregon DEQ NPDES municipal separate stormwater systems (MS4) permit, and other regulations related to stormwater by regulating the contribution of pollutants to the District's stormwater facilities and waters of the state from stormwater discharges from development and redevelopment sites.

The Surface Water Rules apply in Rate Zones #2 and #3. They apply to any property that discharges or requests to discharge, via connection request, development permit, or change in use, to the District's public stormwater system, to groundwater, or to surface waters within District boundaries.

Stormwater management requirements apply to all new development and redevelopment activities that result in 5,000 or more square feet of new or replaced impervious area. Stormwater runoff from the new development and redevelopment areas must meet the technical standards found in the Stormwater Standards.

An excerpt of section 7, Surface Water Rules, with content relating to LID, GI, site planning, infiltration, water quality, hydrology, and stormwater management requirements annotated with highlights is included in Attachment A.

Natural Resources and Vegetated Buffers Rules (Section 8)

The Rules are intended to prevent and reduce adverse impacts and to enhance drainageways and water resources within WES in combination with other state, federal, county, and local laws, and ordinances.

Water Quality Resource Areas (WQRAs) are protected areas that are located along the edge or perimeter of water resources such as streams, lakes, ponds, reservoirs, and wetlands. WQRAs provide water quality treatment and habitat protection. WES requires WQRAs for all new developments and redevelopments that are bounded by or contain water resources. WES requires WQRAs to protect the water quality of water resource areas, which include perennial and intermittent streams and wetlands.

An excerpt of section 8, Natural Resources and Vegetated Buffers Rules, with content relating to LID, GI, site planning, infiltration, water quality, hydrology, and stormwater management requirements annotated with highlights is included in Attachment A.

Stormwater Standards

WES updated its Stormwater Standards in April 2023. The Stormwater Standards apply to all new development and redevelopment activities that result in 5,000 or more square feet of new or replaced impervious area, and they repeatedly emphasize infiltration as the preferred method of stormwater management.

A selection of the numerous objectives of the Stormwater Standards includes the following:

- Minimize the discharge of pollutants and provide water quality treatment of stormwater runoff to preserve the beneficial uses of drainageways, lakes, ponds, wetlands, and other Sensitive Areas.
- Maintain water quality by protecting Sensitive Areas and the associated vegetative buffers.

- Minimize stormwater runoff volumes and maximize groundwater recharge through the process of infiltration of runoff into vegetated stormwater facilities.
- Maintain the pre-development stormwater runoff characteristics to minimize effects on the drainageways, such as erosion and degradation, generally associated with urbanization.
- Protect soil, groundwater, and surface water by capturing pollutants and reducing impacts to the environment.

Highlights of WES's Stormwater Standards include the following:

- **Water Quality Standard**: Capture and treat 80 percent of the average annual runoff volume, with the goal of 80 percent suspended solids removal (Section 6.1.1)
- **Flow Control Standard:** Duration of peak flow rates from Post-Development Conditions shall be less than or equal to the duration of peak flow rates from pre-development conditions for all peak flows between 42 percent of the 2-year peak flow rate up to the 10-year peak flow rate (Section 6.1.2)
- **Sizing Methods for Infiltration:**
  - Infiltration is the preferred strategy to achieve the stormwater management performance standards (both flow control and water quality) (Section 6.2.1)
  - Fully infiltrating the 10-year, 24-hour design storm is assumed to meet the flow duration standard without further analysis (Section 6.2.1)
  - If the SMF cannot be designed to fully infiltrate the 10-year storm event, then an underdrain and outflow will be required to safely convey the discharge from the SMF to an approved discharge point (Section 6.2.1)
  - Infiltration testing is required to obtain a Service Provider Letter from WES (Section 6.2.1)
  - Release rates from a Stormwater Management Facility (SMF) must meet the flow control standard (Section 6.2.1)
  - Fully infiltrating the 10-year, 24-hour design storm in a rain garden, planter, swale, or pond is assumed to meet the water quality standard without further analysis (Section 6.2.1)
- **Flow Control SMF Sizing:** To design for flow duration matching, a hydrologic/hydraulic analytical model capable of performing a continuous simulation of peak flow rates from local long-term rainfall data must be used to determine the peak flow rates, recurrence intervals, and durations. (Section 6.2.3)
- **General Design Requirements:** When a SMF is required, green infrastructure, such as planters, swales, rain gardens, ponds, and other vegetated SMFs are the preferred strategy. The best way to control the rate and duration of runoff is through the incorporation of infiltration using green infrastructure. (Section 6.3)
- **Allowable SMFs:** stormwater planter, rain garden, vegetated swale (also known as bioinfiltration swale), filter strip, drywell, infiltration trench or gallery, constructed wetland, pond, structural detention,

proprietary stormwater treatment devices, sheet flow dispersion, pervious pavement, green roofs. (Section 6.5)

Excerpts of WES's Stormwater Standards with relevant content annotated are provided in Attachment A.

Stormwater Typical Drawings and Standard Details

Appendix C of WES's Stormwater Standards are the Stormwater Typical Drawings and Standard Details. SMFs that can infiltrate, including stormwater planter (infiltration), rain garden (infiltration), vegetated swale (infiltration), and pond (infiltration) are drawn as unlined facilities with drain rock above native subgrade.

If the SMF cannot be designed to fully infiltrate the 10-year storm event, then an underdrain and outflow is required to safely convey the discharge from the SMF to an approved discharge point. The typical drawings show an elevated perforated underdrain pipe situated in the drain rock to allow the SMF to discharge water that cannot infiltrate to a surface water system. In some of the typical drawings, the elevation of the underdrain has not been specified. WES Development Review staff instruct designers to elevate perforated underdrains by 12 inches from the bottom of the drain rock.

Enforcement, Procedures, and Tools

WES's development review procedures and enforcement of the Stormwater Standards influence the outcomes of post-construction stormwater management on development sites by guiding how applicants design SMFs to meet the performance standards.

Otak documented relevant procedures and enforcement policies through discussion with WES's Development Review Supervisor and staff. These include:

- Applicants whose projects trigger the Stormwater Standards are guided to use the BMP Sizing Tool (see next section below) for sizing water quality and flow control SMFs. Other methods for sizing SMFs are allowed but are used infrequently.
- Unless the design professional stipulates that site conditions are not feasible for use of infiltration, applicants are instructed to select an unlined SMF and check the box for using infiltration in the BMP Sizing Tool.
- Applicants are guided to elevate the perforated underdrain of an unlined flow control SMF by 12 inches, which results in runoff collecting beneath the underdrain in the rock gallery which can only discharge via infiltration.
- Development Reviewers review applicant submittals in part for infiltration test results, findings about feasibility of using infiltration on the site, SMF sizing and design plans including ponding depths, media depths, side slopes, elevated perforated underdrain and other elements, and the flow control pass/fail report from the BMP Sizing Tool.

WES's BMP Sizing Tool

The BMP Sizing Tool sizes SMFs to meet the water quality performance standard and the flow control performance standard. The tool uses the results from a continuous simulation HSPF model pre-run for all possible combinations of user inputs for pre-developed and post-developed hydrologic conditions and pre-set facility types and design parameters to size SMFs. The BMP Sizing Tool is designed to target pre-developed hydrology.

The BMP Sizing Tool offers lined and unlined SMF options.

Observed Use of BMP Sizing Tool

After reading drainage reports and discussing real-world application of the Stormwater Standards with WES's Development Review Supervisor and staff, Otak observed that most applicants design and construct SMFs that are slightly larger in volume than the volume specified by the BMP Sizing Tool. We did not assess the frequency or calculate the amount of SMF volume increases. We note the observation here only to suggest that findings based on a modeling study using BMP Sizing Tool volumes for mitigating post-developed hydrology may be conservative compared to the SMFs constructed in the real world.

Study Design and Findings

The study is designed to evaluate whether WES's ASPS generates water quality benefits comparable to the NSRR approach when considered at the District scale. It includes a modeling component and a policy analysis.

The modeling study evaluates whether the post-developed landscape, if fully developed under WES's Stormwater Standards and Development Review procedures, would provide rates of retention that are similar to rates of retention in the pre-developed condition. The modeling study evaluates conditions in Rate Zone #2, which has experienced a high rate of growth in and around Happy Valley, as a proxy for the District.

Otak modeled hydrology in Hydrologic Simulation Program-FORTRAN (HSPF) using a 25-year precipitation record from the Pleasant Valley rain gauge in Clackamas County. HSPF is a continuous simulation hydrology model which can track every drop of rainfall throughout the entire study area including evaporation, surface runoff, interflow, and groundwater (infiltration). The model provides the ability to determine the percentage of rainfall over time that is retained in the study area in both the pre-developed and post-developed mitigated conditions.

Finally, Otak conducted a policy analysis to evaluate whether WES's existing Rules and Regulations, Buffer Standards, Stormwater Standards, stormwater guidance, and review procedures together meet other required elements of the ASPS in Permit Schedule A.3.e.iii(B).

Unit Hydrology

The modeling study began by defining unit hydrology in the District. Each combination of soil, vegetative land cover and slope is known as a "PERLND" (pervious land) in HSFP. Otak modeled hydrology for a representative one-acre basin area for each possible PERLND. In addition, Otak modeled a representative one-acre of impervious land cover (IMPERLND).

The model outputs average annual precipitation in inches and the portion of precipitation that results in evaporation, surface runoff, interflow, and groundwater (infiltration) for each PERLND and IMPERLND. Retention is defined as the portion of precipitation that results in evaporation and groundwater (infiltration).

Average annual precipitation is 46.4 inches per year (in/yr) and the modeled retention for PERLNDs ranges from 26.2 in/year (56.4 percent of average annual precipitation) on C soils to 46.2 in/yr (99.6 percent of average annual precipitation) on A soils. On impervious surfaces, retention is 8.7 in/yr (18.6 percent of average annual precipitation) through the mechanism of evaporation.

Later in the modeling study, these one-acre hydrology units were used to model pre-development and post-development hydrology by calculating proportion of each PERLND and IMPERLND present in the modeling scenario.

Unit hydrology findings for PERLNDS are presented in Table 1 and unit hydrology findings for IMPERLNDS are presented in Table 2.

Table 1 Unit Hydrology Outputs for PERLNDS

				Total Runoff				Retention	
PERLNDs (HSG, Vegetation, Slope)	Basin Area (Ac)	Precipitation (In)	Evaporation (In)	Surface (In)	Interflow (In)	Groundwater (In)	Total Runoff (In)	Groundwater + Evaporation (In)	Groundwater + Evaporation (%)
A, Forest, Flat	1	46.4	21.2	0.02	0.0	25.1	25.1	46.2	99.6%
A, Forest, Mod	1	46.4	21.2	0.02	0.0	25.1	25.1	46.2	99.6%
A, Forest, Steep	1	46.4	21.2	0.02	0.0	25.1	25.1	46.2	99.6%
A, Pasture, Flat	1	46.4	19.2	0.06	0.0	27.0	27.0	46.1	99.4%
A, Pasture, Mod	1	46.4	19.2	0.07	0.0	26.9	27.0	46.1	99.4%
A, Pasture, Steep	1	46.4	19.2	0.08	0.0	26.9	27.0	46.1	99.3%
A, Lawn, Flat	1	46.4	16.3	0.38	0.0	29.4	29.8	45.7	98.5%
A, Lawn, Mod	1	46.4	16.3	0.45	0.0	29.3	29.8	45.6	98.3%
A, Lawn, Steep	1	46.4	16.3	0.02	1.4	28.3	29.8	44.6	96.1%
B, Forest, Flat	1	46.4	21.3	0.01	0.6	24.4	25.0	45.7	98.5%
B, Forest, Mod	1	46.4	21.3	0.01	0.6	24.4	25.0	45.7	98.5%
B, Forest, Steep	1	46.4	21.3	0.01	0.6	24.4	25.0	45.7	98.5%
B, Pasture, Flat	1	46.4	19.3	0.02	1.3	25.6	26.9	44.8	96.6%
B, Pasture, Mod	1	46.4	19.3	0.02	1.3	25.6	26.9	44.8	96.6%
B, Pasture, Steep	1	46.4	19.3	0.02	1.3	25.6	26.9	44.8	96.6%
B, Lawn, Flat	1	46.4	16.5	0.03	3.9	25.7	29.6	42.2	90.9%
B, Lawn, Mod	1	46.4	16.5	0.03	3.9	25.7	29.6	42.2	90.9%
B, Lawn, Steep	1	46.4	16.5	0.03	3.9	25.7	29.6	42.2	90.9%
C, Forest, Flat	1	46.4	21.0	0.10	10.5	14.8	25.3	35.8	77.1%
C, Forest, Mod	1	46.4	21.0	0.12	10.5	14.8	25.3	35.8	77.1%
C, Forest, Steep	1	46.4	20.6	0.15	11.2	14.5	25.8	35.1	75.5%

Table continues on next page.

				Total Runoff				Retention	
PERLNDs	**Basin Area**	**Precipitation**	**Evaporation**	**Surface**	**Interflow**	**Groundwater**	**Total Runoff**	**Groundwater + Evaporation**	**Groundwater + Evaporation**
(HSG, Vegetation, Slope)	**(Ac)**	**(In)**	**(In)**	**(In)**	**(In)**	**(In)**	**(In)**	**(In)**	**(%)**
C, Pasture, Flat	1	46.4	19.2	0.23	14.6	12.4	27.2	31.5	67.9%
C, Pasture, Mod	1	46.4	19.2	0.29	14.5	12.4	27.2	31.5	67.9%
C, Pasture, Steep	1	46.4	18.8	0.35	15.2	12.0	27.5	30.8	66.4%
C, Lawn, Flat	1	46.4	16.6	0.66	19.4	9.6	29.7	26.2	56.4%
C, Lawn, Mod	1	46.4	16.6	0.80	19.3	9.6	29.7	26.2	56.4%
C, Lawn, Steep	1	46.4	16.1	0.93	20.0	9.3	30.2	25.4	54.7%
D, Forest, Flat	1	46.4	26.2	3.04	4.2	13.1	20.3	39.2	84.5%
D, Forest, Mod	1	46.4	26.1	4.11	3.8	12.4	20.3	38.6	83.1%
D, Forest, Steep	1	46.4	26.1	4.98	3.4	11.9	20.3	38.0	82.0%
D, Pasture, Flat	1	46.4	26.0	2.95	3.7	13.8	20.5	39.7	85.6%
D, Pasture, Mod	1	46.4	26.0	4.07	3.4	13.0	20.5	39.0	83.9%
D, Pasture, Steep	1	46.4	25.9	5.02	3.1	12.4	20.5	38.3	82.5%
D, Lawn, Flat	1	46.4	24.3	4.11	3.4	14.6	22.1	38.9	83.8%
D, Lawn, Mod	1	46.4	24.3	5.44	3.1	13.6	22.1	37.9	81.6%
D, Lawn, Steep	1	46.4	24.3	6.52	2.8	12.8	22.2	37.1	79.9%

Table 2 Unit Hydrology Outputs for IMPERLNDs

				Total Runoff				Retention	
IMPERLNDs	**Basin Area**	**Precipitation**	**Evaporation**	**Surface**	**Interflow**	**Groundwater**	**Total Runoff**	**Groundwater + Evaporation**	**Groundwater + Evaporation**
	(Ac)	**(In)**	**(In)**	**(In)**	**(In)**	**(In)**	**(In)**	**(In)**	**(%)**
Impervious	1	46.4	8.7	37.77	0.0	0.0	37.8	8.7	18.6%

Pre-Developed Hydrology

Consistent with the Permit and WES's Stormwater Standards, Otak modeled pre-developed hydrology as the site conditions immediately prior to development and redevelopment.

Otak first attempted to model pre-developed and post-developed mitigated hydrology for all of Rate Zone #2. After reviewing model results, we found the mitigated post-developed results were unrealistic because the modeled SMFs were infeasible. Results of this attempt were discarded. Otak then scaled Rate Zone #2 down by 1,000 and modeled a hypothetical basin using scaled representative inputs. The hypothetical 1/1000th-scale basin representing Rate Zone #2 (scaled basin) is 13.92 acres. Inputs for the scaled basin's pre-developed conditions were derived using the procedures described below.

Pre-Developed Soil Types

To attain a representative distribution of HSG types, Otak found the total areas of each HSG within the entirety of Rate Zone #2 using soil data from the Natural Resources Conservation Service (NRCS). The scaled basin comprises 21 percent (2.88 acres (ac)) B soils, 55 percent (7.72 ac) C soils, and 24 percent (3.32 ac) D soils. HSG A soils were negligible and were discarded from the analysis.

Pre-Developed Impervious Coverage

To estimate pre-developed impervious land cover for the hypothetical basin, WES staff and Otak evaluated and selected representative recent development and redevelopment projects WES permitted in Rate Zone #2. The group of sites met a specific set of qualifications to be used in the study, as follows:

- SMFs designed using the WES BMP Tool
- The group of sample sites needed to vary in total project area
- The group of sample sites needed to have all types of Hydrologic Soil Groups (HSG) represented

WES provided Otak with drainage reports and/or plan drawings for 14 sites. Otak evaluated each of the sites and chose eight to include in the study. The remaining sites were not selected either because they did not meet the requirements, or they had redundant site characteristics. The selected sample sites and characteristics are presented in Table 3.

Table 3 Sample Sites

Project Name	Project Type	Pre-Dev Pervious Area (ac)	Pre-Dev Impervious Area (ac)	Post-Dev Pervious Area (ac)	Post-Dev Impervious Area (ac)	HSG B	HSG C	HSG D
Pleasant Valley Villages - Phase 1 (formerly phase 3)	Subdivision	38.38	0.00	13.08	25.30	-	-	100%
Sunrise Water Authority - Facility Building	Industrial	3.65	0.00	0.93	2.73	-	100%	-
Bieker Cottage Cluster (12-Units)	Mult-Family	0.63	0.06	0.26	0.42	-	100%	-
Alpina Estates (9-Lot)	Subdivision	2.18	0.00	0.95	1.23	-	50%	50%
Avery Terrace - Phase 2	Subdivision	16.58	0.03	7.88	8.73	3%	97%	-
Happy Valley Superblock Phase 3	Road	2.60	0.12	0.61	2.11	-	62%	38%
Avery Terrace - Phase 1	Subdivision	8.60	0.00	3.14	5.46	-	36%	64%
Iseli Estates Subdivision (40 Lots)	Subdivision	8.93	0.00	4.51	4.42	-	100%	-

Otak calculated percentages of pre-developed impervious coverage from the sample sites for use as inputs to both the pre-development model in HSPF and the SMF sizing models in the BMP Sizing Tool, which are described in the Mitigated Developed Hydrology section starting below.

Pre-developed model inputs from sample sites are presented in Table 4.

Table 4 Pre-developed soils, pervious, and impervious coverage for scaled basin

Scaled Basin		Pre-developed		
Soil Type (HSG)	Total Area (ac)	Pervious (ac)	Impervious (ac)	HSG Weight (% of Total Area)
B	2.88	2.73	0.15	21%
C	7.72	7.69	0.03	55%
D	3.32	3.31	0.00	24%
Total	**13.92**	**13.73**	**0.18**	**100%**

Pre-Developed Slope

To simplify the analysis, Otak modeled the scaled basin as flat (0-5 percent slopes). Because total retention is higher on flat slopes (reference unit hydrology in Table 1), this choice is conservative when used to compare retention achieved in the mitigated post-developed landscape.

Pre-Developed Pervious Land Cover (Vegetation)

Because Otak did not have the full vegetative pre-development land cover proportions for all of Rate Zone #2, we chose to prepare two pre-development models of the scaled basin – one in which all pre-developed pervious land cover is modeled as pasture and one in which all pre-developed pervious land cover is modeled as lawn. The pre-developed model using pasture is more representative of a basin undergoing new development, and the pre-developed model using lawn is more representative of a basin undergoing redevelopment.

Mitigated Post-Developed Hydrology

Otak modeled mitigated post-developed hydrology for the scaled basin in HSPF. Inputs for the post-developed conditions were based on the sample sites described above, assumptions, and hypothetical SMFs sized using the BMP Sizing Tool, each described below.

Post-Developed Soil Types

The post-developed model uses the same distribution of HSG types as the pre-developed model, or 21 percent (2.88 ac) B soils, 55 percent (7.72 ac) C soils, and 24 percent (3.32 ac) D soils.

Post-Developed Impervious Cover

Otak calculated post-developed impervious cover from the sample sites described above for each HSG, or 45 percent on B soils, 57 percent on C soils, and 66 percent on D soils.

Post-developed model inputs from sample sites are presented in Table 5.

Table 5 Proportionate Post-Developed Pervious and Impervious Areas for Scaled Basin Based on Sample Sites

Scaled Basin		Post-Developed		
Soil Type (HSG)	Total Area (ac)	Pervious (ac)	Impervious (ac)	Impervious from Sample Sites (%)
B	2.88	1.59	1.29	45%
C	7.72	3.34	4.38	57%
D	3.32	1.14	2.18	66%
Total	**13.92**	**6.07**	**7.85**	

Post-Developed Slope

To simplify the post-developed analysis, Otak modeled the scaled basin as flat (0-5 percent slopes).

Post-Developed Pervious Land Cover (Vegetation)

To simplify the analysis, Otak modeled the scaled basin's post-developed vegetation as lawn in HSPF.

Stormwater Facilities

Otak used the BMP Sizing Tool to size SMFs to mitigate post-developed conditions for the scaled basin. Otak sized one SMF for each soil type.

We used the following options and settings in the BMP Sizing Tool:

- Impervious pre-development surface was input based on the average of impervious pre-developed land cover proportion derived from the group of sample sites.
- Pervious pre-development surface was input as grass based on the average of pervious pre-developed land cover proportions derived from the group of sample sites.
- Post-development surfaces were input as landscape or impervious based on the average of pervious and impervious post-developed cover derived from the group of sample sites.
- The Detention Pond BMP was selected, using the "unlined" and "use infiltration" options.
- Ponds have 3:1 side slopes and variable depth based on the size of the contributing discharge management area.
- The B soil pond used an infiltration rate of 0.5-0.99 in/hr.
- The C soil pond used an infiltration rate of 0.25-0.34 in/hr.
- The D soil pond used an infiltration rate of 0.02-0.07 in/hr.

The BMP Sizing Tool generated SMF sizes and configurations to manage post-developed drainage from each HSG consistent with WES's flow control performance standard and water quality performance standard.

Otak used the resulting pond footprints, depths, side slopes, volumes, and orifice sizes as inputs to the mitigated post-developed model in HSPF.

We made the following assumptions about the operation of the BMP Sizing Tool:

- The calculations for sizing ponds incorporate the 12-inch elevated perforated underdrain as described by WES's Development Review staff.
- The model accurately evaluates the passing or failing of a facility against WES's flow control standard.

Mitigated Post-Developed Hydrology Findings

Using the hypothetical ponds sized in the BMP Sizing Tool as mitigation, and the post-developed land covers and characteristics described above, Otak created the mitigated post-developed hydrology model for the scaled basin in HSPF and compared results to pre-developed hydrology.

Modeled Water Quality Benefits Findings

The modeling component of this study is designed to evaluate whether the post-developed landscape of Rate Zone #2, if fully developed under WES's Stormwater Standards, would provide rates of retention that are similar to pre-developed rates of retention. Otak compared the percentage of runoff that is retained over a long period (25 years) in the pre-developed condition and mitigated post-developed condition. Results were then weighted by relative proportion of HSG in Rate Zone #2 to assess the overall effect on retention rates of developing land under WES's Stormwater Standards.

Assuming pre-developed vegetation is pasture (similar to a new development scenario), the post-development landscape attains a weighted total of 98.56% of the pre-developed retention percentage. Assuming pre-developed vegetation is lawn (similar to a redevelopment scenario), the post-developed landscape attains 107.01% of the pre-developed retention percentage. Comparison results are presented in Table 6.

Table 6 Mitigated Post-Developed Retention Attainment Compared to Pre-Developed

A	B	C	D	E	F	G	H	I
	Pre-developed Retained (%)		**Mitigated Post-Developed Retained (%)**		**Retention Shortfall Compared to Pre-developed (%)**		**Retention Attainment Compared to Pre-developed (%)**	
Soil Type (HSG)	**Pasture**	**Lawn**	**On Pasture**	**On Lawn**	**On Pasture** [D-B]	**On Lawn** [E-C]	**On Pasture** [1+(D-B)]	**On Lawn** [1+(E-C)]
	Unweighted Results							
B	92.98%	87.79%	99.59%	99.63%	6.61%	11.83%	**106.61%**	**111.83%**
C	67.94%	56.57%	67.15%	67.15%	-0.79%	10.57%	**99.21%**	**110.57%**
D	58.68%	54.18%	48.72%	48.72%	-9.96%	-5.47%	**90.04%**	**94.53%**
	Weighted Total							
B	19.24%	18.16%	20.60%	20.61%				
C	37.68%	31.38%	37.24%	37.24%				
D	13.99%	12.92%	11.62%	11.62%				
Total Retained	**70.91%**	**62.46%**	**69.46%**	**69.47%**	**-1.44%**	**7.01%**	**98.56%**	**107.01%**

The results estimate the percentage of the pre-developed retained precipitation that is retained in the post-developed landscape. For example, on pre-developed pasture on B soils, the pre-developed scaled basin retains 92.98% of precipitation and the mitigated post-developed scaled basin retains 99.59% of precipitation, which means that the mitigated post-developed B soils retain 106.61% of the pre-developed condition.

When results are weighted for the proportion of each HSG in Rate Zone #2, mitigated post-developed retention on all soils if pasture was the pre-developed vegetation achieves 98.56% of the pre-developed retention rate, and mitigated post-developed retention on all soils if lawn was the pre-developed vegetation achieves 107.01% of the pre-developed retention rate.

The findings for the scaled basin are scalable to Rate Zone #2 because the scaled basin has representative proportions of HSG types.

Policy Findings

Compliance with Permit Schedule A.3.e.iii(B) requires co-permittees to demonstrate how their post-construction stormwater standards prioritize infiltration, low impact development (LID), and green infrastructure (GI), include pollutant removal goals, target natural surface or pre-development site hydrology, and reduce the discharge of pollutants from new or replaced impervious surfaces. The ASPS requires co-permittees to establish and enforce the following procedures and standards:

- Requirements for site layout plans and a minimum set of specific onsite stormwater controls (collectively "site design measures") based on the GI approach of emphasizing infiltration, evapotranspiration, and/or harvesting/reuse of stormwater. Site design measures shall be used to reduce the amount of runoff, comparable to the NSRR, to the extent technically feasible and not prohibited by other constraints such as land use regulations or other state or federal regulations. Site planning procedures shall require projects to consider site layout options that optimize retention of stormwater.

- At sites where retention is infeasible due to technical and/or site constraints, at least 80 percent of average annual runoff from new and/or replaced impervious surfaces must be treated with an extended filtration stormwater control prior to discharge, to target removal of TSS.

- Stormwater discharged offsite must target natural surface or predevelopment hydrology (as measured by rate, duration, and/or volume of discharge) to minimize the potential for hydromodification impacts, except in circumstances where the co-permittees can demonstrate that the risk of hydromodification impacts is negligible, (e.g., large tidally influenced waterways or flow-managed waterways).

WES's ASPS is made up of the existing Rules and Regulations, Buffer Standards, Stormwater Standards, stormwater guidance, and review procedures. WES's Surface Water Rules, contained in Chapter 7 of the Rules and Regulations, apply stormwater management requirements to all new development and redevelopment activities that result in 5,000 or more square feet of new or replaced impervious area. Stormwater runoff from the new development and redevelopment areas must meet the technical standards found in the Stormwater Standards. WES's Natural Resources and Vegetated Buffers Rules, contained in Chapter 8 of the Rules and Regulations, apply buffer rules to all development or redevelopment of property within the District, stating that "No person shall undertake development activities on a parcel that contains water resources without first obtaining Water Quality Resource Areas (WQRA) approval from the District. Sites with a WQRA must follow the Buffer Standards." Development and redevelopment activities that trigger the Rules must follow the applicable standard, with review of applications by WES Development Review team who dispense guidance to applicants and follow development review procedures.

Permit Definitions

Definitions are found in Permit Schedule C.4.

Evaporate is rainfall that is changed or converted into a vapor.

Evapotranspiration is the sum of evaporation and transpiration of water from the earth's surface to the atmosphere. It includes evaporation of liquid or solid water plus the transpiration from plants.

Extended Filtration is the technique of using stormwater facilities designed to promote stormwater runoff filtration through natural or engineered media. The runoff is treated through physical, biological, and chemical processes as it filters through the media of the facility. Filtration is promoted by constructing the

facility with media of an appropriate infiltration rate and typically includes an underlying aggregate rock reservoir or other engineered flow-through and filtration media, with an underdrain to convey to a discharge location.

Green Infrastructure (GI) is a specific type of stormwater control using vegetation, soils, and natural processes to manage stormwater. At the scale of a neighborhood or site, green infrastructure refers to stormwater management systems designed to mimic nature by reducing and/or storing stormwater through infiltration, evaporation, and transpiration. At the site level, such measures may include the use of plant or soil systems, permeable pavement or other pervious surfaces or substrates, stormwater harvest and reuse, or landscaping to store, infiltrate, or evapotranspirate stormwater and reduce flows to sewer systems or to surface waters. At the scale of city or county, green infrastructure refers to the patchwork of natural areas that provides flood protection and natural processes that remove pollutants from stormwater.

Infiltration is the process by which storm water penetrates into soil.

Low Impact Development (LID) is a stormwater management approach that seeks to mitigate the impacts of increased runoff and stormwater pollution using a set of planning, design and construction approaches and stormwater management practices that promote the use of natural systems, green infrastructure, and other techniques for infiltration, filtration, evapotranspiration, and reuse of rainwater, and can occur at a wide range of landscape scales (e.g., regional, community and site). Low impact development is a comprehensive land planning and engineering design approach to stormwater management with a goal of mimicking the predevelopment hydrologic regime of urban and developing watersheds.

Natural surface hydrology is not defined.

Predevelopment Hydrologic Function is the hydrology of a site reflecting the local rainfall patterns, soil characteristics, land cover, evapotranspiration, and topography. The term predevelopment as used in predevelopment hydrologic function is consistent with the term predevelopment as discussed in Federal Register Volume 64, Number 235 and refers to the runoff conditions that exist onsite immediately before the planned development activities occur.

Stormwater Control refers to non-structural, structural stormwater controls and/or BMPs. Predevelopment is not intended to be interpreted as the period before any human-induced land disturbance activity has occurred.

Structural Stormwater Controls or BMPs are stormwater controls that are physically designed, installed, and maintained to prevent or reduce the discharge of pollutants in stormwater to minimize the impacts of stormwater on waterbodies. As noted in the 64 Federal Register 68760 (December 9, 1999), examples of structural stormwater controls or BMPs include: (1) storage practices such as wet ponds and extended-detention outlet structures; (2) filtration practices such as grassed swales, sand filters and filter strips; and (3) infiltration practices such as infiltration basins and infiltration trenches.

Transpiration means to release water vapor into the atmosphere through plant stomata or pores.

Demonstration of Post-Construction Alternative Site Performance Standard

In accordance with Permit Schedule A.3.e.iii(B), the co-permittee must demonstrate how their ASPS meets four goals, and the co-permittee must establish and enforce three specific requirements. Table 7

describes how WES achieves each of these requirements. See Attachment A for annotated excerpts of WES's Rules and Regulations and standards documents to verify language summarized in Table 7.

Table 7 Policy Analysis

Requirement	Analysis
Permittee Must Demonstrate How Their Performance Standard…	
Prioritizes Infiltration, LID, and GI	WES's Rules and Regulations, and associated Stormwater Standards and Buffer Standards, prioritize infiltration, LID, and GI. Prioritization of infiltration and LID/GI is ubiquitous within the Surface Water Rules and Stormwater Standards and is thoroughly reviewed in the WES LID-GI Strategy Document technical memorandum by Brown and Caldwell, dated November 21, 2023 (Attachment B). WES's Buffer Standards implement GI practices by requiring development sites of all sizes to identify and protect, if present, wetlands, and watercourses. These standards are required and implemented site-by-site and meet the definition of GI by protecting or developing a "patchwork of natural areas that provides flood protection and natural processes that remove pollutants from stormwater."
Includes pollutant removal goals	WES's Stormwater Standards include pollutant removal goals. The water quality performance standard requires treatment of a design storm representing 80 percent of average annual runoff, which is calculated to be a 1-inch design storm event. SMFs are required to be designed to capture and treat 80 percent of the average annual runoff volume, to the maximum extent practicable with the goal of 80 percent total suspended solids removal.

Requirement	Analysis
Targets natural surface or pre-development site hydrology	WES's Stormwater Standards target pre-development site hydrology through application of the flow control performance standard. Flow control SMFs must be designed so that the duration of peak flow rates from post-development conditions is less than or equal to the duration of peak flow rates from pre-development conditions for all peak flows between 42 percent of the 2-year peak flow rate up to the 10-year peak flow rate. In addition, Otak's modeling study described above demonstrates that use of the BMP Sizing Tool to implement the Stormwater Standards effectively mimics pre-development retention when viewed at the District scale by modeling area-wide retention that is between 98.56% to 107.01% of rates of pre-developed retention.
Reduces discharge of pollutants from new and/or replaced impervious surfaces	Discharge of pollutants from new and/or replaced impervious surfaces is achieved through implementation of both the water quality and flow control performance standards described above.
Permittee Shall Require…	
Requirements for site layout plans and a minimum set of specific onsite stormwater controls (collectively "site design measures") based on the GI approach of emphasizing infiltration, evapotranspiration, and/or harvesting/reuse of stormwater. Site design measures shall be used to reduce the amount of runoff, comparable to the NSRR, to the extent technically feasible and not prohibited by other constraints such as land use regulations or other state or federal regulations. Site planning procedures shall require projects to consider site layout options that optimize retention of stormwater. The Permit Fact Sheet (for National Pollutant Discharge Elimination System Municipal Separate Storm Sewer Systems Clackamas Group Phase I Individual Permit Modification #1), dated April 18, 2023, gives the following examples of site optimization measures: ▪ Defining development and protected areas, identifying areas that are most suitable for development and areas to be left undisturbed.	**Site Optimization** Requirements for site design measures in WES's Stormwater Standards are discussed in the WES LID-GI Strategy Document technical memorandum by Brown and Caldwell, dated November 21, 2023 (Attachment B). See discussions of Section 7.2.2 for Onsite Storm Drainage System, which requires applicants to replicate the site's natural drainage patterns, and Appendix A, Permitting and Submittal Requirements, which describes various site planning activities which are required to be submitted with the Service Provider Letter (SPL) prior to receiving approval from the land use permitting authority. WES's Buffer Standards require development and redevelopment sites to set back development from creeks, wetlands, and riparian habitats. Buffer Standards apply to development activities of all sizes. The BMP Sizing Tool User Guide also includes provisions for site planning to optimize the site layout by preserving natural drainage features and minimizing the impervious area footprint through pervious surfaces or LID.

Requirement	Analysis
▪ Concentrating development on portions of the site with less permeable soils and preserving areas that can promote infiltration. ▪ Limiting overall impervious coverage of the site with paving and roofs. ▪ Setting back development from creeks, wetlands, and riparian habitats. ▪ Preservation of significant trees. ▪ Conforming the site layout along natural landforms. ▪ Avoiding excessive grading and disturbance of vegetation and soils. ▪ Replicating the site's natural drainage patterns. ▪ Detaining and retaining runoff throughout the site. The Permit Fact Sheet gives the following examples of a minimum set of specific onsite stormwater controls: ▪ Soil Quality Improvement and Maintenance ▪ Tree Planting and Preservation ▪ Rooftop and Impervious Area Disconnection ▪ Porous Pavement ▪ Green Roofs ▪ Vegetated Swales ▪ Rain Barrels and Cisterns	**Minimum Onsite Stormwater Controls** All development and redevelopment sites that trigger the thresholds for stormwater management must provide a SMF onsite. SMFs must meet the flow control and water quality performance standards. Options include stormwater planter, rain garden, vegetated swale (also known as bioinfiltration swale), filter strip, drywell, infiltration trench or gallery, constructed wetland, pond, structural detention, proprietary stormwater treatment devices, sheet flow dispersion, pervious pavement, and green roofs.

Requirement	Analysis
At sites where retention is infeasible due to technical and/or site constraints, at least 80 percent of average annual runoff from new and/or replaced impervious surfaces must be treated with an extended filtration stormwater control prior to discharge, to target removal of TSS.	Whether retention is feasible or infeasible, development sites that trigger stormwater management requirements must meet the water quality performance standard. It requires treatment of a design storm representing 80 percent of average annual runoff, which is calculated to be a 1-inch design storm event. SMFs must be designed to capture and treat 80 percent of the average annual runoff volume, to the maximum extent practicable with the goal of 80 percent total suspended solids removal. Most SMFs allowed by WES to meet the water quality performance standard use extended filtration. These include stormwater planter, rain garden, vegetated swale (also known as bioinfiltration swale), constructed wetland, pond, proprietary stormwater treatment devices, and green roof. WES also allows filter strip, which uses filtration. Regardless of method (extended filtration vs. filtration), WES's Stormwater Standards require water quality SMFs to capture and treat 80 percent of the average annual runoff with the goal of 80 percent TSS removal. Because all water quality SMFs must meet the performance standard, we assert that both extended filtration and filtration provide equal protection.
Stormwater discharged offsite must target natural surface or predevelopment hydrology (as measured by rate, duration, and/or volume of discharge) to minimize the potential for hydromodification impacts, except in circumstances where the co-permittees can demonstrate that the risk of hydromodification impacts is negligible, (e.g., large tidally influenced waterways or flow-managed waterways).	Flow control SMFs must be designed so that the duration of peak flow rates from Post-Development Conditions is less than or equal to the duration of peak flow rates from pre-development conditions for all peak flows between 42 percent of the 2-year peak flow rate up to the 10-year peak flow rate. Flow control is not required for projects that discharge directly to the Willamette River, the Tualatin River, or the Clackamas River, under four conditions which ensure water quality is protected.

Conclusions

The Permit introduces the concept of the ASPS using these words, “the co-permittees may establish design requirements including site performance standards determined to generate water quality benefits comparable to the NSRR approach for new development and redevelopment.”

WES enforces Rules and Regulations, Stormwater Standards, and Buffer Standards which together require sites to be designed to preserve and protect WQRAs, consider drainage design and infiltration rates early in the site design process, and use onsite stormwater controls that first infiltrate, if technically feasible, and then treat and control any remaining flow to established performance standards. WES’s performance standard for both treatment and flow control meet the minimum requirements for treatment and control expressed in Permit Schedule A.3.e.iii.

A modeling analysis conducted for this study has demonstrated that implementation at development and redevelopment sites of WES’s Stormwater Standards using the BMP Sizing Tool, standard drawings, and WES Development Review staff’s design guidance result in rates of retention, when considered at the District scale, that are comparable to pre-developed rates of retention in Rate Zone #2.

This memorandum demonstrates how WES’s ASPS prioritizes infiltration, low impact development (LID), and green infrastructure (GI), includes pollutant removal goals, targets natural surface or pre-development site hydrology, and reduces the discharge of pollutants from new or replaced impervious surfaces. In addition, this memorandum documents how WES establishes and enforces the following: site optimization coupled with minimum onsite stormwater controls, treatment of 80% of average annual runoff from the site, and discharge of runoff from the site targeting pre-development hydrology.

Therefore, we conclude that WES’s existing Rules and Regulations, Buffer Standards, Stormwater Standards, stormwater guidance, and review procedures together generate water quality benefits comparable to the NSRR approach for new development and redevelopment. WES’s ASPS meets the requirements of Permit Schedule A.3.e.iii(B).

Next Steps

Through this study, WES has concluded that its typical drawings, standard details, and design guidance for SMFs could be clearer. In the next round of administrative updates to its Stormwater Standards, WES plans to update its standard details to make the following requirements and standards clearer and easier to find:

- The requirement for SMFs to be designed with an infiltration component, unless otherwise stipulated by the design professional.
- The requirement to elevate the perforated underdrain of unlined SMFs for flow control by a specific height - 12 inches - which compels SMFs to infiltrate a significant portion of rainfall.

Attachment A

Annotated Excerpts of Rules and Standards

7. Surface Water Rules

This section presents the District's surface water rules. The purpose of these rules is to:

- Provide for the effective management of surface water, stormwater, and drainage.
- Maintain and improve water quality in the public surface water system and protect beneficial uses of waters of the state.
- Control hydromodification for the purpose of protecting in-stream physical habitat.
- Establish minimum stormwater management requirements to protect water quality of receiving waters and protect downstream parties from the effect of changes in runoff duration and quality due to development activities.
- Implement the requirements of the CWA, the Oregon DEQ NPDES municipal separate stormwater systems (MS4) permit, and other regulations related to stormwater by regulating the contribution of pollutants to the District's stormwater facilities and waters of the state from stormwater discharges from development and redevelopment sites.

7.1 Purpose and Objectives

The District declares its intention to acquire, own, construct, reconstruct, equip, operate, regulate, and maintain within the District, and outside the District limits when consistent with the Board's adopted policies or intergovernmental agreements, a public stormwater system, and to require persons responsible to construct, reconstruct, maintain, and extend the public stormwater system.

The construction of both the public stormwater system and private stormwater management facilities through or adjacent to a new development shall be provided by the person responsible for the development. Improvements shall comply with all applicable District Rules and Regulations, state and federal standards, and local city ordinances, policies, and standards.

No portion of this section, subsequent interpretations of this section, or policies adopted to implement this section shall relieve any property owner of assessments levied against real property for a local improvement project or for abating conditions on the property that violate any provision of these Rules and Regulations.

Stormwater shall be managed in accordance with the District's Stormwater Standards to avoid a negative impact on adjoining properties, nearby streams, wetlands, groundwater, and other water bodies. All local, state, and federal permit requirements related to implementing stormwater management facilities must be met prior to facility use. Surface water discharge from on-site stormwater management facilities shall be conveyed via a drainage system approved by the District.

7.2 Applicability

These Rules and Regulations apply to any property that discharges or requests to discharge, via connection request, development permit, or change in use, to the District's public stormwater system, to groundwater, or to surface waters within District boundaries. These Surface Water Rules apply in Rate Zones 2 and 3.

Stormwater management requirements apply to all new development and redevelopment activities that result in 5,000 or more square feet of new or replaced impervious area. Stormwater runoff from the new development and redevelopment areas must meet the technical

standards found in the Stormwater Standards. These same standards apply to impervious areas subject to a change in point of discharge.

Source control requirements apply to development proposals with high-risk characteristics. Development proposals include new development, redevelopment, tenant improvements, or to existing sites that propose new offsite discharges. High-risk characteristics and the required source controls are identified in the Stormwater Standards. Source control requirements are applied to areas where the high-risk characteristics occur and any areas that are hydraulically connected to those areas.

Erosion control requirements apply to all development and construction related activity. Sites that disturb 800 square feet or more are required to obtain an Erosion Prevention and Sediment Control Permit from WES.

7.3 Discharge Regulations and Requirements

7.3.1 Compliance with Permits

Any industrial discharger, discharger associated with construction activity, or other discharger subject to any valid NPDES or Water Pollution Control Facility permit issued by the DEQ, from which pollutants may enter the public or private stormwater system, shall obtain and comply with all provisions of such permits, including notifying and cooperating with local entities as required by state and federal regulations. Proof of compliance with said permits may be required in a form acceptable to the District prior to issuance of any grading, building, occupancy permits, or business license. At the District's request, the discharger shall submit a copy of Discharge Monitoring Reports required by NPDES or Water Pollution Control Facility permits to the District.

7.3.2 Compliance with State, Local, and Federal Regulations

All users of the public stormwater system and any person or entity whose actions may affect the system shall comply with all applicable federal, state, and local laws. Compliance with the requirements of this section shall in no way substitute or eliminate the necessity for compliance with applicable federal, state, and local laws.

7.3.3 Accidental Spill Prevention and Control

Dischargers who handle, store, or use hazardous or toxic substances (or discharges prohibited under Section 7.7 shall, upon written request of the District, prepare and submit an Accidental Spill Prevention and Control Plan to the District for submittal. If other laws or regulations require an Accidental Spill Prevention and Control Plan, a plan that meets the requirement of those other laws and regulations will satisfy the requirement of this section.

7.3.4 Notification of Spills

As soon as any person in charge of a facility or responsible for emergency response for a facility becomes aware of any suspected, confirmed, or unconfirmed release of material, pollutants, or waste creating a risk of discharge to the public stormwater system and/or surface waters, such persons shall immediately do the following:

A. Begin containment procedures.

B. Notify proper emergency personnel in case of an emergency.

C. Notify appropriate District and/or state officials regarding the nature of spill.

D. Dischargers shall immediately take all reasonable steps to minimize the effects of an illicit discharge to the public storm sewer and drainage system or any waters of the state. These actions may include cleaning the impacted public and private system components under public direction or performing additional monitoring to determine the nature and extent of the discharge.

E. Follow-up with the District regarding compliance and modified practices to minimize future spills, as appropriate. The Director may require dischargers to make structural or operational modifications to their facilities, equipment, or drainage systems or to take other measures to protect the public storm sewer and drainage system. Such structures and site modifications must be reviewed and approved by the Director to determine sufficiency.

   The notification requirements of this section are in addition to any other notification requirements set forth in federal, state, or local regulations and laws. The notification requirements do not relieve the person of necessary remediation.

7.3.5 Removal of Illicit Connections

The District may require by written notice that a person responsible for an illicit connection to the public stormwater system comply with the requirements of this section to eliminate the illicit connection or secure approval for the connection by a specified date.

7.3.6 Removal of Illicit Discharges

Whenever the District finds that a discharge of pollutants is taking place or has taken place which will result in, or has resulted in, pollution of stormwater or the public stormwater system, the District may require, by written notice, that the discharge cease, the pollution be remediated, and the affected property restored.

Whenever the District determines that any person engaged in any activity and/or owning or operating any facility which may cause or contribute to stormwater pollution or illicit discharges to the public stormwater system, the District may, by written notice, order that such person undertake such monitoring activities and/or analyses and furnish such reports as the District may deem necessary to demonstrate compliance with the requirements of these Rules and Regulations.

The written notice shall be served either in person or by certified or registered mail, return receipt requested, and shall set forth the basis for such order and shall particularly describe the monitoring activities and/or analyses and reports required.

The burden to be borne by the owner or operator, including costs of these activities, analyses, and reports, shall bear a reasonable relationship to the need for the monitoring, analyses, and reports and the benefits to be obtained.

The recipient of such order shall undertake and provide the monitoring, analyses, and reports within the time frames set forth in the order.

7.4 Stormwater Management Requirements

This section establishes performance standards for stormwater systems and stormwater management facilities.

7.4.1 General Policy

All development shall be planned, designed, constructed, and maintained to:

A. Protect and preserve existing streams, creeks, natural drainage channels, and wetlands to meet state and federal requirements or to the maximum extent practicable.

B. Protect property from flood hazards. Provide an overflow route for runoff if the system fails.

C. Provide a system by which storm/surface water within the development will be controlled without causing damage or harm to in-stream conditions or habitat, or to property or persons.

Development projects shall not be phased or segmented in such a manner to avoid the requirement of these Rules and Regulations.

7.4.2 Stormwater Review

All development and redevelopment activities that result in 5,000 sf or greater of new or replaced impervious surface area, cumulative over the last three years, are subject to stormwater review including, but not limited to, developments that are subject to land use review and building permitting processes. These processes generally include all land use proposals, site development, and permit approvals within, or proposed to be within, District boundaries. The stormwater requirements can be found in the District's Stormwater Standards.

7.4.3 Stormwater Review Exemptions

Projects in the following categories are generally exempt from stormwater review:

A. Residential structures being re-built following fire damage, flooding, earthquake, or other natural disasters, as long as the structure is re-built at the same scale and discharging to the same disposal point. Expansions to the original footprint, such as adding or altering the original structure, may trigger stormwater management requirements for the expanded impervious area.

B. Interior remodeling projects and tenant improvements.

C. Stream enhancement or restoration projects approved by the County.

D. Development activities that are considered farming and forest practices that are also exempt from local zoning ordinances, land-use approval and building code requirements including roads, structures, and site improvement for properties that are located outside of the UGB where stormwater is managed through dispersion with no direct connection to the public drainage system. Buildings and site development improvements associated with farm and/or forest practices that are required to obtain a building permit or land-use approval including structures, roads and impervious surface areas are subject to the requirements of these standards.

E. Modular/temporary structures that will be removed at the completion of the project and do not have a direct connection to the public stormwater system.

F. Actions by a public utility or any other governmental agency to remove or alleviate an emergency condition.

G. Road and parking area preservation/maintenance projects such as pothole and square cut patching, surface sealing, replacing, or overlaying of existing asphalt or concrete pavement, provided the preservation/maintenance activity does not disturb the native subgrade or expand the existing area of impervious coverage above the thresholds provided in the Stormwater Standards.

H. Underground utility projects that replace the ground surface with in-kind material or materials with similar runoff characteristics.

I. Non-pollution generating, linear projects (e.g., pedestrian and bicycle pathways, sidewalks, trails, and ramps) that disperse stormwater runoff into vegetated areas, as long as there is no connection to a storm system as part of the project.

7.4.4 Stormwater Minimum Requirements

The District restricts the uncontrolled and untreated discharge of stormwater runoff into any stormwater system and/or natural drainageway. The District's Stormwater Standards are intended to provide the basic design criteria necessary to mitigate stormwater runoff. The District Stormwater Standards address flow control, water quality, conveyance system design, downstream analysis, safe overflow pathway, erosion prevention and sediment control, source control for high pollutant activities, and operations and maintenance. In the District's sole discretion, the District may authorize the use of a fee in lieu approach where a site is determined by District staff to be unable to meet the flow control or water quality performance standards. The District's Stormwater Standards provide additional detail on the eligibility criteria and the process for implementing the fee in lieu program.

7.4.5 Submittals

Development plans subject to the District Rules and Regulations and Standards shall be prepared by a licensed professional engineer registered in the State of Oregon. All plans and reports must be stamped and signed by the project engineer. For additional information on the submittal requirements see the applicable appendices of the Stormwater Standards.

7.4.6 Construction and Certification

All publicly maintained infrastructure such as conveyance systems, vaults, stormwater facilities, or other improvements shall be constructed per the District's standards and specifications.

Following completion of construction, the engineer shall submit applicable as-built drawings and documents, stamped by a professional engineer, indicating all of the infrastructure has been inspected and installed per approved plans and/or approved changes.

7.5 Source Control Requirements

7.5.1 Purpose

The purpose of this section is to minimize the risk of specific site uses and characteristics that have the potential to generate higher levels of pollutants than typical stormwater runoff. The objective is to manage pollutants at the point of generation, reduce their transport into stormwater, and mitigate potential impacts. Source controls may include, but are not limited to, requirements for cover, drainage, containment, discharge to sanitary sewer, hydraulic isolation, shut-off valves, and operational activities such as spill prevention, signage, and storage.

7.5.2 General Policy

Development proposals that include site uses or characteristics that can contribute pollutants to stormwater must manage and mitigate those impacts as a condition of

development. Source control requirements are included in the District's Stormwater Standards.

7.5.3 Maintenance of Source Controls

The property owner shall maintain all source controls required by the District as long as the tenant or site occupant continues operation with the same site uses or characteristics.

7.5.4 Inspection

The source control measures shall be installed by the owner or their representative and shall be inspected and approved by a District inspector prior to the start of any site uses that triggered the source controls. The District inspector may inspect the development site to determine compliance with the source control plan and development permit at any time during the construction of the project. If applicable, the development site must satisfactorily pass a final inspection prior to District approval of the Certificate of Occupancy.

7.6 Erosion Control Requirements

7.6.1 Purpose

The purpose of this section is to minimize the amount of sediment, construction waste, and other pollutants reaching the surface water management system as a result of construction, grading, excavating, clearing, and any other activity which causes or accelerates erosion and to minimize the disturbance of existing vegetation. The objective is to control erosion at its source as a means of maintaining and improving water quality and minimizing water pollution, downstream flooding, and wildlife habitat damage.

7.6.2 General Policy

All development, regardless of permit applicability or status, shall keep sediment laden water and any other forms of stormwater pollution from entering the public stormwater system.

The requirements for erosion prevention and sediment control shall be implemented in accordance with the Erosion Prevention and Sediment Control (EPSC) Plan requirements included in the District's Stormwater Design Standards and the District's Erosion Prevention and Sediment Control Planning and Design Manual (EPSC Manual).

7.6.3 Measures During Construction

A. Temporary and permanent measures for all construction projects shall be required to lessen the adverse effects of erosion and sedimentation. The owner or their agent shall properly install, operate, and maintain both temporary and permanent works to protect the environment, adjacent properties, and the public storm system during the useful life of the project. No visible or measurable erosion shall leave the property during construction or during activity. The owner of the property, together with any person who causes such action from which the visible or measurable erosion occurs, shall be responsible for cleanup, fines, and damages. Cleanup responsibilities include cleaning up the storm system, creeks, drainage ways, wetlands, or rights-of-way impacted by a project. For the purposes of this section "visible and measurable erosion" includes, but is not limited to, the following:

a. Deposits of mud, dirt, sediment, construction waste such as concrete washout debris or saw cutting slurry, construction materials such as rocks or asphalt, or similar material on public or private streets, adjacent property, or into the storm and surface water system, either by direct deposit, dropping, discharge, or as a result of the action of erosion or construction activity

b. Evidence of concentrated flows of water over bare soils; turbid or sediment-laden flows; or evidence of on-site erosion such as rivulets or bare soil slopes, where the flow of water is not filtered or captured on the site

c. Earth slides, mud flows, earth sloughing, or other earth movement, which results in material leaving the property

B. Dust and other particulate matters containing pollutants have the potential to settle on property and be carried to waters of the state though rainfall or other means. Dust shall be minimized to the extent practicable, utilizing all measures necessary.

C. Maintenance and repair of existing facilities shall be the responsibility of the applicant.

D. The applicant is responsible for updating the EPSC Plan with additional controls and resubmitting to the District if the approved EPSC Plan is determined to be ineffective or inadequate for changing site and weather conditions.

E. EPSC measures set forth in any approved erosion control plan shall be implemented and maintained on the site until the completion of the project. The District may allow for the removal of selected erosion control measures at an earlier date if erosion control is assured by established landscaping and approved by the District.

7.6.4 Erosion Prevention and Sediment Control Permit

The applicant for a development permit shall submit an EPSC Plan as part of the application specifying appropriate BMPs. An EPSC Permit is required under the following conditions:

A. Prior to placement of fill, site clearing, or land disturbances, including, but not limited to, grubbing, clearing, or removing ground vegetation, grading, excavating, or other activities, any of which results in the disturbance or exposure of soils covering an area of 800 square feet or greater.

B. For disturbed areas or exposed soils of areas less than 800 square feet, where the District has determined that site conditions may result in visible and measurable erosion and where the District has provided written notice of the requirement to obtain an EPSC Permit to the property owner. Upon notice by the District, all work shall cease pending receipt of an EPSC Permit and installation of approved erosion control measures.

C. For any lot that includes natural resources regulated by the District, an EPSC Permit shall be required prior to placing fill, site clearing, or disturbing land, including, but not limited to, grubbing, clearing or removing ground vegetation, grading, excavating, or other activities, any of which has the potential for, or results in, visible and measurable erosion, regardless of the area of disturbance.

Timing

Obtaining the EPSC Permit is required prior to the following, whichever comes first:

A. Issuance of grading permits, building permits, construction plans and other applicable development permits.

B. Placement of fill, site clearing, land disturbances, including, but not limited to, grubbing, clearing, or removing ground vegetation, grading, excavating, or other activities, any of which disturbs or exposes soil.

Permit Duration

A. Development or construction must be initiated as per the approved final development plans within one (1) year of the date of EPSC Permit issuance or the permit will be null and void. If a Hearings Officer or the Board specify a period for commencing development, that period shall supersede.

B. EPSC Permits (excluding 1200-C and 1200-CN permits) issued by the District shall expire and become null and void 24 months after the date of permit issuance unless extended by the District.

   a. If the work authorized by such permit has not received final inspection approval prior to the permit expiration date, and the permit has not been extended by the District, all work shall stop until a new permit is obtained that conforms to the erosion control regulations in effect at the time of re-application.

   b. The District may extend the time for action by the permittee for a period not exceeding 12 months in the District's sole and absolute discretion on written request by the permittee showing that circumstances beyond the control of, and unforeseeable by, the permittee have prevented work from being completed.

C. All 1200-C and 1200-CN permits shall expire and become null and void if the permit is not renewed annually or as per the general permit schedule set forth by the DEQ.

7.6.5 Erosion Prevention and Sediment Control Plan

Prior to approval of an EPSC Permit, the applicant shall submit an EPSC Plan for review and approval. The EPSC Plan shall be developed in accordance with the Erosion Prevention and Sediment Control Planning and Design Manual. The EPSC Plan shall contain a list of BMPs to be used during construction to control and limit soil erosion in accordance with the District's current EPSC Manual.The EPSC Plan shall include a description of erosion control methods that are adequate to ensure that siltation and pollutants from the grading, site clearing, or construction are contained onsite during the period of activity on the site until the final landscaping is sufficiently established to control erosion.

7.6.6 Approval Process Fees

Fees for EPSC Plan review, site inspections, related activities, and the District's EPSC Manual will be set and adopted by the Board.

7.6.7 Maintenance and Amendment of Inadequate Measures

The permittee shall maintain all facilities required by an approved EPSC Plan to assure their continued effectiveness during construction or other permitted activity. If the facilities and techniques approved in an erosion control plan are not effective or sufficient as determined by the District Site Inspector, the permittee shall submit a revised plan within three (3) working days of written notification by the District. In cases where erosion is occurring, the District may require the permittee to immediately implement interim control measures in accordance with the enforcement procedures in Section 10. .

Upon District approval of the revised plan, the permittee shall immediately implement the revised plan. The permittee shall also immediately remove any eroded sediment carried or tracked onto pavement surfaces, off-site areas, or into the surface water management system such as storm drain inlets, pipes, ditches, culverts, stream corridors, wetlands, or other water bodies. Sediments shall be removed from wetlands, vegetated swales, stream corridors, and water bodies in accordance with District Rules and Regulations and federal, state, and local jurisdictions.

7.6.8 Inspection

The erosion control measures shall be installed by the owner or their representative and shall be inspected and approved by a District inspector prior to the start of any excavation work. The permittee or their designated representative shall be responsible for inspecting and monitoring the site erosion controls during the project and keeping records of their inspection. These records shall be made available to District staff upon request. The District inspector may inspect the development site to determine compliance with the erosion and sediment control plan and permit at any time during the construction of the project. If applicable, the development site must satisfactorily pass a final erosion control inspection prior to District approval of the Certificate of Occupancy.

7.7 Stormwater Discharge Prohibitions

7.7.1 Non-Stormwater Discharge Prohibitions

The commencement, conduct, or continuance of any non-stormwater discharge to the public stormwater system or surface waters is prohibited and is a violation of this section, except as outlined below:

A. The prohibition shall not apply to any non-stormwater discharge permitted or approved under a valid Industrial or Municipal NPDES Permit, waiver, or discharge order issued to the discharger and administered by the DEQ, provided that the discharger is in full compliance with all requirements of the permit, waiver, or discharge order and other applicable laws or regulations and provided that written approval has been granted by the District for any discharge to the Public Stormwater Conveyance System.

B. The prohibition shall not apply to the following non-stormwater discharges to the public stormwater system: uncontaminated water line flushing, landscape irrigation, diverted stream flows, rising groundwater, uncontaminated groundwater infiltration (as defined in 40 CFR 35.2005(20)) to the District's Public Stormwater System, uncontaminated pumped groundwater, discharges from potable water sources, startup flushing of groundwater wells, foundation drains, air conditioning condensation, irrigation water, dechlorinated swimming pool discharges, springs, water from crawl space pumps, footing drains, lawn watering, individual car washing, charity car washing[1], flows from riparian habitats and wetlands, fire hydrant flushing, street wash water, routine external building wash-down[2], water associated with dye

[1] Provided that chemicals, soaps, detergents, steam, or heated water are not used. Washing is restricted to the outside of the vehicle, no engines, transmissions, or undercarriages.

[2] Provided that chemicals, soaps, detergents, steam, or heated water are not used.

testing activity, discharges of treated water from investigation, removal and remedial actions selected or approved by the DEQ, and flows from firefighting. This assumes these discharges are not significant source of pollution.

Discharge of flows to the public or private stormwater system from private washing of sidewalks, streets, and parking lots are discouraged to the maximum extent practicable.

The Director may require BMPs to reduce pollutants or may prohibit a specific discharger from engaging in a specific activity identified in Section 7.7 if at any time the Director determines that the discharge is, was, or will be a significant source of pollution.

7.7.2 Discharge in Violation of Permit

Any discharge that would result in or contribute to a violation of a Municipal NPDES Permit, either separately considered or when combined with other discharges, is a violation of this section and is prohibited. Liability for any such discharge shall be the responsibility of the persons causing, or responsible for, the discharge, and such persons shall defend, indemnify, and hold harmless the District in any administrative or judicial enforcement action against the permit holder relating to such discharge.

7.7.3 Illicit Connections and Illicit Discharges

No person shall establish, use, maintain, or continue illicit connections to the public stormwater system, or begin or continue any illicit discharges to the public stormwater system or surface waters.

7.7.4 Waste Disposal Prohibitions

No person shall throw, deposit, leave, maintain, keep, or permit to be thrown, deposited, left, or maintained, in or upon any public or private property, driveway, parking area, street, alley, sidewalk, catch basin, inlet, or other component of the public stormwater system, materials that may cause or contribute to pollution, including, but not limited to, any refuse, rubbish, garbage, fuels, oils, litter, yard debris, landscape materials, compost, topsoil, bark, gravel, sand, dirt, sod, sediment or sediment-laden runoff from industrial, construction or landscaping activities, hazardous materials, or other discarded or abandoned objects, articles, and accumulations.

Commercial or industrial operations or businesses shall not discharge any process water directly to a private or public stormwater system or surface waters except as permitted or approved under a valid Industrial or Municipal NPDES permit, waiver, or discharge order issued to the discharger and administered by the DEQ. This includes, but is not limited to, outdoor commercial, industrial, or business activities that create airborne particulate matter, process by-products or wastes, hazardous materials, or fluids from stored vehicles, where runoff from these activities discharges directly or indirectly to a private or public stormwater system or surface waters.

7.7.5 General Discharge Prohibitions

No person or person in charge of property shall discharge or cause to be discharged into the public stormwater system any of the following:

A. Any discharge that may harm human health or aquatic life when discharged to a surface water.

B. Any discharge in violation of the conditions of the discharger's NPDES or other permit or authorization.

C. Any unauthorized discharge that is intentionally routed to District Underground Injection Control (UIC) systems.

D. Any discharge with any of the following characteristics or materials:

   a. A visible sheen

   b. A visible discoloration including, but not limited to, those attributable to dyes and inks, except for non-toxic dyes used or approved by the District to investigate the potential source of an illicit connection

   c. Any discharge having a pH of less than 6.5 or greater than 8.5 or that contains toxic chemicals

   d. Heat that could damage or interfere with any element of the District's storm sewer and drainage system or that causes or contributes to a violation of the receiving-water temperature standards

   e. Toxic substances at concentrations that cause or contribute to violations of in-stream water quality standards set by the DEQ or that exceed remedial action goals defined in a DEQ or EPA Record of Decision for the protection of surface water or sediment

   f. Any discharge containing human sanitary waste or animal feces

   g. Refuse, rubbish, garbage, discarded or abandoned objects, articles, or accumulations of discharges that contain visible floating solids

   h. A Process Wastewater, unless authorized to discharge under a DEQ permit

   i. A volume that causes or contributes to an exceedance of the planned capacity of the storm sewer and drainage system, as established by the Director

   j. Liquids, solids, or gases which, either alone or by interaction, could cause a fire or an explosion including waste streams with a closed-cup flashpoint of less than 140° F (60° C) (using test methods described by 40 CFR 261.21); or discharges which cause the atmosphere in any portion of the city's storm sewer and drainage system to reach a concentration of 10 percent or more of the lower explosive limit per National Institute for Occupational Safety and Health standards

   k. A substance that causes or may cause a nuisance, hazard, interference, obstruction or damage to the District's storm sewer and drainage system, District personnel, the general public, receiving waters, or associated sediments

   l. Any substance that causes or contributes to a violation of the terms of the District's NPDES MS4 Discharge Permit or Water Pollution Control Facility for Class V UIC Permit or in-stream water quality standards set by the State of Oregon

8. Natural Resources and Vegetated Buffers

8.1 Purpose and Objectives

The provisions of this section are intended to prevent and reduce adverse impacts and to enhance drainageways and water resources. These requirements are intended to protect the beneficial uses of drainageways and water resources within the District in combination with other state, federal, county, and local laws, and ordinances.

Water Quality Resource Areas (WQRAs) are protected areas that are located along the edge or perimeter of water resources such as streams, lakes, ponds, reservoirs, and wetlands. WQRAs provide water quality treatment and habitat protection. The District's requires WQRAs for all new developments and redevelopments that are bounded by or contain water resources.

The District requires WQRAs to protect the water quality of water resource areas, which include perennial and intermittent streams and wetlands.

8.2 Applicability within District

The provisions of this section shall apply to all development or redevelopment of property within the District. No person shall undertake development activities on a parcel in the District that contains water resources without first obtaining WQRA approval from the District.

8.3 Applicability with Other Agency Requirements

The applicant shall, at a minimum, meet the District WQRA requirements as provided in the Buffer Standards. However, the local planning authority may have additional requirements, which may be more or less restrictive than the District requirements; local, state, or federal agencies may have similar requirements that may or may not align with the District's requirements and policies for WQRAs.

8.4 General Requirements

All parcels containing a water resource or within 200 feet of a water resource located on an adjacent parcel must submit to the District for a WQRA Boundary Verification prior to any development activity. Any parcel with a WQRA must submit to the District for a WQRA Development Permit prior to any development activities.

Any impacts to the WQRA must be mitigated as calculated by the Buffer Standards.

The preliminary site plan must meet design requirements and submittal requirements laid out in the Buffer Standards, including, but not limited to documentation methodology, vegetated corridors widths, mitigation priorities, and landscaping and planting plans.

A partition or subdivision of property that contains a WQRA shall require that the WQRA shall be platted as a tract rather than as part of any lot. The tract shall be protected from development by restrictive covenant, public dedication, or District approved equivalent. However, the tract may be subject to an easement conveying storm and surface water management rights to the surface water management authority.

8.5 General Prohibitions

The following uses and activities are prohibited within a WQRA:

A. The planting of invasive non-native or noxious vegetation; and

B. Uncontained areas of hazardous materials as defined by the Oregon Department of Environmental Quality

Water Environment Services Stormwater Standards

April 2023

CLACKAMAS
WATER
ENVIRONMENT
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1. Definitions

Words, terms, and acronyms specific to these Standards are defined below.

1.1 Words and Terms

The Water Environment Services (WES) Rules and Regulations (Rules) contains words and terms that apply to and are consistent across the Rules and all adopted standards. Unless the context specifically indicates otherwise, the following words and terms, as used in these Standards, shall have the meanings hereinafter designated:

Applicant. See the WES Rules.

Approved Point of Discharge. A location down slope from a development that the District has deemed adequate to accept stormwater flows from all or a portion of the Development area.

Best Management Practice (BMP). See the WES Rules.

BMP Sizing Tool. A computer program, approved by the District, for use in calculating the required size of Stormwater Management Facilities (SMFs). This tool is limited to a set list of pre-defined SMFs.

Board. See the WES Rules.

Bond. See the WES Rules.

Building Drain. See the WES Rules.

Building Sewer. See the WES Rules.

Contractor. A person duly licensed or approved by the State of Oregon to perform the type of work to be done under a permit or contract.

Conveyance System. See the WES Rules. As relates to these Standards, conveyance system refers to the stormwater and surface water conveyance system and includes sewers SMFs, drainageways, detention facilities, infiltration facilities, pretreatment facilities.

Debris. Discarded human made objects that would not exist in an undeveloped stream corridor or wetland. Debris includes, but is not limited to, tires, vehicles, litter, scrap metal, construction waste, lumber, plastic, or Styrofoam. Debris does not include objects necessary to a use allowed by Section 709, or ornamental and recreational structures. Debris does not include existing natural plant materials or natural plant materials that are left after flooding, downed, or standing dead trees, or trees that have fallen into protected water resources.

Design Storm. The distribution of rainfall intensity over time, identified to have a probability of recurrence, given in years (i.e., 5-year design storm).

Detention. The release of surface water runoff from a site at a slower rate than it is collected by the drainage system, the difference being held in temporary storage.

Developer. See the WES Rules.

Developer's Engineer. See the WES Rules.

Developer's Engineer's Inspector, or **Engineer's Inspector**. The Developer's Engineer's Inspector(s) shall be the Developer's Engineer of record, or recognized as representatives of the Developer's Engineer, and their duties shall be to approve materials and workmanship as required by the plans and specifications in accordance with District Stormwater Standards.

Development. See the WES Rules.

Discharge. See the WES Rules.

District. See the WES Rules.

District Employee or **District Personnel**. See WES Rules.

Disturbed Area or **Disturbance.** Areas of disturbance for activities defined under "Development". Work area includes areas used for storage of equipment or materials that are used for these activities.

Drainageway. See the WES Rules.

Drywell. An approved receptacle used to receive storm, surface and other water, the sides and bottom being porous, permitting the contents to seep into the ground. A drywell must conform to local agency standards and Oregon Department of Environmental Quality (DEQ) Underground Injection Control (UIC) standards.

Easement. See the WES Rules.

Ecology. The Washington State Department of Ecology.

Emergency. Any anthropogenic or natural event or circumstance causing or threatening loss of life, injury to person or property, and includes, but is not limited to, fire, explosion, flood, severe weather, drought, earthquake, volcanic activity, spills or releases of oil or hazardous material, contamination, utility or transportation disruptions, and disease.

Engineer. See the WES Rules.

Enhancement. The process of improving upon the natural functions and/or values of an area or resource that has been degraded by human activity. Enhancement activities may or may not return the site to a pre-disturbance condition but create/recreate beneficial processes and resources that occur naturally.

Erosion. See the WES Rules.

Fill. See the WES Rules.

Green Infrastructure. A SMF that mitigates stormwater runoff similar to the natural surface hydrological functions through infiltration and/or evapotranspiration, or that involves stormwater reuse.

Hazardous Materials. See the WES Rules.

Impervious Surface. See the WES Rules. For purposes of these Standards, standing water areas of SMFs and wetlands shall be considered as impervious surfaces. Permeable pavement SMFs, such as permeable pavement designed to mimic the natural hydrology of the site, are considered impervious surfaces for the purpose of determining project impervious surface area thresholds but may be used as a SMF to mitigate the stormwater from the impervious surface area.

Inspector. See the WES Rules.

Installer. Either the Owner of the property being served or a Contractor doing work in connection with the installation of a Building Sewer or conveyance system under a permit from the District, City, or County.

Intermittent Stream. See the WES Rules.

Landscape Architect. A registered professional licensed to practice in the State of Oregon by the Oregon State Board of Landscape Architecture.

Mitigation. The reduction of adverse effects of a proposed project by considering, in the following order:

A. Avoiding the impact altogether by not taking a certain action or parts of an action.

B. Minimizing impacts by limiting the degree or magnitude of the action and its implementation.

C. Compensating for the impact by replacing or providing comparable substitute Water Quality Resource Areas.

D. Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.

Municipal Separate Storm Sewer System (MS4). A storm drainage system(s) (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains) as defined in 40 Code of Federal Regulations (CFR) 122.26(b)(8).

Native Vegetation. Vegetation native to the Portland metropolitan area provided that it is not invasive non-native or noxious vegetation. See the Portland Plant List maintained by the City of Portland Bureau of Planning and Sustainability.

Owner. See the WES Rules.

Parcel. See the WES Rules.

Permit. See the WES Rules.

Permittee. See the WES Rules.

Person. See the WES Rules.

Pervious Pavement. Surface to walk, drive or park on that may reduce stormwater runoff by allowing water to soak/infiltrate into the ground. Examples are permeable pavers, pervious concrete, and porous asphalt.

Perennial Stream. See the WES Rules.

Plans. Construction plans submitted to the District for review and approval, in accordance with the Stormwater Standards.

Pollutant. See the WES Rules.

Post-Developed Conditions. Refers to the time period, or conditions that may reasonably be expected or anticipated to exist, after completion of the land development activity on a site.

Practicable. Available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purpose.

Pre-Developed. See the WES Rules.

Pretreatment Device or Facility. Any structure or drainageway that is designed, constructed, and maintained to collect and filter, retain, or detain surface water runoff during and after a storm event for the purpose of water quality improvement.

Pretreatment or Treatment. A reduction in the amount of pollutants, the elimination of pollutants, or the alteration of the nature of pollutant properties in water to a less harmful state.

Private Stormwater. Flows that include stormwater runoff from private properties (i.e., homes, driveways, roads), that may include pipes and other natural drainageways, creeks, streams.

Private Stormwater System. See the WES Rules.

Professional Engineer (PE). See the WES Rules for the definition of Engineer.

Proprietary Stormwater Treatment Device. A manufactured device, often proprietary, in which stormwater receives treatment before being discharged to the storm drainage system, to a SMF, or to the receiving water. This is a broad category of SMFs with a variety of pollutant removal mechanisms and varying pollutant removal efficiencies.

Public Right-of-Way (ROW). See WES Rules.

Public Stormwater. Public stormwater runoff is defined as flows that include stormwater runoff from public streets that may include pipes, natural drainageways, creeks, streams and rivers.

Public Stormwater Easement. See WES Rules for definition of Easement.

Public Stormwater Mainline. See the WES Rules for Public Mainline. As relates to these Standards, Public Stormwater Mainline refers to the portion of the Public Stormwater System which conveys wastewater through a piping system flowing by gravity.

Public Stormwater System. See the WES Rules.

Redevelopment. See the WES Rules.

Replaced Impervious Surface. The removal of an impervious surface that exposes soil, or native subgrade, followed by the placement of an impervious surface is considered Redevelopment of an impervious surface area. Replacement does not include repair or maintenance activities on structures or facilities taken to prevent decline, lapse or cessation in the use of the existing facility or surface, provided the repair or maintenance activity does not expand the coverage of the existing impervious area. If a proposed Development disturbs native subgrade of an existing impervious surface, then these stormwater standards apply.

Retention. The process of collecting and holding surface water runoff with no surface outflow.

Riparian. Those areas associated with streams, lakes, and wetlands where vegetation communities are predominately influenced by their association with water.

Seasonal High Groundwater. The maximum elevation to which the groundwater can be expected to rise due to a normal wet season.

Sensitive Areas. See the WES Rules.

Service Connection. See the WES Rules.

Sewer. See the WES Rules.

Soil. The upper layer of earth in which plants grow; a black or dark brown material typically consisting of a mixture of organic remains, clay, and rock particles.

Source Control. SMFs and/or specific actions taken that attempt to control high risk pollutant loading from entering the stormwater runoff through site activities and site design.

Storm Drain. See the WES Rules.

Storm Sewer. See the WES Rules.

Stormwater. See the WES Rules.

Stormwater Mainline. See Public Stormwater Mainline.

Stormwater Management. See the WES Rules.

Stormwater Management Facility (SMF). See the WES Rules.

Stormwater Management Plan. A plan that is stamped by a Professional Engineer (PE) and contains specific information regarding plans to locate and construct SMFs and stormwater drainage systems to meet WES performance and design standards.

Stream. See the WES Rules.

Stream, Intermittent. See the WES Rules.

Stream, Perennial. See the WES Rules.

Structure. A building or other major improvement that is built, constructed, or installed, not including minor improvements—such as fences, utility poles, flagpoles, or irrigation system components—that are not customarily regulated through zoning codes.

Utility Facilities. Buildings, structures, or any constructed portion of a system that provides for the production, transmission, conveyance, delivery, or furnishing of services including, but not limited to, heat, light, water, power, natural gas, sanitary sewer, stormwater, telephone, and cable television. Utility facilities do not include stormwater pretreatment facilities.

Vegetated Corridor. See the WES Rules.

Waters of the State. See the WES Rules.

WES Rules. WES Rules and Regulations, as adopted by the Board.

Wet Weather. The portion of the year when rainfall amounts and frequency tend to have the most significant effect on erosion prevention and sediment control (October 1 to May 31).

Wetland. See the WES Rules.

1.2 Abbreviations

Unless the text specifically indicates otherwise, the following abbreviations are used in these standards to refer to the following:

Abbreviation	Definition
AASHTO	American Association of State Hwy and Transportation Officials
BMP	Best Management Practice
CFR	Code of Federal Regulations
cfs	cubic feet per second
CKD	cement kiln dust
CLSM	controlled low strength material
CMP	corrugated metal pipe
CN	curve numbers
CTB	cement treated base
DEQ	Oregon Department of Environmental Quality
DSL	Oregon Department of State Lands
DTD	Clackamas County Department of Transportation and Development
EPA	Environmental Protection Agency
EPSC	Erosion Prevention and Sediment Control
FEMA	Federal Emergency Management Agency

Abbreviation	Definition
ft.	feet
fps	feet per second
GIS	Geographic Information Systems
GULD	General Use Level Designation
h:v	horizontal to vertical
HDPE	high density polyethylene pipe
HEC-RAS	Hydrologic Engineering Centers – River Analysis System
HGL	hydraulic grade line
IE	invert elevation
in.	inches
mm	millimeter
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resource Conservation Service
OAR	Oregon Administrative Rules
ODFW	Oregon Department of Fish and Wildlife
ODOT	Oregon Department of Transportation
O&M	Operations and Maintenance
OPSC	Oregon Plumbing Specialty Code
OR	Oregon
ORS	Oregon Revised Statutes
OSHA	Occupational Safety and Health Authority
PDF	Portable Document Format
PE	Professional Engineer
ppm	parts per million
psi	pounds per square inch
PVC	polyvinyl chloride
ROW	Right-of-Way
SBUH	Santa Barbara Urban Hydrograph
sec.	seconds
sf	square feet
SDR	Standard Dimensional Ratio
SMF	Stormwater Management Facility
SWM	stormwater management
SWMM	Stormwater Management Model
SS	Sanitary Sewer
ST	Storm Sewer
SU	Standard Units
Tc	Time of Concentration

Abbreviation	Definition
UIC	Underground Injection Control
UPC	Uniform plumbing code
U.S.	United States
USACE	United States Army Corps of Engineers
WES	Water Environment Services
WPCF	Water Pollution Control Facility
WQRA	Water Quality Resource Area

2. General Information

The stormwater standards in this document describe requirements and methods for minimizing the hydrologic and water quality impacts of development in areas managed by the District. Implementing these standards will help protect water resources which, in turn, will benefit human health, fish and wildlife habitat, recreational resources, and drinking water.

As land is developed, creation of new impervious surfaces and loss of vegetation increases stormwater runoff during rainfall events, altering the natural hydrologic cycle. Without stormwater management, the changes in runoff and/or discharge patterns lead to reduced groundwater recharge and hydromodification of stream channels. The effects of hydromodification include increased erosion of streambanks, increased incision and/or aggradation of stream channels, reduction of high value riparian habitat, impacts to aquatic organisms, and degradation of water quality.

Runoff flowing from roadways, parking areas, rooftops, and other impervious surfaces also collects pollutants that are transported to streams, rivers, and groundwater. Stormwater pollutants are generally separated into the following categories: suspended solids (sediment), oxygen-demanding pollutants, bacteria, organic carbon, hydrocarbons, metals (cadmium, copper, lead, mercury, and zinc), nutrients (nitrogen and phosphorous), and pesticides/ herbicides.

This chapter describes the authority, purpose, applicability, and administrative review requirements of these Standards.

2.1 Authority and Purpose

WES, located in Clackamas County, Oregon, is an intergovernmental entity formed pursuant to Oregon Revised Statutes Chapter 190 for the purpose of providing stormwater and surface water management, including all facilities necessary for collecting, conveying, treating, and disposing of stormwater within its boundaries. It is further declared to be the policy of the District to provide and offer stormwater and surface water management services for such areas adjacent to the District as may, in the judgment of the District, be feasibly served upon such terms, conditions, and rates as the District shall determine, and as provided in other applicable federal and state laws.

The District, through its Director or other authorized designee or representative, shall have the authority to administer all the requirements, regulations, and provisions set forth in these Standards.

The District may promulgate new or amended standards in accordance with the process outlined in the WES Rules.

Conformance with these standards shall not be a substitute for, or eliminate the necessity of, conforming with any and all federal, state, and local laws, ordinances, rules and regulations which are now, or may in the future, be in effect. Other applicable regulations may include the hazardous materials storage requirements of Articles 79 and 80 of the Oregon State Fire Code; the Spill Prevention, Countermeasure, and Containment Regulations of §40.112 of the Code of Federal Regulations (CFR) administered by the Environmental Protection Agency (EPA); the Resource Conservation and Recovery Act; or Willamette Basin Total Maximum Daily Load (TMDL) Programs regulated by the DEQ.

Any provisions or limitations of these standards are suspended and supplemented by any applicable federal, state, or local requirements existing or adopted subsequent hereto which are more stringent than the provisions and limitations contained herein. In the event of a conflict, the most stringent local, state, or federal regulations generally apply.

The purpose of these Standards is to provide a consistent policy under which certain physical aspects of stormwater system design will be implemented. Many of the elements contained in this document are public works oriented and are related to public improvements; however, it is intended these Standards apply to both public and private work designated herein.

2.2 Objectives

The objectives of the Stormwater Standards are as follows:

- Meet federal and state National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permitting requirements.
- Minimize the discharge of pollutants and provide water quality treatment of stormwater runoff to preserve the beneficial uses of drainageways, lakes, ponds, wetlands, and other Sensitive Areas.
- Maintain water quality by protecting Sensitive Areas and the associated vegetative buffers.
- Minimize stormwater runoff volumes and maximize groundwater recharge through the process of infiltration of runoff into vegetated stormwater facilities.
- Maintain the pre-development stormwater runoff characteristics to minimize effects on the drainageways, such as erosion and degradation, generally associated with urbanization.
- Protect the safety of persons and property by safely conveying all stormwater runoff from site development and preventing the uncontrolled or irresponsible discharge of stormwater onto adjoining public or private property.
- Construct SMFs which are safe, effective, and economical to maintain and minimize future replacement costs.
- Provide for orderly development by preserving the drainageways and natural storm drainage systems shaped by the existing topography and creating man-made storm drainage systems with adequate capacity for future development upstream.
- Provide guidance to designers and engineers in meeting the requirements of stormwater regulations when developing land and constructing infrastructure within the District.
- Protect soil, groundwater, and surface water by capturing pollutants and reducing impacts to the environment.
- Redirect flows to the sanitary sewer from areas with the potential for relatively consistent wastewater discharges and manage areas that have potential for pollutant releases or spills with containment or disposal.
- Prioritize structural controls over operational procedures to provide permanent and reliable source control.
- Minimize the movement of soil during construction and the associated impacts to water quality through proper erosion prevention and sediment control practices.

2.3 Applicability

These Stormwater Standards shall govern design, construction, and upgrading of all publicly and privately financed Public Stormwater Systems in the District and applicable work within the District, unless it is shown that the District's authority to impose these standards are superseded by another local jurisdiction.

These Stormwater Standards shall govern design, construction, and maintenance of all privately owned stormwater systems in the District, unless it is shown that the District's authority to impose these standards are superseded by another local jurisdiction.

Some facilities may be required to obtain a NPDES Industrial Stormwater General Permit 1200-Z (1200-Z Permit) issued by DEQ before discharging to the District's Public Stormwater System or to Waters of the State. The 1200-Z Permit includes discharge benchmarks for facilities with industrial activities that are exposed to rainfall and stormwater runoff. The state also has water quality standards listed in Oregon Administrative Rules (OAR) 340 Division 041 for discharges to surface waters.

Applicants may be required to obtain an Industrial Wastewater Discharge Permit from the local wastewater service provider for discharges to the sanitary sewer system. Facilities subject to these requirements are generally commercial or industrial. Typical discharges include process wastewater, cooling water, or other discharges generated by some of the sources that are required that drain to a sanitary sewer system.

The requirements presented in these Standards do not exclude or replace the requirements of other applicable codes or regulations, such as the Willamette or Tualatin River Basin TMDL Programs, the Industrial NPDES Permitting Program, or any other applicable federal or state regulations or permit requirements.

All development within Federal Emergency Management Agency (FEMA) regulated streams and floodplain overlay zones may be required to meet the FEMA floodplain requirements and the requirements of the local planning and building authority.

If it is determined by the District that stormwater management or storm drainage system facilities, in addition to the onsite facilities required by these standards, are necessary to manage and protect natural resources, Public Stormwater Systems, and/or private property effectively, the District may require additional facilities or modifications at the sole discretion of the District.

Table 1 lists the stormwater minimum requirements and the applicable design standards within these Standards.

Table 1. Stormwater Minimum Requirements

Threshold	Minimum Requirements
Development or redevelopment proposing < 5000 square feet (sf) of impervious surface areas, including the cumulative impervious surface area that was developed/redeveloped over the last 3 years.	Verify impervious areas through submission of a site plan that shows the exact square footage (< 5,000 sf) of all new or replaced impervious surfaces.
Development or redevelopment proposing ≥5,000 sf of impervious surface areas, including	Submit a Preliminary Site Plan.

Threshold	Minimum Requirements
the cumulative impervious surface area that was developed/ redeveloped over the last 3 years.	Design and construct SMF(s) to meet the flow control, and water quality performance standards. Execute and record an Operations and Maintenance (O&M) Plan for stormwater facilities on private property to ensure the long-term functionality of the SMF(s).
Development or redevelopment proposing ≥ 5,000 sf of impervious surface areas, including the cumulative impervious surface area that was developed/redeveloped over the last 3 years that discharges stormwater runoff to a natural or manmade storm drainage system.	Submit a Downstream Analysis and design Storm Drainage Systems.
Development or redevelopment that is categorized as high risk for increased stormwater pollutant loading	Design and implement applicable source controls.
Development or redevelopment that is proposed to disturb ≥ 800 sf of soil.	Develop Erosion Prevention and Sediment Control (EPSC) Plans and obtain EPSC Permit.
Creation of stormwater	

2.3.1 Stormwater Management Requirements

All new Development and Redevelopment activities that result in 5,000-sf or greater of new or replaced impervious surface area, cumulative over the last 3 years, are subject to the requirements of these Standards for all newly proposed and replaced impervious surface areas within the overall project boundary.

Stormwater runoff from all of the Developed and Redeveloped impervious surface areas shall be treated in accordance with these Standards. Water quality facilities shall be designed to capture and treat the first 1 inch of stormwater runoff from a 24-hour storm event. The water quality facility shall use either an approved vegetated SMF or an approved Proprietary Stormwater Treatment Device.

All projects that discharge into an offsite storm drainage system are subject to storm drainage system and downstream analysis requirements.

All existing site development that desires to change the existing point of discharge and the stormwater runoff from impervious areas exceeds the 5,000-sf impervious threshold shall comply with these Standards, and for design criteria purposes the impervious area will be considered as redevelopment.

All Development and Redevelopment activities that result in the creation of private stormwater facilities must execute and record an Operations and Maintenance Plan.

All private storm drains outside the building envelope shall be designed using these standards, along with the Oregon Structural Code, Oregon Plumbing Specialty Code (OPSC), and/or other applicable codes as appropriate.

The stormwater management requirements are in addition to the applicable source control and erosion control requirements.

Exemptions

Projects in the following categories are exempt from the stormwater minimum requirements:

A. Residential structures being re-built following fire damage, flooding, earthquake, or other natural disasters, as long as the structure is re-built at the same scale and discharging to the same disposal point. Expansions to the original footprint, such as an addition or alteration to the original structure, may trigger stormwater management requirements for the expanded impervious area.

B. Interior remodeling projects and tenant improvements.

C. Stream enhancement or restoration projects as approved by the District.

D. Farming practices as defined by Oregon Revised Statutes (ORS) 30.930 and farm use as defined in ORS 214.200 and including farm roads, including farm structures and farm access roads outside the Urban Growth Boundary where stormwater is managed through dispersion with no direct connection to the public drainage system. Buildings associated with farm practices and farm access roads are subject to the requirements of these standards if there is a direct discharge to a Storm Drainage System. Residential homes proposed to be built on farmland are not exempt from these Standards.

E. Forest practices as defined by ORS 527.610.

F. Modular/temporary structures that will be removed at the completion of the project and do not have a direct connection to the Storm Drainage System.

G. Actions by a public utility or any other government agency to remove or alleviate an emergency condition.

H. Road and parking area preservation/maintenance projects such as pothole and square cut patching, surface sealing, replacing or overlaying of existing asphalt or concrete pavement, provided the preservation/maintenance activity does not disturb the native subgrade or expand the existing area of impervious coverage above the thresholds listed in this section.

I. Underground utility projects that replace the ground surface with in-kind material or materials with similar runoff characteristics.

J. Non-pollution generating, linear projects (e.g., pedestrian and bicycle pathways, sidewalks, trails, and ramps not included in a larger project) that disperse stormwater runoff into vegetated areas, as long as the pathways do not include inlets connected to the Storm Drainage System.

K. Storm Drainage Systems shall be designed to meet the requirements of Section 5, except when the Development/Redevelopment is not above the impervious thresholds listed in this section, and the storm drainage system is located entirely on a privately-owned parcel, is privately maintained, and receives no stormwater from outside the parcel’s property limits. Those systems exempted from the stormwater storm drainage system requirements will remain subject to the requirements of the OPSC and shall be reviewed by the building official.

2.3.2 Source Control Requirements

Source control requirements apply to all developments with high-risk characteristics during new development, redevelopment, tenant improvements, or when existing sites proposing new offsite discharges.

Source controls shall be applied to the areas of the site with high-risk characteristics as well as any areas hydraulically connected to a high-risk area. With redevelopment projects, only areas that are being disturbed with the redevelopment are required to make structural source control changes.

Projects with the following site uses/characteristics are considered to be high-risk and are subject to source control requirements in Chapter 5. :

A. Fuel Dispensing Facilities and Surrounding Traffic Areas
B. Above-Ground Storage of Liquid Materials
C. Recycling and Solid Waste Storage Areas
D. Exterior Storage of Bulk Materials
E. Material Transfer Areas/Loading Docks
F. Equipment and/or Vehicle Washing Facilities
G. Equipment and/or Vehicle Repair Facilities
H. Land with Suspected or Known Contamination
I. Covered Vehicle Parking Areas for Commercial or Industrial Uses
J. Industrial and Commercial High Traffic Areas

Applicants are required to address all high-risk site characteristics listed above. For example, if a development includes both a fuel dispensing area and a vehicle washing facility, the source controls in both those sections will apply.

The source control requirements are in addition to the applicable stormwater management and erosion control requirements. Developments that have existing or proposed offsite SMFs are not exempt from the source control requirements.

2.3.3 Erosion Prevention and Sediment Control Requirements

All development that disturbs in excess of 800 sf of soil shall be subject to the Erosion Prevention And Sediment Control (EPSC) requirements of Chapter 8. The Permittee shall be required to obtain an EPSC Permit, unless otherwise excluded by the District.

The erosion control requirements are in addition to the applicable stormwater management and source control requirements.

2.4 Variance

Alternative materials and methods will only be accepted if the Applicant can demonstrate that the existing standards are not appropriate for a given site and the proposed alternative provides the same or greater level of performance s as defined in these standards. Alternate materials or methods not explicitly approved herein will be considered for approval through the variance process outlined below.

2.4.1 Variance Request

A variance request to the Standards shall be submitted in writing to the District. The written request for a variance should be submitted to the District prior to land use approval if a land use action is required. Land use conditions of approval are commonly written so there is little, if any, flexibility after land use approval is issued. If land use approval has already been issued or is not required, then the variance request should be submitted in writing along with the first plan review submittal.

Once the District approves the plans, a variance request will only be accepted at the discretion of the District, and if the request is the only feasible solution without regards to delays or cost. Only minor variance requests will be considered during the construction phase of the project to address a specific design or construction problem. It is the responsibility of the Applicant to obtain all approvals from any local, county, state or federal authority having any jurisdiction or permitting of the activities before proceeding with an approved variance.

This written request shall include the following:

A. The desired variances(s);

B. The reason(s) for the request(s);

C. A comparison between the specification(s) and standard(s) and the variance(s) for performance, function, maintainability, safety, etc.;

D. References to regionally and/or nationally accepted standards, records of successful use by other agencies or other supportive information.

2.4.2 Criteria for Variance

The District may grant a variance when the request does not compromise the following: public safety, environmental protection, maintenance/repair/replacement, and when any one of the following conditions are met:

A. Topography or other geographic conditions impose an environmental or safety concern and the request is considered an equivalent alternative, which can accomplish the intent and criteria that is provided in these standards.

B. A minor change to the standard is required to address a specific design or construction problem which, if not enacted, will result in an unreasonable or disproportionate burden or obstacle to development. The financial viability of meeting the requirements of these design standards is not in itself a justification for a design exception.

C. The variance request is in the public interest and requirements for safety, function, appearance, and maintainability are based upon sound engineering and functionality of the proposed system is a feasible alternative.

All requests will be evaluated on a case-by-case basis, and approval of alternative materials and methods for one development proposal will not imply an approval under similar circumstances in another proposal. Approval of a variance, or denial of a site-specific request shall not constitute a precedent for use at other locations with potentially similar circumstances.

2.4.3 Review Process

The request for variance shall be reviewed by the District. The District shall make one of the following decisions:

A. Approve as proposed, or

B. Approve with changes, or

C. Deny with an explanation.

It is the responsibility of the Applicant to obtain all approvals from any local, county, state or federal authority having any jurisdiction or permitting of the activities before proceeding with an approved variance.

2.4.4 Appealing Variance Request Decision

The Applicant may make a written request to the District to appeal the variance request decision as outlined in the appeals process contained in Section 3.7 of the District Rules and Regulations.

3. General Stormwater Standards

Chapter 3 of the Stormwater Standards presents an overview of the general policies, methods, and processes associated with the Stormwater Standards as a whole.

3.1 General Policy

Public improvements are conditioned through the development review and land use approval process, described, and administered under the local planning department administering the zoning and development ordinance, or by federal, state, or other local government regulation. These Stormwater Standards cannot provide for all situations and are intended to assist, but not to substitute for competent work by design professionals. It is expected that the design professionals will bring to each project the best of skills from their respective disciplines.

These Stormwater Standards are not intended to limit unreasonably any innovative or creative effort that could result in better quality, cost savings, or both.

General stormwater requirements for all projects and developments are as follows:

A. The District does not allow the diversion of stormwater runoff from one watershed to another watershed.

B. All public storm drainage systems shall be gravity systems without the use of pumps or other mechanical means to convey or transport stormwater.

C. The Approved Point of Discharge for all stormwater may be a piped system or open channel as approved by the District. All outfalls to an existing or proposed stormwater facility, stormwater system, drainageway, or surface water system shall be approved by the District.

D. The Approved Point of Discharge for surface water, stormwater and/or groundwater shall not be a sanitary sewerage system, except as provided in Chapter 5.

E. No project shall directly or indirectly discharge, to the public storm system, any quantity of stormwater, pollutant, substance, or wash water that will violate the Discharger's permit (if one is issued), the District's NPDES MS4 permit, or other environmental laws or regulations.

3.2 Development Policy

Requirements for development of a property or a tract of land are as follows:

A. Design of surface water and stormwater systems must include provisions to control runoff from impervious and pervious areas within and upstream of the development without exceeding capacities of available facilities and downstream drainageways.

B. Development proposals shall maintain the natural drainage pathways for seasonal and intermittent drainages or provide alternate manmade natural drainage pathways.

C. Pre-existing surface or subsurface drainage, caused or affected by development, shall not flow over adjacent public or private property in a volume, flow rate or location significantly different from that which existed prior to development, but shall be collected and conveyed to an acceptable point of discharge as approved by the District.

D. Surface drainage entering a development from offsite areas shall be intercepted at the naturally occurring locations. Offsite surface drainage shall be conveyed through the site in a separate stormwater drainage system and will not be mixed with the stormwater collected

and treated within the onsite SMFs unless the onsite SMFs are designed to manage and treat the additional flows from the upstream drainage basin(s) assuming full development potential.

E. When an Approved Point of Discharge is located and/or conveyed on an adjacent private property, the Applicant shall be responsible to acquire all applicable downstream private and/or Public Stormwater Easements. An easement is not necessary if the point of discharge is considered an intermittent stream, perennial stream, river, wetland, or natural resource.

F. In compliance with Oregon Drainage Law, development shall not adversely impact downstream properties. Stormwater runoff from a development shall be safely conveyed to prevent the uncontrolled or irresponsible discharge of stormwater onto adjoining public or private property.

G. Development shall not cause or increase flooding of adjacent or downstream property. An upstream and downstream analysis of the drainage system shall be conducted according to the guidelines in Chapter 7. Open channel and closed conduit systems shall be designed to safely convey the design storms listed in Chapter 7.

H. All development, regardless of permit status, shall keep sediment laden water and any other forms of stormwater pollution from entering natural drainage systems, wetlands, natural resources, and the Public Stormwater System.

I. All development must obtain a Service Provider Letter from the District prior to applying for Land Use/Design Review to the local planning authority. To obtain the Service Provider Letter from the District the Applicant must demonstrate that the proposed development is viable in accordance with District Rules and Standards. The Service Provider Letter will only be issued once the Applicant has provided sufficient plans, reports, and studies needed for preliminary review by the District. Based on the preliminary review, the District may request additional information prior to issuance of the letter or as part of the forthcoming land use application. Receipt of the Service Provider Letter does not imply that all District requirements have been met or guarantee that land use approval for the development will be granted. Service Provider Letter submittal requirements are found in Appendix A.

J. Developments subject to O&M requirements are required to submit an O&M Plan and shall include an agreement that allows District Personnel access to the SMFs for inspections or abatement of a public nuisance or to correct a violation of these Standards.

K. All publicly maintained SMFs shall be fully located in the Public ROW or within a tract of land that has adequate maintenance access and rights dedicated to the District, and the Storm Drainage System(s) shall be located within an easement or tract of land that has rights dedicated to the District.

L. District maintained SMFs shall be fully located in the Public ROW or within a tract of land with an easement granted to the District. Both tracts of land and easements with rights granted to the District shall include the minimum access requirements in accordance with Section 6.4.1 to accommodate perpetual maintenance of the infrastructure. The Owner shall provide the District with all necessary documentation granting such easements and dedications. Upon approval of the easement document, the District will either process the easement or require the Applicant, at their own expense to process and record the document as a land record with the Recording Division of Clackamas County. The District will not approve the final construction plans until all public and private easement documents have been completed and recorded to the satisfaction of the District.

M. A public drainage easement is required on existing open drainages that conveys Public Stormwater.

N. The District requires vegetated buffers in Water Quality Resource Areas (WQRA) to protect the water quality of water resources, which include perennial and intermittent streams and wetlands as outlined in the WES Rules and the Buffer Standards.

3.3 Engineering Policy

It shall be the policy of the District to require compliance with ORS 672 for Professional Engineers, Surveyors, Photogrammetrists, and Geologists.

All engineering plans, Stormwater Management Plans, stormwater reports, infiltration reports, geotechnical reports, or documents shall be prepared by a registered PE or by a subordinate employee under the Engineer's direction and shall be stamped with the Engineer's seal and signed to indicate the Engineer's responsibility for the design. It shall be the Engineer's responsibility to review any proposed Public Stormwater System, variance, or other change with the District prior to engineering or proposed design work, to determine any special requirements and/or whether the proposal is permissible. A "Plans Approved for Construction" (or equivalent) stamp of the District on the Plans, etc., for any project, does not in any way relieve the Engineer of responsibility to meet all requirements of the District or obligation to provide a Public Stormwater System in accordance with the District Rules and Stormwater Standards, and protect life, health, and property of the public. The District reserves the right to change the Plan for any project prior to final acceptance at any time it is determined that the full requirements of the District Rules have not been met.

All drawings submitted for approval shall be stamped and signed by a registered PE. No plan review or approval shall be made without the Plans being stamped and signed by the PE.

3.4 Stormwater Standard Detail Drawings

The District's Standard Drawings shall be used for public and private development projects and cannot be modified by designers, unless approved by the District on a project-by-project basis. It is the responsibility of the Engineer to incorporate the standard detail drawings as originally intended. See Appendix C for the District's Stormwater Typical Drawings and Standard Details.

3.5 Approval of Alternate Materials and Methods

Any substitution of materials or alternate methods not explicitly approved herein will be considered for approval as set forth in Section 2.4 of these Standards. Persons seeking such approvals shall make application in writing. Approval of any deviation from these Standards shall be provided in writing. Approval of minor matters will be made in writing, if requested.

Any alternative materials and/or methods must meet or exceed the minimum requirements set forth in these Standards.

The written request is to include, but is not limited to, the manufacturer's specifications and testing results, design drawings, calculations, reason and justification, and other pertinent supporting information.

Any deviations or special problems shall be reviewed on a case-by-case basis and approved by the District. When requested by the District, full design calculations shall be submitted for review with the request for approval.

3.6 Special Design Applications

Special applications not covered in these Standards require review and approval by the District. Submittal of full design calculations, supplemental drawings, and other information shall be required before any approval is considered.

6. Stormwater Management Facility Design

SMFs include a variety of methods to mitigate stormwater runoff and remove pollutants from stormwater, including detention, infiltration/retention, sedimentation, filtration, plant uptake, ion exchange, adsorption, and bacterial decomposition. Infiltration is the preferred method to address stormwater runoff for water quality and flow control requirements. In some cases, using a combination of SMFs may be the most effective strategy for removal of specific pollutants of concern in designated high-risk areas.

This chapter describes the methods and criteria for designing SMFs to meet water quality and flow control performance standards. Additional structural source controls may be required for certain types of development categorized as high risk for pollutants as described in Chapter 5.

The District's Stormwater Standards guide the design of Stormwater Management Plans for new development and redevelopment projects. Site-specific Stormwater Management Plans are most effective when developed early in the site planning process. Strategies for meeting the requirements in these standards depend on several site factors, including soil infiltration capacity, available infrastructure, proposed development plans, and downstream conveyance. The plan review and approval requirements are specific to each jurisdiction and may vary from one application, submittal, and building permit to another. To obtain further information on a specific plan review or permit process, contact the District.

6.1 Stormwater Management Performance Standards

Applicants of projects subject to stormwater review must demonstrate that the proposed project will include SMFs that meet water quality and flow control performance standards.

6.1.1 Water Quality Performance Standard

SMFs shall be designed to capture and treat 80 percent of the average annual runoff volume, to the maximum extent practicable with the goal of 80 percent total suspended solids removal. In this context, "maximum extent practicable" means less-effective treatment may not be substituted when it is practicable to provide more effective treatment. Based on local rainfall frequency and intensity, the required treatment volume equates to a Water Quality Design Storm of 1.0 inch over 24 hours. SMFs for water quality shall be designed in conformance with the design guidelines in this section.

Hydrodynamic separators, when used as a sole method of stormwater treatment, do not meet the "maximum extent practicable" requirement for stormwater treatment effectiveness with regard to these Standards.

6.1.2 Flow Control Performance Standard

Flow control facilities shall be designed so that the duration of peak flow rates from Post-Development Conditions shall be less than or equal to the duration of peak flow rates from pre-development conditions for all peak flows between 42 percent of the 2-year peak flow rate up to the 10-year peak flow rate. A hydrologic/hydraulic analytical model capable of performing a continuous simulation of peak flow rates from local long-term rainfall data must be used to determine the peak flow rates, recurrence intervals, and durations. SMFs for flow control shall be designed in conformance with the design guidelines in Section 6.4.

Flow control is not required for projects that discharge directly to the Willamette River, the Tualatin River, or the Clackamas River, provided that all of the following conditions are met:

A. The project site is drained by a storm drainage system that is composed entirely of man-made conveyance elements (e.g., pipes, culverts, ditches, outfall protection, etc.) and the storm drainage system extends to the ordinary high-water line of the exempt water body.

B. The entire length of the storm drainage system between the project site and the exempt receiving water shall have sufficient hydraulic capacity to convey discharge from the proposed development of the site and the existing development condition from the remaining drainage area contributing to the storm drainage system for the 25-year storm event, based on the conveyance of the design storm as outlined in Section 7.3.

C. Any erodible elements of the man-made storm drainage system must be adequately stabilized to prevent erosion under the conditions noted above.

D. The constructed storm drainage system does not result in an inter-basin transfer of runoff, as determined by the District.

Projects that are exempt from flow control are still subject to the other requirements outlined in these standards, including requirements to provide erosion and sediment control, water quality treatment, storm drainage systems, downstream storm drainage system analysis and applicable source controls.

In designated basins with limited downstream conveyance capacity, flow control shall be designed to reduce the 25-year, 24-hour, post-developed runoff rate to the 2-year, 24-hour pre-developed discharge rate. If there are segments of the downstream Conveyance System that can be upgraded, this additional flow control requirement may still require downstream stormwater conveyance system improvements in order to safely convey all existing and proposed stormwater runoff generated from the upstream and onsite drainage basins.

The District has identified the following drainage basins as having limited downstream capacity within portions of the existing associated stormwater Conveyance System:

A. Cedar Creek Basin (see **Figure 1**)

B. Johnson Creek Basin (see **Figure 2**)

C. Upper Kellogg Creek Basin (see **Figure 3**)

D. Tributary Basin of Mt. Scott Creek (see

E.

F. **Figure** 4)

Figure 1. Cedar Creek Basin

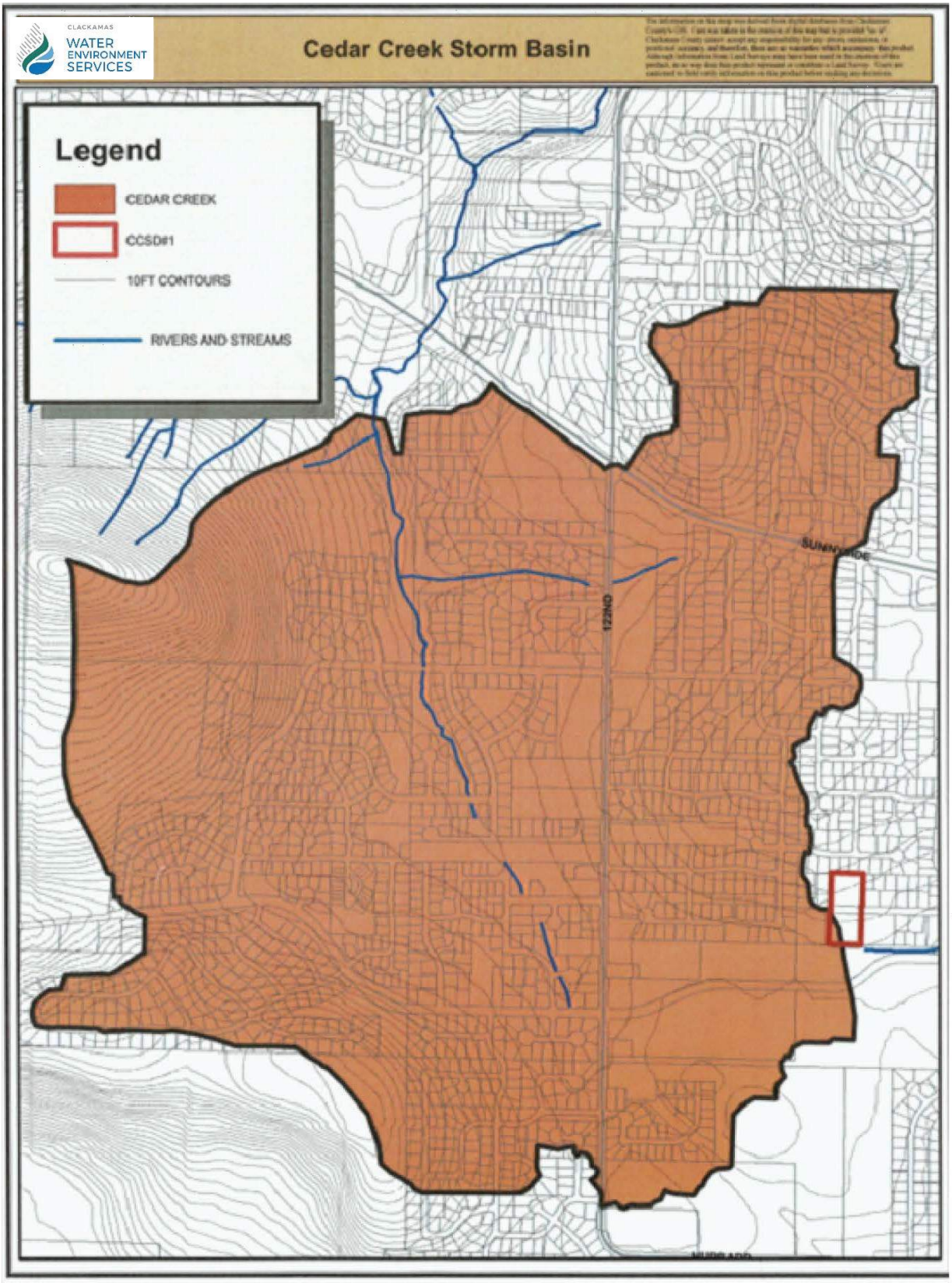


Figure 2. Johnson Creek Basin

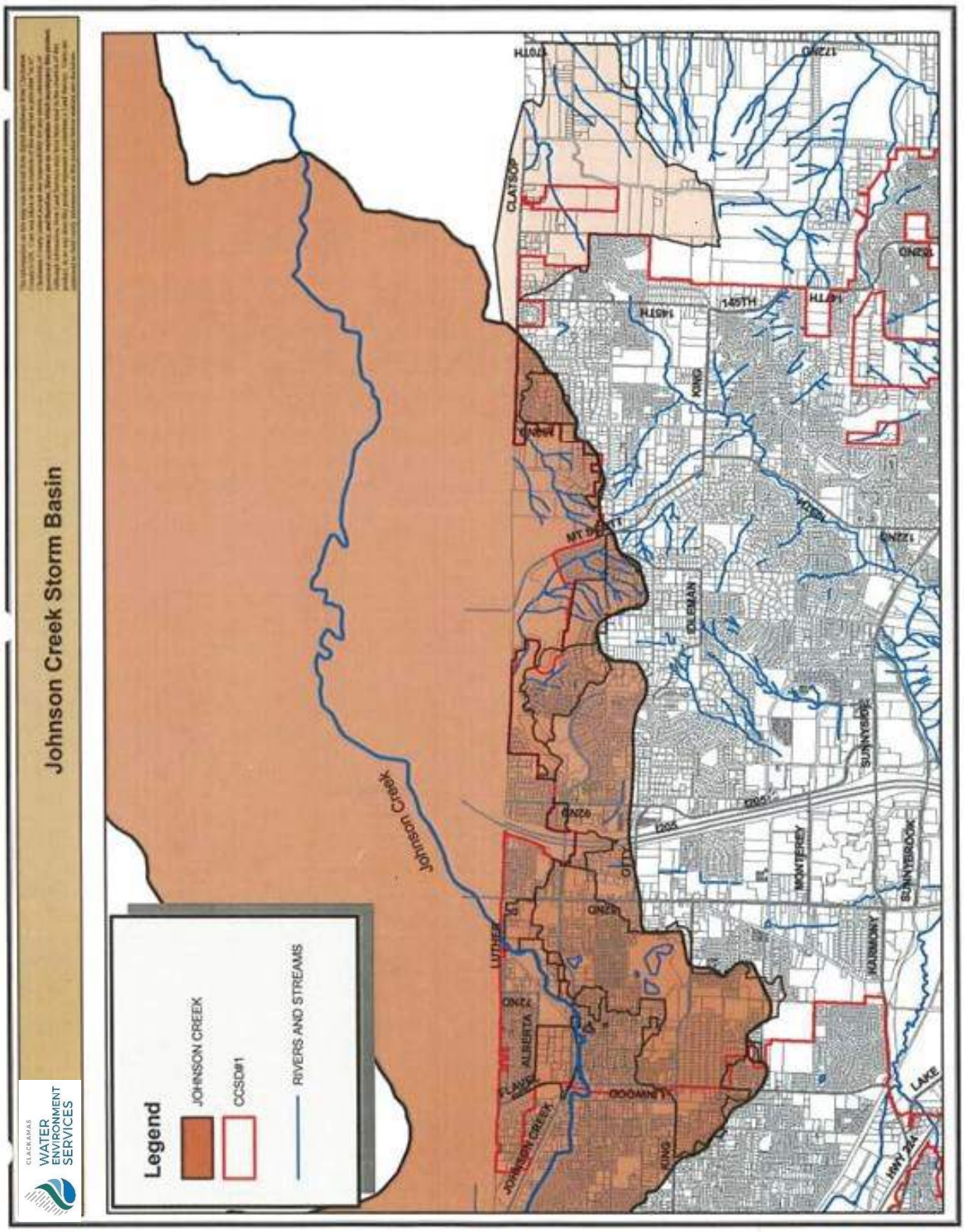


Figure 3. Upper Kellogg Creek Basin

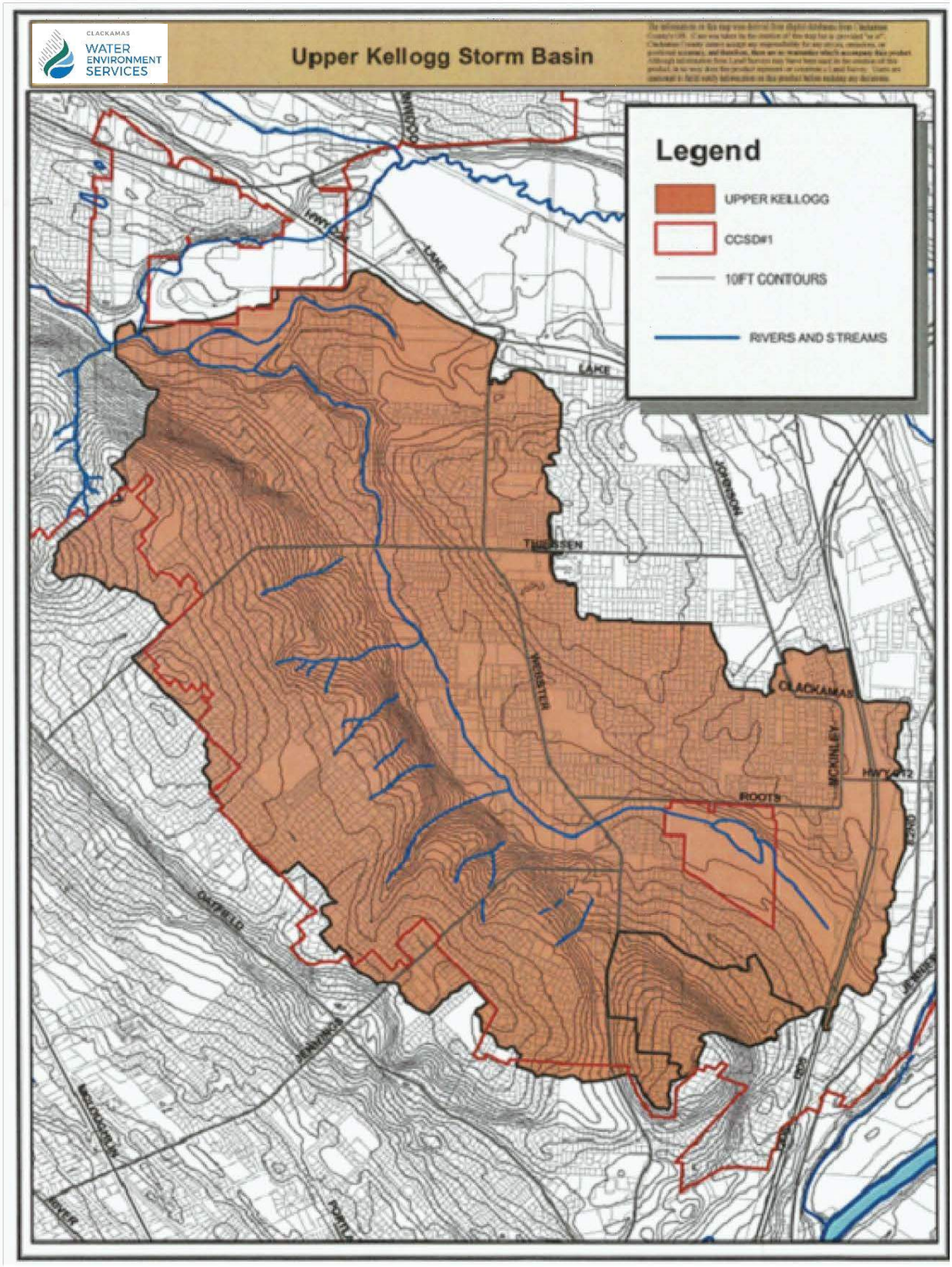
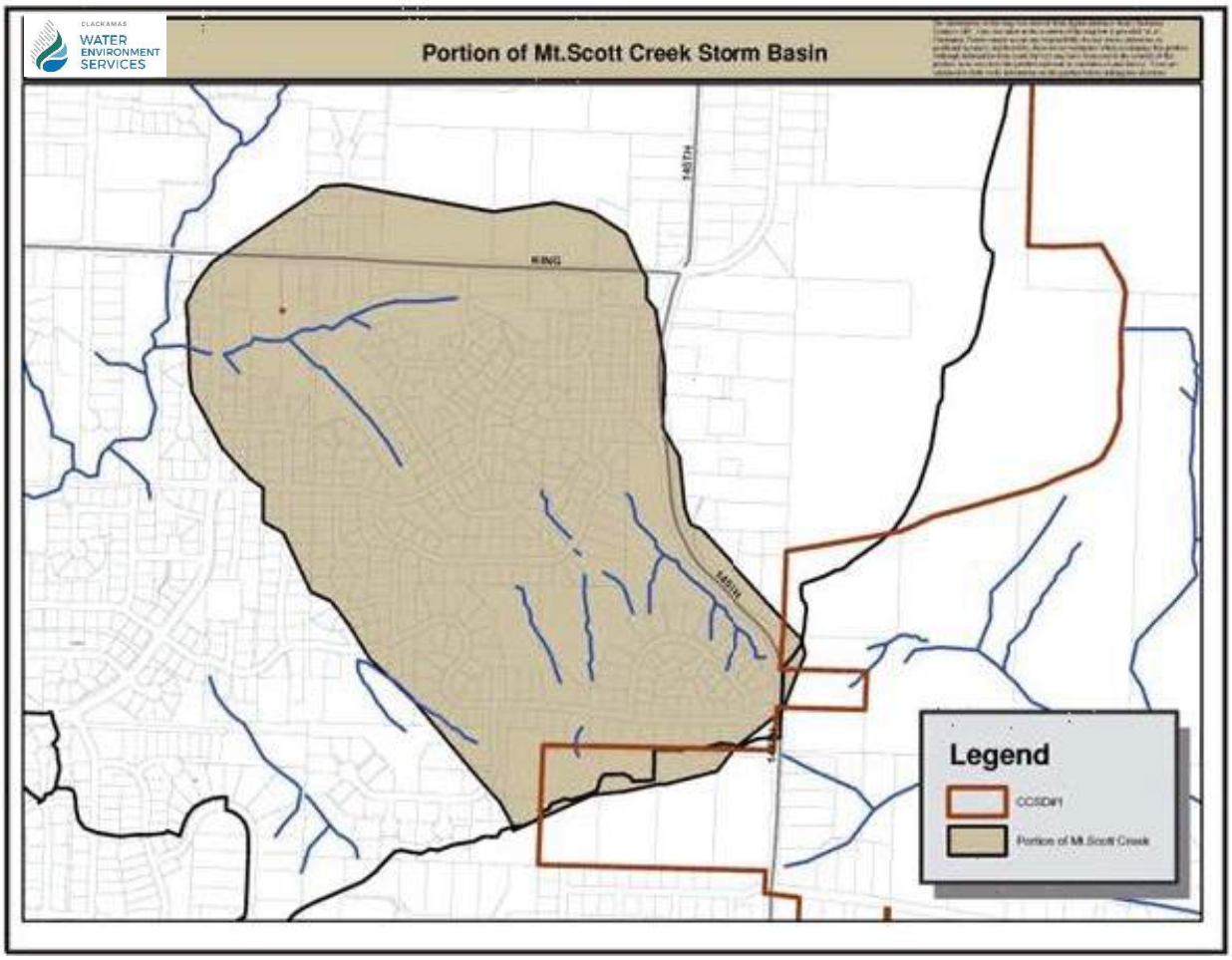


Figure 4. Tributary Basin of Mt. Scott Creek



6.1.3 Emergency Overflow Pathway

For all projects with SMFs, an overland emergency overflow pathway must be identified and/or designed that allows runoff from large storm events to discharge without risk of injury or property damage. The emergency overflow pathway must be incorporated into the design to show how flow will escape from the site during rainfall events larger than the design storm and/or from failure of the primary stormwater storm drainage system. If a Storm Drainage System is used as a component to convey the emergency overflow pathway, then the structure(s) and system shall be designed to convey the 100-year Design Storm.

The Applicant shall identify the proposed 100-year emergency overflow pathway. If downstream properties are impacted by the 100-year storm event, then the Applicant shall provide additional flow control or secondary SMFs to mitigate the potential impact.

6.1.4 Fee In Lieu

When a proposed development is unable to meet the flow control or water quality performance standards, the District may allow Applicants to pay a fee in lieu of stormwater management improvements. In such a case, the fee shall be based on a proportional cost for the District to construct an equivalent SMF including costs for land acquisition, design, construction, maintenance, and administration.

The financial viability of designing and constructing onsite or offsite SMFs is not a justification to use the fee in lieu program. Applicants must demonstrate that the proposed development site has one or more physical limitations that prevent the installation of onsite SMFs, and that offsite or regional facilities are not a feasible alternative. All projects should meet the downstream storm drainage system capacity requirements, and provide an emergency overflow pathway, as needed.

6.2 Stormwater Management Facility Sizing Methods

This section explains the methods accepted by the District for determining the appropriate size and configuration of SMFs to achieve the performance standards.

A Stormwater Report that meets the submittal requirements of **Appendix A** must accompany the engineered stormwater plans to demonstrate and document the design, including sizing methods and calculations.

6.2.1 Infiltration

When site conditions allow, infiltration is the preferred strategy to achieve the stormwater management performance standards. When a SMF is designed to fully infiltrate the 10-year, 24-hour Design Storm, the facility is assumed to meet the flow control performance standard without further analysis. Such facilities provide onsite stormwater retention for most rainfall conditions and should only result in partial downstream discharge during events larger than a 10-year storm. When site conditions do not allow infiltration of the full 10-year, 24-hour Design Storm, infiltration can still be incorporated into the flow control facility design to reduce the volume of discharge released from the site. Flow control facilities designed with partial infiltration should include an underdrain, control structure, and overflow system to manage the release rates from the facility. Whether or not infiltration is incorporated into the design, release rates from the facility must meet the flow control performance standard in Section 6.1.2.

When a rain garden, planter, swale, or pond is designed to fully infiltrate the 10-year, 24-hour Design Storm, the facility is also assumed to meet the water quality performance standard, without further analysis. UIC facilities, such as drywells, infiltration trenches, and infiltration chambers may require upstream water quality treatment to meet the water quality performance standards. Refer to the individual facility design requirements in Section 6.5 to determine which infiltration facilities can be used to provide upstream water quality treatment for UICs. When a UIC facility is designed to infiltrate the 10-year 24-hour Design Storm, the Applicant is responsible for demonstrating the proposed UICs will be rule authorized under Oregon Administrative Rules (OAR) 340-44-008 or will obtain an DEQ-issued UIC Permit.

The Applicant shall conduct infiltration testing and establish a design infiltration rate as described in this section. Infiltration testing is required as part of obtaining the Service Provider Letter.

Infiltration may be limited where any of the following conditions exist:

A. Infiltration rates of less than ½-inch per hour.

B. Sites that include steep slopes (>25 percent) and/or geologic hazard zone designation (Subsection 1002.01, Hillsides of the Clackamas County Zoning and Development Ordinance). A geotechnical engineering or geologist report and District approval is required for infiltration facilities located on moderate slopes of 10 to 25 percent.

C. Sites in areas of seasonal high groundwater table. Sites with jurisdictional wetlands or FEMA floodplains may be required to perform a seasonal high groundwater table assessment to determine that the seasonal groundwater table is at least 12 inches below the bottom of proposed non-infiltrating stormwater facilities.

D. Sites within the 2-year time of travel to irrigation or drinking water wells or within the 500-foot horizontal setback from irrigation or drinking water wells are not suitable for UICs, such as drywells or infiltration trenches or galleries. However, green infrastructure facilities that provide water quality treatment in conjunction with infiltration, such as rain gardens, planters, and bioinfiltration swales, may still be used within water pollution control facility (WPCF) permit setback distances.

E. Sites where SMFs would be located on new or existing structural fill material.

F. Sites that have contaminated soils must be evaluated by the DEQ and/or the EPA to determine if areas on the property are suitable for infiltration without the risk of mobilizing contaminants in the soil or groundwater. Documentation showing contamination assessment and determination must be submitted to the District at the time of application.

G. There is a conflict with required source controls for high-risk sites (see Chapter 5).

For sites with limiting conditions, Applicants should document the infiltration limitations and design SMFs that do not use infiltration. Infiltration testing may still be required to document select limitations.

Sites without limiting conditions have the potential to use infiltration as part of the stormwater management strategy. Applicants shall conduct infiltration testing and establish a design infiltration rate for potential SMFs. Infiltration, even at slow rates, has the potential to retain stormwater at the source, recharge groundwater, and reduce offsite flows. Incorporating infiltration into SMF design can also reduce the footprint of required SMFs.

Regardless of the tested infiltration rate of the soils on the site, Applicants must demonstrate that SMFs will meet the performance standards for water quality treatment and flow control detailed in Chapter 6.

Infiltration testing is required to determine the suitability to retain the stormwater runoff.

Infiltration Testing to Establish Site Characteristics and to Assess Stormwater Facility Viability

Infiltration testing should be conducted to establish site conditions and soil strata. Infiltration testing can identify ideal locations for SMFs or to identify where site constraints exist.

Required Infiltration Tests

The type and number of required infiltration tests depends on the size and type of proposed development (see **Table 3** and

Table 4). Infiltration testing shall be conducted according to the specifications in **Appendix A**, or using an equivalent method approved by the District. When a confining layer, or soil with a greater percentage of fines is observed during the subsurface investigation to be within 4 feet of the bottom of the planned SMF, the testing should be conducted within the confining layer

Table 3. Types of Infiltration Tests

Development Size	Test Type	Number of Tests
Development less than 10,000 square feet of impervious area	Basic Method	One test at the location and depth of each proposed SMF
Development equal to or greater than 10,000 square feet of impervious area	Professional Method	See Table 4.

Table 4. Number of Professional Method Infiltration Tests

Type of Development	Location of Infiltration Test	Minimum Number of Infiltration Tests	Maximum Number of Infiltration Tests
Single Family and Partitions	At the location and depth of the proposed SMF(s)	One test per SMF	One test per SMF
Subdivisions	At location and depth of the proposed SMF(s)	One test per SMF	If more than five SMFs are proposed, the District may accept a recommended infiltration rate from a Geotechnical Engineer based on the consistency of the soil classification(s) throughout the site, unless otherwise permitted by the District
Non-single family residential (e.g., multi-family, commercial, industrial, and all other types)	At location and depth of the proposed SMF(s)	One test per SMF	If more than five SMFs are proposed, the District may accept a recommended infiltration rate from a Geotechnical Engineer based on the consistency of the soil classification(s) throughout the site, unless otherwise permitted by the District

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Design Infiltration Rate

When feasible, infiltration is the preferred strategy to satisfy the flow control performance standard. The design infiltration rate shall be determined by the Developer's Engineer conducting the infiltration test. A minimum correction factor of 2 shall be applied to the field-tested infiltration rates to determine the design infiltration rate for SMF design.

The design infiltration rate after applying the safety factor shall not exceed 100 in/hr for non-vegetative facilities, such as drywells or infiltration chambers. Vegetated facilities with growing media shall be designed at a maximum infiltration rate of 6.0 in/hr through the growing media.

SMFs shall be designed with an infiltration component, unless otherwise stipulated by the design professional. If the SMF cannot be designed to fully infiltrate the 10-year storm event, then an underdrain and outflow will be required to safely convey the discharge from the SMF to an approved discharge point. If the proposed facility does not have an approved discharge point, then it must be designed to fully infiltrate the 25-year storm event as required by the District.

6.2.2 Water Quality Facility Sizing

Water quality SMFs shall be sized to capture and treat 80 percent of the average annual stormwater runoff with the goal of 80 percent total suspended solids removal. This is equivalent to treating runoff from the first 1.0 inch of an individual 24-hour storm event.

The water quality design volume or flow rate shall be determined through one of the following methods:

A. The water quality design volume for volume based SMFs (constructed wetlands, ponds, planters, rain gardens, and bioinfiltration swales) shall be calculated as the total runoff volume from a storm with 1.0 inch of precipitation. Volume analysis may be performed using a hydrograph analysis program or spreadsheet tools. (Refer to Chapter 7. and **Appendix D** for design limitations and calculation references when using the Santa Barbara Urban Hydrograph [SBUH], Technical Release 55 (TR-55), or SWMM method for sizing water quality treatment.) The City of Portland's Stormwater Management Manual Presumptive Approach Calculator is not approved for use to meet WES Water Quality Facility Sizing.

B. The design flow rate for flow based SMFs (filter strips and most manufactured treatment systems) shall be calculated as the peak discharge from design storm with the following peak rainfall intensities:

    a. Design storm intensity for online facilities of 0.18-inches per hour (in/hr)

    b. Design storm intensity for offline facilities of 0.10 in/hr

C. Use a continuous simulation hydrologic/hydraulic model analysis that addresses the design equivalent of capturing and treating 80 percent of the average annual stormwater runoff.

D. Volume calculations using the 1.0-inch Design Storm and the following equation:

$$V_{imp} \text{ or } V_{perv} = 3{,}630 * A * \frac{\left(P_{design} - 0.2 * \left[\frac{1{,}000}{CN} - 10 \right] \right)^2}{\left(P_{design} + 0.8 \left[\frac{1{,}000}{CN} - 10 \right] \right)}$$

where:

V = runoff volume (impervious or pervious), cubic feet

A = drainage area, acres

P = design precipitation depth, inches (assumed to be 1.0 for water quality sizing)

CN = National Resource Conservation Service (NRCS) curve number, unitless (see **Appendix D**)

6.2.3 Flow Control Facility Sizing

To design for flow duration matching, a hydrologic/hydraulic analytical model capable of performing a continuous simulation of peak flow rates from local long-term rainfall data must be used to determine the peak flow rates, recurrence intervals, and durations.

The Developer's Engineer may use any analytical model capable of performing a continuous simulation of peak flows from long-term local rainfall records. Regardless of how the stormwater calculations are performed, the report submitted to the District must show how the proposed SMFs meet the flow control performance standards. Creation of

a continuous simulation hydrologic model for a specific development site requires specialized expertise and usually takes additional time and expense to develop and review. The Applicant may be required to pay additional fees to the District to review the Stormwater Management Plan developed using other modeling methods. These fees will be used to pay for a third-party peer review of the stormwater report, hydrologic model, and facility design.

6.3 General Design Requirements

When a SMF is required, green infrastructure, such as planters, swales, rain gardens, ponds, and other vegetated facilities are the preferred strategy to meet the stormwater management requirements for water quality treatment and flow control. The best way to control the rate and duration of runoff is through the incorporation of infiltration using green infrastructure.

6.3.1 Allowable Facilities

While the District provides design guidance for numerous public and privately maintained SMF types, not all facilities are acceptable for use in every jurisdictional area. **Table 5** and **Table 6** provide lists of facilities that are approved for use in different parts of the District. The tables cover areas managed by the District, the City of Happy Valley, and the Clackamas County Department of Transportation and Development (DTD).

Applicants should consult with District and local agency staff to understand the types of SMFs that could be approved for use on the project.

If a proposed facility meets the DEQ criteria for a UIC, the Applicant shall comply with UIC requirements and prepare appropriate registration information for DEQ.

Table 5. Facilities Allowed by the District

	Facilities within a Public Street/ROW❶	Publicly Maintained Facilities❶❸	Privately Maintained Facilities❷
Stormwater Planter	YES	YES	YES
Rain Garden	YES	YES	YES
Vegetated Swale	YES	YES	YES
Filter Strip	YES	YES	YES
Drywell	YES	YES	YES
Infiltration Gallery or Trench	NO	YES	YES
Constructed Wetland	NO	YES	YES
Detention or Infiltration Ponds	NO	YES	YES
Structural Detention	NO	YES	YES
Manufactured Treatment	YES	YES	YES
Sheet Flow Dispersion	YES	YES	YES
Pervious Pavement	NO	YES	YES
Green Roof	NO	NO	YES

Notes:

❶ Publicly Maintained Stormwater Facilities - Stormwater Facilities and storm drainage systems that convey stormwater runoff from any Public Rights-of-Way must be maintained by a public agency.

❷ Privately Maintained Stormwater Facilities - Stormwater runoff fully contained on private property and mitigated through a privately owned facility must be maintained by the Owner(s). An on-site maintenance agreement must be recorded as a land record specifying the minimum required amount of maintenance in accordance with District Rules and Standards.

❸ Pervious pavement constructed within the Public ROW requires the approval of the local roadway authority.

Table 6. Facilities Allowed by Happy Valley and DTD

	Facilities within a Public Street/ROW ❶	Publicly Maintained Facilities ❶	Privately Maintained Facilities ❷
Stormwater Planter	YES	YES	YES
Rain Garden	YES	YES	YES
Vegetated Swale	YES	YES	YES
Filter Strip	YES	YES	YES
Drywell	YES (with WES maintenance)	YES (with WES maintenance)	YES
Infiltration Gallery or Trench	NO	NO	YES
Constructed Wetland	NO	YES	YES
Detention or Infiltration Ponds	NO	YES	YES
Structural Detention	YES	YES	YES
Manufactured Treatment	YES (WES maintenance for DTD facilities)	YES	YES
Sheet Flow Dispersion	YES (WES maintenance for DTD facilities)	YES (WES maintenance for DTD facilities)	YES
Pervious Pavement	NO	NO	YES
Green Roof	NO	NO	YES

Notes:

❶ Publicly Maintained Stormwater Facilities - Stormwater Facilities and storm drainage systems that convey stormwater runoff from any Public Rights-of-Way must be maintained by the public.

❷ Privately Maintained Stormwater Facilities - Stormwater runoff fully contained on private property and mitigated through a privately owned facility must be maintained by the Owner(s). An on-site maintenance agreement must be recorded as a land record specifying the minimum required amount of maintenance in accordance with District Rules and Standards.

6.3.2 Alternative Facilities

Applicants may propose SMFs that are not allowed as per Section 6.3.1. Such a proposal will require the Applicant to submit a request for a variance per Section 2.4. Alternate facilities must be designed to meet the performance standards outlined in Section 6.1.

6.4 General Facility Design Requirements

The following design requirements apply to all SMFs. Additional facility specific design criteria are included in Section 6.5.

6.4.1 Location and Setbacks

Applicants must review local zoning, building and plumbing code requirements to understand setback requirements for SMFs. The minimum setback for a stormwater facility is 5 feet from a property line, unless more distance is specified by the Developer's Engineer, geotechnical engineer, and/or by local and state minimum setback requirements. See District Buffer Standards for further information on the design requirements for vegetated facilities and buffer areas.

In addition, stormwater facilities that incorporate an infiltration component are subject to all local and state minimum setback requirements. A geotechnical report is required to determine setbacks from slopes for infiltration facilities installed near slopes ≥15 percent or within 200 feet of a steep slope hazard area or landslide hazard area.

Easements and Setbacks

Piped storm drainage systems shall generally be located in the Public ROW. Public storm drainage system facilities not located in the Public ROW shall be located within an easement granted to the District.

When design conditions require locating storm drains in easements, the storm drain shall typically be centered in the easement.

An easement shall be centered on the pipe centerline, unless otherwise approved by the District, and easements shall typically be exclusive. Combined easements shall be a minimum of 20 feet wide with a minimum separation of 5 feet between utilities and be approved by the District on a case-by-case basis.

All public manholes, junction or inlet structures in easements shall be accessible to District personnel at all times. A minimum 15-foot-wide access easement is required between the nearest ROW and each structure. Paved or gravel access road maybe be required by the District, if access is deemed necessary, and otherwise unavailable.

Unless shown on a proposed plat of subdivision, all onsite easements shall be furnished to the District for review, approval, and recordation prior to approving the Stormwater Management Plan.

All offsite easements shall be furnished to the District for review, approval, and recordation prior to approving the Stormwater Management Plan.

The District may require that an area of 5 feet in all directions from the edge of a public manhole, catch basin, cleanout, or field inlet be encompassed in a Public ROW or easement granted to the District.

Access easements shall be provided to all stormwater structures such as manholes, catch basins, and other related structures, as required by the District.

When a pipe will be stubbed, the easement shall extend a minimum of 5 feet past the end of the stub.

The center of the storm pipes in an easement shall be located no closer than 5 feet from the easement line.

The following easement requirements are the minimum requirements established to maintain, repair and/or replace the stormwater infrastructure or open storm drainage system.

A. Easements shall be minimum 15 feet wide for pipes up to 24 inches in diameter.

B. Easements for pipes over 24 inches in diameter shall be 20 feet wide or greater as determined by the District.

C. The District may require wider easements for large trunk sewers, sewers greater than 10 feet deep and areas with topographic constraints such as steep slopes or sites where maintenance, repair or replacement would require a wider easement.

D. A reduced easement width must be approved by the District.

E. Easement widths shall be increased as required in 5-foot increments as per **Table 7**.

Table 7. Minimum Pipe Size per Minimum Easement Width

Pipe Size (inches)	Minimum Easement Width (feet)
6–12	15
15 < 24	15
24 < 54	20
> 54	30

When a conservation easement is not required, the minimum open storm channel easement width shall extend 5 feet from each side of the top of bank of the open channel.

Structures constructed within easements shall meet the following requirements:

A. Structures constructed within easements shall require an encroachment agreement with the District. Approval of the encroachment is at the discretion of the District and may involve the imposition of specific conditions in the granting of such. The Applicant will complete an encroachment agreement application and pay all applicable charges and fees.

B. The encroachment agreement shall allow the District to remove the structure, as needed, to access the storm drainage system. Replacement of the structure shall be at the Owner’s expense.

C. The District may require increased protection for the storm drainage system in the vicinity of an encroachment. All special protection requirements and plans will be reviewed and approved by the District. All review and/or approval costs associated with this provision will be paid by the Applicant.

6.4.2 Outlet Structures

SMFs designed as flow through systems shall have a perforated pipe underdrain system to convey water from the facility to a flow control structure and/or downstream storm drainage system.

Orifice sizes for SMFs will be specified by the BMP Sizing Tool results. Orifices shall be located to prevent clogging and blockages. Outlet structures (orifices, weirs, overflow risers, etc.) shall be configured to operate as passive systems and shall not require adjustments during normal operation.

Flow control structures shall be located in an enclosed structure, outside the open water storage area, in a location that provides sufficient maintenance access for a minimum of 20 feet. Flow control manholes shall have solid locking covers, however open grates may be permitted.

Outlet structures and overflow configurations must address the 100-year overflow pathway requirements in Section 6.1.3.

Additional outlet requirements for specific facility types are addressed in Section 6.5.

6.4.3 Stormwater Facility Signage

All vegetated and porous SMFs, including permeable surfaces such as pervious pavement shall have at least one informational sign that is clearly visible and legible to the public.

The Permittee shall install the applicable sign(s) before the District deems the project is completed, and/or prior to the issuance of the Certificate of Occupancy Permit.

Signs for publicly maintained SMFs require the following:

A. The Permittee shall be responsible for obtaining and installing the stormwater facility sign at their own expense.

B. The material shall be aluminum with green reflective sheeting and silk screen lettering or equal as approved by the District.

C. The minimum sign size shall be 12 by 18 inches. The maximum sign size shall be 24 by 30 inches.

D. The sign shall be affixed to metal signpost, or facility fencing.

E. The sign shall be installed near the stormwater facility in a location highly visible to the public.

F. The sign shall be created and installed in accordance with the Standard Detail Drawing D.26 SWM ST-3.0 Storm – Surface Water Facility Signs.

G. An electronic file format of the sign is available upon request from the District.

H. Signs may be available for purchase from the District.

Signs for privately maintained vegetated SMFs shall be provided by the Permittee and will include:

A. Description of the facility and its purpose

B. Contact information for maintenance complaints or to report a problem

Signs for privately maintained permeable surfaces, such as pervious pavement, shall be provided by the Permittee and will include at least the following information:

A. Description of the facility and its purpose

B. Contact information for maintenance complaints or to report a problem

C. Operations and maintenance instructions, such as:

    a. Avoid tracking or piling dirt, mud, or sediment on the driveway.

    b. If debris is tracked onto the driveway surface, clean by using a vacuum-type street cleaner during dry weather.

    c. Maintain vegetation along the sides of the driveway to help keep erosion and sediment laden water from clogging the surface.

    d. Do not place any sealants on the driveway.

6.4.4 Soil Mixes for Stormwater Management Facilities

Vegetated facilities require a soil/landscape system that simultaneously supports plant growth, soil microbes, water infiltration, nutrient and pollutant adsorption, sediment and pollutant filtration, and pollutant decomposition. Therefore, the soil mix selected for a facility is critical to its success.

Facilities that include soil, such as swales, planters, curb extensions, and basins, must use the Blended Soil Specification for Vegetated Stormwater Systems from the most currently adopted City of Portland's Standard Construction Specifications in section 0104.14(d), titled Stormwater Facility Blended Soil. See the City of Portland's Stormwater Management Manual website[1] for information about the most current soil specification information and a list of stormwater facility blended soil vendors and haulers.

6.4.5 Planting and Irrigation

SMF planting guidelines are included in **Appendix B**. Planting plans must meet the following requirements:

A. Establish and implement procedures such as control of the following: invasive weeds, animal and vandal damage, mulching, re-staking, and watering to the extent needed (as determined by the District) to ensure plant survival. Plastic and mesh tubes are prohibited and shall not be used within a publicly maintained facility.

B. Stormwater facilities located in the Public ROW are not permitted to include trees.

C. Selected plant materials should be appropriate for soil, hydrologic, and other facility and site conditions (see **Appendix B**).

D. For facilities located in riparian corridors, all plants within the facility area shall be appropriate native species from the plant list found in **Appendix B** of the Buffer Standards.

E. No nuisance, invasive, or prohibited plants shall be used in any stormwater facilities.

[1] See https://www.portland.gov/bes/stormwater/swmm.

F. The design for plantings shall minimize the need for herbicides, fertilizers, pesticides, or soil amendments at any time before, during, and after construction and on a long-term basis.

G. Plants shall be selected and planted to minimize the need for mowing, pruning, and irrigation once established.

H. Side slopes of planted areas shall not exceed 3h:1v.

The Developer's Engineer or Landscape Architect shall determine the appropriate irrigation strategy to maintain the plant survivability. Temporary irrigation systems must be fully removed by the Developer before the District releases the storm warranty bond.

6.4.6 Pond Embankment, Retaining Walls, Fencing, Gates and Handrails

Pond embankments and retaining walls are allowed to impound water to enhance the functionality of the SMF.

Pond Embankments

Pond embankments must be constructed with a maximum slope of 3h:1v on the upstream and downstream face. Side slopes within the pond must be sloped no steeper than 3h:1v below the maximum water surface elevation, unless otherwise approved by the District.

Retaining Walls

Retaining walls greater than 4-feet in height shall have a professional structural or geotechnical engineer registered in Oregon provide stamped design calculations and detail drawings required for the retaining wall construction, per local building code requirements. Stormwater ponds that require retaining walls will be limited to the height of 10 feet above the vegetated surface elevation for 50 percent of the circumference of the facility, and 6 feet for the remaining portion of the circumference, unless otherwise approved by the District.

Retaining Wall Ownership

The District shall not have any maintenance or ownership responsibility for retaining walls. The Owner of the property (HOA) shall be responsible for the maintenance, repair and/or replacement of the retaining wall(s) within the public easement(s) or tract(s). The ownership and maintenance responsibility for the retaining wall shall be clearly specified in the CCRs and/or within the stormwater maintenance plan.

Fencing, Gate and Handrails

A minimum 6-foot high fence is required to be constructed around the parameter of all publicly maintained stormwater facilities with a designed water depth greater than 3 feet. Publicly maintained stormwater facility must provide a maintenance access gate with a minimum opening width of 12 feet wide that consists of two 6-foot sections. Fencing or handrails may be required along the top of the retaining wall in accordance with local zoning and building codes.

6.4.7 Public Maintenance Access

Publicly maintained stormwater facilities and structures must provide an access road designed and constructed for the intended use and purpose for accessing and maintaining the proposed SMFs. District maintained facilities should be located adjacent

to the Public ROW. Public maintenance access roads shall be designed and constructed to the minimum standards as specified in Table 8.

A. Maintenance road access for District-maintained facilities shall be shown on the recorded plat and be situated in a separate tract and identified with the specific and intended use for maintenance access.

B. The District may require additional protection for access roads, including fencing, signs and/or bollards to restrict public access. Minimum maintenance access of 20 feet to structures is required.

C. All access roads must be rated for a minimum of 80,000 pounds.

Table 8. Access Road Specifications

SLOPE	DESIGNATION	WIDTH		SURFACE	DESIGN NEEDS	STRUCTURAL SUPPORT
		TOTAL	ROAD			
< 8%	EASEMENT	15-ft	12-ft	GRAVEL	N/A	8-INCH GRAVEL FILTER FABRIC
>8% < 12%	TRACT	15-ft	12-ft	2-INCH A.C.	W/O TURNAROUND	8-INCH GRAVEL FILTER FABRIC
12% - 15%	TRACT	20-ft	15-ft	2-INCH A.C.	W/ TURNAROUND W/ LANDING	8-INCH GRAVEL FILTER FABRIC
>15%	**CONTACT DISTRICT**					

General Requirements

A Profile of the access road is required.

Maximum grade:

A. 15 percent with a maximum 3 percent cross-slope.

B. Special permission is required for grades over 15 percent.

Minimum width of surface:

A. 12 feet on straight runs and 15 feet on curves.

B. Curves will be designed with a minimum 40-foot interior radius.

C. Access will extend to within 10 feet of all pollution control structures unless otherwise approved by the District.

D. Access roads in excess of 150 feet in length is required to have a turnaround.

E. Turnaround is required when access is taken from a collector or arterial roadway.

Provide a minimum 12-foot wide double opening gate at the entrance of the stormwater facility maintenance access.

Access Road Contained Within a Tract of Land

All publicly maintained stormwater facilities must provide an access road in accordance with these Standards and must be contained within a Tract of Land that has a WES storm drainage easement.

Design

Access Road:

A. Horizontal curves
    a. Minimum Radius for (inside) = 40 feet
B. Vertical Curves
    a. Vertical Curves
        i. Crest maximum K = 4
        ii. Sag maximum K = 6

    Where K = L/A

    L= algebraic difference in grades percent

    A= length of vertical curve (feet)

Landing:

A. Maximum slope = 4 percent
B. Minimum length of 40 feet

Turnaround:

A. Design per Clackamas County Roadway Standards – Detail C350
B. Maximum cross slope = 4 percent
C. Minimum width of the access road 12 feet
D. Minimum radius for (inside) = 30 feet

Typical Surface:

Three 3-inches of class “B” asphaltic concrete and 2 inches of ¾”-0” compacted crushed rock; over 8 inches of 1½”-0” compacted crushed rock; over subgrade compacted to 95 percent AASHTO T-99.

The Developer’s Engineer may submit a certified road design capable of supporting a 30-ton maintenance vehicle in all weather conditions.

Driveway Access:

All access roads shall have a standard driveway with 6 inches of concrete over 2 inches of gravel. The plan will include design of strengthened sidewalk sections (6 inches of concrete minimum) where maintenance vehicles will cross. (See D600 Clackamas County Department of Transportation).

The final plan will have to show how maintenance equipment will safely access the pond. At least one side of the detention pond is required to have an access suitable for maintenance equipment (backhoe etc.). Direct access to the pond must be 15 feet wide and slopes of 4h:1v or flatter.

6.4.8 Private Maintenance Access

Privately maintained facilities shall be located in a manner so that the facility can be safely and efficiently maintained. Egress and ingress access routes shall be clear of any obstacles and constructed of a sufficient surface to safely convey the size and weight of vehicles, and equipment necessary to maintain, repair and replace the SMF.

6.4.9 Underground Injection Control Registration

Infiltrators and infiltration trenches are generally classified as UICs by DEQ. The District will evaluate each case and may accept ownership and/or maintenance responsibility for UICs. For UICs on private property, with the exception of single-family residential roof and footing drains, there is a requirement to register the UICs and provide site inventory data to DEQ.

Any proposed UIC facility shall be rule authorized pursuant to OAR 340-44-008, have an DEQ-issued UIC permit associated with the facility, or have a notice of intent to issue a UIC permit.

6.5 Stormwater Facility Design Requirements

The following section includes SMF design guidelines for facilities approved for use in the District. Typical facility drawings are included in **Appendix C**.

6.5.1 Stormwater Planter

Stormwater planters are walled basins that capture and treat runoff through a combination of vegetation and an engineered soil mix called biofiltration soil medium. Planters may also be used for flow control when designed with infiltration or with an underdrain with controlled outlet.

Planters treat stormwater through sedimentation of particles in ponded water; filtration and phytoremediation through contact with vegetation; and biodegradation and adsorption of pollutants through contact with soil organisms and chemical soil processes. Planters and rain gardens provide similar treatment and flow control performance, though planters require less space than rain gardens to treat the same contributing area.

General Stormwater Facility Requirements

Water quality pretreatment is generally not required.

Stormwater facilities shall be designed to treat the entire inflow.

An infiltration test shall be conducted at the location and depth of the facility.

SMFs shall have a minimum separation of 3 feet from the bottom of the facility to the seasonal high groundwater elevation or other layer that limits infiltration (e.g., bedrock, clay lens).

If infiltration is used as a design component to determine retention, then the maximum draw down time is 24 hours.

Native soil infiltration rate shall be at least 0.25 in/hr for an infiltration planter. If the infiltration rate is less than 0.25 in/hr, an underdrain is required. For native soil infiltration rates between 0.25 and 2.0 in/hr, the engineer shall determine the need for an underdrain based on design performance calculations.

Attachment B

WES LID-GI Strategy Document

Technical Memorandum by Brown and Caldwell

November 21, 2023

Otak

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Technical Memorandum

Prepared for: Clackamas Water Environment Services

Project Title: Clackamas Water Environment Services NPDES 2023-24 Support

Project No.: 186261

Technical Memorandum

Subject: WES LID-GI Strategy Document

Date: November 21, 2023

To: Leah Johanson, PE Water Environment Services

From: Angela Wieland, P.E, Project Manager

Prepared by: _____
Angela Wieland, PE and Melissa Jannusch, PE

Reviewed by: _____
Krista Reininga, PE

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List of Abbreviations

BC	Brown and Caldwell
DEQ	Oregon Department of Environmental Quality
GI	Green Infrastructure
LID	Low Impact Development
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
NSRR	Numeric Stormwater Retention Requirement
NPDES MS4 Permit	NPDES Phase I Municipal Separate Storm Sewer System Permit
TM	Technical Memorandum
TSS	Total Suspended Solids
WES	(Clackamas) Water Environment Services

Section 1: Introduction/Background

Schedule A.3.e.ii of the Clackamas County Phase I National Pollutant Discharge Elimination System (NPDES) municipal separate storm sewer system (MS4) Permit (Permit) requires co-permittees by December 1, 2023, to:

"review and update or develop and begin implementation of a strategy to require to the maximum extent feasible, the use of Low Impact Development (LID) and Green Infrastructure (GI) design, planning and engineering strategies intended to minimize effective impervious area or surfaces, and reduce the volume of stormwater discharge and the discharge of pollutants in stormwater runoff from development and redevelopment projects".

In accordance with definitions listed in the NPDES MS4 Permit, DEQ defines LID and GI as follows:

- **2021 NPDES MS4 Permit definition for Green Infrastructure (GI):** *a specific type of stormwater control using vegetation, soils, and natural processes to manage stormwater. At the scale of a neighborhood or site, green infrastructure refers to stormwater management systems designed to mimic nature by reducing and/or storing stormwater through infiltration, evaporation, and transpiration. At the site level, such measures may include the use of plant or soil systems, permeable pavement or other pervious surfaces or substrates, stormwater harvest and reuse, or landscaping to store, infiltrate, or evapotranspirate stormwater and reduce flows to sewer systems or to surface waters. At the scale of city, green infrastructure refers to the patchwork of natural areas that provides flood protection and natural processes that remove pollutants from stormwater*.
- **2021 MS4 Permit definition for Low Impact Development (LID)**: Low Impact Development (LID) means *a stormwater management approach that seeks to mitigate the impacts of increased runoff and stormwater pollution using a set of planning, design and construction approaches and stormwater management practices that promote the use of natural systems, green infrastructure, and other techniques for infiltration, filtration, evapotranspiration, and reuse of rainwater, and can occur at a wide range of landscape scales (e.g., regional, community and site). Low impact development is a comprehensive land planning and engineering design approach to stormwater management with a goal of mimicking the pre-development hydrologic regime of urban and developing watersheds.*

The Permit requires the co-permittees to document the LID/ GI Strategy in the subsequent annual report (due December 1, 2023) and incorporate or reference the strategy in the Stormwater Management Program Document (SWMP) after completion and Department of Environmental Quality (DEQ) approval.

Clackamas Water Environment Services' (WES or Districts') Stormwater Standards (WES SS) and Rules and Regulations (WES RR) were updated in 2023 to clarify technical standards and specifications related to stormwater management within the Districts' service area, which includes the cities of Happy Valley and Rivergrove, and within the urbanized portion of unincorporated Clackamas County that is regulated by the MS4 Permit.

The purpose of this document is to summarize and document the Districts current LID/GI Strategy to meet the 2021 Permit requirements. The Strategy includes a review of the LID/GI requirements in the WES-SS.

This Strategy is organized as follows:

- Section 2 provides the District's existing LID/GI Strategy as outlined by planning objectives, stormwater management facility (SMF) selection, and use of infiltration to support stormwater management.
- Section 3 provides a summary of next steps.

Section 2: LID/GI Strategy

The WES SS and WES RR provide policy and design requirements for the management of post-construction stormwater runoff and is the primary mechanism by which the District complies with Schedule A.3.e of the NPDES MS4 Permit requirements. All applicable public and private new and redevelopment projects meeting the permit-specified impervious area threshold must adhere to the Districts' water quality treatment standards and flow control performance standards (WES SS Section 6.1.2), as well as show how onsite infiltration is used in the achievement of the performance standards (WES SS Section 6.2.1).

This section summarizes how the WES SS and WES RR incorporate LID approaches and GI facilities in the requirements for development and redevelopment projects.

The District adheres to the Alternative Compliance Performance Standard in Schedule A.3.e.iii.(B) of the NPDES MS4 Permit with focus on prioritization of infiltration in order to target natural surface or pre-development site hydrology and reduction of pollutant discharge from new and replaced impervious surfaces. There are multiple references to "infiltration-first" as a preference in the WES SS. Implementation of infiltration where possible is beneficial in meeting the Districts' water quality and flow control performance standards. Adherence to a flow control performance standard that requires mimicking pre-development (historic) peak flow and flow duration matching using of peak flow rates from a long-term rainfall record, and facility sizing will be optimized if infiltration is accounted for.

LID is not explicitly defined in the WES SS or WES RR, but WES does require various site assessment and site planning principals to be addressed with applicable new and redevelopment activities in conjunction with receipt of a Service Provider Letter (SPL), which is due prior to submitting for land use or design approval. WES views implementation of LID as a comprehensive approach, and adherence to the flow control performance standard ensures more direct adherence to the goal of mimicking the pre-development hydrologic regime of urban and developing watersheds, and reducing runoff where feasible.

The District plans to clarify the application of LID per the Permit definition. Use of LID will be clarified in updates to the WES SS and/or supporting guidance documents by December 1, 2024.

Table 1 summarizes aspects of the District's LID/GI Strategy as referenced throughout the WES SS and WES RR. Direct language is reflected in *italics*.

Table 1. Summary of the WES LID/GI Strategy	
WES SS Section Reference	**Content/Short Description**
Section 1 Definitions	
Section 1 Definitions	Relevant definitions are listed in both the WES SS and WES RR. The District's current definition for GI and SMF is similar with the NPDES MS4 permit definition of GI in that applies to facilities that may retain and infiltrate stormwater runoff. The WES SS definition of GI and the Permit definition of GI both relate to the ability of the facility to mimic nature (or natural surface hydrological function). • **WES SS definition for Green Infrastructure (GI)**: *a stormwater management facility (SMF) that mitigates stormwater runoff similar to the natural surface hydrological functions through infiltration or evapotranspiration, or that involves stormwater reuse.* • **WES RR definition for Stormwater Management Facility (SMF)**: *Any facility that is designed, constructed, and maintained to collect, treat, filter, retain, or detain surface water runoff during and after a storm event for the purpose of controlling flows and/or reducing pollutants in stormwater runoff. SMFs include, but are not limited to constructed wetlands, rain gardens, water quality swales, stormwater planters, infiltration facilities, and ponds. SMFs can be privately or publicly owned and maintained.*
Section 2 General Information	
Section 2.2 Objectives	Two of the 13 documented objectives of the WES SS relate to LID and the use of GI: • *Minimize stormwater runoff volumes and maximize groundwater recharge through the process of infiltration of runoff into vegetated stormwater facilities.* • *Maintain the pre-development stormwater runoff characteristics to minimize effects on the drainageways, such as erosion and degradation, generally associated with urbanization.*
Section 3 General Stormwater Standards	
Section 3.2 Development Policy	The Service Provider Letter (SPL) is required early in the development process, prior to applying for Land Use/ Design Review and is intended to demonstrate that the proposed development is viable in accordance with the WES SS and WES RR. *…The Service Provider Letter will only be issued once the Applicant has provided sufficient plans, reports, and studies needed for preliminary review by the District. Based on the preliminary review, the District may request additional information prior to issuance of the letter or as part of the forthcoming land use application. Receipt of the Service Provider Letter does not imply that all District requirements have been met or guarantee that land use approval for the development will be granted….* Service Provider Letter submittal requirements are detailed in this table below in conjunction with Appendix A.
Section 6 Stormwater Management Facility Design	
Section 6 Stormwater Management Facility Design	Section 6 of WES' SS state that infiltration is the preferred method to meeting the flow control and water quality standards and provide guidance on site-specific stormwater plans for site assessment activities. Specific references to infiltration and site planning are underlined in the quoted content. *SMFs include a variety of methods to mitigate stormwater runoff and remove pollutants from stormwater, including detention, infiltration/retention, sedimentation, filtration, plant uptake, ion exchange, adsorption, and bacterial decomposition. Infiltration is the preferred method to address stormwater runoff for water quality and flow control requirements. In some cases, using a combination of SMFs may be the most effective strategy for removal of specific pollutants of concern in designated high-risk areas……Site-specific Stormwater Management Plans are most effective when developed early in the site planning process. Strategies for meeting the requirements in these standards depend on several site factors, including soil infiltration capacity, available infrastructure, proposed development plans, and downstream conveyance….*

Table 1. Summary of the WES LID/GI Strategy	
WES SS Section Reference	**Content/Short Description**
6.1.1 Water Quality Performance Standard	In the WES SS, adherence to the water quality performance standard is addressed by requiring treatment of a design storm representing 80% of average annual runoff which is a 1-inch design storm event. SMFs including raingardens, swales and planters are considered effective treatment facilities, by definition of an SMF and as implied by reference to the MEP standard below: *SMFs shall be designed to capture and treat 80 percent of the average annual runoff volume, to the maximum extent practicable with the goal of 80 percent total suspended solids removal. In this context, "maximum extent practicable" means less-effective treatment may not be substituted when it is practicable to provide more effective treatment…..Hydrodynamic separators, when used as a sole method of stormwater treatment, do not meet the "maximum extent practicable" requirement for stormwater treatment effectiveness with regard to these Standards.*
6.1.2 Flow Control Performance Standard	In the WES SS, adherence to the flow control performance standard is addressed by requiring peak flow and flow duration matching for flows that are considered to have the greatest potential for hydromodification impacts (i.e., 42% of the 2-year peak flow to the 10-year peak flow). Full infiltration of the 10-year, 24-hour storm may also be implemented to adhere to the flow control performance standard (as detailed under Section 6.2.1 below). *Flow control facilities shall be designed so that the duration of peak flow rates from Post-Development Conditions shall be less than or equal to the duration of peak flow rates from pre-development conditions for all peak flows between 42 percent of the 2-year peak flow rate up to the 10-year peak flow rate.*
6.2.1 Infiltration	Infiltration is the preferred facility sizing method in the WES SS: *… When a SMF is designed to fully infiltrate the 10-year,24-hour Design Storm, the facility is assumed to meet the flow control performance standard without further analysis…When site conditions do not allow infiltration of the full 10-ytear, 24 hour Design Storm, infiltration can still be incorporated into the flow control facility design to reduce the volume of discharge released from the site….* *When a rain garden, planter, swale, or pond is designed to fully infiltrate the 10-year, 24-hour Design Storm, the facility is also assumed to meet the water quality performance standard, without further analysis.* *SMFs shall be designed with an infiltration component, unless otherwise stipulated by the design professional.* Guidance on use of design infiltration rates and technical infeasibility criteria is also provided in this section to support the application of infiltration into water quality and flow control facilities. Infiltration limitations are required to be identified early in the design process and are assessed prior to receipt of the SPL. Sites without limiting conditions have the potential to use infiltration as part of the stormwater management strategy.
6.3 General Design Requirements	*When a SMF is required, green infrastructure, such as planters, swales, rain gardens, ponds, and other vegetated facilities are the preferred strategy to meet the stormwater management requirements for water quality treatment and flow control. The best way to control the rate and duration of runoff is through the incorporation of infiltration using green infrastructure.*

Table 1. Summary of the WES LID/GI Strategy	
WES SS Section Reference	**Content/Short Description**
6.5 Stormwater Facility Design Requirements	GI facilities are defined in Chapter 6 of the Manual. This section details design and site planning specifications, including minimum infiltration rates, for the following GI SMFs with infiltration incorporated as part of their design: • Vegetated Swales (infiltration and filtration) • Stormwater planters (infiltration and filtration) • Rain Gardens (infiltration and filtration) • Ponds (infiltration and filtration) • Green Roofs (filtration and impervious area reduction) • Pervious pavements (filtration and impervious area reduction)
Section 7 Storm Drainage System Design	
7.2.2 Onsite Storm Drainage System	This section references the District's goals to preserve pre-development hydrologic function through maintenance of existing drainage patterns: *The site shall be planned and designed to generally conform to onsite natural drainage patterns and discharge to natural drainage paths within a drainage area.....*
Appendix A Permitting and Submittal Requirements	
Section 1 Review and Permitting Requirements	Various site planning activities and results are required to be submitted with the Service Provider Letter (SPL), as detailed below: • *Preliminary Stormwater Management Plan and Drainage Report* • *Site assessment and maps* • *Proposed drainage system and stormwater facilities, including infiltration, detention and water quality.* • *Infiltration testing results* • *Other supporting reports and information (as deemed necessary by the District)* • *BMP Sizing Tool calculations* • *WQRA Boundary Verification or Natural Resource Assessment* The BMP Sizing Tool method is one option to size the stormwater facilities to meet the water quality and flow control performance standards. The BMP Sizing Tool User Guide also includes provisions for site planning to optimize the site layout by preserving natural drainage features and minimizing the impervious area footprint through pervious surfaces or LID facilities.

Section 3: Summary and Next Steps

The Districts' LID/ GI Strategy as described above in Table 1 outlines existing design, planning, and engineering strategies implemented by WES that prioritize the use of LID/GI for development and redevelopment projects.

In conjunction with development of this LID/ GI Strategy document, in the fall 2023, the District conducted a comparative analysis on the WES SS for adherence to the NPDES MS4 Permit performance standards as outlined in Schedule A.3.e.iii. As a result of the comparative analysis and other identified editorial needs, WES anticipates minor refinement of their standards by the December 1, 2024 compliance deadline. Such refinement is anticipated to include adjustment of site planning requirements for the SPL submittal; clarification regarding the application and use of referenced tools (i.e., BMP Sizing Tool) to meet water quality and flow control performance standards; and terminology around design versus measured infiltration rates and associated, allowable infiltration rates associated with design of SMFs in accordance with the use of a sizing method other than the BMP Sizing Tool.

Finally, as the WES SS and WES RR apply to NPDES MS4 permit coverage areas beyond WES' service area, additional effort related to ongoing application and implementation of the WES SS will occur with partner agencies including Clackamas DTD and the city of Happy Valley.

References

Clackamas Water Environment Services Stormwater Management Program Plan, Clackamas Water Environment Services, November 2022.

NPDES MS4 Phase I Permit, Oregon Department of Environmental Quality, 2023.

Water Environment Services Rules and Regulations, Clackamas Water Environment Services, April 2023.

Water Environment Services Stormwater Standards, Clackamas Water Environment Services, April 2023.

Appendix D: List of RiverHealth Stewardship Program 2023-24 Grant Awards

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WES' RiverHealth Stewardship Program 2023-24 Grant Awards

#	Project Name	Organization	Amount	Project Summary
1	Mill's End Wetland Restoration	Bob's Red Mill	$26,516	Restore 4.56 acres of Mill's End Wetland located on our property, just south of 3-Creeks, by controlling invasive species and planting natives, to improve habitat and water quality. The project mitigates runoff from our impervious areas by filtering stormwater for treatment. We plan to involve employees in work events and are committed to be stewards of our wetland and continue stormwater work in future years.
2	Clackamas Basin Urban Shade Our Streams Program	Clackamas River Basin Council	$29,811	This project will steward four previously installed projects; two along Sieben Creek and its tributaries, one along a tributary of Rock Creek, and one along the mainstem Clackamas River. CRBC will treat noxious weeds on 12.5 acres of riparian habitat and 1,200 lf of river and streams. Also funds Shade Our Streams Stakeholder Engagement and Outreach program to streamside residents in the Rock and Sieben Creek watersheds. Note that the Clackamas River site work is adjacent to WES' Carli Creek property.
3	Backyard Habitat Certification Program - Clack Co	Columbia Land Trust-Portland Audubon	$18,135	The BHCP turns residents into restoration and clean river volunteers by providing in-person and follow-up education, resources, and recognition for them to manage stormwater on their properties, plant native plants, remove invasive weeds, reduce or eliminate use of pesticides, and steward wildlife. Within WES' service area, 195 residents have enrolled in the program. Approximately 30 new sites will be added.
4	Clackamas County Education & Watershed Stewardship 2024	Friends of Trees	$30,000	Restoration, volunteer engagement, and community stewardship to educate and empower landowners, and engage youth through hands-on environmental education experiences. We will host three volunteer events, two community workshops, and two education days with students at Oregon Trail Elementary, adjacent to WES' Rose Creek property. We will also engage contractors to help with site preparation and maintenance through invasive treatments.
5	Happy Valley Natural Area Restoration	Happy Valley Heights HOA	$29,361	Four Homeowner Associations have partnered to develop a large scale plan to restore our natural areas in Happy Valley. The HOAs will collaborate on riparian and streamside treatments to mitigate impacts of stormwater runoff from increased impervious area. Work will be completed in the Mt Scott Creek, Johnson Creek and Clackamas River basins.
6	Johnson Creek Volunteer Stewardship, Education, and CreekCare	Johnson Creek Watershed Council	$29,490	Project includes stewardship and education. We aim to engage 200 volunteers and 6 community partners in the Johnson Creek Clean-Up, 300 volunteers in Watershed Wide, including at least 25 at the Luther road site, 40 participants in Science in the Park, and to lead Watershed Discovery Day at Kellogg Park. We also plan to increase participation of private landowner riparian restoration in our CreekCare program.
7	Sunnyside School Parking Lot Stormwater Retrofit	Lower Columbia Estuary Partnership	$26,997	Estuary Partnership & N. Clackamas School Dist. will design and build facilities that capture and treat stormwater from Sunnyside Elementary's back parking lot. Project will capture runoff from 9,000 sf of parking lot -and combined with a previous parking lot stormwater retrofit project in the front parking lot- enable the school site to capture and treat almost all parking lot runoff. We also hope to engage students through project design and planting. This provides opportunities for historically underserved and excluded communities to benefit from watershed health education and hands-on opportunities (48% of Sunnyside students are non-white).
8	Streamside Stewards:	North Clackamas	$29,995	Project will expand landowner stewardship of the Streamside Stewards Program restoring vital riparian conditions in the Kellogg-Mt. Scott

WES' RiverHealth Stewardship Program
2023-24 Grant Awards

#	Project Name	Organization	Amount	Project Summary
	Landowner Stewardship	Watersheds Council		Watershed. We will develop a sustainable model for landowner stewardship of 61 restoration sites that meets both ecological outcome objectives and positions the program for expansion in the future when Kellogg Creek is accessible due to the planned removal of Kellogg Dam. We will continue our successful engagement of community members in understanding watershed function in WES's Service Area.
9	NYC Young Women Inclusion Stewardship Program	Northwest Youth Corps	$27,000	The NYC Young Women Inclusion Stewardship program introduces girls ages 15-24 from diverse ethnic and income backgrounds to natural resource-based service. Through activities with Friends of Trees, youth will earn money as they work outdoors, increase their understanding of nature through daily environmental lessons, and earn academic credit depending on their home school. Work will be conducted by members of Girls, Inc. plus their leaders, during the summers. Youth from within WES boundaries will be given priority status during our application process. After each workday, the crews will engage in education lessons, for which they can earn money and academic credit, while taking care of their communities.
10	Riparian Enhancement and eDNA Analysis of Priority Lower Tualatin River Tributaries	Tualatin River Watershed Council	$26,955	Engage stream side landowners in riparian forest restoration, develop partnerships to improve water quality, wildlife habitat and our communities. We will begin new projects, maintain investments on previous projects and conduct monitoring to both clarify priorities and track progress.
11	West Linn Tualatin River Restoration and Watershed Education	West Linn-Wilsonville School District	$16,740	West Linn HS students in the Environmental Science Career & Technical Education program will train Riverside HS students to remove invasive species and plant native vegetation along the Tualatin River behind school property. High School students will lead restoration work with Stafford Primary 5th graders & instruct on watershed health. 5th grade teachers will lead watershed lessons for Stafford Primary students.
12	Salmon Watch	World Salmon Council	$9,000	Provide environmental education that combines classroom and online curriculum, field learning, community service, incorporating innovative learning activities designed to enhance students' critical thinking and problem-solving skills. Program enables students to explore their natural heritage and develop a sense of stewardship and future career exploration through learning about watershed health and the lifecycle and habitat needs of Northwest salmon. Will implement in middle schools in WES' district.
		TOTAL	**$300,000**	

Appendix E: List of Trainings to Ensure Staff Implements the 2022 Shared SWMP Document in accordance with the 2021 NPDES MS4 Permit

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List of 64 Staff Who Received Training to Implement the 2022 Shared SWMP Document in accordance with the 2021 NPDES MS4 Permit

Name	Position	Course Name	Training
Andersen, Jeannie	Permits Technician	Erosion Control & Stormwater Management Summit	City of Salem
Bachman, Andrew	Civil Engineer, Senior	PNCWA Annual Conference	PNCWA - Pacific Northwest Clean Water Assoc
Baker, Adam	Field Operations Technician 1	Vegetated Stormwater Facilities	Clackamas Community College
Bazan, Giovanni	Field Operations Technician 1	Street Maintenance & Collections Systems	APWA - American Public Works Association
		Vegetated Stormwater Facilities	Clackamas Community College
Bennington, James	Field Operations Technician 1	Street Maintenance & Collections Systems	APWA - American Public Works Association
		Vegetated Stormwater Facilities	Clackamas Community College
Bertram, Erik	Development Review Specialist	Aquatic Weed Management	Oregon State University
		Erosion Control & Stormwater Management Summit	City of Salem
		Organic Systems	Oregon State University
		UERC Urban Ecology & Conservation Symposium	Urban Ecosystem Research Consortium of Portland/Vancouver
Bodner, Jeremy	Field Operations Technician 1	Street Maintenance & Collections Systems	APWA - American Public Works Association
Bruce Brown	Development Review Inspector	Mid-Willamette Erosion Control and Stormwater Management Summit	Mid-Willamette Erosion Control and Stormwater Management Summit
		Certified Erosion and Sediment Control Lead (CESCL) Re-Certification Training	Certified Erosion and Sediment Control Lead (CESCL) Re-Certification Training
Bryson Hellman	Transportation Maintenance Specialist	Mid-Willamette Erosion Control and Stormwater Management Summit	Mid-Willamette Erosion Control and Stormwater Management Summit
Cameron Aronson	Transportation Maintenance Specialist	Mid-Willamette Erosion Control and Stormwater Management Summit	Mid-Willamette Erosion Control and Stormwater Management Summit
Colton, Andrew	Field Operations Technician 1	Vegetated Stormwater Facilities	Clackamas Community College
Contreras Jr, Manuel	Pol, Perf & Research Analyst	ACWA Stormwater Summit	ACWA - Assoc of Clean Water Agencies
		October Forum - One Water Summit	Oregon City Business Alliance
		PNCWA Annual Conference	PNCWA - Pacific Northwest Clean Water Assoc
Dakota Rushing	Transportation Maintenance Specialist	Mid-Willamette Erosion Control and Stormwater Management Summit	Mid-Willamette Erosion Control and Stormwater Management Summit
David Holmes	Transportation Maintenance Specialist	APWA Street Maintenance & Collection Systems School	APWA Street Maintenance & Collection Systems School
Degliantoni, Nicholas	Technical Services Specialist	Erosion Control & Stormwater Management Summit	City of Salem
		Certified Erosion and Sediment Control Lead (CESCL) Re-Certification Training	Eco-3
Desiderati, Christopher	Environmental Services Supervisor	ACWA Annual Conference	ORACWA - Oregon Assoc of Clean Water Agencies
Devin Patterson	CIP Project Manager & Stormwater Reporting Coordinator	Association of Clean Water Agencies (ACWA) Summit	Association of Clean Water Agencies (ACWA) Summit

List of 64 Staff Who Received Training to Implement the 2022 Shared SWMP Document in accordance with the 2021 NPDES MS4 Permit

Name	Position	Course Name	Training
		Mid-Willamette Erosion Control and Stormwater Management Summit	Mid-Willamette Erosion Control and Stormwater Management Summit
Dillon Hagaman	Development Review Inspector	Mid-Willamette Erosion Control and Stormwater Management Summit	Mid-Willamette Erosion Control and Stormwater Management Summit
		Certified Erosion and Sediment Control Lead (CESCL) Re-Certification Training	Certified Erosion and Sediment Control Lead (CESCL) Re-Certification Training
Eric Fine	CIP Inspector	Fundamentals of Erosion and Sediment Control Workshop	Fundamentals of Erosion and Sediment Control Workshop
Estrada, Elena	Risk & Loss Control Analyst	Street Maintenance & Collections Systems	APWA - American Public Works Association
Fredinburg, Kaydin	Field Operations Tech Trainee	Street Maintenance & Collections Systems	APWA - American Public Works Association
		Vegetated Stormwater Facilities	Clackamas Community College
Gates, Akiko	Administrative Specialist 1	Johnson Creek Science Symposium	Johnson Creek Watershed Council (JCWC)
		UERC Urban Ecology & Conservation Symposium	Urban Ecosystem Research Consortium of Portland/Vancouver
Geist, Gregory	Director	ACWA Annual Conference	ORACWA - Oregon Assoc of Clean Water Agencies
		PNCWA Annual Conference	PNCWA - Pacific Northwest Clean Water Assoc
Hoffman, Robert	Field Operations Technician 1	Street Maintenance & Collections Systems	APWA - American Public Works Association
		Vegetated Stormwater Facilities	Clackamas Community College
Hoshovsky, Galen	Technical Services Specialist	ACWA Stormwater Summit	ACWA - Assoc of Clean Water Agencies
		Erosion Control & Stormwater Management Summit	City of Salem
		Johnson Creek Science Symposium	Johnson Creek Watershed Council (JCWC)
		UERC Urban Ecology & Conservation Symposium	Urban Ecosystem Research Consortium of Portland/Vancouver
Jason Gomez	Development Review Inspector	Mid-Willamette Erosion Control and Stormwater Management Summit	Mid-Willamette Erosion Control and Stormwater Management Summit
Johanson, Leah	Civil Engineer, Senior	ACWA Stormwater Summit	ACWA - Assoc of Clean Water Agencies
		Sustainable Stormwater Symposium	ASCE - American Society of Civil Engineers
Johnny Gish	Development Review (Plan Review)	Fundamentals of Erosion and Sediment Control Workshop	Fundamentals of Erosion and Sediment Control Workshop
Kara Ballinger	Transportation Maintenance Specialist	APWA Street Maintenance & Collection Systems School	APWA Street Maintenance & Collection Systems School
Kathleen Doherty	Transportation Maintenance Specialist	Mid-Willamette Erosion Control and Stormwater Management Summit	Mid-Willamette Erosion Control and Stormwater Management Summit
Kay, Timothy	Field Operations Coordinator	Street Maintenance & Collections Systems	APWA - American Public Works Association
Kelly Peterson	Building Inspector	Erosion Control Class	Erosion Control Class
Kevin Morris	Bridge Maintenance Supervisor	DEQ's Hazardous Waste RCRA Basic Training	DEQ's Hazardous Waste RCRA Basic Training
Koellermeier, Zachary	Technical Services Coord	Street Maintenance & Collections Systems	APWA - American Public Works Association
Kurt Snowley	Transportation Maintenance Specialist	Mid-Willamette Erosion Control and Stormwater Management Summit	Mid-Willamette Erosion Control and Stormwater Management Summit

List of 64 Staff Who Received Training to Implement the 2022 Shared SWMP Document in accordance with the 2021 NPDES MS4 Permit

Name	Position	Course Name	Training
Kyle Kivett	Transportation Maintenance Specialist	Mid-Willamette Erosion Control and Stormwater Management Summit	Mid-Willamette Erosion Control and Stormwater Management Summit
Laura Garrett	Transportation Maintenance Specialist	APWA Street Maintenance & Collection Systems School	APWA Street Maintenance & Collection Systems School
Livingston, Robert	Technical Services Specialist	ACWA Stormwater Summit	ACWA - Assoc of Clean Water Agencies
		Erosion Control & Stormwater Management Summit	City of Salem
		Johnson Creek Science Symposium	Johnson Creek Watershed Council (JCWC)
		Certified Erosion and Sediment Control Lead (CESCL) Re-Certification Training	CWT, LLC
Loggan, Todd	PGA	PNCWA Communication Camp	PNCWA - Pacific Northwest Clean Water Assoc
Lundgren, Otis	Field Operations Technician 2	Street Maintenance & Collections Systems	APWA - American Public Works Association
Mejia, Justin	Field Operations Tech Trainee	Vegetated Stormwater Facilities	Clackamas Community College
Morris, Alexa	Policy, Perf & Research An, Sr	ACWA Stormwater Summit	ACWA - Assoc of Clean Water Agencies
Nathan Loffler	Transportation Maintenance Specialist	APWA Street Maintenance & Collection Systems School	APWA Street Maintenance & Collection Systems School
Ogbeide, Haakon	Civil Engineer, Senior	PNCWA Annual Conference	PNCWA - Pacific Northwest Clean Water Assoc
Parini-Runge, Shelly	Policy Analyst, Senior	ACWA Annual Conference	ORACWA - Oregon Assoc of Clean Water Agencies
Ricardo Sandoval	Transportation Maintenance Supervisor	APWA Street Maintenance & Collection Systems School	APWA Street Maintenance & Collection Systems School
Rice, Mike	Civil Engineer, Senior	PNCWA Annual Conference	PNCWA - Pacific Northwest Clean Water Assoc
Rice, Steven	Civil Engineering Supervisor	ACWA Annual Conference	ORACWA - Oregon Assoc of Clean Water Agencies
Rinner, Jessica	Civil Engineering Supervisor	PNCWA Annual Conference	PNCWA - Pacific Northwest Clean Water Assoc
Romaine, Terrance	WES Tech Division Manager	ACWA Annual Conference	ORACWA - Oregon Assoc of Clean Water Agencies
Ronald Dethloff	Transportation Maintenance Specialist	Mid-Willamette Erosion Control and Stormwater Management Summit	Mid-Willamette Erosion Control and Stormwater Management Summit
Rotrock, Kevin	Field Operations Technician 2	Street Maintenance & Collections Systems	APWA - American Public Works Association
Sandra Sather	Transportation Maintenance Specialist	APWA Street Maintenance & Collection Systems School	APWA Street Maintenance & Collection Systems School
Seaver, Nathan	Civil Engineer, Associate	PNCWA Annual Conference	PNCWA - Pacific Northwest Clean Water Assoc
Shaloum, Gail	Technical Services Coord	ACWA Stormwater Summit	ACWA - Assoc of Clean Water Agencies
		Johnson Creek Science Symposium	Johnson Creek Watershed Council (JCWC)
		October Forum - One Water Summit	Oregon City Business Aliance
		UERC Urban Ecology & Conservation Symposium	Urban Ecosystem Research Consortium of Portland/Vancouver

List of 64 Staff Who Received Training to Implement the 2022 Shared SWMP Document in accordance with the 2021 NPDES MS4 Permit

Name	Position	Course Name	Training
Skinner, Robert	Field Operations Technician 2	Street Maintenance & Collections Systems	APWA - American Public Works Association
Stallard, Jeffery	Capital Program Manager	PNCWA Annual Conference	PNCWA - Pacific Northwest Clean Water Assoc
Sundstrom, Daniel	Field Operations Technician 1	Street Maintenance & Collections Systems	APWA - American Public Works Association
		Vegetated Stormwater Facilities	Clackamas Community College
Swanson, Andrew	Water Quality Analyst	ACWA Stormwater Summit	ACWA - Assoc of Clean Water Agencies
		Johnson Creek Science Symposium	Johnson Creek Watershed Council (JCWC)
Terry (Shane) Abbott	Transportation Maintenance Manager	APWA Street Maintenance & Collection Systems School	APWA Street Maintenance & Collection Systems School
Tyrell Abbett	Transportation Maintenance Specialist	Mid-Willamette Erosion Control and Stormwater Management Summit	Mid-Willamette Erosion Control and Stormwater Management Summit
Wayne Kumpf	Transportation Maintenance Specialist	APWA Street Maintenance & Collection Systems School	APWA Street Maintenance & Collection Systems School
Wierenga, Ronald	Assistant Director	ACWA Annual Conference	ORACWA - Oregon Assoc of Clean Water Agencies
Oleson, Mike	CIP Inspector	ODOT Environmental Construction Inspector course	ODOT Environmental Construction Inspector course

Appendix F: Snow Removal Procedures Map

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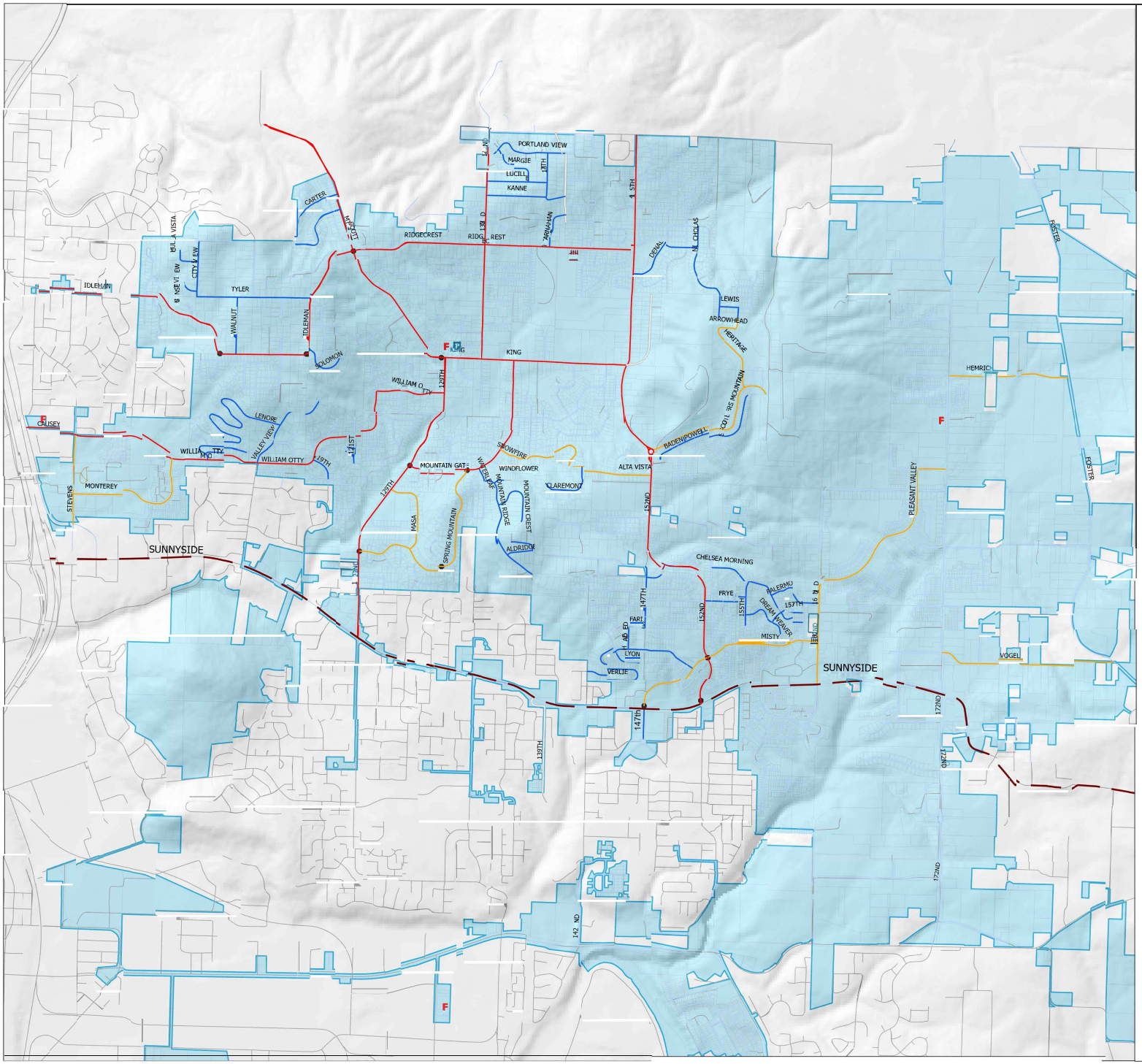

HAPPY VALLEY, OR
EST. 1965

City of Happy Valley Snow Removal & Sanding Procedures

- Priority 1 Arterial Streets 13.6 Miles
- Priority 2 Major/Minor Collectors 7.8 Miles
- Priority 3 Local/Residential 12.25 Miles

Priority based on accident data

City Elevations

1097 ft.	Mt. Scott
503 ft.	CPC
937 ft.	Scout Camp
840 ft.	Ridgecrest at Idleman
581 ft.	132nd at Clatsop
901 ft.	Idleman at Walnut
617 ft.	Deerfield

N

0 0.33 0.65 1.3 Miles

Source: Data from Clackamas County GIS and Metro data (2022)

 Last Update: 1/11/2024

Document Path: G:\Maps\Maps For Public Works\Snow Removal\2023\Snow Removal Map 2022 Internal.aprx