

# WASHINGTON STATE MUNICIPAL STORMWATER CONFERENCE



Funding provided by

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# WELCOME BACK IN PERSON!

The Washington Stormwater Center and our partners—the City of Wenatchee, the Washington State Department of Ecology, and our Statewide MuniCon Planning Team—are excited to bring you the fifth Washington Statewide Municipal Stormwater Conference—April 25 & 26, 2023.

This year our unique two-day experience will be brought to you both in person at the City of Wenatchee Convention Center and in a real-time virtual platform for those unable to make the trip to Wenatchee. Virtual attendees will have access to all of the presentations on Wednesday (April 26) on Zoom.

As with past MuniCons, our event brings together amazing stormwater professionals from across the state to share their experience and knowledge in all things stormwater. This conference is packed with workshops and presentations about the latest stormwater research, studies, designs, training, and lessons learned managing stormwater in Washington State from municipal permittees, consultants, agencies, and organizations. Exhibitors will also be present to share the latest advances in technology.

The two-day event provides both training workshops with interactive components and informational presentations. The conference kicks off with seven fantastic workshops to choose from including Source Control Inspections, Spill Response, SMAP, Inspecting and Maintaining Private BMPs, Education and Outreach, Managing Stormwater with Drones, and a BMP tour. Day two features 44 different presentations across four tracks covering topics including Education & Outreach; Research & Multidisciplinary; Design & Planning; Regulation & Planning; and IDDE/Source Control/ Operations and Maintenance.

The MuniCon schedule also has built-in opportunities between workshops and presentation sessions to network. This is a great opportunity to reconnect with colleagues from across Washington, nerd out on your favorite stormwater area of interest, meet new people, and converse with the experts. And our lunch keynote on Wednesday will discuss Permaculture Solutions for Stormwater Planning.

Finally, I want to acknowledge the people who make this conference possible. The Washington State Department of Ecology (our funder), City of Wenatchee (host), planning team, WSC staff, presenters, keynote speaker, sponsors, exhibitors, moderators, and volunteers—thank you all. And to all of our attendees—**welcome to Wenatchee!** 

Laurie Larson-Pugh Washington Stormwater Center Permit Assistance Programs & MuniCon Manager

# **KEYNOTE** WEDNESDAY APRIL 26

# Andrew Millison

Andrew Millison is a Senior Instructor II in the Department of Horticulture at Oregon State University (OSU) where he founded OSU Permaculture Design program in 2009. Collaborating with experts at OSU, Andrew developed an online permaculture education program with niche offerings that has evolved into a worldwide program that has served thousands of students throughout the globe. The primary focus of Andrew's 27 year career in Permaculture has been water management systems. Andrew has travelled the world filming and analyzing innovative water and land restoration projects as a documentary videographer, creating educational content for his online courses as well as for the general public on his popular YouTube channel.





# WORKSHOPS TUESDAY APRIL 25





7:00 - 7:45 AM	Registration & Refreshments					
7:45 - 8:00 AM	Fuji 1& 2	Welcome and Abbey Stockwell, Washington State D Fuji 3&4	Orchard Exhibit Hall Gala 3&4			
	<b>TRACK 1</b> EDUCATION & OUTREACH; RESEARCH, MULTIDISCIPLINARY	<b>TRACK 2</b> DESIGN & PLANNING	<b>TRACK 3</b> REGULATION & PERMITTING	<b>TRACK 4</b> IDDE; SOURCE CONTROL, O & M		
8:00- 8:30 AM	Adopt-A-Storm Drain: A Multijurisdictional Stormwater Education Campaign Sarah Norberg, City of Tacoma; Tally Greulich, City of Redmond	Stormwater Treatment & Infiltration Where You Can't Duane Studer, City of Spokane	Retrofitting and Trees, Department of Ecology Stormwater Grants David Mora, Department of Ecology	Mobile Businesses and Stormwater Source Control Alison Schweitzer, King County; James Packman, Aspect Consulting		
8:35- 9:05 AM	<b>Right-Sized Public Outreach</b> Julie Brandt, Parametrix	City of Spokane: Cochran Basin Stormwater Mitigation Mark Papich, City of Spokane	2022 Lacey Stormwater Design Manual: Local Enhancements Julianne Chechanover, Herrera	<b>GIS-based Tools for</b> <b>Prioritizing Pipe Repairs</b> Meiring Borcherds, City of Mukilteo; Erin Nelson, Altaterra Consulting		
9:10- 9:40 AM	Translation Services in the Field and Beyond Erik Lust & Heidi Zarghami, Seattle Public Utilities	A Modeling Approach to Cost-effective Stormwater Planning Stephanie Truitt & Carly Greyell, King County	Stormwater Self-Inspection Program: What Was Learned Nels Rasmussen, City of Arlington	Planning for and Implementing a Phase II Source Control Program in Western Washington Meiring Borcherds, City of Mukilteo; James Packman, Aspect Consulting		
9:40 - 9:55 AM	Refreshments					
9:55- 10:25 AM	SPU RV Wastewater Program and Data Driven Interventions Chris Wilkerson, Seattle Public Utilities	Lincoln Street Stormwater Projects: Creative Solutionism Trey George, City of Spokane	Updates to TAPE and Transition to STEPP Carla Milesi, UW/WSC; Doug Howie, Department of Ecology	Resources for Implementing Source Control Inspection Programs Rebecca Dugopolski & Mindy Fohn, Herrera		
10:30- 11:00 AM	Follow the Water: Building an Interstate Public Awareness Campaign Eric Lambert, Clark County	Wenatchee 9th Street Stormwater Retrofit: Meeting Community Needs through Stormwater Planning Josh Van Wie, Osborn Consulting	We Can Do More: Finding and Addressing Sources of PCBs in Building Material Myles Perkins, Department of Ecology	Real-Time Maintenance Sensing in Stormwater Control Measures John Pedrick, Contech Engineering Solutions		
11:05 AM- 12:05 PM	Street Sweeping: Wash-off + Blow-off Pollutant Reductions Shelly Basketfield, Seattle Public Utilities	Building Toward Collective Regional Action on Stormwater John Brosnan, King County	Washington Stormwater Benchmarking and Rate Structure Survey Results Tage Aaker & John Ghilarducci, FCS GROUP	Pipe Rehabilitation: How to Replace or Rehab 1,000,000 Feet of Pipes Le Nguyen, WSDOT		



	Fuji 1&2	Fuji 3&4	Gala 1& 2	Gala 3&4		
	<b>TRACK 1</b> EDUCATION & OUTREACH; RESEARCH, MULTIDISCIPLINARY	<b>TRACK 2</b> DESIGN & PLANNING	TRACK 3 REGULATION & PERMITTING	<b>TRACK 4</b> IDDE; SOURCE CONTROL, O & M		
12:05- 1:00 PM	Lunch			Orchard Exhibit Hall		
	KEYNOTE   Permaculture Solutions for Stormwater Planning Andrew Millison, Oregon State University Permaculture Design Program			Orchard Exhibit Hall		
1:00- 1:30 PM	Study Design for Swales: Fun with Swales!!! Chris Gustafson & Kevin Brandhorst, WSDOT	Addressing Escalating Project Costs Panel Discussion Kaela Mansfield, Evergreen StormH2O;	2024 Permit Reissuance	City of Wenatchee Asset Management Use to Track Inspections and IDDE Kelsey Grover, City of Wenatchee		
1:35- 2:05 PM	Vegetated Filter Strip and Modified Vegetated Filter Strip BMP Effectiveness Evaluation Chris Gustafson & Brad Archbold, WSDOT	Jon Morrow, City of Ellensburg; Mark Papich, City of Spokane; Tony Bush & Keith Kusler, WSDOT; Adam Benton, City of Marysville; Shilo Sprouse, Department of Ecology	Abbey Stockwell, Amy Waterman, Doug Howie & Brandi Lubliner, Department of Ecology	Asset Management Success for Operation and Maintenance Programs Cory Olson, Snohomish County		
2:05- 2:20 PM	Refreshments					
2:20- 2:50 PM	Performance of a Non-Vegetated Filtration Swale BMP Taylor Hoffman-Ballard, Evergreen StormH2O	Piloting Innovative Stormwater Treatment on Waterfront Properties Jane Dewell, Port of Seattle	BMP Owner Awareness Effectiveness Study Kelsey Grover, City of Wenatchee	Using ArcGIS FieldMaps to Conduct Catchbasin Inspections Dave Kangiser, City of Tumwater		
2:55- 3:25 PM	Chemical Properties, Fate, and Treatment of 6PPD-Quinone Ximin Hu, University of Washington	The Park Place and POST Media Story Chris Webb & Dylan Ahearn, Herrera	Private Stormwater Infrastructure & Biodiversity in Washington Jim Leamy, Thurston County	City of Tacoma: Stormwater Inspections Kevin Brennan, City of Tacoma		
3:30- 4:00 PM	6PPD Panel Discussion Jana Crawford, Jacobs Engineering Group (moderator); Jen McIntyre, WSU: Aimee Navickis-Brasch	Stormwater Parks Jenny Gaus, City of Kirkland; Michelle Perdue, Kitsap County	Coordinating a New EPA Municipal Stormwater Permit Merita Trohimovich, City of Tacoma	Managing a Municipal Stormwater Inspection Program through ArcGIS Online Amber Shows, GHD		
(L) 5 MIN 4:05 - 4:35 PM	Evergreen StormH2O; Rhea Smith, Department of Ecology; Melanie Vance, WSDOT		MS4 Problems Solved with Drywells Kathryn Thomason, Oldcastle	Management Strategies for Beavers in an MS4 Dave Kangiser, City of Tumwater		
4:35 PM	Conference Concludes					

# WORKSHOPS TUESDAY APRIL 25

### TRACK W1 | WORKSHOP

1:00-5:15 PM

WORKSHOPS

### Source Control Inspection Program Training

Rebecca Dugopolski & Mindy Fohn, Herrera

This workshop is for Phase II jurisdictional staff conducting the source control business Inspections. Objectives of this training include discussing key topics in the NPDES Phase II permit; providing an overview of the Source Control Inspection Program Guidance Manual; highlighting critical items related to developing an inspection program and conducting inspections; providing peer-to-peer learning opportunities; and practicing using inspection forms, asking questions, and identifying potential issues. Target audiences include municipal source control inspectors, municipal stormwater program managers, and consultants hired by a jurisdiction to support source control inspections.

\*This training is for municipal inspection staff that have not attended the training sessions in October 2022. The training is open to eastern Washington permittees.

#### TRACK W2 | WORKSHOPS

1:00 - 3:00 PM

#### Spill Response Training for Field Staff

Ryean-Marie Tuomisto, City of Kirkland; Tanya MacFarlane, City of Bellevue; Scott McQuary, City of Redmond; Andy Quast, Department of Ecology

In 2022, three adjacent Puget Sound cities held their first joint training for municipal field staff who, as part of their normal job responsibilities, routinely encounter spills or illicit discharges, and assist in response or cleanup actions. The training was focused on safety awareness, the importance of immediate reporting and response to prevent downstream impacts, jurisdictional and interjurisdiction team coordination and field work, and demonstrated a variety of spill response materials and equipment on hard and soft surfaces. This workshop may help program managers create a training program for field staff, help field staff learn practical field response steps, and promote the benefits of inter-departmental and inter jurisdictional communication and cooperation.

Get an overview of how three cities cooperatively developed and delivered training on spill response for field staff, including:

- Safety
- Reporting & Response
- Multi-Departmental/Jurisdictional Cooperation & Communication
- Response Roles (city utility staff response vs fire dept response vs ECY spill response)
- · Demo response materials and equipment

3:15 - 5:15 PM

SMAP Development Round Table, Information Gained, Lessons Learned & Next Steps

Moderated by Don McQuilliams, City of Bellevue

This workshop will focus on attendees sharing their SMAP experiences, lessons learned, and perhaps recommendations for the 2024 permit.

- Receiving Water Assessment, Development of Watersheds & descriptions including stormwater influences
- How did you develop the classifications. What did you learn from this?
- General discussion about the process was it of value, where do you see your municipality going with this in the future
- To what extent, if any, did uncertainty with potential obligations in the reissued permit factor into development
  of the action actions?

Fuji 1 & 2

Fuji 3&4

### TRACK W3 | WORKSHOP

#### 1:00 - 5:15 PM

# Guidance Manual for Inspecting and Maintaining Privately Owned BMPs

Francesca White & Taylor Hoffman-Ballard, Evergreen StormH2O

This workshop will provide an overview of the *Stormwater Management Guidance Manual: Strategies for Privately Owned Best Management Practices* that was developed based on the outcomes of the *BMP Inspection and Maintenance Responsibilities: Privately Owned Facilities Effectiveness Study.* The study indicated Permittees use a combination of inspection and maintenance strategies for privately owned BMPs, but there was no clear pattern that identified the most effective strategies. Per study recommendations, Yakima County received an Ecology GROSS grant to develop a manual providing customizable guidance to municipalities statewide on inspection and maintenance of BMPs on private property. The workshop will walk through each chapter providing a summary of the content, guidance for using the manual, approaches EWA and WWA Phase II Permittees are implementing, and time for attendees to discuss strategies for improving their maintenance, inspection, and enforcement programs for privately owned BMPs. The workshop will also include:

- · Case studies presented by EWA and WWA permittees about their experiences.
- · Overview of the manual tools (calculators and templates) with example problems to practice the tools.
- · Inspection demonstration of Pybus Pond (approx. 5-10 minute walk from the Wenatchee Convention Center).

# TRACK W4 I WORKSHOP

Gala 3&4

Gala 1&2

#### 1:00-5:15 PM

#### Education and Outreach: Multicultural Marketing, Communication & Project Review

Martha Sanchez & Mario Zavaleta, Latino NW Communications; Tere Carral, Bridge Latino; Mary Rabourn, King County

This workshop has its foundation in key priorities in public service: Environmental Justice, the Municipal NPDES Permit and customer-centered service. Conversation and questions welcome!

#### 1:00 - 1:30 pm

· Review of participants' projects and discussion of common issues.

### 1:30 - 3:00 pm (about 20-30 min.)

- Spanish language media (Martha Sanchez & Mario Zavaleta, Latino NW Communications)
- Audience research and strategy (Tere Carral, Bridge Latino)
- Example of designing project for LatinX audiences, including ethnic media practices (Mary Rabourn, King County)

#### 3:00 - 4:00 pm

• Brainstorming session for participants' projects.

# TRACK W5 | WORKSHOPS

# **Golden Delicious West**

# 1:00 - 3:00 PM

### Managing Stormwater with Drones

Zach Holt and Darren Podraza, City of Port Orchard

Tired of walking large developments over and over again for inspections? Wanting to streamline your inspection processes? Perhaps creating a drone, or Unmanned Aerial Vehicle (UAV) program could help. Zack Holt and Darren Podraza present a talk on how the City of Port Orchard Public Works is utilizing UAV's to integrate inspection and permit compliance into their stormwater management program. Darren and Zack describe the process of setting up a program, procuring the equipment needed, and certification for operating UAV's. After a short classroom session, they will give a demonstration of their equipment outside for the audience, along with an informal Q&A session. Upon completion of the session attendees will better understand:

- FAA licensing requirements to operate UAV's
- Tips on how to develop a municipal UAV policy
- How to check airspace requirements, file a flight plan and get clearance to fly
- Basics of flight and operation of a UAV

# **Outside Orchard Exhibit Hall**

# workshops W

# TRACK W5 | WORKSHOPS

3:15 - 5:15 PM

City of Wenatchee BMP Tour

City of Wenatchee Staff

The BMP Tour features approximately a two-mile walk along Wenatchee's *Apple Capital Loop Trail*. The tour will begin and end at the Wenatchee Convention Center and feature stormwater infrastructure along the City's Waterfront. The Tour will be led by City of Wenatchee Staff who will share installation along with maintenance lessons learned.

Tour participants will meet outside the Orchard Exhibit Hall and divide into groups of 12-15 to accommodate a variety of walking paces.



# TRACK 1 | EDUCATION & OUTREACH

### Fuji 1&2

TRACK

Fuji 1&2

8:00 - 8:30 AM

### Adopt-A-Storm Drain: A Multijurisdictional Stormwater Education Campaign

Sarah Norberg, City of Tacoma; Tally Greulich, City of Redmond

**SARAH NORBERG** Sarah is an Environmental Specialist in the City of Tacoma's Science and Engineering, Environmental Programs Group. She is responsible for implementing the stewardship and behavior change portions of education and outreach section of the NPDES Phase 1 municipal stormwater permit as well as additional components of the Stormwater Management Work Plan (SWMP). Sarah was born and raised in Tacoma and enjoys climbing and working on house projects in her spare time.

TALLY GREULICH Tally has worked for the City of Redmond for seven years, where she administers the Pollution Prevention Assistance program at local businesses. She also implements the stormwater education and outreach portion of the NPDES permit, including the regional dumpster outreach campaign and Adopt-a-Drain. She is a native Washingtonian who loves hiking in our beautiful forests.

As MS4 Permittees approach the start of a new permit cycle, they will be faced with updating or implementing new behavior change, and stewardship programs as required by NPDES permits. The Adopt-A-Storm Drain (AAD) program is a stewardship and behavior change opportunity that encourages community members to take regular and sustained actions to prevent flooding and reduce stormwater runoff pollution through the simple action of clearing their storm drain twice a month. This presentation will provide an overview of the AAD program, challenges and success stories experienced by currently enrolled municipalities, and information on how to participate.

#### 8:35 - 9:05 AM Right-Sized Public Outreach

Julie Brandt, Parametrix

JULIE BRANDT Julie is a senior water resources engineer at Parametrix specializing in NPDES compliance; municipal and industrial stormwater management; watershed planning; and hydrologic and hydraulic modeling. Julie has a certificate in LID from WA Ecology and is a Certified Erosion and Sediment Control Lead (CESCL). Prior to joining Parametrix, Julie was an environmental inspector and enforcement agent for the U.S. EPA.

What is right-sized public outreach for stormwater management projects? Join us for an overview of Stormwater Management Action Planning (SMAP) public outreach stories from over a dozen different Washington municipalities; where our goal is for you to learn strategies to efficiently reach the public for any of your stormwater management outreach campaigns. This presentation will highlight online tools like GIS story maps and equity dashboards, why timing matters, how to increase inclusion in your outreach, and lessons learned about pitfalls (both logistical and legal) to watch out for. We'll show you how to showcase data you already have and access additional equity information that is readily available; and specific examples from the Cities of Renton, Des Moines, Bothell, and Camas will be used.

#### 9:10 - 9:40 AM Translation Services in the Field and Beyond

Erik Lust & Heidi Zarghami, Seattle Public Utilities

ERIK LUST Erik Lust is a Source Control Pollution Prevention Stormwater Manager for Seattle Public Utilities. The job includes managing a team of 11 Environmental Compliance staff along with overseeing a team of Spill Responders. My curriculum vitae includes coming to Seattle from Arcata California where I was Deputy Director of Public Works and graduated from Humboldt State University with a Biology degree in Aquaculture/Mariculture.

HEIDI ZARGHAMI Heidi Zarghami is an SPU Environmental Compliance Inspector and Emergency Spill Responder for the City of Seattle. As part of her duties she interacts with business owners and residents across the city during stormwater investigations and enforcement procedures.

It can be hard to predict when translation services will be needed when working in the field conducting business inspections or other related stormwater investigations. Set your team up to provide equitable education and outreach services to your city residents with this introductory course to in-field translation services. This presentation will cover how to choose a translation service, establish supportive translation resources, and provide training for field staff.



### SPU RV Wastewater Program and Data Driven Interventions

Chris Wilkerson, Seattle Public Utilities

CHRIS WILKERSON Chris Wilkerson has dedicated his career toward improving health outcomes through proper environmental stewardship. He has earned a bachelor's degree from Southern Illinois University School of Agriculture and a master's degree from the University of Washington School of Environmental Health Technology where he focused on the impacts from environmental contamination on disease. Professionally he has served the State of Washington as an oil spill responder and educated businesses on stormwater best management practices with Seattle Public Utilities. More recently, Mr. Wilkerson has led the development of Seattle Public Utilities RV Wastewater Program which works to mitigate the disease risk and environmental impact from vehicle-based homelessness.

Seattle Public Utilities (SPU) RV Wastewater Program was initiated in 2020 as a response to an increasing frequency and severity of spills of sewage from recreational vehicles. Over the last three years, SPU has created a successful program which proactively collects wastewater from unhoused vehicle residents to prevent spills and improve water quality and public health. This presentation will focus on how we incorporate data collection into our process and how that information may be utilized to create community consensus to support interventions related to mitigation of the harms associated with homelessness.

#### 10:30 - 11:00 AM

9:55 - 10:25 AM

# Follow the Water: Building an Interstate Public Awareness Campaign

Eric Lambert, Clark County

**ERIC LAMBERT** Eric Lambert is an outreach specialist for Clark County Public Works focused on NPDES education and outreach requirements. He supports regional collaboration to meet these requirements by leading Stormwater Partners of Southwest Washington and sitting on the steering committee for the Clean Rivers Coalition.

In 2020, Clark County joined the Clean Rivers Coalition (CRC), a statewide Oregon-based group of municipalities, agencies and non-profits working on water awareness and behavior change topics. Seeking to give a 'voice to water', in 2022 the CRC launched the public awareness campaign Follow the Water. This presentation will discuss how the CRC's values-based and regional approach has helped Southwest Washington overcome challenges accessing mass media and developing high quality content essential for successful public awareness campaigns.

### 11:05 AM - 12:05 PM Street Sweeping: Wash-off + Blow-off Pollutant Reductions

Shelly Basketfield, Seattle Public Utilities

SHELLY BASKETFIELD Shelly Basketfield, P.E. manages Seattle Public Utilities' street sweeping for water quality program, a partnership with Seattle Department of Transportation. She brings an operations-based continuous improvement approach gained through public and private sector experience as a practicing professional engineer.

Measuring street sweeping effectiveness in stormwater is challenging. A trend towards performance-based monitoring, measuring both wash- and blow-off load reductions, provides a practical alternative. We collected sweeping samples (n=256, n=4+ for 6PPD-q), representing whole environment reductions (water/sediment, land, and air), and applied a wash-off model to estimate direct wash-off reductions. FINDINGS: (1) Preliminary 6PPD-q results show promise; (2) Direct wash-off load reductions likely under-represent sweeping performance by four to eight times; and (3) Seattle's whole environment dry season average pickup rates of 7.3, 49, and 20 gm/curb-mile for copper, phosphorus, and zinc, respectively may be applicable to urban eastern Washington.

### 1:00 - 1:30 PM Study Design for Swales: Fun with Swales!!!

Chris Gustafson & Kevin Brandhorst, WSDOT

CHRIS GUSTAFSON B.S. in Geology from the University of Montana. 15 years working in stormwater. 8 years in stormwater asset mapping and IDDE prior to moving into stormwater water quality monitoring for the last 7.

**KEVIN BRANDHORST** B.S. in Environmental Science from the Ohio State University. Worked in the water quality field performing data collection and laboratory analysis for 10 years in Florida prior to joining the WSDOT Stormwater Monitoring and Research Program.

For the past decade, WSDOT has been designing water quality studies at various Bioswales. These studies have been plagued with difficulties and provided many lessons learned. WSDOT has now used these lessons to create a study methodology and site selection strategy that can be applied to bioswales and potentially other ephemeral stormwater BMPs. The unique hydraulics of bioswales caused challenges in collecting scientifically sound, single storm event, composite samples. The slow-flowing, flat profiles of swales pushed the capabilities of volume and flow measuring technologies (WSDOT utilized flumes over weirs to minimize back watering). Using past failures, WSDOT was able to develop a site selection process and sampling methodology that ensures accurate hydrological data collection is possible at any study site.

### 1:35-2:05 PM Vegetated Filter Strip and Modified Vegetated Filter Strip BMP Effectiveness Evaluation

Chris Gustafson & Brad Archbold, WSDOT

CHRIS GUSTAFSON B.S. in Geology from the University of Montana. 15 years working in stormwater. 8 years in stormwater asset mapping and IDDE prior to moving into stormwater water quality monitoring for the last 7.

**BRAD ARCHBOLD** Masters in Environmental Studies, The Evergreen State College. 13 years in Stormwater Monitoring. Currently the Stormwater Monitoring Program Data Management and Reporting Lead.

The Washington State Department of Transportation (WSDOT) completed an effectiveness evaluation of vegetated filter strips (VFS) and modified vegetated filter strips (MVFS) at two locations along Interstate 5 (I-5) north of Everett, Washington. This performance evaluation includes water quality and hydrologic data collection and analysis to support issuance of a General Use Level Designation (GULD) for basic and dissolved metals treatment from the Washington State Department of Ecology (Ecology) for both the MVFS and VFS (TER submitted January 2023). A goal of the study was to see how well VFS and MVFS work at different widths (2 and 4 meter) and to calculate residence times. To evaluate VFS and MVFS performance, monitoring procedures and methods in the Technical Guidance Manual for Evaluating Emerging Stormwater Treatment Technologies - Technology Assessment Protocol - Ecology (TAPE) (Ecology 2011) were followed. The experimental site design included stormwater runoff collectors and sampling points at the pavement edge (PE), two meters, and four meters downslope from the top of the roadside embankments.

### 2:20 - 2:50 PM Performance of a Non-Vegetated Filtration Swale BMP

Taylor Hoffman-Ballard, Evergreen StormH2O

TAYLOR HOFFMAN-BALLARD Taylor Hoffman-Ballard, PE, is a project manager for Evergreen StormH2O and has specialized experience in research, planning, and NPDES compliance. She serves as an adjunct faculty for Civil Engineering Senior Design students at Gonzaga University.

Non-vegetated BMPs would benefit permittees statewide that are located in areas with hot and dry summers by providing a BMP option that does not require a supplemental water source. In particular, biofiltration swales include vegetation that requires irrigation and the cost to construct and operate irrigation systems adds to the overall expense of a BMP and consumes water that could have a higher beneficial use. In response to this need, Eastern Washington jurisdictions\* conducted an effectiveness study evaluating a non-vegetated filtration swale to fulfill Eastern Washington MS4 Permit Requirements in S8.A Monitoring & Assessment. This presentation will summarize the development of the study design involving controlled field tests in West Richland, the treatment performance of the BMP, the estimated maintenance needs, and lessons learned during the study. At the time this abstract was submitted, the data collection phase of work was complete, and the data analysis is underway. If the BMP meets basic treatment performance goals, a modification to the Ecology-approved biofiltration swale design guidance will be recommended to include an option for non-vegetated filtration swales. This study was funded by and Ecology GROSS Grant.



Fuii 1&2

2:55 - 3:25 PM

# Chemical Properties, Fate, and Treatment of 6PPD-Quinone

Ximin Hu, University of Washington

XIMIN HU Ximin Hu is a Ph.D. student in Environmental Engineering with UW Seattle. He is studying data analysis on the LC-MS data and urban stormwater contamination issues associated with emerging contaminant 6PPDQ.

In the U.S. Pacific Northwest, one species of salmon, (coho salmon, *Oncorhynchus kisutch*), annually exhibit previously unexplained acute mortality upon stormwater exposure when adult salmon migrate to near-urban creeks to spawn. We subsequently identified the transformation product "6PPD-quinone" of the globally ubiquitous tire rubber antioxidant 6PPD as the primary causal toxicant for coho salmon mortality. Subsequent research efforts have shown that this compound is ubiquitous in roadway environments and highly toxic to several species of fish. Here, we describe some of our recent research efforts to describe the chemical properties of 6PPD-quinone and its environmental occurrence and fate. Additional results related to treatment of roadway runoff in several representative treatment systems also will be presented.

#### 3:30 - 4:35 PM 6PPD Panel Discussion

Jana Crawford, Jacobs Engineering Group; Jen McIntyre, Washington State University; Aimee Navikis-Brasch, Evergreen StormH2O; Rhea Smith, Department of Ecology; Melanie Vance, WSDOT Local Programs

JANA CRAWFORD Jana Crawford has 20 years of experience in the stormwater field in Washington State and is a Stormwater Retrofit Project Manager at Jacobs Engineering Group. Prior to joining Jacobs, she spent 17 years working for the Washington State Department of Transportation in the Stormwater Branch and has experience in erosion and sediment control, total maximum daily loads (TMDLs), stormwater retrofit, and municipal permit implementation.

JEN MCINTYRE Dr. Jenifer McIntyre is a professor of aquatic toxicology at Washington State University's School of the Environment. Her research is focused on the impact of aquatic pollutants on aquatic organisms. In 2020, she and her collaborators at University of Washington discovered the novel tire-derived chemical 6PPD-quinone and its role as the primary toxicant responsible for acute die-offs of coho salmon in the Puget Sound region.

AIMEE NAVIKIS-BRASCH Aimee Navickis-Brasch is a Principal Engineer and President of Evergreen StormH2O. She holds a Ph.D. in Civil Engineering and has 30 years of stormwater management experience with specialized expertise in applied stormwater research. Aimee was also the project manager and one of the authors of the Stormwater Treatment of Tire Contaminants BMP Effectiveness Report which was included in Ecology's 6PPD in Road Runoff Assessment and Mitigation Strategies Report prepared for the Washington State Legislature.

RHEA SMITH Rhea Smith is a Natural Resource Scientist at Ecology with over 20 years of experience in aquatic sciences. Rhea coordinated and co-wrote Ecology's 6PPD in Road Runoff Assessment and Mitigation Strategies Report as an initial response to our State officials on how Ecology and Partners plan to address the 6PPD-q transport and exposure to receiving waters and impact on vulnerable species. Rhea is currently co-developing methods with partners to monitor 6PPDq in the environment and assess exposure to receiving waters using mapping tools to focus reconnaissance efforts.

MELANIE VANCE Melanie Vance has over 20 years of experience at both the local and state level with National Environmental Policy Act (NEPA) compliance on transportation projects. She started her career at Spokane County Engineering and Roads, then worked in the Washington State Department of Transportation (WSDOT) Eastern Region office. From there she took a position with WSDOT Local Programs, assisting local agencies with NEPA compliance on their projects receiving Federal Highway Administration funding. She currently manages the Environmental Program for WSDOT Local Programs, and still assists local agencies with NEPA on their federally-funded transportation projects.

Most stormwater managers in Washington are aware of research findings that identified 6PPD-quinone as the toxicant responsible for Coho mortality in some urban streams. Related studies have found the chemical is also toxic to steelhead and rainbow trout, and other aquatic species across the state may also be at risk. While requirements related to 6PPD-quinone aren't included in municipal permits yet, significant updates proposed in the 2024 permits and manuals will include addressing tire wear research findings related to road runoff. Many stormwater managers want to act now, but most don't know how to address tire toxicity or where to do it. This 60-minute panel session will facilitate a discussion among those filling in the current data gaps to address sources and control of 6PPD-quinone. The panel objective is to help stormwater managers understand the current state of knowledge on effective prioritization and management strategies and upcoming research and policy shifts.

# TRACK 2 | DESIGN & PLANNING

### Fuji 34

# ·

8:00 - 8:30 AM

### Stormwater Treatment & Infiltration Where You Can't

Duane Studer, City of Spokane

DUANE STUDER Duane Studer, P.E., is a Principal Engineer at the City of Spokane Wastewater Management Department. In his 30-plus year career and working for the City, he has focused on stormwater management, including planning and leading the design and construction engineering of the City's combined sewer overflow and stormwater projects.

The City of Spokane designed and constructed an innovative stormwater treatment facility to reduce discharges of runoff pollution to the impaired Spokane River from a basin where PCBs and heavy metals are ubiquitous. The presence of legacy contaminants in stormwater and subsurface soils required a solution beyond typical bioswale designs. Runoff impacted by 303d listed contaminants is detained in an 80,000 gallon subsurface concrete storage tank prior to being metered into a lined bioinfiltration swale constructed with an underdrain to convey the effluent offsite for infiltration. The project was achieved with Ecology funding and private partnerships, and it offered several challenges and learning opportunities. By being open to innovative treatment system designs and cooperative partnerships, a creative solution was implemented on a challenging footprint in order to reduce discharges of untreated runoff to a 303d listed waterway.

## 8:35 - 9:05 AM City of Spokane: Cochran Basin Stormwater Mitigation

Mark Papich, City of Spokane

MARK PAPICH Mark Papich, PE, is a senior engineer in the City of Spokane's Integrated Capital Management Department and is responsible for capital project scoping, funding, and programming the City's utility projects. Mark has designed and programmed water, sewer, and stormwater capital projects, with project involvement from inception to completion of construction.

Stormwater runoff from the Cochran Basin in north Spokane is currently conveyed to a single outfall on the Spokane River, which can see discharges of up to 200 million gallons annually. This basin is the City of Spokane's largest MS4 basin, covering approximately 5,200 acres. Multiple BMPs have been implemented and will use green stormwater infrastructure to manage all stormwater runoff generated in the basin from rain events up to the 6-month design storm. The project consists of an innovative control vault and pump station that separates and conveys a dedicated flowrate of run-off calculated to each of several downstream multi-use stormwater treatment facilities that act as recreation areas when not actively managing stormwater.

#### 9:10 - 9:40 AM A Modeling Approach to Cost-effective Stormwater Planning

Stephanie Truitt & Carly Greyell, King County

**STEPHANIE TRUITT** Stephanie Truitt is a Water Quality Manager for King County working on the Water Quality Benefits Evaluation Toolkit. Stephanie is a licensed geologist and has her master's degree in Geology from Western Washington University. She has a background in in hydrologic modeling and groundwater quality, and is passionate about improving water quality in the Puget Sound.

CARLY GREYELL Carly has worked with King County since 2013 helping wastewater and stormwater managers with issues related to toxic chemicals in the environment. During this time, she has worked on projects addressing pathways of priority pollutants to the Lower Duwamish Waterway, studies on stormwater treatment effectiveness, and strategic planning efforts related to stormwater management and water quality improvements.

Stormwater utilities often face difficult decisions in siting new projects and choosing when and where to update aging infrastructure. King County's Water Quality Benefits Evaluation (WQBE) Toolkit provides a suite of modeling tools which allow us to make data-driven decisions on how we invest in stormwater infrastructure. The WQBE Toolkit uses the SUSTAIN model to evaluate cost-effective stormwater solutions for three programs: GSI Incentives, Roadway Treatment, and Regional Facilities. A user can select a cost-based goal, or a pollutant reduction goal. After a goal is chosen, the user can then view the cost-effectiveness curve to see which stormwater BMPs are needed to meet that target. Information from SUSTAIN can support goal setting and regional collaboration as a part of a larger decision-making structure. This presentation will demonstrate how WQBE Toolkit can contribute to cleaner, healthier waters in King County, and provide a framework for modeling in other locations.

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TRACK 2 Fuji 3&4

# Lincoln Street Stormwater Projects: Creative Solutionism

Trey George, City of Spokane

**TREY GEORGE** Trey is an Environmental Analyst for the City of Spokane, where he acts as the City's focal point for the Eastern Washington Phase II Municipal Stormwater Permit. He has 17 years of stormwater management experience, with the first 13 years focused on implementation of construction and industrial stormwater permits in the consulting and chemical manufacturing business sectors, respectively. When Trey is not snowboarding, he spends time at work or hanging out with his dogs.

The presentation will provide details for each project individually with a focus on the unique aspects of the project to include aesthetic considerations and design solutions unique to location (e.g. right of way vegetation for homeowners to maintain, an unlikely discovery of a beneficial infiltration location, and use of some unutilized space at the base of an interstate on ramp). The project discussions will culminate into an overview of the arterial stormwater system as a whole that identifies the larger scale benefits such as aquifer recharge, minimizing pollutant transport, freeing up wastewater treatment capacity, cost savings, beautification, among others. Challenges that required outreach will be presented with lessons learned, specifically incorporating homeowner buy-in into vegetation design for a project that replaced turf grass with bioretention cells the homeowners were to maintain per city ordinance. An "all in the family" discussion will be presented on the use of separate Ecology funding agreements to independently construct treatment BMPs in accordance with Phase II permit conditions that also provided benefits to the wastewater treatment system that is regulated by a wholly different NPDES permit. Ultimately, the collective projects as a whole benefit the regions residents by contributing to the water balance of the aquifer in lieu of discharge to the river, in addition to benefitting the ratepayers by eliminating costs of stormwater treatment as a combined sanitary wastewater.

#### 10:30 - 11:00 AM

9:55 - 10:25 AM

#### Wenatchee 9th Street Stormwater Retrofit: Meeting Community Needs through Stormwater Planning Josh Van Wie, Osborn Consulting

JOSH VAN WIE Josh Van Wie has worked on a variety of water resources projects in Washington State. His experience includes planning and design for stormwater retrofits, municipal capital improvement projects, and fish passage culverts and habitat restoration. Josh has closely coordinated with agencies including the City of Wenatchee, City of Spokane, Spokane County, and others to successfully develop planning studies and PS&E packages.

The 9th Street Basin Stormwater Retrofit Project provides an example for public agencies needing to efficiently address multiple needs. The City is utilizing an Ecology SFAP Grant to add stormwater retrofits in an area lacking water quality treatment and conveyance for storm events. The retrofits will improve water quality in the Columbia River and Chelan County's No. 2 Canyon Drain, an open channel, by removing untreated runoff that currently discharges to the Canyon Drain from the surrounding streets and Wenatchee Valley Community College campus. Constructing new water quality treatment facilities and conveying treated runoff through the City's storm drain system to the river will meet the goals of the SWMMEW, the municipal stormwater permit, and city's comprehensive plans for stormwater management. A unique challenge has been adjusting the project schedule for the extensive cultural resources review by Ecology, which has delayed the selection of water quality BMPS until a full archaeological review including survey and onsite monitoring could be done. Early stakeholder engagement has also been critical, particularly with Wenatchee Valley Community College, who will donate space for the stormwater BMPs and will also benefit from educational components of the stormwater improvements.

# 11:05 AM - 12:05 PM Building Toward Collective Regional Action on Stormwater

John Brosnan, King County

JOHN BROSNAN John is the Strategic Planning Manager with King County Stormwater Services Section. John brings over 20 years of experience in lead roles with regional environmental planning, spanning habitat restoration, land conversation, and environmental protection. His past roles include executive director of Seattle Audubon, statewide director of land protection for the Minnesota Land Trust, and regional program manager with the Sonoma Land Trust.

King County and partners have been supporting a regional summit series, calling for greater watershed-scale coordination on stormwater management across Puget Sound. Beginning with an event in April 2021, hundreds of regional stormwater practitioners gathered at the first Aligning Across Watersheds: A Stormwater Summit. Local jurisdictions can each meet their NPDES regulatory requirements, but that does not change the fact polluted stormwater remains the largest source of untreated pollution that reaches Puget Sound every year. What is the full range of benefits the region could realize with enhanced watershed-scale co-planning and implementation strategies? Join us to learn more.

#### 1:00 - 2:05 PM Addressing Escalating Project Costs Panel Discussion

Kaela Mansfield, Evergreen StormH2O; Jon Morrow, City of Ellensburg; Mark Papich, City of Spokane; Tony Bush & Keith Kusler, WSDOT; Adam Benton, City of Marysville; Shilo Sprouse, Department of Ecology

KAELA MANSFIELD Kaela Mansfield, PE, is a project manager and lead design engineer for Evergreen StormH2O. Kaela has over ten years of experience in stormwater planning and design statewide. She has recent experience managing escalating costs on design and construction projects that were funded by Ecology grants. Kaela earned her Bachelor of Science in Civil and Environmental Engineering from the University of Washington in Seattle.

JON MORROW Jon Morrow, Stormwater Utility Manager for the City of Ellensburg going on 14 years. Prior employment, City of Bothell and Kirkland. Current, Director of the Ellensburg Rodeo, loves horseback riding, ranching cattle, playing guitar and traveling. Family roots in farming and ranching, raised in the Heartland, has lived in Washington 35 years. Spouse Paula, Son Dylan, owner and operator of the Lazy D Ranch in the Teanaway Valley.

MARK PAPICH Mark Papich, PE, is a senior engineer in the City of Spokane's Integrated Capital Management Department and is responsible for capital project scoping, funding, and programming the City's utility projects. Mark has designed and programmed water, sewer, and stormwater capital projects, with project involvement from inception to completion of construction.

TONY BUSH Tony Bush erves as the Stormwater Branch Manager for the Washington State Department of Transportation. He has worked in the Environmental Services Office at WSDOT for over 20 years in both Wetlands and Stormwater. Tony approaches work with partnership and innovation as critical components for success.

KEITH KUSLER Keith Kusler has worked at the Washington State Department of Transportation for over 12 years and currently serves as the North Central Region Hydraulic Engineer. Keith has 30 years of experience in roadway, airport, municipality, and private construction projects in various roles including design, inspection and working for contractors.

ADAM BENTON Adam Benton has been with the City of Marysville for 14 years, currently serving as the Storm and Wastewater Utility Manager. Adam has over 17 years of experience in the stormwater field, in both the private and public sectors, ranging from design to construction management. He's most recently managed the design and construction of numerous Ecology funded Low Impact Development projects, over the course of the last 8 years. These projects, especially in the post-Covid era, have provided Adam with experience planning for and managing escalating costs, throughout all phases of design and construction. Adam earned his Bachelor of Arts in Geology, with an emphasis in Environmental Studies, from Cornell College.

SHILO SPROUSE Shilo Sprouse is the Eastern Regional Municipal Stormwater Grant & Loan Project Manager for the Washington State Department of Ecology. Shilo has worked directly in stormwater management for the last 16 years starting in his role at Ecology less than a month ago. Shilo's experience includes management of the Industrial Stormwater General Permit, Construction Stormwater General Permit and Eastern Washington Phase II Municipal Stormwater General Permit. Shilo has served in multiple stormwater leadership roles throughout his career.

Over the last few years inflation has significantly impacted budgets and delivery of both stormwater design and construction projects. This panel presentation is intended to focus on managing recent inflation issues and hard-to-predict future cost conditions. The panel will include representatives from municipalities on both sides of Washington State, as well as Ecology, for a discussion about their experiences and lessons learned addressing rising costs related to engineering projects. Topics will include planning, designing, and constructing projects; labor and material costs; and proactive approaches to mitigate cost escalation including on grant funded projects. The open format session will be guided, with opportunity for audience to ask questions and learn about best practices for managing escalating costs on their projects from planning through construction. TRACK

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2:20 - 2:50 PM

## Piloting Innovative Stormwater Treatment on Waterfront Properties

Jane Dewell, Port of Seattle

JANE DEWELL As Senior Manager, Marine Stormwater Utility, Jane helped set up the utility in 2016 and manages all regulatory and asset management elements. Utility work is supported by field staff who ensure that the Port's stormwater permit requirements are met or exceeded, and a maintenance team that innovates stormwater treatment systems and repairs and maintains waterfront assets. Jane has been involved in environmental protection and pollution prevention since the mid 1980s, including positions with state government, non-profits, and environmental consultants.

The Port of Seattle Stormwater Utility (SWU) was established in 2014, and a top priority is investing in innovative stormwater treatment on waterfront properties. With 1,000 acres of commercial and industrial land in the Duwamish River/Elliott Bay, the SWU can pilot and demonstrate effective stormwater treatment that supplements best management practices (BMPs) for Port operations. This presentation features low-tech stormwater treatment examples with monitoring data that demonstrates effectiveness of oyster shells, bioretention in a box, and commercial products that fit small footprints (e.g., Hula Bug? and Retain Drain). We make use of systems with straight-forward operation and maintenance (O&M) protocols that improve stormwater quality for properties that discharge directly into urban rivers and bays. The SWU will share monitoring information, O&M wisdom, and educational materials intended to encourage other commercial and industrial operations to add low-tech stormwater treatment to supplement BMPs or as pre-treatment to more sophisticated treatment technologies.

## 2:55 - 3:25 PM The Park Place and POST Media Story

Chris Webb & Dylan Ahearn, Herrera

CHRIS WEBB Chris Webb is a Principal Engineer with Herrera Environmental Consultants in Bellingham, WA. For over 25 years, he has worked with many local and state governments, private and public entities, utilities, and nonprofit groups to implement stormwater quality projects and is recognized as a regional leader in green infrastructure design. Chris was the Project Manager and lead designer for the Park Place Stormwater Facility which is the subject of this presentation.

DYLAN AHEARN Dr. Dylan Ahearn is a hydrologist who has spent the last 20 years figuring out how best to eliminate toxic pollution in our waterways. He is currently an adjunct professor at Edmonds College and the Associate Director of Water Science with Herrera, Inc. Dylan specializes in Green Stormwater Infrastructure, with a particular focus on stormwater treatment research, development, and verification.

This presentation describes the story of the development of the POST media and the Park Place Stormwater Facility in Bellingham. The project began with an R&D phase (2018) which entailed testing media components to create a new high-rate non-proprietary stormwater treatment media targeting phosphorus removal. Then a pilot scale filter (2019-2021) was built and monitored and achieved a GULD for phosphorus in 2021. Then a full-scale facility was designed and built around an active dosing system with construction beginning in June 2021 and the project being completed in 2022. This project resulted in a high-performance regional stormwater facility to meet TMDL goals that also 1) created a new open-source stormwater treatment tool for the region, 2) implemented the tool for the first time, 3) used an PLC based active dosing system for the first time on a stormwater project in the region, and 4) met the City's cost effectiveness threshold.

#### Stormwater Parks

3:30 - 4:00 PM

Jenny Gaus, City of Kirkland; Michelle Perdue, Kitsap County

JENNY GAUS Jenny works as the Strategic Surface Water Advisor for the City of Kirkland. Her current focus is on stormwater retrofit planning, and in particular how to maximize the benefits of stormwater facilities by combing them with parks, greenways, and other community needs and interests. Jenny has used her education in engineering and forest ecology to address municipal surface water issues of aquatic habitat, water quality, and flood reduction for the past 30 years.

MICHELLE PERDUE Michelle Perdue has over 17 years of experience in municipal stormwater management and environmental outreach, with a focus on delivering critical community outcomes like flood protection, improved surface water quality, efficient regulation of development, well-planned watersheds, and effective and empathetic customer service. Her work at Kitsap County, in harmony with the Clean Water Kitsap partnership, has included nationally-recognized projects and programs that reduce flooding, prevent pollution and restore fish habitat, ensuring that our shellfish beds, streams and waterbodies remain functional for the humans and wildlife that depend on them. Prior to joining Kitsap County, Michelle was the Municipal NPDES Stormwater Permit Manager for the City of Moses Lake, Washington.

Stormwater parks are facilities that provide both stormwater treatment and recreation and can help with many challenges that cities and counties face, such as equity, health, and degraded water quality. They can provide cost effective regional stormwater retrofits in impaired watersheds. Stormwater parks that have been built to date vary greatly in form, function, and size, indicating they can work well on a variety of sites. The objectives of the session are to show different types of stormwater parks and share guidance on planning stormwater parks, as well as lessons learned from planning, constructing, and maintaining them.

# TRACK 3 | REGULATION & PERMITTING

8:00 - 8:30 AM

TRACK

Gala 1& 2

# Retrofitting and Trees, Department of Ecology Stormwater Grants

David Mora, Department of Ecology

DAVID MORA David has been with the Washington State Department of Ecology since 1993. At Ecology David has worked in spill response and assessment, water quality monitoring, and in stormwater-retrofit grants. David has a masters degree from Indiana University in Environmental Science and Bachelor of Science from Bowling Green.

At Ecology we have long been debating how trees fit into our stormwater retrofit grant program. Our presentation pertains to all permittees, since all are eligible to participate in our stormwater retrofit grant program. In our presentation we will: Review our existing grant guidance regarding funding trees in BMPs. Report on the general condition BMPs with trees funded by Ecology (25 projects and 175 examples). We will report on structural damage, tree statistics, and mortality. Share some of the nuances of our tree debate, challenges, and opportunities to help steer our program.

#### 8:35 - 9:05 AM

# 2022 Lacey Stormwater Design Manual: Local Enhancements

Julianne Chechanover, Herrera

JULIANNE CHECHANOVER Julianne Chechanover is a water resources engineer with Herrera Environmental Consultants in Seattle, Washington. She specializes in National Pollutant Discharge Elimination System (NPDES) permit compliance; storm and surface water comprehensive planning; and developing operations & maintenance (O&M), illicit discharge detection and elimination (IDDE), and design manuals for Phase I and Phase II jurisdictions in Western and Eastern Washington.

This presentation will summarize the updated 2022 City of Lacey Stormwater Design Manual (SDM), which incorporates several local enhancements. Originally published in 2010 and updated in 2016, the 2022 update to the SDM includes new guidance on deep Class V stormwater underground injection control (UIC) wells, including additional design, testing, and construction requirements. Other updates include a new submittal requirement for a wet-season Stormwater Pollution Prevention Plan (SWPPP), and operations & maintenance (O&M) cost estimates for commercial businesses and residential properties, which may be useful to other jurisdictions. The goal of the presentation is to share key enhancements in the Lacey SDM that go above and beyond the 2019 Stormwater Management Manual for Western Washington (SWMMWW) to ensure successful stormwater management as part of new development and redevelopment projects.

# 9:10 - 9:40 AM Stormwater Self-Inspection Program: What Was Learned

Nels Rasmussen, City of Arlington

NELS RASMUSSEN Nels Rasmussen is the Stormwater Utility and Natural Resources Lead for the City of Arlington Public Works Department. Nels has over 17 years of experience in state and local government focusing on water quality and stormwater permit compliance. He has focused on municipal phase II permit program creation and management for the past 10 years in Minnesota and Washington.

The Arlington self-inspection program was developed and implemented in 2020 to complete onsite inspections of private stormwater systems. This involved public outreach, education, and support for private stormwater system owners to complete an annual inspection form identifying any maintenance needs and returning these to the City Stormwater Department. The program received an 80% response rate in its first two years with numerous maintenance projects completed throughout the city. 2022 marked a new chapter in this program by implementing an online inspection submittal to increase the efficiency of records keeping and data analysis. Details on what was learned with this new process and what will be modified for the upcoming 2023 program will be discussed.

Gala 1& 2

#### 9:55 - 10:25 AM Updates to TAPE and Transition to STEPP

Carla Milesi, University of Washington-Tacoma/WSC; Doug Howie, Department of Ecology

CARLA MILESI Carla Milesi is the Emerging Stormwater Technologies Coordinator for the Washington Stormwater Center at University of Washington Tacoma's Center for Urban Waters. As such, she is the lead scientist for the Center's collaboration with the Washington State Department of Ecology's Technology Assessment Protocol (TAPE) program. Prior to joining the Center in 2014, Carla spent over 10 years as an environmental consultant at Cardno implementing and managing stormwater monitoring and BMP assessment projects.

**DOUG HOWIE** Doug Howie has more than 40 years-experience in planning, design, and construction of stormwater projects. He is a stormwater engineer for the Department of Ecology working with permit managers to assist jurisdictions throughout the state in meeting their Permit requirements. Doug also manages the Technology Assessment Protocol - Ecology (TAPE) program where Ecology evaluates emerging technologies for use in Washington State.

TAPE turned 20 in 2022! The success of the program is due in part to its evolution over the years. This presentation will include a discussion of the updates we're working to roll out in 2023—including additional testing requirements that would provide more data on the maintenance cycle for General Use Level Designation (GULD) BMPs. The presentation will conclude with a short discussion of the status of the Stormwater Technology Evaluation for Products and Practices (STEPP) program. The STEPP program will provide a national platform for the monitoring and evaluation activities currently provided by TAPE.

#### 10:30 - 11:00 AM We Can Do More: Finding and Addressing Sources of PCBs in Building Materials

Myles Perkins, Department of Ecology

MYLES PERKINS Myles Perkins is an environmental engineer who works to reduce toxics in the settings in which they are used. Myles supervises a group of staff who provide product replacement assistance to businesses. Myles also manages Ecology's PCB's in Building Materials Project.

It's been more than 40 years since polychlorinated biphenyls (PCBs) were banned from manufacture in the United States, but this group of chemicals is still considered one of the most significant toxic chemicals in Puget Sound, impacting salmon populations. While new chemicals are being discovered and tackled, finding and removing sources of PCBs in our watersheds is still an essential need; we must remove the sources of PCBs to our waterways if we want to eventually decrease their prevalence in aquatic biota. We know a lot about PCBs already, and we are doing a lot, indirectly, through implementing NPDES permits and stormwater BMPs. But we can do more. Ecology's 2015 PCB Chemical Action Plan recommended developing and promoting best management practices (BMPs) to address PCBs in building materials to reduce exposure to people and to prevent PCBs from entering stormwater. In response to that recommendation, and the overall need to prevent PCBs from impacting people and fish populations, Ecology recently developed How to Find and Address PCBs in Building Materials, a guidance document for property owners, developers, and contractors to help them identify, characterize, and abate PCB-containing building materials. A significant portion of How to Find and Address PCBs in Building Materials describes BMPs to protect stormwater during demolition or renovation activities, or while properties are awaiting re-development. Municipalities should follow the new guidance when planning renovations, especially since large public buildings from the 50's, 60's and 70's, built with longevity in mind, have potential to contain PCBs in window and door caulk, exterior concrete joints, paint, and interior devices like light ballasts. This talk is intended to (1) raise awareness of the existing sources of PCBs in buildings, (2) share information about how to identify and remove these sources safely and legally, and (3) provide a technical foundation for the potential inclusion of PCB-specific BMPs in the next versions of the MS4 permits and stormwater management manuals.

Gala 1&2

TRACK

Gala 1& 2

# 11:05 AM - 12:05 PM Washington Stormwater Benchmarking and Rate Structure Survey Results

Tage Aaker & John Ghilarducci, FCS Group

TAGE AAKER Tage is a FCS GROUP senior project manager with experience in working with stormwater, water, and sewer utility clients to develop level of service scenarios that involve CIP analysis and alternative funding strategies. He has also helped develop more equitable rate structures for many stormwater utilities in the region and has experience presenting these topics to elected officials (including Solutions to Stormwater Rate Challenges at 2021 MuniCon). In his free time, Tage enjoys backpacking throughout Washington and fishing for trout in pristine alpine lakes and streams. JOHN GHILARDUCCI John is FCS GROUP President, and a principal and shareholder with 33 years of professional experience. His practice focuses on all aspects of utility rate studies and utility and general services system development charge (SDC) and impact fee studies — from technical modeling and policy analysis to public involvement, ordinance drafting and implementation. He has formed dozens of stormwater and transportation utilities and developed water, sewer, stormwater, transportation and parks rates and charges for hundreds of clients in thePNW and western U.S.

This benchmarking survey (and associated presentation) provides insight into the current practices of Washington State stormwater utilities, providing both quantitative and qualitative context for evaluating the types of stormwater rates currently in use and the conditions that support or hinder their success. This survey was a part of a study funded by a Water Quality Stormwater Grant administered by Washington State Department of Ecology and performed in coordination with the City of Tacoma. Over 60 responses from utilities across Washington State were collected. The survey procured information about each utility's program and service area, connection charges, rates, environmental justice, and other topics. Respondents also provided insightful qualitative answers to questions such as "Are there any aspects to your existing rate structure that you would like to see change and, if so, why?" and "Can you share effective approaches to customer outreach and education regarding rates and rate structures?" This presentation will share key highlights and findings of the survey.

#### 1:00 - 2:05 PM 2024 Permit Reissuance

Abbey Stockwell, Amy Waterman, Doug Howie & Brandi Lubliner, Department of Ecology

ABBEY STOCKWELL Abbey is municipal stormwater team lead and the Phase II Municipal Stormwater permit writer for the state. She received her M.S. in Natural Resources Planning from Humboldt State University where she focused on policy barriers to implementation of Low Impact Development. Prior to moving to Washington, she worked as a county planner and coordinated the Phase II municipal stormwater program.

AMY WATERMAN Amy has worked in stormwater management for 12 years, primarily in the non-profit sector and has been at Ecology for 3.5 years. She has done research, program management, grant writing, outreach, and enforcement in stormwater, wetland management, and watershed planning on the east coast and Washington. She has a M.S. in water resources from Cornell University.

DOUG HOWIE Doug Howie has more than 40 years-experience in planning, design, and construction of stormwater projects. He is a Senior Stormwater Engineer for the Department of Ecology working with Ecology permit planners to assist jurisdictions throughout the state in meeting their Municipal and Industrial Permit requirements. He edits and provides training on the two Ecology Stormwater Manuals. Doug also manages the Technology Assessment Protocol - Ecology (TAPE) program where Ecology evaluates emerging technologies for use in Washington State.

**BRANDI LUBLINER** Brandi Lubliner is a senior stormwater engineer with Ecology's Water Quality Program and is the manager of the Stormwater Action Monitoring (SAM) program, a cooperative stormwater management studies and adaptive feedback program. She is also leading our research and development effort on stormwater treatment of emerging contaminants of concern.

Prepare to be informed and intrigued by proposed updates and changes to the Phase I and Phase II Municipal Stormwater Permits. And that's not all, we will also share our thinking on proposed updates to the Stormwater Management Manuals for WA State. Hot topics include: Overview of reissuance process, sweeping, stormwater planning and retrofits, and highlights of the feedback received.

2:20 - 2:50 PM BMP Owner Awareness Effectiveness Study

Kelsey Grover, City of Wenatchee

KELSEY GROVER I have been the Stormwater Technician for the City of Wenatchee for the last 5 years. I came to the City with a background in Environmental Studies and Natural Resource Management.

It is a common perception among stormwater program managers that the general public has little knowledge about post-construction stormwater BMPs and their role in maintaining BMPs. This effectiveness study evaluates the effectiveness of the recorded Operations & Maintenance Agreement at informing owners about BMPs and their responsibility to maintain BMPs. The study consists of a survey to residents in subdivisions one acre and larger with one or more post-construction BMPs serving more than one home. The study results are anticipated to present trends and factors effecting owner awareness for stormwater BMPs and how program managers can effectively provide education.

# 2:55 - 3:25 pm Private Stormwater Infrastructure & Biodiversity in Washington

Jim Leamy, Thurston County

JIM LEAMY I spent several years in the field and then managing/directing field crews and quality assurance inspectors at a private stormwater management firm. Prior to joining the public sector, I started a pollinator health initiative for a major retailer which led to the installation of thousands of pollinator gardens across the U.S., Canada, and Mexico, a significant reduction of pesticide use in the grocery supply chain, and the establishment of many acres of native meadows on private lands. Now with Thurston County, I inspect residential stormwater facilities and focus my energies on public outreach and education.

TRACK

Gala 1&2

If you build it, they will come. There is no keeping frogs, birds, or bees out of stormwater ponds and roadside ditches, so these spaces are examined here for understanding what critical habitat is nearby and which native flora and fauna are using them. The content of this presentation will be an in-person discussion with associated slides, detailing the role of private infrastructure in Washington State in optimizing biodiversity. Wildlife corridors, critical habitats, and wetlands are already established into most WA municipalities' plat boundaries. Swales, ditches, and dry ponds extend these connected green spaces into lawns, community areas, and utility easements. Communication with HOAs through annual inspection activities can steer landowners towards practices which passively and actively help pollinators and native species. Meanwhile, municipal practices such as burn bans can prevent the mowing of ponds and ditches throughout the summer, allowing meadows to establish and butterflies to flourish. We examine stormwater practices throughout the years which have attracted pollinators and small vertebrates, incidentally and on purpose, and where we can gain ground from here in promoting best biodiversity practices.

### 3:30 - 4:00 PM Coordinating a New EPA Municipal Stormwater Permit

Merita Trohimovich, City of Tacoma

**MERITA TROHIMOVICH** Merita Trohimovich is a Professional Civil Engineer with over twenty years of experience in the fields of wastewater and stormwater. Merita leads the City of Tacoma's NPDES Phase I Municipal Stormwater Permit compliance team and has led projects in Low Impact Development and Green Stormwater Infrastructure policy and capital projects. Merita has a Bachelor of Science in Civil Engineering from the University of Washington and has worked for both municipalities and consulting firms.

EPA is issuing the City of Tacoma a Municipal Stormwater Permit for Discharge into Waters of the US/Waters of the Puyallup Tribe (EPA Permit). Tacoma staff have reviewed and commented on two drafts of the EPA Permit and expect a final Permit to be issued approximately first quarter 2023. Tacoma's EPA Permit will be an individual permit. WSDOT and Pierce County are also in process for individual EPA Permits and additional potential permittees have been notified to submit applications. For Tacoma, there will be overlap in the areas of applicability of the EPA and Ecology Permits. Separate and somewhat different requirements and annual reports will be required for each Permit. Challenges for implementation include: new requirements in the EPA Permit, two sets of requirements in portions of Tacoma, ramp up for EPA Permit, EPA and Puyallup Tribe oversight, changes to reporting systems, and staff education.

#### 4:05 - 4:35 PM MS4 Problems Solved with Drywells

Kathryn Thomason, Oldcastle Infrastructure

KATHRYN THOMASON Kathryn holds a B.A. in Chemical Engineering from Oregon State University and has worked in both the stormwater manufacturing industry and private civil consulting. She has over 15 years of experience in stormwater treatment design including infiltration, detention, rainwater harvesting, and regional stormwater management.

This presentation will focus on a deep drywell project that was installed in the City of Gresham, OR to solve their MS4 capacity issues. By using a drilled drywell, you can get past low infiltration till layers, reduce installation time, and fit drywells between existing utilities. I will help identify where deep infiltration is a preferred solution based on WA geology, groundwater elevations, and Ecology's regulations. I will discuss deep infiltration construction methods on this project and how deep drywells can be installed in between existing utilities and reduce street closure time due to their fast installation, and I will evaluate the benefits of deep infiltration for reducing MS4 capacity issues.



Gala 3&4

# TRACK 4 | IDDE; SOURCE CONTROL, O & M

8:00 - 8:30 AM

#### Mobile Businesses and Stormwater Source Control

Alison Schweizer, King County; James Packman, Aspect Consulting

ALISON SCHWIZER As a program/project manager within Stormwater Services at King County, Alison Schweitzer engages in numerous regional stormwater collaborative planning efforts and facilitates strategic planning efforts. She loves building bridges and connecting people with helpful resources. Alison is passionate about listening intently to everyone's unique stories, asking questions to better understand perspectives, and ensuring everyone's voice is heard.

JAMES PACKMAN James Packman is an Associate Hydrologist with Aspect Consulting, LLC. He has 24 years of professional experience and a Master of Science degree in forest engineering from the University of Washington. James combines effective communication, ecological science, and sound engineering practices to manage projects and find cost-effective integrated solutions to water resource issues.

This presentation will cover the progress, challenges, and initial findings from a current Stormwater Action Monitoring (SAM) Study that is a deep dive into stormwater source control and mobile businesses. As a subset of commercial enterprises, mobile businesses have unique challenges related to stormwater and pollution prevention due to their mobile nature and providing services at dispersed sites in multiple jurisdictions. The Study is developing and testing new tools and guidance to support municipal stormwater permittees, including best practices for defining, identifying, and inspecting mobile businesses of interest to stormwater source control, and providing resources for municipal coordination across jurisdictional boundaries. Preliminary outcomes to be covered include how to use businesses, and progress with a pilot program in King County for testing and refining the resources developed by the Study.

#### 8:35 - 9:05 AM GIS-based Tools for Prioritizing Pipe Repairs

Meiring Borcherds, City of Mukilteo; Erin Nelson, Altaterra Consulting

**MEIRING BORCHERDS** *Mr.* Borcherds is currently the Surface Water Program Manager for the City of Mukilteo and works on programs related to stormwater management, flooding, erosion, and water quality. He has over 20 years of experience in land use management and stormwater, working towards land and water conservation and preservation programs on three different continents. He has worked on several stormwater, stream & wetland restoration projects, and always incorporated education programs into his work. He has worked with government and non-government agencies alike and have co-authored several manuals, articles, and curriculum over the years. Please feel free to contact him at mborchereds@mukilteowa.gov for any additional information or a networking opportunity.

**ERIN NELSON** Erin is water resources engineer/geomorphologist with over 30 years of experience in the Pacific Northwest. Her primary area of expertise and interest is in stormwater and watershed planning, and she has led dozens of planning efforts for jurisdictions in the Puget Sound Region. She enjoys supporting clients to solve their most challenging surface and stormwater issues.

The use of GIS-based tools to assess stormwater pipe risk and collect and track pipe cleaning and condition assessment status in the field will be demonstrated. These tools are useful for directing limited funding to the highest priority infrastructure repair needs based on risk and potential consequences of pipe failure.

### Gala 3&4

9:10 - 9:40 AM

# Planning for and Implementing a Phase II Source Control Program in Western Washington

Meiring Borcherds, City of Mukilteo; James Packman, Aspect Consulting

**MEIRING BORCHERDS** *Mr.* Borcherds is currently the Surface Water Program Manager for the City of Mukilteo and works on programs related to stormwater management, flooding, erosion, and water quality. He has over 20 years of experience in land use management and stormwater, working towards land and water conservation and preservation programs on three different continents. He has worked on several stormwater, stream & wetland restoration projects, and always incorporated education programs into his work. He has worked with government and non-government agencies alike and have co-authored several manuals, articles, and curriculum over the years. Please feel free to contact him at mborchereds@mukilteowa.gov for any additional information or a networking opportunity.

JAMES PACKMAN James Packman is an Associate Hydrologist with Aspect Consulting, LLC. He has 24 years of professional experience and a Master of Science degree in forest engineering from the University of Washington. James combines effective communication, ecological science, and sound engineering practices to manage projects and find cost-effective integrated solutions to water resource issues.

The City of Mukilteo began planning for its permit-required source control program for existing development when the current municipal stormwater permit took effect in 2019. Working with a consultant since 2020, planning is continuing through January 2023 when program implementation will began. Planning included: estimating the program budget and staffing needs; updating municipal code and adopting a source control ordinance; creating a business site inventory; outreach and communication with businesses in the City; software evaluation and setup; and developing guidance for progressive enforcement. The City overcame significant hurdles to launch the program, including working with multiple City governance bodies for program approval (in addition to City Council), staff turnover in the Surface Water Program, and a new Public Works Director. This presentation will share the City's approach to preparing for and implementing its source control program, how it managed the challenges to get there, and how the program is going so far three months since it began.

#### 9:55 - 10:25 AM Resources for Implementing Source Control Inspection Programs

Rebecca Dugopolski & Mindy Fohn, Herrera

**REBECCA DUGOPOLSKI** Rebecca Dugopolski, PE, is an associate engineer with Herrera Environmental Consultants in Seattle, Washington with over 17 years of experience in stormwater monitoring, design, and NPDES permit compliance. She received her Bachelor's degree in Environmental Engineering from Michigan Technological University and her Master's degree in Civil and Environmental Engineering from the University of Washington. Ms. Dugopolski has helped over 100 Phase I and Phase II jurisdictions in Eastern and Western Washington comply with the municipal NPDES permit requirements and personally trained over 5,000 municipal and business staff.

MINDY FOHN Mindy Fohn is a scientist with Herrera Environmental Consultants in Seattle, Washington. Prior to consulting, she was employed in the Kitsap region implementing water resources and inspection programs for Bremerton, Kitsap Public Health and Kitsap County. She has conducted over 500 inspections engaging and educating homeowners and commercial properties to reduce, prevent and correct pollution sources.

The Source Control (Business/Site) Inspection Program Guidance Manual funded by the Stormwater Action Monitoring (SAM) program provides resources, templates, and strategies developed based on research, input, and experiences of jurisdictions that have developed similar programs. The 8-chapter hybrid manual is posted on the Washington Stormwater Center website and includes a variety of resources for starting a new inspection program or enhancing an existing program. Four in-person source control inspection trainings were conducted as part of this project in October 2022. This presentation will provide an overview of the collaborative process, manual content, supplemental resources, and training resources (including an online training module).



Gala 3&4

10:30 - 11:00 AM

**Real-Time Maintenance Sensing in Stormwater Control Measures** John Pedrick, Contech Engineering Solutions

JOHN PEDRICK John Pedrick currently serves as a Senior Project Manager at Contech Engineered Solutions. He manages research efforts associated with product performance evaluation and verification projects and works closely with state, regional, and national regulatory and testing agencies to provide product testing data necessary for product approvals. Throughout his 20+ years in the stormwater treatment industry, he has managed numerous stormwater BMP monitoring programs including product certification and verification projects in Washington State using the Technology Assessment Protocol – Ecology (TAPE), New Jersey using the Technology Assessment Reciprocity Partnership Tier II Protocol (TARP Tier II), and North Carolina under the North Carolina Department of Environment and Natural Resources (NCDENR) Preliminary Evaluation Period (PEP) Program.

As NPDES permit requirements evolve to focus on green infrastructure and water-quality-based approaches, many municipal stormwater programs are incorporating a wide array of disconnected stormwater control measures (SCMs) spanning both green and gray infrastructure. Managing these diverse assets poses a growing logistical challenge. Depending on the design and application, SCMs may require specialized training to inspect and maintain, especially in highly urbanized areas where they might be located underground or in heavily trafficked areas. Additionally, stormwater systems serving equivalent drainage areas may need vastly different maintenance oversight depending on the pollutant loading associated with their respective land uses. In response, several technology approaches have been under development to assist stormwater asset managers by delivering SCM operating data in real time. These systems typically utilize in situ sensors capable of monitoring hydraulic variables such as flow or stage as well as water quality parameters such as pH or turbidity. While the scope of these applications is appropriately broad, their cost and complexity can inhibit their adoption, especially by the municipal permittees who stand to benefit the most from their use. Contech Engineered Solutions developed a sensor system to determine when an SCM requires maintenance and notify the site owner automatically. Multiple systems were installed in partnership with city agencies in the Pacific NW as part of a pilot study program spanning two years. During this time, numerous enhancements were made to sensor components and data systems to improve operating reliability and data usability. This study resulted in an optimized implementation methodology that emphasizes robust hardware, limited power requirements, and streamlined data systems to deliver necessary SCM operating information at a minimized cost. The presentation includes sensor component specifications and sample system output, proposals for integration into stormwater geographic information systems, as well as cost modeling to demonstrate the scalability of the technology. When integrated into a municipal asset management system, this approach can improve the efficiency of inspection and maintenance operations, yielding cost savings and better reliability for effluent water quality.

#### Pipe Rehabilitation: How to Replace or Rehab 1,000,000 Feet of Pipes 11:05 AM - 12:05 PM

Le Nguyen, WSDOT

LE NGUYEN My name is Le Nguyen, and I have been working for WSDOT for over thirty years. Currently, I am working in Headquarters Hydraulics Section.

In the Washington State Department of Transportation, we have miles and miles of aging pipes that need to be replaced or rehabilitated. So far, we have been focusing on upgrading existing culverts to fish-passable culverts. Until recently, we have dealt with many urgent problems due to sinkholes popping up here and there along the highways. I have been studying pipe rehabilitation, the pros and cons of it, the cost, technical issues, etc., but knowing about pipe rehabilitation alone does not solve the real issue that we need to replace or rehabilitate these pipes as quickly as possible before more and more sinkholes popping up. How are we going to do it as a state agency? Funding is one of the challenges, but it is not the only one. How we identify which pipes to be replaced or rehabilitated, how we create a mechanism to rehab these pipes effectively in terms of cost, schedule, and impact to the traveling public, just to name a few.

# 1:00 - 1:30 PM City of Wenatchee Asset Management Use to Track Inspections and IDDE

Kelsey Grover, City of Wenatchee

TRACK 4 Gala 3 & 4

KELSEY GROVER I have been the Stormwater Technician for the City of Wenatchee for the last 5 years. I came to the City with a background in Environmental Studies and Natural Resource Management.

The City of Wenatchee uses the Elements Asset Management software to track IDDE, facility inspections and maintenance. Elements is a web-based, GIS-integrated program which allows staff to record inspections, maintenance, insert attachments, request follow up work, and generate reports for both private and publicly owned facilities. This study will focus on using the asset management software for IDDE tracking and follow-up, event-based facility inspections and clean-up, and improved record keeping for Municipal Stormwater Permit compliance. This case study highlights multiple user groups and communication between groups. Additionally, this case will discuss important lessons learned developing an asset management program.

#### 1:35 - 2:05 PM Asset Management Success for Operation and Maintenance Programs

Cory Olson, Snohomish County

CORY OLSON Cory Olson is the Drainage Facility Coordinator with Snohomish County Surface Water Management division and leads a team that inspects and ensures maintenance of both County owned or operated and regulated drainage facilities. Cory holds a BA in Geography from Western Washington University and has over 10 years of stormwater experience in mapping, asset management program development and operation and maintenance planning.

Snohomish County implemented Cartegraph OMS in 2016 as its asset management system, used to track work and activities and play a key role in demonstrating compliance with its Municipal Phase I Stormwater permit (NPDES). With five years of data and work history, Snohomish County Surface Water Management division can make insightful, programmatic decisions and forecast future maintenance needs and costs from data sets its produced. Data filters provide necessary information for annual reports, statistics for stormwater facilities types and maintenance activities, and generate costs figures used to project asset repair and replacement, develop scopes of work, and ensure better planning and budgeting of resources. Our presentations will use examples to show you how to maximize your asset management system, highlight the importance of quality controls and demonstrate the capacities and benefits of a developing and utilizing asset management software to best benefit your organization and meet your program goals.

### 2:20 - 2:50 PM Using ArcGIS FieldMaps to Conduct Catchbasin Inspections

Dave Kangiser, City of Tumwater

DAVE KANGISER Dave Kangiser is a Water Resources Specialist for the City of Tumwater focused on implementing the Stormwater Management Program including the Illicit Discharge Detection Elimination Program, Stormwater Management Action Plan, Source Control Inspection Program, and Stormwater Inspection Program. He has worked for the City of Tumwater for 3 years and is a lifelong resident in the Tumwater area. He has a Master's Degree in Environmental Studies from the Evergreen State College where he focused on conservation biology and wildlife corridors. His previous work experiences include working with local jurisdictions on water quality restoration projects with the Washington Department of Health's Shellfish Program. He also has experience as a Salmon and Steelhead Biologist working on salmon, steelhead and habitat restoration efforts on Hood Canal watersheds.

The City of Tumwater's Operation and Maintenance Team recently deployed a catch basin inspection program that utilizes ArcGIS Field Maps. The inspection form was born from collaboration between the Stormwater Team, Operations and Maintenance Leads and the GIS Team at the City. Through a modified Value Stream Mapping collaborative process, the teams identified a desired inspection process and created a user friendly system that simplifies the inspection process and provides visual cues for catch basins maintenance needs. This presentation will review the modified Value Stream Mapping collaboration and demonstrate the Field Maps inspection process for other jurisdictions who are considering alternatives to their current catch basin inspection program.



MS4 can become problematic for managing stormwater facilities and maintenance crews. A strategic, site specific approach to managing beavers can prove successful and require less maintenance than the typical trapping strategies that are widely used. Tumwater has used several different strategies to successfully keep beaver habitat intact while allowing for stormwater treatment and conveyance. This presentation will explore some of the strategies that are recommended to successfully live with beavers and the many ecosystem benefits that they provide.



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