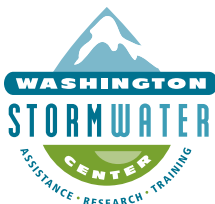




 WASHINGTON STATE
MUNICIPAL STORMWATER CONFERENCE

May 16 & 17, 2017 • Yakima, Washington

In partnership with



Funding provided by



WELCOME TO THE 2017 WASHINGTON STATE MUNICIPAL STORMWATER CONFERENCE!

The Washington Stormwater Center—in partnership with Yakima County, the Washington Department of Ecology, and our statewide conference advisory committee—is pleased to welcome you to the 2017 Washington State Municipal Stormwater Conference (MuniCon 2017). This unique conference focuses specifically on addressing high-priority issues and challenges faced by municipal NPDES permittees statewide. Throughout both days of the conference there are opportunities to meet with, talk to, and learn from stormwater managers from around the state. Workshops and presentation sessions are constructed so that there is ample time for idea exchange among the attendees.

As with most conferences, there are so many people to thank and to honor. There are many across the state who have contributed their support and hours of emails and discussion to make this valuable conference happen. From the Washington Department of Ecology (our funder) and Yakima County (our host) to the partners, advisors, presenters, sponsors, and exhibitors—all have had a large role in putting together this statewide conference. We are especially thankful to this great group and have devoted a section in this program to list each of their names and organizations.

A note on conference structure: the conference takes place over two days. The first day is devoted to in-depth workshops on three topics of interest led by experts who have worked hard to assemble a meaningful and informative afternoon. The second day is more in-line with a typical conference structure, with presentations that take place at three locations within the convention center.

As this is only the second statewide conference, and we are hoping to continue these valuable gatherings in the future, please fill out the conference survey that will be emailed to you later. We will be looking for ideas and suggestions on how to grow the conference in future years.

Thank you all for your interest and support of this conference. And—welcome to Yakima.

Eric Geary
Grant Recipient & Municipal Lead
Yakima County

Dr. John Stark
Director
Washington Stormwater Center

DAY 1 | MAY 16, 2017

10:00 AM	Pre-Conference Activity Eastern Washington BMP Effectiveness Studies Open House <i>Coordinated by the Eastern Washington Stormwater Group</i>			27
12:30 PM	Registration <i>Lunch on your own. Light snacks will be served.</i>			BALLROOM
	Workshops			
	ROOM 100	ROOM 200	ROOM 300	
	WORKSHOP 1 EDUCATION & OUTREACH	WORKSHOP 2 STORMWATER MANUAL TRAINING	WORKSHOP 3 STORMWATER BMP INFILTRATION TESTING	
1:00 PM	Methods for Developing, Implementing and Evaluating Effective E&O Programs <i>Aimee Navickis-Brasch, HDR;</i> <i>Amanda Hess, Spokane County;</i> <i>Abbey Stockwell, Department of Ecology;</i> <i>Janet Geer, City of Bothell; Jessica Shaw, City of Wenatchee; Mary Rabourn, King County; Tiffany O'Dell, Pierce County</i>	Stormwater Management Manual for Western Washington (SWMMWW) Training <i>Doug Howie, Department of Ecology</i>	Determining Stormwater BMP Infiltration Rates: Requirements, Approaches, Emerging Methods and Current Research <i>Erick Fitzpatrick, AHBL; Andrew Austreng, Aspect; Scott Kindred, Kindred Hydro;</i> <i>Tony Allen, WSDOT; Tom Atkins, Aspect;</i> <i>Craig Doberstein, CPD Solutions;</i> <i>Aimee Navickis-Brasch, HDR</i>	
5:00 PM	Networking Reception <i>Sponsored by HDR, Inc.</i>			

DAY 2 | MAY 17, 2017

7:00 AM	Registration & Continental Breakfast			BALLROOM
7:30 AM	Discussion of Washington's Participation in MS4 National Group			BALLROOM
8:00 AM	Welcome & Keynote <i>John Stark, Director, Washington Stormwater Center</i>			BALLROOM
	ROOM 100	ROOM 200	ROOM 300	
	TRACK 1 BIG PICTURE STORMWATER	TRACK 2 STORMWATER PROGRAM EFFICIENCIES NOW	TRACK 3 STORMWATER RESEARCH, SCIENCE & NEWS	
8:15 AM	Collaborating to Use Lessons Learned for Improved Stormwater Management <i>Blair Scott & Doug Navetski, King County</i>	Cleaner. Water. Faster. Bi-state Interpretive Trail Project <i>Jim Ekins, University of Idaho Extension</i>	RSMP Effectiveness Study: Stormwater Retrofits for Treating Highway Runoff to Echo Lake <i>Carly Greyell, King County Water and Land Resources</i>	3, 9, 12
9:00 AM	How Do You Know That Your Stormwater Program Is Working? Developing Measuring Sticks to Demonstrate Effectiveness <i>Art Jenkins, City of Spokane Valley; Aimee Navickis-Brasch, HDR</i>	Streamlining On-site Stormwater Management: Helping Municipalities Implement New Stormwater Requirements <i>Rebecca Dugopolski, Herrera; Jonathan Boehme, City of Port Angeles</i>	IDDE Analysis: A Five-Year Study of Phase I Data <i>Dan Smith, Pierce County Planning and Public Works</i>	5, 10, 13
9:45 AM	Outfall Elimination: Is It a Cost-effective Alternative? <i>Teresa Reed-Jennings, City of Pasco; Matthew Fontaine, Herrera</i>	Practical Permeable Pavement <i>Veronica Sisseck, Pierce County Planning and Public Works</i>	Illicit Discharge Detection and Elimination Data Evaluation for Western Washington <i>James Packman, Aspect; Greg Vigoren, City of Lakewood</i>	6, 11, 14
10:30 AM	City of Poulsbo Liberty Bay TMDL Implementation Plan <i>Diane Lenius, City of Poulsbo; Phil Struck, Sealaska Environmental Services</i>	Fitting Green Infrastructure in a Historic Neighborhood <i>Marcia Davis, City of Spokane</i>	Statistical Assessment of Kitsap County's Macroinvertebrate and Streamflow Data <i>Joy Michaud, Herrera; Eva Crim, Kitsap County</i>	7, 11, 16
11:15 AM	Intersections for Action: Connecting Stormwater Management, Urban Growth and Salmon Recovery <i>Andy Rheume, City of Redmond; Abbey Stockwell, Department of Ecology; John Stark, Washington Stormwater Center</i>	TAPE 101 <i>Carla Milesi, Washington Stormwater Center TAPE Program</i>	Private Facility Inspection Program: The Good, the Bad & the Ugly [Case Study] <i>Nikki Guillot, City of Vancouver</i>	8, 12, 16
Noon	Lunch (provided)			
1:00 PM	Lake Whatcom Homeowner Incentive Program: Retrofits on a Watershed Scale <i>Eli Mackiewicz, City of Bellingham; Ingrid Enschede, Whatcom County</i>	Kendall Yards and More: Stormwater in the Eastern Region <i>Cynthia Wall, Shannon Petrisor, Brandy Reynecke & Dave Duncan, Department of Ecology</i>	Regional Stormwater Monitoring Program/ Stormwater Action Monitoring <i>Brandi Lubliner, Department of Ecology</i>	17, 18, 19
2:00 PM	Refreshments			
2:15 PM	Climate Change Impacts on Stormwater Management in Washington State <i>Guillaume Mauger, University of Washington</i>	My Soil Won't Drain, Can I Still Use LID? <i>John Knutson, Aspect; Rob Buchert, City of Pullman</i>	South Park Water Quality Treatment: Testing the Waters <i>Sheila Harrison, Seattle Public Utilities; Vicki Sironen, HDR</i>	20, 22, 25
3:00 PM	Tacoma's Regional Facilities Program for NPDES Stormwater Treatment/ Flow Control Requirements <i>Dana de Leon, City of Tacoma</i>	Solving Pollution at the Source: Seattle Public Utilities Source Control Program <i>Kevin Buckley & Beth Schmoyer, City of Seattle</i>	Local Monitoring Can Yield Big Dividends in Evaluating Program Effectiveness <i>Larry Schaffner, Thurston County; Scott Collyard, Department of Ecology</i>	20, 23, 26
3:45 PM	Protecting Shellfish One Rain Garden at a Time <i>Brian Stahl, Kitsap Conservation District</i>	Pollution Prevention: Elements of an Effective Source Control Program <i>Laura Frolich & Sean Hare, Snohomish County Public Works</i>	Detecting and Quantifying Road-salt Run-off in Seattle Streams <i>Chapin Pier & Danielle Rapoza, Seattle Public Utilities</i>	21, 24, 27
4:30 PM	Conference Concludes			

NEW Contacts

Use this page to keep track of new contacts and professional resources from the conference.

Name	Job Title
Organization/Company	
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10:00 am - 12:00 pm

Pre-conference Open House

BALLROOM

Eastern Washington BMP Effectiveness Studies

Coordinated by the Eastern Washington Stormwater Group

Join the Eastern Washington Stormwater Group for an open house as they present an introduction to their BMP Effectiveness Studies.

12:30 - 1:00 pm

Conference Registration

LOBBY

Come check-in to the conference and meet your colleagues. Light snacks & beverages will be served, however lunch is on your own.

1:00 - 5:00 pm

Workshops

EDUCATION & OUTREACH WORKSHOP

ROOM 100
1:00 pm

Methods for Developing, Implementing and Evaluating Effective E&O Programs

Aimee Navickis-Brasch, HDR; Amanda Hess, Spokane County; Abbey Stockwell, Department of Ecology; Janet Geer, City of Bothell; Jessica Shaw, City of Wenatchee; Mary Rabourn, King County; Tiffany O'Dell, Pierce County

Stormwater E&O programs strive to increase public awareness and encourage behavior change that will lead to improved water quality. However, achieving these goals and producing measureable results that demonstrate the effectiveness of E&O programs is challenging. This workshop will focus on providing attendees with information and examples that will assist them in developing and implementing targeted E&O programs as well as methods for measuring the impact of the program. The presentations during this workshop will focus on:

- An overview of E&O permit requirements for both Phase I and Phase II permittees.
- Determining what your message is. How to choose the hot topic, the requirement that will get you the great results.
- Strategies for effectively communicating your program message.
- Tools for creating effective educational programs that focus on changing public behavior.
- Case study presentations on two established E&O programs including: Don't Drip and Drive Vehicle Leaks Program and Dump Smart Mobile Business Program. The presentations will cover the research that provided the basis for developing these programs, how the programs were implemented, approaches for evaluating the effectiveness of these programs, and lessons learned.
- A new QAPP Template developed specifically for evaluating the effectiveness of E&O programs.

STORMWATER MANUAL TRAINING WORKSHOP

ROOM 200
1:00 pm

Stormwater Management Manual for Western Washington (SWMMWW) Training

Doug Howie, Department of Ecology

This workshop will cover the nine Minimum Requirements in the Stormwater Management Manual for Western Washington (SWMMWW) including:

- How to evaluate the thresholds when determining New/Redevelopment criteria.
- The difference between "Retrofit" and New/Redevelopment.
- The requirements in the application of the Minimum Requirements with emphasis on Minimum Requirements 5, 6, and 7.
- Infeasibility Criteria: What it is and what it isn't.

The training is presented from the point of view of a typical engineer who is developing the Stormwater Site Plan and looking at the decisions that he/she must make (from site assessment, through to final design and plan submission) with regards to New/Redevelopment.

ROOM 300
1:00 pm

Determining Stormwater BMP Infiltration Rates: Requirements, Approaches, Emerging Methods, and Current Research

Erick Fitzpatrick, AHBL; Andrew Austreng, Aspect; Scott Kindred, Kindred Hydro; Tony Allen, WSDOT; Tom Atkins, Aspect; Craig Doberstein, CPD Solutions; Aimee Navickis-Brasch, HDR

Determining representative infiltration rates for a project site is critical to BMP design, particularly when meeting Ecology requirements related to low impact development and onsite management of stormwater runoff. This workshop will provide attendees with a broad understanding of the requirements for determining infiltration rates; as well as approaches, emerging methods, and current research. The presentations during this workshop will focus on:

- An overview of the SWMMWW and SWMMEW requirements for determining infiltration rates at proposed BMP sites.
- Selecting appropriate field testing methods and locating test sites.
- Case studies from project sites in both EWA and WWA including common approaches, challenges, and lessons learned.
- Highlights of tools available to facilitate meeting permit requirements.
- Emerging methods to estimate infiltration rates.
- Overview of current WSDOT research focused on developing a method for estimating saturated hydraulic conductivity from soil grain size parameters and its application to infiltration design, including consideration of soil compaction effects.

5:00pm - 7:30pm

Networking Reception

Sponsored by HDR, Inc.



BALLROOM

Join your fellow stormwater professionals for an evening of sharing, networking and fun. Hors d'oeuvres and beverages will be served.

7:00 am - 8:00 am

Registration & Continental Breakfast

BALLROOM

Get organized for your day and meet with colleagues over a light continental breakfast.

7:30 am - 8:00 am

Discussion of Washington's Participation in the MS4 National Group

Lead by Merita Trohimovich, P.E., City of Tacoma

BALLROOM

Washington State is recognized as being on the forefront of many stormwater regulatory and program management issues. National conversations about stormwater can benefit from Washington experience and Washington can also benefit from the experience of other stormwater permittees across the nation.

During this breakfast session, join with other permittees to discuss a new national organization developing now with a sole focus on stormwater. We will have a table discussion about the new National Municipal Stormwater Alliance (NMSA) which is affiliated with Water Environment Federation (WEF) and WEF's newly established Stormwater Institute. We can also briefly talk about other existing organizations, such as National Association of Clean Water Agencies (NACWA), APWA and WEF that many may know. Most organizations have several areas of focus and can be joined by individuals or individual municipalities. NMSA is different in that it is a wholly stormwater focused group open to groups of five or more Phase I or Phase II MS4 permittees. Join us to see how you could benefit from joining these organizations. Let's put Washington on the national stormwater "map!"

8:00 am - 8:15 am

Welcome & Keynote | Salmon Toxicology and Science: Using Research to Get Support for your Stormwater Program

BALLROOM

Dr. John Stark, Director, Washington Stormwater Center

8:15 am - 12:00 pm

Conference Tracks

TRACK 1: BIG PICTURE STORMWATER

ROOM 100
8:15 am

Collaborating to Use Lessons Learned for Improved Stormwater Management

Blair Scott, King County; Doug Navetski, King County

BLAIR SCOTT Blair Scott is currently with King County working on water quality policy and the implementation of the NPDES Municipal Stormwater permit. He graduated from the University of Washington before receiving his Masters in Integrated Water Management from the International Water Centre in Brisbane, Australia. He is passionate about taking a collaborative, multidisciplinary approach to water management.

DOUG NAVETSKI Doug Navetski has over 30 years of experience working in environmental programs in the Pacific Northwest and throughout the western and southern United States. As a consultant he conducted oceanographic and ecological studies in marine, estuarine, and freshwater ecosystems throughout the western U.S. He has been at King County for the last 16 years, nine years with King County Department of Transportation and his now with the Department of Natural Resources and Parks. He is the Managing Supervisor of the Water Quality Compliance Unit in King County's Stormwater Services Section. He is responsible for the implementation and coordination of stormwater management programs that are required by the Phase I Municipal NPDES permit. These programs include business inspections; code enforcement; public education and outreach; operations and maintenance for both the stormwater system and county-owned properties; and response programs for spills, illicit connections, and illegal dumping. Several of his programs are currently working with the King Conservation District and include the Vashon Island Pollution Identification and Correction program (PIC program) and three TMDL bacteria pollution reduction programs. He is currently working on the lower Duwamish Superfund Cleanup.

ABSTRACT. King County's Phase I Municipal Stormwater Permit is going to be reissued in 2018. Ecology is responsible for writing the permit and has a regulatory process they must follow for reissuance. During this process, public input on permit requirements has been done through a formal comment period after the draft permit is issued. This process has not allowed for in-depth conversations on permit requirements which would incorporate lessons learned from implementers into permit language. Some of the comments provided by King County in the past through the public comment period have been incorporated. Some comments were not incorporated by Ecology, and were important enough to litigate through the Pollution Control Hearing Board (PCHB). This process has missed out on opportunities to improve permit

language and requirements and created dissonance among the stakeholders which included permit holders, Ecology and environmental advocacy groups. This drove a self-selected group of permit holders to discuss more effective ways to improve stormwater management programs through the permit with a collaborative approach to reissuance. This group wanted to work with the stakeholders to address issues prior to Ecology starting the 2018 permit writing process.

2018 Ad-Hoc committee development: The 2018 Ad-Hoc Committee was started as an informal group of Western Washington municipal Phase I and Phase II stormwater permittees discussing how to achieve two goals:

1. Address problems prior to the drafting of permits: where changes, clarifications, and information sharing might lead to meaningful improvements in the efficiency and effectiveness of stormwater management (reduce the appeal issues).
2. Build Relationships: Develop an open and transparent process to discuss issues thereby improving communications and seeking common ground and collaboration among stakeholders (environmental advocacy groups, Permittees, and Ecology) who share an interest in protecting receiving waters from the impacts of polluted stormwater runoff.

Through this process, suggestions to make the permit language more clear and effective were provided to Ecology prior to drafting permit language. Furthermore, stakeholders worked together in topic groups to address particularly complex and challenging elements of the NPDES Municipal Stormwater permit. For example:

- For the watershed scale planning requirements, this topic group was able to distill a number of lessons learned and agree on the fact that the intent of the watershed planning requirement should be to end up with a tool to guide capital and programmatic stormwater actions. This group was also able to provide Ecology with useful feedback on prioritized actions that would provide discrete outcomes to work towards the suggested intent of watershed scale planning.
- For the Structural Stormwater Controls topic group, there was an innovative idea put forward for addressing impacts from existing development. This topic group looked to develop standard methodologies for calculating tons of sediment removed by stormwater BMPs.

As a result of the 2018 Ad-Hoc committee process, Ecology has adapted their process to have additional focus group discussions (reconstituting the Ad-Hoc Committee topic groups) in addition to the required general public permit listening sessions.

LEARNING OBJECTIVES. Permittees will learn how to build lessons learned from implementers and adaptive management into the Municipal Permit process.

It is extremely important to work with stakeholders (Ecology, Permittees, Environmental advocacy groups, etc.) to share ideas, forge relationships, and build common ground. This is the most effective way to improve permit requirements and how they are implemented.

ROOM 100
9:00 am

How Do You Know That Your Stormwater Program Is Working? Developing Measuring Sticks to Demonstrate Effectiveness

Art Jenkins, City of Spokane Valley; Aimee Navickis-Brasch, HDR

ART JENKINS Art Jenkins, PE has over 24 years of Civil Engineering experience including material transportation systems, road, bridge, stormwater design and construction, and project/program management in these realms. He has directly worked for both consultants and owners in both the private and public sectors. He has over 14 years of direct stormwater experience designing, managing, and implementing National Pollutant Discharge Elimination System (NPDES) Phase 1 and 2 permits and Underground Injection Control (UIC) requirements, programs, and projects.

AIMEE NAVICKIS-BRASCH Aimee Navickis-Brasch, PE, has 23 years of combined experience in water resources and environmental engineering with specialized experience in stormwater management including a robust combination of expertise in design, research, policy development, and technical training. She is a senior stormwater engineer at HDR and works out of their Spokane Washington office. Aimee has a B.S. in Mechanical Engineering from Gonzaga University, a M.S. in Civil Engineering from WSU, and expects to complete her PhD in Civil Engineering at the University of Idaho in 2017.

ABSTRACT. For the past several years, the Washington State Department of Ecology has funded grants to further collaboration between local jurisdictions in Eastern Washington (EWA) on determining the effectiveness of various stormwater best management practices (BMPs). This presentation presents a case study that describes the considerations, approaches, and progress the joint effort has made to date as well as future work the various partners plan to complete. Another key aspect of the presentation is a discussion regarding the Quality Assurance Project Plans (QAPPs) templates which were developed specifically for Stormwater Effectiveness Studies.

Eighteen cities and six counties in EWA currently have municipal stormwater permits allowing discharges of public storm drains to surface waters of the State. Pursuant to those permits, jurisdictions are required to “collaborate with other permittees to select, propose, develop, and conduct Ecology-approved studies to assess, on a regional or sub-regional basis, the effectiveness of permit-required stormwater management program activities and best management practices (BMPs)”. In response to these requirements, a collaborative effort of staff from the EWA jurisdictions identified 24 study ideas (Phase 1) and then developed a ranked list of the top 14 studies (Phase 2). Phase 3 will focus on developing the experimental design for the 14 “EWA Effectiveness Studies”, and occurs in two parts with the aim of delivering the following documents for each study: 3a) the Detailed Study Design Proposal (Proposal) and 3b) the Quality Assurance Project Plan (QAPP). The final Phase 4 of the process will carry out the individual studies for 8 to 12 projects and report findings.

The proposed 14 EWA effectiveness studies include three classifications of BMPs classifications (i.e. structural, operational, and education & outreach). A distinction in the BMP classifications is made because, the variables that directly affect a BMPs effectiveness, differ between these classifications (i.e. structural, operational, and education & outreach). Subsequently the types and quality of data needed to evaluate effectiveness are also different along with the potential sources of error that may occur during the creation of the data. In an effort to meet permit goals for evaluating the effectiveness of these BMPs in an efficient manner, the Effectiveness Study QAPP Templates were developed for each of the three BMP classifications: Structural BMPs, Operational BMPs, and Education and Outreach BMPs.

LEARNING OBJECTIVES.

1. Provide an overview of the approach the EWA jurisdictions are taking to meet regulations for evaluating the effectiveness of their permit required stormwater management program along with an overview of the top 14 Effectiveness Study Ideas.
2. Discuss the rationale for developing Quality Assurance Project Plan Templates and provide an overview of the differences in the templates.
3. Discuss how EWA jurisdictions plan to apply the study findings to refine various stormwater management programs and projects.

Outfall Elimination: Is It a Cost-effective Alternative?

Teresa Reed-Jennings, PE, City of Pasco; Matthew Fontaine, PE, Herrera

TERESA REED-JENNINGS *Teresa Reed-Jennings is a Senior Civil Engineer at the City of Pasco. She has over 25 years of experience in civil engineering management and design. Teresa specializes in design, preparation of construction documents, direction of environmental impact studies for capital projects, and construction administration. She is a member of the Eastern Washington Stormwater Managers Group, a committee member at American Water Works Association, and past president of the American Society of Civil Engineers North Branch Seattle Section.*

MATTHEW FONTAINE *Matt Fontaine is a Water Resources Engineer with over 10 years of experience in stormwater planning, stormwater design, hydrologic modeling, low impact development (LID), stormwater retrofits, environmental permitting, and stormwater manual development and compliance. Matt leads Herrera's basin planning business line and has led and contributed to over a dozen basin plans, CIP plans, and retrofit plans. He has been the project engineer responsible for engineering designs, specifications, and cost estimates for stormwater conveyance and capacity improvements, stormwater retrofits, permeable pavement, bioretention, stormwater treatment, flow control, stream restoration, and industrial stormwater management. He has also audited stormwater programs, provided construction observation, and conducted climate change vulnerability assessments.*

ABSTRACT. The City of Pasco presents the ideal location for eliminating stormwater outfalls by retrofitting existing development with infiltration facilities. This is because there are only five stormwater outfalls in the City and the land area associated with those outfalls is relatively small—only 16% of the City. Also, the low rainfall amounts and high infiltration rates make stormwater facility size small relative to the tributary drainage area. Another local advantage is the wide streets and rights-of-way that provide ample opportunity for retrofitting. It doesn't get better than this!

Herrera evaluated the feasibility of eliminating Pasco's outfalls by providing an order of magnitude cost estimate for retrofitting the five basins. After desktop and field investigation of the project area, retrofit design templates were developed for residential and commercial/industrial land use types at sites in the two basins that discharge directly to the Columbia River. Hydrologic modeling was used to size the stormwater facilities in each template to infiltrate the 100-year storm. GIS analysis was used to apply these block-scale templates basin-wide and define costs for outfall elimination.

The concept of eliminating outfalls and decreasing the risk of potential impacts to surface water from stormwater (while also eliminating potential long term stormwater monitoring needs) is probably limited to climates and characteristics of locales like Pasco, with low rainfall and good infiltration. Although the total cost for retrofitting was prohibitively high at the basin scale, there can still be value in taking this approach for select areas where downstream resources are vulnerable, where contamination risks are high, and where site conditions are particularly favorable. The cost of large scale retrofits like this may also be more reasonable to consider where aging conveyance infrastructure needs replacement or rehabilitation.

As is always the case in a modeling effort of this scale, numerous assumptions were applied at each step of the analysis. By intent these assumptions were designed to conservatively represent a broad range of site complexity for retrofits. In next steps, the City plans to construct pilot projects that can be used to refine underlying assumptions of the model and resulting retrofit cost estimates.

LEARNING OBJECTIVES. Benefits: Eastern and Western Washington permittees will benefit from seeing an example of retrofit planning focused on outfall elimination.

Eastern Washington permittees will benefit from seeing a local Eastern Washington-centric stormwater retrofit planning example (few examples exist at this time).

Tools: Permittees will learn approaches for considering stormwater retrofits at a basin scale, including extrapolating from the site scale retrofits to basin-scale or city-scale retrofits.

Challenges: Siting retrofit projects in a developed right of way; managing runoff from storms up to the 100-year storm.

Lessons learned: Given some uniformity within the basins, representative retrofit templates can be developed to estimate basin-scale retrofit costs. Even with good soil conditions, basin scale retrofits can be prohibitively expensive.

Improve Efficiency: As permittees are faced with the need to rehabilitate aging conveyance infrastructure and control or treat unmanaged stormwater within their jurisdictions, this presentation will provide an example for them to consider in their own planning efforts.

ROOM 100
10:30 am

City of Poulsbo Liberty Bay TMDL Implementation Plan

Diane Lenius, City of Poulsbo; Phil Struck, Sealaska Environmental Services

DIANE LENIUS *Diane Lenius is the City Engineer of Poulsbo, Washington and has 25 years of experience in the design, construction and operation of municipal infrastructure. She directs the City's stormwater program, including NPDES compliance, program planning and capital project construction. She has managed many stormwater projects including comprehensive plans, LID retrofits and regional facilities.*

PHIL STRUCK *Phil Struck is the Engineering and Environmental Services Program Manager for Sealaska Environmental Services. He has 30 years of experience with surface and stormwater management including NPDES compliance, watershed assessment, water quality assessment, LID design and retrofit, comprehensive planning and regional facility planning and design.*

ABSTRACT. Total Maximum Daily Load (TMDL) Plans apply to many waters of the state, and specific TMDL compliance requirements are attached to dozens of municipal NPDES permits. TMDL compliance requirements have increased with each NPDES permit update, and are likely to increase in future updates as long as receiving waters continue to not meet water quality standards. The City of Poulsbo Liberty Bay TMDL Implementation Plan project describes one community's successful approach to proactively addressing and attaining TMDL requirements.

The City of Poulsbo is the primary municipality affected by the Liberty Bay TMDL Plan, which is designed to restore beneficial uses that include commercial shellfish harvesting. Stormwater from the City was identified in the TMDL Plan as a primary loading source, requiring significant reductions at multiple locations. In response, the City prepared the Poulsbo TMDL Implementation Plan to describe the historical water quality context, storm system analysis, technical prioritization criteria, CIP and funding plan for attaining TMDL goals.

The City used a watershed assessment approach that included evaluation of seven sub-watersheds, over 40 sub-basins, and 10 years of water quality monitoring data to assess progress toward water quality goals, as well as identify and prioritize corrective action needs. Assessment results showed significant progress has been achieved in attaining water quality standards, with specific improvements associated with over \$10M in stormwater quality retrofit projects that have been implemented by the City over the last 10 years.

Specific project challenges included securing funding for the project, coordination with other jurisdictions within the watershed, and obtaining elected official support for implementation. These challenges were addressed through creative funding approaches, an interagency technical review team, and multiple meetings and presentations to public officials. The ability to demonstrate that past investment was producing measurable water quality improvement was a key component of meeting each of these challenges, as showing that implementation could be accomplished within the existing rate structure.

The City's TMDL Plan provides a success story that shows how water quality goals and TMDL compliance can be funded, accomplished, documented and sustained. It provides an effective tool to ensure utility funds are used in a cost effective manner. The project also provides a potential model approach for other NPDES permittees that are interested in taking proactive steps to meeting TMDL requirements, improving water quality and demonstrating effective use of utility rates to their communities.

LEARNING OBJECTIVES. The presentation will describe the City's watershed based strategy and plan for compliance with receiving water (Liberty Bay) Total Maximum Daily Load (TMDL) requirements. TMDL requirements are common elements of many NPDES permits, and are intended to restore water quality and beneficial uses in degraded waters. Stormwater is typically a key loading source in TMDL Plans, particularly in western Washington. This presentation will provide other permittees an approach and model for addressing TMDL water quality based compliance needs. Specific tools will include proactive strategies for TMDLs; techniques to assess and prioritize needs; and funding strategies for implementation including elected official support and grant funding strategies. A central challenge of the project was to demonstrate that prior City investments (\$10M over 10 years) resulted in a measurable difference in water quality and

ROOM 100
11:15 am

TMDL compliance, and that continued investment was necessary to sustain and improve water quality. A key lesson learned is the importance of long term monitoring to provide a basis for measuring progress, identifying corrective actions and demonstrating compliance with standards. This presentation will show how to improve the efficient use of capital and operations funds by ensuring that specific investments and actions are matched to highest priority loading sources. It also will show how to create a baseline assessment that can be used to better understand system operation and performance over time, how to measure the effectiveness of program activities, and an adaptive management approach to municipal stormwater NPDES compliance.

Intersections for Action Connecting Stormwater Management, Urban Growth and Salmon Recovery

Andy Rheume, City of Redmond; Abbey Stockwell, Department of Ecology; John Stark, Washington Stormwater Center

ANDY RHEAUME *Andy Rheume has over 15 years' experience working in municipal stormwater management and urban watershed management planning for the City of Redmond and Seattle Public Utilities. During his tenure, Andy has attained extensive experience creating stormwater management regulations and policies including: municipal code modifications, local stormwater management manual adoption, and watershed planning for urban stream habitat recovery. In addition to stormwater management, Andy is currently the Mayor of Bothell and the WRIA 8 Salomon Recovery Council Chair.*

ABBEY STOCKWELL *Abbey Stockwell is the Phase II Municipal Stormwater permit writer for the state. She received her Master's degree from Humboldt State University in Natural Resources Planning, 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.*

JOHN STARK *John Stark is the Director of the Washington Stormwater Center. He is also a full Professor and runs the Ecotoxicology Program at WSU. Dr. Stark earned a B.S. degree in Biology from Syracuse University, a B.S. degree in Forest Biology from SUNY Syracuse, an M.S. degree in Entomology from Louisiana State University and a Ph.D. in Toxicology from the University of Hawaii. Dr. Stark's research interests focus on protection of endangered species and ecological risk assessment of pollutants with particular emphasis on salmon and aquatic invertebrates. He teaches courses in toxicology. Dr. Stark has published over 125 peer-reviewed papers in scientific journals, numerous book chapters and a recent book on ecological risk assessment entitled "Demographic Toxicity: Methods in Ecological Risk Assessment". He is also a member of the Puget Sound Partnership Science Panel (2007-present).*

ABSTRACT. Puget Sound has a global reputation for blue skies, green forests and the magnificence of the Puget Sound waters. Unfortunately, local water bodies and the Puget Sound are at risk due to impacts from unprecedented urban development and polluted stormwater runoff. Annually, millions are spent in the Puget Sound watershed to build stormwater controls when development occurs. By design of current regulations, it will take over 60 years to have enough stormwater controls in place to protect urban water bodies. In the meantime, salmon are in decline and some salmon species are listed as threatened and cannot wait 60 years for their habitat to be restored. At this pace, quality of life for all who live and work in the Puget Sound basin will also suffer.

The credit for the foundation of this presentation lies with a small and innovative group from state agencies, cities, environmental organizations and other interested professionals working over the past few years to produce new thinking and approaches for creating a new model for urban sustainability. Spearheaded by the Washington Department of Commerce and the South Central Local Integrating Organization, and working with Ecology and the City of Redmond, two guidance documents (Building Cities in the Rain; Stormwater Control Transfer Program) were created that show a pathway for creating resilient cities of the future.

This presentation will provide seminal information and tools on an innovative and foundational approach to solving urban problems by addressing three root causes: increases in toxic and eroding stormwater runoff, urban sprawl encroaching on healthy natural spaces, and the decline of healthy salmon populations. As local governments need to evaluate and manage the natural assets within their jurisdictions, working through the intersection of planning, stormwater management, and salmon recovery creates a place to start managing natural assets instead of stopping at mitigating further impacts. This presentation discusses platforms needed to begin the paradigm shift from meeting the letter of the law (stormwater regulations, CWA, ESA) to instead addressing the intent of the law. It provides the place, the information and the discussion on how to begin this shift and will result in a more strategic approach to upcoming substantial investments so that results come sooner than 60 years from now.



LEARNING OBJECTIVES. As the watershed planning process for stormwater management continues to evolve, this presentation will benefit both Eastern and Western Washington permittees by offering tools and ideas that can help assess, prioritize and fund the recovery of water bodies in the face of urban growth and disappearing salmon habitat.

The approach recognizes the role that urban density can play to reduce impacts to water quality, support effective aquatic ecosystem protection and recovery, and preserve outlying areas. The context of watershed basin planning will be presented from the perspective of stream health and the Benthic Index of Biotic Integrity (B-IBI) scoring system examining the biological conditions of the streams. Recent guidance from Ecology and Commerce provides a planning framework for collaborative work within jurisdictions to begin using these three foci as they work to build their futures. A working example from the City of Redmond's cross-silo work group's Watershed Management Plan shows the effective collaborations of city planners, stormwater engineers and habitat/environmental resource staff.

TRACK 2: STORMWATER PROGRAM EFFICIENCIES NOW

ROOM 200
8:15 am

Cleaner. Water. Faster. Bi-state Interpretive Trail Project

Jim Ekins, University of Idaho Extension

JIM EKINS *Jim has a Natural Resource degree from Western Carolina U, and a Masters in Collaboration and Volunteerism from U. Oregon. He worked in three National Parks, on a research base in Antarctica, and in wetland restoration for watershed councils in Oregon and Idaho.*

ABSTRACT. The *Cleaner. Water. Faster. Bi-state Interpretive Clean Water Trail* project is focused on protecting critical regional waterways through natural stormwater pollution treatment via native plant wetland and bioinfiltration swales and education. It is a catalyst for 24 partners along 60 miles of Lake Coeur d'Alene and the Spokane River in two states to provide coordinated, impactful clean water educational programming. This collaborative project is battling more than just stormwater pollution, but also widespread public perception of endless supplies of pristine water in the region.

The Lake Coeur d'Alene-Spokane River corridor is the physical thread connecting this geographically unique project. Science-based, well-engineered bio-swales and research-based impactful environmental education is the common intellectual thread. Stormwater treatment wetland/bioinfiltration swales, raingardens, and riparian buffers will be constructed with 1,000 locally-sourced new woody native shrubs as demonstration projects in highly visible areas along the corridor. The goal is to demonstrate the beauty, usefulness, and ecosystem services they provide!

LEARNING OBJECTIVES. This presentation will outline an innovative education and BMP implementation program that includes academic service-learning, interpretive signs, outdoor classroom, and projects in two states with 24 community partners. Stormwater permittees will find new insights into multi-stakeholder grant funded demonstration projects.

Streamlining On-site Stormwater Management: Helping Municipalities Implement New Stormwater Requirements

Rebecca Dugopolski, Herrera; Jonathan Boehme, City of Port Angeles

REBECCA DUGOPOLSKI *Rebecca Dugopolski, PE, is a senior engineer with Herrera Environmental Consultants in Seattle, Washington with over eleven 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 recently helped several Phase II jurisdictions across the state of Washington integrate new stormwater requirements into their municipal code and is now involved with helping to develop implementation tools to support those code revisions.*

JONATHAN BOEHME *Jonathan Boehme PE, is a Civil Engineer II with the City of Port Angeles, with 5 years of experience in stormwater design and NPDES permit compliance. He received his Bachelor's degree in Civil Engineering from Saint Martin's University in Lacey WA. Mr. Boehme is involved with reviewing development applications for code compliance, stormwater design and construction management, and he managed the City's recent LID code integration project.*

ABSTRACT. Implementing the new on-site stormwater management requirements in the state of Washington can be a challenging and often daunting task. The Phase I permittees (including Seattle, Tacoma, Pierce County, and King County) have started implementation of the new Minimum Requirement #5 in the Washington State Department of Ecology's (Ecology) Stormwater Management Manual for Western Washington by developing and adopting their own stormwater manuals, which went into effect in 2016. Starting in January 2017, a majority of the 88 Phase II jurisdictions in Western Washington were required to implement either the on-site stormwater management requirements developed by Ecology or one of the Phase I jurisdictions. There is a huge learning curve for developers, designers, engineers, and plan reviewers for implementing this new approach to low impact development (LID). Applicants will be required to document the technical infeasibility of a specific LID best management practice (BMP) before moving on to the next potential BMP on the list. Proof of technical infeasibility may require on-site infiltration testing.

Several Phase I and Phase II jurisdictions have been developing implementation tools to help ease this transition for municipal staff and the development community. Examples of these implementation tools will be provided during this presentation including an infeasibility map that depicts spatial data including steep slopes, landslide and erosion hazard areas, and contaminated soils to show where infiltration is infeasible. Other examples include handouts summarizing the requirements for small projects, case studies documenting infeasibility criteria for example scenarios, factsheets outlining the post-construction soil quality and depth requirement, templates for simplified stormwater site plans and Construction Stormwater Pollution Prevention Plans (SWPPP) and calculators for selecting and sizing BMPs.

LEARNING OBJECTIVES. A variety of implementation tools will be presented from several jurisdictions. Attendees (Phase I and Phase II permittees from Western and Eastern Washington) may discover ideas for streamlining and improving the implementation of LID BMPs in their own jurisdictions, whether they are faced with similar regulatory requirements or simply have an interest in easing the application of LID in their own community.

ROOM 200
9:45 am

Practical Permeable Pavement

Veronica Sisseck, Pierce County Planning and Public Works

VERONICA SISSECK *Veronica Sisseck, P.E. has worked for Pierce County Public Works in Road Operations for the past five years. In this position she has designed solutions to roadway impediments including land subsidence, flooding, and pavement distress. She has conducted testing of liquids and solids removed by routine storm system cleaning. Presently she is working on coordinating pervious pavement maintenance research and regional shared maintenance equipment.*

ABSTRACT. Many Permittees are now responsible for the long term success of permeable pavement. As with any other roadway assets this success is based on appropriate design, installation, and maintenance. While guidelines and regulations have been established for stormwater facilities and for paved surfaces individually, there are many unknowns when these facilities are combined. With the 2014 Stormwater Management Manual for Western Washington requiring permeable pavement if feasible and the 2004 Stormwater Management Manual for Eastern Washington allowing porous pavement, it seems prudent to prepare for a potential future where permeable pavement is commonplace.

While infiltration rates of freshly installed permeable pavement were readily available, Pierce County staff found very little published information on infiltration rates over time or durability of pavement outside of laboratory conditions. Pierce County designed, installed, and continues to maintain several permeable pavement facilities with the intention of estimating and reducing life cycle costs. The facilities constructed include a cul-de-sac with a history of flooding, arterial roadway, road shoulder, sidewalk and parking lot. The county tested infiltration rates and performance of various cleaning methods to support development of a successful maintenance program.

This presentation will address the objectives of pervious pavement and the performance over time. Design and installation will be briefly discussed to share known parameters and the unexpected observations in the establishment of the test sites. The results of field testing with various types of equipment to clear particulate embedded in pavement will be presented. The county will share the lessons learned and suggestions on how to reduce life cycle cost.

Pierce County has more to learn on how to maintain pervious pavement. We are in the process of establishing a partnership with Washington State University Extension to publish maintenance guidelines.

LEARNING OBJECTIVES. This presentation aims to educate attendees on effective management of permeable pavement facilities. Attendees will learn about the requirements, risks, and rewards of permeable pavement both as a stormwater feature and as a hard surface. While the lessons learned are all sourced from a Phase I Municipal Stormwater Permittee’s transportation infrastructure in the Puget Sound Lowlands, the presentation is intended to apply to permit requirements, environmental conditions and hard surface functions statewide. Lessons learned include pavement structural failure, infiltration rate degradation, and observations on several pavement cleaning methods. Attendees will leave with a baseline for developing a maintenance standard and budgeting for the life cycle of the facility.

ROOM 200
10:30 am

Fitting Green Infrastructure in a Historic Neighborhood

Marcia Davis, City of Spokane

MARCIA DAVIS *As the principal engineer of the City of Spokane’s Integrated Capital Management Department, Marcia is responsible for capital project scoping, funding, and programming. For the past two decades, she has designed and programmed water, sewer, stormwater, and transportation capital projects. Marcia has worked on the City’s CSO Abatement program for over 10 years, and was the City’s technical lead for the 2014 Integrated Clean Water Plan and the 2013 CSO Plan Amendment. For the past three years, Marcia has been responsible for the programming, coordination with the enhanced surface improvements, and funding of the CSO program, following projects from inception to completion of construction.*

ABSTRACT. The West Central Neighborhood is one of the oldest neighborhoods in Washington State. Two combined sewer basins within this neighborhood were identified for stormwater treatment and infiltration. Several alternatives were evaluated for constructability, impact to neighbors, and cost. The selected alternative will be presented with the reasons why it was the best choice.

LEARNING OBJECTIVES. This presentation will identify challenges of retrofitting stormwater BMPs in a historic neighborhood; discuss the lessons learned; and reveal the advantages of the selected alternative.

TAPE 101

Carla Milesi, Washington Stormwater Center TAPE Program

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. In partnership with Ecology, she manages the operation and development of the TAPE program for certifying emerging stormwater treatment technologies. Carla earned a B.A. in Environmental Studies with a concentration in Chemistry from the University of Vermont. Prior to joining the Center, Carla spent over 10 years as an environmental consultant at Cardno implementing stormwater monitoring and BMP assessment projects.*

ABSTRACT. Washington State Department of Ecology's Technology Assessment Protocol-Ecology (TAPE) is a peer reviewed certification process for stormwater treatment best management practices (BMPs). Certified BMPs are then included as an "Emerging Technology" in the stormwater management manuals for Western and Eastern Washington and can be employed to meet Phase I and Phase II permit requirements for new and redevelopment projects. The protocol is robust and rigorous, providing a standardized method for evaluating treatment BMPs, assurance in the quality and representativeness of the data, and confidence in any resulting certification. However, navigating the protocol can also be costly, prolonged, and confusing. The TAPE 101 presentation will detail the requirements of the TAPE program, provide estimates of costs and time involved in obtaining certification in Washington, and highlight the suitability of the certification for BMP use in both Western and Eastern Washington.

LEARNING OBJECTIVES.

- Understanding the level of cost and effort required to complete a full TAPE evaluation.
- Are treatment BMPs evaluated in Western Washington appropriate to use in Eastern Washington?
- Does the design of BMPs need to vary between Western Washington and Eastern Washington installations?

TRACK 3: STORMWATER RESEARCH, SCIENCE & NEWS

RSMP Effectiveness Study: Stormwater Retrofits for Treating Highway Runoff to Echo Lake

Carly Greyell, King County Water and Land Resources

CARLY GREYELL *Carly Greyell (BS, Western Washington University) has a degree in Environmental Toxicology and has worked in King County's Water and Land Resources Division for the past four years. During this time, she has contributed significantly to projects addressing pathways of priority pollutants to the Lower Duwamish Waterway, literature reviews about bioretention performance, and studies on stormwater treatment effectiveness.*

ABSTRACT. This presentation will cover the findings from the Regional Stormwater Monitoring Program (RSMP) Effectiveness Study: Effectiveness of Stormwater Retrofits for Treating Highway Runoff to Echo Lake. This study evaluated the treatment effectiveness of bioretention planter boxes and Filterra (for phosphorus treatment) installed as part of a stormwater retrofit along Highway 99 in Shoreline, Washington. These treatment installations receive runoff from a mix of highway, commercial and residential areas. Composite grab samples were collected over two storm seasons (2015-2017) from the inlet and outlet of the treatment installations. Parameters included total suspended solids, nutrients, bacteria, total and dissolved metals, polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs).

This study is relevant to National Pollutant Discharge Elimination System (NPDES) permittees, because it was designed to address data gaps identified by the Washington Stormwater Work Group (SWG) on the effectiveness of stormwater treatment technologies being installed in the Puget Sound Region. NPDES permittees selected this project as one of the first-round RSMP Effectiveness Studies for funding.

This study provides valuable information for several reasons:

1. This study evaluated bioretention installations that were more than three years old, whereas other local field studies have focused on newly-constructed bioretention installations. Treatment effectiveness may change as an installation ages, which makes the findings of this study valuable.
2. The parameter list for this project is more extensive than most stormwater studies. In particular, PCBs are known to be a major concern in waterbodies throughout the state, with stormwater often being the key pathway. This field study provides information about the effectiveness of bioretention installations for removing PCBs from stormwater.
3. Historical water quality data were available for the stormwater basin and receiving waterbody. These data, in combination with effectiveness of individual treatment installations, were used to consider whether the stormwater retrofit may have contributed to water quality improvements in the receiving waterbody.
4. This project also identified several challenges in sampling bioretention planter boxes, and some maintenance activities that were required to keep the installations functioning. These findings will be presented and may benefit project managers of future effectiveness studies as well as stormwater program managers.

The final report is expected to be complete in the summer of 2017, and the collected data will be entered into publically available databases by the end of 2017.

LEARNING OBJECTIVES. The presentation will identify contaminants that were consistently reduced through the bioretention planter boxes and Filterra, and discuss factors that contribute to treatment effectiveness. The talk will also discuss how the design of the inlet to bioretention installations could influence maintenance requirements. These findings could help stormwater program managers in selecting appropriate treatment options for a particular stormwater basin.

ROOM 300
9:00 am

IDDE Analysis: A Five-Year Study of Phase I Data

Dan Smith, Pierce County Planning and Public Works

DAN SMITH *Dan Smith is the Permit Management Unit Supervisor for Pierce County Planning and Public Works, Surface Water Management. Mr. Smith has more than 30 years of experience in the environmental and health & safety field spanning both public and private sectors. The vast majority of his professional work has centered on the implementation of municipal stormwater permit compliance strategies, with specific focus on illicit discharge detection and elimination programs. He received a B.S. degree in Environmental Health from Wright State University.*

ABSTRACT. Municipal NPDES stormwater permits require the implementation of procedures designed to characterize, trace, and eliminate environmental threats posed by illicit discharges. However, merely documenting and recording individual Illicit Discharge Detection and Elimination (IDDE) actions and activities alone do not make the bigger picture of stormwater management more clear. Consequently, in order to achieve a greater level of understanding, permittees should begin to seek answers to the following questions: What are the IDDE pollutants of concern within their jurisdictions? Where across the landscape are these incidents occurring and to what frequency? Are there identifiable trends? Can more detailed IDDE information be generated to improve the practicality, efficiency and/or effectiveness of IDDE efforts or other stormwater management programs?

Unincorporated Pierce County (population 380,000), is the second largest Phase I NPDES Municipal Stormwater permittee within the State of Washington; the County's Surface Water Management (SWM) division is charged with managing both the natural surface water systems and the stormwater collection and conveyance infrastructure situated within its 1,800 square mile service area. In an attempt to answer the questions posed above, Pierce County SWM has completed a study (independent of permit requirements) involving the analysis of IDDE records spanning a duration of five years (2012-2016).

The five year analysis summarizes, quantifies, and further examines in detail, the County's Municipal Stormwater Permit IDDE Program. After organizing and classifying more than 1,000 separate IDDE incidents that occurred across both urban and rural County settings during the study period, a subsequent assessment and evaluation of these data yielded a number of key findings, including: (1) an identification of stormwater IDDE pollutants of concern, (2) a demonstration of IDDE incident frequency within drainage basins, (3) the establishment of temporal trends, (4) a correlation between IDDE incidents, percent impervious coverage, and land use categories, and (5) measurable characteristics of IDDE operations and functions.

As a compliment to the broader Source Identification Information Repository (SIDIR) monitoring component required under each of the Washington State Department of Ecology Phase I and Phase II Municipal Stormwater Permit programs, the voluntary Pierce County IDDE Analysis clearly validates the critical importance of locally-produced IDDE information, and demonstrates how local and smaller geographic data sets are better suited in isolating and solving problems at the jurisdictional level. The County's study adds to the growing body of knowledge related to stormwater management, and it helps direct priorities and resources for adaptive management of these programs. Additionally, it fills a gap—the study sets a standard by establishing a framework for other municipalities to use in building their own IDDE analyses to measure performance.

LEARNING OBJECTIVES. The Pierce County Surface Water Management IDDE Analysis clearly validates the critical importance of locally produced IDDE information, and demonstrates how local and smaller geographic data sets are better suited in isolating and solving problems at the jurisdictional level. It will set a standard by establishing a framework for other municipalities to use in building their own IDDE analyses to measure performance.

ROOM 300
9:45 am

Illicit Discharge Detection and Elimination Data Evaluation for Western Washington

James Packman, Aspect; Greg Vigoren, City of Lakewood

JAMES PACKMAN *James Packman is a hydrologist who specializes in surface water ecology, engineering, and management. With 22 years of experience, he has successfully managed and collaborated on dozens of projects for local governments, industrial and private clients, universities and research agencies, and non-governmental organizations. James focuses on how surface waters are monitored, managed, and protected, and he is passionate about solving problems and helping manage water resources efficiently.*

GREG VIGOREN *Greg Vigoren, P.E., is the Surface Water Division Manager with the City of Lakewood, Washington. He manages the Stormwater Utility for the City, which includes implementing the requirements of the NPDES municipal stormwater permit. Greg also manages capital projects for Lakewood, including stormwater and sanitary sewer projects, and he supervises the development review team for the Public Works Department. Greg is a licensed civil engineer in the State of Washington with 22 years of experience.*

ABSTRACT. The NPDES municipal stormwater permits for both western and eastern Washington include requirements to have a program to “prevent, detect, characterize, trace, and eliminate illicit connections and illicit discharges into the MS4.” As part of the Stormwater Action Monitoring program for western Washington (SAM, formerly known as the RSMP or Regional Stormwater Monitoring Program), a source control effectiveness study was developed to evaluate municipal efforts for controlling sources of stormwater pollution. One task of the study was to compile and evaluate illicit discharge detection and elimination (IDDE) data as reported by permittees in 2014. As an adaptive management effort, the SAM program and the IDDE data evaluation are important for informing permittees and the Department of Ecology (Ecology) how the IDDE permit requirements are being implemented. With direction and guidance from the Source Identification (Source ID) subgroup of the SAM program, three objectives for the IDDE data evaluation were identified:

1. Set priorities for municipal IDDE efforts to reduce sources of stormwater pollution and ensure consistent reporting of data.
2. Identify the most commonly used and best methods to reduce or eliminate illicit discharges and connections.
3. Inform regional funding decisions to address common source control issues.

The data evaluation objectives were addressed by collating and analyzing IDDE data, including identifying what data are being collected by permittees, how those data are reported, and reviewing the breadth and range of the types of IDDE-related stormwater pollution. In addition, the observed distributions of pairs of data fields were compared to random distributions using contingency tables and tested for significant differences with the maximum likelihood chi-squared statistic.

A total of 2,913 records were reviewed and included 1,269 records from six Phase I permittees and 1,644 records from 71 Phase II permittees. One challenge was parsing the data from disparate sources into a common database. This required reviewing the notes from each record and developing methods for consistent coding of data. Another challenge was the high variability in the number of IDDE incidents reported by each jurisdiction, which ranged from one to over 700. This variability biased the evaluation toward the jurisdictions who reported the most incidents.

The results indicate that efforts to reduce or eliminate IDDE-related stormwater pollution should focus on the largest quantities of discharge, the most frequent occurrences, and the relative hazard the pollutants pose for water quality. Results also highlight the need to streamline IDDE reporting, and Ecology has already begun to investigate ways to reduce redundancy in permittees' pollution reporting. With the commonality of IDDE permit requirements in western and eastern Washington along with common land uses and potential pollution generating activities, the results from this evaluation help inform Ecology and permittees throughout the state what is the most useful, consistent, and efficient information to report for IDDE incidents.

LEARNING OBJECTIVES. There are three learning objectives for this presentation:

1. Learn about the motivation and methodology of the regional IDDE data evaluation that was undertaken as part of Ecology's SAM program for adaptive stormwater management.
2. Learn what IDDE incident types, pollutants, and resolution times were reported by western Washington municipal NPDES permittees along with the most common methods use for indicator detection, source tracing, and correction to achieve environmental compliance.
3. Learn how the results from this evaluation are being used by Ecology to streamline IDDE reporting requirements.

Attendees will benefit from this presentation by learning how western Washington municipal NPDES permittees have addressed the IDDE permit requirements and what lessons have been learned from these efforts. With identical IDDE requirements in both eastern and western Washington, results from this data evaluation are informative to both Ecology and permittees statewide.

One key challenge this evaluation brought to light is the inconsistency of how IDDE incidents are reported by municipalities. A refined and focused list of data fields was identified through this evaluation that would meet NPDES requirements and improve sharing of information across agencies while decreasing redundant reporting efforts by permittees. Attendees will take away helpful information from this presentation about how to consistently and efficiently report IDDE incidents, including non-IDDE events reported through IDDE communication channels (e.g. pollution hotlines).

ROOM 300
10:30 am

Statistical Assessment of Kitsap County's Macroinvertebrate and Streamflow Data

Joy Michaud, Herrera; Eva Crim, Kitsap County

JOY MICHAUD Joy Michaud, is a Principal at Herrera Environmental Consultants and the head of the Olympia office. She has an interdisciplinary background that includes; water quality studies and stormwater research, fish and aquatic habitat assessments, watershed planning, policy development and project permitting. Joy understands and has wrestled with the complex issues of policy and practicality when it comes to stormwater science. As a water quality expert, she has designed and managed stormwater studies, and has also been the one in the field climbing into manholes to collect samples. She is keenly familiar with the vagaries of monitoring, data analysis, and interpretation. She has also been involved in complex and high-level policy and permitting issues, especially as they relate to stormwater.

ABSTRACT. Kitsap County's Watershed Health Monitoring program has collected streamflow, water quality, habitat, and macroinvertebrate data for over two decades. Since there is now a fairly robust dataset available, the County decided to capitalize on the years of effort and conduct a rigorous analysis of the data and the evaluation metrics. The overarching goal of the monitoring program is to be able to relate specific actions within a watershed (e.g. restoration, development, and adoption of new technologies) to biological outcomes for the purpose of informing adaptive management of the watershed. To achieve this goal, a rigorous, multifaceted statistical evaluation is being done for both macroinvertebrate and stream flow data. This evaluation is being done in two phases; the first phase of which has been completed and is the focus of this presentation.

The objectives of this first phase included:

- Evaluate whether there are individual macroinvertebrate metrics that may perform better as early indicators for trend detection.
- Assess whether there is evidence of long-term or short-term trends in the macroinvertebrate data.
- Analyze continuous stream flow data to determine how much of the observed variation can be explained by precipitation, and how much might be the result of other factors such as watershed processes, land use changes, and restoration activities.

LEARNING OBJECTIVES. The assessment techniques developed may be valuable for use by other entities who are collecting this data. By sharing these initial findings, it may generate interest by others to test the findings and ultimately strengthen the understanding of this data.

ROOM 300
11:15 am

Private Facility Inspection Program: The Good, the Bad & the Ugly [Case Study]

Nikki Guillot, City of Vancouver

NIKKI GUILLOT Nikki Guillot works for the City of Vancouver's Surface Water Program, focusing on water resource protection including illicit discharge investigations, private facility inspection and source control. She has spent over a decade working in the stormwater management field from agricultural conservation to municipal permit compliance in Illinois, Kansas and Washington. She has an Environmental Science degree from Drake University and is a Certified Stormwater Manager (CSM) with APWA.

ABSTRACT. The City of Vancouver recently initiated a private stormwater facility inspection and maintenance project with grant funding from the Department of Ecology's Stormwater Financial Assistance Program (SFAP). For municipal agencies, an inspection program can elevate baseline maintenance on private sites and encourage implementation of a more consistent standard to provide better water quality outcomes.

Private stormwater facilities designed to help remove oil, chemicals, metals and sediment from runoff before it is discharged must be maintained to achieve that function. Even simple mowed grass swales accumulate debris and pollutants from paved surfaces and must be periodically cleaned up to distribute flow and maximize pollutant removal. Accumulation of sediment over time blocks inlets, buries flow controls and reduces swale storage capacity. Of the initial 300 facilities inspected, Vancouver found that nearly 60% of common turf swales have deficiencies severe enough to inhibit function, twice our original estimate, and a considerable loss of water quality treatment.

A few challenges encountered in this project were a large number of previously undocumented private stormwater facilities discovered in the field, confusion from owners and property managers

about jurisdiction and maintenance responsibilities, the absence of coordinated maintenance from homeowners' associations and undetermined private conveyances. Future work includes subsequent grant applications to address these time-consuming and more detailed activities with the goal of creating a comprehensive private facility inventory and improved treatment value from existing private facilities.

LEARNING OBJECTIVES. Learn the benefits of initiating a private facility inspection program on pre-permit required sites, what to expect in the start-up phase and how to integrate data collection into existing asset management frameworks. For most permittees, the effort to kick off an inspection program can be valuable to elevate baseline maintenance on private sites and encourage implementation of a more consistent standard, providing better water quality outcomes and more consistent standards, particularly in anticipation of high level oversight in emerging low impact development practices. This presentation will outline challenges in field recon, compliance rates and cooperation at residential facilities as well as lessons learned on approaching new stormwater "customers" and how to boost capacity with contractors.

12:00 pm - 1:00 pm

Lunch

BALLROOM

Featuring a silent slide show showcasing projects and interesting facts related to Stormwater Management in Washington State. From the new and innovative to historical, a wide range of solutions to stormwater challenges will be displayed. Also identified are similarities/differences between Eastern and Western Washington Stormwater, such as the need to respond to varying climate conditions.

1:00 pm - 2:00 pm

Conference Tracks

TRACK 1: BIG PICTURE STORMWATER

ROOM 100
1:00 pm

Lake Whatcom Homeowner Incentive Program: Retrofits on a Watershed Scale

Eli Mackiewicz, City of Bellingham; Ingrid Enschede, Whatcom County

ELI MACKIEWICZ *Eli Mackiewicz has been working to implement on-the-ground stormwater retrofit projects on private properties, on behalf of the Lake Whatcom Management Program, for more than eight years. His experience includes the design and installation of native landscaping, bioretention, permeable pavements, and unique BMPs associated with phosphorus reduction. Programs under Eli's direction have invested more than \$1,000,000 into residential-scale LID retrofits since 2011, and now have an annual budget of \$400,000. He holds a certificate in Low Impact Development Design and is a Certified Erosion and Sediment Control Lead. Eli has an undergraduate degree in Wildlife Biology from Ohio University and a Master of Science in Environmental Science and Policy from Johns Hopkins University. He spent the first 18 years of his life in Ohio and lived and worked in 10 states over the next eight years before settling down in Washington in 2007. He loves mountains and clean water.*

INGRID ENSCHEDÉ *Ingrid Enschede has been working to develop and implement stormwater education and stormwater management programs for Whatcom County since 2009. She joined the Homeowner Incentive Program (HIP) team in 2016. Her experience includes working with citizen advisory committees, engaging the community to address water quality and quantity problems, water quality monitoring, and coordinating multi-agency programs. She enjoys writing and translating technical information into plain English. Ingrid has a BA in Environmental Studies, Geography from Western Washington University and Graduate Teaching Certificate from Boise State University. In her free time, Ingrid finds her way outside to her yard, a local trail, or the mountains.*

ABSTRACT. Lake Whatcom, the drinking water source for more than 100,000 Whatcom County residents, has seen a marked decline in water quality over the past 50 years. Excess nutrients generated by residential properties have caused a significant decrease in dissolved oxygen levels as well as seasonal algal blooms. In April, 2016, the Environmental Protection Agency finalized the Lake Whatcom Total Maximum Daily Load study, which has set in motion a 50-year cleanup effort focused on reducing phosphorus inputs by nearly 87%. While local jurisdictions are implementing a capital retrofit program, much of the developed land lies outside of the reach of infrastructure projects, especially along the lake shore. Additionally, end-of-pipe treatment systems are both inefficient at phosphorus removal and prohibitively expensive, considering the price of acquiring land around Lake Whatcom.

The Homeowner Incentive Program (HIP) approaches the problem from a complimentary angle, providing technical and financial assistance to property owners to reduce phosphorus entering

public infrastructure or the lake. Since its launch in 2011, the HIP has facilitated the completion of more than 180 private site retrofits, installing more than 420 P-reducing Best Management Practices. These BMPs include native landscaping, infiltration trenches, specially-designed rain gardens, permeable pavements, specialty filters, and accessory BMPs that reduce the impact of residential properties on the lake. The HIP has invested more than \$1,000,000 into reimbursements to participating property owners, for expenses paid to more than 150 local businesses and contractors. Perpetual phosphorus reduction resulting from HIP projects is estimated at 25lbsP per year, an amount which would cost an estimated \$3,500,000 to remove via capital projects designed, built, and maintained by the jurisdictions.

After a five-year pilot period, the HIP is re-launching as a permanent program funded through municipal budgets for the 50-year TMDL response. Extensive audience research and program redesign, including surveys, focus groups, stakeholder panels, and the creation of specialized technical and outreach materials, was completed in 2016. The improved HIP will roll out in early 2017, expanding to new areas, offering a more robust technical and financial support package, and engaging a larger portion of the private sector. HIP-specific improvements for 2017 include a re-branding effort, new design details and material specifications, design templates for each BMP, example landscape plans, a professional certification program, training and marketing support for material suppliers, and DIY workshops for homeowners.

With more than six years of experience operating, managing, and troubleshooting an incentive-based residential retrofit program that promotes specific LID BMPs on private properties for the benefit of the public at large, HIP staff would be honored to share their insights, lessons learned, success stories, and knowledge with and amongst others who are thinking about, developing, or implementing similar programs in their jurisdictions.

LEARNING OBJECTIVES. This presentation will provide insight, lessons learned, and unique perspectives regarding residential-scale, incentive-based, LID programs for private properties within an impaired watershed. The Homeowner Incentive Program has just emerged from a five-year pilot phase and is relaunching as a permanent, locally-funded program in early 2017. The new and improved program will be a significant part of the Lake Whatcom TMDL response plan. This presentation will describe the pilot program, its successes and failures, and how the new program has been developed to overcome barriers to participation and other challenges. We addressed a diverse set of barriers, from technical design issues to communication best practices to streamlining permitting and construction methodologies. The program is an equal mix of education and technical assistance (along with a lot of administrative formalities and documentation), and should to provide perspectives that are helpful to many permittees throughout the state.

TRACK 2: STORMWATER PROGRAM EFFICIENCIES NOW

ROOM 200
1:00 pm

Kendall Yards and More: Stormwater in the Eastern Region

Cynthia Wall, Shannon Petrisor, Brandy Reynecke, Dave Duncan, Department of Ecology

TEAM BIO *Cynthia is a water quality grant and loan project manager for the eastern region; Shannon is the construction stormwater inspector for the eastern region; Brandy is the municipal stormwater grant and loan project manager for the eastern and central regions; Dave is the municipal stormwater permit implementation planner for the eastern region.*

The team provides assistance to municipalities to help them maintain compliance with their stormwater permits, and obtain funding assistance for design and construction of stormwater facilities that address the unique needs of eastern Washington. The team has over 25 years of combined experience working with stormwater.

ABSTRACT. This presentation will discuss the Kendall Yards project and provide an overview of the stormwater issues in eastern Washington.

The Kendall Yards project is located in Spokane and is a former railroad site that has been turned into an urban neighborhood. The Kendall Yards Stormwater Project is an innovative and collaborative approach to stormwater pollution reduction. The project is helping the City of Spokane achieve compliance with their Phase II stormwater permit by removing PCBs, heavy

metals, and other pollutants from stormwater. The project utilizes an infiltration facility that showcases public/private partnership, low impact development, and education and outreach.

Spokane is also working the redevelopment of Riverfront Park, the former site of the Expo '74 World's Fair. The project is east of the Kendall Yards project and is also part of the former railyards system. The site has contaminated soils, which present challenges to construction stormwater management.

LEARNING OBJECTIVES. Eastern Washington has a unique climatology that presents a variety of issues to municipal governments trying to achieve and maintain compliance with Washington State stormwater regulations.

This presentation will discuss the challenges that governments face on the east side of the state and showcase an innovative and creative stormwater solution constructed on a former Brownfields site. The project included a public/private partnership component that continues to benefit the residents of Spokane.

The spectrum of stormwater issues in eastern Washington is relevant to the west side of the state and generally to all of the other United States. Attendees have an opportunity to learn about innovative solutions to stormwater pollution.

TRACK 3: STORMWATER RESEARCH, SCIENCE & NEWS

ROOM 300
1:00 pm

Regional Stormwater Monitoring Program/Stormwater Action Monitoring

Brandi Lubliner, Department of Ecology

BRANDI LUBLINER Brandi Lubliner, PE, is the western Washington stormwater permit's Regional Stormwater Monitoring Program's (RSMP; now SAM) Coordinator. She manages the budgets, contracts, studies, and communications for this collaborative program. Brandi has 19 years of scientific (11 years as an engineer) experience in the fields of water quality, stormwater, and wastewater gained from both the private and public sectors. Her BS is in Environmental Science from Western Washington University and MS in Environmental Engineering from Washington State University.

ABSTRACT. Stormwater Action Monitoring (SAM) is a collaborative, regional stormwater monitoring effort program that is funded by more than 90 cities and counties, the ports of Seattle and Tacoma, and the Washington State Department of Transportation. SAM's goal is to improve stormwater management to reduce pollution, improve water quality, and reduce flooding. We do this by measuring stormwater impacts on the environment and evaluating the effectiveness of stormwater management actions.

SAM creates a feedback loop to identify effective actions that reduce pollution and flooding associated with stormwater. SAM's projects are developed in an open, coordinated, and shared manner that capture a regional understanding of how management actions can lead to results. The pooling of funds allows jurisdictions throughout the region—large and small—to benefit from projects designed to produce transferable findings. Any jurisdiction with science staff, expertise, and interest can participate in SAM projects. This presentation will broadly discuss the structure of SAM, transparent administration, active participation from stakeholders, and the active SAM projects.

Note: The Regional Stormwater Monitoring Program (RSMP) changed its name to Stormwater Action Monitoring (SAM) in 2017 in recognition of SAM's broader role—using the results of monitoring and studies to inform policy decisions and identify the most effective management actions.

LEARNING OBJECTIVES. Stormwater permittees and professionals will learn about the successful launch of the RSMP/SAM in western Washington. The presentation will cover the program structure, active projects, early findings and feedback loops for sharing findings.

2:00 pm - 2:15 pm

Break

Light snacks and beverages will be served.

TRACK 1: BIG PICTURE STORMWATER

ROOM 100
2:15 pm

Climate Change Impacts on Stormwater Management in Washington State

Guillaume Mauger, UW Climate Impacts Group

GUILLAUME MAUGER *Guillaume Mauger, PhD is a research scientist working at the Climate Impacts Group at the University of Washington, Seattle. Specializing in Climate Science, his work focuses on understanding and assessing the impacts of climate change on human and natural systems, with a particular focus on flooding and stormwater. Guillaume has worked on projects that assess hydrologic changes across a variety of northwest watersheds and worked to support the use of this information in decision-making.*

ABSTRACT. Stormwater runoff affects water quality, human health, slope stability, and freshwater and marine habitat quality. Climate change is expected to exacerbate stormwater issues, in particular due to the dual impacts of sea level rise and more intense heavy rain events. This talk will review the state of the science on stormwater and climate change, providing information about ongoing research that may be of interest to attendees. Although the presentation will focus on these two principal drivers of stormwater impacts, the presentation will review other climate change impacts that may be of relevance to stormwater, and possible directions for future work.

LEARNING OBJECTIVES. State of the science on climate change implications for stormwater management. Information on data and tools that could be used to assess local impacts on stormwater.

ROOM 100
3:00 pm

**Tacoma's Regional Facilities Program for NPDES Stormwater Treatment/
Flow Control Requirements**

Dana de Leon, City of Tacoma

DANA DE LEON *Dana de Leon is a professional engineer at the City of Tacoma Environmental Services Department, in Washington State. Dana is a chemical engineer with 27 years of experience in stormwater studies related to quality/quantity studies, source control, NPDES regulatory issues and stormwater treatment technologies. Dana's main focus is stormwater source control, fate and transport of stormwater contaminants and stormwater treatment.*

ABSTRACT. Development in Tacoma can be complex due to the highly urbanized area. The complexities are driven by limited space, aging infrastructure and demolition costs. The City of Tacoma has developed a Regional Stormwater Facility Plan for new development and redevelopment projects by constructing regional facilities in-lieu-of constructing individual site-specific facilities.

The primary goal of this Regional Stormwater Facility Plan is to establish, use, and manage the City's Payment In-Lieu-of Construction Program for new development and redevelopment projects where stormwater flow control/water quality treatment is required. Goals of the program include:

- Providing viable and sustainable options for stormwater treatment for new and redevelopment projects.
- Utilizing scale efficiencies by combining the stormwater mitigation needs of individual projects into larger regional project (e.g., effectively reduce maintenance costs).
- Reducing the cost and land impacts imposed on the development community.
- Promoting redevelopment and jobs in Tacoma.
- Efficiently meeting NPDES Permit requirements.
- Developing a process to identify feasible locations and to prioritize and construct stormwater mitigation projects on a regional scale.
- Providing an effective and transparent accounting structure for tracking stormwater mitigation needs and capacity.

With this voluntary program, participants will be allowed to pay a system development charge and maintenance surcharge in-lieu-of constructing individual site-specific stormwater facilities. This program incorporates:

- Individual watershed plans which specify the types and locations of facilities in the program.
- Flow control and/or water quality capacity credit for each regional stormwater facility will be calculated.
- A distinct system development charge and maintenance surcharge for each watershed (a normalized unit cost based on the aggregate square footage of capacity credit for the regional facilities). The one-time system development charge will be used for capital costs and property acquisition and a monthly maintenance surcharge will be used for long-term operation and maintenance of regional facilities.
- Maintain and track the balance of capacity used and available for each watershed.

When the amount of capacity used for any regional facility reaches 85%, Tacoma will seek to provide additional regional facility capacity through construction of new or retrofit of existing facilities.

The financial impact of this program on participants was evaluated by comparing the cost of “example” development charges developed from existing large scale regional Tacoma facilities to life cycle costs for on-site facilities at representative development sites. The analysis shows that the Program is a viable option in Tacoma and average projected development charge and maintenance surcharges range from:

- Capital Costs of \$0.35/sf to \$1.02/sf for stormwater treatment only facilities with average Annualized 20 year O&M Costs of \$0.01/sf.
- Capital Costs of newly constructed larger facilities are \$1.08/sf to \$1.47/sf for flow control only facilities with Annualized 20 year O&M Costs of \$0.01/sf or less.

LEARNING OBJECTIVES. Tacoma’s Payment In-Lieu of Construction Program is intended to meet the intent of Minimum Requirement #6—Water Quality and/or Minimum Requirement #7—Flow Control for stormwater mitigation as required by the Washington State Phase I and Phase II National Pollutant Discharge Elimination System Municipal Stormwater Permit. The Program and Regional Facility Plan seeks to: 1) mitigate areas of the City of Tacoma faster than would occur under normal development/redevelopment circumstances which will result in flow and pollutant load reductions to receiving waters by building regional facilities upfront of development/ redevelopment; 2) use economy of scale to get the best unit price for both construction and operations and maintenance of stormwater facilities by building larger regional facilities as opposed to smaller on-site facilities; and 3) build mitigation in specific areas of concern resulting in an immediate relief in areas prone to localized flooding and an immediate increase in pollutant load removal.

ROOM 100
3:45 pm

Protecting Shellfish One Rain Garden at a Time

Brian Stahl, Kitsap Conservation District

BRIAN STAHL *Brian Stahl has a Bachelor’s Degree in Agriculture Business from the University of Wisconsin - River Falls and moved to Washington in 1996. Brian Stahl has been with the Kitsap Conservation District since 1996 and is currently the Technical Resource Coordinator. As a non-regulatory agency, the Kitsap Conservation District works cooperatively with private property owners and small farms that have natural resource concerns affecting their properties. Our goal is to provide the technical assistance needed to manage land in a way that will allow owners to both use and protect their natural resources.*

ABSTRACT. As development increases, there has been an adverse effect on shellfish growing areas throughout the Puget Sound Region due to increased stormwater entering our streams. Management of storm water through control of impervious surfaces becomes critical. Kitsap County has code requiring any development or redevelopment to meet Kitsap County Storm Water Drainage requirements, but what can be done to reduce runoff from existing developments or properties? Kitsap Conservation District (KCD), along with Kitsap County Public Works, Kitsap Public Health

District, and Washington State University Extension formed a unique, nationally recognized program called Clean Water Kitsap. The Rain Garden element of this productive program, administered by the Kitsap Conservation District, has been successful because it offers cost share to help homeowners solve stormwater runoff issues using low impact development approaches (LID) such as rain gardens, pervious parking, and cisterns. The Kitsap Conservation District's Rain Gardens & More Program provides solutions to storm water management. The program is reaching the existing homeowners and providing technical assistance and incentive funds to make it possible for them to successfully retrofit their systems used to collect and transfer the runoff from their parcel.

In 2010, the first year of the program's outreach, 100 rain garden cost share applications were received from Kitsap County citizens. With this large influx of applicants in the beginning phase of the program, it became clear there would be a high interest in rain gardens, but only 13 projects were installed. We discovered barriers to installation when applicants either did not know who to contact to install their garden, did not know where to purchase the materials, or did not have enough experience in construction to get started. Due to those factors, Kitsap Conservation District launched "Dig Days" in 2012. "Dig Days" is a program where, once a cost share application is approved, KCD arranges for excavation of the rain garden site, delivers the rain garden soil mix, pipe, fittings and Zone 1 plants. These gardens are typically completed in just one day. Since inception of "Dig Days", KCD has installed over 220 LID practices and has a waiting list which exceeds next year's cost share budget. Kitsap Conservation District believes that sharing our experience with other agencies or groups will make a difference in our natural resource environment and stormwater management.

LEARNING OBJECTIVES. Kitsap Conservation District (KCD), along with Kitsap County Public Works, Kitsap Public Health District, and Washington State University Extension formed Clean Water Kitsap (CWK), a partnership to provide leadership and education to the county's residents. CWK is a unique, nationally recognized, multi-agency partnership created to reduce flooding, prevent pollution, and restore fish habitat through stormwater management activities. A significant portion of the funding is devoted to retrofitting existing facilities in target watersheds. With our non-regulatory pledge to private property owners, Kitsap Conservation District provided the link to retrofit stormwater systems on private properties. "Dig Days" was a program that turned the tide by increasing private property owner involvement.

TRACK 2: STORMWATER PROGRAM EFFICIENCIES NOW

ROOM 200
2:15 pm

My Soil Won't Drain, Can I Still Use LID?

John Knutson, Aspect; Rob Buchert, City of Pullman

JOHN KNUTSON *John has managed stormwater planning, modeling, permitting, compliance, and design projects for clients throughout eastern Washington and the Pacific Northwest. He has an in-depth understanding of the Eastern Washington NPDES II permit and Washington's current UIC Rule. He has an expert level of knowledge in hydrology, hydraulics, water quality, and filtration and infiltration BMPs, and has developed several regional stormwater design manuals. John has planned and designed well over a hundred stormwater drainage systems and BMPs using the eastern Washington stormwater manual, eastern Washington LID Manual, WSDOT Highway Runoff Manual, Yakima County LID Manual, Yakima County regional stormwater manual, Spokane regional stormwater manual, WSDOT hydraulics manual, and Ecology's technical standards for underground infiltration systems. John has led small and large LID retrofit planning and design projects, and managed stormwater permitting and design teams for major infrastructure projects.*

ROB BUCHERT *Rob Buchert has twenty years of experience working on water issues in southeast Washington. He currently serves as the Program Manager for the City of Pullman's Stormwater Services Division, a position he has held since 2007. Rob is responsible for Pullman's Stormwater Management Program, including compliance with the city's NPDES Phase II Municipal Stormwater Permit. Prior to the city, Rob worked for ten years at the Palouse Conservation District. While at the District, he served as lead coordinator and facilitator for WRIA 34 - Palouse Watershed Planning and led other watershed planning, water quality and water conservation initiatives.*

ABSTRACT. This presentation illustrates some of the key considerations when designing and constructing LID retrofits in the City of Pullman which has low permeability soils, significant cold and snow prone conditions, and moderate precipitation levels. Topics will include cold and snow prone considerations, modified subgrade preparations, when and how to use liners and under-drains, how the feasibility of retaining and infiltrating the water quality storm into low permeability soil varies by the type of

LID BMP, and the benefit of using LID even when under-drains are necessary. Lessons learned from the bidding and construction process will also be discussed. A couple important things came out of the Pullman LID retrofit project that are of interest to designers and permit compliance managers:

1. It is sometimes feasible to effectively apply LID even in lower permeability soils, but the effectiveness of LID at treating and infiltrating the water quality storm varies by type of BMP. Permeable pavements (which do not concentrate runoff), may be able to infiltrate the entire water quality storm into lower permeability soils, while a bio-retention BMP (which handles concentrated runoff) may not. This has implications not just for selecting the preferred LID BMP based on soils, but also for assessing the overall feasibility of various BMPs to meet NPDES on-site retention requirements for larger events. Generally, BMPs that promote dispersed infiltration, rather than concentration of runoff will be able to infiltrate larger storm events into marginal soils.
2. Credit for water quality and flow control benefits are still warranted even when under-drains are used with LID. However the reason for the credit, and level of flow control benefit vary by BMP. For example, permeable pavements which infiltrate at least the entire water quality storm event, should get full water quality credit and significant flow control credit, even if they cannot infiltrate the entire 10 year storm; while bioretention facilities which filter the water quality storm through porous media, but cannot infiltrate the entire water quality volume, should get full water quality credit, plus partial flow control credit due to impoundment of runoff in the facility and retention through soil moisture, both of which reduce the peak discharge to receiving waters.

LEARNING OBJECTIVES. This presentation provides the following learning opportunities for permittees: (a) applying LID in low permeability soils; (b) designing LID for cold and snow prone conditions; (c) using liners and under-drains; (d) how the soil and specific BMP interact to affect the feasibility of retaining and infiltrating the water quality storm; and (e) the benefit of using LID even when under-drains are necessary.

ROOM 200
3:00 pm

Solving Pollution at the Source: Seattle Public Utilities Source Control Program

Kevin Buckley, City of Seattle; Beth Schmoeyer, City of Seattle

KEVIN BUCKLEY *Kevin Buckley is a strategic advisor and the Acting Manager of the Code, Policy and Regulatory team at Seattle Public Utilities. Mr. Buckley has been involved in stormwater management and source control for the past 18 years and was formerly the NPDES Phase I permit coordinator for the City of Seattle.*

BETH SCHMOYER *Beth Schmoeyer is a senior engineer for Seattle Public Utilities (SPU). For the past 12 years, she's has served as the City's technical lead for source control programs for the Lower Duwamish and East Waterway Superfund sites. Beth also plans and develops regional stormwater retrofit projects for SPU.*

ABSTRACT. The City of Seattle is blessed by an abundance of waterbodies around the City. Unfortunately many of these water bodies have become impaired over time due to stormwater pollution and some water bodies, such as the Lower Duwamish Waterway, are listed as Superfund Cleanup sites. Seattle Public Utilities (SPU) and other City of Seattle departments have been successfully identifying and controlling sources of stormwater pollution to the Lower Duwamish Waterway (LDW) in coordination with the Washington State Department of Ecology (Ecology) and other agencies for over ten years. However, with the issuance of the Record of Decision for the Lower Duwamish Superfund Cleanup, Ecology and EPA have required SPU to develop and implement an adaptive management program for source control. The focus of the adaptive management program is to reduce sources of stormwater pollution, including PCBs, discharging from the City's municipal separate storm sewer system (MS4) so that the Superfund cleanup can proceed and recontamination of the cleanup site is minimized.

SPUs MS4 discharges to the Lower Duwamish out of 30 outfalls from an area that covers approximately 20,000 acres. To manage such a large area, SPU uses MS4 solids data to implement a data driven approach for source control adaptive management. MS4 solids are compared to applicable standards to prioritize source control activities such as pollution source tracing, line cleaning, best management practice inspections, and siting of stormwater infrastructure projects. Innovated tools such as designing a sediment trap that fits in smaller pipes, using a detection dog

to sniff out PCBs and evaluating how to use the principals of Capacity, Management, Operations and Maintenance along with the MS4 solids data to develop defensible approaches for meeting operation and maintenance regulatory compliance requirements for the MS4 are included in the plan. The adaptive management program allows SPU to focus resources on sources of pollution, prioritize work, coordinate activities to control stormwater pollution and support Ecology and EPA's Lower Duwamish Superfund cleanup program.

The information that will be presented is of benefit to other municipalities engaged in stormwater management by describing the tools, processes and methods that can be used to identify and control sources of pollution. Phase II communities can gain knowledge of how a mature source control program is designed and all who attend will enjoy and find interesting the many innovated techniques that SPU is exploring to identify sources of pollution to make Seattle the best place to live.

LEARNING OBJECTIVES.

- Permittees in both eastern and western Washington will gain a better understanding of source control methods that can be used to meet permit requirements.
- Permittees will learn about the data management tools that SPU uses and how the data is used to prioritize source control actions.
- By the time we present, the results of the PCB detection dog will be available and will provide permittees on innovative/new ways to conduct source control.
- Permittees will better understand how to develop and implement an adaptive management plan for compliance with the permit.

ROOM 200
3:45 pm

Pollution Prevention: Elements of an Effective Source Control Program

*Laura Frolich, Snohomish County Public Works Department - Surface Water Management Division;
Sean Hare, Snohomish County Public Works Department - Surface Water Management Division*

LAURA FROLICH *Laura Frolich oversees a team of fifteen professionals who execute NPDES program requirements including source control, IDDE, operation and maintenance, drainage inventory and mapping, and asset management. She has worked in local government for over 13 years designing and implementing stormwater management programs in California, Colorado and Washington. Her area of expertise is municipal stormwater compliance for both Phase I and Phase II jurisdictions. She holds a B.S. in Earth Sciences from CalPoly-San Luis Obispo and a M.P.A. in Public Administration from the University of Washington.*

SEAN HARE *Sean Hare works as a Pollution Prevention Specialist with Snohomish County Surface Water Management and holds a B.A. in Geography from Central Washington University. Sean has spent the past 17 years in public service including the last seven years focusing on NPDES commercial and industrial pollution source control program development and implementation.*

ABSTRACT. Snohomish County implements a source control program, performing an average of 600 site inspections annually, and over 6,000 total site evaluations since the program began in 2007. The program focuses on working with commercial and industrial properties as well as rural landowners to control pollution. County Pollution Prevention Specialists inspect properties that perform activities that have a potential to pollute to surface waters. One of the goals during an inspection is to identify, and eliminate illicit connections and discharges from commercial and industrial properties. Routine site evaluations are designed to prevent unfortunate situations for businesses, the environment, and the surrounding community. Using an education and outreach approach, the county successfully contributes to ensuring clean water while maintaining effective relationships with industrial, agricultural and the general business community. Although meeting federal and state mandates is costly, this program ranks well on its benefits to cost ratio.

Snohomish County developed creative and practical solutions for source control implementation that meets permit requirements. Snohomish County navigated issues such as; accessing private property, establishing outside agency partnerships (e.g. Conservation Districts, Health Districts, Ecology), working with agricultural and livestock operations, and producing reports that clearly demonstrate compliance.

This presentation is relevant to all permittees who desire to have a business inspection program as a part of their source control program. Source control is required for all Phase I permittees

and is incorporated into both eastern and western Washington Phase II permits under the illicit discharge detection and elimination requirements. Many Phase II's choose to implement a type of local source control program to assist in fulfilling IDDE objectives. Permittees would benefit from learning how a county, with thousands of properties that generate pollution, execute their program. At Snohomish County, our future plans include facilitating creative partnerships, promoting regional stormwater campaigns, fostering more collaboration with the Phase II permittees, and developing a business recognition program.

LEARNING OBJECTIVES. Permittees will learn the basics of an effective source control program including: generating an accurate and effective business inventory list, criteria to determine a site's potential to pollute, effective BMPS for varying business sectors, critical site visit information to collect, best suited software tools, and progressive code enforcement strategies. Permittees will also gain a better understanding of the challenges involved implementing a source control program and the workable solutions to overcome barriers. Over the last decade, Snohomish County has learned what program implementation techniques work well and how to build and evolve a sustainable, long-term program. Permittee's that seek to create a new program but need assistance with program development may benefit greatly by examining the successes and challenges encountered by existing source control program administrators.

TRACK 3: STORMWATER RESEARCH, SCIENCE & NEWS

ROOM 300
2:15 pm

South Park Water Quality Treatment: Testing the Waters

Sheila Harrison, Seattle Public Utilities; Vicki Sironen, HDR

SHEILA HARRISON *Sheila is a senior engineer at Seattle Public Utilities. She works on large drainage and wastewater projects, where teams are big, relationships are complex and communication is crucial. Since 2014, she has concentrated on drainage improvements in the South Park neighborhood of Seattle.*

VICKI SIRONEN *Vicki Sironen is a senior engineer with over 35 years' experience working for public agencies. Her work has focused on sewers, including storm sewer, sanitary sewers and combined sewers.*

ABSTRACT. Seattle Public Utilities (SPU) is pursuing a bold new approach to municipal stormwater treatment; implementing an active mechanical stormwater treatment plant. Target pollutants include: fecal coliform, PCBs, total phosphorus, total copper, total suspended solids, and total zinc. After initial screening of available options, two technologies, chemically enhanced sand filtration and ballasted sedimentation, were selected for further evaluation. Both technologies are commonly used in the drinking water and wastewater industry, although to our knowledge neither has been piloted with municipal stormwater.

The planning phase of this project built upon the piloting knowledge developed in the drinking water and wastewater industries. Pilot testing was designed to evaluate an array of coagulants, polymers, and operational scenarios. We acknowledged that both bench scale testing and pilot testing of stormwater would be a challenge due to the intermittent nature of flows and the fluctuation of variable influent water quality (including tidal saltwater); more so than in the drinking water and wastewater industries.

Developing the approach to the bench scale testing and pilot operations incorporated flexibility in the plans to allow adjustments to the changing conditions. Our belief that flexibility would be key to our success was confirmed during the pilot system operations. As anticipated, the weather surprised us, the equipment required mechanical skill, and the work plans required modification as we proceeded.

This presentation describes the lessons learned during the bench scale and piloting effort. It also presents the costs associated with the effort and suggests a contingency budget.

LEARNING OBJECTIVES. Learn about an alternate approach to stormwater treatment.

Local Monitoring Can Yield Big Dividends in Evaluating Program Effectiveness

Larry Schaffner, Thurston County; Scott Collyard, Department of Ecology

LARRY SCHAFFNER Larry has been with Thurston County since July 2014 where he coordinates compliance with the County's municipal stormwater permit as well as provides technical and policy support on water resource and stormwater management issues. Prior to joining the County, Larry worked 12 years for WSDOT performing a similar role. Earlier in his career, Larry spent eight years as a planner in Oregon for Lane Council of Governments on projects involving natural resource, land use, and transportation issues.

SCOTT COLLYARD Scott has been Ecology's Statewide Effectiveness monitoring coordinator since joining the state in 2008. Prior to joining Ecology, Scott worked for the Wyoming DEQ for six years assessing waters of the state and USEPA's Office of Research and Development in Duluth MN for 13 years conducting research in support of the development of freshwater water and sediment quality criteria.

ABSTRACT. Thurston County, the City of Lacey, and the City of Olympia have been implementing programmatic and structural best management practices (BMPs) in the Henderson Inlet Watershed since the early 90s. In 2013-2014, a TMDL effectiveness monitoring study conducted by the Department of Ecology's Environmental Assessment Program (EAP) in the Henderson Inlet watershed indicated that bacteria and nitrogen levels are declining throughout watershed. These reductions occurred despite an increase in human population in this Thurston County watershed and an increase in parcel density within the urban growth areas. A comparison of projects implemented in the watershed and water quality suggests that stormwater retrofits, septic-to-sewer projects, and land acquisition projects are likely responsible for the majority of the fecal coliform declines. The study found that: "Many of the water quality improvements outlined in this report are the result of coordination between Thurston County and the Cities of Lacey and Olympia, up-front investments made in planning, and Thurston County's long-term monitoring program."

The "Thurston County's long-term monitoring program" mentioned in the report refers to a formal partnership between Thurston County and the cities of Lacey, Olympia, and Tumwater that has jointly developed and implemented a coordinated monitoring program of water quality, stream flows, lake level, and precipitation to aid in the assessment of the health of regional water resources since 1991. The intended mission of this joint effort is to:

"Assess the health of regional water resources to inform the development of programs, policies and capital facility plans to protect those water resources for beneficial uses in perpetuity."

With the reissuance of the Western Washington Stormwater Permit in 2012 (Permit), ironically resources for this joint partnership came under strain. Tough choices had to be made as the local partnership simply did not have sufficient resources to continue to fully fund local efforts and meet the Permit's new monitoring obligations. As a result of needing to meet the new Permit obligation, funding for the local monitoring was slashed by over 40 percent. As a result, this partnership's ability to assess the health of our regional water resources to inform the development of programs, policies, and capital facility plans to protect those water resources had been compromised. The same could be said for any of EAP's future efforts in the region.

There is value in having and maintaining a large regional monitoring program to provide context for local efforts, yet it is still important to support and maintain local monitoring efforts in order to inform local adaptive management processes within a reasonable time frame. Can we do something to rectify these unintended consequences? The reissuance of the 2018 Permit certainly provides an opportunity to give it a try.

LEARNING OBJECTIVES. Foster stronger coordination and alignment between environmental assessment, water quality clean-up planning and implementation, and stormwater permitting efforts to support more effective outcomes statewide.

ROOM 300
3:45 pm

Detecting and Quantifying Road-salt Run-off in Seattle Streams

Chapin Pier, Seattle Public Utilities; Danielle Rapoza, Seattle Public Utilities

CHAPIN PIER *Chapin Pier has worked at Seattle Public Utilities (SPU) for over 2 years as an Environmental Analyst focused on water quality monitoring, stream restoration, and salmon habitat enhancement. Before SPU, he spent 4 years working in the fields of watershed management and restoration ecology in Washington and Oregon.*

DANIELLE RAPOZA *Danielle Rapoza has five years of experience providing support for environmental monitoring projects with an emphasis on fisheries and water quality.*

ABSTRACT. Throughout the winter of 2016-17 there were multiple applications of rock-salt on Seattle roads. The wash-off of this salt into several Seattle streams was quantified using data loggers, recording conductivity and temperature at one-minute intervals, 24 hours/day. These conductivity readings provide a measure to quantify level of salinity increases as well as an accurate method to quantify the timing and duration of the wash-off events. Conductivity readings spiked after temperatures increased above freezing and were associated with precipitation events. The conductivity spikes were between two and 100 times higher than average conductivity levels in Seattle streams. This monitoring approach collects data at a frequent enough time scale to describe transient events accurately while avoiding the requirement to make pre-storm judgment calls on sampling.

LEARNING OBJECTIVES. Provides a semi-autonomous method for monitoring storm impacts to streams, emphasizes the need to sample at a frequent time-scale and addresses the weakness of relying on grab samples to describe these events. Provides specific water quality data relevant to salmonid spawning and rearing in Washington streams. The presentation is both a methodology presentation and water quality impact presentation. This presentation provides a methodology for collecting data at a relevant time scale for evaluating water quality impacts to surface waters and potential impacts to biota.

4:30 pm **Conference Concludes**

BALLROOM

Poster Displays

While there is not a dedicated poster session at MuniCon 2017, a number of posters will be on display for the duration of the Conference detailing research, processes, statuses and/or results over a range of topics.

Stormwater Infiltration Feasibility Assessment for Seattle-Tacoma International Airport

Tom Atkins, PE, LG-Aspect Consulting

To comply with its NPDES permit the Port of Seattle is developing LID BMP guidelines for future development and redevelopment projects at Seattle-Tacoma International Airport. Existing GIS layers, geologic data, and other relevant information was used to identify shallow and deep stormwater infiltration opportunities across a broad landscape. Information sources included GIS data from local municipalities and agencies, surficial quadrangle geologic maps, topographic survey information and LiDAR elevation data, and subsurface hydrogeologic information from boring logs.

Infiltration feasibility was based on evaluation of factors that affect infiltration potential and identification of units that represent unique combinations of these factors. GIS layers of each factor were created and the infiltration feasibility was evaluated. Shallow and deep infiltration maps were created highlighting areas with good, moderate, and poor stormwater infiltration feasibilities, and the results are now being incorporated into the Port’s Stormwater Management Manual for Aviation Division Property.

POSTERS
May 16 & 17

Trash Talk: New Data Tools for Citizen Science, Outreach, IDDE

Margaret McCauley, U.S. Environmental Protection Agency; Sydney Barnes-Grant, University of Washington Intern

The Trash Talk presentation will illustrate contemporary and emerging trash tracking and data analysis technology. Providing insight on the strengths and weakness of the available tools addressing storm water, street sweeping, and trash collection methods; the poster can aid in program improvement throughout different jurisdictions. Permittees can take away ideas for how they can incorporate these technologies and evaluate whether trash management is worth a different approach.

National View of Water Quality Outcomes Achieved Using MST Technology

James Herrin, Source Molecular Corporation

Identifying sources of fecal pollution is important for effective watershed management. The need to more accurately identify where the contamination is coming from and how much bacteria is present has spurred the development of the U.S. Environmental Protection Agency's (EPA's) source ID and Digital Polymerase Chain Reaction (PCR) technology. EPA's patented genetic testing methods developed specifically to detect human, cattle, chicken, and dog fecal pollution have undergone rigorous review and been proven to be more sensitive and more accurate. The upcoming EPA standard for microbial source tracking (MST) will enable watershed managers to use genetic-based methods for broader applications. It also will increase the credibility of MST as a useful source of information in assessing potential sources of fecal contamination and possible public health risks. Digital PCR is an advanced technology that provides absolute quantification of the target DNA, allowing water managers to know the source of fecal pollution as well as exactly how much fecal bacteria is in the water. It also improves sensitivity, allowing watershed managers to find the fecal source even if it has been some time since the pollution event, and creates the possibility of direct pathogen detection.

Bioretention Hydrologic Performance Across Western Washington

Bryan Berkompas, Aspect Consulting LLC; Jenny Saltonstall, Associated Earth Sciences, Inc.

The Bioretention Hydrologic Performance Study was funded by Stormwater Action Monitoring and is evaluating the actual hydrologic performance of ten bioretention facilities across the Puget Sound region. The study is ongoing and this poster will provide an overview of the study design and methods and a discussion of the hydrologic and hydrogeologic/geotechnical evaluations a few of the bioretention facilities based on preliminary results from data collected in the fall of 2016.

Eastern Washington BMP Effectiveness Studies Posters

Pursuant to the Eastern Washington (EW) Phase II Municipal Stormwater (MS4) Permit Section S8.B, permittees are required to "collaborate with other permittees to select, propose, develop, and conduct Ecology-approved studies to assess, on a regional or sub-regional basis, the effectiveness of permit-required stormwater management program activities and best management practices (BMPs)" [1]. In response to these requirements, the Eastern Washington Stormwater Group (EWSG), which consists of staff from the cities and counties covered under the permit, worked collaboratively and identified 24 study ideas (Phase 1) and developed a ranked list of the top 14 studies (Phase 2). Phase 1 and Phase 2 were submitted to Washington State Department of Ecology (Ecology) on June 30, 2015 and June 30, 2016 respectively. These studies are commonly referred to as the "EW Effectiveness Studies Development Project" and the current Phase 3a focuses on developing the detailed study design proposal for the 13 studies listed below. Ecology Gross Grants have assisted in the initial development of study ideas and detailed study design proposals, and as part of the grant requirements, the EWSG is hosting a Public Open house. During this time, the public is welcome to stop by and view posters for each of the studies which provide an overview the reason why the studies are being conducted, plans for conducting the studies, and how these studies may improve the stormwater management programs in eastern Washington.

- Modernizing Education and Outreach Strategies
- Use of Non-Vegetative Swale with Native Soils
- Street Sweeping and Catch Basin Cleaning Comparison
- Mobile Contractor Illicit Discharge Education
- Sand Filter Vault BMP
- Catch Basin Retrofit Device Placement
- BMP Inspection and Maintenance Responsibilities
- Seasonal Differences in Street Sweeping Material Removal
- Stormwater BMP Owner Awareness
- Determining Pollutant Contributions from Municipal Stormwater in EWA using GIS
- Biochar Media Stormwater Treatment Study
- Sharp Ave. Porous Pavement Study
- Long-term Permeable Pavement Sidewalk Infiltration Performance

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ACKNOWLEDGEMENTS & Thanks



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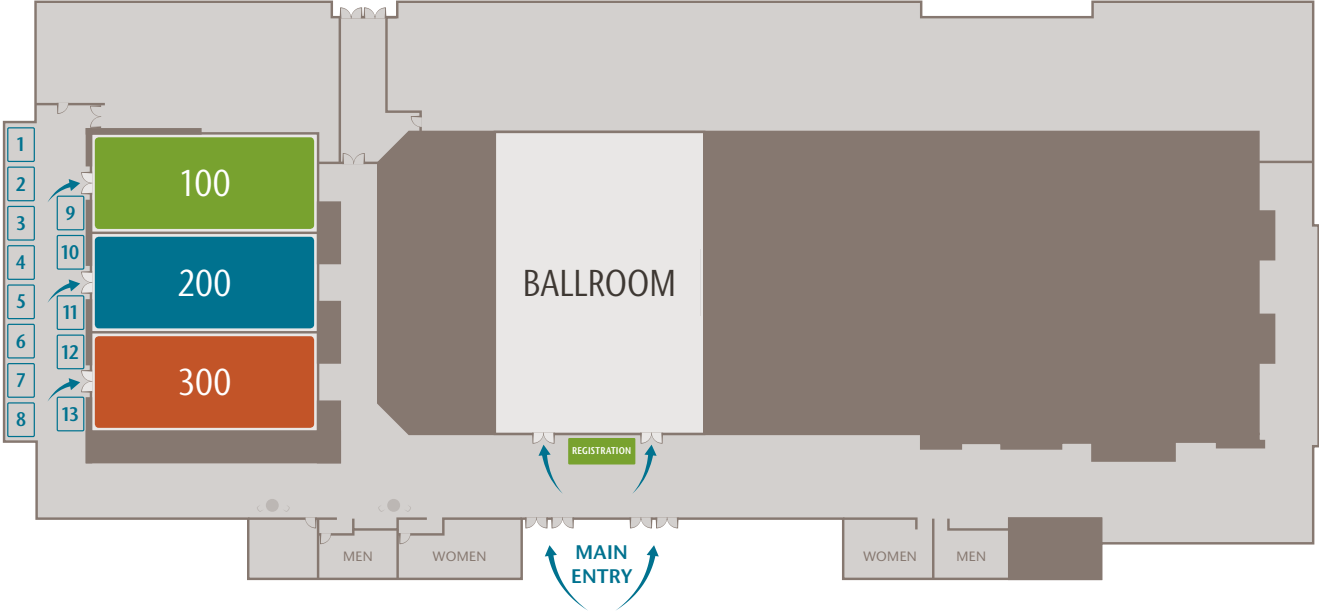
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