**SWG 6PPD Subgroup Meeting**January 17, 2023 from 1-3pm

## Participants: Aimee Navickis-Brasch, Amanda Royal, Andrew Kenefick, Anna K. Beyette, Jessica Archer, Ashley Bagley, Morgan Baker, Abby Barnes, David Batts, Eric Blankenship, Mark Bozlee, Jana Braaten, Madison Bristol, Tony Bush, Cindy Callahan, Andrea J. Carey, Jose Carrasquero, Travis Casey, Stephen Conroy, Courtney Littrell, Matt Cox, Jana Crawford, Jim Crawford, Brent Dhoore, Dimitrios Athanasiou, Tatiana Dreisbach, Dylan Ahearn, Mike Ehlebract, Emily Gonzalez, Emma Trewhitt, Troy Fields, Bryson Finch, Kamilee Ginder, Gretchen Tellessen, Lauren Haren, Nathan Hart, Elizabeth Herrmann, Danyel Hiland, Doug Howie, Todd Hunsdorfer, Natesha Hutchison, Jamie McNutt, Jay Word, Jeremy Graham, Jenna Judge, Julia Finley, Juliana Andrade, Julie Panko, K Baxter, Katie Holzer, Kelsey Payne, Jeff Killelea, Jesse Kirkpatrick, Laurencio, Mallory Little, Lizbeth, Brandi Lubliner, Lynn Simpson, Eli Mackiewicz, Maria Peraki, Mark Hennon, Maureen Meehan, Margaret McCauley, Bob McKane, Don McQuilliams, Victor Medina, Stephanie Merrell, Michael Abboud, Mike Vermeulen, Molly Bidwell, Gregor Myhr, Nathan Hardebeck, Nova Heaton, Norm Payton, Barry Pepich, Chapin Pier, Sheena Pietzold, Rose Propst, Joan Protasio, Rachel Konrady, Katie Rathmell, River Wan, Roger Dailey, Royce Young, Cindy Ryals, Sarah Montero, Scott Groce, Sean Dixon, Erika Shaffer, Rhea Smith, Stefan Grozev, Abbey Stockwell, Sue Barclift, Dorie Sutton, Francis Sweeney Taylor Hoffman-Ballard, Nick Tealer, Tim Jackson, Trevor Richardson, Amy Waterman, Nicholas Wegener, Jennifer White, Dean Wilson, Rebecca Wood, Zachary Richardson, Zack Holt

## **Welcome**

## - Eli Mackiewicz reviewed this subgroup’s role and focus points

## **Ecology updates**

## **Katie Rathmell**

* Ecology’s Water Quality Program is steadily building a team of 6PPD-focused personnel to continue funding BMP research.
* Since the fall, two new staff, Morgan Baker and Madison Bristol, have joined Water Quality
* Assuming funding from the Legislature is granted, two more positions will be recruited.
* We have reason to believe that our ask of an additional four years of funding will pass this legislative session, and this will grant us $1.5 million per annum in 6PPD funding. These dollars will allow us to move forward with requests for proposals (RFPs) for continued BMP research.

**Morgan Baker**

* Since our last subgroup meeting in October, Water Quality has funded two new BMP research projects
	+ The University of Washington-Tacoma – seeking to fill data gaps in 6PPD/6PPD-q literature by studying soils and sorbents and these items’ ability to filter out 6PPD-q
	+ King County – testing columns of high performance bioretention soil mixes (HPBSMs) to test their effectiveness at 6PPD-q filtration.

**Brandi Lubliner**

* Two additional studies with a 6PPD/6PPD-q focus have been tacked on to existing SAM studies
	+ Washington State University-Puyallup – studying the longevity of bioretention media
	+ City of Redmond – adding 6PPD-q testing to its existing sampling to gauge the effectiveness of street sweeping in receiving waters.
* Osborn & Evergreen Storm H2O Consulting is providing Ecology with consultant services to support this subgroup, and a stormwater particle size literature review.

## **Washington State Department of Transportation (WSDOT) updates**

**Sheena Pietzold**

* WSDOT employs a robust set of personnel for operation and maintenance and to create mapping stormwater assets with a focus on MS4 areas.
* With funds from Move Ahead Washington, WSDOT plans to extend mapping statewide and a focus on retrofits for areas with high percentage of pavement in the drainage area.
* WSDOT plans to quadruple mapping efforts statewide.
* Current “next steps” for research seek to add 6PPD-q to current testing efforts (once accredited labs are available), which includes their first flush studies and BMP studies.
* WSDOT currently initiates retrofits under two scenarios:
	+ when required to by the stormwater permit (which is when a project exceeds a certain size)
	+ when opportunistic projects are done in an area that needs more stormwater management.
* Many retrofits use LID, often they are BMPs like media filter drain (MFD), compost-amended bioswales (CABS), compost-amended vegetative filter strips (CAVFS). As WSDOT learns more about treating contaminants they will update the Highway Runoff Manual (HRM), their stormwater manual.
* Fish-passage projects will also be a focus, adding triggers (e.g. presence of Coho or high ADT) to require more retrofitting to these projects.

**Tony Bush**

* The existing WSDOT statewide Retrofit Strategy’s prioritization approach will be updated as directed by Move Ahead and evolving 6PPD information.
* With the $500 million in Move Ahead funds, WSDOT plans to identify areas for retrofitting based on several new factors, including input from regional partners and legislative direction on five points: health disparities, cost effectiveness, 6PPD and salmon recovery, ecosystem health, and pollution.
	+ These priorities will bring urbanized areas to the forefront, more than the previous retrofit strategy. WSDOT will utilize [Ecology’s 2022 Legislative report on BMPs and prioritizing areas for evaluation](https://apps.ecology.wa.gov/publications/summarypages/2203020.html) and ongoing work on mapping to develop a map this Fall for future Retrofit Strategy.
* WSDOT has hired Tatiana Dreisbach to help with strategy and outreach.
* WSDOT put in an appendix to the Ecology Legislative Report.
* An initial evaluation using these new factors shows there may be 5 creeks that would be in the new strategy for retrofits that coincide with existing plans for retrofits.
* The agency reiterated their efforts to be efficient using tax-payer resources and doing the retrofit already planned.
* The other several streams will be added to the opportunistic stand-alone retrofit. A Transportation Team (state, federal, tribal) – is under construction – to help advise on some of these efforts.
* An initial idea is to define and treat “super outfalls”, with a goal to utilize projects with multiple community benefits
	+ Tony shared a map with 473 outfalls in the MS4 areas spanning from untreated to up to current standards.

**Chat topics:**

Zack Holt: asked that WSDOT keep in touch with local jurisdictions to ensure their retrofitting and regional facility efforts are meeting the design standards needed to adequately address 6PPD-q.

## **Updates from others on monitoring**

**Andrea Carey, DFW** (co-worker of Sandy O’Neill)

* mussels and juvenile Coho tissue samples were sent to NOAA Fisheries in Seattle for analysis of 6PPDQ (reporting limit not stated).
	+ 6 out of 10 mussel samples detected 6PPD-q, and,
	+ 2 of 11 Coho tissue samples detected 6PPD-q

**Eli Mackiewicz**

* Planning to have a discussion at Green Infrastructure Summit in March

**Elizabeth Herrmann (chat)**

* I have to run to a lab but wanted to mention my advisor at UoI (I'm a graduate student) just received a grant from the EPA to use crayfish as an indicator species for 6PPD-q and tire wear particles throughout the middle and upper Columbia River Basin- would love to chat more with anyone who might be interested! eherrmann@uidaho.edu

**Jenna Judge (PSP) funding**

* [Funding round-up, including salmon science RFI](https://pspwa.box.com/s/hcmnlowj3st2ynqkghihfce5chc47ezp)
* Bipartisan Infrastructure Funding Opportunity tool: [Microsoft Power BI](https://app.powerbigov.us/view?r=eyJrIjoiNjE3ZGJlYTktMGFkYy00OWNlLTgyYWUtYjMyMDBkNWM0ZDE5IiwidCI6IjExZDBlMjE3LTI2NGUtNDAwYS04YmEwLTU3ZGNjMTI3ZDcyZCJ9&pageName=ReportSection4135b7dbe5123b276369) (powerbigov.us)

### **Environmental Protection Agency**

## **Lab Method Development**

**Barry Pepich** (EPA)

Barry occasionally sits in on 6PPD Subgroup and has been a helpful source of regional information for last couple years. Director at the EPA R10 lab and Method Development. Adrian Hanley (he/him) Office of Water is developing the methods for EPA.

EPA Actions over the last year for 6PPD/q

* EPA Office of Water is convening cross-EPA workgroup (Office of Water, Office of Policy, and Region 10).
	+ TSCA, pollution prevention, new chemical, 21st century toxicology, and Clean Water Act.
* Developing 1600-series analytical methods to detect 6PPD-q
* Interest in convening Western state environmental and transportation departments to share emerging info and BMPs.
* New toxicological research at a couple of labs for use in BMPs and cell line/bioassays
* Developing VELMA model to identify stormwater hotspots to help guide stormwater management and treatment
* Convening workgroup on microplastics (to get at tire wear) through EPA’s Trash Free Waters Program.
* EPA’s Puget Sound funding has grown for work on stormwater toxics, including 6PPD science. Funding research at NOAA and WSC/UW-T. Funds from EPA to Clean Water State Revolving Fund (via Ecology) and Stormwater Strategic Initiative (via Ecology).

 \*[*PSP factsheet*](https://pspwa.app.box.com/s/9hcdue4rf085aj9fxl1et9auryio8arf) *summarizing all these end of federal session accomplishments*

* Barry described the process for EPA’s 1600 Series method for 6PPD-q lab analysis.
* Background on equipment: UW-T used the highest resolution equipment to identify and do quantification work. This equipment is often referred to as HPLC-HRMS. EPA’s workgroup wanted to develop a method for equipment that is readily available at most labs, a typical LC-MS/MS, not high resolution (HR). EPA’s work group includes multiple EPA offices, OR, WA, AK state labs, NOAA, Tribes, and USGS.
* Office of Water and CleanWater/Drinking Water started work on 1600 Series, isotope dilution LC-MS/MS method. This series typically focuses on consistent discharges like wastewater but are currently focusing for 6PPD-q on stormwater.
* They have reached out to Eurofins, who also contributing in-kind work.
* QAPP for method development and stormwater samples are coming from four different areas nationally.

The method:

* Amber glass is a default bottle choice.
* No headspace was opted for to prevent further degradation with ozone.
* USGS reported they found loss with plastic containers and headspace.
* Preservation explored to prevent microbial degradation and ozone scavenger.
* Findings so far is that preservation degrades 6PPD-q and think its acid catalyzed degradation.
* Storage and Preservation confirmation work are finished.
* Un-preserved samples did fine and how they are moving forward with only cooling as the preservation.

*This methodology of no headspace, planned cooling, and amber bottles allowed adequate stability for a 14 day hold time.*

EPA is working on precision and accuracy studies now, Region 10 will do the verification of the data packages.

Office of Water will ultimately determine whether to publish the methodology as a 1600 series method. If they do, they anticipate a Fall 2023 timeframe.

**Chat topics:**

Katie Holzer: asked for an estimation of sample processing cost
Barry Pepich: estimated in the ballpark of $100/sample.
Dylan Ahearn: stated that commercial labs are currently charging between $300-600

Amy Waterman: received confirmation of proceeding without reagents

### **Environmental Assessment Program (EAP) at Ecology**

Jess Archer – Section Manager of EAP

* -Ecology’s EA has both Manchester Environmental Laboratory (MEL) and Laboratory Accreditation Unit (LAU). They do distinct work.

Joan Protasio- MEL Organics Supervisor

* In July 2021 MEL filled a chemist position to develop a method for 6PPD-q in water, (given there is no EPA Method). MEL will switch to EPA method if EPA publishes one. At MEL the calibration curve for a 250mL water sample is from 0.001 to 4 ug/L (1-4000 ng/L). MEL plans to expand the method to sediment and tissue matrices.
* Currently, the LC50 threshold discovered in July 0f 2021 still stands, and that is a lethality for Coho at 0.1 micrograms per liter.

Rebecca Wood – LAU Supervisor

* Accreditation means that based on third party review, the lab has the capacity to provide accurate and defensible data.
* Accreditation requests are subject to technical reviews. For this parameter, 6PPD-q, they have had to come up with a novel approach for accreditation.
* They cannot rely on typical resources (an existing EPA method or performance test expectations) since this is so novel
* Currently, they review list of accuracy related items from the lab’s own Standard Operating Procedure (SOP):
	+ lab manual
	+ calibration curves
	+ instrument performance
	+ Initial demonstration of capability
	+ Method detection limit study or lower limit of quantification study
* Currently, no lab is accredited.
* Five labs have put in for accreditation reviews.
* All five are in various states of review, some may have incomplete packages. Hope to have a few different labs accredited fairly soon.

*In lieu of accreditation, waivers for 6PPD and 6PPD-q lab studies are available via application.*

**Aimee Navickis-Brasch and Taylor Hoffman-Ballard (Evergreen StormH20)**

## **Using Stormwater Best Management Practices Guidance (published in mid-2022)**

* [Report](https://fortress.wa.gov/ecy/ezshare/wq/Permits/Flare/2019SWMMWW/Content/Resources/DocsForDownload/2022_SWTreatmentOfTireContaminants-BMPEffectiveness.pdf) focused on applying the results and using the BMPs.
* Overview of her report from literature, focus on tires as sources, and evaluated BMPs in stormwater manuals from 7 other states.
* When looking at the BMPs, the study was synced with Ecology’s stormwater manuals in categories and also focused on the mechanism of treatment.
* Developed a qualitative table on expectations for BMP success with 6PPD, 6PPD-q, and tire wear debris.
* Knowns and unknowns at the time of the report:
	+ Knowns:
		- bioretention soil mix prevents acute toxicity to Coho
		- 6PPD-q is likely to adhere to other organic matter or high-carbon media
		- 6PPD-q is somewhat soluble and unlikely to evaporate from typical stormwater environments.
	+ Unknown (at the time of the report):
		- No other BMP or BMP media information
		- Leaching or desorption from soil or other media occurs
		- If particle size matters for sorption
		- Sorption kinetics
		- Highly variable half-life information.

No notable updates on this list of unknowns since July 2022.

* Evergreen StormH20 presented in “plain language” which BMPs are presumed (and why) to provide source control or treatment control services for 6PPD-q management from tire-associated sources of stormwater.
* This understanding can change as we learn more about particulate sorption and less in dissolved phase; many of the medium potential BMPS may move up to high potential BMPs.
* - Stormwater BMP designers and reviewers can use this report when considering a project site.
* The BPJ advice from this consultant team is to focus on highly urbanized areas where the sites are more likely to have tire wear from multiple activities/sources (lots of low speed turning, heavy vehicles, high ADT, etc.).
* When applying Source Control BMPs a similar approach was taken, and this approach leaned on physiochemical properties for the BPJ.
* There are still significant unknowns surrounding preferences on sorbtion to smaller or larger particles.
* The half-life of 6PPD-q is extremely variable.
* It should be noted that BMPs ranked in the “medium” effectiveness category could, pending scientific updates, could shift to a ranking of “high.”

*To explore a BMP’s potential as an effective treatment for 6PPD-q, select a BMP from the SWMMWW or SWMMEW that is site-suitable. Cross-reference this BMP with the tables found in the appendix of the report.*

**Chat topics:**

Andrew Kenefick: requested clarification of an assessment of implementation – cited potential difficulties, expenses, etc. Confirmed this is in the report.
Eli Mackiewicz: we are in the process of figuring out many things about BMPs including if they are truly effective, practicable, implementable, and reasonable.

Brandi Lubliner: Link to [2019 SMMWW](https://fortress.wa.gov/ecy/ezshare/wq/Permits/Flare/2019SWMMWW/2019SWMMWW.htm#Topics/AdditionalResources/EmergingGuidance.htm?TocPath=Additional%2520Resources%257C_____3)

**Dylan Ahearn**
**Herrera Environmental Consultants - Review of regional street sweeping studies.**

* Source control BMPs are favored by many municipalities, as these BMPs:
	+ Remove pollutants higher in the delivery chain
	+ Are easier to implement than capital projects
	+ Easier (relatively) for OM
	+ Quantify pollution removed with greater ease
* There is quite an investment debt being created with all the installed treatment BMPs being built across the landscape that all have maintenance needs.

This region has always been interested in street sweeping science, and there is a lot of local knowledge on this topic. This BMP was initially studied for sediment management, sediment reduction implications for receiving waters, and lately has been studied directly for WQ improvement.

Past studies:

* 2009 SPU pilot study using hand vacuum/paired basin approach – found the combo of street sweeping and catch basin (CB) cleaning removes more when paired together. Also found sweeping to be 2-10 times cheaper than treatment BMPs.
* 2015 SPU street sweeping study added WQ testing into study design. This is a frequently cited study on major reductions of larger solid particles but an increase on the finest particle size (clay fraction). Reductions TSS and total copper were noted. No detected difference in dissolved pollutants or nutrients. The size of particles is relevant to 6PPD-q as the sorption to different sized particles is an unknown.
* 2019 Redmond’s Paired Basin Study– Increasing sweeping to a bi-weekly occurrence improved small stream WQ: TSS levels decreased. The results were surprising, but the small stream was key for effectiveness.

Ongoing Studies:

* SPU – Recently added 6PPD-q testing to a long-term study on street waste composition. Shelley Basketfield will present at 2023 MuniCon.
* Redmond’s Paired Basin Study – Repeating the 2019 study in new basin (Tosh Creek) and Ecology has added funds to include 6PPDq & PAHs to monitoring list.

[Map of Seattle street sweeping routes](https://seattlecitygis.maps.arcgis.com/apps/webappviewer/index.html?id=81b55d54b406409cb4af17cc891dac79)
[Seattle Street Sweeping Pilot Study](https://www.herrerainc.com/publications/seattle-street-sweeping-pilot-study-monitoring-report/)
[Street Sweeping Water Quality Effectiveness Study (MLK 2016)](https://www.herrerainc.com/publications/npdes-phase-i-municipal-stormwater-permit-street-sweeping-water-quality-effectiveness-study-final-report/)
[Monticello Basin Street Sweeping Water Quality Trend Analysis](https://www.herrerainc.com/publications/monticello-basin-street-sweeping-water-quality-trend-analysis/)