**SWG 6PPD Subgroup Meeting**May 4th, 2023 from 1-3 PM

**Participants**: Amanda Royal, Anna Beyette, Morgan Baker, Abby Barnes, David Batts, Dustin Bilhimer, Frances Bothfeld, Mark Bozlee, Brian Muegge, Madison Bristol, Tony Bush, Isabella Caballero, Andrea Carey, Carly Michiels, Carol Falkenhayn-Maloy, Jose Carrasquero, Nicole Chen, Chris Jorgensen, Stephen Conroy, Courtney Littrell, Matt Cox, Dan Kent, Daniel Hotovitsky, Dave Kangiser, David Wark, Mike Ehlebracht, Meghan Elkey, Emma Trewhitt, Ezra Miller, Danielle Gallatin, Stephanie Gill, Amanda Gillen, Gretchen Tellessen, Gwen Gyldenege, Nathan Hart, John Herrmann, Doug Howie, Jamie McNutt, Jay Spears, Jennifer Bare, Jessica Atlakson, Josh Baker, Joshua Craig, Julia Finley, Julie Panko, Katie Byrnes, Katie Holzer, Iris Kemp, Larry Franks, Lori Blair, Brandi Lubliner, Craig Manahan, Sheila Marcoe, Maria Peraki, Marissa Paulling, Pablo Martos, Maureen Meehan, Erin McCabe, Don McQuilliams, Melissa Petrich, Michael Posey, Mike Vermeulen, Laura Nokes, Chapin Pier, Rose Propst, Rachel Bowen, Lorraine Rau, Renee Scherdnik, River Wan, Rob Zisette, Robert Holbrook, Rod Swanson, Ross Dunning, Sarah Montero, Sarah Amick, Sean Dixon, Seth Sokol, Erika Shaffer, Shawn Hall, Stefan Grozev, Stephen Hochberg, Abbey Stockwell, Sue Barclift, Susan K. Bator, Scarlet Tang, Taylor Hoffman-Ballard, Thomas Poole, Tanya Williams, Zach Holt

**Welcome**Eli Mackiewicz reviewed this subgroup’s history, purpose, and role under the umbrella of the Stormwater Work Group.

The SWG 6PPD Subgroup was formed in 2021 to address the emergent chemical of concern, 6PPD and its transformation product, 6PPD-q. Stormwater-specific action was and still is needed, and this subgroup was and remains an information-sharing forum for gathering the latest data, efforts, and rapidly growing knowledge surrounding 6PPD.

This group’s purpose is to make recommendations on how to fill data gaps and identify what information surrounding 6PPD and stormwater is still needed. Priority topics involve how to manage 6PPD and where to focus those efforts. It is important to do the research that will answer these priority concerns and beyond, but it is more important to do the studies in a way that makes sense to us.

**Ecology updates**

**Morgan Baker**:

* The state legislature has passed the budget, which as of May 4th is awaiting Governor Inslee’s signature.
* Ecology’s Water Quality Program has received another $1.5 million over the upcoming biennium, funding 6PPD/6PPD-q BMP effectiveness research through 2025.
* We are working quickly to determine how best to spend this next round of funding, with current discussions revolving around new staff for capacity increases and the prioritization of filling data gaps that will best inform stormwater management of 6PPD and 6PPD-q.
* We obligated every cent of the $1.5 million awarded to us in our current biennium and intend to continue using this funding strategically to best benefit research efforts.

**Katie Rathmell**:

* Water Quality’s 6PPD team will expand imminently, likely to include another environmental engineer.
* The recruitment process can begin now that funding has been granted.

**Brandi Lubliner**:

* SAM (Stormwater Action Monitoring) received twelve Letters of Intent (LOIs) as part of the SAM’s Round 4 RFP process.
* SAM is a permittee-driven, permittee-funded program that seeks to study and inform stormwater management practices and requirements by Ecology. This Round 4 solicitation process has about $2.5 million for new studies to finish out the permit cycle. . More information on the general process of the SAM RFP can be found [here](https://ecology.wa.gov/Regulations-Permits/Reporting-requirements/Stormwater-monitoring/Stormwater-Action-Monitoring). Full proposals are due to Ecology by May 31st 2023. Stormwater Work Group will decide on which studies to fund in November 2023.
* Six of the twelve LOIs submitted revolved around studying 6PPD and 6PPD-q, and those proposed studies and accompanying links are as follows:
  + [**City of Tacoma**](https://www.ezview.wa.gov/Portals/_1962/Documents/SAM/LOI1-StormwaterCharacterizationforCECs.pdf)
  + [**University of Washington**](https://www.ezview.wa.gov/Portals/_1962/Documents/SAM/LOI2-6PPDQReductionbyFloatingTreatmentWetlands.pdf)
  + [**Seattle Public Utilities**](https://www.ezview.wa.gov/Portals/_1962/Documents/SAM/LOI3-6PPDQReductionbyStreetSweeping.pdf)
  + [**Washington Stormwater Center**](https://www.ezview.wa.gov/Portals/_1962/Documents/SAM/LOI9-BURitoDesignConstraints.pdf)
  + [**King County**](https://www.ezview.wa.gov/Portals/_1962/Documents/SAM/LOI11-ToxicsReductionFullscaleHPBSM-TAPEprotocol.pdf)
  + [**Washington Stormwater Center**](https://www.ezview.wa.gov/Portals/_1962/Documents/SAM/LOI12-StreetSweepingProgramConsiderations.pdf)
* This subgroup is invited to participate in the review of these proposals. Contact [Brandi.Lubliner@ecy.wa.gov](mailto:Brandi.Lubliner@ecy.wa.gov) to attend the two review meetings: June 7th and July 19th.

**Tanya Williams**:

* The 6PPD Interagency Forum is now meeting monthly to discuss strategies for cooperation and collaboration in the realm of 6PPD and 6PPD-q.
* Participating agencies are as follows:
  + The Washington State Department of Ecology
  + The Washington State Department of Health
  + The Puget Sound Partnership
  + The Washington State Department of Fish and Wildlife
  + The Washington State Department of Natural Resources
  + The Washington State Department of Transportation
* Two informational webinars, one Tribal-only and one general public, will occur June 14th & June 21st, respectively. The following agencies are participating in the webinars:
  + The Washington State Department of Ecology
  + The Washington State Department of Health
  + The Puget Sound Partnership
  + The Washington State Department of Fish and Wildlife
  + The Washington State Department of Transportation
* Materials for the webinar will be posted online one month prior to the live viewing.
* A live webinar will further feature panelists from agencies available for Q&A.
* Finally, Ecology’s participation in the Interstate Technology and Regulatory Council ([ITRC](https://itrcweb.org/home)) Tire Anti-Degradants Team is being led by Tanya Williams, Madison Bristol, and Rhea Smith, with Tanya providing overall leadership for ITRC, Madison being a co-lead of the Solutions Subgroup (BMPs, remediation, alternative chemicals, policy), and Rhea being a co-lead of the Assessment Strategies Subgroup (GIS tools, modeling, sampling and analytical methods) Members of the public are encouraged to [sign up](https://itrcweb.org/teams/active/6ppd-q) for this team if interested.

**Chat topics:**

Lori Blair requested the listerv link for Ecology’s general 6PPD mailing list. That sign up can be found [here](https://public.govdelivery.com/accounts/WAECY/subscriber/new?topic_id=WAECY_291).

Lori further asked if the ITRC was open to government-only members.   
Sean Dixon shared it is not, and that the public is encouraged to join.  
There is a cost for industry members to join ITRC while public and government agencies, including universities, may join at no cost.

**Group updates**

**Dr. Ani Jayakaran**:

* PhD student Chelsea Mitchell has finalized data collection for her project surrounding 6PPD-q and permeable pavement.
* This subgroup should expect results to be presented at an upcoming meeting, but highlights include an over 90% 6PPD-q reduction rate across all media.

**Katie Holzer, City of Gresham**:

* Data out of Oregon has shown high 6PPD-q levels in large roads, with concentrations exceeding the currently accepted LC50 value of 0.1 ug/L. Porous large roads, small roads, and urban runoff smaples showed markedly lower concentrations, but a few of the data points above the LC50 level. Soccer fields, urban streams, and rural streams showed negligent values of 6PPD-q, and all below the LC50 mark. For questions regarding this study, please contact Katie at [katie.holzer@greshamoregon.gov](mailto:katie.holzer@greshamoregon.gov).

**Tony Bush**:

* Washington State Department of Transportation (WSDOT) is formalizing a partnership with King County to support research surrounding high performance biorentention soil mixes (HPBSM).
* Further impending partnerships include ODOT and CalTrans, WSDOT counterparts in Oregon and Washington, respectively through the tire toxicity pooled fund.
* They plan to add 6PPD-q testing to their existing first flush monitoring program.
* The hope is to inform cost-effective solutions for DOTs nationwide.
* For questions regarding these initiatives and studies, please contact Tony at [tony.bush@wsdot.wa.gov](mailto:tony.bush@wsdot.wa.gov).

**Chat topics:**

Ed Kolodziej recommented the Zhao et al. paper for data on 6PPD-q levels in sports field runoff.

**Dr. Ed Kolodziej**:

* Multiple papers have been released regarding over 25 transformation products of 6PPD.
* Notable findings include:
  + 6PPD-q compared to a list of pesticides is ranked as the second most toxic identified compound to aquatic organisms.
  + As cited in Hu et al., 6PPD-q has been found to have low solubility – lower than computer models are currently simulating. It is moderately hydrophobic, which is a factor in its efficacy as a rubber protectant, and will partition into soil, rubber, and plastic materials. This will affect both treatment systems and sampling protocols. **Glass is still the recommended material.**
  + These characteristics contribute to 6PPD-q being easily bioavailable to fish with a log Kow value of 4.3.
  + Current studies do not indicate much effect on the pH of 6PPD-q in water, and refrigeration has not appeared to notably affect concentrations.
  + Loss of 6PPD-q in samples is relatively low, with an approximate loss of 10% within 1-2 weeks post-sample, and up to a 30% loss from simple water jars.
  + Headspace is thought to only affect samples if containing reactive levels of ozone or other known or unknown 6PPD-q reactors.
  + Stream and field studies did find other PPD products in samples, as other PPDs are utilized in a variety of other products.
  + Additional transformation products were also found to be more abundant than 6PPD as a parent compound alone can account for, supporting the potential for additional parent sources.
* This presentation and a more expansive look at this data can be viewed [**here**](https://www.youtube.com/watch?v=0NtVyBVu1_4) in full as was presented at the 2023 Salmon Recovery Conferece.

**Chat topics:**

Katie Holzer noted how interesting 6PPD-q’s low solubility is. She further noted that in her previously mentioned study, “the 6PPD-q concentrations seemed to be fairly constant throughout a storm.” This marks a difference from other pollutants, which showed highest levels in the first flush and continued to decrease in concentration.

Howard Colvin asked about 6PPD-q’s solubility and whether it’s affected by any other possible material in the water. Ed noted that sometimes constituents in samples can affect solubility.

David Batts requested information on temperature and headspace, in which Ed encouraged a “nitty gritty” exploration of the paper (linked above), but did note that headspace itself does not seem to cause 6PPD-q to disappearing in samples. Temperatures for samples providing the presented data were noted to be either at room temperature or 4 Celsius, aka refrigerator temperature.

Howard Colvin asked for further comments on the reactivity of 6PPD-q in terms of electrochemistry. Ed noted that this is an important data gap that needs further exploration.

Stephen Conroy asked if any studies regarding the effects of 6PPD-q on Coho embroys had been done. It was noted that this is work Dr. Jen McIntyre is exploring.

Howard Colvin noted that DPPDDQ findings in samples may be explained by the existence of DPPD in some tires.

Howard further asked if chitosan has been considered as a treatment material as it is known to “complex with quinones as well as other material in process wastewater.” Doug Howie has noted that CESF treatment is included in the SWMMWW as BMP C250 and C251, found in Volume II.

Larry Franks asked if there is any data connecting 6PPD-q to human health impacts. Madison Bristol linked [this study](https://pubs.acs.org/doi/abs/10.1021/acs.estlett.2c00821). Ximin Hu, Ed’s PhD student, presented these at MuniCon 2023 where it was noted that the concentrations of 6PPD-q found in human urine were significantly higher in pregnant women.

Ross Dunning asked if TP274 might be a good “marker” for 6PPD-q and might be used as a “more easily detected or cheaper surrogate.” Ed responded that TP274 is not necessarily the perfect marker for 6PPD-q, but is a good marker for 6PPD and roadway runoff. There may also be other sources of TP274 that contribute to its presence in samples.

Taylor Hoffman-Ballard notes Evergreen StormH2O’s BMP effectiveness report also considered the existing construction BMPs for their potential efficacy at managing 6PPD-q in stormwater.

**Wrap up**

**Eli Mackiewicz**:

Eli is moving away from his role as chair, and is seeking volunteers for a replacement. Eli’s work within this subgroup has been invaluable, and his continued support of this work is something we all express tremendous gratitude for. Eli’s transition away from co-charing this subgroup will open more time to implement 6PPD and 6PPD-q treatments as a stormwater manager in the City of Bellingham.