LOI # 15

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Study Title: Understanding 6PPD-Quinone Dynamics in Roadway Runoff Outfalls, Treatment BMPs, and Associated Materials

Which topics from the SWG's priority list (Appendix A) do you propose to address?

1, 4, 8, 14, 15, 19

What type of project is being proposed?

Environmental sampling study;Paired Laboratory Studies

Short description of the proposed project

To advance source management and BMP effectiveness goals, we will quantify 6PPDQ and related roadway parameters in field and laboratory studies for these priority topics:

Topics 1, 4: Despite being a critical parameter for treatment, source dynamics of 6PPDQ in roadway runoff remain poorly understood. Runoff 6PPDQ concentrations can reach 1000s of ng/L but the range of concentrations and mass-time relationships across different outfalls, storms, antecedent dry periods, seasons, roadway geometries, and traffic volumes is poorly understood in Washington, although a recent 3-year study by CalTrans indicates these are important variables. We propose high frequency (every 1-2 hours) composite sampling at outfalls for this task.

Topics 8, 19: BMPs and stormwater detention basins will be evaluated for event-based performance by analyzing paired influent/effluent samples (and if possible, midpoints). A combination of grab, time series, and limited composite sampling during storm events will evaluate the temporal dynamics and performance outcomes for 6PPDQ. To evaluate removal mechanisms, we will also analyze used BMP materials (i.e., old cartridges, soils, sorbent, vegetation, etc.) for 6PPDQ mass and their leaching potential for 6PPD and 6PDQ.

Topics 14, 15: Good treatment requires media that effectively sequesters and retains 6PPDQ (through sorption or physical tire-particle filtration) over time, and ideally, by degrading 6PPDQ. Sequestration and retention outcomes govern long-term performance of BMP media, as well as maintenance and disposal needs for media. Via field sampling and paired laboratory studies, we will evaluate these processes for BMP media types, including biochars.

What type of information will be collected or analyzed for this proposed study?

Our data collection in this study will largely focus on measuring 6PPDQ concentrations in water and related matrix types using our ECY-accredited liquid chromatography-tandem mass spectrometry analytical method.

Topics 1 and 4 (Source term and geographic priorities):

We will measure concentrations of 6PPD, 6PPDQ, and a suite of other tire-related chemicals in roadway runoff across several varying outfalls.

Topics 8 and 19 (BMP Performance):

We will evaluate performance of existing BMP installations by measuring 6PPD, 6PPDQ, and a suite of roadway or 6PPDQ-related chemicals in paired influent/effluent samples from roadway runoff BMPs, including comparison of filtered and unfiltered samples. By measuring influent/effluent concentrations, we will be able to evaluate 6PPDQ source terms from roadways and performance. We will also measure 6PPDQ mass and transformation products arising from degradation in used BMP materials and evaluate the potential for these medias to leach or form (from 6PPD) 6PPDQ over time, influencing maintenance and disposal needs.

Topics 14 and 15 (BMP materials):

We will measure various performance metrics for existing and potential future BMP materials for the treatment of 6PPDQ. This will include rates of sorption/desorption and transformation outcomes in the material.

What are the anticipated measurable outcomes and key deliverables that will be produced by the proposed study and how will they be used by Permittees and the Washington State Department of Ecology?

This project will provide the following deliverables and outcomes:

-Outfall concentration-mass-time dynamics and assessment of dissolved versus particulate transported 6PPDQ.

-Relationships/correlations between 6PPDQ and traffic, storm, season, and antecedent dry period variables

-BMP removal performance for 6PPDQ (% and mass)

-Relative leaching/degradation outcomes for BMP media

-Recommendation for BMP optimization and management, and/or source control strategies

List the permittees or agencies you are proposing to coordinate with.

WA Department of Transportation (Brad Archbold), as well as regional municipalities.