

Letter of intent (LOI)

Interested parties should submit a Letter of Intent (LOI) on or before February 28, 2023 for each individual proposal. Letter of intent should include applicant contact information and seven questions about proposed study. More details about SAM study selection process, eligibility and funding availability can be found in SAM REF guidelines in SAM Effectiveness webpage.

The respondent's email (jenee.colton@kingcounty.gov) was recorded on submission of this form.

Applicant contact information

Applicant Full Name *

Jenee Colton

Organization *

King County

Phone number *

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Proposed Study Information

1. Proposed Study Title *

Treatment effectiveness of full-scale multiple bioretention soil media types for removing 6PPD-Q and/or toxicity to juvenile coho salmon (*Oncorhynchus kisutch*) and zooplankton (*Daphnia pulex*) from stormwater in urban and suburban settings

2. Which topic(s) from the SWG's priority list do you propose to address? *

The proposed study topic should be in the SWG's priority list

The proposed study addresses topics 6, 7 and 8 of the Approved Round 4 Priority Topics List.

3. Select type of project being proposed *

- Survey
- Literature Review & Synthesis
- Environmental Sampling Study
- Other

4. Short Description of the Proposed Study *

250 word limit: describe how results will assess effectiveness and advance regional understanding and permittees' implementation of specific stormwater management approaches

Effectiveness of Ecology-approved HPBSM to remove 6PPD-Q and/or acute toxicity of stormwater to coho salmon has not been demonstrated at full-scale, in-place bioretention facilities. The proposed project will build on already-planned evaluations of bioretention systems now under construction in the Longfellow Creek neighborhood, Seattle (sponsored by Seattle Public Utilities; SPU) and the Geneva neighborhood in Bellingham (sponsored by Whatcom County). The study systems are:

- Longfellow Creek: 1) Ecology-approved high performance bioretention soil media (HPBSM) Type 31; 2) 70/30 (sand/compost) plus polishing layer
- Geneva: 1) Ecology-approved HPBSM Type 2

Water quality monitoring (following TAPE protocols) is currently planned by project sponsors. This project will leverage planned monitoring to collect additional information on effectiveness of these systems to reduce or eliminate 6PPD-Q concentrations and toxicity to coho and zooplankton. At Longfellow, SPU will monitor 6PPD-Q removal effectiveness and loading rates. We will add toxicity testing to the monitoring plan. At Geneva, Whatcom County is focusing on TAPE parameters; we will add toxicity testing and 6PPD-Q to the monitoring plan. These projects provide opportunities to evaluate effectiveness of bioretention, including HPBSM, in situ, in different traffic settings, and with multiple sampling events over two to three years. Note: 6PPD-Q and toxicity are the focus, but we may also use the opportunity at Geneva to address removal effectiveness for per and polyfluoroalkyl substances (PFAS); or reduction of toxic forms of metals at both locations.

The proposed research will build evidence of full-scale bioretention system effectiveness for reducing risk of urban runoff mortality syndrome (URMS) in coho. Regardless of study outcomes, results will inform alterations to surface water design manuals, support development of cost information (installation, maintenance, renovation) and help permittees optimize limited budgetary resources for maximum long-term environmental benefit.

5. What type information will be collected or analyzed for this proposed study? *

If existing permittees' data are needed, specify the type, and the expected timing of a request for existing information from Permittees.

The proposed project will leverage two ongoing bioretention monitoring projects to develop new information on the effectiveness of full-scale bioretention for reducing URMS. For samples collected at bioretention influent and effluent locations, the project will assess:

- 6PPD-Q at the Geneva project.
- Direct toxicity tests with juvenile coho salmon (subset of samples based on fish developmental stage and availability) and zooplankton (*Daphnia pulex*). Toxicity tests will have a synoptic 6PPD-Q analysis for the toxicity test water at each bioretention facility.
- Other water quality parameters at both projects to improve understanding of the functioning of bioretention (HPBSM and 70/30+polish) in removal or reduction of 6PPD- Q.

We will measure gross water quality conditions that may change reactivity of water with 6PPD-Q (e.g., pH, oxidation reduction potential; dissolved oxygen, temperature, conductivity). We will evaluate differences in these variables in influents and effluents, and covariation with 6PPD-Q concentrations. Dissolved organic carbon and total suspended solids will be measured in both bioretention influents and in toxicity tests to explore whether these parameters may covary with toxicity or target analyte concentrations.

These data will be collected at multiple time points across a period of two to three years at each facility.

King County is coordinating with SPU and Whatcom County, and primarily working with their consultant for both projects, Herrera Environmental Consultants, Inc. (Herrera). Herrera is a leader in stormwater quality control and management and related technical investigations. No specific information requests from the two permittees are anticipated. King County will team with these partners to maximize the efficiency of project implementation. For example, the existing projects provide QAPPs that can be amended with King County's study elements, simplifying King County's study planning documentation. We will also time the collection of samples to be compatible with planned efforts, to minimize complexity and costs of field sampling and related logistics.

6. 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? *

Data for 6PPD-Q and stormwater toxicity reduction effectiveness of bioretention with Ecology-approved HPBSM deployed at scale do not yet exist. This information is critical for King County and other jurisdictions to evaluate proposals to use HPBSM to achieve 6PPD-Q and antidegradation requirements likely to be in future permits. The proposed project provides the opportunity to develop critical information on bioretention effectiveness for these key parameters as quickly as possible. The results will also provide more accurate treatment effectiveness estimates for scientists and planners developing 6PPD-Q reduction plans at a regional or watershed scale (e.g., modeling degree and location of treatment needed).

The deliverable will be a comprehensive technical and data report on the effectiveness of in situ bioretention systems to address 6PPD-Q, aquatic toxicity of stormwater influent relative to bioretention effluent, along with selected potential water quality parameters that may be covariates with the core study variables. The report will provide comparisons among bioretention types, summaries of performance over time, and evaluation of treatment effectiveness across different traffic environments to help inform revisions to existing design standards.

7. Permittees or agencies you are proposing to coordinate with (provide staff names and contact information, if known) *

Enter "NA" if not applicable.

Seattle Public Utilities: Shanti Colwell, P.E., GSI Projects Manager.

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