

# Memorandum

July 9, 2014

To: Stormwater Work Group and King County Water & Land Resources Division

From: Brandi Lubliner, Washington State Department of Ecology

RE: Ecology engineering review of the RSMP effectiveness study proposal entitled: *Effectiveness of LID Retrofits for Treating Highway Runoff to Echo Lake*

Ecology was asked to provide comments on the initial four RSMP Effectiveness studies listed below:

- A. Effectiveness of LID Retrofits for Treating Highway Runoff to Echo Lake. Project Manager: Carly Greyell, King County.
- B. Effectiveness of Bioretention in Reducing Stormwater Flows, Pollutants and Toxicity. Project Manager Kate Macneale.
- C. Testing the effectiveness of bioretention at reducing the toxicity of urban stormwater to coho salmon. Project Manager: Jay Davis, USFWS
- D. Paired Urban Small Stream Watershed Restoration Effectiveness Study. Project Manager: Andy Rheume, City of Redmond.

This memo discusses the proposal for *LID Retrofits for Treating Highway Runoff to Echo Lake*. The RSMP Coordinator, Brandi Lubliner, organized a review team made of to the following Ecology staff: Brandi Lubliner, Ed O'Brien, Doug Howie, Amanda Heye, Bobb Nolan, Randall Marshall and Mindy Roberts. The comments were compiled in this memo. Thanks for the opportunity to comment.

## Overall Comments for Echo Lake Retrofit Study

1. The study lays out the need to gather BMP effectiveness information from actual field implemented conditions, particularly from certain land uses that may provide a spectrum of pollutants that weren't tested for under the TAPE program.
2. Ecology's main concern is that a great deal of money and effort will be spent to study "BMPs as built". In this proposal, there is confusion on exactly what BMP is in place. Without certainty and adherence to quality control, the results for these BMPs studied will have limited to no transferability to other sites, and the effort would fail to satisfy the 'regionally' applicable focus of the larger monitoring effort.
3. Because this is a retrofit project to treat stormwater the concerns brought up at the retrofit table are mentioned here.
  - a. Some permittees felt retrofits aren't useful to permit modifications and have limited utility for spending \$. They wanted to know if these efforts can inform future permits. This point was heavily debated among permittees at the retrofit table. Other permittees want to gather information on retrofits even if they've been modified from existing BMPs in the manual.
    - i. Ecology's response is that BMP effectiveness information can inform the manual if the BMP is built to a known BMP specification. Other BMPs can be monitored but it's still of utmost importance to know exactly how they were built.
4. This project was expanded between the March 20 and May 6 2014 Effectiveness studies workshops to include Filterra and detention tank.
  - a. In the May workshop a yellow card was raised on this project; to ask the group whether we want to spend \$ to evaluate commercial devices. This is also an Ecology concern raised below (7a).

## Bioretention BMPs

5. It's important to be clear with stormwater BMP terminology as it relates to the manual in Washington. Clear communication will alleviate confusion, misconception and time spent discussing what is being built and studied. At a minimum, proponents will need to clarify with the construction/design engineers on what BMPs are actually built. Ecology suggests the proposal for this study include a detailed review by a King County stormwater engineer.
  - a. Be aware that the while Filterra advertises their box product as a "bioretention box", Ecology does not classify this proprietary device as a bioretention BMP in its manual.
  - b. Filterra boxes are not LID. Referring to them as an LID BMP is incorrect and will add to misconceptions of what qualifies as LID. Filterra boxes are a treatment BMP for basic or enhanced treatment; clarify which has been built onsite.
  - c. "Rain garden planters" are not a treatment BMP for new and redevelopment.
  - d. "Rain gardens" if underdrained are not LID.

- e. Neither Filterra boxes, nor rain gardens should be referred to as “bioretention.” “Bioretention” is a treatment BMP that uses soil media that are specified in BMP T7.30 in the SWMMWW. The Filterra BMP uses a different, propriety media through which stormwater flows much more quickly than through “bioretention.”
  - f. The term, “rain garden” refers to mixing compost into a site’s soils within a depression built to capture stormwater. If the rain garden planters are truly rain gardens (been mixed with native soils), then the native soils need to also be classified to be “known”. Because the pollutant removal and hydraulic performance of a “rain garden” will vary with the type of native soil on a site, performance will vary from location to location. So, the performance of a “rain garden planter” at this site is transferrable only to other sites with the same native soil.
  - g. If the devices referred to as “rain garden planters” are in fact, “bioretention planters,” then the performance data will add to performance data collected at multiple other sites for conventional pollutants and dissolved metals. The results will add to limited data collected at other sites for PAH’s, bacteria, and diesel and motor oil range hydrocarbons and PCB’s.
6. The project proposes to provide additional data on the performance of the propriety Filterra treatment device which has already been approved through TAPE.
- a. Ecology is concerned about the competitive edge given to a private company using public funds. Ecology asks that this be documented as a decision made by the SWG.
  - b. SWG should consider if data would be more regionally useful if the effluent from the Filterra devices were tested similarly to how the UW/NOAA/WSU are proposing to test raw and bioretention-treated stormwater for toxicity to adult salmon and salmonid eggs/embryos.
7. Regarding expected BMP performance it was difficult for Ecology’s engineers to critique the project at this proposal stage due a lack of information on the size and design of BMPs themselves.
- a. If the detention tank were sized and fitted with a release structure to fully meet the flow duration standard for its service area, then looking at pollutant removal performance could be useful; and looking at its hydraulic performance for comparison to the intended (design) performance could be informative. But if the detention facility has a reduced detention function, that likely compromises use of the data for anything other than documenting improvements garnered for this particular watershed.
  - b. The proposal says the BMPS were all built to the 2005 SWMMWW (manual). The ’05 manual did not have design criteria for “rain gardens” or Filterra systems. The ’05 manual had a much less prescriptive “bioretention” soil specification (see page C-13, Appendix III-C of Volume III, and the ’04 LID Manual) than the soil specifications in the 2012 stormwater manual. If the project has a “bioretention” facility to monitor (rather than a rain garden or a Filterra system) it is crucial to capture the exact details from the design and as-builts so that we know what is being monitored. If a “bioretention”

facility was constructed with a soil media that differs from the '2012 manual, the results may be of little value outside of this project.

8. Based on existing studies on bioretention soils, we know that it's very important to know the source material for compost that may have been a component of the soil media. . If compost was used a component of the soil media, can you verify the compost source material? Can you verify that manure or biosolids were not used?

Note: We are learning that bioretention soil media using compost leach phosphorus and will likely leach for an extended time.

#### Flow Control

9. A detention tank is a long detention BMP and paired (inflow/outflow) samples are not appropriate. You need to develop a monitoring plan using Ecology's Long-Detention Monitoring guidance.
  - a. Continuous flow monitoring would be needed to understand flow improvements

#### Toxicity

10. Ecology recommends not taking water samples from BMP effluents for toxicity for several reasons.
  - a. Toxicity is an effect and not a substance. A onetime toxicity test is not worthwhile given the variability of toxic stormwater constituents. No conclusion based on the results would be reliable. The major toxic stormwater pollutants (metals and PAHs) are already known. The usual toxic substances in stormwater have steep concentration-response relationships. As a consequence, stormwater and receiving water toxicity can be highly variable.
  - b. The best use of a toxicity test is to screen for unknown toxicants or mixtures. A toxicity evaluation aims to identify toxicants and requires that the same water quality be available for each iterative test to identify the contaminant(s). However this can be very difficult with stormwater discharges because they are weather dependent, intermittent and variable. Getting an adequate sample volume that is representative for the purposes of the study is difficult. Having test organisms of the right age and number ready when that sample arrives at the lab is difficult. Getting weather forecasts accurate enough for short-term planning is difficult.
  - c. Chemical and physical measurements are much better for evaluating treatment system effectiveness. Suspended solids reduction, metals removal, TPH reduction, etc. are relatively easy to determine and immediately meaningful.

#### Echo Lake Receiving Water

11. Ecology's BMP engineers suggest "success" should be measured in terms of BMP-scale monitoring, not receiving water monitoring, particularly in this case. The monitoring of

influent/effluent from specific BMPs is sufficient to inform us about the effectiveness of those BMPs in reducing specific pollutants to the lake.

12. Bobb Nolan from Ecology NWRO recalled that the retrofits will address 11 acres of the 215 acre basin to Echo Lake. If this number is accurate, Ecology does not expect a noticeable water quality change within Echo Lake, especially in a 3 year timeframe.
13. If SWG decides that quantifying the effects on the lake water quality is still a focus of the project, then the compilation of existing data task sounds reasonable. The following are approaches to quantify the lake's response.
  - a. Mindy Roberts (Ecology) developed a simple spreadsheet model to help predict lake water quality outcomes given phosphorus loadings in Loma Lake (Snohomish County). This calculator (XLS file) can be made available to the study leads. The report below gives ideas for quantifying sediment releases based on seasonal monitoring data. Some type of screening-level assessment, like the Lake Loma calculator, would be helpful context for assessing how much of an effect this project would have on the lake ahead of time. The final report is here:  
<https://fortress.wa.gov/ecy/publications/SummaryPages/1303031.html>
  - b. Regarding phosphorus impacts to a lake there are ways to analyze epilimnion/hypolimnion phosphorus concentration x volume = mass before and after stratification. Specify in the QAPP how you plan to do the overall comparison and for what parameters. Ecology suspects that the mass eliminated (or temporarily added) from the retrofit is small in comparison with the sediment releases, but an assessment is needed to figure it out.
  - c. If you find "no change" it's not necessarily that the BMPs aren't effective, just that other sources remain.