

# Bioretention Media Study Phase 2 Partner Meeting

Agenda: April 19, 2018

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| 10:00-10:15 | Introductions <ul style="list-style-type: none"><li>• Partner introductions</li><li>• Meeting objective(s)<ul style="list-style-type: none"><li>○ Project schedule</li><li>○ Project objectives</li><li>○ Review previous studies</li><li>○ QAPP/study approach</li></ul></li></ul>   |
| 10:15-10:30 | Project objectives and schedule <ul style="list-style-type: none"><li>• Study objectives</li><li>• Milestones</li><li>• Partner meeting schedule</li></ul>  |
| 10:30-11:00 | Previous studies <ul style="list-style-type: none"><li>• Kitsap BSM Study (original high-performance media study, report date 2015)</li><li>• Kitsap Phase 1 Study (plant study, report date 2017)</li><li>• Seattle Polishing Layer Study (polishing layer under compost-based media, report date 2016)</li><li>• City of Bellingham media study</li></ul> |
| 11:00-11:45 | QAPP/Study design <ul style="list-style-type: none"><li>• Treatments</li><li>• Study approach</li></ul>   |
| 11:45-12:00 | Wrap-up <ul style="list-style-type: none"><li>• Next steps</li></ul>  |

## MEETING MINUTES

**Date:** 4-19-18      **Location:** Herrera Seattle office

**Project Number:** 16-06230-000

### Attendees:

Curtis Hinman	Shanti Colwell	Brandi Lubliner
Chris May	Chris Webb	Dana Deleon
Doug Howie	John Lenth	Dylan Ahern
Marcus Flury	Jenee Colton	Mark Maurer
Joy Michaud	Henry Stevens	

### Meeting Objective:

Kick-off meeting for BSM Phase 2 Study to discuss previous BSM research findings, project objectives and initial study design.

### Discussion:

- Study Objectives
  1. Recommendation for high performance BSM specification as part of Minimum Requirement #6.
  2. BSM must meet basic treatment and enhanced treatment (dissolved copper, dissolved zinc, phosphorus) and be affordable, and support plants.
- Study tasks
  1. Test Media Blend
    - a. Media analysis will be conducted at WSU Bellingham.
    - b. Confirm flow and WQ acceptance criteria for parameters outside TAPE protocol.
    - c. Flush, dose, and test hydraulic conductivity.
      - More dosing repetitions that Phase 1 study (8 reps, 5 previously)
        - ✓ Goal to gain a better sense of how long media will last before break through.
        - ✓ Need to determine volume that will be applied to dosing scheme (equivalent to 1 or more water year)?
        - ✓ Doug H would like to see hydraulic conductivity testing at end of testing to see if clogging is an issue.
    - d. Develop appropriate metrics and lab analysis for media specification.
      - Determine the numeric metrics and appropriate ranges of values (e.g., water holding capacity).

- o Specification may help improve native soil specification metrics like cation exchange capacity specifications in Ecology stormwater manual.
      - o 60/40 BSM will remain as the default in the Ecology manual, this new media will be for specific scenarios that drain to sensitive water bodies.
    - e. Aquatic organism toxicity testing at WSU with Jen McIntyre.
      - o Run in parallel with dosing phase and expose aquatic organisms to stormwater and stormwater filtered through media columns.
  - Schedule/Milestones
    1. Contract with King County fully executed.
    2. Draft QAPP in May.
    3. QAPP finalized by June.
    4. Column testing system set up by August.
    5. Dosing phase in November-February.
    6. Final report by end of June 2019.
    7. Project Advisory Group meetings.
      - a. Curtis recommend we do not meet in person for the “review and confirm BSM component and blend selection” meeting, instead correspond electronically.
    8. Schedule is well padded, team is optimistic about meeting schedule.

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Topic: Previous Studies

Discussion:

- Initial high-performance media testing with Kitsap County.
  1. Identified aggregate, organic fractions, additives that do not leach metals or phosphorus. Media did not meet basic treatment.
  2. Best performers - volcanic sand (clean sand), coco coir additive (water holding capacity, dissolved organic carbon), high carbon wood ash (water holding capacity, metals capture, plant growth).
- City of Seattle polishing layer study.
  1. Very good phosphorus removal using activated alumina and iron aggregate
    - a. SPU to use polishing layer on next phase of Swale on Yale.
    - b. HEC designing system at Park Place in Bellingham with polishing layer targeting Lake Whatcom phosphorus TMDL.
    - c. Risk of iron to oxidize and brick up, reducing hydraulic conductivity.
    - d. Iron (shipped from Chicago) and activated alumina are expensive.
- Phase 1 - plant growth study
  1. Tested 2-inch compost mulch over high performance media, which grew plants as well as 60/40 mix.
  2. Water quality testing was not performed during this testing.

3. Chris May says Kitsap has been using 70sand/20compost/10mulch successfully in retrofit projects.
  4. Pilot project in Redmond - 80sand/20coir grows plants, has been hand watered
- Phase 1 – hydraulic conductivity testing
    1. Very high filtration rates (~50 inch-per-hour), likely why the high-performance media does not meet basic treatment.

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## Topic: Study Design for Phase 2

### Discussion:

- Phase 2 to demonstrate water quality treatment, ability to protect aquatic organisms, and develop formal specifications.
- Hydraulic conductivity testing discussion.
  1. Discussion regarding previous concerns about fines clogging systems and pre-treatment requirements. High performance media has the opposite problem.
  2. Based on Phase 1 study the high-performance media will need to be slowed down either with outlet control, e.g., orifices, or with finer media.
    - a. Will depend on if the media alone can meet basic treatment. If it cannot, then outlet control may be part of the specification.
  3. Shanti says outlet control will need to be easily maintainable.
  4. Compaction during construction has a big impact on hydraulic conductivity which is difficult to control during construction.
  5. Testing is required.
  6. 12-inch per hour will continue to be used for minimum rate and sizing, but the high-performance media does not need to meet 12 inches per hour just has to meet basic treatment.
    - a. If orifice control is required to meet basic treatment, specification for design will be difficult.
      - Is one treatment with an orifice is enough data to inform developing the new specification.
- Treatments
  1. Do we need to include 60/40 as control?
    - a. Consensus, keep for consistency.
  2. Polishing layer needed if using compost blanket?
    - a. 70vs/20cp/10ash/compostmulch – most promising high performance mix plus compost mulch (has not been tested for water quality).
    - b. 70vs/20cp/10ash/compostmulch/aafep-layer – same as above but with a polishing layer to see if polishing layer is necessary to meet water quality since compost blanket is present. Polishing layer includes 90% state sand, 7% activated alumina and 3% iron aggregate.
  3. Can high hydraulic conductivity sands meet basic treatment?

- a. 70vs/20cp/10ash – volcanic sand
  - b. 70ss/20cp/10ash – same as above but state sand is a coarse clean sand from Puget Sound region, provides a very high hydraulic conductivity (100-200 inch/hour), could be orifice controlled. To be compared with volcanic sand performance.
4. Is orifice control necessary to meet basic treatment?
- a. 70ls/20cp/10ash – new sand to test, lava sand, porous sand with high hydraulic conductivity (~200 inch/hour).
  - b. 70ls/20cp/10ash/orifice control – same as above but orifice controlled.
5. Can a polishing layer mitigate compost-based BSM?
- a. 60sand/40compost/p-layer
6. Discussion
- a. Depth of all columns is consistent. Polishing layer replaces aggregate layer for pipe bedding. Polishing layer covers outlet in column, but application in field more challenging to fully cover under drain.
  - b. Proposed media layering is the same that is currently specified for bioretention, i.e., pipe bedding, media, and mulch layer.
  - c. Media testing is focusing on testing sand permutations with goal to achieving basic treatment
    - o Previous testing demonstrates good phosphorus and metals capture using the coir and wood ash.
    - o Doug Howie is concerned about justifying why we are focusing on just coir and wood ash.
      - ✓ Current study needs to explicitly state findings of previous studies and which medias have been tested and why they fell off as feasible options.
  - d. Other permutations to test
    - o Traditional 60/40 with a polishing layer?
      - ✓ Maybe 70/30 mix? We already know 40% is too much compost.
  - e. Experiments will simulate a water year.
    - o One water year for flushing phase.
    - o Dosing phase cannot simulate a water year, it would require too much dirty water.
      - ✓ Will simulate events with very high concentration doses.
  - f. Have not including mulch in column experiments which captures solids.
    - o Arborist chips float, typically placed above the water line.
    - o SPU and Kitsap use compost mulch.
    - o No mulch will be used in the columns.

**Action Items:**

Action	Due Date	Assigned To
HEC to send out scope and schedule		Curtis
HEC to send out draft media blends		Curtis
Team to provide comments on selected media blends		All
Draft QAPP (give team warning when ready for review)	late May	Curtis
Final QAPP	mid-June	Curtis
Finalize toxicity testing methodology	June	Curtis, Jen, Jenee