

Stormwater Retrofit Project Management Team Meeting

December 13, 2012

9:00 am to 12:00 pm

King Street Center Room 3-E

Attendance:

Jim Simmonds, King County (KC); Project Lead
Tamie Kellogg, Kellogg Consulting; Facilitator
Emily Santee, Floyd | Snider; Recorder
Beth Ledoux, KC
Chris Thorn, City of Auburn
Chris Knutson, KC
Curt Crawford, KC
Curtis DeGaspari, KC
Dan Smith, KC
David Funke, KC
Dino Marshalonis, Environmental Protection Agency (EPA)
Don Robinett, City of Seatac
Doug Navetski, KC
Ed O'Brien, Washington State Department of Ecology (Ecology)
Giles Pettifor, KC
Jeff Burkey, KC

Mark Wilgus, KC
Mary Roderick, UW
Michelle Wilcox, EPA
Mindy Roberts, Ecology
Olivia Wright, UW
Richard Horner, University of Washington (UW)
Tim Nyerges, UW

Not In Attendance:

Ben Parrish, City of Covington
Brendan Grant, KC
Dave White, KC
David Batts, KC
Elissa Ostergaard, KC
Erkan Istanbuluoglu, UW
Larry Jones, KC

Introductions followed by description of the purpose of the meeting.

Project Updates and Presentations. Since the last meeting, Jim Simmonds and Beth Ledoux have presented the project update at a workshop sponsored by EPA; and presented results to groups from the City of Seattle, Burien, and Federal Way.

The objectives of these presentations are to:

- Present more personalized information than at stakeholder workshops;
- Increase attendance at stakeholder workshops;
- Increase confidence in, and perceived value of, project results;
- Gather input to shape how the information is presented to stakeholders.

There continues to be interest in the project, though some skepticism remains pertaining to reliability of SUSTAIN model. We are trying to address those concerns through a "project clarifications" question and answer sheet.

We are making progress, but are behind schedule as a result of the steep learning curve associated with the SUSTAIN model, and staff availability issues. We are still on track to submit the last reports in December 2013. This is an ambitious schedule that will require focused effort throughout the year.

WRIA 9 Newaukum Sustain Update.

Curtis DeGaspari describes the modeled results representing stormwater mitigation BMP implementation in a 270 acre basin in Newaukum over a 3 year timeframe. The red dots in the scatter plots represent the optimized (best possible) outcome, defined as the most cost effective way to minimize the pulse count. The model attempts to reduce the pulse count to zero; however, this does not

represent a real-world physical scenario. We are trying to reduce the number of high-volume “pulses” rather than eliminate the pulses.

Generally, the results indicate that the pulse count can be reduced by 60% in our most effective case – which has an estimated cost of approximately \$5 million. Changing assumptions, including infiltration rate, altered the distribution of BMPs (e.g. from predominantly bioretention to a combination of bioretention and on-site detention) but did not have a significant impact on the pulse count reduction or BMP cost. The report will explain this result and other results, in addition to model assumptions and sensitivity analysis.

Curtis has already written several memos on the design and cost assumptions used in SUSTAIN. Feedback received and the resulting modifications are described below:

1. The assumption that porous pavement parking lots will last 30 years is too long. *There are no/few porous pavement roads that have been around for 30 years; while 30 years may be too long a timeframe for roads, we think it is a reasonable assumption for parking lots, and the assumption will not be modified.*
2. The assumed 0.5 inches/hour infiltration rate for till soils is likely too great; this is likely closer to a total rate that includes both evapotranspiration and infiltration. *The 0.5 inch/hr assumption includes soil amendment when needed (soil composition affects the infiltration rate, especially in winter when the soil is saturated). In response to this concern, will modify the model to use an infiltration rate of 0.3 inch/hr, and will include a separate evapotranspiration term.*
3. We need to do a better job deciphering what a reasonable envirotranspiration term is. *There is likely to be a large amount of professional disagreement in the values selected for this term; it is dependent on climate and other factors and a single value may not be suitable.*
4. The assumption that rain barrel/cisterns provides adequate storage capacity for most sites is probably not reasonable. *We increased the modeled size of rain barrels/cisterns and renamed this BMP “On-Site Detention.” This is a blanket term that includes both cisterns and rain barrels. We increased the orifice size to 5/8 inches (standard hose width).*
5. What the model refers to as “Wet Ponds” are actually stacked wet and dry ponds with some storage capacity. *Curtis will rename “Wet Ponds” to “Wet+Dry Ponds.”*
6. If SUSTAIN modeling is presumed to accurately reflect future real-world scenarios, much more stormwater will be put into the ground. Water may penetrate deeper into the ground before moving laterally to the catchment, and may not make it into the catchment we are modeling; or soil may become saturated more quickly, thus increasing lateral flow and decreasing the infiltration rate. We don’t know how the overburden will be affected in a wet year vs a dry year when the stormwater flows into the ground. *There are still some uncertainties associated with the model because modeling of this scale has never been done before.*

Additional comments on model assumptions, received at the PMT meeting:

Input Parameter Selection.

1. The assumption of a 0.3 in/hr infiltration rate may still be too ambitious; the Juanita modeling assumed a 0.15 in/hr infiltration rate. The model includes an aquifer storage term that can be modified to account for soil saturation and overburden, but the current Newaukum modeling effort assumes infinite storage rather than assuming a finite volume.
2. Other basins may have more or less pavement/development, which impacts the cost to get from the starting point to the desired end point(s) even if the end points are the same for all modeling scenarios.

3. We need a concept of not just the cost of the technology, but the volume and number of units of the technologies: what is the “hydrologic magnitude” of the BMP (e.g. will the land be consumed by 80% cisterns in order to be effective?).
4. Newaukum may be an atypical basin because it is more developed than some others in WRIA 9.

Cost Related Questions and Assumptions.

1. In residential neighborhoods, the BMP costs include purchasing land for Wet+Dry Ponds; it is assumed that there is no cost to purchase land for other BMP technologies; the costs associated with other BMPs are primarily construction related. All construction costs include 30 year O&M lifespan costs.
2. The land cover/land use data layer used in the Newaukum model are for 2007, not future predicted 2040 land use/land cover. This is different from the Juanita study. This need to be transparent to the end user for planning purposes.
3. In Juanita, land acquisition costs are double what they are in Newaukum basin. The impact that these differences in cost have on optimization will need to be considered in modeling of this and other basins.
4. The SUSTAIN model can be used by municipalities, private organizations, etc. For smaller organizations that are lobbying for retrofits, the capital cost is very important, not just the O&M/lifecycle cost as a lump sum. *This level of cost analysis is not appropriate for the modeling report, but the year-end report should include this level of detail.*

Additional cost-related assumptions to consider:

- a. Inspection and enforcement costs – are they included?
- b. Are the assumed O&M costs large enough? Which basins do they apply to?

The goal of this exercise is not to determine a single accurate cost for each BMP; it is to determine if there are costs that just haven’t been addressed.

Key Points.

1. Herrera has not completed their modeling effort in Federal Way; their assumptions may inform ours. As a result, we may modify the assumptions used in our modeling and our report.
2. All of the results that Curtis presented are preliminary, and are subject to change as we refine our inputs and desired end points. Please understand these are preliminary and NOT final results. The output is only as good as the design and cost assumptions; these were developed extensively over the summer, but can still be improved over the coming weeks before we perform additional model runs for other basins.
3. We cannot eliminate all of the potential sources of error in the model, so it is essential to clearly state assumptions and perform focused sensitivity analysis to increase our understanding of potential sources of error and their relative magnitude.
4. Sensitivity analysis will be performed on many parameters, including: the impact of using a shorter life span for porous pavement parking lots; the evapotranspiration term; the orifice diameter; and infiltration rate. Sensitivity analysis will be used to define the importance of some parameters that are still unknown. Those that have little impact on results won’t be further refined at this point. Those that have a large impact should be refined and analyzed as part of the model runs.
5. As we improve our confidence in our input values, we can refine our input terms, assumptions, and modeling results.

Curtis also presents information pertaining to scatter plots that represent SUSTAIN modeling results from a different Newaukum basin modeling effort. There is a 50%-60% percent reduction in the high pulse count by adding BMPs. Rich Horner has related pulse count reduction to metrics more familiar to those who work with stormwater, including B-IBI, 2 year peak flow, TSS load, turbidity effects, copper concentrations, etc. These are not targets that SUSTAIN can be optimized for, but we can evaluate the impact of pulse count optimization to these parameters to determine target ranges.

Next Steps. Curtis will take the two templates he has previously developed and apply them to other catchments in WRIA 9. Variables that may be explored between now and March in order to finish the modeling and associated reports by the end of the year:

- a. Refine assumptions (percent rooftop, etc) using sensitivity analysis and analysis of output from pilot study.
- b. How long does it take to do a 10-year model run vs. a 61-year model run? (The longer the timeframe modeled, the longer it takes to run the model.)
- c. What difference on the results does it make on the results to do a 10 year model run vs. a 61 year model run?
- d. Which basins are representative of others in WRIA 9 and the Puget Sound?
- e. Which basins are the priority basins to model? Basins with pre-existing data that can be incorporated into the analysis may be useful to evaluate the accuracy of modeled results (note: Juanita has some I-IBI data).
- f. How many basins and scenarios can we reasonably expect to model given technological restraints (number of boxes, computing capacity) and time constraints (number of hours in a work week). *The students at UW may have access to larger data processing capacity than we do, but there is a significant time tradeoff with setup and data transfer. The most economical and realistic way to increase the amount of modeling that can be completed in our limited timeframe is to get additional boxes.*

Timeline. The assumptions made in the Newaukum urban sub-basin modeling, and associated sensitivity analysis results, will be finalized before the March PMT meeting and documented in a modeling report that Curtis will prepare for the June PMT meeting.

The most current reports on BMP cost and design assumptions will be sent out to group.

Suggested modifications to cost or other assumptions, or comments on any assumptions we might be missing, must be sent to Curtis by the end of the first week in February so he may incorporate them into the model.

Curtis will also attempt to create a template that shows how different WRIA9 basins respond to various modeled scenarios and assumptions.

Updates on Related Efforts

SUSTAIN and EPA. Dino Marshalonis describes that EPA considers Version 1.2 to be sufficient for use at a national level. After this fiscal year (September 2012), EPA does not anticipate making any other changes to the model at a national level. Changes that are requested by the PMT user-group at a regional level and for specialized output (like high pulse count) may be made until the end of 2013 utilizing a small EPA fund reserved for this purpose. Identification and resolution of any other bugs in the model should also be completed before the end of 2013. EPA does not anticipate continued funding for the SUSTAIN model after the end of 2013. Office of Research and Development (ORD) will be available

to respond to questions on SUSTAIN after this time, but will not have a specifically dedicated SUSTAIN support staff.

Update on EPA projects/Seattle & Bremerton. SPU is not using the SUSTAIN model. Gorsuch Creek is modeling future predicted buildout and small sub-basin is being modeled with SUSTAIN; they also plan to complete modeling by December 2013.

Department of Ecology staff noted that in the next King County NPDES permit, there will be a Phase I basin plan modeling requirement. The anticipation is that SUSTAIN can be used to perform this modeling; HSPF or other models are also still acceptable.

Newaukum Alternative Approach. Olivia Wright presents the results of an alternative modeling approach to stormwater mitigation in the 270-acre Newaukum basin. Terrestrial health of the basin and growth and dormancy is considered, in addition to stormwater capture. The impervious surface is constant in Olivia's model; instead, the impact of increasing the treatment area is evaluated. 2007 land use/land cover information is utilized in the alternative approach.

When there is no treatment in the urban area, the pulse count is ~27; as biocells are added and their volume is increased, the pulse count decreases and then eventually stabilizes, at which point increasing the treatment area no longer predicts improvements to stream health. The pulse count was unable to be improved to the "good" range with biocells. Other measures of health, including leaf area index and B-IBI, were evaluated. Leaf area index is the size of the canopy.

The two lines of research in the Newaukum basin are complimentary and are producing similar results.

Update on Ecology project. Mindy Roberts announces that Herrera's contract ends December 31, 2012. Herrera sent a draft report to the project advisory group, and will share the report with anyone who is interested via FTP site. Herrera will be presenting results on Monday, December 17th at 10:00 (please RSVP if interested in attending). If you have comments, they need to be received by December 21 to be incorporated into the final report.

Herrera's efforts explore stormwater mitigation efforts on TSS and dissolved copper. They have identified a strong sensitivity to regional cost, and regions that various technologies are more or less effective. Herrera will make this information available to the public. If others intend to use these resources over time, this information should be put in a central repository optimized for the Puget Sound region, which can be maintained by a department or organization with the funding available to maintain this regional stormwater resource.

HSPF Modeling. Jeff Burkey provides an updated Gantt chart. Due to other work obligations, Jeff has pushed back most deadlines by two months. He will be prioritizing completion of this work over the next two months so that overall project deadlines will be met.

SUSTAIN Project Scope and Limitations

SUSTAIN will help users determine how much they can expect to spend in order to achieve the outcomes we want. After the Newaukum Basin study is completed, the team can interpolate the results to garner information about stormwater mitigation efforts in larger areas (WRIA 9 and/or Puget Sound).

SUSTAIN does not provide the user with information on whether it is possible to target the worst offenders and get acceptable results; it provides information for the basin as a whole. It does not make a determination as to the right balance between effectiveness and cost.

This model gives the user an idea of the scale of how much is eventually needed; but it is fundamentally a decision support tool. It is still up to the jurisdiction to make a decision based on this tool and other available information. Planners may decide to use rain gardens or other more visible BMPs (which may meet community education goals, or have more community support) rather than the optimized solution from the model.

SUSTAIN by itself does not provide enough information for a municipality to develop a 20 year Comprehensive Management Plan; it does not identify where the bioretention should go and how much retention volume is needed in each area. This is beyond the scope of this group; rather, the jurisdictions need to discuss and decide how to use the data in a way that is useful to meet this objective.

SUSTAIN Project Clarifications

The project team, headed by Beth Ledoux, is developing a handout that is intended to preemptively address the questions that the project team has received most commonly. The answers should be concise and present the group's work accurately. Some comments on the "Project Clarifications" handout were discussed and generally agreed upon as a group. These are incorporated into the draft Project Clarifications document attached.

Additional comments may be submitted electronically in track changes. **The deadline for additional comments on the Project Clarifications document is December 20th.** Beth will incorporate changes received by this deadline and send out a new document for group review before finalizing the document.

Next Steps, Next Meetings

The Next PMT Meeting will be March 6th 2013 from 9 am to 12 pm in the King Street Center. It will primarily focus on Curtis's work with the Newaukum basin (revisions to assumptions, sensitivity analysis, determination of basins to model, etc).

The next workshop will be in mid April (sometime during the week of April 15-19). There will be two workshops next year. We expect to receive input at this workshop. The workshop will likely cover:

- a. Model results, similar to modeling presented at the March PMT meeting;
- b. Solicitation of feedback on Newaukum report;
- c. Draft HSPF report (to be sent as draft before the meeting); and
- d. Water quality targets (to be sent to stakeholders before the meeting).

We will have another workshop in September or October 2013 regarding prioritization and options after reviewing the model report. Workshop can also include discussion of barriers to implementation and ways to overcome these barriers, particularly with respect to approaches for implementation.