WRIA 9 Retrofit Workshop #1
LOCATION: Tukwila Community Center
SUMMARY – April 12, 2011
8:30 A.M. – 12:00 P.M.

Agenda

1. Meeting Project Team, Q and A
2. Welcome, Introductions and Project Purpose
3. Project Overview
4. Flow and Water Quality Indicators
    a. Input on Proposed Flow Indicators
    b. Input on Proposed Water Quality Indicators
5. Watershed Modeling Scenarios
    a. Input on Characteristics and Scenarios to Model.

Attendees

A list of attendees is posted on the project web site at:
http://www.kingcounty.gov/environment/watersheds/green-river/stormwater-retrofit-project.aspx.

Handouts Provided at Meeting (posted in the products section of the project web site)

1. Stakeholder Workshop #1 Stormwater Retrofit Planning Project for WRIA 9 Powerpoint Slides
2. Development of a Stormwater Retrofit Plan for Water Resources Inventory Area (WRIA) 9 and Estimation of Costs for Retrofitting all Developed Lands of Puget Sound (Printed Report and Powerpoint Slides)
3. Modeling Scenario Development Powerpoint Slides
4. University of Washington SUSTAIN Modeling Report

Meeting Summary

The meeting summary provided here is a transcription of the flip-chart and white board notes taken by Tamie Kellogg during the meeting and supplemented by staff notes. This does not provide a full documentation of the dialogue, but provides a record of the primary input received from the attendees.

Welcome, Introductions and Project Purpose

A lot of development has occurred without consideration of stormwater impacts. The retrofit idea encourages improvement not only slowing impacts.

Stormwater retrofits include construction of stormwater improvements, previously developed areas, do not include redevelopment projects.

Currently, there is no comprehensive stormwater retrofit program. Nobody really knows how much is needed or how much is adequate. We anticipate future requirements. Cost estimates for retrofits are preliminary and in the billions of dollars. And at what timescale?

The objectives of the Project are to assess stormwater retrofit needs in King County (WRIA 9), establish a cost minimizing approach, and prioritize retrofit activities. Project findings could potentially be extrapolated to address retrofit costs throughout Puget Sound area.

The Project area focus is on WRIA 9. Does not include upstream of Howard Hanson Dam, City of Seattle, or Vashon-Maury Island.

The focus of this Project include: Newaukum Creek, Soos Creek, Crisp Creek, Mill Creek, Springbook Creek, DesMoines Creek, Miller/ Walker Creeks, Joes Creek, and other streams. These tributary streams are highly sensitive to stormwater management.

Partners in the Project include USEPA, University of Washington, Washington Department of Ecology, City of Auburn, City of Covington, and City of SeaTac.

Information gained from the Project would be beneficial in defining funding needs for retrofit programs; update basin plans and stormwater management plans. The results of the Project will help inform future retrofit requirements.

Project Overview

- Data collection – A number of ongoing water flow and water quality monitoring locations already. Measuring stream flow, weather, rain, water quality. Additional data was needed to refine the calibration. 13 more sites were added. **Requesting any additional data agencies may have.**
- In-stream flow -- Flow controls are based on duration and storm size. In-stream low flow is only the standard and is not sensitive to stormwater management . Indicators like flashiness and pulses are the metrics for a healthy stream. Setting targets for those indicators will be the topic of another workshop. This workshop is only about the indicators, as the targets will be covered in a fall 2011 workshop.
- Water Quality – Focusing on the solids rather than dissolved. This is the parameter that most stormwater treatment systems are designed to remove.
- Modeling – Using two models– HSPF and SUSTAIN. The watershed hydrologic model (HSPF) will be used to assess past and current conditions and models for the future scenarios. Then the SUSTAIN model will be used to model improvements and water quality from BMP/LID measures and provide a cost assessment for the BMPs. This will allow us to find a way to minimize the cost and develop the most cost effective approach to BMPs and requirements.
- Plan development – From there we will consider costs, priorities, funding opportunities, develop the plan, and work towards support for adoption.
- Schedule – 2010 was data collection, 2011 conduct the watershed modeling, 2012 conduct the retrofit modeling, 2013 develop the plan and eventually extrapolate to the rest of Puget Sound.
- Opportunities to Participate – This is the first of four stakeholder workshops. We will also provide one on one outreach, and encourage review and comment on reports and results.

Project Overview Questions and Answers

You've mentioned initial coordination efforts with WRIA 9. What level of buy in do you have?

We attended the WRIA 9 forum meeting in February. We received enthusiastic support. All members acknowledge WRIA's heavy focus on the main stem and recognize the impacts of the tributaries. We also have a couple of meetings set up with specific WRIA 9 staff.

The WRIA 9 technical committee is currently working on developing a monitoring program. Have you worked with them to ensure there is no overlap?

We are gathering complimentary information, there is no overlap, working with Dennis Clark at WRIA 9. The WRIA focus is on fish habitat.

There are limitations of SUSTAIN. For instance, optimization is limited to few indicators, and duration not one of them.

We have been working with Tetra Tech (SUSTAIN developers) to work on duration as an indicator. TetraTech is open to working on it, but not funded.

What percentage of Seattle is not in the CSO? Can that part of Seattle be considered?

This information was not available at the workshop. As a follow-up, a GIS assessment was done by King County Wastewater Treatment Division staff for the Lower Duwamish catchment within the city of Seattle. It is estimated that 62% of this area is connected to the combined sewer system, 32% is connected to the municipal stormwater (MS4) system, and that the remaining 3% drains directly to the Duwamish River. Because of the complex interconnected nature of this area, and due to budget constraints, it is not possible to include this part of Seattle into this project.

There has been a fair amount of effort on how to manage large storm flows, but how do we manage during the low flows? Concerned that the amount of damage to water quality during the summer from runoff is higher than in the winter from golf courses etc.

Summer flows will be covered in the modeling.

Any interest in continuing the data collection?

There is interest but funding is not available at the end of the wet season. Data collection will continue in the original monitoring points, but the 13 additional sites will end.

There are other BMP options not listed in the presentation. Will they be considered?

Other solutions are being considered.

MS4 have large discharges are those being considered?

No. We are focusing on in-stream impacts.

If data collection is not ongoing – how do you assess the outcome, long term changes?

The original monitoring sites will continue. Data collection for the augmented sites will not continue.

What types of goals or targets are you envisioning?

We imagine different streams having different goals and targets. These will be discussed at our fall workshop.

Other Related Projects- *"The Solar System"*

The following list is compiled from a workshop stakeholder participation exercise. Stakeholders identified projects and programs that may have relevance to the Retrofit work program.

Puget Sound Partnership Projects

Action Agenda – developing targets for certain pressures
Target Setting
Stormwater Needs Assessment
Draft Stormwater Vision

EPA

Stormwater Rulemaking Project
Chico Creek (Kitsap County)

Gorst Creek (Kitsap County)
Piper's Creek Flow Control in City of Seattle is an EPA Grant

Ecology

Source Control on the Duwamish including a survey of caulk and other PCB sources
NPDES Municipal Stormwater Permits
Watershed Characterization Study
Industrial Stormwater NPDES Permits
TMDL Activities
Toxics Loading Studies
Ecology/EPA Clarks Creek (TMDL) WRIA 10 Study

King County

Juanita Creek
Miller/Walker Basin Plan
Des Moines Basin Plan
WRIA 9 Salmon Plan
Lake Washington PCB Pathways
Seattle/King County CSO Control Program and Green Infrastructure Study – Summer 2011 with Preliminary results in Fall

Kitsap County

Similar Project

Thurston County –

Using HSPF and SUSTAIN to look at strategies to accommodate growth

WSDOT

Retrofit project – Expect to have the basin Scored by June 30

Pierce County

Running a basin scoring program - ongoing

Tacoma

Tacoma is working on a similar model for the Foss where they are targeting specific locations for BMP placement.

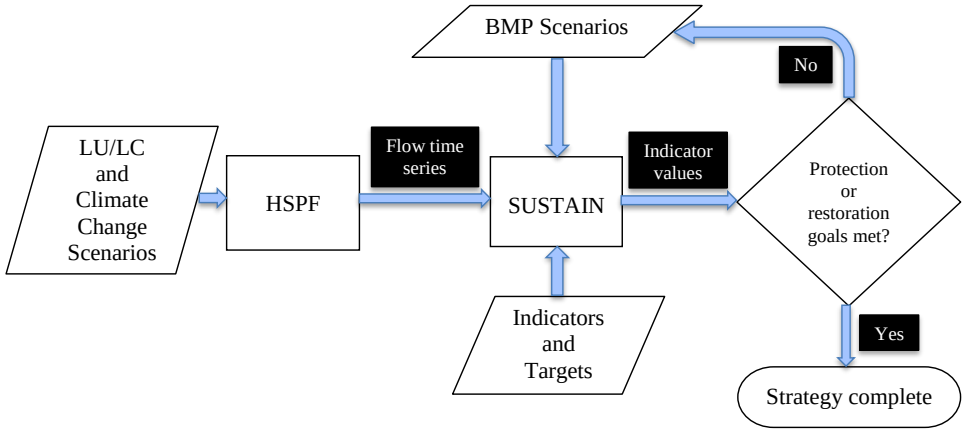
Flow and Water Quality Indicators

Please review Dr. Horner's report Development of a Stormwater Retrofit Plan for Water Resources Inventory Area (WRIA) 9 and Estimation of Costs for Retrofitting All Developed Lands of Puget Sound. ***Provide comments and input by the end of April.***

Components and Relationships of a Watershed Ecosystem: Alteration of the aquatic habitat may result in loss of aquatic biota. Including climate change scenarios.

Definitions: Target – predictable biologic outcome; then control the indicators to get our target outcome and meet our goals. Expect to set some very ambitious targets in some areas – other areas may simply be no further damage.

Modeling Framework



With the BMP scenarios we can play a lot of games within SUSTAIN.

Land Use/Land Coverage: Projected new developments on "greenfields"; forecast redevelopment of already developed property; and retrofit existing development. What new development and what forecasted redevelopment – then in order to achieve our goals, what retrofit do we need to do?

Modeling Framework Questions and Answers:

If this is only about retrofit why are you modeling greenfields?

We have to consider the new development in the model.

Will you report on the three categories (New development, redevelopment, and existing development)?

Population and land use change models will be used.

How will you handle the range in possibilities of projected land use?

Will go with projections associated with PSRC's Vision 2040 population estimates and the land use/land cover model at UW.

Have a problem with using the term climate change . Maybe use "climate variability"? But consider the oscillating cycles.

Climate change and climate variability describe different phenomenon. For our purposes, we are using climate change to describe future conditions that are different from current conditions primarily due to human-caused emissions of greenhouse gases.

Where are you incorporating climate change in the model? Is it a single projection or are you considering variability?

We will take a middle ground on the climate change. Jim will address climate change issues later in this workshop.

Key Issue: To what extent can goals be met through management of new development and redevelopment, and how much retrofitting will be necessary to achieve them?

We have a good science base for the relationship between LU/LC and habitat and biologic integrity. We find the highest biological index when we have a low 2-year peak mean winter base flow ratio. The 2-year Peak: Mean Winter Base Flow Ratio is linked to the % Total Impervious Area.

Hydrology is hit first and hardest – that is why we focus on the flows. But we are not forgetting water quality. Zinc concentrations increase with an increase in impervious surface as well.

Potential Hydrologic Indicators

Out of 40 possible indicators, we selected 20 as potential indicators for modeling. These candidate hydrologic indicators can be clustered into 5 groups:

- Pulse metrics (hydrograph oscillations)
- Minimum flow metrics
- Hydrograph pattern metrics (rise/fall)
- Flashiness metrics (rate of change in the hydrograph)
- Relative stream power metrics (ability of the stream flow to alter the channel)

Section Criteria for Hydrologic Indicators

The selection of the hydrologic criteria is based on six criteria:

- Extent and quality of the database linking the candidate indicator to LU/LC
- Extent and quality of the database linking the candidate indicator to biological integrity
- Ability of candidate indicator to be established reliably by both actual stream data and HSPF
- Independence of the candidate indicator from potentially confounding variables (basin area, channel slope, soil type, elevation, precipitation)
- Ability to add information independent of other indicators
- Ability to obtain SUSTAIN model input

SUSTAIN is fairly primitive in its hydrologic output.

Certain indicators fell into place quickly.

- High pulse count
- High pulse range
- Time above 2 year mean flow – the fraction of the time during a water year that the daily average flow exceeds the 2-year mean flow rate for a forested condition
- 2 year peak: mean winter base flow ratio – ratio of peak flow rate within a 2-year return frequency to the mean base flow rate between October 1 and April 30.

Questions/Input Regarding Hydrology Indicator Selection

Some of the indicators model back to forested conditions. Which ones does that work for?

We can model back to forested for any of the indicators – going back to forested is the idea.

Appreciate the model but can you model the impervious in relation to where it is? Can we overlay this with roads and density?

As part of the modeling we consider the loads from the roads as a separate land use. Coming up to a limitation of the approach.

Ecology already has the GIS layer that identifies the different road types.

We'll consider it. We are accounting for the roads now by increases in impervious surfaces. Need to be able to project to the future for it to work with the model and approach.
Currently there is no way to consider the location in relation to a creek. A road within 50 ft of a stream is the same as one a thousand feet, as long as it's in the same drainage area.

Flow question: Will you address LID infiltration and how the increase in groundwater impacts the base flow?

Outside of scope. But projecting the impervious surface will take LID pervious surfaces into account.

Can your model consider the difference between tree canopy cover vs vegetation?

Yes they are identified as different land cover.

Is there anyway to consider the impacts of converting from septic to sewer?

King County Wastewater Treatment Division is trying to understand quantities of exports to sewer. This will not be explicitly considered in this project.

Water Quality Indicator Selection

Under the Project Scope, TSS was designated as the principal water quality indicator. Impacts to stream health from TSS include:

- Covering fish spawn beds and fish food sources
- Filling in pools and deeper habitat
- Reduce visibility
- Reduce light
- Abrades soft tissue of fish
- Transports other pollutants

However, the association between TSS and biological integrity has not been established and there is no water quality for TSS. We have a lot of data for turbidity but turbidity is not a SUSTAIN output.

King County has a large dataset for the Green River for TSS, turbidity, flow rate, copper, lead, and zinc. We may be able to develop statistical relationships with strong confidence levels.

Potential next steps:

- Set TSS targets down to forested?
- Set turbidity targets based on water quality criteria and translate to TSS?
- Probability of meeting metals criteria as a function of success in controlling TSS?
- Set metals targets based on water quality criteria and translate to TSS?

Questions and Input on Water Quality Indicators

What do you have to do to form those relationships?

A lot of data and statistical analyses.

Are you considering the difference between erosion within the water body vs discharge to the water body?

Flashiness is the reason you get erosion in the streambanks – so taken into account implicitly rather than explicitly.

Can you break it down between specific land uses?

We will break it down into sub-basins. We had not anticipated breaking it up into any socio-economic way. Entire mix of land uses will come into the model. If we have some sub-basins that represent high industrial or high road areas, can come out in the modeling. Drainage basins and monitoring was set up to consider variability in land use.

Indicators are oriented to in-stream and biological values – TSS is an indicator of sediment yields as well. We will monitor the sediment yield as a byproduct.

Will O&M and long-term costs be considered in the costs? SUSTAIN gives present value.
Follow-up Response. SUSTAIN model DOES incorporate O&M costs.

Are inputs to models considering things that we're going to be doing anyway?
Goes into definition of BMPs.

There needs to be some way to determine whether it is TSS moving within the stream rather than input into the stream.
Agree, this is a concern to address in this project.

Particle size distribution needs to be considered.

Watershed Modeling Scenarios

Development has altered hydrology and water quality in streams. Population growth and land use changes are continuing. Climate change will continue to impact.

There is no need to address new development or redevelopment. That is already managed in current stormwater design manual. This Project is only concerned about retrofitting already existing stormwater that is not up to today's standards.

- Modeling – We will use the Watershed hydrologic Model (HSPF) to assess past and current conditions and then project to future scenarios. We will use SUSTAIN to model the improvements in flow and water quality from BMP/LID measures. This will identify the most cost-effective approach for meeting in-stream goals.
- Questions we hope to answer with HSPF:
    - How has stream hydrology and water quality changed due to development?
    - How do we expect stream hydrology and water quality change in the future considering population increase and climate change?

This information is then used in the SUSTAIN model.

- Questions we hope to answer with SUSTAIN:
    - What is the most cost-effective suite of BMPs/LID measures that will meet in-stream goals?
    - How do these estimates change considering population growth and climate change?
    - How are these estimates divided between new development, redevelopment, and retrofits?
- Land Use and Land Cover Assumptions – We are using fully forested as the past condition. We will use 2007 land use and land cover from satellite images for current conditions. And we will use Projected 2040 land use and land cover for future conditions. The 2040 conditions will be based on Puget Sound Regional Council's UrbanSim and UW's Landcover model. Population growth and land use changes provided in Vision 2040 will also be used.
- Proposed Weather Assumptions – We have measured weather conditions from 60 years of data collection throughout the region. We will model future conditions using "most likely" carbon emissions and information already available from the UW Climate Impacts Group (dataset from 2006 through 2090).
- Questions for the Group
    - Are there other future conditions besides population growth and climate change that we should be considering?

- Do you believe we are on the right track? Could the results of this modeling approach serve as a basis for a retrofit plan?
- What other asset management in the region is going on?

Questions and Answers re HSPF Modeling Approaches

There are studies that suggest a socioeconomic impact of climate change will result in a massive population migration out of the southwest and into the PNW. Eco NW – Socio Economic Population Shift (population migration). Is that considered?

Such a migration is not included in the Vision 2040 but we agree it's an issue.

Economic growth will be a factor. Economic Growth vs Population Growth is a driver for development. How will you handle?

Agree the land cover change will vary and will be a factor.

What was in the Vision 2040? What were the policy decisions?

Vision 2040 assumes no change in the urban growth boundary. Additional information can be found here: http://psrc.org/growth/vision2040.

Will you be tweaking the rainfall scenarios and climate change for sub-basins?

We will calibrate for each sub-basin. We will use the ensemble forecast approach that mirror the UW climate change study.

What are the outputs of the model? How do we sort out sub-basin and engineering level BMPs. How will it inform actual projects?

HSPF outputs are flow and TSS concentrations over time..
For SUSTAIN – the next workshop will consider what suite of BMPs we will look into.

How will future population and development be reflected?

Population changes from PSRC are used to develop land use/land cover changes. The 2040 land use / land cover is used as input to the watershed model.

BMPs mean a lot of different things to different people – the street sweeping and pet waste disposal are non-structural BMPs. Define exactly what you are talking about with the BMPs structural vs non-structural, capital costs, long-term O&M.

SUSTAIN will only do so much – it's generally limited to the structural BMPs. That maintenance is all required for permits. This will get us to prioritize the others.

How will the project prioritize the BMPs? Consider where are your hotspots and where the BMPs will be most effective.

The project team will develop a variety of possible BMP prioritization options in the next few months, to be discussed at the next workshop.

Seems like a moving target. How do you consider BMPs are always being implemented or currently implemented now compared to when the Project is done.

Now is defined as today+2007. We'll get an answer for now and then start from there.

Are you using gross indicators and then can we refine them? Limited by funding, but also by the models capabilities.

The model can do anything – devil is in the details? Do we have the data to support it is the question? Possibly a misconception regarding non-point BMPs – if you can quantify the sediment removal, you can model it.

Need to define the term BMP? What do you consider a BMP?

SUSTAIN supports point BMPs, linear BMPs, and area BMPs. The following structural BMP options are currently supported:

BMP Option	*BMP Type*
Bioretention	*Point LID*
Cistern	*Point LID*
Constructed Wetland	*Point BMP*
Dry Pond	*Pont BMP*
Grassed Swale	*Linear BMP*
Green Roof	*Area BMP*
Infiltration Basin	*Point BMP*
Infiltration Trench	*Linear BMP*
Porous Pavement	*Area BMP*
Rain Barrel	*Point LID*
Sand Filter (non-surface)	*Linear BMP*
Sand Filter (surface)	*Point BMP*
Vegetated Filter strip	*Linear BMP*
Wet Pond	*Point BMP*

The Stormwater Work Group is soliciting comments about effectiveness studies by the end of April.

More information can be found here:
http://sites.google.com/site/pugetsoundstormwaterworkgroup/home/selection-of-effectiveness-studies

Suggestion to consider the changes to base flow of the stream due to climate change.

This will be addressed via the modeling.

How will this link to the WRIA process? That process is different. Is it just to inform the WRIA?

Regular and routine coordination with WRIA 9 Watershed Ecosystem Forum is ongoing and will continue throughout the life of the project and is an essential component of this project. It is unclear how WRIA 9 ultimately will prioritize stormwater retrofit projects at this time.

EPA should come up with additional money to complete the project with the newly identified components now, rather than waiting until it is completed and trying to gather additional funding.

Comment noted.

Can you leverage additional redevelopment and increase the "footprint"?

The way it's defined is if there is a change in volume its redevelopment if there is no change in volume its retrofit.

Next Steps

In the fall we will hold a workshop where we will focus on gathering your input on the BMPs, and the water quality and flow targets.

We may send out a survey with the summary of this meeting to gather additional information from you.

Jim Simmonds (jim.simmonds@kingcounty.gov) and Giles Pettifor (giles.pettifor@kingcounty.gov) are available to come meet with your organization and do a briefing on this project. Please contact them if you are interested.

Questions and Comments Raised During Breaks

Water Quality Indicators Station

Why do you think just tracking TSS levels will track dissolved pollutants too?-- Maybe trust??? (illegible) or focus on BMPs that have high confidence of dissolved metal removal for analysis of trace metal treatment effectiveness.

The project team does not expect TSS levels to perfectly predict and track with dissolved pollutant levels. Statistical analyses will be done relating TSS and flow to dissolved pollutant levels to assess the level of confidence in addressing this issue.

Hydraulic Indicator Station

- Consider route density from Ecology GIS maps
- Consider groundwater influence on a stream
- Consider septic to sanitary sewer conversions
- Provide details on specifics to land use conditions (TSS breakdown)
    - Industrial vs open space
- Address sediment yield
- What about O&M Costs? Remove inputs to model, silo not considered future actions.
- Pollution control uplands connection to discharge point in stream
- Consider analyzing the size fraction of sediment
- Other data?
- Other conditions?
- Be helpful?

Larry's Sheet

- Source Control for Duwamish – need to address someplace

Additional Questions and Comments Following Meeting

- Recommend that we look into a program at UW – Infrastructure Management. They are researching various types of infrastructure – Transport, water, energy, food. Integrate how to manage these systems. Interesting wrinkle, backdrop about stormwater capital and O&M needs.

  This is an interesting idea. We will consider this.

- What about having a call for metrics. Maybe there are some more ideas.

  There are many possible metrics. We have requested comments on our draft selection and welcome any suggestions.

- Maybe create a chat room with colleagues to discuss these issues. Jessica in Tacoma is approaching in a different way. Might be interesting to have shared chat space to discuss issues, ideas, approaches, findings.

  This might be an appropriate role for Ecology, EPA, or the PSP.

- Could EPA fund a comparative study – compare Larry Schaffner's approach (DOT)? We have enough info to ID priorities and implement solutions vs. our approach of disciplined analysis and develop plan. Maybe there is a way to assess cost/benefits of the two very different approaches.

  This might be interesting and we would welcome this study.

- Overlay retrofit priorities from WSDOT into our plan since they will be done this summer.

  We anticipate trying to leverage the WSDOT plan into our project.

- Keep a thorough list of things want to do but can't get to. This will be essential in the future.

  Excellent idea.

- Are the tribes involved? Was anybody there? How are we getting them involved?

  Yes a briefing was done earlier this year for the Muckleshoot tribe.