

# Snohomish County 2012 NPDES Structural Stormwater Control Program

## Phase I Permit Requirement S5.C.6. Structural Stormwater Controls

- i. *No later than 1 year after the effective date of this permit, each Permittee shall develop a Structural Stormwater Control program designed to control stormwater impacts that are not adequately controlled by other required actions of the SWMP. Implementation of the program shall begin no later than 18 months after the effective date of this permit. Permittees shall provide a list of planned individual projects that are scheduled for implementation during the term of this permit and describe how the selected projects comply with AKART and MEP requirements. Updates and revisions to the list will be provided in the annual report and will address any concerns identified by Ecology during its review of the Structural Stormwater Control program.*

*The Structural Stormwater Control program may also include a program designed to implement small scale projects that are not planned in advance.*

## County Stormwater Management Program

The County's Stormwater Management Program, or SWMP, includes the elements of NPDES Phase 1 municipal stormwater permit requirement S5.C, which are:

1. Legal Authority
2. Municipal Separate Storm Sewer System Mapping and Documentation
3. Coordination
4. Public Involvement and Participation
5. New Development / Redevelopment / Construction Site Runoff Control
6. Structural Stormwater Control Program
7. Stormwater Pollution Source Control Program
8. Illicit Connections and Illicit Discharges Detection and Elimination
9. Operation and Maintenance of Stormwater Facilities, Roads, and Properties
10. Education and Outreach Program

The permit does not specifically include the monitoring requirements contained in permit requirement S8 in the SWMP, but for practical purposes Snohomish County considers them part of the SWMP actions.

The NPDES permit also contains requirements taken from USEPA-approved Total Maximum Daily Load (TMDL) Water Cleanup Plans for North Creek, Swamp Creek, and tributaries to the Snohomish River. The TMDL-related requirements in the permit do not add any fundamentally new programs to the permit, but rather place geographically-focused emphases to the existing programs. For example, The Stormwater Pollution Source Control Program requires the County to inspect a certain percentage of businesses in the County each year, but does not specify which businesses, or that any given business will ever be inspected. The TMDL-related permit requirements go beyond this by stating, for example, that the County will inspect all commercial animal handling facilities in the TMDL watersheds. The TMDLs are summarized in Table 1 below:

**Table 1: Snohomish County TMDL Water Bodies Noted in Phase I NPDES Permit**

Water Body	TMDL Parameter	Watershed
North Creek	Fecal Coliform	Cedar-Sammamish
Swamp Creek	Fecal Coliform	Cedar-Sammamish
Lower Snohomish River Tributaries	Fecal Coliform	Snohomish River

Briefly, the SWMP provides for a broad range of activities that are largely of a programmatic nature:

- Element 1 deals with the legal framework for administering the SWMP.
- Element 2 maps out the MS4.
- Element 3 is oriented toward inter- and intra-agency relationships and coordination on the SWMP.
- Elements 4 and 10 concern working with the community for public involvement and participation (element 4) and education and outreach (element 10).
- Element 5 concerns regulatory functions and tools to effect stormwater pollution control in development and redevelopment, including construction pollution prevention.
- Element 7 uses non-structural controls initially, then structural controls if needed, for source control of pollution.
- Element 8 involves field screening and source tracing, investigation, then enforcement and corrective action if needed, to stop illicit discharges and remove illicit connections.
- Element 9 uses inspection, operations and maintenance procedures to ensure proper function of county stormwater control facilities, roads and properties to control stormwater pollution.

Appendix 2 of the Phase I NPDES permit has TMDL program requirements that address North and Swamp Creeks, and the tributaries of the Snohomish River. These water bodies have impaired water quality due to fecal coliform. The program requirements include monitoring, public education and outreach, water pollution control activities, and use of structural methods to prevent additional stormwater bacterial pollution.

Additionally, Snohomish County is required by its Phase I NPDES permit to have a water quality monitoring program.

The remaining element of the SWMP, Element 6, requires a structural stormwater control program to address water quality problems from MS4 discharges that other parts of the SWMP do not address. The following are types of stormwater impacts that are not specifically addressed by the NPDES Phase I municipal permit, and are targeted by the structural stormwater control program.

**Stormwater Impacts not Addressed by Other Required SWMP Elements**

1. The Phase I permit requires the SWMP to address water bodies with TMDLs. However, there are numerous 303(d) listed water bodies, meaning they have impaired

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water quality, that do not have TMDLs in Snohomish County, and hence have no protective measures established yet through the NPDES permit. Figure 1 shows the 2008 303(d) listed water bodies in Snohomish County (Category 5 in the water quality assessment classification system). The complete list of 2008 303(d) water bodies is given in Appendix A.

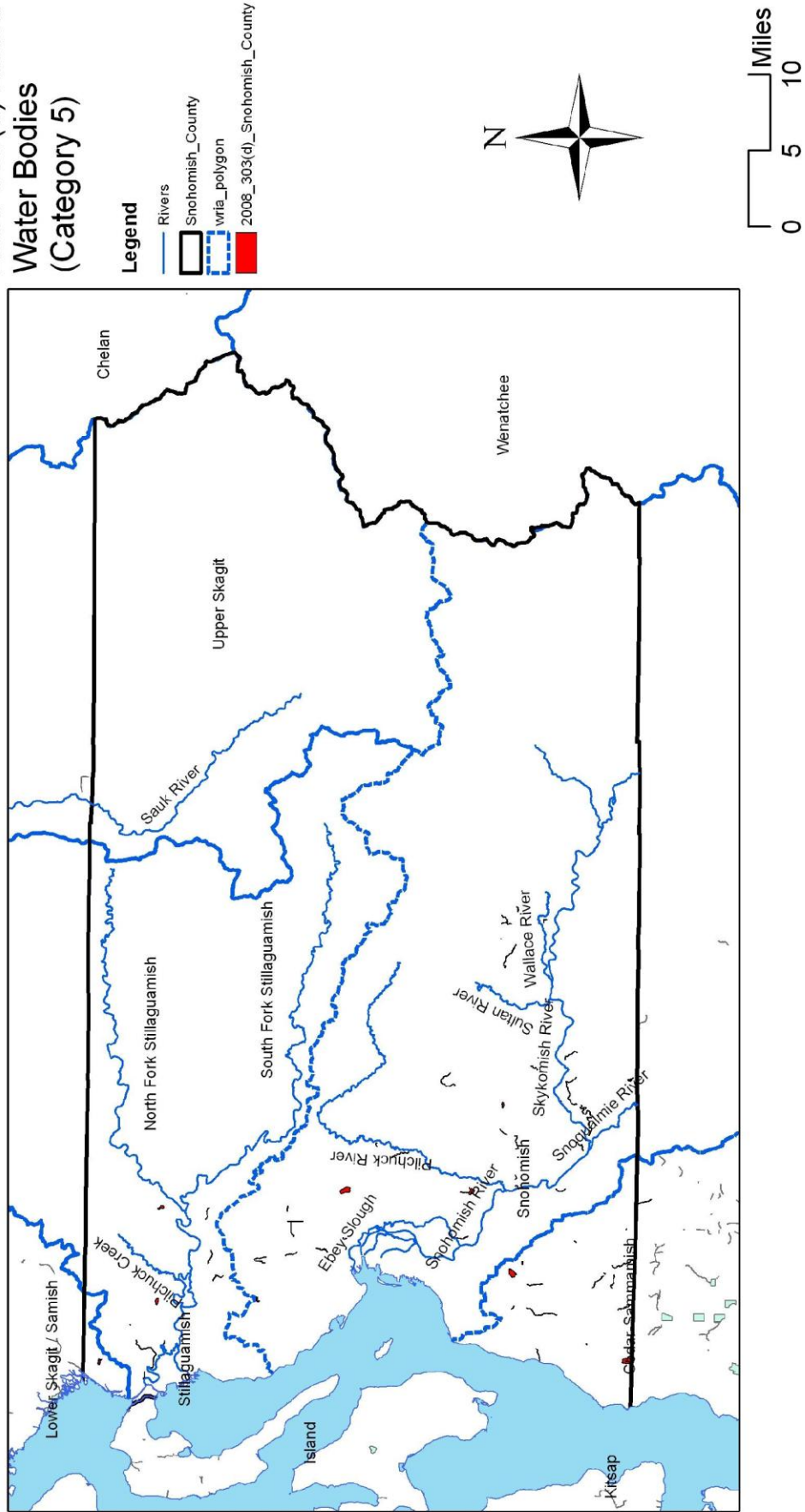
Some of the water bodies that have been historically 303(d) listed and have had recent TMDL activity, but the TMDLs have not been formally adopted yet. Table 2 below lists the water bodies with TMDL activity, and pollutants (parameters) of concern.

**Table 2: Snohomish County Water Bodies with TMDL Activity  
(Not Noted in Phase I NPDES Permit)**

<b>Water Body</b>	<b>TMDL Parameter</b>	<b>Watershed</b>
Stillaguamish River	Temperature, Fecal Coliform, Dissolved Oxygen, pH, Mercury, Arsenic	Stillaguamish River
Ballinger Lake	Total Phosphorus	Cedar-Sammamish
Little Bear Creek	Fecal Coliform	Cedar-Sammamish
Bear-Evans Watershed	Bacteria, Temperature, Dissolved Oxygen	Cedar-Sammamish
Snoqualmie River	Temperature	Snohomish River

Figure 1

2008 303(d) Listed Water Bodies (Category 5)



2. The Phase I permit does not require the SWMP to address retrofit of stormwater facilities that were designed to past standards, which may have had reduced or no water quality treatment requirements. This includes stormwater detention ponds and outfalls of existing drainage systems.
3. The Phase I permit does not require the SWMP to address protection for streams that serve as natural drainage ways, but are vulnerable to thermal pollution due to lack of tree cover, riparian erosion from high flows of stormwater runoff, damage from livestock activity, or other cause.
4. The Phase I permit does not address stormwater management needs for river basins subject to instream flow rules. All basins in Snohomish County are subject to instream flow rules.

### **Structural Stormwater Control Program**

The Structural Stormwater Control Program addresses stormwater impacts that are not adequately controlled by other required actions of the SWMP. The program includes a list of projects that will be periodically updated and a program designed to identify additional potential future projects. Prioritization process, procedures and criteria used to select the structural stormwater control projects are described below.

#### **Goals of the Structural Stormwater Control Program**

The Stormwater Structural Control Program is intended to address stormwater impacts that are not addressed by other elements of the SWMP, as previously described. Specifically, the goals are to provide structural stormwater controls in the following areas:

1. Stormwater treatment or other best management practices (BMPs) in the watersheds of the 303(d) listed water bodies in Snohomish County that are not addressed by other BMPs in the SWMP.
2. Retrofit of existing stormwater facilities to improve water quality treatment and/or flow control.
3. Improved stream riparian buffers that would otherwise be vulnerable to the effects of runoff from development or modified land, whether directly through the riparian area, or from collected stormwater runoff in the stream, such as lack of tree or vegetative cover which would moderate or mitigate thermal pollution due to lack of cover, reduced wetland areas that could provide biofiltration treatment of instream runoff, riparian erosion from high flows of stormwater runoff, or other causes.
4. Low impact development and infiltration BMPs to promote groundwater recharge and stream flow.
5. Improved stormwater treatment in urbanized and urbanizing areas of the County.

### **Allowable BMPs**

Pursuant to the Phase I permit, the Structural Stormwater Control program “shall consider impacts caused by stormwater discharges from areas of existing development, including runoff from highways, streets and roads owned or operated by the Permittee, and areas of new development, where impacts are anticipated as development proceeds.” (Phase I permit, S5.C.6)

Also, “the program shall consider the construction of projects such as: regional flow control facilities; water quality treatment facilities; facilities to trap and collect contaminated particulates; retrofitting of existing stormwater facilities; and rights-of-way, or other property acquisition to provide additional water quality and flow control benefits. Permittees should also consider other means to address impacts, such as reduction or prevention of hydrologic changes through the use of on-site (infiltration and dispersion) stormwater management BMPs and site design techniques, riparian habitat acquisition, or restoration of forest cover and riparian buffers, for compliance with this requirement. Permittees may not use in-stream culvert replacement or channel restoration projects for compliance with this requirement.” (Phase I permit, S5.C.6)

### **Structural Stormwater Control Program Priorities**

The Structural Stormwater Control Program extends to the entire county: all major basins in Snohomish County have 303(d) listed waters and instream flow rules. Given the limitations on county resources, however, at least the following will be considered in evaluating project priority:

- Location in areas of existing development or new development, including land modified for agriculture or other use.
- Concentration of potential pollutant sources, indicating higher potential return for investment in water quality improvements.
- Leveraging existing projects to install or increase structural control measures, so that water quality treatment can be bundled at incremental cost, taking advantage of economy of scale, and making a more cost-effective capital project. This would include County stormwater facilities needing repair or other work that might otherwise be too small to be labeled as an individual “project.”
- Logistical feasibility, including secured funding, land development/access rights, permits, etc. to provide the structural control improvement(s).

### **Structural Stormwater Control Program**

The Structural Stormwater Control Program combines activities and projects from several Surface Water Management (SWM) work areas, including new capital stormwater improvements, structural retrofits to existing stormwater systems, riparian buffer work, and riparian buffer acquisition. Because of the varied nature of these activities and projects, each will have specific attributes and profiles for the nature of work being done, the environmental and water quality benefits being achieved, and the method of public involvement being used.

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The County anticipates spending approximately \$250,000 on an average annual basis for the structural stormwater control program. This represents an increase from the \$90,000 historical baseline amount that was used in the earlier NPDES Phase I permit term, as the estimated cost for the required two elements: detention facility retrofits and other water quality improvements. Depending on availability, grants and other funding sources will be used as allowable to leverage SWM funding.

In any given year, the Structural Stormwater Control Program will consist of a combination of a variety of specific project types. The project type will vary from year to year, as the County continues to evaluate water quality problems, coordinate priorities with the public, and identify capital projects to address those problems. As stated earlier, the County expects to spend approximately \$250,000 on an average annual basis for this Program. The amounts may vary from year to year depending on such factors as funding opportunity, permitting, and weather constraints. Table 3 provides a list of projects for the Structural Stormwater Control Program that have been completed since 2008, that are currently underway, and that are potentially planned through 2012. More detailed information on project options and types is provided in Appendix B. The list in Table 3 will be evaluated and updated each year as projects are completed and new projects are added.

The projects are considered to comply with MEP (maximum extent practicable) and AKART (all known and reasonable technology) requirements for their respective project development processes and as a whole because: (1) they reflect what Snohomish County is best able to implement within its available funding and demands for surface water projects; and (2) they address stormwater impacts not adequately controlled by other permit-required actions, which basically complies with permit condition S5.C.6. By complying with this condition together with all other applicable permit requirements, compliance with MEP and AKART is said to be achieved as set forth in Snohomish County's NPDES Municipal Stormwater Permit condition S4.E.

### **Specific Project Selection Process**

The project selection process for specific projects in the Structural Stormwater Control Program will vary by project type, funding, watershed, water quality benefit, and public participation opportunity. Projects may take several years to plan, fund and develop due to permitting, funding, and coordination needs. The use of a \$250,000 floor for project size is to ensure that sufficient size and complexity are involved to accommodate the requirements of part S5.C.6 of the Phase I NPDES permit, regarding the Structural Stormwater Control Program. Under the Phase I NPDES permit modification effective June 17, 2009, current and future projects are to meet the requirements for use of AKART within the framework of the benefit area and water quality goals, and achievement of the MEP for water quality benefit within the budgetary framework.

Projects are initially conceptualized and planned by the Surface Water Management Division, and eventually are subject to County Council budget review, public hearing, and decision. Projects with grant funding or multi-government participation may have separate Council review for interlocal agreements.

Projects in the Stillaguamish Clean Water District may also be reviewed by an advisory board that includes citizens and agency representatives, and is staffed by Snohomish County. Projects in the Stillaguamish Clean Water District may also be reviewed by a technical committee that includes agency representatives, and is staffed and led by Snohomish County. Past surface water

projects in the Stillaguamish Clean Water District have included riparian restoration, tree planting, and flood fencing.

Projects in the South County and Snohomish Watershed Management Areas have more varied participation processes than in the Stillaguamish Clean Water District. Long term planning and development processes characterized several detention pond retrofit projects in the Lake Stevens area, and included extensive community outreach and participation.

The Water Quality Facilities Program began in the South County Watershed Management Area in 2008, and has continued into 2012. Initial selection of the first pilot area and program targets was established by the Surface Water Management Division as the North Creek watershed and region in the north Bothell vicinity. A Water Quality Facilities Plan was completed for that area (Silver Creek Water Quality Facilities Plan), and project implementation has begun. The Water Quality Facilities Program is starting to bring in areas with other land use types in the South County watershed and the Stillaguamish watershed. The projects being developed out of the Water Quality Facilities Program are shaped and guided by an extensive citizen participation program in the early stages of the program in the target watershed, and consider a range of retrofit types and sites, as well as water quality needs and benefits for the target watershed. This approach maximizes within the pilot area the objectives of AKART and MEP in the final project selection. More discussion of the Water Quality Facilities Program is given below and in Appendix B.

### **Public Involvement for Structural Stormwater Control Program**

This document, which represents the master Structural Stormwater Control Program, was posted on the County's NPDES website for public review and comment on February 15, 2008. The public comment period concluded after 30 days on March 17, 2008. No comments were received during this initial review. The Structural Stormwater Control Program will be periodically updated and posted to the County's NPDES website for public review and comment, and revised as needed. The Stormwater Management Program and the Annual Report both must be submitted annually by March 31, to the Department of Ecology.

The individual projects and project types/options that comprise the Structural Stormwater Control Program, as noted above, may also have project or program-specific public involvement, which may include some or all of the following:

- Neighborhood notification of potential project;
- Neighborhood meetings to gain feedback on priority areas or project types; and
- Coordination with neighborhood or other groups on specific project construction.

In addition, Snohomish County goes through an extensive public input process for its yearly Annual Construction Program (ACP) and 6-year Capital Improvement Program (CIP) development and approval. This process includes updating and having formal public meetings for the County Planning Commission and, afterwards, the County Council, who has the responsibility of approving the yearly budget. Projects in this Program will be part of the public process because they will be included in the County's ACP and 6-year CIP.



**Table 3: Projects in Snohomish County Structural Stormwater Control Program  
Revised 2/7/12**

**Updated to reflect (A) Projects Completed, (B) Projects Underway (2012), and  
(C) Potential Projects (2013 or beyond)**

**A. Projects Completed**

**2008 - Lake Stevens/Crestline Estates Detention Retrofit**

**Location:** Lake Stevens area, in the Snohomish River watershed

**Brief Description:** Stormwater pond retrofit. Estimated cost: \$258,000 (including matching grant)

**Water quality benefits:** Improved solids settling and maintenance, elimination of hydraulic short-circuiting through the pond, improved biological uptake with wetland plant installation.

**2009 - Water Quality Facilities Program, planning and project selection phase**

**Location:** North Creek watershed, in the South County Watershed Management Area

**Brief Description:** Comprehensive watershed program to plan, design, and implement a range of stormwater best management practices for the target watershed, which may include LID, water quality inlets, source controls, detention pond retrofits, and improved maintenance. Initial planning and program development costs for the North Creek watershed pilot effort was budgeted at \$149,000.

Water quality benefits: removal of certain pollutants, such as TSS, nutrients and total suspended solids, water quantity improvement (flow control).

**2009 - Retrofit Project**

**Location: 4<sup>th</sup> Avenue W. Detention Pond Retrofit.**

**Brief Description:** Stormwater pond retrofit. Estimated cost: \$111,000

**Water quality benefits:** Improved solids settling and maintenance, improved biological uptake with wetland plant installation.

**2010 –Retrofit Projects**

**Locations:**

12305 46th Dr. SE Det. Pond Retrofit-Design and construction cost \$155,000

4610 148th St. SW Det. Pond Retrofit- Design and construction cost \$42,000

**Brief Description:** Two pond retrofit projects.

**Water quality benefits:** Detention pond retrofits, will allow performance improvements for removal of certain pollutants (nutrients, total suspended solids).

**2010 – Water Quality Facilities Program – Silver Creek Water Quality Facilities Plan implementation (continuation of 2009 Water Quality Facilities Program project in the North Creek watershed).**

**WQFP Location:** Silver Creek sub-watershed in the North Creek watershed, between the cities of Mill Creek and Bothell.

**Brief Description:** Development of 22 options for 12 possible projects for the Silver Creek area. Project development costs for 2010 were roughly \$91,000.

**Proposed projects include:**

- Rain gardens
- Rain garden terraces

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- Soil amendments
- Vegetated strips
- Pervious pavement
- Reduced pavement
- Vegetated swales
- Roadside ditch amendments

**Project Implementation Location:** North Creek watershed, Mays Pond area, in the South County Watershed Management Area

**Brief Description:** Implementation of two LID pavement reduction rain garden projects (6A and 7A) in the Mays Pond area from the Silver Lake WQFP, to reduce pollution from county roads, developed in the 2009 planning and selection phase, in coordination with local residents. \$125,000 total cost.

**Water quality benefits:** removal of certain pollutants, such as TSS, nutrients and total suspended solids, polyaromatic hydrocarbons, and heavy metals; water quantity improvement (flow control).

#### **2011 – Water Quality Facilities Program –**

**Location:** Pilot Sub-watershed in Stillaguamish River basin

This pilot sub-watershed is in the Stillaguamish watershed area. Preliminary coordination has occurred with the Stillaguamish Clean Water District Advisory Board. The specific subbasin and project locations will be selected in 2012.

**Brief Description:** Initial stages of a water quality planning effort to plan, design, and implement a range of stormwater best management practices for the target watershed, which may include LID, water quality inlets, source controls, detention pond retrofits, and improved maintenance. Initial planning and program development costs for the pilot effort for 2011 were roughly \$68,000 (WA8615 and WA8594) and an additional \$137,000 (WC118C and WC118Q) is budgeted for planning and project implementation in 2012.

**Water quality benefits:** removal of certain pollutants, such as TSS, nutrients and total suspended solids, polyaromatic hydrocarbons, and heavy metals; water quantity improvement (flow control).

**Location:** South County Silver Creek watershed.

**Brief Description:** Additional project development and implementation. Program development costs for 2011 were \$54,000 (WA8594), including \$20,000 for consultant services in program development. An additional \$172,000 (WA8605) is budgeted for 2012 for implementation.

**Water quality benefits:** removal of certain pollutants, such as, nutrients and total suspended solids, polyaromatic hydrocarbons, and heavy metals, and water quantity improvement (flow control).

#### **2011 Retrofit Projects**

**Locations:**

Rain garden projects at 23rd Ave (2 sites, 12 A and 12 B) – Budgeted cost \$115,000 –

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<p>Project received a grant for 75% of cost, net County cost of about \$29,000 (WQFP implementation)</p> <p>4216 174th PL NW Rain garden-Budgeted cost \$50,000 (rounded). Project received a grant for 75% of cost, net County cost of about \$13,000 (rounded)</p> <p>158<sup>th</sup> Pl. SW, detention facility bioswale retrofit. Project cost \$125,000 (rounded)</p> <p><b>Brief Description:</b> Individual improvement projects which retrofit various drainage system components for water quality improvement. Rain gardens provide low impact development technology. The two rain gardens on 23<sup>rd</sup> Avenue are projected to capture from about 84% to 99% of mean annual runoff, with resulting reduction in runoff pollution. The bioswale retrofit addresses a bioswale that had been filled in, and restores basic treatment of pollutants from the discharge from the detention facility upstream of the bioswale. The rain garden on 174<sup>th</sup> PL NW is projected to capture about 94% of mean annual runoff, with resulting reduction in runoff pollution. For the two infiltration swales included with the 174<sup>th</sup> PL NW project, bioretention soil mix will treat offsite runoff flowing into the swales, and grass in the swales will filter overland flows.</p> <p><b>Water quality benefits:</b> Low impact development improvements will reduce runoff and improve runoff water quality, The bioswale and infiltration swale retrofits will improve removal of suspended solids and treatment for other pollutants. The bioswale and infiltration swale retrofits also will provide some water quantity improvement (flow control).</p>
<p><b>B. Projects Underway (2012)</b></p>
<p><b>2012 -Water Quality Facilities Program</b></p> <p><b>Location:</b> Stillaguamish Pilot Sub-watershed</p> <p>Sub-watershed selection and planning, design and implementation of the sub-watershed plan. Estimated budget of \$75,000 (WC118C) for program development and \$62,000 (WC118Q) for design work.</p> <p><b>Water quality benefit:</b> removal of certain pollutants, such as nutrients and total suspended solids, polyaromatic hydrocarbons, and heavy metals, and water quantity benefit (flow control).</p> <p><b>Location:</b> Second South County Pilot Sub-watershed – Commercial Area</p> <p>Sub-watershed selection and planning, design and implementation of the sub-watershed plan. Estimated budget of \$101,000 (WC118D)</p> <p><b>Water quality benefit:</b> removal of certain pollutants, such as nutrients and total suspended solids, polyaromatic hydrocarbons, and heavy metals, and water quantity benefit (flow control).</p> <p><b>2012 – Retrofit Projects</b></p> <p><b>Locations:</b></p> <p>LID at Brook Blvd. (Rain garden) Site 7C (WA8612)- \$95,000 (Water Quality Facilities</p>

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<p>Plan implementation)</p> <p>LID at Brook Blvd. (Rain garden) Site 2E (WA8613- \$110k (Water Quality Facilities Plan implementation)</p> <p>Eastside View Det. Pond Retrofit- \$135,000</p> <p>Hampton Court III Water quality (storm filter installation) (WA8614)-\$75K</p> <p>58th DR SE Slope Drain (WA8811)- \$105,000</p> <p>Cemetery Rd. Slope Drain (WA8808)-\$115,000</p> <p><b>Brief Description:</b> Individual improvement projects which include retrofits to various drainage system components for water quality improvement (pipe slope drains, water quality inlets/catch basins, detention pond improvements, low impact development technology).</p> <p><b>Water quality benefits:</b> Water quality facility improvements (e.g., water quality inlets, detention pond retrofit, etc.) will allow performance improvements for removal of certain pollutants (nutrients, total suspended solids). Benefits from drainage improvements such as slope drains improvements will prevent erosion of hillsides and removal of earth, and the water quality benefit may be typically estimated in terms of linear feet protected or other descriptive measure. Low impact development improvements will reduce runoff and improve runoff water quality,</p>
<p><b>C. Potential Projects (2013 or beyond).</b> Approximately \$250,000 per year, funds may be augmented with grants when available.</p>
<p><b>Water Quality Facilities Plan; Silver Creek basin</b></p> <ul style="list-style-type: none"> <li>• <b>2013 design and construct projects 2E and 7C</b></li> <li>• <b>2014 design and construct projects 2A, 10</b></li> </ul> <p><b>Detention facility retrofits: approximately \$150,000 annually</b></p> <p><b>Potential Project Locations:</b> Urban growth areas in Snohomish, Cedar/Sammamish, or Stillaguamish watersheds.</p> <p><b>Brief Description:</b> Individual improvement projects which may include retrofits to various drainage system components for water quality improvement, such as pipe slope drains, water quality inlets/catch basins, detention pond improvements, swale improvements, etc.</p> <p><b>Water quality benefits:</b> Water quality facility improvements (e.g., water quality inlets, detention pond retrofit, etc.) will allow performance improvements for removal of certain pollutants (nutrients, total suspended solids). Benefits from drainage improvements such as slope drains improvements will prevent erosion of hillsides and removal of earth, and the water quality benefit may be typically estimated in terms of linear feet protected or other descriptive measure.</p> <p><b>Water Quality Facilities (other locations)</b></p> <p><b>Low Impact Development projects</b></p>

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**Approximately \$100,000 annually**

**Location:** County-wide

**Water quality benefits:** Low impact development improvements will reduce runoff and improve runoff water quality,

**Riparian planting/restoration**

**Location:** County-wide

**Brief description:** Riparian restoration work using native plants

**Water quality benefits:** Water quality benefits come from erosion protection from runoff and stream flow, improved biological treatment of runoff, and improved evapotranspiration of rainfall (reducing runoff volume). Native plants also provide an aesthetic and ecological benefit from restoring indigenous species to an area. Improvements are typically noted in terms of numbers of plants, linear feet of riparian zone, or acres of riparian buffer.

**APPENDIX A: 2008 303(d) LISTED WATER BODIES IN SNOHOMISH COUNTY  
WRIAS**

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2008 303(d) Listed Waterbodies in Snohomish County

LLID_NR	WTRBD_DS	CAT_DS	PARAM_DS	MED_DS	LISTING_ID
1221390481029	ALLEN CREEK	5	Dissolved Oxygen	Water	7260
1221661480390	ALLEN CREEK	5	pH	Water	7392
1221661480390	ALLEN CREEK	5	Dissolved Oxygen	Water	47499
1221661480390	ALLEN CREEK	5	Dissolved Oxygen	Water	7261
1221228482268	ARMSTRONG LAKE	5	Total Phosphorus	Water	22587
1223274477809	BALLINGER LAKE	5	PCB	Tissue	52646
1223274477809	BALLINGER LAKE	5	Dieldrin	Tissue	52014
1223274477809	BALLINGER LAKE	5	2,3,7,8-TCDD	Tissue	51543
1217225478679	BEAR CREEK	5	Temperature	Water	35165
1217225478679	BEAR CREEK	5	Temperature	Water	35163
1217137478985	BEAVER CREEK	5	Temperature	Water	35166
1220901478489	BEECHER LAKE	5	Total Phosphorus	Water	22463
1220928479323	BLACKMANS LAKE	5	Fecal Coliform	Water	6312
1220941480523	CASSIDY LAKE	5	Total Phosphorus	Water	22465
1220455480080	CATHERINE CREEK	5	Temperature	Water	7395
1219697479040	CHAIN LAKE	5	Total Phosphorus	Water	22612
1222452481950	COOK SLOUGH	5	Fecal Coliform	Water	9777
1222066477960	CRYSTAL CREEK	5	Dissolved Oxygen	Water	47990
1220869477535	DANIELS CREEK	5	Temperature	Water	48588
1222079480442	EBEY SLOUGH	5	Fecal Coliform	Water	9798
1222088478060	FILBERT CREEK	5	Dissolved Oxygen	Water	47992
1222301481839	FISH CREEK	5	Dissolved Oxygen	Water	47537
1220872478883	FRENCH CREEK	5	Temperature	Water	10640
1220872478883	FRENCH CREEK	5	pH	Water	7282
1220872478883	FRENCH CREEK	5	Dissolved Oxygen	Water	7276
1220872478883	FRENCH CREEK	5	Temperature	Water	9273
1220872478883	FRENCH CREEK	5	Dissolved Oxygen	Water	7272
1220872478883	FRENCH CREEK	5	pH	Water	40748
1220872478883	FRENCH CREEK	5	Dissolved Oxygen	Water	40743
1220872478883	FRENCH CREEK	5	pH	Water	7273
1221438477856	HOWELL CREEK	5	Dissolved Oxygen	Water	47969
1221438477856	HOWELL CREEK	5	Mercury	Water	45386
1223683482401	IRVINE SLOUGH	5	Fecal Coliform	Water	43042
1223515482351	JORGENSON SLOUGH (CHURCH CREEK)	5	Dissolved Oxygen	Water	47598
1223515482351	JORGENSON SLOUGH (CHURCH CREEK)	5	Dissolved Oxygen	Water	7238
1223515482351	JORGENSON SLOUGH (CHURCH CREEK)	5	pH	Water	50866
1223515482351	JORGENSON SLOUGH (CHURCH CREEK)	5	Dissolved	Water	40903

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			Oxygen		
1223515482351	JORGENSON SLOUGH (CHURCH CREEK)	5	Dissolved Oxygen	Water	7240
1219317477837	KAYAK LAKE	5	Total Phosphorus	Water	40964
1223439482823	KETCHUM LAKE	5	Total Phosphorus	Water	6343
1219098478459	KISSEE CREEK	5	Dissolved Oxygen	Water	47421
1219098478459	KISSEE CREEK	5	pH	Water	50735
1221675477549	LITTLE BEAR CREEK	5	Dissolved Oxygen	Water	40786
1220358479889	LITTLE PILCHUCK CREEK	5	pH	Water	40817
1222514481342	LOMA LAKE	5	Total Phosphorus	Water	6350
1223192482232	MILLER CREEK	5	Dissolved Oxygen	Water	9250
1223313478654	NORMA CREEK	5	Fecal Coliform	Water	7450
1222081478017	NORTH CREEK	5	Dissolved Oxygen	Water	47991
1221873477562	NORTH CREEK	5	Dissolved Oxygen	Water	7455
1221873477562	NORTH CREEK	5	Dissolved Oxygen	Water	7457
1223515482361	OLD STILLAGUAMISH CHANNEL	5	Temperature	Water	15560
1223515482361	OLD STILLAGUAMISH CHANNEL	5	Temperature	Water	15559
1216972478925	OLNEY CREEK	5	Temperature	Water	35169
1217124478723	OLNEY CREEK	5	Temperature	Water	35296
1217121479027	PEKOLA CREEK	5	Temperature	Water	35297
1220899479044	PILCHUCK RIVER	5	Temperature	Water	7295
1220899479044	PILCHUCK RIVER	5	pH	Water	7294
	PORT GARDNER AND INNER EVERETT HARBOR	5	Sediment Bioassay	Sediment	504390
1222452481960	PORTAGE CREEK	5	Turbidity	Water	8639
1222452481960	PORTAGE CREEK	5	Turbidity	Water	8638
1222137480420	QUILCEDA CREEK	5	Dissolved Oxygen	Water	7302
1221923481342	QUILCEDA CREEK, W.F.	5	Dissolved Oxygen	Water	47983
1221749480850	QUILCEDA CREEK, W.F.	5	Dissolved Oxygen	Water	47502
1220116478251	RILEY SLOUGH	5	pH	Water	50753
1220116478251	RILEY SLOUGH	5	pH	Water	50752
1220116478251	RILEY SLOUGH	5	pH	Water	50751
1220116478251	RILEY SLOUGH	5	pH	Water	50750
1220116478251	RILEY SLOUGH	5	pH	Water	50749
1221927478831	RUGGS LAKE	5	Total Phosphorus	Water	22474
1223060478205	SCRIBER LAKE	5	Total Phosphorus	Water	6368
1222076478926	SILVER LAKE	5	PCB	Tissue	52693
1220450478302	SKYKOMISH RIVER	5	Dissolved Oxygen	Water	9296
1220450478302	SKYKOMISH RIVER	5	Temperature	Water	6569
1222080480202	SNOHOMISH RIVER	5	Fecal Coliform	Water	3756
1222080480202	SNOHOMISH RIVER	5	2,3,7,8-TCDD	Tissue	51584
1222080480202	SNOHOMISH RIVER	5	Fecal Coliform	Water	7406
1222080480202	SNOHOMISH RIVER	5	Fecal Coliform	Water	16696



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1222080480202	SNOHOMISH RIVER	5	PCB	Tissue	52699
1220450478301	SNOQUALMIE RIVER	5	Temperature	Water	6570
1219452479496	SORGENFREI CREEK	5	Dissolved Oxygen	Water	47423
1223515482361	STILLAGUAMISH RIVER	5	Dissolved Oxygen	Water	47605
1223515482361	STILLAGUAMISH RIVER	5	Dissolved Oxygen	Water	47603
1223515482361	STILLAGUAMISH RIVER	5	Dissolved Oxygen	Water	14559
1223515482361	STILLAGUAMISH RIVER	5	Dissolved Oxygen	Water	14556
1221262482038	STILLAGUAMISH RIVER, N.F.	5	Turbidity	Water	15912
1221262482048	STILLAGUAMISH RIVER, S.F.	5	Dissolved Oxygen	Water	10582
1222564482293	SUNDAY LAKE	5	Total Nitrogen	Water	40865
1222564482293	SUNDAY LAKE	5	Total Phosphorus	Water	8637
1222404477542	SWAMP CREEK	5	pH	Water	51293
1222404477542	SWAMP CREEK	5	Dissolved Oxygen	Water	40892
1222404477542	SWAMP CREEK	5	Dissolved Oxygen	Water	40747
1222404477542	SWAMP CREEK	5	Dissolved Oxygen	Water	7462
1221592479467	SWAN TRAIL SLOUGH	5	Ammonia-N	Water	9298
1220936479104	SWIFTY (FERGUSON) CREEK	5	Dissolved Oxygen	Water	17494
1220936479104	SWIFTY (FERGUSON) CREEK	5	Temperature	Water	17495
1221950477907	UNNAMED CREEK (TRIB TO NORTH CREEK)	5	Dissolved Oxygen	Water	47988
1220248480200	UNNAMED CREEK (TRIB TO PILCHUCK RIVER)	5	Dissolved Oxygen	Water	47441
1221626480995	UNNAMED CREEK (TRIB TO QUILCEDA CREEK)	5	Dissolved Oxygen	Water	47492
1221988481271	UNNAMED CREEK (TRIB TO QUILCEDA CREEK, W.F.)	5	Dissolved Oxygen	Water	47512
1220200478332	UNNAMED CREEK (TRIB TO SKYKOMISH RIVER)	5	Dissolved Oxygen	Water	47439
1220200478332	UNNAMED CREEK (TRIB TO SKYKOMISH RIVER)	5	pH	Water	50754
1222533478906	UNNAMED CREEK (TRIB TO SWAMP CREEK)	5	Dissolved Oxygen	Water	48005
1217191478679	WALLACE RIVER	5	Temperature	Water	7435
1219192478714	WOODS CREEK, W.F.	5	Dissolved Oxygen	Water	14726
	PUGET SOUND (CENTRAL)	5	Fecal Coliform	Water	42489
	PUGET SOUND (N-CENTRAL) AND USELESS BAY	5	Fecal Coliform	Water	42488
	PUGET SOUND (N-CENTRAL) AND USELESS BAY	5	Fecal Coliform	Water	42487
	POSSESSION SOUND (NORTH)	5	Dissolved Oxygen	Water	10155
	POSSESSION SOUND (NORTH)	5	Dissolved Oxygen	Water	48964
	POSSESSION SOUND (NORTH)	5	Dissolved Oxygen	Water	48965
	PORT SUSAN	5	Dissolved Oxygen	Water	48967
	PORT SUSAN	5	Dissolved Oxygen	Water	10123

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	SKAGIT BAY AND SIMILK BAY	5	Fecal Coliform	Water	53165
	SKAGIT BAY AND SIMILK BAY	5	Fecal Coliform	Water	53166
	SKAGIT BAY AND SIMILK BAY	5	Fecal Coliform	Water	53197
	SKAGIT BAY AND SIMILK BAY	5	Fecal Coliform	Water	53200

**APPENDIX B: POTENTIAL CATEGORIES OF STRUCTURAL STORMWATER CONTROL PROJECTS**

## **Potential Categories of Structural Stormwater Control Projects:**

### **Drainage facility retrofits**

- Program synopsis

SWM has an annual construction program (ACP) and a 5-year capital improvement program (CIP) for drainage improvements. Projects in the 5-year CIP will be evaluated periodically for water quality retrofit opportunities as stand-alone projects, or that can be added to drainage improvement projects. Projects tend to be located in urban growth areas, and derive information from the Drainage Needs Report (DNR), Drainage Rehabilitation and Implementation (DRI) program, and other sources.

Water quality related projects in recent years have included swale improvements, pipe slope drains, and detention pond retrofits. Future projects may include similar or other improvements, such as water quality catch basins, vaults, low impact development BMPs, or other.

Water quality facility improvements (e.g., water quality inlets, detention pond retrofit, etc.) will allow performance improvements for removal of certain pollutants (nutrients, total suspended solids). Benefits from drainage improvements such as slope drains improvements will prevent erosion of hillsides and removal of earth, and the water quality benefit may be typically estimated in terms of linear feet protected or other descriptive measure.

This program may eventually merge with the Water Quality Facilities Management Plan (described below) for more comprehensive and integrated capital program development for water quality facilities.

Public involvement with individual projects will vary. The Lake Stevens projects, which included the Crestline Estates detention pond retrofit, had extensive public involvement, as described previously, including meetings, hearings, agency coordination, homeowner association communications, etc. This arose from the development of the Lake Stevens Urban Growth Area Plan and the Lake Stevens Master Drainage Plan in 2000 and 2001, respectively. Water quality related improvements have included detention pond retrofits, bioswale improvements, and other improvements.

The Eastmont area program, completed the first two phases of projects in 2007, and will go into phase 3 in 2008. In Eastmont, public involvement has been in the form of massive mail outs to the community to identify drainage problems, discussions with property owners, and correspondence, in a direct, interactive form of public involvement.

### **Water Quality Facilities**

- Project synopsis

In order to protect and improve water resources, SWM is planning to develop a Water Quality Facilities program for different areas of the County. The program is intended to evaluate existing water quality conditions at the neighborhood scale and recommend specific capital projects and maintenance actions for implementation to help address these problems and improve water quality. The program will evaluate both traditional and innovative programs to manage existing surface water facilities. The program will also be proactive in planning the development and construction of facilities that

emphasize LID designs, taking advantage of natural processes wherever possible to minimize disruptions to the natural hydrologic system. Water quality facility improvements (e.g., water quality inlets, detention pond retrofit, etc.) will allow performance improvements for removal of certain pollutants (nutrients, total suspended solids).

The short term goal of the pilot program will be to measurably improve water quality in the watershed by recommending a combination of capital projects and maintenance actions. Potential projects that will likely be considered include retrofitting existing facilities and outfalls, enhancing ditches, and implementing source control BMPs in their contributing areas. Potential maintenance activities may include use of high efficiency vacuum-sweepers for roads. The long-term goal of the pilot program will be to serve as a template that can be applied to watersheds throughout the county.

The intended highlights include:

- Develop timelines, budgets, staffing requirements and identify funding sources
- Develop a pilot watershed selection process
- Develop a public process to engage all stakeholders in the development of the plan
- Inventory and map all facilities, including their contributory areas
- Develop an assessment protocol and prioritize facilities
- Create a project list based on priorities
- Identify, assess, and prioritize all sources of pollution entering facilities for source reduction strategies
- Develop public involvement and outreach plans
- Develop a project list and implementation schedule
- Develop an early action component based on citizen input and existing data on current facility failures or problems

### **Riparian planting/restoration**

- Program synopsis

SWM is active in riparian area restoration. One component of its riparian restoration activities is the Native Plant Program. Utilizing community volunteers and with the support of a Washington Conservation Corps crew, the Native Plant Program installs approximately 40,000 plants per year in riparian (streamside) zones throughout Snohomish County. Plants improve air quality, prevent flooding and erosion, improve water quality, create fish habitat, and play a crucial role in stream ecology.

Measurements are typically noted in terms of numbers of plants, linear feet of riparian zone, or acres of riparian buffer. Restoration work has ranged from several hundred square feet of planting area to several acres at a time, with plants ranging from wetland plants, to grasses, to shrubs and bushes, to conifers and deciduous trees. The program has a strong community outreach component, training volunteers in riparian restoration, and providing community participation opportunities. The Native Plant Program has an ongoing program for monitoring all installation projects.

Along with the ongoing Native Plant Program, SWM from time to time conducts specific riparian area restoration projects. Typical work has included such projects as:

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- Sister of Friar project, completed in 2007 and improving a ¼ mile reach of Sister of Friar Creek (Snohomish River watershed)
- West Fork Wood Creek (under project development), to improve 625 linear feet of West Fork Wood Creek and 365 linear feet of a tributary, total of 1.3 acres. (Snohomish River watershed)
- Mosher Creek, improving in-stream, streamside, and wetland habitat along 600 feet of the creek.
- South Fork Big Trees project, which started in 2007, and is located along the south fork of the Stillaguamish River between Arlington and Granite Falls (4.6 stream miles). (Stillaguamish River watershed)

Public involvement on some of the larger projects, such as the South Fork Big Trees project, may include review and coordination with the local boards, committees and agencies. In the case of the South Fork, there was review and coordination with the Stillaguamish River Clean Water District Advisory Board (consisting of community, commercial, public agency, and tribal representatives), the Stillaguamish Implementation Review Committee (consisting of public agency and tribal representatives), and other groups.

Monitoring may vary depending on project size and needs. For example, in the South Fork Big Trees project, riparian vegetation and stream conditions will be monitored for a four year period.