



WASHINGTON STATE  
DEPARTMENT OF  
E C O L O G Y

**North Creek  
Fecal Coliform Bacteria  
Total Maximum Daily Load**

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**Detailed  
Implementation  
Plan**

September 2003  
Publication Number 03-10-047



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# **North Creek Fecal Coliform Bacteria Total Maximum Daily Load**

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## **Detailed Implementation Plan**

by

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## **Acknowledgments**

Thanks are due to all of the participating organizations and citizens that pledged their help to clean up the polluted waters within the North Creek Watershed. Many people were involved in developing schedules for the planned activities and reviewing and rewriting the description of pollution sources and how they will be addressed.



# EXECUTIVE SUMMARY

This is the Detailed Implementation Plan (Action Plan) for the North Creek Fecal Coliform Bacteria Total Maximum Daily Load (North Creek TMDL) as required under the Memorandum Of Agreement Between The United States Environmental Protection Agency and The Washington State Department Of Ecology Regarding The Implementation Of Section 303(d) Of The Federal Clean Water Act. This document details the actions needed to return the impaired waters in the North Creek Watershed to acceptable levels of bacteria content. In the North Creek TMDL evaluation, target geometric means are set as the goals for meeting the bacteria criteria of the Washington State Water Quality Standards, Washington Administrative Code (WAC) 173-201A.

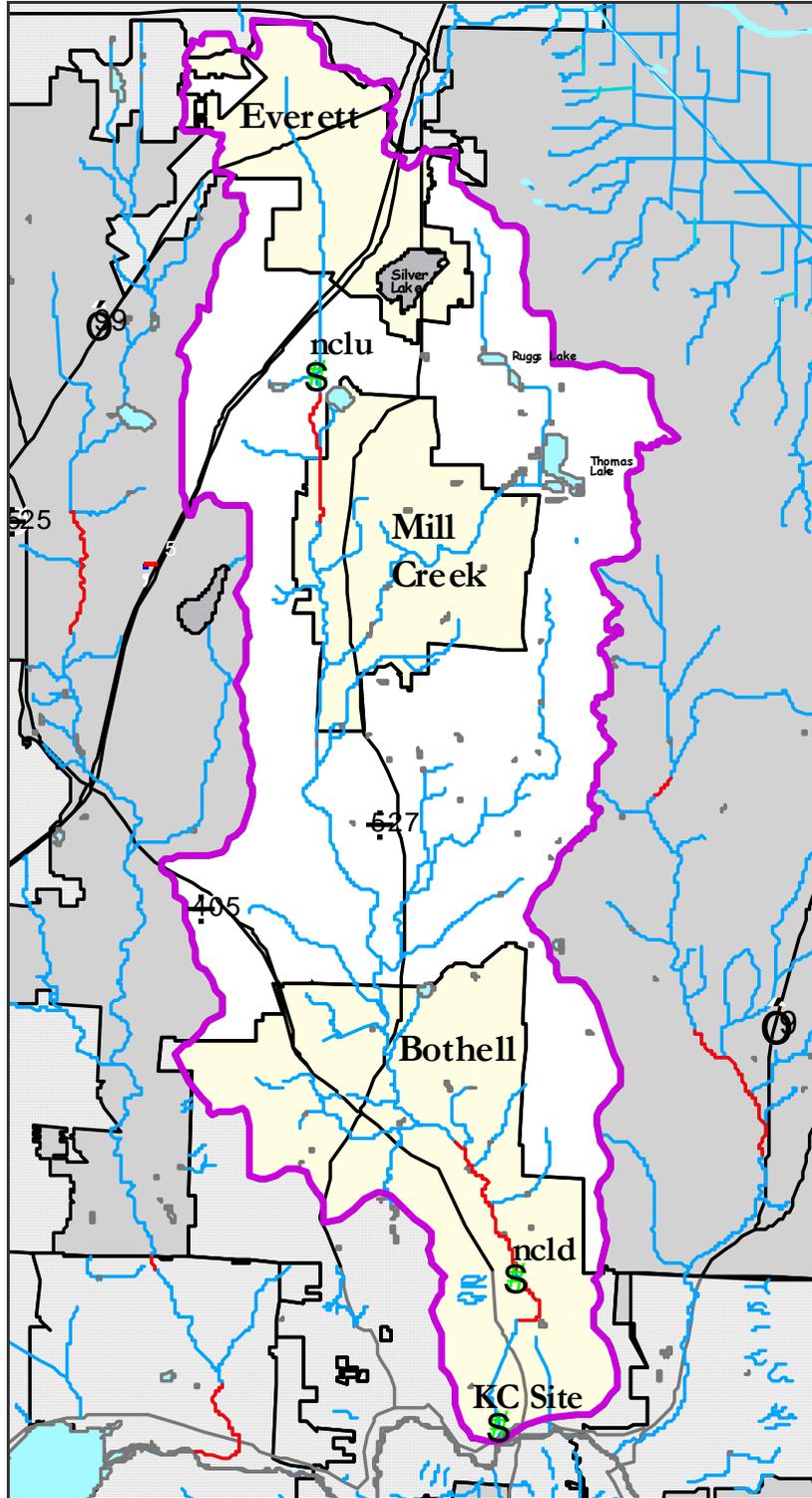
Water quality monitoring, pollution source identification, and implementation of best management practices are among the wide variety of activities proposed in this Action Plan to reduce bacterial pollution levels. Targeted percent reductions in 90<sup>th</sup> percentile bacteria levels range from 86 to 96 percent to reach modeled values. Ecology anticipates that if state and local coordination proceed as expected, by December 2008, each of the sampling stations within the North Creek Watershed will be within state standards.

Participating entities include Snohomish County, each of the local city governments, and other basin stakeholders. Some of these actions are voluntary, and some are required as in the case of current and future National Pollutant Discharge Elimination System (NPDES) stormwater permit holders. Many of the activities are already funded or planned for implementation in the near future. Where funding is not currently available, Ecology will assist in finding appropriate funding sources. All activities other than those required in NPDES permits are voluntary—this TMDL does not establish new state regulations and requirements.

The implementation of the North Creek TMDL is based on the assumption the actions proposed in this Action Plan will be adequate if they are fully implemented. However, several factors are anticipated to affect the rate of progress in reducing bacteria levels. First, the sources of bacterial pollution are expected to be diffuse and will take time to locate. Second, specific source identification data is very limited at this time; therefore, stormwater and receiving water monitoring will be needed in many locations to determine not only where, but what type of corrective actions are needed. Finally, there are few models to follow regarding the cleanup of urban watersheds with respect to bacterial pollution. Thus, it is anticipated that adaptive management methods will play an important role in identifying specific actions needed from existing programs or if new programs are needed.

The primary means of ensuring that activities detailed in this plan are implemented is the periodic examination of water quality monitoring data and collaboration of Ecology staff with basin stakeholders. Ecology will facilitate information sharing, coordinate activities between the various governmental and private entities working to reduce pollution inputs, and thus maximize the efficient use of available resources. Ecology will also require certain implementation activities through its NPDES permit programs where applicable.

In order to gauge the progress of this TMDL, Ecology will convene a meeting of municipal stakeholders no less than annually in order to share water quality data, trends (where applicable), and to evaluate the status of implementation activities within the North Creek watershed.



**Figure 1. North Creek Watershed.** The North Creek watershed supports several species of salmon and a diverse wildlife population. North Creek should be available for recreation opportunities such as wading and swimming. The dots labeled nclu, ncl, and KC site indicate long-term monitoring locations detailed in Svrjcek and Glenn (2002).



# INTRODUCTION

North Creek is polluted due to excessive levels of bacteria originating from numerous sources. Although each of the specific sources and their relative contribution has not been identified, we know that many of the potential sources come from humans or human activities. In some cases it may be from our pets and livestock, in others it could be from failing septic tanks or inadequate sewage collection and treatment systems. For this reason, Ecology prepared the North Creek Fecal Coliform Total Maximum Daily Load Submittal Report, (Svrjcek and Glenn, 2002, also called the Submittal Report). In the Submittal Report, Ecology set targets for measuring cleanup progress at three locations on the main stem of North Creek. At hand now is the task of deciding what activities need to be undertaken to make local waters more safe for children and adults that come into direct contact with North Creek—those activities are detailed in this document.

The sources of bacterial pollution affecting North Creek are not clearly understood at this time. This Total Maximum Daily Load (TMDL) study assumes that North Creek became polluted largely because of the way we do things, not the activities themselves. For example, owning and caring for dogs, cats, horses, and other animals is not a problem in itself, rather, it is the way that we care for them and manage their wastes. Similarly, roads and parking lots are a reality of our modern society, but the way we build roads, neighborhoods, and shopping centers is causing our local streams and creeks to be polluted. The solution is to do these things differently so that we can have animals and a modern lifestyle as well as clean water.

This report is part of the Federal Clean Water Act TMDL process for cleaning up polluted waters<sup>1</sup>. This Detailed Implementation Plan (referred to hereafter as the Action Plan) lists activities that need to be taken to reduce bacteria levels in North Creek. The Action Plan details planned or ongoing projects being undertaken by state, local, tribal, and federal governments, as well as nonprofit organizations and citizens groups, to improve the water quality of North Creek. Monitoring strategies and adaptive management procedures are also discussed.

The TMDL Submittal Report documented that bacterial pollution was a significant problem in the main stem of North Creek. It also assumes that the problem is widespread through the watershed. The amount of bacteria that can enter state waters before it reaches the level of being a pollutant is called the loading capacity. Local waters can accept no more than the loading capacity before they are considered polluted. The available loading capacity for the polluted waters in the North Creek watershed has been

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<sup>1</sup> This Detailed Implementation Plan (DIP) for the North Creek Fecal Coliform Bacteria Total Maximum Daily Load is written to meet the requirements of the Memorandum Of Agreement Between The United States Environmental Protection Agency and The Washington State Department Of Ecology Regarding The Implementation Of Section 303(d) Of The Federal Clean Water Act dated October 29, 1997. It is based on the technical report titled North Creek Watershed Total Maximum Daily Load Evaluation for Fecal Coliform Bacteria (Glenn, 2001) and the North Creek Tributaries Fecal Coliform Total Maximum Daily Load Submittal Report (Svrjcek and Glenn, 2002). Both of these documents are available through the Washington State Department of Ecology web site at <http://www.ecy.wa.gov/programs/wq/tmdl/index.html>.

assigned equally between nonpoint sources (load allocation) and point sources (wasteload allocation), the latter of which are associated with permitted stormwater discharges. Wasteload allocations for other point sources are zero (i.e., Pacific Topsoils Composting Facility).

This document describes our current understanding of the bacterial pollution problem in the North Creek watershed and shares information on the many partners participating in this cleanup effort and the activities they hope to accomplish. Ecology expects that much more will be learned about the extent of bacterial pollution as more water quality monitoring is done. Although we have many excellent strategies for improving pollution from failing septic tanks and poor livestock manure management practices, dealing with bacterial pollution problems in urban areas is likely to be more of a challenge. Through adaptive management, information sharing, and close cooperation of all stakeholders, we will meet this challenge and return local waters to good health.



**Figure 2. Washington waters should be safe.**

When bacteria levels in Washington waters exceed state standards, the risk of illness after swimming and bathing increases. In some areas, pollution becomes more concentrated in the summer, just when we depend on our local streams for recreation the most.

# PROBLEM STATEMENT

Fecal coliform bacteria indicate the presence of fecal wastes from warm-blooded animals. Water quality testing by Snohomish County and King County has confirmed that high levels of fecal coliform bacteria exist in the North Creek watershed (Glenn, 2001). Livestock, failing septic systems, domestic pets, and wildlife are all potential contributors. Where bacteria levels exceed state standards, an unacceptable health risk exists for fishermen, bathers, and children that engage in recreational activities that involve contact with those polluted waters. For these reasons, a TMDL for fecal coliform bacteria was prepared for the North Creek watershed.



Similarly, Ecology determined that dissolved oxygen levels are impaired in the North Creek watershed. Although Ecology did not set TMDLs for dissolved oxygen at this time, it is assumed that implementation actions taken to reduce bacteria levels will also improve dissolved oxygen levels. Therefore, this report will also detail selected activities aimed at improving dissolved oxygen levels in North Creek and its tributaries.

## Health Risk From Fecal Coliform Bacteria

The high levels of fecal coliform bacteria in North Creek indicate an increased risk of becoming ill when swimming (primary contact recreation), wading, fishing, or boating (secondary contact). Potential illnesses due to pathogen-contaminated recreational waters include gastrointestinal, respiratory, eye, ear, nose, throat, and skin diseases (EPA, 1986). EPA estimates that there is a theoretical risk of 8 illnesses per 1,000 swimming events when mean fecal coliform levels are 200 cfu/100 mL in fresh water. Although only several areas in the North Creek watershed are commonly used by adults for swimming (e.g., Silver Lake, Ruggs Lake), North Creek has many connected ponds and deep pools that are suitable for direct contact recreation by children. There are numerous locations where children have access for nonswimming-related recreational contact.

## About Dissolved Oxygen

Low dissolved oxygen levels are most pronounced during the dry summer months, when water levels drop, temperatures rise, and pollutants become more concentrated. The fecal matter from which bacterial pollution comes, is known to contain nutrients that support plant and animal growth. Algae and other organisms that utilize these nutrients can deplete oxygen under certain environmental conditions. The relationships between fecal coliform levels and their accompanying nutrient inputs to North Creek have not been

determined; however, to the extent that nutrient sources are found to be above natural background levels, their reduction should help improve dissolved oxygen levels.

Dissolved oxygen is also directly related to the temperature of water. As the temperature of water rises, its ability to absorb and hold oxygen goes down. Thus, there are multiple factors that depress dissolved oxygen levels during the summertime when water levels are lower. This lack of dissolved oxygen is a problem for fish, especially small fish which are less able to migrate to areas with better water quality.

## Bacterial Standards Changes

EPA, Washington State, and other states have questioned for some time whether fecal coliform bacteria are an optimal indicator of pathogenic bacteria in water. In 2002, Ecology considered changing its freshwater bacteria criteria (Hicks 2001) and basing the new criteria upon the use of Escherichia coli (E. coli). In 2003, concerns over the increased risk of illness and economic concerns resulted in a decision by Ecology to retain the current fecal coliform standard. The U.S. Environmental Protection Agency is currently reviewing Ecology's new proposed standards for approval in federally-related projects.



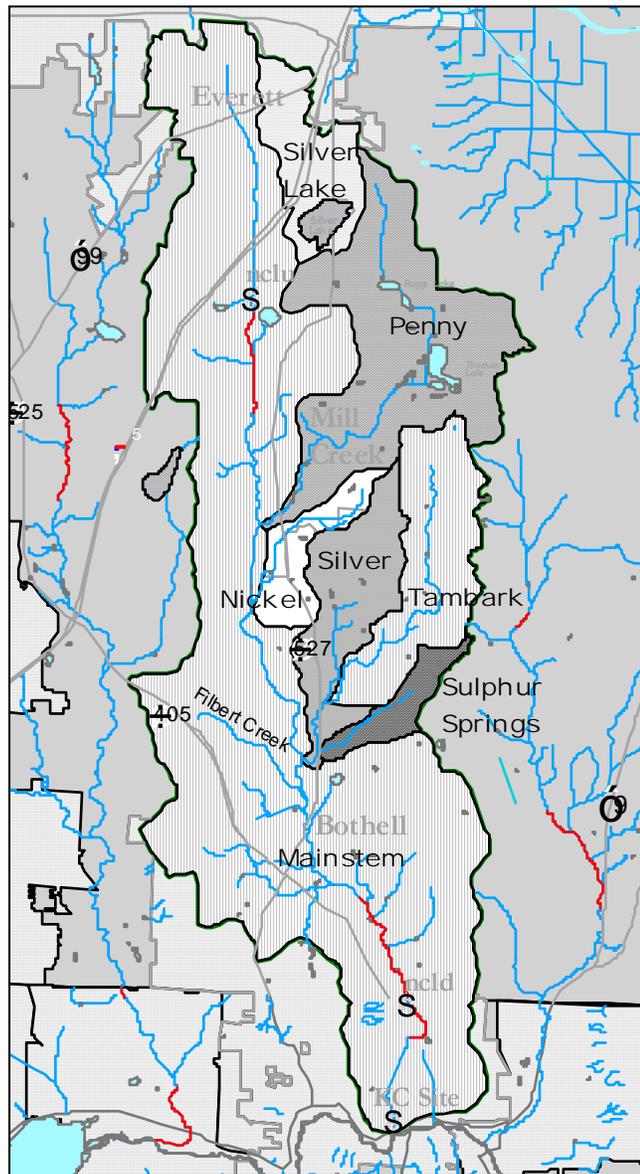
Ecology periodically reviews its water quality standards and makes changes based upon new information or priorities. If in the future, Ecology changes the bacterial standard to E. coli or other similar indicator organism, the implementation activities for reducing bacterial pollution in North Creek will remain the same as those detailed in this Action Plan.

# BASIN DESCRIPTION

The North Creek basin drains approximately 30 square miles and discharges to the Sammamish River, which is tributary to Lake Washington. The TMDL study area is comprised of the mainstem of North Creek and all the tributaries that contribute to it. Land use within the basin is primarily urban or suburban with some pockets of rural and forested land. The basin is being rapidly developed for residential and commercial use. Urbanization and land development activities greatly affect water quality in the basin through riparian corridor alteration, conversion of forests, inadequate retention/detention of stormwater from new and existing impervious surfaces, and poorly treated stormwater run-off.

North Creek is located predominantly in south Snohomish County and is shown in Figure 1. The headwaters originate in the Everett Mall Way area of south Everett and flow southerly for 12.6 miles before discharging to the Sammamish River, within the city of Bothell. The seven major sub-basins within the watershed are mainstem North Creek, Penny Creek, Silver Lake Creek, Nickel Creek, Silver Creek, Tambark Creek, and Sulphur Springs Creek (Figure 3). The major lakes are Silver Lake, Rugs Lake, and Thomas Lake.

More detail on the characteristics of the North Creek Watershed can be found in the TMDL Submittal Report (Svrjcek and Glenn, 2002).



**Figure 3. North Creek Subwatersheds.** A number of tributaries comprise the North Creek watershed. The North Creek TMDL addresses all seven of the distinct subwatersheds shown above.



**Figure 4. North Creek Pollution Sources.**

The sources of bacteria and other polluting materials that can depress dissolved oxygen levels are numerous and widespread throughout the North Creek watershed. It will take the combined efforts of state and local governments, businesses, and citizens to return North Creek to good health.

# POLLUTION SOURCES AND CORRECTIVE ACTIONS

All human activities have some effect on the natural environment. When done properly, the impact can be managed and surface waters can remain available for the wide range of uses that our society and law demands. Through a combination of data analysis, literature reviews, interviews with stakeholders, and windshield surveys, Ecology has examined the sources of pollution in the North Creek watershed and determined many of the actions needed to reduce pollutant inputs and return local waters to good health (Table 1). These determinations are discussed below for each identified pollutant source.

**Table 1 - Potential Pollution Sources and Pollution Factors**

| Sources                               | Explanation  |
|---------------------------------------|--|
| Stormwater                            | Small farm and residential pet waste. Illegal connections of sewer to storm drainage system. Nutrient runoff from excessive lawn and garden fertilization. Failing onsite septic tanks. Car wash wastewater. Stormwater runoff from composting facilities.   |
| Residential Wastewater                | <ul style="list-style-type: none"> <li>- Surfacing septic tank wastewater enters streams during dry periods or rain events.</li> <li>- Subsurface septic tank wastewater that reaches nearby streams</li> <li>- Direct discharge of septic tank waste to a stream or stormwater system.</li> </ul> |
| Sediment                              | Storage of historic contamination that may be re-suspended   |
| Commercial Agriculture – Nonpermitted | Bacteria, nutrients, and surface runoff from improper grazing or manure management practices. Excessive use of fertilizers. Removal of riparian vegetation. Certain ditch maintenance practices.   |
| Small Farms                           | Bacteria, nutrients, and surface runoff from improper grazing or manure management practices. Removal of riparian vegetation.  |
| Wildlife                              | Usually considered part of natural background levels. An exception can occur when a pollution source is created by man made alterations of the environment.  |
| Altered Stream Hydrology              | Loss of summer base flows concentrates pollutants because there is less water in the stream than under natural conditions. High peak flows accelerate natural bank scouring processes and add too much sediment to stream systems.   |
| Loss of Riparian Habitat              | Lack of shading and riparian microenvironment effects results in increased stream temperatures and reduced dissolved oxygen levels.  |

## Altered Hydrology/Loss of Base Flows

Changes in stream hydrology (Figure 5) can play a great role in the water quality of urban creeks. As opposed to the natural environment, which provides opportunities to filter out or otherwise treat potential pollutants, stormwater and stormwater conveyance systems provide an efficient mechanism to rapidly transport pollutants to surface waters. Development practices that quickly shunt stormwater to the nearest creek or stream for disposal can cause sudden increases in flow rates that lead to bank erosion and flooding in downstream areas. Excessive water turbidity, stream widening due to sediment deposition, and loss of fish habitat are among the problems that can be associated with

altered streamflow events in urban watersheds that have high levels of impervious cover (Center for Watershed Protection, 2002). A recent study conducted in the Puget Sound area showed significant changes in several streams affected by urbanization (Konrad and Booth, 2002). In that study, trends towards higher peak flows and fast returns to base levels indicate the influence of stormwater on local stream hydrology.

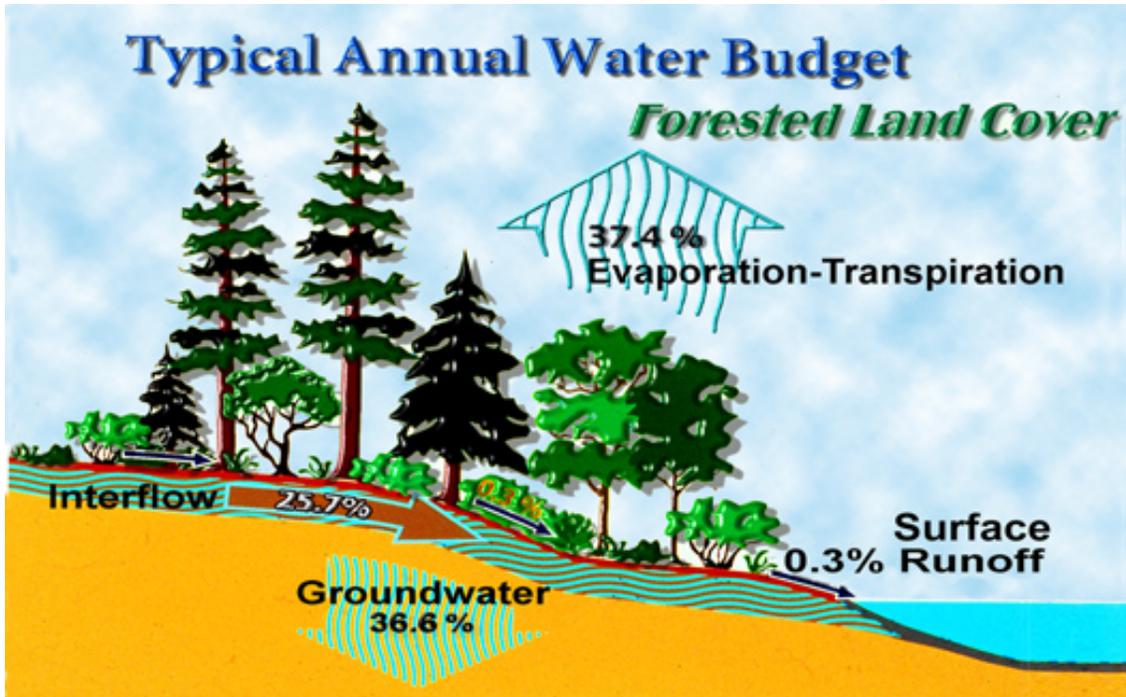
This same water, which typically would infiltrate into the ground or be stored in a wetland, may no longer be available during summer months when there is no rainfall and thus streams could be adversely affected in all seasons. When water levels in a stream decrease and pollutant loadings stay the same, then the concentration of pollutants in the water becomes greater. Such a decrease in summer baseflows would increase the challenge that we face as a society to reduce pollutants and return streams to good health. Current research on the reduction of summer base flows by impervious cover in heavily urbanized watersheds is inconclusive (Konrad and Booth 2002, CWP 2002). Lawn irrigation water, aquifer depletion by wells, alteration of local infiltration characteristics, prevalence of onsite septic systems, and other factors may be affecting North Creek hydrology and thus pollutant levels. Additional research is needed.

No analyses of North Creek seven-day low flow trends or other methods that focus specifically on summer baseflows have been identified during the preparation of this plan; therefore, this TMDL takes a conservative approach to conserving streamflows and recommends infiltration of stormwater wherever feasible. This approach will not only reduce the potential for creating contaminated surface runoff, but also will help ensure adequate long-term groundwater resources (including interflows) that do not rely on transient recharge sources such as lawn irrigation water and onsite septic tanks.

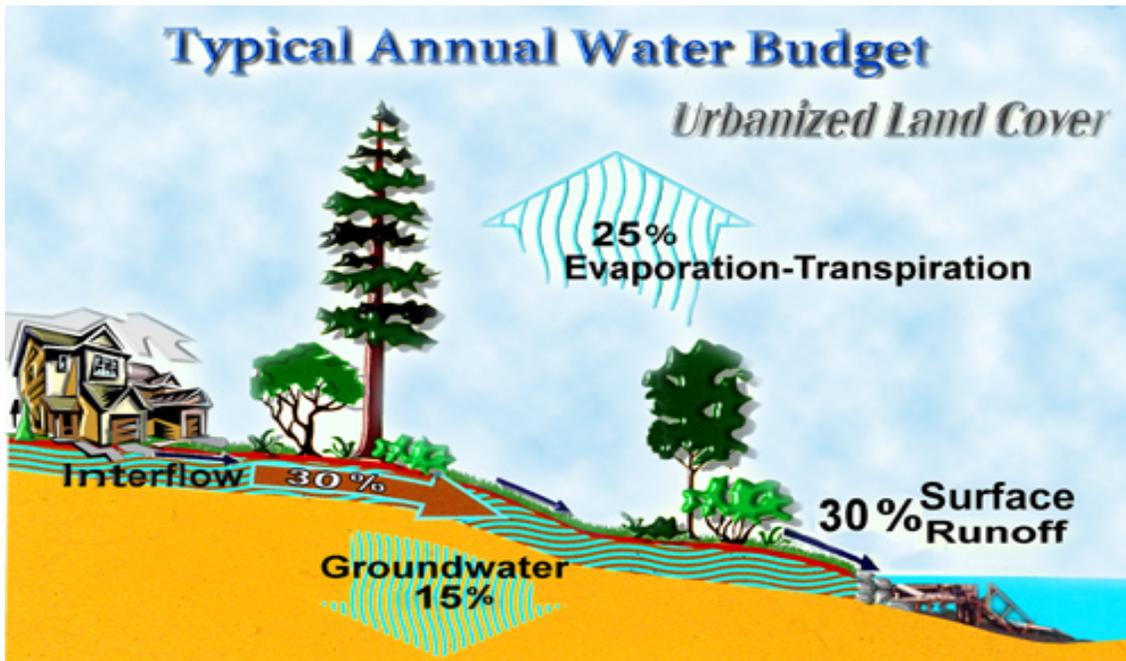
**Corrective/preventative actions:** This TMDL recommends that that state and local government work together to advance the use of Low Impact Development (LID) practices in new development and consider LID retrofits as funding and redevelopment opportunities allow. Ecology, the Puget Sound Action Team (PSAT), and Snohomish County should collaborate to develop the necessary ordinances, guidance, and training to facilitate the transition of builders from the use of high impact development practices to LID practices. Training should be provided for city governments.

Consistent with a conservative approach to maintaining adequate streamflows fed by interflow and other groundwater sources, this TMDL recommends all stakeholders examine stormwater pathways on their properties and assess the feasibility of infiltrating stormwater onsite to maintain sub-watershed groundwater levels and reduce the potential for creating contaminated stormwater.

**Stakeholder groups:** Ecology, PSAT, Snohomish County, cities, building industry, residential homeowners.



**Figure 5. Altered Hydrology.** Roads, rooftops, and sidewalks, change the water cycle in significant ways. Where water used to seep into the ground to feed streams in the summer, much of our water resource now runs quickly to a storm drain and is lost to us. Not only can groundwater levels drop (less drinking water) as a result, but when there is less water in streams in the summer, pollution levels rise as well. This same phenomenon contributes to flooding in the winter.



## **Livestock and Commercial Animal Handling Facilities**

### **Animal Kennels and Commercial Stables**

Animal kennels can generate significant amounts of animal wastes as a byproduct of the boarding and care of dogs and other animals. It is estimated that there are over two dozen kennels in the North Creek watershed. Animal kennels are not regulated by the Snohomish Health District.

Although Snohomish County is home to a particularly large number of horses boarded in commercial stables, the number of horses in the North Creek watershed is relatively low and likely to decrease as the trend towards urbanization continues in the basin. It is estimated that one horse produces 50 pounds of manure a day...this adds up to over eight tons of manure per year. The additional waste produced from bedding soiled with 8-10 gallons of urine from each horse per day can create a challenge for any small business.

Because wetlands are not suitable for grazing and grass production throughout the year, wetland areas are commonly found close to waste manure piles. Sometimes waste is directly deposited in the wetlands for fill or for convenience since they tend to be found in lower areas of a property. Wetlands frequently drain to local streams and thus become a pathway for bacterial pollution.

**Corrective/preventative actions:** It is especially important for these businesses to recognize the importance of proper manure and pasture management to protect water quality. Animal kennels should manage fecal waste products to prevent their entry into surface or stormwater systems by implementing the BMPs listed below:

- Regularly sweep and clean animal keeping areas to collect and properly dispose of droppings to prevent their entry into surface waters or stormwater systems.
- Do not hose down areas of potential fecal contamination to storm drains or to receiving waters. Always verify that drains used for this purpose go to the sanitary sewer.
- Do not allow any washwaters to be discharged to storm drains or to receiving waters.
- If animals are kept in unpaved and uncovered areas, the ground should have vegetative cover or some other type of ground cover such as mulch.
- If animals are not leashed or in cages, the area where animals are kept should be surrounded by a fence or other means that prevents animals from moving away from the controlled area where BMPs are used.

Livestock manure storage piles should not be located by any water drainage system, including wetlands that connect to local streams. All commercial stables should have a farm plan developed in conjunction with the Snohomish Conservation District and fully implement all elements relating to water quality protection.

**Stakeholder groups:** Local governments, Snohomish Conservation District, Snohomish Health District, commercial stable owners, animal kennel owners.

## Residential Equestrian Facilities

The majority of land dedicated to caring for horses is associated with homeowners and their personal stables. The range of land types used for residential horse facilities is very diverse. For budgetary and other reasons, residential horse owners frequently have limited area for grazing and exercise. Thus, many times horses live in wooded conditions or are confined to small outdoor paddocks where grass and vegetation is quickly consumed or destroyed. Manure deposited by animals frequently finds its way into natural drainage corridors and becomes a source of water pollution.

**Corrective/preventative actions:** Like commercial facilities, these horse owners need to carefully manage their pastures and the manure produced by their animals. All small farms in the proximity of a drainage conveyance should contact the Snohomish Conservation District to have a farm plan developed.

**Stakeholder groups:** Local governments, Snohomish Conservation District, private horse owners. This TMDL strongly recommends that local agencies working with residential equestrian facilities be adequately funded to combat this diffuse and significant potential source of bacterial pollution through the development of farm plans and regular technical assistance visits to help homeowners protect local water quality.



**Figure 6. Equestrian Facilities.** The average horse generates 50 pounds of manure per day (that's 8 tons per year not counting soiled bedding). This owner uses gravel, rubber mats, wood pellet bedding, interceptor drains, and frequent use of the dumping fork to prevent water pollution and improve compost quality. Composting manure is covered to prevent rain from carrying waste to surface water.

## Loss of Riparian Habitat

Riparian habitat (streamside buffers) plays a valuable role in water quality. Adequately sized and healthy riparian buffers help filter out a variety of pollutants including fecal coliform bacteria and substances that can lead to the depletion of oxygen in streams.

In addition, temperature plays an important role in determining how much oxygen water can hold. When treed stream buffers are removed to establish lawns, establish pasture or cropland, or to make room for development, water temperatures increase due to exposure to warm air and sunlight. Direct shading from trees is one important component that can affect stream temperatures. The other is the size of the buffer around the stream—larger treed buffers can lower the local air temperature and thus help prevent increases in stream temperatures. There is controversy over the proper size of buffers needed to maximize the benefit to streams and stream life. Determination of optimal buffer widths is outside of the scope of this water cleanup plan.

**Corrective/preventative actions:** This TMDL encourages all affected landowners and developers to maximize buffer widths consistent with reasonable land use expectations and meeting the goal of providing stream shading during summer months to help minimize stream temperatures. Regarding the introduction of sediment and other pollutants to streams, certain riparian vegetation, such as small shrubs and thickets, can also aid in excluding animals from water and drainage areas while it also helps filter pollutants flowing overland during extended or high intensity rainfall events.

**Stakeholders:** All local governments, Snohomish Conservation District, Adopt-a-Stream Foundation, all streamside landowners, land developers.

## Sediment

Although not generally considered a source of bacterial pollution, sediment can affect local waters in a variety of ways 1) covering salmon eggs, and 2) filling streams making them wider and shallower, 3) providing a storage area for bacteria. Excessive sediments can affect dissolved oxygen levels by causing stream widening, which leads to increased contact of water with warmer surface air and sunlight. Warmer water holds less oxygen. The two most common sources are sediment runoff from construction sites and hydraulic scouring caused by increased amounts of stormwater from impervious surfaces.

Fecal coliform bacteria can survive in sediment by bonding to sediment grains (e.g., clay) or organic matter. The degree to which surface water contamination is affected by contaminated sediments is unknown. This phenomenon has been documented in Puget Sound and is often referred to as “sediment archiving” of bacteria. Agricultural areas are likely locations where sediment archiving of bacteria has already occurred. The prevalence of sediment archiving in urban streams has not investigated yet as part of this TMDL.

**Corrective/preventative actions:** This TMDL does not recommend actions to address sources of fecal coliform that may be present in sediments at this time. Efforts to improve stream hydrology that reduce the frequency of sediment and bedload movements should reduce the likelihood that contaminated sediments will affect bacteria or dissolved oxygen levels.

This TMDL does recommend that erosion control BMPs and flow control BMPs be utilized as outlined in the Western Washington Stormwater Manual in order to prevent stream sedimentation and widening that may lead to increased dissolved oxygen levels. The disconnection of stormwater with surface waters through low impact development or stormwater infiltration to reduce high flows is also encouraged. Additional investigation of sediment archiving should be considered through the adaptive management process of this TMDL.

## Urban Stormwater

Stormwater can be a significant source of bacterial and nutrient inputs to local water bodies. In this document, stormwater is defined very broadly and includes 1) rainwater that hits the ground and does not infiltrate at that location and 2) other discharges that are collected in stormwater collection systems (pipes or ditches) and is conveyed to local surface waters. (See the Ecology website @ <http://www.ecy.wa.gov/programs/wq/stormwater> for more information.) Sources of stormwater pollution that are not conveyed in a regulated stormwater system are discussed individually elsewhere in this chapter.



**Figure 7. Urban stormwater.** If there was such a thing as a pollution smorgasbord, urban stormwater would be the ultimate dining experience. Laden with fertilizer, pesticides, petroleum products, heavy metals from tire wear, and bacteria, to name a few, we now know that we must increase our efforts to protect local waters from this pollution source. Most storm drains in Western Washington drain directly to a pond or ditch that empties into fish bearing waters.

Urban stormwater can carry bacteria from pet wastes on the ground, surfacing wastewater from failing OSSs, excess nutrients from lawns and gardens, and pollutants associated with activities such as car washing and sidewalk cleaning.

In urban areas around Puget Sound and elsewhere across the country, bacteria concentrations in stormwater range from approximately 1,000 to over 100,000 organisms/100 mL (Chang 1999, Doran et al. 1981, Pitt 1998, Varner 1995). In a recent study by the Center for Watershed Protection, mean fecal coliform concentrations in urban stormwater were 15,000 cfu/100 mL (Center for Watershed Protection, 1999). That same study showed that nearly every individual stormwater runoff sample exceeded bacterial standards, usually by a factor of 75 to 100.

DNA ribotyping studies of bacteria found in streams and creeks in urban Puget Sound streams consistently show the presence of bacteria from dogs and cats (Table 2). In a watershed containing 100,000 people, it is estimated that dogs alone generate over two and one half tons of feces each day—that is almost 2 million pounds per year. Although current methods do not allow for quantification of sources, the consistent presence of pet waste in regional studies indicates that BMPs to control these

particular sources should begin as soon as possible in obvious public locations where animals are taken for exercise and there is a high potential for stormwater contamination where pets may defecate. Unfortunately, our ability to accurately quantitate the contribution from any single bacterial source (either domesticated or wild animals) using DNA ribotyping is still a goal.

**Corrective/preventative actions for Municipal Stormwater:** Federal regulations address urban stormwater through the Phase I and Phase II Municipal Stormwater Permit programs. Snohomish County currently has a Phase I permit and many cities and towns will be covered by the Phase II permit program in the future. Many of the basic provisions of these permit programs will contribute to this TMDL.



**Figure 8. Fluffy's pet waste.** Studies show that both dog and cat waste are finding their way into our local streams. Citizens associations and local governments should work together to make pet waste disposal as easy as possible where it is needed the most. Shown is a pet waste management station located where urban and suburban residents walk their pets on a daily basis. (Photo courtesy of Dogipot Inc.)

The portion of stormwater generated in North Creek that is located in, and conveyed through stormwater systems operated and maintained by Snohomish County, is regulated by Ecology's Phase I General Stormwater Permit for the Island/Snohomish Water Quality Management Area. The county's current permit contains the elements shown below.

1. Eliminate illicit discharges (such as illegal sanitary sewer connections),
2. Analyze, prioritize, and schedule the implementation of stormwater management needs,
3. Establish adequate legal authority to control stormwater discharges from its stormwater system,
4. Monitor the effectiveness of its stormwater management program,
5. Develop watershed-wide coordination mechanisms for shared water bodies,
6. Develop a program to control runoff from new development, redevelopment activities, and construction sites discharging to the storm sewer system,
7. Ensure appropriate treatment and source control measures are in place to reduce pollutants from existing commercial and residential areas discharging to the storm sewer,
8. Ensure appropriate operation and maintenance of stormwater facilities discharging to the storm sewer system, and
9. Development of an educational program aimed at residents, businesses, industries, and employees whose job functions may impact stormwater quality.

The Phase II Municipal Permit will be issued to communities located within urbanized areas as determined by the U.S. Census. For more information on the Phase II and other stormwater permits, visit NPDES section at the EPA website @ <http://www.epa.gov/owm/index.htm>. The terms and conditions of Ecology's Phase II Stormwater permit have not been determined yet. During the years 2003-4, Ecology will draft the eligibility requirements and the conditions of the permit for public review. At a minimum, the Phase II Municipal Stormwater permit will require permit holders to address the following federal requirements:

1. Public education and outreach
2. Public participation/involvement
3. Illicit discharge detection and elimination
4. Construction site runoff control
5. Post-construction runoff control
6. Pollution prevention/good housekeeping
7. Implementation of applicable TMDLs
8. Program evaluation and reporting

**Table 2. Summary of bacteria sources identified in urban streams in Puget Sound.** Data provided is shown as a percentage of the total isolates evaluated. Values shown do not accurately reflect source concentrations from each category.

| Source        | Glennwood Creek | Edgewater Creek (2000) | Swamp Creek (2000) | Woodland Creek (2002) |
|---------------|-----------------|------------------------|--------------------|-----------------------|
| Avian         | 28              | 8                      | 13.5               | 11                    |
| Cat           | 14              | 6.8                    | 1.6                | 1.5                   |
| Dog           | 21              | 7.4                    | 14.3               | 10.3                  |
| Canine        |                 |                        |                    | 14                    |
| Opossum       | 2               | 2.7                    | 2.4                | 1.5                   |
| Rabbit        | 0.5             |                        |                    |                       |
| Raccoon       | 2               | 10.8                   | 7.1                | 5.1                   |
| Rodent        | 9               | 2                      | 0.8                | 5.1                   |
| Storm Drain   | 0.5             |                        |                    |                       |
| Human         |                 | 1.4                    | 2.4                | 14.7                  |
| Squirrel      |                 | 1.4                    | 0.8                |                       |
| Deer          |                 |                        |                    | 6.6                   |
| Multi species |                 |                        |                    | 6.6                   |
| Beaver        |                 |                        |                    | 3.7                   |
| Horse         |                 |                        |                    | 3.7                   |
| Bovine        |                 |                        |                    | 3.7                   |
| Goose         | 1.3             |                        | 4.8                | 2.2                   |
| Sea gull      | 0.7             |                        | 1.6                | 1.5                   |
| Chicken       |                 |                        |                    | 0.7                   |
| Duck          |                 |                        |                    |                       |
| Unknown       | 21              | 60.1                   | 50.8               | 8.1                   |
|               |                 |                        |                    |                       |
| Total         | 100             | 100                    | 100                | 100                   |

### Special Permit Requirements for Municipal Stormwater Permits

Federal law requires applicable TMDLs to be addressed when water quality permits are issued. Where a TMDL has been approved, NPDES permits must contain effluent limits and conditions consistent with the TMDL (40 CFR 122.44(d)(1)(vii)(B), 40 CFR 122.34(e)(1)). Additionally, state law (RCW 90.48) does not permit the introduction of polluting matter into state waters. Although effluent limitations are typically expressed in a numerical form, effluent limitations for municipal stormwater discharges should be in the form of BMPs. This TMDL recommends an iterative, adaptive management BMP approach be taken.

Each municipality affected by this TMDL faces variations in the number of potential source areas, types and numbers of land uses, financial constraints, and other issues that will affect the scope TMDL-related activities within their jurisdiction. Ecology recognizes this and intends there to be flexibility in the development and implementation of BMPs and water quality monitoring programs associated with this TMDL. It should also be noted, however, that where surface waters have been identified as polluted, it is assumed that existing resources and programs alone are inadequate to address the problem and additional steps must be taken to resolve existing pollution problems.

In order to demonstrate progress toward meeting water quality standards, the following are actions that Ecology intends to include as permit requirements in Phase I and Phase II Municipal Stormwater NPDES permits for entities whose stormwater discharges are identified as sources of loadings to this TMDL. These requirements will be included in the first permit issued after the completion of the Detailed Implementation Plan. Subsequent permits will include different requirements, depending on the success in achieving the goals of the TMDL.

The baseline requirement for all municipal stormwater permittees includes adoption and enforcement of an ordinance requiring the application of source control BMPs related to bacterial pollutants (equivalent to Volume IV of the 2001 Ecology Stormwater Management Manual for Western Washington) for existing land uses and activities that generate bacterial pollution. Specifically, Volume IV contains BMPs for 1) commercial animal handling areas, 2) commercial composting facilities, and 3) illicit connections to storm drains. Where these activities are not occurring, no action is required.

Where potential sources do exist, operational source control BMPs shall be required for all pollutant generating sources. Only in those cases where a facility is demonstrated to be causing a violation of surface or ground water standards, or is discharging illegally, shall structural source control BMPs shall be required as related to this TMDL. The provision for structural source control BMPs is not intended to apply to individual municipal stormwater outfalls.

Monitoring for BMP effectiveness is essential to the success of this TMDL. Therefore, one or both of the following implementation strategies must be applied on either a jurisdiction wide or sub-basin scale during the first permit cycle. Strategy A is the default implementation strategy unless the permittee chooses to implement Strategy B in all or part of the area subject to the TMDL:

#### **Strategy A, Targeted Implementation Approach**

- Conduct sampling of streams and/or discharges from stormwater conveyances to determine areas with highest bacterial pollutant concentrations (high priority areas)
- Conduct additional monitoring in high priority areas to locate sources
- Develop a Bacterial Pollution Remediation Plan
- Conduct public review of and finalize the Bacterial Pollution Remediation Plan prior to submitting new permit application at the end of permit cycle

#### **Strategy B, Early Action Approach**

- Propose Early Action BMP plan within six months of permit effective date
- Conduct public review of the Early Action BMP plan
- Implement Early Action BMPs
- Design and implement a water quality monitoring program that assesses whether or not affected water bodies are meeting state water quality standards
- Update early action BMP plan at the end of the permit cycle

The *Targeted Implementation Approach* has the benefit of providing additional assurance that BMPs will be effective when applied in target areas. This approach delays the certainty of BMP implementation until the following permit cycle; however, where the contribution of individual source categories is very unclear, this is a valid and acceptable approach. High priority areas shall be determined for both dry and wet seasons through sampling of stormwater and/or receiving waters. The Bacterial Pollution Remediation Plan is then prepared and reviewed through a public process during the first permit cycle. Implementation of the Plan will be required in the following permit cycle. This TMDL encourages the voluntary initiation of BMPs at the earliest possible date. Determination of pollutant loading levels is highly encouraged as part of this required monitoring.

The *Early Action Approach* has the benefit of focusing available funding immediately on BMP implementation, some of which may already be proposed as a voluntary option in this plan. These BMPs, which will be implemented within one year of the permit effective date, shall specifically address bacterial pollution across municipal separate storm sewer systems (MS4s) affected by this TMDL. This suite of BMPs shall be accompanied by adequate receiving water monitoring to determine whether surface waters are meeting state bacteria standards during both dry and wet seasons. Activities required in subsequent permits will be based upon the use of adaptive management principles and the documentation of future actions in the updated Bacterial Pollution Remediation Plan. Monitoring of stormwater and determination of pollutant loading levels is highly encouraged as part of this required monitoring.

**Table 3. Implementation Plan Considerations.** Municipal stormwater permittees must consider the applicability of the following approaches in the development of their Bacterial Pollution Remediation Plans. Where watershed plans have been developed, permittees should refer to those plans.

| Action Item   | Phase I | Phase II |
|---|---------|----------|
| Development and implementation of a Pet Waste Ordinance   | X       | X        |
| Evaluate current water pollution ordinance enforcement capabilities   | X       | X        |
| Evaluation of critical areas ordinance in relation to TMDL goals  | X       | X        |
| Development of an educational program directed at reducing bacterial pollution  | X       | X        |
| Investigation and implementation of methods that prevent additional stormwater bacterial pollution through stormwater treatment, reducing stormwater volumes, and preventing additional sources of stormwater in association with new development | X       | X        |
| Implementation of activities in the North Creek Watershed Management Plans that address bacterial pollution and dissolved oxygen problems   | X       | X        |
| Ambient water quality and stormwater quality sampling to specifically identify bacterial pollution sources  | X       | X        |
| Development and implementation of a Livestock Ordinance   | X       |          |
| Development and implementation of a Compost Ordinance   | X       |          |

For each of the strategies above, the actions detailed in Table 3 shall be considered and discussed for inclusion in the Bacterial Pollution Remediation or Early Action BMP Plans.

Pet waste BMPs outside of commercial settings are not being required at this time due to the lack of quantitative data on loadings from this source. However, because of the overwhelming evidence of pet waste in Puget Sound stormwater, the availability of educational techniques and structural facilities to address this pollution source, and the potential for pet waste to harbor and transmit disease to humans, municipal stormwater permittees are highly encouraged to begin the strategic use of BMPs immediately to control pet waste as they develop their stormwater programs.

### **Corrective/preventative actions for Private Stormwater Systems:**

Private stormwater systems are subject to the same pollution sources as publicly owned systems. Within the North Creek watershed there are numerous private storm sewer systems. Business Parks cover a significant area within parts of the North Creek watershed and should examine their land use and maintenance strategies to improve local water quality. Educational outreach to individual business owners is recommended by this TMDL to prevent car washing and other activities that contaminate stormwater or constitute illicit or illegal discharges. In addition, this TMDL encourages business park owners to coordinate their activities with local government and examine landscaping practices, protection of water flowing from springs on their property, and performing riparian restoration where feasible. There are a number of opportunities for business to collaborate with local government to educate business park workers and citizens utilizing the North Creek trail system. Grant funding sources are encouraged to support these collaborative efforts.

## **Wastewater**

Wastewater takes many forms. In this Action Plan, wastewater from showers, toilets, and sinks is defined as “domestic wastewater.” Domestic wastewater can be generated in private residences or commercial businesses and is either treated by onsite septic systems or is conveyed to a wastewater treatment facility through a regional sewage conveyance system.

Other wastewaters are generated during typical home and automotive maintenance activities in the North Creek Watershed. Most common are carwash wastewater and overflow or excessive irrigation water. A discussion of each of these potential pollution sources is provided below.

### **Regional Conveyance Systems**

Centrally collected wastewater in the North Creek Watershed is conveyed through one or more sewer systems operated by the Alderwood Sewer District, city of Bothell, city of Everett, Mukilteo Sewer District, or Silver Lake Sewer District. The majority of this wastewater is conveyed to the King County wastewater treatment system. The vast majority of North Creek is serviced by the Alderwood Sewer District.

It is possible that centrally conveyed sewage could enter surface waters under several scenarios. Overflows from pump stations are one possibility. Ecology does not generally allow sewer overflow pipes at pump stations, rather system redundancy and telemetry are employed to help ensure that overflows do not occur if and when mechanical or physical problems occur. Where allowed, overflow points are capped and locked and can only be opened in the event of an emergency. Ecology reviews all such incidents when they occur and is not aware of any overflow points into the North Creek watershed. When overflows occur they are short-lived and cannot account for the consistent high bacterial counts observed in the mainstem of North Creek. Overflows due to line blockages are another potential source of bacterial pollution; however, like pump station overflows, these events are short-lived and cannot account for consistent high bacterial counts observed in North Creek.

Less is known about the potential of leaky sewer lines to contaminate local surface and ground waters. Pipe deterioration is more frequently observed when groundwater pressure forces water into sewage pipes causing an increase in flows to wastewater treatment plants in winter months.

**Corrective/preventative actions:** This TMDL recommends that all sewer conveyance purveyors inspect their pump stations for unauthorized emergency overflow points. If they are found to exist, they should be capped or otherwise eliminated. Where sewer lines intersect with surface waters, the need for water quality testing upstream and downstream of the lines should be evaluated based on the history of line integrity, age of the line, type of materials, and any other relevant factors. Other reasonable methods to inspect pipe integrity such as TV inspection and pressure testing should be considered also as they are appropriate.

It is anticipated that the EPA will be issuing new regulations governing the operation of sewage conveyance lines in spring/summer of 2003. Ecology is the delegated authority for implementing the NPDES program in Washington State and would therefore administer that program. The new regulation is intended to control pollution from conveyance systems.

**Stakeholders:** Ecology, EPA, sewer districts and other conveyance purveyors.

### **Onsite Septic Systems**

Onsite septic systems, both community-based and individual systems, are not a problem when designed, sited, and operated properly. A properly functioning OSS uses the soil surrounding the drainfield to remove bacteria and some nutrients from the wastewater. However, soil compaction, clogging of the soil with solids, and hydraulic overload can all cause a failure of the system to adequately treat wastewater. Signs of OSS failure include:

- Odors, surfacing sewage, wet spots, or lush vegetation in the drainfield area,
- Plumbing or septic tank backups,
- Slow draining fixtures, and
- Gurgling sounds in the plumbing system.

If wastewater surfaces as described in the first bullet above, it is possible that this wastewater could go directly to a nearby stream, or it could be carried there when it rains and water travels over the land surface.

Connecting septic systems to stormwater sewers or piping them directly to surface waters is occasionally discovered and is illegal. Another problem observed in some older septic systems is the subsurface movement of wastewater through extremely porous soils. This latter problem can be difficult to detect.

**Corrective/preventative actions:**

Homeowners should contact the Snohomish Health District for assistance if they suspect a problem with their septic tank. Homeowners should have their septic systems pumped and inspected on a regular basis. Information on the location and operation of your septic system is available by calling the Snohomish Health District at <http://www.snohd.org/envhealth/www/waste.html> or by calling 425-339-5250.

Repair costs for failing septic systems can vary greatly and can only be determined on a case by case basis.

The Snohomish Housing Authority has a low interest loan program to help moderately-low income residents (family of two less than \$46,000 income) to finance septic system repairs. You can contact the Snohomish Housing Authority by calling 425-290-8499 or at <http://hasco.org>. (See Funding Sources Section for more information).

**Stakeholders:** Residential homeowners

**Home and automotive maintenance activities**

Many of the everyday pleasures (or chores, depending on how you look at it) that we take for granted as a normal, acceptable, modern activities can have a dramatic effect on local waters. That is because the sewer systems that remove excess water from our streets do not take the water to our local sewage treatment plant as one might believe.



**Figure 9. On site septic systems.** Septic systems require regular servicing. If you know you have a septic system and the ground above it is wet, squishy, or smells bad, you should contact the Snohomish Health District to help prevent the possibility you or your family could be at increased risk for contracting disease associated with residential wastewater.

Car wash wastewater going to North Creek is a common problem. Whether or not we use biodegradable soap, the suds that go off our driveway and down the street often end up in the local stream. Most folks wouldn't dream of emptying dirty soapy water into the stream but actually, that is just what happens.

Similarly, if water runs off a fertilized lawn, the same thing can happen although you don't have the suds to let you know the pollution is there. Pesticides and herbicides we put on our lawns are also being found in urban creeks. These compounds act the same way in the water as they do on your lawn. Common garden chemicals are now widespread throughout Puget Sound and damaging local waters.

Although these sources of wastewater are not sources of bacterial pollution, they can lower the oxygen content of the water far away from where they first enter a stream and cause problems for fish. Pesticides and herbicides are designed to kill, injure, or suppress plant or animal growth, and that is just what they will do in the stream.



**Figure 10. What's wrong with this picture (other than the plaid pants?).** Although you can't drive your car onto a lake as shown in this picture, the ultimate destination of car wash wastewater is North Creek and Lake Washington. Car washing water, excess fertilizer, pet wastes, and anything else that can dissolve in water will travel in stormwater runoff and eventually pollute North Creek. Instead, wash your car on your lawn or take it to a salmon-friendly car wash. Use as little fertilizer and pesticides as you can to prevent stormwater from washing these chemicals into your local stream.

**Corrective/preventative actions:** If possible, wash your car on your lawn—otherwise go to a salmon-friendly charity car wash (Mill Creek, Bothell, Everett, and Snohomish County all will help them set the car wash up in an environmentally safe manner), or to a local car wash. Local charities can contact the [Puget Sound Car Wash Association](http://www.pugetsoundcarwash.org/) (PSCWA, 1-800-509-9274) for discount tickets to be used at the General Brushless Car Wash on Evergreen Way, Papa Bear’s Car Wash on Bothell Everett Hywy, or other 21 participating car washes in the Puget Sound area. If you are interested in having Snohomish County’s basin steward talk to you about other ways to reduce your potential to create stormwater pollution through better landscaping, contact Craig Young at <http://www.co.snohomish.wa.us/publicwk/swm/steward/index.htm>.

**Stakeholders:** Homeowners, businesses

## Wildlife

Similar to other nonpoint sources, wildlife contributes to the level of bacteria in surface waters. Contributions from wildlife are typically not considered pollution. In those cases where man-caused alterations of the natural environment have caused concentrations of wildlife that lead to high bacteria levels, wildlife contributions may be considered a source of pollution that should be reduced. Examples of man-caused alterations may include certain agricultural areas (birds congregating on warm farm roofs for example) or recreational areas offering year-round refuge for large numbers of Canadian geese. At this time, no such areas have been identified in the North Creek study area.



**Figure 11. Are Wood Ducks contributing to our bacterial pollution problems?** Ducks, geese, and other wildlife in their natural settings are not generally considered sources of pollution by this TMDL. However, where human activities are concentrating animal populations and no other sources exist to explain high bacteria numbers, the increased risks to human health should be addressed.

## PLANNED ACTIVITIES AND SCHEDULES

A wide variety of activities is proposed in this Action Plan to reduce bacterial pollution levels. Local governments and others that have planned activities to reduce bacteria levels in the Snohomish Tributaries include Snohomish County, each of the local city governments, and others detailed in Appendix B. The actions required of National Pollutant Discharge Elimination System (NPDES) stormwater permit holders are anticipated to have a great affect on pollution levels and greatly improve public awareness of the contributions of stormwater pollution—those activities are detailed under the section Sources of Pollution, Stormwater. Many of the activities underway have been previously detailed in the North Creek Submittal Report (Svrjcek and Glenn, 2002).

Listed below is a brief summary of the voluntary and required actions that will address the bacterial pollution and dissolved oxygen problems in the North Creek TMDL area. Because of the large number of activities planned, greater detail is provided in Appendix B

*EPA* provides considerable funding to Ecology through its Clean Water Act 319 program to help Washington State accomplish TMDL activities. Periodic conferences are conducted to help local and state governments meet the technical and organizational challenges of the TMDL program and staff are available to assist with other technical issues.

*The Muckleshoot Indian Tribe's Fishery Department* has an ongoing water quality program that assesses regional efforts affecting fish bearing waters such as North Creek that are within their Usual and Accustomed Fishing and Hunting Area.

*Ecology* will be coordinating water cleanup activities throughout the watershed. Grant funding and assistance with the preparation of grant applications is available. Ecology will provide technical assistance to basin stakeholders, issue and administer a stormwater permit program, and perform enforcement. Ecology may also assist in monitoring if resources allow and will report annually on TMDL progress in North Creek.

*Snohomish Conservation District* received grant funding from Ecology in 2003 to perform educational outreach/technical assistance to small farms in the North Creek Watershed. Two workshops will be held in 2003, one workshop in 2004, and Horses-4-Clean Water classes will occur in 2005. A south Snohomish County web page for small farm management will be developed in 2004. Selected farms will receive water quality monitoring to measure BMP effectiveness in the south county area.

*The Puget Sound Action Team (PSAT)* will provide technical assistance to local governments and administer the PIE personal services contract program. PSAT is also actively promoting Low Impact Development (LID) practices and will develop and distribute LID information as resources allow.

*Snohomish County* will continue to perform water quality monitoring, public education, and provide technical assistance to citizens, businesses, and local government. Snohomish County will address stormwater pollution under its Phase I Municipal Stormwater Permit. Ecology has offered grant funding for the County's Animal Waste Management Campaign and the Integrating Stormwater Water Quality Management

project. The county investigates water quality complaints, performs enforcement, and promotes Low Impact Development practices.

*The city of Bothell* was awarded grant funding from Ecology in 2003 to implement the Lower North Creek TMDL Action Plan, which involves water quality monitoring, education and outreach, and other actions to assist with this TMDL. Additional grant funding has been offered build educational kiosks in the North Creek/Sammamish River trail system. Stormwater pollution will also be addressed under its Phase II Municipal Stormwater Permit. The city provides education and volunteer opportunities for its citizens through classroom study, cleanup and planting days, public access TV, & written material. Water quality complaints are investigated & enforcement performed.

*The city of Everett* performs monitoring, education and outreach, and corrective actions to assist with this TMDL. In addition, the city will be addressing stormwater pollution in the future under its Phase II Municipal Stormwater Permit. Educational outreach through classroom visits are offered to all schools and citizens and both web-based and written materials on water quality are available. Water quality complaints are investigated and enforcement is performed. Everett is working with Ecology to address the low summer base flows in North Creek using groundwater pumping augmentation techniques.

*The city of Mill Creek* performs water quality monitoring and intends on offering opportunities for volunteer monitoring in the future. Working with the Mill Creek Community Association and its Parks Department, pet waste stations are being installed and maintained in a number of locations to assist with this TMDL. Education and outreach will be made through flyers, brochures, and articles in the local media. The city recently received grant funding to provide educational signage at creek crossings throughout the city. Water quality complaints are investigated and enforcement is performed with attention to detention pond maintenance. The city will be addressing stormwater pollution in the future under its Phase II Municipal Stormwater Permit.

*Snohomish Health District* is working in partnership with Snohomish County and Ecology to identify and address bacterial pollution from failing septic tanks. The district responds to requests from local government when problems are reported and provides technical assistance and educational materials to homeowners.

*The Adopt-A-Stream Foundation (AASF)* received a grant from Ecology to organize the North Creek Streamkeepers and improve the overall health of North Creek. AASF was recently offered additional funds by Ecology to perform door-to-door outreach in selected areas of the North Creek watershed. AASF offers educational and volunteer opportunities for all North Creek residents. AASF is also expected to increase its role in local water quality monitoring as funding permits.

*The Mill Creek Community Association (MCCA)* will help educate its residents on stormwater pollution and work with local government to reduce the impact of stormwater pollution on Penny Creek. Pet waste management stations are an early goal to assist with this TMDL. Opportunities to improve riparian conditions will be explored with local government and environmental groups.

# MEASURING PROGRESS TOWARDS GOALS

Table 4 below summarizes the target geometric means for fecal coliform bacteria set forth in the North Creek TMDL. Ecology’s modeling of available data predicts that when the target geometric means are met, that both the geometric mean, and the 90 percentile values for Class AA waters will be within state water quality criteria.

**Table 4 - Water Quality Targets.** The following is a summary of the current understanding of bacterial pollution levels in North Creek and the target levels set forth in the North Creek Submittal Report.

| Monitoring Station       | Fecal Coliform Bacteria Levels from previous sampling (Geometric Mean Value) |            | Target Geometric Mean (cfu/100 mL) |            |
|--------------------------|--|------------|------------------------------------|------------|
|                          | Geometric Mean (cfu/100 mL)  |            | Geometric Mean (cfu/100 mL)        |            |
|                          | Wet Season   | Dry Season | Wet season                         | Dry Season |
| nclu (McCollum Park)     | 128  | 230        | 23                                 | 25         |
| ncll (County line)       | 111  | 292        | 19                                 | 35         |
| KC Site (mouth of creek) | 155  | 264        | 34                                 | 45         |

Ecology anticipates that if state and local coordination proceed as expected, by December 2008 each of the sampling stations within the North Creek watershed will be within water quality standards for bacteria. Filbert, Tambark, and Penny Creeks (which are assumed to be out of compliance due to downstream bacteria levels) are anticipated to be achieving standards by 2006.

In order to gauge the progress of this TMDL, Ecology will convene a meeting of municipal stakeholders no less than annually in order to share information on the state of water quality in the watershed and status of implementation activities. Water quality data, trends (where applicable), regulatory changes, new and innovative concepts, and funding sources will be discussed to evaluate the overall status of the TMDL. Ecology will solicit input from the workgroup at this time in order to help direct the adaptive management of this TMDL.

# MONITORING PLAN

As noted earlier, an essential part of this water cleanup effort is the monitoring of surface waters and identification of potential pollution sources. Monitoring is needed during all phases of the TMDL to identify polluted areas, contributing sources, and to verify that corrective actions have been, and remain effective in protecting local waters. Each of the municipalities affected by this TMDL faces variations in the number of potential source areas, types and numbers of land uses, financial constraints, and other issues that will affect the scope of TMDL-related monitoring within their jurisdiction. Ecology recognizes this and intends there to be flexibility in the development of water quality monitoring programs associated with this TMDL.

The conceptual framework for monitoring related to this TMDL is discussed below. Due to the factors noted above, this Action Plan will not attempt to detail the scope of monitoring needed by current and future stormwater permittees at this time. The scope of monitoring should be evaluated through the public review of the Bacterial Pollution Reduction or Early Action BMP Plans detailed earlier in this document.

Ecology acknowledges that great variability may exist in some of the currently available data and that this appears to present a challenge when verifying the effectiveness of BMP implementation in the future. It is assumed that this variation exists as a result of very high data points that should be eliminated as pollution reduction activities are implemented. When clearly identified BMP implementation begins, then a new baseline for data analysis will begin for purposes of reevaluating compliance of local waters with state standards.

Monitoring efforts that can contribute to the successful implementation of this plan will take several forms. These include ongoing ambient monitoring programs, targeted source control monitoring, effectiveness monitoring, and special purpose studies.

## Ongoing Ambient Water Quality Studies

Ambient water quality samples are generally collected at or near the mouth of major streams and just above the confluence of incoming creeks whenever possible. Sampling sites are also dependent on the presence of public access points or those granted by local landowners.

Snohomish County currently performs monthly monitoring water quality in North Creek at two locations, McCollum Park and at the county line at 240<sup>th</sup> ST SE, and intends to continue monitoring at these sites. Snohomish County data can be found on the internet at [http://198.238.192.103/spw\\_swhydro/wq-search.asp](http://198.238.192.103/spw_swhydro/wq-search.asp).

The city of Everett currently performs quarterly monitoring within the North Creek watershed at two sites; above McCollum Park where North Creek flows underneath Interstate 5, and on Silver Lake Creek. The city intends at this time to continue quarterly monitoring at these sites.

The city of Mill Creek is currently developing a water quality monitoring program which it hopes to initiate in September of 2003. At this time, it is anticipated that approximately four sites will be monitored monthly to help characterize water quality in Penny Creek

and mainstem North Creek. The city hopes to continue this water quality monitoring program beyond June 2004 if funding and staff resources are available.

The city of Bothell is currently monitoring all tributaries of North Creek within its jurisdiction. The city will develop baseline data on the water quality of these streams then implement a program of water quality improvements. After pollution prevention and abatement practices have been put into place, the city will re-characterize local waters to determine if improvement has occurred.

King County currently collects monthly water quality samples in North Creek upstream of the State Route 522 Bridge. The county intends on continuing sampling at this point and their data can be found on the internet at <http://dnr.metrokc.gov/wlr/waterres/streams/north.htm>

The Adopt-A-Stream Foundation is currently recruiting volunteers to perform water quality monitoring and stream assessments. Ecology will work with AASF to include bacterial testing in this program.

## **Targeted or Source Identification Monitoring**

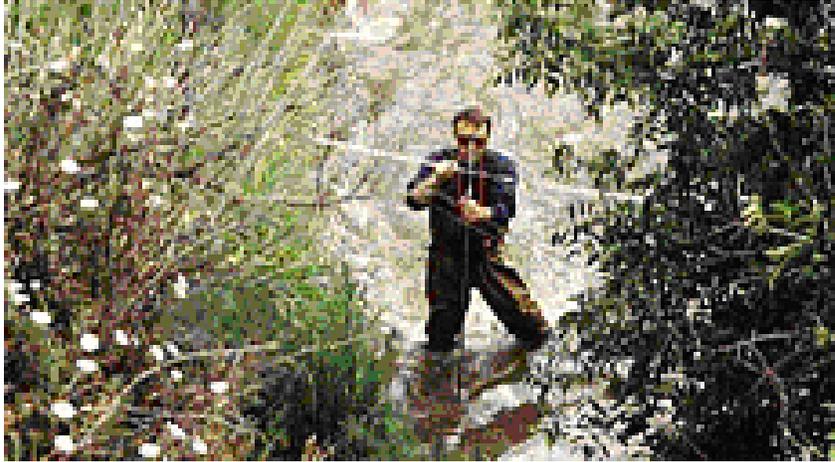
Targeted monitoring is used to pinpoint suspected pollution sources and allow the limited resources of local government and private groups to focus their resources efficiently where they are needed most. Targeted monitoring is used when pollution sources are not obvious and additional data is needed to track down the unknown or suspected sources. Events that typically trigger the need for targeted monitoring include:

- When ambient water quality monitoring has identified high bacteria levels on either a consistent or a sporadic basis.
- Where potential sources of fecal coliform bacteria are identified such as poorly managed animal confinement/recreation areas or illicit discharges.

When high bacteria levels are observed, additional sampling can help to track the bacteria source down to a discrete geographic area. Ecology and local government authorities will review the data and determine how to proceed to control the source(s). This TMDL supports funding for targeted monitoring programs to identify pollutant sources and develop programs to reduce or eliminate those sources.

## **Effectiveness Monitoring**

The purpose of effectiveness monitoring is to provide assurance that control measures put in place as a result of this TMDL reduce pollutant loads so that the waters of North Creek return to compliance with state standards. Ecology is responsible for determining, through effectiveness monitoring, the status of water bodies subsequent to the development and implementation of each TMDL. The timing of this monitoring will be dependent upon the pollution parameters addressed in the TMDL, the period after which positive results should be identifiable, and the availability of resources. Effectiveness monitoring priorities will be selected by each regional office and verified through the annual scoping process. Ecology will use all available sources of data when effectiveness monitoring is initiated.



**Figure 12. Water Quality Monitoring.** Direct measurement of the quality of surface waters is needed throughout the North Creek watersheds in order for this TMDL to be effective. Monitoring surface water helps us find where pollution is coming from and whether or not our implementation efforts have been, and continue to be, effective in protecting local streams.

In order to be thorough in accomplishing this task, monitoring personnel in Ecology's Environmental Assessment Program (EAP) will follow a review sequence. The sequence will include consultations with the original TMDL modeler to determine critical parts of the implementation plan and to verify critical locations. The EAP will also contact the regional office TMDL coordinator to determine the status of the TMDL implementation plan and what ongoing monitoring has been initiated as part of implementation activities. On completion of these steps, an examination of the resulting data will be made and a water quality status determination will be announced for the water body in an advisory memorandum followed by a technical report.

## **Special Purpose Studies**

In some cases, special purpose monitoring studies may be needed to support the goals of this TMDL. There is a great need to improve the efficiency, accuracy, and the scope of water quality monitoring with respect to bacterial source control. Potential areas for special studies that have been identified at this time are as follows:

- Evaluating the success of individual projects in order to evaluate BMP effectiveness.
- New techniques for source tracking such as DNA ribotyping, antibiotic resistance, bacteriodes testing, optical brightener testing, etc....
- Effects of sediment archiving where BMPs have been applied and other obvious sources have been addressed.
- GIS-, or landscape scale analyses that include monitoring for model or process verification or pollution source identification (e.g., identifying areas with a high potential for the presence of failing septic tanks).

# REASONABLE ASSURANCES

When establishing a TMDL, reductions of a particular pollutant are allocated among the pollutant sources (both point and nonpoint sources) in the water body – for the North Creek Fecal Coliform Bacteria TMDL, both point and nonpoint sources exist. TMDLs (and related Action Plans) must show “reasonable assurance” that these sources will be reduced to their allocated amount. Education, outreach, technical and financial assistance, permit administration, and enforcement will all be used to ensure that the goals of this water clean up plan are met.

The first step in implementing control actions will be through a cooperative approach with agencies with technical or financial assistance missions or responsibilities through NPDES permits when they are issued or reissued. When those tools are not effective in achieving implementation of control measures, enforcement may be used. Planned and ongoing control actions that establish reasonable assurance are discussed below. If implementation actions have occurred as planned and North Creek has not returned to compliance with state standards, then adaptive management will take place as set forth in the North Creek TMDL Submittal Report.

## NPDES Permit Programs

Several NPDES permit programs will be directly affected by this TMDL. These include the municipal stormwater permit program and the industrial permit program. Bacterial contributions from municipal stormwater will be controlled through Snohomish County’s Phase I Municipal Stormwater Permit in unincorporated Snohomish County. Phase II stormwater permits will be issued to the cities of Everett, Mill Creek, and Bothell. Water cleanup activities from these entities are discussed earlier in this document.

## Ecology Funding Programs

Ecology has a Centennial Grant program that is widely used by North Creek stakeholders to help fund water cleanup activities. Currently, the Snohomish Conservation District, the city of Bothell, and the Adopt-A-Stream Foundation are all performing TMDL-related activities within the North Creek watershed using Ecology grant funds. In the 2004 funding cycle, Snohomish County, city of Bothell, and the AASF all received grant funding offers for additional work in the North Creek watershed.

Ecology also has a small amount of intergovernmental contract funding (up to \$10,000/annually) that will be available for funding small projects related to the North Creek, Snohomish Tributaries, and Snoqualmie TMDLs. Ecology provided funding for pet waste collection stations and water quality monitoring to the city of Mill Creek during the period July 2003-June 2004. When fencing and riparian restoration projects are identified, stakeholders can also work with the North Creek TMDL lead to explore funding through the Coastal Protection Fund.

## Other Water Cleanup Activities

In addition to regulatory and grant funding programs in place through the Department of Ecology, there are numerous other water cleanup activities planned, which are detailed in

Appendix A. Among the participating entities are Snohomish County, local cities, Snohomish Health District, Snohomish Conservation District, Adopt-a-Stream Foundation, the UW Bothell/Cascadia College, and the Mill Creek Community Association.

## **Adaptive Management**

The adaptive management approach for the North Creek TMDL calls for evaluating whether BMPs are effective at causing North Creek to attain water quality standards after five years of implementation activities. Following the successful implementation of BMPs and adequate sampling representing all climatological, hydrological, and land use characteristics, a reassessment of compliance with water quality standards can be made.

If water quality standards for both fecal coliform bacteria are met without meeting the target geometric means or target percent reductions specified in Table 4, then the objectives of this TMDL are met and no further reductions or additional BMPs are needed. If the target geometric means and target percent reductions in Table 4 are met, but the stream still does not meet water quality standards for dissolved oxygen, then Ecology will develop a TMDL for dissolved oxygen.

For the first five years following approval of this TMDL the emphasis will be on implementation and development of monitoring programs. Both targeted source control monitoring and routine long-term ambient monitoring are needed. As fecal coliform source control measures and activities are successfully completed, the implementation of this TMDL will be based on the adjustment of source control efforts throughout the watershed as determined by ambient water quality monitoring. If new fecal coliform sources are found that were not previously identified, they will be corrected through appropriate jurisdictions.

## **Enforcement**

The Water Pollution Control Act (chapter 90.48 RCW) provides broad authority to issue permits and regulations, and to prohibit illegal discharges to surface water. It designates Ecology as the state water pollution control agency for all the purposes of the federal Clean Water Act. The act openly declares that it is the policy of the state to maintain the highest possible standards to ensure the purity of all waters of the state and to require the use of all known, available, and reasonable means to prevent and control water pollution. The act defines waters of the state and pollution and authorizes the Department of Ecology to control and prevent pollution, to make and enforce rules, including water quality standards. Under this statute, Ecology is authorized to administer wastewater disposal permits and to require prior approval of plans and methods of operation of sewage or other disposal systems.

Local governments are also expected to continue exercising their authority to enforce their ordinances. Ecology will also encourage local government to enforce local ordinances pertaining to stormwater discharge or water quality where in effect and applicable.

# PUBLIC INVOLVEMENT

The timelines for voluntary implementation activities have been created in consultation with all of the agencies and organizations involved. Ecology convened a municipal workgroup to guide the preparation of this Action Plan and consulted with other parties directly. Timelines and actions related to future wastewater permit requirements were prepared solely by Ecology. This document was reviewed by all participating organizations in Appendix B.

A comment period was provided to gather input on the draft version of this Action Plan. The comment period ran from May 26, 2003 through June 20, 2003. Comments received during that timeframe were reviewed and incorporated as appropriate into the final version of the Action Plan. Responses to comments can be found in Appendix A of this document.

An Ecology report on local water quality and announcement of the public comment period was mailed to one third of the households in the North Creek watershed (randomly selected) and to interested parties on May 28, 2003. A news release was also sent to newspapers serving residents of the North Creek watershed.

A public meeting on the draft plan was held on the evening of Wednesday, June 11, 2003 at the Knights of Columbus Hall in Bothell.

Current information on the status of the North Creek TMDL can be found at the following website:

[http://www.ecy.wa.gov/programs/wq/tmdl/watershed/north\\_creek/index.html](http://www.ecy.wa.gov/programs/wq/tmdl/watershed/north_creek/index.html)

# FUNDING OPPORTUNITIES

There are a number of sources of funding available from agencies mentioned in this document. These are some of the more popular funds used in our area; however, project proponents should consider contacting the regional Ecology TMDL lead for more ideas. There are many other funding sources, especially for projects that benefit both water quality and salmon habitat.

A good source of information on funding sources is the Catalog of Federal Funding Sources for Watershed Protection Web site. This site provides a searchable database of financial assistance sources (grants, loans, cost-sharing) available to fund a variety of watershed protection projects. To learn more about the federal catalog, use the following link: <http://cfpub.epa.gov/fedfund/>

An important aspect of gaining funding is to have a clear need identified. It is recommended that you contact the grant specialist for the grant you are considering in order to obtain up-to-date information on current grant priorities, deadlines, and procedures. The following is a partial list of funding opportunities that are popular in western Washington.

## Environmental Protection Agency



### Environmental Education Grants Program

Education institutions, environmental and educational public agencies, and not-for-profit organizations are eligible for this funding which supports environmental education projects. These grants require non-federal matching funds for at least 25 percent of the total cost of the project. If project requests are \$5,000 or less through a Regional Office or \$100,000 or less through EPA Headquarters, chances of being funded increase. For more information contact Diane Berger @ (202) 260-8619, [berger.diane@epa.gov](mailto:berger.diane@epa.gov), or on the Internet @ [www.epa.gov/enviroed](http://www.epa.gov/enviroed).

## Ecology Funding Opportunities



### Centennial/SRF/319 Fund

These three funding sources are managed by Ecology through one combined application program. Centennial and 319 funds are grants and the State Revolving Fund (SRF) is a low interest loan program and each is available to public entities. Grants require a 25 percent match. They may be used to provide education/outreach, technical assistance, for specific water quality projects, or as seed money to establish various kinds of water quality related programs or program components. At the time of this report, grant funds are generally not available for making capital improvements to private property. However riparian fencing, riparian re-vegetation, and alternative stock watering methods are grant eligible. Eligibility rules can change so one should check at the beginning of each grant cycle. It is recommended that you contact the Ecology Water Cleanup Specialist for your watershed directly to discuss and develop grant proposals.

Low-interest loans are available to public entities for all the above uses, and have also been used as “pass-through” to provide low-interest loans to homeowners for septic system repair or agricultural best management practices (loan money can be used for a wider range of improvements on private property), for instance.

Ecology’s grant and loan cycle kicks off each year with public meetings held throughout the state. In 2003, it is anticipated to start in December, but in 2004 and future years, it will likely begin much earlier in August. See Ecology’s webpage at <http://www.ecy.wa.gov/programs/wq/links/funding.html> for more information on Ecology funding assistance as well as other funding sources.

### **Coastal Protection Fund**

Since July 1998, water quality penalties issued under Chapter 90.48 RCW have been deposited into a sub-account of the Coastal Protection Fund. A portion of this fund is made available to regional Ecology offices to support on-the-ground projects to perform environmental restoration and enhancement. Local governments, tribes, and state agencies must propose projects through Ecology staff. Stakeholders with projects seeking to reduce bacterial pollution are encouraged to contact their Ecology Water Cleanup specialist to investigate fund availability and to determine if their project is a good candidate.

### **King County**

King County offers a number of grant programs for water quality/salmon habitat related projects. Two of these programs are available to a majority of the North Creek watershed that is served by the King County Wastewater Treatment Division. The programs described below are generally available for projects that occur south of Silver Lake.



### **WaterWorks**

Grants up to \$50,000 are available for community projects focused on watershed improvement. Depending on the level of funding needed, one of three application processes apply. There is no deadline for applying for awards less than \$5,000. For larger projects, there are two application periods ending April 1 and August 1 (for 2003). See the King County website at <http://dnr.metrokc.gov/wlr/pi/grant-exchange/waterworks.htm>.

### **Splash**

The Splash Water Quality Education Fund provides grants up to \$15,000 for educational projects related to water quality. The primary activity of the project must be community education. Depending on the level of funding needed, one of three application processes apply. There is no deadline for applying for awards less than \$5,000. For larger projects, there are two application periods ending April 1 and August 1 (for 2003). See the King County website at <http://dnr.metrokc.gov/wlr/pi/grant-exchange/splash.htm>.

## Snohomish Conservation District Programs



### Conservation Reserve Enhancement Program (CREP)

The CREP is a voluntary program to establish forested buffers along streams where streamside habitat is a significant limiting factor for salmonids. In addition to providing habitat, the buffers improve water quality and increase stream stability. These same actions can also help reduce bacterial pollutant loadings to local waters. Land enrolled in CREP is removed from production and grazing, under 10-15 year contracts. In return, landowners receive annual rental, incentive, maintenance and cost share payments. The annual payments can equal 100 percent of the weighted average soil rental rate (incentive is 110 percent in areas designated by Growth Management Act).

### Environmental Quality Incentives Program (EQIP)

This federally funded program is also managed by Snohomish Conservation District. The EQIP program has the following features:

- Provides technical assistance, cost share payments and incentive payments to assist crop and livestock producers with environmental and conservation improvements on the farm.
- \$5.8 billion over next 6 years (nationally).
- 75 percent cost sharing but allows 90 percent if producer is a limited resource or beginning farmer or rancher.
- Program funding divided 60 percent for livestock-related practices, 40 percent for crop land.
- Contracts are one to ten years.
- NO annual payment limitation; sum not to exceed \$450,000 per individual/entity.

### The Public Involvement and Education (PIE) Program



The PIE program is administered by the Puget Sound Action Team. PIE dollars help citizens, schools, businesses, non-profits, local and tribal governments to:

- Create solutions to local pollution problems
- Protect, preserve and restore habitat
- Motivate people to be environmental stewards
- Partner with others for lasting results

PIE is not a grant program. Instead, through personal services contracts, the Puget Sound Action Team obtains the services of individuals and organizations to educate and involve residents of Puget Sound as they carry out the 2001 - 2003 Puget Sound Water Quality Work Plan. The Action Team staff provides guidance on fulfilling a state contract as well as technical assistance related to the project.

If you would like to receive notification of PIE funding opportunities, e-mail or phone your contact information to [gwilliams@psat.wa.gov](mailto:gwilliams@psat.wa.gov), 360-407-7311. To help you decide if PIE is the right program to fund your project, read through the [current and past PIE project descriptions](#).

## **Snohomish Housing Authority**

The Snohomish Housing Authority is an independent agency that helps build stronger communities by providing affordable housing and assisting low-income residents in maintaining their homes through low interest loans. When low-income residents face the challenge of replacing a failing septic tank, SHA assistance may be an option. Borrowers need to be moderately low income; a family of two with income less than \$45,000 or a family of four with income less than \$56,000. Homeowners making less than \$30,000 may be eligible for 0 percent loans. The home must be owner-occupied with a 20 percent equity stake and the housing authority loan must be in 2<sup>nd</sup> position. The maximum loan is \$40,000 for 30 years at 3 percent interest. You can contact the Snohomish Housing Authority by calling 425-290-8499 or at <http://hasco.org>.



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# **APPENDIX A: RESPONSE TO COMMENTS**



## Response to Comments

Comments regarding factual inaccuracies, improved wording, or those that clarify policy positions by other government agencies have been directly incorporated into the text of the final submittal report. All other comments are summarized below. In order to avoid redundant responses to similar or related comments, some comments have been combined.

- 1. Comment:** The Implementation Plan needs to acknowledge that natural bacterial sources also exist and could preclude attainment of numeric standards. In such cases, the natural levels would actually be the standards (WAC 173-201A-070(2)). Perhaps after a number of efforts to reduce bacterial loading it may be necessary to identify an alternate bacteria target level. The TMDL should acknowledge that a Use Attainability Analysis (UAA) to identify whether the designated uses are appropriate and to identify an alternate bacteria target level could be necessary if implementation proves that the Water Quality Standards are not attainable. Such evaluation should be made within the first two permit cycles.

**Response:** Natural bacteria sources are acknowledged in the North Creek TMDL Implementation Plan under Wildlife in the section titled Pollution Sources. Ecology acknowledges that whenever natural conditions are of a lower quality than the criteria assigned, the natural conditions shall constitute the water quality criteria. Differentiating between natural background and other bacteria sources that can be reduced is typically feasible only after extensive monitoring has occurred and source control measures have been applied. Determining natural conditions in relation to the reevaluation of load and wasteload allocations may become necessary during the adaptive management phase of this TMDL.

Ecology's initial approach to the North Creek bacteria TMDL is that the waters can be improved to attain suitability for their full range of beneficial uses; in other words, that North Creek can be cleaned up to meet water quality standards. Concurrently, Ecology acknowledges that finding the specific bacterial pollution sources and developing control strategies for the numerous sources will be challenging, especially for urban areas where the successful control of bacterial pollution is largely unexplored. This challenge exists for controlling the many human sources of pollution and in some cases, could be made more difficult given high concentrations of bacteria from wildlife sources.

At this early stage in the North Creek TMDL, Ecology is not considering use attainability studies for waters now considered polluted. The option to perform a use attainability analysis can be reconsidered during the five-year reassessment of implementation progress. The initiation of a use attainability analysis will be more likely in the event that concerted efforts at source control with additional BMPs have not been effective in bringing about water quality improvement.

- 2. Comment:** Figure 2 asserts that North Creek should be available for recreation opportunities. Recreational activities of concern for bacteria include wading and swimming. Where are the wading and swimming sites? Such sites should be clearly identified for each tributary on a separate figure. Since this is asserted in several

places in the text, and since it is human exposure that is the issue, the implementation plan should identify where all these sites are. In the public health interest, if it is considered a problem, then these areas should be posted to warn waders and swimmers. What criteria describe waters suitable for swimming? Seems like a certain depth is necessary. Warm water helps and so does access. So where in the summer is the water deep enough for swimming and where is there access for swimming? Note: there is no swimming potential at McCollum Park, wading is discouraged because of salmonids spawning beds.

**Response:** State water quality criteria for waters where swimming is a specified beneficial use are contained in WAC 173-201A-030(1) and (2). Ecology does not sanction swimming in any particular location or water body, or define the conditions under which swimming can take place. Due to both the dynamic nature of local streams and the infeasibility of enumerating all locations where children and adults have access to wade, fish, or bath in North Creek, this TMDL does not attempt to identify such locations. Ecology considers the posting of warning notices to local citizens to be a responsibility of local health districts.

**3. Comment:** Fish are not adversely affected by fecal coliforms. So, any reference to fish should be in the context of a dissolved oxygen discussion.

**Response:** Ecology concurs that fecal coliform bacteria do not adversely affect fish. However, reduced oxygen levels that may result from the excessive nutrients that are known to be associated with many fecal coliform sources. The narrative was changed to more clearly reflect the close association between dissolved oxygen and fish.

**4. Comment:** Figure 2 shows wading and inner tubing activity on a stretch of river at least 50 feet across—it should be removed. The flow in North Creek is, and probably always has been, insufficient to support anything close to the recreational activity depicted in the photo. An interesting imponderable to ponder is that swimmers are themselves sources of bacteria. The picture of the small child pouring a bucket over its head should be removed.

**Response:** Figure 2 was not intended to be representative of conditions in North Creek. Figure 2 and the picture of the small child are intended to provide the reader with a visual example to accompany the generic narrative on swimming, wading, and bathing activities in water. It is the goal of this TMDL to make local waters of North Creek watershed suitable for these types of activities.

Swimming and other recreational uses of North Creek are not expected to cause significant bacteria loading to the stream. When these activities are found to cause significant contamination, then signage, restroom facilities, educational campaigns or other measures are recommended for source control.

**5. Comment:** The Implementation Plan states that Ecology anticipates sampling stations will be within water quality standards by 2008. This goal is unattainable. Similarly, the stated 90 percent reduction in bacteria levels is not achievable in this watershed. The DIP also refers to an adaptive management process whereby the

suggested BMPs in this document become required actions. Municipal stormwater permittees do not want to be put in an unacceptable position of being out of compliance with NPDES permit requirements because of an unreachable TMDL standard.

**Response:** Based upon the Memorandum of Agreement Between The United States Environmental Protection Agency and The Washington State Department of Ecology Regarding The Implementation of Section 303(d) of The Federal Clean Water Act, Ecology must provide timeframes for meeting interim targets and water quality standards in this Action Plan. Ecology believes that water quality goals, and tracking of progress toward attaining those goals, are necessary to return local waters to compliance with state standards. Should goals not be reached according to the prescribed schedule, Adaptive Management will be employed as stated in this TMDL.

Should additional BMPs need to be incorporated into NPDES permits, permit holders will have the opportunity to appeal those provisions.

**6. Comment:** The recommendation that developers should maximize buffer widths is inappropriate. Buffer widths are established through the land use authority of local governments and the Growth Management Act. The TMDL should not be used to dictate land use conditions to local government. Landowners and developers do not make the decision on the size of minimum buffer widths. Instead, it could be suggested that property owners along streams contact their local government to work on planting trees on their property to reduce stream temperatures. It is suggested to replace the word "...maximize..." with "...preserve...".

**Response:** This TMDL does not impose additional land use regulations or buffer-width requirements on any parties. Rather, general recommendations are made that are intended to improve local water quality and encourage all stakeholders (citizens, businesses, local government) to participate voluntarily. Thus, the TMDL does not dictate land use conditions to local government, nor does it stipulate new requirements for developers. Developers have choices in how developments proceed and can choose to have larger buffers than the minimum prescribed in regulation.

For those cases where buffers are being created, or enlarged as a part of a development project, the current wording is broader and more inclusive of the possible scenarios than could occur than the proposed change in wording would allow. In the case of NPDES permits, the authority to incorporate portions of this Action Plan as enforcement elements of a permit are established in the NPDES permit consistent with existing state and federal laws and regulations, not as part of this TMDL document. Those proposed conditions may also be appealed as part of the issuance of an NPDES permit.

**7. Comment:** The data in Table 3 summarizing DNA testing are quite significant. In spite of the numerous qualifiers and disclaimers in the title, it makes a clear statement that in similar creeks, there are both human and domestic animal sources of bacteria as well as natural wildlife sources. It is fair to lump cats, dogs, humans, horses, bovines, and chickens as clearly human-caused sources. It is also fair to say that avian, canine, opossum, rabbit, raccoon, rodent, squirrel, deer, multi species, beaver,

goose, and sea gull are essentially natural sources. Granted, sometimes humans do things to attract some birds, but humans have also been responsible for greatly reducing the amount of wildlife. While Ecology believes the data may not be used to accurately quantitate loadings from each source category, the data probably provide the best information we have at this time.

The data in Table 3 clearly suggest that natural bacterial sources may contribute as much as 50 percent of the bacteria. The data therefore suggest that a TMDL reducing the human sources will not achieve the numeric standards. The data also provide a further means to evaluate the success of any BMPs implemented. If the percentages for the human associated sources decrease, the BMPs are having an effect. Data in Table 3 is inaccurate for Glenwood Creek is not as no human sources were detected.

**Response:** Available DNA ribotyping data provides information on the various sources of bacterial pollution, but not their relative contributions on a quantitative level. The studies were not designed to determine the relative proportion from each bacteria source. Therefore, the data cannot be used to say that nonhuman sources constitute a specific portion of the pollution problem in any of the studies cited. Ecology is encouraging that the use of this scientific procedure be examined further, and if it can be done cost effectively, procedures should be developed to allow for quantification of bacterial sources.

Ecology recommends a number of source identification techniques in this TMDL and believes that local government and citizens need to determine which techniques are most practical and work best in their watershed. Ecology advocates initial use of conventional source identification techniques such as visual inspections and water quality sampling before the expenses of DNA tracking methods are undertaken. DNA source tracing techniques currently being used can still provide important information; 1) to help confirm the makeup of discrete, high concentration sources identified in conjunction with other source identification techniques including ambient/receiving water monitoring, and 2) to provide a general picture of the range of sources contributing to bacterial pollution in a watershed.

Data for Table 3 have been corrected to reflect that no human sources were found. Data for Glennwood are from the combined data for both Glennwood studies and breaks the 30 percent avian category into 28 percent avian, 1.3 percent goose, and 0.7 percent sea gull categories based on analysis of raw data to improve comparability with other studies presented.

**8. Comment:** The TMDL plan encourages stormwater infiltration, but the 2001 Western Washington Stormwater Manual discourages infiltration by increasing the minimum separation between the bottom of the infiltration trench and either the water table or the hardpan from three feet to five feet. This is a much more stringent requirement than the corresponding requirement for septic systems (see Chapter 246-272 WAC), which allows infiltration of septic system effluent with a separation of 1 foot provided that sand filtration is used.

**Response:** Lacking sufficient data and analysis on the unique hydrologic features and trends for the North Creek watershed, this TMDL takes a practical and a precautionary approach to stormwater management. Infiltration of stormwater has the dual benefit of eliminating stormwater as a potential pollution source and the likelihood of maintaining natural hydrologic processes. Detailed discussion on the technical foundation of the 2001 Western Washington Stormwater Manual (WWSM) is not included in this TMDL

In developing the WWSM, Ecology must ensure that the proposed practices will be protective of both surface and groundwater quality. One challenge to the use of infiltration as a stormwater disposal method is the need to provide adequate treatment to protect groundwater supplies. For that reason, Ecology determined that in cases where a pond functions to perform both treatment and disposal, a five foot separation between the bottom of an infiltration pond and the seasonal high groundwater level is generally needed. This is based upon the best available information and includes observations of pond performance since the previous Ecology stormwater manual was published.

Because of the great differences in loading rates and treatment technologies between septic systems and stormwater treatment and infiltration ponds, this TMDL will not expand on why a smaller separation distance is acceptable in the case of onsite septic systems.

**9. Comment:** The predominant soil type within North Creek basin is Alderwood soils, with a hardpan/water table at approximately 36 inches (before any grading associated with lot development and leveling), thus the 2001 Stormwater Manual requirements preclude infiltration at many sites. If infiltration is so desirable, why does the 2001 DOE stormwater manual make it difficult to use infiltration as a stormwater disposal method? It is recommended that Ecology change the 2001 Stormwater Manual design criteria for infiltration to facilitate its use.

**Response:** Ecology does not consider soils mapping a reliable indicator of water table depth. The 2001 Ecology Stormwater Manual is correct in discouraging siting of infiltration basins where high water table or low permeability soils preclude optimal infiltration performance.

Under certain circumstances, the separation distance for infiltration basin can be less than three feet, or may need to be greater than five feet, depending on site conditions and pond functions (Ecology 2001 Manual, Volume 5, page 7-13). It is the reviewing agency's (city or county) responsibility to make the final decision based upon the specific conditions in consideration of a professional engineer's investigation and reports. An example of where an alternative separation distance might be appropriate, is where clean roof water is being infiltrated. Ecology is currently organizing several two-day training seminars on infiltration pond design that will take place during October 28-31, 2003.

Ecology also encourages the use of low impact development strategies to reduce stormwater volumes and thus the need for or size of stormwater conveyance and treatment systems.

**10. Comment:** The TMDL notes that ducks, geese, and other wildlife in their natural settings are “not generally considered sources of pollution by this TMDL.” However, they are sources of bacteria and their contributions could be sufficient to prevent attainment of the bacteria standards and the TMDL. Even if human conditions change the distribution of some wildlife, recognize that human conditions also have reduced the total amount of wildlife in the North Creek drainage basin, and what remains should be considered to be “natural”.

**Response:** The commenter makes a good point that wildlife is a source of bacteria and should be considered a “natural source” in the watershed. Quantifying the magnitude of contribution from wildlife typically involves some implementation of source control for other sources of bacteria and additional monitoring.

This TMDL has not documented the effect of human activities on wildlife populations in North Creek. Should the pollution identification and remediation activities recommended by this TMDL prove to be ineffective, the effect of wildlife populations can be considered as Adaptive Management is used to identify alternate courses of action to improve local water quality. Larger wildlife contributions mean the rest of us must contribute less pollution and thus smaller wasteload allocations for point sources.

**11. Comment:** Fecal coliform counts in surface waters are extremely variable. The coefficient of variance for twelve years of fecal coliforms monitoring by the city of Everett is 1.6. With such an extreme variability it will be very difficult and costly to determine the effectiveness of any BMP in reducing fecal coliforms. Therefore, effectiveness monitoring should be limited to determining if the BMP has been implemented and is operational rather than trying to prove that the reduction in fecal coliforms attributable to a particular BMP is statistically significant.

**Response:** Ecology acknowledges that monitoring bacterial pollution levels involves data that exhibits relatively high variability—this is reflected in state’s use of two water quality criteria (geometric mean and a 90<sup>th</sup> percentile component) to characterize acceptable bacteria levels. The first criterion is based on the use of a geometric mean to help address this variability. The second criterion is similarly crafted to help address this inherent variability by setting a limit on the upper decile of the sample population.

It is anticipated that in many cases implementation activities will result in the identification and reduction/elimination of pollutant sources resulting in the elimination of many of the peak values observed before pollution reduction activities began. This will reduce variability, which in itself could be a measure of change. Reducing this variability should also improve our ability to detect changes using geometric mean bacteria levels.

**12. Comment:** The first paragraph of the Reasonable Assurances section implies that NPDES stormwater permittees will be legally liable for achieving the goals of the TMDL. As pointed out above, it is not feasible to comply with the numeric water quality standards for fecal coliform bacteria because natural sources are not well understood, but may very well be sufficient to exceed the numeric water quality

standards. While the water quality standards include specific allowances for natural conditions, the TMDL and the DIP essentially deny such allowances. Therefore, it will be impossible for permittees to comply with the conditions of their NPDES permits to show that they will meet their allocated amount of reductions. Local governments should not be legally required to comply with an unattainable water quality standard. Therefore, reasonable assurances should be limited to verification that NPDES permittees have implemented the BMPs required by the TMDL.

**Response:** Ecology does not concur that the referenced text implies NPDES stormwater permittees are legally liable for achieving the overall goals of the TMDL. The TMDL provides wasteload allocations to municipal stormwater dischargers, which are designated as point sources by federal law. As noted in the first paragraph, Ecology will use enforcement when a cooperative approach to "...achieve the implementation of control measures..." is ineffective.

Ecology must establish water-quality-based effluent limitations for NPDES permittees where water quality problems have been documented. This TMDL documents such water quality problems. Although effluent limitations are typically expressed in a numerical form, effluent limitations for municipal stormwater discharges will be in the form of BMPs to be implemented by the permittees. If BMPs are implemented as specified in the NPDES permit, then Ecology, in its role as the designated authority for implementation of the NPDES program, will consider the permittees to be in compliance with its effective discharge limitations. The section on Reasonable Assurances must contain a discussion of all activities expected to lead to local waters meeting state standards.

**13. Comment:** The second paragraph in the Adaptive Management section needs to also acknowledge that adaptive management may help to better understand natural sources and lead to site specific bacteria targets and the need for a use attainability analysis. In such case, modification of the TMDL and the Action Plan will also be necessary. These are clearly allowed outcomes under both state and federal water quality standards, which may prove to be essential in North Creek and other watersheds.

**Response:** Please refer to responses to comments #1, and 10, which address the use of Adaptive Management principles and fecal coliform contributions from natural sources.

**14. Comment:** Table 4 is a summary of Implementation Plan Considerations. Adoption of these requirements is inconsistent with subsequent recommendations pertaining to alternative strategies for pollution abatement and application of BMPs. The county has a legal responsibility under the stormwater permit to reduce pollution entering the County stormwater system. The statutory requirement is for compliance with the water quality standards. Although development and adoption of these recommended codes is one mechanism to meet compliance with the water quality standards, there are other mechanisms to achieve the desired results. It is inappropriate to list these specific ordinances until we have implemented other approaches suggested in the plan and monitored their effectiveness. Better community education and watershed councils which implement the action items in their own specific communities are alternatives. Alternative language suggestions are as follows; "The following list of

actions items constitute guidance that may be considered by municipal stormwater permittees. Effective alternative actions are also acceptable.”

**Response:** As stated in the text, municipal permittees are required only to consider the use of actions provided in Table 4, not necessarily to adopt each one. For example, if it is determined by the permittee that one of the listed action items is unsuitable for addressing pollution sources within its jurisdiction, then that permittee would choose not to use that control strategy. It is however, Ecology’s expectation that each of these tools be evaluated for their usefulness in addressing bacterial pollution within the North Creek TMDL area. Different approaches are encouraged, and where adopted, should be documented in the Bacterial Pollution Remediation Plan or Early Action Plan as necessary.

The Implementation Plan considerations provided in Table 4 constitute the most common tools available to local governments to help address the water quality problems identified in this TMDL. Lacking specific information on alternative control mechanisms being considered by the many jurisdictions affected by this TMDL that would constitute a reasonable alternative to these approaches, Ecology believes that the requirement to consider the strategies in Table 4 is necessary.

**15. Comment:** The Action Plan states that the pollution contributed from various sources poses an unacceptable health risk for fishermen, bathers, and children. Although we support cleaning up North Creek, we should not be encouraging anyone to wade, swim, fish, or bathe in North Creek.

**Response:** Ecology is not advocating any particular uses of the waters of North Creek in planning to meet water quality standards for these uses. Ecology concurs that available data does not allow us to encourage the use of North Creek for bathing, fishing, and other direct contact recreation. Several reviewers noted that the use of visual aids to depict citizens were either not representative of North Creek, or that they encourage the use of North Creek for the uses illustrated. Care has been taken not to encourage recreational activities in North Creek, but rather to advocate and plan to bring the water quality to a level which is clean enough for its optimal beneficial uses. Various visual aids were added throughout the Action Plan to complement written text and to improve the delivery of important messages to basin stakeholders.

**16. Comment:** The data presented in the TMDL do not clearly indicate that human activities are causing high bacteria levels; therefore, it is not clear that BMPs will significantly improve water quality. The TMDL should clearly state that source identification is vital to reducing bacteria levels and may indicate that these are natural levels of bacteria.

**Response:** Recent fecal coliform data taken from three relatively pristine water bodies are provided as an indication of the low fecal coliform levels present in natural waters when human activities are not present. For example, fecal coliform bacteria levels in the upper Snoqualmie, Skykomish, and Stillaguamish Rivers were 3, 6, and 4 cfu/100mL, respectively. Assuming healthy wildlife populations in these watersheds, natural wildlife sources do not appear to be contributing bacteria to surface waters such that state standards are in jeopardy of being violated. Ecology concurs that source identification is

vital to the goal of this TMDL to reduce fecal coliform bacteria numbers to acceptable levels.

**17. Comment:** Several times in the document, BMPs for dissolved oxygen are discussed. Given that this TMDL may strongly influence future NPDES permit requirements, it is inappropriate to include any recommendations in the plan that discusses pollutants other than fecal coliform bacteria. This document should not include BMPs for parameters that have not been through an appropriate TMDL process.

**Response:** Ecology acknowledges that this TMDL provides wasteload allocations only for fecal coliform bacteria and those allocations result in an effect on the conditions of certain NPDES permits. Those conditions are limited to the reduction of bacterial pollution only. However, because segments of North Creek are listed on the Clean Water Act 303(d) list of impaired waters and nutrient inputs from bacterial pollution sources and reduced summer base flows can both affect dissolved oxygen levels, Ecology has provided information on impaired dissolved oxygen levels in order to encourage voluntary efforts to correct the problem. Ecology believes that including information on related impairments, such as dissolved oxygen, is consistent with the intent and goals of the federal TMDL program to address 303(d)-listed water bodies.

Language in the adaptive management section of Action Plan has been revised to further clarify that dissolved oxygen is not a parameter directly addressed by this TMDL. If dissolved oxygen levels do not improve, or if additional monitoring reveals impairment elsewhere in the North Creek Watershed, Ecology will prepare a TMDL directed at dissolved oxygen.

**18. Comment:** The section entitled “Altered Hydrology/Loss of Base Flows” contains erroneous and unfounded speculations and uses them to promote an off-base recommendation. Snohomish County data collected monthly between 1991 and 2000 from North Creek shows that there is no wet/dry seasonal stratification of fecal coliform concentrations. Ecology speculates that summer baseflows are low in North Creek because of the amount of impervious surface. The controlling factors for reduced baseflow in North Creek are not known at this time, although they could be determined with further analysis. Ecology uses these speculations as a basis to recommend “advancement” of low impact development (LID) methods, which would reduce impervious surface in new development. This recommendation is not supported by the information presented and it should be removed.

**Response:** Throughout the discussion of pollution sources, Ecology has provided a general discussion about the nature of potential of those sources to affect either fecal coliform bacteria, dissolved oxygen levels, or both. The section on Altered Hydrology/Loss of Base Flows is similarly structured and written so as to discuss the potential problems facing all urban streams. Care was taken not to make unsubstantiated claims as well as to note that no research was identified regarding the reduction of summer base flows due to the large amount of impervious cover in the North Creek watershed. Similarly, LID practices were recommended based upon the fact that hydrologists generally support the notion that natural systems rely upon the infiltration of

rainwater during wet seasons to create interflows and groundwater supplies that provide an important portion of stream flows during dry weather periods.

**19. Comment:** Aspects of LID, such as reduction of road widths, may partially conflict with the Uniform Fire Code. It is less cumbersome and much more expedient to approve LID development through a consistent waiver process than it will be for codes that are applicable across the nation to be changed. It is recommended that Ecology, PSAT, and Snohomish County collaborate to create a checklist, including engineering standards and practices, which would constitute a consistent, predictable set of standards for plan development, plan review, and plan approval for LID development.

The 2002 Ecology Stormwater Manual for Western Washington has some provisions for LID practices, but the provisions are limiting when topographic constraints are imposed. Rather than ask Snohomish County to develop an LID code through this one particular TMDL, it would seem more broadly useful for Ecology to develop a model code that could be applied throughout the region and would reflect a robust public and technical review process.

**Response:** Ecology encourages the use of Low Impact Development (LID) strategies to reduce stormwater volumes and thus the need for or size of stormwater conveyance and treatment systems. Ecology concurs that the above-described approach provides the necessary flexibility for local government to incorporate LID into their development practices prior to the establishment of more detailed guidance and regulatory mechanisms.

Ecology and the Puget Sound Action Team (PSAT) are currently working on several projects to promote LID. Recently PSAT published "*Natural Approaches to Stormwater Management*," which details LID projects already completed or underway in the Puget Sound area. The document also includes a section on ordinances, regulations, and other LID implementation strategies developed by various local governments. In addition, PSAT is developing guidance for how to put together an LID plan for a site.

Ecology and the PSAT both intend to provide more specific guidance on use of certain LID practices in western Washington. Ecology is likely to publish guidance regarding design criteria for various types of engineered LID practices (e.g., bioretention, vegetated roofs, low impact foundations, various dispersal techniques, amended soils, etc...) and to provide a way by which to estimate a reduction in surface water flows attained by use of those practices. Using this approach, designers can choose those practices that fit their development or that meet certain locally adopted goals or requirements for reduced surface water runoff or reduced site disturbance.

Local governments may choose to require certain minimum LID features through their site development standards (e.g., city of Olympia site development standards for the Green Cove Basin). Ecology believes that it is more appropriate for local governments to specify such standards because: 1) local governments are primarily responsible for land use management through the Growth Management Act, and 2) the standards can be tailored to the needs or goals for a particular watershed.

**20. Comment:** If additional regulations are needed, perhaps they are best adopted and enforced at the state or federal level. Ecology has implied or directly stated that the specific problems leading to the ordinance recommendations are general and widespread. For example, the issues with livestock management and composting are stated as typical of these activities, not peculiar to these activities in the North Creek Watershed. It would be most helpful for Ecology to develop either uniform statewide regulations or model ordinances for local jurisdictions to consider that were based on rigorous public and technical review processes.

**Response:** The state of Washington has already developed regulatory programs to address a number of potential bacterial pollution sources including dairy manure management, composting facilities, and stormwater management. Under existing stormwater management regulations, local governments must have the ability to control pollution entering their stormwater system.

**21. Comment:** Water quality data collected from North Creek near the Everett city limits within the last six months indicate that Klebsiellae species may be a significant source of bacteria. Some species of Klebsiellae are associated with vegetation and are not indicative of pollution from humans or animal sources.

**Response:** Klebsiella bacteria are common in natural waters and are enumerated in fecal coliform tests even though they do not always originate from intestinal tracts of warm blooded animals. Between 10 to 40 percent of human and animal populations may have Klebsiella as an intestinal bacterium (Storm, 1981; Duncan, 1988). They have been found to be a major factor in the fecal and total coliform counts from forest environments (Duncan and Razzel, 1972).

Ecology's workgroup on evaluating state bacterial standards concluded that risk of illness from environmental exposure to Klebsiellae species is low, and that Klebsiella is an opportunistic pathogen that primarily acts upon people that are already immune challenged (Hicks, 2001; <http://www.ecy.wa.gov/biblio/0010072.html>). However, Klebsiella has been documented as a causative agent in food-borne outbreaks of gastroenteritis in healthy individuals (Rennie *et al*, 1990). Although Klebsiellae species constitute a lower risk for infection than some other pathogens, they are enumerated in the fecal coliform bacteria test and thus their presence has been accounted for in previous risk assessments used to set state bacteriological standards.

Ecology has reviewed the two sample results from the city of Everett and believes that more information is needed to determine the contribution of Klebsiellae species to fecal coliform results.

**22. Comment:** The first sentence on page 18 describing the Targeted Implementation Approach should be deleted since Strategy A, correctly in our opinion, does not require BMP effectiveness monitoring.

**Response:** Determining the effectiveness of TMDL activities can take many forms. The referred sentence highlights the benefit of targeting BMP implementation on high priority areas in order to help ensure cleanup activities will be successful. Ecology believes that

effectiveness monitoring is critical to the success of this TMDL and intends on showing flexibility in determining whether or not stormwater management programs are improving or protecting surface waters. Program evaluation and reporting is a minimum federal requirement for all municipal stormwater permit holders regardless of the presence of a TMDL.

**23. Comment:** Given that most sewers in the North Creek watershed have been constructed within the last 30 years, it is unlikely that sewer lines are a significant source of bacteria. Rather than requiring testing upstream and downstream of every sewer line that crosses North Creek, DNA source tracking should be used to determine if there are human sources of bacteria in that segment of North Creek. If the DNA source tracking suggests that there are no human sources of bacteria, monitoring at sewer line crossings should not be required.

**Response:** Ecology does not recommend testing upstream and downstream of every sewer line that crosses North Creek or its tributaries. Given the many miles of pipe, the potential for sporadic problems to occur, and the tremendous amount of untreated wastewater conveyed by these systems, it is prudent to recognize them as potential bacterial pollutant sources. Only where water quality data indicate a localized water quality problem, or where the history of line integrity, age of the line, type of materials, geological conditions, or other factors point to an area of potential concern, does this TMDL recommend water quality testing upstream and downstream of a sewer line.

DNA source tracking, whitener tests, or caffeine tests could be used in conjunction with other methods to determine presence of human bacteria sources and integrity of sewer line crossings.

**24. Comment: Page 9, Altered Hydrology/Loss of Baseflow:** The second paragraph in this section suggests that urbanization in North Creek has decreased streamflow in the summer months. As pointed out in this paragraph, Konrad and Booth (2002) found no consistent trend for either annual mean discharge or seven-day low flow across a gradient of urbanized watersheds in Western Washington. However, Konrad and Booth did find a statistically significant trend of increasing seven-day low flow for Swamp Creek. Swamp Creek is adjacent to, and similar to North Creek in many geomorphologic characteristics such as percent urbanization, soils, topography and watershed size.

**Response:** In the narrative for this North Creek Detailed Implementation Plan, Ecology is not asserting that urbanization in North Creek has caused decreased summer streamflows. No analysis of North Creek hydrology was conducted in association with this TMDL Implementation report. Rather, generic statements are made in the report regarding the typical effect on streams of increasing impermeable surface on storm flows and consequently, on baseflows.

While Konrad and Booth (2002) found a statistically significant increase in the Swamp Creek seven-day low flow, they also note that  $Q_{\min}$  (seven-day low flow) was not consistently affected by urban development in Puget Sound streams. They offer that some of the differences could be because of interbasin water transfers and responses to

withdrawal of shallow groundwater (pg. 36). They also note the belief of other researchers that the effects of urban development on seven-day low flow warrants further examination in western Washington streams given the conflicting responses observed in other regions (pg. 11). Konrad and Booth also assert that the increasing trend in the Swamp Creek seven-day low flow could be a response to urban development in that water may be supplied to the stream by interbasin water-supply transfer (pg. 36), which could also be true for North Creek.

**25. Comment:** USGS gauging station data in North Creek indicate that average water yield in the North Creek watershed increased rather than decreased during urbanization from 1945 to 1986. USGS streamflow data was collected in North Creek during the periods from 1945 to 1973 and from 1985 to 1986. The 1945 to 1973 USGS data show a water yield of 0.33 cfs/ sq mile while the later data from 1985-1986 show a yield of .43 cfs/ sq mile. Therefore, if anything, the low flow in North Creek increased as urbanization occurred from 1945 to 1986. The increased water yield in North Creek for the 1985-1986 period is not explainable by an increase in precipitation since rainfall at Everett during 1949-1972 was very close to the long-term average, and 1985-1986 rainfall was well below normal.

**Response:** The commenter makes a strong case using the USGS data that overall water yield in North Creek basin has not diminished due to urbanization between 1945 and 1986. In fact, the USGS data indicate that basin water yield increased between 1945 and 1986. As noted in response to comment # 24, this TMDL did not include a detailed analysis of basin hydrology, rather, wet and dry seasons were determined and generally accepted hydrologic principles were provided for the reader.

Reduced recharge impacts of impervious cover still may have been offset during this period by lawn and garden irrigation using imported public water supply. Ecology remains concerned about the critical summer low flow period because of the implications for concentrating pollutants when flows decrease, thus, making the job of meeting water quality standards more difficult. It is also the time when local waters are most likely to be used for recreation. Because of the potentially transitory nature of imported water (leaky irrigation systems, septic systems), this TMDL takes a cautionary approach regarding the complex issue of hydrology and relies on the use of basic hydrologic principles where accurate data does not exist. We should not rely upon leaky irrigation systems and septic tanks to provide proper base flows for North Creek, should that be the case.

Ecology remains very interested in working with North Creek Basin stakeholders to collect and evaluate hydrologic data on North Creek. We are especially interested in defining discharge/pollutant loading relationships that may have seasonal or spatial relevance.

**26. Comment:** The USGS North Creek streamflow data was e-mailed to the Department of Ecology on May 10, 2002 and in May 2003. Yet, the USGS data is not even mentioned in the Detailed Implementation Plan. To avoid the appearance of bias, the Detailed Implementation Plan should present and discuss the USGS data and its significance.

**Response:** Detailed evaluation of stream hydrology trends is outside the scope of this bacteria water cleanup plan. Therefore, the USGS data are not included. However, we look forward to further examining the stream discharge/contaminant relationships and hydrologic trends in the North Creek watershed with watershed stakeholders.

**27. Comment:** The fifth sentence in the second paragraph in the **Altered Hydrology/Loss of Baseflow** section speculates that lawn irrigation and other factors may account for variability observed from watershed to watershed. This sentence is apparently referring to the variability in summer baseflows. A reference should be cited here to identify who is speculating about the variability of summer baseflows.

**Response:** Although Konrad and Booth 2002 note a number of the factors above in their report as affecting different stream flow characteristics, the previous statement was made by the author of this report based on discussions with Ecology hydrologists and existing research. The statement in the text has been modified to improve clarity.

# **APPENDIX B: IMPLEMENTATION SCHEDULES**



# Implementation Activity Summaries and Schedules

The following actions have been proposed by the implementing agencies to improve water quality in the North Creek TMDL area. Some tasks are already funded and others are not. Funding sources, both existing and future, have been identified wherever possible. Ecology believes that these actions, and those required as part of the municipal stormwater permit program, will return North Creek to compliance with state standards for fecal coliform bacteria.

Those tasks associated with the Municipal Stormwater Permits are likely to be incorporated into the respective Stormwater Management Programs following the issuance/re-issuance of permits by Ecology and approval by city or county councils. Schedule dates provided are based upon an anticipated permit revision date of 2004. Schedule dates are therefore subject to change based if permit issuance is delayed.

Appendix B contains voluntary actions proposed by participating organizations agencies—it is not intended to identify mandatory BMPs for municipal stormwater permit holders, although projects noted may be incorporated into BMPs at some point in the future. Where potential funding sources have not been identified, each agency has committed to work with Ecology staff in the future to try and identify one. The schedules for beginning implementation projects were developed by each of the implementing agencies.

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## Department of Ecology

| Pollution Source                      | Action   | Schedule | Implementation Strategy   |
|---------------------------------------|--|----------|---|
| <b>Education/Technical Assistance</b> |  |          |   |
| Stormwater                            | Provide technical assistance (T/A) to municipalities developing stormwater programs using Western Washington Stormwater Manual.  | Ongoing  | One position has been filled for the geographic area covered by the NWRO. One position filled in Ecology's HQ in Lacey.   |
| All Sources                           | Evaluation of North Creek water quality.   | Annually | Ecology will coordinate a meeting of the municipal stakeholders on no less than an annual basis in order to review available water quality data, water quality trends (where applicable), and the status of implementation of TMDL activities in the North Creek Watershed.     |
| All Sources                           | Report on North Creek TMDL implementation.   | Annually | To be accomplished by Ecology watershed lead which is funded.   |
| <b>Financial Assistance</b>           |  |          |   |
| All nonpoint sources.                 | Provide funding through 319 Funds, Centennial Grants, and State Revolving Loan Funds. Assist local and private entities in locating grant sources.   | Ongoing  | Funded, established ongoing program.  |
| <b>Water Quality Permitting</b>       |  |          |   |
| Stormwater                            | Issue Phase I and Phase II Municipal Stormwater, Industrial Stormwater, and Construction Stormwater General NPDES permits under Clean Water Act.   | Ongoing. | General permits issued from HQ office. Permit manager assigned for Snohomish County Phase I permit. Anticipated issue date for municipal permits is 2004. Resources for Phase II permit administration not yet identified. Industrial Stormwater Permit currently under appeal. |
| <b>Enforcement/Inspection</b>         |  |          |   |
| All Pollution Sources                 | Operate a 24-hour water quality pollution reporting hotline.   | Ongoing  | Funded  |
| Stormwater                            | Inspect/enforce as needed at construction sites clearing > 5 acres, any future industrial stormwater permit holders, and municipal wastewater conveyance systems. Enforce state Water Pollution Control Act (RCW 90.48 ). Perform oversight of Phase I/II permits to municipalities. | Ongoing  | <ul style="list-style-type: none"> <li>• One stormwater inspector responsible for Snohomish and Kitsap Counties. Phase I municipal permit manager assigned.</li> <li>• Either permit manager or inspector officer may conduct inspections and enforcement.</li> </ul>           |

## Environmental Protection Agency

| Pollution Source            | Action   | Schedule | Implementation Strategy  |
|-----------------------------|--|----------|--|
| <b>Enforcement</b>          |  |          |  |
| All sources                 | Enforce Clean Water Act on tribal lands and perform oversight of state responsibility to implement NPDES and TMDL program.   | Ongoing  |  |
| <b>Financial Assistance</b> |  |          |  |
| All Sources                 | Grants to states and tribes to fund water quality facilities and activities through 319 and SRF funding (administered through Ecology's Water Quality Financial Assistance Program). | Annually |  |
| Point sources               | 104(b)(3) grant funding opportunities.   | Annually |  |
| <b>Education</b>            |  |          |  |
| Stormwater                  | Provide guidance on stormwater BMPs.   | Ongoing  | EPA currently provides information on a variety of BMPs to improve stormwater quality at the following website:<br><a href="http://cfpub.epa.gov/npdes/stormwater/menuofbmps/menu.cfm">http://cfpub.epa.gov/npdes/stormwater/menuofbmps/menu.cfm</a> |

## Puget Sound Action Team

| Pollution Source            | Action  | Schedule   | Implementation Strategy   |
|-----------------------------|---|------------|---|
| <b>Technical Assistance</b> |   |            |   |
| Stormwater                  | Tech. assistance to local governments addressing water quality problems.  | Annually   | Funded. One FTE covers Whatcom, Skagit, and Snohomish County. One FTE specializing in stormwater and LID areas.   |
|                             | Develop and distribute LID tools to affected local governments.   | Ongoing    | Partially funded. Currently grant funded to research nationwide LID techniques and prepare regional resource guide. Also collection of information to support update of Ecology stormwater modeling software. Continue to apply for funding of additional work as opportunities become available. |
| <b>Education</b>            |   |            |   |
| All Sources                 | Provide web-based literature & publish the Soundwaves newsletter to educate public re: bacterial water pollution.   | Ongoing    | Funded. Publications can be found at the following website:<br><a href="http://www.wa.gov/puget_sound/Publications/Pub_Master.htm">http://www.wa.gov/puget_sound/Publications/Pub_Master.htm</a>  |
| <b>Financial Assistance</b> |   |            |   |
| Stormwater                  | Administer the Public Education and Information (PIE) Personal Services Contract Program to provide education and technical assistance on water quality issues. | Biannually | Funded. Provide funding every two years. Funding amounts will vary each biennium based on legislative appropriations.   |

## Snohomish Health District

| Pollution Source                      | Action   | Schedule                            | Implementation Strategy  |
|---------------------------------------|--|-------------------------------------|--|
| <b>Education/technical assistance</b> |  |                                     |  |
| Residential                           | Distribute educational material on proper operation and maintenance of OSSs.                         | Ongoing                             | Currently performing educational outreach in the Quilceda/Allen Watershed. Apply for Centennial Grants, PIE Grants, and other funding as available annually to cover all TMDL areas within 6 years.  |
| <b>Onsite system repair</b>           |  |                                     |  |
| Residential                           | Respond to 5 requests for assistance from local governments when illicit connections are detected.   | Annually                            | Funding currently available to investigate a minimum number of failing systems. Additional funding needed for additional work.   |
| <b>Sanitary surveys</b>               |  |                                     |  |
| Residential                           | Assist in the development of criteria for determining the need for and location of sanitary surveys. | Summer 2003                         | Work w/Snohomish County Surface Water Management to determine criteria for future work in locating & investigating failing on site systems.  |
| Residential                           | Perform sanitary surveys in TMDL areas suspected to have substandard onsite systems.                 | January 2005 and annually as needed | Currently unfunded. Apply for Centennial funds in partnership with Snohomish County SWM staff. Apply for funding on a watershed basis to ensure best results and gain efficiencies with other water cleanup activities (monitoring, outreach, etc...). |

## Snohomish Conservation District

| Pollution Source                                 | Action   | Schedule          | Implementation Strategy   |
|--|--|-------------------|---|
| <b>Education/technical Assistance</b>            |  |                   |   |
| Agriculture                                      | Outreach, technical assistance, and cost sharing to residential equestrian facilities in North Creek Watershed.            | 2003 through 2007 | Two workshops in 2003, one workshop in 2004, Horses for Clean Water classes in 2005. Funded by Centennial Grant.                |
|  | Circulate 1000 newsletters to small farms and flood district members across District service area (including North Creek). | Annually          | Partially funded by Snohomish County PDS.   |
|  | Provide workshops, tours, and educational activities.  | Annually          | Unfunded after 2007, seek other funding as needed.  |
| <b>Establish Riparian Vegetation/Restoration</b> |  |                   |   |
| Agriculture                                      | “Hedgerows”<br>Establish native tree and shrub plantings along riparian areas degraded by livestock access and overuse.    | 2001 through 2003 | Funded by Centennial Grant. Partially funded by Conservation Commission. Apply for Centennial Grant of other funding as needed. |
|  | Install fencing for livestock exclusion<br>And provide off-stream water as needed.   | 2003 through 2006 | Funded by Centennial Grant. Primarily unfunded after 2006, apply for other funding as needed.                                   |

| <b>Financial Assistance/Implementation</b> |   |                   |   |
|--|---|-------------------|---|
| Agriculture                                | Prepare approximately 1 farm plan per quarter through June 2006 (as requests are made by facility owners).    | 2003 through 2006 | Funded by Centennial Grant. Partially funded by Snohomish County PDS. Partially funded by Conservation Commission. Other funding such as EQIP or CREP should be sought after for implementation |
| <b>Monitoring</b>                          |   |                   |   |
| Agriculture                                | Perform BMP effectiveness monitoring in South Snohomish County Service area (of which North Creek is a part). | 2004 through 2006 | Partially funded by Centennial Grant. Seek other funding prioritizing WQ monitoring. 3 sites to be monitored.   |

## Snohomish County

| <b>Pollution Source</b>                    | <b>Action</b>  | <b>Schedule</b> | <b>Implementation Strategy</b>   |
|--|--|-----------------|--|
| <b>Plan Review and Approval</b>            |  |                 |  |
| Stormwater                                 | Promote LID practices in new development.  | Ongoing         |  |
| <b>Planning and Regulation Development</b> |  |                 |  |
| Stormwater                                 | Detailed drainage mapping outside the urban growth area to assist in tracing pollution sources.  |                 | Currently unfunded.  |
|  | Work cooperatively w/Economic Development Council to implement low impact development (LID) strategies.  | Ongoing         |  |
|  | Perform literature reviews, local surveys, focus groups, and monitoring data analysis as needed to develop a residential pet waste management program. | February 2003   | Ecology funding offered in Summer 2003. Work is expected to begin in 2004.   |
| Stormwater, Agriculture                    | Provide basin steward assistance to help Snohomish Conservation District identify problem farms and implement solutions.                               | Ongoing         | Explore funding possibilities as they are available.   |
| Loss of natural hydrologic functions       | Conduct a hydro-geologic inventory to identify potential groundwater problems. Identify strategies to improve identified problems.                     | ongoing         | Partially funded. Master Drainage Report study for urban areas completed. Master Drainage Plan for Tambark Creek under development Explore funding possibilities as available. |
| <b>Inspection and Monitoring</b>           |  |                 |  |
| All sources                                | Continue ambient monitoring at current core sites within the plan area.  | Ongoing         | Funded   |
| Stormwater                                 | Perform stormwater outfall monitoring to support pollution source identification activities and enforcement activities.                                | Ongoing         | Continue current actions as funding allows. Discuss program changes in new permit.   |
|  | Implement program to inspect, maintain, and retrofit county detention facilities.  | Ongoing         | Continue current actions as funding allows. Discuss program changes in new permit.   |

| <b>Pollution Source</b>                 | <b>Action</b>   | <b>Schedule</b> | <b>Implementation Strategy</b>  |
|---|---|-----------------|---|
|   | Identify commercial sites (kennels, equestrian facilities, etc..) w/potential to contribute bacterial pollution to MS4. | 2004            | Work in cooperation with the Snohomish Conservation District as part of Ecology Centennial Grant. Snohomish County has been offered grant funding from the 2004 funding cycle.  |
|   | Inspect commercial sites to ensure source control BMPs are being implemented.   | 2005            | Ecology grant funding has been offered to accomplish work to inspect animal kennels as part of the 2004 funding cycle.  |
|   | Investigate water quality problems as reported on hotline.  | Ongoing         | Funded.   |
| Residential wastewater                  | Assist the Snohomish Health District in identifying failing onsite septic systems.                                      | Annually        | Work in cooperation with the Snohomish Health District as resources allow.  |
| <b>Riparian restoration</b>             |   |                 |   |
| All sources                             | Stream Savers program for private landowners.   | Ongoing         | Funded  |
|   | Develop re-vegetation plans for detention ponds, swales, ditches, and connections to streams.                           | Ongoing         | Funded  |
| Loss of natural hydrologic functions    | Develop restoration plans and hydraulic analyses for urban wetlands.  | Annually        | The county will work with Ecology on investigating a basin-wide approach to assessing the value of wetlands to prevent downstream flooding and provide water quality benefits. Upon successful project development, grant funding will be sought. |
|   | Establish a Conservation Futures Fund for the purchase of critical farmlands for preservation or wetlands restoration.  | Ongoing         | Funded.   |
| <b>Education and Community Outreach</b> |   |                 |   |
| All sources                             | Develop an educational program addressing bacterial pollution in MS4.   | Ongoing         | Funded  |
|   | Continue the Watersheds of Snohomish County Program (Watershed Keepers).  | Twice yearly    | Funded  |
|   | Participate in North Creek Streamkeepers Activities.  | Ongoing         | Funded  |
|   | Provide web-based information on WQ monitoring data, publications, and volunteer and educational opportunities.         | Ongoing         | Funded  |
|   | Develop and support citizen action groups throughout TMDL focus area.   | Ongoing         | Funded through activities of basin steward  |
|   | Mark stream crossings and other appropriate areas with signage to increase public awareness.                            | Ongoing         | Continue existing program   |
|   | Meet twice per year with SCD to review farm plan development and implementation..                                       | Ongoing         | Funded  |

| Pollution Source   | Action   | Schedule | Implementation Strategy  |
|--------------------|--|----------|--|
|                    | Develop incentive programs for implementation of bacterial control BMPs at businesses and small farms.   | Annually | Currently unfunded. Apply to Ecology and others for grant funding annually   |
|                    | Work with the Snohomish Conservation District to provide technical assistance to kennels and commercial operations (equestrian facilities) with the potential to create bacterial pollution. | Ongoing  | Ecology funding offered in Summer 2003. Work is expected to begin in 2004. Additional funding may be needed when grant funds have expired. |
|                    | Develop county-wide pet waste outreach program..   |          | Currently unfunded. Apply for Ecology grant funding.   |
|                    | LID retrofit program to reduce peak flows and improve recharge.  | 2006.    | Apply to Ecology and other sources for grant funding   |
|                    | Basin Steward for Snohomish Tributaries basin.   | Ongoing  | Funded.  |
| <b>Enforcement</b> |  |          |  |
| All sources        | Enforcement of the Critical Areas Ordinance.<br>Enforcement of county WQ Ordinance (Chpt 7.53 SCC).  | Ongoing  | Funded.  |

## City of Bothell

| Pollution Source                        | Action  | Schedule      | Implementation Strategy   |
|---|---|---------------|---|
| <b>Education and Public Involvement</b> |   |               |   |
| Stormwater                              | Present information on how citizen's can improve water quality as part of volunteer events. | Ongoing       | <ul style="list-style-type: none"> <li>Provide information during two volunteer work parties or through local news media.</li> <li>Show TV spot(s) focusing on water quality on the local access channel (BCTT).</li> </ul>   |
|   | Provide car wash insert kits for charity car washes.  | Ongoing       | Two inserts available on a loan basis. The number of loans of the kit will be tracked.  |
|   | Provide opportunity for public to provide input on city stormwater program.                 | 2004          | Provide at least one public meeting to gather public input.   |
|   | Provide public with information on how to report suspected water quality problems.          | Ongoing       | Provide information on city web site.   |
|   | Neighborhood outreach on water quality pollution.   | Winter 2004-5 | <ul style="list-style-type: none"> <li>Use internal staff or contracted services to develop and implement a pollution prevention/outreach program based as practical on water quality characterization and other data as available.</li> <li>Contract with Snohomish Health District to send as built system drawings to all homeowners within Bothell that are served by on site systems.</li> </ul> |

| <b>Pollution Source</b>  | <b>Action</b>   | <b>Schedule</b> | <b>Implementation Strategy</b>   |
|--|---|-----------------|--|
|  | Business outreach on water quality pollution.   | Winter 2004-5   | Use internal staff or contracted services to develop and implement a pollution prevention/outreach program based as practical on water quality characterization and other data as available.   |
| <b>Operations, Maintenance, and other Pollution Reduction Activities</b> |   |                 |  |
| Stormwater   | Improve ability to respond to drainage complaints and track pollutants in storm drains.   | Ongoing         | Map is currently available for field staff to use when tracking pollutants in storm drains.  |
| Stormwater   | Educate city employees and public about the hazards of illegal discharges to storm sewer.   | Ongoing         | <ul style="list-style-type: none"> <li>Database is used to track contact of employees and the public that led to the elimination of a pollution source. Number of calls from the public can be tracked.</li> <li>Enhance the training for field operations covering basic pollution prevention strategies at municipal facilities.</li> </ul>            |
|  | Develop, implement, and enforce a program to reduce pollutants in stormwater runoff to storm sewer system from construction activities.   | Ongoing         | <ul style="list-style-type: none"> <li>Ordinance and development design standards adopted.</li> <li>Guidelines in place.</li> <li>Checklist for site plan review available for use in plan review process.</li> <li>Require corrective actions where city authority exists. Refer other pollution problems to appropriate agencies as needed.</li> </ul> |
|  | Develop, implement, and enforce a program to reduce pollutants in post-construction runoff to city storm system from new development and redevelopment projects >5 acres in size. | Ongoing         | <ul style="list-style-type: none"> <li>City-owned stormwater structures identified and mapped.</li> <li>Easement language developed that requires maintenance of privately owned detention facilities. Database in place to track inspections and maintenance of both public and private stormwater facilities.</li> </ul>                               |
|  | Development of implementation and remediation strategies.   | 2004-2006       | Prepare list of recommended remediation strategies for problems identified during streamwalks and other monitoring activities.   |
| <b>Environmental Monitoring and Pollution Identification</b>             |   |                 |  |
| All sources  | Initiate water quality characterization project.  | Ongoing         | <ul style="list-style-type: none"> <li>Prepare QAPP for water quality characterization project June 2003</li> <li>Purchase sampling equipment July 2003</li> <li>Initiate monitoring in 2003</li> <li>Conduct effectiveness monitoring in 2007</li> </ul>  |
|  | Investigate North Creek Main Stem Pollution Sources.  |                 | Complete stream walks prepare maps locating outfalls and potential pollution sources by October 2004   |

## City of Everett

| Pollution Source                  | Action  | Schedule | Implementation Strategy  |
|-----------------------------------|---|----------|--|
| <b>Education</b>                  |   |          |  |
| Stormwater                        | School Newsletter   | Ongoing  | Distribute newsletter annually to all schools within the North Creek watershed within City limits. The newsletter will announce the available school presentations and programs the City will offer that school year.  |
|                                   | School Presentations                                      | Ongoing  | Funded. Surface water presentations will be offered to up to 50% of the grade schools each year within the city's portion of the North Creek watershed.  |
|                                   | Neighborhood/business Presentations                       | Ongoing  | Funded. Offer at least one surface water management presentation each year to neighborhood associations and/or business organizations within the city's portion of the North Creek watershed.  |
|                                   | Surface Water Brochure                                    | Ongoing  | Funded. Produce and distribute at least one surface water brochure each year.  |
| <b>Public Involvement</b>         |   |          |  |
| Stormwater                        | Catch Basin Stenciling                                    | Ongoing  | Funded. Stencil at least 100 catch basins within the North Creek watershed over five years.  |
|                                   | Stream Cleanup Days                                       | Ongoing  | Funded. Conduct at least one stream cleanup day within the North Creek watershed over five years.  |
|                                   | 24-hour Water Quality Hotline                             | Ongoing  | Funded. Reply to all calls received on the water quality hotline within 48 hours.  |
| <b>Operations and Maintenance</b> |   |          |  |
| Residential Wastewater            | Public Sewer Connection Incentive                         | Ongoing  | Funded. Continue to offer up to \$4,000 zero interest loans to Everett residents to connect to the public sewer system.  |
| Sediment                          | Catch Basin Cleaning                                      | Ongoing  | Funded. 50 catch basins within the city's North Creek service area will be cleaned over 5 years.   |
| Sediment                          | Street Sweeping   | Ongoing  | Funded. All streets within the city's portion of the North Creek watershed will be swept at an average frequency of once every two months.   |
| Stormwater                        | Erosion and Sediment Control Plans for Construction Sites | Ongoing  | Funded. Each construction site greater than or equal to one acre shall be required to submit and obtain City of Everett approval of an erosion, sediment and source control plan. Each plan shall include BMPs designed to minimize the discharge of sediment and other pollutant sources during construction. |

| Pollution Source | Action  | Schedule | Implementation Strategy  |
|------------------|---|----------|--|
|                  | Erosion and Sediment Control Plan Inspections | Ongoing  | Funded. Each construction site greater than or equal to one acre shall be inspected for compliance with their approved erosion, sediment and source control plan at least once per week for projects not actively under construction during the rainy season. For projects actively under construction, an inspection will be made at least three times per week during the rainy season.  |
|                  | Small Parcel Erosion and Sediment Control     | Ongoing  | Funded. Each single-family residential lot within a subdivision of greater than one acre shall receive an initial inspection to review the need for erosion and sediment control.  |
|                  | Stormwater Plan Review                        | Ongoing  | Funded. Each development or re-development site greater than or equal to one acre shall be required to submit and obtain City of Everett approval of a stormwater plan. Each plan shall include BMPs designed to minimize the discharge of stormwater-related pollutant during the post-development phase.   |
|                  | Stormwater Plan Inspection                    | Ongoing  | All development and re-development sites greater than or equal to one acre shall be inspected for compliance with the approved stormwater plan prior to final approval   |
|                  | Stormwater BMP Maintenance                    | Ongoing  | Funded. All stormwater BMPs for single-family development and within a public right-of-way-or easement shall be maintained by the City of Everett. For all other developments, the private property owner will be responsible for stormwater BMP maintenance. The City of Everett will annually inspect privately maintained new development and re-development sites greater than or equal to one acre. The city will notify all property owners whose stormwater BMPs are not being maintained in accordance with the approved stormwater plan within two weeks of the annual inspection. Unless an extension is requested and granted by the city, property owners will be required to correct all deficiencies within 60 days of the notice of deficiency. |
|                  | Municipal Operations                          | 2006     | Funded. All municipal operations will comply with the Regional Road Maintenance Program  |

| <b>Pollution Source</b>                                      | <b>Action</b>                 | <b>Schedule</b> | <b>Implementation Strategy</b>   |
|--|-------------------------------|-----------------|--|
| <b>Riparian Restoration and Protection</b>                   |                               |                 |  |
| Loss of Riparian Habitat                                     | Critical Areas Ordinance      | Ongoing         | Funded. Enforce City of Everett stream and wetland buffer requirements.  |
| <b>Environmental Monitoring and pollution identification</b> |                               |                 |  |
|  | Illicit connection inspection | 2005            | Provided the city has legal access and as funding allows, fifty percent of all commercial and industrial sites within the North Creek watershed within city limits shall be inspected for illicit discharges over five years.  |
|  | Illicit connection correction | 2005            | As funding allows, illicit connections with the potential to pollute surface water found during inspections shall be provided a notice to disconnect within 5 days of inspection. Corrective action will generally be required within 60 days of the notice to disconnect. |

## City of Mill Creek

| <b>Pollution Source</b> | <b>Action</b>   | <b>Schedule</b>                         | <b>Implementation Strategy</b>   |
|-------------------------|---|---|--|
| <b>Education</b>        |   |   |  |
| Stormwater              | Create partnership with Everett school district to develop/participate in watershed education program.              | Ongoing                                 | <ul style="list-style-type: none"> <li>• Continue existing program</li> <li>• Meet with local school district administrator (or environmental curriculum specialist) in 2003.</li> </ul> |
|                         | Develop and distribute water quality/at-home recharge information to new/all residents through the billing process. | Initiate in 2004<br>Annually thereafter | <ul style="list-style-type: none"> <li>• Funded</li> </ul>   |
|                         | Provide web-based information on North Creek Watershed via website.   | Initiate in 2003                        | <ul style="list-style-type: none"> <li>• Funded</li> </ul>   |
|                         | Develop and implement enhanced storm drain marking program.   | Ongoing                                 | <ul style="list-style-type: none"> <li>• Funded. Continue current actions.</li> </ul>  |
|                         | Write two stormwater-related articles per year in city newsletter or local paper.                                   | 2003                                    | <ul style="list-style-type: none"> <li>• Funded. Continue current actions.</li> </ul>  |
|                         | Mark stream crossings with signage to increase public awareness.  | Initiate in 2003                        | <ul style="list-style-type: none"> <li>• Partially funded. Received Small Change Grant from King County in Summer 2003.</li> </ul>   |

| <b>Pollution Source</b>                                      | <b>Action</b>   | <b>Schedule</b>                         | <b>Implementation Strategy</b>   |
|--|---|---|--|
|  | Placement of signs along stream buffers, wetlands, wetland buffers.   | Ongoing                                 | <ul style="list-style-type: none"> <li>Funded. Continue current actions.</li> </ul>  |
|  | Develop educational display on stormwater pollution to be available for public meetings.  | Initiate in 2004                        | <ul style="list-style-type: none"> <li>Unfunded.</li> </ul>  |
|  | Create brochure on pet waste ordinance, distribute through, veterinary offices, pet stores.   | Initiate in 2003                        | <ul style="list-style-type: none"> <li>Funded</li> <li>Coordinate with other local governments to develop initial brochure</li> </ul>  |
|  | Provide outreach and education on new fundraising techniques to replace car washes.   | Ongoing                                 | <ul style="list-style-type: none"> <li>Funded. Continue current actions.</li> </ul>  |
|  | Distribute streamside savvy/stormwater pollution literature.  | Ongoing                                 | <ul style="list-style-type: none"> <li>Funded. Continue current actions.</li> </ul>  |
|  | Install pet waste management stations.  | Ongoing                                 | <ul style="list-style-type: none"> <li>Funded. Currently have two pet waste stations at parks that are near our streams. City of Mill Creek will install and maintain two more pet waste stations by 6/30/2004.</li> </ul>         |
| <b>Enforcement</b>   |   |   |  |
| Stormwater   | Ensure compliance with city ordinances that affect water quality.   | Ongoing                                 | <ul style="list-style-type: none"> <li>One FTE is currently funded to do code compliance work.</li> </ul>  |
| <b>Planning and Regulation Development</b>                   |   |   |  |
| Stormwater   | Update Critical Areas Ordinance   | Ongoing                                 | <ul style="list-style-type: none"> <li>Initiated in 2002. Still working on it. Completion is anticipated in 12/2004.</li> </ul>  |
| <b>Riparian Restoration</b>                                  |   |   |  |
| Loss of riparian habitat                                     | Stream Cleanup and riparian restoration activities to improve shading and reduce temperatures, and prevent pollution within city owned portion of watershed. Replant up to 50 ft of stream bank per year. | Initiate in 2004<br>Annually thereafter | <ul style="list-style-type: none"> <li>Unfunded.</li> <li>Prioritize projects by 3/2004.</li> <li>Initiate first annual project in 2004. Continue annually until all projects are completed.</li> <li>Look for funding.</li> </ul> |
| <b>Environmental Monitoring and pollution identification</b> |   |   |  |
| All sources  | Monitor water quality (stormwater or receiving waters, or both).  | Ongoing                                 | <ul style="list-style-type: none"> <li>Funded first year by Ecology</li> <li>Review QAPP by 8/31/2003</li> <li>Purchase equipment and supplies by 7/31/2003</li> <li>Initiate monitoring by 9/30/2003</li> </ul>                   |

| Pollution Source | Action  | Schedule  | Implementation Strategy  |
|------------------|---|---|--|
|                  | Sponsor volunteer water quality monitoring program. | Initiate in 2005<br>Annually thereafter               | <ul style="list-style-type: none"> <li>Funded</li> <li>Implement program with Jackson High School students by 2005.</li> </ul>   |
|                  | Illicit connection detection                        | Initiate in 2004<br>Annually until all areas surveyed | <ul style="list-style-type: none"> <li>Funded</li> <li>Develop prioritization strategy by 3/2004</li> <li>Develop procedures by 5/2004</li> <li>Implement program by 7/2004</li> </ul> |

### Adopt-A-Stream Foundation

| Pollution Source                                     | Action  | Schedule                 | Implementation Strategy  |
|--|---|--------------------------|--|
| <b>Riparian Restoration and Pollution Prevention</b> |   |                          |  |
| All Sources  | Conduct a physical and biological survey of tributary streams to identify, photograph and map locations of fish and wildlife habitat degradation and water pollution sources. Reduce water temperatures and improve dissolved oxygen content by improving riparian habitat. Install fencing and other appropriate exclusion devices to prevent livestock from direct access to streams whenever possible. | Ongoing                  | Completed inventory of barriers to fish migration in North Creek watershed. Funded to develop the North Creek Streamkeepers through 2004. Additional funding from grants and other sources will be needed on a project-by-project basis. |
|  | Perform door-to-door outreach to landowners to perform environmental audits including bacterial pollution assessments as a component.   | 2/04, annually as needed | Funded. Centennial Grant funds offered in Summer 2003. Work to proceed in 2004.  |
| <b>Education</b>                                     |   |                          |  |
| All sources  | Work with community groups, schools, businesses, and private citizens to increase awareness of water quality issues.  | Annually                 | Continue to work with all parties as resources allow.  |
| <b>Water Quality Monitoring</b>                      |   |                          |  |
| All sources  | Perform water quality monitoring at sites where bacterial pollution prevention has occurred or perform general water quality monitoring.  | Annually                 | Partially funded. Apply for additional grant funding as available.   |

## University of Washington, Bothell/Cascadia Community College

| Pollution Source                                     | Action   | Schedule | Implementation Strategy   |
|--|--|----------|---|
| <b>Riparian Restoration and Pollution Prevention</b> |  |          |   |
| Loss of Riparian Areas                               | Maintain North Creek Floodplain Restoration Site   | Ongoing  | Monitor site until approximately 2011 to ensure restoration project is successful   |
| <b>Education</b>                                     |  |          |   |
| All sources  | Work with community groups, schools, businesses, and private citizens to increase awareness of water quality issues and importance of natural functions. | Ongoing  | <ul style="list-style-type: none"> <li>Funded. Provide tours of restoration site as resources allow.</li> <li>Unfunded. Continue to explore the development of the</li> </ul>   |
| <b>Pollution Prevention</b>                          |  |          |   |
| Stormwater   | Install pet waste collection stations throughout campus and along trail system.  | Ongoing  | Partially funded. Many stations have been already been installed on campus. Apply for additional grant funding in the future to maximize educational message along trail sites. |

## Mill Creek Community Association

| Pollution Source  | Action   | Schedule  | Implementation Strategy  |
|---|--|---|--|
| <b>Education/technical assistance</b>                         |  |   |  |
| Pet waste, oxygen depleting substances                        | Education to association members   | Annually  | Publish several educational articles per year in the bimonthly newsletter on surface water protection. Topics to include pet waste management, car wash rules, proper fertilizer use, use of natural, low maintenance vegetation, etc... |
| Pet waste   | Install education kiosks and pet waste collection stations.  | Annually  | Install/maintain 5 pet waste stations per year until critical areas covered. Grant funding will be necessary to accomplish this.   |
| <b>Stream Restoration</b>                                     |  |   |  |
| Poor Riparian Habitat   | Re-vegetate streamside areas where no trees are present to provide shading and reduce stream temperatures. | Annually, plant 100-300 feet of bank with native plant species. | Sponsor annual tree planting events in cooperation with the Adopt-a-Stream Foundation or other organization.   |
|   | Work with the city of Mill Creek to remove excess sediment behind the dam.                                 | Annually until completed.                                       | Work with AASF, Ecology and other organizations to find grant funding.   |
| <b>Stormwater Management</b>                                  |  |   |  |
| Reduction of base flows and creation of excessive peak flows. | Low Impact Development retrofits   | Annually  | Investigate funding opportunities with local government and work with the MCCA community to identify both promising areas for LID retrofits and grant funding to accomplish the task.  |





**APPENDIX C:**

**IMPLEMENTATION SCHEDULE TRACKING  
SHEET**



## **Implementation Schedule Tracking Sheet**

The action items listed in the following table reflect information collected from the Appendix B of this document and the North Creek Fecal Coliform TMDL (Svrjcek and Glenn, 2002).

Those tasks associated with the Municipal Stormwater Permits are likely to be incorporated into the respective Stormwater Management Programs following the issuance/re-issuance of permits by Ecology and approval by city or county councils. Schedule dates provided are based upon an anticipated permit revision date of 2004.

Schedule dates are therefore subject to change if permit issuance is delayed. The table below does not constitute a list of actions required by NPDES permit authority, which are detailed under the Section "Pollution Sources and Corrective Actions" shown earlier in this document.

## Water Cleanup Activities Tracking Sheet

| Entity  | Action  | Year |      |      |      |      |                   |
|---|---|------|------|------|------|------|-------------------|
|   |   | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 <sup>1</sup> |
| U.S.E.P.A   | Administer Clean Water Act (CWA) 319 Program  |      |      |      |      |      |                   |
|   | Provide CWA 104(b)(3) funding opportunities   |      |      |      |      |      |                   |
| Puget Sound Action Team   | Administer PIE Personal Services Contracts to support water cleanup activities                                      |      |      |      |      |      |                   |
|   | Develop Low Impact Development Tools  |      |      |      |      |      |                   |
|   | Provide technical assistance to local governments in support of water cleanup activities                            |      |      |      |      |      |                   |
| Snohomish Health District   | Distribute educational materials  |      |      |      |      |      |                   |
|   | Respond to up to 5 requests for assistance to local govern.   |      |      |      |      |      |                   |
|   | Assist in development of sanitary survey criteria   |      |      |      |      |      |                   |
|   | Perform sanitary surveys in selected TMDL areas   |      |      |      |      |      |                   |
| Snohomish Conservation District   | Perform outreach, technical assistance, and cost sharing to residential equestrian facilities                       |      |      |      |      |      |                   |
|   | Circulate 1000 newsletters to small farms across District service area (including North Creek)                      |      |      |      |      |      |                   |
|   | Utilize Hedgerows program as applicable <sup>2</sup>  |      |      |      |      |      |                   |
|   | Install fencing for livestock exclusion from streams/install off-stream watering as needed                          |      |      |      |      |      |                   |
|   | Prepare 1 farm plan per quarter (as requested by residents)   |      |      |      |      |      |                   |
| Snohomish County  | Promote LID practices in new development & through the Economic Development Council                                 |      |      |      |      |      |                   |
|   | Execute animal waste control program  |      |      |      |      |      |                   |
|   | Conduct hydro-geologic inventory to identify potential groundwater problems and solutions                           |      |      |      |      |      |                   |
|   | Conduct water quality monitoring (Phase I permit, TMDL-related, ambient monitoring)                                 |      |      |      |      |      |                   |
|   | Implement program to inspect, maintain, and retrofit county stormwater ponds  |      |      |      |      |      |                   |
|   | Investigate water quality problems as reported on-line and by phone   |      |      |      |      |      |                   |
|   | Assist Snohomish County is identifying failing onsite septic systems  |      |      |      |      |      |                   |
|   | Continue Stream Savers Program for private landowners   |      |      |      |      |      |                   |
|   | Develop re-vegetation plans for detention ponds, swales, ditches, and connections to streams                        |      |      |      |      |      |                   |
|   | Establish/utilize Conservation Futures Fund to purchase critical farmlands for preservation or wetlands restoration |      |      |      |      |      |                   |
|   | Continue Watersheds of Snohomish County Program (Watershed Keepers)   |      |      |      |      |      |                   |
|   | Participate in North Creek Streamkeepers Activities   |      |      |      |      |      |                   |
|   | Fund North Creek Basin Steward (to assist citizen action groups, businesses, and citizens)                          |      |      |      |      |      |                   |
| Provide web-based water quality information (monitoring data, volunteer and education opportunities, etc...). |   |      |      |      |      |      |                   |

| Entity          | Action  | Year |      |      |      |      |                   |
|-----------------|---|------|------|------|------|------|-------------------|
|                 |   | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 <sup>1</sup> |
|                 | Work with Ecology to investigate a basin-wide approach to assess the value of wetlands to provide water quality benefits. Apply for grant funding after project plan developed. |      |      |      |      |      |                   |
|                 | Mark stream crossings and other appropriate areas w/signage to increase public awareness.   |      |      |      |      |      |                   |
|                 | Meet twice per year with Snohomish Conservation District to review farm plans and coordinate activities.  |      |      |      |      |      |                   |
|                 | Develop/implement an educational program addressing bacterial pollution in MS4 area.  |      |      |      |      |      |                   |
|                 | Apply for funding for incentive program to implement bacterial control BMPs at businesses and small farms.  |      |      |      |      |      |                   |
|                 | Implement pilot LID retrofit program and targeted watershed improvement through management of Native Growth Protection Areas.   |      |      |      |      |      |                   |
|                 | Enforcement of Critical Areas Ordinance   |      |      |      |      |      |                   |
| City of Bothell | Provide education and volunteer opportunities for citizens, businesses and staff  |      |      |      |      |      |                   |
|                 | • Riparian restoration work parties   |      |      |      |      |      |                   |
|                 | • Local access TV spot on water quality   |      |      |      |      |      |                   |
|                 | • Public meeting to gather input on local water quality needs   |      |      |      |      |      |                   |
|                 | • Neighborhood outreach on water quality problems   |      |      |      |      |      |                   |
|                 | • Business community outreach on water quality problems   |      |      |      |      |      |                   |
|                 | • Inform citizens on how to report water quality problems   |      |      |      |      |      |                   |
|                 | • Provide classroom instruction on local water hydrology and pollution problems   |      |      |      |      |      |                   |
|                 | • Provide car wash kits to local citizen groups   |      |      |      |      |      |                   |
|                 | • Participate in North Creek Streamkeepers Activities   |      |      |      |      |      |                   |
|                 | Track employee responses to reported water quality problems   |      |      |      |      |      |                   |
|                 | Develop, implement, and enforce program to reduce pollutants in stormwater runoff   |      |      |      |      |      |                   |
|                 | Initiate water quality monitoring program   |      |      |      |      |      |                   |
|                 | Complete streamwalks and prepare maps locating outfalls and potential pollutant sources   |      |      |      |      |      |                   |
|                 | Develop and implement strategies to improve problems identified during streamwalks and other monitoring activities.   |      |      |      |      |      |                   |
| City of Everett | Provide water quality education to citizens, businesses, and students   |      |      |      |      |      |                   |
|                 | • Distribute newsletter annually to local schools announcing availability of programs and presentations by the City each year   |      |      |      |      |      |                   |
|                 | • Offer to give presentations at 50% of North Creek schools each year   |      |      |      |      |      |                   |
|                 | • Offer at least one surface water presentation to citizen's groups annually  |      |      |      |      |      |                   |
|                 | • Produce and distribute at least one surface water brochure per year   |      |      |      |      |      |                   |

| Entity  | Action  | Year |      |      |      |      |                   |
|---|---|------|------|------|------|------|-------------------|
|   |   | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 <sup>1</sup> |
|   | Stencil at least 100 catch basins within North Creek over five years  |      |      |      |      |      |                   |
|   | Perform at least one stream cleanup event within North Creek over five years  |      |      |      |      |      |                   |
|   | Reply to all calls received on the water quality hotline within 48 hours  |      |      |      |      |      |                   |
|   | Offer up to \$4,000 zero interest loans to Everett residents to connect to public sewer system  |      |      |      |      |      |                   |
|   | Clean 50 catch basins in North Creek service area over five years   |      |      |      |      |      |                   |
|   | Sweep all city streets once every two months (on average)   |      |      |      |      |      |                   |
|   | Require submission of and approval of Erosion and Sediment Control Plans and Stormwater Plans for all sites greater than 1 acre. Inspect each site. |      |      |      |      |      |                   |
|   | Enforce stream and wetland buffer requirements  |      |      |      |      |      |                   |
|   | Perform water quality monitoring at the mainstem above McCollum Park and on Silver Lake Creek   |      |      |      |      |      |                   |
| City of Mill Creek  | Create partnership with Everett School District to develop/participate in watershed education program   |      |      |      |      |      |                   |
|   | Develop and distribute water quality/at-home recharge information to City residents   |      |      |      |      |      |                   |
|   | Provide web-based information on North Creek via website  |      |      |      |      |      |                   |
|   | Develop and implement enhanced storm drain marking program  |      |      |      |      |      |                   |
|   | Write two stormwater-related articles per year in city newsletter or local paper.   |      |      |      |      |      |                   |
|   | Mark stream crossings with signage to increase public awareness.  |      |      |      |      |      |                   |
|   | Develop educational display on stormwater pollution to be available for public meetings.  |      |      |      |      |      |                   |
|   | Create brochure on pet waste ordinance, distribute through, veterinary offices, pet stores.   |      |      |      |      |      |                   |
|   | Provide outreach and education on new fundraising techniques to replace car washes.   |      |      |      |      |      |                   |
|   | Distribute streamside savvy/stormwater pollution literature   |      |      |      |      |      |                   |
|   | Install pet waste management stations   |      |      |      |      |      |                   |
|   | Ensure compliance with city water quality ordinances.   |      |      |      |      |      |                   |
|   | Update Critical Areas Ordinance   |      |      |      |      |      |                   |
|   | Monitor water quality within city limits  |      |      |      |      |      |                   |
| Sponsor volunteer water quality monitoring program          |   |      |      |      |      |      |                   |
| Illicit connection detection program, develop and implement |   |      |      |      |      |      |                   |
| Adopt-A-Stream Foundation                                   | Organize and participated in meetings of the North Creek Coalition.   |      |      |      |      |      |                   |
|   | Perform door-to-door outreach in selected areas of the North Creek Watershed  |      |      |      |      |      |                   |

| Entity   | Action   | Year |      |      |      |      |                   |
|--|--|------|------|------|------|------|-------------------|
|  |  | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 <sup>1</sup> |
|  | Perform water quality monitoring at selected locations using volunteers  |      |      |      |      |      |                   |
|  | Work with community groups, schools, and citizens to promote the general health of the North Creek Watershed.                                    |      |      |      |      |      |                   |
| University of Washington, Bothell/<br>Cascadia Community College | Install pet waste collection stations  |      |      |      |      |      |                   |
|  | Provide tours of Lower North Creek Restoration Site  |      |      |      |      |      |                   |
| Mill Creek Community Association                                 | Publish several educational articles per year in the bimonthly newsletter on surface water protection.   |      |      |      |      |      |                   |
|  | Install educational kiosks/pet waste management stations, up to 5 per year if grant funding can be found (until all suitable sites are covered). |      |      |      |      |      |                   |
|  | Work with local government and environmental groups to re-vegetate 100-300 feet of streambank/year with native species.                          |      |      |      |      |      |                   |
|  | Collaborate with local government to perform a Low Impact Development Retrofit project as grant resources allow.                                 |      |      |      |      |      |                   |

<sup>1</sup>Expected point of compliance with State Water Quality Standards.

<sup>2</sup> Hedgerows program will proceed beyond 2003 if additional funding can be found.