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# Bacteria Pollution Control Plan

*Total Maximum Daily Load for Fecal Coliform Bacteria: Version 7-01*



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DRAFT

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## Introduction

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### **Water Quality Impairment in North Creek and Swamp Creek**

In 1996, the Washington State Department of Ecology (WDOE) listed North Creek and Swamp Creek on the 303 (d) list of impaired water bodies for fecal coliform bacteria (FCB) and dissolved oxygen Total Maximum Daily Loads (TMDLs). (<http://www.ecy.wa.gov/programs/wq/303d/1996/index-1996.html>).

### **City Works to Improve Water Quality**

In 2001, the City of Bothell prepared a TMDL Evaluation Report for North Creek. In 2003, WDOE approved an Implementation Plan to improve water quality. In 2006, WDOE prepared and approved a TMDL Report an Implementation Plan for Swamp Creek.

In 2007, WDOE issued a National Pollution Discharge Elimination System (NPDES) stormwater permit to all small municipalities. The NPDES permit conditioned TMDL(s) to develop Bacteria Pollution Control Plan (BPCP) for North Creek and Swamp Creek. This BPCP is designed to meet and/or exceed NPDES permit requirements for both creeks. The City's goal is to improve water quality to meet state standards for FCB levels. This is a living document that will be periodically updated to reflect lessons learned.

The City designed a multi-phase process to determine the source FCB sources in North Creek and to engage the community in a solution. Phase I work began in 2003 with funding from a WDOE grant and matching funds from the City. Initial findings were published in 2004. Baseline monitoring found several FCB sources, from rodents to humans. Certain areas contributed high FCB levels. A survey found a general lack of awareness within the community about the existence of North Creek and the potential for septic systems and pet waste to contribute to FCB levels in surface waters (Kalenius 2008). Building on lessons learned in Phase I, Phase II outreach work was designed to inform the community about North Creek.

Phase III involves long-term monitoring of FCB levels in three North Creek tributaries. The City continues to sample these three sites monthly. An annual report summarizing test results is available online at the City's web site. Find the report in the Surface Water Management section of City Services. <http://www.ci.bothell.wa.us/Site/Content/Public%20Works/Surface%20Water%20Mgmt/updatedWWphase2arform2009%20Bothell.pdf>

This Bacteria Pollution Control Plan discusses the most likely contributor FCB sources, as listed in the NPDES permit, and proposes actions to reduce or eliminate FCB discharges to stormwater. The City will implement the proposed actions depending upon available funding.

## Pet Waste Ordinance

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It has become general knowledge that pet wastes pollute surface waters. Pet waste consumes oxygen leading to low oxygen levels that are unhealthy for fish and other aquatic life. Bacteria, viruses, and parasites are found in pet waste such that if not handled properly can threaten the health of humans and wildlife. Pet waste can contribute excess of nutrients leading to eutrophication of streams, ponds, and lakes. This often makes swimming and recreation unappealing or even unhealthy.

To encourage pet owners to properly dispose of pet waste by bagging and placing it in the garbage, some cities and counties have adopted pet waste ordinances. Ordinances vary both in what constitutes an infraction (i.e., failure to carry a poop scooper on city park lands or failure to clean up pet waste on private and/or public property) and in the range of fines.

In August 2009 the City of Bothell adopted an ordinance prohibiting the discharge of pollutants to ground, surface or storm waters (BMC Title 18.04.260, Prohibited Acts). However, the ordinance does not prohibit the discharge of pollutants onto dry land, as is the case with pet waste.

### Action Plan

Identify existing pet waste ordinances in comparable jurisdictions and determine their effectiveness in preventing pet waste from polluting surface waters. Considerations may include assessment of the penalty structure, acceptance by the public, and the ability to enforce.

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## Water Pollution Control Enforcement

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Effective enforcement requires that prohibited actions be easily identifiable, the authority to enforce be clearly established, and the process easily understood by the enforcement officer and the violator.

In August 2009 the city broadened enforcement capabilities with regards to polluted discharges to surface, ground and storm waters. The new codified language was not targeted towards bacteria sources. However, if a bacteria source is found discharging to surface, ground or storm water it would be considered a pollutant and, as such, enforcement actions can be taken.

The city based the new enforcement code language on *Writing Regulations to Prohibit Illicit Discharges, Dumping, and Illicit Connections*, August 2008, from the WDOE Guidelines for Municipal Stormwater General Permit Guidance for Cities and Counties.

### Action Plan

Evaluate existing enforcement capabilities.

- 1) How many bacteria source cases have been processed through enforcement and to what degree?
- 2) Do violations form a pattern (i.e., repeat offenders and/or locations)?
- 3) How are enforcement codes typically applied?
- 4) Are penalties an effective deterrent?

## Critical Areas Ordinance Update

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The City's critical areas ordinance (COA) is updated periodically, as required under the Growth Management Act (GMA), most recently in July 2005.

### Action Plan

Include TMDL goals in COA updates.

- 1) How does the current CAO address FCB?
- 2) Do fecal bacteria source control measures need to be added?
- 3) What existing guidelines and/or case studies can serve as resources as we write our own CAO?

## Education Outreach

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Studies conducted in 2004 identified pet waste as a common contributor of FCB in our local waterways. All 12 locations sampled by the City of Bothell in 2004 showed the presence of either dog or cat DNA (Kalenius 2008). Regionally, DNA ribotyping studies of bacteria in urban Puget Sound streams also have consistently shown the presence of bacteria from dogs and cats (Svrycek, 2003).

In 2006, the City began a targeted water quality education and outreach effort aimed at pet owners to inform them of the need for responsible pet waste removal.

Survey results provided insight to pet owners' perceptions of the problem and what might motivate them to change their behavior. Recommendations included youth education, posting more pet waste pick-up signs and providing bag stations and trash cans for proper disposal. The City also contacted local veterinarians and pet store managers to encourage them to help residents adopt this Best Management Practice (BMP).

### Action Plan

#### 1) Youth Education

In 2007, the City initiated a stormwater youth education program. City staff gave presentations to local students which contained a pet waste component. In 2009, the City contracted with a local non-profit group, Nature Vision, Inc., to provide more comprehensive conservation and stormwater presentations to grades K-12. To encourage teacher participation, the presentations were designed to meet Essential Academic Learning Requirements (EALRs). In 2009, Nature Vision, Inc. conducted presentations or field trips for 1,587 students. So far this year, 1,430 students have benefited from a presentation or field trip program. The City has received a very positive response to the program from parents, students, and teachers. Program materials provided include a stormwater poster for each classroom, a stormwater activity booklet to provide students with continued learning opportunities, and materials for the students to bring home to provide parents with education concerning stormwater pollution and the BMP's associated with the home.

#### 2) Low Impact Development Education

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In 2009, the City adopted a new Stormwater Design Manual that mandates Low Impact Development (LID) techniques be considered for new construction and redevelopment projects where possible. To promote adoption of this BMP for retrofitting existing structures, the City offered two rain garden workshops to homeowners and installed a demonstration rain garden at Bothell's King County Library. In 2010 the City hopes to sponsor two more workshops providing expert advice on a variety of LID techniques.

## Bacterial Pollution Prevention

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### Pet Waste

The City provided pet waste information and education from 2008 to 2010 through events, articles, mailers, brochures, individual outreach to neighborhoods and local business offices, annual reports and a Bothell Cable News (BCTV) segment.

To test the effectiveness of our outreach in a particular location, we selected a target neighborhood based on pet waste complaints and reports from City field staff. William Penn Park, Stipek Park and the Canyon Park Junior High neighborhood were found to have significant pet waste in their green spaces and along sidewalks and paths. These areas were targeted in the initial education phase in 2006 and already contained pet waste signs, bag dispensers and trash receptacles. Every home within the target area received a mailer reporting the TMDL levels of bacteria found in sample tests of Bothell streams. The mailer warned residents about potential health risks associated with pet waste found in their neighborhood and emphasized the importance of picking up pet waste at home and in public areas. This year, door hangers with similar messaging will be placed on every door in the target neighborhood. City staff conducts pet waste counts on a monthly basis to try and identify any trends over time and help determine whether pet waste owners are changing their habits. Several other methods will be attempted to determine the best way to encourage adoption of this BMP and the most effective methods will be used to deliver messaging throughout the North Creek and Swamp Creek drainage communities.

### Septic Systems

A concerted effort has been made to determine the amount of homes currently utilizing septic systems in Bothell. The City has worked with the King and Snohomish Counties, four separate Sewer Districts (City of Bothell, Woodinville

Water/Sewer, Northshore Utilities, and Alderwood Water & Wastewater District), and City staff to compile a list of potential users. The next step will be to reach out to these homes and definitively determine which are still on septic. This way, we can target our outreach and investigation efforts most effectively.

### Stormwater Treatment, Volume Reduction and Pollution Source Controls

The City established TMDL baseline monitoring for North Creek and Swamp Creek to determine FCB sources. In 2010 the City entered into an inter-local agreement with Snohomish County Surface Water Management to conduct a source tracking survey in Perry Creek, a North Creek tributary. The plan is described in Quality Assurance Project Plan (QAPP) Snohomish River Tributaries, North Creek and Swamp Creek: Fecal Coliform Bacteria Total Maximum Daily Load Monitoring, Version 1.0 July 16, 2009.

The City conducts FCB monitoring monthly at three North Creek Tributaries and compiles the results in an annual report. A study description and monitoring results can be found in City of Bothell, 2010.

Swamp Creek TMDL levels did not meet the WDOE threshold that would require the City to monitor Little Swamp Creek, but in late 2009, the Washington State Department of Ecology (WDOE) recorded high FCB levels during routine sampling of Little Swamp Creek. Follow-up monitoring and source tracking is ongoing. In coordination with WDOE, the City now monitors FCB levels in Little Swamp Creek monthly. Method and procedures can be found in City of Bothell, 2010.

In the summer and fall of 2010, the City will collaborate with WDOE to conduct a more detailed FCB source-tracking survey. Several sources have been identified from initial site investigations. These sites will be monitored to determine their potential contribution to FCB in Little Swamp Creek.

Stormwater treatment activities are discussed in the Watershed Management Plan section of this report, but it should be noted that stormwater treatment controls are appropriate in each of the three action categories.

### Action Plan

- 1) Continue source tracking and monthly FCB monitoring in North Creek and Swamp Creek.
- 2) Continue to improve geographic information system (GIS) data base to facilitate identification of properties on septic systems.

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- 3) Encourage LID techniques through education, outreach and, if feasible, by constructing LID demonstration projects.
  - 4) Work collaboratively with all jurisdictions within the North and Swamp Creek watersheds (i.e., Swamp Creek Watershed Forum hosted by the City of Kenmore).

## Watershed Management Plans

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*“The best approach when developing control measures for these diffuse sources is to maintain or increase flow rates throughout the dry season, while focusing on lowering concentrations in the water. Flow attenuation can be achieved in this watershed with detention ponds, establishing or restoring wetlands, and managing riparian corridors. A long-term monitoring strategy would be essential to track and evaluate the effectiveness of the source control measures.”*

North Creek Watershed Management Plan, Svrjcek 2003

As advised above, a key component to flow attenuation is recovery of lost or compromised wetlands and floodplains – a critical wetland type. We cannot achieve flow attenuation through upland use of LID techniques alone. Wetlands and floodplains safely store flood flows and provide some of the most productive habitat for aquatic species. A degraded floodplain incorporated into a stormwater treatment system exacerbates FCB levels by unnaturally congregating wildlife sources and concentrating stormwater flows into inadequately designed stormwater systems.

Most of North Creek’s and nearly 100 percent of the Sammamish River’s historic flood plains have been modified by levees. This impact has been ongoing for nearly 100 years. Lowering Lake Washington to accommodate the Ballard Locks construction in 1917 reduced the Sammamish River’s and North Creek’s connectivity to their floodplains. Some estimates have described water level drops upwards of 8 to 9 feet at Lake Sammamish (King County, 2002).

Losing floodplain storage for peak flows and wetland summer recharge of stream flows has negatively impacted many attributes of stream health. During summer low -flow periods, the lack of connectivity increases the human health risk associated with primary and secondary recreation contact. Summer recreation activities in and around water pose the highest risk of human exposure to unsafe levels of FCB.

## Action Plan

- 1) Locate and make available previous watershed management plans.
- 2) Use previous watershed management plans to inform future actions and assess past implementations (Snohomish County's report "North and Swamp Creeks Developed an Early Action BMP Plan," Snohomish County Public Works, 2008).
- 3) Analyze the historic and current status of wetland loss and implications of current land use plans.
- 4) Create a prioritized wetland restoration and recovery project list.

## Ambient Water Quality Study

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The City collects ambient water quality data at four locations specifically to identify bacterial pollution levels. Since about 2003, the City has collected FCB samples in North Creek, and recently began sampling Swamp Creek. The method is detailed in City of Bothell, 2009 and City of Bothell 2010. At this time, the City does not propose ambient monitoring of direct stormwater discharges except during source tracking surveys.

City of Bothell 2010 reported that FCB levels in North Creek tributaries have been relatively stable, but still typically exceed state standards. Wet weather sampling, October through May, shows no rising or falling trend in FCB levels. Junco Creek is the only site to routinely meet State water quality standards. Dry weather sampling shows an increase in FCB concentrations. In 2009, Perry Creek recorded the largest increase over 2008, approximately tenfold. The other sites recorded approximately two-fold increases. Data for Little Swamp Creek is unavailable for 2009 because sampling began in 2010.

## Action Plan

- 1) Continue to monitor ambient water quality monthly at three locations in North Creek and one in Swamp Creek (City of Bothell, 2010). Assess results annually.
- 2) Describe trends and patterns to FCB levels.
- 3) Use results to direct future source-tracking surveys.

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## Glossary

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**Ambient Monitoring:** Monitoring that is done to determine existing environmental conditions or pollution levels in the environment and acts as a baseline for comparison with future conditions.

**Bacteria Pollution Control Plan (BPCP):** No later than August 16, 2010, a BPCP shall be developed. At a minimum, it shall consider the use of the following approaches:

- 1) pet waste ordinance,
- 2) evaluation of water pollution control enforcement capabilities,
- 3) evaluation of Critical areas ordinance related to TMDL goals,
- 4) educational program directed at reducing bacterial pollution,
- 5) 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,
- 6) implementation of activities in the North Creek Watershed Management Plan, and
- 7) ambient water quality and stormwater quality sampling to specifically identify bacterial pollution sources.

**Critical Areas Ordinance:** city code pertaining to any of the following areas or ecosystems: aquifer recharge areas, fish and wildlife habitat conservation areas, frequently flooded areas, geologically hazardous areas, and wetlands, as defined in Chapter 36.70A RCW and by Chapter 14.04 Bothell Municipal Code.

**Dissolved Oxygen:** Oxygen that is dissolved in water and therefore available for fish and other aquatic animals to use. If the amount of dissolved oxygen in the water is too low, then aquatic animals may avoid the water or die. Waste water and naturally occurring organic matter contain oxygen-demanding substances that consume dissolved oxygen.

**Eutrophication:** The process by which a water body, usually a lake, builds up excess nutrients resulting in algae blooms and low water clarity. This is a natural aging process in lakes, but it maybe accelerated by human activities.

**Fecal Coliform Bacteria (FCB):** Fecal coliform bacteria are bacteria that are found in the intestinal tracts of mammals. The presence of high numbers of fecal coliform bacteria in a water body can indicate the recent release of untreated wastewater or the presence of animal feces. These organisms may also indicate the presence of pathogens that are harmful to humans. High

numbers of fecal coliform bacteria therefore limit beneficial uses of a water body such as swimming and shellfish harvesting.

**Flood Plain:** the total land area adjoining a river, stream, watercourse, or lake subject to inundation by the base flood. A base flood is a flood having a one percent chance of being equaled or exceeded in any given year. It is also referred to as the “100-year” flood.

**Geographic Information System (GIS):** is any system that captures, stores, analyzes, manages, and presents data in a digital computer generated format that are linked to location. In the simplest terms, GIS is the merging of cartography, statistical analysis, and database technology.

**Growth Management Act:** In 1990 the Legislature found that “uncoordinated and unplanned growth, together with a lack of common goals, pose a threat to the environment, sustainable economic development, and the health, safety, and high quality of life enjoyed by residents of this state. It is in the public interest that citizens, communities, local governments, and the private sector cooperate and coordinate with one another in comprehensive land use planning.” (RCW 36.70A.010)

**Illicit Connections:** any man-made conveyance that is connected to a municipal separate storm sewer (storm water drainage) without a permit, excluding roof drains and other similar type connections. Examples include sanitary sewer connections, floor drains, channels, pipelines, conduits, inlets, or outlets that are connected directly to the municipal separate storm sewer system (MS4).

**Illicit Discharge:** means any discharge to a municipal separate storm sewer (storm water drainage) that is not composed entirely of storm water except discharges pursuant to a NPDES permit (other than the NPDES permit for discharges from the MS4) and discharges resulting from fire fighting activities.

**Impaired Water Bodies 303 (d) List:** The 303(d) list reports on category 5 waters, the impaired waters of the state. Waters placed on Category 5 require the preparation of a plan to improve water quality by limiting pollutant loads. "Total Maximum Daily Loads" (TMDLs) are a key tool in the work to clean up polluted waters.

**Low Impact Development (LID) techniques:** a storm water management and land development strategy applied at the parcel and subdivision scale that emphasizes conservation and use of on-site natural features integrated with engineered, small-scale hydrologic controls to more closely mimic pre-development hydrologic functions. For example: reduced building foot prints, green roofs, porous concrete, and rain gardens.

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**National Pollution Discharge Elimination System (NPDES) permit:** the national program for issuing, modifying, revoking, and reissuing, terminating, monitoring, and enforcing permits, and imposing and enforcing pretreatment requirements, under sections 307, 402, 318, and 405 of the Federal Clean Water Act, for the discharge of pollutants to surface waters of the state from point sources. These permits are referred to as NPDES permits and, in Washington State, are administered by the Washington Department of Ecology.

**Primary/Secondary Contact Recreation:**

**“Primary contact recreation”** activities where a person would have direct contact with water to the point of complete submergence including, but not limited to, skin diving, swimming, and water skiing.

**"Secondary contact recreation"** activities where a person's water contact would be limited (e.g., wading or fishing) to the extent that bacterial infections of eyes, ears, respiratory or digestive systems, or urogenital areas would normally be avoided.

**Watershed:** The geographic region within which water drains into a particular river, stream, or body of water. A watershed includes hills, lowlands, and the body of water into which the land drains.

## References

- City of Bothell, 2009. Surface Water Quality Monitoring BioAssessment Version 2009.5-28. City of Bothell, Public Works, Bothell, WA 98011
- City of Bothell, 2010. North Creek Sample Results 2009 Fecal Coliform Bacteria Total Maximum Daily Load. City of Bothell, Public Works, Bothell, WA 98011
- City of Bothell, 2010. Surface Water Management Program, Version 2009 - 4.0. City of Bothell, Public Works, Bothell, WA 98011
- Glenn, Norm, 2001. North Creek Watershed Total Maximum Daily Load Evaluation for Fecal Coliform Bacteria. Publication 01-03-020. Washington Department of Ecology Water Quality Program, P.O. Box 47600, Olympia, WA 98504-7600.  
<http://www.ecy.wa.gov/biblio/0103020.html>
- Kalenius, Shana, 2008. North Creek Centennial Grant Summary, North Creek Stream and Habitat Project City of Bothell. Agreement No. G0300107, City of Bothell, WA 98011
- King County, 2002. Sammanish River Corridor Action Plan, Final Report. King County Department of Natural Resources and Parks, Water and Land Resources Division, King County, Washington.
- Snohomish County, 2008. Total Maximum Daily Load Early Action Best Management Practice Plan Snohomish River Tributaries, North and Swamp Creeks. Snohomish County Public Works, Surface Water Management Division, Everett, Washington.
- Snohomish County, 2009. Quality Assurance Project Plan (QAPP) Snohomish River Tributaries, North Creek and Swamp Creek: Fecal Coliform Bacteria Total Maximum Daily Load Monitoring, Version 1.0 July 16, 2009.
- Svrjcek, Ralph, 2003. North Creek Fecal Coliform Bacteria Total Maximum Daily Load, Detailed Implementation Plan. Publication 03-10-047. Washington Department of Ecology Water Quality Program, P.O. Box 47600, Olympia, WA 98504-7600.  
<http://www.ecy.wa.gov/biblio/0310047.html>
- Svrjcek, Ralph, 2006. Swamp Creek Fecal Coliform Bacteria Total Maximum Daily Load, Water Quality Improvement Report and Implementation Plan. Publication 06-10-021. Washington Department of Ecology Water Quality Program, P.O. Box 47600, Olympia, WA 98504-7600. <http://www.ecy.wa.gov/biblio/0610021.html>
- Municipal Stormwater General Permit Guidance for Cities and Counties Writing Regulations to Prohibit Illicit Discharges, Dumping, and Illicit Connections, 2008. Washington Department of Ecology, Pub. # 08-10-061.