Union River

Fecal Coliform Water Cleanup

Detailed Implementation Plan

August, 2003

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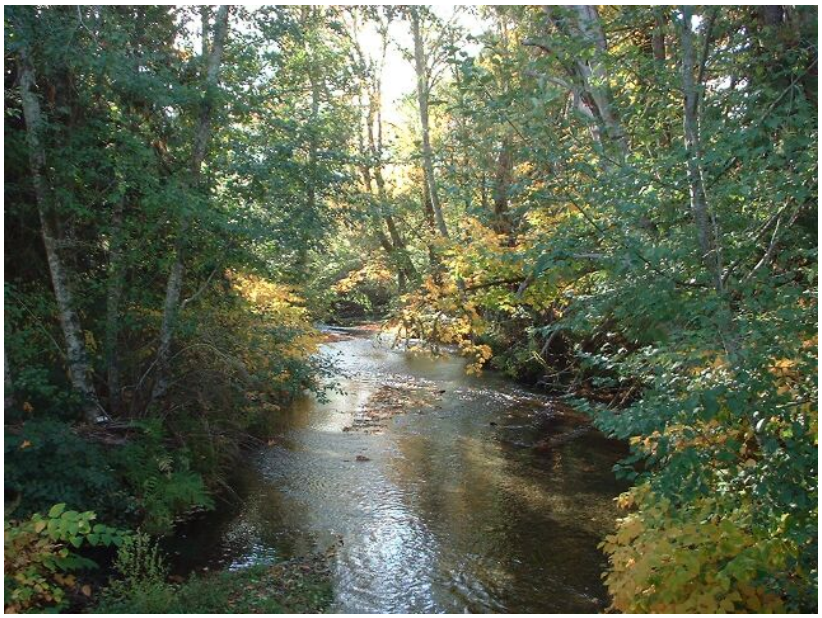

Union River
Fecal Coliform Water Cleanup

Detailed Implementation Plan

by

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August 2003

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Executive Summary

This report, called the Union River Fecal Coliform Water Cleanup Detailed Implementation Plan (DIP), provides detail on watershed activities intended to clean up bacteria contamination in the Union River. DIPs are a required element of the water cleanup planning process known as Total Maximum Daily Loads (TMDLs) in accordance with an agreement between Ecology and the United States Environmental Protection Agency (U.S. EPA, 1997). TMDLs are required under the Clean Water Act when water bodies fail to meet state water quality standards and are placed on a list of "impaired" water bodies - the state 303(d) List. The goal of the TMDL is to ensure the impaired water body will attain water quality standards.

The Ecology TMDL study documenting the bacteria problem in Union River was based on data collected in 1998 (Ward et al., 2001). Based on the study, a public process ensued through which a water cleanup plan was developed, and the Union River TMDL (or Water Cleanup Plan) was approved by EPA in August 2002 (Sweet et al., 2002). The Union River drains 23 square miles in Kitsap and Mason counties and is largely rural with few prominent urban areas. The river flows south-southwest into Lynch Cove at the end of Hood Canal, near the town of Belfair. Lynch Cove, at the Union River estuary, contains productive commercial and recreational shellfish beds. The Union River provides 65 percent of Bremerton's drinking water supply from a diversion below Casad Dam and the Union River reservoir.

The Union River TMDL was initiated because water quality sampling of the river demonstrated that fecal coliform bacteria exceeded the state Class AA water quality standards at several stations since 1990. Class AA waters require a maximum geometric mean of 50-cfu/100 mL and a 90^{th} percentile of 100 cfu/100 mL. The Union River has been on Washington State's 303(d) impaired water bodies list since 1996. The Union River Water Cleanup Plan calls for fecal coliform load reductions measured at five stations ranging from 8 to 38 percent. The probable sources of bacteria to the Union River are failing on-site systems, inadequate agricultural and livestock practices, stormwater runoff from homes, roads and commercial businesses, pet wastes, and wildlife (Sweet, et al., 2002). The city of Bremerton biosolids project and the Olympic View Sanitary Landfill were also identified as potential sources of bacteria to the Union River, but are not considered significant based on monitoring results.

Agencies and organizations responsible to help the Union River meet state water quality standards include Kitsap County Surface and Stormwater Management, Kitsap County Public Works, Kitsap County Health District, Kitsap and Mason Conservation Districts, Mason County Department of Health Services, Mason County Department of Utilities/Waste Management, Mason County Public Works, Lower Hood Canal Watershed Implementation Committee, Washington State Departments of Ecology and Health, city of Bremerton, and the Port of Bremerton. Businesses and residents in the watershed are also responsible for helping prevent Union River bacteria contamination. Other groups playing a role in Union River cleanup include University of Washington Sea Grant Program, Hood Canal Salmon Enhancement Group, WSU Cooperative Extension, Hood Canal Coordinating Council, Hood Canal Watershed Project, and other citizen groups and volunteers.

Several key projects in the watershed are expected to reduce bacteria in the Union River. These include a Kitsap County Health District grant for the Upper Union River Restoration Project

funded by the Centennial Clean Water Fund (CCWF) and a similar CCWF project to be conducted by Mason Conservation District and Hood Canal Salmon Enhancement Group for the Lower Union River Restoration Study. These projects will monitor Union River quality, and will identify and correct pollution sources in each respective county. Stormwater and sewer improvements planned for Belfair and the Port of Bremerton Industrial Park will also eventually result in improvement of bacteria in the Union River. Other efforts include failing on-site system repair and replacement, and animal waste management improvements on small farms.

Numerous monitoring efforts occurring in the Union River watershed will help further identify pollution sources, track water quality trends, and evaluate pollution control efforts. Comparison of water quality with state standards is assisted by Kitsap County Health District's ongoing trend monitoring of Kitsap County surface waters with funding from Kitsap County Surface and Stormwater Management Program. Source identification is assisted by sampling associated with Centennial Clean Water grant projects in Kitsap and Mason counties, and site specific monitoring programs such as at Olympic View Landfill, Bremerton Biosolids application site, Bremerton Airport/Industrial Park, and in the Bremerton watershed.

The Union River Fecal Coliform Water Cleanup will be adaptively managed such that the river and its tributaries will meet state water quality standards by 2007. Adaptive management methods will include: adjusting best management practices in accordance with new information, modifying stream sampling frequency and/or locations to further delineate fecal coliform sources, and conducting special inspections in identified source areas. Adaptive management will also include helping to develop, fund, and conduct water quality projects that address bacteria pollution, local educational initiatives, and other means of conforming management measures to current watershed information.

Ecology continues to respond to environmental complaints, conduct inspections, and issue NPDES permits as part of its responsibilities under state and federal laws and regulations. Ecology will pursue implementation of farm plans and "Best Management Practices" (BMPs) for small farms in cooperation with conservation districts, and may use formal enforcement, including fines, if voluntary compliance is unsuccessful.

Sufficient reasonable assurance exists that the Union River TMDL goals will be met by 2007. Among the elements of reasonable assurance for the TMDL are dedicated local funding for surface water monitoring and pollution control, past health district successes in identifying and abating on-site contamination in Kitsap and Mason counties, and recent CCWF grant projects to identify and correct fecal coliform pollution in the Union River. The most valuable assurance of Union River cleanup success is the considerable local involvement and commitment to water quality and natural resources of the watershed.

Introduction

Washington State Department of Ecology (Ecology) established a Total Maximum Daily Load (TMDL) for fecal coliform bacteria in the Union River watershed in 2002. TMDLs are required by the Clean Water Act when a lake, river, or stream fails to meet designated water quality standards. The state is required to place waters that do not meet state standards on a list of "impaired" water bodies and to prepare an analysis called a TMDL. TMDLs have the goal of ensuring that impaired waters will attain water quality standards and include a written, quantitative assessment of water quality problems and pollutant sources. The TMDL determines the amount of the pollutant, called loading capacity, that can be discharged to the water body and still meet standards, and allocates that load among the various sources.

The Union River Bacteria TMDL addresses impairment to the beneficial uses of the Union River and its tributaries due to excessive bacteria in the water. Monitoring data collected by Ecology, Mason County Department of Health Services, and Kitsap County Health District have documented periodic bacteria pollution in portions of the Union River since 1990. The Union River TMDL study (Ward et al., 2001) was initiated to determine the loading capacity of the stream, identify nonpoint pollution sources of fecal coliform, and set load reduction targets in the stream. The Union River TMDL (Sweet et al., 2002) was approved by EPA on August 2, 2002, documents the public involvement process for the cleanup plan, and outlines a summary implementation strategy for the TMDL.

The Detailed Implementation Plan (DIP) is a required element of TMDLs in accordance with an agreement between Ecology and EPA (U.S. EPA, 1997). DIPs are typically developed in the year following submittal to EPA of the summary implementation strategy and water cleanup report. This Union River DIP provides detail on how implementation will occur, a specific framework for implementing the TMDL bacteria load reductions, and documents on-going and planned actions designed to bring the Union River watershed into compliance with state water quality standards.

This Detailed Implementation Plan includes:

- Characteristics of the Union River watershed, the statutory basis for Water Cleanup Plans (TMDLs), and review of the components of the Union River Bacteria TMDL.
- Description of the sources of fecal coliform bacteria to the Union River.
- Roles, activities, and schedules of various agencies and watershed groups for actions designed to bring the Union River into compliance with water quality standards.
- Monitoring programs to identify sources and verify source control effectiveness and performance measures and targets for evaluating cleanup progress.
- Adaptive management measures that will be applied as cleanup proceeds and available enforcement authority to help ensure success.
- Elements of reasonable assurance that the water cleanup plan will succeed and potential funding sources for future implementation actions.

Background

Watershed Characteristics

The Union River watershed is located in the Puget Sound Basin on the Kitsap Peninsula of Western Washington. The Kitsap Peninsula is bordered on the west by Hood Canal and on the east by Puget Sound. The Union River system drains approximately 23 square miles (14,500 acres) of land in Kitsap and Mason Counties and flows into Lynch Cove at the southeastern end of Hood Canal, near the town of Belfair. The largest tributaries to the mainstem river are the East Fork, Bear Creek, Hazel Creek, and Courtney Creek (Figure 1).

The Union River provides 65 percent of the drinking water supply for the city of Bremerton. The headwaters are impounded by Casad Dam to form the 93-acre Union River Reservoir in the upper watershed. Bremerton maintains very strict water quality controls in the watershed and reservoir, as the city's Union River diversion is one of the few unfiltered municipal water-supply systems in the country. Bremerton water quality controls for drinking water are more restrictive than Washington State water quality standards for bacteria. Public access is not allowed in the watershed above McKenna Falls (a natural fish barrier) and the access roads are gated and patrolled. Managed forestry is the only activity allowed in the city's 3,000-acre watershed.

The Union River basin is largely rural with few prominent urban areas or major point sources. Below McKenna Falls, the most common land uses are forestry, residential, and small farms (small agricultural or livestock operations). Other land uses in the watershed include Olympic View Sanitary Landfill, Bremerton International Airport, the Port of Bremerton Industrial Park, city of Bremerton biosolids application site, a Christmas tree farm, Chet's Trusses, and several sand and gravel mining operations. Belfair, an unincorporated community located near the mouth, is the largest urban area in the basin. Belfair is designated an Urban Growth Area (UGA) and is currently working to meet requirements of the Growth Management Act (GMA), which includes sewerage. The lower Union River contains salmon habitat for small runs of chum, chinook, coho, cutthroat, and steelhead (CTC, 2000). White sturgeon are also known to inhabit the Union River and estuary. Lynch Cove, at the Union River estuary, contains commercial and recreational clam and oyster beds.

The topography of the Union River basin is diverse. Gradients, or steepness of stream channels, are high in the western headwater area, while the lower mainstem is mostly a broad river valley with stream gradients near three percent. The headwaters of the Union River begin approximately five miles west of Bremerton near the 1,760-foot high Gold Mountain. Elevations are generally higher in the western half of the Union River Basin and most of the tributaries such as Hazel Creek, Bear Creek, and Courtney Creek originate in this area. Basin soils consist of erodible glacial outwash silt, sand, and gravel. Because of the low stream gradient in the lower Union River Basin, there are only minor erosion problems in the lower watershed. Most eroded material is deposited near the river mouth as alluvial floodplain and mudflat sediments.

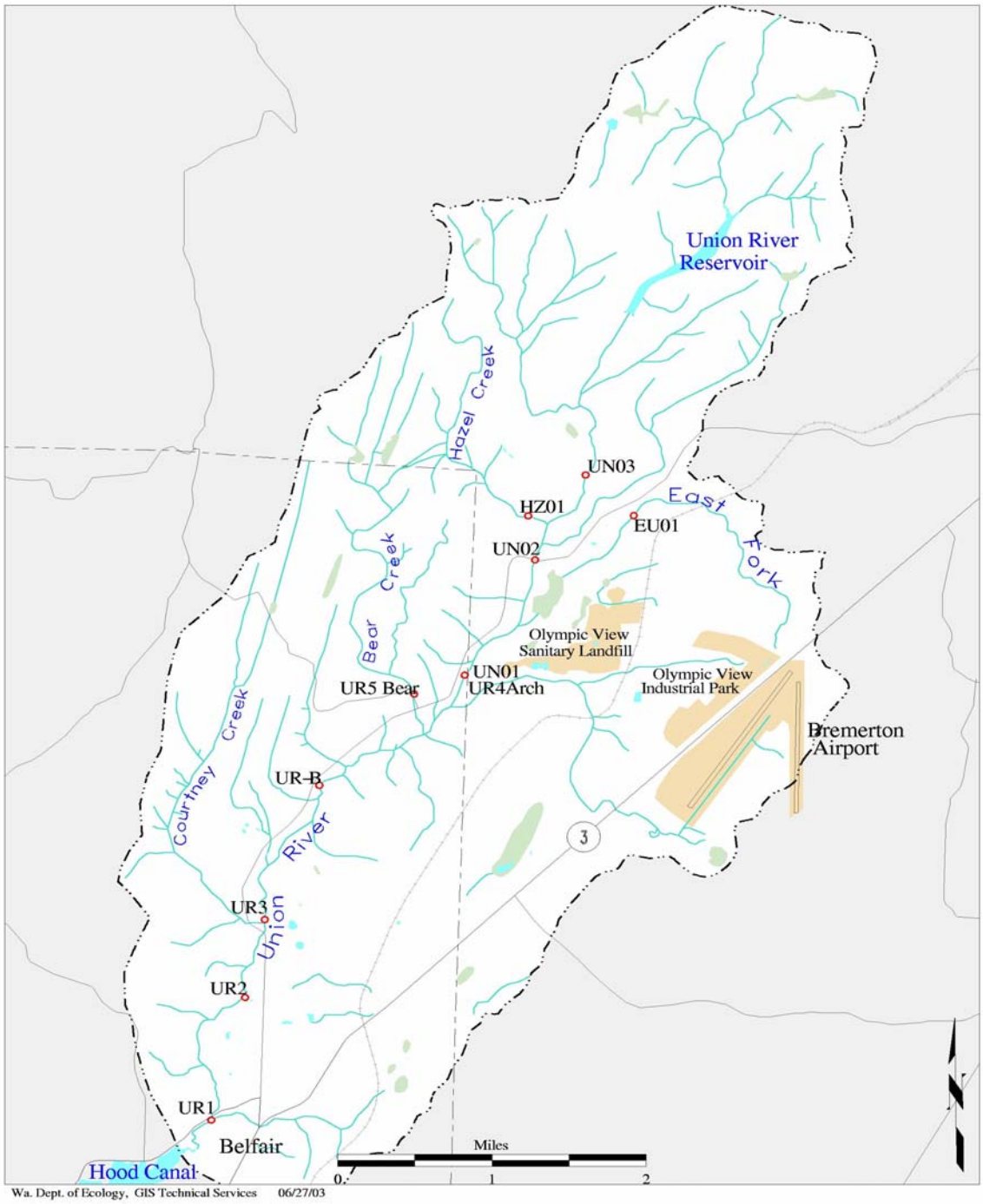

Figure 1. Union River Watershed showing sampling station locations UR1 through UR5, plus additional stations.

Union River Water Cleanup Plan

The Union River bacteria cleanup was initiated because water quality sampling of the river since 1990 demonstrated that fecal coliform concentrations at several sampling locations exceeded state standards. Where a stream, such as the Union River, flows into shellfish harvesting areas, Washington State's water quality standards apply the Class AA (extraordinary) designation to the stream. Criteria for Class AA waters are a maximum geometric mean of 50 colony forming units / 100 milliliters (50 cfu/100 mL) and a 90th percentile limit of 100 cfu/100 mL (Ecology 1997).

Portions of shellfish beds in Lynch Cove in the Union River estuary have been closed due to bacteria contamination since 1987. In the early 1990s, Mason County Department of Health Services (MCDHS) initiated water quality sampling and sanitary surveys to determine sources of fecal coliform to Lynch Cove. During this work, they sampled the lower Union River at the Highway 300 Bridge between August 1990 and August 1991, and found fecal coliform concentrations exceeding the state standard. These data resulted in listing the lower Union River on the state's Section 303(d) List. To address the shellfish closure problem and help prevent further closures, MCDHS created a Shellfish Protection District around Belfair and Lynch Cove in 1992 and initiated programs as required by RCW 90.72.045 for shellfish protection districts. Table 1 shows information relevant to the Union River 303(d) fecal coliform listing.

Table 1. The 303(d) Listing for Union River Fecal Coliform

Stream Name	1996 Water body ID Listing	1998 Water body ID Listing	WRIA	Township/ Range/ Section
Union River	WA-15-2010	MF56EG	#15	23N/01W/29

The marine waters of Lynch Cove are also on the 303(d) list for fecal coliform near the mouth of the Union River and at four other locations along the north shore of Hood Canal. Lynch Cove is one of many productive shellfish growing areas in Mason County, but has been closed for 16 years as discussed above. The shellfish industry in other parts of Mason County is the second largest private sector employer in the county and yielded an estimated $32.2 million in gross sales in 2001. There are 625 jobs that directly and indirectly depend on shellfish production in Mason County (Mason County Economic Development Council, 2002).

Ecology's Environmental Assessment Program, Water Quality Program, and Kitsap County Health District (KCHD) have collected data since the early 1990s showing that the Union River continues to exceed fecal coliform standards at several sampling stations in the watershed. A summary of data collected in the Union River watershed up through 1998 is included in the Union River Fecal Coliform Total Maximum Daily Load Study (Ward, et al., 2001). Recent Ecology sampling in the Union river watershed shows high fecal coliform concentrations in streams draining the Belfair urban area (Ecology, 2003).

The Union River is only one of many bacteria contributions to Lynch Cove. Other potential sources include shoreline residences, stormwater, boat wastes, and wildlife. Because shellfish are filter feeders that pump large amounts of water through their bodies, they concentrate bacteria in

their tissues causing little or no harm to the animal, but posing potential health risks for human consumers. The fecal coliform reductions specified in the Union River TMDL will lower bacteria inputs to Lynch Cove. However, Ecology and Mason County must complete a marine TMDL to further reduce the contamination risk to shellfish beds and to address additional sources of bacteria to Hood Canal.

The Union River water cleanup involves reducing bacterial pollution that originates exclusively from nonpoint sources. Since calculating separate load allocations for each nonpoint source is improbable due to the diffuse nature and natural variability of bacteria sources, the Union River TMDL sets instream water quality-based load reduction targets at five monitoring stations. The loading capacities and load reductions needed to meet water quality standards at four stations on the Union River and one on its major tributary, Bear Creek, were determined by Ward, et al. (2001) and are shown in Table 2.

Table 2. Fecal coliform loading capacity in Union River and Bear Creek.

Station	Reach	Load Reduction Needed (%)	Fecal Coliform Loading Capacity (cfu/day)
UR1HY300	Mouth to RM 1.3	8%	--
UR2Tmbr	RM 1.3 to RM 1.8	38%	4.8×10^{17}
UR3River	RM 1.8 to RM 4.5	22%	1.9×10^{12}
UR4Arch	RM 4.5 to Headwaters*	17%	1.7×10^{12}
UR5Bear	Bear Creek	12%	1.4×10^{12}

The load reductions required at monitoring stations on the Union River and near the mouth of Bear Creek are set as percent reductions needed within the river segment and upstream tributaries associated with each station. Reduction targets in the watershed range from 8 percent to 38 percent and equate to the state Class AA fecal coliform water quality standard (Table 2). Target geometric means and 90^{th} percentiles were calculated based on sample population characteristics at each station and are shown in Table 3.

Table 3. Allocation targets in the Union River TMDL.

Station	Reach	Geometric Mean (cfu/100mL)	10% of Samples Cannot be Over (cfu/100mL)
UR1HY300	Mouth to RM 1.3	44	100
UR2Tmbr	RM 1.3 to RM 1.8	50	54
UR3River	RM 1.8 to RM 4.5	50	51
UR4Arch	RM 4.5 to Headwaters*	50	57
UR5Bear	Bear Creek	50	62

* This segment applies from RW 4.5 to McKenna Falls and headwaters of Union River tributaries that are downstream of McKenna Falls.

Seasonal variation was considered in this water cleanup plan by calculating water quality statistics for each month of the year at each sampling station used in the study (Ward, et al.,

2001). Fecal coliform data from the study show a significant increase in bacteria concentration during summer (beginning in May and lasting through August). This period of increased bacteria concentration coincides with the dry low-flow season and indicates there is a continuous, steady component to the pollution loading. Continuous bacteria loading to the river is most likely attributed to failing on-site systems, farm animals, and wildlife.

In fall and winter, high bacteria concentrations in the Union River coincide with increased rainfall, especially "first flush" runoff occurring between September and November. These episodic increases of bacteria loading during winter months indicate there is a stormwater component to the pollution loading. Bacteria pollution loading from stormwater is probably runoff from urban/semi-urban surfaces (including pet wastes) and small farms.

A detailed discussion of pollutant sources is given in the next section.

Pollution Sources

The most probable sources of bacterial contamination to the Union River are on-site sewage system failures; inadequate agricultural and livestock practices; pet wastes; wildlife; and runoff from homes, highways, and commercial businesses (Sweet, et al., 2002). The city of Bremerton biosolids project and the Olympic View Sanitary Landfill were also identified as potential sources of bacteria to the Union River. Sources of bacterial pollution to the Union River are summarized in Table 4 and are discussed below.

Table 4. Potential sources of bacterial pollution to the Union River.

Source	Explanation
On-Site Septic Systems	Failing or improperly designed/installed on-site septic tanks and/or drainfields that allow discharge of partially treated effluent to groundwater or surface water.
Stormwater	Contaminated runoff from airport, industrial park, urban parking lots, streets, roofs, and runoff contaminated with residential pet wastes.
Small Farms	Runoff and drainage from hobby farms, fields, intensive animal use areas, and pastures. Improper manure application and/or storage practices.
Wildlife	Contamination from wildlife in the watershed such as deer, bear, beaver, geese, ducks, and heron.
Olympic View Sanitary Landfill	Landfill leachate-contaminated runoff or groundwater from Olympic View landfill.
Bremerton Biosolids Application	Runoff or groundwater contamination from land application of Bremerton municipal biosolids to 475 acres in the watershed.

Commercial and residential On-Site sewage systems

On-site sewage systems are a source of pollutants to the Union River if they are sub-standard, failing, or located near the river or a tributary. Potential sources of bacteria, nutrients, and other contaminants include: sewage from failing residential on-site sewage systems, inadequate community wastewater systems, and accidental spills or illegal dumping from sewage collection.

Greywater (or wastewater from bathtubs, showers, kitchen and bathroom sinks, washing machines, and dishwashers) is a potential pollution source regulated under state regulation Chapter 246-272 WAC. The Washington State Department of Health (DOH) stresses that greywater can contain harmful bacteria, viruses, and chemicals that pose a risk to public health and the environment unless properly managed. Field investigations by the Kitsap County Health District have identified

four household greywater discharge failures in the upper Union River watershed. A greywater discharge failure is discharge of greywater to the ground surface or to a surface water body. None of the greywater discharges in the Union River watershed resulted in direct discharges to the Union River.

Approximately one tenth of the Union River watershed is residential and a significant portion in Belfair is commercial. Currently, no sewerage service is available and all properties have individual or community on-site sewage systems. Sewer system service is planned for portions of the Belfair Urban Growth Area (UGA) as discussed below, but is not expected to be on line for at least several years. Sewer service is eventually expected for the Port of Bremerton facilities at the Bremerton Airport and Olympic View Industrial Park due to projected expansion as discussed under Port of Bremerton below. These sewer improvements will accommodate some residents and commercial on-site systems in portions of the Union River watershed, but not all. Therefore, proper operation and maintenance of existing on-site systems will continue to be critical.

Urban and semi-urban stormwater runoff

Insufficient stormwater control and treatment can cause excessive sedimentation and erosion, increased stream temperatures, and decreased dissolved oxygen levels. Stormwater can introduce bacteria, toxic chemicals, metals, and other contaminants into receiving waters. Pet and wildlife wastes deposited on curbs and paved surfaces may wash off during storm events and contribute bacteria and nutrient contamination to streams and shellfish beds (Horner et al., 1994).

Significant stormwater is generated in unincorporated Belfair and at the Port of Bremerton airport and industrial park. Increasing amounts of impervious surface in developed areas can decrease groundwater recharge (and thus decrease minimum streamflows), increase erosive storm flows, and directly deliver pollutants accumulated on pavements to the stream. Recent storm sampling of streams draining the Belfair urban area show high bacteria concentrations in runoff (Ecology, 2003). Stormwater problems and plans for the Union River watershed are discussed below under Mason County Department of Public Works and Port of Bremerton, respectively.

Small-scale farming or commercial horticultural activities

Small-scale farming and commercial horticulture involve fertilizers, pesticides, and animal wastes that can impact nearby water bodies. Homeowner use of fertilizers and pesticides can also affect water bodies. Runoff from manure and barn clean-out piles, common in many agricultural areas, can be significant sources of bacteria, nitrogen, and phosphorus pollution to surface and groundwater. Bacterial pollution from farms is implicated in many shellfish bed closures around Puget Sound. There are a significant number of small-scale or hobby farms in the Union River watershed.

Wildlife

Wildlife may contribute bacteria, nutrients, and particulate organic material to surface waters, occasionally in significant amounts. Bear, deer, beaver, otter, ducks, geese, heron, and other wildlife are observed in the Union River watershed. These and other wildlife contribute bacteria loading to the river and its tributaries both indirectly and directly. Wildlife can make a significant contribution to loading during fall when birds and other animals are feeding on spawned-out salmon carcasses in the river.

Olympic View Sanitary Landfill

Figure 2. Olympic View sanitary landfill in the Union River watershed.
(operating in 1987)

Olympic View Sanitary Landfill (OVSL) is located in the Union River basin approximately ten miles southwest of the city of Bremerton. An extensive wetland complex of over 130 acres is located north and west of the landfill and includes portions of the floodplain of the East Fork. Landfilling at the site began in 1963 when the total landfill area was about 25 acres. After 1975, the site accepted mixed municipal solid waste, industrial, demolition, and other special waste.

Today, the landfill occupies approximately 65 acres of the total 500-acre tract owned by OVSL, a Waste Management Inc. company. OVSL leachate is collected and pre-treated in an on-site lagoon system and trucked to the Bremerton Sewage Treatment Plant. Stormwater at the landfill is collected in a separate stormwater lagoon system covered under state Waste Discharge Permit #7271. Ecology is requiring implementation of technology-based pollution controls for stormwater from the landfill through the Stormwater Pollution Prevention Plan (SWPPP) associated with Permit #7271. The landfill stopped accepting municipal solid waste in July 2002 and is currently in closure (Wall, 2003).

Past surface water monitoring at Olympic View landfill has included quarterly sampling from 1996 to 2000 and individual wetland monitoring and off-site monitoring events (Geomatrix, 2001). Semiannual surface water monitoring at stormwater ponds and other outfalls began in 2001 and will continue until the Kitsap County Health District issues a post-closure permit for the facility. Ecology is working with the health district to oversee the closure and will be making periodic inspections of the landfill and surrounding environs.

While OVSL is considered a potential source of bacteria, closure and post-closure monitoring of the site will help ensure that the Union River is not being contaminated from this potential source.

Other additional monitoring surveys may be conducted in association with this TMDL to further characterize potential sources of bacteria in and around the closed landfill.

City of Bremerton biosolids land application program

Biosolids are organic semi-solid material derived from municipal wastewater that can be beneficially recycled but must meet strict quality standards for pathogens, animal attraction, and pollutant concentrations. Biosolids produced at Bremerton's Wastewater Treatment Plant (NPDES Permit No. WA 002928-9) have been land-applied to forestlands owned by the Bremerton Water Utility since 1992. Bremerton Water Utility manages the city's biosolids program and applies to approximately 470 acres, approximately 170 of which are located within the upper Union River watershed. In 2002, a total of 4,317 cubic yards of dewatered biosolids were applied to 412 acres at the site (Bremerton, 2003).

The Bremerton biosolids permit allows land application of Class B-treated biosolids on the city-owned site located between State Highway 3 and Old Belfair Highway, adjacent to the Gold Mountain Golf Course. Kitsap County Health District (KCHD) was the permitting authority for the biosolids application until 1998, when Ecology became permitting authority under the General Permit for Biosolids Management (Permit # BA 0029289). Regulations found in RCW 70.95J authorize and direct Ecology and local governments to meet federal regulatory requirements for managing municipal biosolids. Ecology and Kitsap County Health District provide oversight for biosolids management in Kitsap County.

Bremerton monitors their biosolids land application site for environmental impacts and provides quarterly and annual reports to KCHD and Ecology. Surface water, soils, soil water and groundwater are monitored closely and impacts are within Ecology and EPA guidelines for biosolids programs. Local groundwater meets drinking water standards and surface water monitoring immediately downstream of the land application site in 2002 showed fecal coliform levels averaging less than 10 cfu/100 mL (Bremerton, 2003).

The Bremerton biosolids application areas are gated and posted to limit unauthorized access and the program is being successfully managed with minimal impacts on the watershed. The biosolids program is therefore not considered a significant source of bacteria contamination to the Union River.

Management Roles, Activities and Schedules

This section describes government agencies, citizen groups, and educators that have regulatory authority, influence, information, resources, or other involvement in the Union River water cleanup. A description of specific implementation activities and schedules is described for each group to document on-going and planned activities to reduce fecal coliform. A summary of implementation projects to reduce bacteria in the Union River watershed is shown in Table 5 and descriptions of implementation actions are tabulated in Appendix A. An abbreviations index is provided at the end of this report.

Table 5. Summary of implementation projects to reduce bacteria in the Union River watershed.

Project	Responsible Parties	Scheduled completion
Kitsap Surface Water Quality Trend Monitoring (including Union River)	SSWM KCHD	Ongoing
Upper Union River Restoration Project (PIC)	SSWM, KCHD Kitsap CD, Ecology	Dec. 2004
Kitsap Self-Help On-Site Sewage Repair Program	KCHD WOSSA, volunteers	Ongoing
Lower Union River Restoration Study	Mason CD, MCDHS, HCSEG, UW Sea Grant, MCPW, Ecology	Nov. 2005
Belfair sanitary sewer improvements	MCUWM	2006
Belfair stormwater improvements	MCPW	2006?
Highway runoff stormwater management	WSDOT, KCPW MCPW	Ongoing
Olympic View Landfill Closure	KCHD - Solid Waste Division, Ecology	June 2005
South Kitsap Industrial Area sewer service	POB, KCPW Port Orchard	2009
Port of Bremerton Industrial Park stormwater improvements	Port of Bremerton SSWM, Ecology	August 2005

Several local agencies have existing programs or plans that will help address the Union River bacteria problem. The Kitsap County Public Works' Surface and Stormwater Management Utility (SSWM) is the funding agency for Kitsap County Health District (KCHD) and Kitsap CD (KCD) PIC and water quality programs. KCHD initiated the Upper Union River Restoration Project (PIC Project) in November 2001 to address pollution problems in the upper Union River watershed (Kitsap County portion).

The Mason Conservation District initiated the Lower Union River Restoration Study with a state Centennial Clean Water grant in February 2003 to address pollution problems in the Mason County portion of the watershed. Several citizen groups such as Lower Hood Canal Watershed Implementation Committee (LHCWIC), Hood Canal Salmon Enhancement Group (HCSEG), Hood Canal Watershed Education Network (HCWEN), and the Hood Canal Coordinating Council

(HCCC) are active in helping sponsor and conduct education, monitoring, and remediation projects relating to Union River water quality. These projects are discussed in detail below. As stated in the Union River TMDL submittal report (Sweet et al., 2002), Ecology anticipates that if planned source control measures are implemented, all sampling stations in the watershed will meet bacteria water quality standards by December 2007.

Kitsap County Surface and Stormwater Management

Kitsap County Public Works' Surface and Stormwater Management Utility (SSWM) is an active participant and supporter of water resource and water quality issues in Kitsap County. SSWM has an interlocal agreement with Port of Bremerton to assist in the construction and maintenance of regional stormwater facilities at Bremerton Airport and Olympic View Industrial Park. SSWM is also the funding agency for the Kitsap County Health District (KCHD)/Kitsap Conservation District PIC and water quality programs described below.

Kitsap County Health District

Kitsap County Health District (KCHD) has taken an active role in monitoring water quality in Kitsap County and correcting environmental pollution sources. KCHD has authority to enforce rules adopted by the state Board of Health, which include rules necessary to assure safe and reliable public drinking water and to protect public health. The health district routinely monitors water quality in county streams and tracks water quality trends in surface water bodies throughout the county (KCHD, 2002).

Funded by Kitsap County Public Works' Surface and Stormwater Management Utility (SSWM), the KCHD On-Site Sewage/Water Quality Program identifies and corrects sources of water pollution. KCHD utilizes an approach in their on-site efforts known as Pollution Identification and Correction (or PIC). The health district's PIC program involves a thorough assessment of land uses in an area, impacts to local water quality, an evaluation of available options for correcting identified pollution sources, and finally, action to remediate the problem.

Upper Union River Restoration Project (PIC)

In response to the Union River fecal coliform problem, the health district initiated the Upper Union River Restoration Project in November 2001. This project is partially funded by Centennial Clean Water Funds and uses the health district's PIC protocol (KCHD, 1999) to identify and correct fecal coliform pollution sources through intensive site-by-site property parcel visits and inspections. In the Upper Union River Restoration Project, the KCHD is conducting sampling and analysis of the Upper Union River tributaries at over 20 sampling stations. The project has a total cost of $150,000 and addresses fecal contamination problems related to failing on-site sewage systems (OSS) and inadequately managed animal wastes. Fecal coliform sources are being corrected through water quality/OSS information and education, and when needed, through enforcement of local OSS and solid waste regulations.

KCHD is conducting door-to-door surveys in the watershed including inspection of sanitary systems in order to locate and correct sources of pollution. Property parcel visits and inspections are performed during the wet season to increase the likelihood of detecting failing systems. Follow-up monitoring is performed after property owners implement best management practices in order to evaluate effectiveness. Of the 179 properties in the Upper Union River watershed (Kitsap County portion), KCHD surveyed 142 (or 79 percent) as of June 2003. The six failures identified to date include two on-site sewage systems and four (4) greywater discharges (Holdcroft, 2003).

Figure 3. Participants in Kitsap Self-Help On-Site Sewage Repair in Union River Watershed, November 2002.

KCHD follows through on identified pollution problems to ensure they are corrected. When a failing on-site system is identified, KCHD works with the property owner to ensure that repairs are consistent with state and local regulations and completed in a timely fashion. If necessary, on-site sewage regulations are enforced in order to get owners of failing systems to comply. Low income owners may receive help from the Kitsap Self-Help On-Site Sewage Repair Program.

If necessary, correction of animal waste management violations is enforced through KCHD's solid waste regulations (Bremerton-Kitsap County Board of Health Ordinance Number 2000-6 Solid Waste Regulations). Referrals are made to Kitsap Conservation District for technical assistance, and voluntary cooperation and implementation of BMPs as an option for the property owner. Property owners may also be provided with information on best practices for pet waste management and reminded of their responsibilities as outlined in county solid waste regulations. Other identified sources of fecal coliform pollution will be referred to the appropriate agency for correction through enforcement of applicable regulations.

Corrective actions associated with the Upper Union River Restoration Project (PIC) project will be completed in 2003 and the final report submitted to Ecology in 2004. KCHD plans to prevent future water quality problems in the upper watershed through an intensive public education campaign targeted on domestic wastewater systems and animal waste management practices. Following completion of the Kitsap Union River PIC Project, KCHD will continue to perform monthly monitoring of 6 stations in the upper Union River.

Kitsap Self-Help On-Site Sewage Repair Program

The Kitsap Self-Help On-Site Sewage Repair Program is a comprehensive charitable on-site system repair program designed to screen low income applicants for assistance; work with homeowners to diagnose reasons for failure; design a repair plan; and coordinate supplies, volunteers, and contract supervision to perform the needed work. The program is sponsored by volunteers, donations, and the Washington On-Site Sewage System Association (WOSSA). The recent suspension of the Kitsap County Health District on-site repair loan program has increased the need for local low-income assistance for on-site repair. One of the two "failing" on-site sewage systems identified by the Upper Union River Restoration Project was repaired through the Kitsap Self-Help Program. The program has yielded additional benefits from the unique opportunity for contractors and regulators to work together on projects.

Kitsap Conservation District

Kitsap Conservation District (KCD) is integral in the effort to improve animal waste management practices in Kitsap County and Union River watershed. KCD is under contract with KCHD to provide information on animal waste management, education, and technical assistance associated with the Upper Union River Restoration Project. KCHD and KCD are conducting nonpoint pollution workshops, developing a prioritized inventory of animal management sites in the project area, and assisting landowners to develop and implement animal waste management plans or farm management plans as needed. Both KCHD and KCD have loan monies and cost-share opportunities available to assist eligible property owners FC pollution correction.

KCD inventoried animal management sites in the Upper Union River watershed and is continuing to assist landowners to implement waste management plans or farm management plans as needed or directed by the health district. KCD has identified and prioritized agricultural properties with

water quality problems based on overall likelihood that current practices may result in surface or groundwater pollution. Agricultural parcels in the Union River watershed make up approximately three percent of the watershed in Kitsap County and were surveyed by KCD in 2001. KCHD is currently using the KCD survey data to prioritize properties for investigation.

Mason County Department of Health Services

Mason County Department of Health Services (MCDHS) is responsible for the public health aspects of on-site pollution problems in Belfair and the Union River watershed. MCDHS has authority to enforce rules adopted by the state Board of Health to assure safe and reliable public drinking water and to protect the public health. They regulate on-site sewage systems and certify and regulate on-site pumpers, installers, and operation and maintenance professionals.

MCDHS also works to reduce on-site pollution problems along the Hood Canal shoreline adjacent to shellfish beds and the Union River estuary. While not directly related to Union River cleanup, monitoring and correction of pollution to shellfish beds near the Union River estuary help bring attention to all sources of contamination to Lynch Cove including the Union River. Portions of shellfish beds in Lynch Cove have been classified as prohibited by Department of Health (DOH) due to bacteria contamination since 1987. MCDHS created a shellfish protection district and associated programs as required by RCW 90.72.045 in 1992.

Mason County Homeowner On-Site Operation and Maintenance Program

Using Clean Water District funds from 1994 to 1999, Mason County Department of Health Services (MCDHS) implemented a homeowner information, notification, inspection and reporting program in the Lower Hood Canal watershed. During this program, MCDHS inspected or tested over 85 percent of the on-site systems in Lower Hood Canal including the Union River watershed. About ten percent of the systems inspected required repair or replacement. After the repairs, a large portion of the area that was closed to shellfish harvesting was reopened based on improved water quality samples collected by state Department of Health Shellfish Division.

Mason County Department of Health Services (MCDHS) manages the Lower Hood Canal Pollution Source Identification Project, funded by a grant from the Centennial Clean Water Fund. The main purpose of the Lower Hood Canal project is to identify the nonpoint pollution sources of fecal contamination along the waterfront area from Gladwin Road to Boad Haven Road on the North Shore of Lower Hood Canal so that nearby shellfish beds might be re-opened to harvest. This project will be completed through research, surveys, and prioritization of potential sources, technical assistance, education, and compliance action referrals when necessary. Most of the failing on-site systems identified through the surveys were repaired, and MCDHS will take enforcement actions to repair or replace additional failing systems as necessary.

MCDHS was also awarded a grant to initiate its Threatened Area Response strategy in Lower Hood Canal. This funding allows the health department to pro-actively respond to shellfish beds which are downgraded to threatened before they are closed.

Mason Conservation District

Mason Conservation District (MCD) develops farm plans to protect water quality and provides animal waste management information, education, and technical assistance to residents. Notices of Correction from Ecology or MCDHS are typically referred to MCD for assistance, and the

district has cost-share opportunities to help qualifying property owners correct bacterial pollution sources. When developing farm plans, the district uses guidance and specifications from the U.S. Natural Resources Conservation Service. MCD is committed to tracking farm planning and implementation, including Geographic Information System mapping of best management practice (BMP) implementation in the Union River watershed.

Lower Union River Restoration Study (MCD)

The Lower Union River Restoration Study, in the Mason County portion of the Union River watershed, is a key project for implementation of the Union River TMDL. Mason Conservation District (MCD) received a $246,580 Centennial Clean Water Fund grant in 2003 to identify and correct sources of bacterial pollution and contaminants toxic to salmon and shellfish in the lower Union River and its estuary. The study will identify bacteria sources, recommend remediation actions, and implement controls for failing on-site systems and agricultural sources. The project will also develop a stormwater runoff and control plan for the Belfair Urban Growth Area (UGA), and establish a community-based watershed stewardship program.

The Lower Union River Restoration Study (LURRS) will determine sources of bacteria contamination by monthly sampling at control points over the length of the river and certain tributaries. Where reconnaissance sampling indicates bacteria sources, MCDHS will rank on-site systems based on risk to groundwater or surface water, conduct inspections, and perform approximately 40 dye traces of suspected failing on-site systems. MCD will provide consultation on BMPs for animal waste management. Remediation actions will be coordinated with property owners and results of repairs and improved practices will be monitored. Sampling and inspections will determine the stormwater runoff and contamination from the Belfair UGA.

Several agencies and watershed groups are collaborating in the Lower Union River Restoration Study in addition to MCD and MCDHS. Hood Canal Salmon Enhancement Group (HCSEG) will oversee water quality sampling; and survey and test stormwater runoff from each commercial site for bacteria and other compounds. HCSEG will also complete the concept plan for management and control of stormwater in the Belfair UGA. MCPW is coordinating on data obtained from the study and is contributing matching resources to the stormwater characterization effort. University of Washington Sea Grant Program and Ecology are assisting to train volunteer samplers and present community education and outreach programs.

Mason County Department of Utilities / Waste Management (MCUWM)

Mason County Department of Utilities and Waste Management has responsibility for utilities and waste management in the unincorporated areas of Mason County. In addition to the operation and maintenance of the Belfair, Hoodsport, Union Drop Box Stations, and Solid Waste Transfer Station near Shelton, Utilities and Waste Management will be involved in implementing future sanitary sewer service in the Belfair Urban Growth Area.

Belfair Future Sewer Plans

Unincorporated Belfair is an Urban Growth Area (UGA) in Mason County and, as such, under the state Growth Management Act, the county is required to provide acceptable infrastructure to serve the anticipated growth. Plans for sewering Belfair are limited to the declared UGA, unless certain conditions such as significant health concerns cause exceptions. Through encouragement

by MCDHS and the LHCWIC, Mason County Department of Utilities and Waste Management (MCUWM) may include sewer service to the north shore of Hood Canal because of the public health risk posed by bacteria contaminated shellfish beds. Failing or inadequate on-site sewage systems are suspected to be the main cause of high marine bacteria levels along the north shore.

In addition to sewering the north shore area, sewer service is also planned to extend northeast from Belfair along State Highway 3 to near the Kitsap/Mason County line. Mason County has decided to sewer the Belfair area via a long (30,000 linear feet) force main to the existing North Bay-Case Inlet water reclamation facility in Allyn. The Belfair sewer main will extend the demand on the Allyn treatment plant from its current 900 connections to about 1,450 connections. As currently configured, the Allyn sewage treatment plant has a capacity of approximately 1,800 connections. Pending timely design and engineering work, the sewer line should be under construction in 2006.

Mason County Public Works (MCPW)

Mason County Public Works Department (MCPW) has responsibility for the engineering, construction, maintenance, and administration of the Mason County road system. MCPW also plays a critical role in managing stormwater issues in the Belfair area, especially since Belfair is an unincorporated urban area.

Belfair Future Stormwater Plans

Current stormwater in the Belfair UGA is largely untreated and unmanaged by an overall stormwater management plan. Recent samples of streams draining the Belfair urban area, such as Belfair Creek during storm events, show high bacteria concentrations in stormwater runoff (Ecology 2003). MCPW is contributing to the stormwater sampling characterization for the Lower Union River Restoration Study.

Lower Hood Canal Watershed Implementation Committee

The mission of the Lower Hood Canal Watershed Implementation Committee (LHCWIC) is to pursue an ongoing and effective Lower Hood Canal Watershed action plan, with ongoing community supported actions focused on protecting water quality and quantity in the Lower Hood Canal Watershed. Over 75 community members, during the past nine years, have volunteered thousands of hours and logged hundreds of miles to work together with businesses and agencies to preserve and protect the Lower Hood Canal.

The members of Lower Hood Canal Watershed Implementation Committee have played an important role in Lower Hood Canal watershed recovery over the last ten years. In 1994, community members helped develop the Lower Hood Canal Watershed Action Plan (LHCWIC, 1994). From 1994-1998, more community citizens advised Mason County on Lower Hood Canal Clean Water District shellfish closure response. In 1998, LHCWIC was officially formed by the Mason County Commissioners to review the watershed action plan and advise the Commission. LHCWIC includes citizens and representatives from the state and county agencies and the Skokomish Tribe and meets monthly to discuss watershed issues and monitor related program progress. LHCWIC prepared the grant proposal for the Lower Union River Restoration Study and will monitor progress and study results of the project.

Belfair Sub-Area Planning Group

Mason County set up the Belfair Sub-Area Planning Group in 2002 to compile public input, plan, and make recommendations for transportation, utilities, and land use development guidelines for the Belfair Urban Growth Area (UGA). The Belfair Sub-Area Planning Group includes representatives of business, residents of the Belfair UGA and environs, and Mason County Planning Department. Initial infrastructure recommendations for Belfair should be forthcoming from the group in fall of 2003.

City of Bremerton

The city of Bremerton impounds the headwaters of Union River with Casad Dam for drinking water supply for the city. Bremerton owns and protects the 3,000-acre watershed above the dam and the watershed is closed to the public, gated, and patrolled. The only activity allowed in the watershed is forestry, which is managed by the city. The water quality is exceptional (more than 96 percent of raw water samples have fecal coliform concentrations less than or equal to 20 cfu/100mL). The city of Bremerton is one of the few surface water supplies in the United States allowed to operate unfiltered (Cahall, 2002).

Since 1995, Bremerton has operated its water diversion on the Union River on a consistent firm yield of between 1880 and 2020 MG/yr. Daily diversions are based on system demands and the city must meet or exceed their minimum downstream flows of 3 cfs (October through May), 2 cfs (June) and 1 cfs (July through September). The reservoir provides some mitigation of high downstream flows during most high precipitation events. However, once the reservoir is full, all excess incoming water overflows downstream.

The 3,000-acre watershed area above Casad Dam averaged 62 inches of precipitation (10,100 acre-feet) per year since 1957 (Cahall, 2002). Average streamflow curves for the Union River near Belfair indicate that groundwater is the primary contributor to river flow during summer, and direct surface water runoff becomes an important factor to streamflow beginning in September and October (Garling et al., 1965). Bremerton's flow monitoring should help ensure careful analysis of the effects of streamflow on water quality. Bremerton is committed to maintaining the current standards of its watershed operation, including restricted access.

Figure 4. Casad Dam on the upper Union River, Bremerton watershed.

Port of Bremerton

The Port of Bremerton operates Bremerton National Airport and Olympic View Industrial Park on State Route 3, approximately eight miles southwest of Bremerton. Domestic wastewater from facilities at the airport and industrial park is discharged to a large on-site wastewater treatment system located within the Union River drainage basin. The port's large on-site sewage system (LOSS) has a design capacity of 72,500 gallons per day (gpd); and is currently operating at about 11,000 gpd. The port's LOSS includes aerated treatment lagoons, a gravel filter, and a 13-acre effluent drainfield area. The subsurface discharge from the Port of Bremerton's LOSS is permitted under state Waste Discharge Permit No. ST 7390. The port samples the LOSS system influent and effluent twice annually and has stayed in compliance with their permit conditions since construction of the new LOSS in 1987.

The Port of Bremerton (POB) also has a general permit to discharge industrial stormwater from the airport and Olympic View Industrial Park. Under the permit, the port will monitor stormwater leaving the airport and industrial park quarterly in accordance with the sampling plan and guidelines established in the permit. Kitsap County Public Works' Surface and Stormwater Management Utility (SSWM) has an interlocal agreement to assist POB to construct and maintain regional stormwater facilities at the airport and industrial park.

In the next ten years, the Port of Bremerton will be adding an 11-acre Northeast Campus Business Park to the Airport and Industrial Park complex. The new Northeast Campus will add domestic wastewater load to the port's LOSS, which still has significant capacity. Eventually, the port complex is expected to receive sewer service from a regional sewage treatment plant, but the schedule is uncertain at this time. The Port of Bremerton received a CCWF grant to prepare a Stormwater Management Study for its business park extension.

South Kitsap Industrial Area (SKIA)

In addition to the Port of Bremerton's Northeast Campus extension, Kitsap County is currently considering comprehensive plan amendments for a much larger (~3,400-acre) South Kitsap Industrial Area (SKIA) industrial and business park. The SKIA surrounds the existing Bremerton Airport and Industrial Park complex and occupies the Union River, Gorst Creek, and Coulter Creek watersheds. The SKIA proposal is an ongoing collaboration between property owners, Port of Bremerton, the cities of Bremerton and Port Orchard, and Kitsap County.

For wastewater treatment during the initial development, SKIA proposes to permit some new on-site systems and utilize the existing capacity of the Port of Bremerton LOSS. The current SKIA proposal anticipates transitioning to the city of Port Orchard Sewer System in 2009. SKIA stormwater facilities will be consistent with the requirements of the Kitsap County Stormwater Manual and the applicants anticipate complying with the Ecology 2001 stormwater manual (Ecology, 2001). Full build-out of the SKIA complex is anticipated by 2017, pending the necessary regulatory approvals (KCDCD, 2002).

Washington State Department of Ecology

Ecology works to protect water quality as authorized under RCW 90.48, and implements many nonpoint source activities through local jurisdictions, resource agencies, watershed groups, and individual landowners. Ecology is also the permitting authority for National Pollution Discharge Elimination System (NPDES) and state Waste Discharge Permits such as the Port of Bremerton (POB) General Industrial Stormwater Permit, the POB Large On-Site Sewage System Permit, the city of Bremerton General Permit for Biosolids Management, and the OVSL landfill leachate discharge permit. Ecology will manage these permits consistent with this bacteria water cleanup and will also coordinate with local watershed groups to facilitate joint water cleanup projects that will assist the TMDL. Ecology provides financial assistance to local governments, tribes, and conservation districts for water quality projects.

Ecology is guided in the Union River TMDL by Washington's Water Quality Management Plan to Control Nonpoint Source Pollution (Ecology, 2000). This plan describes nonpoint source efforts by federal, state, tribal, and local governments as well as citizen groups. The development of the plan was a collaborative effort that identifies gaps in existing programs, sets a strategy for improving the programs, provides tools, recommends timelines, and outlines methods for determining success. The plan meets federal mandates in Section 319 of the Clean Water Act and Section 6217 of the Coastal Zone Act Reauthorization Amendments of 1990.

Washington State Department of Health

The Department of Health (DOH) Shellfish Division, under authority of Chapter 43.70 RCW, monitors marine water quality in commercial shellfish growing areas, including Lynch Cove and Hood Canal. Portions of shellfish beds adjacent to the outfall of the Union River have been threatened or closed starting in 1987 due to fecal coliform contamination. DOH also administers regulations pertaining to on-site systems.

Washington State Department of Transportation

The Washington State Department of Transportation (WSDOT) Water Quality Program provides guidance and technical support to road planning, design, construction, and maintenance to help

WSDOT enhance transportation project delivery and achieve compliance with the federal Clean Water Act and state Water Quality Laws. WSDOT prepares Stormwater Pollution Prevention Plans for major road projects, prepares annual NPDES compliance reports, and conducts water quality monitoring.

Figure 5. Students with Hood Canal Watershed Project sampling the Union River.

Hood Canal Watershed Project

North Mason High School students, under the direction of environmental science teacher Karen Lippy, study the Union River and Belfair Creek to locate sources of bacteria and determine levels of road runoff pollutants. This work is done in cooperation with property owners, Hood Canal Salmon Enhancement Group, and the Belfair Water District. Karen Lippy coordinates the work of approximately 100 high school students who study and monitor water quality, vegetation, birds, and benthic organisms in lower Hood Canal.

Hood Canal Salmon Enhancement Group

The Hood Canal Salmon Enhancement Group (HCSEG) is a public, non-profit corporation and one of the 14 salmon enhancement groups created in 1990 per the Washington State Legislature. HCSEG is dedicated to involving individuals and organizations to support and protect the region's salmon populations for community, recreational, and economic benefits. Its mission is to protect and enhance the genetic diversity and populations of wild salmon in Hood Canal by the protection and restoration of habitats, water quality, education, wild salmon incubators, and other means.

HCSEG is a key participant in the Lower Union River Restoration Study along with Mason Conservation District, Mason County Department of Health Services, UW Sea Grant and Ecology. As part of the project, HCSEG developed the Quality Assurance Project Plan (QAPP)

for toxics sampling and will oversee stream sampling and sampling of stormwater runoff from Belfair. HCSEG will also complete a concept plan for stormwater management and control for the Belfair UGA and will develop a watershed stewardship program for the Union River.

Washington Sea Grant Program, University of Washington

The mission of the Washington Sea Grant Program is to encourage the understanding, use, conservation, and enhancement of marine resources and the marine environment through research, education, outreach, and technology transfer. Washington Sea Grant works with individuals and groups to better understand and conserve marine and coastal resources. The program strives to meet the needs of ocean users while enhancing the environment and economy of the state, region, and nation. Washington Sea Grant Program extends its capabilities through partnerships with agencies, industries, and citizen groups.

A team of water quality education specialists provide technical assistance, public programs, and materials to local governments, tribes, industries, schools, and other water resource users in this community. Through its outreach efforts, the team takes an active role in reducing water pollution from failing on-site sewage systems and other nonpoint pollution generators. Sea Grant has an active and dedicated shellfish bed and nearshore restoration program including homeowner water quality and shellfish monitoring. The Washington Sea Grant Program is currently reviewing implementation of the WAC 400-12 nonpoint pollution watershed plans for all of Mason County's watersheds.

Skokomish Indian Tribe

The Skokomish Tribe has been involved with habitat ambient monitoring in Union River watershed for the past 15 years and they participate in the Lower Hood Canal Watershed Implementation Committee (LHCWIC). The Tribe does not currently collect water quality data on the Union River but supports the Lower Union River Restoration Study by the Mason Conservation District, Mason County Department of Health Services, and Hood Canal Salmon Enhancement Group (HCSEG). The Skokomish Tribe also participates in the Kitsap Peninsula (WRIA 15) Watershed Planning Unit which includes the Union River watershed.

Puget Sound Action Team

The Puget Sound Action Team (PSAT), under authority of Chapter 90.71 RCW, works with governments and organizations across the region to carry out the Puget Sound Water Quality Management Plan. Under different parts of the plan, agencies and governments provide technical and financial assistance to control pollution from on-site sewage systems, farm animal wastes, and stormwater runoff. Action Team support staff assist directly with programs to protect and restore shellfish harvesting in Lynch Cove. The Action Team also administers funding for public involvement and education (PIE) projects.

The Puget Sound Action Team is actively promoting the appropriate use of low impact development (LID) practices. They are involved in education and outreach to homeowners, businesses, developers, and local governments. PSAT conducts periodic LID workshops throughout the Puget Sound Region.

WSU Cooperative Extension

Washington State University's Cooperative Extension Program in Mason County provides research-based water resources information and educational programs to the public. The goal of cooperative extension programs is to promote responsible land and water stewardship to protect aquifers, streams, rivers, wetlands, marine waters, and the resources that these water bodies provide.

WSU Cooperative Extension educational programs range from support for elementary school age activities such as "Kid's Day at Oysterfest" to continuing education programs to help real estate professionals understand water resource issues as they relate to homeowners and property development. The Extension also provides educational programs on on-site sewage systems and provides leadership and assistance to local watershed groups.

Figure 6. Fourth grade students participating in "Kid's Day at Oysterfest" in Shelton.

Hood Canal Coordinating Council

The Hood Canal Coordinating Council (HCCC) is a council of governments consisting of Jefferson, Kitsap, and Mason counties, Port Gamble S'Klallam and Skokomish Tribes, and state and federal agencies. HCCC was established in 1985 in response to growing concerns about water quality problems in the Hood Canal region. The mission of the council is to "improve regulatory decision-making and policy review by providing a forum for discussion of regional water quality related issues affecting Hood Canal."

The HCCC advocates and helps implement locally-appropriate actions to protect and enhance the unique qualities of Hood Canal. The council coordinates salmon, shellfish, and general water quality protection efforts in Hood Canal by providing public education and information about salmon recovery, water quality, and shellfish resource protection. They seek funding for salmon recovery planning and water quality protection efforts and maintain a database of recovery projects and resource protection activities.

Kitsap Peninsula Watershed Planning Unit

The Watershed Planning Unit for Water Resource Inventory Area 15 (WRIA 15), established under Chapter 90.82 RCW, is developing a plan to address water quantity issues in the planning area along with related water quality, habitat, and streamflow issues. The WRIA 15 planning area consists of all of Kitsap County, parts of Mason and Pierce counties on the Kitsap, Longbranch and Gig Harbor Peninsulas, and Vashon and Maury islands in King County.

Members of WRIA 15 Watershed Planning Unit represent various governments and interest groups in the community that can directly influence and participate in implementation activities. Kitsap County is the lead agency for the WRIA 15 Planning Unit, and members include the four counties, the Port Gamble S'Klallam, Skokomish, Squaxin Island, and Suquamish Tribes, area cities, water suppliers, several state agencies, and a number of water-related interests affiliated with business, environmental protection, fisheries, property owners, recreation, and timber/agriculture.

The WRIA 15 Planning Unit just completed its draft Water Quality Assessment (Golder, 2003) which acknowledges the Union River Bacteria TMDL as the first EPA-approved TMDL in WRIA 15. The WRIA 15 plan is scheduled to be completed by early 2005.

Governor's Salmon Recovery Office

The Governor's Salmon Recovery Office was established by the Washington State Legislature through the Salmon Recovery Act (ESHB 2496). The Salmon Office's role is to coordinate and produce a statewide salmon strategy; assist in the development of regional salmon recovery plans; secure current and future funding for local, regional, and state recovery efforts; and provide the Biennial State of the Salmon report to the Legislature.

The 2001-03 Washington State biennial budget includes $270 million in salmon-related expenditures for new activities or changes to existing activities necessary to recover salmon or to meet the requirements of the Endangered Species Act. Funds allocated for salmon recovery are administered through the Salmon Recovery Funding Board and local salmon recovery lead entities such as the Hood Canal Coordinating Council for Lower Hood Canal and the Union River.

Monitoring Programs

Four types of monitoring that are being, or will be utilized in implementing the Union River bacteria TMDL are baseline, trend, source identification, and effectiveness monitoring. Table 6 summarizes water quality-related monitoring activities in Union River watershed.

Table 6. Summary of water quality bacteria monitoring activities in the Union River watershed.

Monitoring Activity	Responsible Parties	Monitoring Type	Schedule
Fecal coliform sampling at 3 stations in Union River watershed (Kitsap County)	SSWM KCHD	Trend	ongoing bi-monthly
Fecal coliform sampling at 12 additional stations for Upper Union River PIC Project	SSWM KCHD	Source identification	through Dec. 2004
Fecal coliform sampling at 25 stations for Lower Union River Restoration Study	MCD, HCSEG, MCDHS, Ecology	Trend & Source ID	through Nov. 2005
Olympic View Landfill Closure	KCHD Ecology	Source ID	June 2005
Bremerton Biosolids land application site	Bremerton KCHD, Ecology	Source ID	ongoing
Bremerton Watershed	City of Bremerton	Baseline	ongoing
Bremerton Airport / Industrial Park	Port of Bremerton	Source ID	August 2005
Hood Canal Watershed Project	North Mason School District	Source ID education	ongoing
Union River reconnaissance and effectiveness monitoring	Ecology LHCWIC	Trend, Source ID, effectiveness	ongoing / future

Abbreviations for responsible parties are explained in the abbreviations index on page 38 and the four types of monitoring in the watershed are described below:

- Baseline monitoring characterizes water quality and provides a basis for future comparisons. Union River baseline monitoring from 1999 was used for the initial TMDL development (Ward et al., 2001).
- Trend monitoring assesses impacts of changes in the watershed over time relative to baseline conditions. This is the most critical type of TMDL monitoring since it documents progress toward achieving the desired water quality goals (U.S. EPA, 2001).

- Source identification monitoring helps identify contamination sources by bracketing and locating persistent 'hot spots' revealed from other types of monitoring.

- Effectiveness (or implementation) monitoring follows up on source control measures and helps ensure that management actions are beneficially affecting water quality.

Kitsap County Health District: Water Quality Trend Monitoring

With funding from the Kitsap County Surface and Stormwater Management Program (SSWM), the Kitsap County Health District (KCHD) began water quality trend monitoring in ten watersheds throughout Kitsap County in 1996. In addition, the health district's Pollution Identification and Correction Program was created to assist communities in the cleanup of contaminated surface waters (KCHD, 2002). The KCHD trend monitoring program conducts extensive sampling in fresh and marine water bodies throughout Kitsap County and samples 92 stream monitoring stations (on 51 streams including the Union River) 12 times per year for bacteria. Sample results from Union River monitoring station UN01 in Kitsap County during 2000-2002 are shown in Figure 7.

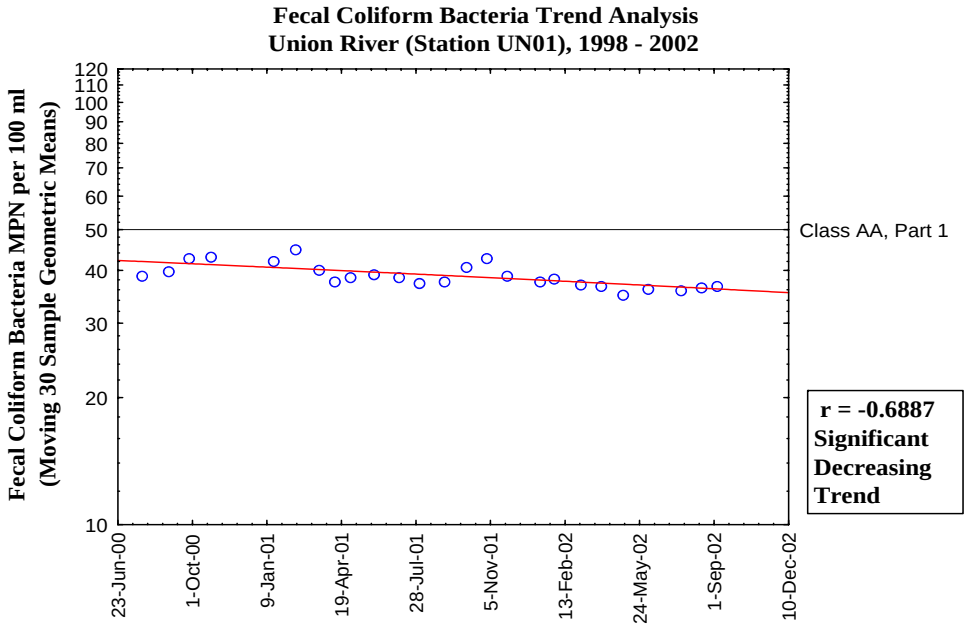

Figure 7. Bacteria trend at Union River station UN01, 2000-02. (from Kitsap County Health District, 2002)

Kitsap County Health District: Upper Union River Restoration Project

The Kitsap County Upper Union River Restoration Project (a KCHD Pollution Identification and Correction Project) involves source identification monitoring in addition to the trend monitoring currently being conducted by the county. Kitsap County Health District is currently sampling over 20 stations in the Upper Union River watershed twice monthly. Figure 8 shows three-month running geometric means calculated from sampling results at three of the Upper Union River stations.

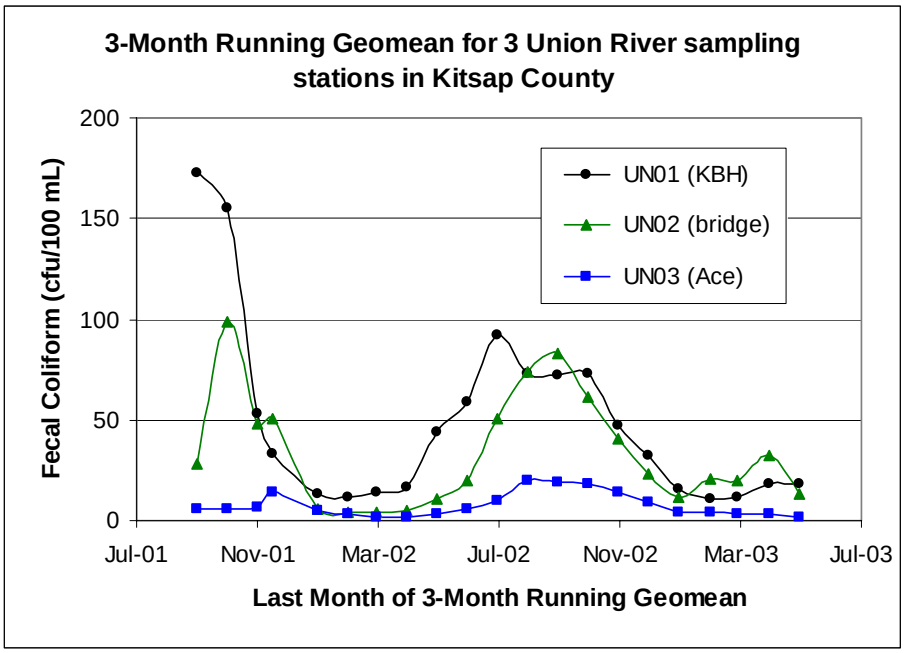

Figure 8. Bacteria concentrations at 3 Union River sampling stations in Kitsap County.

Station UN03, located at Ace Paving Company, is furthest upstream of the three stations plotted in Figure 8. Water quality standards are met at UN03 and are intermittently met at UN02 and UN01. Bacteria concentrations are generally higher in summer and fall when lower streamflows tend to concentrate contamination from perennial sources.

Sampling station UN01, located at the entrance to KBH Archery Range (river mile 4.5) where Union River flows into Mason County, serves as a monitoring station located at the county line where both KCHD and the Lower Union River study are sampling in order to compare and correlate their sampling results. Though Kitsap County Health District sampling stations were not initially used in establishing the Union River TMDL, KCHD station UN01 is the same as UR4Arch used by Ward et al. (2002) in establishing the TMDL. KCHD trend monitoring on the Union River and source identification monitoring related to the Upper Union River PIC project have helped identify and correct sources in Kitsap County and will help document TMDL implementation in the upper watershed.

Over the next two years, Mason and Kitsap Conservation Districts will track farm planning and implementation of best management practices in the Union River Watershed. Local health jurisdictions will monitor Union River water quality as outlined in CCWF and other grant agreements. Following initiation of BMPs, the Lower Union River Restoration Study allows for bacteria monitoring in the Union River through 2005.

City of Bremerton: Watershed Monitoring

Bremerton drinking water taken from the upper Union River is regularly tested in accordance with all federal and state regulations for over 50 constituents in the source water and in the distribution system. Bremerton monitors its drinking water for the compounds listed in Table 7.

Table 7. Upper Union River water quality monitoring by Bremerton.

Sampling Schedule			
Compound	Frequency	Compound	Frequency
Fecal Coliform	5 per week	Giardia/Cryptosporidium	Twice a year
Turbidity	Continuous	Nitrate	Annually
pH	Continuous	Inorganic chemicals	Annually
Radionuclides	Every 4 years	Volatile organics	Every 3 years

The city of Bremerton monitors Union River quality as it exits the Bremerton watershed near McKenna Falls. Table 8 shows constituents that were detected in Union River water during 2001 prior to any treatment by Bremerton Water Utility. Not listed are parameters that were tested for, but were not detected.

Table 8. Water quality monitoring summary for Bremerton watershed, 2001.

Compound	**Maximum Allowed** EPA's MCL	**Ranges Detected in 2001**	**Ideal Goals** EPA's MCLG	**Potential Sources**	**Meets Standard**
Nitrate	10 ppm	0.2 ppm	10ppm	Erosion of natural deposits	Yes
Turbidity	Treatment Technique	0.25 - 2.81 NTU	N/A	Soil runoff	Yes
Fecal Coliform	90% of samples must be $\leq$20 cfu/100mL	N/A	N/A	Occurs naturally in environment from warm-blooded animals	Yes

As shown in Table 8, water quality in the Bremerton watershed is exceptional. All results meet standards and are below levels allowed by federal and state agencies. More than 96 percent of raw water samples taken from the watershed have fecal coliform concentrations less than or equal to 20 colonies/100mL (Cahall, 2002).

Figure 9 shows Bremerton's annual diversions from the Union River for the ten year period between 1992 and 2002. Since 1995, Bremerton's diversion from the Union River has ranged between 1,370 and 2,020 MG/yr. Water use restrictions during drought conditions in 2001 caused less water to be diverted from the Union River diversion than during normal years.

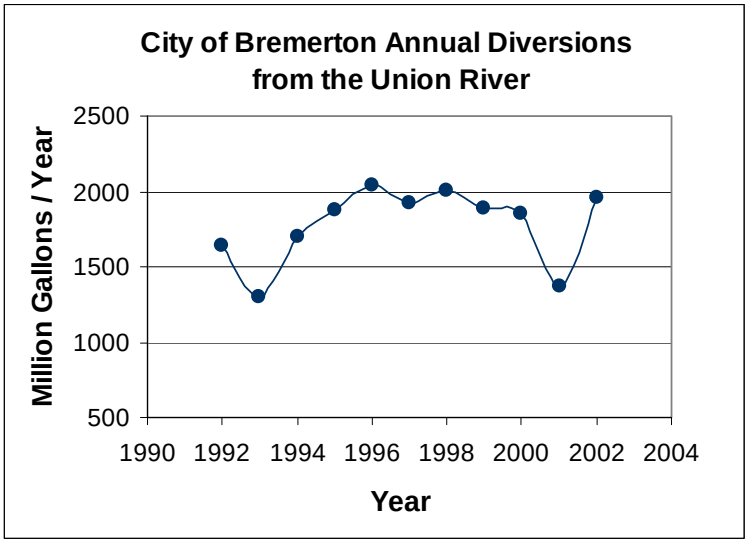

Figure 9. City of Bremerton water-supply diversions from the Union River, 1992 - 2002.

The city of Bremerton intends to keep the watershed protected from all uses other than forestry and will continue monitoring for bacteria at the diversion near McKenna Falls.

City of Bremerton: Biosolids Application Site Monitoring

The city of Bremerton has applied Class B biosolids at permitted sites since 1990. Extensive environmental monitoring is conducted including surface water, soil, soil water, and groundwater. Analysis includes nutrients, metals, fecal coliform bacteria, and other parameters. Annual reports are submitted to the EPA, Ecology, and the Kitsap County Health District.

Port of Bremerton

The Port of Bremerton samples the influent and effluent of its large on-site sewage system (LOSS) twice annually in accordance with its state Waste Discharge Permit No. ST 7390. The port has complied with its permit conditions since construction of the new LOSS in 1987. As the Port of Bremerton adds the 11-acre Northeast Campus Business Park to the Industrial Park complex over the next ten years, stormwater BMPs will continue to be required and bacteria monitoring requirements will be added to its stormwater discharge permit.

Olympic View Sanitary Landfill: Landfill Closure Monitoring

Olympic View Sanitary Landfill is required to monitor groundwater and its stormwater outfall in connection with the landfill closure. The OVSL stormwater outfall has been monitored at the landfill stormwater detention ponds since 2000.

Mason Conservation District: Lower Union River (Mason County)

Mason Conservation District is responsible for managing the Centennial Clean Water Lower Union River Restoration Study grant project. Under the project, once-monthly bacteria sampling will occur at over 20 stations on the Lower Union River. The purposes of the study include water quality trend monitoring in the lower Union River and identification of contaminant sources for major contaminants including bacteria. The Lower Union River Restoration Study will measure stormwater

flows and quality in Belfair and will make stormwater runoff control and treatment recommendations for the Belfair UGA.

Mason County Department of Health Services: Lower Union River Restoration

MCDHS has subcontracted with Mason Conservation District to participate in the Lower Union River Restoration Study as discussed above. In addition, MCDHS currently collects water quality data in the Union River watershed on a complaint basis. Other than the Lower Union River Restoration Study and periodic Ecology reconnaissance sampling, there is no ambient water quality monitoring on the Mason County portion of the Union River at this time.

Washington State Department of Health: Shellfish Areas Monitoring Program

Washington State Department of Health (DOH) Shellfish Division will continue marine bacteria monitoring in Lynch Cove in connection with the shellfish growing classification of the area. DOH shellfish area sampling is on a general schedule of every other month for a minimum of six marine fecal coliform samples at each station each year. Ecology will propose additional monitoring if necessary for source identification or further clarification in determining whether TMDL goals are being met.

Hood Canal Watershed Project: Student Education and Monitoring

North Mason High School students, under the direction of environmental science teacher Karen Lippy, study Belfair Creek and other water bodies in the Belfair area to locate sources of bacteria and determine concentrations of road runoff pollutants. This work has been done in cooperation with property owners, HCSEG, and the Belfair Water District. It is anticipated that Hood Canal Watershed Project will continue to initiate monitoring projects to study bacteria-contaminated stormwater runoff and other contaminants in the Union River watershed and lower Hood Canal. Grant monies to assist student groups such as Hood Canal Watershed Project in bacteria-related projects are considered consistent with this TMDL.

Performance Measures and Targets

Progress toward attaining water quality standards in the Union River will be measured against target trendlines for bacteria concentrations drawn for four stations on the mainstem Union River. Water Quality Standard Criteria for Class AA waters include a Part I maximum geometric mean of 50 fecal colony forming units / 100 milliliters (50 cfu/100 mL) and a Part II 90th percentile limit of 100 cfu/100 mL (Ecology 1997). The Union River TMDL study concluded that comparison with the Part II bacteria water quality standard (90th percentile $\leq$ 100 cfu/100 mL) during the months of May through December is the critical target for Union River sampling data (Ward et al., 2001). Therefore, performance tracking for the Union River TMDL will involve use of 90th percentiles calculated for bacteria data collected from May through December.

Figure 10 describes the target trend for upper deciles in bacteria samples collected from Union River station UR4Arch at river mile 4.5. Station UR4Arch, also known as station UN01 in the Kitsap County Health District sampling, is located on the Kitsap/Mason county line at the entrance to the KBH Archery Range.

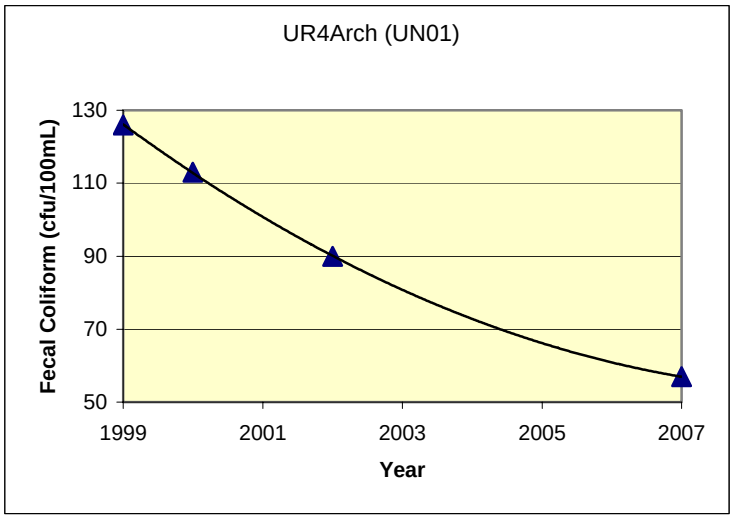

Figure 10. Target trendline for 90th percentile samples at station UN01, Union River mile 4.5.

Station UR4Arch is unique among the Union River TMDL target stations in that extensive historical water quality data are available for the Union River at UR4Arch from Kitsap County Health District (KCHD, 2002). The 90th percentile for fecal coliform samples collected at station UR4Arch show an improving trend through 2002. The target 90th percentile of 57 cfu/100 mL in the year 2007 is the allocation target set by the original TMDL (Table 3). Both Parts I and II water quality standard allocation targets are scheduled to be met in the Union River at all stations by 2007. The 90th percentile targets that are set to be met at each station by 2007 are listed in Table 3.

Mason Conservation District and Hood Canal Salmon Enhancement Group are obtaining additional water quality data for the other three mainstem TMDL performance-monitoring stations under the Lower Union River Restoration Study (LURRS) project. The initial Union River bacteria sampling for LURRS occurred on June 24, 2003 and sampling is scheduled to continue on a monthly basis through November 2005.

The Class AA Part I water quality standard for fecal coliform bacteria (geometric mean $\leq$ 50 cfu/100 mL) will also be used as a performance measure for meeting the Union River TMDL. Geometric means will be calculated from available data at least twice annually and evaluated in relation to 2007 targets. As shown in Figure 7, geometric means for Union River bacteria data collected by Kitsap County Health District at station UR4Arch (UN01) indicate long-term water quality improvement since 1999.

The Lower Hood Canal Watershed Implementation Committee will review the Union River water quality conditions at least twice annually beginning August 4, 2003. The review will involve a short presentation and status report based on current data and comparison with the target trendline, followed by consideration of potential adaptive management actions that may be required to meet the water quality standard targets by 2007. Adaptive management methods will be used to implement the Union River TMDL as described in the following section.

Adaptive Management

Implementation of the Union River Fecal Coliform TMDL will be adaptively managed such that the river and its tributaries will meet Washington State's Water Quality Standards by 2007. Adaptive management methods that will be used to implement the Union River TMDL include adjusting best management practices in accordance with new information, modifying stream sampling frequency and/or locations to further delineate fecal coliform sources, and conducting special inspections in identified source areas. Adaptive management will also include helping develop and fund water quality projects that address fecal coliform pollution, local educational initiatives, and other means of conforming management measures to current information on the impairment.

Requirements of the TMDL are satisfied when sample results validate that Washington State Water Quality Standards are being met following successful implementation of best management practices. Sufficient sampling to verify standards are met should represent all climatic, hydrologic, and land-use characteristics. If the load allocation reductions in Tables 2 & 3 are met at the target stations, but the stream still does not meet water quality standards in other stream segments, then adaptive management methods listed above will be further employed to meet the objectives of this TMDL.

Ecology will review sample results performed during the Upper Union River Restoration Project and the Lower Union River Restoration Study as part of its CCWF grant requirements and will adaptively manage TMDL implementation measures accordingly. If sample results from either project indicate high levels of fecal coliform contamination in the watershed, Ecology will actively pursue source identification and correction with the appropriate local agencies.

Ongoing ambient monitoring conducted by Kitsap County Health District and Washington State Department of Health Shellfish Division, as well as grant project monitoring mentioned above, will assist in enabling the implementing jurisdictions to revise and shift implementation efforts as necessary in order to bring Union River tributaries back into compliance with water quality standards.

Enforcement

Ecology is delegated authority under the Federal Clean Water Act by the U.S. EPA to establish water quality standards, administer the National Pollution Discharge Elimination System (NPDES) wastewater-permitting program, and enforce water quality regulations under Chapter 90.48 RCW. Ecology responds to environmental complaints, conducts inspections, and issues NPDES permits as part of its responsibilities under state and federal laws and regulations. In cooperation with conservation districts, Ecology will pursue implementation of farm plans and best management practices (BMPs) for small farms and may use formal enforcement, including fines, if voluntary compliance is unsuccessful.

Reasonable Assurance

Local involvement and commitment to resolving bacteria problems in the Union River area are considerable. Organizations and their commitments under laws, rules, programs, and contracts to resolve the bacteria problem are listed below. The following rationale help provide reasonable assurance that the Union River TMDL goals for bacteria will be met by 2007.

- Conservation Districts in Mason and Kitsap counties have authority under Chapter 89.08 RCW to develop farm plans to protect water quality and provide animal waste management information, education, and technical assistance to residents. Farmers receiving a Notice of Correction from Ecology or local health jurisdictions will normally be referred to the local conservation district for assistance. When developing farm plans, the district uses guidance and specifications from the U.S. Natural Resources Conservation Service.

- Mason County Department of Health Services (MCDHS) and Kitsap County Health District (KCHD) have the authority to enforce rules adopted by the state Board of Health that include rules necessary to assure safe and reliable public drinking water and to protect the public health. DOH regulates Class A & AA public water supplies; local health districts regulate Class B systems and private wells. Local health districts regulate on-site sewage systems in accordance with Chapter 246-272 WAC and County Board of Health regulations.

- Kitsap County Surface and Storm Water Management (SSWM) program provides dedicated local funding to KCHD and the Kitsap Conservation District for surface water monitoring and pollution identification and correction (currently used in Upper Union River Restoration Project). The majority of Kitsap County monitoring and PIC activities are funded by SSWM.

- KCHD's Upper Union River Restoration Project was initiated in November 2001 and is partially funded by a Centennial Clean Water grant from Ecology. KCHD's primary purpose in doing this project is to reduce fecal coliform levels in the Upper Union River and (if possible) remove the Upper Union River from the state's 303(d) list. To fulfill requirements of the grant, KCHD must submit progress reports and complete the Upper Union River Post Corrective Action Monitoring Plan. If necessary, KCHD has authority to enforce correction of failing on-site sewage systems or inadequate waste management practices pursuant to local on-site sewage system and solid waste regulations, respectively.

- The recent success by Mason County Department of Health Services (MCDHS) in abating contamination in Lower Hood Canal by identifying and repairing failing on-site systems indicates it will be similarly successful in the Union River watershed. MCDHS and Mason Conservation District (MCD) expect to reduce the bacteria levels in the Lower Union River as outlined in their FY 2003 CCWF grant agreement. The Lower Union River Restoration Study allows for fecal coliform monitoring after installation of best management practices through 2005. MCD has committed to track farm planning and implementation, including GIS mapping of best management practice (BMP) implementation in the Lower Union River watershed.

- The city of Bremerton is committed to maintaining the current standards of its drinking water supply operation in the upper Union River Watershed. This includes restriction of the watershed from public access.

- The Urban Growth Area (UGA) designation of unincorporated Belfair has triggered the requirement for a sewerage plan. Sewer service will be provided in the Belfair UGA and may extend from Belfair along the north shore of Hood Canal to Belfair State Park and northeast along Highway 3 to the Kitsap/Mason County line. The eventual elimination of numerous on-site systems by hooking up to sewer reduces the risk of on-site failure and provides additional assurance that the Union River Water Cleanup Plan will be successful.

- Farms that pose significant bacteria sources will be identified through the Upper and Lower Union River Centennial Clean Water Projects. The Union River watershed has several small farms, which may discharge some fecal coliform pollution to the river. Such nonpoint sources will be encouraged, through public outreach and technical assistance, to implement bacteria-reducing best management practices.

- Ecology's enforcement authority adds reasonable assurance that the Union River Water Cleanup will be successful. Whenever applicable BMPs are not being implemented and/or Ecology has evidence that individual sites or facilities are causing pollution in violation of RCW 90.48.080, Ecology will act to enforce state water quality laws. Ecology may pursue orders, directives, permits, or civil or criminal sanctions to gain compliance with state water quality standards. Ecology enforces water quality regulations under RCW 90.48.

- Washington State Department of Health Shellfish Division will continue monitoring marine water quality in Lynch Cove and will downgrade any commercial shellfish growing area that no longer meets its classification criteria for harvesting. Such downgrades call attention to the sources contributing to the water quality problem, initiate shellfish closure response plans, and dedicate resources that help address bacteria sources.

- The University of Washington Sea Grant Program will continue its programs in the Lower Hood Canal/Union River watershed area including ongoing research and public education on pollutants, pathogens, and nutrient loading.

Potential Funding Sources

Multiple sources of financial assistance for water cleanup activities are available through Ecology's grant and loan programs, local conservation districts, and other sources. Some of the potential sources of water cleanup funding are shown in Table 9 and are described below.

Table 9. Potential Funding Sources for Water Cleanup Projects.

Fund Source	Type of Project Funded	Maximum Amounts
Centennial Clean Water Fund	Watershed planning, stream restoration, & water pollution control projects.	$500,000
Section 319 Nonpoint Source Fund	Nonpoint source control; i.e., pet waste, stormwater runoff, failing septic systems, & agriculture, etc.	$500,000
State Water Pollution Control Revolving Fund	Low-interest loans to upgrade pollution control facilities to address nonpoint source problems.	10% of total SRF annually
Coastal Zone Protection Fund	Coastal and estuarine stream restoration projects.	~$50,000
Conservation Reserve Enhancement Program (CREP)	Projects restoring salmon & steelhead habitat on private land.	100% soil rental + 100% for restoration costs
Environmental Quality Incentives Program (EQIP)	Environmental and conservation farm improvements.	~$450,000
Salmon Recovery Fund	Salmon recovery projects; habitat restoration and land acquisition.	~$2,000,000
Oyster Reserve Account	Loans to fund shellfish protection.	0 to 5% interest loans
Public Involvement & Education (PIE) Program	Education and public involvement through personal services contracts.	$45,000
Rural Housing Repair & Rehabilitation Loans	Loans to low-income rural homeowners for safety & sanitation.	~$250,000
Wetland Reserve Program	Wetland enhancement in exchange for retiring marginal ag. land.	average payment ~$195,000
Emergency Watershed Protection	Easement purchases and construction on floodplain land.	construction costs (75%)

The Washington State Centennial Clean Water Fund (CCWF), Section 319 grants under the federal Clean Water Act, and State Revolving Fund loans are available to fund activities to help implement the Union River Water Cleanup Plan. If additional funding is necessary to reach standards, Ecology will work with stakeholders to develop funding applications and prepare appropriate scopes of work that will help implement this TMDL.

In addition to Ecology, other state, local, and federal agencies are available to financially assist water cleanup activities. A limited amount of federal money is available through Kitsap and Mason Conservation Districts via the Natural Resources Conservation Service (NRCS) Conservation Reserve Enhancement Program (CREP) for conservation easements and as cost-share for implementing agricultural best management practices (BMPs). The federal NRCS also administers the Environmental Quality Incentive Program (EQIP), which provides cost share funds for BMPs on agricultural sites. Stream restoration activities and some land acquisitions are eligible for salmon restoration grants through the state Salmon Recovery Funding Board. Potential funding available from these and other sources to help accomplish water cleanup activities are described below.

Centennial Clean Water Fund (CCWF)

A 1986 state statute created the Water Quality Account, which includes the Centennial Clean Water Fund (CCWF). Ecology offers CCWF grants and loans to local governments, tribes, and other public entities for water pollution control projects. During the FY 2004 funding cycle, Ecology is proposing to award $11.1 million from the CCWF. The CCWF is currently helping fund the Upper Union River Restoration Project and the Lower Union River Restoration Study. These important projects are identifying sources of contamination, recommending and, in some cases, remediating pollution sources. The application process is the same for CCWF, 319 Nonpoint Source Fund, and the state Water Pollution Control Revolving Fund.

Section 319 Nonpoint Source Fund

The 319 Fund provides grants to local governments, tribes, state agencies, and nonprofit organizations to address nonpoint source pollution and to improve and protect water quality. Nonpoint source pollution includes many diffuse sources of pollution, such as stormwater runoff from urban development, agricultural and timber practices, failing septic systems, pet waste, gardening, and other activities. Non-governmental organizations can apply to Ecology for funding through a 319 grant to provide additional implementation assistance.

State Water Pollution Control Revolving Fund

Ecology also administers the Washington State Water Pollution Control Revolving Fund. This program uses federal funding from U.S. Environmental Protection Agency and monies appropriated from the state's Water Quality Account to provide low-interest loans to local governments, tribes, and other public entities. The loans are primarily for upgrading or expanding water pollution control facilities such as public sewage and stormwater plants, and for activities to address estuary management and nonpoint source water quality problems.

Coastal Zone 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 that will reduce bacterial pollution are encouraged to contact their local TMDL lead to determine if their project proposal is a good candidate for Coastal Zone Protection funding.

Conservation Reserve Enhancement Program (CREP)

The Conservation Reserve Enhancement Program (CREP) is part of the U.S. Department of Agriculture Farm Service Agency's Conservation Reserve Program and provides incentives to restore and improve salmon and steelhead habitat on private land. The Washington CREP is a voluntary program for agricultural landowners 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.

Through the CREP, farmers can receive annual rental and maintenance payments and cost-share assistance under 10-15 year contracts for establishing long-term resource conserving covers on eligible land. Annual payments can equal 100 percent of the weighted average soil rental rate (incentive is 110 percent in areas designated by the Growth Management Act). Assistance is available in an amount equal to not more than 50 percent of the participant's costs in establishing approved practices. This program is administered by the NRCS and managed by Kitsap and Mason Conservation Districts.

Environmental Quality Incentives Program (EQIP)

The federally funded Environmental Quality Incentives Program (EQIP) is also administered by NRCS and managed by Kitsap and Mason Conservation Districts. EQIP is the combination of several conservation programs that address soil, water, and related natural resource concerns. EQIP encourages environmental enhancements on land in an environmentally beneficial and cost-effective manner. The EQIP program:

- Provides technical assistance, cost share, and incentive payments to assist crop and livestock producers with environmental and conservation improvements on the farm.
- Involves $5.8 billon over next six years (nationally).
- Has 75 percent cost sharing but allows 90 percent if producer is a limited resource or beginning farmer.
- Divides program funding 60 percent for livestock-related practices, 40 percent for cropland.
- Has contracts lasting five to ten years.
- Has no annual payment limitation; sum not to exceed $450,000 per farm.

Salmon Recovery Funding Board (SRFB)

The Salmon Recovery Funding Board (SRFB) provides grants to local governments, tribes, nonprofit organizations, and state agencies for salmon habitat restoration, land acquisition and habitat assessments. Funded projects and programs must produce sustainable and measurable benefits for fish and fish habitat. Most projects designed to improve salmon habitat also provide water quality benefits. As of October 2002, the SRFB has provided grants for 517 projects statewide with an accumulated value of $96.4 million.

Oyster Reserve Account

Shellfish growers in Pacific county and Puget Sound worked with the Legislature to establish the Oyster Reserve Account in 2001. The Puget Sound Action Team administers the Oyster Reserve Account and provides low-interest loans to fund shellfish protection. The loans are obtained through local banks and enable homeowners to repair failing septic systems. Homeowners may obtain loans from 0 to 5 percent interest, depending on their income eligibility.

The Public Involvement and Education (PIE) Program

The PIE Program supports projects that educate and involve citizens in protecting water quality and biological resources. The PIE Program is administered by the Puget Sound Action Team and assists 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, and
- Collaborate with others for lasting results.

Since 1987, the Legislature has allocated $6 million for nearly 400 PIE projects that have advanced environmental community-based education in the Puget Sound area. The PIE Program uses personal service contracts, managed by the Puget Sound Action Team, to obtain the services of individuals and organizations to educate and involve Puget Sound residents in water quality projects. Action Team staff solicit and select project proposals for funding through the PIE program, and provide guidance and technical assistance on fulfilling the state contracts through the 2001 - 2003 Puget Sound Water Quality Work Plan.

Rural Housing Repair and Rehabilitation Loans

The Rural Housing Repair and Rehabilitation Loans are funded directly by the federal government. Loans are available to low-income rural residents who own and occupy a dwelling in need of repairs. Funds are available for repairs to improve or modernize a home, or to remove health and safety hazards such as a failing on-site system. This loan is a one percent loan that may be repaid over a 20-year period.

To obtain a loan, homeowner-occupants must have low income (defined as under 50 percent of the area median income), and be unable to obtain affordable credit elsewhere. They must need to make repairs and improvements to make the dwelling more safe and sanitary. Grants are only available to homeowners who are 62 years old or older and who cannot repay a Section 504 loan.

Wetland Reserve Program (WRP)

The Wetland Reserve Program (WRP) is a voluntary program administered by NRCS to restore and protect wetlands on private property (including farmland that has become a wetland as a result of flooding). The WRP provides technical and financial assistance to eligible landowners to address wetland, wildlife habitat, soil, water, and related natural resource concerns on private lands. The program offers three enrollment options: permanent easement, 30-year easement, and restoration cost-share agreement. Landowners receive financial incentives to enhance wetlands in exchange for retiring marginal agricultural land.

Under WRP, the landowner limits future use of the land, but retains ownership, controls access, and may lease the land for undeveloped recreational activities and possibly other compatible uses. Compatible uses are allowed if they are fully consistent with the protection and enhancement of the wetland. There are currently 1,074,000 acres enrolled in the Wetland Reserve Program. The 2002 Farm Bill authorized continuation of the WRP by enabling the NRCS to enroll up to 250,000 additional acres annually into the program.

Emergency Watershed Protection

The Emergency Watershed Protection (EWP) program was established to respond to emergencies created by natural disasters. It is designed relieve imminent hazards to life and property caused by floods, fires, windstorms, and other natural occurrences through purchase of easements on floodplain lands and the right to conduct restoration activities in exchange for limited future use by the landowner. The NRCS administers the EWP program and cities, counties, general improvement districts, and conservation districts sponsor the projects.

Under the floodplain easement option, a landowner voluntarily offers to sell to the NRCS a permanent conservation easement that provides NRCS with the full authority to restore and enhance the floodplain's functions and values. In exchange, a landowner receives the least of one of the three following values as an easement payment:(i) a geographic rate established by the NRCS state conservationist; (ii) a value based on a market appraisal analysis for agricultural uses or assessment for agricultural land; and (iii) the landowner offer.

The NRCS has purchased floodplain easements on lands that qualify for EWP assistance since 1996. Floodplain easements restore and enhance the functions of the floodplain; conserve natural values including fish and wildlife habitat, water quality, and flood water retention; reduce long-term federal disaster assistance; and safeguard lives and property from floods, drought, and the products of erosion. The average EWP project size is 177 acres and average cost per acre is approximately $1,100. The EWP work is not limited to any one set of prescribed restoration measures. In addition to purchasing floodplain easements, EWP work can include: removing debris from stream channels, bridges, and road culverts; reshaping and protecting eroded banks; correcting damaged drainage facilities; repairing levees and reseeding damaged areas.

Abbreviations Index

BMP	-	Best Management Practice
CCWF	-	Centennial Clean Water Fund
CFR	-	Code of Federal Regulations
cfs	-	cubic feet/second
cfu	-	colony forming units
CREP	-	Conservation Reserve Enhancement Program
DOH	-	Washington State Department of Health
Ecology	-	Washington State Department of Ecology
EPA	-	U.S. Environmental Protection Agency
EQIP	-	Environmental Quality Incentives Program
gpd	-	gallons per day
HCCC	-	Hood Canal Coordinating Council
HCSEG	-	Hood Canal Salmon Enhancement Group
HCWEN	-	Hood Canal Watershed Education Network
KCD	-	Kitsap Conservation District
KCDCD	-	Kitsap County Department of Community Development
KCHD	-	Kitsap County Health District
KCPW	-	Kitsap County Public Works
LHCWIC	-	Lower Hood Canal Watershed Implementation Committee
LID	-	Low impact development
LOSS	-	Large On-Site Sewage System
LURRS	-	Lower Union River Restoration Study
MCD	-	Mason Conservation District
MCDHS	-	Mason County Department of Health Services
MCEDC	-	Mason County Economic Development Council
MCPW	-	Mason County Department of Public Works
MCUWM	-	Mason County Utilities/Waste Management
MG/yr	-	million gallons/year
mL	-	milliliters
NPDES	-	National Pollution Discharge Elimination System
NRCS	-	Natural Resources Conservation Service
OSS	-	On-Site Sewage System
PIC	-	Pollution Identification and Correction
PIE	-	Public Involvement and Education
PSAT	-	Puget Sound Action Team
RCW	-	Revised Code of Washington
RM	-	River mile
SKIA	-	South Kitsap Industrial Area
SRFB	-	Salmon Recovery Funding Board
SSWM	-	Kitsap County Surface and Stormwater Management Utility
SWPPP	-	Stormwater Pollution Prevention Plan
TMDL	-	Total Maximum Daily Load
U.S.	-	United States
UGA	-	Urban Growth Area
WAC	-	Washington Administrative Code
WOSSA	-	Washington On-Site Sewage System Association
WRF	-	Water Reclamation Facility
WSDOT	-	Washington State Department of Transportation

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Appendix A

Union River Bacteria TMDL Implementation Actions

Appendix A. Union River Bacteria TMDL Implementation Actions

Implementation Project	*Description of Implementation Activity*	*Responsible Parties*	*Projected Completion Date*
Kitsap County			
Upper Union River Restoration Project	Through funding from Kitsap County SSWM and an Ecology CCWF Grant, Kitsap County Health District (KCHD) is conducting the Upper Union River Restoration Project, which addresses fecal contamination problems related to failing on-site sewage systems (OSS) and inadequately managed animal wastes through intensive site-by-site property parcel visits and inspections. KCHD is employing its proven "Pollution Identification and Correction" (PIC) protocol to identify and correct FC pollution sources on each property parcel. FC sources will be corrected through water quality/OSS information and education, and when needed, through enforcement of local OSS and solid waste regulations. KCHD is sub-contracting with Kitsap Conservation District (KCD) to provide animal waste management information, education, and technical assistance. Both KCHD and KCD have loan monies and cost-share opportunities available to assist eligible property owners with financial assistance to correct FC pollution sources.	SSWM KCHD KCD	Dec. 2003
Port of Bremerton Industrial Stormwater Permit and stormwater improvements	The Port of Bremerton (POB) General Industrial Stormwater Permit will help ensure that stormwater from the airport and industrial park does not convey pollutants to the Union River. Under the permit, POB will conduct quarterly monitoring of stormwater leaving the airport and industrial park. Kitsap County SSWM has an interlocal agreement to assist POB in construction and maintenance of regional stormwater facilities at the airport and industrial park. Ecology manages the State General Industrial Stormwater Permit and awarded a FY 2003 CCWF grant to POB for a stormwater management study for its business park extension.	POB SSWM Ecology	Ongoing

Implementation Project	*Description of Implementation Activity*	*Responsible Parties*	*Projected Completion Date*
Kitsap County (cont.)			
Port of Bremerton Large On-Site Sewage Treatment Permit	The Port of Bremerton (POB) Large On-Site Sewage System (LOSS) serves Bremerton National Airport and Olympic View Industrial Park and is operated under State Waste Discharge Permit No. ST 7390. The Port maintains the system which includes aerated treatment lagoons, a gravel berm filter, and 13-acre drainfield. The port conducts limited environmental monitoring in the vicinity of its LOSS.	POB Ecology	Ongoing
Olympic View Sanitary Landfill Closure	Closure of Olympic View Sanitary Landfill, and environmental monitoring associated with the landfill closure, will help ensure that landfill leachate and other landfill-associated contamination do not migrate to surface and groundwater resources contiguous with Union River.	KCHD-Solid Waste Division, Ecology	June 2005
Bremerton Biosolids Application Permit	Extensive environmental monitoring associated with the Bremerton Biosolids application permit will help ensure that surface and groundwater resources are not adversely affected by the project. Upgrading biosolids treatment to Class A will provide further protection.	Bremerton KCHD Ecology	Ongoing
South Kitsap Industrial Area Sewer Service	The extensive 3,400-acre industrial and business park development planned around the existing Port of Bremerton-Olympic View Industrial Park complex will ultimately be served by Port Orchard sewer system.	WOSSA volunteers	Ongoing
Kitsap Self-Help On-Site Sewage Repair Program	On a selective ongoing basis, the Kitsap Self-Help On-Site Sewage Repair Program will work with low-income applicants to diagnose and repair failing on-site systems in Kitsap County.	WOSSA volunteers	Ongoing

Implementation Project	*Description of Implementation Activity*	*Responsible Parties*	*Projected Completion Date*
Mason County			
Lower Union River Restoration Study	The Mason Conservation District (MCD) received a $246,580 Centennial Clean Water Fund grant for the Lower Union River Restoration Study in 2002. The project will identify sources of fecal coliform pollution and contaminants toxic to salmon and shellfish in the lower Union River and its estuary, implement remediation measures, develop a stormwater runoff and control plan for the Belfair Urban Growth Area, and establish a community based watershed stewardship program. Sources of FC contamination will be determined by bimonthly water quality measurements at control points over the length of the river followed by inspection and dye tests of suspected sites. Remediation actions will be coordinated with property owners and repairs monitored. The stormwater runoff and potential pollution from the Belfair Urban Growth area will be determined by analysis, inspection, and tests. A concept plan for the stormwater management and control will be developed for future implementation by Mason County.	MCD HCSEG MCDHS Ecology, UW Sea Grant	September 2005
Belfair Sanitary Sewer Improvements	Mason County is currently planning to sewer the Belfair area via a force main to the existing North Bay-Case Inlet water reclamation facility in Allyn. Pending timely design and engineering work, the sewer line should be under construction in 2006.	BSPG MCUWM Ecology	2006
Belfair Stormwater Improvements	The Belfair Subarea Planning Group plans to make recommendations for Belfair urban stormwater management in fall of 2003. MCPW is contributing to the stormwater sampling characterization for the Lower Union River Restoration Study and is committed to implementation of whatever stormwater solutions are determined for Belfair.	BSPG MCPW Ecology	2006

Implementation Project	*Description of Implementation Activity*	*Responsible Parties*	*Projected Completion Date*
Mason County (cont.)			
Hood Canal Watershed Project	Environmental science and water quality-related education projects conducted by Hood Canal Watershed Project will help call attention to Belfair stormwater contamination issues and ecosystem impacts of environmental pollution. The projects will also help future generations obtain ecosystem understanding and environmental appreciation.	NMSD	Ongoing
WSU Cooperative Extension educational programs	WSU Cooperative Extension Program in Mason County will continue to provide environmental and water quality-related educational programs to various groups such as elementary schools and real estate professionals in the Lower Hood Canal area.	WSU	Ongoing
Road runoff stormwater management	Washington State Dept. of Transportation, Mason County Public Works, and Kitsap County Public Works will be responsible for implementing stormwater recommendations on SR3, Hwy 300, and county-maintained roads within the watersheds.	WSDOT KCPW MCPW	Ongoing

BSPG – Belfair Subarea Planning Group
DOH – Washington State Department of Health
Ecology – Washington State Department of Ecology
HCCC – Hood Canal Coordinating Council
HCSEG – Hood Canal Salmon Enhancement Group
KCD – Kitsap Conservation District
KCHD – Kitsap County Health District
KCPW – Kitsap County Public Works
LHCWIC – Lower Hood Canal Watershed Impl. Committee
MCD – Mason Conservation District
MCDHS – Mason County Department of Health Services
MCUWM – Mason County Dept. of Utilities/Waste Management
MCPW – Mason County Public Works
NMSD – North Mason School District
POB – Port of Bremerton
PSAT – Puget Sound Action Team
SSWM – Kitsap County Surface and Stormwater Management
UW Sea Grant – University of Washington Sea Grant Program
WOSSA – Washington On-Site Sewage System Assoc.
WSDOT - Washington State Department of Transportation
WSU - Washington State University Cooperative Extension

Appendix B

Public Involvement

Public Involvement Summary

The Draft Union River Fecal Coliform TMDL was made available for public comment from April 29 through May 30, 2002. The public comment period allowed time to solicit public input and feedback on the draft TMDL, which was available on the internet, at local libraries, and by mail. Ecology held dual public open houses on the Union River Water Cleanup Plan at the Mary E. Theler Community Center in Belfair on May 13, 2002, from 3-5 pm and again at 6:30-8:30 pm. Before and during development of the water cleanup plan, Ecology made presentations to the Lower Hood Canal Watershed Implementation Committee to keep local organizations, agencies, and other residents informed of the Union River bacteria problem, interim sampling results, and aspects of the water cleanup plan. Advertisements for the public meeting and comment period consisted of display ads in local papers; the Mason County Journal Weekly (Shelton, WA on 4/18/02 and 4/25/02), the Belfair Herald Weekly (Belfair, WA on 4/25/02), and the Bremerton Sun Daily (Bremerton, WA from 4/20/02 to 4/23/02).

Ecology mailed an informational fact sheet to local residents and other interested parties in April 2002, notifying them of the availability of the draft Union River TMDL, the comment period, and public meeting. Ecology also distributed the TMDL fact sheet at the public meeting in Belfair on May 13, 2002. Responses to comments received during the public comment period were included in Appendix A of the Union River TMDL Submittal report to EPA (Sweet et al., 2002).

Since EPA approval of the TMDL on August 2, 2002, Ecology has worked with interested parties and consulted with the Lower Hood Canal Watershed Implementation Committee regarding development of the Detailed Implementation Plan (DIP). The Draft DIP was provided to the following persons and organizations. Comments were received from parties with an asterisk (*).

1. Don Atkinson, Belfair citizen
2. Allan Borden, Mason County Planning Department
3. Bill Broughton, Belfair citizen
4. Kathleen Cahall, City of Bremerton *
5. David Dickson, Kitsap County Public Works *
6. Denise Forbes, Mason County Public Works
7. Bob Hager, Lower Hood Canal Watershed Implementation Committee *
8. Dan Hannafious, Hood Canal Salmon Enhancement Group
9. Jerry Hauth, Mason County Public Works *
10. Jeff Heinis, Skokomish Tribe
11. Jodie Holdcroft, Kitsap County Health District *
12. Constance Ibsen, Lower Hood Canal Watershed Implementation Committee *
13. Wes Johnson, Mason County Council
14. Teri King, University of Washington Sea Grant Program *
15. Steve Kutz, Mason County Department of Health Services
16. Anita Latch, Belfair Herald
17. Kim Lincoln, Mason County Department of Health Services *
18. Karen Lippy, North Mason School District and Hood Canal Watershed Project *
19. Mike Madsen, Mason Conservation District *
20. Harry Martin, Belfair citizen

21. Don Melvin, Washington Department of Health Shellfish Division
22. Stan Olsen, Kitsap County Public Works
23. Carla Pizzano, Kitsap Conservation District *
24. Debbie Riley, Mason County Department of Health Services
25. Fred Salisbury, Port of Bremerton *
26. Bob Simmons, Washington State University Cooperative Extension *
27. Geoff Tallent, Department of Ecology, northwest Regional Office *
28. Dave Tucker, Kitsap County Surface and Stormwater Management Utility *
29. Ken VanBuskirk, Belfair citizen *
30. Stuart Whitford, Kitsap County Health District *
31. Phil Wiatrak, Department of Ecology, Southwest Regional Office
32. Gary Yando, Mason County Department of Utilities and Waste Management *

As stated above under Performance Measures and Targets, progress on the implementation of the Union River TMDL will be tracked on a regular basis by the Lower Hood Canal Watershed Implementation Committee. Implementation of Best Management Practices (BMPs), monitoring results, and adaptive management measures will be compiled for the TMDL by Ecology's Northwest Regional Office.