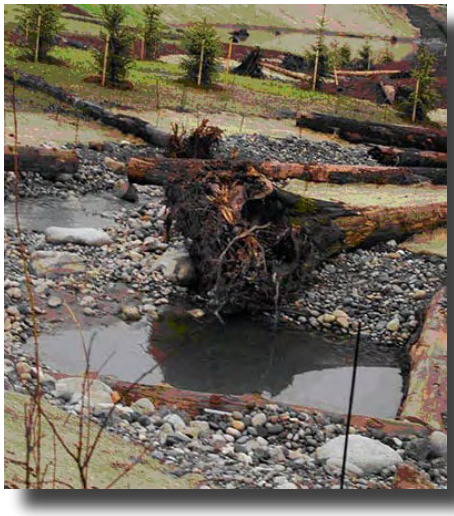
Regional Wastewater Services Plan



2007 Annual Report

September 2008

King County
Department of Natural Resources and Parks
Wastewater Treatment Division

Regional Wastewater Services Plan (RWSP)

RWSP 2007 Annual Report

September 2008

King County

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Executive Summary

Ordinance 15384 and King County Code 28.86.165 require that the King County Executive submit a yearly report to the King County Council on implementation of the Regional Wastewater Services Plan (RWSP). The RWSP outlines a number of important projects, programs, and policies for the county's Wastewater Treatment Division (WTD) to implement through 2030.

The following text summarizes the 2007 RWSP annual report.

Providing Needed Capacity in the Regional System

The RWSP calls for the construction of a new regional treatment plant and conveyance system by the year 2010 to provide additional capacity for projected population growth in the northern portion of King County's wastewater service area. This system, called the Brightwater System, is currently under construction. It will consist of a treatment plant in Snohomish County just north of the City of Woodinville and approximately 14 miles of pipelines constructed in underground tunnels in north King County.

RWSP policies further direct WTD to use the 20-year peak flow storm as the design standard for its separated conveyance system to avoid sanitary overflows and ensure there is sufficient capacity in the regional conveyance system to accommodate projected population growth.

Brightwater System

King County made substantial progress on the Brightwater project in 2007. Over 98 percent of the construction contracts have been awarded. The project is a few months behind schedule. Major construction is scheduled to be completed in early 2011, and the plant will start treating wastewater in May 2011.

King County continues to place a high priority on involving stakeholders and members of the public in the project. In 2007, over 30 meetings and briefings with residents, community leaders, and groups were held, and information booths were set up at several community events.

Brightwater Treatment Plant Site

Construction, design, and contracting for the treatment plant and associated facilities continued in 2007. Grading and site preparation activities that started in mid-2006 were completed, and earth and concrete work for foundations for the grit, headworks, and primary structures was initiated. Other work included design of treatment plant instrumentation and controls and award of construction contracts for the solids/odor control facilities. Also in 2007, King County

obtained building permits for the plant site and made a mitigation payment of $17.5 million to Snohomish County that was used to purchase approximately 145 acres of habitat and recreational land in the vicinity of the site.

Progress was made on implementing mitigation measures at the treatment plant site. Construction of the North Habitat Area occurred during the year. This 40-acre area now includes native wildlife habitat, restored salmon streams, trails, and boardwalks. In addition, WTD obtained the building permit for the Environmental Education/Community Center, and the Washington State Legislature awarded a $675,000 grant to the Friends of Hidden River, a Bothell non-profit group, to help cover final architectural design and sustainable design features of the center.

Brightwater Conveyance System

Three tunnel boring machines were launched in 2007 for construction of the East and Central Tunnels of the Brightwater conveyance system. Construction of the launching shaft for the West Tunnel continued during the year. Other Brightwater conveyance work included award of construction contracts for the Marine Outfall and the Influent Pump Station and construction of the connecting pipe between the Influent Pump Station and the North Creek Pump Station.

Non-Brightwater Conveyance

The *Conveyance System Improvement Program Update*, completed in 2007, identifies projects to meet projected capacity needs through 2050. During the update process, King County worked closely with the Metropolitan Water Pollution Abatement Advisory Committee (MWPAAC) and with individual local agencies.[1] The update recommended that checks and balances be performed, including periodic systematic flow monitoring, field verification, and regular program updates, to update flow projections and avoid overbuilding the system. It also recommended evaluation of demand management methods, such as infiltration and inflow reduction, to meet identified conveyance needs.[2]

WTD completed construction of the Fairwood Interceptor during the year. Three other conveyance projects under construction in 2007—the force main for the Bellevue Pump Station Upgrade project, the Hidden Lake Pump Station and Sewer Improvement project, and the Juanita Bay Pump Station Replacement project—will be completed in 2008. Work also included final design of the North Creek Interceptor Improvement project.

In keeping with RWSP policy amendments, WTD is taking a phased approach in the planning for new projects. The four components of the Kent/Auburn Conveyance Systems Improvements project will be constructed in two phases, one scheduled for completion in 2011 and the other by 2015. The Black Diamond Infrastructure Upgrade project will also be implemented in two

[1] MWPAAC advises the King County Council and Executive on matters related to reducing water pollution. It was created by state law (RCW 35.58.210) and consists of representatives from cities and local utilities that operate sewer systems in King County.

[2] In March 2008, the King County Council approved recommendations made in the update as amendments to RWSP conveyance policies via adoption of Ordinance 16033.

phases. The first phase—construction of a storage facility—is expected to be completed by 2013. Planning for the second phase will incorporate outcomes from development of the storage facility. This phase, which could be completed by 2020, may include larger conveyance facilities, a satellite treatment facility, or both.

Infiltration and inflow (I/I)—clean stormwater and groundwater that enters local sewer systems—takes up capacity in the King County regional conveyance and treatment systems and, along with population growth and other factors, drives the need to build additional capacity. The RWSP calls for improvements to reduce levels of I/I into local collection systems. The *Executive's Recommended Regional Infiltration and Inflow Control Program,* approved in May 2006 by the King County Council via adoption of Motion 12292, directs the county to work with local agencies to implement two to three initial projects to test the effectiveness of I/I reduction. Activities in 2007 included completing interlocal agreements with host jurisdictions; selecting consultants for predesign and sewer system evaluation surveys (SSES); and starting SSES, predesign, and flow monitoring work. In 2008, WTD, in conjunction with MWPAAC's Engineering and Planning Subcommittee, will use the results of this analysis to select the initial projects. It is hoped that the projects will help determine whether and under what conditions it is possible to cost-effectively remove enough I/I from the collection system to delay, reduce, or eliminate some otherwise needed regional conveyance system improvement projects.

Building and Operating Local Treatment Plants

At the request of the Vashon Sewer District and the City of Carnation, and in accordance with RWSP policies, King County extended its wastewater service area to meet specific public health needs and to help manage the environmental impacts of growth in these communities.

Since 1999, King County has managed and operated the Vashon Treatment Plant for the Vashon Sewer District. The county upgraded the treatment plant to expand capacity and meet permit limitations. The upgraded plant was brought online late in 2006 and is operating well. An open house for the community was held in May 2007.

In 2002, the City of Carnation contracted with King County to design, build, and operate a new wastewater treatment plant. By the end of 2007, the treatment plant was 75 percent complete. The plant began operating in May 2008. During startup, the plant will discharge to the Snoqualmie River. After startup and permit approvals, the effluent will meet Class A reclaimed water standards and will be beneficially used to enhance a wetland in the Chinook Bend Natural Area.

Creating Resources from Wastewater

WTD continues to find beneficial uses for byproducts from wastewater treatment—biosolids and digester gas from the solids treatment process and reclaimed water from the liquids treatment process.

Biosolids Recycling

Highlights of Biosolids Program activities and achievements during the year are as follows:

- Approximately 108,000 wet tons of biosolids were produced in 2007, all of which was recycled as soil amendment for forestry and agricultural applications and to make compost.
- Influent screens at West Point are being upgraded to comply with new amendments to the Washington State rule for biosolids management.
- WTD participated in a study on the fate and degradation of endocrine-disrupting compounds in land-applied biosolids. Other research projects are being planned for 2008.
- The program was awarded the Platinum Level designation from the National Biosolids Partnership (NBP) for reaching the highest achievement of biosolids management and environmental stewardship. WTD's program is certified into NBP's environmental management system program (EMS).

The Biosolids Program is planning in 2008 to move toward gaining certification through an International Standards Organization (ISO 14001) EMS instead of the NBP certification. The ISO will allow for certification of WTD's overall program and for other individual components of the program in addition to the solids and biosolids component.

Reclaimed Water

WTD continues to produce and use reclaimed water at the West Point and South plants. Progress was made in 2007 on agreements and approvals to extend the reclaimed water distribution line from South plant so that it can serve the City of Tukwila's Foster Golf Links in addition to currently providing water to the city's Fort Dent Park and the King Conservation District Wetland Nursery.

In keeping with RWSP policy, new treatment plants are incorporating production and distribution of reclaimed water into their designs. Both the Brightwater and Carnation plants will use membrane bioreactor technology to produce reclaimed-quality water. Work was under way in 2007 to install reclaimed water pipelines west of Brightwater as part of the Brightwater conveyance tunnel construction, and planning, design, and permitting took place for the distribution pipes that will serve users south of the plant. WTD will enter into an agreement with the City of Bothell to study the feasibility of providing reclaimed water to the city from Brightwater. For the Carnation project, enhancements to the wetland in the Chinook Bend Natural Area and a distribution pipeline from the plant to the wetland were completed in 2007.

WTD completed a reclaimed water feasibility study to meet the provisions of RWSP Water Reuse Policy 2. The study included reviews of reclaimed water technologies, revenue sources, and markets, and of the environmental and regional benefits of reclaimed water. Among other findings, the study found that reclaimed water is an effective wastewater management tool that can help to better protect Puget Sound and improve the environment. It recommended that a comprehensive plan be developed to help determine the future of the county's reclaimed water

program. In November 2007, the King County Council approved the development of the comprehensive reclaimed water plan in the 2008 budget. It is expected that the King County Executive will transmit a final plan in 2011 for council consideration and approval.

King County also entered into an agreement with the Covington Water District to jointly study the feasibility of developing reclaimed water facilities and completed a preliminary analysis of reclaimed water options in the Green River Valley.

Energy Generation from Digester Gas

Digester gas—energy-rich methane gas produced during solids treatment—is used at the West Point and South plants to produce power and heat for plant processes and buildings. The remaining gas produced at South plant is "scrubbed" and sold to the local natural gas utility. As the result of a two-year fuel cell demonstration project completed at South plant in 2006, WTD is considering the use of a small fuel cell installation at the plant to produce electricity from digester gas. Also, final design is in progress for new cogeneration engines at West Point that will use additional digester gas to help power and heat the plant.

Plans are under way to provide facilities at the new Brightwater plant for research of potential technologies for producing alternative forms of energy from digester gas. Design of the Energy Technology Demonstration Facility is expected to be complete in 2008. The facility will provide a versatile platform for researchers and manufacturers to beta test a wide variety of equipment.

Protecting Water Quality and Complying with Regulations

RWSP reporting policies require a summary in the annual reports of WTD's water quality management programs and its compliance with the Endangered Species Act and other agency regulations and agreements. WTD manages several programs to protect and preserve water quality, including wastewater treatment, combined sewer overflow control, sediment management, and source control.

The policies also require the inclusion of a report on the results of the water quality monitoring program, which measures water and sediment quality near WTD outfalls and facilities and compares the results with measurements in other areas in the same water bodies. The 2007 report, included as an appendix to the 2007 RWSP annual report, indicates that the quality of marine and fresh waters in King County is fair to good, with a slight decrease in quality from 2006 results in some localized areas.

Treatment Plants

Effluent from King County's treatment plants must meet National Pollutant Discharge Elimination System (NPDES) permit requirements and Washington State Water Quality Standards. The quality of treated effluent from its three secondary plants remained high in 2007,

despite an unusually intense storm in December that sent record flows through South plant. Both the South and West Point plants earned the National Association of Clean Water Agencies Gold Peak Performance Award for achieving 100 percent NPDES permit compliance for an entire calendar year. In addition, both plants received the Platinum Peak Performance Award for multiple years of consecutive gold performance. The Vashon plant experienced no permit violations this year—the first full year of operation of the upgraded plant.

Because of the intense storm in December, the number of sanitary sewer overflows (SSOs) was higher than the previous years. Of the 32 SSOs or permit deviations, such as disinfection failures, reported for the year, 17 occurred during this storm. All NPDES permit limitations were met despite these occurrences.

CSO Control and Sediment Management

King County's combined sewer overflow (CSO) facilities are regulated through West Point's NPDES permit. WTD also submits a report to the Washington State Department of Ecology each year on annual CSO volumes and frequencies and on progress made to control its CSOs.[3]

Almost 20 years of data demonstrate progress toward the control goal. As of May 2007, about 13 of King County's 38 CSOs are controlled. Five other CSOs—all part of the Mercer/Elliott West and Henderson/Norfolk CSO control systems that came online in 2005—are expected to achieve control after startup adjustments and modifications are made to these systems. Control status will be confirmed in the hydraulic model recalibration that is under way. The remaining 20 uncontrolled CSOs will meet state standards as projects listed in the RWSP are completed between 2013 and 2030.

Four of the RWSP CSO control projects are under way. Project planning and predesign for these projects, collectively called the Puget Sound Beach projects, began in 2007. Construction is expected to begin in 2011 and end in 2013. Another CSO at the Ballard Regulator Station, scheduled in the RWSP to be controlled in 2029, will be brought under control in 2011 through the Ballard Siphon Replacement project. Other accomplishments of the CSO Control Program in 2007 include the start of a pilot program to assess CSO treatment technologies for future CSO control projects and the launching of a Web site that provides real-time overflow status of county CSO locations.

To meet RWSP policies, WTD is carrying out a sediment management plan developed in the late 1990s to remediate contaminated sediment near CSO outfalls. Most of the contamination is from the first half of the twentieth century. Since completion of the sediment management plan, King County has been partnering with other agencies on sediment management in the Duwamish Waterway under two federal Superfund projects: the Harbor Island and the Lower Duwamish Waterway projects.

Work on three projects in the sediment management plan is under way—cleanup of the Denny Way and Hanford/Lander CSOs and development of a model to better predict the fate and

[3] "Control" is defined as meeting the Washington State standard of an average of no more than one untreated discharge per year per outfall.

transport of contamination. In mid 2007, design was completed for the Denny Way cleanup. King County dredged and capped the area in November 2007–February 2008. Work also began on cleanup of the Hanford/Lander CSOs as part of Harbor Island Superfund project. Sediment in front of the Lander CSO will be remediated in winter 2008–2009.

The draft remedial investigation for the Lower Duwamish Waterway Superfund site was released for public review in November 2007 and is expected to be completed in 2008. The feasibility study, which will identify cleanup alternatives, will be completed in 2009. The county is participating in two early action sites—the Diagonal/Duwamish CSO/Storm Drain and Slip 4 CSO—to clean up portions of the site earlier than required. The cleanup at Diagonal/Duwamish was completed in 2004. Post-remediation monitoring is providing critical information that can be used for determining cleanup alternatives for the Superfund site. In early 2007, source control sampling from areas upland to Slip 4 indicated that polychlorinated biphenyls (PCBs) were still entering the storm drains that discharge to the slip. Cleanup was put on hold until contamination can be adequately controlled.

Source Control

King County operates two source control programs: the Industrial Waste Program and the Local Hazardous Waste Management Program. Both programs work to control pollutants at their source, thereby keeping them out of the wastewater system and, in turn, out of surface waters and the environment.

In 2007, 128 permits and 310 industrial waste discharge approvals were in effect, 405 inspections were conducted, and 29 Notices of Violation were issued. The Industrial Waste Program inspected 89 dental offices in 2007 as part of its nationally prominent program to reduce mercury discharges to sewers. Industrial Waste continued to participate in source control efforts in the Lower Duwamish Waterway, including sampling and analysis of industrial waste discharges and rainfall for contaminants such as phthalates, and began work on the East Waterway source control project.

In 2007, the Local Hazardous Waste Management Program collected 2,998 tons of household hazardous waste from more than 69,950 customers and spurred the collection and appropriate disposal or recycling of at least 105 pounds of mercury through its EnviroStars program, collection of fluorescent bulbs and tubes, and other activities. In addition to collecting household hazardous wastes, program staff partnered with others to provide residents and businesses with information about ways to reduce the use of toxic and hazardous materials. Also in 2007, the program started implementing its 2006 strategic plan, which places increasing emphasis on eliminating the inclusion of the most problematic chemicals in commercial or consumer products, reducing the use of hazardous materials in sensitive environmental areas, and allocating more resources in order to reduce the exposure of the most vulnerable and historically underserved populations to toxic materials.

Endangered Species Act Compliance

WTD consults with the National Marine Fisheries Service and the U.S. Fish and Wildlife Service ("Services"), as required under Section 7 of the Endangered Species Act (ESA), on projects that require a federal permit or receive federal funding. In 2007, WTD continued to work on a technical memorandum on the impact of reclaimed water use on ESA-listed species. The memorandum will serve as a resource for any future King County reclaimed water projects that require environmental review and Section 7 consultations.

In addition, King County scientists continue to track studies on the presence and effects of endocrine-disrupting compounds (EDCs) and other persistent microconstituents to keep up-to-date on new findings. The county's environmental laboratory is investigating new analytical methods for the complex testing of some of these chemicals. Sampling for 15 suspected EDCs in the county's marine and fresh waters found low levels of five types of EDCs. The April 2007 report titled *Survey of Endocrine Disruptors in King County Surface Waters* describes these findings in detail.

Being a Good Neighbor

In all its projects, WTD strives to minimize adverse effects of its facilities on the surrounding community through facility design features, construction best practices, and responsiveness to community input. RWSP policies direct WTD to employ stringent odor control at existing and new facilities.

Odor Control

The RWSP includes policies to guide King County in achieving its goal of preventing and controlling nuisance odor occurrences at all wastewater treatment plants and associated conveyance facilities. The policies also call for implementation of an odor prevention program that goes beyond traditional odor control.

The policies require retrofitting existing treatment and conveyance facilities. Retrofitting work done so far includes the following:

- At the West Point plant, the division channel was covered in 2005 and the odor scrubber system was modified in 2007. Since these modifications were made, the amount of fugitive odors escaping from the system has greatly decreased. In 2008, WTD will evaluate the effects of these improvements and determine if they meet the odor control goal for existing facilities.
- At South plant, installation of the covers for each first pass of the four aeration basins and of covers for the return activated sludge channel began in 2006 and was substantially complete in 2007. Work is anticipated to be complete second quarter 2008.

- Thirteen projects have been identified to improve odor control in the county conveyance system. The first project—at the Hidden Lake Pump Station—is scheduled to be completed in 2008.

RWSP policy directs the county to construct odor control systems for new regional treatment plants that meet the "best in the country for new facilities" level, as described in Attachment A to Ordinance 14712. Brightwater's odor control system was designed to ensure there are no detectable odors at the property line for the treatment plant. Site preparation for the Brightwater solids/odor control facilities was completed and the construction contract for these facilities was awarded in 2007.

Public Involvement

In accordance with RWSP public involvement policies, WTD works with local jurisdictions, affected residents and businesses, and permitting and regulatory agencies during the planning, environmental review, design, and construction of its projects to ensure its facilities are good neighbors. Public involvement activities associated with the capital projects discussed in the 2007 RWSP annual report include community meetings, informational booths, up-to-date Web sites, 24-hour construction hotlines, newsletters, bulletins, and press releases.

Tracking Costs

The 2007 cost estimate for implementing RWSP projects and programs through 2030 is approximately $3.26 billion, an increase of about $57 million, or 1.8 percent, from the 2006 cost estimate. The majority of this difference is attributed to increases in the cost of materials and commodities and to necessary project modifications.

Nearly one-fourth of the 2007 RWSP cost estimate represents planning-level costs. Planning-level cost estimates are based on generic facility concepts. The accuracy of a project's cost estimate will increase as the project progresses through the project life cycle. Costs for projects in planning can have a rough order-of-magnitude estimate in the range of -50 to +100 percent.[4,5] By the time a project enters the construction phase, estimates typically narrow to a range of -10 to + 15 percent.

[4] Project Management Institute's *A Guide to the Project Management Body of Knowledge*, third edition, 2004.
[5] Order-of-magnitude estimates are made without detailed engineering data. They are often referred to as "ball park" estimates.

Chapter 1

Introduction

The purpose of the Regional Wastewater Services Plan (RWSP) 2007 Annual Report is to describe King County's progress in implementing the major elements of the RWSP for the year 2007. This report is presented in response to the RWSP reporting policies outlined in Ordinance 15384 and King County Code 28.86.165.[1]

Each chapter in this report describes accomplishments achieved in 2007 for major RWSP programs or projects. Chapters 2 through 9 also mention anticipated achievements for 2008. The subject matter of each chapter is as follows:

- Chapter 2 describes the progress made on the Brightwater Treatment System.
- Chapter 3 discusses the activities associated with the Conveyance System Improvement Program and summarizes the progress made on RWSP conveyance projects that are in design and construction.
- Chapter 4 provides an update on the Infiltration and Inflow (I/I) Control Program and reports progress made on the initial I/I reduction projects.
- Chapter 5 summarizes the key achievements of the Combined Sewer Overflow Control Program. It also describes efforts to improve water quality in the Lower Duwamish Waterway and the activities associated with the county's Sediment Management Program.
- Chapter 6 reports on completion of the Vashon Treatment Plant upgrades and progress on construction of the Carnation Treatment Plant.
- Chapter 7 discusses the efforts to prevent and control nuisance odors at the county's treatment plants and conveyance facilities.
- Chapter 8 describes the activities and achievements of the biosolids program.
- Chapter 9 provides information on reclaimed water and water conservation activities.
- Chapter 10 provides an update of the RWSP cost estimates through 2030.
- Chapter 11 reports on the Wastewater Treatment Division's water quality management and compliance activities.

The remainder of this chapter provides background on King County's wastewater treatment system and the RWSP.

[1] Previous RWSP annual reports are available at http://dnr.metrokc.gov/wtd/rwsp/library.htm.

1.1 King County's Wastewater Treatment System

King County protects water quality and public health in the central Puget Sound region by providing high quality and effective treatment to wastewater collected from 17 cities, 16 local sewer utilities, and 1 Indian tribe. The county's Wastewater Treatment Division (WTD) serves about 1.4 million people within a 420-square-mile service area, which includes most urban areas of King County and parts of south Snohomish County and northeast Pierce County. King County's wastewater system (Figure 1-1) includes two large regional treatment plants (the West Point Plant in the City of Seattle and the South Plant in the City of Renton), two small treatment plants (one on Vashon Island and one in the City of Carnation), one community septic system (Beulah Park and Cove on Vashon Island), four combined sewer overflow (CSO) treatment facilities (Alki, Carkeek, Mercer/Elliott West, and Henderson/Norfolk—all in the City of Seattle), over 350 miles of pipes, 19 regulator stations, 42 pump stations, and 38 CSO outfalls. Construction on the Brightwater Treatment Plant, the system's third regional treatment plant, began in 2006 and is scheduled for completion in early 2011.

Visit WTD's Web site for more information on projects and programs:
http://dnr.metrokc.gov/wtd/

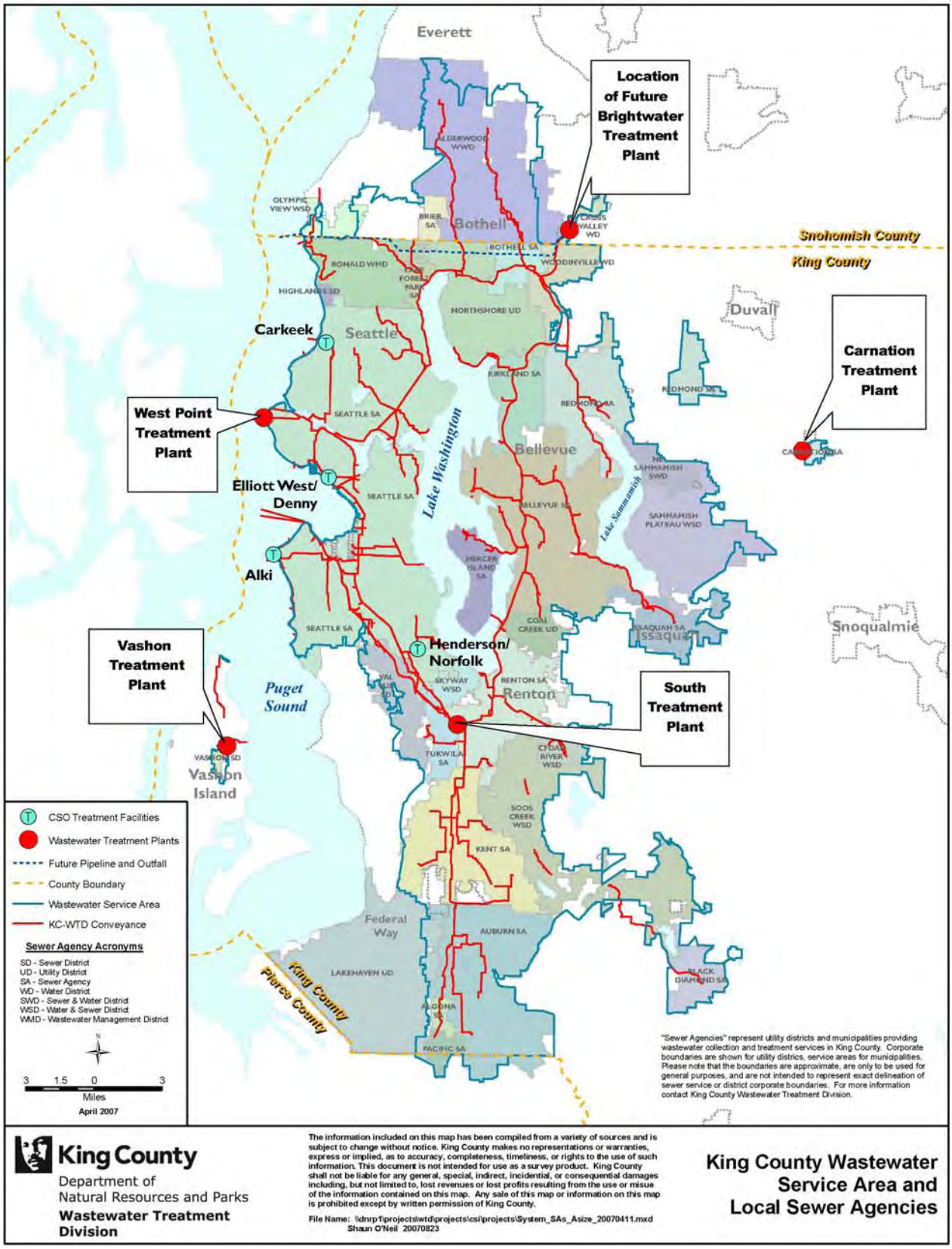


Figure 1-1. King County Wastewater Service Area

1.2 Regional Wastewater Services Plan

In the 1990s, flow estimates based on projected population growth estimates in King County's wastewater service area indicated that King County's regional wastewater treatment system would run out of capacity by 2010. To ensure the continuation of high quality and effective wastewater treatment services in the future, the county carried out an intensive planning effort, involving numerous elected officials, representatives from local sewer agencies, organizations, and individuals from around the region. The RWSP resulted from this effort and was adopted by the Metropolitan King County Council in November 1999, via Ordinance 13680.

The RWSP outlines a number of important projects, programs, and policies for King County to implement through 2030. It calls for building a new treatment plant, known as "Brightwater," to accommodate growth in the northern portion of the wastewater service area. The plan also calls for improvements to the regional conveyance system to meet the 20-year peak flow storm design standard and accommodate increased flows; improvements to reduce existing and future levels of infiltration and inflow (clean groundwater and stormwater) into local collection systems; and improvements to control CSOs so that an average of no more than one untreated discharge occurs per year at each CSO site by 2030.[2]

RWSP Annual Reporting Policies

The policies below were established via adoption of Ordinance 15384. They guide the preparation of the RWSP annual reports.

"A. Regional wastewater services plan annual report. The executive shall submit a written report to the council and RWQC in September each year until the facilities in the RWSP are operational. This report, covering the previous year's implementation, will provide the following:

1. *A summary of activities for each major component of the RWSP, including treatment, conveyance, infiltration and inflow, combined sewer overflows, water reuse, biosolids and highlights of research and development projects underway and proposed for the coming year;*
2. *Details on each active RWSP project in the capital budget, including a project summary, project highlights, project issues, upcoming activities, schedules, and expenditures summary including labor staff and miscellaneous services, a description of adjustments to costs and schedule and a status of the projects contract;*
3. *A status of the odor prevention program, including a listing and summary of odor complaints received and progress on implementing odor prevention policies and projects;*
4. *A summary of the previous year's results for the comprehensive water quality monitoring program;*
5. *A review of the plan elements, including water pollution abatement, water quality, water reclamation, Endangered Species Act compliance, biosolids management and variability of quality over time, wastewater public health problems, compliance with other agency regulations and agreements, to ensure it reflects current conditions; and*
6. *An update of anticipated RWSP costs through the year 2030."*

In addition, the RWSP identifies the need to expand the South Plant in Renton by 2029 to handle projected increased wastewater flows in the southern and eastern portions of the county's wastewater service area.

[2] The Washington State Department of Ecology (Ecology) regulates the level of CSO control based on the number of untreated CSO events that occur in a year. Ecology defines "the greatest reasonable reduction" in CSOs (RCW 90.48) as being "control of each CSO in such a way that an average of one untreated discharge may occur per year" (WAC 173-245-020).

Ordinance 13680 was codified in the King County Code as Chapter 28.86. Amendments to Ordinance 13680 and the King County Code Chapter 28.86 have been made since the RWSP's adoption. Amendments have included updates to the financial policies, new odor control policies for the county's existing regional treatment plants and facilities, a new section on reporting policies, and updates to the conveyance policies.

Visit the RWSP Web site for more information: http://dnr.metrokc.gov/wtd/rwsp/rwsp.htm

The entire contents of this RWSP 2007 Annual Report are available at http://dnr.metrokc.gov/wtd/rwsp/library.htm

Chapter 2

Brightwater Treatment System

The RWSP calls for the construction of a new regional treatment plant and conveyance system in the northern portion of King County's wastewater service area by the year 2010. King County made substantial progress on the Brightwater project in 2007. Over 98 percent of the construction contracts have been awarded. The project is a few months behind schedule. The system is expected to start operating in May 2011.

This chapter focuses on the activities and accomplishments in 2007 related to construction of the Brightwater System. The chapter also reports on mitigation activities, public involvement activities, progress on the reclaimed water system, and the updated cost trend for the project. The chapter concludes with a schedule for 2008.

2.1 Description of the Brightwater System

The locations of the Brightwater facilities are shown in Figure 2-1. The treatment plant will be built in Snohomish County on a site just north of the City of Woodinville. It will have an initial capacity to treat 36 million gallons per day (mgd) with room for future expansion to 54 mgd. In addition to the treatment plant, the Brightwater System includes approximately 14 miles of pipelines to be constructed in underground tunnels in north King County. The pipelines will convey untreated wastewater (influent) to the plant and treated wastewater (effluent) from the plant for discharge through an outfall in Puget Sound.

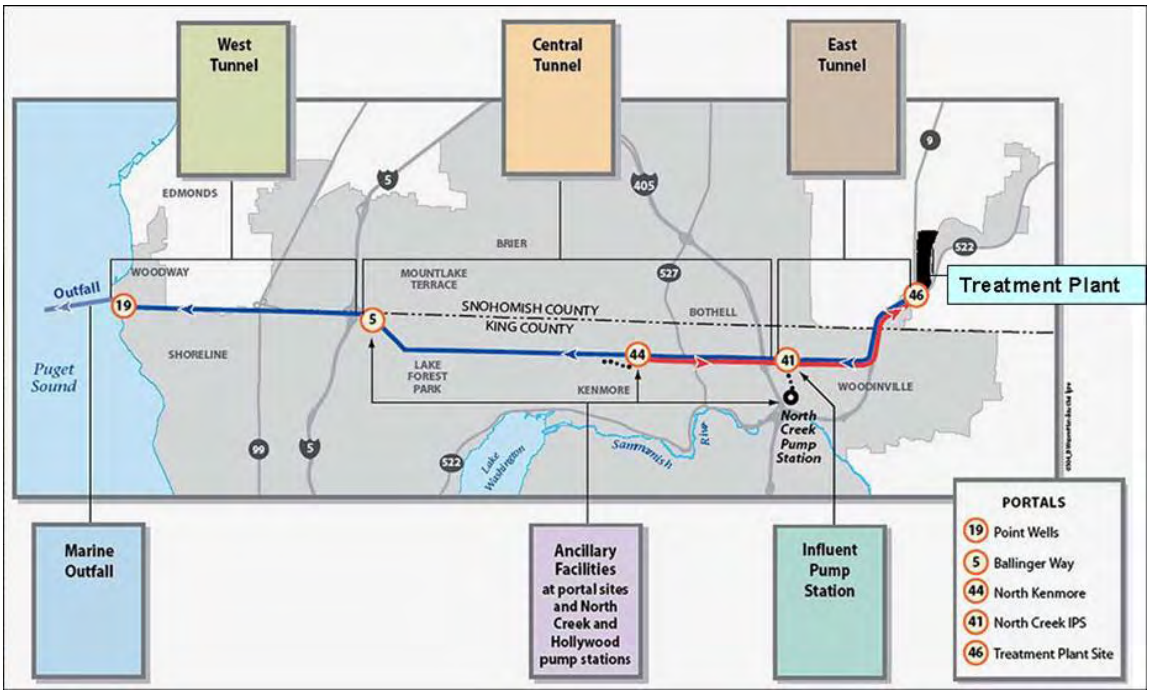


Figure 2-1. Components of the Brightwater System

2.2 Brightwater System Construction

The Wastewater Treatment Division (WTD) and its consultants and contractors completed a significant amount of work on the Brightwater project in 2007. Treatment plant and conveyance system construction accomplishments are summarized below.

2.2.1 Treatment Plant Construction

The 114-acre treatment plant site (known as the Route 9 site) is located in unincorporated Snohomish County east of State Route 9 (SR-9) and just north of the intersection of SR-9 and SR-522. Treatment and support facilities will cover approximately 43 acres.

Highlights of progress made in 2007 on construction, design, and contracting for the treatment plant and associated facilities are as follows:

- Completed preconstruction grading and site preparation activities that started in mid-2006
- Initiated earthwork and concrete work for the grit, headworks, and primary structure foundations (Figure 2-2)
- Completed detailed design for treatment plant instrumentation and controls
- Completed negotiations for construction of the liquids stream facilities and awarded construction contracts for the solids/odor control facilities

In 2008, WTD will continue major site construction activities, including construction of tanks and buildings, installation of major pipes, and demolition of existing buildings (Opus Building). Shaping of landforms on the plant site will continue into 2008, as well.

For more information on the Brightwater Treatment Plant, see http://dnr.metrokc.gov/wtd/brightwater/plantsite/index.htm.

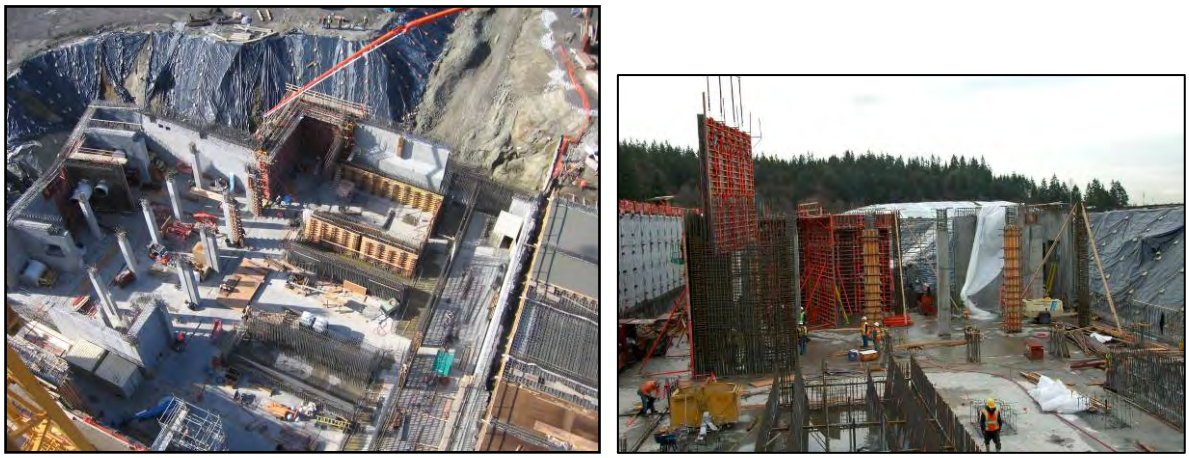


Figure 2-2. Concrete Work for Brightwater Treatment Plant Headworks Building

2.2.2 Conveyance System Construction

The conveyance system includes the pipes and facilities that bring wastewater to and from the treatment plant, and a marine outfall where treated wastewater is discharged to Puget Sound. The system is being built almost entirely below ground in tunnels 40 to 400 feet deep. Five shafts, called portals, provide access to and from the tunnels for workers and tunnel boring machines (TBMs).

Construction of the conveyance system is divided into six major components: the East Tunnel, Central Tunnel, West Tunnel, Influent Pump Station, Marine Outfall, and Ancillary Facilities (see Figure 2-1). Conveyance system construction began in 2006. In 2007, the King County Industrial Waste Program presented Silver and Gold Certificates to WTD for discharge compliance associated with conveyance system construction.

The following sections present highlights of accomplishments in 2007 for each of the six conveyance system components.

East Tunnel

The East Tunnel will consist of about 14,050 feet of 16.6-foot internal-diameter tunnel between the Brightwater Treatment Plant and the North Creek Portal in Bothell. The TBM was launched from the North Creek Portal (Figure 2-3) in September 2007 and is tunneling east to the treatment plant site where it is scheduled to be retrieved in November 2008. Approximately 350 feet of the East Tunnel was tunneled in 2007.

Figure 2-3. North Creek Portal Construction Site

Central Tunnel

The Central Tunnel consists of two 14.3-foot internal-diameter tunnels. One tunnel is about 11,600 feet long, extending from the North Kenmore Portal in Kenmore to the North Creek Portal in Bothell. The second tunnel is 20,100 feet long, extending from the North Kenmore Portal to the Ballinger Way Portal in Shoreline. (Figure 2-4 shows construction at the North Kenmore Portal site.) A TBM was launched from the North Kenmore Portal in mid-September 2007 and is tunneling east to the North Creek Portal, where it is expected to be retrieved in February 2009. Another TBM was launched in December 2007 and is tunneling west toward the Ballinger Way Portal, where it is expected to be retrieved in November 2009. The Ballinger Way Portal is under construction and is expected to be complete in fall 2008.

The construction contract for the Central Tunnel also includes the North Creek Connector, which will connect the new Brightwater Influent Pump Station at the North Creek Portal site and the existing North Creek Pump Station. Construction of this 2,300-foot-long, 65-foot-deep, 72- and 36-inch-diameter pipe began in 2007 and is expected to be complete in 2008. The pipe is being installed via microtunneling.

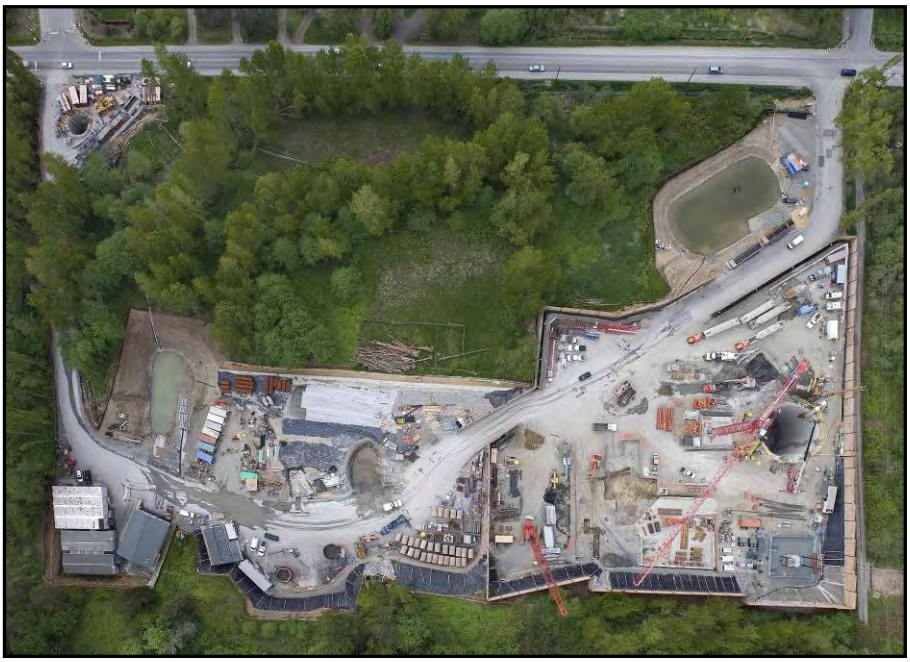


Figure 2-4. North Kenmore Portal Construction Site

West Tunnel and Marine Outfall Connector

The West Tunnel is about 21,200 feet of 12-foot internal-diameter tunnel starting at the Point Wells Portal in unincorporated Snohomish County and leading east to the Ballinger Way Portal in Shoreline. Shaft construction at the Point Wells Portal was under way in 2007; tunneling will begin in 2008.

Preparation for microtunneling of the Marine Outfall Connector took place in 2007. The Marine Outfall Connector will extend northwest from the Point Wells Portal to the start of the Marine Outfall. It will be installed in 2008 using a remotely controlled microtunneling machine.

Marine Outfall

The Marine Outfall will discharge effluent from the Brightwater Treatment Plant into Puget Sound. Extending a total of 5,200 feet, the outfall will include a single 84-inch-diameter pipe followed by two 63-inch-diamter pipes, each with a 250-foot-long diffuser discharging effluent at a depth of approximately 600 feet. The portion of the outfall from the Marine Outfall Connector to a depth of 80 feet will be constructed in a trench. The portion between depths of 80 and 600 feet will be laid on the bottom of the Sound. WTD awarded the construction contract for the Marine Outfall in October 2007. Geotechnical work necessary to finalize project design was completed in late fall 2007. Construction of the outfall is expected to be complete by fall 2008.

Influent Pump Station

The new Influent Pump Station, located at the North Creek Portal, is being built to pump influent to the treatment plant. The pump station will be largely underground; odor control and other facilities at this site will be above ground. The construction contract was awarded in June 2007, construction planning is under way, and construction is expected to start in early 2009.

Ancillary Facilities

Ancillary facilities are being constructed in the existing WTD conveyance system to incorporate Brightwater into the system. Installation of facilities at the Hollywood Pump Station, including odor control equipment, new generators, and electrical panels, started in 2007 and will be complete in 2008. Other facilities, such as flow monitoring equipment and electrical equipment, will be installed in 2008 at other points in the conveyance system.

For more information on Brightwater conveyance system construction, see http://dnr.metrokc.gov/wtd/brightwater/construction/index.htm.

2.3 Mitigation Activities

Mitigation refers to the various measures taken to address construction and operational impacts and enhance the community that hosts a development project. To address the possible impacts of Brightwater construction and operation and to comply with RWSP environmental mitigation policies, WTD has negotiated mitigation agreements with cities, tribal governments, jurisdictions, and local utilities. Some of the mitigation measures address the short-term impacts of construction; other measures are intended to cover longer-term impacts. The sections below describe the progress made in 2007 associated with Brightwater system-wide mitigation.

2.3.1 North Habitat Area

The Brightwater Treatment Plant site will include many acres of publicly accessible open space, trails, and salmon habitat restoration. Forty of these acres, called the North Habitat Area, are at the north end of the site and now include native wildlife habitat, restored salmon streams, trails, and boardwalks (Figure 2-5). Construction, including creation of streams and hills, of the North Habitat Area occurred in 2007.

Figure 2-5. North Habitat Area on the Brightwater Treatment Plant Site

2.3.2 Environmental Education/Community Center

The Brightwater Environmental Education/Community Center will be located on the treatment plant site and will include two learning laboratories, an exhibit hall, and meeting facilities. The building permit for the center was obtained in 2007. The Washington State Legislature awarded a $675,000 grant to the Friends of Hidden River, a Bothell non-profit group, to help cover costs associated with final architectural and sustainable features design. Friends of Hidden River is partnering with WTD and NatureVision, another non-profit group, to secure additional financial and community support for the center. Construction of the building will be completed in 2010.

2.3.3 Mitigation Agreements and Permits

In 2007, King County reached mitigation-related agreements associated with Brightwater construction with the Cities of Shoreline and Kenmore. A Surface Use Agreement was signed with the City of Shoreline to create a community park at the Richmond Beach Pump Station site near the Point Wells Portal, and a Land Transfer Agreement was signed with the City of Kenmore to create 26 acres of public park at the North Kenmore Portal.

Also in 2007, King County obtained all building permits for the treatment plant site from Snohomish County and made a mitigation payment of $17.5 million to Snohomish County. From this payment, approximately 145 acres of habitat and recreational land were purchased to provide improvements to the community surrounding the Brightwater plant.

In addition, a request for proposals to procure landscape plant material for the treatment plant site was issued in 2007. A contract for a portion of the material was awarded in 2008; the

remaining material was included in a subsequent invitation to bid due in July 2008. Plants will be installed through 2011.

2.4 Public Involvement Activities

King County continues to place a high priority on involving stakeholders and members of the public in the Brightwater project. Over 30 meetings and briefings with residents, community leaders, and groups were held in 2007, including informational meetings for community members who live or work near the portal and treatment plant sites, and Brightwater information booths were set up at several community events.

Examples of public involvement activities in 2007 are as follows:

- **Planting event and public tours.** The county hosted a planting event and community tours of the North Habitat Area. The planting event in October provided the opportunity for volunteers to assist with planting native species in this area. Guided public tours of the North Habitat Area took place in April and May.
- **Community meetings and informational booths.** Community meetings on construction and activities at the Point Wells Portal took place in January and May. Brightwater staff worked in information booths at festivals in Shoreline and Woodinville in March, May, and August.
- **Conveyance construction groundbreaking.** In September, the county recognized the startup of construction at the North Creek Portal site in Bothell with the "Tunneling to the Future" celebration.
- **Bulletins, newsletters, news releases, and responses to questions.** The Brightwater project team continued to respond to questions and comments from property owners, jurisdictions, neighbors, and the general public. In addition, the team produced newsletters, bulletins, and news releases and updated the Brightwater Web page to keep people informed about project activities.

2.5 Brightwater Reclaimed Water System

Almost all the wastewater treated at the new Brightwater Treatment Plant will meet Washington State reclaimed water standards and can be safely recycled for irrigation and industrial purposes. In late 2005, the King County Council approved funding for the Brightwater reclaimed water "backbone," a system of pipes to carry reclaimed water south and west of the plant (Figure 2-6).

The backbone is divided into two segments. Reclaimed water pipes in the West Segment are being installed during construction of the Brightwater tunnels. The South Segment, consisting of both new reclaimed water pipes and conversion of an existing force main, will extend south from the new Brightwater Influent Pump Station to Willows Run Golf Course in the Sammamish Valley. Construction of the portion of the South Segment north of the North Creek Pump Station will begin in 2008 and take about five months to complete. Engineering design, environmental review, and permitting for the portions south of the North Creek Pump Station were undertaken

in 2007. Conversion of the existing force main between the North Creek and York Pump Stations is scheduled to be completed in 2008. Acquisition of the remaining land use permits and award of a construction contract for the new pipe extending from the York Pump Station to Willows Run are scheduled for 2008; construction is expected to start in 2008 and be completed in 2009.

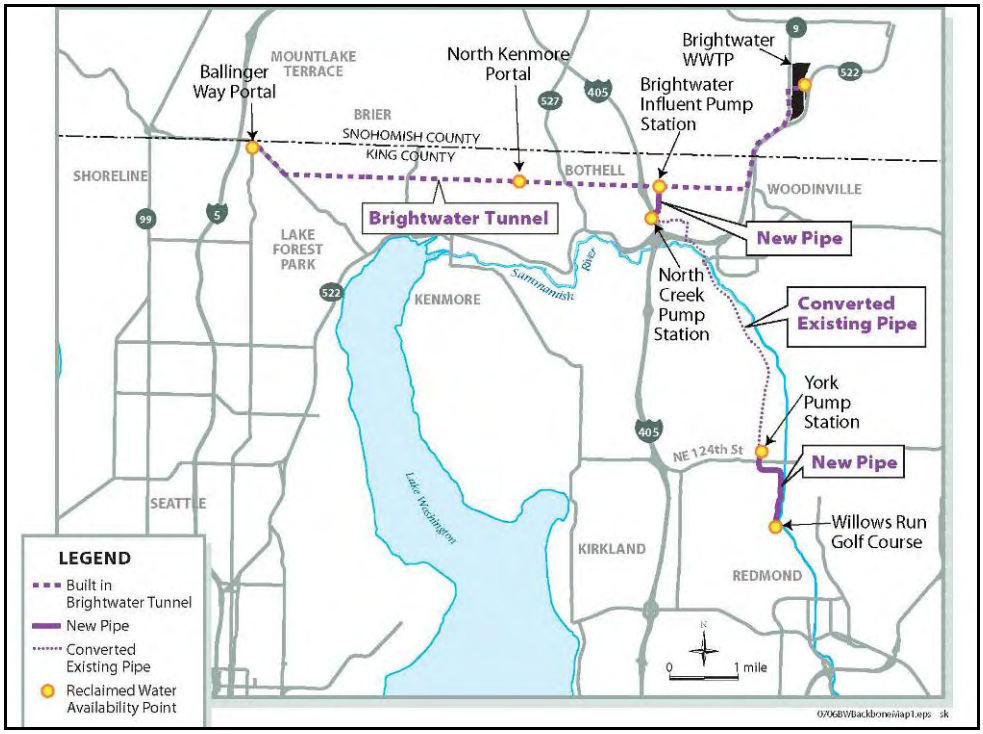


Figure 2-6. Brightwater Reclaimed Water System

2.6 Brightwater Cost Update

Cost estimating is an important part of managing the Brightwater project and of keeping decision makers informed about trends and conditions that could potentially affect project cost. King County has prepared seven cost estimates to date, beginning with the first conceptual estimate in 2001.[1] An independent oversight monitoring consultant reviews the estimates and makes recommendations.

Table 2-1 shows the January 2008 estimate for the project at $1.802 billion (including inflation)—representing an overall increase of about $34.9 million over the January 2007 estimate (an increase of $35.5 million in estimated treatment plant costs and a decrease of about $0.6 million in estimated conveyance costs). The increase is primarily due to inflation of materials and commodities.

[1] *Brightwater Cost Update: Current Conditions and Trends,* Department of Natural Resources and Parks, Wastewater Treatment Division, January 2008. A copy of the report is available on request.

Table 2-1. Comparison of January 2007 and January 2008 Brightwater Cost Estimates (million dollars with Inflation)

	Jan. 2007 King County Estimate	Jan. 2008 King County Estimate	Change Jan. 2007–Jan. 2008	Percent Change	January 2007 OMC Estimate
Treatment plant	$839.8	$875.3	$35.5	4.22%	$882–$911
Conveyance	$927.5	$926.9	$(0.5)	-0.06%	$ 946–$953
Total	**$1,767.3**	**$1,802.2**	**$34.9**	**1.98%**	**$1,827–$1,862**

Note: Estimates assume project completion in 2012. Inflation was calculated based on costs spent to date in inflated dollars, awarded contruction contracts (and associated sales tax and contigency) in inflated dollars, mitigation costs in inflated dollars, and 3 percent inflation over 2008 dollars for remaining construction costs, King County labor, and some consulting costs.

OMC = Oversight Monitoring Consutant.

A baseline budget was prepared for the project in October 2004 after completion of predesign. Table 2-2 shows the baseline budget of $1.483 billion both in 2004 dollars and with inflation at 3 and 5 percent per year through 2012, and compares these numbers with the January 2008 estimate of $1.802 billion with inflation. The January 2008 cost estimate is $12.8 million above the baseline budget forecasted in 2004 with 5 percent inflation. It was predicted in October 2004 that given the significant increases in commodity prices, an inflation assumption of 5 percent might better reflect future conditions.[2] This prediction was borne out by actual inflation experienced over the last two years in construction-related markets.

Table 2-2. Comparison of Brightwater 2004 Baseline Budget Forecast and January 2008 Cost Estimate (million dollars)

	Baseline Budget (2004$)	Baseline Budget with 3% inflation over (2004$)	Baseline Budget with 5% inflation over (2004$)	January 2008 Estimate with Inflation
Treatment plant	$578.4	$639.6	$684.4	$875.3
Conveyance	$904.7	$1,020.5	$1,105.5	$926.9
Total	**$1,483.1**	**$1,660.1**	**$1,789.9**	**$1,802.2**

Note: Estimates assume project completion in 2012. Inflation for the January 2008 estimate was calculated based on costs spent to date in inflated dollars, awarded contruction contracts (and associated sales tax and contigency) in inflated dollars, mitigation costs in inflated dollars, and 3 percent inflation over 2008 dollars for remaining construction costs, King County labor, and some consulting costs.

[2] King County Department of Natural Resources and Parks. *Brightwater Facilities: Addendum to August 23 Report: Brightwater Predesign Cost Estimates.* October 2004. p. 20.

2.7 Schedule for 2008

Activities anticipated in 2008 for the Brightwater Treatment System are as follows:

- Begin construction of the solids/odor control facilities.
- Complete demolition of the Opus Building.
- Award contracts for all components of the treatment plant liquids facilities including the Environmental Education/Community Center and landscaping.
- Complete tunneling of the East Tunnel.
- Continue tunneling of the Central Tunnel.
- Begin tunneling of the West Tunnel.
- Install the Marine Outfall Connector and complete construction of the Marine Outfall.
- Complete construction of ancillary facilities at the Hollywood Pump Station.
- Initiate construction of the South Segment of the reclaimed water backbone and complete associated plumbing at the North Creek Pump Station.
- Transmit mitigation payments and continue to oversee purchases of mitigation properties for parks and recreational lands.

Chapter 3

Conveyance System Improvements

The RWSP calls for improvements to King County's wastewater conveyance system. RWSP conveyance policies direct WTD to use the 20-year peak flow storm as the design standard for its separated wastewater system to avoid sanitary overflows and ensure there is sufficient capacity in the regional conveyance system to accommodate projected population growth. Because no uniform capacity standard was in place before adoption of the RWSP, portions of the regional conveyance system do not currently meet the 20-year peak flow storm standard. In setting this standard, the King County Executive and King County Council recognized that it is one of the most stringent standards in the nation and that it would take some time for the conveyance system to be upgraded to meet this standard.

This chapter begins with a description of the *Conveyance System Improvement Program Update* that was completed in June 2007 and then presents information on the RWSP conveyance projects that were in design or construction in 2007. The chapter concludes with major activities anticipated in 2008 as part of the Conveyance System Improvement (CSI) Program.

3.1 Conveyance System Improvement Program Update

Since 1999, the CSI program has worked to meet RWSP policy. The program has focused on upgrades and improvements to county-owned regional wastewater facilities in three important areas:

- Providing consistent conveyance system planning approach to the entire service area
- Adjusting for population growth and current operational and environmental considerations in the planning process
- Providing opportunities to coordinate capacity planning with local agencies to address issues, leverage resources, and minimize service disruption

The 2007 *Conveyance System Improvement Program Update* identifies projects to meet projected capacity needs through 2050, the date that the separated portions of the wastewater service area are projected to be fully built out.[1] During the update process, King County worked closely with the Metropolitan Water Pollution Abatement Advisory Committee (MWPAAC),

[1] The 2007 *Conveyance System Improvement Program Update* is available at http://dnr.metrokc.gov/wtd/csi/library.htm.

through its Engineering and Planning (E&P) Subcommittee, and with individual local agencies.[2] Details on the update were reported in the *RWSP 2006 Comprehensive Review and Annual Report*.[3]

In recognition that long-term management of the conveyance system is expensive and depends on projections of future flow volumes that are themselves based on projections of regional growth and weather patterns, the update made several recommendations related to future conveyance planning. In November 2007, the King County Executive formalized these recommendations as amendments to RWSP conveyance policies. The King County Council approved the policy amendments via adoption of Ordinance 16033 in March 2008.[4]

Key elements of the adopted conveyance policy amendments are as follows:

- Update the CSI program every five years beginning in 2013 to ensure that the program remains current.
- Conduct systemwide flow monitoring to correspond with the population census that is conducted every ten years, to ensure flow projections remain accurate.
- To avoid overbuilding the system, perform field verification of wastewater flows and conveyance facility conditions prior to implementation of regional conveyance capital projects that are intended to expand capacity of the conveyance system.
- Evaluate other demand management methods to meet identified conveyance needs, such as infiltration and inflow reduction, water conservation, and reclaimed water facilities.

3.2 RWSP Projects in Design and Construction

RWSP conveyance projects in planning and design during 2007 include the Kent/Auburn Conveyance System Improvements, Black Diamond Infrastructure Upgrade, and North Creek Interceptor Improvements. Projects in construction during 2007 include the Bellevue Pump Station Upgrade, Hidden Lake Pump Station Replacement and Sewer Improvement, Fairwood Interceptor Sewer, and Juanita Bay Pump Station Replacement. The locations of these projects are shown in Figure 3-1.

[2] MWPAAC advises the King County Council and Executive on matters related to reducing water pollution. It was created by state law (RCW 35.58.210) and consists of representatives from cities and local utilities that operate sewer systems in King County.
[3] RWSP annual reports and comprehensive reviews are available at http://dnr.metrokc.gov/wtd/rwsp/library.htm.
[4] Ordinance 16033 is available at http://mkcclegisearch.metrokc.gov/attachments/29221.pdf.

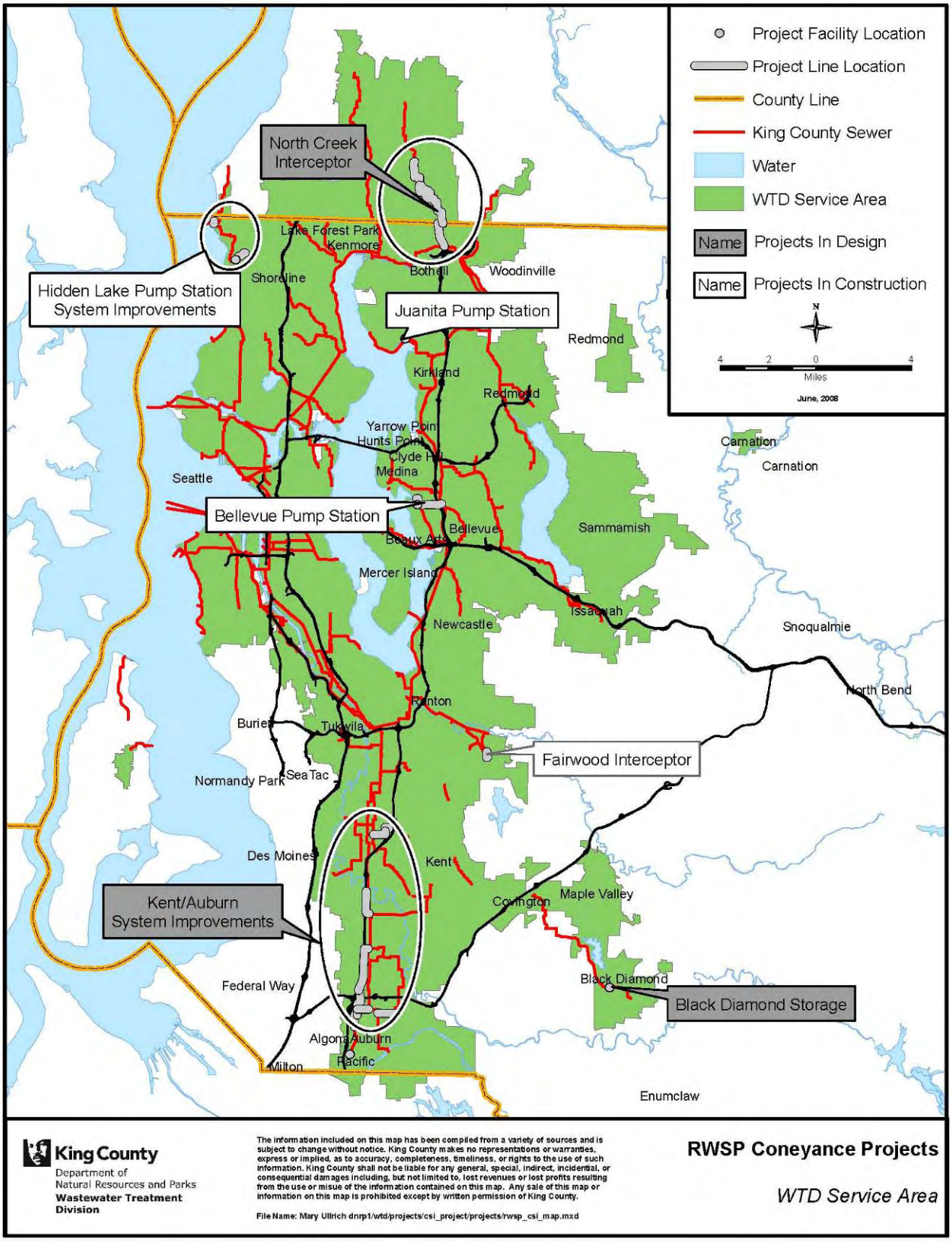


Figure 3-1. RWSP Conveyance Projects in Design and Construction in 2007

3.2.1 Kent/Auburn Conveyance System Improvements

The Kent/Auburn Conveyance System Improvements will provide additional capacity needed in the cities of Kent, Auburn, Algona, and Pacific. This project was formerly known as the Southwest Interceptor project, which proposed to meet the capacity needs in the Kent and Auburn CSI planning areas by rerouting flows to a new large-diameter sewer located primarily in the West Valley Highway right-of-way. In 2006 and 2007, additional analysis determined that the capacity needs could be met with construction of fewer miles of conveyance pipe. The revised project will construct about five miles of new conveyance pipe ranging from 18 to 42 inches in diameter.

To help identify preferred project elements and their locations, WTD staff met with stakeholders, large property owners, and staff from the Cities of Auburn, Kent, Algona, and Pacific. Four elements were identified:

- **Stuck River Trunk**. Located in Auburn, this new gravity pipeline will be constructed to convey flow away from the M Street Trunk to the Auburn West Interceptor.
- **Kent East Hill Diversion.** Located on the East Hill of Kent, this new gravity pipe will divert flow out of the upstream portion of the Mill Creek Interceptor and into the South 277th Interceptor.
- **Pacific Pump Station Discharge.** Located in Pacific, Algona, and Auburn, this new pipe will carry flow north from the Pacific Pump Station to the Auburn West Interceptor.
- **Auburn West Interceptor Parallel**. Located in Auburn, this new gravity pipe will either replace or parallel an existing portion of the Auburn West Interceptor between 15th Street Southwest and West Main Street.

WTD plans to construct the four project elements in two phases. Design for the first phase—the Stuck River Trunk and the Kent East Hill Diversion—will be completed in 2008 and pipes will be constructed by 2011. Property acquisition, permitting, and design drawings for the second phase—the Pacific Pump Station Discharge and Auburn West Interceptor Parallel—will be completed in 2009 and the pipes are planned to be in service no later than 2015.

Visit the project Web site for more information: http://dnr.metrokc.gov/wtd/projects/Kent-Auburn/index.htm.

3.2.2 Black Diamond Infrastructure Upgrade[5]

Growth in Black Diamond is projected to reach approximately 20,000 residents by 2025. As the city's wastewater conveyance and treatment provider, King County must build conveyance capacity to manage and transport flow from Black Diamond.

In 2007, WTD and the City of Black Diamond agreed to a phased approach to building new wastewater management facilities that will provide additional capacity:

[5] Formerly called the Soos Creek Sewer Improvements project.

- The decision was made to build an enclosed storage facility as the first phase of the project. Peak flows entering the pump station in Black Diamond will be stored and released slowly over time to avoid overwhelming the downstream conveyance system. The storage facility will extend the life of existing equipment and defer the need to build additional new pumping and pipeline facilities for several years. The facility is projected to be online in 2013. Activities in 2008 will focus on developing and selecting alternatives, completing predesign, and conducting an environmental review.
- Improvements in the second phase could include larger conveyance facilities, a satellite treatment facility, or a combination of both. The satellite treatment facility would be designed to treat effluent to reclaimed water standards so that the effluent can be used to recharge wetlands, irrigate nurseries and parks, and for some industrial uses. Facilities are projected to be operating by 2020. Activities in 2008 will focus on developing evaluation criteria, identifying potential projects, and conducting public outreach. A final decision will be made after further planning and analysis. Planning will incorporate outcomes from development of the first-phase storage facility and from development of the reclaimed water comprehensive plan (see Chapter 9).

Visit the project Web site for more information:
http://dnr.metrokc.gov/wtd/projects/BlackDiamond/index.htm.

3.2.3 North Creek Interceptor Improvements

Improvements to the North Creek Interceptor are necessary to avoid overflows and meet current and future growth needs in the North Creek basin. This project is located in unincorporated Snohomish County and the City of Bothell and consists of constructing 16,400 feet of gravity sewer pipes, ranging from 21 to 48 inches in diameter, to replace existing sewer pipes. The project will be constructed under two contracts, one for the North Segment located in Snohomish County and one for the South Segment located in the City of Bothell.

King County signed an interlocal agreement with the Alderwood Water and Wastewater District. The district is designing the project and will manage its construction. WTD staff is providing overall project management and oversight, including approving key design and construction decisions.

In 2007, activities focused on final design of the North and South Segments and obtaining all required permits and easements. North Segment construction will begin in summer 2008. Final design on the South Segment is anticipated to be complete in second quarter 2008, and construction is anticipated to begin in late 2008.

3.2.4 Bellevue Pump Station Upgrade

The Bellevue Pump Station needs to be upgraded to handle growing wastewater flows from the Bellevue area. Built in 1964, the facility pumps about 8 million gallons per day (mgd) of wastewater to the Sweyolocken Pump Station near the Mercer Slough. From there, the wastewater is piped to the county's South Treatment Plant in Renton. This project will increase

the Bellevue Pump Station's firm capacity to 11 mgd and will improve the station's electrical and control systems.[6] Because of space constraints, the Sweyolocken Pump Station could not be upgraded to handle these additional flows.

Pump station improvements include new pumps; new electrical, mechanical, and odor control equipment; a new standby generator; new aboveground facilities to house the new equipment; and better access for maintenance vehicles and workers. In addition to these improvements, a new 5,500-foot-long, 24-inch-diameter force main will be constructed to convey the added flows directly from the upgraded Bellevue Pump Station to the East Side Interceptor. The project is being implemented through two construction contracts: one for the force main and one for the pump station. Construction of the force main started in spring 2007 and was completed in 2008. WTD has been updating City of Bellevue staff, community groups, and affected property owners on project progress and milestones through a 24-hour community inquiry hotline and project Web page. WTD also has been responding to community inquiries to minimize disruption during construction. The pump station contract was advertised in November 2007 and was readvertised in June 2008 to secure lower bids. Construction is expected to be completed in 2011.

Visit the project Web site for more information: http://dnr.metrokc.gov/wtd/projects/bellevue/.

3.2.5 Hidden Lake Pump Station Replacement and Sewer Improvement

The 40-year-old Hidden Lake Pump Station does not have capacity to handle existing or future peak storm flows, nor does it meet current design standards for odor control, instrumentation, and equipment handling. Further, the pump station discharges to the Boeing Creek Trunk, which has a history of capacity, odor, and corrosion problems. This project will address these problems through new facilities to control overflows to Puget Sound and increase the capacity of the Boeing Creek Trunk.

The project is located in the City of Shoreline and includes constructing a new Hidden Lake Pump Station on the site of the existing pump station, replacing approximately 12,000 feet of the Boeing Creek Trunk, and building a 500,000-gallon underground storage facility in Boeing Creek Park. The new pump station will have a pumping capacity of 6.8 mgd, an increase of 2.5 mgd over the existing pump station's capacity of 4.3 mgd. Designed with public input, the new pump station will fit in the neighborhood and include native landscaping. The pipelines will be constructed by open-cut and microtunneling methods.

In 2007, the storage facility in Boeing Creek Park was completed and work continued on construction of the pump station and Boeing Creek Trunk. Work in 2008 will include startup of the storage facility, completion of the Boeing Creek Trunk, and completion and startup of the new pump station. Construction closeout will be completed in early 2009.

[6] Firm capacity means the capacity of the pump station with one of the larger pump out of service for maintenance or repair needs.

WTD staff is working closely with nearby residents and businesses to keep them informed of construction activities. Notice of activities is provided via mail, e-mail, phone, and door-hangers. Project updates and newsletters are widely distributed and posted on the project Web site. In addition, WTD holds community briefings and open houses, works directly with affected community members to problem-solve project-related concerns, and has established a 24-hour construction hotline for people to call with questions or concerns.

WTD staff is coordinating with the City of Shoreline, Ronald Wastewater District, and the City of Seattle to minimize community impacts. This coordination has made it possible to keep the Boeing Creek and Richmond Beach parks open during construction. The county is also replacing 6,000 feet of water mains owned by Seattle Public Utilities and replacing existing and constructing new manholes and sewer pipes for the Ronald district as part of this project.

Visit the project Web site for more information:
http://dnr.metrokc.gov/wtd/projects/hiddenlake.htm.

3.2.6 Fairwood Interceptor Sewer

This project replaced the erosion-prone and unstable Madsen Creek pipeline, which served the Fairwood community since the 1970s, with a new deep gravity Fairwood Interceptor located in a new alignment outside the Madsen Creek ravine. The new alignment follows Fairwood Boulevard for several blocks. It includes an inverted siphon underneath the west Madsen Creek tributary from the Fairwood Elementary School to the Bonneville Power Administration's right-of-way near 140th Avenue SE. In accordance with community preference, the new interceptor avoided the need to build a pump station in Fairwood. This project included improvements to existing Cedar River Water and Sewer District pipelines; these improvements were needed to make the new alignment feasible.

Construction of the project was substantially complete and the new interceptor began operating in December 2006. Restoration of roads, sidewalks, and public rights-of-way that were disturbed by project construction was completed in spring 2007. Final restoration of survey monuments and repairs to selected manholes and other closeout activities will be complete in 2008. Because this project is considered complete, this is the last year this project will be reported on in the RWSP annual report.

Visit the project Web site for more information: http://dnr.metrokc.gov/wtd/projects/fairwood/.

3.2.7 Juanita Bay Pump Station Replacement

The existing 14.2-mgd Juanita Bay Pump Station is an aging facility that is experiencing significant operational difficulties in conveying existing flows and that has insufficient capacity to convey future flows. To meet flow demands projected through 2050, a 30.6-mgd pump station is being built to replace the existing station. In addition to increased capacity, the new pump station will include features to improve safety and reliability, such as a standby generator, odor and corrosion prevention systems, improved access for maintenance vehicles and workers, and

equipment lifting devices. The existing and future pump stations are located at the intersection of NE Juanita Drive and 93rd Avenue NE in Kirkland.

Construction began in September 2005. Activities in 2007 focused on completing the 50-foot-deep underground structure that will house the two-stage raw sewage pumps and supporting equipment. Electrical system and heating, ventilating, and air conditioning (HVAC) system construction for the pump station was started in 2007. Startup and commissioning of the new pump station are expected to occur late summer 2008 and routine operation in 2009. The King County Industrial Waste Program presented the Silver Certificate in 2007 to WTD for discharge compliance during construction.

Project staff has been working closely with the surrounding neighbors and community. Staff distributes fliers and e-mail alerts to update community members about construction activities; responds to community questions and concerns via a 24-hour project construction hotline; and regularly updates the project Web site.

Visit the project Web site for more information:
http://dnr.metrokc.gov/wtd/projects/juanita/index.htm.

3.3 Schedule for 2008

CSI activities scheduled for 2008 are as follows:

- Complete design of the Stuck River Trunk in Auburn and the Kent East Hill Diversion, both part of the Kent/Auburn Conveyance System Improvements.
- Conduct predesign and planning activities, including siting and preliminary sizing, for the Black Diamond storage facility.
- Begin construction of the North Segment (summer) and South Segment (late in the year) of the North Creek Interceptor.
- Complete construction of the Bellevue Pump Station force main and advertise the Bellevue Pump Station upgrade construction contract.
- Start up the Boeing Creek Park storage facility, complete the Boeing Creek Trunk, and complete construction and start up the new Hidden Lake Pump Station.
- Complete construction closeout activities for the Fairwood Interceptor Sewer.
- Begin operating the new Juanita Pump Station (summer).

Chapter 4

Infiltration and Inflow

The RWSP calls for improvements to reduce existing and future levels of infiltration and inflow (I/I) into local collection systems. I/I is clean stormwater and groundwater that enter the sewer system through cracked pipes, leaky manholes, or improperly connected storm drains, down spouts, and sump pumps. Most inflow comes from stormwater and most infiltration comes from groundwater (Figure 4-1). I/I takes up capacity in King County conveyance and treatment systems and, along with population growth and other factors, drives the need to build additional capacity.

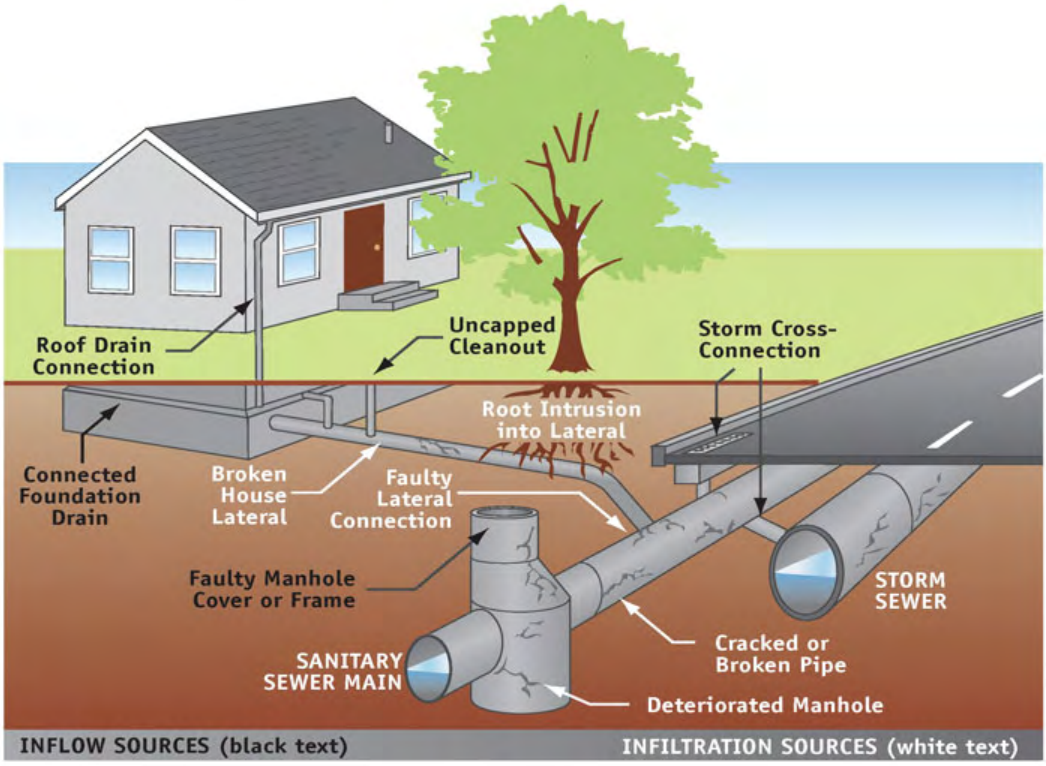


Figure 4-1. Sources of Infiltration and Inflow

In 2007, I/I control program efforts focused on implementing the *Executive's Recommended Regional Infiltration and Inflow Control Program* that was approved in May 2006 by the King County Council via adoption of Motion 12292.[1] The recommended program calls for the county and the local agencies to select, implement, and evaluate two to three initial I/I reduction projects to test the effectiveness of I/I reduction on a larger scale than pilot projects that were completed

[1] The *Executive's Recommended Regional Infiltration and Inflow Control Program* report is available at http://dnr.metrokc.gov/wtd/i-i/library/ExecRec/report.htm.

in 2004.[2] A primary goal is to determine whether and under what conditions it is possible to cost-effectively remove enough I/I from the collection system to delay, reduce, or eliminate some otherwise needed regional conveyance system improvement projects.

This chapter describes the progress made to implement the initial I/I reduction projects and the overall schedule to complete the projects.

4.1 Progress on Initial I/I Reduction Projects

In 2006, WTD worked with the Metropolitan Water Pollution Abatement Advisory Committee's (MWPAAC) Engineering and Planning (E&P) Subcommittee to select four potential project areas that would undergo further evaluation prior to selecting four candidate initial I/I reduction projects. The project areas are in the Cities of Bellevue, Issaquah, and Renton; and in the Skyway Water and Sewer District's service area (Figure 4-2).

Figure 4-2. Initial I/I Reduction Project Areas

[2] The purpose of the pilot projects was to evaluate the effectiveness of various sewer rehabilitation techniques. Details on the pilot projects were provided in the 2005 and 2006 RWSP annual reports and are also available at http://dnr.metrokc.gov/wtd/i-i/pilotprojects.htm.

Activities in 2007 included completing interlocal agreements with host jurisdictions; selecting consultants for predesign and sewer system evaluation survey (SSES) work; and starting SSES, predesign, and flow monitoring work. The sections below describe these efforts.

4.1.1 Interlocal Agreements

WTD completed separate interlocal agreements with host jurisdictions in early 2007. The agreements cover communication protocols, environmental review processes, securing private property right-of-entry agreements, and use of the draft standards that were developed jointly by the county and local agencies for use in long-term I/I control.[3]

4.1.2 Consultant Selection Process

A request for proposal for the predesign work and a request for bids for the SSES work were issued in early 2007. A representative from the MWPAAC's E&P Subcommittee participated in the selection process. A notice to proceed for the SSES work was awarded in April 2007 and for the predesign engineering work in July 2007.

4.1.3 Sewer System Evaluation Survey Work

SSES work is being conducted in the sewer drainage basins in each of the four project areas. The methods being used include closed-circuit TV (CCTV) inspection, smoke testing, and dye testing.

CCTV inspection uses cameras to record conditions in specific sections of a sewer line. The recordings can identify breaks, root intrusion, leaking water (especially infiltration from groundwater), and general deterioration. Camera equipment usually is operated from manholes located in streets or in public rights-of-way. Occasionally, access to easements in backyards or alleys is required to inspect the public sewer in these areas.

Smoke testing involves pumping smoke through sewer pipes from manholes in streets or in public rights-of-way and observing and documenting where smoke exits. Depending on the specific circumstances, the exiting smoke can indicate the location of places where I/I might enter the sanitary sewer system, such as broken pipes, manholes, catch basins, or connections of roof or foundation drains to the sewer system.

Dye testing is another way to locate I/I entry points into the sewer system. Non-toxic dyed water is introduced into roof drain leaders, driveway drains, or area drains or is injected into the ground around foundations. The sewer is then checked downstream for the presence of dyed water.

The SSES work for all four project areas will be completed in summer 2008. Prior to conducting the SSES work, WTD and the host jurisdiction notified residents and businesses in the areas where work was going to take place. Public notification materials and right-of-entry agreements,

[3] The draft standards are available at http://dnr.metrokc.gov/wtd/i-i/library/ExecRec/docs/AppB.pdf.

if needed, were developed in accordance with the guidelines established in the interlocal agreements. Materials included information on the type of work taking place, the purpose of the work, what to expect, and a contact name and number, including a 24-hour information hotline, in the event of any questions or concerns. People were notified through mailings and door hangers.

During 2007, about 550 rights-of-entry were acquired for smoke testing in the Skyway project area to allow field inspection crews to enter onto properties to record smoke exiting from roof drains, yard drains, and other storm drainage that cannot be seen from the public right-of-way.

4.1.4 Predesign Engineering Efforts

Geotechnical and environmental field assessments of the project areas began in late 2007. Other efforts under way include predesign cost estimating, mapping, and analysis of SSES data. The results of this analysis are expected to be complete in 2008 and then will be presented to the MWPAAC E&P Subcommittee for project selection.

4.2 Schedule, Decisions, and Milestones for Initial I/I Reduction Projects

Figure 4-3 shows the schedule, including decision points and milestones, for the initial I/I reduction projects. Schedule highlights are as follows:

- Complete predesign in third-quarter 2008.
- Select projects in October 2008, in consultation with host local local agencies and the MWPAAC E&P Subcommittee.
- Complete the predesign report in November 2008.
- Begin final design in December 2008 and complete final design by the end of 2009.
- Construct projects between 2010 and 2012.

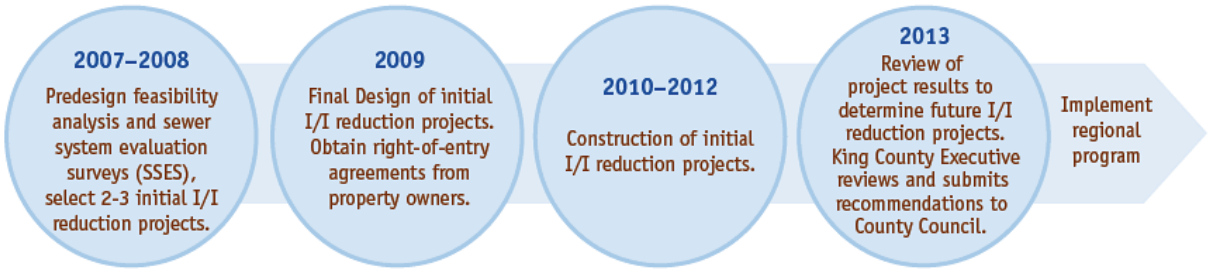


Figure 4-3. Schedule, Decisions, and Milestones for Initial I/I Reduction Projects

More information on King County's regional I/I control program can be found at http://dnr.metrokc.gov/wtd/i-i/.

Chapter 5

Combined Sewer Overflow Control

During heavy rainstorms when combined sewers in Seattle are full, untreated wastewater and stormwater may discharge into Puget Sound, the Duwamish Waterway, Elliott Bay, Lake Union, the Lake Washington Ship Canal, or Lake Washington.[1] These discharges, called combined sewer overflows (CSOs), help protect treatment plants and prevent sewer backups into buildings and onto streets. Although the wastewater in CSOs is greatly diluted, CSOs can carry chemicals and disease-causing pathogens that may be harmful to public health and aquatic life.

The RWSP calls for continued improvements to CSOs. RWSP CSO control policies provide direction regarding control project schedules, stipulating that highest priority be given to controlling CSOs that have the greatest potential to impact human health, bathing beaches, and/or species listed under the federal Endangered Species Act. So far, about one-third of the county's CSO locations are controlled to meet the Washington State Department of Ecology (Ecology) standard of no more than an average of one untreated discharge per year at each CSO location. The RWSP identifies 21 projects to control all King County's CSOs by 2030. The policies also direct the county to implement its long range sediment management strategy and, where applicable, to participate with partners in sharing responsibilities and costs of cleaning up sites such as the Superfund sites in the Lower Duwamish Waterway.

This chapter provides information on CSO control and sediment management activities in 2007. The discussions include plans for activities in 2008.

5.1 CSO Control Activities in 2007

Key achievements of the CSO control program in 2007 are as follows:

- Continued startup of the Mercer/Elliott West and Henderson/Norfolk control systems
- Start of public outreach and document production efforts for the 2008 CSO control plan update
- Start of planning and predesign of the Puget Sound Beach projects
- Incorporation of Ballard CSO control needs in the Ballard Siphon replacement project
- Start of the CSO treatment technology pilot program
- Submission to Ecology of the *Final Public Notification Feasibility Study* and launching of the real-time overflow status Web site
- Continued coordination with the City of Seattle on CSO and stormwater management
- Preparation for a program audit by the U.S. Environmental Protection Agency

[1] Combined sewers exist in older cities across the nation, including Seattle.

5.1.1 Startup of Mercer/Elliott West CSO Control System

The Denny Way/Lake Union CSO control project was under way prior to adoption of the RWSP. This project was a joint effort of King County and the City of Seattle to control CSOs into Lake Union and Elliott Bay. The new Mercer/Elliott West CSO control system was brought online in May 2005. It will control several of the city's CSOs in addition to the county's Denny Way and Dexter Avenue CSOs.

The system operated during the 2005–2006 and 2006–2007 CSO reporting periods (June through May).[2] Although volumes and frequencies at the Denny Way and Dexter Avenue CSOs have been substantially reduced, these locations are not yet controlled to the state standard.

Removal of Duckbill Valve from Elliott West Outfall

Seattle and the county have made adjustments to improve system operation and are continuing to assess the need for other refinements to address permit compliance issues (see Chapter 9). For example, the duckbill valve was removed from the outfall of the Elliott West CSO Treatment Facility in March 2007 to address hydraulic problems identified after the large storms in November and December 2006. Because these facilities operate only seasonally and intermittently, several rounds of monitoring, planning and design, implementation, and testing over several seasons may be required to ensure the efficacy of solutions.

5.1.2 Startup of Henderson/Norfolk CSO Control System

The Henderson/Norfolk CSO control project was under way prior to adoption of the RWSP. The new system was brought online in May 2005. This system was built to control two CSOs in Lake Washington and one CSO on the Duwamish Waterway at Norfolk.

The system started full operation in late 2006. Programming errors, which have since been identified and corrected, prevented the Henderson treatment tunnel from operating during the 2005–2006 reporting period. All permit conditions, except for the maximum daily chlorine limit, were met in 2006–2007. Modifications were implemented to correct this deficiency.

After commissioning of this system, all of the county's CSOs along Lake Washington will be controlled.

5.1.3 2008 CSO Control Plan Update

To implement RWSP CSO control policies and prepare for the 2008 CSO control plan update, the county's Wastewater Treatment Division (WTD) reviewed the benefits of continuing the

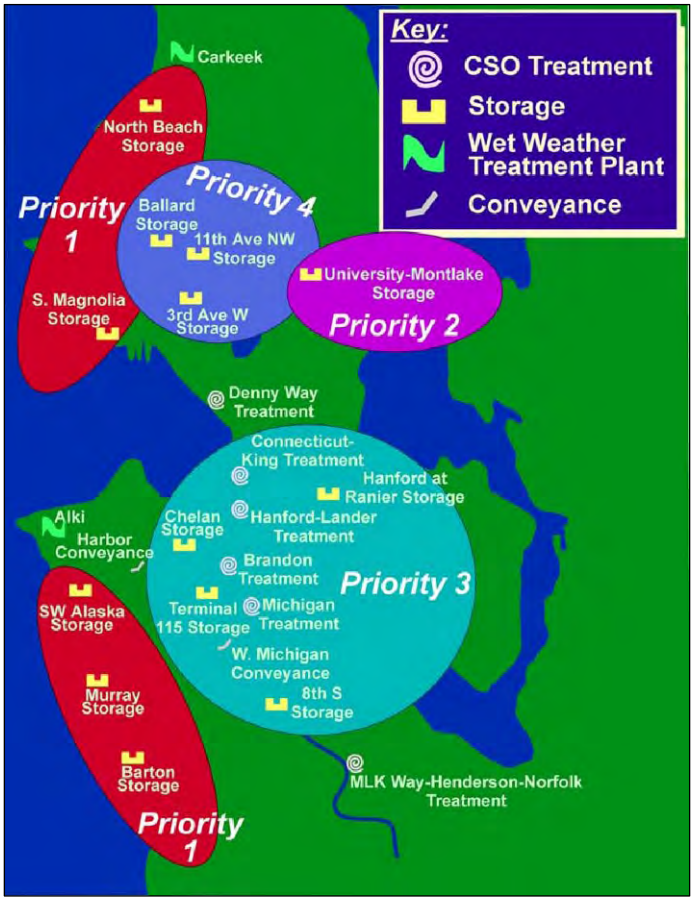
[2] CSO volumes and frequencies are reported to Ecology for the period from June 1 through May 31 each year so as to capture data for a whole wet season.

CSO control program outlined in the RWSP.[3] The CSO control program review was completed and transmitted to the Metropolitan King County Council in spring 2006.

The review confirmed that the schedule for completing the CSO control projects meets the RWSP's direction to prioritize projects according to their potential to protect human health, the environment, and endangered species.

The project priorities are shown in Figure 5-1 and described below.

- **Priority 1, CSOs near Puget Sound Beaches.** Four projects are under way and are scheduled for completion in 2013 (described later in this chapter).[4]
- **Priority 2, University-Montlake CSO.** This CSO is located at the east end of the Lake Washington Ship Canal. The control project, scheduled for completion in 2015, was given a high priority because of the amount of boating in that area and the associated potential for secondary contact with the water.
- **Priority 3, CSOs Along the Duwamish River and in Elliott Bay.** The RWSP calls for completion of nine projects along the Duwamish Waterway and in Elliott Bay between 2017 and 2027. These projects were given third priority because King County's 1999 *Combined Sewer Overflow Water Quality Assessment for the Duwamish River and Elliott Bay* indicated that the level of bacterial pollution originating upstream of CSOs was high enough to dwarf any improvements in water quality resulting from CSO control projects.



Note: The SW Alaska Storage project is no longer needed; updated monitoring and modeling data indicate that this CSO is already controlled.

Figure 5-1. Prioritized RWSP CSO Projects

[3] CSO control plan updates are prepared in conjunction with National Pollutant Discharge Elimination System (NPDES) permit renewal applications for the West Point Treatment Plant. The permit is renewed about every five years. The previous update was submitted in 2000.

[4] The SW Alaska CSO control project, also included as a Puget Sound Beach project in the RWSP, was removed from the list. The CSO at this site is controlled as a result of a project to transfer flows from the Alki drainage basin to West Point and to treat excess flows at the Alki CSO Treatment Plant.

- **Priority 4, CSOs at the West End of the Ship Canal.** Three projects to control CSOs at the west end of the Lake Washington Ship Canal are scheduled to be completed by 2030. These are the last projects to be completed because significant CSO control had already been accomplished in this area prior to adoption of the RWSP. As described later in this chapter, it is possible that the Ballard CSO will be controlled through the Ballard Siphon replacement project.

The priorities and schedule are being carried forward in the 2008 CSO control plan update. Work on the update began in 2006 with a public workshop and continued in 2007 with public outreach and document production activities. The update will be submitted to Ecology in mid 2008.

WTD is in the process of analyzing the differences between predicted and actual CSO frequency and volume in order to update and recalibrate its hydraulic model. Recalibration is done routinely to ensure that the model accurately predicts actual conditions. The process should be complete in late 2008 and may lead to changes in sizing, schedules, and costs of CSO control projects. At the end of 2010, WTD will complete another CSO control program review that incorporates information from the recalibrated hydraulic model, a review of technologies including the results of CSO treatment pilots under way, and any new environmental or public health findings with implications for CSO control. Project definitions and implementation order may be redefined at that time; any modifications will be sent to the King County Council for approval.

The 2000 CSO control plan update and the 2006 CSO control program review are available at http://dnr.metrokc.gov/wtd/cso/library.htm#plans.

5.1.4 Puget Sound Beach Projects

In January 2007, King County hired a consultant to conduct the planning and predesign phase of the four CSO control projects along Puget Sound beaches—Murray and Barton in West Seattle, South Magnolia along north Elliott Bay, and North Beach near Carkeek Park. Because the Barton Pump Station sends flow to the Murray Pump Station and anything that happens at one affects the other, design and construction of the pump station upgrades and CSO control projects are being coordinated.

Control options that may be considered, either alone or in combination, are as follows:

- Store peak flows during large storms and send flows to the existing treatment plant once the storm passes
- Increase pumping and conveyance capacity to direct peak flows to existing treatment facilities
- Reduce peak flows of stormwater and groundwater into the wastewater collection system, including the potential use of low-impact development

- Treat peak flows at a new local treatment facility during large storms

Alternative control options and sites will be identified based on screening criteria. Initial criteria have been developed and will be further refined based on community feedback. Community meetings have been held in each of the four project basins. Public comments are being tracked and will be used to involve stakeholders in future community meetings.

Flow monitoring in the City of Seattle's sewer system will be conducted in each of the four basins to assess whether removing stormwater from these sewers is a viable option for CSO control. In addition, the use of green infrastructure will be explored as an alternative for CSO control in one of the basins. The most suitable basin will be identified in cooperation with the City of Seattle, and the feasibility and costs of the strategy will be assessed.

Predesign will continue through 2009 and end with issuance of facility plans. Washington State low-interest loans were awarded to fund facility plans for all but the South Magnolia project. Construction is expected to begin in 2011 and to be completed by 2013. More information can be found at http://dnr.metrokc.gov/wtd/projects/cso/index.htm.

5.1.5 Ballard Siphon Replacement Project and CSO Control

WTD continues to find opportunities to optimize cost-effectiveness by coordinating CSO control with other WTD projects. The Ballard Siphon replacement project is one example of such coordination. The project—initiated in 2006 and scheduled for completion in 2011—will protect water quality in the Lake Washington Ship Canal by replacing the 70-year-old wooden sewer pipe that extends across the floor of Salmon Bay near the Hiram M. Chittenden Locks.

The project is being designed to bring the CSO at the Ballard Regulator Station under control and eliminate the need for the CSO storage project at this location that was scheduled in the RWSP for completion in 2029. Replacement of the siphon also will reduce CSOs at the 11th Avenue Regulator Station, likely reducing the size of the CSO storage project planned to be completed at this location in 2030.

5.1.6 CSO Treatment Technology Pilot Program

The RWSP calls for satellite CSO treatment for CSOs at four sites—Kingdome-Connecticut, Hanford-Lander, Brandon, and Michigan. Flows at these CSO sites are so high that storage facilities to hold all the flows would be large, difficult to site, and prohibitively expensive. Even if such storage facilities could be built, they could not be drained to regional plants before the next storm begins to fill them again.

The RWSP called for the use of conventional primary sedimentation for CSO treatment. Since adoption of the RWSP, some technological advancements have occurred that could have application to CSO control. In 2007, a program was started to pilot test emerging treatment technologies for these sites. The objective of the program is to determine whether high-rate sedimentation technologies hold the potential to be cost-effective alternatives to the currently planned conventional primary CSO treatment. The program will provide reliable information to

support decision-making and will help the county to better understand the capabilities and limitations of various technologies. The pilot program consists of three phases:

- Phase 1 (2007) – Project development, jar testing, technology identification, and public involvement
- Phase 2 (2008) – Pilot-scale testing at a treatment plant
- Phase 3 (2009) – Pilot-scale testing at a CSO site, if necessary

5.1.7 Final Public Notification Feasibility Study to Ecology

King County, the City of Seattle, and Public Health–Seattle & King County operate a joint public outreach program to inform the public about the location of CSOs, their occurrence, and the possible health or environmental impacts of CSOs. Signs are posted near CSO outfalls. In addition, the outreach effort includes media releases and a brochure, fact sheet, Web site (http://www.metrokc.gov/health/hazard/cso.htm), and telephone number to respond to health concerns regarding CSOs.

The modified National Pollutant Discharge Elimination System (NPDES) permit for West Point required that King County conduct a study to determine the feasibility of providing more immediate notification of overflows, including the feasibility of providing a Web-based notification system.[5] WTD submitted a draft study report to Ecology in July 2006 and then incorporated Ecology comments on the draft, solicited public input through briefings and displays, and submitted a final report in July 2007. The *Final Public Notification Feasibility Study* can be found at http://dnr.metrokc.gov/wtd/cso/library/Notification/FinalPublicNotificationFeasibilityStudyReport-July2007.pdf.

WTD began pilot testing a Web-based real-time notification system in November 2007 (http://dnr.metrokc.gov/wtd/cso/status/). A map on the site shows county CSOs that are overflowing or that have overflowed in the last 48 hours. Status of CSO locations that are linked to the county's SCADA system is updated every 10 minutes.[6] Use of the Web site is being monitored. The county is working with Public Health–Seattle & King County on ways to make the real-time status available by phone and in other languages. If this information is found to be useful, further improvements will be made.

To ensure development of a seamless public information system for all CSOs in the area, the county is coordinating with Seattle Public Utilities in exploring ways to provide real-time status of city-owned CSOs.

[5] The permit was modified in June 2005 to include the new Mercer/Elliot West and Henderson/Norfolk CSO control systems. CSO public notification programs are required by the U.S. Environmental Protection Agency.
[6] SCADA = supervisory control and data acquisition.

5.1.8 Coordination with the City of Seattle

Extensive coordination with the City of Seattle, including exchange of rainfall, modeling, flow, and GIS data, has occurred during the year. The county has provided data in support of the city's work in developing a system hydraulic model and in implementing CSO control projects in the Windermere, Genesee, and Diagonal areas. The city has provided data to the county in support of system characterization and consideration of green infrastructure alternatives for the county's Puget Sound Beach projects.

5.1.9 Program Audit

In December 2007, the U.S. Environmental Protection Agency (EPA) began an audit of King County's CSO control program for alignment with EPA's 1994 CSO Control Policy. The City of Seattle's CSO control program began a similar audit at the same time. These audits are being routinely conducted across the country with larger CSO communities. The audits often result in consent decrees covering CSO Long Term Control Plans and project schedules. The county is waiting to receive the audit findings.

5.2 Sediment Management Activities in 2007

King County is responsible for remediating CSO-related sediment contamination under the federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the state Model Toxics Control Act (MTCA).[7] To meet RWSP policies, WTD is carrying out a sediment management plan developed in the late 1990s to remediate sediment near CSO outfalls that are contaminated with a variety of heavy metals (lead, copper, zinc), phthalates, polychlorinated biphenyls (PCBs), and hydrocarbons.[8] Most of the contamination is from the first half of the twentieth century.

Since completion of the sediment management plan, King County has been coordinating its sediment management efforts in the Duwamish Waterway with two federal Superfund projects: the Harbor Island and the Lower Duwamish Waterway projects. The Harbor Island Superfund project will remediate sediments at the county's Lander and Hanford CSOs. The Lower Duwamish Waterway project area includes nine county CSOs.

5.2.1 Sediment Management Plan

Work on three projects in the sediment management plan is under way—cleanup of the Denny Way and Hanford/Lander CSOs and development of a model to better predict the fate and transport of contamination:

- In mid 2007, design was completed for cleanup of the old Denny Way CSO site off of Myrtle Edwards Park. Ecology finalized an Agreed Order and interim action work plan in

[7] CERCLA is commonly known as Superfund.
[8] The sediment management plan is available at http://dnr.metrokc.gov/WTD/sediment/library.htm

October 2007. King County dredged and capped the area in November 2007–February 2008. Roughly 14,000 cubic yards of sediment contaminated with polychlorinated biphenyls (PCBs), hydrocarbons, and mercury was removed. After dredging, the excavated area was backfilled with clean sand, armor rock, and habitat-enhancing gravel to match the seabed's existing grade. King County will monitor sediment quality at the site over the next 10 years. After five years of monitoring, the county will evaluate alternatives for cleaning up additional areas.

- In 2006, King County, the Port of Seattle, and the City of Seattle formed a group to complete the work necessary to determine the final cleanup of the Duwamish East Waterway (Harbor Island Superfund project). EPA approved the scope of the remedial investigation/feasibility study in spring 2007, and work has started. The county's Hanford/Lander CSOs are part of Superfund cleanup. Approximately 20,000 cubic yards of sediment in front of the Lander CSO will be remediated in winter 2008–2009.
- The model to better predict deposition of contaminants around CSO outfalls will be ready in 2008. The model will help to identify which CSOs are likely to have contaminated sediments and will inform cleanup decisions.

Visit the Sediment Management Program Web site for more information: http://dnr.metrokc.gov/wtd/sediment/.

5.2.2 Lower Duwamish Waterway Superfund Site

The county continues to work to improve water quality in the Lower Duwamish Waterway through actions such as reducing CSOs, restoring habitats, capping and cleaning up sediments, and controlling toxicants from industries and stormwater runoff. WTD is partnering with the City of Seattle, the Port of Seattle, and the Boeing Company under a consent agreement with EPA and Ecology to prepare a remedial investigation/feasibility study for the Lower Duwamish Waterway Superfund site. The draft remedial investigation, which defines the extent and inherent risks of contamination, was released for public review in November 2007 and is expected to be completed in 2008. The feasibility study, which will identify cleanup alternatives, will be completed in 2009.

The county is participating in two early action sites—the Diagonal/Duwamish CSO/Storm Drain and Slip 4 CSO—to clean up portions of the waterway earlier than required.[9] The cleanup at Diagonal/Duwamish was completed in 2004. The dredged area was capped with 3 to 6 feet of clean sediment and gravel to provide new fish habitat. Follow-up work was completed at the site in February 2005, and post-remediation monitoring at the site is providing critical information that can be used for determining cleanup alternatives for the Superfund site.[10]

[9] The Slip 4 cleanup is being managed by the City of Seattle. King County is partnering with the city on this cleanup effort.

[10] The Diagonal/Duwamish remediation closure report issued in July 2005 summarizes the purpose for and details of the follow-up work. The closure report is available on the Web at http://dnr.metrokc.gov/wtd/duwamish/diagonal.htm.

In early 2007, source control sampling from areas upland to Slip 4 indicated that PCBs were still entering the storm drains that discharge to the slip. EPA put the cleanup of Slip 4 on hold until contamination can be adequately controlled to prevent recontamination of the cleanup.

The Lower Duwamish Source Control Work Group continues to meet to discuss source control issues and activities that can affect sediment remediation in the area. In 2007, WTD's Industrial Waste Program participated in source control efforts, including sampling and analysis of industrial waste discharges and of rainfall samples for contaminants, such as phthalates, found in the cleanup area (see Chapter 9).

Visit the Duwamish Waterway Programs Web site for more information: http://dnr.metrokc.gov/WTD/duwamish/.

Chapter 6

Local Treatment Plants

At the request of Vashon Sewer District and the City of Carnation, and in accordance with RWSP policies, King County extended its service area to meet specific public health needs and to help manage the environmental impacts of growth in these communities. Since 1999, King County has managed and operated the Vashon Treatment Plant for the Vashon Sewer District. Upgrades to the plant were substantially complete in 2006. In 2002, the City of Carnation contracted with King County to design, build, and operate a new wastewater treatment plant. This chapter summarizes the progress made in 2007 on the Vashon Treatment Plant and Carnation Treatment Facility projects.

6.1 Vashon Treatment Plant

Since 1999, the county has carried out several steps to improve the Vashon Treatment Plant to meet regulatory requirements and protect public health and the environment. It extended the marine outfall farther into Puget Sound and completed interim upgrades to improve the plant's performance and compliance with NPDES (National Pollution Discharge Elimination System) permit requirements.[1] Further upgrades were completed in 2006 to increase plant capacity and enhance its backup systems. Improvements include new headworks, an oxidation ditch, two secondary clarifiers, a stormwater detention tank, an administration building, and an electrical building. This project was funded in part by loans from the Public Works Trust Fund, Washington State Department of Ecology, and U.S. Environmental Protection Agency.

The upgraded treatment plant was brought online late in 2006 and is operating well (Figure 6-1). An open house for the community was held in May 2007; closeout of the construction contract will occur in 2008.

Visit the project Web site for more information: http://dnr.metrokc.gov/wtd/vashon/.

[1] NPDES permits are issued by the Washington State Department of Ecology and set limits on the quality and quantity of effluent (treated wastewater) discharged from point sources such as treatment plants,combined sewer overflows, and industrial facilities.

Figure 6-1. Vashon Wastewater Treatment Plant

6.2 Carnation Treatment Facility

The City of Carnation decided to replace onsite septic systems with a new wastewater treatment facility and collection system to better protect public health and the environment, achieve the city's comprehensive plan goals, and maintain and enhance community livability. The city designed and built the local wastewater collection system and contracted with King County to design, build, operate, and maintain a new treatment plant and associated discharge facilities.

The plant will use membrane bioreactor technology (MBR) and will produce reclaimed water that will be used to enhance a wetland in the Chinook Bend Natural Area. During startup, the plant will discharge effluent through an outfall to the Snoqualmie River. After startup, the Chinook Bend Natural Area will become the primary discharge location. The river outfall will remain operational and will serve as a backup to the wetland when maintenance or equipment problems prevent the plant from producing reclaimed water. Figure 6-2 shows the location of the Carnation treatment and discharge facilities.

At startup, the plant will have the capacity to treat a maximum daily flow of about 480,000 gallons per day and an average daily flow of 210,000 gallons per day. The facilities will initially serve about 2,000 people in Carnation's urban growth area, with provisions to make adjustments to serve up to 4,000 people in 2030 when the area is expected to be built out.

The following sections describe work done to enhance the Chinook Bend Natural Area and present project accomplishments in 2007 and activities planned for 2008.

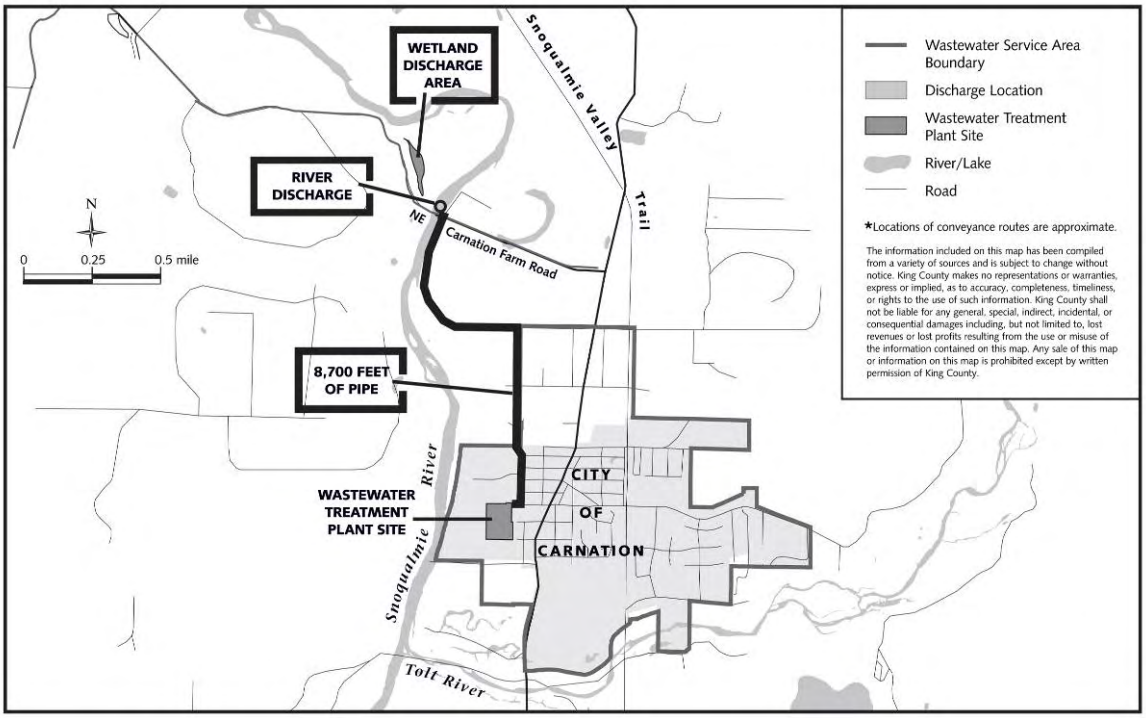


Figure 6-2. Location of Carnation Treatment Facilities

6.2.1 Chinook Bend Natural Area

The 59-acre Chinook Bend Natural Area is owned by King County and managed as an open space and habitat protection area by King County Parks. The county partnered with Ducks Unlimited, a non-profit group dedicated to wetland conservation, to enhance the wetland. The partners worked with the Snoqualmie Tribe, Wild Fish Conservancy, and other interested stakeholders to develop a design. The wetland design increases the size of the wetland to nearly four acres, benefiting wildlife and enhancing opportunities for passive recreation. Figure 6-3 shows components of the Chinook Bend Natural Area enhancement.

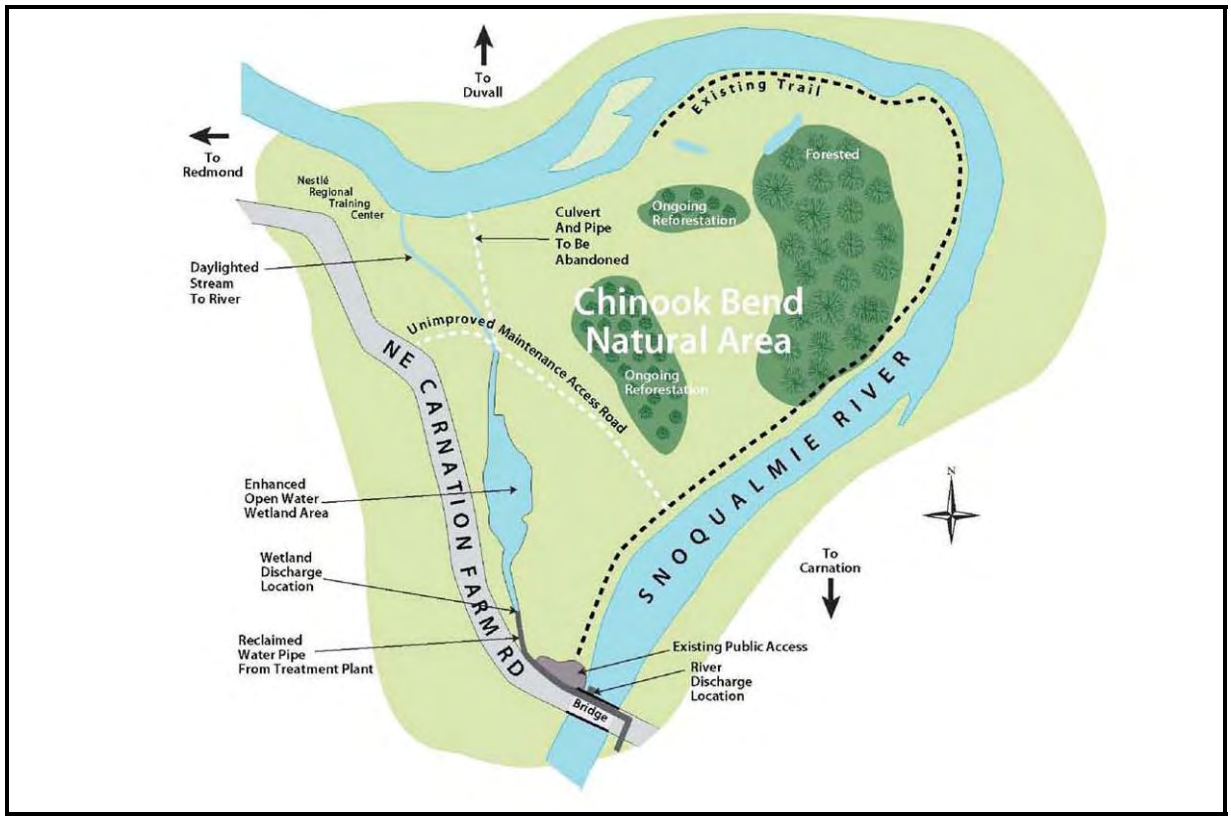


Figure 6-3. Chinook Bend Natural Area Wetland Enhancement

6.2.2 Accomplishments in 2007 and Outlook for 2008

King County made substantial progress on the Carnation Treatment Plant and associated discharge facilities in 2007. By the end of 2007, the treatment plant was 75 percent complete (Figure 6-4). Construction of the wetland enhancement was completed in October. A fish-passable water control structure was installed to manage wetland water levels, and minor earthwork was done to create hummocks, depressions, and a more diverse shoreline (Figure 6-5).

In 2007, the Wastewater Treatment Division (WTD) and City of Carnation staff worked closely to involve Carnation residents and businesses in the project and to minimize potential construction impacts. A 24-hour construction hotline was available for community members to call with questions or concerns. Several newsletters, a large public meeting, monthly city council meetings on the project, and monthly information tables at the local farmers market provided opportunities for people to get their questions answered on the project.

The plant started operating in early 2008. A Reclaimed Water Use permit application will be submitted to the Washington State Departments of Health and Ecology. The reclaimed water discharge to the wetland is expected to begin in late 2008 or early 2009 after the permit is issued.

Visit the Carnation project Web site for more information: http://dnr.metrokc.gov/wtd/carnation/.

Figure 6-4. Carnation Wastewater Treatment Plant

Point where reclaimed water will be released into the wetland. Designed to simulate groundwater seep.

Physical habitat modifications and native plantings to create complexity in the wetland.

Figure 6-5. Enhancements at Chinook Bend Natural Area

Chapter 7

Odor Control Program

The RWSP includes policies to guide King County in achieving its goal of preventing and controlling nuisance odor occurrences at all wastewater treatment plants and associated conveyance facilities. The policies also call for implementation of an odor prevention program that goes beyond traditional odor control. RWSP reporting requirements call for an annual report on the status of the odor prevention policies and projects, including a summary of odor complaints.

This chapter fulfills the annual reporting requirement for 2007. It describes the implementation of odor control improvements at the West Point and South Treatment Plants, the odor control improvements planned for conveyance system facilities, and the odor control design planned for the Brightwater System. The last section of the chapter lists odor control activities planned for 2008. Appendix A provides a summary of odor complaints received in 2007.

7.1 Phased Retrofit of the West Point and South Plants

The RWSP odor control policies, as established via Ordinance 14712, require that odor control retrofits be phased at the West Point and South Treatment Plants, implementing those that generate the greatest improvements first.[1] To that end, the Wastewater Treatment Division (WTD) has undertaken projects at each plant to identify and implement changes to existing odor control systems and to install new systems.

At the West Point plant, improvements include covering the division channel and modifying the odor scrubber system. In 2005, the channel was covered and changes were made to divert the air directly to the ventilation system. In early 2007, modifications to the odor scrubber system were completed. Since these modifications were made, the amount of fugitive odors escaping from the system has greatly decreased. In 2008, WTD will collect samples and perform modeling to evaluate the effects of these improvements and determine if they meet the odor control goal for existing facilities.

At South plant, installation of the covers for each first pass of the four aeration basins and of covers for the return activated sludge channel began in 2006 and was substantially complete in 2007. Work was completed in early 2008.

[1] Ordinance 14712 and accompanying attachments are available on the King County Council's legislation site at http://mkcclegisearch.metrokc.gov/detailreport/?key=4469.

7.2 Conveyance System Upgrades

RWSP policy calls for retrofitting conveyance facilities that pose nuisance odor problems with odor prevention systems as soon as such odors occur, subject to technical and financial feasibility. Table 7-1 lists projects to improve odor control in the county conveyance system. The table also includes the type of control technology planned and anticipated completion date for each project.

Table 7-1. Current and Planned Odor Control Projects in Conveyance System

Facility	Odor Control Technology	Anticipated Completion Date
Hidden Lake Pump Station[a]	Carbon bed odor scrubber & chemical injection	4th quarter 2008
Kenmore Lakeline	Carbon bed odor scrubber & chemical injection	4th quarter 2013
Sweyolocken Force Main Discharge	Replacement of phoenix/carbon scrubber with bioscrubber	4th quarter 2009
Lake City Regulator Station	Replacement of phoenix/carbon scrubber with carbon bed odor scrubber	2nd quarter 2009
University Regulator Station	Carbon bed odor scrubber	4th quarter 2008
Interbay Pump Station	Carbon bed odor scrubber	4th quarter 2013
King Street Regulator Station	Carbon bed odor scrubber	1st quarter 2009
53rd Avenue Pump Station	Carbon bed odor scrubber	2nd quarter 2009
Juanita Bay Pump Station[a]	Carbon bed odor scrubber & chemical injection	3rd quarter 2008
Kirkland Pump Station	Carbon bed odor scrubber	1st quarter 2012
Bellevue Pump Station	Carbon bed odor scrubber & chemical injection	4th quarter 2011
Eastside Interceptor	Chemical injection	1st quarter 2009
Soos Creek Pump Station & Pipeline	Carbon bed odor scrubber & chemical injection	4th quarter 2020

[a] These are new pump stations that are being built to replace existing stations.

7.3 Brightwater Odor Control System

RWSP policy directs the county to construct odor control systems for new regional treatment plants that meet the "best in the country for new facilities" level, as described in Attachment A to Ordinance 14712. Brightwater's odor control system was designed to meet this level and ensure there are no detectable odors at the property line for the Brightwater Treatment Plant.

To remove odors, air will be collected from treatment process units, enclosed buildings, and loading areas and then routed to odor control systems. All treatment process units will be covered, and buildings that house the headworks and solids handling equipment will be fully

enclosed.[2] Odors from these facilities will be absorbed and neutralized through a multistage treatment process that includes the use of biological, chemical, and carbon odor scrubbers.

Site preparation for the Brightwater solids/odor control facilities was completed and the construction contract for these facilities was awarded in 2007.

7.4 Schedule for 2008

WTD will continue to implement odor control improvements in accordance with RWSP policies. The following activities are planned for 2008:

- Evaluate the effectiveness of modifications to the odor control scrubber system at West Point Plant completed in 2007.
- Complete the installation and evaluate the effectiveness of aeration basin covers at South Plant.
- Continue to design and implement odor control improvements to conveyance system facilities that are listed in Table 7-1 of this chapter.
- Begin construction of Brightwater odor control facilities.

Visit the Odor Control Program's Web site for more information: http://dnr.metrokc.gov/wtd/odorcontrol/.

[2] The headworks is the first step in wastewater treatment. Large solids and grit are removed from the wastewater before it moves to the next step of treatment.

Chapter 8

Biosolids Program

Biosolids are the nutrient-rich organic material produced by treating wastewater solids. After they are processed and treated, biosolids can be beneficially reused as a fertilizer and soil amendment. RWSP biosolids policies guide King County to continue to produce and market Class B biosolids and to evaluate alternative technologies to produce the highest quality marketable biosolids, including Class A biosolids.[1,2] In addition, the policies call for the county to use methane, also produced during solids processing at the treatment plants, for energy and other purposes where cost-effective.

This chapter describes the county's Biosolids Program accomplishments in 2007 and its planned activities for 2008.

8.1 Accomplishments in 2007

8.1.1 Use of Biosolids

The Wastewater Treatment Division (WTD) continued to produce high quality Class B biosolids at the South and West Point Treatment Plants. Approximately 108,000 wet tons of biosolids were produced in 2007, all of which was recycled as a soil amendment for forestry and agricultural applications and to make compost. The sale of biosolids generated $86,300 in revenue. Monitoring continues to show low levels of pollutants and excellent nutrient value of biosolids.

In 2007, King County's biosolids were used as a soil amendment for a variety of applications:

- 3,900 acres of wheat in Douglas County
- 314 acres of canola, 534 acres of hops, and 126 acres of timothy grass (hay) in the Yakima Valley
- 354 acres of state forestlands and 1,162 acres of Douglas-fir plantations in Hancock's Snoqualmie Forest as part of the Mountains to Sound Greenway Biosolids Forestry Program

[1] Class B biosolids refer to biosolids that have been treated to significantly reduce pathogens to levels that are safe for beneficial use in land application.

[2] Class A biosolids refer to biosolids that have been treated to reduce pathogens to below detectable levels. Biosolids that meet this designation can be used without site access or crop harvest restrictions and are exempt from site-specific permits. Federal regulations require Class A level of quality for biosolids that are sold or given away in a bag or other container or that are applied to lawns or home gardens.

8.1.2 Meeting Permit Requirements

In June 2007, the Washington State Department of Ecology (Ecology) issued amendments to Chapter 173-308 WAC, the 1998 state rule for biosolids management. The purpose of the amendments is to improve the permit process, allow for better septage management, adjust the biosolids permit fee structure, incorporate policy changes, and address "general housekeeping" issues.

The effects of some of the amendments on WTD's program are as follows:

- The amendments now require all agencies and septage management facilities to pay permit fees. (Only certain types and sizes of operations were required to pay before the amendments.) The greater number of payers and implementation of a new permit fee structure are increasing the funds available to Ecology for overseeing the state biosolids program. Under the new fee structure, King County's annual permit fee has decreased by nearly $19,000.
- The amendments require submittal of a spill prevention and response plan for transporting biosolids. WTD has had such a plan in effect for many years, and this plan is consistent with the amendments.
- The amendments include a requirement, which became effective June 24, 2007, to "significantly remove manufactured inerts," such as plastics, metals, ceramics, and other manufactured items that remain relatively unchanged during the wastewater treatment process. Meeting this requirement can be achieved by a barscreen with a maximum aperture of 3/8 inch. WTD is undertaking a project to upgrade its influent barcreens at West Point and expects to advertise for consultant design services in late 2008. Facilities must comply with the requirement by July 1, 2012.

8.1.3 Environmental Management System Certification

In 2004, the county's Biosolids Program passed an independent audit and was certified into a national program of Environmental Management Systems (EMS). The EMS program was developed by the National Biosolids Partnership (NBP) to support continual improvement and enhance environmental performance of biosolids programs. In 2007, NBP awarded the Platinum Level designation to WTD's Biosolids Program. The Platinum Level designation represents the highest achievement of biosolids management and environmental stewardship.

In 2007, WTD evaluated the EMS program designed by NBP against the International Standards Organization's EMS, known as ISO 14001. The evaluation determined that ISO 14001 methods would be comparable but less expensive to implement than NBP methods. ISO 14001 is also a more nationally recognized standard.

WTD will change from the NBP EMS to ISO 14001. WTD expects to complete planning and implementation for the ISO 14001 transition for its solids treatment and biosolids activities and for the overall WTD program in 2008 and to become certified in 2009. In 2009, WTD will begin to expand the program to all WTD activities.

8.1.4 Producing Energy from Methane

Digester gas is energy-rich methane gas naturally produced during solids treatment by microorganisms degrading solid organic matter. The West Point and South plants recover digester gas to generate heat, electricity, and natural gas; design is under way for a facility at the Brightwater plant for testing new technologies that generate energy from digester gas.

At West Point, digester gas is used to run boilers that provide heat for plant processes and buildings. The gas is also fed to internal combustion engines that provide power to run the raw sewage pumps. In 1984, West Point began using digester gas to power cogeneration engines that produce power and heat. The engines had reached the end of their useful life in 2007 and were removed from the plant site. WTD staff assessed alternatives for a new cogeneration facility and recommended implementation of a plan to install two new internal combustion engines capable of supplying up to 4.6 megawatts of power. WTD is coordinating with Seattle City Light, which serves West Point, and the U.S. Environmental Protection Agency (EPA), which is expected to fund part of construction of the project. Final design is under way. The goal is to have a new cogeneration facility online by 2012.

At South plant, digester gas is used to run a boiler that provides heat for plant processes and buildings. The remainder of the gas is "scrubbed" and sold to the local natural gas utility. During months of high energy use, a turbine cogeneration system (two gas turbines and one steam turbine) may be used to generate supplemental heat and electricity and reduce peak load utility charges for the plant. The gas turbines run on scrubbed digester gas; the steam turbine runs on heat recovered from the gas turbines.

In 2004–2006, digester gas was used to fuel a 1-megawatt molten carbonate fuel cell at South plant during a successful two-year demonstration project of the new technology.[3] Fuel cells are electrochemical devices that convert chemical energy from fuels containing hydrogen directly to electricity and heat. The demonstration project was conducted in cooperation with EPA and FuelCell Energy, Inc. The final report is expected to be complete in 2008 and will serve as a resource for other agencies considering fuel cell stationary power plants as a means to beneficially use digester gas. The fuel cell is currently not in use because it needs significant repairs. WTD is considering repairing it or moving to a smaller portable version that incorporates improvements based on demonstration project results. For more information on the fuel cell demonstration project, visit the project's Web site at http://dnr.metrokc.gov/wtd/fuelcell/index.htm.

Some of the digester gas produced at the Brightwater Treatment Plant when it comes online will be used to run a boiler that generates heat for the digestion process and buildings. In 2007, WTD completed a study to explore the feasibility of technologies that could use the surplus digester gas to generate alternative forms of energy at the plant site. The study includes estimates of capital and operating costs for a new Energy Technology Demonstration Facility (ETDF). The ETDF will interconnect with digester gas sources and treatment plant utilities to provide a versatile platform for researchers and manufacturers in the Northwest to beta test a variety of

[3] Natural gas (both scrubbed digester gas and gas supplied by the local utility) was used to power the fuel cell power plant at times when plant and digester gas supply systems were being adjusted.

near or commercially ready equipment. Devices being tested will be displayed to students and the general public. Siting of the ETDF was incorporated into the design of Brightwater. Design of the ETDF is expected to be complete in 2008. Friends of the Hidden River, a non-profit organization, worked with King County to develop broad support for the project and secured funding for the feasibility study and ETDF design through a series of Washington State Department of Community, Trade and Economic Development grants. Funding for construction and long-term operation is being sought from a mix of private and public sources.

For more information on WTD's energy recovery efforts, visit the program Web site at http://dnr.metrokc.gov/wtd/energy/.

8.1.5 WTD Energy Plan

In 2007, WTD began work on an energy plan specific to wastewater treatment operations. The plan will develop criteria for determining where to focus energy efficiency efforts. Teams comprised of staff at both West Point and South Treatment Plants meet regularly to identify, prioritize, and follow through with energy-related efforts. A draft energy plan is scheduled to be complete in 2008. The King County Executive's *King County Energy Plan*, drafted in 2007, contains two specific goals for WTD: (1) by 2012, achieve a 10 percent reduction in energy use, based on the amount of water treated, and (2) 50 percent of WTD's energy use must come from renewable sources by 2012.

8.1.6 Cooperative Research

In 2007, WTD continued biosolids-related research and demonstration in cooperatation with the Northwest Biosolids Management Association (NBMA) and scientists from the University of Washington (UW), Washington State University, and the University of Arizona. UW led a study during the year on the fate and degradation of endocrine-disrupting compounds in land-applied biosolids. The researchers evaluated nonylphenol, a product of common household detergents, and concluded that it degrades quickly in the soil environment. Research that focuses on the environmental effects of biosolids and on carbon sequestration opportunities will continue with NBMA and university researchers in 2008.

8.1.7 Awards

The Society for Technical Communication awarded WTD an Excellence Award for the *Biosolids, the Ultimate in Recycling*, poster (Figure 8-1). STC is a membership organization dedicated to advancing the arts and sciences of technical communication. It is the largest organization of its type in the world. The poster was developed for use as an educational tool for teachers, students, and adults who tour WTD treatment plants. WTD Biosolids Program staff developed the poster in cooperation with the GIS, Visual Communications, and Web Unit of the Department of Natural Resources and Parks.

Figure 8-1. *Biosolids, the Ultimate in Recycling*, Poster

8.2 Schedule for 2008

The following Biosolids Program activities are planned for 2008:

- Issue a request for information (RFI) to learn of market options available for supplementing, strengthening, or diversifying its Biosolids Program and to learn of reliable, cost-effective, publicly acceptable, and environmentally beneficial biosolids management options that can be implemented in the next decade.
- Continue to conduct cooperative research and demonstration projects to evaluate the safety and benefits of the county's biosolids projects, including evaluating new uses that provide additional environmental benefits, and to respond to public concerns or questions.
- Complete Phase 1 of the transition to ISO 14001 EMS. Phase 1 consists of preparing an EMS manual for WTD and the documents necessary for implementing the EMS for solids treatment and biosolids.
- Advertise for consultant design services to upgrade influent screens at West Point.
- Complete a draft energy plan.
- Complete the report for the South plant fuel cell demonstration project.

- Prepare for an independent audit in 2009.

Visit the Biosolids Program Web site for more information: http://dnr.metrokc.gov/wtd/biosolids/.

Chapter 9

Reclaimed Water Program

Reclaimed water is wastewater treated to such a high level that it can be used safely and effectively for many purposes. Production and use of reclaimed water can help King County to better manage its effluent and provide regional benefits such as reducing effluent discharges to Puget Sound and increasing flows for fish in local streams.

RWSP water reuse policies call for King County to pursue the use of reclaimed water and to develop a water reuse program. Water reuse is also a component of the RWSP treatment plant policies. These policies call for continued reuse at existing facilities and for exploration of opportunities for expanded reuse at existing treatment facilities and reuse at all new facilities. In addition, RWSP policy calls for the county to support regional water supply agencies and water purveyors in their public education campaign on the need and ways to conserve water.

This chapter describes the county's Reclaimed Water Program accomplishments in 2007 and anticipated activities for 2008.

9.1 Reclaimed Water from Existing Facilities

King County's reclaimed water program is over 10 years old. The Wastewater Treatment Division (WTD) has been safely using reclaimed water since 1997 at the South and West Point plants. The plants used 294 million gallons of reclaimed water for landscape irrigation, internal plant reuse, and other non-drinking purposes in 2007. The South plant, which produces approximately 99 million gallons per year of Class A reclaimed water, distributes some of this water offsite to the King Conservation District Wetland Nursery and Fort Dent Park sports fields for irrigation during the summer months.[1]

As called for in RWSP treatment plant policies, WTD is exploring ways to expand reclaimed water use at and in the vicinity of the South and West Point plants. An agreement to extend the reclaimed water distribution line from South plant to Foster Golf Links was approved by the City of Tukwila's utility committee and is expected be on the agenda for city council approval in July 2008. If approved, the extension is scheduled to be built in fall 2008. Construction will be managed by the City of Tukwila.

[1] "Class A Reclaimed Water" is reclaimed water that, at a minimum, is at all times an oxidized, coagulated, filtered, and disinfected wastewater. Allowed end uses of Class A reclaimed water are irrigation of food and non-food crops and irrigation of open access areas, such as parks. The water could also be used for industrial cooling and process water and other non-drinking-water (non-potable) uses.

9.2 Reclaimed Water from New Facilities

In 2007, WTD made progress on developing reclaimed water projects associated with new treatment facilities. Both the Brightwater Treatment Plant and Carnation Wastewater Treatment Facility will use membrane bioreactor technology (MBR) to produce reclaimed-quality effluent when they come online in 2011 and 2008, respectively. Reclaimed water distribution pipelines are under construction to bring water south from the Brightwater plant through Bothell to the Sammamish Valley and west as far as I-5 in Shoreline. Enhancements of a nearby wetland and distribution pipe from the Carnation facility to the wetland were completed in 2007 to prepare for eventual discharge of effluent to the wetland.

9.2.1 Brightwater Reclaimed Water Pipeline

As much as 21 mgd of the wastewater treated at the new Brightwater Treatment Plant will meet reclaimed water standards and can be safely recycled for irrigation and industry. In late 2005, the King County Council approved funding for the Brightwater reclaimed water "backbone" (Figure 9-1). The backbone will consist of reclaimed water pipes in tunnels already being built for the Brightwater conveyance system (West Segment of the backbone) and will install new pipe from the Brightwater Influent Pump Station to the North Creek Pump Station, convert an existing 4.5-mile wastewater pipe to the York Pump Station, and install new pipe to carry reclaimed water to the Sammamish Valley (South Segment).

In 2007, WTD initiated construction of the reclaimed water pipes in the Brightwater tunnels and made headway on engineering design, environmental review, and permitting for conversion of the existing 4.5-mile wastewater pipe and construction of new pipe to distribute reclaimed water to the Sammamish Valley. Completion of final design, acquisition of permits, and award of a construction contract for these portions of the South Segment are anticipated in 2008. Construction of the new portion of the South Segment to the North Creek Pump Station will begin in 2008.[2]

WTD is identifying and working with customers to be served by the South Segment of the backbone. Discussions were initiated with the City of Bothell regarding the feasibility of distributing reclaimed water in the city. WTD and the city agreed to develop and enter into a memorandum of agreement (MOA), expected to occur in 2008, to carry out a feasibility study.

[2] Also see Chapter 2 of this report for information on the Brightwater reclaimed water backbone.

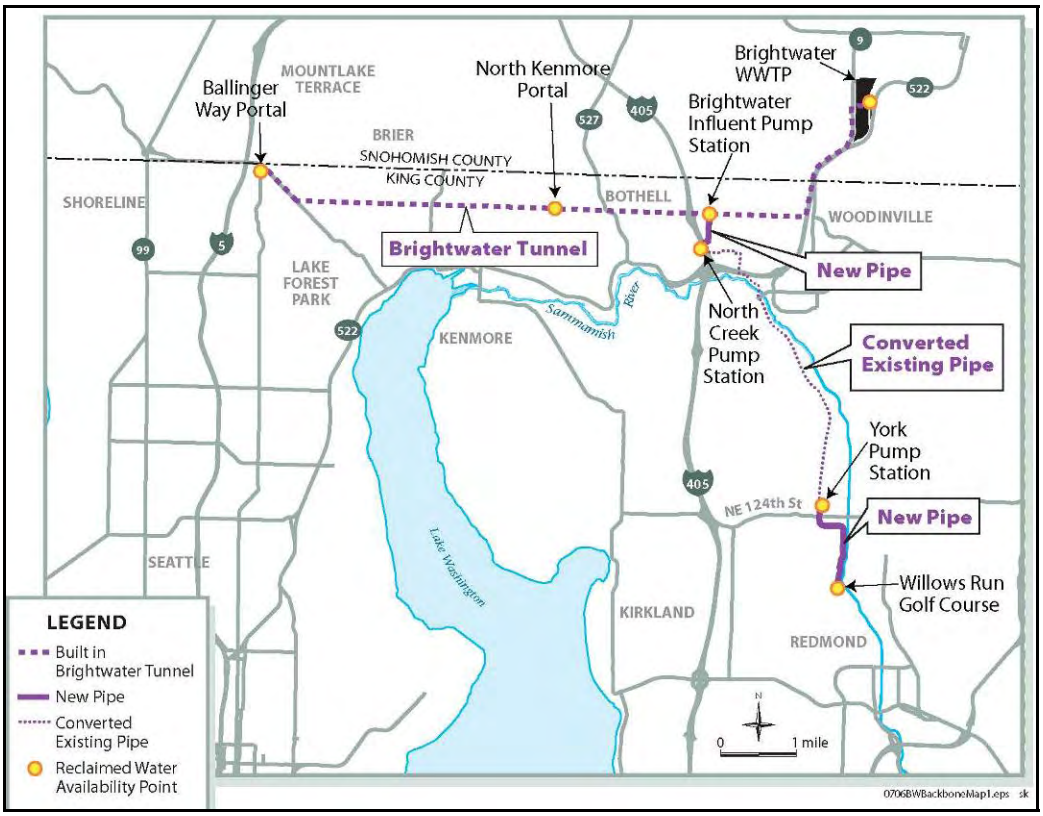


Figure 9-1. Brightwater Reclaimed Water System

9.2.2 Wetland Enhancement for Discharge from the Carnation Treatment Facility

The Carnation Wastewater Treatment Facility will produce reclaimed water that will be used to enhance a wetland in the Chinook Bend Natural Area (Figure 9-2). WTD is partnering with Ducks Unlimited, a non-profit group dedicated to wetland conservation, to develop the wetland enhancement. Ducks Unlimited completed construction of the wetland enhancement in October 2007. WTD completed construction of the reclaimed water distribution line to the Chinook Bend Natural Area in 2007. After treatment facility startup is complete and a Washington State reclaimed water use permit has been issued, the wetland will become the primary discharge location for reclaimed water.

See Chapter 6 of this report for more information on the wetland enhancement project.

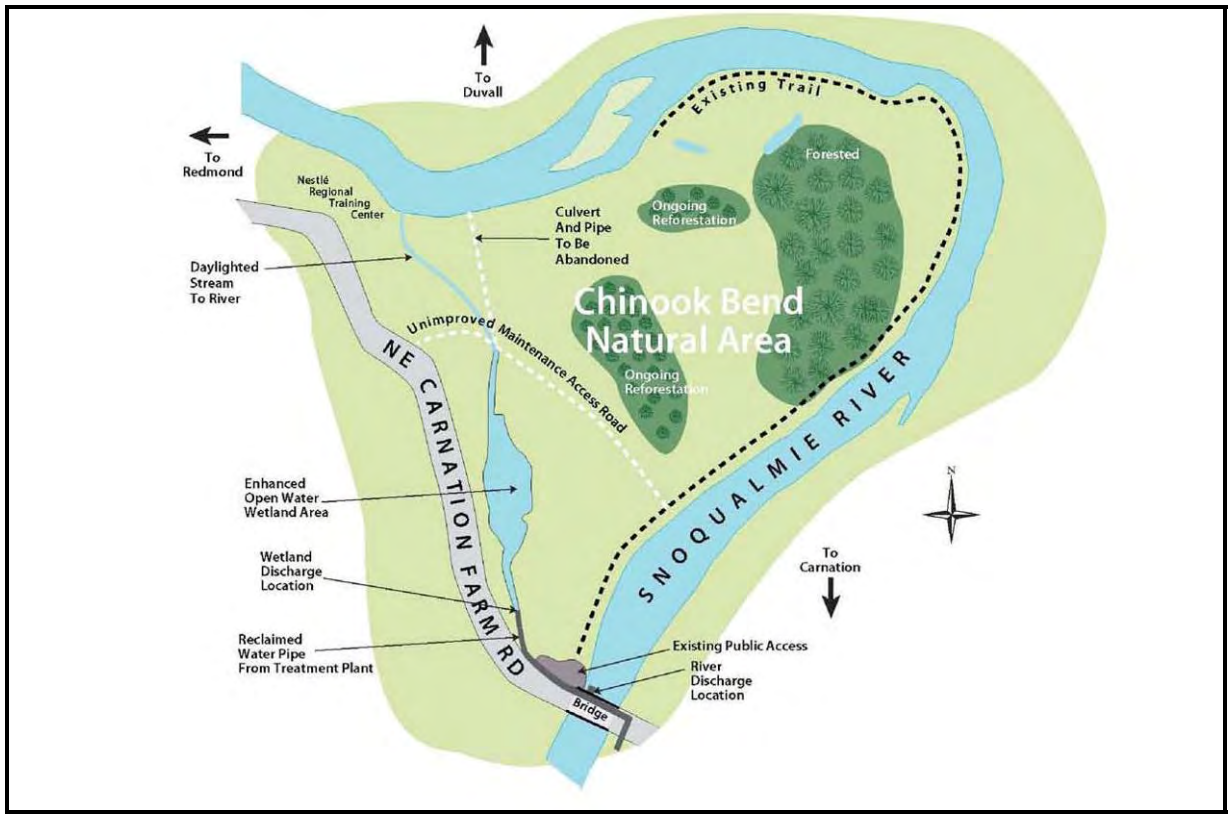


Figure 9-2. Components of the Chinook Bend Natural Area Wetland Enhancement

9.3 Reclaimed Water Studies

In 2007, King County completed two studies to aid in developing its reclaimed water program: a reclaimed water feasibility study to meet RWSP policy objectives and a study to explore reclaimed water options in the Green River Valley. The county also agreed to work with the Covington Water District on exploring the feasibility of reclaimed water facilities in the district.

9.3.1 Reclaimed Water Feasibility Study

In 2007, WTD prepared a reclaimed water feasibility study to meet the provisions of RWSP Water Reuse Policy-2 (WRP-2).[3] Provisions call for reviews of reclaimed water technologies, revenue sources, markets, and environmental and regional benefits. The general approach for completing each of these reviews was as follows:

- The reviews of reclaimed water treatment technologies and revenue sources relied in part on case studies that highlight the types of treatment technologies used in Washington and other states, including construction and operations costs for these technologies, and how reclaimed water producers are funding and recovering costs for reclaimed water systems.

[3] The study was submitted to the King County Council in spring 2008.

- The market analysis update identifies potential users based on review of available data, on proximity to reclaimed water sources, and on interviews and focus groups conducted for the feasibility study.
- The environmental and regional benefits are presented in terms of wastewater and water resource management challenges in the region, including reducing wastewater discharges to Puget Sound, protecting threatened and endangered fish species, and preparing for uncertainties associated with climate change, population growth, and other unknowns.

Information from these reviews was used to show how the economic framework, developed by WateReuse Foundation, can be used as a tool for evaluating the costs and benefits of reclaimed water and determining the feasibility of potential projects.[4]

Overall findings of the feasibility study are as follows:

- Reclaimed water is an effective wastewater management tool.
- Reclaimed water technologies in use at West Point and South Treatment Plants and planned for the Carnation and Brightwater Treatment Plants are highly effective.
- Benefit-cost analysis and tools like the WaterReuse Foundation's framework should be used to evaluate projects.
- Sources of revenue are varied and may be increasing at state and federal levels.
- Feasible projects would include one or more of the following characteristics:
    - Reclaimed water is a requirement or a secondary benefit of new or upgraded wastewater facilities.
    - Reclaimed water demand is close to supply.
    - Reclaimed water will mitigate or benefit another environmental objective for which others will contribute to costs.
- Public education and research/development are essential to maintain public support for reclaimed water.
- A comprehensive reclaimed water plan is needed that identifies and prioritizes water resource management needs for a full range of beneficial uses.

The reclaimed water feasibility study is part of a continuum in developing a reclaimed water program for King County. It offers methods for analyzing reclaimed water projects more systematically and enables the county to focus on areas where there is the greatest potential to implement feasible projects. Subsequent efforts, including a reclaimed water comprehensive plan to be developed over the next couple of years, will build on the work of this feasibility study and supply information not included in its scope. Information on the comprehensive plan is provided later in this chapter.

[4] The WateReuse Foundation is an educational, nonprofit, public-benefit corporation that serves as a centralized organization for the water and wastewater community to advance the science of water reuse, recycling, reclamation, and desalination.

More information the Reclaimed Water Feasibility Study is available on the Web: http://dnr.metrokc.gov/wtd/reuse/docs/FeasibilityStudy/index.htm.

9.3.2 Green River Reclaimed Water Study

In 2007, WTD completed a preliminary analysis of reclaimed water options in the Green River Valley to answer questions raised by the Cities of Auburn, Covington, Kent, Renton, and Tukwila. The key questions addressed in the study are as follows:

- What treatment processes and equipment are necessary to produce and deliver Class A reclaimed water to the Green River Valley?
- How much reclaimed water might be made available through each production/delivery scenario?
- What can be estimated about the relative capital and operating costs for each production/delivery scenario?
- What appears to be the most feasible approach to producing and delivering reclaimed water in the Green River Valley based on preliminary estimated costs, capacities, demands, and operational issues?

The study considered various delivery options, including a South plant backbone, satellite reclaimed water polishing plants, and satellite reclaimed water treatment plants. Preliminary cost estimates and analysis of ability to meet reclaimed water demands were prepared for each delivery option. Cost and flexibility to support various demand, distribution, and supply needs were key criteria used in the analysis.

Of the three scenarios assessed, the South plant backbone appears to be the most cost-effective overall and offers the greatest flexibility to support varied reclaimed water demand, distribution, and supply needs. This preliminary finding was based on best available estimates and assessments. The study recommended further refinement and development as reclaimed water options for the Green River Valley are reviewed and considered. WTD plans to do this during development of the reclaimed water comprehensive plan.

9.3.3 Covington Feasibility Study

In 2007, King County and the Covington Water District signed an MOA to jointly study the feasibility of developing reclaimed water facilities. Implementing the MOA in 2008 will include focusing on updating the 2006 *Covington Water District Water Reuse Feasibility Report* with current WTD flow data. Future work under the MOA will be used to inform WTD's reclaimed water comprehensive plan and will be coordinated with other local agencies in southeast King County.

9.4 Public Outreach

Public education activities in 2007 included support of reclaimed water and water conservation Web sites and inclusion of reclaimed water and water conservation education in tours of King County wastewater treatment plants.

In June 2007, King County and the Pacific Northwest Clean Water Association cosponsored a conference "Reclaimed Water: Tapping the New Resource." The conference brought together 260 representatives from jurisdictions, agencies, and environmental groups in Washington State to discuss reclaimed water issues. It received positive reviews from attendees.

9.5 Reclaimed Water Comprehensive Plan

The King County Council approved development of a reclaimed water comprehensive plan in the 2008 budget adopted in November 2007. The reclaimed water comprehensive plan will define WTD's reclaimed water business plan both near term (next 10 years) and long term (next 30 years). The plan is being developed to find ways to manage treated effluent as a water resource and reduce the amount of effluent discharged to Puget Sound from WTD's wastewater treatment system. It is expected to result in amendments to the existing RWSP water reuse policies. Operation of WTD's existing regional reclaimed water program will continue while the plan is being developed.

Stakeholders, including regional leaders, industrial and commercial organizations, interest groups, organizations, and the general public, will be involved throughout the planning process. These stakeholders will assist in shaping the plan through individual interviews and a series of workshops. Each stakeholder will be interviewed multiple times to gather information on a variety of topics including reclaimed water uses, alternatives development, and alternatives analysis. Up to four workshops will be held with all stakeholders together to present analytical findings and information gathered through stakeholder interviews.

Development of a draft reclaimed water comprehensive plan that reflects the input of all stakeholders is expected to take two years (2008 and 2009) to complete. In 2010, the draft plan will be issued for public review and comment. In 2011, the King County Executive will transmit a final plan to the council for consideration and approval.

9.6 Schedule for 2008

The following reclaimed water activities are planned for 2008:

- Continue construction of the reclaimed water backbone in the Brightwater East and West Tunnels. The schedule for construction of this portion of the reclaimed water pipeline is included in and coincides with the East and West Tunnel construction schedules (see Chapter 2).

- Complete final design, acquire permits, and award construction contract for conversion of the existing 4.5-mile pipe and construction of new reclaimed water pipe to distribute reclaimed water to the Sammamish Valley (see Chapter 2).
- Begin construction of the new reclaimed water pipe between the Brightwater Influent Pump Station and the North Creek Pump Station.
- Continue to identify and work with reclaimed water customers.
- Start up the Carnation Wastewater Treatment Facility; submit and receive approval of a reclaimed water use permit application from the Washington State Departments of Health and Ecology; and begin discharge of reclaimed water to enhance the wetland at the Chinook Bend Natural Area once the permit is issued.
- Begin to develop the reclaimed water comprehensive plan, including interviewing stakeholders and holding a workshop on policy criteria to guide development and evaluation of reclaimed water alternatives.

For more information on the Reclaimed Water Program, visit http://dnr.metrokc.gov/wtd/reuse/.

For more information on the Water Conservation Program, visit http://dnr.metrokc.gov/WTD/waterconservation/.

Chapter 10

RWSP Cost Estimates

RWSP reporting policies call for including in RWSP annual reports an update of the RWSP cost estimates through the year 2030. The cost estimates presented in this chapter include estimates for projects in various stages of development including planning, predesign, final design, and construction. Costs of completed RWSP projects are also included.

Details on RWSP capital projects in design and construction are provided as Appendix B. In accordance with RWSP reporting policies, the appendix presents a schedule, an expenditures summary (including staff labor and miscellaneous services), a description of any adjustments to costs and schedules, and the status of contracts for each project.

This chapter discusses the accuracy of cost estimates and presents an overview of the 2007 RWSP cost estimates, followed by a summary table of the 2007 cost estimates as compared to the 2006 cost estimates presented in the *RWSP 2006 Comprehensive Review and Annual Report*.[1] The chapter concludes with an alternative way of showing RWSP cost estimates.

10.1 Accuracy of Cost Estimates

The accuracy of cost estimates increases as projects become more defined and are specified in greater detail. Often the scopes of work and estimated costs for projects in the planning phase will change significantly as more detailed information becomes available over time.

Planning-level cost estimates are based on generic facility concepts. Specific details of a project such as location, technologies, and environmental impacts and potential mitigation of such impacts are determined later during project predesign. Costs for projects in planning can have a rough order-of-magnitude estimate in the range of -50 to +100 percent.[2,3] By the time a project enters the construction phase, estimates typically narrow to a range of -10 to +15 percent of the final cost.

King County assumes a standard increase of 3 percent per year in projecting costs for its wastewater projects to account for price increases in project components such as materials, labor, equipment, supplies, and contractor markups. This rate is used because it closely approximates the actual rate of inflation over a long period of time. However, since 2004, inflation has significantly affected projects across the country. Overall, construction-related inflation has averaged 4.5 percent per year from 2004 through 2007 as measured by the *Engineering News*

[1] The *RWSP 2006 Comprehensive Review and Annual Report* is available at http://dnr.metrokc.gov/wtd/rwsp/library.htm#CompReview

[2] Project Management Institute's *A Guide to the Project Management Body of Knowledge*, third edition, 2004.

[3] Order-of-magnitude estimates are estimates without detailed engineering data; they are often referred to as "ball park" estimates.

Record Construction Cost Index. This average masks a volatile period in which annual price increases ranged from 6.3 percent in 2004 to 2.8 percent in 2007. The Wastewater Treatment Division will continue to use 3 percent inflation in its estimates while also evaluating its appropriateness.

A complication to providing a meaningful comparison of costs is that the RWSP is an ongoing plan that includes expenditures incurred in the past plus expenditures planned for the future. In presenting the comparison shown in Table 10-1, expenditures that have occurred through 2007 are included at their original value and future expenditures, planned for 2008 to 2030, are adjusted for inflation to a base year of 2007.

10.2 2007 RWSP Cost Estimates

Table 10-1 summarizes the 2007 RWSP cost estimates and compares them to the 2006 estimates. The 2007 estimate for implementing the projects and programs associated with the RWSP through 2030 is approximately $3.26 billion in 2007 dollars, an increase of about $57 million, or 1.8 percent, from the 2006 RWSP cost estimate of $3.21 billion in 2007 dollars.

Total project cost estimates reflect anticipated costs from the initial planning stage through construction and startup. The estimates also include the costs for RWSP projects that have been completed and projects that are in the planning, design, or construction phase. Nearly one-fourth of the total 2007 RWSP cost estimate represents planning-level costs. As noted earlier in the chapter, planning level cost estimates have a rough-order-of magnitude estimate in the range of -50 to +100 percent.

The RWSP costs shown in Table 10-1 are broken down by the following categories:

- Brightwater Treatment System
- Treatment and Odor Control Improvements (Non-Brightwater)
- Conveyance (Non-Brightwater)
- Infiltration/Inflow
- Combined Sewer Overflow Control
- Reclaimed Water
- Water Quality Protection
- Habitat Conservation Plan/Programmatic Biological Assessment
- RWSP Planning and Reporting

The table is followed by an explanation of cost changes associated with each category.

Table 10-1. Comparison of 2006 and 2007 RWSP Cost Estimates (1999–2030)

RWSP Element	2006 RWSP Cost Estimates (2006$ x 1M)	2006 RWSP Cost Estimates (2007$ x 1M)	2007 RWSP Cost Estimates (2007$ x 1M)	Cost Change (2007$ x 1M)
Total RWSP	**$3,137**	**$3,207**	**$3,264**	**$57**
Total Brightwater Treatment System[a]	**$1,664**	**$1,701**	**$1,732**	**$31**
Brightwater Treatment Plant	$587	$601	$623	$22
Brightwater Conveyance	$835	$856	$861	$5
Land and Right-of-Way	$97	$97	$102	$5
Mitigation	$145	$147	$145	($2)
Total Treatment & Odor Control Improvements (Non-Brightwater)	**$163**	**$167**	**$174**	**$7**
Odor Control at South Plant	$7	$7	$7	--
West Point Odor Control	$1	$1	$2	$1
West Point Digestion Improvements	$6	$6	$6	--
King Street Regulator Odor Control Project	$3	$3	$5	$2
South Plant Expansion	$106	$109	$109	--
Vashon Treatment Plant Upgrade	$20	$20	$22	$2
Carnation Treatment Plant	$19	$20	$20	--
Chinook Wetlands Enhancement			$3	$3
Total Conveyance System Improvements (CSI) (Non-Brightwater)	**$754**	**$771**	**$791**	**$20**
Completed CSI projects, acquisitions, and planning	$143	$143	$173	$30
CSI projects in design or construction in 2006	$197	$202	$192	($10)
Planned CSI projects, acquisitions, and& planning	$414	$426	$426	--
Total Infiltration/Inflow (I/I)[b]	**$49**	**$49**	**$44**	**($5)**
Total Combined Sewer Overflow Control	**$444**	**$456**	**$456**	**--**
CSO Control Projects[c]	$388	$400	$400	--
CSO Planning and Updates	$6	$6	$8	$2
Sediment Management/Lower Duwamish Superfund	$49	$49	$47	($2)
Total Reclaimed Water	**$36**	**36**	**$41**	**$5**
Technology Demonstration (completed in 2004)	$1	$1	$1	--
Future Water Reuse	$3	$3	$6	$3
Water Reuse Satellite Facility (cancelled in 2003)	$5	$5	$5	--
Reclaimed Water Backbone	$25	$25	$25	--
RWSP Water/WW Conservation (completed in 2005)	$1	$1	$1	--
Reclaimed Water Comprehensive Plan			$3	$3
Water Quality Protection (completed in 2006)	**$16**	**$16**	**$16**	**--**
Habitat Conservation Plan (HCP)/ Programmatic Biological Assessment	**$8**	**$8**	**$8**	**--**
RWSP Planning and Reporting	**$3**	**$3**	**$2**	**($1)**

Notes: All costs in 2007 column are as of December 31, 2007; projects shown are not exhaustive, but are listed to Illustrate changes. Totals may not add due to rounding. Expenditures that have occurred through 2007 are included at their original value.

[a] The Brightwater cost estimates are shown in constant dollars to be consistent with other components of total RWSP costs. Section 10.4.2 of this chapter discusses presenting Brightwater costs in nominal dollars, consistent with the *Brightwater Cost Update: Current Conditions and Trends*, January 2008.

[b] Design and construction costs for the initial I/I reduction projects are funded by the CSI program in accordance with the recommended program approved by the King County Council in 2006; therefore, these costs are not shown in this line item.

[c] The 2006 and 2007 cost estimates for the CSO control projects are the 1998 planning-level estimates adjusted for inflation. Updated estimates for the CSO Puget Sound Beach projects are anticipated at the end of predesign. The remainder of the CSO control project cost estimates are expected to be updated as part of the 2010 CSO program review.

10.3 Explanation of RWSP Cost Estimate Summary Table

Table 10-1 on the previous page includes four columns:

- **2006 RWSP Cost Estimates (2006$ x 1M) column.** This column shows the 2006 RWSP cost estimates as presented last year in the *RWSP 2006 Comprehensive Review and Annual Report* in 2006 dollars. The 2006 cost estimates include costs expended through 2006 at their original value and costs anticipated for 2007 through 2030 adjusted for 3 percent inflation to a base year of 2006.
- **2006 RWSP Cost Estimates (2007$ x 1M) column.** This column shows the 2006 RWSP cost estimates adjusted to 2007 dollars to create a common base for comparison with current estimates. Adjustments for inflation are based on the assumption of a standard increase of 3 percent per year. Expenditures that occurred through 2006 are included at their original value and not adjusted for inflation.
- **2007 RWSP Cost Estimates (2007$ x 1M) column.** This column shows the updated 2007 cost estimates in 2007 dollars that were developed based on project details as of December 31, 2007. Future expenditures—costs anticipated for 2008 to 2030—have been adjusted for inflation to a base year of 2007. Expenditures that occurred through 2007 are included at their original value.
- **Cost Change (2007$ x 1M) column.** This column shows the changes in cost estimates for each line item and total category cost from the 2006 cost estimates to the 2007 cost estimates in 2007 dollars.

The following sections provide more detail on each category presented in Table 10-1.

10.3.1 Brightwater Treatment System

The Brightwater cost estimates in Table 10-1 are shown in 2007 dollars to be consistent with the other RWSP costs presented in the table. In other words, Brightwater costs planned for 2008 through 2012 have been adjusted to 2007 dollars. This is a different approach than that used in the cost trend reports that are published annually. Information on the January 2008 Brightwater cost trend update is provided in Section 10.4.2 of this chapter.

Table 10-1 indicates that Brightwater costs have increased by $31 million over the 2006 estimates. This increase is primarily due to inflation of costs of materials and commodities.

Chapter 2 provides more information on the Brightwater Treatment System.

10.3.2 Treatment and Odor Control Improvements (Non-Brightwater)

The costs in Table 10-1 for non-Brightwater treatment and odor control improvements include treatment plant improvements and specific odor control improvements that result from implementing RWSP policies. The 2007 cost estimates for these projects is $174 million, an increase of about $7 million from the 2006 cost estimates. The projects and programs that make up the total treatment and odor control improvements cost estimate follow.

Odor Control at South Plant

There were no significant cost changes from the 2006 cost estimate for odor control at South plant.

West Point Odor Control

This project was substantially complete by the end of 2007. There were no significant cost changes from the 2006 estimate. The change shown in Table 10-1 is a reflection of rounding.

West Point Digestion Improvements

There were no significant cost changes in 2007 from the 2006 estimate.

King Street Regulator Odor Control Project

The 2007 cost estimate for this project increased by approximately $2 million from the 2006 estimate. This change reflects an increase in construction costs based on an updated construction cost estimate. Costs related to design work also increased to address issues such as site contamination and design revisions to improve safety and functionality.

South Plant Expansion

Because the South plant expansion is planned for 2029, the cost estimates for this project have not been updated since the 1998 RWSP cost estimate. The current estimate of $109 million reflects the 1998 preliminary planning-level estimate adjusted for inflation, using the 3 percent per year assumption, to 2007 dollars.

Vashon Treatment Plant Upgrade

The 2007 cost estimate for this project increased by approximately $2 million. This change is attributed to costs associated with improvements to the stormwater management system at the site and costs associated with responding to a construction claim for a differing site condition; the claim was received in summer 2007.

Carnation Treatment Plant

There were no significant cost changes from the 2006 cost estimate for the Carnation Treatment Plant.

Chinook Wetlands Enhancement

The Chinook Wetlands Enhancement project is a new project, adding $3 million to the 2007 estimate of the overall Treatment and Odor Control Improvements category in Table 10-1.

Chapter 6 provides more information on the Vashon and Carnation treatment plant projects. Chapter 7 provides more information on the odor control program.

10.3.3 Conveyance (Non-Brightwater)

The 2007 cost estimate shown in Table 10-1 for non-Brightwater conveyance is $791 million, an increase of approximately $20 million from the 2006 cost estimate. Over one-half of the total conveyance costs represent planning-level cost estimates.

The completed projects category shows a cost change of $30 million from 2006. This reflects the addition to this category of two projects that were completed in 2007: Fairwood Interceptor Sewer at the cost of $22 million and Pacific Pump Station at the cost of $8 million.

The change (decrease of $10 million) shown in the projects that are in design and construction category is the net result of completion of the Fairwood Interceptor Sewer and Pacific Pump Station projects and increases in construction costs of certain projects. For example, construction costs for the Bellevue Pump Station increased by approximately $10 million because of market conditions, including higher than estimated labor rates, and additional construction management services needed because of the complexity of the project, such as tunneling under occupied structures. Construction costs for the North Creek Interceptor project increased by about $9 million. This increase reflects the need for additional micro-tunneling and dewatering locations. These additional activities were identified during final design because of the high groundwater conditions, environmentally sensitive areas, and the need to avoid major traffic impacts on two state highways. Higher than anticipated easement acquisition costs and longer than anticipated delays in obtaining critical permits also contributed to the cost estimate increase of this project.

There were no cost changes from the 2006 estimates in the planned projects category.

Chapter 3 provides more information on RWSP conveyance system improvements.

10.3.4 Infiltration/Inflow

The change (decrease of $5 million) in this category reflects a correction to the 2006 estimates (infiltration/inflow pilot study projects should have been listed as $40 million, not $45 million). The total 2007 infiltration/inflow (I/I) Program estimate reflects expenditures through 2007,

covering costs associated with the I/I pilot study projects ($40 million) and projected costs ($4 million) related to flow monitoring for the initial I/I reduction projects; ongoing modeling, cost-benefit analysis, planning, and reporting; public education; and regional I/I clearinghouse and other program related costs.

In accordance with the recommended I/I control program that was approved by the King County Council in May 2006, design and construction costs for the initial I/I reduction projects are funded by the Conveyance System Improvement Program and not included as part of I/I program costs. The purpose of the recommended I/I control program is to invest in I/I reduction in lieu of investing in larger conveyance system improvements when it is cost-effective to do so.

Chapter 4 provides more information on the I/I Control Program.

10.3.5 Combined Sewer Overflow Control Program

The total combined sewer overflow (CSO) control program cost estimate includes costs associated with CSO control projects, CSO planning and updates, the Sediment Management Program, and the Lower Duwamish Waterway Superfund projects. The 2007 total CSO control program cost estimate is $456 million, which is the same as the program's total cost estimate in 2006.

The cost estimates associated with CSO control projects represent the 1998 RWSP cost estimates of the 21 planned CSO control projects adjusted for inflation to 2007 dollars. There were no changes from the 2006 estimate.

The cost estimates associated with CSO planning and updates increased by approximately $2 million. This increase is due to additional staff needs to migrate data from the current model to a new model, refinements made in the CSO treatment technology pilot program, and work associated with the U.S. Environmental Protection Agency's program audit.

The change shown in the Sediment Management Program category (decrease of $2 million) is a result of anticipating expenses for the Hanford and Lander cleanups to occur in the 2010–2011 timeframe instead of 2008–2009 timeframe.

Chapter 5 provides more information on the CSO Control Program.

10.3.6 Reclaimed Water

The 2007 cost estimate for the Reclaimed Water Program is $41 million, reflecting an increase of approximately $5 million from the 2006 cost estimate. The projects and programs that make up the total reclaimed water cost estimate follow.

Technology Demonstration Project

This project was complete as of December 31, 2004. The 2007 cost estimate represents the total expenditures for this project.

Future Water Reuse

The future water reuse category includes activities to support the existing Reclaimed Water Program. Costs increased in 2007 by $3 million from the 2006 estimate. This increase is due to the additional staff needs for the work associated with reclaimed water permitting for the Carnation and Brightwater facilities, customer development, and funding of research that is being conducted by the University of Washington.

Sammamish Valley Reclaimed Water Facility (Water Reuse Satellite Facilities)

This project was cancelled in favor of the reclaimed water capabilities at the Brightwater Treatment Plant. The Sammamish facility would have produced 1.5 million gallons per day (mgd) of reclaimed water at a cost of $36 million in 2005 dollars. The cost of the Brightwater reclaimed water pipeline or "backbone" is $25 million in 2005 dollars and will be able to deliver 7 mgd of reclaimed water to the Sammamish Valley.

The costs expended on the Sammamish Valley facility will continue to be included as part of the RWSP cost estimate.

Reclaimed Water Backbone

There were no changes in costs from the 2006 cost estimate of this project.

RWSP Water/Wastewater Conservation Program

This project was completed in 2005. The 2007 cost estimate represents the total expenditures for this project.

Reclaimed Water Comprehensive Plan

This is a new project as of December 2007. The total cost estimate for this project is anticipated to be approximately $3 million.

Chapter 9 provides more information on the Reclaimed Water Program.

10.3.7 Water Quality Protection

This program provided scientific information on water quality and hydrologic conditions in both the Lake Washington and Green River watersheds and was complete as of December 2006. The 2007 cost estimate represents the total expenditures for this project.

10.3.8 Habitat Conservation Plan/Programmatic Biological Assessment

As reported in the *RWSP 2005 Annual Report*, the majority of the funds allocated to the Habitat Conservation Plan have been expended. The remaining funds are being used for consultations with the National Marine Fisheries Service and the U.S. Fish and Wildlife Service, as required under Section 7 of the Endangered Species Act, on projects that require a federal permit or receive federal funding. Total costs are expected to be approximately $8 million.

10.3.9 RWSP Planning and Reporting

Table 10-1 shows a decrease of $1 million from the 2006 cost estimate for RWSP Planning and Reporting. This is due to adjustments made based on previous expenditure history.

10.4 Alternative Way to Show RWSP Cost Estimates

The *RWSP 2006 Comprehensive Review and Annual Report* noted that the Wastewater Treatment Division (WTD) is exploring additional and alternative ways in which to present and compare costs in the most informative manner. One approach that WTD has been discussing is to summarize the RWSP cost estimates by the following categories:

- **Completed RWSP Projects.** This category is comprised of projects for which all activity has been completed.
- **Brightwater Cost Trend Update.** This category is comprised of the trend estimate that is created on an annual basis for Brightwater to incorporate the most current cost and activity and data.
- **RWSP Projects in Design or Construction (non-Brightwater).** This category is comprised of all RWSP projects that are in the current capital improvement plan (CIP) budget for WTD.
- **Projects Planned for the Future.** This category is comprised of projects in which activity has yet to begin.

Presenting costs in this manner provides the reader with an informative snapshot of the progress being made and costs associated with implementing the RWSP. The categories provide a different perspective of project costs by identifying past, present, and future projects in the RWSP and their respective costs. In this way, incurred, current, and future costs can be tracked separately as projects move through the categories. It should be noted that the sum of these categories will not yield a meaningful total cost comparison as is done with the estimates in Table 10-1. This is because some categories would present costs in nominal dollars and some in base-year or constant dollars. An explanation and a summary table of each category follows.

10.4.1 Completed RWSP Projects

Completed RWSP projects refer to projects or programs that have been completed and for which no future expenditures are anticipated. Table 10-2 summarizes the expenditures associated with completed projects and compares expenditures as of December 31, 2007, to those as of December 31, 2006.

Table 10-2. Completed RWSP Projects (million dollars)

	Expenditures as of Dec. 31, 2006	Expenditures as of Dec. 31, 2007	Cost Change
Total completed projects	**$206**	**$238**	**$32**
Total completed Conveyance System Improvement projects, acquisitions, planning	**$143**	**$173**	**$30**
Projects completed through 2006	$143	$143	--
Projects completed in 2007: Fairwood Interceptor Sewer & Pacific Pump Station		$30	$30
Total completed Treatment and Odor Control projects (non-Brightwater)		**$2**	**$2**
West Point Odor Control		$2	$2
Total completed Reclaimed Water projects	**$7**	**$7**	**--**
Technology Demonstration	$1	$1	--
Water Reuse Satellite Facility	$5	$5	--
RWSP/WW Conservation	$1	$1	--
Total completed I/I Pilot Study projects and program	**$40**	**$40**	**--**
Total completed Water Quality Protection	**$16**	**$16**	**--**

Note: Expenditures are shown at their original value. Totals may not add due to rounding.

The 2007 expenditures in completed projects is $32 million more than the expenditures as of December 31, 2006, because of completion of two conveyance projects and one odor control project in 2007. The two conveyance projects that were completed in 2007 are the Fairwood Interceptor Sewer and the Pacific Pump Station projects. The total cost for the Fairwood Interceptor Sewer project is $22 million; the total cost for the Pacific Pump Station is $8 million. The total cost of the odor control project, West Point Odor Control, is $2 million.

10.4.2 Brightwater Cost Trend Update

The January 2008 *Brightwater Cost Update, Current Conditions, and Trends* report notes that the way Brightwater cost estimates are presented has changed over time to reflect the maturing of the project and to better address the needs of the report's end users. Prior to 2006, Brightwater cost estimates were presented in constant dollars; that is, dollars adjusted for inflation (deflated) to the year of the estimate. With the project's transition from design to construction in 2006, costs are now presented in nominal (inflated) dollars to account for the fact that contractors included inflation as part of their bid packages.

Following issuance of the January 2007 Brightwater cost update, the Brightwater Oversight Monitoring Consultant recommended modifications to the presentation format to ensure costs could be compared year to year. Consequently, King County's Department of Natural Resources and Parks proposed using the Brightwater monthly report format adopted by the King County Council in 2005.[4] The costs presented in the January 2008 Brightwater cost update reflect this revised format and are shown in Table 10-3. As part of the new presentation format, the costs for land and mitigation are now included as part of the treatment and conveyance costs instead of being listed separately.

Table 10-3 shows the January 2008 estimate for the project at $1.802 billion (including inflation)—representing an overall increase of about $34.9 million over the January 2007 estimate (an increase of $35.5 million in estimated treatment plant costs and a decrease of about $0.6 million in estimated conveyance costs). The increase is primarily due to inflation of materials and commodities.

Table 10-3. Comparison of January 2007 and January 2008 Brightwater Cost Estimates (million dollars with inflation)

	Jan. 2007 King County Estimate	Jan. 2008 King County Estimate	Change Jan. 2007–Jan. 2008	Percent Change
Treatment plant	$839.8	$875.3	$35.5	4.22%
Conveyance	$927.5	$926.9	$(0.5)	-0.06%
Total	**$1,767.3**	**$1,802.2**	**$34.9**	**1.98%**

Note: Estimates assume project completion in 2012. Inflation is assumed to be 3 percent per year for costs not covered by specific contracts or agreements.

10.4.3 RWSP Projects in Design or Construction (non-Brightwater)

Table 10-4 shows the cost estimates of projects in design or construction as of December 31, 2007, as compared to the cost estimates of projects in design or construction as of December 31, 2006. The projects in this table were included as part of the 2008 and 2007 King County adopted budget, respectively. The cost estimates are shown in inflated dollars. Some costs have been spent; some are allocated to out years. For the 2006 estimate, the expenditures that occurred through 2006 are included at their original value; for the 2007 estimates, the expenditures through 2007 are included at their original value.

The cost estimates for projects in design or construction in 2007 is $370 million, an increase of $6 million from the 2006 estimate of $364 million.

[4] Motion 12189, approving a monthly report format and baseline budget for the Brightwater project, was passed by the King County Council in August 2005. More information on Motion 12189 is available at http://mkcclegisearch.metrokc.gov/detailreport/?key=5807

Table 10-4. RWSP Projects in Design or Construction (non-Brightwater) (million dollars)

	2006 Cost Estimates[a]	2007 Cost Estimates[b]	Cost Change
Total Costs for RWSP Projects in Design/Construction	**$364**	**$370**	**$6**
Total Conveyance Projects	**$205**	**$197**	**($7)**
Hidden LakePS/Boeing Trunk	$38	$38	--
Fairwood Interceptor Sewer[c]	$22	--	($22)
Bellevue Pump Station	$21	$32	$11
Juanita Bay Pump Station	$37	$37	--
Kent/Auburn Conveyance Improvements	$45	$46	$1
Pacific Pump Station[c]	$8	--	($8)
Black Diamond Storage	$6	$5	($1)
North Creek Pipeline Project	$28	$38	$10
Northshore Utility District Acquisition[d]		$1	$1
Total Non Brightwater Treatment and Odor Control	**$57**	**$63**	**$6**
Odor Control at South Plant	$8	$7	($1)
Odor Control at West Point[c]	$1	--	($1)
WP Digestion Improvements	$6	$6	--
King St Odor Control	$3	$5	$2
Vashon TP	$20	$22	$2
Carnation TP	$20	$20	--
Chinook Wetland Enhancement[d]		$3	$3
Total I/I[e]	**$4**	**$4**	**--**
Total CSO Control Program[f]	**$56**	**$59**	**$3**
Sediment Management/Lower Duwamish Superfund	$50	$50	--
CSO Planning and Updates	$7	$9	$2
Habitat Conservation Plan (HCP)/Programmatic Biological Assessment	**$8**	**$8**	**--**
Reclaimed Water	**$31**	**$36**	**$5**
Brightwater Reclaimed Water Backbone	$27	$27	--
Future Water Reuse	$3	$6	$3
RW Comp Plan[d]		$3	$3
RWSP Planning and Reporting	**$3**	**$3**	**--**

Note: Totals may not add due to rounding.
[a] Project costs in this column reflect costs reported in the 2007–2012 WTD CIP budget submittal (October 2006).
[b] Project costs in this column reflect costs reported in the 2008–2013 WTD CIP budget submittal (October 2007).
[c] These projects were in design or construction in 2006, and completed during 2007. Their total expenditures for 2007 are reflected in Table 10-2, Completed RWSP Projects.
[d] These are new projects as of 2007.
[e] These costs reflect projected costs related to flow monitoring for the initial I/I reduction projects; ongoing modeling, cost-benefit analysis, planning, and reporting; public education; and regional I/I clearinghouse and other program related costs. The expenditures associated with the I/I pilot programs are reflected in Table 10-2, Completed RWSP Projects.
[f] Although the Puget Sound Beach CSO control projects were included in the 2008–2013 WTD CIP budget submittal, they are not reflected in this table. Updated cost estimates for these projects will occur at the completion of predesign. Because their costs reflect planning-level costs, these project costs are included in Table 10-5, RWSP Projects Planned for the Future.

10.4.4 RWSP Projects Planned for the Future

Table 10-5 shows the planning-level cost estimates for projects planned in the future for 2006 and 2007. As was noted previously in the chapter, costs for projects in planning can have a rough order-of-magnitude estimate in the range of -50 to +100 percent. The costs in Table 10-5 are presented in constant (2007) dollars. Costs shown in constant dollars are adjusted for inflation (deflated) to reflect base-year prices and therefore do not include the effects of changing prices and inflation.

There were no cost changes in projects planned for the future from the 2006 estimates.

Table 10-5. RWSP Projects Planned for the Future

	2006 Cost Estimates (2006$ x 1M)	2006 Cost Estimate (2007$ x 1M)	2007 Cost Estimate (2007$ x 1M)	Cost Change (2007 x 1M)
Total Planned Projects	**$908**	**$935**	**$935**	**--**
Planned Conveyance Projects[a]	$414	$426	$426	--
Planned CSO Control Projects[b]	$388	$400	$400	--
Planned South Plant Expansion[c]	$106	$109	$109	--

[a] Conveyance project costs are based on the cost estimates developed for planned projects through 2030 as part of the 2007 CSI Program Update
[b] CSO Control Project cost estimates reflect the 1998 planning-level estimates adjusted for inflation for the planned CSO Control projects.
[c] South Plant expansion cost estimates reflect the 1998 planning-level estimate adjusted for inflation.

Chapter 11

Water Quality Management and Compliance

RWSP reporting policies call for including in RWSP annual reports a summary of the Wastewater Treatment Division's water quality management programs and its compliance with the Endangered Species Act and with other agency regulations and agreements.

The Wastewater Treatment Division (WTD) manages several programs to protect and preserve water quality. An important task is to ensure that King County's wastewater treatment plants produce effluent that meets permit requirements and water quality standards. The quality of treated effluent from the three secondary treatment plants remained high in 2007, despite an unusually intense storm that sent record flows through the South Treatment Plant. Both the South plant and West Point plant earned the National Association of Clean Water Agencies (NACWA) Gold Peak Performance Award.[1] Both plants also received the Platinum Peak Performance Award for multiple years of consecutive gold performance. The Vashon plant experienced no permit violations this year—the first full year of operation of the upgraded plant.

WTD is working to reduce marine discharges of treated effluent through expansion of its reclaimed water system (Chapter 9). In addition, it recycles 100 percent of biosolids produced at the plants and recovers methane (digester gas) to generate energy for running plant operations and for sale to local utilities.

WTD has committed to controlling all its combined sewer overflow (CSO) locations by 2030 so that they meet the Washington State standard of no more than one untreated discharge per year. About one-third of the county's CSOs are controlled thus far. The total volume of untreated CSOs was down to approximately 691 million gallons (MG) during the year compared to a baseline of 2,339 MG, representing a 70.5 percent reduction in CSO volume over time.

The best way to protect our waterways is to control pollutants at their sources. Two programs work to prevent pollutants from reaching King County treatment plants—the Industrial Waste Program and the Local Hazardous Waste Management Program. Among other achievements, these programs have helped to reduce the level of mercury in biosolids by 50 percent from levels in 2000.

This chapter reports on WTD water quality management and compliance activities in 2007. Detailed information on the 2007 results of the county's water quality monitoring program is included as Appendix C.

[1] The gold award is given to plants that have achieved 100 percent compliance with their National Pollutant Discharge Elimination System (NPDES) permits for an entire calendar year.

11.1 Wastewater Treatment Plant Capacity, Flows, and NPDES Compliance

On average, WTD's three secondary treatment plants process over 178 million gallons of wastewater each day. All three plants operated in 2007 without a single violation of their National Pollutant Discharge Elimination (NPDES) permit limits.

One rain event on December 3 and 4 was notable for its intensity. South plant processed the greatest flow ever recorded (235 million gallons per day [mgd]). The plants and conveyance system performed well during the storm, although multiple overflows occurred when facilities were overwhelmed.

11.1.1 South Treatment Plant

The South Treatment Plant provides secondary treatment for wastewater flows from customers in the lower Green River basin, suburban cities east of Lake Washington, and Seattle's Rainier Valley, in addition to flows from parts of Snohomish and Pierce Counties. The South plant also treats septic tank solids from the region and sludge from treatment facilities in neighboring areas such as Snoqualmie Valley cities and Vashon Island.

South plant is designed to manage an average dry-weather flow of 96 mgd, average wet-weather flow of 115 mgd, and instantaneous maximum flow of 325 mgd.[2] Its outfalls at Duwamish Head in West Seattle discharge secondary effluent into Puget Sound 10,000 feet from shore at a depth of 600 feet into the denser deeper water layer. In 2007, the plant processed an average monthly volume of 79.58 mgd.

Despite the fluctuation of influent volume and composition, South plant's secondary treatment process consistently produces high quality secondary effluent. In 2007, the plant accepted over 15 million gallons of septic tank solids. From November 2006 through April 2007, the plant managed an average wet-weather flow of 101.1 mgd. Treatment efficiency remained high and consistent, even though primary and secondary treated effluent were blended for discrete periods during the high intensity and duration storms in January, November, and December to maintain the optimum plant operation and to meet permit limits. No NPDES permit effluent limit exceptions occurred during the year; the plant earned the National Association of Clean Water Agencies (NACWA) Gold Peak Performance Award for 2007 and its Platinum Peak Performance Award for 10 consecutive years of gold performance.

[2] For the South and Vashon plants, the average wet-weather flow (AWWF) is the average flow during the wet season, between November and April, on days when no rainfall has occurred on the previous day. For the West Point plant, the "non-storm" AWWF is calculated without counting the flow on days when it rains or the days immediately following a rain event.

11.1.2 West Point Treatment Plant

The West Point Treatment Plant provides secondary treatment for wastewater from customers located in the greater Seattle area and in southwest Snohomish County. West Point is the largest plant in the King County system. This plant is designed to manage an average dry-weather flow of 110 mgd, average non-storm wet-weather flow of 133 mgd, and instantaneous maximum flow of 440 mgd. After treatment, the secondary effluent is discharged through an outfall near the plant into Puget Sound. The outfall discharges 3,650 feet from shore at a depth of 240 feet. The increasingly dilute effluent plume flows northward most of the year, out of Puget Sound.

West Point is designed to provide secondary treatment for up to 300 mgd of wastewater. Capacity between the 300-mgd capacity for secondary treatment (defined as 2.25 times the average wet-weather flow of 133 mgd) and the 440-mgd peak capacity is used to manage captured CSO flows. After receiving CSO treatment (equivalent to primary treatment), these flows are mixed with secondary effluent for disinfection, dechlorination, and discharge at the deep marine outfall. The blended effluent must meet secondary effluent quality limits, with a small reduction in total suspended solids removal requirements (from 85 to 80 percent).

From November 2006 through April 2007, the average wet-weather flow through the West Point Treatment Plant was 130.76 mgd. Several disinfection failures occurred during the year, each caused by a different operational issue that has since been resolved. None of these short interruptions in disinfection affected compliance with state Water Quality Standards. The December storm caused several overflows in the system and a power bump at the plant that temporarily disrupted operations. No NPDES permit effluent limit exceptions occurred during the year; the plant earned the NACWA Gold Peak Performance Award for 2007 and its Platinum Peak Performance Award for six consecutive years of gold performance.

11.1.3 Vashon Treatment Plant

The Vashon Treatment Plant was originally designed to manage a monthly average flow of 0.264 mgd and a peak flow of approximately 1.0 mgd. Late in 2006, the upgraded plant with increased capacity began full operation (see Chapter 2). The upgraded plant is designed to manage an annual average flow of 0.18 mgd, maximum monthly average flow of 0.52 mgd, and instantaneous maximum flow of 1.74 mgd. An outfall discharges 2,900 feet offshore to Puget Sound at a depth of minus 200 feet mean lower low water (MLLW).

The annual average flow through the Vashon plant in 2007 was 0.12 mgd, and the 2006–2007 average wet-weather flow was 0.22 mgd. The plant had no permit effluent limit exceptions during 2007. In the four years before the upgrade, the plant had been experiencing an average of four exceptions per year.

WTD also owns and operates the Beulah Park/Cove Treatment Facility on Vashon Island. This facility collects wastewater from approximately 60 residences via a vacuum system and pump station; treats the wastewater with a series of septic tanks, recirculating sand filters, and ultraviolet disinfection; and then pumps the effluent to a drip field for percolation to subsurface

soils. King County reports quarterly on the operation of this facility. This facility exceeded its pH limits during 2007. Operating procedures are being modified to address the pH problem.

11.2 Sanitary Sewer Overflows and Permit Deviations

Extensive resources have been committed to maintaining the integrity of the system and preventing sanitary sewer overflows (SSOs).[3] WTD's Maintenance and Asset Management groups regularly inspect, maintain, and repair facilities to prevent mechanical failures. In addition, WTD regularly updates its Conveyance System Improvement Program to ensure that conveyance facilities keep pace with projected needs for increased capacity.

In 2004 and 2005, the numbers of SSOs and NPDES permit deviations were below the 15-year annual average of 15 occurrences. In 2006 and 2007, the numbers of these events were about double the annual average, primarily because of extreme storms that hit the region both years. Table 11-1 lists SSOs and Table 11-2 lists permit deviations that occurred in 2007. The extreme storm on December 3 and 4, 2007, caused significant overflows at various points in the King County regional system and in local systems. During this storm, 17 SSOs or permit deviations occurred at 16 locations. During the rest of the year, 15 events occurred at 7 locations. The affected volumes ranged in size from about 100 gallons to 101 million gallons.

One type of permit deviation—interruption of disinfection—occurred at the West Point plant on three separate occasions during the year. The reasons for these failures were investigated and remedied. Because of mechanical problems at the plant on five other occasions, a small volume of primary treated effluent was diverted around secondary treatment and then subsequently blended with the secondary flow prior to discharge (also considered a permit deviation). The discharged blended effluent stayed within permit limits. Electrical systems were upgraded to address these problems.

While there may be some short-term risk to public health and the environment from SSOs and permit deviations, the volumes of releases do not produce long-term effects. For all SSOs, WTD implements overflow response procedures, including posting the area, cleaning up the area as appropriate, and monitoring water quality in the vicinity of the overflow to determine when pollutant concentrations have returned to levels consistent with state Water Quality Standards.

[3] SSOs are discharges of wastewater from separated sewer systems and from combined systems when no rain is occurring. They can flow from manholes, broken pipes, or pump stations to city streets, water bodies, and basements. SSOs occur on rare occasions such as extreme storms and power outages.

Table 11-1. Sanitary Sewer Overflows in 2007

Date	Location	Estimated Volume (gallons)	Duration	Discharge Type	Receiving Water	Reason for Overflow or Permit Deviation
Jan. 19	Vashon Treatment Plant	1,500	9 minutes	Waste activated sludge	Onto the ground and a small amount to Gorsuch Creek	Programmable logic controller problems caused accidental spill from tank
Mar. 10	South Mercer Pump Station	5,000	10 minutes	Untreated wastewater	South Lake Washington	After power failure, emergency generator engaged but then stopped working after 20 minutes
April 5–6	Lake Hills Blvd. Siphon	100–200	~2 days	Untreated wastewater	Onto the ground in backyards; did not reach a waterway	One siphon line was damaged; flow was transferred to second line
July 2	Murray Pump Station	1,000	10 minutes	Untreated wastewater	Puget Sound	Power failure
Sept. 8	8-inch line in Bellevue	<1,000	~16 hours	Untreated wastewater	Onto the ground; contained and remediated in a parking lot.	Construction contractor accidently damaged the line
Dec. 2–3	Cedar River Siphon	500	Unknown	Untreated wastewater	Onto the ground at a manhole near the siphon; did not reach a waterway	Siphon line failure
Dec. 3	Kirkland Pump Station	300,000	Up to 9 hours	Untreated wastewater	Onto the ground near the Starfire Sports complex	High-intensity storm
Dec. 3	North Portal	~900,000–3,600,000	60–90 minutes	Untreated wastewater	Thornton Creek	High-intensity storm
Dec. 3	Carkeek Pump Station	Unknown	Up to 1.5 hours	Untreated wastewater	Over ground and into Pipers Creek	High-intensity storm caused overflow at a manhole and from the chlorine contact channel and sedimentation tanks
Dec. 3	Juanita Bay Pump Station	1,000	30 minutes	Untreated wastewater	Lake Washington	High-intensity storm
Dec. 3	Hidden Lake Pump Station	1,200,000	>18 hours	Untreated wastewater	Puget Sound	High-intensity storm
Dec. 3	Yarrow Bay Pump Station	<1,000	2 hours, 10 minutes	Untreated wastewater	Lake Washington	High-intensity storm
Dec. 3	Medina Pump Station	250,000–500,000	2 hours	Untreated wastewater	Lake Washington	High-intensity storm.
Dec. 3	Kenmore Pump Station	200,000	1 hour, 40 minutes	Untreated wastewater	Sammamish Slough	High-intensity storm
Dec. 3	Elliott West CSO Treatment Facility	Unknown	3 hours	Combined wastewater and stormwater	Myrtle Edwards park grounds	High-intensity storm plus high tide caused surcharging
Dec. 3	Duwamish Pump Station	6,300,000	2 hours	Combined wastewater and stormwater	Duwamish Waterway	High-intensity storm
Dec. 3	Richmond Beach Pump Station	Unknown	6.5 hours	Untreated wastewater	Puget Sound	High-intensity storm.
Dec. 3	North Mercer Pump Station	10,000–50,000	Up to 5 hours	Untreated wastewater	Lake Washington	High-intensity storm caused overflow at unsecured manhole
Dec 3	North Creek Pump Station	250,000–500,000	~ 1 hour	Untreated wastewater	Over ground and into a drainage swale	Faulty drain valve on the west force main drained when put into service during high-intensity storm

Date	Location	Estimated Volume (gallons)	Duration	Discharge Type	Receiving Water	Reason for Overflow or Permit Deviation
Dec. 3	South Mercer Force Main	100,000	Up to 5 hours	Untreated wastewater	Into a drainage swale and then into Lake Washington	Overflow from manhole during high-intensity storm
Dec. 3	Wilburton Pump Station	20,000	17 minutes	Untreated wastewater	Kelsey Creek	Overflow from influent manhole during high-intensity storm

Table 11-2. Permit Deviations in 2007

Date	Location	Estimated Volume (gallons)	Duration	Discharge Type	Receiving Water	Reason for Overflow or Permit Deviation
Jan. 6	West Point Treatment Plant	1,230,000	13 minutes	Partially treated wastewater mixed with fully treated effluent	Puget Sound	Power bumps
Jan. 15	West Point Treatment Plant	3,100,000	Unknown	Partially treated wastewater mixed with fully treated effluent	Puget Sound	Power issues
May 21	Elliott West CSO Treat-ment Facility	560,000	36 minutes	Combined wastewater and stormwater	Elliott Bay	Disinfection failure
July 1	West Point Treatment Plant	Unknown	13 minutes	Treated wastewater without disinfection	Puget Sound	Disinfection failure
Aug. 12	West Point Treatment Plant	Unknown	Unknown	Treated wastewater without disinfection	Puget Sound	Disinfection failure
Oct.10	West Point Treatment Plant	1,600,000	39 minutes	Partially treated wastewater mixed with fully treated effluent	Puget Sound	Equipment failure opened CSO gate after plant testing activity
Nov. 11	West Point Treatment Plant	<500,000	6 minutes	Partially treated wastewater mixed with fully treated	Puget Sound	CSO gate opened; cause not determined
Nov. 15	West Point Treatment Plant	4,400,000	20 minutes	Treated wastewater without disinfection	Puget Sound	Disinfection failure
Nov. 16	Elliott West CSO Treat-ment Facility	1,020,000	1.5 hours	Combined wastewater and stormwater	Puget Sound	Disinfection failure
Dec. 3–4	Elliott West CSO Treatment Facility	101,300,000	22 hours	Combined wastewater and stormwater	Elliott Bay	Disinfection failures during high-intensity storm.
Dec. 31	West Point Treatment Plant	50,000	8 minutes	Partially treated wastewater mixed with fully treated effluent	Puget Sound	Power issues

11.3 Combined Sewer Overflows

King County's CSO facilities are regulated through West Point's NPDES permit. With each permit renewal application (about every five years), WTD submits a CSO plan update to the Washington State Department of Ecology (Ecology). WTD also submits a report to Ecology each year on annual CSO volumes and frequencies and on progress made to control its CSOs.[4]

King County began to develop plans for controlling CSOs as early as 1979, after treatment plants and conveyance lines were in place. Almost 20 years of data demonstrate progress toward the control goal (Figure 11-1). As of May 2007, about 13 of King County's 38 CSOs are controlled. Five other CSOs—all part of the Mercer/Elliott West and Henderson/Norfolk CSO control systems that came online in 2005—are expected to achieve control after startup adjustments and modifications are made to these systems.[5] Control status will be confirmed in the hydraulic model recalibration that is under way. The remaining 20 uncontrolled CSOs will meet state standards as projects listed in the RWSP are completed between 2013 and 2030 (see Chapter 5).

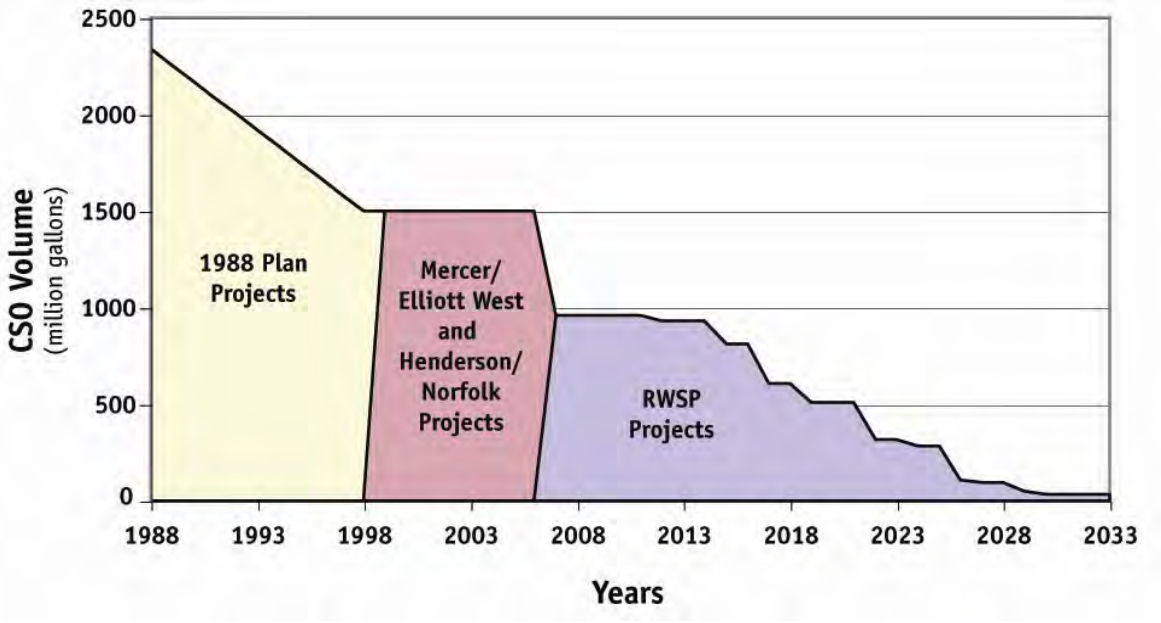


Figure 11-1. Actual and Planned CSO Reduction, 1988–2030

[4] "Control" is defined as meeting the Washington State standard of an average of no more than one untreated discharge per year per outfall. An update and calibration of the hydraulic model, expected to be ready in 2007, will help to verify the control status of King County CSOs.

[5] The CSOs are the Denny Way Regulator Station, Dexter Avenue Regulator Station, Henderson Pump Station, Martin Luther King, Jr., Way weir, and Norfolk Street Regulator Station CSOs. See Chapter 5 for a description of the Mercer/Elliott West and Henderson/Norfolk systems.

11.3.1 Frequencies and Volumes of Untreated CSOs

King County reports CSO data beginning in June of one year and ending in May of the next year. The period between 1981 and 1983 is used as the baseline for measuring progress toward controlling CSOs. Baseline volumes were determined using computer modeling. As shown in Figure 11-2, there is a pattern of decreasing volumes of untreated CSOs over time despite fluctuations in rainfall from year to year.[6]

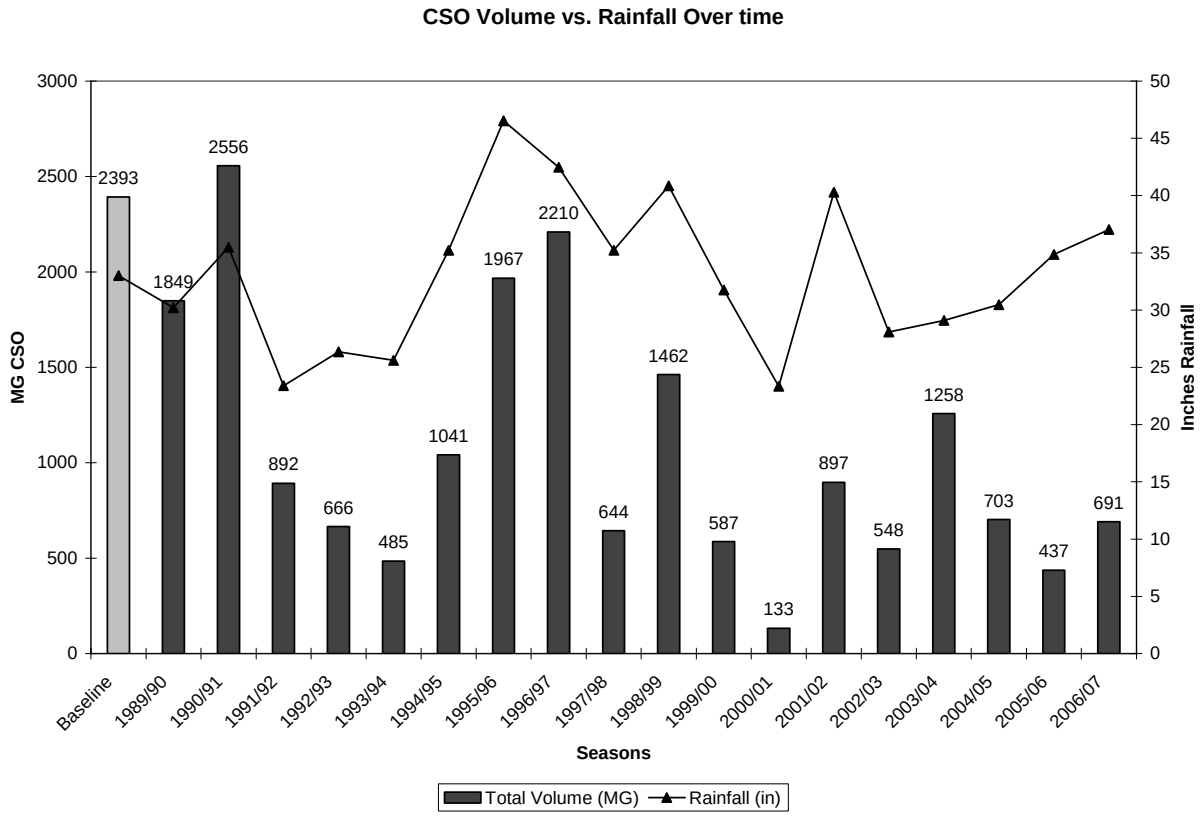


Figure 11-2. Annual CSO Volumes—2000 through 2007

A total of 268 untreated CSO events were recorded in 2006–2007 (162 events in the South Service Area; 87 events in the North Service Area; and 19 events in the Alki Service Area). The total of 268 untreated CSO events represents a 43.3 percent reduction in frequency over the 1981–1983 baseline of 471 events.

The total volume of untreated CSOs for 2006–2007 was 690.92 million gallons (MG) (572.76 MG in the South Service Area; 85.77 MG in the North Service Area; and 32.38 MG in the Alki Service Area). The 690.92 MG total represents a 70.5 percent reduction over the 1981–1983 baseline of 2,339 MG.

[6] More information about specific CSOs can be found in the *Combined Sewer Overflow Program 2006–2007 Annual Report* at http://dnr.metrokc.gov/wtd/cso/library/AnnualReport/2006-07_CSOAnnual.pdf.

While a reasonable relationship between annual rainfall and CSO volumes can be seen in Figure 11-2, large and/or intense storms can contribute most of the year's CSO volume, especially if the storms cause power outages and flooding at WTD facilities. This was the case in 2006–2007, where approximately one-third of the annual rainfall and one-half of the CSOs occurred during two storms that took place November 2–15 (8.67 inches) and December 9–15 (4.12 inches).

11.3.2 Frequencies and Volumes of Treated CSOs

In 2006–2007, treated flows were discharged a total of 71 times from King County's five CSO treatment facilities. Total discharge volume was 1,139.88 MG. Table 11-3 shows frequency and volume for each facility.

Table 11-3. Frequency and Volume of Treated CSOs
June 2006–May 2007

CSO Facility	Events [a]	Volume (million gallons)
Alki plant	6	68.23
Carkeek plant	8	21.70
Elliott West	13	489.20
Henderson/Norfolk	3	9.00
West Point CSO process	41	551.75
TOTAL	**71**	**1,139.88**

[a] Events are defined by a 48-hour dry inter-event interval; West Point defines events in terms of days.

For the 2006–2007 CSO year, there were 41 occurrences totaling 551.75 MG of treated CSO discharges from West Point.

The total volume of treated CSO discharged from the Alki CSO Treatment Plant was 68.23 MG during six events. In the past, the plant operated an average of only two times per year. These events occurred under the largest storms and so were the most dilute and difficult to treat. During 2006–2007, more flow was treated at Alki as a result of an operating approach for the West Seattle Pump Station that relieved pressure on the Elliot Bay Interceptor (EBI) and Duwamish Pump Station. This larger volume slightly improved the annual total suspended solids (TSS) removal at the Alki plant when compared to previous years, but was not sufficient to meet the 50 percent TSS removal requirement for these storms.

Implementation in the 2007–2008 season of a different pumping control strategy at the 63rd Avenue Pump Station may improve TSS removal at the Alki plant. The station tended to cycle on-off during high flows in 2006–2007. The new control strategy will moderate changes in flow

rates and provide a better opportunity for the clarifiers at the plant to remove TSS. The new control strategy and repairs made in 2006–2007 to correct short-circuiting in the plant's dechlorination contact channel may also help prevent future exceedances of the chlorine limit that had been occurring whenever the channel short-circuited.

During this reporting period, the Carkeek CSO Treatment Plant operated 20 times, with eight discharge events totaling 21.7 MG in volume. NPDES effluent limits were met. The new dechlorination system and upgraded chlorination system functioned well during the second year of operation. Refinements to optimize disinfection effectiveness and to improve pumping are in progress.

Carkeek CSO Treatment Plant

There were 13 discharge events from the Elliott West CSO outfall. The total discharge volume for the reporting period was 489.2 MG. Discharge effluent limits were not met, and Ecology issued a Notice of Violation (NOV 5059) on September 6, 2007. King County has been responding to the questions in the NOV. Hydraulic, solids management, and disinfection problems were identified and are being analyzed. Because the Elliott West facility operates intermittently, several rounds of monitoring, planning and design, implementation, and testing over several seasons may be required to ensure the efficacy of solutions. King County is keeping Ecology informed of progress in addressing the problems and achieving CSO control.

Elliott West CSO Treatment Facility

In 2006–2007, there were three discharge events from the Henderson/Norfolk CSO Treatment Facilities (9.0 MG of treated CSO was discharged). All permit conditions were met, except for the 39 microgram-per-liter maximum daily chlorine limit. Modifications to improve chlorine measurement and bisulfite dosing were implemented to correct this deficiency.

See Chapter 5 for more information on the county's CSO control program.

11.4 Pollution Source Control

King County operates two source control programs: the Industrial Waste Program and the Local Hazardous Waste Management Program. Both programs work to control pollutants at their source, thereby keeping them out of the wastewater system and, in turn, out of surface waters and the environment. The two programs complement each other. The Industrial Waste Program focuses on larger businesses in a regulatory manner, issuing permits and discharge authorizations under a federally mandated pretreatment program. The Local Hazardous Waste Management Program focuses on smaller businesses and on households in a non-regulatory manner, providing technical assistance, resources, and education under a state-mandated program.

11.4.1 Industrial Waste Program

The King County Industrial Waste Program (KCIW) regulates industrial wastewater discharged into the King County wastewater system. The program serves to protect surface water and biosolids quality, the environment, public health, and the wastewater system and its workers. It does this by ensuring that industries treat wastewater for harmful substances such as metals, oils, acids, flammables, organic compounds, gases, and solids before discharging the wastewater to sewers.

Permits, Authorizations, and Enforcement

KCIW may regulate any industry, from largest to smallest, if the industry discharges to the wastewater system. To do this, the program issues three main kinds of discharge approvals: letters of authorization, discharge authorizations, and permits. Letters of authorization are issued for limited duration construction dewatering discharges. Discharge authorizations are issued to smaller industries. Permits are issued to industries that discharge more than 25,000 gallons per day and/or that are included in federally regulated categories. The Environmental Protection Agency (EPA) requires at least 20 categories of industries to get permits, whatever their size or quantity of wastewater. Permits have more comprehensive operating and self-monitoring requirements than do discharge authorizations.

Discharge of fats, oil, and grease from a petroleum or mineral origin (nonpolar FOG) is limited to 100 milligrams per liter. Industries must use oil/water separators to pretreat oily wastewater to prevent harm to the biological phase of wastewater treatment and must submit plans for the separators to the local sewer utility or to KCIW for review and approval before installing the separators. FOG from an animal or a vegetable origin (polar FOG) can block sewer lines. Although polar FOG has no numerical limit, dischargers are required to minimize free-floating polar FOG and may be required to complete a FOG control plan for King County's review and approval.

KCIW investigators inspect facilities before issuing discharge approvals and also inspect facilities with existing approvals to ensure that they are complying with regulations. Most companies are required to self-monitor their discharges. In addition, industrial waste specialists take verification samples at facilities that have been issued permits. If they find violations, the specialists conduct follow-up inspections and sampling.

The program issues a Notice of Violation when a company discharges more contaminants or volume than allowed, violates conditions of its discharge approval, or fails to submit required reports. For enforcement, KCIW uses tools such as compliance schedules, fines, charges for monitoring and inspections, and cost recovery for damages.

In 2007, 128 permits and 310 industrial waste discharge approvals were in effect and 405 inspections were conducted. Table 11-4 shows the number of compliance samples collected versus the number of violations detected. During 2007, KCIW issued Notices of Violation to 29 companies for 58 violations (with several companies having multiple violations in more than one category):

- Sixteen companies had 29 discharge violations, including those based on self-monitoring data.
- Ten companies had 25 permit/code violations.
- Four companies had 4 reporting violations.

Two companies had six violations each: Cibo Naturals, a Seattle food processing facility, and TTM Technologies, a Redmond circuit board manufacturer.

During 2007, KCIW issued six fines totaling $49,210. The largest fine, $36,620, was issued to Sound Transit, the regional transit provider for Central Puget Sound. The fine is currently the subject of an appeal to the King County Hearings Examiner. The 2005 RWSP annual report mentioned a $23,894 fine issued to Argent Laboratories. Argent Laboratories placed an appeal before the King County Hearing Examiner but subsequently withdrew the appeal before it could be heard. In 2006, the company started making monthly payments and, in 2007, paid the final balance of $11,947.

None of the violations identified by KCIW or by self-monitoring in 2007 caused NPDES permit exceptions at King County treatment facilities.

Table 11-4. Number and Type of Compliance Samples of Industrial Wastewater Collected in 2007

	Compliance Monitoring	Post-Violation	Discharge Violation[d]
Cyanide amendable to chlorination	26		
Total cyanide	131	1	
Metals	417	8	19
Organics			
BNA	37		3
VOA	138		1
Fats, oils, and grease			
Total	0		
Polar[a]	24		
Nonpolar	325		
pH (field)[b]	552	5	5
Surcharge	545		
Miscellaneous[c]	70		1

[a] The polar fats, oils, and grease (FOG) analyses are for the visual free-floating FOG test, not laboratory analyses.

[b] The number of pH samples is somewhat misleading because it shows only discrete pH samples collected and analyzed in the field. The number does not include readings from continuous pH measurements.

[c] Miscellaneous includes tests for dissolved sulfide, hydrogen sulfide (H_2S) field, polychlorinated biphenyls (PCBs), settleable solids, total phosphorus, and turbidity.

[d] Discharge violations do not include those based on self-monitoring data.

Categorical Pretreatment Regulation Activity

It is KCIW's standard practice to submit comments to EPA concerning proposed pretreatment regulations. EPA did not propose any new or revised pretreatment standards in 2007; however, at the end of October, it issued the *Notice of Availability of Preliminary 2008 Effluent Guidelines Program Plan* (EGP). EPA issues such notices biennially. The focus for 2008 will be on four industrial sectors: steam electric power generating, coal mining, oil and gas extraction, and health services. In December, KCIW submitted comments on the health services industry (HSI) portion of the EGP. (There are no dischargers in the other three sectors in the county's wastewater service area.)

EPA's primary interests in the HSI are in dental mercury and unused pharmaceuticals. In regard to dental mercury, KCIW's comments emphasized the effectiveness of its non-permit approach in reducing mercury loading in the county's biosolids. It made the case that in its experience, a program of mandatory controls with follow-up inspections works well and that the additional resources required to implement categorical standards are not justified.

In regard to unused pharmaceuticals, KCIW pointed out that Ecology had recently developed an Interim Enforcement Policy for Pharmaceutical Waste Management in Healthcare and that KCIW had advised local hospitals to employ it. KCIW also noted that its authorizations "listed Best Management Practices for the substances most commonly found in hospitals that were in some cases discharged to the sewer." Its conclusion was that its current methods to control the disposal of unused pharmaceuticals to the sewer can be as effective as, or even more effective than, the use of categorical standards.

Dental Waste Program

KCIW's nationally prominent dental waste program allows dentists to demonstrate that they are in compliance with the local limits for mercury by installing a pretreatment unit commonly known as an amalgam separator. While it is difficult to precisely quantify the impact of this program, it may be partly responsible for the more than a 50 percent reduction in the amount of mercury in King County biosolids from 2000, the year before King County began implementing this program, to 2004, the year in which a 97 percent compliance rate was achieved by local dentist offices (Figure 11-3).[7] The annual median concentration of mercury in biosolids has started to stabilize at around 1.1 milligrams per kilogram (dry weight basis).[8]

[7] See also the discussion on the EnviroStars program in the section on the Local Hazardous Waste Management Program.

[8] Washington State's monthly average limit for mercury in biosolids is 17 milligrams per kilogram (WAC 173-308-160).

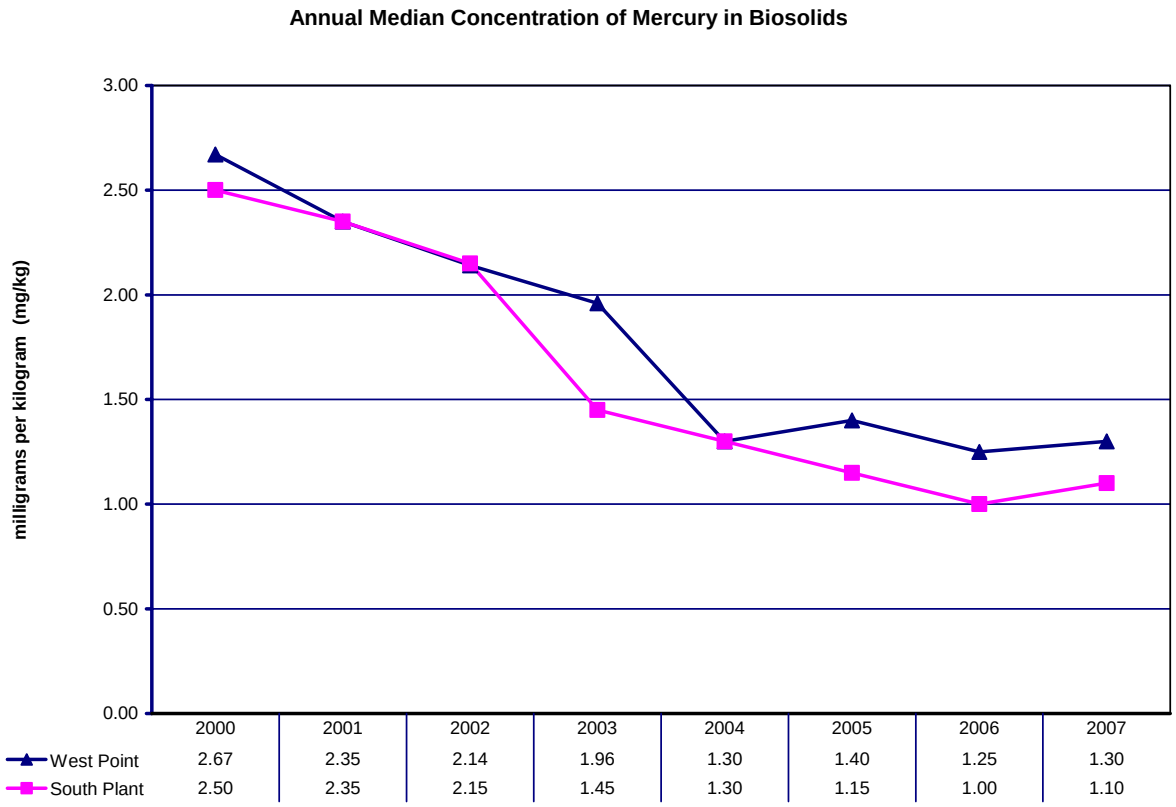


Figure 11-3. Decline of Mercury Concentrations in Biosolids, 2000 through 2007

Accomplishments in 2007 include the following:

- Updated the Dental Waste Program Internet page.
- In partnership with WTD's Biosolids Program, sent a letter to all dentists in its service area, thanking them for their role in reducing mercury levels in biosolids and reminding them that KCIW will continue to conduct random compliance inspections. Enclosed with the letter was a copy of the fact sheet *Discharging Dental Wastewater into the King County Sewer System.*
- Inspected 89 dental offices in 2007, finding two offices that had not yet installed a separator.
- Continued to participate in a national study of mercury concentrations in treatment plant influent, effluent, and biosolids under the auspices of the National Association of Clean Water Agencies (NACWA).

Duwamish Waterway Source Control Projects

Although the sanitary wastewater component in CSOs is small and the industrial wastewater component even smaller still, KCIW actively seeks to control sewer-related pollution wherever it occurs in our system. To that end, the program is supporting efforts to clean up contaminated

sediments in the Lower Duwamish Waterway (LDW) and East Duwamish Waterway (EW) by participating in programs to control sources of pollution at their sources and thus reduce the potential for recontamination following cleanup.

Lower Duwamish Waterway

In 2007, KCIW performed the following source control activities in the Lower Duwamish drainage basin:

- **Sampling of industrial sewer dischargers for phthalates.** Between March and November 2006, KCIW collected 34 samples from industrial sewer dischargers in the Lower Duwamish basin to analyze them for concentrations of two chemicals of concern for the Lower Duwamish Waterway: bis-2-ethylhexyl phthalate (BEHP) and butylbenzyl phthalate (BBzP). KCIW is interested in determining if there are controllable industrial sources of these chemicals. Analysis of data and report writing occurred in 2007; a final report will be completed in early 2008.
- **Atmospheric deposition sampling.** From October 2005 to April 2007, KCIW staff collected 16 rounds of atmospheric deposition samples in the Lower Duwamish basin. This sampling was conducted to evaluate the atmospheric deposition pathway to the LDW for phthalates, carcinogenic polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs) The final monitoring report will be available in early 2008.
- **Participation in the Lower Duwamish Waterway Source Control Work Group.** KCIW participates in monthly meetings of the Lower Duwamish Waterway Source Control Work Group (SCWG). The group includes three of the four members of the Lower Duwamish Waterway Group (King County, Port of Seattle, and City of Seattle) and the two agencies with regulatory responsibility for different aspects of LDW sediment remediation (Ecology and EPA). The SCWG was formed to discuss source control issues and activities that can affect sediment remediation in the LDW and has met regularly for several years. In one of the 2007 meetings, a WTD staff member made a presentation on King County CSOs.

East Duwamish Waterway

Initiated in 2007, the East Waterway source control project, being conducted in conjunction with sediment remediation, is a new project for KCIW. The remediation is being implemented under an agreed order between the Port of Seattle and EPA. The City of Seattle and King County are participating with the Port of Seattle because of stormwater and CSO inputs to the EW. During 2007, KCIW participated in several source control meetings, review of source control documents, and planning of source control activities. KCIW source control activities in the EW are expected to continue through 2008 and likely into 2009.

11.4.2 Local Hazardous Waste Management Program

The Local Hazardous Waste Management Program (LHWMP) in King County is a regional program that complements WTD's efforts to protect water quality. LHWMP brings together resources from four local government agencies and 37 suburban cities to protect and enhance public health and environmental quality by helping citizens, businesses, and government reduce the threat posed by the production, use, storage, and disposal of hazardous materials. The program is a regional partnership comprising King County Water and Land Resources Division and Solid Waste Division, Seattle Public Utilities, Public Health–Seattle & King County, and the Suburban Cities Association. In 2007, WTD paid more than $2.1 million into the Local Hazardous Waste Fund to support LHWMP. This contribution comes from King County Board of Health fees levied per million gallons of wastewater treated at wastewater treatment plants in King County's service area.

The program provides collection and recycling services for household hazardous materials and wastes and offers public outreach aimed at proper handling and reduction in use of hazardous products. It also provides technical assistance, incentives, and recognition to businesses that generate small quantities of hazardous waste.

Waste Disposal and Recycling

LHWMP furnishes King County residents with household hazardous waste collection services at the Household Hazardous Wastemobile, which travels throughout the county, and at three fixed facilities located in Factoria (Bellevue), North Seattle, and South Seattle. In 2007, the program collected 2,998 tons of household hazardous waste from more than 69,950 customers at these collection facilities:

- 17,753 customers brought 774 tons into the North and South Seattle sites
- 21,345 customers brought 832 tons into the Factoria drop-off site
- 21,852 customers brought 1,392 tons to the Wastemobile

The program's suburban city partners sponsored 47 events that resulted in the collection of an additional 189 tons of waste. Also in 2007, more than 221,050 gallons of used motor oil were collected at public and private collection sites throughout the county. Were it not for LHWMP's collection services, much of this waste could have ended up in regional landfills, sewers, storm drains, and the environment.

Several LHWMP projects work to reduce the use of mercury and ensure its proper disposal. In 2007, LHWMP spurred the collection and appropriate disposal or recycling of at least 105 pounds of mercury through the following activities:

- The EnviroStars program recognizes businesses that have taken steps to reduce pollution and to properly manage their hazardous wastes. In 2007, four King County dentists

became new EnviroStars in recognition of their efforts to prevent discharge of mercury to sewers. A total of 79 dentists in the county are EnviroStars.

- Approximately 2.1 million mercury-containing lamps were recycled as the result of LHWMP outreach efforts and incentives to businesses and others.
- LHWMP is working to expand the Take-It-Back-Network, which provides private sector options for recycling fluorescent tubes and electronics—and their hazardous components—in a safe and cost-effective manner. In 2007, the Take-It-Back Network collected 41,090 fluorescent bulbs and tubes.
- Program staff worked with local contractors and distributors to increase their usage of the thermostat recycling program sponsored by the Thermostat Recycling Corporation. Through this program, 1,703 thermostats containing 21 pounds of mercury were collected.

In addition, LHWMP is participating in a statewide medicine take-back pilot project that began in 2006. In 2007, all 25 Group Health Cooperative clinical pharmacies in the state (including 11 in King County) started collecting old, unused waste medicines from the public. The project will expand to Bartell Drug retail stores in 2008. About 4,000 pounds of old medicines were collected in 2007, and 10,000 pounds were collected since the project was launched. In addition, LHWMP provided key support in drafting safe medicine return legislation for consideration in the 2008 Washington State legislature. LHWMP staff have become recognized national experts on this issue and have helped to initiate a national dialogue via the Product Stewardship Institute, which will formally launch in spring 2008. More information on this project is available at http://www.medicinereturn.com/.

Strategic Planning and Refocus

In 2007, LHWMP started implementing its 2006 strategic plan. While continuing many of the program's existing activities, the plan places increasing emphasis on eliminating the inclusion of the most problematic chemicals in commercial or consumer products; reducing the use of hazardous materials in sensitive environmental areas such as groundwater and wellhead protection zones, flood hazard zones, and commercial generators on septic systems; and allocating more resources to reducing the exposure of the most vulnerable and historically underserved populations to toxic materials.[9]

The program is encouraging companies that manufacture hazardous products to reduce the toxicity of their products and to view their responsibilities for those products expansively, through their full lifecycle. Progress is being made with respect to establishing take-back systems for consumer electronics, which is now in state law; pharmaceuticals, with major initiatives under way; lighting products, with a national system recently announced; and paint, with a

[9] The most problematic chemicals include priority pesticides, bisphenol-A, solvents, mercury, pharmaceuticals, lead, and polybrominated diphenyl ethers (PBDEs).

national agreement that will take effect in Washington State in 2009. Local take-back efforts have been developed for thermostats, fluorescent lamps, and other problem wastes.[10]

Community Outreach/Technical Assistance, Recognition, and Incentives for Businesses

During 2007, LHWMP staff began to work in the new areas of emphasis while continuing to provide key program services to residents and businesses. In addition to collecting household hazardous wastes, program staff partnered with community-based organizations, business organizations, trade organizations, housing authorities, and others to provide residents and businesses with information about ways to reduce the use of toxic and hazardous materials.

For example, the Priority Pesticide project conducted these and other activities during the year:

- Trained 2,723 landscape professionals, nursery workers, and horticultural students on integrated pest management (IPM) techniques. Special IPM trainings for Spanish-speaking and Vietnamese landscapers were held.
- Trained approximately 254 nursery staff and horticulture students in Less Toxic Weed Control and Natural Lawn Care.
- Provided Natural Landscaping training to 2,185 professionals in environmentally friendly site design and landscape installation and maintenance practices.
- Answered at least 2,800 IPM-related questions on the Natural Lawn & Garden Hotline.

The program expanded its outreach efforts to historically underserved and vulnerable populations. The Environmental Justice Network In Action Team partnered with seven community-based organizations in the region and reached people of 30 ethnicities involving 12 languages in projects across 39 King County zip codes. A total of 1,200 green home kits were distributed to promote proper disposal of household hazardous waste and the use of safer alternative products. The healthy home tips, shopper card, and disposal flyer were translated into seven languages.

Other 2007 assistance and outreach programs include the following:

- Teaching students and educators about hazardous products and ways to reduce them and working with schools to remove mercury and other hazardous materials.
- Providing technical consultations, fact sheets, brochures, and the Business Waste Line to help small businesses understand how to properly use, store, manage, and dispose of hazardous products and wastes. The Business Waste Line assisted more than 1,747 callers, and field staff made at least 348 technical assistance visits to 326 businesses.
- Offering industry-specific information about ways to reduce the use of toxic and hazardous material.

[10] Take back programs generally mean either that the manufacturers directly take back the product or that they pay for taking back and disposing of waste products, generally through a third party.

- Giving limited financial assistance to qualified businesses to facilitate waste disposal/reduction. In 2007, the Voucher Incentive Program reimbursed 164 businesses a total of approximately $82,245.
- Recognizing businesses, through the EnviroStars program, for their efforts to reduce pollution. In 2007, 26 businesses became new EnviroStars and 25 businesses increased their EnviroStar rating. As of the end of 2007, there were 375 EnviroStar businesses.
- Operating the Industrial Materials Exchange (IMEX), which matches businesses that no longer need a hazardous material with businesses that have a need for that material. IMEX has an online listing of available and wanted materials.
- Coordinating the Interagency Compliance Team (ICT), which is composed of multiple enforcement agencies focusing on priority problem sites throughout the county. ICT opened seven cases in 2007 and brought five sites into compliance.
- Sustaining the Interagency Resource for Achieving Cooperation (IRAC), which serves as an umbrella meeting place for local, regional, and federal regulatory agencies. IRAC sponsored five training sessions for 165 attendees. Its Lead-based Paint Work Group produced a variety of useful tools and continued active involvement in EPA's proposed new Renovation, Repair and Painting rule.

11.5 Endangered Species Act Compliance

WTD continues to consult with the National Marine Fisheries Service and the U.S. Fish and Wildlife Service ("Services"), as required under Section 7 of the Endangered Species Act (ESA), on projects that require a federal permit or receive federal funding. WTD has determined that the traditional ESA Section 7 consultation process is the most efficient way to ensure that its projects comply with ESA and has abandoned the alternative strategy of negotiating programmatic agreements with the Services (habitat conservation plan, programmatic biological assessments). WTD's past efforts to develop programmatic agreements and its funding of a position at National Marine Fisheries Service (NMFS) to review projects have helped make the Section 7 consultations more predictable and efficient.

In 2007, ESA compliance activities included extending the agreement under which WTD funds an NMFS position for reviewing WTD projects and continuing to work on a technical memorandum on the impact of reclaimed water use on ESA-listed species. The memorandum will serve as a resource for any future King County reclaimed water projects that require environmental review and Section 7 consultations.

11.6 Endocrine-Disrupting Chemicals and Other Microconstituents

Endocrine-disrupting chemicals (EDCs) are natural or synthetic chemicals that interfere with or mimic the hormones responsible for growth and development of an organism. Information is

continually emerging about these natural and synthetic chemicals that people and industries use every day and dispose of down their drains and toilets. Because the potential impact of EDCs on aquatic life and wildlife is an issue of national and international scope, it is beyond the capability of a local agency or utility to solve alone. Studies will continue for many years before definitive answers are known and regulations adopted.

Other chemicals are gaining attention because of their persistence in the waste stream and the environment. These microconstituents include pharmaceuticals and non-EDC components in personal care products (sun screens, analgesics, fragrances, plasticizers).

King County scientists are tracking this issue carefully to keep up-to-date on new findings. The county's environmental laboratory is investigating new analytical methods for the complex testing of some of these chemicals. Sampling for 15 suspected EDCs in the county's marine and fresh waters found low levels of five types of EDCs: natural estrogen (estradiol), synthetic estrogen (ethynylestradiol), plasticizers (phthalates), surfactants from soaps (nonylphenol), and epoxy compounds (bisphenol A). The April 2007 report titled *Survey of Endocrine Disruptors in King County Surface Waters* describes these findings in detail. More information about this work can be found at http://dnr.metrokc.gov/wlr/waterres/streamsdata/reports/Endocrine-disrupting-compounds.htm.

Conventional secondary wastewater treatment and newer technologies such as membrane bioreactors are designed to remove solids and biodegradable organic material from wastewater. These technologies remove many EDCs and other chemicals. For some chemicals, the removal rate is from 50 to 90 percent; for others, the removal rate is much less. Controlling chemicals at their source is the easiest and least expensive way to protect the environment and people from the harmful effects of all pollutants, including EDCs, pharmaceuticals, and personal care products. WTD will continue its efforts to protect water quality and will adapt its programs, if needed, as more information on these microconstituents emerges. View WTD's latest information at http://dnr.metrokc.gov/WTD/community/edc/.

Appendices

Appendix A. 2007 Summary of Odor Complaints

Appendix B. RWSP Project Reports

Appendix C. The Health of Our Waters, Water Quality Monitoring Results for 2007

Appendix A
2007 Summary of Odor Complaints

The Wastewater Treatment Division (WRD) received and investigated 64 odor complaints in 2007. It was determined that 34 complaints were attributable to WTD wastewater facilities. The other complaints were determined to be from non-county or indeterminate sources. WTD took actions for all complaints related to county wastewater facilities.

Detailed information for each complaint is included in the table below. The table lists the complaints in four groups:

- **West Point Treatment Plant Area.** This area is adjacent to the West Point plant. It received 7 complaints in 2007.
- **West Service Offsite Area.** This area encompasses the network of pipes that delivers wastewater to West Point. These pipes are generally located north and east of the plant. The area received 17 complaints in 2007.
- **South Treatment Plant Area.** This area is adjacent to South plant. It received 14 complaints in 2007.
- **South/East Service Offsite Area.** This area encompasses the network of pipes that delivers wastewater to South plant. These pipes are generally located south and east of the plant. The area received 26 complaints in 2007.

Location	Date	Complaint	Resolution
West Point Treatment Plant Area			
West Point Treatment Plant	7/25/07	Complainant sensed very strong rotten egg odor from area of house and on street.	Investigation detected slight sulfide odor from City of Seattle manhole nearby complainant's house. The city was performing cleaning operations at the time and the manhole was open. The manhole was sealed and a message left on the complainant's answering machine. Because the manhole in question belonged to the city, the complaint was designated as non-county.
West Point Treatment Plant	8/30/07	Complainant sensed strong odor inside his residence and suspected that West Point was the source.	All odor control units were operating at the time of the complaint. Some process unit fans were off to allow for painting. The process unit fans (west sedimentation, grit, and screen room) were placed back in service at 1:50 p.m. Investigations for complaints at this residence are ongoing (see odor complaints for 8/30, 9/1, 9/8, 9/10, and 9/15 below). A consultant is assessing the odor control systems at the plant. Until the assessment is completed, these complaints will be considered indeterminate.

Location	Date	Complaint	Resolution
West Point Treatment Plant	9/1/07	Complainant sensed moderate sweet, pungent odor inside residence and suspected that West Point was the source.	The low tide occurred 2 hours before the time of his complaint. There were no unusual odors or activities coming from West Point on that day. The complaints are recurring, and a consultant is assessing the odor control systems at the plant (see odor complaint from 8/30 above).
West Point Treatment Plant	9/8/07	Complainant sensed odor inside residence and suspected West Point was the source.	The tide was up at the time of his complaint. A faint sewage odor was sensed at the trail north of the plant and mild "biosolids" odor at the evacuation route by the north digesters. All odor control systems were in operation. Investigators ensured that prechlorination was operating properly and roll-up doors were closed, and directed Operations to place covers on the east side distribution channels and hose Digester 3 cover. The complaints are recurring, and a consultant is assessing the odor control systems at the plant (see odor complaint from 8/30 above).
West Point Treatment Plant	9/10/07	Complainant sensed moderate odor inside his residence and suspected West Point was the source.	There was a very low tide at the time of complaint. No sewage odors sensed at residence upon investigation, only "low tide odor." Residence next door could not sense any sewage odors, only "low tide odors." No further action taken at this time. The complaints are recurring, and a consultant is assessing the odor control systems at the plant (see odor complaint from 8/30 above).
West Point Treatment Plant	9/15/07	Complainant sensed sewage odor inside and outside residence all day and suspected West Point was the source.	There were light "methane" odors outside the plant upon investigation. No odors were sensed on the north berm. All doors were checked for closure, and odor control units were checked to ensure they were in service. No changes were made to plant operation. The complaints are recurring, and a consultant is assessing the odor control systems at the plant (see odor complaint from 8/30 above).
West Point Treatment Plant	10/21/07	Initial complaint received on 10/21 on King County Councilman's e-mail. The complaint was forwarded to West Point a few days later (11/5), so no immediate investigation could be performed.	From the operators log on 10/21, the west sedimentation fan was off for maintenance activities. The most likely source of odor on the beach were the digesters. A letter was sent to the complainant, which recommended that future complaints be sent directly to West Point so that an immediate investigation and action can take place.
West Service Offsite Area			
Perkins Way, McAleer odor control unit	3/14/07	Lake Forest Park citizen sensed sewage odors from the odor control unit while driving on Perkins Way.	Investigation revealed that the carbon in the unit had expired. The carbon was changed on 3/22.
Matthews Beach Pump	7/19/07	Complainant sensed sewage odor from the bike path near the pump	A strong odor from the exhaust stack was sensed during investigation, but no odors were

Location	Date	Complaint	Resolution
Station		station.	sensed in the park or beach area. The Pepcon unit was operating, but the oxidation-reduction potential (ORP) probe was out of calibration. The ORP probe was recalibrated.
Dexter Regulator Station	7/22/07	Complaint of sewage odor came from condos located just above the regulator station.	A similar problem occurred at this location last summer when the exhaust fan in the tunnel was left on. As a result of the complaint, the exhaust fan was turned off.
Richmond Beach/Hidden Lake Pump Station	7/23/07	Complainant sensed moderate rotten egg odor. The complainant could not use outside patio during the evening hours because of the odor.	The Bioxide feed pump at Hidden Lake was found to be airbound. A new suction line was replaced on the chemical feed pump, and manholes next to residence were sealed.
Richmond Beach/Hidden Lake Pump Station	7/24/07	Complainant sensed moderate rotten egg odor at same residence as 7/23 complaint.	See resolution for 7/23 complaint above.
North Portal	7/29/07	Complainant sensed odor at his residence. Recurring odor complaints have come from the residence.	Odors could have been caused by the storage program at the Lake City Regulator Station to accommodate construction work at West Point. The operating mode was such that the Lake City Tunnel was not ventilated when the control gate was closed, thus displacing air to the North Portal. A different operating mode for storage will be tried to ensure that odors do not back up to the North Portal.
5100 block of NE 90th Place	8/3/07	Complainant sensed very strong sewage odor near his residence.	The closet King County facility is the Matthews Beach Pump Station. The Pepcon unit at the station was operating normally. There was a slight sewage odor emanating from two manholes that belonged to the City of Seattle. The complainant was notified of the findings. Because the manholes lie within the city's jurisdiction, the complaint was designated as non-county.
Perkins Lane/McAleer Odor control unit	8/5/07	Complainant sensed strong odor outside.	The McAleer odor control unit was in operation, but the strong odors sensed from the exhaust indicated that the carbon was expired. The carbon was changed.
Matthews Beach Pump Station	8/11/07	Complainant sensed strong sewage odor several times outside during the past 2 weeks.	No odors were sensed at the station at the time of investigation. The odor control unit was in operation and working. No further action was taken at this time.
Wilmot Park (Sammamish Interceptor/ Woodinville)	8/17/07	Complainant sensed very strong odor at Wilmot Park.	Faint sewage odors coming from manholes along trail were sensed. The Woodinville Pump Station and Force Main Discharge Structure were checked for odors. All of the manholes at the station were already sealed. The manhole cover openings, where faint sewage odors were sensed, were caulked.
Matthews	8/26/07	Complainant sensed strong odor	Moderate to heavy sulfide odors were sensed

Location	Date	Complaint	Resolution
Beach Pump Station		during daylight hours.	on the northwest side of the station during investigation. A low ORP reading was found to be the cause of the odors. The hypochlorite pump was switched to manual operation until the target ORP reading was reached, after which the odor subsided.
17700 block of Beach Drive NE	9/7/07	Complainant sensed strong odors (manure/compost) inside her residence.	Investigation found faint odor at the house and at a City of Seattle sewer manhole in front of the house, which appeared to be the source of the odor. The nearest county facility is the Log Boom Regulator. The nearest county manhole, approximately 120 feet away, had negative pressure. As a precaution, the manhole was plugged. Complaint was designated as non-county.
3600 block of Thorndyke Avenue W	9/11/07	Complainant sensed very strong manure/compost odor inside her business location. Recurring odor complaints have come from the business.	Investigation found that the mobile odor control unit at the Interbay Force Main Discharge Structure was off (electricity kicked out). The unit was reset. There are no alarms to indicate when the mobile unit fails. The Odor/Corrosion Task Force is discussing the need for a permanent odor control unit at the structure.
18500 block of 26th Avenue NE	10/2/07	Complainant reported strong rotten egg odor in her bathroom.	Upon investigation, the McAleer odor control unit was found to be without power. Seattle City Light was contacted and power was restored. Seattle City Light had done a “phase down”.
4500 block of NE 89th Street	10/24/07	Complainant reported a strong odor.	The Matthews Beach Pump Station and North Portal are the closest county facilities. The odor control system at the station was found to be operating normally. Complainant was contacted and a suggestion was made to check the City of Seattle manhole close to the residence when odors are noticed. Complaint was designated as non-county.
Woodinville Pump Station	12/5/07	Odor complaint was submitted via the WTD Director’s office.	Investigation determined that the source of the odor was standing water from the storm event on 12/3 and not associated with the Woodinville Pump Station. The finding was reported to the WTD Directors office. Complaint was designated as non-county.
2300 block of NE 127th Street/ North Lake City Trunk	12/18/07	Complainant reported odor.	Manhole cover NWW9-25 was found open because of the excessive storm flows on 12/3. The manhole was reset and sealed.
South Treatment Plant Area			
South Treatment Plant	2/7/07	Complaint received via e-mail on odor Web page. Resident had sensed strong odors during evening hours for the past month. Complainant had	Investigation of the area did not reveal any odors, and county conveyance facilities are not nearby. The county transfer station is about a mile away from resident. Complainant resides

Location	Date	Complaint	Resolution
		diffculty describing the odors but thought they were close to manure and sewage.	in the Renton Highlands area, far away from South plant. Suggested that complainant contact the City of Renton or file a general odor complaint with the Puget Sound Clean Air Agency. Complaint was designated as non-county.
South Treatment Plant	4/18/07	Complainant sensed strong sewage odor predominantly during the late evening/night hours every other day over the past month.	No odors sensed outside residence during investigation the next morning. The residence is quite a distance from South plant. No unusual activities were recorded in the operators log during the past week, and all odor control units in the plant were in operation. No further action was taken at this time. Asked complainant to call plant again when odors are sensed and to maintain a log depicting time, description, and intensity of the odors. Complaint was designated as non-county.
South Treatment Plant	4/26/07	Complainant sensed a strong sewage odor outside residence during daytime hours.	No odors sensed outside residence during investigation one half-hour after complaint was recieved. Complainant also could not sense the odor during investigation and reported the odor comes and goes quickly. No unusual activities were recorded in the operators log on 4/26. All odor control units in the plant were in operation. No further action was taken at this time. Complaint was designated as non-county.
South Treatment Plant	4/27/07	Complainant sensed strong sewage odors during late afternoon.	No sewage odors sensed outside residence during investigation one half-hour after complaint was recieved. Very strong odors were sensed from a garbage dumpster filled with house remodel debris. The wind was from the west at the time of the complaint, making it highly unlikely that South plant was the source of the odor. It was recommended that complainant empty the garbage dumpster to make odor monitoring easier. No further action was taken at this time. Complaint was designated as non-county.
South Treatment Plant	4/30/07	Complainant sensed ongoing odors during late afternoon.	No odors were sensed outside the residence during investigation. The operators log on 4/30 noted that roof hatches were open on Digester 2 and that secondary Sedimentation Tank 10 was being hosed. All odor control units in the plant were operating. Odors were also reported at this residence on 4/18, 4/26, 4/27 (see above). Complaints will be discussed at the upcoming Odor/Corrosion Task Force meeting. No further action was taken at this time. Complaint was designated as non-county.
South Treatment Plant	4/30/07	Complaint received via e-mail to WTD Director from a representative of a business located just east of South	A memo was drafted and sent to the contact person at Black River Corporate Park, detailing the importance of odor control at the plant and

Location	Date	Complaint	Resolution
		plant. Customers come into office and inquire about the "stench" coming from the treatment plant.	the current construction that should help to scrub odors from the secondary treatment process in the future.
South Treatment Plant	5/23/07	Received odor complaint from Puget Sound Energy (PSE), which was informed by the Renton Fire Department that many citizens were calling them about strong sewage odors in an area about 2.7 miles away from South plant.	No sewage odors were sensed in the area during investigation. A natural gas odor was sensed at Longfellow Drive and Monster Road near the plant. During the following 3 days, natural gas odors were sensed from a widespread area (Tukwila, Renton). The Tukwila Fire Department visited South plant on 5/25 and 5/30 in response to calls concerning natural gas odors in buildings. (The fire department sent out HazMat response teams for each complaint.) PSE and the Tukwila Fire Department ran checks of the South plant scrubbed gas line to PSE and detected no leaks. Natural gas odor continues to be sensed from different areas. Complaint considered indeterminate at this time.
South Treatment Plant	6/1/07	Complainant sensed "fish-type" odors from a property near Martin Luther King, Jr., Way and stated that the odors are from the treatment plant.	No odors were detected during investigation at the property. The person working at the address did not detect any offensive odors all morning. The property owner was not present at the time of the complaint. During a previous investigation in response to odor complaints at this property, no odors could be detected. No further action was taken at this time. Complaint was designated as non-county.
South Treatment Plant	6/5/07	Complaint received via the Tukwila Fire Department. A citizen called the fire department about natural gas odors in that area. The fire department was investigating and would call South plant Main Control if needed.	The fire department did not call back. Complaint was designated as non-county. A recent correspondence from the Puget Sound Clean Air Agency suggests that they may have found the source of the natural gas odor (a transport tanker cleaning operation).
South Treatment Plant	7/12/07	Complaint received from residence.	Two Operations staff investigated the complaint and noticed a faint "fresh sewage" odor near the residence, but one not typically associated with the plant. While driving back to the plant, staff sensed odors on the Beacon Coal Mine Road and found a Skyway Sewer and Water District lift station that may have been the source of the odor. Complaint was designated as non-county.
South Treatment Plant	8/28/07	Complaint received via e-mail from City of Renton. Complainant sensed odors while driving to work and although the situation has gotten considerably better, thinks the odors are unhealthy and should be invesitgated.	No odors were sensed during investigation. Highly unlikely that South plant is the source of the complaint because the distance is over a mile. The county does not have any manholes or lines in that area (closest manhole is on the South Interceptor at Oakesdale and 27th). No further action was taken at this time. Complaint was designated as non-county.

Location	Date	Complaint	Resolution
South Treatment Plant	9/28/07	Complainant sensed moderate "rotten eggs" odor inside and outside a business.	No outdoor odors were sensed during investigation. Indoor odors were sensed at two businesses (Habitat for Humanity and an engineer's office). The county manhole at the corner of 153rd is sealed. The City of Tukwila was notified. Complaint was designated as non-county.
South Treatment Plant	11/13/07	Compaintant sensed odor at residence.	The residence is not in the immediate South plant area. Operators walked around the plant and did not sense any unusual odors. They drove to the transfer station and Interurban Pump Station and did not detect any odors. The only odors sensed were of a bark/compost nature from the northwest side of the plant. Complaint was designated as non-county.
South Treatment Plant	12/21/07	Compaintant sensed odor at her residence. She initially thought the odor was from the county solid waste facility near residence. King County Soild Waste Division informed her to call South plant.	The residence is not in the immediate South plant area and no county conveyance facilities are nearby (residence is near Renton vocational school). Investigated area near residence and could not detect any odors. Suggested complainant contact the Puget Sound Clear Air Agency and register a complaint if odors continue. Complaint was designated as non-county.
South/East Service Offsite Area			
Medina Force Main Discharge area	2/23/07	Complaint received via the Bellevue Fire Department and PSE. Reported sensing propane, natural gas odors along the railroad tracks.	Carbon odor was sensed from the mobile odor unit exhaust during investigation. The carbon in the three odor control units was changed on 3/1.
Tukwila Crossing/Hat Highlands Manhole MO-3	4/20/07	Complaint received via the ValVue Sewer District. Odors were sensed inside and outside Habitat for Humanity (15349 53rd Avenue S).	Organic odors were sensed and positive pressure was blowing air out at Manhole MO-3 during investigation. The manhole was caulked. In addition, Facilities Inspection found a local manhole next to Habitat for Humanity with a buildup of solids and debris. A message was left with the Tukwila's sewer district recommending that this line be flushed out, which was done on 4/24.
12100 block of SE 31Street Street – Juniper Ridge Apartments	5/3/07	Complaint received via the WTD Community Relations section. Moderate sewer odor was sensed at apartments (near the Sweyolocken Force Main Discharge Structure) during early evening hours off and on since late April.	An odor was sensed during investigation. The recharged water dump cycle at the structure was adjusted, and the canisters in the Phoenix odor control unit were changed.
17200 block of 97th Place SW, Vashon Island	5/15/07	Complainant has called in the past about similar odor problems (methane in the afternoon). Complainant has a sewer main running beneath her deck and has	The operator at the Vashon plant performs a routine operation for about a half-hour every afternoon, which stirs up the sludge in the holding tank. The operator will contact the Vashon Sewer District and inquire about

Location	Date	Complaint	Resolution
		apparent plumbing and venting issues.	drawings of the sewer main and whether they could flush out the line. No other action was taken at this time. If problems persist, Facilities Maintenance may perform a smoke test. Complaint was designated as non-county.
Henderson Regulator Outlet Station	5/15/07	Complainant sensed strong "outhouse" odor inside residence.	The duct from the regulator building exhaust fan points in the direction of the residence. Inspection found that the intake fan belt to the sample area was broken. Also the water seal to the screening area level was low, allowing odors to escape. Maintenance was notified. The belt was replaced, and the screening area level was refilled.
7100 block of Beach Drive SW, Seattle	6/2/07	Resident near the Murray Avenue Pump Station reported sensing intermittent rotten egg odor.	Investigation did not detect any noticeable odor. The carbon in the odor control unit had been changed recently. The fan filters easily clog with grease and could have plugged foul air from entering the odor control unit. The wet well was hosed down, and the filter was changed.
South Mercer Pump Station	6/4/07	Complainant sensed strong rotten egg odor over the past several days.	No odors were detected during investigation, and the odor control unit was in operation.
61st SW/ Spokane Street, Seattle	6/20/07	Complaint was called in to West Point on 6/19, sent via fax to the South plant that evening, and reviewed the following morning.	Because the fax was not reviewed until the following morning, staff did not meet the 2-hour response criterion. The complainant did not sense an odor at the time he was called. The county owns a conveyance line at the location of his complaint (near the 63rd Avenue Pump Station). The odor control unit at the Alki CSO plant was in operation. No further action was taken at this time.
25800 block of 115th Avenue SE, Kent	6/25/07	Complaint from property owner and neighbors living at an apartment complex.	During investigation, odors were sensed emanating from a vent pipe located 20 feet up a utility pole and connected to a county sewer line. A carbon filter was attached to the vent pipe to treat the odors. The carbon requires periodic changing.
11900 block of NE 1st Street, Bellevue	6/27/07	Complainant (security personnel for City University located just above the hill of the Medina Force Main Discharge Structure) has called in the past about similar odor problems. He sensed a "dead rat" odor all day.	Investigation did not detect any odors. All three odor control units located at the discharge structure were changed in late February 2007, making it unlikely that the odor control facilities were the cause of the complaint. There were no additional odor complaints from this area as of mid July 2007. Complaint was designated as non-county.
25800 block of 116th Avenue SE, Kent	7/6/07	Complaint from an apartment complex property owner and neighbors.	Investigation found odors are emanating from a vent pipe located 20 feet up a power pole, which is connected to a county sewer line. A carbon filter was attached to the vent pipe to treat the odors and will be changed periodically. The power pole will have to be moved in the near future to accommodate

Location	Date	Complaint	Resolution
			widening of traffic lanes in the area.
3500 block of Beach Drive SW, Seattle	7/8/07	Complainant lives near the 63rd Avenue Pump Station and has sensed odors for the past 2 weeks. Also complained about water running on top of the station and out of the ground (informed Seattle Public Utilities).	Investigation did not detect odors around the station and tunnel manholes. Also checked the fans and odor control unit at the Alki CSO plant, which were operating correctly. Because no odors were detected and all odor control units were functioning, this complaint was designated as non-county.
North Mercer Pump Station	7/11/07	Complainant sensed sewage odor during the past few evenings at residence west of the North Mercer Pump Station.	No odors were sensed around the station during investigation. The odor control unit was operating properly. The salt solution in the Pepcon odor control unit was recharged the next day.
North Mercer Pump Station	7/17/07	Complainant sensed strong sewage odors while on her deck.	No noticeable odors were detected around the perimeter or inside the pump station during investigation. The Pepcon odor control unit was operating properly. Further investigation found odors escaping from the manhole where Bioxide is being dosed (positive pressure), so the manhole was sealed.
Beulah Cove, Vashon Island	8/2/07	Property owner just above the Beulah Cove treatment trains sensed a “methane” type odor.	A hydrogen sulfide odor was sensed during investigation. A high tide eliminated the possibility of beach decay as the source of the odor complaint. The carbon barrels at the Cove were replaced as the immediate response. The carbon in the caps of the vent pipes were replaced a few weeks later.
Medina Force Main Discharge Structure	8/5/07	Security at City University located above the hill of the discharge structure sensed “dead animal” odor.	An “organic” odor from the treatment of foul air though caustic-impregnated carbon in the mobile unit was sensed during investigation. No sewage odors were sensed. The complainant was informed. No further action was taken at this time. If further complaints arise, the carbon in the mobile unit may need to be changed to activated carbon.
12000 block of SE 11th Street, Bellevue	8/14/07	Complainant sensed strong odors and contacted the WTD Community Relations section, who forwarded the complaint to the South plant.	No detectable odors were noticed at the Wilburton Siphon Outlet Structure during investigation. All manholes in the area were sealed. The complainant was notified and agreed that the odor was not from the siphon structure. No further action was taken at this time. Complaint was designated as non-county.
Enatai Beach Park, Bellevue	8/28/07	Complainant sensed “rotten eggs and vegetation” odors at park.	Slight sewer odors were sensed during investigation. A few of the manholes were reseated and then sealed. The City of Bellevue was notified.
Wilburton Siphon Inlet Structure mobile odor control unit at	9/7/07	Car dealership located below the odor control units at the Medina Force Main Discharge Structure sensed strong sewage odor.	On investigation, strong sulfide odors were sensed at ground level from the mobile odor control unit exhaust (490–660 ppb H_2S). The carbon in both the skid-mounted and mobile odor units was changed on 9/12. Further

Location	Date	Complaint	Resolution
Medina Force Main Discharge Structure			investigation on why the previous media lasted only 6 months is needed. There is an extremely high sulfide level at the Wilburton Siphon Inlet Structure.
Fauntleroy Ferry Dock, Seattle	9/12/07	Complainant (ferry ticket operator) sensed very strong manure/rotten egg odors next to Barton Pump Station.	No odor was sensed at the time of investigation, and the complainant could not sense any more odors. The odor control unit was operating properly at the station. The day after this complaint, process staff checked the odor control unit and could not sense any odors. The sulfide measured coming out the exhaust was minimal (2 ppb). No further action was taken at this time. Complaint was designated as non-county.
7100 block of Beach Drive SW, Seattle	9/13/07	Complainant sensed moderate manure/compost odors from a manhole located next to residence.	Positive pressure and high levels of hydrogen sulfide were measured from two manholes on Beach Drive SW near complainant's residence during investigation. The manholes were sealed, and the filter for the wet well fan was changed.
500 block of 102nd Avenue SE	10/23/07	The WTD Community Relations section received a complaint from parents and staff of a childcare center. Odor was thought to be coming from construction in the area.	The nearest county facility is the Bellevue Pump Station. The Pepcon unit was operational and no odors were noticed during investigation. Complaint was designated as non-county
25700 block of 119th Avenue SE, Kent	10/24/07	Complainant described a very strong manure/compost/sewage odor from a manhole that has been occurring for the past 6 months.	The manholes were sealed.
17600 block of NE 67th Court, Redmond	10/26/07	Complainant described a very strong sewer gas odor outside and believed the odor was backing up into building drains. He thought that the odor was coming from a manhole located just outside his building.	Investigation determined that the manhole belonged to the City of Redmond. Complaint was designated as non-county.
Wilburton Siphon Inlet Structure skid-mounted odor control unit	11/14/07	Complainant sensed a very strong "rotten egg" odor from inside building located just below the Medina Force Main Discharge Structure.	On investigation, it was discovered that the fan unit to the skid-mounted odor control unit malfunctioned and shut down. The unit was restarted, and the complainant was notified.
Murray Avenue Pump Station	12/26/07	Complainant sensed odor from an air grate in the park next to the pump station.	Investigation found that the odor control system was operating but that the exhaust fan belt was broken. Installed a new belt for the fan and started the fan. The filter in the system was also replaced. The complainant was notified.

Appendix B

RWSP Project Reports

The RWSP reporting policies call for details on RWSP capital projects, including a project schedule, an expenditures summary (including staff labor and miscellaneous services), a description of any adjustments to costs and schedules, and a status of the project contracts. This appendix meets these requirements and includes a project report for the year 2007 on the following RWSP capital projects that are in design or construction:

- Brightwater Treatment Plant, project #423484[1]
- Brightwater Conveyance, project #423575
- Brightwater Reclaimed Water Pipeline, project #423600
- Vashon Treatment Plant, project #423460
- Carnation Treatment Plant, project #423557
- Chinook Wetlands Enhancement, project #423611
- West Point Odor Control Improvements, project #423584
- South Plant Odor Control Improvements, project #423585
- King Street Regulator Odor Control, project #423580
- Bellevue Pump Station, project #423521
- Black Diamond Storage, project #423373, subproject 621
- Kent/Auburn Conveyance System Improvements, project #423582
- Hidden Lake Pump Station and Boeing Creek Trunk, project #423365
- Fairwood Interceptor Sewer Project, project #423494
- Juanita Bay Pump Station, project #423406
- North Creek Pipeline, project #423596

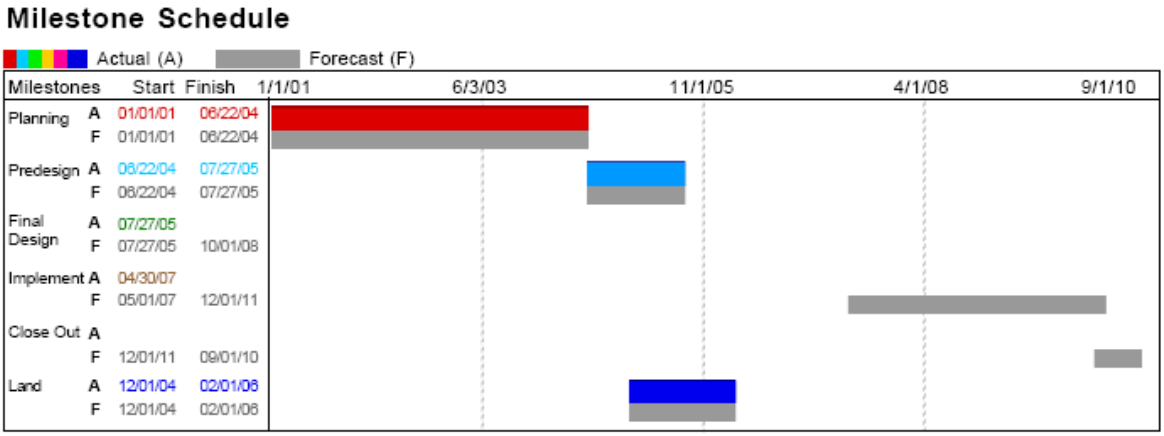
[1]Each wastewater capital project is assigned a six-digit number such as 423484. The first two numbers (42) identify this as a wastewater project (as opposed to a transit or roads project). The third number (3) identifies the project as capital project (as opposed to operating) and the last three numbers are sequential numbers reflecting the order the projects were assigned in a particular year.

- RWSP Local System I/I Control, project #423297
- Magnolia CSO Control and Improvements, project #423607
- Murray CSO Control and Improvements, project #423608
- North Beach CSO Control and Improvements, project #423609
- Barton CSO Control and Improvements, project #423610
- Sediment Management Program, project #423368
- Lower Duwamish Waterway Superfund, project #423589

Each report is generated from the Wastewater Treatment Division (WTD) Project Management and Financial Forecast Database. An explanation of the information provided in each report follows.

Schedule and Cost Summary Page

The second page of each report shows the project's milestone schedule in a bar graph format. The graph includes timelines for the various phases of a project: planning, predesign, final design, implementation, close out, and land acquisition. An example of a project schedule follows.



The cost summary table provides expenditure information for the year 2007 and lifetime budget information based on the adopted 2007 budget. An example of a project cost summary table and an explanation of how to read the summary follows.

Cost Summary

	2007 Actual Expenditure and Plan			Lifetime Actual Expenditure and Budget		
Expenses	IBIS YTD Dec-07	Adopted Plan	Updated Plan	IBIS LTD Dec-07	Lifetime Budget	Updated Budget
CONSTRUCTION	6,430,546	8,812,923	9,209,150	14,938,120	22,964,516	21,719,286
Construction Contracts	6,430,546	8,704,000	9,204,000	14,916,962	22,684,448	21,600,354
Outside Agency Construction		15,450	0	0	30,450	15,450
Other Capital Charges	0	93,472	5,150	21,158	249,618	103,482
NON-CONSTRUCTION	1,951,735	2,645,341	2,372,040	12,477,150	14,012,401	14,280,099
Engineering	783,382	1,518,000	500,000	7,062,531	8,670,261	7,281,648
Planning & Management Svcs.	22,786	0	46,000	127,466	70,804	174,280
Permitting & Other Agency Support	43,407	161,464	91,515	136,802	214,318	184,910
Right-of-Way	0	0	0	1,541,751	1,541,751	1,541,751
Misc. Services & Materials	79,771	5,150	55,000	203,297	86,405	204,275
Staff Labor	1,022,389	960,726	1,679,525	3,405,304	3,428,862	4,893,234
PROJECT RESERVE			10,000	0		1,075,713
Project Reserve			10,000	0		1,075,713
Total $	8,382,281	11,458,263	11,591,190	27,415,269	36,976,918	37,075,097

Expenses
CONSTRUCTION
Construction Contracts
Owner Furnished Equipment
Outside Agency Construction
Other Capital Charges
NON-CONSTRUCTION
Engineering
Planning & Management Svcs.
Permitting & Other Agency Support
Right-of-Way
Misc. Services & Materials
Staff Labor
PROJECT RESERVE
Project Reserve
CREDITS AND REVENUES
Credits and Revenues
Total $

The "Expenses" column of the cost summary table is broken down into four main headings:

- Construction. These are costs associated with construction.
- Non-Construction. These are the costs associated with outside engineering services, permitting and other agency support (costs for permits), planning and management services, right-of-way (costs associated with acquisition and easements), and WTD and other county labor costs.
- Project Reserve. These are costs associated with project contingency.
- Credits and Revenues. Credits and revenues reflect grants received, rents received, or salvage/surplus revenues.

2007 Actual Expenditure and Plan		
IBIS YTD Dec-07	Adopted Plan	Updated Plan
6,430,546	8,812,923	9,209,150
6,430,546	8,704,000	9,204,000
	15,450	0
0	93,472	5,150
1,951,735	2,645,341	2,372,040
783,382	1,518,000	500,000
22,786	0	46,000
43,407	161,464	91,515
0	0	0
79,771	5,150	55,000
1,022,389	960,726	1,679,525
		10,000
		10,000
8,382,281	11,458,263	11,591,190

The columns under "2007 Annual Expenditure and Plan" of the cost summary table reflect expenditures for 2007. The three headings under annual expenditures include:

- IBIS* DEC-07. This column reflects the expenditures for the year 2007, from January through December 2007.
- Adopted Plan. The costs in this column reflect approved appropriation and breakdown by expense category for the year 2007.
- Upated Plan. The costs in this column reflect what was anticipated to be expended of the 2007 King County Council-approved project budget in preparation for the 2008-2013 budget submittal. Project managers begin developing their project budget submittals nine months before a budget is adopted and appropriated. Changes may occur from the time a budget is developed as compared to the actual budget year. Such changes may result from new information that could affect the project's scope or schedule, construction delays, or permitting and environmental review complexities.

* IBIS refers to King County's financial reporting system.

Lifetime Actual Expenditure and Budget		
IBIS LTD Dec-07	Lifetime Budget	Updated Budget
14,938,120	22,964,516	21,719,286
14,916,962	22,684,448	21,600,364
0	30,450	15,450
21,158	249,618	103,482
12,477,150	14,012,401	14,280,099
7,062,531	8,670,261	7,281,648
127,466	70,804	174,280
136,802	214,318	184,910
1,541,751	1,541,751	1,541,751
203,297	86,405	204,275
3,405,304	3,428,862	4,893,234
0		1,075,713
0		1,075,713
27,415,269	36,976,918	37,075,097

The columns under "Lifetime Actual Expenditure" and Budget of the cost summary table include the following four columns:

- IBIS LTD Dec-07. The costs in this column refer to total project expenditures through December 2007.
- Lifetime Budget. The costs in this column refer to projected total inflated project costs as adopted in the 2007-2012 budget (November 2006).
- Updated Budget. The costs in this column reflect the projected total inflated project costs as adopted in the 2008-2012 budget (November 2007). As noted earlier, project managers begin developing their project budget submittals around nine months before a budget is adopted and appropriated. The next year's (2008) budget submittal takes into account changes to the project scope or schedule, or new information identified since the current year's (2007) budget was adopted.

Contract Status

The third page of each project report includes information on contract status, if there are contracts associated with the project.

The contract status table provides the name of the contract, the original contract amount, amounts associated with amendments or change orders, and percentage paid of contract. The "Phased Amends" column refers to additional planned phases of the contract; the value of those planned phase amendments are included in the "Base Contract Amount" column. If work

associated with the contract was not planned when the original contract was signed, the costs associated with that work is seen in the "Change Amends or COs" column.

An example of the contract status table follows.

Contract Status

Contract	Original Contract Amount	Phased Amends	Base Contract Amount	Change Amends or COs	Change Percentage	Nbr of Amends/CO's to Date	Current Contract Amount	Amount Paid	Thru Pmt No.	% Paid
Juanita Bay Pump Station Replacement C43085C	$18,888,000	$0	$18,888,000	$108,070	1%	4	$19,096,070	$13,176,328	21	69%
Eng'g Services for Juanita Bay & Forcemain Update E03037E	$1,849,354	$6,577,438	$8,426,792	$0	0%	4	$8,426,792	$6,990,122	78	82%

RWSP Project Report
DECEMBER 2007

423484 Brightwater Treatment Plant

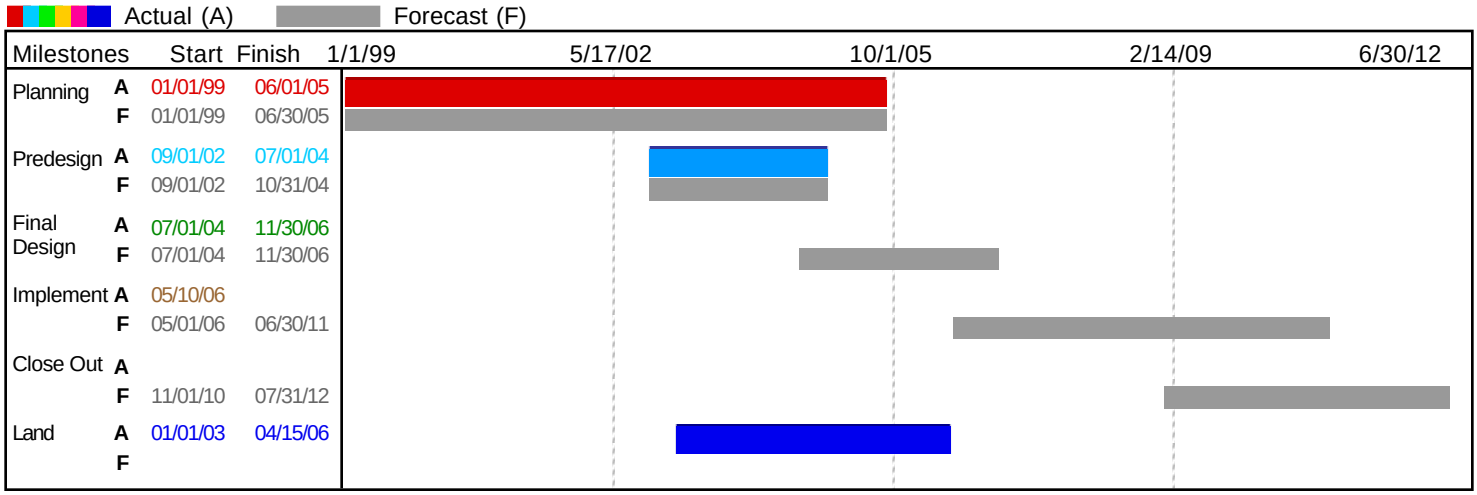
Project Description

This project will design and construct a treatment plant to provide 36 million gallons per day (mgd) of treatment capacity (average wet weather flow) by 2011 and 54 mgd of capacity by 2040. The Brightwater Treatment Plant will be located just east of State Route 9 and north of State Route 522 and Woodinville. Treatment and support facilities will cover approximately 43.0 acres (with additional area for stormwater treatment, open space, wildlife habitat and wetlands). The Brightwater plant will include membrane bioreactor (MBR) secondary treatment systems, Class B biosolids, reclaimed water production, odor control systems, and disinfection.

Project Phase: 4 Implementation

King County
Department of Natural Resources and Parks
Wastewater Treatment Division

Milestone Schedule



Schedule Adjustments

Cost Summary

Expenses	2007 Actual Expenditure and Plan			Lifetime Actual Expenditure and Budget		
	IBIS YTD Dec-07	Adopted Plan	Updated Plan	IBIS LTD Dec-07	Lifetime Budget	Updated Budget
CONSTRUCTION	33,639,823	23,302,968	32,965,972	58,348,045	478,861,442	530,713,965
Construction Contracts	33,541,646	23,595,078	30,263,804	58,057,923	478,130,950	506,833,207
Owner Furnished Equipment	9,785	0	837,910	44,216	34,431	7,216,824
Outside Agency Construction	59,836	0	0	122,535	0	4,562,699
Other Capital Charges	28,556	-292,110	1,864,258	123,372	696,061	12,101,235
NON-CONSTRUCTION	29,097,275	34,632,543	32,537,840	262,622,004	306,271,754	315,812,250
Engineering	4,868,175	973,552	3,394,738	61,229,223	56,867,396	66,328,597
Planning & Management Svcs.	2,340,207	2,867,858	2,143,536	14,299,890	24,754,525	26,331,979
Permitting & Other Agency Support	18,506,785	27,476,974	1,220,169	59,824,440	88,175,072	8,081,476
Right-of-Way	-69,962	0	22,419,156	105,290,164	103,792,966	183,749,283
Misc. Services & Materials	601,992	323,209	323,209	3,902,753	4,826,964	4,473,838
Staff Labor	2,850,078	2,990,951	3,037,032	18,075,534	27,854,832	26,847,077
PROJECT RESERVE		0	0	0	19,508,447	4,000,000
Project Reserve		0	0	0	19,508,447	4,000,000
CREDITS AND REVENUES	-410,359	-7,956,750	0	-3,035,415	-10,609,482	-10,606,932
Credits and Revenues	-410,359	-7,956,750	0	-3,035,415	-10,609,482	-10,606,932
Total $	62,326,738	49,978,761	65,503,811	317,934,634	794,032,160	839,919,283

Cost/Budget Adjustments

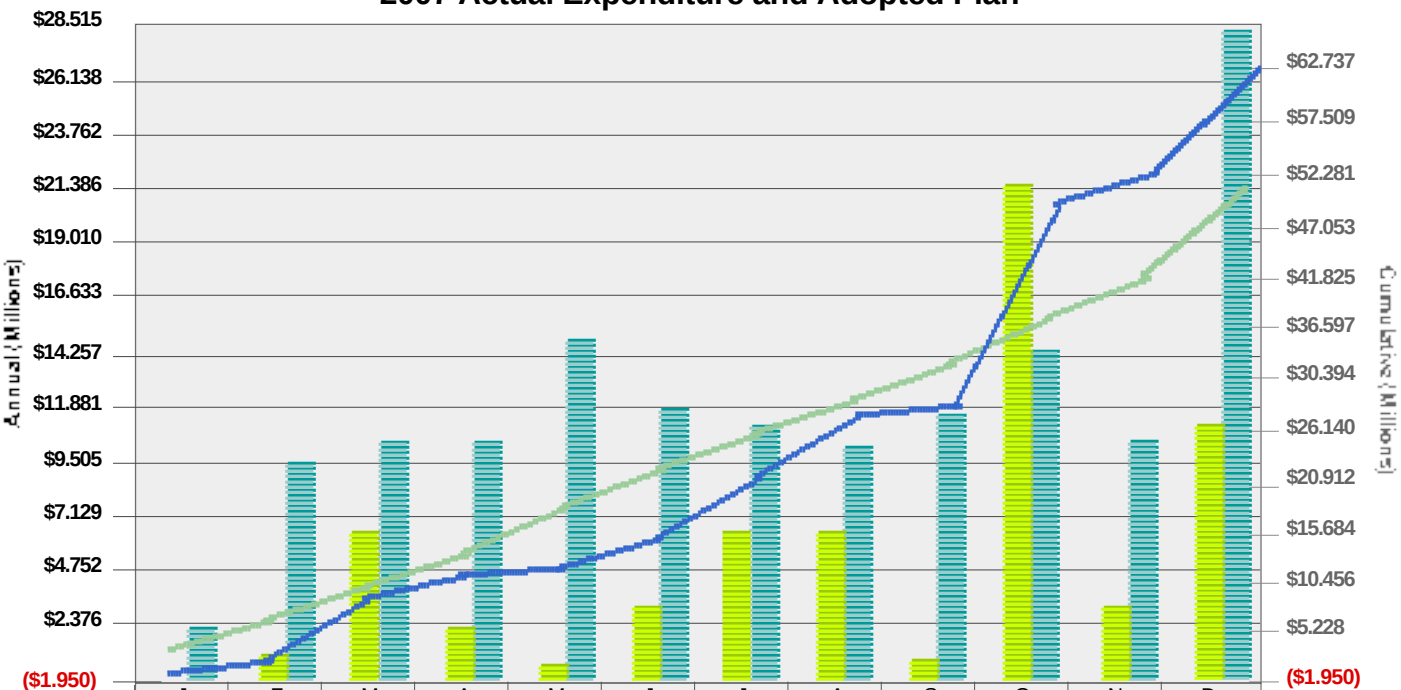
- Construction Contracts cost increases are primarily due to general and commodities-specific inflation in addition to a refinement of costs based on 100% design.
- The categories of Owner Furnished Equipment, Outside Agency Construction and Other Capital Charges reflect the relocation of costs from the Construction Contracts category for I&C equipment and Landscape materials, substation construction and OCIP insurance costs.
- Engineering costs increases associated with repackaging of the Solids contract and a reestimate of Engineering Services During Construction.
- Permitting & Other Agency Support moved mitigation payments to the Right of Way Category No net cost change
- Project Reserves reduced due to increased certainty on project costs.

Contract Status

Contract	Original Contract Amount	Phased Amends	Base Contract Amount	Change Amends or COs	Change Percentage	Nbr of Amends/CO's to Date	Current Contract Amount	Amount Paid	Thru Pmt No.	% Paid
Brightwater Treatment Plant Solids / Odor Control Facilities	$166,459,000 C00168C07	$0	$166,459,000	$0	0%		$166,459,000	$0		0%
Engineering Services for Brightwater Treatment Plant	$9,719,364 E13035E	$45,871,493	$55,590,857	$16,684,569	30%	34	$72,275,427	$58,346,216	409	81%
North Treatment Facilities Site Selection	$4,617,000 P93012P	$0	$4,617,000	$7,629,920	165%	12	$12,246,920	$12,001,214	71	98%
Architectural, Landscape Arch & Interior Design Svcs/Brightwater	$4,401,280 E23002E	$0	$4,401,280	$39,338	1%	2	$4,440,618	$4,363,046	21	98%
Brightwater Legal Services	$3,500,000 Agreement/Brightwater legal Svcs	$0	$3,500,000	$0	0%		$3,500,000	$204,486	14	6%
Construction Management Services for the Treatment Plant	$1,497,206 P53007P	$3,776,236	$5,273,442	$303,438	6%	3	$5,576,880	$2,324,557	211	42%
GCCM Contract for Brightwater	$1,424,428 C38138C	$305,141,553	$306,565,981	$2,574,321	1%	29	$309,140,302	$38,469,101	116	12%
NTF Legal Services	$1,150,000 T01129T	$2,150,000	$3,300,000	$0	0%	4	$3,300,000	$2,899,590	61	88%
NTF Legal Services	$1,150,000 T01130T	$0	$1,150,000	$2,463,000	214%	4	$3,613,000	$3,435,882	67	95%
Engrg & Design Svcs to Construct Electrical Infrastructure	$157,500 Agreement 299593	$0	$157,500	$388,700	247%	2	$546,200	$354,334	11	65%
Brightwater Treatment Plant Testing and Inspection	$100,000 P00001P06	$200,000	$300,000	$264,000	88%	3	$564,000	$342,797	19	61%
Brightwater Team Facilitation	$69,932 P56016P	$0	$69,932	$24,374	35%	2	$94,306	$68,744	7	73%

Annual Cash Flow

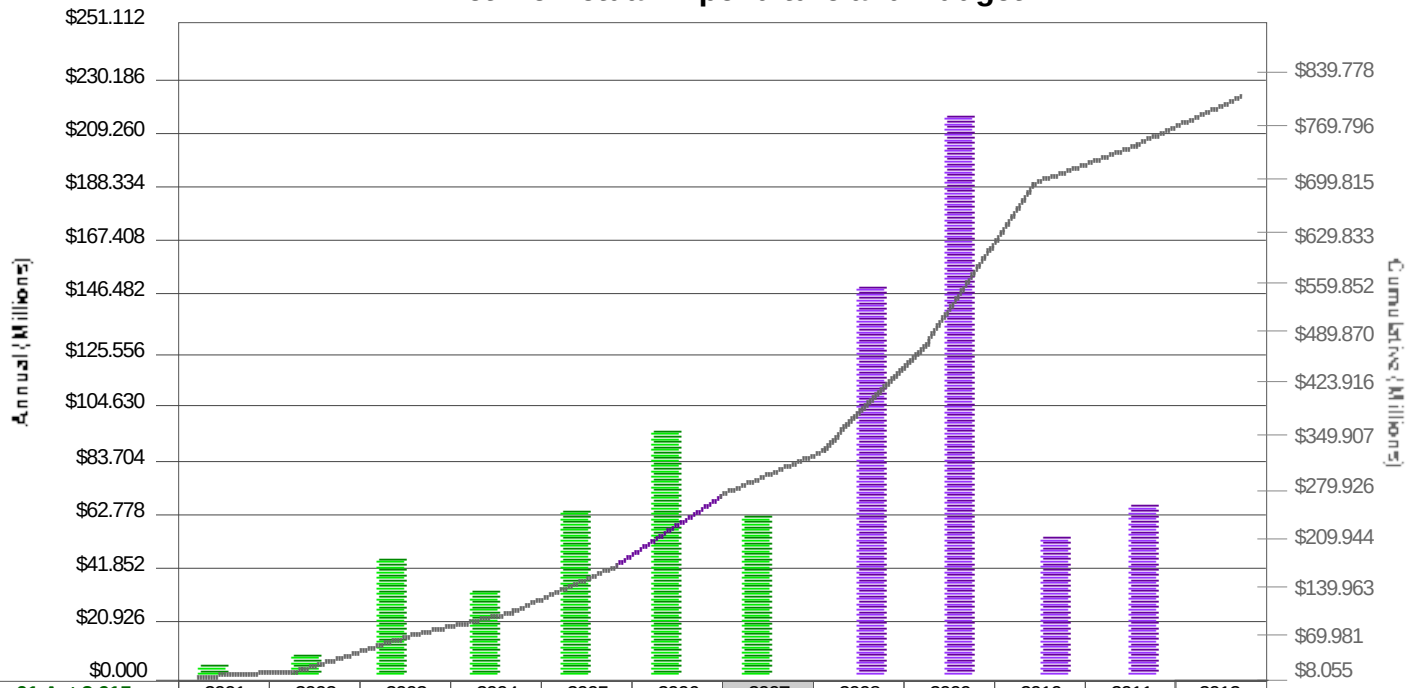
2007 Actual Expenditure and Adopted Plan



	J	F	M	A	M	J	J	A	S	O	N	D
Actual	-1.950	1.330	6.670	2.488	0.745	3.250	6.521	6.576	0.998	21.627	3.348	11.133
Adopted Plan	2.352	9.701	10.583	10.436	14.992	12.053	11.318	10.289	11.612	14.551	10.583	28.368
Cum. Plan	0.600	3.748	7.397	10.895	15.793	19.942	23.690	27.288	31.187	40.383	40.383	49.979
Cum. Act	-1.950	-0.620	6.050	8.537	9.283	12.533	19.055	25.631	26.629	48.256	51.604	62.737

Lifetime Cash Flow

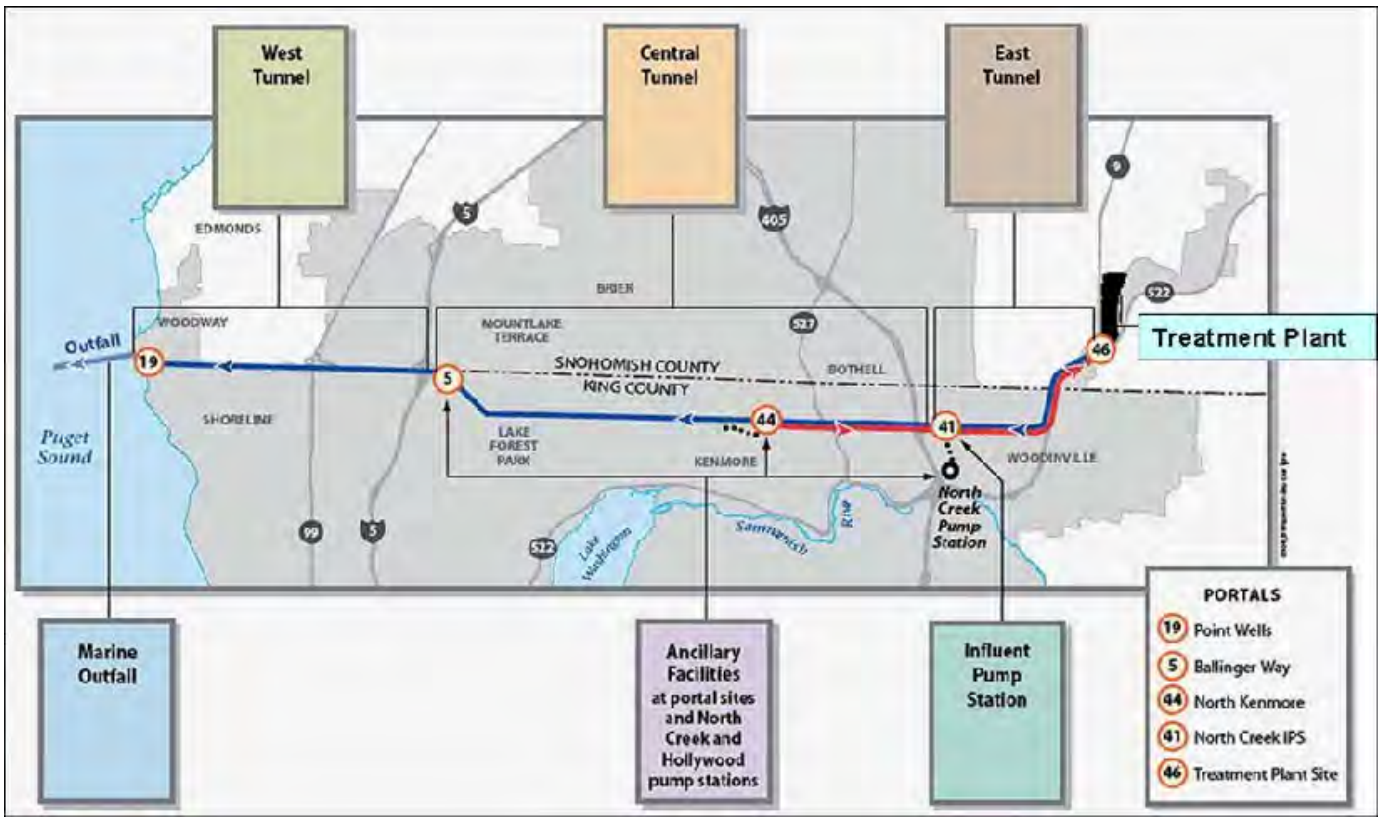
Lifetime Actual Expenditure and Budget



Pre-01 Act 2.615	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Actual Dec-07	5.441	9.675	46.925	33.541	64.348	95.688	62.737					
Budget								149.396	215.616	54.362	66.354	0.000
CumAct+Bdgt	8.055	17.730	64.655	98.197	162.545	258.233	320.970	470.366	685.982	740.344	806.698	806.698

RWSP Project Report
DECEMBER 2007

423575 Brightwater Conveyance



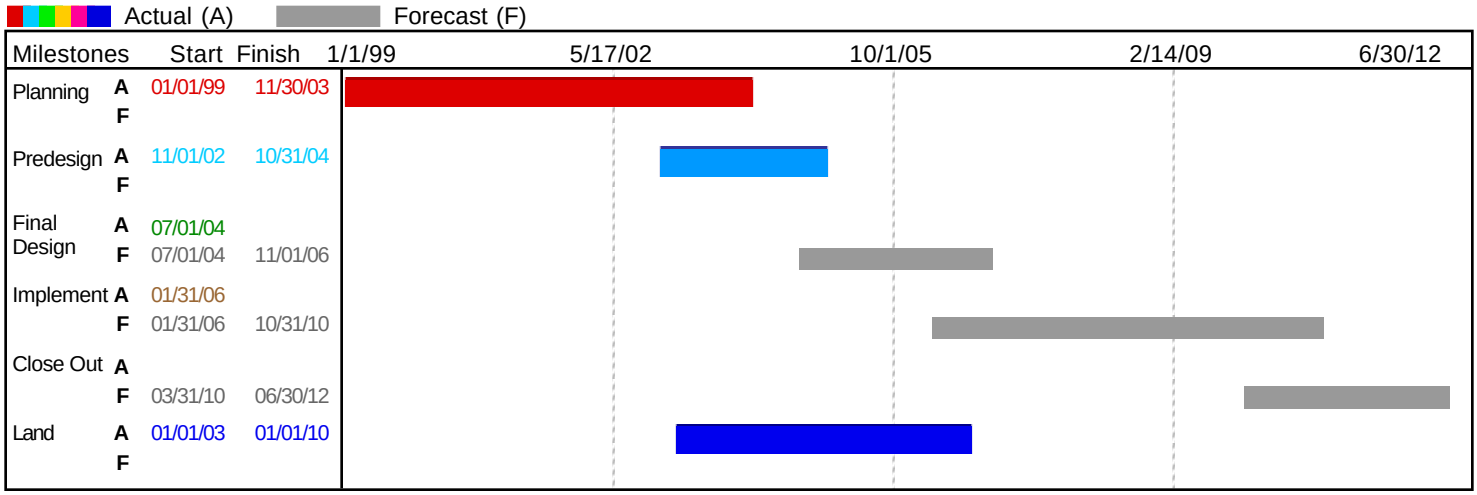
Project Description

This project will carry treated and untreated wastewater to and from the Brightwater treatment plant located north of Woodinville along State Route 9. The Brightwater project will serve south Snohomish County and north King County once it becomes operational in 2011. The 14.9-mile-long Brightwater conveyance system is composed of a deep large diameter deep tunnel extending from the treatment plant to Puget Sound. The tunnel will discharge highly treated effluent through a new outfall located one mile offshore of point Wells at a depth of 600 feet.

Project Phase: 4 Implementation

King County
Department of Natural Resources and Parks
Wastewater Treatment Division

Milestone Schedule



Schedule Adjustments

Cost Summary

Expenses	2007 Actual Expenditure and Plan			Lifetime Actual Expenditure and Budget		
	IBIS YTD Dec-07	Adopted Plan	Updated Plan	IBIS LTD Dec-07	Lifetime Budget	Updated Budget
CONSTRUCTION	126,159,530	131,004,392	133,169,815	182,352,709	660,848,472	713,354,996
Construction Contracts	123,975,700	131,004,392	128,866,328	179,574,467	650,047,986	690,391,721
Owner Furnished Equipment	0	0	0	87,999	87,999	87,999
Outside Agency Construction	2,127,017	0	1,183,479	2,449,447	3,724,740	5,056,347
Other Capital Charges	56,813	0	3,120,007	240,797	6,987,748	17,818,930
NON-CONSTRUCTION	24,836,459	21,823,044	25,666,753	144,401,199	206,563,963	196,062,640
Engineering	8,061,628	5,840,994	3,893,428	67,321,682	82,878,546	70,005,067
Planning & Management Svcs.	7,097,219	9,120,569	9,202,829	27,742,389	57,860,431	57,595,909
Permitting & Other Agency Support	4,902,465	3,170,667	7,455,000	6,450,875	13,924,480	13,304,695
Right-of-Way	461,544	0	1,359,239	18,036,305	16,714,069	18,933,999
Misc. Services & Materials	673,970	351,555	382,713	3,932,250	4,799,717	5,261,277
Staff Labor	3,639,632	3,339,258	3,373,545	20,917,698	30,386,720	30,961,693
PROJECT RESERVE		0	0	0	93,094,949	18,200,829
Project Reserve		0	0	0	93,094,949	18,200,829
CREDITS AND REVENUES	-1,064	0	0	-6,415	-1,850	-5,351
Credits and Revenues	-1,064	0	0	-6,415	-1,850	-5,351
Total $	150,994,925	152,827,435	158,836,568	326,747,493	960,505,535	927,613,115

Cost/Budget Adjustments

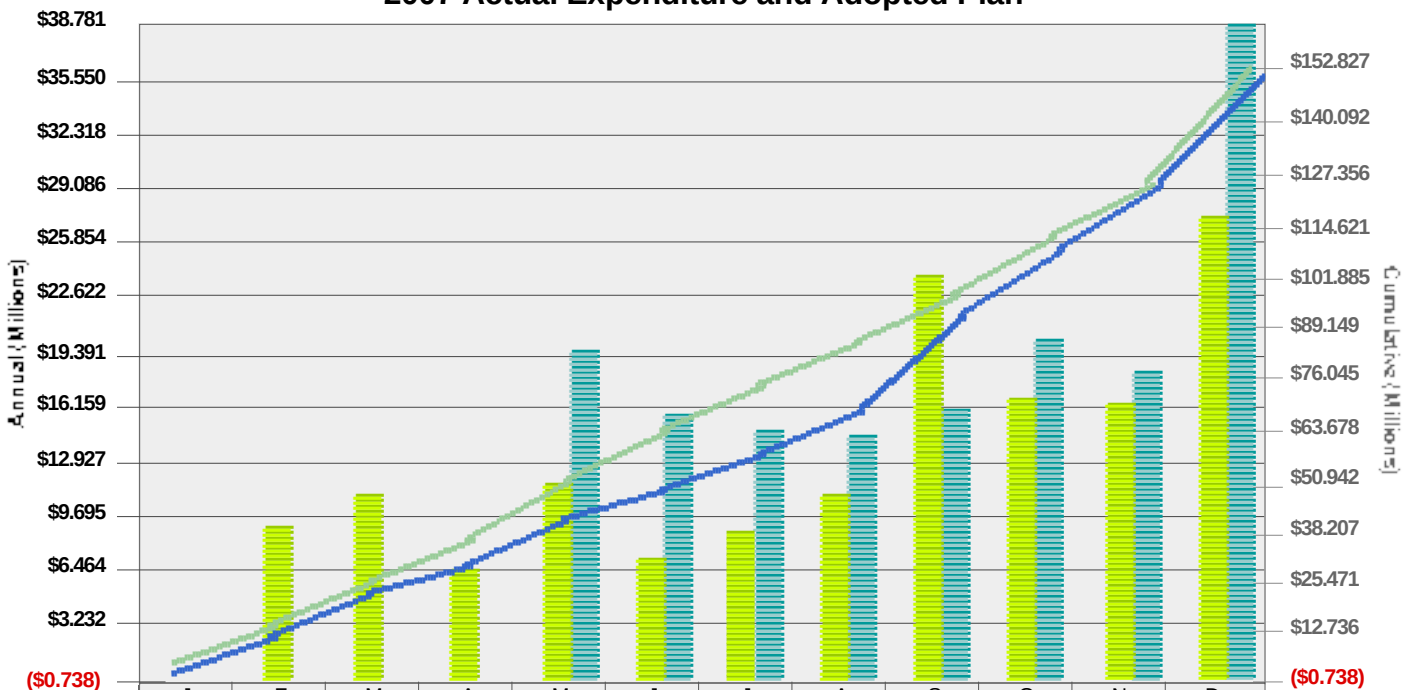
- Increased forecast construction costs due primarily to inflation and market impact on West Tunnel and IPS contracts. Some of these costs were offset by favorable bid environment for the Central Tunnel Contract.
- Other Capital Charges reflect the relocation of costs from the Construction Contracts category for OCIP insurance costs.
- Engineering costs forecast to decrease based on lower design/services during construction and Geotech engineering based on actual use. Also moved Outfall Design costs up to Construction Contracts as part of Design-Build cost.
- Decrease in overall Project Contingency due to reduction in uncertainties relating to land acquisition, mitigation and design as well as the actual award of Central and West contracts

Contract Status

Contract	Original Contract Amount	Phased Amends	Base Contract Amount	Change Amends or COs	Change Percentage	Nbr of Amends/CO's to Date	Current Contract Amount	Amount Paid	Thru Pmt No.	% Paid
Brightwater Conveyance Sys, Central Contract, BW Tunnel,	$211,076,058 C00005C06	$0	$211,076,058	$853,016	0%	6	$211,929,074	$73,686,061	22	35%
East Combined Tunnel	$130,848,750 C53060C	$0	$130,848,750	$1,004,775	1%	6	$131,853,525	$64,029,907	25	49%
Brightwater Conveyance System - West Contract	$102,453,000 C00007C06	$0	$102,453,000	$3,401,466	3%	1	$105,854,466	$15,172,455	8	14%
CM Services for BW Conveyance	$13,327,255 P43020P	$16,687,974	$30,015,229	$2,295,318	8%	4	$32,310,547	$11,548,072	32	36%
Geotechnical Services for the Brightwater Conveyance	$11,474,386 E23007E	$10,386,010	$21,860,396	$368,876	2%	5	$22,229,272	$15,437,124	592	69%
Brightwater Conveyance	$11,173,313 E33015E/A	$2,291,578	$13,464,890	$0	0%	1	$13,464,890	$12,022,094	41	89%
Prof Svcs for Brightwater Conveyance Final Design	$7,167,571 E33015E/C	$1,581,546	$8,749,117	$0	0%	1	$8,749,117	$6,782,133	41	78%
Prof Svcs for Brightwater Conveyance Final Design	$5,672,837 E33015E/B	$1,234,040	$6,906,877	$0	0%	1	$6,906,877	$4,709,981	41	68%
Brightwater Reclaimed Water Conveyance Facility	$1,918,771 E43010E	$2,039,387	$3,958,158	-$469,808	-12%	5	$3,488,350	$2,785,767	212	80%
Construction Management Services for the Brightwater	$933,568 P53017P	$0	$933,568	$0	0%		$933,568	$278,439	17	30%
Brightwater Oversight Monitoring Consultant	$475,916 P43024P	$337,636	$813,552	$0	0%	1	$813,552	$587,022	32	72%
Brightwater Conveyance Testing & Inspection	$250,000 P53018P	$0	$250,000	$0	0%		$250,000	$49,927	32	20%

Annual Cash Flow

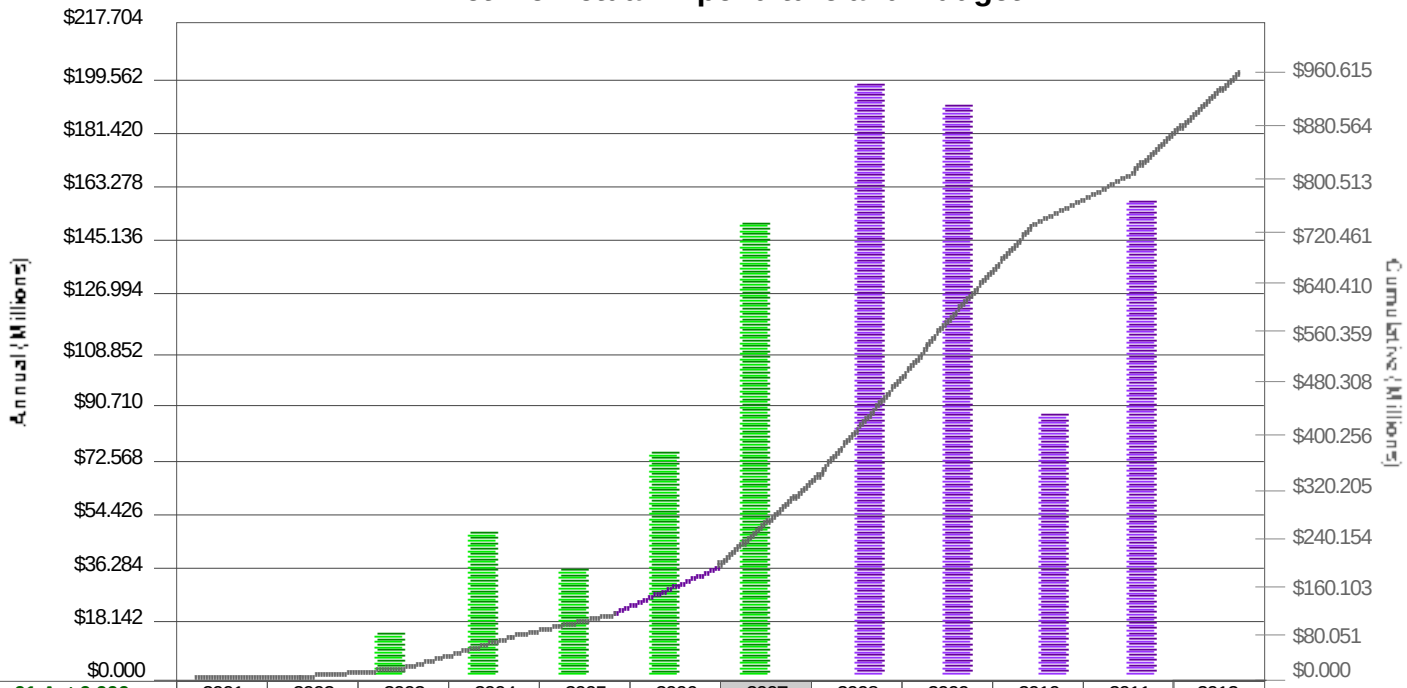
2007 Actual Expenditure and Adopted Plan



	J	F	M	A	M	J	J	A	S	O	N	D
Actual	-0.738	9.291	11.085	6.886	11.795	7.503	9.098	11.191	23.999	16.814	16.508	27.564
Adopted Plan					19.790	15.992	14.993	14.593	16.392	20.190	18.391	38.781
Cum. Plan	1.834	11.462	22.618	33.316	48.293	60.978	72.440	83.444	95.364	123.485	123.485	152.827
Cum. Act	-0.738	8.553	19.639	26.524	38.320	45.822	54.920	66.111	90.111	106.924	123.432	150.996

Lifetime Cash Flow

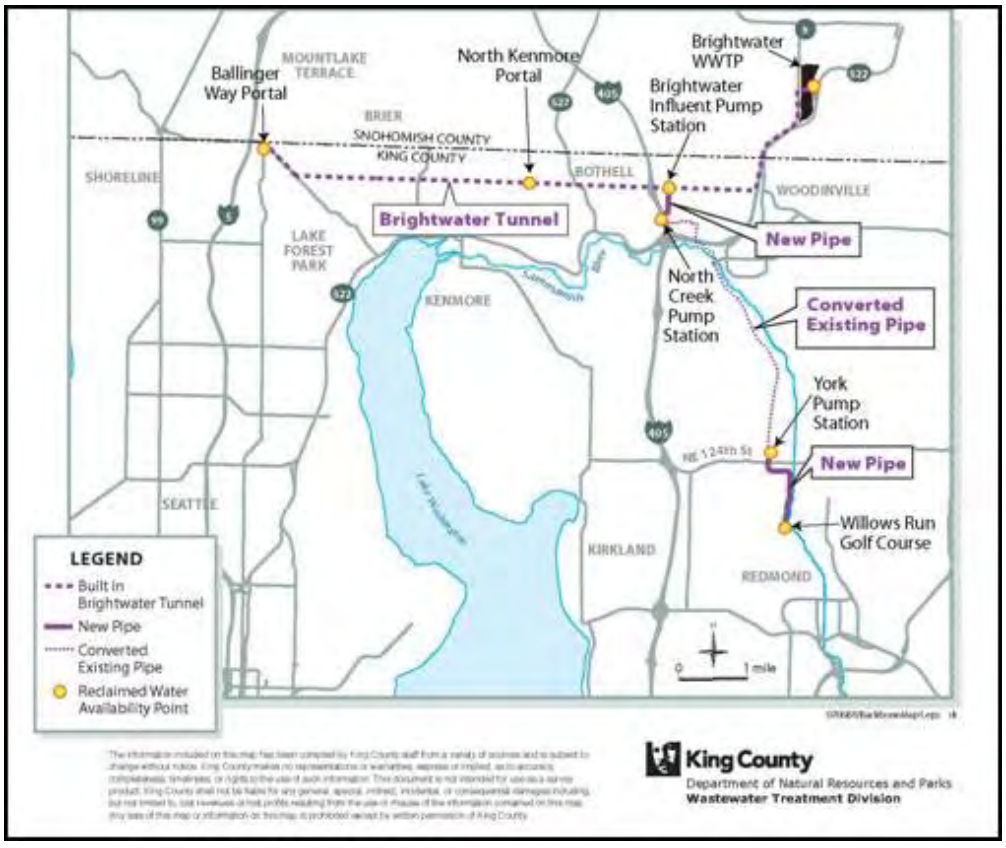
Lifetime Actual Expenditure and Budget



Pre-01 Act 0.000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Actual Dec-07			14.907	49.223	36.973	74.655	150.996					
Budget								198.024	190.821	86.927	158.089	0.000
CumAct+Bdgt	0.000	0.000	14.907	64.130	101.103	175.758	326.754	524.778	715.599	802.526	960.615	960.615

RWSP Project Report
DECEMBER 2007

423600 Brightwater Reclaimed Water Pipeline

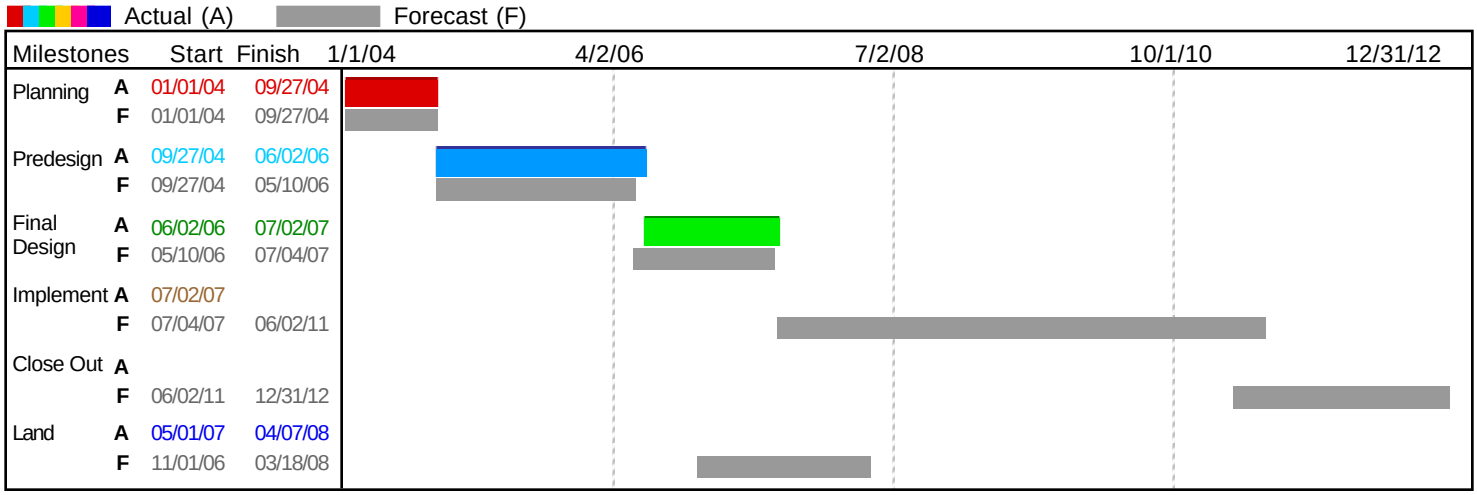


Project Description

This project will convey Class A reclaimed water produced at the Brightwater Treatment Plant to the Sammamish Valley and to potential customers along the effluent pipeline system starting in 2011. The system initially (Phase I) will provide up to 7 mgd of reclaimed water to the area by gravity. The second phase will bring the West segment of the backbone into service by adding pumping capacity as needed to match demand, providing up to 14 mgd of additional reclaimed water for a total 21 mgd. Phase II has not been authorized nor is budgeted at this time.

Project Phase: 4 Implementation

Milestone Schedule



Schedule Adjustments

Cost Summary

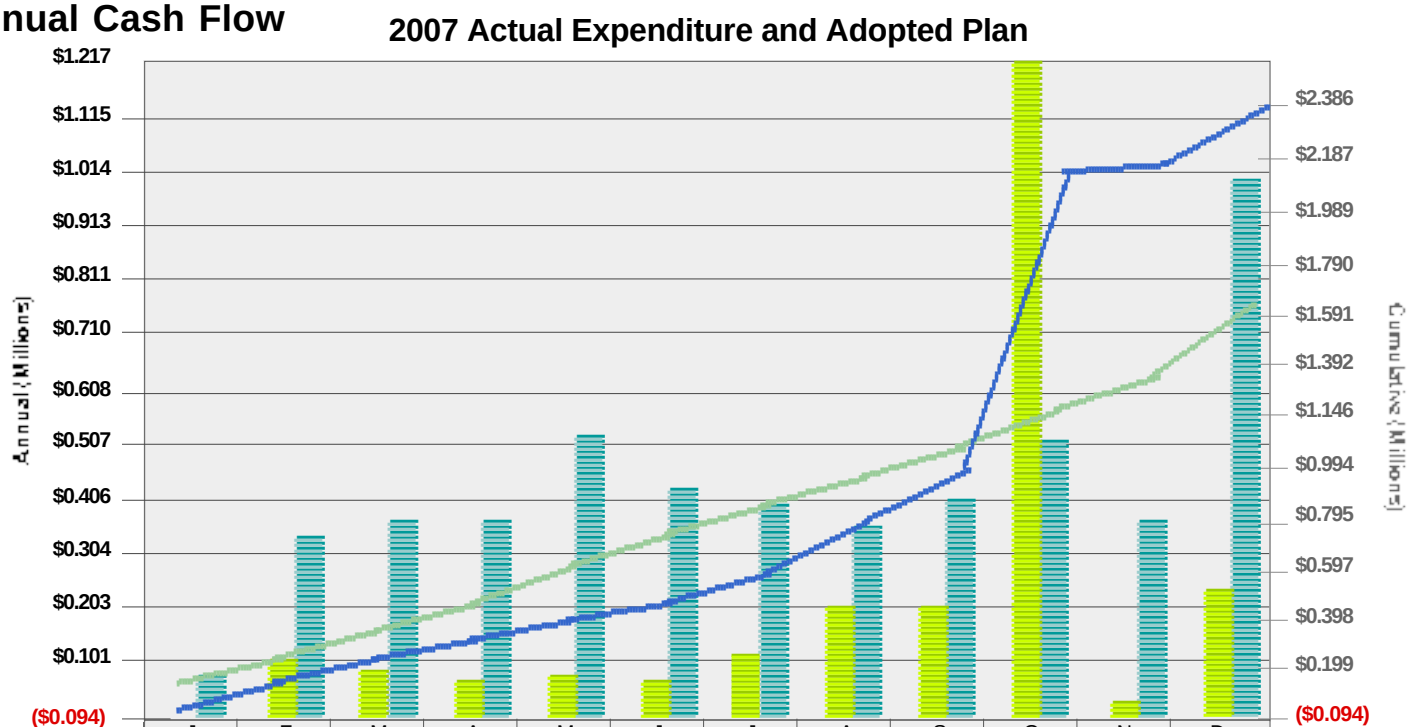
Expenses	2007 Actual Expenditure and Plan			Lifetime Actual Expenditure and Budget		
	IBIS YTD Dec-07	Adopted Plan	Updated Plan	IBIS LTD Dec-07	Lifetime Budget	Updated Budget
CONSTRUCTION	1,074,187	0	0	1,074,441	17,771,168	13,967,002
Construction Contracts	1,063,770	0	0	1,063,770	17,552,440	13,880,602
Owner Furnished Equipment	10,413			10,413		
Other Capital Charges	5	0	0	259	218,728	86,400
NON-CONSTRUCTION	1,312,028	1,578,572	1,424,295	3,016,585	6,884,874	8,318,521
Engineering	878,804	1,032,255	880,391	1,901,745	3,519,460	3,830,097
Planning & Management Svcs.			25,000	0		310,693
Permitting & Other Agency Support	36,608	30,900	50,000	41,291	159,273	128,182
Right-of-Way	12,700	103,000	25,000	12,700	266,955	289,522
Misc. Services & Materials	27,191	35,665	34,627	57,189	197,709	188,331
Staff Labor	356,725	376,751	409,278	1,003,660	2,741,476	3,571,696
PROJECT RESERVE		0	0	0	2,830,985	4,730,517
Project Reserve		0	0	0	2,830,985	4,730,517
Total $	2,386,215	1,578,572	1,424,295	4,091,026	27,487,027	27,016,040

Cost/Budget Adjustments

Contract Status

Contract	Original Contract Amount	Phased Amends	Base Contract Amount	Change Amends or COs	Change Percentage	Nbr of Amends/CO's to Date	Current Contract Amount	Amount Paid	Thru Pmt No.	% Paid
Brightwater Reclaimed Water Conveyance Facility E43010E	$1,918,771	$2,039,387	$3,958,158	-$469,808	-12%	5	$3,488,350	$2,785,767	212	80%

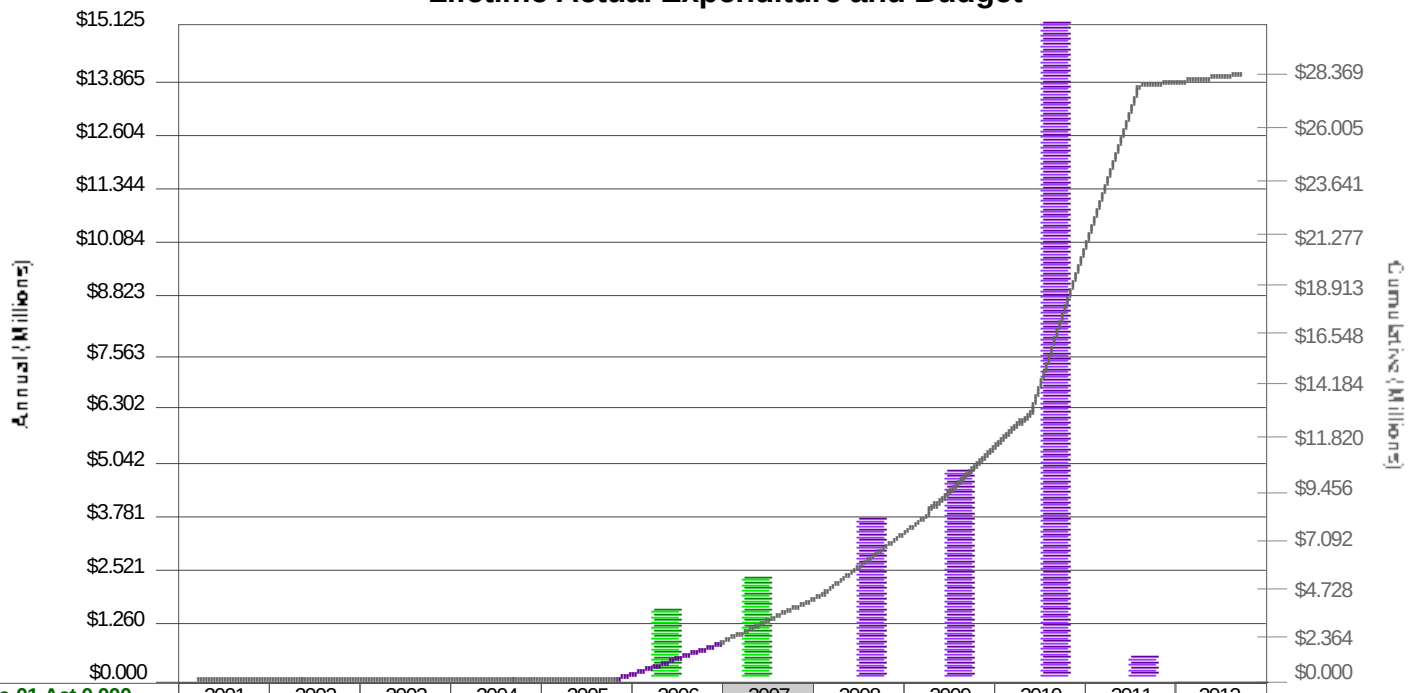
Annual Cash Flow



	J	F	M	A	M	J	J	A	S	O	N	D
Actual	-0.094	0.116	0.095	0.077	0.080	0.072	0.121	0.215	0.212	1.217	0.031	0.243
Adopted Plan	0.083	0.343	0.374	0.369	0.530	0.426	0.400	0.364	0.411	0.515	0.374	1.004
Cum. Plan	0.019	0.118	0.234	0.344	0.499	0.630	0.748	0.862	0.985	1.275	1.275	1.579
Cum. Act	-0.094	0.022	0.117	0.194	0.274	0.347	0.468	0.683	0.895	2.112	2.143	2.386

Lifetime Cash Flow

Lifetime Actual Expenditure and Budget



Pre-01 Act 0.000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Actual Dec-07						1.705	2.386					
Budget								3.729	4.841	15.125	0.582	0.000
CumAct+Bdgt	0.000	0.000	0.000	0.000	0.000	1.705	4.091	7.820	12.661	27.787	28.369	28.369

RWSP Project Report
DECEMBER 2007

423460 Vashon Island T.P. Upgrade

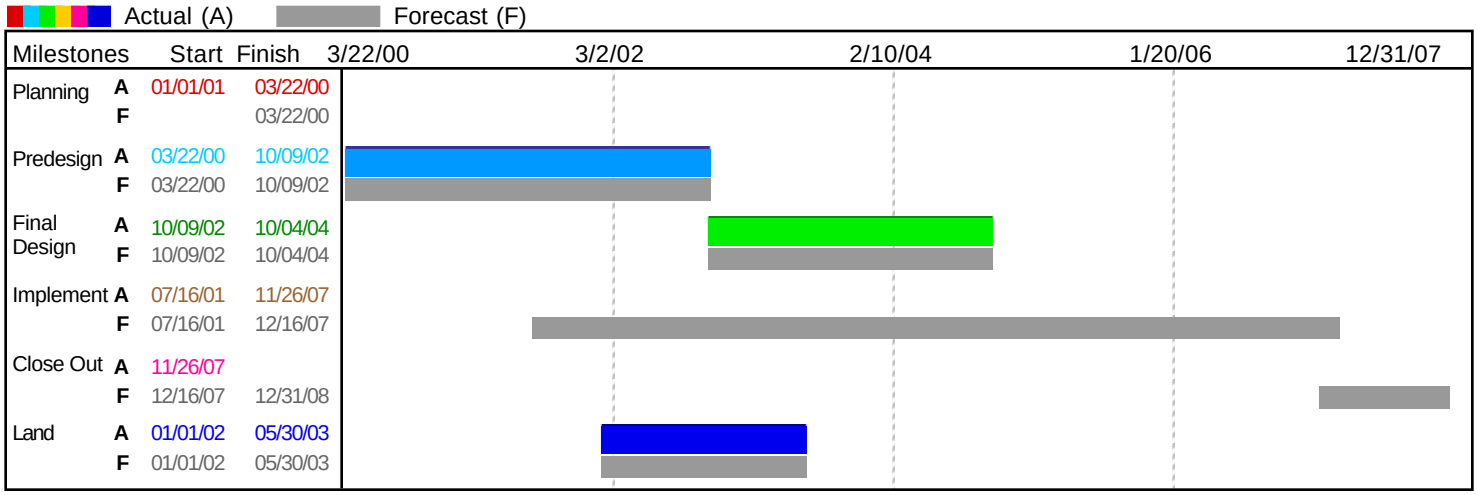
Project Description

This project expands and upgrades the existing Vashon Island Wastewater Treatment Plant and outfall In accordance with a contract executed in 1999 with the Vashon Sewer District. Under this agreement, King County has also worked with the local sewer district to implement operational and safety improvements to the local sewage collection systems. Construction on the treatment plant upgrades to increase capacity and add back-up treatment systems began in 2004. Substantial completion of these improvements was achieved in December 2006. Other related improvements implemented via this project include: moving the marine outfall farther out in Puget Sound, installation of a telemetry system to allow communication and coordination with King County's South Treatment plant and various safety improvements.

Project Phase: 5 Closeout

King County
Department of Natural Resources and Parks
Wastewater Treatment Division

Milestone Schedule



Schedule Adjustments

Cost Summary

Expenses	2007 Actual Expenditure and Plan			Lifetime Actual Expenditure and Budget		
	IBIS YTD Dec-07	Adopted Plan	Updated Plan	IBIS LTD Dec-07	Lifetime Budget	Updated Budget
CONSTRUCTION	374,940	459,166	372,000	14,260,385	13,855,429	15,287,444
Construction Contracts	371,820	459,166	272,000	14,100,422	13,701,812	15,030,602
Owner Furnished Equipment	0	0	0	4,839	4,839	4,839
Other Capital Charges	3,121	0	100,000	155,123	148,778	252,003
NON-CONSTRUCTION	786,323	249,213	220,190	7,786,730	6,513,211	7,255,008
Engineering	171,154	82,000	95,000	3,377,528	3,227,039	3,301,374
Planning & Management Svcs.	181,987	20,000	0	1,096,950	643,390	914,963
Permitting & Other Agency Support	2,196	0	0	192,669	183,851	190,473
Right-of-Way	58	0	0	58	0	0
Misc. Services & Materials	35,734	0	0	456,934	376,584	421,200
Staff Labor	395,194	147,213	125,190	2,662,590	2,082,347	2,426,998
CREDITS AND REVENUES	0	0	0	-433,900	0	-433,900
Credits and Revenues	0	0	0	-433,900	0	-433,900
Total $	1,161,264	708,379	592,190	21,613,214	20,368,640	22,108,552

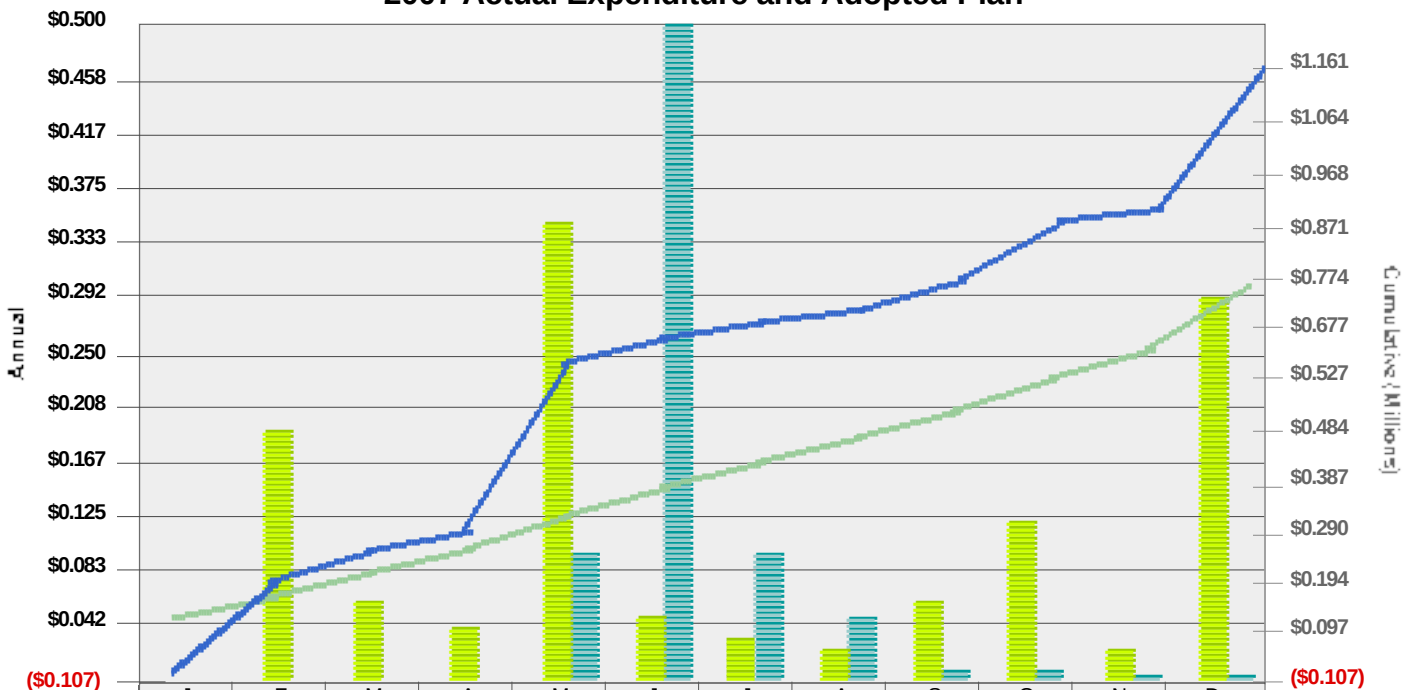
Cost/Budget Adjustments

Contract Status

Contract		Original Contract Amount	Phased Amends	Base Contract Amount	Change Amends or COs	Change Percentage	Nbr of Amends/CO's to Date	Current Contract Amount	Amount Paid	Thru Pmt No.	% Paid
Vashon Island Treatment Plant Upgrade	C46131C	$7,164,201	$0	$7,164,201	$1,829,871	26%	13	$8,994,072	$8,947,553	29	99%
Vashon Island Treatment Plant Upgrade Project	E93057E	$599,681	$1,617,764	$2,217,445	$646,538	29%	8	$2,863,983	$2,538,697	83	89%
Outfall Improvements Vashon Island Treatment Plant	C33127C	$204,454	$0	$204,454	$0	0%		$204,454	$204,454	2	100%

Annual Cash Flow

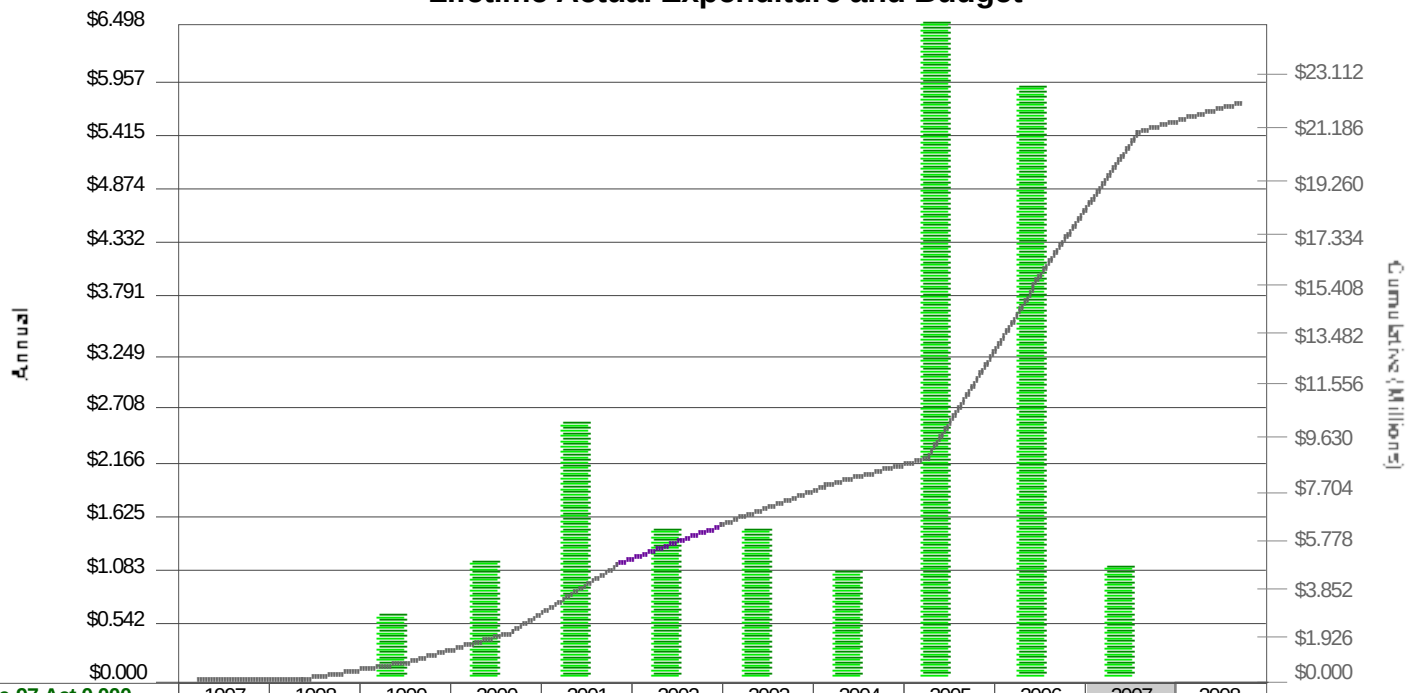
2007 Actual Expenditure and Adopted Plan



	J	F	M	A	M	J	J	A	S	O	N	D
Actual	-0.107	0.191	0.065	0.041	0.352	0.052	0.034	0.026	0.063	0.123	0.025	0.295
Adopted Plan					0.100	0.500	0.100	0.050	0.010	0.010	0.005	0.005
Cum. Plan	0.009	0.053	0.105	0.154	0.224	0.283	0.336	0.387	0.442	0.572	0.572	0.708
Cum. Act	-0.107	0.085	0.149	0.191	0.543	0.595	0.629	0.655	0.718	0.841	0.866	1.161

Lifetime Cash Flow

Lifetime Actual Expenditure and Budget



Pre-97 Act 0.000	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Actual Dec-07			0.661	1.179	2.554	1.504	1.497	1.088	6.498	5.904	1.161	
Budget												0.000
CumAct+Bdgt	0.000	0.000	0.661	1.841	4.395	5.899	7.396	8.484	14.982	20.886	22.047	22.047

RWSP Project Report
DECEMBER 2007

423557 Carnation Treatment Plant

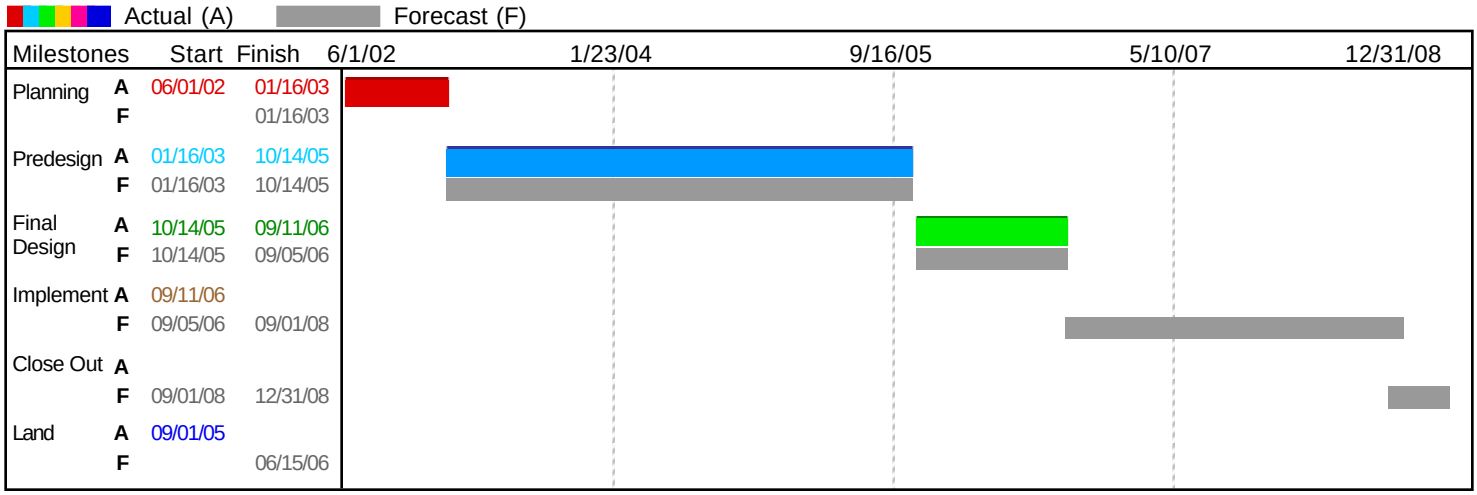
Project Description

This project will provide the City of Carnation with a new state of the art 0.43 mgd MBR treatment facility that will be owned and operated by King County. The plant will produce Class A reclaimed water that will initially be used to enhance existing wetlands at the Chinook Bend Natural Area. The project includes all work to implement this objective including planning, permitting, design and construction of a new treatment plant. The City of Carnation is replacing its on-site septic systems with a collection system to protect public health and the environment, achieve the city's comprehensive plan goals, and maintain and enhance community livability. The city is responsible for the design and construction of the local wastewater collection system. Construction of the sewage collection system is scheduled to be substantially complete by the end of 2007, and the facility will be operational in spring 2008.

Project Phase: 4 Implementation

King County
Department of Natural Resources and Parks
Wastewater Treatment Division

Milestone Schedule



Schedule Adjustments

Cost Summary

Expenses	2007 Actual Expenditure and Plan			Lifetime Actual Expenditure and Budget		
	IBIS YTD Dec-07	Adopted Plan	Updated Plan	IBIS LTD Dec-07	Lifetime Budget	Updated Budget
CONSTRUCTION	8,884,026	9,406,150	9,271,094	10,392,259	14,660,230	12,961,045
Construction Contracts	8,869,901	8,666,198	8,552,694	10,378,133	13,740,678	12,242,645
Owner Furnished Equipment	14,125	739,952	718,400	14,125	919,552	718,400
NON-CONSTRUCTION	2,011,046	1,206,240	1,182,144	7,310,282	5,257,920	6,689,950
Engineering	961,767	378,947	378,947	4,347,180	2,807,368	3,859,097
Planning & Management Svcs.	27,187	432,600	420,000	210,199	761,213	711,162
Permitting & Other Agency Support	28,489	52,089	50,571	254,536	94,351	211,619
Right-of-Way	238,261	309,000	300,000	337,863	320,250	464,602
Misc. Services & Materials	81,540	4,352	4,226	195,776	55,387	122,024
Staff Labor	673,802	29,252	28,400	1,964,728	1,219,351	1,321,446
Total $	10,895,072	10,612,391	10,453,238	17,702,541	19,918,150	19,650,995

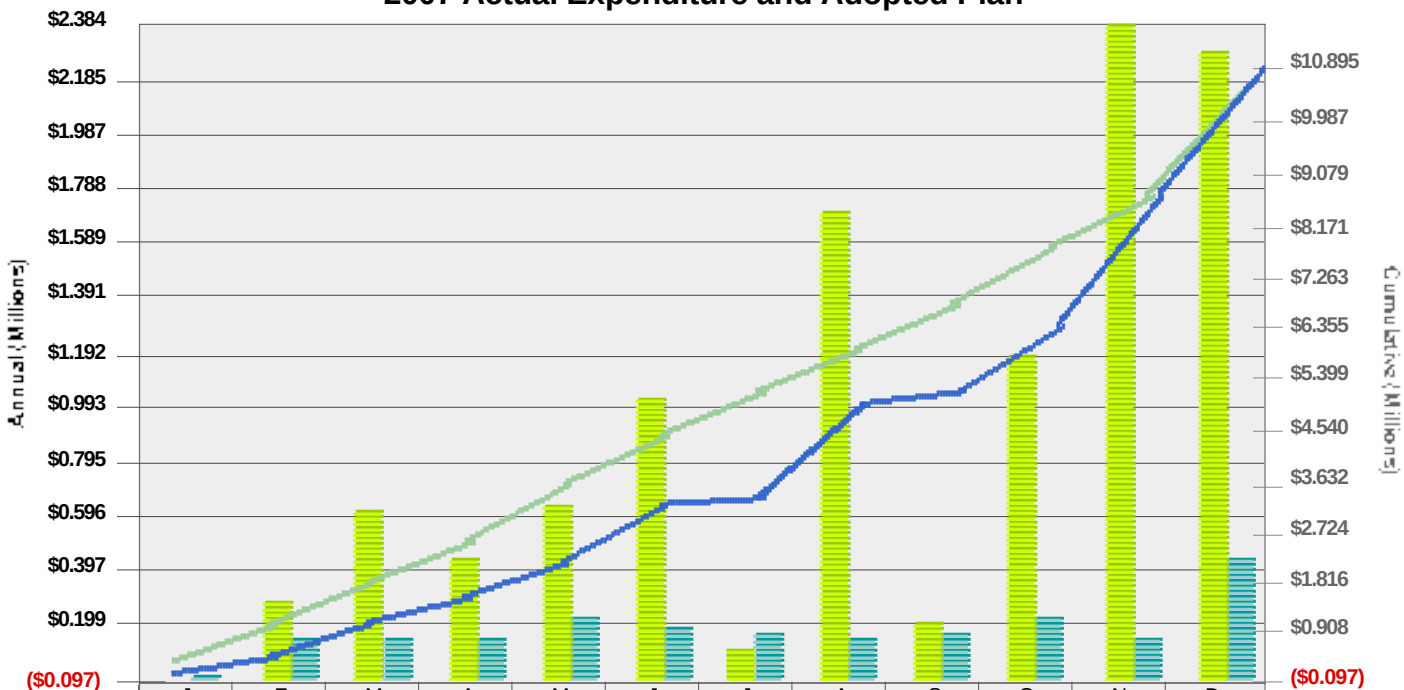
Cost/Budget Adjustments

Contract Status

Contract	Original Contract Amount	Phased Amends	Base Contract Amount	Change Amends or COs	Change Percentage	Nbr of Amends/CO's to Date	Current Contract Amount	Amount Paid	Thru Pmt No.	% Paid
Carnation Wastewater Treatment Facility C00036C06	$11,794,500	$0	$11,794,500	$1,584,807	13%	8	$13,379,307	$9,606,887	15	72%
Carnation Treatment Facility E23020E	$629,804	$3,414,299	$4,044,103	$311,600	8%	5	$4,355,703	$3,921,889	57	90%
Carnation WWTP Construction Management Services P00004P06	$610,919	$0	$610,919	$0	0%		$610,919	$455,076	13	74%
Professional Archaeological Services P43007P	$100,000	$0	$100,000	$0	0%		$100,000	$67,566	23	68%

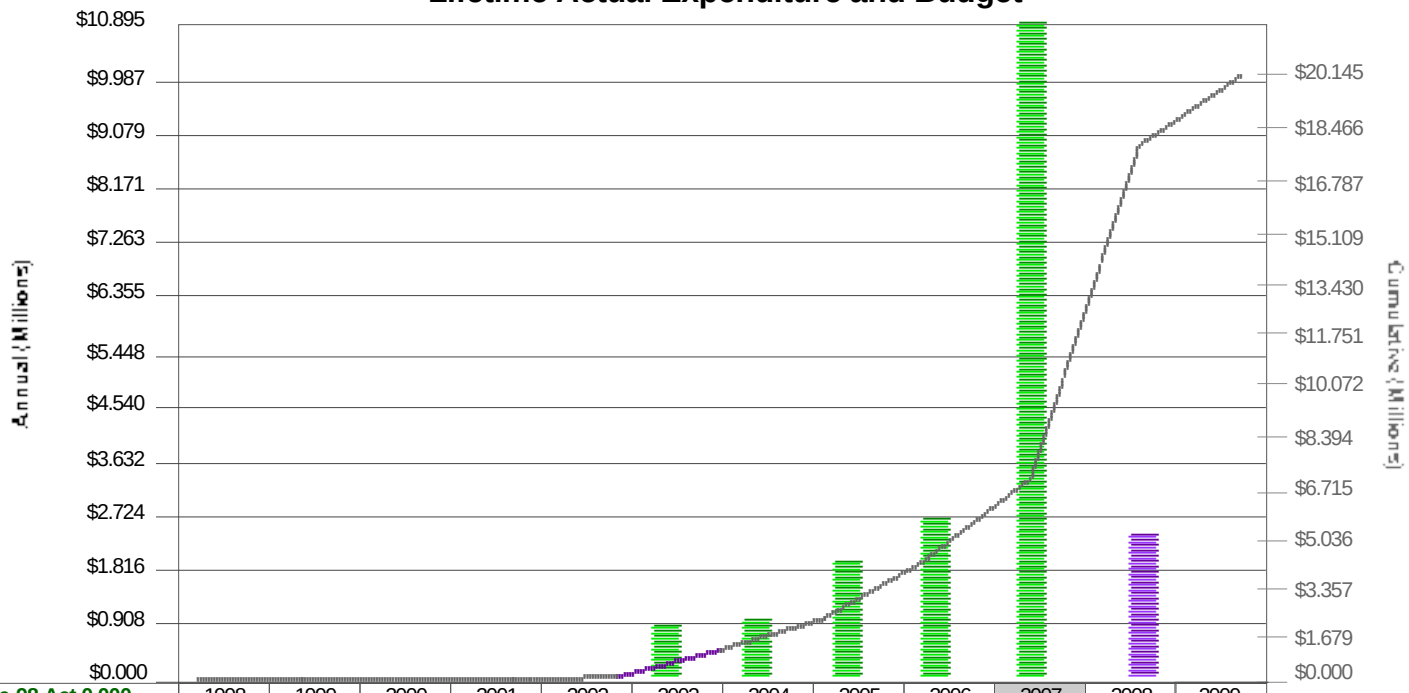
Annual Cash Flow

2007 Actual Expenditure and Adopted Plan



	J	F	M	A	M	J	J	A	S	O	N	D
Actual	-0.097	0.301	0.625	0.457	0.642	1.044	0.119	1.711	0.225	1.195	2.384	2.292
Adopted Plan	0.038	0.158	0.172	0.170	0.244	0.196	0.184	0.167	0.189	0.237	0.172	0.461
Cum. Plan	0.127	0.796	1.571	2.314	3.354	4.234	5.030	5.794	6.622	8.575	8.575	10.612
Cum. Act	-0.097	0.203	0.828	1.285	1.927	2.971	3.090	4.800	5.025	6.220	8.604	10.895

Lifetime Cash Flow



Pre-98 Act 0.000	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Actual Dec-07					0.068	0.926	1.052	2.020	2.742	10.895		
Budget											2.442	0.000
CumAct+Bdgt	0.000	0.000	0.000	0.000	0.068	0.994	2.046	4.066	6.807	17.703	20.145	20.145

RWSP Project Report
DECEMBER 2007

423611 Chinook Wetlands Enhancement

Project Description

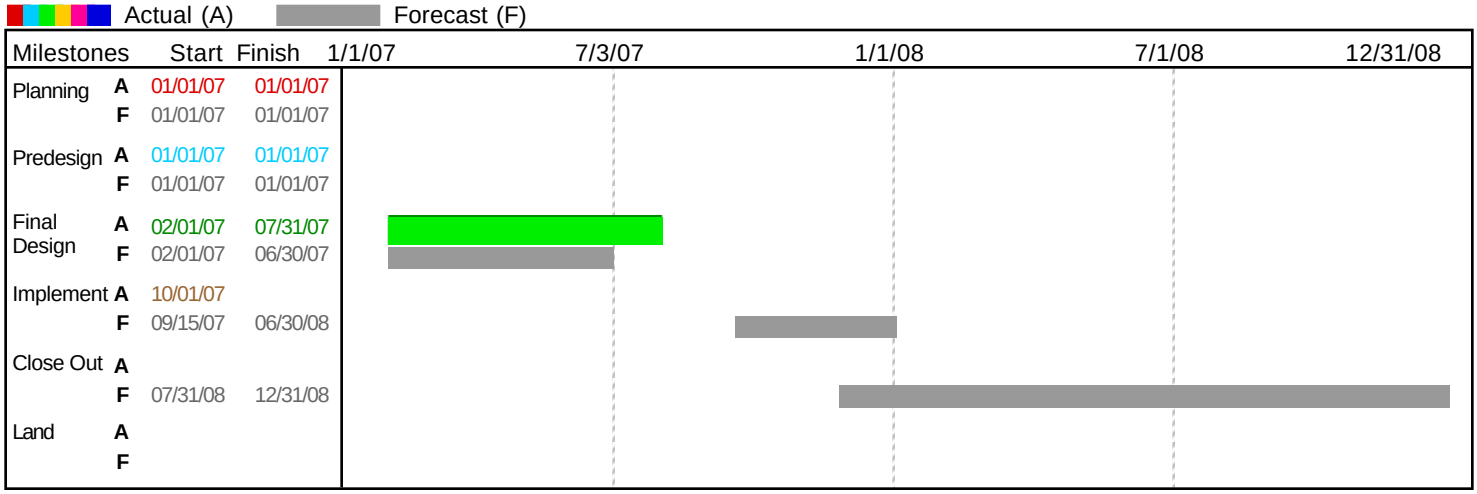
This project will direct and discharge Class A reclaimed water produced by the Carnation Wastewater Treatment Facility to the Chinook Bend Wetlands. This project is being carried out in collaboration with Ducks Unlimited. It includes the additional piping needed to bring reclaimed water to the wetland and improvements at the Carnation Facility, such as additional UV disinfection equipment, to meet the reclaimed water requirements for a wetland discharge.

Project Phase: 4 Implementation

King County
Department of Natural Resources and Parks
Wastewater Treatment Division

Milestone Schedule

Actual (A) Forecast (F)



Schedule Adjustments

Cost Summary

Expenses	2007 Actual Expenditure and Plan			Lifetime Actual Expenditure and Budget		
	IBIS YTD Dec-07	Adopted Plan	Updated Plan	IBIS LTD Dec-07	Lifetime Budget	Updated Budget
CONSTRUCTION	266,294	843,893	819,313	266,294	852,910	828,068
Construction Contracts	266,294	843,893	819,313	266,294	852,910	828,068
NON-CONSTRUCTION	734,281	2,135,008	2,107,924	734,281	2,248,322	2,217,992
Engineering	113,237	1,205,111	1,205,111	113,237	1,207,000	1,207,000
Planning & Management Svcs.	210	35,329	34,300	210	35,329	34,300
Permitting & Other Agency Support	112,134	44,143	42,857	112,134	51,721	50,214
Misc. Services & Materials	33,500	12,299	11,941	33,500	12,299	11,941
Staff Labor	475,201	838,126	813,714	475,201	941,973	914,537
Total $	1,000,575	2,978,901	2,927,237	1,000,575	3,101,232	3,046,060

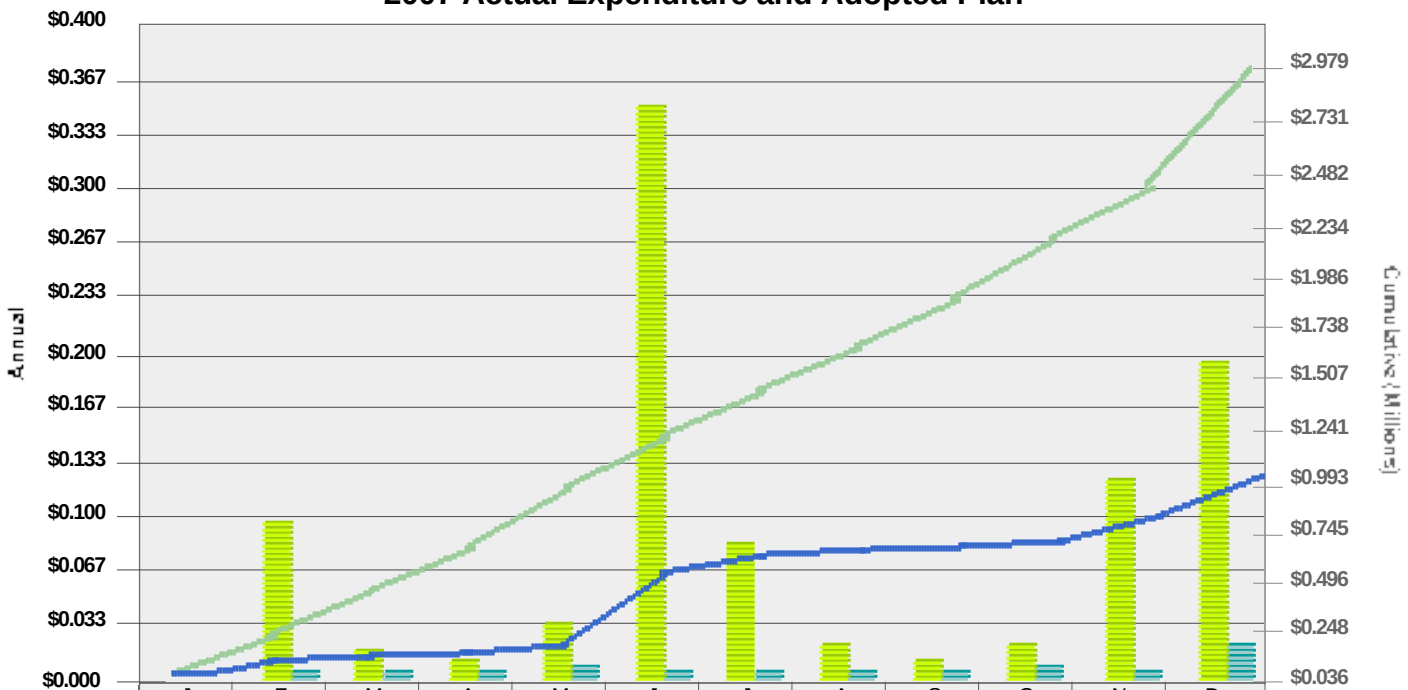
Cost/Budget Adjustments

Contract Status

Contract	Original Contract Amount	Phased Amends	Base Contract Amount	Change Amends or COs	Change Percentage	Nbr of Amends/CO's to Date	Current Contract Amount	Amount Paid	Thru Pmt No.	% Paid
Carnation Wastewater Treatment Facility C00036C06	$11,794,500	$0	$11,794,500	$1,584,807	13%	8	$13,379,307	$9,606,887	15	72%
Carnation Treatment Facility E23020E	$629,804	$3,414,299	$4,044,103	$311,600	8%	5	$4,355,703	$3,921,889	57	90%
Professional Archaeological Services P43007P	$100,000	$0	$100,000	$0	0%		$100,000	$67,566	23	68%

The contract for the construction associated with Chinook Wetlands is combined with the construction contract for the Carnation Wastewater Facility.

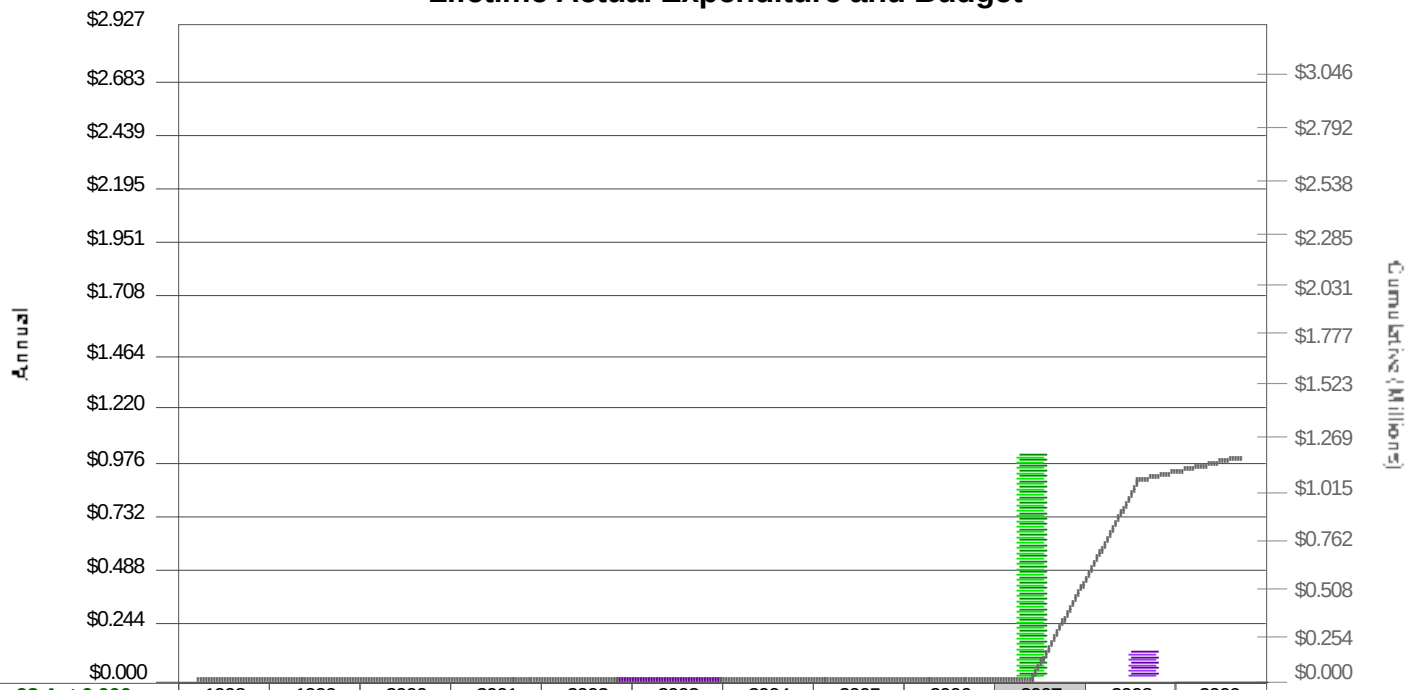
Annual Cash Flow



	J	F	M	A	M	J	J	A	S	O	N	D
Actual	0.000	0.100	0.020	0.015	0.038	0.353	0.085	0.026	0.016	0.025	0.126	0.197
Adopted Plan	0.002	0.008	0.009	0.008	0.012	0.010	0.009	0.008	0.009	0.012	0.009	0.023
Cum. Plan	0.036	0.223	0.441	0.649	0.941	1.189	1.412	1.626	1.859	2.407	2.407	2.979
Cum. Act		0.100	0.120	0.135	0.173	0.526	0.611	0.637	0.653	0.678	0.804	1.001

Lifetime Cash Flow

Lifetime Actual Expenditure and Budget



Pre-98 Act 0.000	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Actual Dec-07										1.001		
Budget											0.122	0.000
CumAct+Bdgt	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.001	1.123	1.123

RWSP Project Report
DECEMBER 2007

423584 West Point Odor Improvements

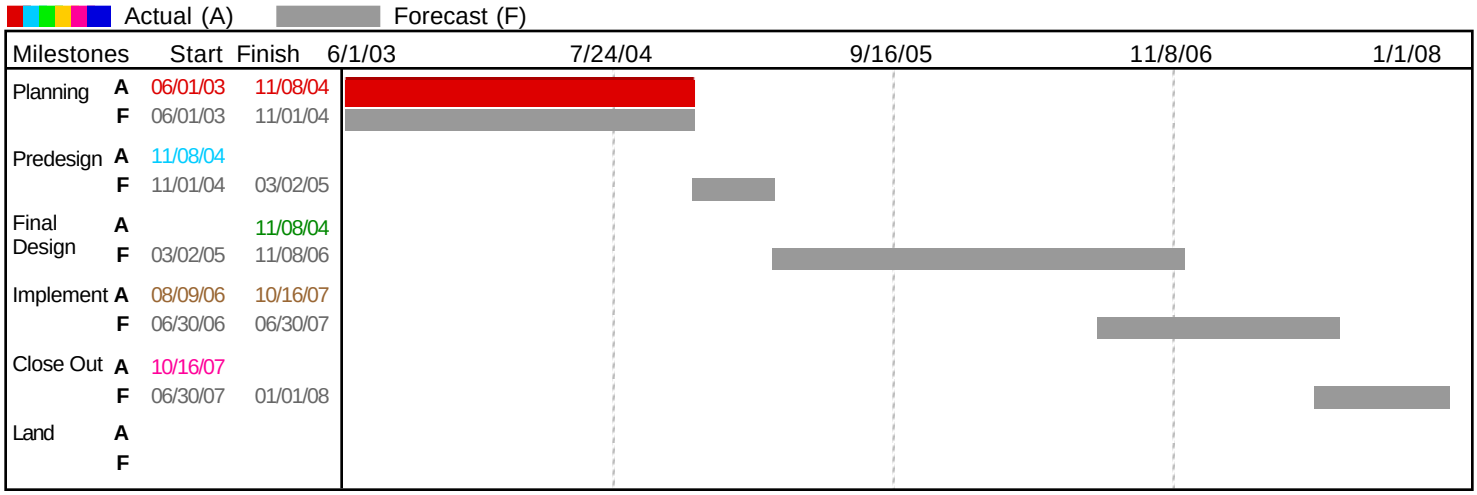
Project Description

This project will reduce odor emissions by modifying the scrubber sump chemistry storage, feed and regulation system to allow injection of sodium hypochlorite. As part of the project, the division channel has also been covered and its foul air is now treated in the scrubber system.

Project Phase: 4 Implementation

King County
Department of Natural Resources and Parks
Wastewater Treatment Division

Milestone Schedule



Schedule Adjustments

Cost Summary

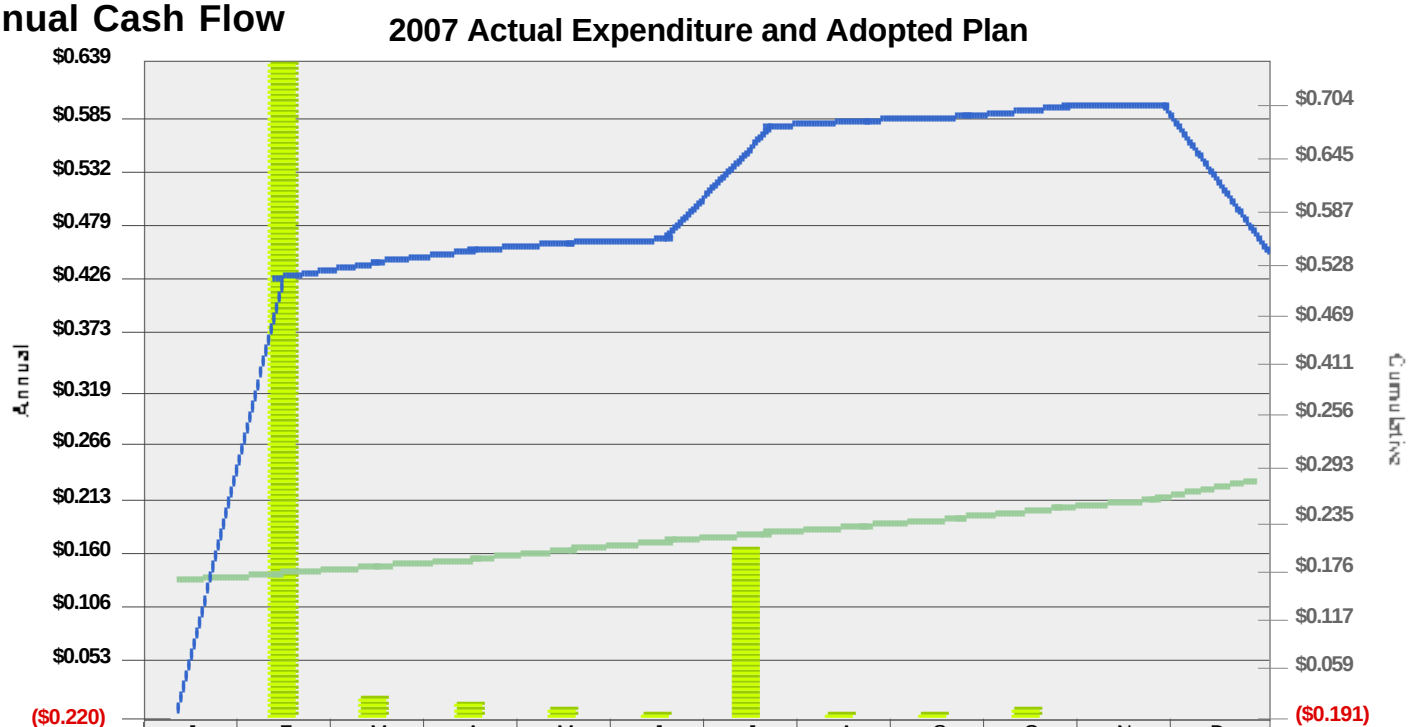
Expenses	2007 Actual Expenditure and Plan			Lifetime Actual Expenditure and Budget		
	IBIS YTD Dec-07	Adopted Plan	Updated Plan	IBIS LTD Dec-07	Lifetime Budget	Updated Budget
CONSTRUCTION	332,267	136,053	594,948	554,037	694,915	816,718
Construction Contracts	329,584	136,053	591,948	551,276	679,915	813,639
Owner Furnished Equipment	2,683	0	3,000	2,761	15,000	3,078
NON-CONSTRUCTION	152,201	13,707	34,698	835,294	539,641	717,790
Engineering	14,449	0	21,390	396,154	330,481	403,095
Planning & Management Svcs.	0			0		
Permitting & Other Agency Support	0	0	0	3,614	2,225	3,614
Right-of-Way	152	0	0	152	0	0
Misc. Services & Materials	1,953	0	0	23,884	3,764	21,930
Staff Labor	135,647	13,707	13,308	411,490	203,172	289,151
PROJECT RESERVE		0	25,000	0	30,900	25,000
Project Reserve		0	25,000	0	30,900	25,000
Total $	484,468	149,760	654,646	1,389,331	1,265,456	1,559,507

Cost/Budget Adjustments

Contract Status

Contract	Original Contract Amount	Phased Amends	Base Contract Amount	Change Amends or COs	Change Percentage	Nbr of Amends/CO's to Date	Current Contract Amount	Amount Paid	Thru Pmt No.	% Paid
WPTP Odor Improvements C00024C06	$765,340	$0	$765,340	-$59,459	-8%	2	$705,881	$705,881	5	100%
West Point Odor Improvements E43012E	$73,614	$251,889	$325,503	$35,722	11%	2	$361,225	$357,087	30	99%

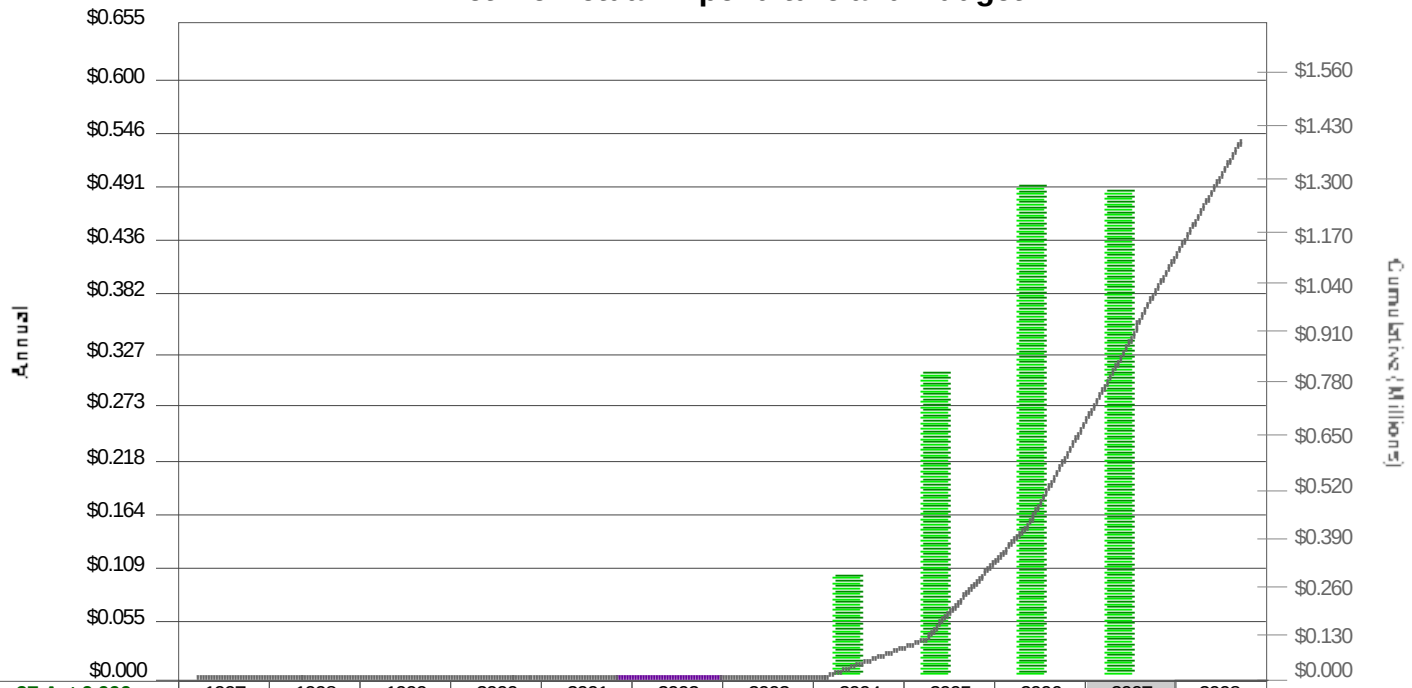
Annual Cash Flow



	J	F	M	A	M	J	J	A	S	O	N	D
Actual	-0.191	0.639	0.024	0.019	0.011	0.005	0.166	0.010	0.006	0.015	0.002	-0.220
Adopted Plan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cum. Plan	0.002	0.011	0.022	0.033	0.047	0.060	0.071	0.082	0.093	0.121	0.121	0.150
Cum. Act	-0.191	0.448	0.471	0.490	0.501	0.506	0.672	0.682	0.687	0.702	0.704	0.484

Lifetime Cash Flow

Lifetime Actual Expenditure and Budget



Pre-97 Act 0.000	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Actual Dec-07								0.103	0.307	0.494	0.484	
Budget												0.000
CumAct+Bdgt	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.103	0.411	0.905	1.389	1.389

RWSP Project Report
DECEMBER 2007

423585 South Plant Odor Improvements

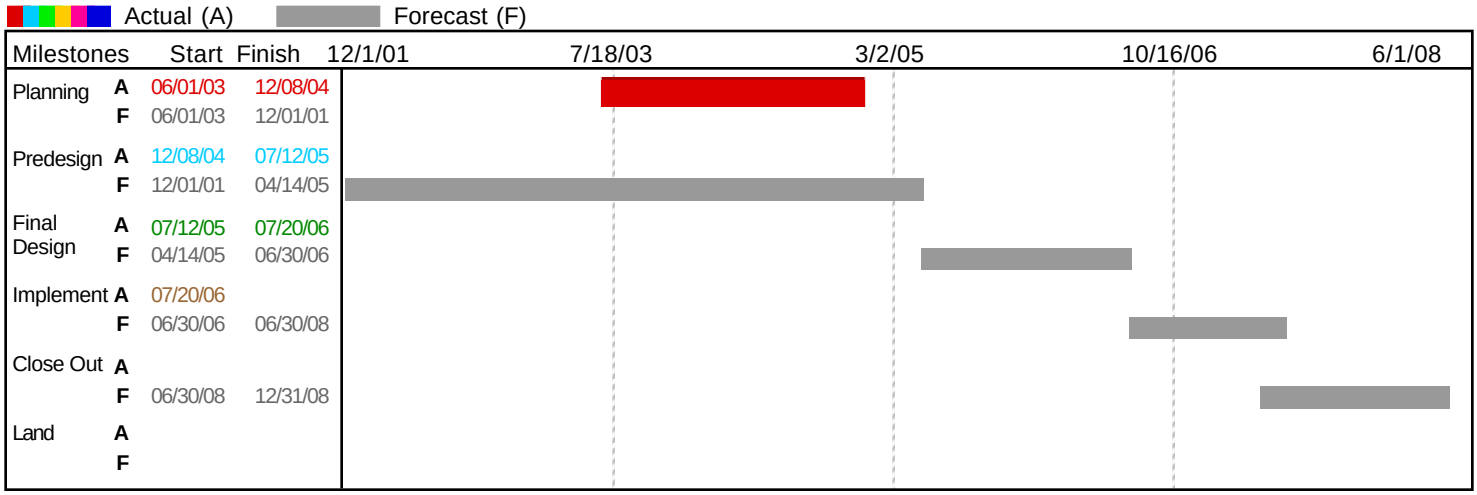
Project Description

This project will install covers on the first pass of each aeration basin and the return activated sludge channel. The foul air from those sources will be ducted to a new chemical scrubber for treatment prior to discharge to the atmosphere.

Project Phase: 4 Implementation

King County
Department of Natural Resources and Parks
Wastewater Treatment Division

Milestone Schedule



Schedule Adjustments

Cost Summary

Expenses	2007 Actual Expenditure and Plan			Lifetime Actual Expenditure and Budget		
	IBIS YTD Dec-07	Adopted Plan	Updated Plan	IBIS LTD Dec-07	Lifetime Budget	Updated Budget
CONSTRUCTION	4,296,151	3,698,112	3,698,112	5,543,204	6,365,489	5,686,097
Construction Contracts	4,296,151	3,698,112	3,698,112	5,497,178	6,343,045	5,640,072
Owner Furnished Equipment	0	0	0	46,026	22,445	46,026
NON-CONSTRUCTION	690,493	148,165	148,165	1,868,927	1,156,235	1,381,342
Engineering	111,389	0	0	706,749	535,598	595,360
Planning & Management Svcs.	266	0	0	622	0	356
Permitting & Other Agency Support	0	0	0	24,001	25,750	24,001
Misc. Services & Materials	43,007	19,011	19,011	168,306	101,412	144,311
Staff Labor	535,831	129,154	129,154	969,249	493,475	617,315
PROJECT RESERVE		16,390	16,390	0	40,505	16,390
Project Reserve		16,390	16,390	0	40,505	16,390
Total $	4,986,644	3,862,668	3,862,668	7,412,131	7,562,229	7,083,831

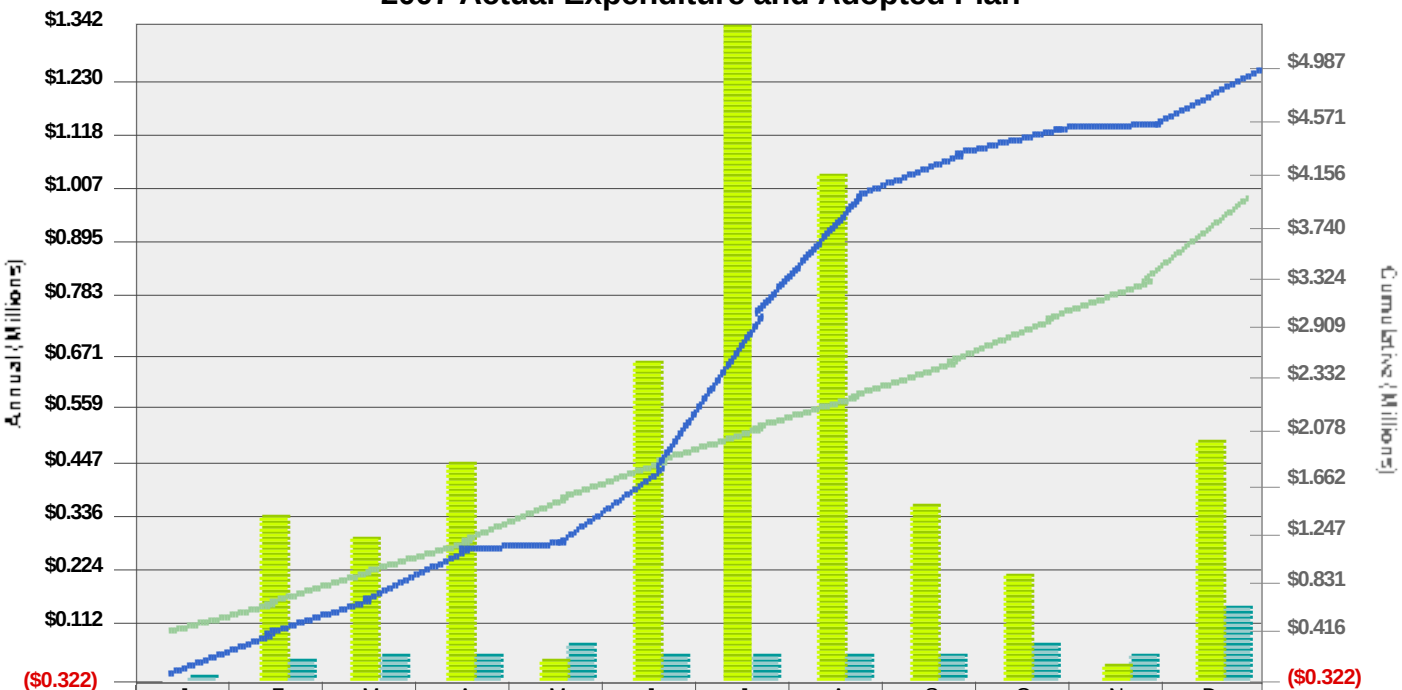
Cost/Budget Adjustments

Reduction in total project costs is due to implementation of a value engineering proposal that was proposed by the contractor.

Contract Status

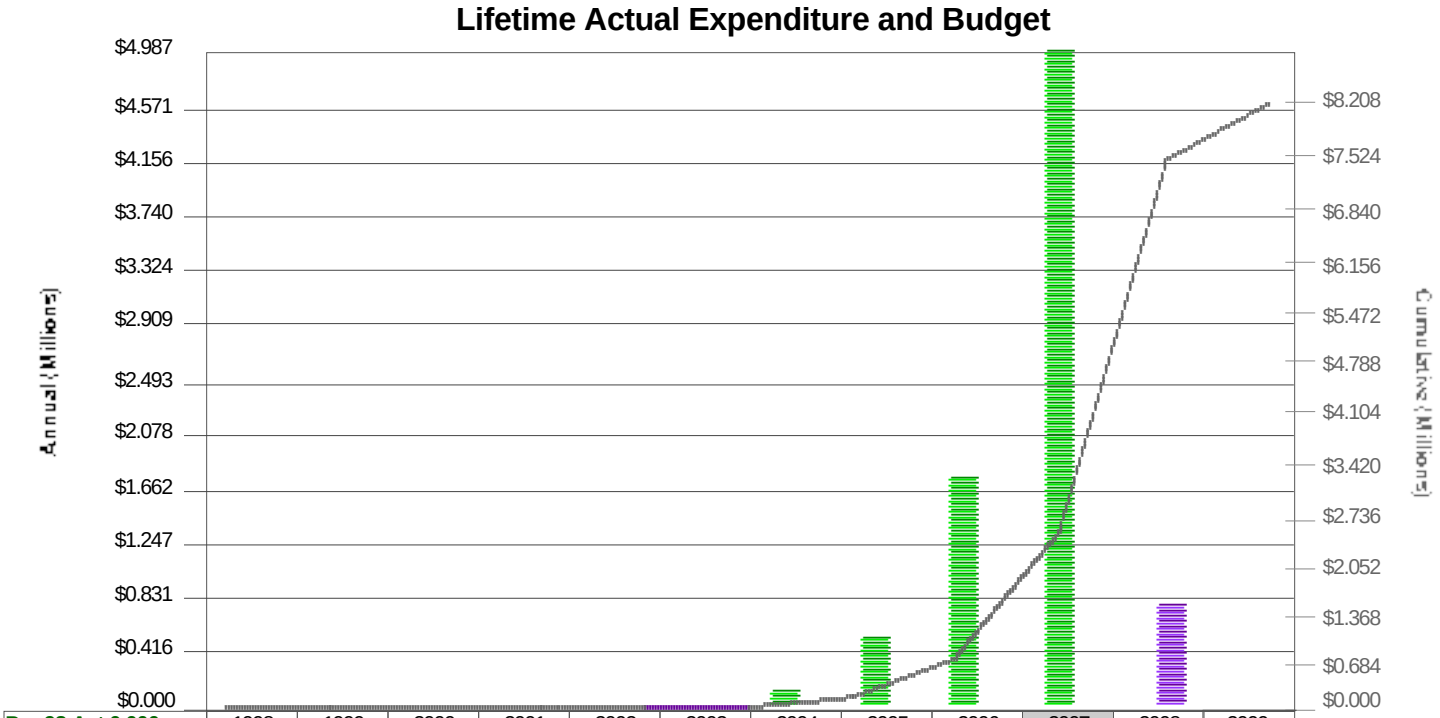
Contract	Original Contract Amount	Phased Amends	Base Contract Amount	Change Amends or COs	Change Percentage	Nbr of Amends/CO's to Date	Current Contract Amount	Amount Paid	Thru Pmt No.	% Paid
South Plant Odor Control Improvements C00016C06	$6,157,648	$0	$6,157,648	-$575,363	-9%	4	$5,582,285	$5,308,019	15	95%
South Plant Odor Improvements E43016E	$108,056	$330,979	$439,034	$175,491	40%	5	$614,525	$574,379	35	93%

Annual Cash Flow



	J	F	M	A	M	J	J	A	S	O	N	D
Actual	-0.322	0.349	0.295	0.448	0.050	0.665	1.342	1.044	0.363	0.223	0.039	0.492
Adopted Plan	0.013	0.053	0.057	0.056	0.081	0.065	0.061	0.056	0.063	0.079	0.057	0.154
Cum. Plan	0.046	0.290	0.572	0.842	1.221	1.541	1.831	2.109	2.410	3.121	3.121	3.863
Cum. Act	-0.322	0.027	0.322	0.769	0.820	1.484	2.826	3.871	4.233	4.456	4.495	4.987

Lifetime Cash Flow



Pre-98 Act 0.000	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Actual Dec-07							0.139	0.541	1.745	4.987		
Budget											0.796	0.000
CumAct+Bdgt	0.000	0.000	0.000	0.000	0.000	0.000	0.139	0.680	2.425	7.412	8.208	8.208

RWSP Project Report
DECEMBER 2007

423580 King Street Regulator Odor Control

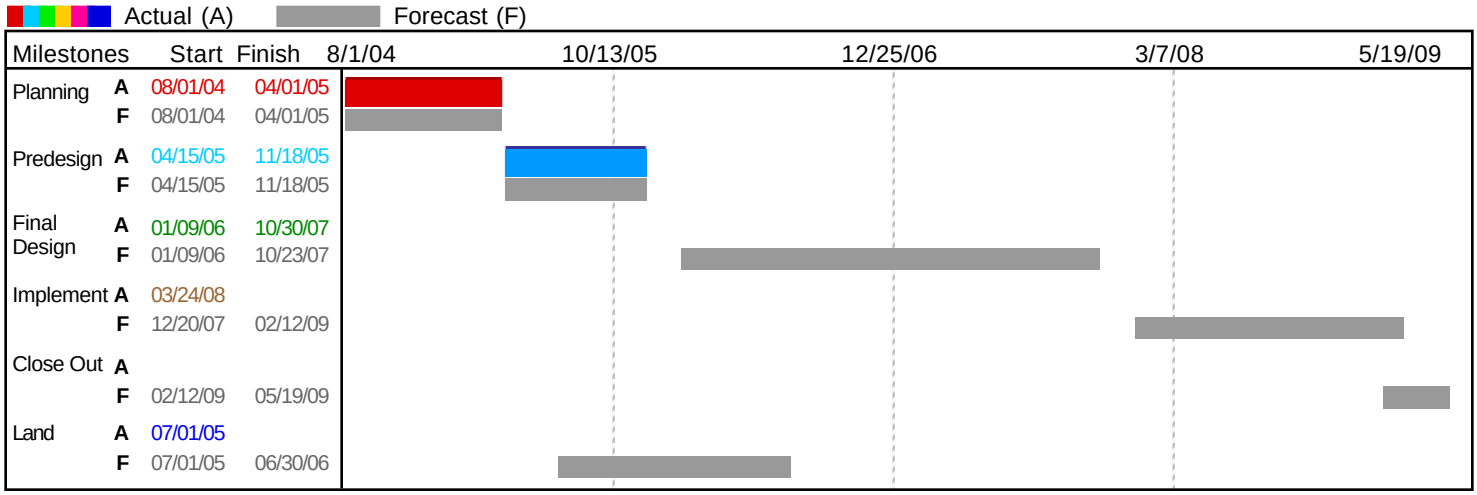
Project Description

This project will reduce foul odors from the Elliott Bay Interceptor (EBI) in the south Pioneer Square and Stadium areas. As this is part of the old combined sewer system, there are many open connections to the EBI such as surface drains that allow a direct path for odors to escape. The facility will also reduce corrosion within the EBI by removing hydrogen sulfide.

Project Phase: 4 Implementation

King County
Department of Natural Resources and Parks
Wastewater Treatment Division

Milestone Schedule



Schedule Adjustments

Cost Summary

Expenses	2007 Actual Expenditure and Plan			Lifetime Actual Expenditure and Budget		
	IBIS YTD Dec-07	Adopted Plan	Updated Plan	IBIS LTD Dec-07	Lifetime Budget	Updated Budget
CONSTRUCTION	4,941	1,053,402	1,361,276	6,576	2,328,467	3,522,207
Construction Contracts		1,053,402	1,360,209	0	2,328,467	3,518,956
Owner Furnished Equipment	3,584	0	0	3,584	0	0
Other Capital Charges	1,357	0	1,067	2,992	0	3,251
NON-CONSTRUCTION	557,918	53,051	535,777	1,030,954	541,613	1,331,516
Engineering	-89,543	0	155,000	26,586	252,120	276,279
Planning & Management Svcs.	406,370	0	108,777	612,097	96,761	368,892
Permitting & Other Agency Support	13,135	0	0	13,251	0	116
Right-of-Way	5,436	0	0	5,436	0	0
Misc. Services & Materials	15,748	0	3,333	20,744	1,206	10,045
Staff Labor	206,772	53,051	268,667	352,840	191,526	676,184
PROJECT RESERVE		0	0	0	90,038	185,400
Project Reserve		0	0	0	90,038	185,400
Total $	562,859	1,106,453	1,897,053	1,037,530	2,960,119	5,039,123

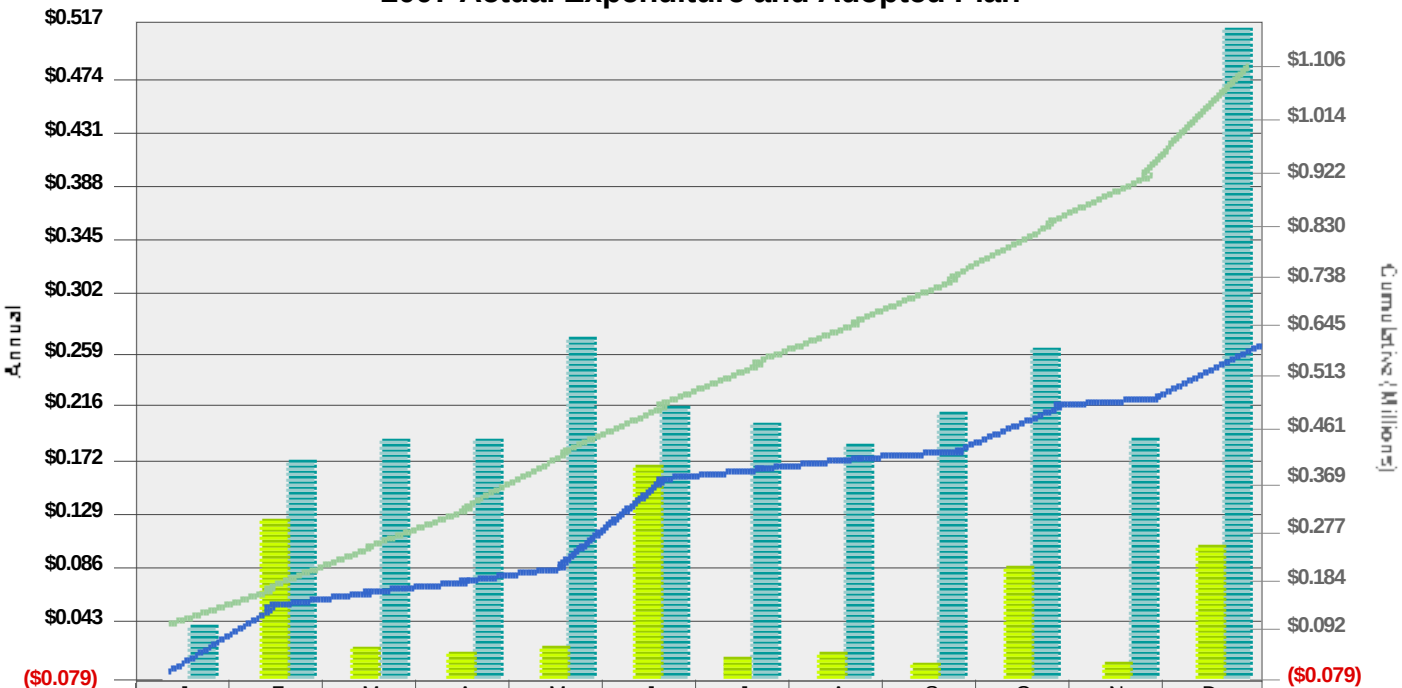
Cost/Budget Adjustments

Increase in construction costs is due to updated construction cost estimate. Design consultant's budget increased to address site contamination, provide geotechnical support, and incorporate design revisions to improve safety and functionality. Added WTD construction management staff budget and budget for materials testing during construction.

Contract Status

Contract	Original Contract Amount	Phased Amends	Base Contract Amount	Change Amends or COs	Change Percentage	Nbr of Amends/CO's to Date	Current Contract Amount	Amount Paid	Thru Pmt No.	% Paid
King Street Regulator Station and Conveyance System Odor E43024E	$368,892	$0	$368,892	$302,721	82%	5	$671,613	$468,700	19	70%

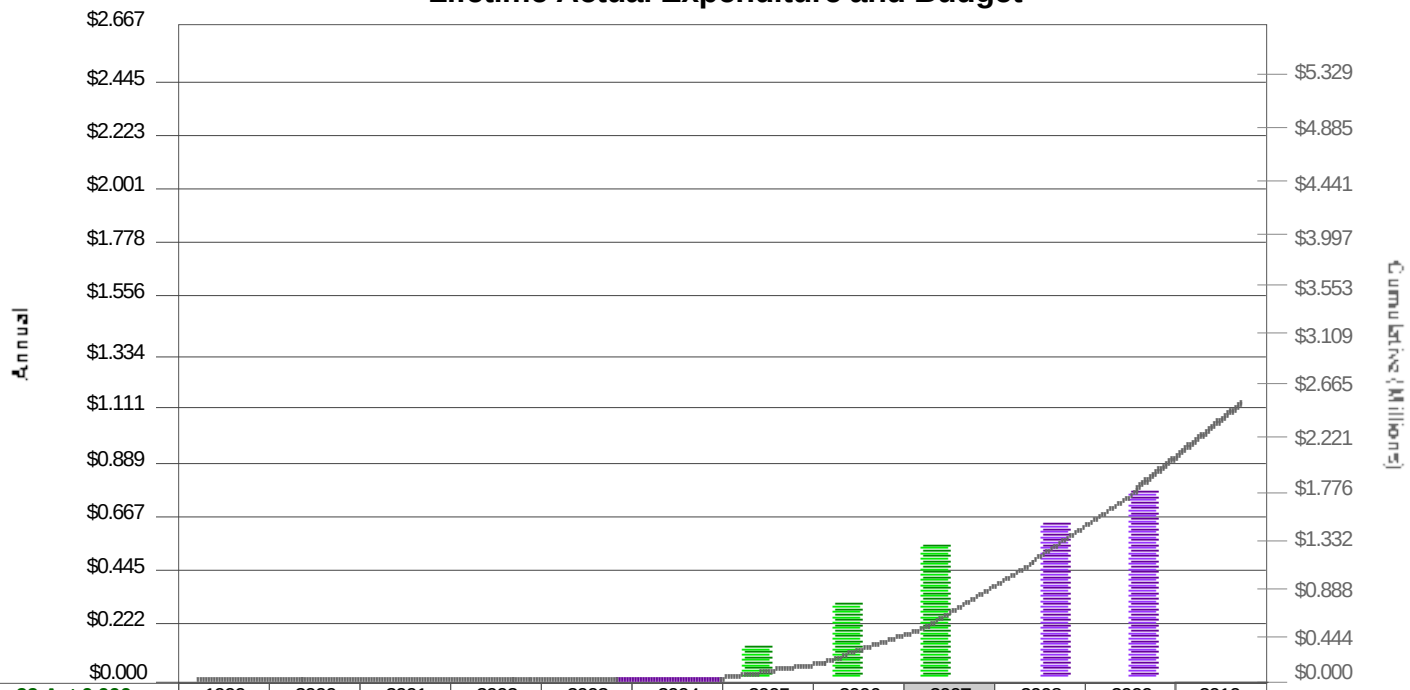
Annual Cash Flow



	J	F	M	A	M	J	J	A	S	O	N	D
Actual	-0.079	0.127	0.028	0.021	0.028	0.172	0.020	0.021	0.014	0.089	0.016	0.106
Adopted Plan	0.043	0.176	0.192	0.189	0.272	0.219	0.205	0.187	0.211	0.264	0.192	0.515
Cum. Plan	0.013	0.083	0.164	0.241	0.350	0.441	0.524	0.604	0.690	0.894	0.894	1.106
Cum. Act	-0.079	0.047	0.075	0.096	0.124	0.297	0.317	0.338	0.352	0.441	0.457	0.563

Lifetime Cash Flow

Lifetime Actual Expenditure and Budget



Pre-99 Act 0.000	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Actual Dec-07						0.007	0.144	0.324	0.563			
Budget										0.631	0.765	0.000
CumAct+Bdgt	0.000	0.000	0.000	0.000	0.000	0.007	0.150	0.475	1.038	1.669	2.434	2.434

RWSP Project Report
DECEMBER 2007

423521 Bellevue Pump Station

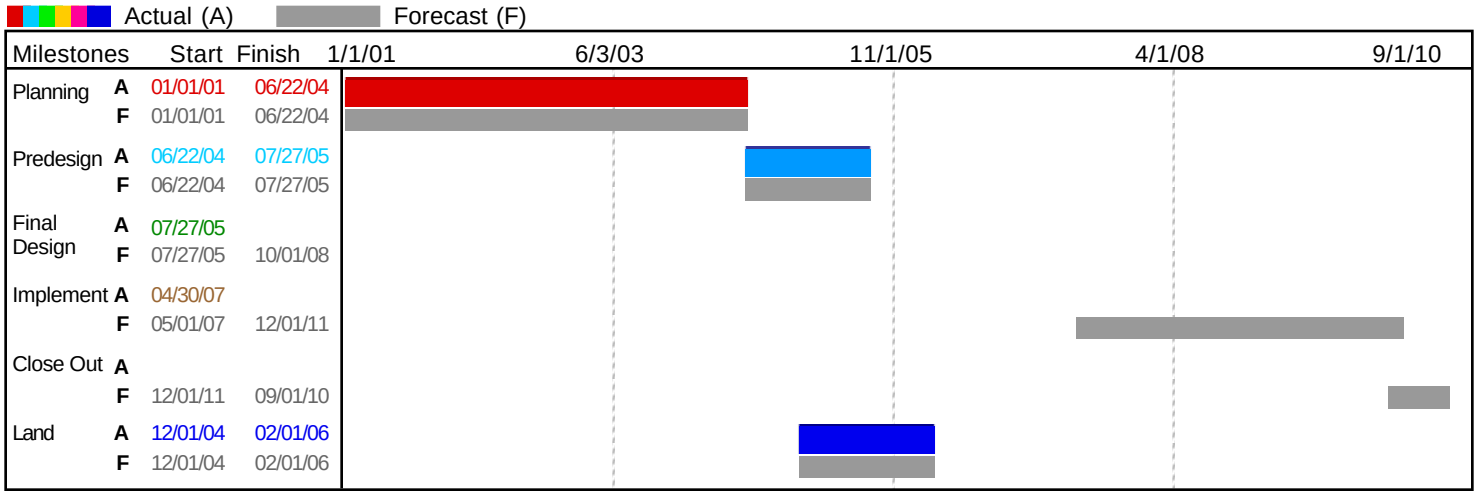
Project Description

This project will increase the Bellevue Pump Station's firm capacity to 11 mgd and will improve the station's electrical and control systems. This work will be implemented through two construction contracts (Force Main and Pump Station) with all the design work performed under one consultant design contract. Under the Force Main contract, 5300 feet of pipe will be installed. For a major portion of the pipe installation, a Horizontal Direction Drill (HDD) method will be used. A small portion of the pipe will be installed in an open trench. Under the Pump Station contract, the existing pump station will be expanded. All the expansion will occur on King County property. As part of the project, existing equipment including pumps, generator, electrical system, controls, odor control and chemical storage will be replaced.

Project Phase: 4 Implementation

King County
Department of Natural Resources and Parks
Wastewater Treatment Division

Milestone Schedule



Schedule Adjustments

Cost Summary

Expenses	2007 Actual Expenditure and Plan			Lifetime Actual Expenditure and Budget		
	IBIS YTD Dec-07	Adopted Plan	Updated Plan	IBIS LTD Dec-07	Lifetime Budget	Updated Budget
CONSTRUCTION	14,151,438	8,734,900	9,158,077	14,151,438	13,408,748	22,573,050
Construction Contracts	14,151,438	8,704,000	9,158,077	14,151,438	13,367,848	22,499,920
Outside Agency Construction		30,900	0	0	40,900	73,130
NON-CONSTRUCTION	1,346,888	1,108,321	979,269	6,292,679	5,793,431	8,259,243
Engineering	667,063	674,949	385,450	4,583,060	4,201,255	5,262,946
Planning & Management Svcs.	494	16,374	206,667	49,297	66,364	783,517
Permitting & Other Agency Support	52,319	25,407	20,000	114,453	92,917	135,195
Right-of-Way	20,431	0	0	58,281	45,000	37,850
Misc. Services & Materials	82,160	6,277	35,000	121,970	24,455	132,078
Staff Labor	524,421	385,315	332,153	1,365,618	1,363,440	1,907,658
PROJECT RESERVE		0	0	0	1,786,025	725,125
Project Reserve		0	0	0	1,786,025	725,125
Total $	15,498,326	9,843,221	10,137,346	20,444,117	20,988,204	31,557,419

Cost/Budget Adjustments

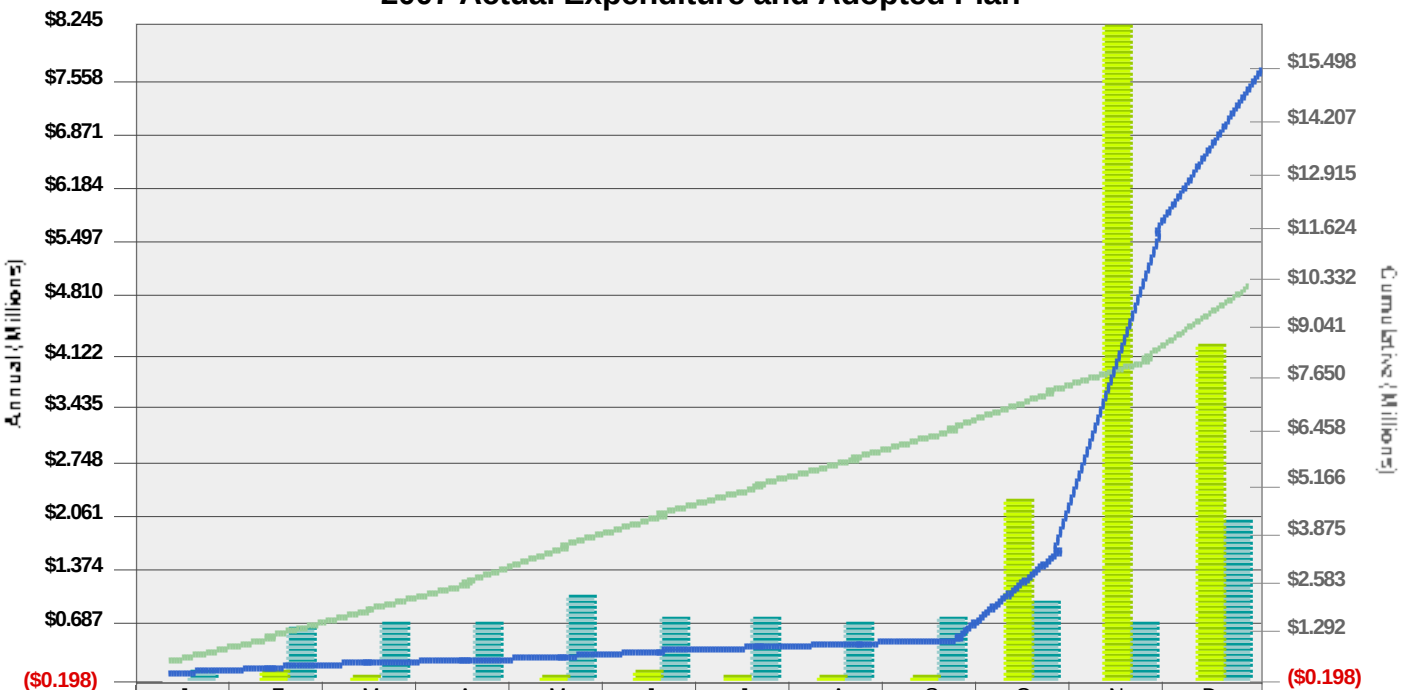
Construction costs for force main increased due to: market conditions--horizontal direction drilling for 4300 feet of the force main is needed for this project--this method is used for placing oil and gas pipelines and costs associated with the drilling have increased due to the demand, only one bid was submitted for this work; cost increases are also attributed to: contractor's labor rates for key personnel were higher than engineer's estimate; additional costs for installing casings at entry and exist points; and need for additional construction management services to support project needs.

Contract Status

Contract	Original Contract Amount	Phased Amends	Base Contract Amount	Change Amends or COs	Change Percentage	Nbr of Amends/CO's to Date	Current Contract Amount	Amount Paid	Thru Pmt No.	% Paid
Bellevue Pump Station Upgrade- Force Main C00044C06	$13,883,125	$0	$13,883,125	$0	0%		$13,883,125	$12,430,955	4	90%
Engineering Services for the Bellevue Pump Station E23015E	$775,015	$4,235,326	$5,010,341	$0	0%	6	$5,010,341	$4,022,140	41	80%
Construction management service for Bellevue Pump P00016P06	$298,445	$0	$298,445	$0	0%		$298,445	$34,183	3	11%

Annual Cash Flow

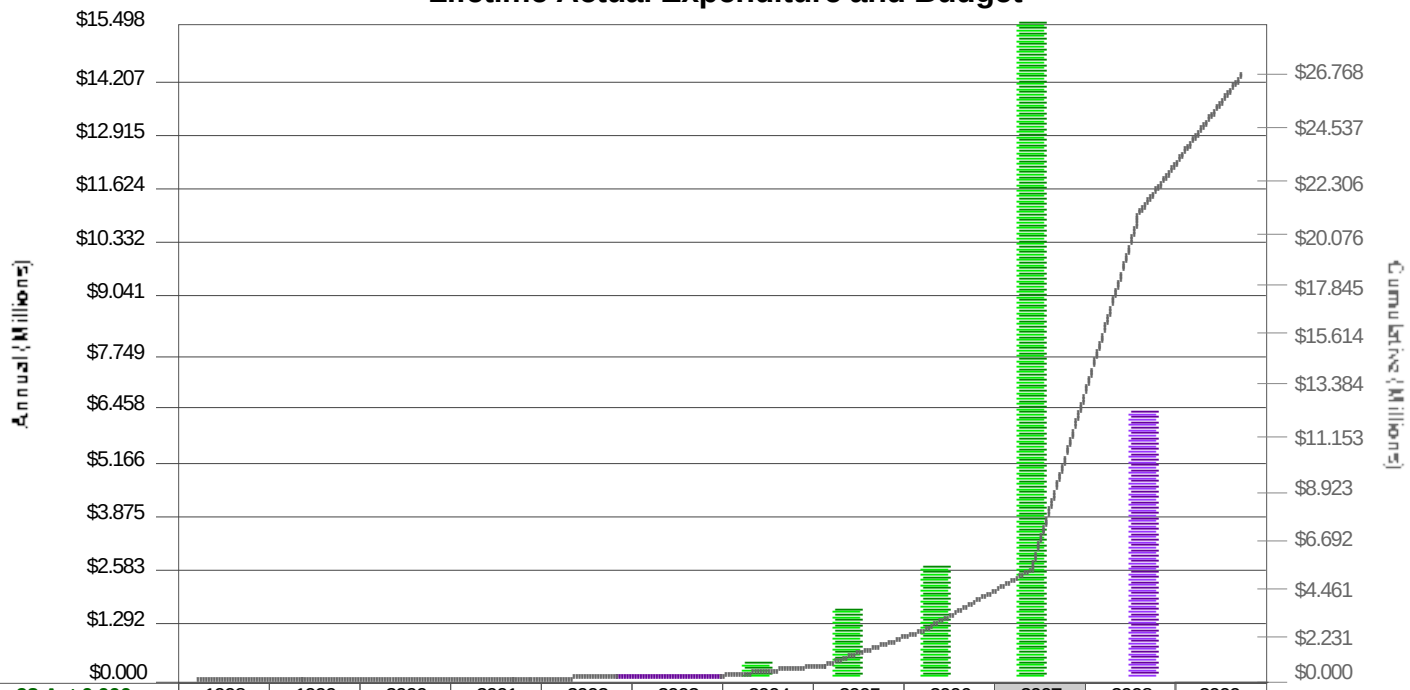
2007 Actual Expenditure and Adopted Plan



	J	F	M	A	M	J	J	A	S	O	N	D
Actual	-0.198	0.153	0.127	0.060	0.085	0.159	0.091	0.103	0.095	2.327	8.245	4.253
Adopted Plan	0.170	0.700	0.763	0.753	1.081	0.869	0.816	0.742	0.837	1.049	0.763	2.046
Cum. Plan	0.118	0.738	1.457	2.146	3.110	3.927	4.666	5.374	6.142	7.953	7.953	9.843
Cum. Act	-0.198	-0.046	0.082	0.142	0.226	0.386	0.476	0.579	0.674	3.000	11.245	15.498

Lifetime Cash Flow

Lifetime Actual Expenditure and Budget



Pre-98 Act 0.000	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Actual Dec-07			0.006	0.014	0.068	0.072	0.472	1.656	2.658	15.498		
Budget											6.323	0.000
CumAct+Bdgt	0.000	0.000	0.006	0.021	0.088	0.161	0.632	2.288	4.946	20.444	26.768	26.768

RWSP Project Report
DECEMBER 2007

423373 CONVEYANCE SYSTEM IMPROVEMENTS
621 Black Diamond Storage Facility

Project Description

This project will design and construct a storage facility in the City of Black Diamond to equalize peak flows entering the existing pump station near Jones Lake. Peak flows will be stored and released slowly over time to avoid overwhelming the downstream conveyance system. This project will extend the life of existingequipment and defer the need to build additional new pumping and pipeline facilities for several years.

Project Phase: 2 Predesign

King County
Department of Natural Resources and Parks
Wastewater Treatment Division

Milestone Schedule

Actual (A) Forecast (F)

Milestones		Start	Finish
Planning	A		02/26/07
	F	11/05/05	10/15/06
Predesign	A	02/26/07	
	F	10/15/06	11/05/05
Final Design	A		
	F		
Implement	A		
	F		
Close Out	A		
	F		04/30/11
Land	A		
	F	06/01/07	06/01/08

Schedule Adjustments

Cost Summary

Expenses	2007 Actual Expenditure and Plan			Lifetime Actual Expenditure and Budget		
	IBIS YTD Dec-07	Adopted Plan	Updated Plan	IBIS LTD Dec-07	Lifetime Budget	Updated Budget
CONSTRUCTION		0	0	0	2,713,724	2,634,745
Construction Contracts		0	0	0	2,495,184	2,422,565
Outside Agency Construction		0	0	0	218,540	212,180
NON-CONSTRUCTION	391,848	460,568	789,761	441,415	2,347,542	2,267,724
Engineering	208,686	285,714	620,000	208,686	1,000,000	1,000,000
Planning & Management Svcs.	91,018	0	0	91,018	23,340	22,660
Permitting & Other Agency Support		0	0	0	106,090	103,000
Right-of-Way		0	0	0	424,360	412,000
Misc. Services & Materials	591	13,390	13,000	2,950	42,432	42,541
Staff Labor	91,552	161,464	156,761	138,760	751,320	687,523
PROJECT RESERVE		0	0	0	590,888	573,682
Project Reserve		0	0	0	590,888	573,682
Total $	391,848	460,568	789,761	441,415	5,652,154	5,476,150

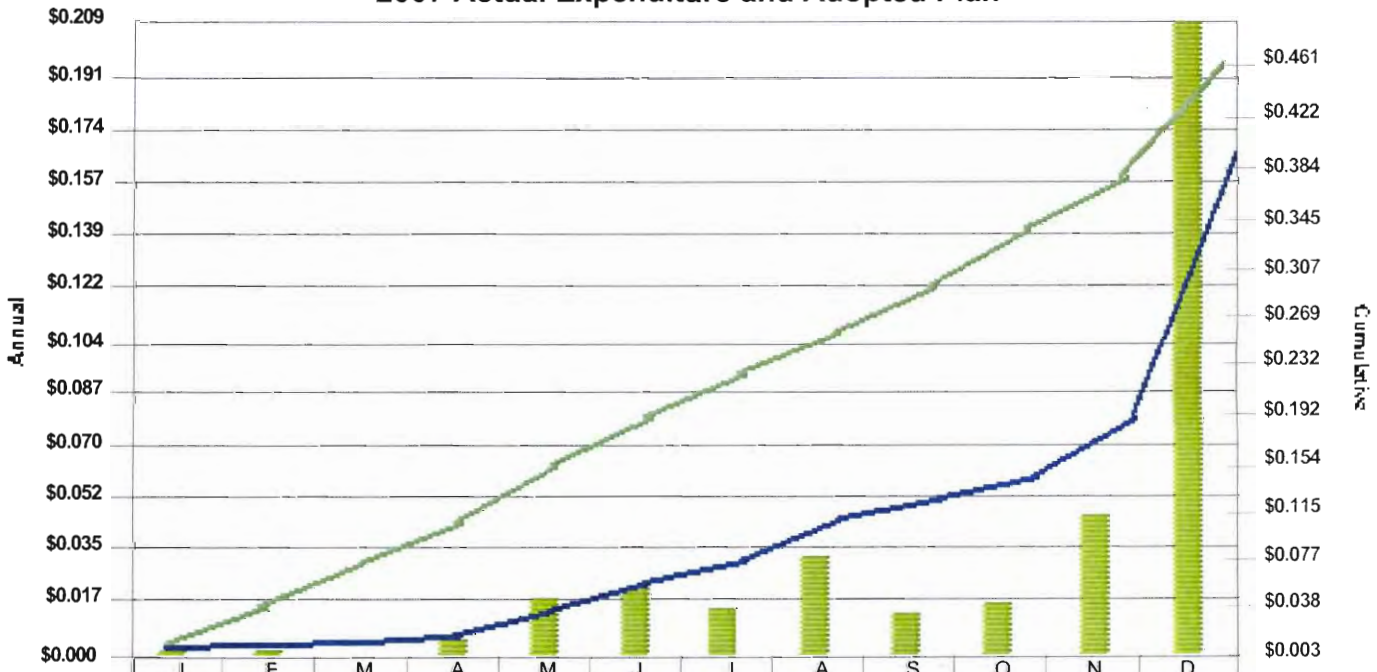
Cost/Budget Adjustments

Contract Status

Contract	Original Contract Amount	Phased Amends	Base Contract Amount	Change Amends or COs	Change Percentage	Nbr of Amends/CO's to Date	Current Contract Amount	Amount Paid	Thru Pmt No.	% Paid
Black Diamond Storage Facility E00003E06	$617,610	$0	$617,610	$278,499	45%	1	$896,109	$71,160	6	8%

Annual Cash Flow

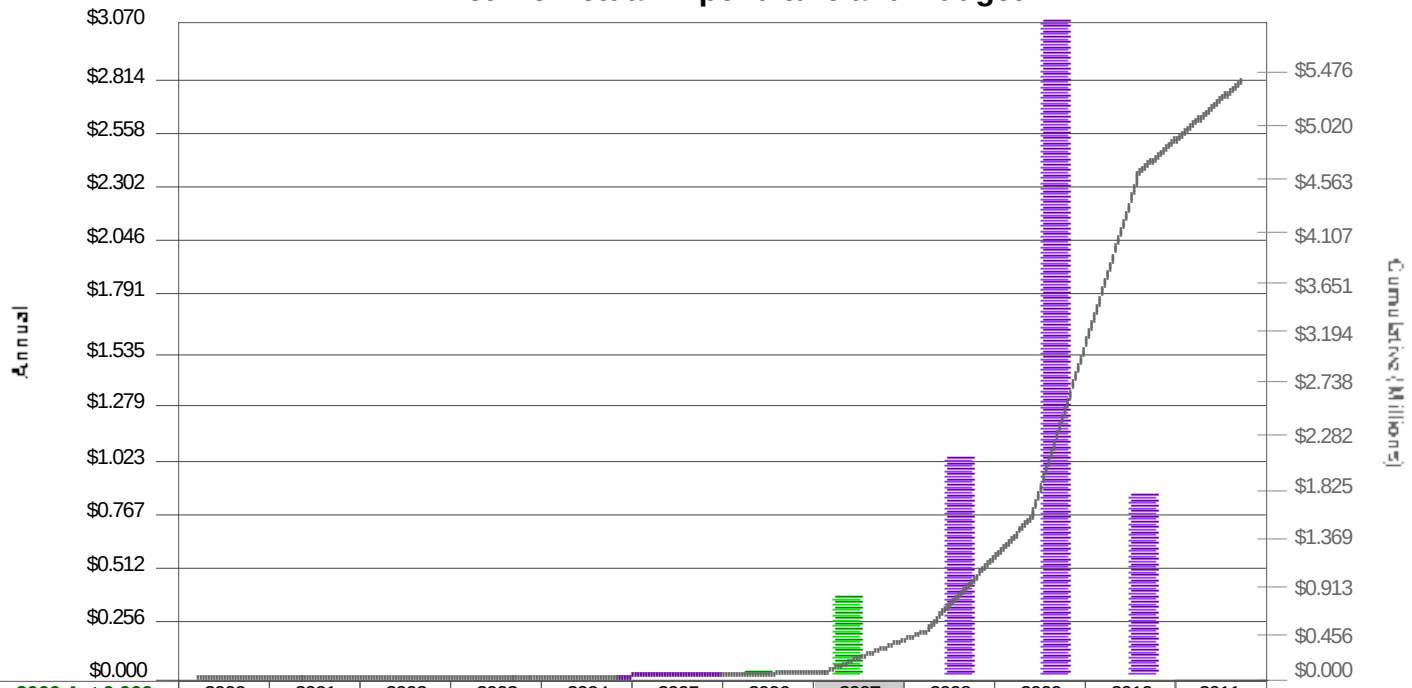
2007 Actual Expenditure and Adopted Plan



	J	F	M	A	M	J	J	A	S	O	N	D
Actual	0.003	0.002	0.001	0.005	0.019	0.022	0.017	0.034	0.015	0.017	0.047	0.209
Adopted Plan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cum. Plan	0.006	0.035	0.068	0.100	0.146	0.184	0.218	0.251	0.287	0.372	0.372	0.461
Cum. Act	0.003	0.005	0.006	0.012	0.031	0.053	0.070	0.103	0.119	0.136	0.183	0.392

Lifetime Cash Flow

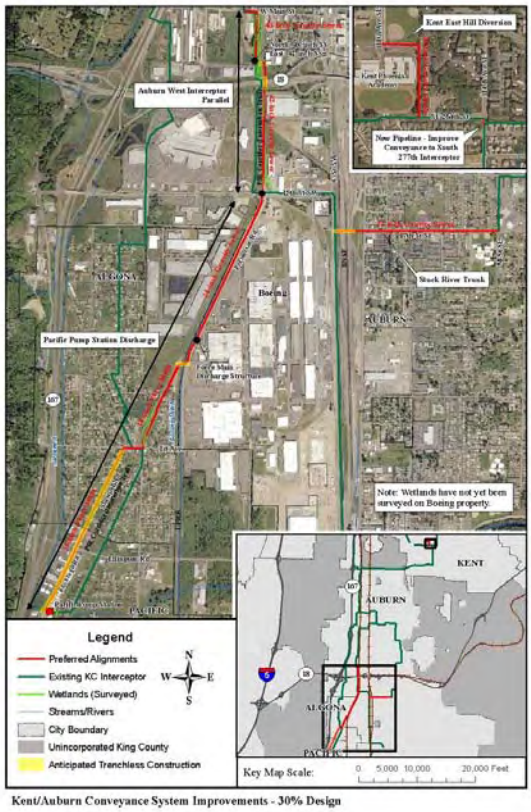
Lifetime Actual Expenditure and Budget



Pre-2000 Act 0.000	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Actual Dec-07			0.010			0.012	0.027	0.392				
Budget									1.028	3.070	0.859	0.000
CumAct+Bdgt	0.000	0.000	0.010	0.010	0.010	0.023	0.050	0.441	1.469	4.539	5.397	5.397

RWSP Project Report
DECEMBER 2007

423582 SW Interceptor



Kent/Auburn Conveyance System Improvements - 30% Design

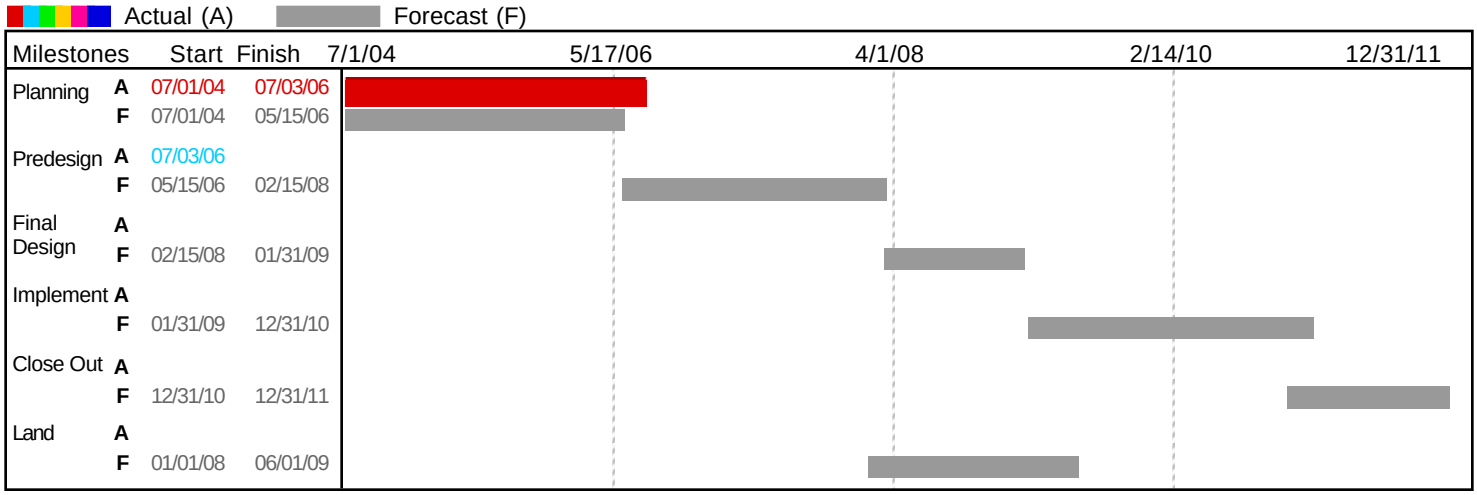
Project Description

This project will construct approximately 5 miles of new sewer in Kent, Auburn, Algona, and Pacific ranging in size from 18 inch diameter to 42 inch diameter. There are 4 distinct project elements: 1) Pacific Pump Station Force Main and gravity sewer located in Pacific, Algona and Auburn-this pipe will run north and direct flow to the Auburn West Interceptor and relieve capacity in the Auburn West Valley Interceptor, 2) Auburn West Valley parallel interceptor located in Auburn will parallel the Auburn West Interceptor and add capacity, 3) the Stuck River Trunk in Auburn will convey sewage flow away from the M-Street Trunk to the new parallel interceptor listed in (2) above, and 4) the East Hill Diversion in Kent, will divert some flow out of the Mill Creek Interceptor and convey it to the South 277th Interceptor on the Kent East Hill thereby relieving capacity problems in the Mill Creek Interceptor in downtown Kent.

Project Phase: 2 Predesign

King County
Department of Natural Resources and Parks
Wastewater Treatment Division

Milestone Schedule



Schedule Adjustments

Cost Summary

Expenses	2007 Actual Expenditure and Plan			Lifetime Actual Expenditure and Budget		
	IBIS YTD Dec-07	Adopted Plan	Updated Plan	IBIS LTD Dec-07	Lifetime Budget	Updated Budget
CONSTRUCTION	5,294	0	0	5,294	31,967,529	32,110,149
Construction Contracts		0	0	0	31,967,529	32,021,143
Other Capital Charges	5,294	0	0	5,294	0	89,006
NON-CONSTRUCTION	1,715,604	3,652,893	3,086,881	2,460,810	10,737,423	12,264,803
Engineering	1,275,369	2,406,080	2,589,625	1,722,224	6,904,768	5,916,081
Planning & Management Svcs.	61,000	0	0	61,000	0	1,488,321
Permitting & Other Agency Support	4,438	144,431	10,000	4,438	208,187	282,950
Right-of-Way		721,000	0	0	1,039,270	1,060,900
Misc. Services & Materials	32,063	0	32,000	43,931	6,008	561,300
Staff Labor	342,734	381,382	455,256	629,218	2,579,191	2,955,251
PROJECT RESERVE		0	0	0	1,857,075	1,802,999
Project Reserve		0	0	0	1,857,075	1,802,999
Total $	1,720,898	3,652,893	3,086,881	2,466,104	44,562,027	46,177,951

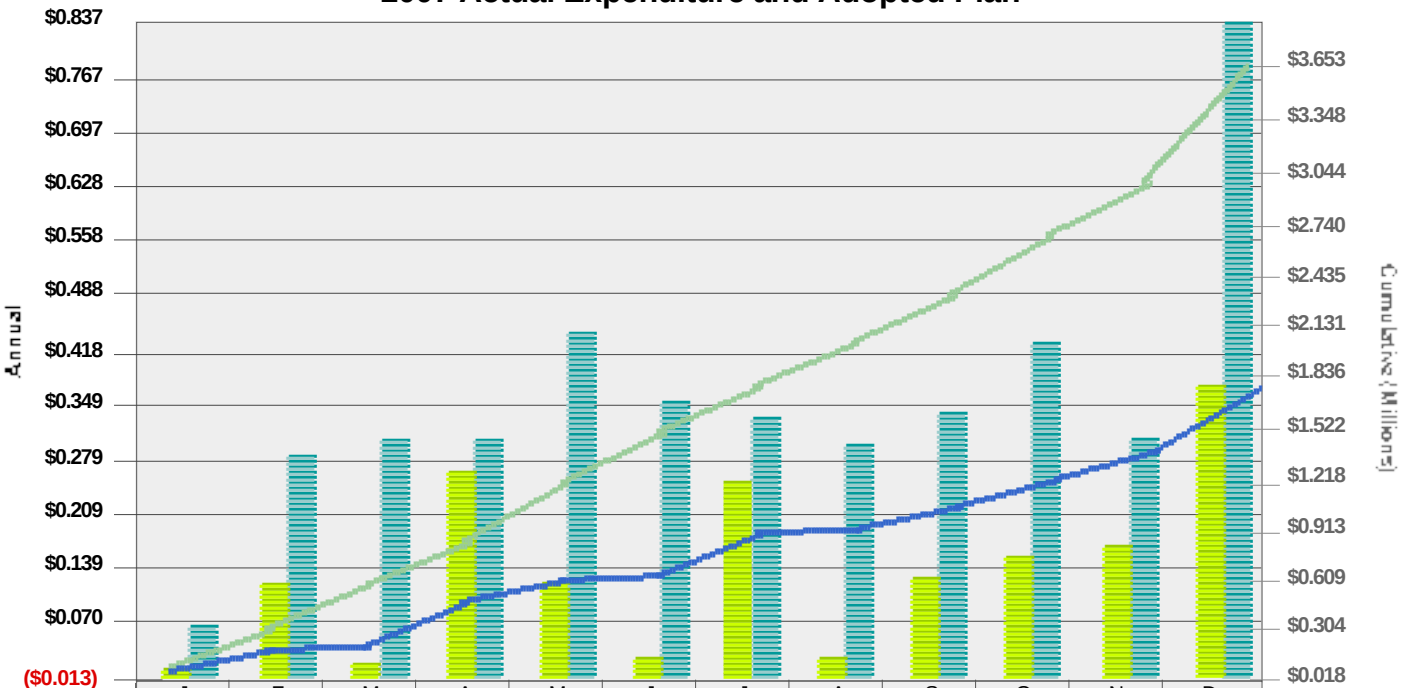
Cost/Budget Adjustments

The increase in the project cost estimates is attributed to updated information resulting from completion of 30% design.

Contract Status

Contract	Original Contract Amount	Phased Amends	Base Contract Amount	Change Amends or COs	Change Percentage	Nbr of Amends/CO's to Date	Current Contract Amount	Amount Paid	Thru Pmt No.	% Paid
Engineering Services for Kent Auburn Conveyance System E53009E	$2,686,967	$0	$2,686,967	$0	0%		$2,686,967	$1,636,717	16	61%

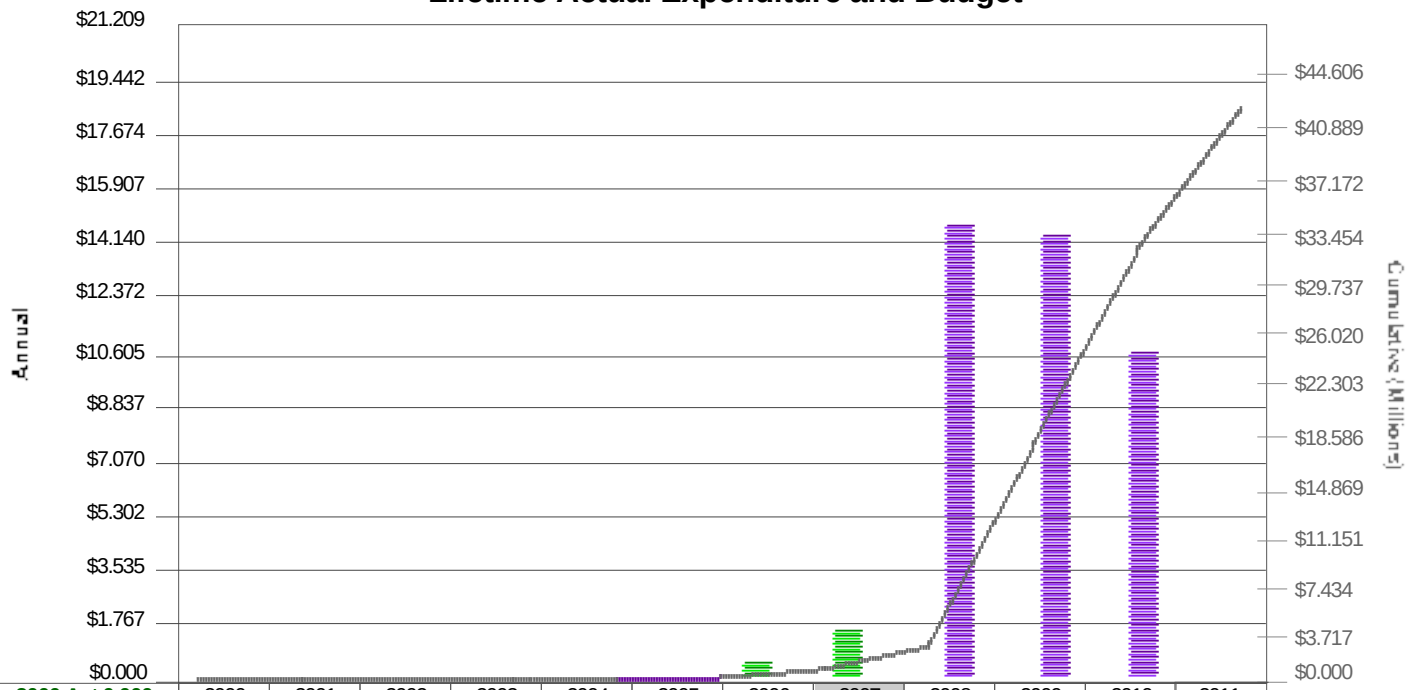
Annual Cash Flow



	J	F	M	A	M	J	J	A	S	O	N	D
Actual	0.018	0.128	0.023	0.266	0.129	0.029	0.253	0.028	0.135	0.162	0.174	0.375
Adopted Plan	0.069	0.286	0.312	0.308	0.442	0.356	0.334	0.304	0.343	0.429	0.312	0.837
Cum. Plan	0.044	0.274	0.541	0.796	1.154	1.458	1.731	1.994	2.279	2.952	2.952	3.653
Cum. Act	0.018	0.146	0.169	0.435	0.564	0.593	0.846	0.875	1.010	1.172	1.346	1.721

Lifetime Cash Flow

Lifetime Actual Expenditure and Budget



Pre-2000 Act 0.000	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Actual Dec-07					0.015	0.087	0.643	1.721				
Budget									14.760	14.371	10.594	0.000
CumAct+Bdgt	0.000	0.000	0.000	0.000	0.015	0.102	0.745	2.466	17.226	31.597	42.190	42.190

RWSP Project Report
DECEMBER 2007

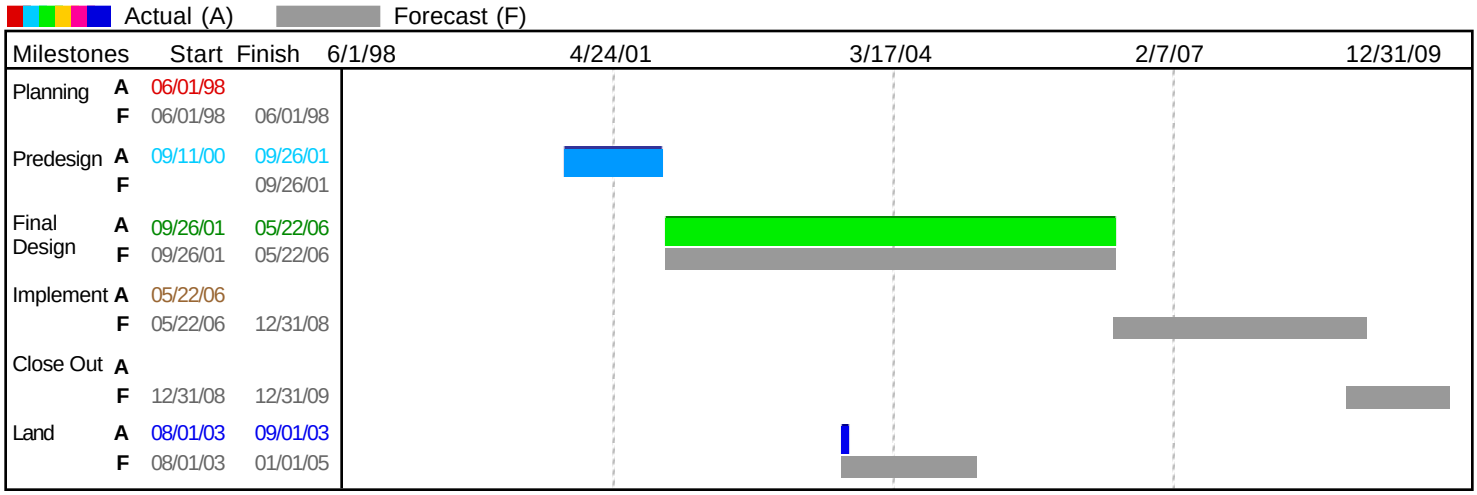
423365 HIDDEN LAKE PS/BOEING CREEK TRUNK

Project Description

This project will construct a new Hidden Lake pump station, approximately 12,000 feet of new sewer pipeline, and a 500,000 gallon underground storage pipe. The project is located in the City of Shoreline. The pipelines will be constructed by open trenching and microtunneling. The pump station will be constructed by conventional above ground methods. Construction started in May 2006. In 2007, the storage facility in Boeing Creek Park was completed and work continued on construction of the pump station and Boeing Creek Trunk.

Project Phase: 4 Implementation

Milestone Schedule



Schedule Adjustments

Cost Summary

Expenses	2007 Actual Expenditure and Plan			Lifetime Actual Expenditure and Budget		
	IBIS YTD Dec-07	Adopted Plan	Updated Plan	IBIS LTD Dec-07	Lifetime Budget	Updated Budget
CONSTRUCTION	10,224,958	13,657,585	8,729,263	18,897,767	27,572,644	26,612,848
Construction Contracts	10,189,789	13,070,288	8,244,906	18,850,089	26,539,828	25,738,339
Owner Furnished Equipment	490			490		
Outside Agency Construction		587,297	484,357	0	1,032,816	861,999
Other Capital Charges	34,679	0	0	47,189	0	12,510
NON-CONSTRUCTION	1,999,331	1,701,671	1,962,381	10,130,518	10,091,741	12,016,804
Engineering	241,684	534,512	399,846	4,511,208	5,140,453	4,996,517
Planning & Management Svcs.	392,834	874,989	705,927	802,535	1,676,343	1,690,859
Permitting & Other Agency Support	27,595	34,686	34,917	1,279,162	1,212,527	1,302,019
Right-of-Way	67,375	0	32,790	217,008	149,633	216,196
Misc. Services & Materials	122,081	0	80,250	352,377	133,988	382,389
Staff Labor	1,147,763	257,484	708,651	2,968,228	1,778,798	3,428,823
PROJECT RESERVE		0	0	0	1,201,970	268,342
Project Reserve		0	0	0	1,201,970	268,342
CREDITS AND REVENUES		-179,419	-213,642	0	-465,834	-433,694
Credits and Revenues		-179,419	-213,642	0	-465,834	-433,694
Total $	12,224,289	15,179,837	10,478,002	29,028,285	38,400,521	38,464,299

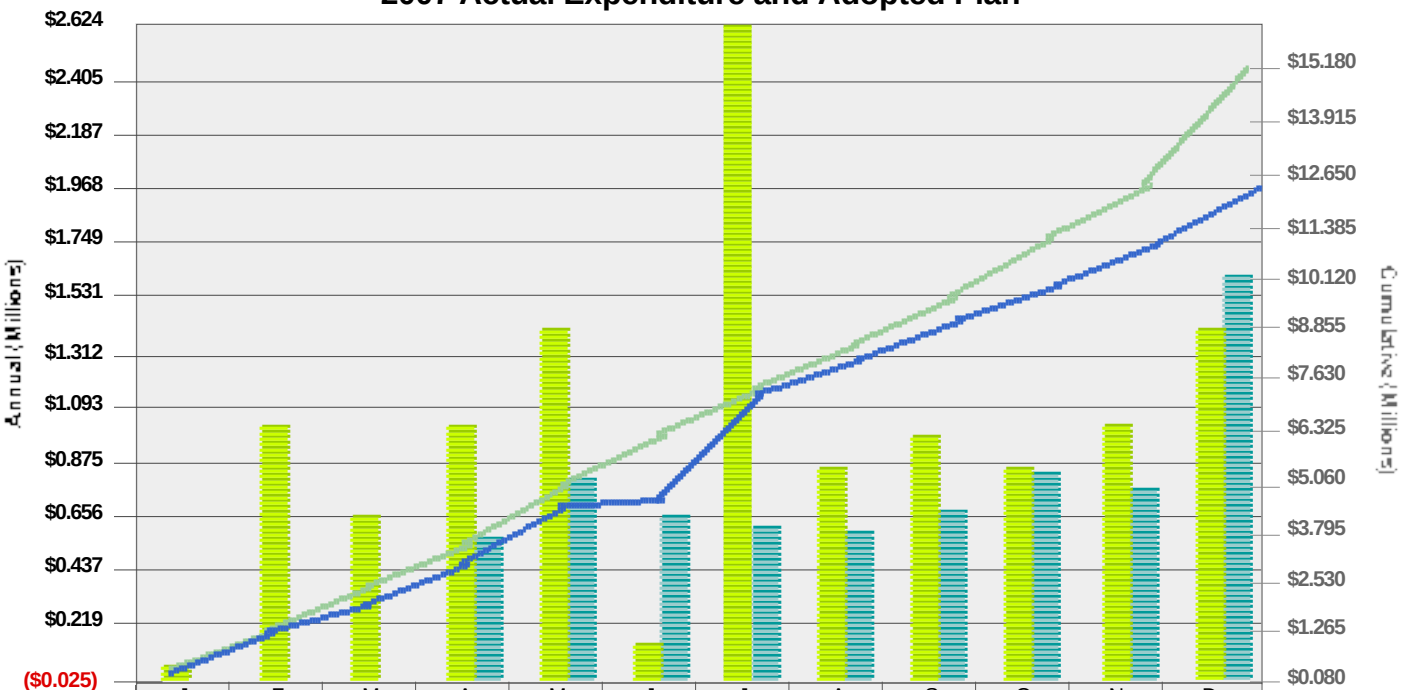
Cost/Budget Adjustments

Contract Status

Contract	Original Contract Amount	Phased Amends	Base Contract Amount	Change Amends or COs	Change Percentage	Nbr of Amends/CO's to Date	Current Contract Amount	Amount Paid	Thru Pmt No.	% Paid
Hidden Lake Project C53108C	$20,929,000	$0	$20,929,000	$226,326	1%	3	$21,155,326	$16,297,043	17	77%
Hidden Lake Pump Station E03036E	$2,699,191	$0	$2,699,191	$2,381,297	88%	5	$5,080,487	$4,354,842	61	86%
Construction Management Services for the Hidden P43017P	$1,500,071	$0	$1,500,071	$0	0%	1	$1,500,071	$364,938	13	24%
Mitigation for Hidden Lk PS and boeing Creek Trunk Sewer MOA 3415	$1,100,000	$0	$1,100,000	$0	0%		$1,100,000	$1,100,000	1	100%
Permanent Underground Svcs for Hidden Lake PS Agreement/SCL	$60,000	$0	$60,000	$0	0%		$60,000	$0		0%

Annual Cash Flow

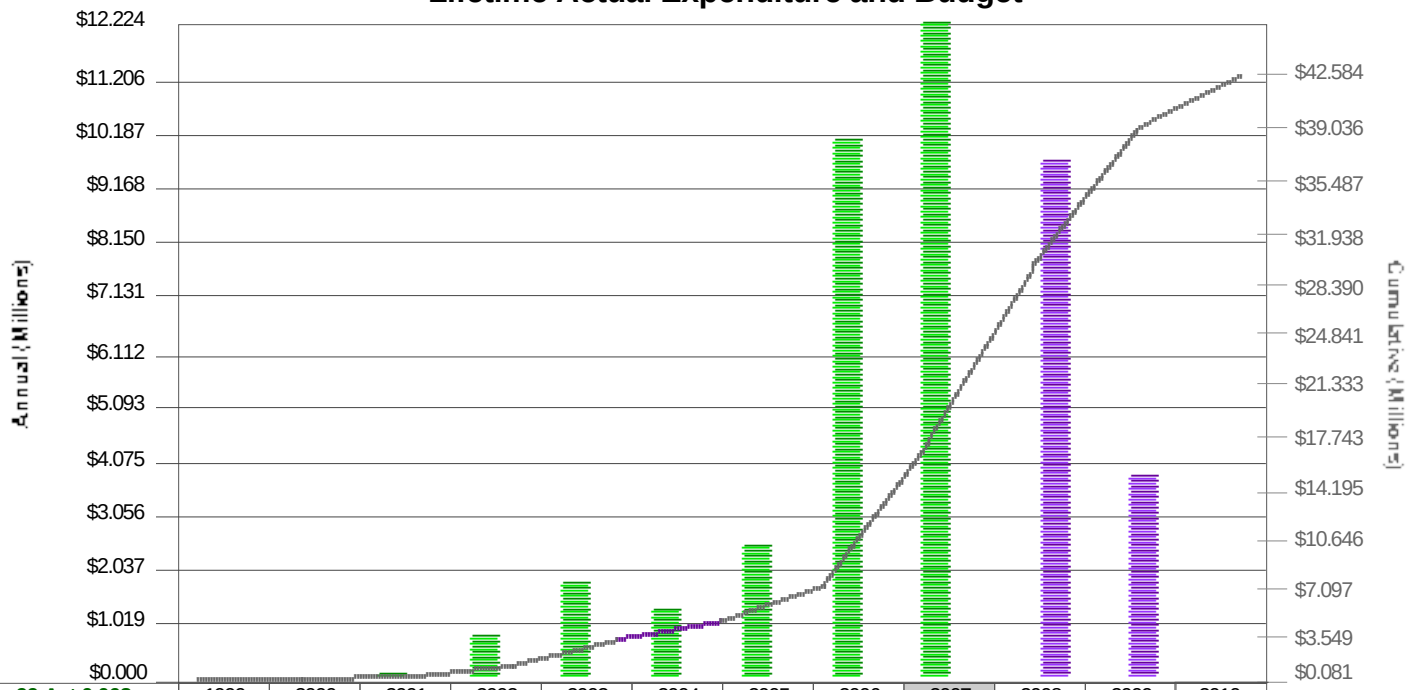
2007 Actual Expenditure and Adopted Plan



	J	F	M	A	M	J	J	A	S	O	N	D
Actual	0.080	1.025	0.677	1.033	1.425	0.170	2.624	0.871	0.989	0.868	1.045	1.418
Adopted Plan				0.579	0.830	0.671	0.629	0.612	0.688	0.847	0.771	1.627
Cum. Plan	0.182	1.138	2.247	3.309	4.797	6.057	7.195	8.288	9.472	12.265	12.265	15.180
Cum. Act	0.080	1.105	1.782	2.815	4.240	4.410	7.034	7.905	8.894	9.762	10.807	12.224

Lifetime Cash Flow

Lifetime Actual Expenditure and Budget



Pre-99 Act 0.068	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Actual Dec-07	0.013	0.043	0.105	0.814	1.814	1.300	2.547	10.101	12.224			
Budget										9.704	3.852	0.000
CumAct+Bdgt	0.081	0.124	0.229	1.043	2.856	4.156	6.703	16.804	29.028	38.733	42.584	42.584

RWSP Project Report
DECEMBER 2007

423494 Fairwood Interceptor (formerly Madsen Creek)

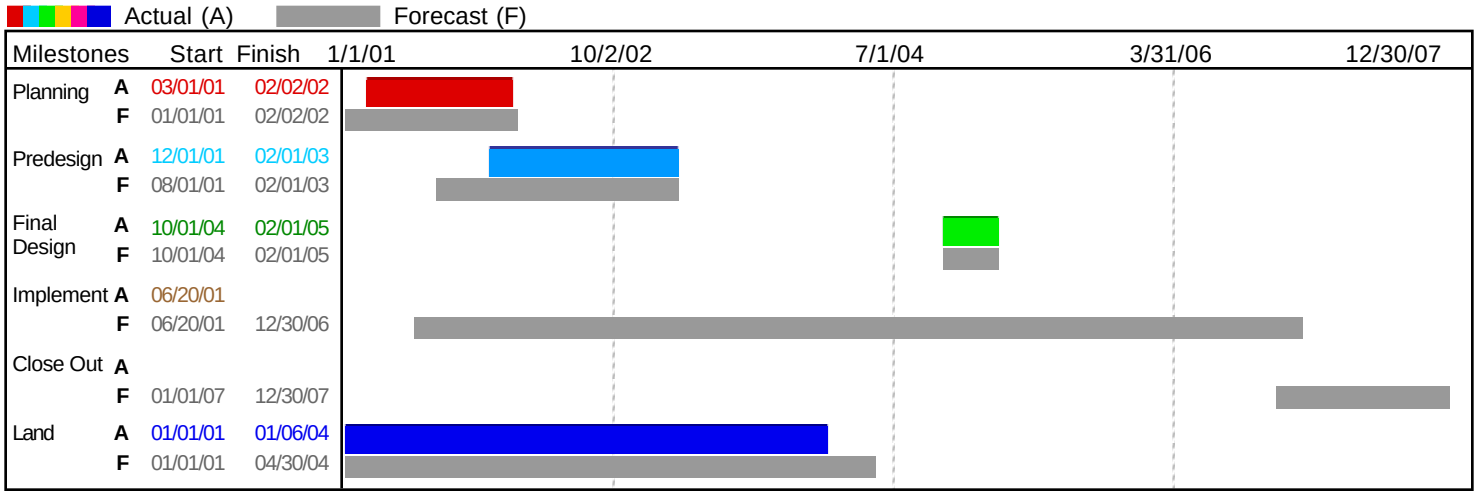
Project Description

This project will abandon existing erosion prone and unstable Madsen Creek sewer pipeline which conveys sewage from the Fairwood area near SE Renton to the Maple Valley trunk. Replace with a new, deep gravity sewer in a new alignment, outside the Madsen Creek ravine. The new alignment follows Fairwood Blvd. for several blocks, and includes an inverted siphon underneath the west Madsen Creek tributary, from the Fairwood Elementary School to the Bonneville Power Authority right-of-way near 140th Avenue. This new deep gravity interceptor avoids the need for a pump station to be located in the Fairwood area. The project was divided into 3 major phases: Phase 1 - Inverted Siphon, Phase 2A Pipe bursting, and Phase 2B Microtunneling.
Construction is substantially complete on all three phases and the new Fairwood interceptor is in service. Restoration activites took place in 2007.

Project Phase: 4 Implementation

King County
Department of Natural Resources and Parks
Wastewater Treatment Division

Milestone Schedule



Schedule Adjustments

Cost Summary

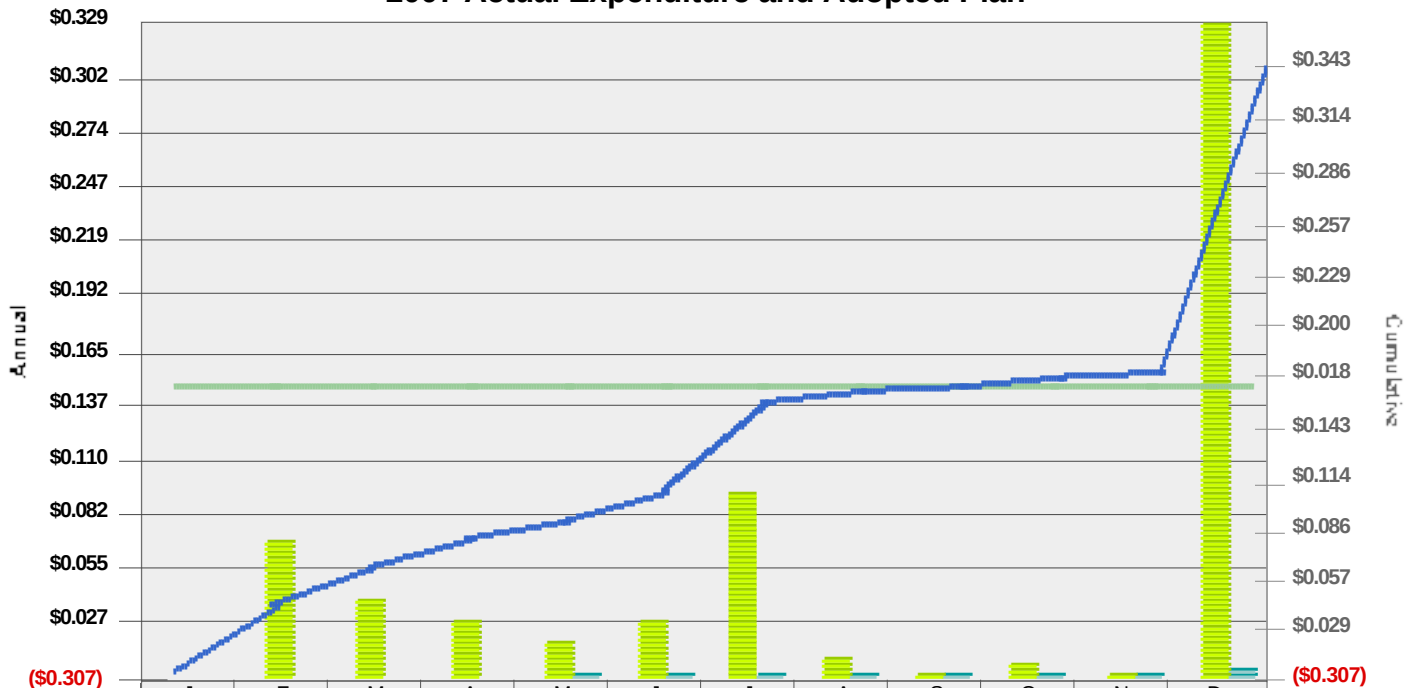
Expenses	2007 Actual Expenditure and Plan			Lifetime Actual Expenditure and Budget		
	IBIS YTD Dec-07	Adopted Plan	Updated Plan	IBIS LTD Dec-07	Lifetime Budget	Updated Budget
CONSTRUCTION	212,474	0	500,000	16,742,000	17,117,978	17,029,526
Construction Contracts	163,974	0	500,000	16,655,499	17,117,660	16,991,525
Other Capital Charges	48,500	0	0	86,501	319	38,001
NON-CONSTRUCTION	130,410	0	348,000	4,524,629	4,588,557	4,762,819
Engineering	-42,765	0	62,000	2,238,756	2,666,770	2,343,521
Planning & Management Svcs.	13,287	0	0	77,349	16,248	64,062
Permitting & Other Agency Support	52,747	0	82,000	390,022	334,637	419,275
Right-of-Way	0	0	75,000	231,134	205,392	306,134
Misc. Services & Materials	1,033	0	0	78,204	62,106	77,170
Staff Labor	106,107	0	129,000	1,509,164	1,303,405	1,552,657
PROJECT RESERVE			67,840	0		85,309
Project Reserve			67,840	0		85,309
Total $	342,884	0	915,840	21,266,629	21,706,535	21,877,654

Cost/Budget Adjustments

Contract Status

Contract	Original Contract Amount	Phased Amends	Base Contract Amount	Change Amends or COs	Change Percentage	Nbr of Amends/CO's to Date	Current Contract Amount	Amount Paid	Thru Pmt No.	% Paid
Fairwood Interceptor Phase 2B, Microtunneling C53002C	$7,699,750	$0	$7,699,750	$118,494	2%	4	$7,818,244	$7,810,554	18	100%
Fairwood - Evaluation and Design of Madsen Creek E03002E	$385,376	$2,058,746	$2,444,123	$189,325	8%	3	$2,633,447	$2,176,920	80	83%

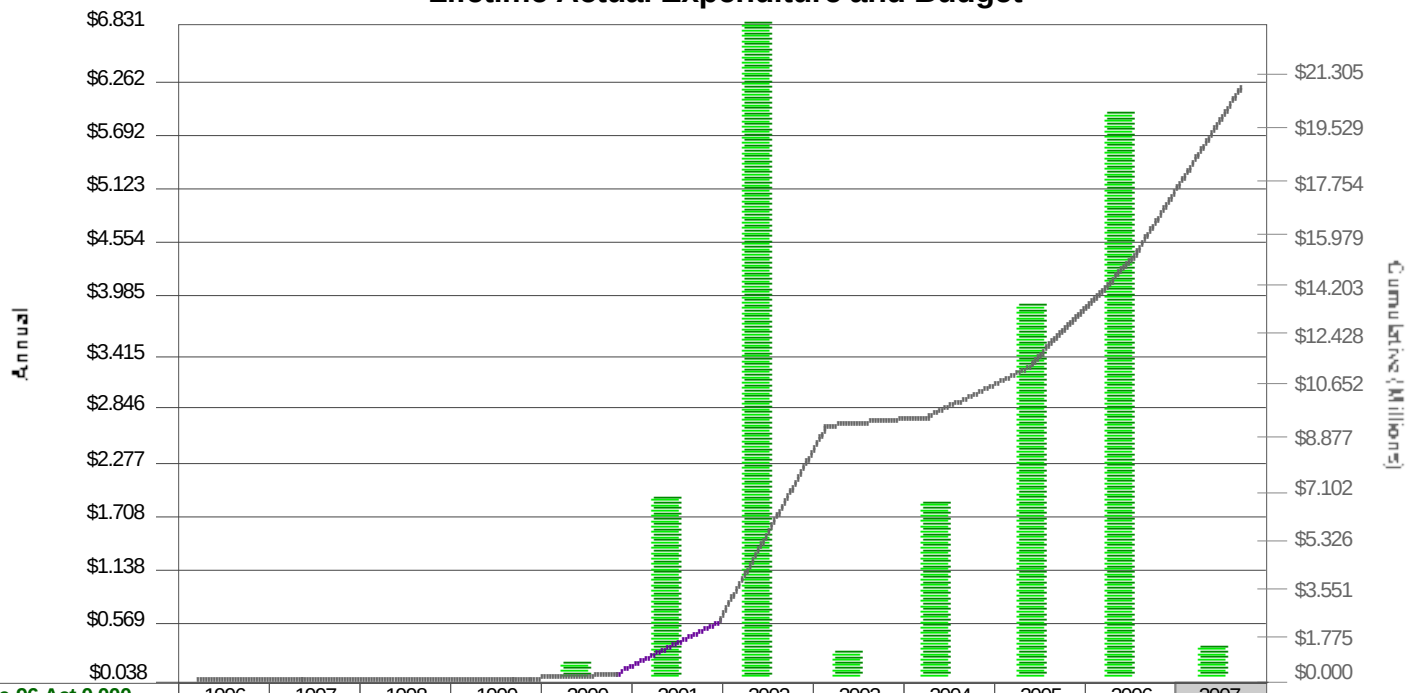
Annual Cash Flow



	J	F	M	A	M	J	J	A	S	O	N	D
Actual	-0.307	0.071	0.041	0.031	0.019	0.031	0.096	0.012	0.005	0.010	0.005	0.329
Adopted Plan					0.004	0.003	0.003	0.003	0.003	0.004	0.004	0.007
Cum. Plan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cum. Act	-0.307	-0.236	-0.195	-0.165	-0.146	-0.115	-0.018	-0.006	-0.001	0.009	0.014	0.343

Lifetime Cash Flow

Lifetime Actual Expenditure and Budget



Pre-96 Act 0.000	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Actual Dec-07					0.186	1.906	6.831	0.328	1.853	3.902	5.918	0.343
Budget												
CumAct+Bdgt	0.000	0.000	0.000	0.000	0.186	2.092	8.923	9.251	11.103	15.006	20.924	21.267

RWSP Project Report
DECEMBER 2007

423406 JUANITA BAY PS - MODIFICATIONS

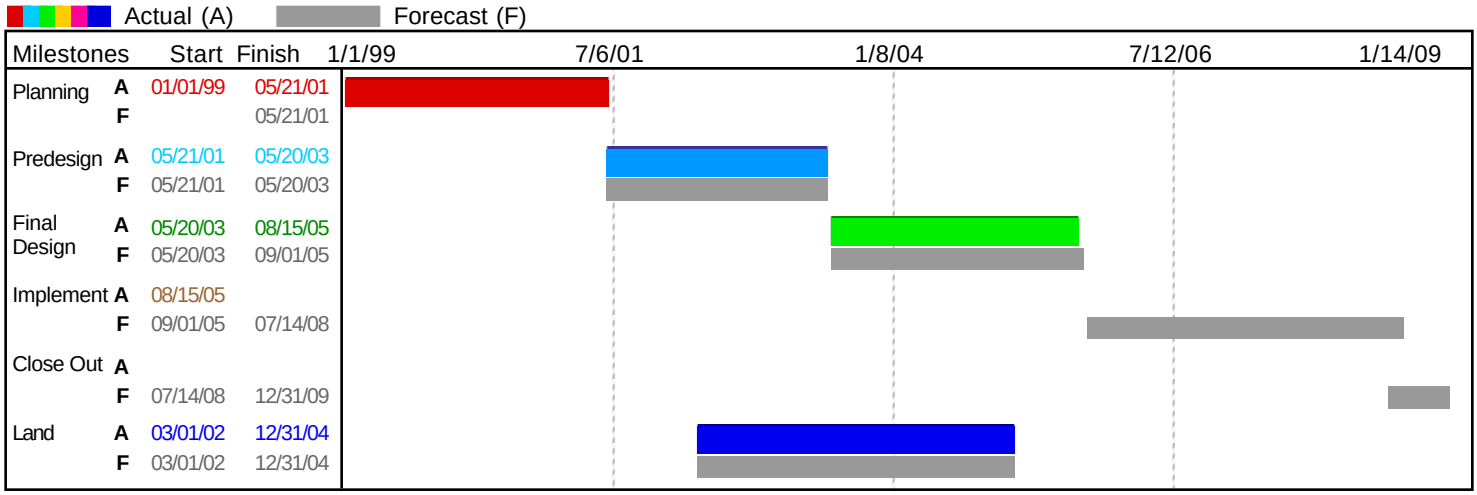
Project Description

This project will construct a 30.6 million gallon per day wastewater pump station to increase the capacity of and replace an aging pump station. The existing and future pump stations are located at the intersection of NE Juanita Drive and 93rd Ave NE in Kirkland. The station will include four pairs of two-stage pumps, odor control and chemical addition systems for odor and corrosion prevention, equipment lifting devices, equipment sound attenuation, and a standby generator. A large portion of the facility will be in an underground 86-foot-diameter, 50-foot-deep circular structure. The underground structure will be constructed with 4-foot diameter reinforced concrete secant (interlocking) piles. A Juanita Force Mains capacity upgrade will be performed under a separate future project.

Project Phase: 4 Implementation

King County
Department of Natural Resources and Parks
Wastewater Treatment Division

Milestone Schedule



Schedule Adjustments

Cost Summary

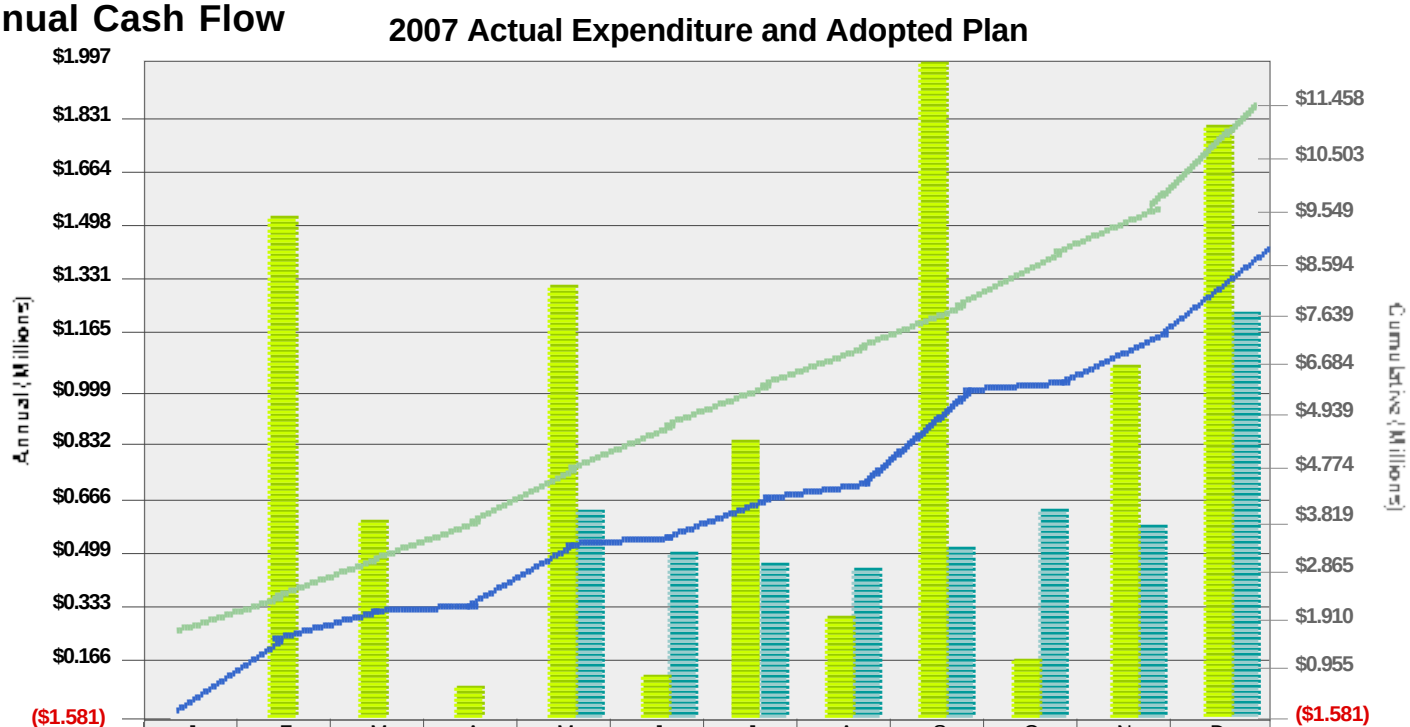
Expenses	2007 Actual Expenditure and Plan			Lifetime Actual Expenditure and Budget		
	IBIS YTD Dec-07	Adopted Plan	Updated Plan	IBIS LTD Dec-07	Lifetime Budget	Updated Budget
CONSTRUCTION	6,430,546	8,812,923	9,209,150	14,938,120	22,964,516	21,719,286
Construction Contracts	6,430,546	8,704,000	9,204,000	14,916,962	22,684,448	21,600,354
Outside Agency Construction		15,450	0	0	30,450	15,450
Other Capital Charges	0	93,472	5,150	21,158	249,618	103,482
NON-CONSTRUCTION	1,951,735	2,645,341	2,372,040	12,477,150	14,012,401	14,280,099
Engineering	783,382	1,518,000	500,000	7,062,531	8,670,261	7,281,648
Planning & Management Svcs.	22,786	0	46,000	127,466	70,804	174,280
Permitting & Other Agency Support	43,407	161,464	91,515	136,802	214,318	184,910
Right-of-Way	0	0	0	1,541,751	1,541,751	1,541,751
Misc. Services & Materials	79,771	5,150	55,000	203,297	86,405	204,275
Staff Labor	1,022,389	960,726	1,679,525	3,405,304	3,428,862	4,893,234
PROJECT RESERVE			10,000	0		1,075,713
Project Reserve			10,000	0		1,075,713
Total $	8,382,281	11,458,263	11,591,190	27,415,269	36,976,918	37,075,097

Cost/Budget Adjustments

Contract Status

Contract	Original Contract Amount	Phased Amends	Base Contract Amount	Change Amends or COs	Change Percentage	Nbr of Amends/CO's to Date	Current Contract Amount	Amount Paid	Thru Pmt No.	% Paid
Juanita Bay Pump Station Replacement C43085C	$18,988,000	$0	$18,988,000	$108,070	1%	4	$19,096,070	$13,176,328	21	69%
Eng'g Services for Juanita Bay & Forcemain Update E03037E	$1,849,354	$6,577,438	$8,426,792	$0	0%	4	$8,426,792	$6,930,122	78	82%

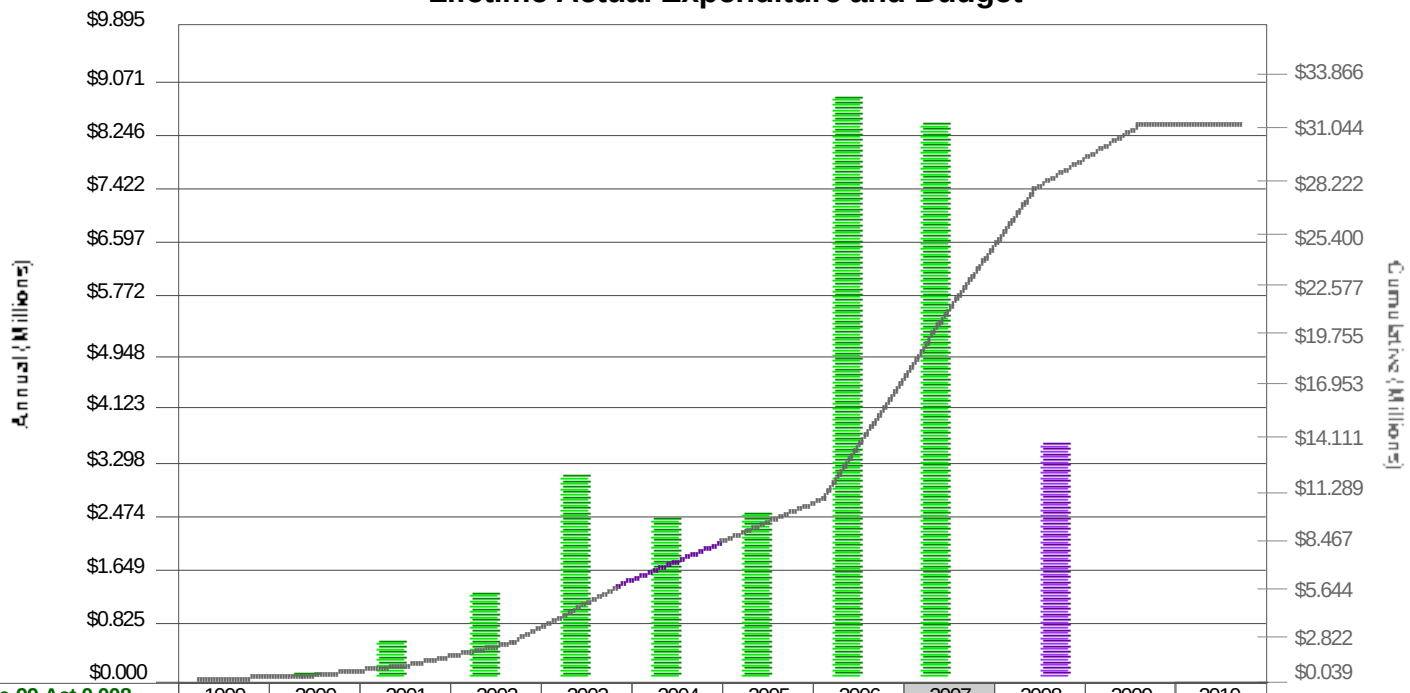
Annual Cash Flow



	J	F	M	A	M	J	J	A	S	O	N	D
Actual	-1.581	1.528	0.614	0.111	1.319	0.144	0.851	0.320	1.997	0.193	1.076	1.809
Adopted Plan					0.635	0.513	0.481	0.468	0.526	0.648	0.590	1.244
Cum. Plan	0.137	0.859	1.696	2.498	3.621	4.572	5.431	6.256	7.150	9.258	9.258	11.458
Cum. Act	-1.581	-0.053	0.561	0.673	1.991	2.136	2.987	3.307	5.304	5.497	6.573	8.382

Lifetime Cash Flow

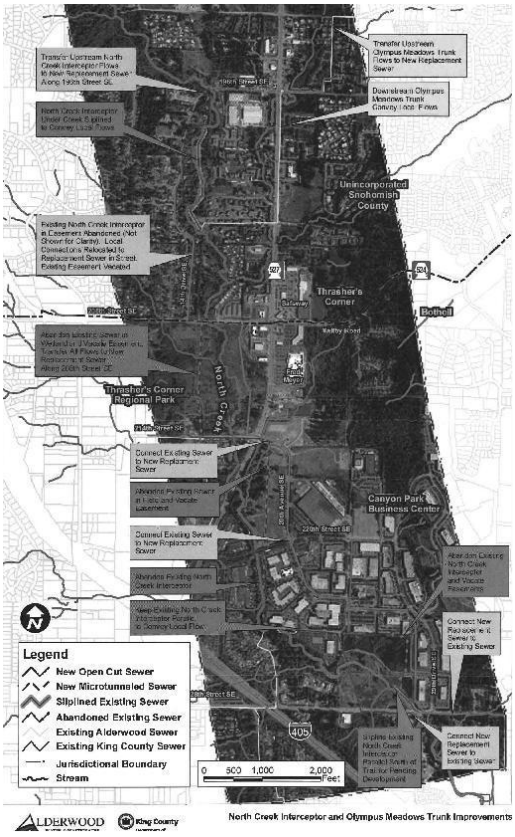
Lifetime Actual Expenditure and Budget



Pre-99 Act 0.008	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Actual Dec-07	0.032	0.151	0.639	1.290	3.125	2.475	2.513	8.800	8.382			
Budget										3.552	0.045	0.000
CumAct+Bdgt	0.039	0.190	0.830	2.120	5.244	7.720	10.233	19.033	27.415	30.968	31.012	31.012

RWSP Project Report
DECEMBER 2007

423596 North Creek Pipeline

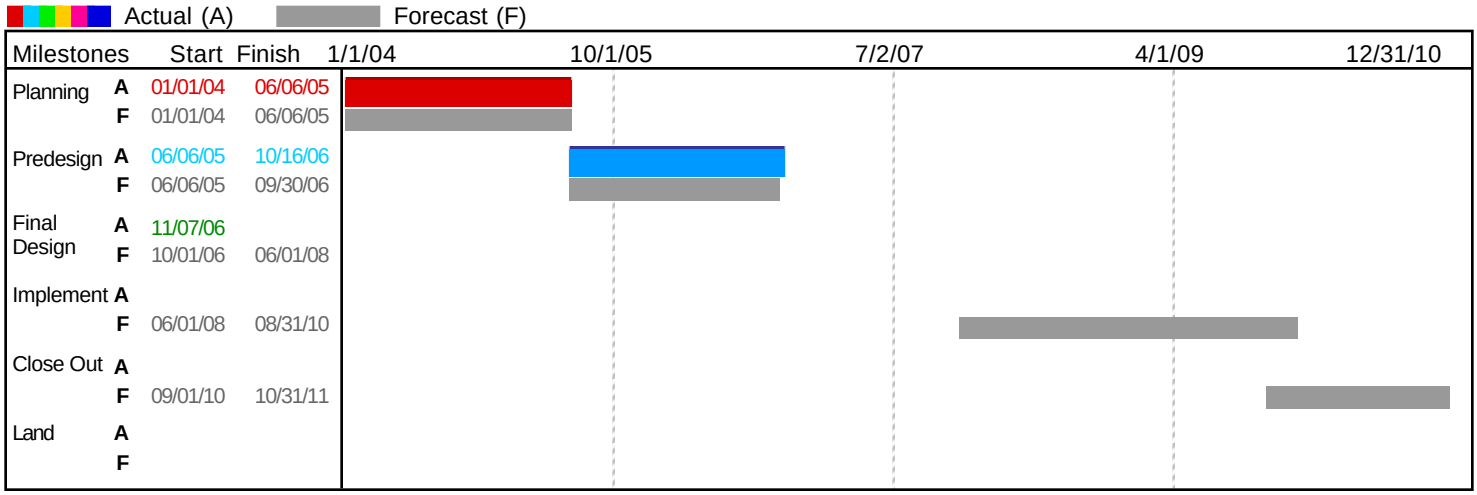


Project Description

King County signed an interlocal agreement with the Alderwood Water and Wastewater District on this project. The district is designing the project and will manage its construction. King County staff is providing overall project management and oversight, including approving key design and construction decisions. The improvements will consist of 16,400 feet of gravity sewer pipes, ranging from 21 inches to 48 inches that replace the existing pipes. The sewer pipes will be installed using open cut construction, with trenchless construction methods used for special crossings where the pipe crosses areas with high potential for traffic or environmental impacts.

Project Phase: 4 Implementation

Milestone Schedule



Schedule Adjustments

Cost Summary

Expenses	2007 Actual Expenditure and Plan			Lifetime Actual Expenditure and Budget		
	IBIS YTD Dec-07	Adopted Plan	Updated Plan	IBIS LTD Dec-07	Lifetime Budget	Updated Budget
CONSTRUCTION		5,553,662	3,189,103	0	23,010,304	29,805,319
Construction Contracts		4,280,582	3,189,102	0	20,863,042	29,805,318
Outside Agency Construction		1,273,080	0	0	2,147,262	0
NON-CONSTRUCTION	2,000,676	1,716,409	3,839,738	3,094,871	5,343,423	8,354,813
Engineering	1,676,629	224,540	2,188,445	2,651,428	2,072,995	5,544,011
Permitting & Other Agency Support			553,846	0		553,846
Right-of-Way		651,990	600,000	0	1,151,990	600,000
Misc. Services & Materials	40,458	0	0	45,854	0	5,396
Staff Labor	283,589	839,879	497,447	397,589	2,118,438	1,651,559
Total $	2,000,676	7,270,071	7,028,841	3,094,871	28,353,727	38,160,130

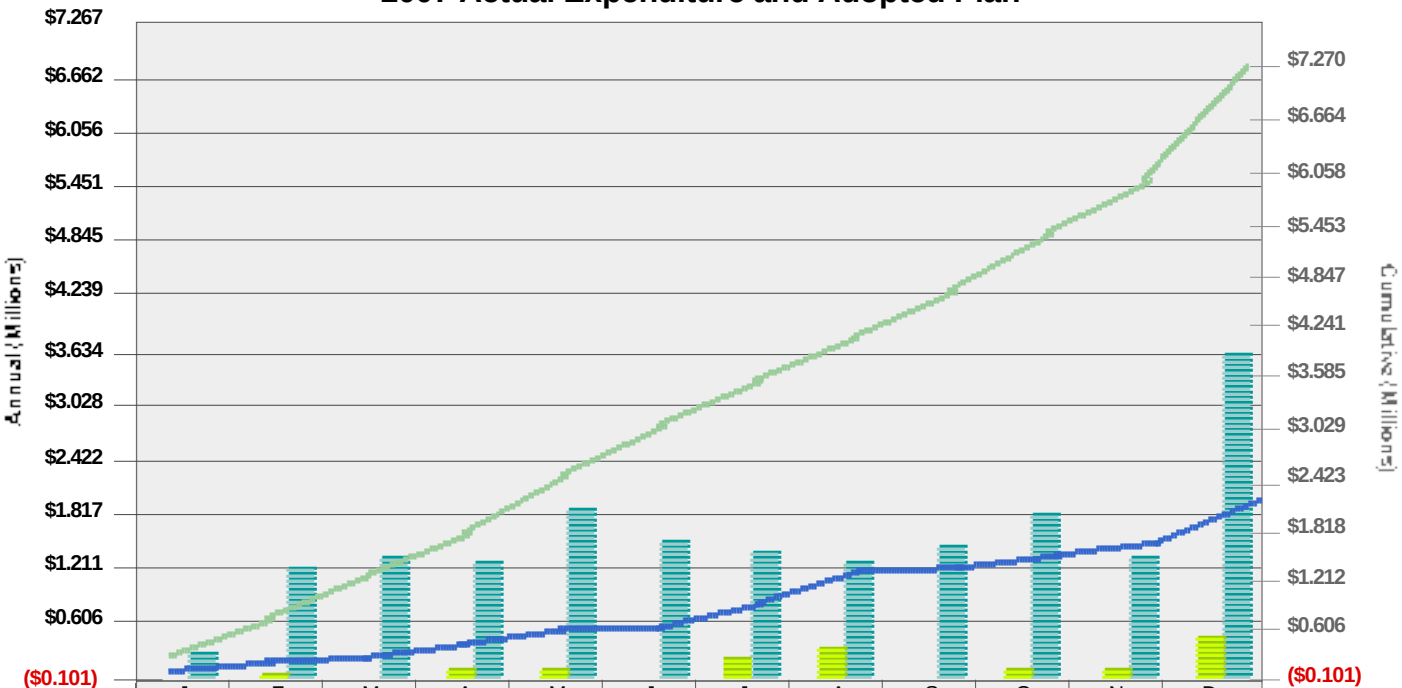
Cost/Budget Adjustments

The increase in costs reflects the need for additional micro-tunneling and dewatering locations. These additional activities were identified during final design because of the high groundwater conditions, environmentally sensitive areas, and the need to avoid major traffic impacts on two state highways. Higher than anticipated easement acquisition costs and longer than anticipated delays in obtaining critical permits also contributed to the cost increase.

Contract Status

Contract	Original Contract Amount	Phased Amends	Base Contract Amount	Change Amends or COs	Change Percentage	Nbr of Amends/CO's to Date	Current Contract Amount	Amount Paid	Thru Pmt No.	% Paid
North Creek Interceptor Improvements A-NCI-2005	$31,100,000	$0	$31,100,000	$0	0%		$31,100,000	$2,669,164	28	9%

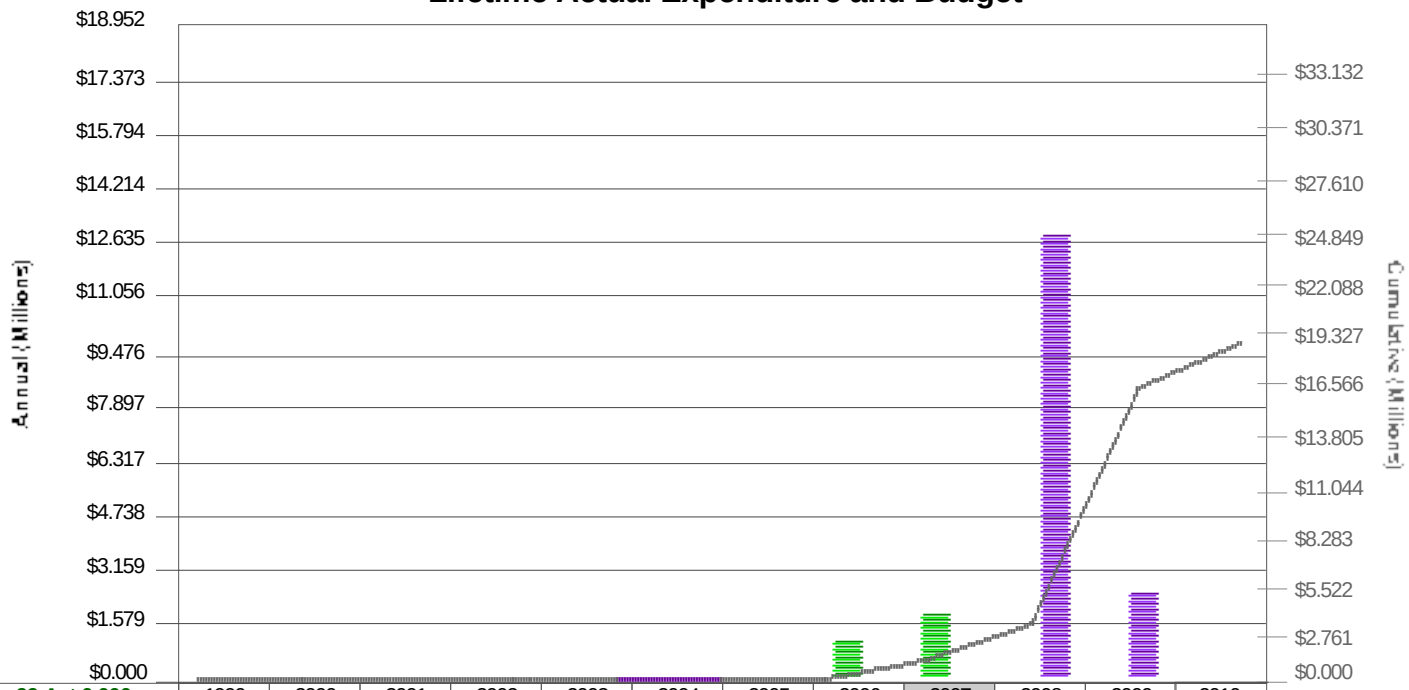
Annual Cash Flow



	J	F	M	A	M	J	J	A	S	O	N	D
Actual	-0.101	0.114	0.055	0.162	0.176	0.023	0.295	0.409	0.022	0.160	0.155	0.531
Adopted Plan	0.303	1.251	1.365	1.346	1.933	1.554	1.459	1.327	1.497	1.876	1.365	3.658
Cum. Plan	0.087	0.545	1.076	1.585	2.297	2.901	3.446	3.969	4.537	5.874	5.874	7.270
Cum. Act	-0.101	0.013	0.068	0.230	0.406	0.430	0.724	1.134	1.155	1.315	1.470	2.001

Lifetime Cash Flow

Lifetime Actual Expenditure and Budget



Pre-99 Act 0.000	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Actual Dec-07								1.094	2.001			
Budget										12.806	2.555	0.000
CumAct+Bdgt	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.094	3.095	15.901	18.456	18.456

RWSP Project Report
DECEMBER 2007

423297 RWSP Local System I/I Control

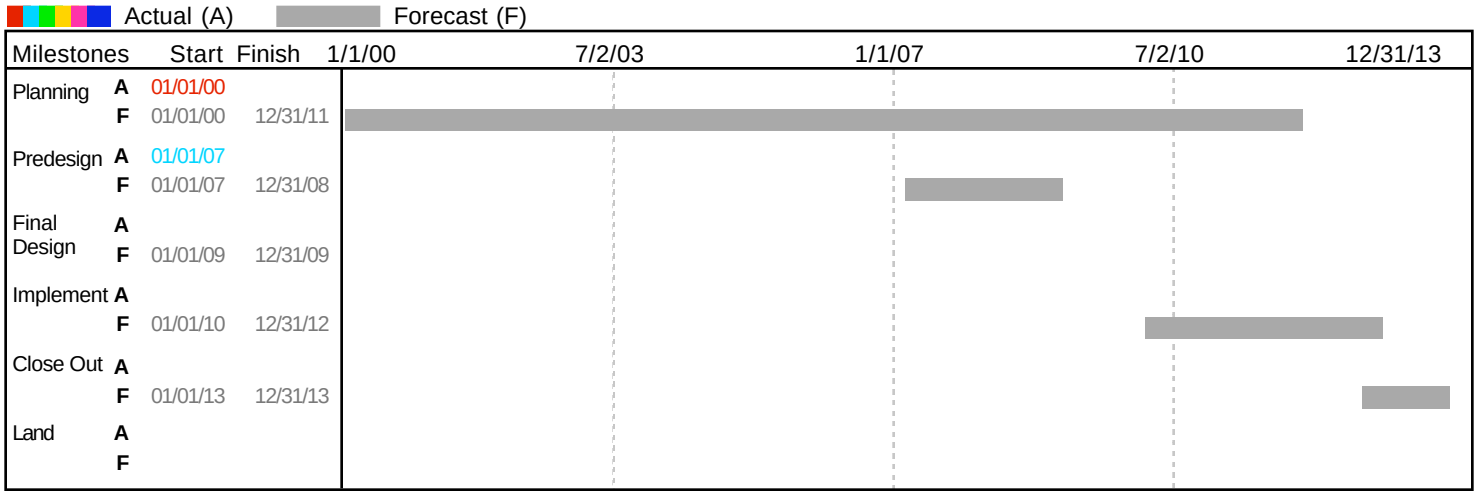
Project Description

The I/I initial projects are part of the Executive's Regional Infiltration/Inflow Control Program that was approved by the King County Council in May 2006. These projects will test the County's ability to cost-effectively reduce I/I within project basins to a point where planned more expensive conveyance system improvement projects will not be needed.

Project Phase: 2 Predesign

King County
Department of Natural Resources and Parks
Wastewater Treatment Division

Milestone Schedule



Schedule Adjustments

Cost Summary

Expenses	2007 Actual Expenditure and Plan			Lifetime Actual Expenditure and Budget		
	IBIS YTD Dec-07	Adopted Plan	Updated Plan	IBIS LTD Dec-07	Lifetime Budget	Updated Budget
CONSTRUCTION	419,460	0	400,000	5,875,459	38,754,179	27,563,061
Construction Contracts	241,101	0	0	5,660,922	38,718,976	26,714,883
Owner Furnished Equipment	178,359	0	0	205,406	26,073	27,046
Other Capital Charges	0	0	400,000	9,131	9,131	821,131
NON-CONSTRUCTION	887,530	990,456	1,282,280	34,083,367	46,046,836	44,855,709
Engineering	233,140	190,354	500,000	25,560,736	34,312,049	31,554,100
Planning & Management Svcs.	53,953	0	0	99,485	45,533	45,533
Permitting & Other Agency Support	0	0	0	1,865,036	1,865,036	1,865,036
Misc. Services & Materials	89,209	28,432	302,586	710,815	802,295	1,107,980
Staff Labor	511,227	771,670	479,694	5,847,295	9,021,923	10,283,061
CREDITS AND REVENUES	0	0	0	-2	0	-2
Credits and Revenues	0	0	0	-2	0	-2
Total $	1,306,989	990,456	1,682,280	39,958,824	84,801,016	72,418,768

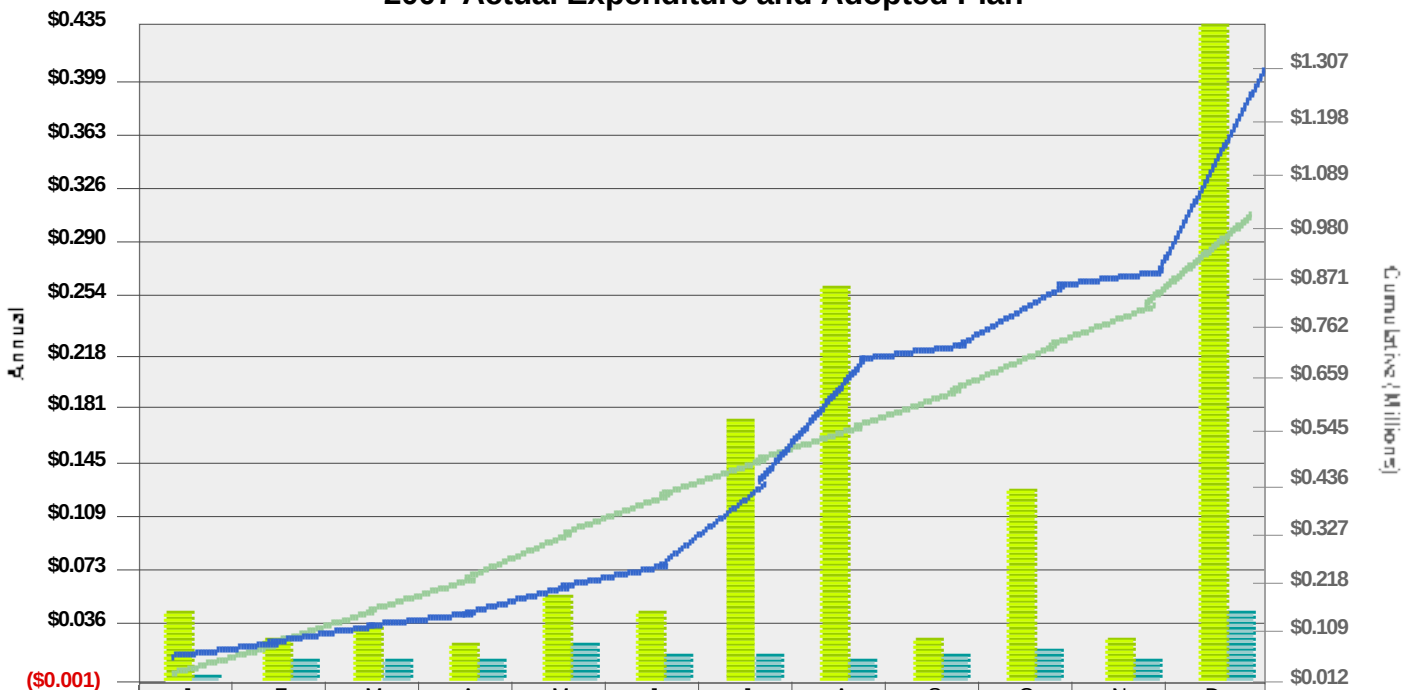
Cost/Budget Adjustments

Contract Status

Contract	Original Contract Amount	Phased Amends	Base Contract Amount	Change Amends or COs	Change Percentage	Nbr of Amends/CO's to Date	Current Contract Amount	Amount Paid	Thru Pmt No.	% Paid
Engineering Services for Initial Infiltration/Inflow Reduction E00057E07	$1,393,139	$0	$1,393,139	$6,076	0%	1	$1,399,215	$166,644	3	12%

Annual Cash Flow

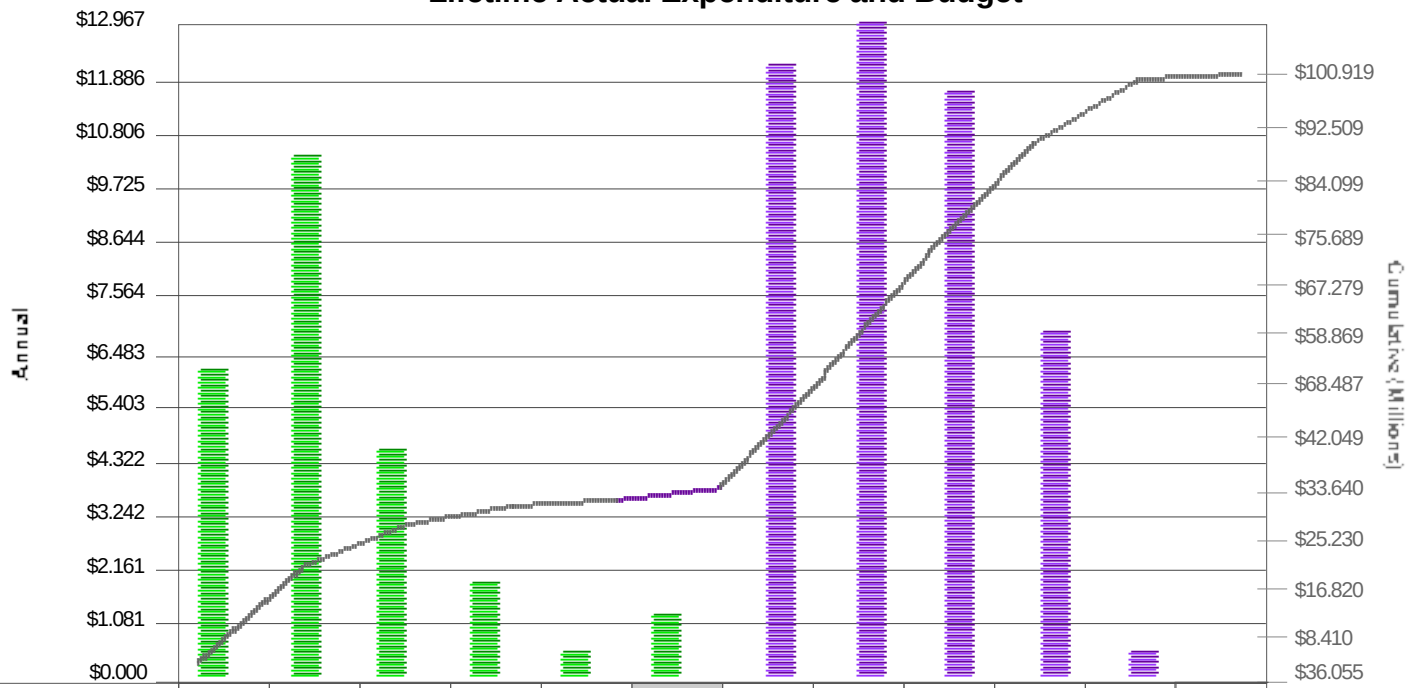
2007 Actual Expenditure and Adopted Plan



	J	F	M	A	M	J	J	A	S	O	N	D
Actual	0.049	0.029	0.036	0.026	0.058	0.046	0.177	0.264	0.030	0.128	0.030	0.435
Adopted Plan	0.004	0.016	0.018	0.017	0.025	0.020	0.019	0.017	0.019	0.024	0.018	0.047
Cum. Plan	0.012	0.074	0.147	0.216	0.313	0.395	0.469	0.541	0.618	0.800	0.800	0.990
Cum. Act	0.049	0.078	0.114	0.140	0.198	0.244	0.421	0.684	0.715	0.842	0.872	1.307

Lifetime Cash Flow

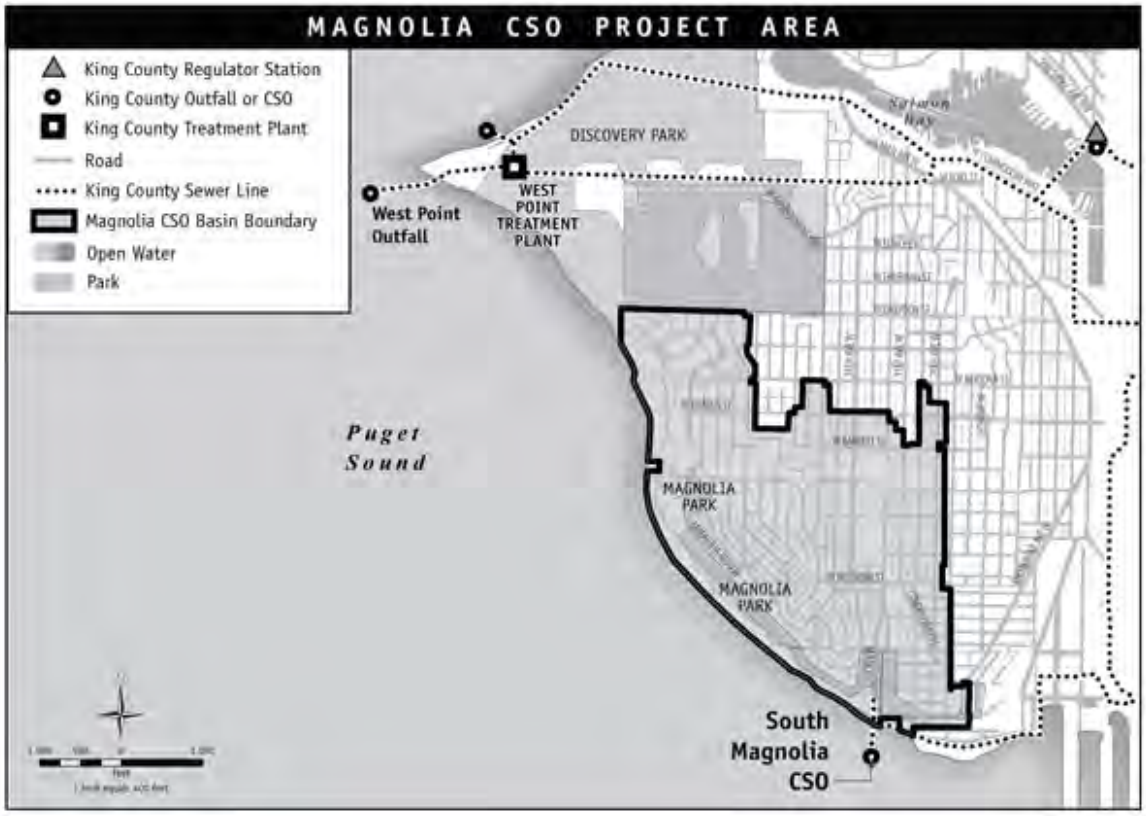
Lifetime Actual Expenditure and Budget



Pre-02 Act 31.503	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Actual Dec-07	6.180	10.429	4.552	2.000	0.597	1.307						
Budget							12.208	12.967	11.694	6.905	0.577	0.000
CumAct+Bdgt	37.683	48.112	52.664	54.664	55.261	56.568	68.775	81.742	93.436	100.341	100.919	100.919

RWSP Project Report
DECEMBER 2007

423607 CSO Control & Improvements - Magnolia



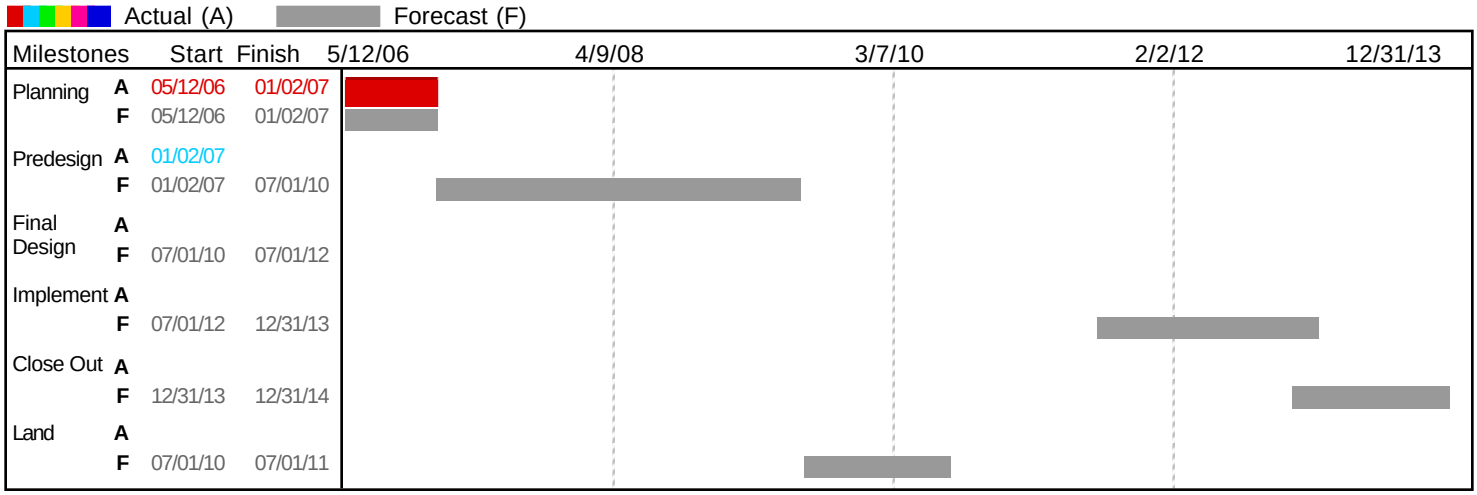
Project Description

Construct a CSO facility to control the CSO overflows at the South Magnolia outfall to meet State regulations of no more than 1 CSO overflow per year on average.

Project Phase: 2 Predesign

King County
Department of Natural Resources and Parks
Wastewater Treatment Division

Milestone Schedule



Schedule Adjustments

Cost Summary

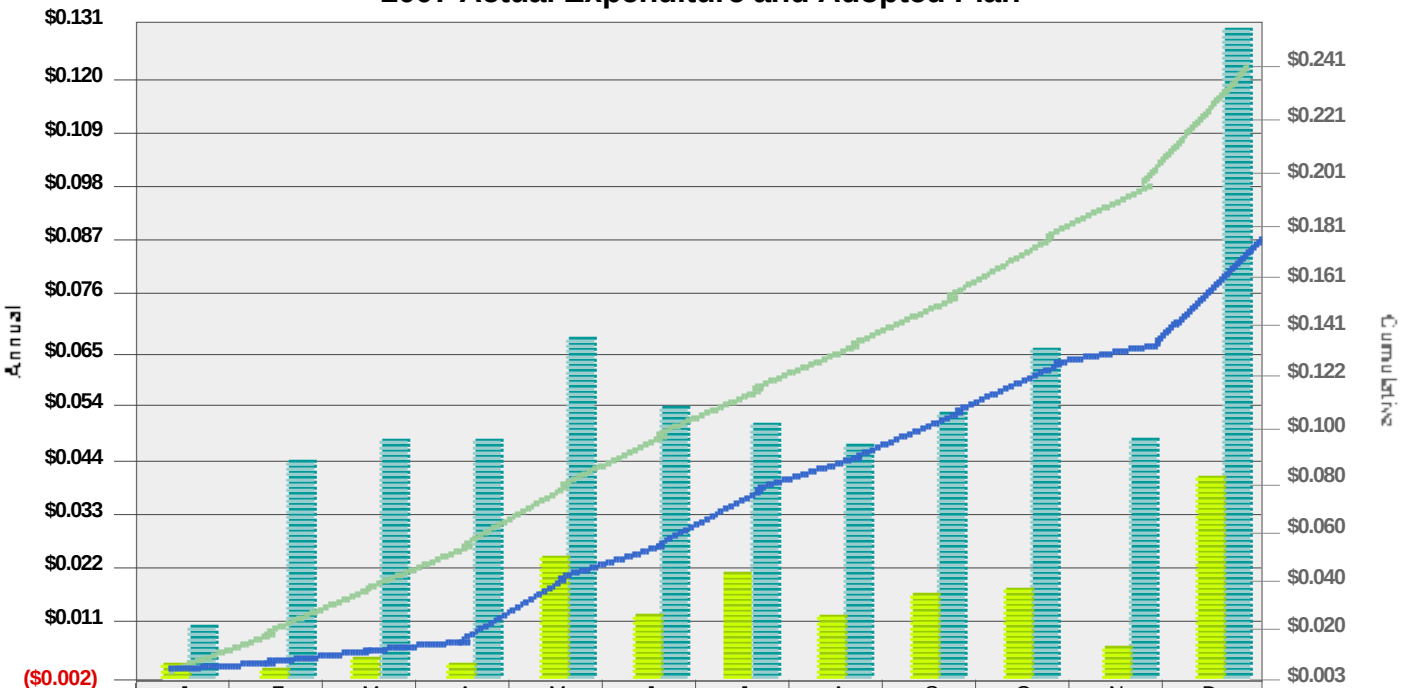
Expenses	2007 Actual Expenditure and Plan			Lifetime Actual Expenditure and Budget		
	IBIS YTD Dec-07	Adopted Plan	Updated Plan	IBIS LTD Dec-07	Lifetime Budget	Updated Budget
CONSTRUCTION		0	0	0	4,773,662	4,913,453
Construction Contracts		0	0	0	4,656,273	4,796,021
Outside Agency Construction			0	0		9
Other Capital Charges		0	0	0	117,389	117,422
NON-CONSTRUCTION	172,489	241,165	345,048	172,489	2,197,021	2,251,047
Engineering	104,181	0	256,543	104,181	1,142,583	1,062,389
Planning & Management Svcs.			0	0		7
Permitting & Other Agency Support		39,974	0	0	81,147	83,587
Right-of-Way		34,414	0	0	34,414	35,981
Misc. Services & Materials	4,565	20,246	0	4,565	107,489	0
Staff Labor	63,743	146,531	88,505	63,743	831,389	1,069,084
PROJECT RESERVE		0	0	0	1,099,470	984,246
Project Reserve		0	0	0	1,099,470	984,246
Total $	172,489	241,165	345,048	172,489	8,070,153	8,148,746

Cost/Budget Adjustments

Contract Status

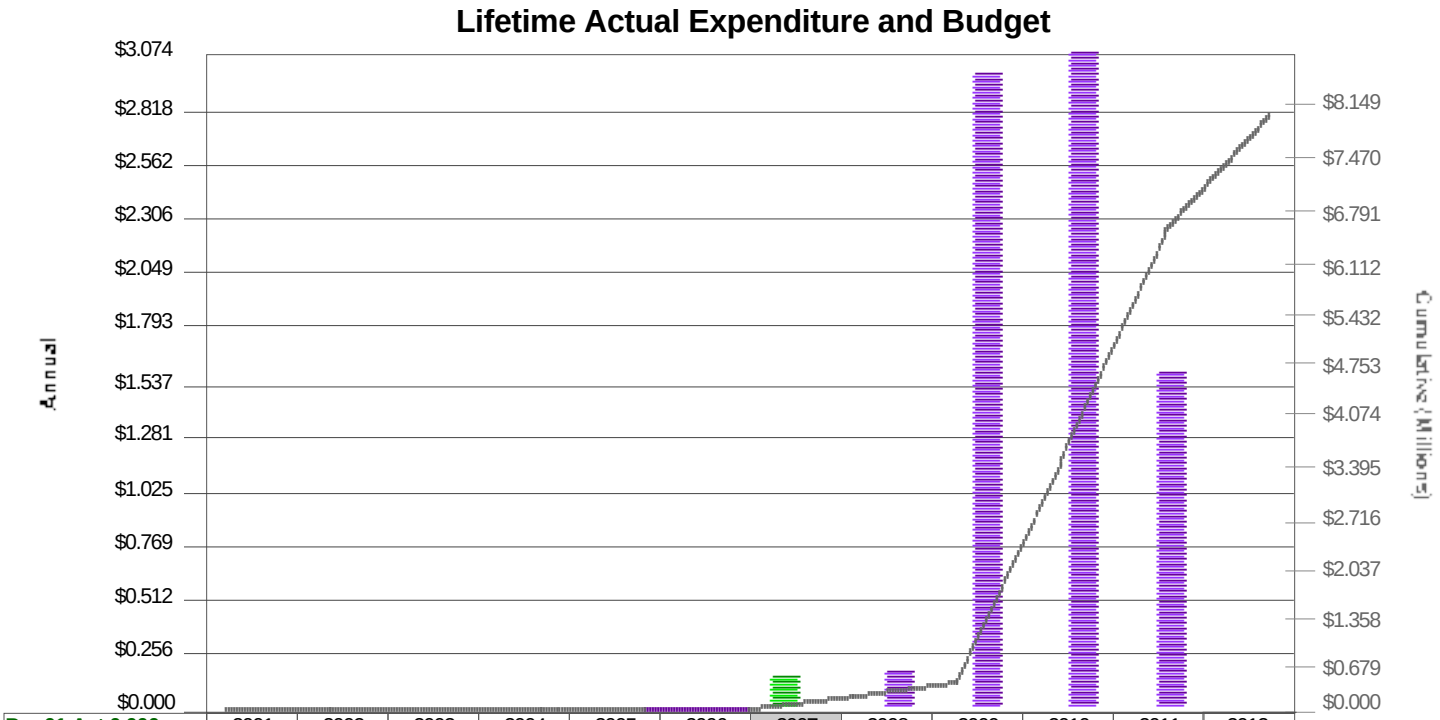
Contract	Original Contract Amount	Phased Amends	Base Contract Amount	Change Amends or COs	Change Percentage	Nbr of Amends/CO's to Date	Current Contract Amount	Amount Paid	Thru Pmt No.	% Paid
Barton, Murray, Magnolia, & North Beach Combined Sewer E00022E06	$4,468,869	$0	$4,468,869	$408,349	9%	1	$4,877,217	$415,595	9	9%

Annual Cash Flow



	J	F	M	A	M	J	J	A	S	O	N	D
Actual	0.004	0.003	0.004	0.004	0.025	0.013	0.022	0.013	0.018	0.019	0.007	0.041
Adopted Plan	0.011	0.044	0.048	0.048	0.069	0.055	0.052	0.047	0.053	0.067	0.048	0.130
Cum. Plan	0.003	0.018	0.036	0.053	0.076	0.096	0.114	0.132	0.150	0.195	0.195	0.241
Cum. Act	0.004	0.006	0.011	0.015	0.040	0.053	0.075	0.088	0.105	0.124	0.132	0.172

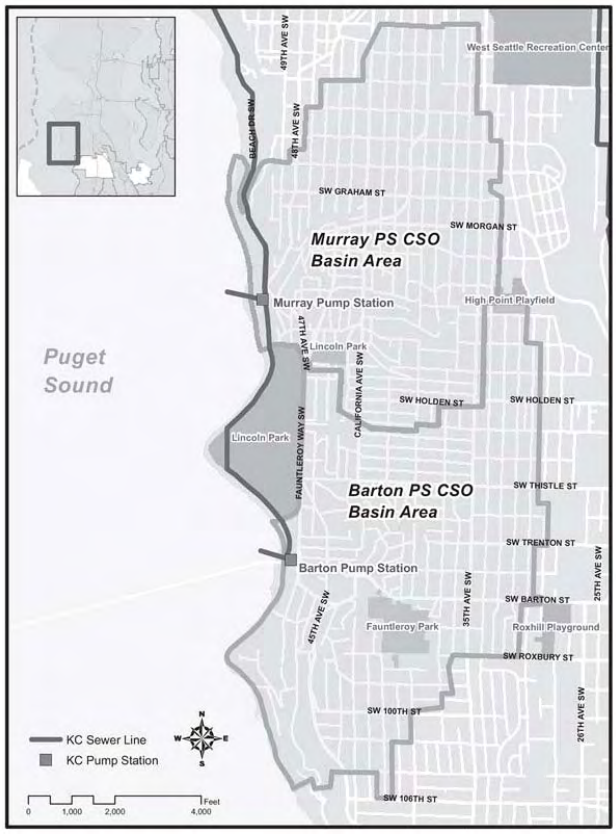
Lifetime Cash Flow



Pre-01 Act 0.000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Actual Dec-07							0.172					
Budget								0.191	2.986	3.074	1.577	0.000
CumAct+Bdgt	0.000	0.000	0.000	0.000	0.000	0.000	0.172	0.364	3.350	6.424	8.001	8.001

RWSP Project Report
DECEMBER 2007

423608 CSO Control & Improvements - Murray



Project Description

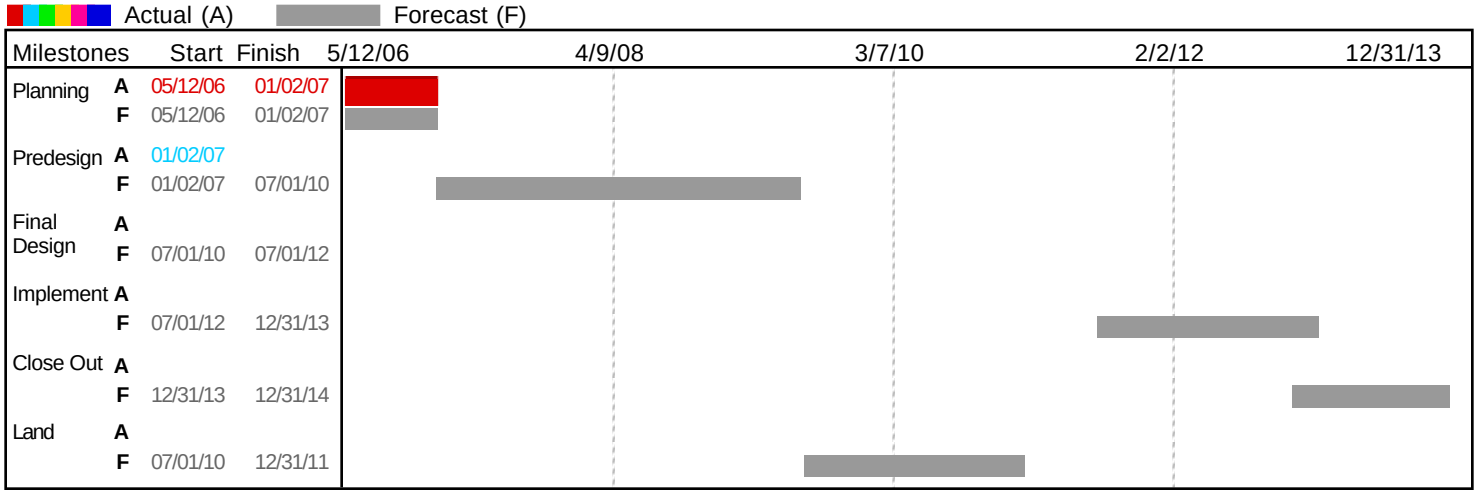
Construct a CSO facility to control the CSO overflows at the Murray Pump Station to meet State regulations of no more than 1 CSO overflow per year on average.

Project Phase: 2 Predesign

King County
Department of Natural Resources and Parks
Wastewater Treatment Division

Milestone Schedule

Actual (A) Forecast (F)



Schedule Adjustments

Cost Summary

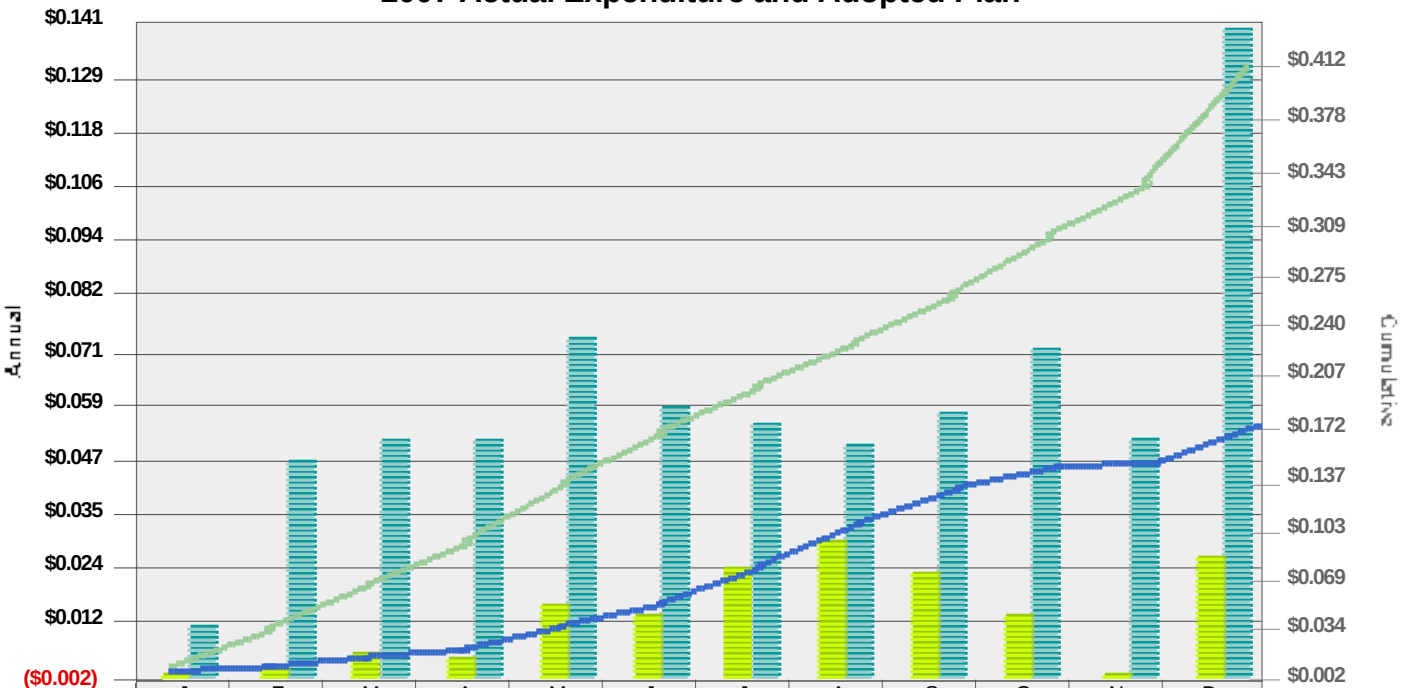
Expenses	2007 Actual Expenditure and Plan			Lifetime Actual Expenditure and Budget		
	IBIS YTD Dec-07	Adopted Plan	Updated Plan	IBIS LTD Dec-07	Lifetime Budget	Updated Budget
CONSTRUCTION		0	0	0	3,633,615	3,740,058
Construction Contracts		0	0	0	3,545,315	3,651,724
Outside Agency Construction			0	0		9
Other Capital Charges		0	0	0	88,300	88,325
NON-CONSTRUCTION	169,739	412,149	393,756	169,739	1,555,987	2,220,905
Engineering	125,827	159,631	307,302	125,827	667,832	1,250,482
Planning & Management Svcs.			0	0		7
Permitting & Other Agency Support		20,045	0	0	61,957	62,875
Right-of-Way		108,440	0	0	108,440	113,370
Misc. Services & Materials	2,374	15,235	0	2,374	80,885	0
Staff Labor	41,538	108,798	86,454	41,538	636,874	794,172
PROJECT RESERVE		0	0	0	1,997,744	1,261,916
Project Reserve		0	0	0	1,997,744	1,261,916
Total $	169,739	412,149	393,756	169,739	7,187,347	7,222,880

Cost/Budget Adjustments

Contract Status

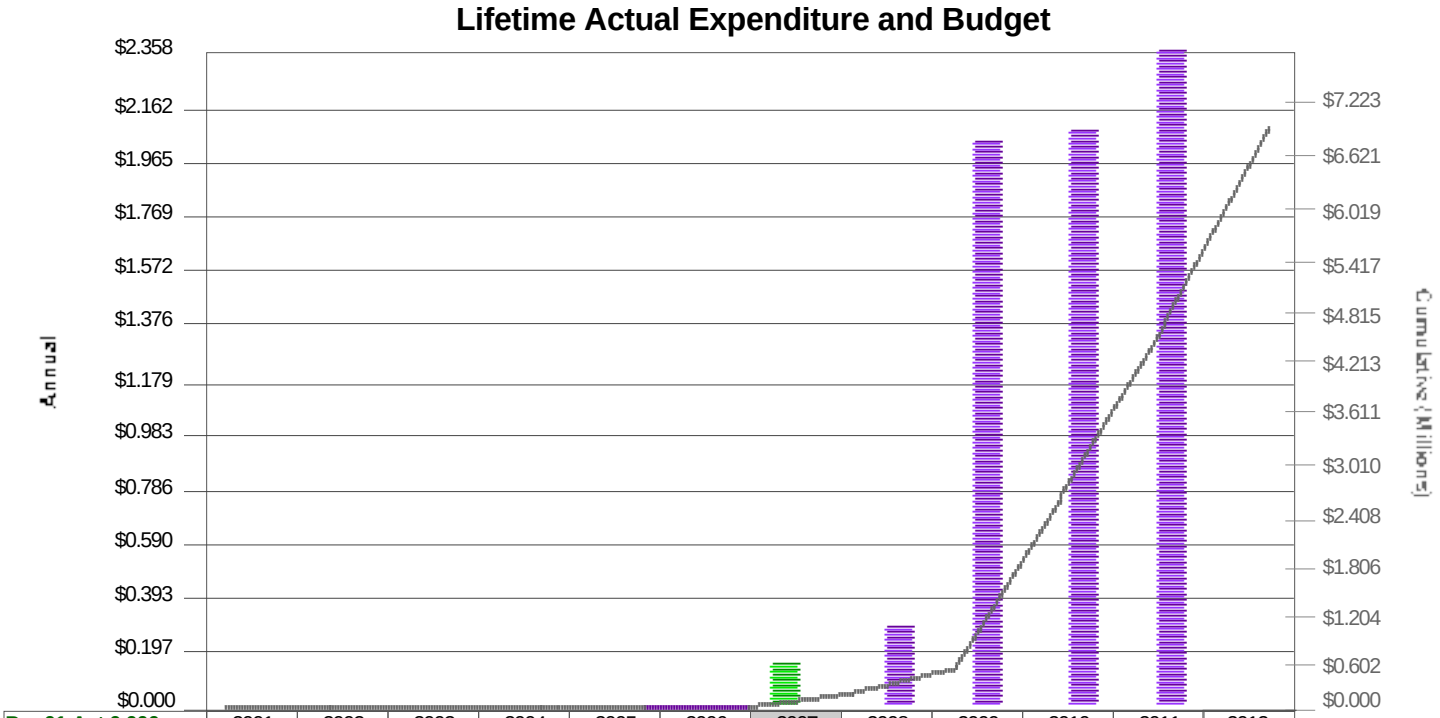
Contract	Original Contract Amount	Phased Amends	Base Contract Amount	Change Amends or COs	Change Percentage	Nbr of Amends/CO's to Date	Current Contract Amount	Amount Paid	Thru Pmt No.	% Paid
Barton, Murray, Magnolia, & North Beach Combined Sewer E00022E06	$4,468,869	$0	$4,468,869	$408,349	9%	1	$4,877,217	$415,595	9	9%

Annual Cash Flow



	J	F	M	A	M	J	J	A	S	O	N	D
Actual	0.002	0.003	0.007	0.005	0.016	0.015	0.025	0.030	0.024	0.014	0.002	0.026
Adopted Plan	0.012	0.048	0.052	0.052	0.074	0.060	0.056	0.051	0.057	0.072	0.052	0.140
Cum. Plan	0.005	0.031	0.061	0.090	0.130	0.164	0.195	0.225	0.257	0.333	0.333	0.412
Cum. Act	0.002	0.005	0.012	0.017	0.033	0.048	0.073	0.103	0.127	0.141	0.143	0.170

Lifetime Cash Flow



Pre-01 Act 0.000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Actual Dec-07							0.170					
Budget								0.305	2.038	2.074	2.358	0.000
CumAct+Bdgt	0.000	0.000	0.000	0.000	0.000	0.000	0.170	0.474	2.513	4.587	6.945	6.945

RWSP Project Report
DECEMBER 2007

423609 CSO Control & Improvements - North Beach

Project Description

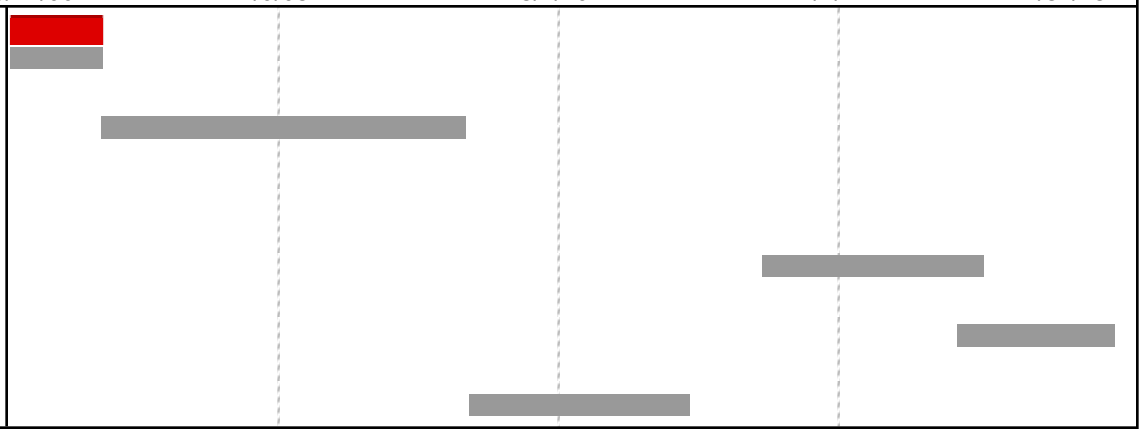
Construct a CSO facility to control the CSO overflows at the North Beach Pump Station to meet State regulations of no more than 1 CSO overflow per year on average.

Project Phase: 2 Predesign

Milestone Schedule

Actual (A) Forecast (F)

Milestones		Start	Finish
Planning	A	05/12/06	01/02/07
	F	05/12/06	01/02/07
Predesign	A	01/02/07	
	F	01/02/07	07/01/10
Final Design	A		
	F	07/01/10	07/01/12
Implement	A		
	F	07/01/12	12/31/13
Close Out	A		
	F	12/31/13	12/31/14
Land	A		
	F	07/01/10	12/31/11



Schedule Adjustments

Cost Summary

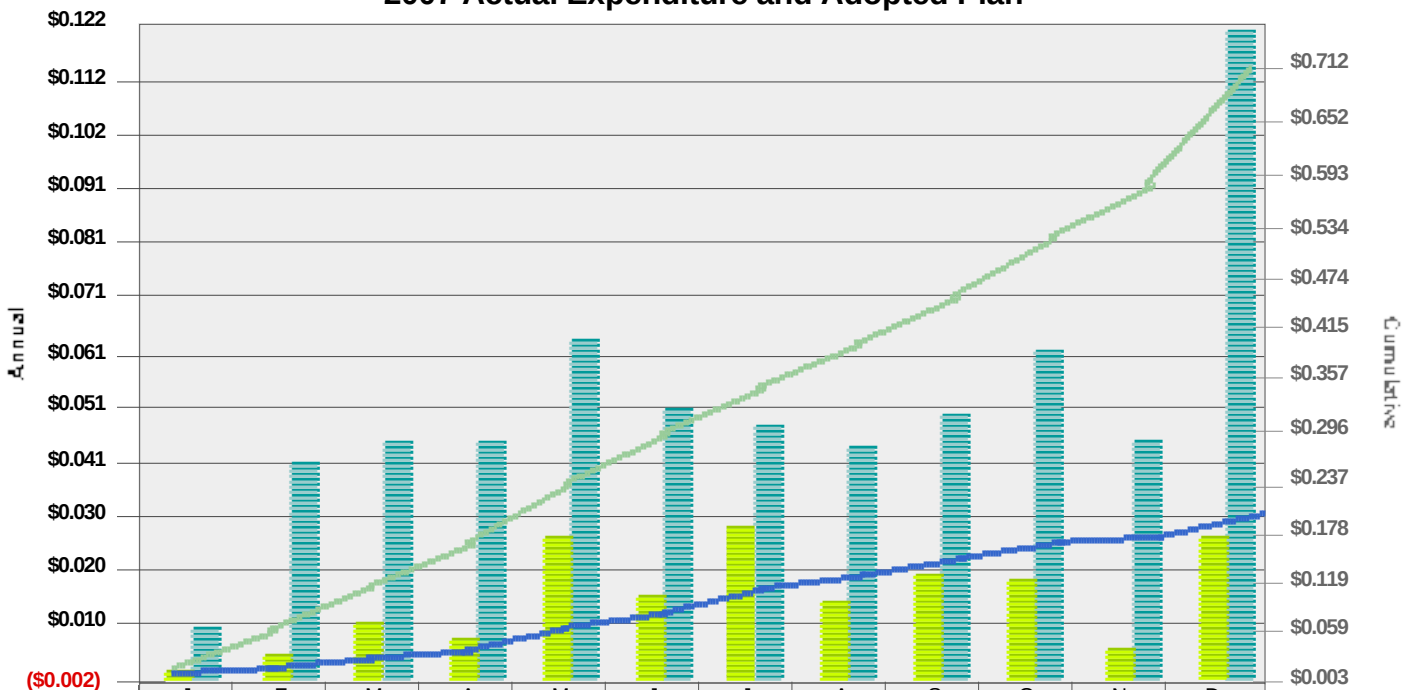
Expenses	2007 Actual Expenditure and Plan			Lifetime Actual Expenditure and Budget		
	IBIS YTD Dec-07	Adopted Plan	Updated Plan	IBIS LTD Dec-07	Lifetime Budget	Updated Budget
CONSTRUCTION		9,083	0	0	2,845,780	2,880,440
Construction Contracts		0	0	0	2,797,554	2,831,512
Outside Agency Construction			0	0		9
Other Capital Charges		9,083	0	0	48,225	48,919
NON-CONSTRUCTION	190,091	702,477	330,327	190,091	1,668,148	1,937,145
Engineering	96,258	552,501	247,240	96,258	996,975	1,006,077
Planning & Management Svcs.			0	0		7
Permitting & Other Agency Support		15,543	0	0	31,552	32,505
Right-of-Way		41,718	0	0	41,718	43,617
Misc. Services & Materials	4,915	13,565	0	4,915	74,054	0
Staff Labor	88,918	79,150	83,087	88,918	523,848	854,940
PROJECT RESERVE		0	0	0	1,474,260	1,131,443
Project Reserve		0	0	0	1,474,260	1,131,443
Total $	190,091	711,561	330,327	190,091	5,988,187	5,949,029

Cost/Budget Adjustments

Contract Status

Contract	Original Contract Amount	Phased Amends	Base Contract Amount	Change Amends or COs	Change Percentage	Nbr of Amends/CO's to Date	Current Contract Amount	Amount Paid	Thru Pmt No.	% Paid
Barton, Murray, Magnolia, & North Beach Combined Sewer E00022E06	$4,468,869	$0	$4,468,869	$408,349	9%	1	$4,877,217	$415,595	9	9%

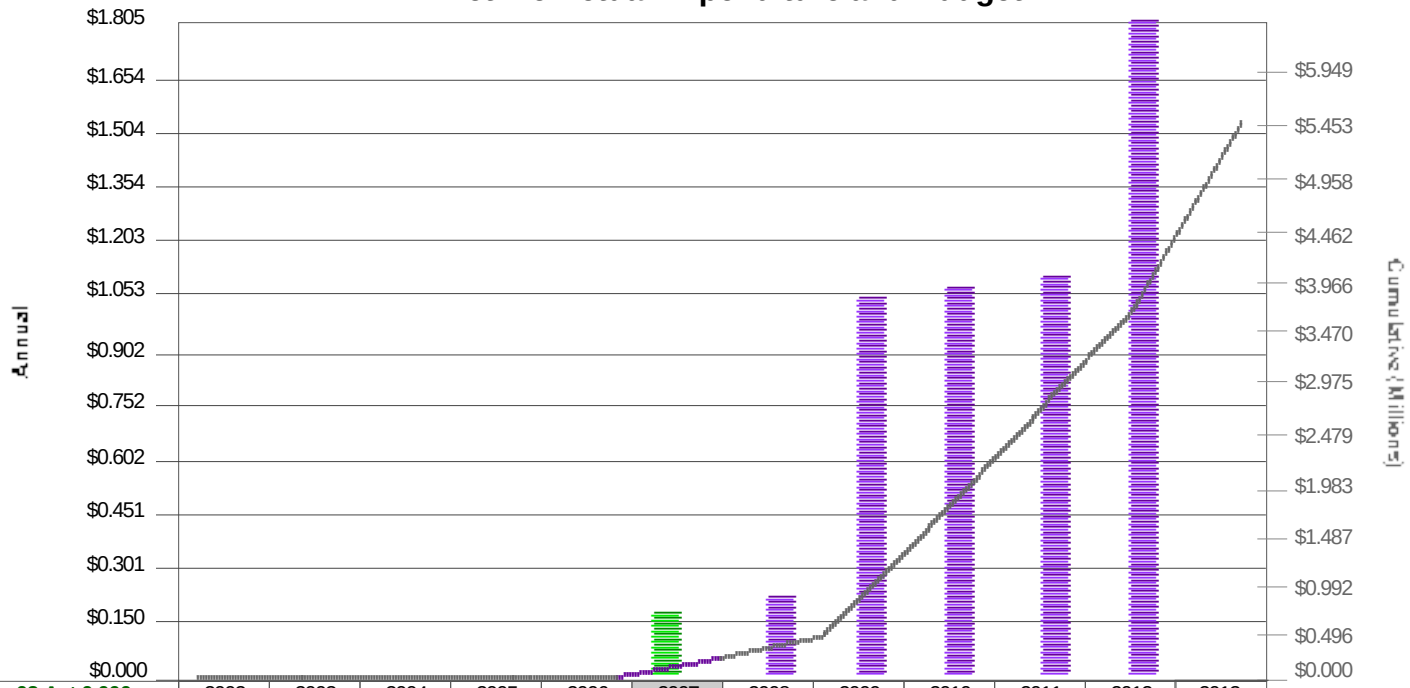
Annual Cash Flow



	J	F	M	A	M	J	J	A	S	O	N	D
Actual	0.003	0.006	0.011	0.009	0.027	0.017	0.029	0.015	0.020	0.019	0.006	0.027
Adopted Plan	0.010	0.042	0.045	0.045	0.064	0.052	0.048	0.044	0.050	0.062	0.045	0.121
Cum. Plan	0.009	0.053	0.105	0.155	0.225	0.284	0.337	0.389	0.444	0.575	0.575	0.712
Cum. Act	0.003	0.009	0.020	0.029	0.056	0.073	0.102	0.117	0.137	0.157	0.163	0.190

Lifetime Cash Flow

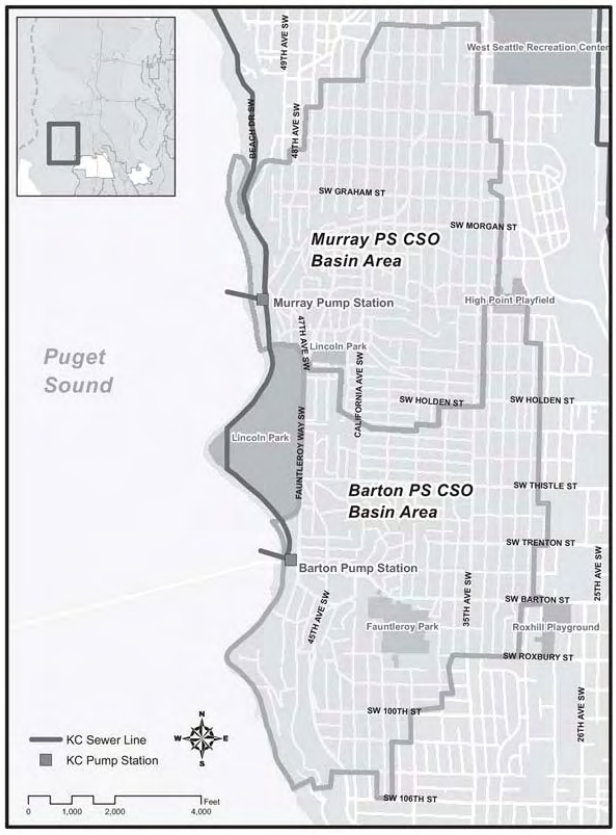
Lifetime Actual Expenditure and Budget



Pre-02 Act 0.000	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Actual Dec-07						0.190						
Budget							0.223	1.051	1.083	1.115	1.805	0.000
CumAct+Bdgt	0.000	0.000	0.000	0.000	0.000	0.190	0.413	1.464	2.547	3.662	5.467	5.467

RWSP Project Report
DECEMBER 2007

423610 CSO Control & Improvements - Barton



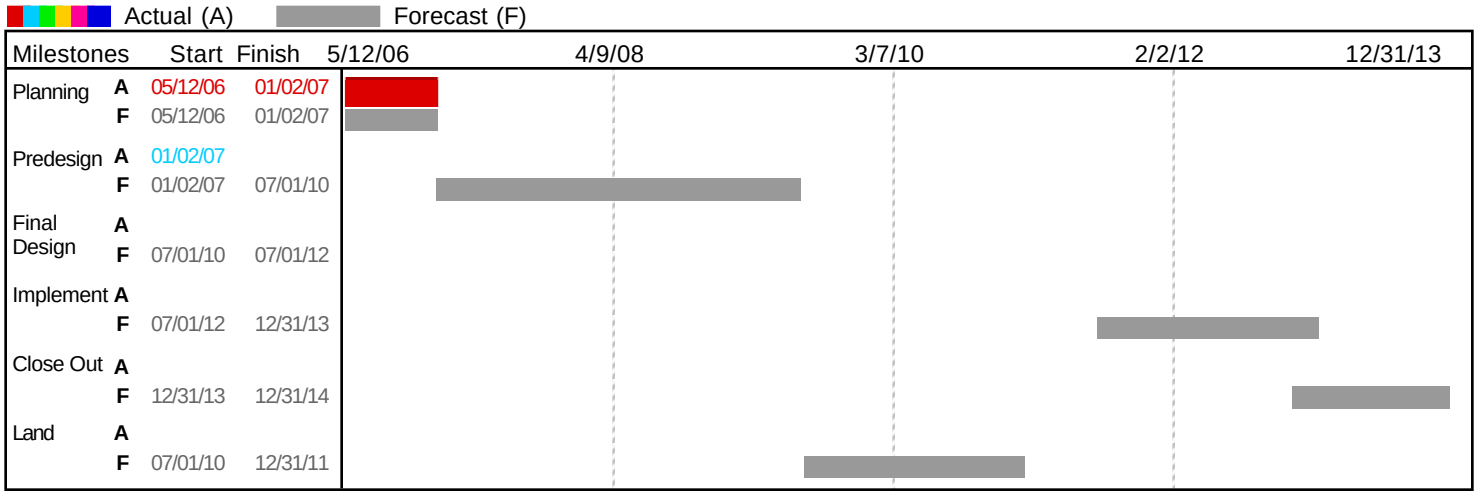
Project Description

Construct a CSO facility to control the CSO overflows at the Barton Pump Station to meet State regulations of no more than 1 CSO overflow per year on average.

Project Phase: 2 Predesign

King County
Department of Natural Resources and Parks
Wastewater Treatment Division

Milestone Schedule



Schedule Adjustments

Cost Summary

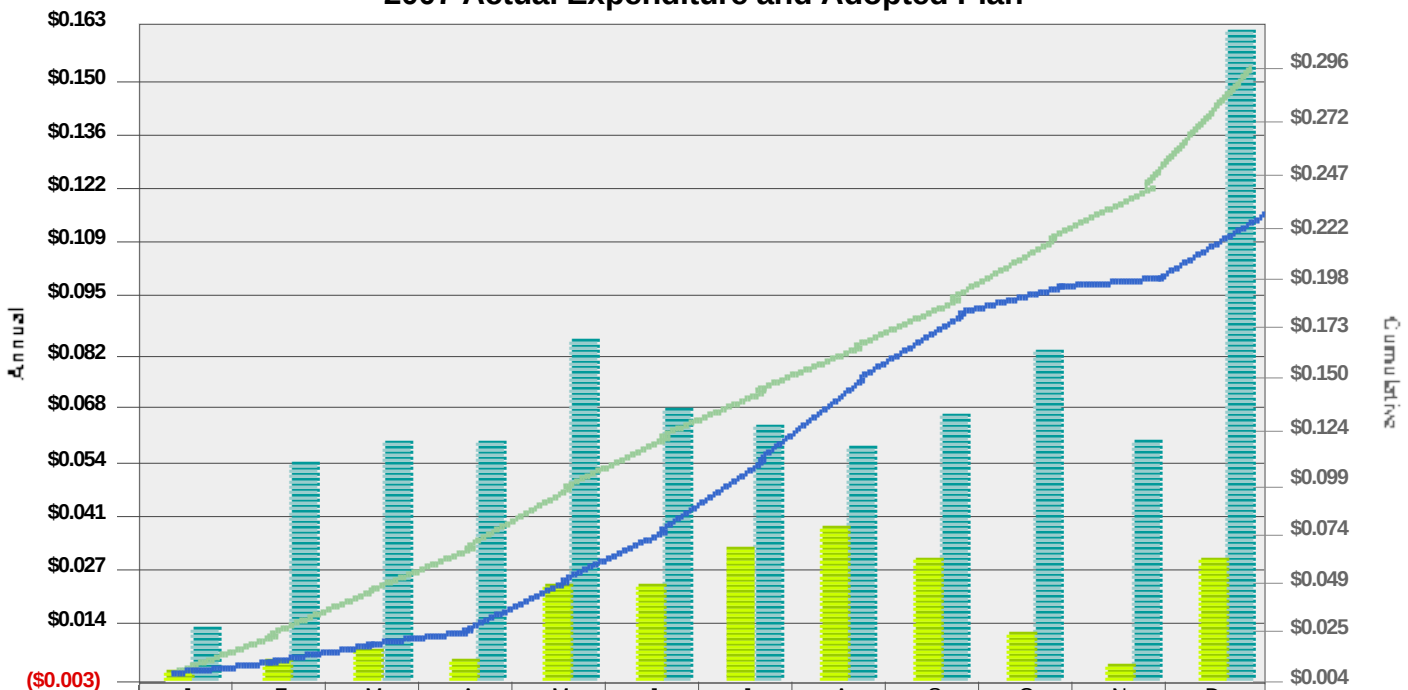
Expenses	2007 Actual Expenditure and Plan			Lifetime Actual Expenditure and Budget		
	IBIS YTD Dec-07	Adopted Plan	Updated Plan	IBIS LTD Dec-07	Lifetime Budget	Updated Budget
CONSTRUCTION		0	0	0	6,898,412	6,983,861
Construction Contracts		0	0	0	6,730,983	6,821,253
Outside Agency Construction			0	0		9
Other Capital Charges		0	0	0	167,429	162,599
NON-CONSTRUCTION	225,639	296,486	434,409	225,639	3,174,407	3,033,155
Engineering	141,798	0	320,324	141,798	1,629,638	1,502,643
Planning & Management Svcs.	3,846	0	0	3,846	0	4
Permitting & Other Agency Support		37,443	0	0	115,732	117,441
Right-of-Way		1,853	0	0	1,853	1,939
Misc. Services & Materials	6,016	36,513	0	6,016	203,205	0
Staff Labor	73,979	220,676	114,085	73,979	1,223,978	1,411,127
PROJECT RESERVE		0	0	0	2,750,280	2,750,169
Project Reserve		0	0	0	2,750,280	2,750,169
Total $	225,639	296,486	434,409	225,639	12,823,099	12,767,184

Cost/Budget Adjustments

Contract Status

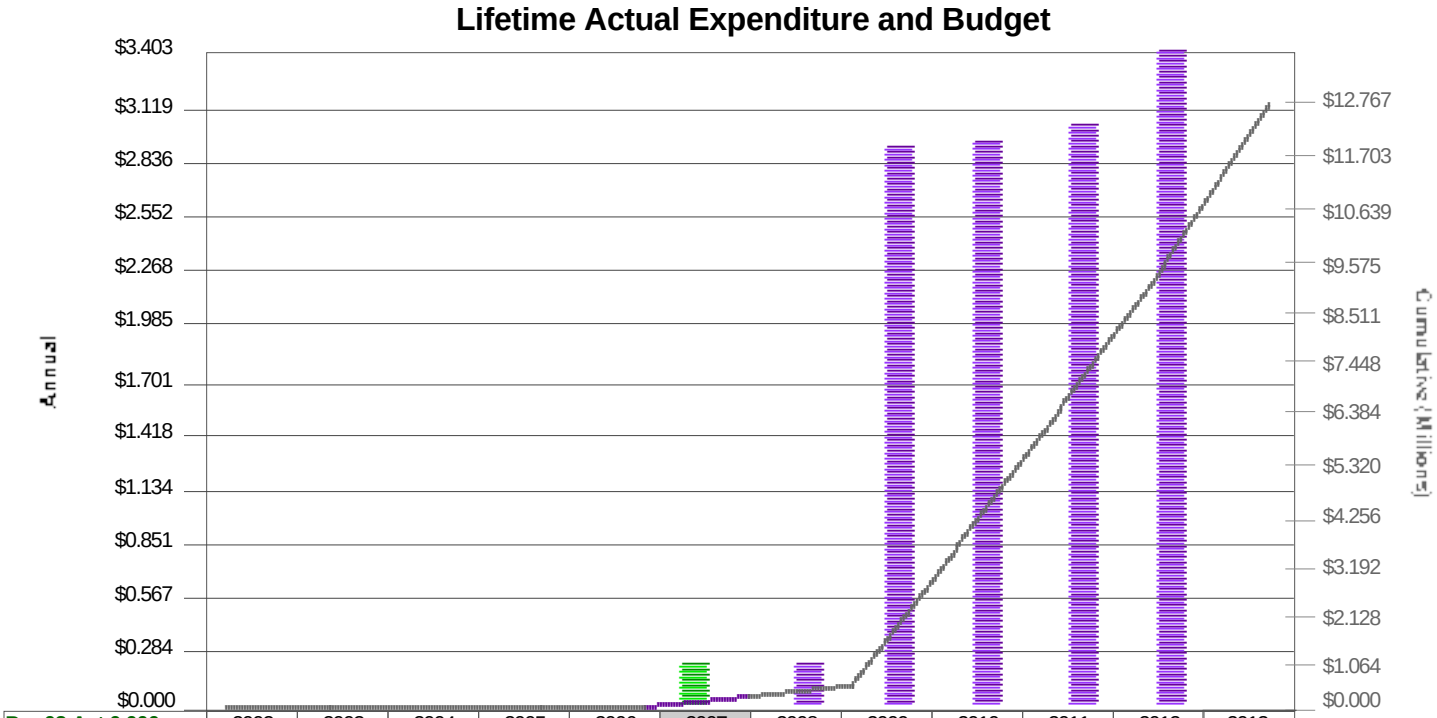
Contract	Original Contract Amount	Phased Amends	Base Contract Amount	Change Amends or COs	Change Percentage	Nbr of Amends/CO's to Date	Current Contract Amount	Amount Paid	Thru Pmt No.	% Paid
Barton, Murray, Magnolia, & North Beach Combined Sewer E00022E06	$4,468,869	$0	$4,468,869	$408,349	9%	1	$4,877,217	$415,595	9	9%

Annual Cash Flow



	J	F	M	A	M	J	J	A	S	O	N	D
Actual	0.004	0.005	0.008	0.006	0.025	0.024	0.034	0.040	0.031	0.013	0.004	0.031
Adopted Plan	0.013	0.056	0.061	0.060	0.086	0.069	0.065	0.059	0.067	0.083	0.061	0.162
Cum. Plan	0.004	0.022	0.044	0.065	0.094	0.118	0.141	0.162	0.185	0.240	0.240	0.296
Cum. Act	0.004	0.009	0.017	0.024	0.049	0.073	0.107	0.147	0.178	0.191	0.195	0.226

Lifetime Cash Flow



Pre-02 Act 0.000	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Actual Dec-07						0.226						
Budget							0.240	2.907	2.944	3.032	3.403	0.000
CumAct+Bdgt	0.000	0.000	0.000	0.000	0.000	0.226	0.466	3.373	6.317	9.350	12.752	12.752

RWSP Project Report
DECEMBER 2007

423368 Sediment Managment Plan

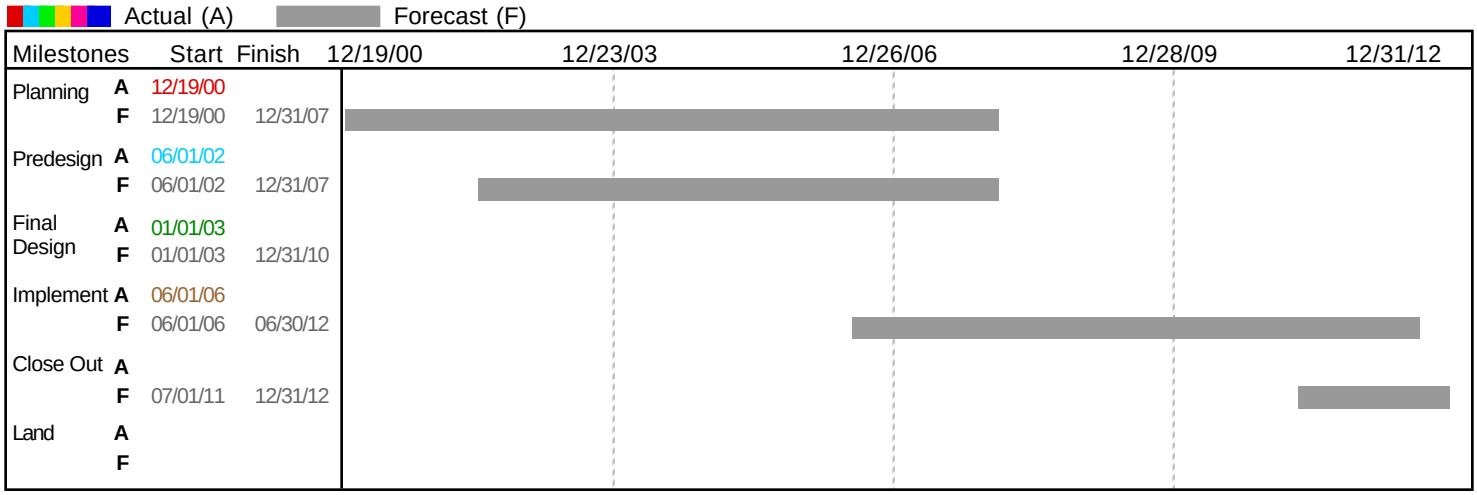
Project Description

The Sediment Management Program (SMP) addresses sediment contamination cleanups required under federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and state Model Toxics Control Act (MCTA) regulations. The SMP objectives are to repair potential environmental damage in a timely, efficient and economical process, to prevent harm to public health, and to limit future liability.

Project Phase: 2 Predesign

King County
Department of Natural Resources and Parks
Wastewater Treatment Division

Milestone Schedule



Schedule Adjustments

Cost Summary

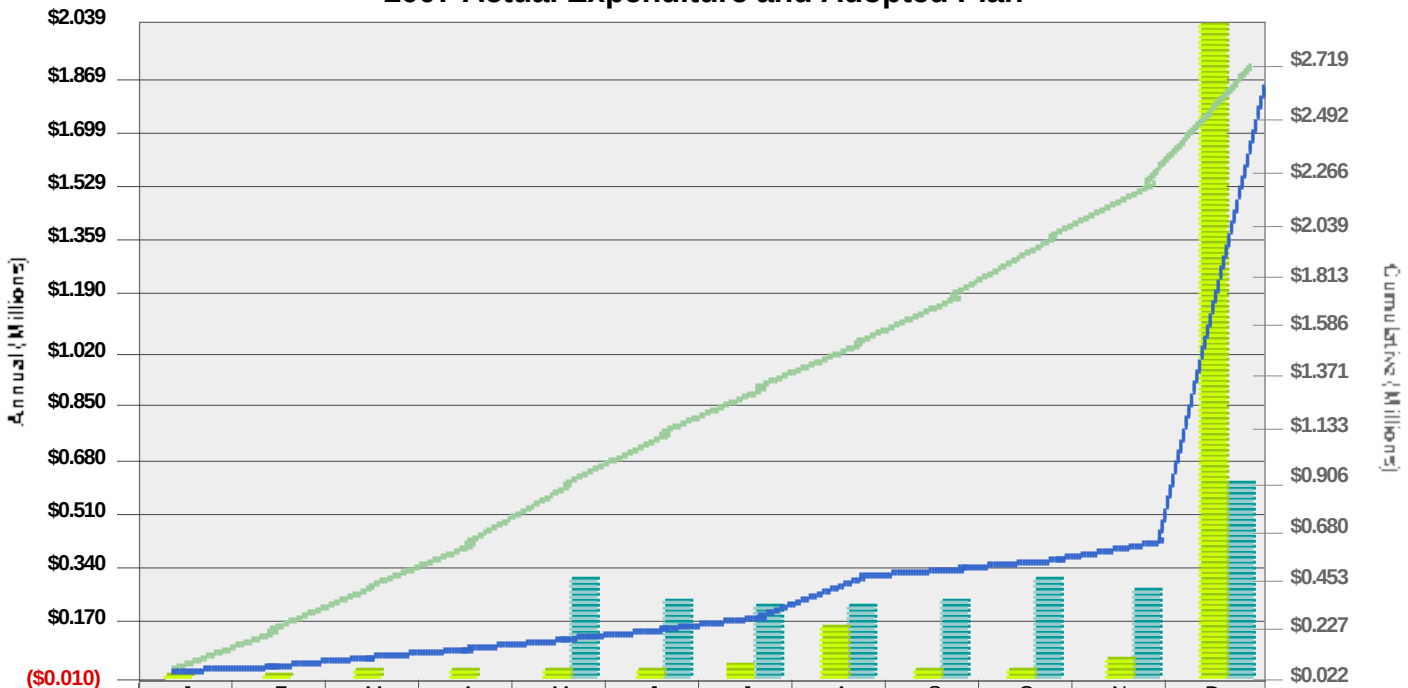
Expenses	2007 Actual Expenditure and Plan			Lifetime Actual Expenditure and Budget		
	IBIS YTD Dec-07	Adopted Plan	Updated Plan	IBIS LTD Dec-07	Lifetime Budget	Updated Budget
CONSTRUCTION	1,635,678	701,459	681,028	1,641,090	30,995,230	30,494,388
Construction Contracts	1,635,678	701,459	681,028	1,635,678	30,972,014	30,471,172
Owner Furnished Equipment	0	0	0	5,412	5,412	5,412
Other Capital Charges		0	0	0	17,805	17,805
NON-CONSTRUCTION	1,006,266	2,017,580	2,176,499	6,748,842	12,951,500	13,900,935
Engineering	181,276	1,195,489	1,304,052	1,553,087	4,460,353	5,223,553
Planning & Management Svcs.	112,485	0	0	473,187	360,702	360,702
Permitting & Other Agency Support	731	53,045	51,500	96,778	377,657	369,467
Right-of-Way	2,500			2,500		
Misc. Services & Materials	49,617	32,357	31,415	1,702,351	1,775,002	1,801,716
Staff Labor	659,657	736,689	789,532	2,920,939	5,977,786	6,145,497
CREDITS AND REVENUES	-116,528		0	-267,166		-150,639
Credits and Revenues	-116,528		0	-267,166		-150,639
Total $	2,525,417	2,719,039	2,857,527	8,122,766	43,946,730	44,244,685

Cost/Budget Adjustments

Contract Status

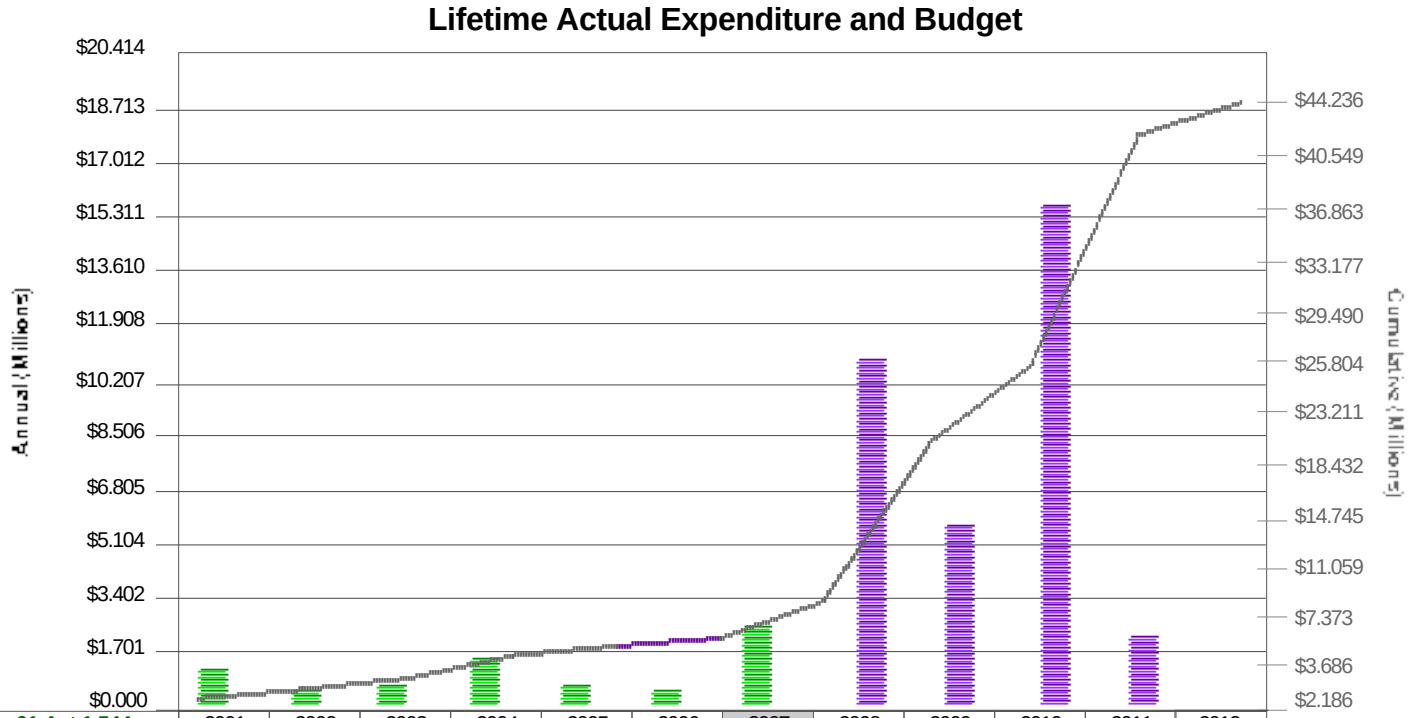
Contract		Original Contract Amount	Phased Amends	Base Contract Amount	Change Amends or COs	Change Percentage	Nbr of Amends/CO's to Date	Current Contract Amount	Amount Paid	Thru Pmt No.	% Paid
Sediment Management	P23009P	$526,052	$0	$526,052	$704,947	134%	2	$1,230,999	$601,471	56	49%
Phase 2/Discharge Modeling for Contaminated Sediment	P39020P	$266,664	$0	$266,664	$0	0%		$266,664	$257,518	8	97%
Discharge Modeling for Contaminated Sediment	P03014P	$53,692	$0	$53,692	$10,136	19%	1	$63,828	$63,383	12	99%

Annual Cash Flow



	J	F	M	A	M	J	J	A	S	O	N	D
Actual	0.022	0.020	0.043	0.036	0.044	0.043	0.058	0.179	0.035	0.042	0.080	2.039
Adopted Plan					0.316	0.255	0.239	0.233	0.262	0.322	0.294	0.619
Cum. Plan	0.033	0.204	0.402	0.593	0.859	1.085	1.289	1.485	1.697	2.197	2.197	2.719
Cum. Act	0.022	0.043	0.085	0.122	0.165	0.209	0.266	0.445	0.481	0.522	0.603	2.642

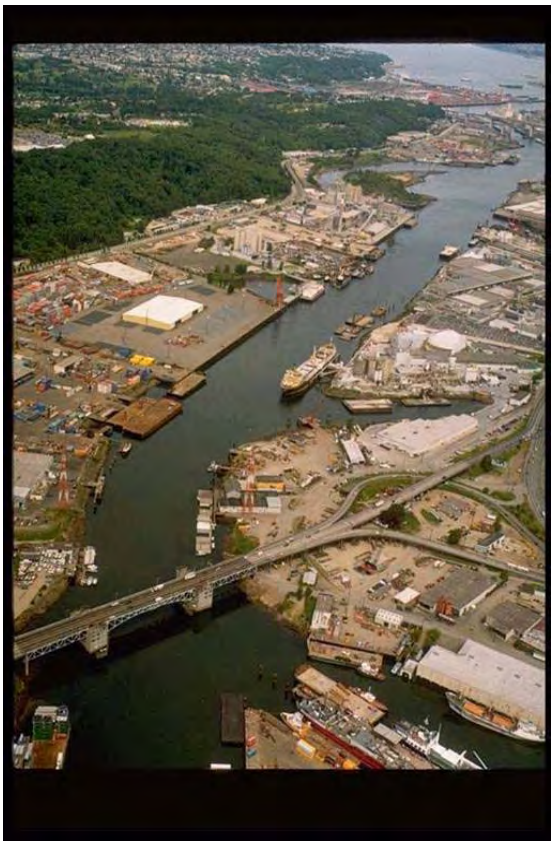
Lifetime Cash Flow



Pre-01 Act 1.544	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Actual Dec-07	1.249	0.643	0.771	1.577	0.689	0.524	2.642					
Budget								10.882	5.650	15.749	2.315	0.000
CumAct+Bdgt	2.793	3.435	4.206	5.784	6.473	6.997	9.639	20.521	26.172	41.921	44.236	44.236

RWSP Project Report
DECEMBER 2007

423589 Lower Duwamish Waterway Superfund



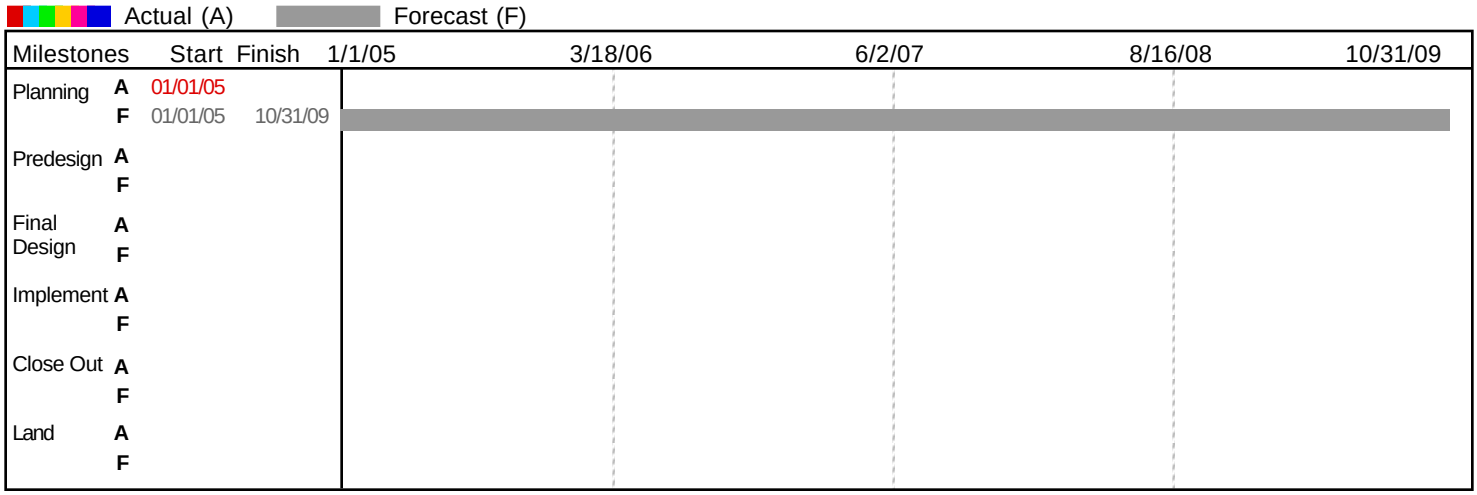
Project Description

The project implements the County's shared responsibilities under a signed Administrative Order on Consent (AOC) to conduct a Remedial Investigation/Feasibility Study (RII/FS) for the Lower Duwamish Waterway Superfund Site, conduct source control along the waterway, and pay for EPA and Ecology oversight costs.

Project Phase: 1 Development

King County
Department of Natural Resources and Parks
Wastewater Treatment Division

Milestone Schedule



Schedule Adjustments

Cost Summary

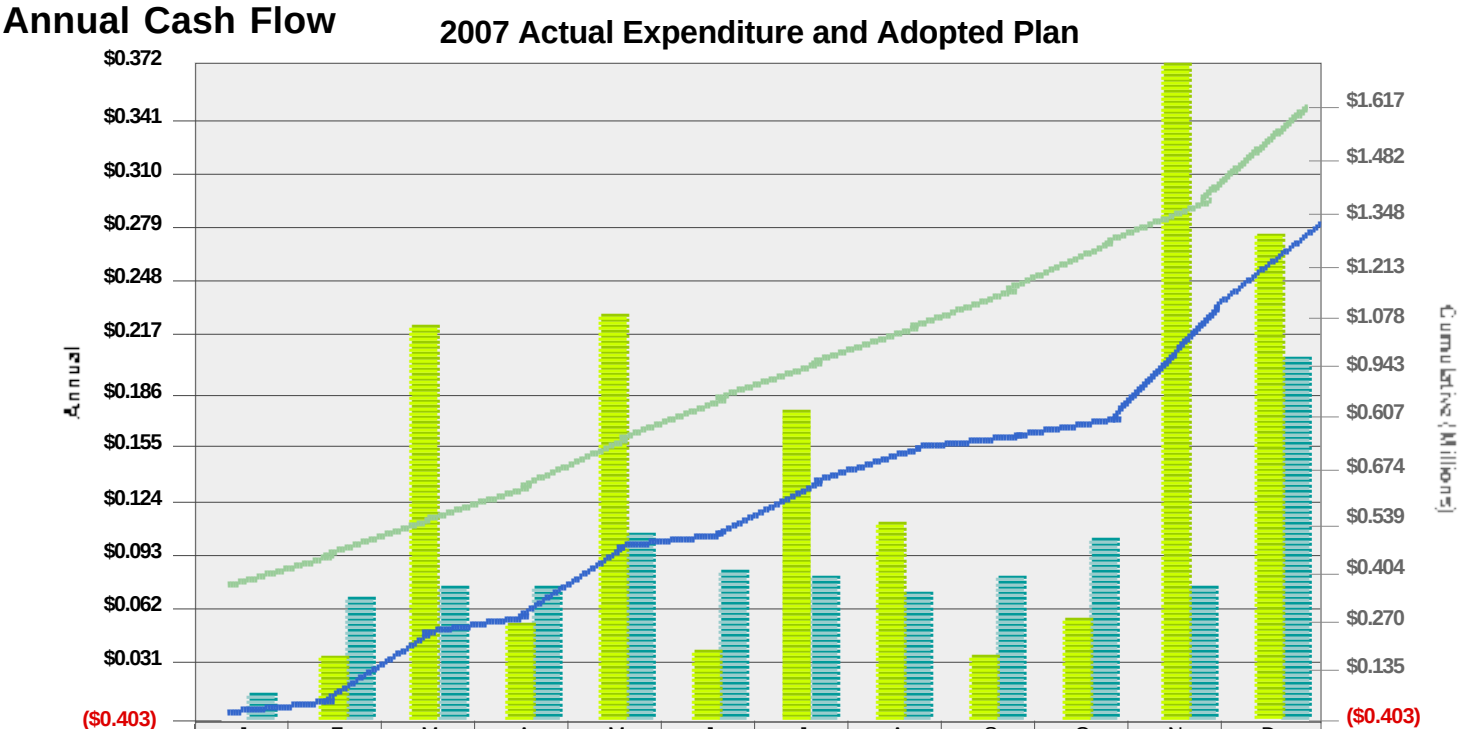
Expenses	2007 Actual Expenditure and Plan			Lifetime Actual Expenditure and Budget		
	IBIS YTD Dec-07	Adopted Plan	Updated Plan	IBIS LTD Dec-07	Lifetime Budget	Updated Budget
CONSTRUCTION	138	0	0	138	0	0
Construction Contracts	138	0	0	138	0	0
NON-CONSTRUCTION	1,229,591	1,617,044	1,525,922	5,207,756	5,857,690	7,043,370
Engineering	-405,408	1,018,717	973,660	88,952	2,738,946	2,206,160
Planning & Management Svcs.	519,544	0	0	885,474	988	365,930
Permitting & Other Agency Support	266	0	0	386	0	120
Misc. Services & Materials	504,856	0	20,000	2,483,138	1,070,515	2,081,609
Staff Labor	610,333	598,327	532,262	1,749,806	2,047,241	2,389,550
CREDITS AND REVENUES	-875,319		0	-1,997,146		-1,121,827
Credits and Revenues	-875,319		0	-1,997,146		-1,121,827
Total $	354,410	1,617,044	1,525,922	3,210,747	5,857,690	5,921,542

Cost/Budget Adjustments

Contract Status

Contract	Original Contract Amount	Phased Amends	Base Contract Amount	Change Amends or COs	Change Percentage	Nbr of Amends/CO's to Date	Current Contract Amount	Amount Paid	Thru Pmt No.	% Paid

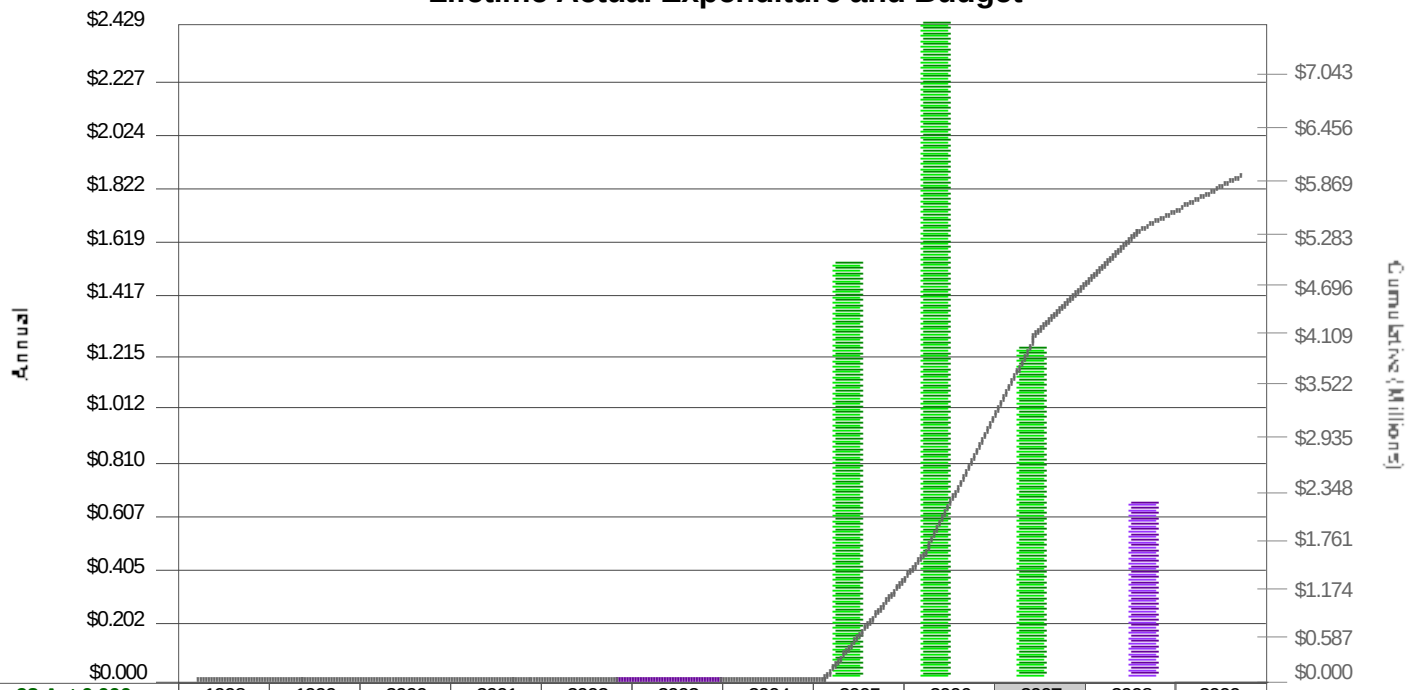
Annual Cash Flow



	J	F	M	A	M	J	J	A	S	O	N	D
Actual	-0.403	0.039	0.227	0.056	0.233	0.041	0.177	0.113	0.039	0.060	0.372	0.278
Adopted Plan	0.017	0.070	0.077	0.076	0.109	0.087	0.082	0.075	0.084	0.106	0.077	0.206
Cum. Plan	0.019	0.121	0.239	0.353	0.511	0.645	0.766	0.883	1.009	1.307	1.307	1.617
Cum. Act	-0.403	-0.365	-0.138	-0.083	0.150	0.191	0.368	0.481	0.520	0.580	0.952	1.230

Lifetime Cash Flow

Lifetime Actual Expenditure and Budget



Pre-98 Act 0.000	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Actual Dec-07								1.549	2.429	1.230		
Budget											0.667	0.000
CumAct+Bdgt	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.549	3.978	5.208	5.875	5.875

Appendix C

The Health of Our Waters, Water Quality Monitoring Results for 2007

Contents

This appendix presents a summary of the quality of King County's marine water and freshwater bodies in 2007. The summary is followed by more detailed information on water quality monitoring locations, procedures, and results. The information satisfies the RWSP reporting policies that call for inclusion of yearly water quality monitoring results as a part of the RWSP annual report.

Summary of 2007 Water and Sediment Monitoring

To protect public health and its significant investment in water quality improvements, King County regularly monitors wastewater treatment plant effluent, marine water, fresh water, and sediments (Table C–1 at the end of this summary). The biological, chemical, and physical parameters used to assess a water body's health under Washington State Water Quality Standards are fecal coliform bacteria, dissolved oxygen, temperature, pH, nutrients, turbidity, and a variety of chemical compounds. King County uses other indicators in addition to these parameters.

Monitoring activities in 2007 found that in general, the quality of marine and fresh waters in King County is fair to good.

Some water quality indicators…

Fecal coliform bacteria. The presence of fecal indicator bacteria indicates that the water has been contaminated with the fecal material of humans, birds, or other warm-blooded animals. One type of fecal indicator bacteria, fecal coliforms, may enter the aquatic environment from domestic animals, wildlife, stormwater runoff, wastewater discharges, and failing septic systems. Although these bacteria are usually not harmful, they often occur with other less easily measured disease-causing bacteria and their presence indicates the potential for pathogens to be present and to pose a risk to human health.

Dissolved oxygen. Aquatic plants and animals require a certain amount of dissolved oxygen (DO) for respiration and basic metabolic processes. Waters that contain high amounts of DO are generally considered healthy ecosystems. DO concentrations are most important during the summer season when oxygen-depleting processes are at their peak.

Temperature. Temperature influences many of the chemical components of the water, including DO concentration. Temperature also exerts a direct influence on the biological activity and growth and, therefore, the survival of aquatic organisms. Temperature levels in waters that bear salmonids (cool water fish) are also very important.

Treatment Plant Effluent

King County regularly samples wastewater effluent from its three secondary wastewater treatment plants—West Point, South, and Vashon plants—and analyzes these samples at process laboratories at the plants and at its environmental laboratory in Seattle. The plants discharge their effluent into Puget Sound through deep outfalls. Discharges continue to be in compliance with the terms and conditions of the National Pollutant Discharge Elimination System (NPDES) permit for each plant, and so are in compliance with the Washington State Water Pollution Control Law, the Federal Water Pollution Control Act, and the Federal Clean Water Act.

Marine Water and Sediment

King County's marine water quality monitoring program routinely collects samples near treatment plant and CSO outfalls to assess potential effects to Puget Sound water quality from

wastewater discharges. Additional samples are collected at ambient locations in the Sound to better understand regional water quality and to provide data needed to identify trends that might indicate impacts from long-term cumulative pollution.[1] Seventeen sites were monitored in 2007 for nutrients, fecal coliform bacteria, dissolved oxygen, turbidity, temperature, salinity, chlorophyll, stratification, and other parameters.

The quality of Puget Sound is evaluated by two fecal coliform bacteria standards—the geometric mean and the peak. All offshore marine monitoring locations—both ambient and outfall locations—met these fecal coliform bacteria standards in 2007. One nearshore site in Elliott Bay along the Seattle waterfront and another nearshore site at the mouth of the Lake Washington Ship Canal failed fecal coliform bacteria standards. Both sites are near freshwater bacteria sources such as storm drains and the mouths of streams and creeks.

The program also monitors for fecal coliform bacteria levels at Puget Sound beaches, including beaches near outfalls. Twenty-five beach sites were monitored in 2007. Twelve of the 25 monitoring locations at Puget Sound beaches in King County met fecal coliform bacteria standards. Most of the beach sites that failed both standards are near freshwater sources. Of the six beach sites near outfalls, only two met both standards (compared with all sites in 2006), most likely because 2007 was a wetter year. Sites near freshwater sources that failed standards in 2006 also failed standards in 2007.

The overall quality of marine water is evaluated through the water quality index (WQI). Results of 2007 monitoring indicate that overall water quality in Puget Sound is good. Two of the fourteen monitoring sites, both in Quartermaster Harbor near Vashon Island, received a WQI score of high concern. All of the six marine outfall sites were classified as having good water quality (low level of concern).

Sediment quality is monitored near outfalls, at ambient locations in Elliott Bay and the Central Basin of Puget Sound, and as part of projects to remediate sediments contaminated from historical CSO discharges. Sediment quality in ambient locations in Elliott Bay and the Central Basin of Puget Sound is generally good, with some isolated impacts from human activity.

Lake Water and Sediment

The Major Lakes Monitoring Program has been collecting samples from 25 open-water sites in Lake Union and the Ship Canal, Lake Washington, and Lake Sammamish since the early 1970s. Sampled parameters include temperature, dissolved oxygen, pH, conductivity, clarity (Secchi transparency), phosphorus, nitrogen, and fecal coliform bacteria.

The quality of the three major lakes in King County is evaluated by using two fecal coliform bacteria standards—one for ambient lake water and the other for swimming beaches. Ambient water quality, as indicated by fecal coliform bacteria levels, is generally good. In 2007, 100 percent of the Lake Sammamish stations, 85 percent of the Lake Washington stations, and 60 percent of the Lake Union stations achieved the exceptionally high standard used to assess

[1] Ambient monitoring measures surrounding (background) conditions.

ambient lake water. Fewer Lake Washington samples met the standard in 2007 than in 2006. This decrease was due to high concentrations recorded in two different samples at each of two stations, one at the south end and one on the southwest side of the lake. Lake Union/Lake Washington Ship Canal waters showed a similar decrease, mainly because of high concentrations measured at two stations. Six of the eleven highest bacteria concentrations were collected after record rainfall the first week of January 2007, with accompanying increases in volume of combined sewer overflow (CSO) and stormwater discharges into Lakes Washington and Union.

Summer phosphorus concentrations are converted to a trophic state index to assess overall water quality in Lakes Washington, Sammamish, and Union. The 1994–2007 results for Lakes Sammamish and Washington show that phosphorus concentrations fluctuated between the low and moderate thresholds from year to year, indicating that the water quality varies from good to moderate with low potential for nuisance algal blooms (algae feeds on phosphorus). Lake Union typically shows phosphorus concentrations in the moderate water quality range. In 2007, however, high phosphorus levels placed Lake Union in the poor water quality range. High phosphorus concentrations in urbanized areas can result from poorly designed drainage systems, inadequate maintenance of sewer infrastructure, and home and business landscaping practices.

The Major Lakes Sediment Monitoring Program monitors sediment in Lakes Washington, Sammamish, and Union. Five stations are monitored each year for trends. Other stations are sampled to investigate sediment quality in swimming beaches, nearshore habitat, and in areas with known contamination. Samples are analyzed for metals, organics, and physical parameters.

The Swimming Beach Monitoring Program assesses 17 beaches on Lake Sammamish, Lake Washington, and Green Lake every summer. This effort, ongoing since 1996, tests for fecal coliform bacteria as an indicator of risk to human health. Monitoring of these swimming beaches during summer 2007 shows that the higher concentrations of fecal coliform bacteria occur at beaches adjacent to streams that drain urbanized drainage basins. Bacteria levels were low in Green Lake for the fifth year in a row (all samples met the standard). Lake Sammamish levels remain consistently low, with slight variability from year to year (about 90 to 100 percent of samples have met the standard since 1999). High bacteria levels resulted in the closure of four beaches on Lake Washington in 2007: Juanita, Magnuson off-leash area, Gene Coulon, and Meydenbauer Bay swimming beaches. There were no beach closures in 2006.

Stream and River Water and Sediment

The Stream and River Monitoring Program targets rivers and streams that cross sewer trunk lines and those that are considered a potential source of pollutant loading to a major water body. This long-term program has collected samples at 56 sites on four rivers and twenty-eight streams for many years. Overall water quality of rivers and streams in King County, as measured by the water quality index for rivers and streams, varies between and within streams. Increased urbanization has resulted in more surface runoff and changes to peak streamflow that cause flooding, channel erosion, and increased contaminant loading.

In 2007, the water quality index indicated that 45 percent of the fifty-six sampling sites—compared to 63 percent in 2006—were of moderate or high water quality (moderate or low concern) and 55 percent were rated to be of low water quality (high concern). Of the sixteen sites

in WRIA 9, six sites were rated of low concern, six sites were of moderate concern, and four sites were of high concern. Of the forty sites in WRIA 8, one site was rated of low concern, twelve sites were of moderate concern, and twenty-seven sites were of high concern.[2] All sites rated of high concern were impacted in part by excessive nitrogen and/or phosphorus loading, and most of these sites were affected by high fecal coliform bacteria (97 percent of all sites), low dissolved oxygen (74 percent of all sites), high temperatures (58 percent of all sites), and high suspended solids/turbidity (32 percent of all sites).

The Streams Sediment Monitoring Program monitors sediment in small wadeable streams in WRIAs 8 and 9. Samples are collected at one location in 10 index creeks each year and analyzed for trends. In addition, one-time samples are collected every creek-mile in approximately three stream basins each year. All 30 streams in the program will be monitored within 10 years. Samples are analyzed for metals, organics, and physical parameters.

Other Monitoring

In addition to ongoing water and sediment quality monitoring, the county conducts special intensive investigations. Recently, studies were completed to understand water quality issues and needs, to project future impacts of population growth, and to identify any needed improvements to salmon habitat in the two primary watersheds in King County (WRIAs 8 and 9).

Other studies are under way to support decision-making, siting, and construction of wastewater capital projects. For example, the wetland that will receive effluent from the new Carnation Treatment Plant is being monitored both before plant startup to establish a baseline and after discharge begins to monitor for any trends in water and sediment quality.

Availability of Monitoring Data on the Web

In 2007, King County's regional data management program continued to maintain and upgrade the methods used to store and disseminate monitoring data so that the public can directly download substantial amounts of data from the Web:

- The Puget Sound Marine Monitoring Program page provides tables and graphs of measurements of Puget Sound water quality collected from the surface to the bottom. This page was upgraded in 2007 to provide data for continuous water quality meters in Elliott Bay and Quartermaster Harbor. The page is found at http://dnr.kingcounty.gov/wlr/waterres/marine/Index.htm.
- The Swimming Beach Monitoring Program page provides tables, graphs, and maps of monitoring results as they become available each week and provides the most current information on beach closures. The page is found at http://dnr.kingcounty.gov/wlr/waterres/swimbeach/default.aspx.

[2] The two major watersheds—called Water Resource Inventory Areas (WRIAs)—in King County are the Lake Washington/Cedar/Sammamish watershed (WRIA 8) and the Green/Duwamish and Central Puget Sound watershed (WRIA 9).

- The Major Lakes Monitoring Program page and the Stream and River Monitoring Program page provide tables and graphs of monitoring results as they become available each month. These pages continue to allow for direct data download from the Web. A substantial upgrade to the Stream and River monitoring page was released in May 2008. The major lakes monitoring page is found at http://dnr.kingcounty.gov/wlr/waterres/lakes/index.htm; the stream and river monitoring page is found at http://green.kingcounty.gov/WLR/Waterres/StreamsData/.
- The Hydrologic Information Center page provides the public with access and robust ability to download rainfall, streamflow, water quality, and other hydrologic data collected at King County gauge sites. It also offers a summary of the year's precipitation and provides access to presentations made by King County's hydrology staff. The page is found at http://green.kingcounty.gov/wlr/waterres/hydrology/.
- The Lakes Stewardship Program page was upgraded to provide the ability to download data and to access graphs and maps of the lakes and the monitoring data. The page is found at http://dnr.kingcounty.gov/wlr/waterres/smlakes/index.htm.

Table C-1. Summary of King County Water Quality Monitoring Programs

Program	Media and Locations	Parameters	Methods	Sampling Frequency	Program Purpose	Duration
Ambient Monitoring						
Marine monitoring	Water and sediment in areas of Puget Sound away from outfalls and CSOs; shellfish (butter clams) from Puget Sound beaches	Water: temperature, salinity, clarity, DO, nutrients, chlorophyll, and bacteria Sediment: metals, organics, and physical properties Shellfish: lipids and metals	Water samples collected at multiple depths, ranging from 1 to 200 m Sediment: VanVeen grab sampler for subtidal sediments; sediment corer for intertidal sediments[a] Shellfish: shovel	Water: monthly Sediment: biannually (Elliott Bay), every 5 years (Puget Sound) Shellfish: semi-annually	To assess potential effects to water quality from point and nonpoint pollution sources and to compare quality county wastewater sources	Ongoing
Major lakes monitoring	Water and sediment in Lakes Washington, Sammamish, and Union at ambient locations and near stormdrains and CSOs	Water: temperature, DO, pH, conductivity, clarity, phosphorus, nitrogen, and fecal coliform; micorcystin is measured at select stations Sediment: metals, organics, and physical properties	Water samples collected every 5 m from 1 m below the surface to bottom at one station in center of lake and from the surface around various locations around the shoreline Sediment: surface, petite ponar	Water samples: biweekly during the growing season; monthly during the rest of the year Sediment: yearly	To identify impacts from the wastewater conveyance system and to document the condition of lakes	Ongoing
Small lakes monitoring	Volunteers monitor 50 small lakes in King County	Precipitation, lake level, temperature, Secchi depth, phosphorus, nitrogen, chlorophyl-a, phytoplankton	Single-point and vertical profiles	Rainfall & lake level: daily Temperature & Secchi depth: weekly Other parameters: every 2 weeks April to October	To characterize and identify trends in water quality	Ongoing

BMP = best management practices; BOD = biochemical oxygen demand; DNR = Washington State Department of Natural Resources; DO = dissolved oxygen; Ecology = Washington State Department of Ecology; HPA = Hydraulic Permit Approval; SAP = sampling and analysis plan; TMDL = total maximum daily load; TOC = total organic carbon; TSS = total suspended solids.

[a] Intertidal zone is the area that is exposed to the air at low tide and submerged at high tide; subtidal zone is the area below the intertidal zone that is always covered by water.

[b] Petite ponar is a type of grab sampler that can easily be carried by one person in the field and can be deployed without the use of a winch or crane recommended for larger samplers.

Table C-1. Summary of King County Water Quality Monitoring Programs

Program	Media and Locations	Parameters	Methods	Sampling Frequency	Program Purpose	Duration
Rivers and streams monitoring	Rivers and streams of both watersheds; emphasis on wadeable streams that cross wastewater conveyance lines or that could be a source of pollution Stream sediment samples for trends analysis at 10 sites, plus spatial analysis of stations every creek mile	Baseflow and storm samples: turbidity, TSS, pH, temperature, conductivity, DO, nutrients, ammonia, bacteria Storm samples: trace metals Sediment: metals, organics, and physical parameters	Various methods for collecting water samples Sediment: surface sediments, core tube, petite ponar	Monthly sampling under baseflow conditions; three to six times per year at mouth of streams under storm conditions Sediment: yearly	To identify impacts from the wastewater conveyance system and to document the condition of streams and rivers	Ongoing
Swimming beach monitoring	Cedar-Sammamish Watershed: Lake Washington, Lake Sammamish, and Green Lake	Bacteria; microcystin is measured at select stations	Water samples at swimming beaches	Weekly, in the summer from Memorial Day through end of September	To evaluate human health risks and necessity for beach closures	Ongoing
Benthic macroinvertebrate monitoring	Wadeable stream sub-basins	Size and distribution of aquatic macroinvertebrate populations	Samples colllected with a Surber stream bottom sampler	Annually	To establish a baseline for identifying long-term trends	Ongoing
Wastewater Treatment Plant Outfall Monitoring						
Marine wastewater plant outfall water column and beach monitoring	Puget Sound water column at treatment plant outfalls; water and shellfish (butter clams) at beaches near outfalls	Water: temperature, salinity, clarity, DO, nutrients, chlorophyll, and bacteria Shellfish: lipids and metals	Water samples at outfalls collected at multiple depths, ranging from 1 to 200 m Shellfish: shovel	Water samples: monthly Shellfish: semi-annually	To assess potential effects to water quality from wastewater discharges	Ongoing
Marine NPDES sediment monitoring	Sediments in Puget Sound near treatment plant outfalls and the Denny Way CSO	Grain size, solids, sulfides, ammonia-nitrogen, oil & grease, TOC, metals, organic compounds, and (at South and West Point plants) benthic infauna	Sediment samples in a grid pattern as defined in the SAP approved by Ecology	Sediment samples at outfalls once per permit cycle (about every 5 years)	NPDES permit requirement	Ongoing

BMP = best management practices; BOD = biochemical oxygen demand; DNR = Washington State Department of Natural Resources; DO = dissolved oxygen; Ecology = Washington State Department of Ecology; HPA = Hydraulic Permit Approval; SAP = sampling and analysis plan; TMDL = total maximum daily load; TOC = total organic carbon; TSS = total suspended solids.

Table C-1. Summary of King County Water Quality Monitoring Programs

Program	Media and Locations	Parameters	Methods	Sampling Frequency	Program Purpose	Duration
Special Studies						
Brightwater Outfall Studies	Water, sediment, and eelgrass for the Brightwater outfall site Upland soils at outfall Portal 19	Water: temperature, salinity, DO, nutrients, and fluoresence Sediment: benthic community and chemistry	Water column samples and continuous buoy readings Surface sediments Eelgrass survey	Annual	To meet HPA and DNR outfall lease requirements	Through 2014
Brightwater Construction NPDES Stormwater Monitoring	Stormwater and surface water	Stormwater quality	Various	Intensive	To meet NPDES Construction Stormwater permit	Through 2010
Elliott West/Denny Way CSO sediment monitoring	Sediment near the new Denny Way Regulator and Elliott West CSO Treatment Facility outfalls and in sediment cleanup areas associated with the old Denny Way CSO discharge site	Benthic communities, sediment chemistry	Sediment samples per approved SAP	Variable	To meet U.S. Army Corps of Engineers permit requirements and an Ecology cleanup order	Through 2021
Diagonal/Duwamish post-remediation sediment monitoring	Sediment near the Seattle Diagonal storm drain (includes city and county CSO outfalls) and the county's Duwamish CSO outfall	Sediment chemistry, turbidity, cap surveys	Sediment samples per approved SAP	Annual	Under an EPA/Ecology Consent Order	Through 2013
Wetland monitoring for Carantion Treatment Plant	Water quality in discharge wetland, existing tributaries, and outflow Sediment quality in wetland pond	Water: metals, organics, nutrients, bacteria Sediment: metals, organics, and physical parameters	Water column Surface sediments	Variable	Determine conditions before and after treatement plant discharge	2006–2010

BMP = best management practices; BOD = biochemical oxygen demand; DNR = Washington State Department of Natural Resources; DO = dissolved oxygen; Ecology = Washington State Department of Ecology; HPA = Hydraulic Permit Approval; SAP = sampling and analysis plan; TMDL = total maximum daily load; TOC = total organic carbon; TSS = total suspended solids.

Marine Water Monitoring Results

This section describes the results of marine monitoring activities in 2007 in terms of fecal coliform bacteria levels and overall water quality rankings (water quality index).

Monitoring Locations

Figure C-1 shows ambient and outfall water quality monitoring locations in Puget Sound. Offshore, nearshore, and beach areas are monitored. Ambient sites are monitored to gauge general environmental conditions. Outfall monitoring sites are located near King County wastewater treatment plant and CSO outfalls.

Fecal Coliform Bacteria

Ambient and Outfall Locations

Levels of fecal coliform bacteria at 17 offshore and nearshore Puget Sound locations were measured monthly in 2007 to gauge the risk posed to human health from recreational uses of these waters. Two sites were added to the 15 sites monitored in 2006. A site in Salmon Bay was added because Salmon Bay is a high-use area and is close to the mouth of the Lake Washington Ship Canal. Another site in Fauntleroy Cove was added because of several potential sources of bacteria in the cove and the need for data from an offshore station to compare with the data from the beach site in the cove.

For marine surface waters, two fecal coliform standards are used: a geometric mean standard of 14 colony-forming units (CFU) per 100 mL and a peak standard that specifies that no more than 10 percent of the samples used to calculate the geometric mean exceeds 43 CFU/100 mL.[3] The period of averaging for the geometric mean standard should not exceed 12 months. Because samples are collected monthly, a total of 12 samples was used to calculate the geometric mean for each location.

All 13 offshore (7 ambient and 6 outfall) sites met the fecal coliform standards in 2007 (Figure C-2). Results for the 4 nearshore stations were mixed. The two nearshore sites in Quartermaster Harbor met both of the fecal coliform standards; the site at the mouth of the Lake Washington Ship Canal at Shilshole passed the geometric mean standard but failed the peak standard; and the site in Elliott Bay along the Seattle waterfront failed both standards. Bacteria levels tend to be higher along the waterfront than at offshore sites in Elliott Bay because of freshwater input from the Duwamish River and stormwater outfalls.

Ambient and Outfall Locations at Puget Sound Beaches

In 2007, fecal coliform bacteria levels at 25 Puget Sound beach sites were measured monthly to assess the risks to human health from direct contact with marine waters during activities such as

[3] A colony-forming unit (CFU) is a measure of viable bacterial numbers. Unlike in direct microscopic counts where all cells, dead and living, are counted, CFU measures only viable cells.

swimming, wading, scuba diving, and surfing. Nineteen sites are located in ambient areas, and six sites are in the vicinity of treatment plant and CSO outfalls. Although all of King County's treatment plant and CSO outfalls are located in offshore waters, beach areas that are inshore of the outfalls are considered as beach outfall sites.

Ten more beach monitoring sites were added in 2007 to the total of 15 sites monitored in 2006. The sites were added in order to increase spatial coverage, to monitor sites with stormwater discharges, and to support the BEACH (Beach Environmental Assessment, Communication and Health) Program, administered by the Washington State Departments of Ecology and Health, at locations with observed diminished water quality. More information on the BEACH Program can be found at http://www.doh.wa.gov/ehp/ts/waterrec/beach/default.htm.

Monitoring results in 2007 show that 12 of the 25 sites met both the geometric mean and peak standards, 5 sites met the geometric mean standard but not the peak standard, and 8 sites failed both standards (Figure C-2). The greatest determination of compliance with bacteria standards tends to be proximity to a freshwater source. Most of the sites that failed both standards are near freshwater sources such as storm drains and the mouths of streams and creeks. Sites near freshwater sources that failed standards in 2006 also failed standards in 2007. The site at Redondo, which is not near a freshwater source, had some of the highest bacteria counts of all the beach stations. The bacteria source is not evident and will be investigated further.

Although all beaches in the vicinity of outfalls met fecal coliform standards in 2006, this was not the case in 2007. The northern West Point and Vashon sites met both the standards, but other sites failed either both standards or the peak standard. Fluctuations in bacteria levels are likely caused by annual variability in amount and intensity of rainfall. For example, lower bacteria counts were recorded at all stations during 2004, 2005, and 2006—which were drier than normal years. On the other hand, 2007 was wet compared to recent years, particularly during the summer months, which would likely explain the higher fecal coliform levels.

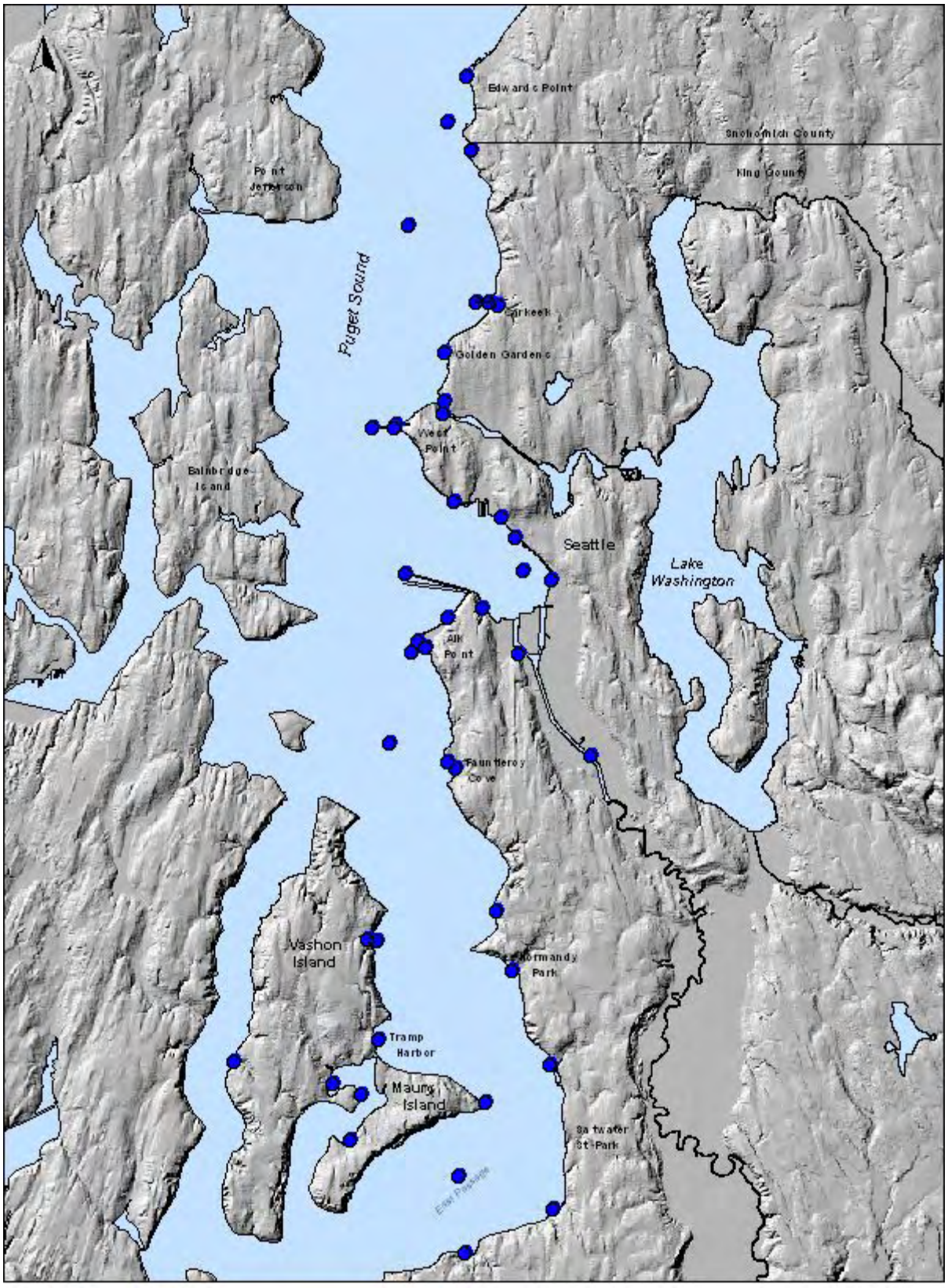


Figure C-1. Ambient and Outfall Water Monitoring Locations in Puget Sound

Figure C-2. Fecal Coliform Bacteria 2007 Results for Puget Sound Monitoring Sites

Overall Offshore Quality in Puget Sound—Water Quality Index

In 2007, King County monitored 14 sites each month to assess overall quality of offshore marine water. Two sites were added to the 12 sites monitored in 2006. Both sites are in Quartermaster Harbor near Vashon Island—one site is in the inner harbor and the other site is off the Dockton Park dock.

To determine overall water quality, the county uses a modified version of the water quality index (WQI) developed by the Washington State Department of Ecology (Ecology). The determination is based on four indicators: dissolved oxygen, dissolved inorganic nitrate and nitrite (nitrate+nitrite), ammonia, and density stratification strength and persistence. Each monitoring site is categorized as low, moderate, or high concern.

Low dissolved oxygen (DO) serves as an indication of both stratification strength and high primary productivity, driven by high nutrient concentrations. DO values of 5.0 mg/L and 3.0 mg/L are used as threshold indicators. The 5.0 mg/L value is a Washington State water quality guideline that indicates "good quality"; the 3.0 mg/L value is used because at this level, biological effects can be seen. Low dissolved nitrate and nitrite concentrations for consecutive months indicate that phytoplankton growth may be nutrient limited and that the site may be at risk for eutrophication (the process by which excess nutrients lead to excessive phytoplankton and algal growth), while high ammonia concentrations indicate the presence of a nutrient source. Strong and persistent stratification indicates reduced mixing between surface and bottom waters, which can trap waters with low DO near the bottom where many invertebrates live.

Figure C-3 shows the locations and WQI determinations for all offshore sites in 2007. Water quality at 11 of the 14 offshore sites , including the 6 outfall sites, was ranked as low concern. Although some sites in the Central Basin of Puget Sound experienced moderate-infrequent stratification, low DO levels were not observed.

This is the first year since 2003 that some sites were ranked as either moderate or high concern (Figure C-4). The three sites ranked as either moderate or high concern—representing about 21 percent of the sampling sites—were in embayments. Water quality at the Elliott Bay site was ranked as moderate concern. The ranking was based on strong-intermittent density stratification and DO values of less than 5.0 mg/L for two consecutive months.[4] The DO level in Elliott Bay was never less than 3.0 mg/L. The two Quartermaster Harbor sites had a high level of concern in 2007, the first year these sites were sampled. The ranking was based on nitrate+nitrite concentrations that were below the detection limits for five consecutive months.

[4] The Elliott Bay station showed five months of density stratification greater than 2.0 sigma-*t* and a mean annual sigma-*t* greater than 2.0.

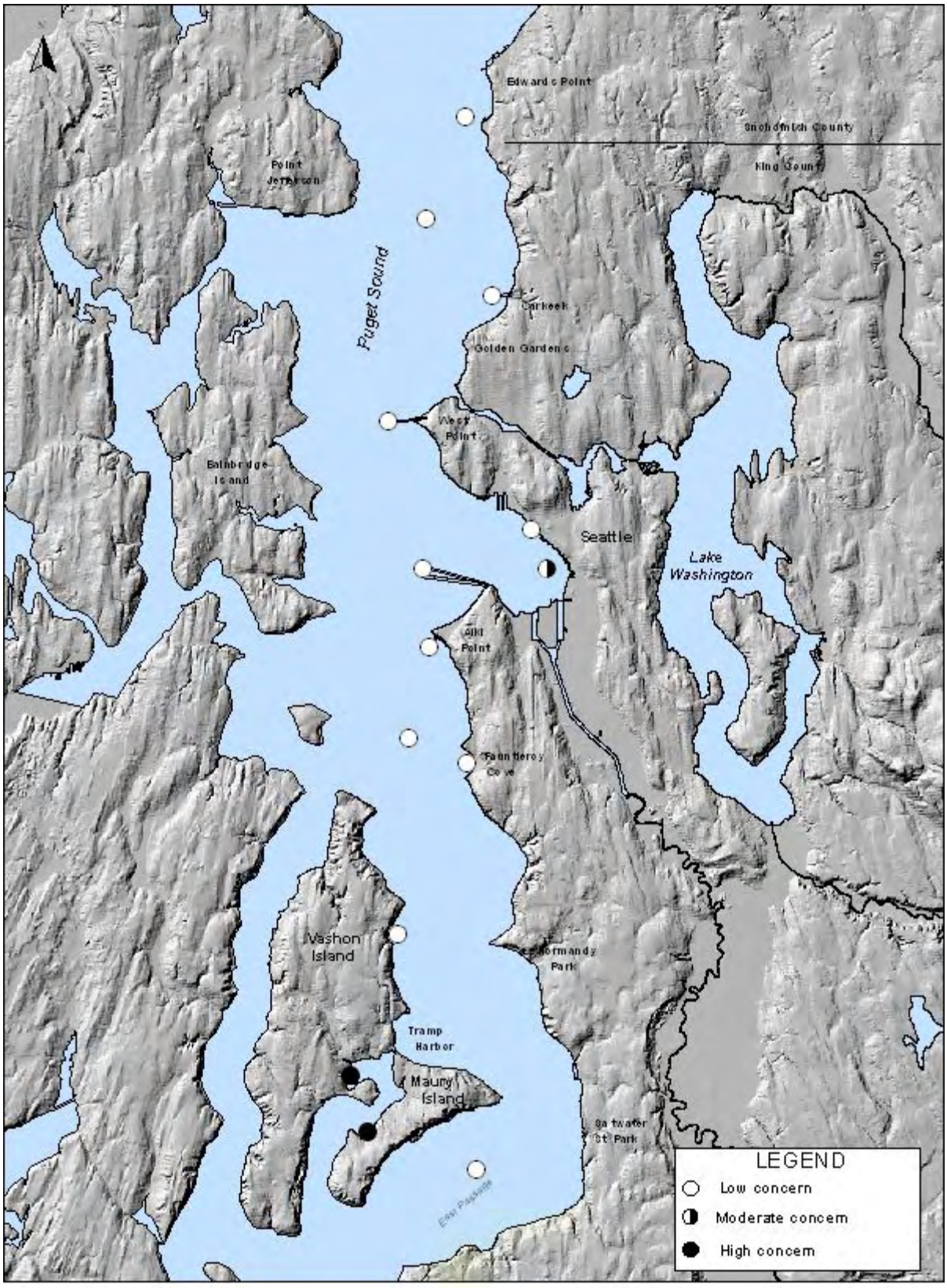


Figure C-3. Water Quality Index Scores for King County Offshore Stations in 2007

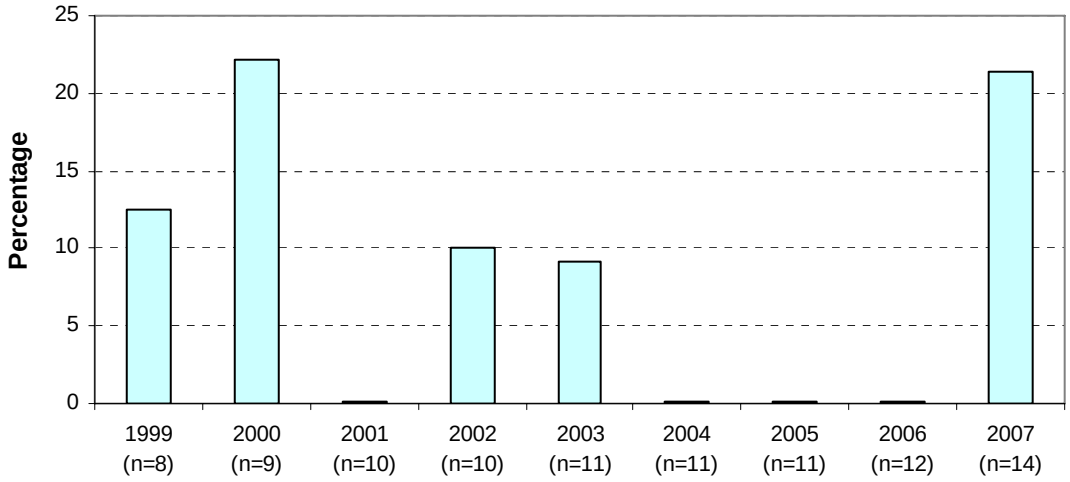


Figure C-4. Percentage of King County Offshore Stations with Moderate or High Concern Rankings Based on Water Quality Index, 1999–2007

Marine Sediment Monitoring Results

Sediments not only can be impacted by pollutant discharges but also can be a source of pollution through resuspension to the water column and through the food chain as benthic organisms and shellfish are consumed. This section discusses methods and results of sediment sampling and analysis conducted in 2007 at ambient locations throughout King County, at the West Point Treatment Plant outfall in support of NPDES permit requirements, and at the Elliott West CSO Treatment Facility/Denny Way CSO outfall areas in support of U.S. Army Corps of Engineers permit requirements and an Ecology cleanup order. It also describes findings of a recent remedial investigation of contamination in the Lower Duwamish Waterway.

Ambient Sediment Quality in Puget Sound and Elliott Bay

King County collected sediment quality data from subtidal ambient monitoring stations for many years, annually at first and then biennially between 1996 and 2004. These subtidal monitoring stations were located in Elliott Bay and in the Central Basin of Puget Sound near the City of Seattle. Sampling stations were located in areas away from the direct impact of potential point-source pollution, such as wastewater and stormwater outfalls, and from the impact of general non-point sources such as the Duwamish Waterway. Samples were collected from the top two centimeters (0.8 inch) of sediment and analyzed for metals and organic chemicals to evaluate sediment quality in the most recently deposited material. Metals and organics concentrations were compared to the published sediment quality chemical criteria of the Washington State Sediment Management Standards (SMS) and to region-wide Puget Sound sediment data.

The subtidal sediment monitoring program was temporarily discontinued after 2004 to enable King County staff scientists time to evaluate data generated from the program and from other

data collection efforts in the region. Following the review, King County began an expanded subtidal sediment monitoring program in 2007 that focuses on sediment quality in Elliott Bay while also monitoring ambient sediment quality in the Central Basin of Puget Sound and in three embayments of interest——Quartermaster Harbor, Fauntleroy Cove, and outer Salmon Bay.

Locations of sampling stations are shown in Figure C-5 (stations that are not in insets on the figure). The eight stations in Elliott Bay are sampled every two years, and the six ambient stations are sampled every five years. Four of the Elliott Bay stations and one of the Central Basin stations were part of the earlier sediment monitoring program.

In 2007, King County collected subtidal sediment samples from all 14 locations and analyzed them for metals and organic chemicals. Analytical results showed that 11 of the 14 stations met Washington State SMS chemical criteria for all regulated metals and organic compounds, which means that concentrations were below levels at which impacts to marine organisms might occur (Figure C-5). Three of the 14 stations showed exceedences of one or more regulated chemicals. The station in Quartermaster Harbor showed an exceedence for mercury, most likely from smokestack emissions from the old Asarco smelter.[5] The station located in Elliott Bay, just off Harbor Island, showed exceedences for mercury and butyl benzyl phthalate (an organic compound used as a plasticizer), most likely historical contamination from heavy industry on Harbor Island. The station located in East Passage, between Vashon–Maury Island and the south King County mainland, showed an exceedence for bis(2-ethylhexyl) phthalate, another plasticizer. No apparent source of bis(2-ethylhexyl) phthalate, other than introduction of contamination during sampling, could be identified for this deep ambient station.

In general, sediment quality at areas sampled by King County in Elliott Bay, Puget Sound, and three associated embayments are of good quality with some evidence of minor impacts from human activities at three locations.

Sediment Quality Near the West Point Outfall

Sediment samples are collected in the vicinity of the West Point Treatment Plant marine outfall once during each NPDES permit cycle (usually five years). Nineteen surface sediment samples were collected in September 2006 for analysis of chemical parameters including sediment conventionals, metals, and trace organics. A subset of these samples was also used for toxicity testing and benthic community analysis. In 2007, data analysis was completed and a final report was issued to Ecology to meet NPDES reporting requirements.

Samples from all 19 stations passed Washington State SMS chemical criteria. Samples from three stations near the end of the diffuser failed one or more sediment bioassays, exceeding SMS biological criteria (West Point inset, Figure C-5). These toxicity testing results, however, do not correlate well with sediment chemistry and benthic community analysis results. Sediment chemistry results at the three stations showed that chemical concentrations are well below SMS

[5] This assumption is based on the proximity of the old smelter to the sampling location and on elevated (but not above SMS chemical criteria) concentrations of lead and arsenic in Quartermaster Harbor compared with other Puget Sound ambient sites.

chemical criteria. Other chemical compounds not regulated under SMS, including pesticides, herbicides, brominated organic flame retardants, organotins, and other metals, that were analyzed to provide a complete picture of sediment quality at the location were not detected or did not show elevated concentrations.[6] Two of three stations also support a robust, diverse benthic community that has been stable over the last three monitoring events completed between 1998 and 2006.[7] (The third site was resampled for benthic community and results are being analyzed.) Benthic infaunal organisms are excellent biological integrators of chemical and physical sediment conditions and, as such, are considered a sensitive indicator of a healthy marine environment.[8]

Six stations were sampled and analyzed using the Puget Sound Sediment Quality Triad. Samples for analysis of sediment chemistry, toxicity, and benthic community assemblages were collected at the same time to classify sediment quality in one of four categories: high, intermediate/high, intermediate/degraded, and degraded. Sediments at four of the six stations were classified high quality. Two stations were classified as intermediate/high quality. These are the two stations whose toxicity results did not correlate with chemistry and benthic results.

Meetings will be held with Ecology to discuss these results and to determine whether additional sampling and monitoring are warranted and whether sediment monitoring will continue to be required as part of West Point's NPDES permit.

Sediment Quality Near the Future Brightwater Outfall

In 2001, 2006, and 2007, King County collected pre-construction baseline sediment quality data at 10 stations in the vicinity of the planned diffuser for the Brightwater Treatment Plant marine outfall and at one nearby reference station (Brightwater inset, Figure C-5). Additional sediment quality data will be collected following construction and prior to outfall operation.

Sediment data collected in 2007 were similar to data collected in 2001 and 2006. Chemistry analytical results show that sediments at all stations meet Washington State SMS chemical criteria for all regulated compounds. Additional chemical compounds, including pesticides, herbicides, brominated organic flame retardants, organotins, and other metals, were analyzed to provide a complete picture of sediment quality at the location. Results of the analysis indicate that chemicals are not present in sediments at the location of the Brightwater outfall diffuser at levels that would impact the marine environment. Benthic community data collected in 2001,

6 Organotin compounds or stannanes are chemical compounds based on tin with hydrocarbon substituents. Organotin compounds are used as a biocide in polyvinyl chloride (PVC), as a wood preservative, and as an anti-foulant in paints to protect the hulls of boats and ships, buoys, and pilings from marine organisms such as barnacles.

7 "Robust" means that it is a healthy and thriving benthic community that is able to stand up to the rigors of statistical analysis.

8 Benthic infauna live in sediment in soft substrate areas such as shallow mud flats and sand flats. They include worms, bivalves and crustaceans. All these species have burrowing mechanisms. Benthic communities provide a significant food source for many species of fish. Wading birds also rely on benthic infauna to form an integral part of their diet.

2006, and 2007 indicate a stable benthic community that is typical for sediments found in areas of Puget Sound with similar depth and physical properties.

In general, sediment quality at the location of the future Brightwater outfall diffuser is good, with a stable benthic community typical of the type of sediment found at the site and little evidence of impacts from chemical compounds.

Sediment Quality Near the Denny Way/Elliott West CSO Outfalls

Two new outfalls went online in 2005 as a part of the Denny Way/Lake Union CSO control project. One outfall discharges primary-treated effluent from the new Elliott West CSO Treatment Facility; the other outfall discharges untreated CSO from the Denny Way Regulator Station and replaces the previous outfall that was closer to shore. In 2006 and 2007, King County collected sediments from 16 stations in the area to meet long-term monitoring requirements of a U.S. Army Corps of Engineers permit and an Ecology cleanup order for the project (Denny Way inset, Figure C-5).

The sediment samples collected in 2007 were analyzed for chemical parameters and benthic community assemblages. Results indicate that concentrations of one or more chemicals at 13 of the 16 stations exceeded Washington State SMS chemical criteria and that benthic assemblages in both the new and former CSO outfall locations show minor impacts from outfall operation.

The area is undergoing remediation of historical sediment contamination resulting from CSO discharges from the Denny Way outfall before the site was controlled and from other unrelated inputs. Remediation of a nearshore subarea was completed in early 2008. A six-year monitoring program will track results of the remediation. King County and Ecology are monitoring three other subareas to see whether they will recover naturally or will require further remediation.

Sediment Quality in the Duwamish Waterway

King County has been coordinating its sediment management efforts in the Duwamish Waterway with two federal Superfund projects: the Harbor Island and the Lower Duwamish Waterway projects.[9]

The county has been working in partnership with the Port of Seattle since 2003 on the Harbor Island Superfund project. The project is remediating historical sediment contamination at the county's Lander and Hanford CSOs.

In 2001, EPA added about five miles of the Lower Duwamish Waterway (LDW) to its list of Superfund cleanup sites. Nine county CSOs are located in this stretch of the waterway. King County, the Port of Seattle, the City of Seattle, and Boeing became involved early in the process

[9] Superfund is the common name for the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Enacted by Congress in 1980 and amended in 1986, this law provides broad federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment.

before the site was listed under Superfund and initiated work in support of the remedial investigation and feasibility study (RI/FS). Phase 1 of the RI examined existing data on the risks to human health and the environment from sediment-associated chemicals in the LDW. As a result of the Phase 1 study, EPA identified seven early action sites. Two of the seven early action sites were near the county's Norfolk and Diagonal/Duwamish CSOs. Sediment near the Norfolk site had already been remediated in 1999; remediation of the Diagonal/Duwamish sediment was completed in 2004.

Phase 2 of the RI generated additional data and estimated risks that will remain after completion of early remedial actions. The draft RI was circulated for public review in November 2007. Some key findings are as follows:

- The waterway contains a diverse assemblage of aquatic and wildlife species and a robust food web that includes top predators.
- Much of the sediment contamination resulted from historical releases that are now generally buried under cleaner more recently deposited sediment. Almost all new sediment that enters the waterway comes from the Green River.
- In general, high concentrations of chemicals, including polychlorinated biphenyls (PCBs) were detected in surface sediment in localized areas—frequently called "hot spots"—separated by larger areas of the LDW with lower concentrations. Relatively high surface sediment contamination is present in some areas as a result of a number of processes, including low net sedimentation rates in a few areas with primarily historical contamination or because of the presence of ongoing localized sources.
- The highest risks to people are associated with consumption of fish, crabs, and clams, with lower risks associated with activities that involve direct contact with sediment, such as clamming, beach play, and netfishing.
- Most of the human health risk is from PCBs, arsenic, cPAHs, and dioxins and furans.
- Ecological risks to fish and wildlife were relatively low, with the exception of risks to river otter from PCBs.

Some Chemicals Defined…

PCBs (polychlorinated biphenyls). Used in electrical equipment, paints, plastics, dyes, and other products, before being banned in the U.S in 1977. Known to cause cancer in animals and produce health effects in humans.

PAHs (polycyclic aromatic hydrocarbons). Byproducts of combustion of coal, oil, gas, wood, garbage, and tobacco, and in charboiled meat. May cause cancer, reproductive problems, birth defects, impaired immune function, and other health effects. (cPAHs are carcinogenic PAHs.)

EDCs (endocrine disrupting chemicals). May be in natural or synthetic hormones, personal care products, industrial byproducts, plastics, and pesticides. Mimic, inhibit, or alter the hormonal regulation of the immune, reproductive, or nervous systems or other parts of the endocrine system.

TBT (tributyl tin). An EDC used in paints and as a pesticide. Is stable, persists in the environment, and is toxic to aquatic life.

Phthalates. Used in a variety of consumer products such as deodorant, nail polish, and perfume. Found to cause adverse health effects, including cancer, in laboratory animals.

Furans (and related dioxins). Byproducts of combustion, manufacture of herbicides, and bleaching of paper pulp. Found to cause adverse effects, including endocrine disruption, in laboratory animals. May cause cancer in humans.

- Sediment contamination in approximately 75 percent of the LDW is estimated to have no effect on the benthic invertebrate community; approximately 7 percent of the surface sediment has chemical concentrations exceeding the higher of the two state standards associated with potential adverse effects to the benthic invertebrate community. The potential for effects in the remaining 18 percent of the LDW is more uncertain. Most of the state sediment standard exceedances were for PCBs and phthalates, although 41 different chemicals had at least one exceedance.

The draft RI included two recommendations in its key findings:

- The control of local sources of toxics is critical to the long-term success of specific remedial actions in the Lower Duwamish Waterway.
- Continued coordination of cleanup actions and source control will be necessary to ensure that any actions taken are not unduly impacted by local sources.

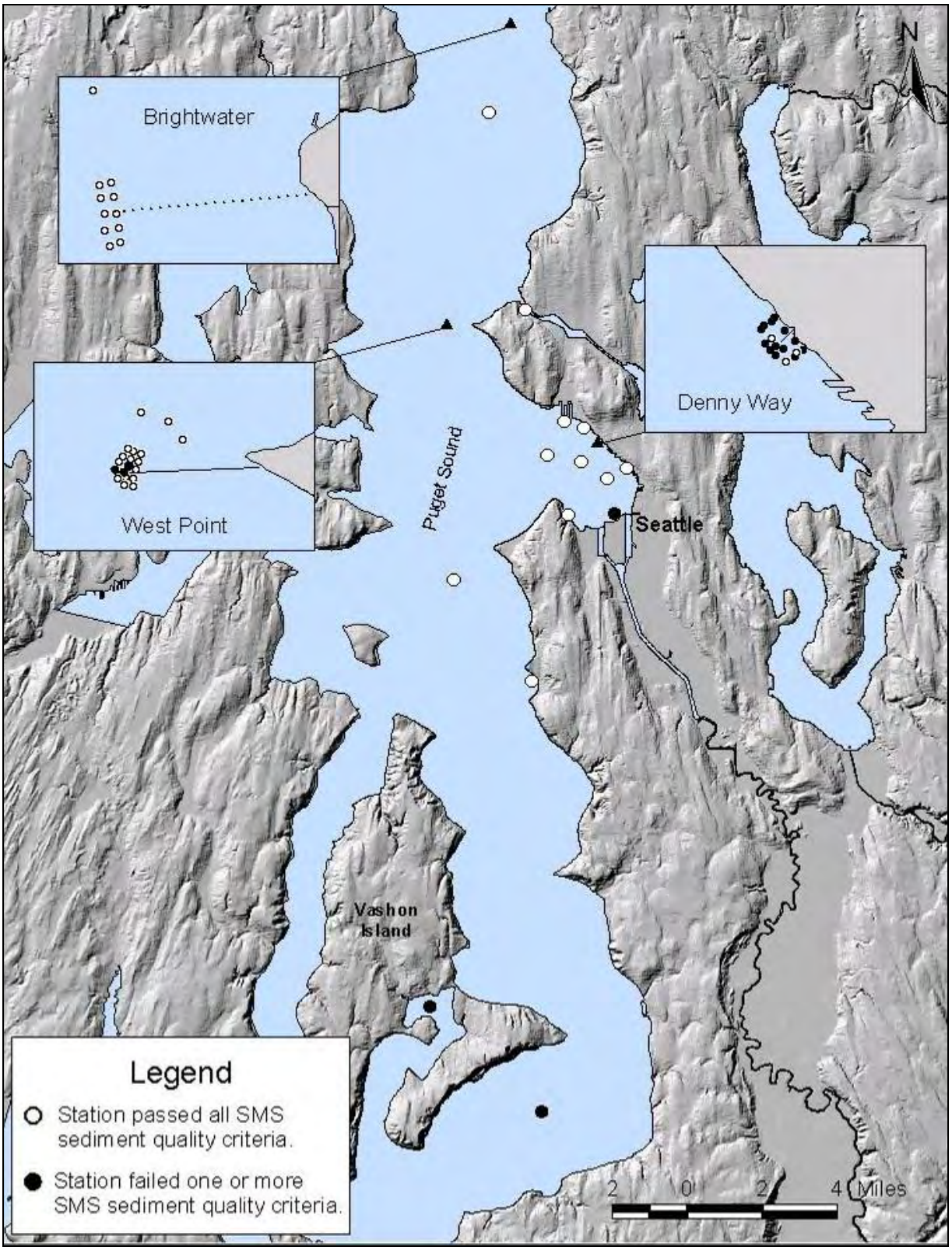


Figure C-5. Sediment Monitoring Stations in Elliott Bay and Central Basin of Puget Sound

Major Lakes Monitoring Results

This section describes the results of fecal coliform bacteria sampling at ambient and swimming beach locations in the major lakes of King County. It also describes overall water quality in these lakes based on calculation of their trophic state index.

Monitoring Locations

Figure C-6 shows the 25 ambient sampling locations in Lakes Washington, Sammamish, and Union and in the Lake Washington Ship Canal. Figure C-7 shows the 17 swimming beach sampling locations in Lake Washington, Lake Sammamish, and Green Lake.

Figure C-6. Ambient Monitoring Locations in Lakes Washington, Sammamish, and Union (including the Lake Washington Ship Canal)

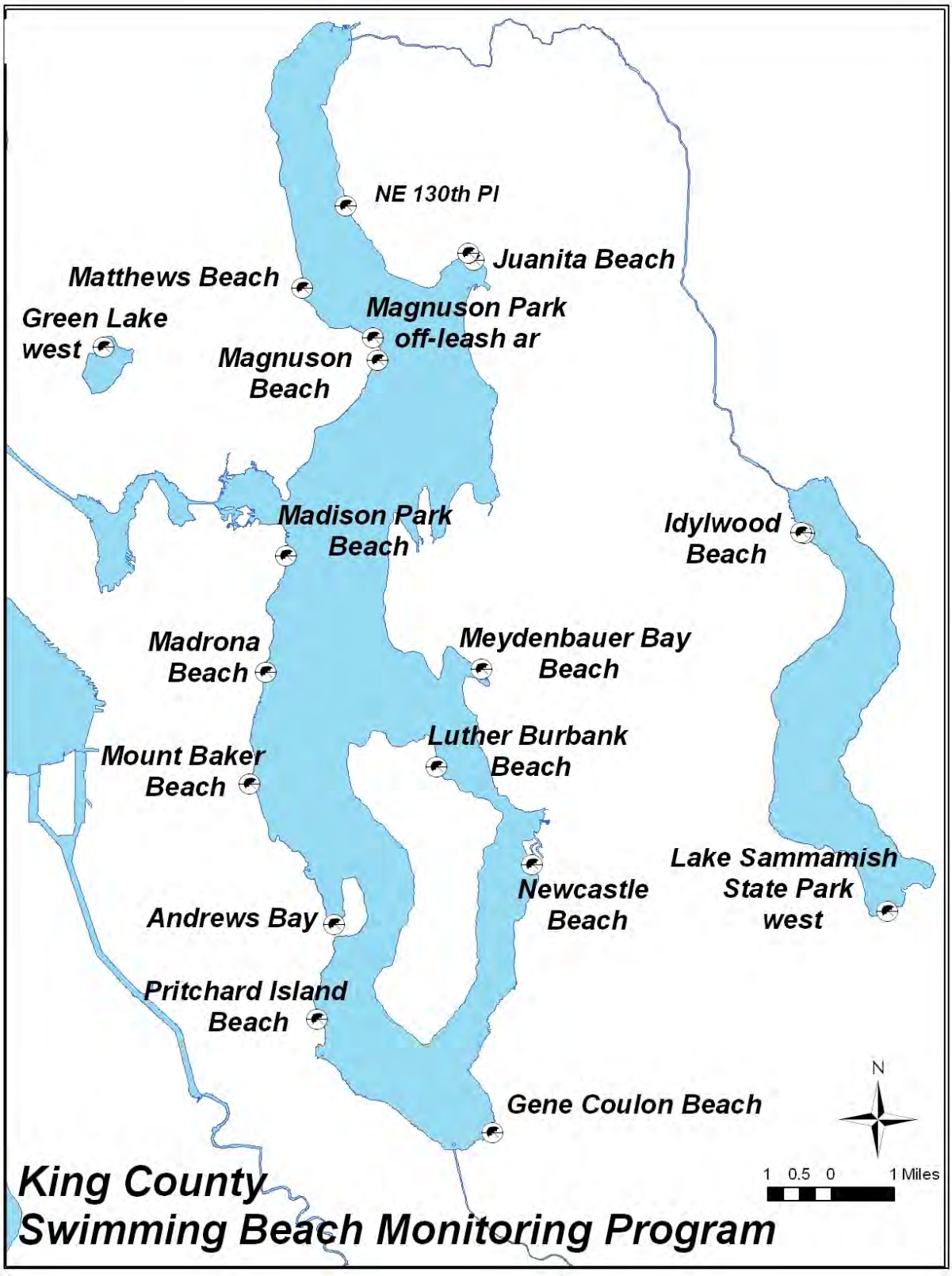


Figure C-7. Swimming Beach Monitoring Locations in Lake Washington, Lake Sammamish, and Green Lake

Fecal Coliform Bacteria—Ambient Mid-Lake (Open-Water) and Nearshore

Samples are collected for fecal coliform bacteria from both mid-lake (open water) and nearshore locations in Lakes Washington, Sammamish, and Union biweekly during the growing season and monthly during the rest of the year to measure.

The lake standard for fecal coliform bacteria addresses human health risk from direct contact with lake water during activities such as swimming and wading. The standard is a geometric mean value of less than 50 colonies per 100 mL with no more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 100 colonies per 100 mL (WAC 173-201A).

Even though the lake standard for fecal coliform bacteria is exceptionally difficult to attain, 100 percent of the Lake Sammamish stations, 85 percent of the Lake Washington stations, and 60 percent of the Lake Union/Ship Canal stations achieved the standard in 2007 (Figure C-8).[10] Compared to 2006, fewer Lake Washington samples met the standard (92 percent in 2006). Two high concentrations were found at each of two stations in Lake Washington: Station 0829 at the south end of the lake and Station 4903 northwest of Station 0829. The number of Lake Union/Ship Canal samples that met the standard also decreased, from 80 percent in 2006 to 60 percent in 2007, because of high concentrations measured at Stations 0512 and 0518.

The two stations on Lake Washington and the two stations on Lake Union failed to meet both parts of the standard. Six of the 11 samples that had fecal coliform greater than 100 colonies per 100 mL were the result of unusual storm conditions. The highest bacteria concentrations were collected shortly after record rainfall swept through the region the first week of January 2007 (Stations 4903, 0512, 0518).

[10] Percentages shown in Figure C-8 for 2000–2006 are different from the percentages shown for the same years in earlier reports. Calculations were upgraded in 2007 to include both parts of the fecal coliform standard.

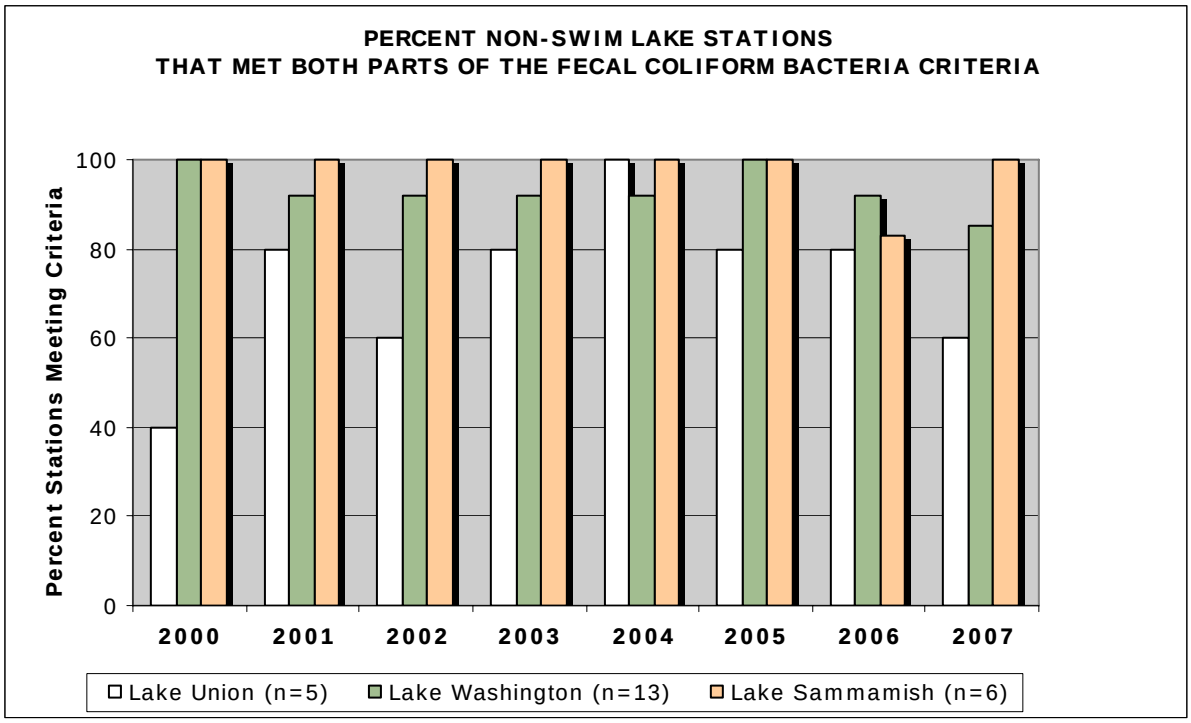


Figure C-8. Percentage of Ambient Stations in Lakes Washington, Sammamish, and Union that Met the Fecal Coliform Bacteria Standard, 2000–2007

Fecal Coliform Bacteria—Swimming Beaches

Samples are collected for fecal coliform bacteria each week between Memorial Day and the end of September at 17 swimming beaches in Lake Washington, Lake Sammamish, and Green Lake.[11]

King County's standard for acceptable fecal coliform bacteria levels in swimming beaches is that none of the testing sites violates both parts of the Washington State Department of Health's fecal coliform bacteria target, which is the geometric mean of 200 colonies per 100 mL with no single sample exceeding 1,000 colonies per 100 mL. Public Health–Seattle & King County and the Washington State Department of Health currently use this standard, which is called the Ten State Standard.

In 2007, 100 percent of samples from Green Lake and Lake Sammamish met both parts of the fecal coliform bacteria standard (Figures C-9 and C-10). This is the fifth year in a row that all Green Lake samples have met the standard. Lake Sammamish results vary slightly from year to

[11] The 2006 water quality report gave results for 21 swimming beaches, including beaches that King County monitors under contracts with other jurisdictions. This 2007 report does not include beaches monitored for other jurisdictions. The contracted beaches are not part of the county's Swimming Beach Monitoring Program and not included in the KingStat Web site (http://www.metrokc.gov/dnrp/measures/default.aspx).

year, showing percentages somewhere between the low 90s and 100 for the past nine years. For Lake Washington, 91 percent of the samples, compared to 96 percent in 2006, met the standard (Figure C-11).[12] High bacterial counts resulted in closures at four Lake Washington swimming beaches: Juanita, Magnuson off-leash area, Gene Coulon, and Meydenbauer Bay. There were no beach closures in 2006.

Fecal coliform bacteria can enter lakes from untreated wastewater effluent, household or farm animals, wildlife, stormwater runoff, sewage overflows,or failing septic systems. The most impacted beaches are adjacent to streams that drain urbanized drainage basins.

Overall Quality in Major Lakes—Trophic State Index

Samples are collected to assess overall water quality in Lakes Washington, Sammamish, and Union from both mid-lake (open water) and nearshore locations biweekly in the summer and monthly during the rest of the year.

Overall water quality is determined by measuring the summer (June–September) total phosphorus concentrations and converting them to the trophic state index (TSI-TP). The trophic state index relates phosphorus to the amount of algae that the lake can support. The potential for nuisance algal blooms is considered low if the TSI-TP is less than 40, moderate if less than 50, and high if greater than 50. High algae productivity often relates to poor water quality. Although such high productivity may not reduce beneficial uses in all cases, depending on the natural condition of the lake, a trend toward increased TSI-TP could indicate changes in the watershed.

TSI-TP results vary from year to year, depending on climate and biological interactions that create unique annual conditions in each lake (Figure C-12). The 1994–2007 results for Lakes Sammamish and Washington show that phosphorus concentrations fluctuate between the low and moderate thresholds from year to year, indicating that water quality varies from good to moderate with a low potential for nuisance algal blooms. Lake Union typically shows phosphorus concentrations in the moderate water quality range. In 2007, however, high phosphorus levels put Lake Union in the poor water quality range. These higher phosphorus concentrations may have been induced by stormwater runoff because precipitation in June, July, and September were above the historical average.

[12] Percentages shown in Figures C-9, C-10, and C-11 for 1996–2006 are different from the percentages shown for the same years in earlier reports. Calculations were upgraded in 2007 to include both parts of the fecal coliform standard. To comply with KingStat requests, the figures show data as far back as 1996. No data were collected at Green Lake beaches in 1997.

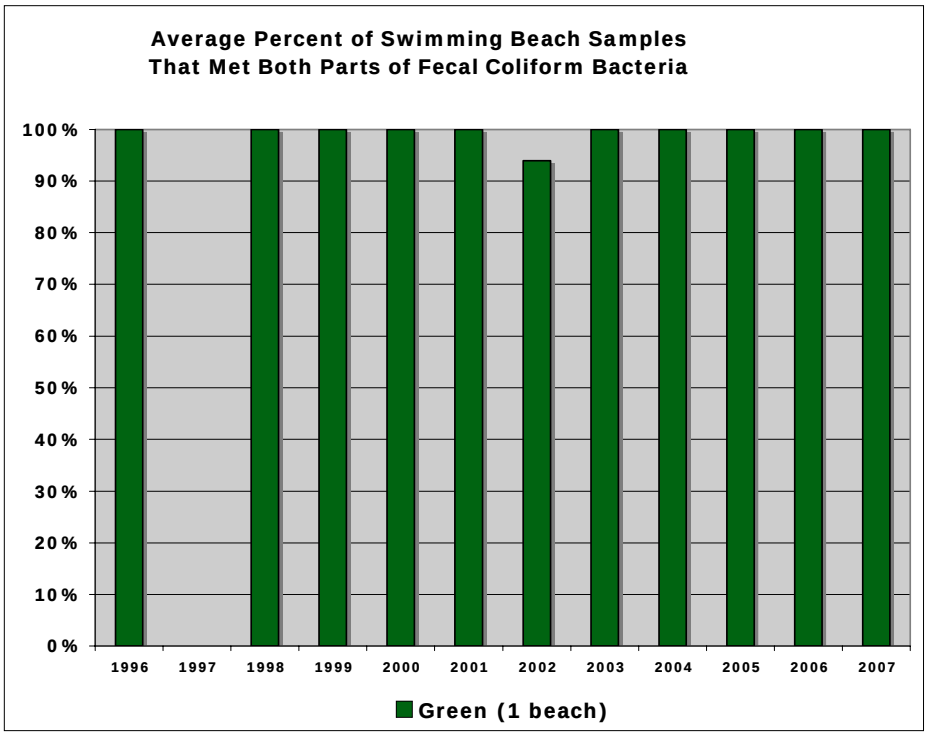


Figure C-9. Percentage of Samples that Met the Fecal Coliform Bacteria Standard at Green Lake Swimming Beaches, 1996–2007

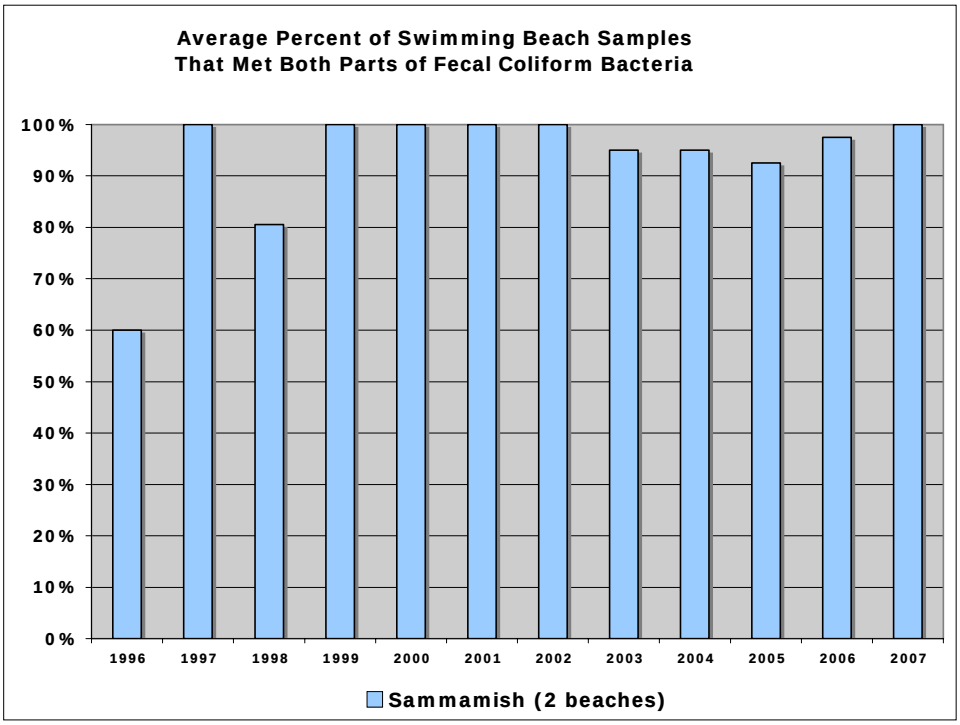


Figure C-10. Percentage of Samples that Met the Fecal Coliform Bacteria Standard at Lake Sammamish Swimming Beaches, 1996–2007

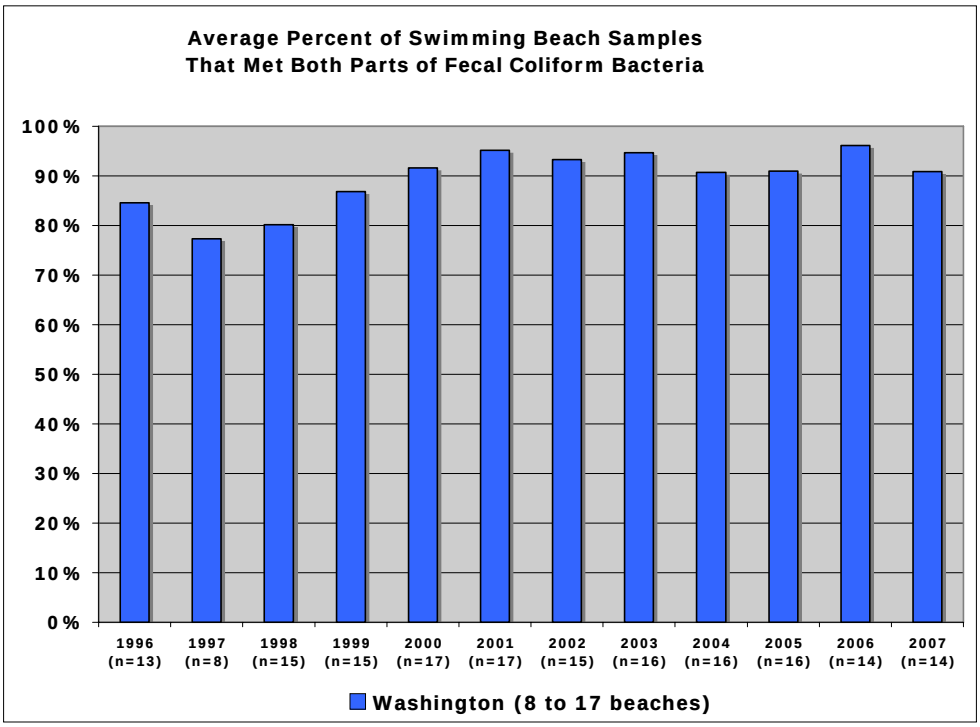


Figure C-11. Percentage of Samples that Met the Fecal Coliform Bacteria Standard at Lake Washington Swimming Beaches, 1996–2007

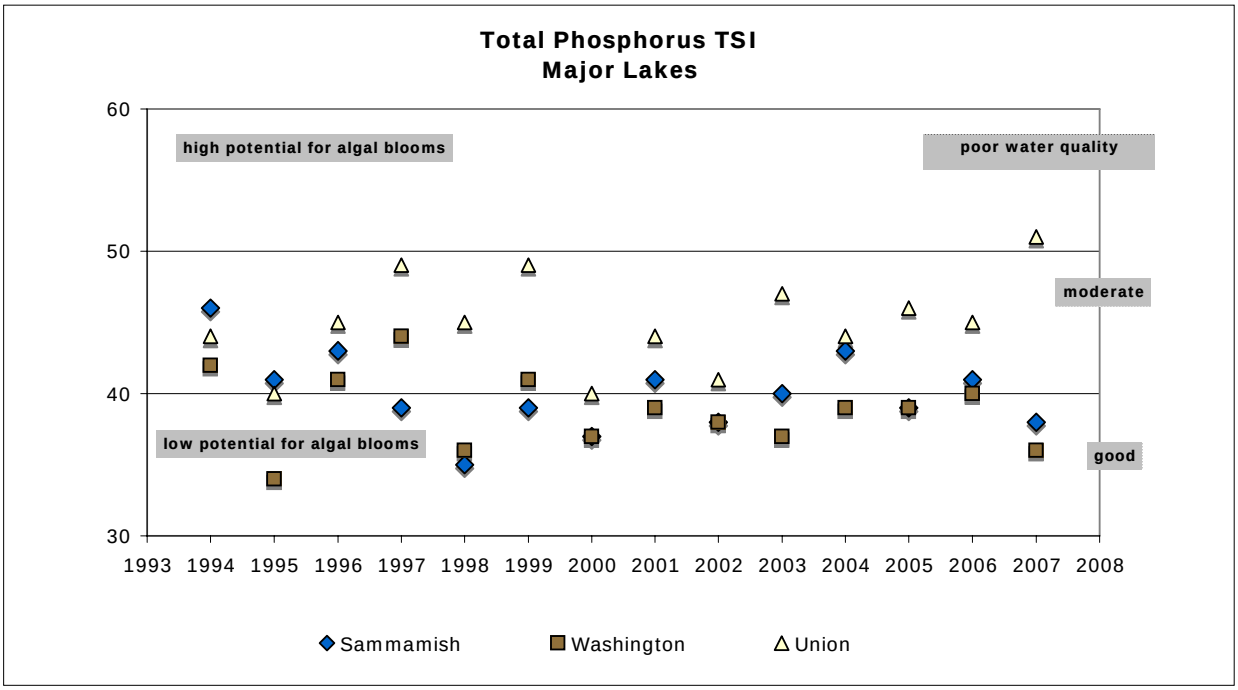


Figure C-12. Overall Water Quality in Lakes Washington, Sammamish, and Union Based on the Trophic State Index for Total Phosphorus, 1994–2007

Lake Sediment

Sediment quality is an important indicator of environmental health and, along with indicators of water quality, habitat, and the aquatic food web (plankton, invertebrates, and fish), can present a picture of environmental health. Chemical contaminants that are washed into streams and lakes from urban areas can attach to sediments, settle to the bottom, and act as record of both historical and recent contaminants discharged into surface waters.

Results of sediment monitoring in Lakes Sammamish, Washington, and Union between 1999 and 2001 indicate that sediment quality in the three lakes was generally good although certain areas showed contamination. Most of the contaminated areas were near stormwater outfalls and CSOs, indicating that stormwater and other runoff continue to affect sediment quality.[13] An updated 10-year program was designed in 2006. The purpose of the updated program is to determine long-term trends, if any, and to fill data gaps identified in the previous monitoring.

The program incorporates a stratified sampling strategy. The strata include deep water stations, swimming beaches, nearshore habitat, and areas that previous studies have shown to be contaminated. A total of 20 sediment samples will be collected each year. Five samples will be collected for long-term trend monitoring from ambient stations in the deep main basins of the lakes (Figure C-13). Fifteen one-time samples will be collected from the following locations:

- In the wading zone at public swimming beaches to better understand the public's exposure to sediment contaminants at swimming beaches.
- In shallow non-developed shoreline areas to determine if contaminant levels are a concern in the nearshore terrestrial/aquatic habitat.
- In areas where previous studies showed contaminant levels above sediment quality guidelines. Sampling grids will be used to determine the spatial extent of contamination.

Samples will be analyzed for metals, organics, and physical parameters. Results will be compared to sediment quality guidelines, including Ecology's floating percentile guidelines and guidelines developed as part of the International Association for Great Lakes Research, to understand their effect on aquatic life.[14]

The monitoring began in 2007 by collecting samples from Lake Sammamish.[15] It will move to Lake Washington in summer 2008, most likely focusing on Lake Washington for a few years

[13] The CSOs are at King County's East Pine Street, Rainier Avenue, Henderson, and Dexter Avenue locations.

[14] Smith, S. S., D.D. MacDonald, K.A. Keenleyside, C.G. Ingersoll, and L.J. Field. 1996. A preliminary evaluation of sediment quality assessment values for freshwater ecosystems. *J. Great Lakes Res.* 22(3): 624-638. Internat. Assoc. Great Lakes Res.
Washington State Department of Ecology and Avocet Consulting. 2003. Development of freshwater sediment quality values for use in Washington State. Phase II Report: Development and recommendation of SQVs for freshwater sediments in Washington State. Washington State Department of Ecology, Olympia, WA.

[15] These data are still being analyzed.

before moving to Lake Union. The three lakes will be covered within the program's 10-year timeframe.

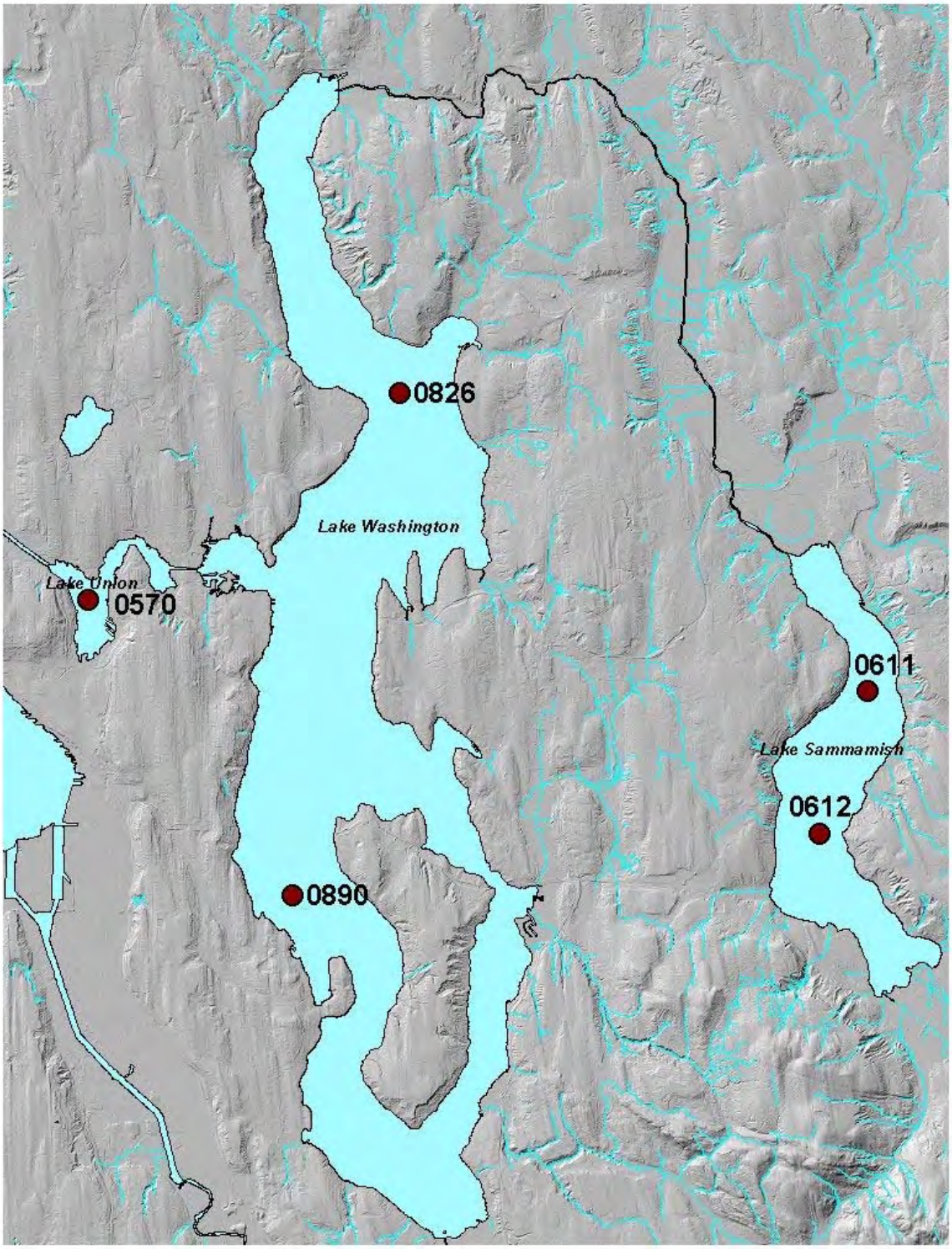


Figure C-13. Long-Term Sediment Monitoring Stations in Lakes Washington, Sammamish, and Union

Water Temperature—Effects of Climate Change

Global climate change is having an impact on our local weather patterns and subsequently on county aquatic resources. On average, ambient air temperatures in the Pacific Northwest have increased over the twentieth century by roughly 1.5ºF.[16] Air temperatures in the region are expected to continue to increase by another 2 to 9ºF over the next 80 years.

Warmer temperatures have reduced the snow pack levels in Washington and, thus, the timing and quantity of flows in regional rivers and streams. Higher air temperatures and changes in wind patterns also increase lake temperatures through surface heat exchange processes. January water temperatures are taken at a 1-meter depth from the mid-lake monitoring stations in Lakes Washington, Sammamish, and Union (Figure C-14). Because the lakes are well mixed during January, temperatures at the surface reflect the temperatures throughout the water column.

The University of Washington has routinely measured temperatures in Lake Washington since 1957. King County (then Metro) began monitoring temperatures in Lakes Washington, Sammamish, and Union in 1979. Additional Lake Washington data were collected in 1913, 1933, and 1950–1952. Lake temperatures vary annually, depending on seasonal weather conditions (wind, precipitation, cloudiness, and ambient air temperatures). Overall, winter water temperatures have increased about 0.25^{o}C (0.45^{o}F) per decade since 1960 in Lake Washington and about 1^{o}C (1.8^{o}F) per decade since 1979 in Lakes Sammamish and Union. The smaller increase in Lake Washington is likely due to its larger volume, which is roughly 8 times greater than Lake Sammamish and 118 times greater than Lake Union.

[16] For more information on climate in the Pacific Northwest, see the University of Washington's Climate Impacts Group Web site at http://www.cses.washington.edu/cig/pnwc/pnwc.shtml.

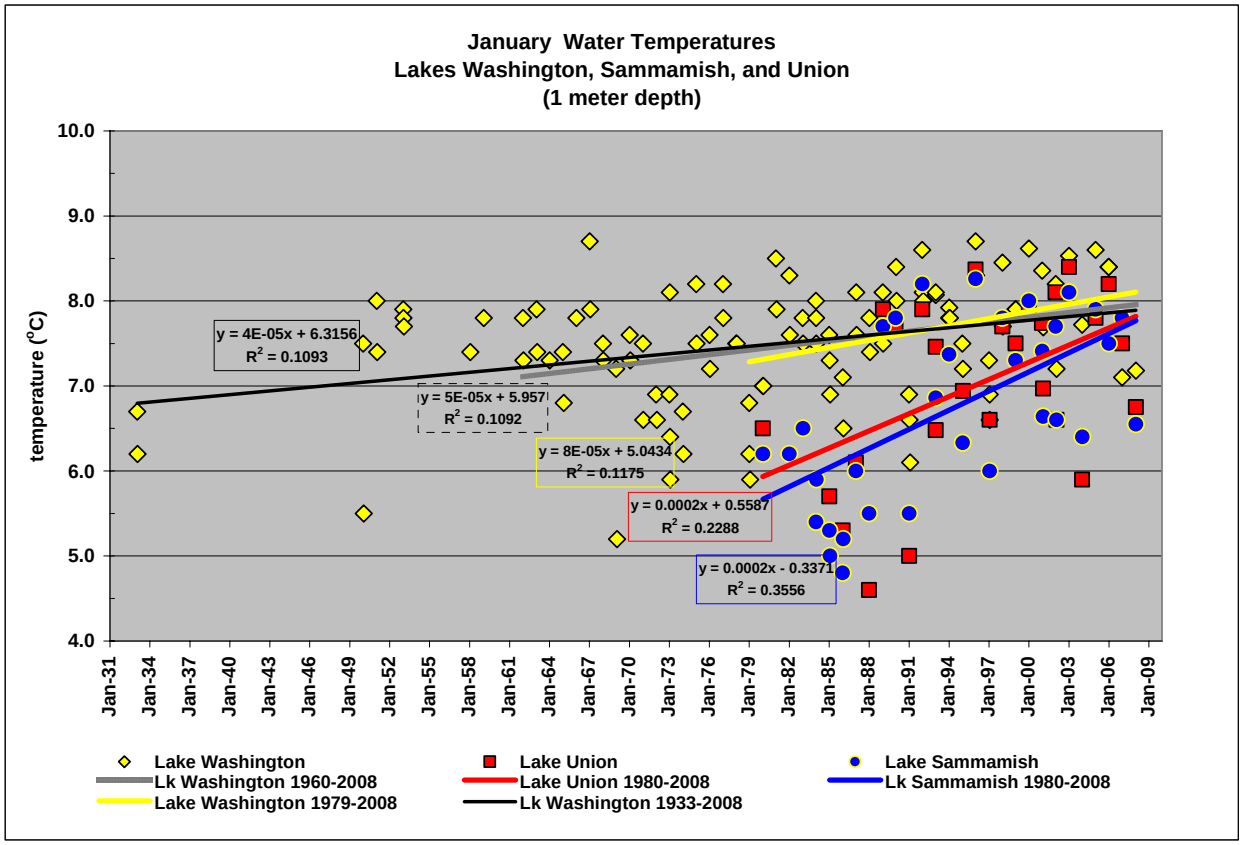


Figure C-14. January Water Temperatures in Lakes Washington, Sammamish, and Union, 1933-2008

River and Stream Monitoring Results

This section describes the quality of water in King County rivers and streams in terms of overall water quality (water quality index) and normative streamflows.

Monitoring Locations

Fifty-six sites along rivers and streams in Water Resource Inventory Areas (WRIAs) 8 and 9 (Cedar-Sammamish and Duwamish-Green watersheds) have been sampled monthly, some for over 30 years. Numerous water quality parameters are monitored, including those used to determine the water quality index (Figure C-15). Samples are collected monthly under base flow conditions and three to six times each year at the mouth of streams under storm conditions.

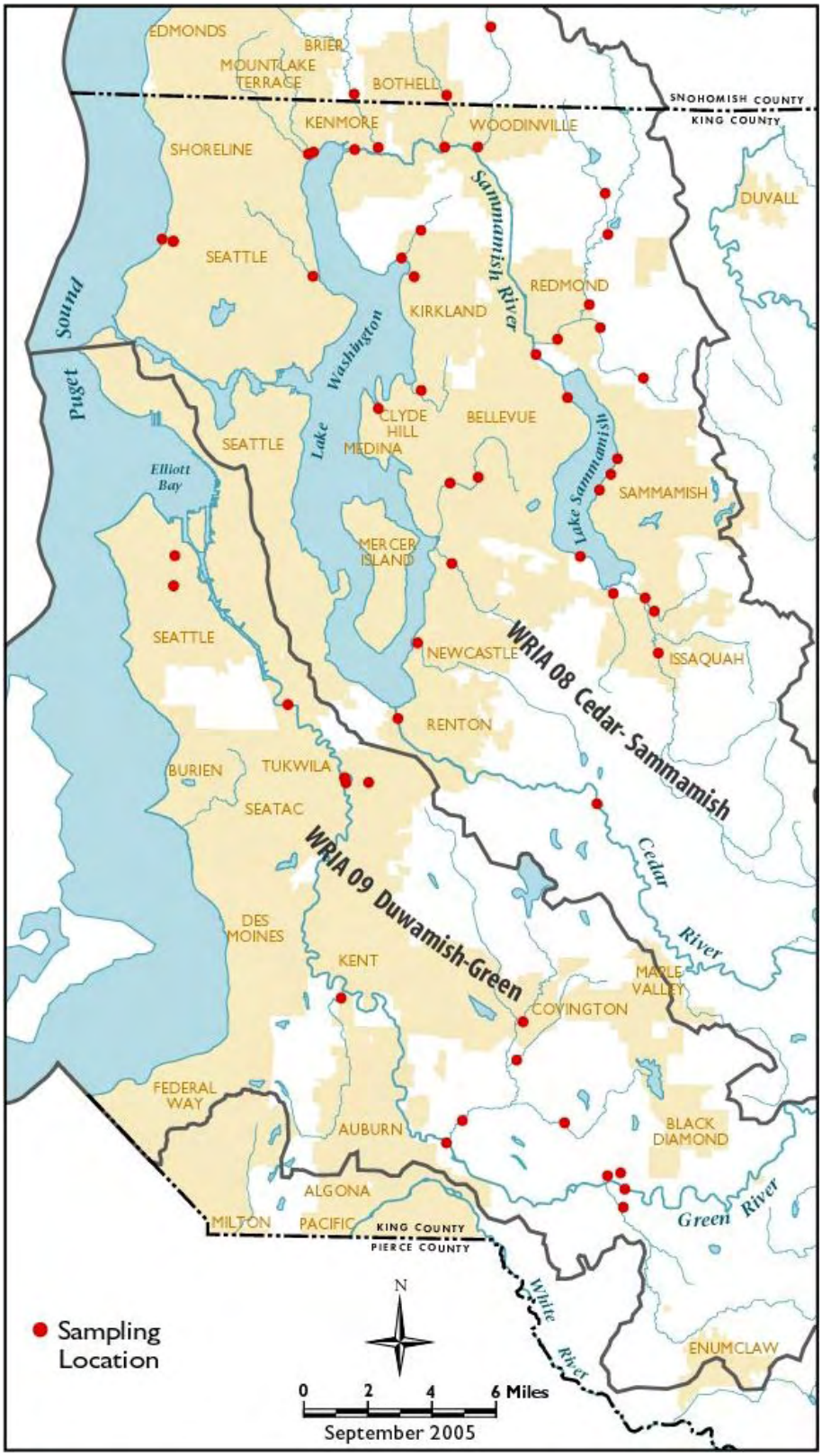


Figure C-15. Monitoring Locations in Rivers and Streams

Overall River and Stream Water Quality—Water Quality Index

The water quality index (WQI) for rivers and streams attempts to integrate a series of key water quality indicators into a single number that can be used for comparison over time and among locations. The WQI is based on a version proposed by Ecology and originally derived from the Oregon water quality index. The WQI is a number ranging from 1 to 100—the higher the number, the better the water quality. For temperature, pH, fecal coliform bacteria, and dissolved oxygen (DO), the index expresses results relative to state standards required to maintain beneficial uses. For nutrient and sediment measures, where the state standards are not specific, results are expressed relative to expected conditions in a given eco-region. Multiple constituents are combined, results are aggregated over time to produce a single score, and a rating of low, moderate, or high concern is assigned for each sampling station.

Overall water quality in King County streams varies between and within streams, reflecting the effects of a population of almost two million residents and intense urbanization. Increased development and greater volumes of stormwater runoff have impacted and continue to impact the water quality of rivers and streams. Increased stormwater runoff is most likely the reason why overall WQI values dropped in 2007. Weather in the 2006–2007 water year (October 1 through September 30) was particularly wet. Cumulative rainfall was well above historical averages, and record-breaking precipitation occurred in November and December 2006.

In the 2006–2007 water year, 45 percent of the fifty-six sampling sites (twenty-five sites)—compared to 63 percent in 2006—were considered moderate or high water quality (moderate or low concern) and 55 percent (thirty-one sites) were rated to be of low water quality (high concern) (Figure C-16). Of the sixteen sites in WRIA 9, six sites were rated of low concern, six sites were of moderate concern, and four sites were of high concern (Figure C-17). Of the forty sites in the WRIA 8, one site was rated of low concern, twelve sites were of moderate concern, and twenty-seven sites were of high concern (Figure C-18).

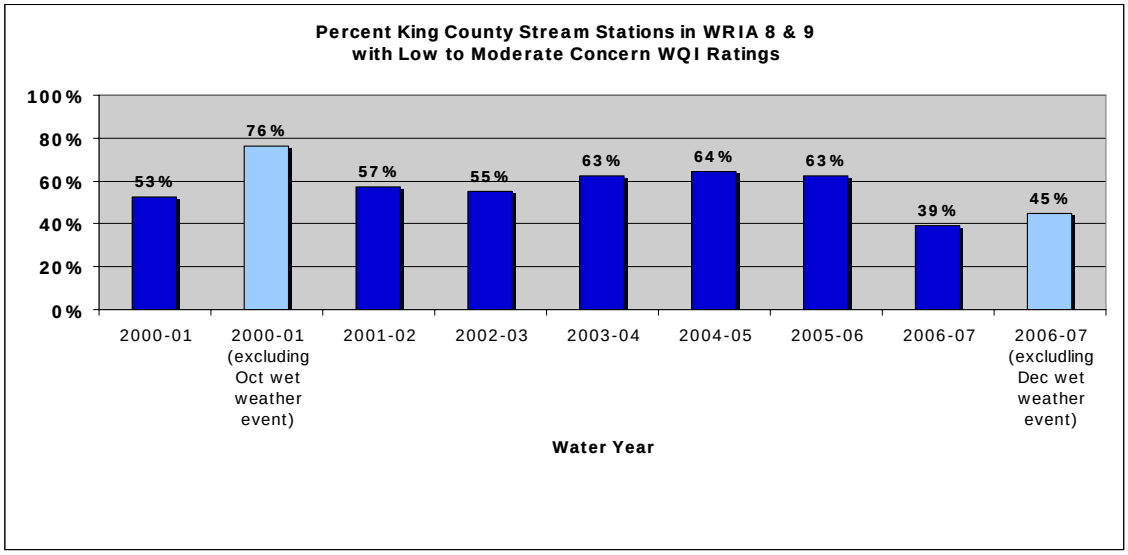


Figure C-16. Percentage of Streams in WRIAs 8 and 9 with Low or Moderate Concerns Based on Water Quality Index, 2000–2007

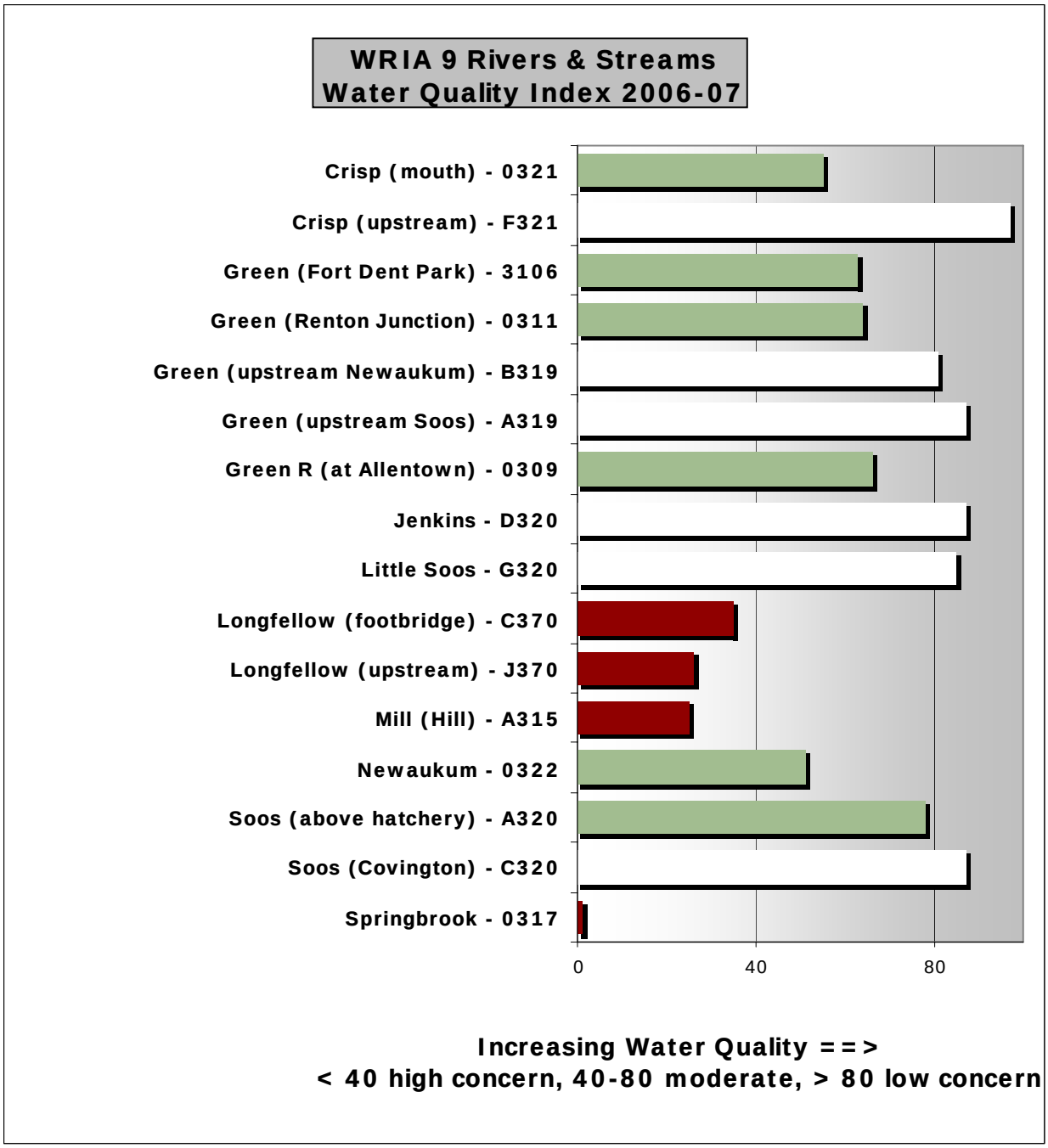


Figure C-17. Water Quality Index Rankings for Rivers and Streams in WRIA 9, 2006–2007

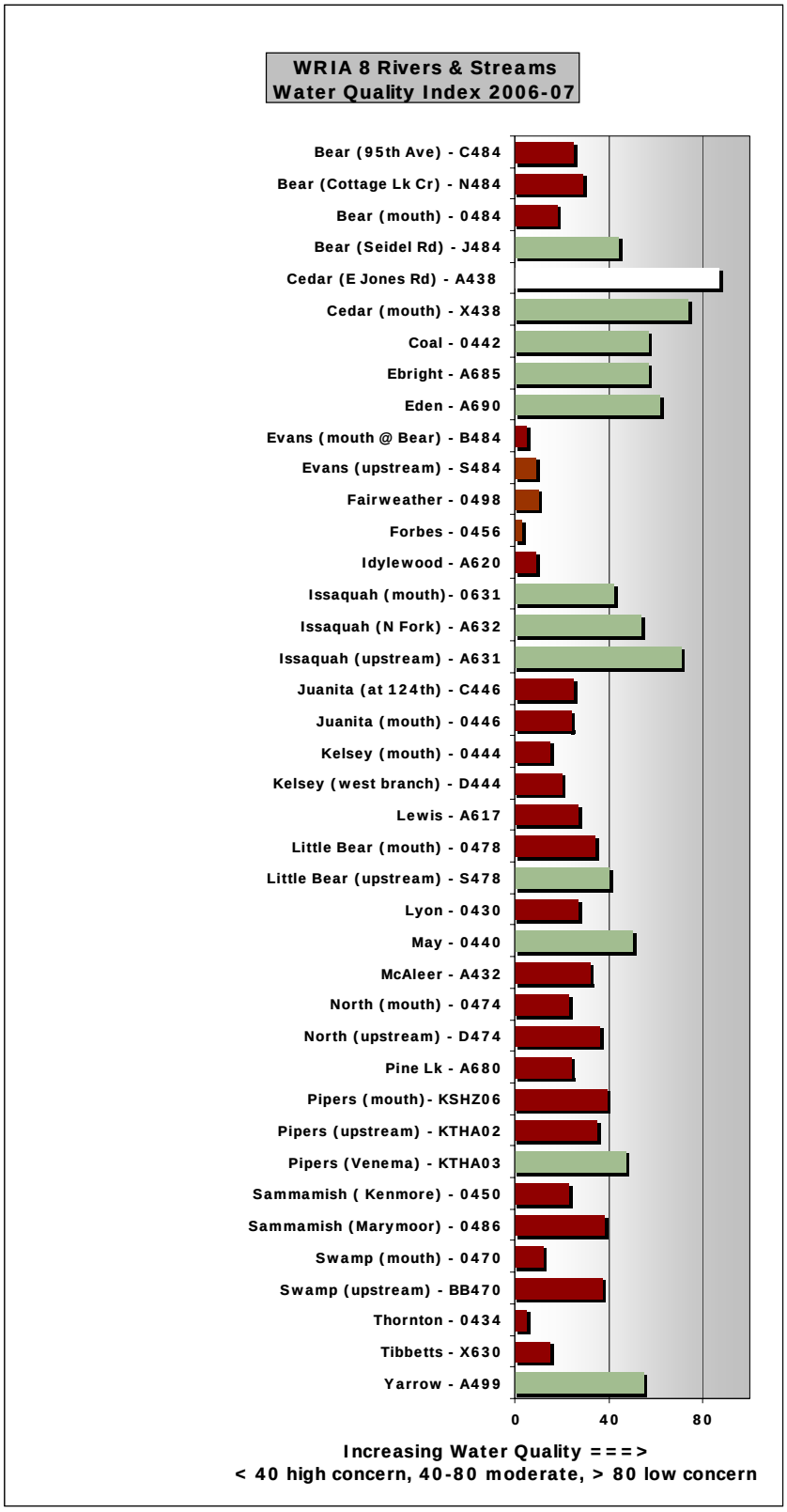


Figure C-18. Water Quality Index Rankings for Rivers and Streams in WRIA 8, 2006–2007

These percentages do not include routine samples taken in December 2006 during an extreme wet-weather event. If these samples had been included, only 39 percent of the samples would have been rated as low or moderate concern for 2006–2007. Excluding this event allows for year-to-year comparison of routine events. Figure C-16 shows the percentages for 2006–2007 both with and without the extreme wet-weather event to illustrate the impact that one wet-weather event can have on water quality. (Two percentages are also given for 2000–2001.)

All samples that were rated of high concern in 2007 showed excessive nitrogen and/or phosphorus concentrations. Almost all of these samples also showed high fecal coliform bacteria (97 percent), low DO (74 percent), high temperatures (58 percent), and high-suspended solids/turbidity (32 percent).

Stormwater and waterfowl and pet wastes are the most likely sources of bacteria in urban streams. Poor livestock manure management and failing septic systems can be a potential source of bacteria in agricultural and suburban areas. In wetlands, wildlife excrement and stagnant water conditions can lead to elevated bacteria counts. High phosphorus concentrations are found in fecal material and elevated concentrations of phosphorus are often linked to similar sources as bacteria. Elevated phosphorus concentrations are also linked to areas undergoing development. Low DO concentrations can be associated with low flows, wetlands, high temperatures (colder water holds more oxygen), and high levels of organic matter (bacteria use oxygen in the process of decomposing).

Stream Sediment

The Stream Sediment Monitoring Program began in 1987. Monitoring between 1987 and 2002 in WRIAs 8 and 9 found concentrations of several metals, including arsenic, cadmium, copper, nickel, and zinc, above available sediment quality guidelines. The data also showed elevated concentrations of petroleum hydrocarbons.

Using these data and new information, the county began an updated 10-year stream sediment monitoring program in 2004. The updated program was designed to address data gaps identified during the original program, monitor the effects of pollutant sources (point sources, stormwater, and other urban discharges), achieve a better understanding of sediment quality in entire stream basins, and determine long-term trends.

Additional parameters were added to those monitored in the original program. Samples collected through the updated program are analyzed for metals, organics, and physical parameters. All parameters are compared to sediment quality guidelines, including Ecology's floating percentile guidelines and guidelines developed as part of the International Association for Great Lakes Research, to understand their effect on aquatic life.[17]

[17] Smith, S. S., D.D. MacDonald, K.A. Keenleyside, C.G. Ingersoll, and L.J. Field. 1996. A preliminary evaluation of sediment quality assessment values for freshwater ecosystems. *J. Great Lakes Res.* 22(3): 624-638. Internat. Assoc. Great Lakes Res.
Washington State Department of Ecology and Avocet Consulting. 2003. *Development of freshwater sediment*

For trend analysis, 10 small wadeable streams in WRIAs 8 and 9 were selected from the original program, allowing for use of historical metal and conventional data. Samples are collected yearly. Trends will be evaluated when sufficient data have been collected over time.

For stream basin analysis, one-time samples are collected along each mile of a stream to monitor the processes that affect sediment quality in WRIAs 8 and 9. Three streams are monitored each year. All 30 streams in the program will be monitored by the end of the 10-year program. So far, Thornton, McAleer, Lyon, Swamp, North, Little Bear, Juanita, Forbes, Bear, Evans, Cottage, Kelsey, and Coal Creeks have been monitored.

Results from the preliminary analysis of stream basin data collected between 2004 and 2006 show that about half of the samples exceeded at least one sediment quality guideline (Figure C-19).[18] Chemicals that exceeded guidelines include metals, PAHs, and bis(2-ethyhexyl)phthalate. Other chemicals that exceeded guidelines were organochlorines, including PCBs and banned insecticides such as DDT, DDD, DDE (DDD and DDE are byproducts of DDT), chlordane, and dieldrin. The presence of these organochlorines shows that chemicals can persist in the environment decades after being banned. These types of chemicals can accumulate in aquatic organisms and be taken up by organisms that are higher in the food chain (larger fish). A current advisory suggests limiting the consumption of some types of fish from Lake Washington because of high levels of some of these contaminants.

Data from this program along with data from lake sediment and fish tissue samples are beginning to form a picture of the fate and transport pathway of these persistent chemicals.

Normative Streamflows

Streams in urban areas respond more quickly to rainfall than streams in forested areas. Because less rainfall is being absorbed by vegetation and soil, more surface runoff occurs. Higher, more rapid, and frequent pulses of runoff ("flashiness") lead to flooding and channel erosion. From a biological perspective, streams with more frequent peak flows are disturbed more often. Organisms that survive in these conditions are those that have adapted to more frequent and severe disturbances.

Flows from 17 stream sites, including 4 sites monitored by the U.S. Geological Survey, were measured and their flashiness calculated during the 2007 water year (October 2006–September 2007) (Figure C-20). The "flashiness index" is based on the reciprocal of the fraction of days during the year that the flow rises above the annual mean daily flow ($1/T_{Qmean}$). The stream flashiness index was also calculated for previous years using historical data. The number of streams where data were available ranges from one stream in 1941 to twenty-one streams in 2001. The median flashiness declined between 2006 and 2007, primarily from interannual variation resulting from variation in rainfall. In general, the median of the flashiness index scores

quality values for use in Washington State. Phase II Report: Development and recommendation of SQVs for freshwater sediments in Washington State. Washington State Department of Ecology, Olympia, WA.

[18] Data from 2007 are still being analyzed.

across streams measured in King County has increased between 1945 and 2007 (Figure C-21). These data suggest that increased urbanization has resulted in faster surface runoff and peak streamflow rise and fall (increased flashiness) than previously occurred for at least some streams.

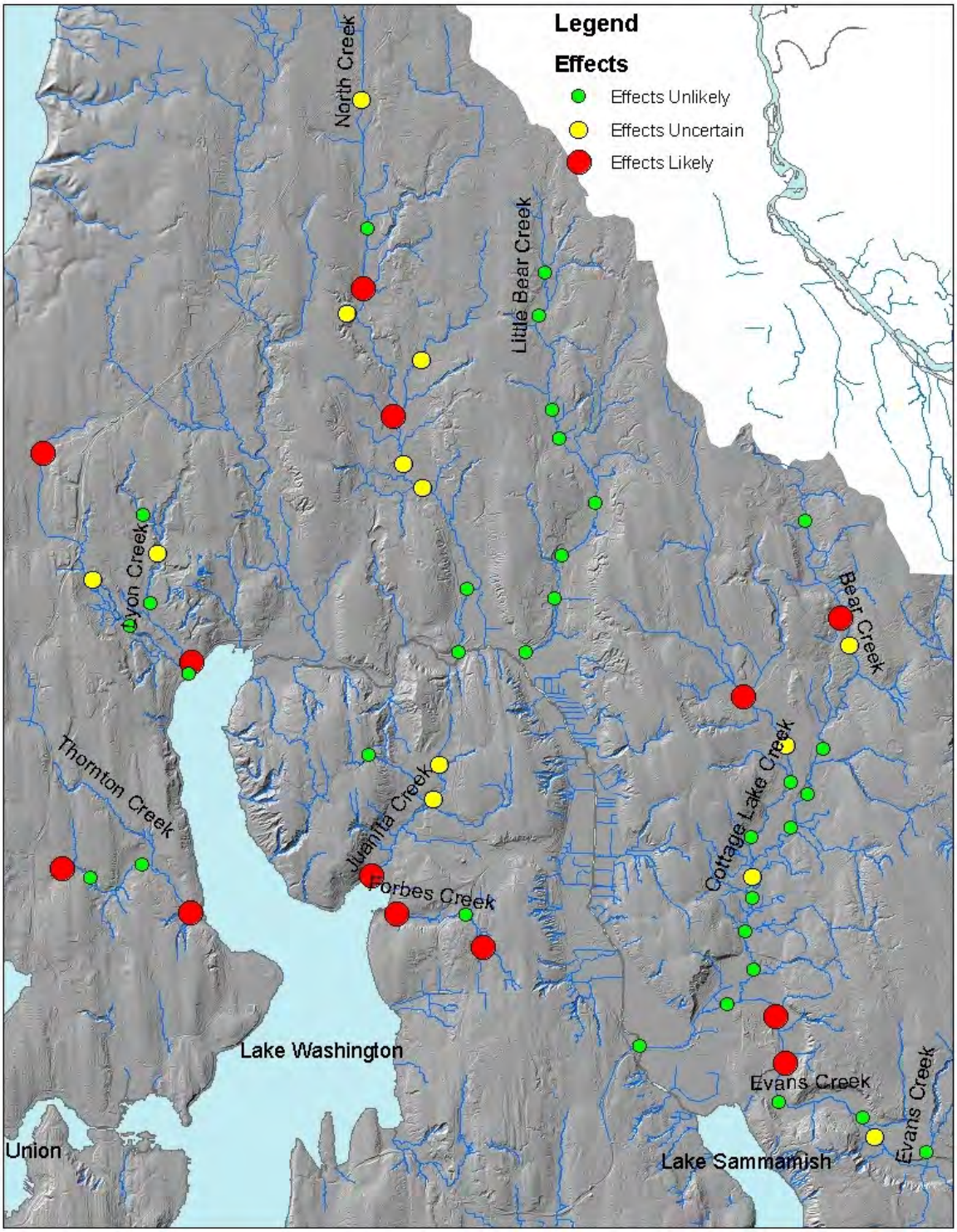


Figure C-19. Stream Basin Sediment Sampling Results, 2004–2006

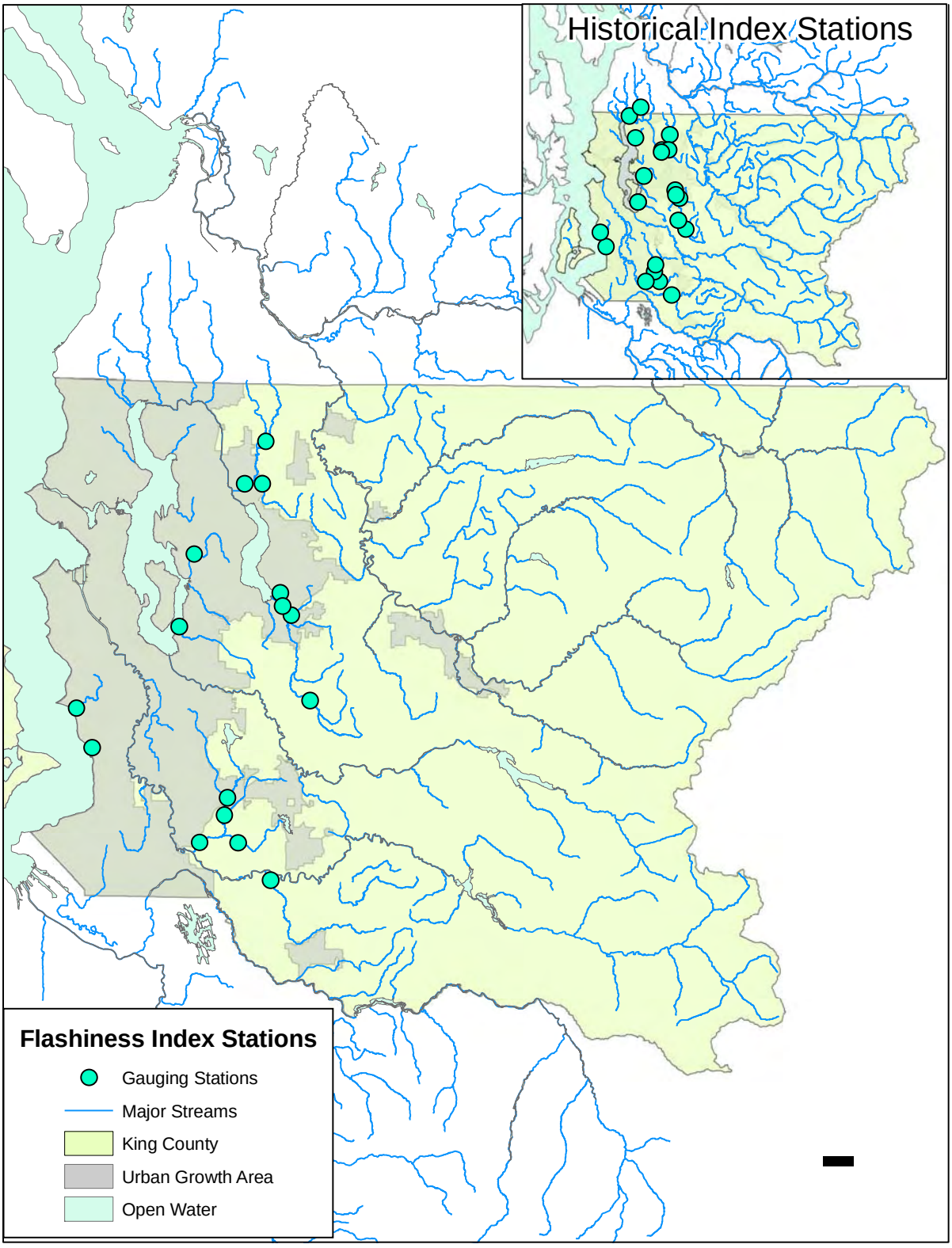


Figure C-20. Hydrologic Monitoring Stations Used to Calculate the Stream Flashiness Index, 1945–2007

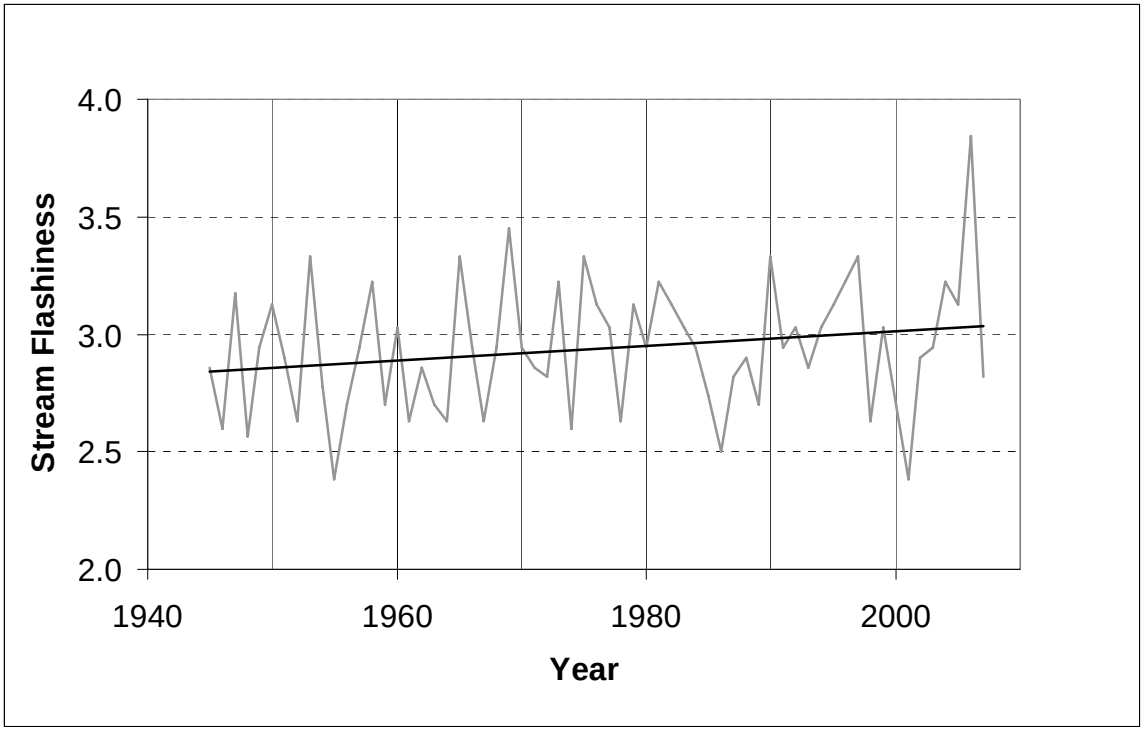


Figure C-21. Annual Median Stream Flashiness Index Scores, 1945–2007

Wetland Monitoring for Carnation Treatment Plant Discharge

The City of Carnation and King County are designing and building a wastewater collection and treatment system to serve the City of Carnation. The wastewater treatment plant, scheduled to begin operating in 2008, will use membrane bioreactor (MBR) technology to produce reclaimed-quality water. During startup, the plant will discharge effluent to the Snoqualmie River. After startup, the effluent will be discharged to a wetland at the Chinook Bend Natural Area just North of Carnation.

Enhancements were made to the wetland in preparation for discharge. As part of its reclaimed water use permit application to the Washington State Departments of Ecology and Health, the county collected samples in 2006 to establish water and sediment quality at the wetland site before the enhancements. Data analysis results were reported in 2007. Post-enhancement monitoring will be conducted in 2008 and post-discharge monitoring in 2009–2010. The monitoring is investigating the quality of the pond water, inflow source water, outflow water, and sediment.

Water samples were collected twice during 2006, once during the summer dry season and once during the winter wet season at three locations: where surface water enters the wetland, in the middle of the open-water pond, and where water flows out of the wetland. Sediment samples were collected during the summer from the central area of the open-water pond, the shoreline of

the pond, and the wet soils where groundwater is seeping into the pond. All samples were analyzed for organics, metals, and physical parameters.

Water quality data indicate that aluminum exceeded the chronic water quality criteria in the pond and in the outflow stream during both the wet and dry seasons. Maximum concentrations of metals were most often found in the pond water. Few maximum concentrations were found in the inlet water stream. These findings indicate that metals in inflow are probably not the source of metals to the pond.

The nutrient balance in the pond during the dry season indicates that the pond may be nitrate limited, which is unusual in freshwater systems. Samples from the pond indicate very eutrophic conditions with high phosphorus levels. Normally, these conditions would contribute to unsightly anaerobic conditions. However, dissolved oxygen levels were good and the aquatic ecosystem appeared to be functioning well.

Only a few organic chemicals were detected out of the 128 organic compounds that were analyzed in water samples. Estrone and estrodiol were found at all sites at least once during both the wet and dry seasons. Estrone was the most often detected of the hormones that were analyzed.[19]

Preliminary statistical comparisons indicated significant differences between the summer and winter results, including lower phosphorus, higher nitrogen, and higher metals in the winter. These differences are likely to be at least partly the result of flooding that occurred just prior to winter sampling. The higher metal results in the winter indicate that metals concentrations in the pond may increase from periodic inundation by flood waters.

The sediment analysis found that copper in the pond center exceeds the draft Washington State sediment quality guidelines.[20] However, application of a bioavailability indicator and measurement of total organic carbon concentrations indicate that such metals are not likely to cause toxicity in the pond sediments even with additional inputs.

These concentrations and indicators will be followed in the coming years during post-enhancement and post-discharge monitoirng.

[19] These natural hormones are classified as endocrine-disrupting chemicals (EDCs). See the definition earlier in this report under "Sediment Quality in the Duwamish Waterway."

[20] Washington State Department of Ecology and Avocet Consulting. 2003. *Development of freshwater sediment quality values for use in Washington State. Phase II Report: Development and recommendation of SQVs for freshwater sediments in Washington State.* Washington State Department of Ecology, Olympia, WA.