

Regional Wastewater Services Plan

2014 Annual Report

September 2015



King County

Department of Natural Resources and Parks
Wastewater Treatment Division

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Table of Contents

Executive Summary.....	2
Background	2
Conveyance System Improvement Program	3
Conveyance System Improvement Program Update Project.....	3
Sunset and Heathfield Pump Stations and Force Main Upgrade Project.....	4
North Creek Interceptor Project.....	5
North Lake Sammamish Flow Diversion Project	7
North Mercer Island and Enatai Sewer Upgrade Project	7
Lake Hills and Northwest Lake Sammamish Sewer Upgrade Project.....	8
Kent-Auburn Conveyance System Improvements Project (Phases A and B)	10
Infiltration and Inflow Control Program	10
Protecting Our Waters Program	11
CSO Control Projects	12
North Beach CSO Control Project	12
South Magnolia CSO Control Project	13
Murray CSO Control Project.....	14
Barton CSO Control Project.....	15
Rainier Valley Wet Weather Storage Project.....	15
Georgetown Wet Weather Treatment Station Project	17
T115/West Michigan CSO Control Project.....	18
Water Quality Assessment and Monitoring Study	18
Sediment Management Program	19
Lower Duwamish Waterway Superfund Cleanup.....	19
Odor Prevention and Control Program.....	20
Biosolids Recycling Program	21
Energy Efficiency and Recovery Program	21
Reclaimed Water Program.....	22
South Treatment Plant.....	22
West Point Treatment Plant	22
Carnation Treatment Plant	22
Brightwater Treatment Plant	22
RWSP Policy Review.....	23
RWSP Cost Estimates	23
Comparison of 2013 and 2014 RWSP Cost Estimates	23
Completed RWSP Projects.....	25
RWSP Projects in Design or Construction.....	25
RWSP Projects Planned for the Future.....	26
Permit Compliance.....	27

Water and Sediment Monitoring..... 27

Conclusion..... 28

List of Figures

Figure 1. Locations of Conveyance System Capacity Needs Identified
in the Initial Regional Needs Assessment..... 4

Figure 2. Sunset and Heathfield Pump Stations and Force Main Upgrade Project Area..... 5

Figure 3. North Creek Interceptor Project Area..... 6

Figure 4. North Lake Sammamish Flow Diversion Project Area 7

Figure 5. North Mercer Island and Enatai Interceptors Upgrade Project Area 8

Figure 6. Lake Hills and Northwest Lake Sammamish Sewer Upgrade Project Area..... 9

Figure 7. Phase B Kent-Auburn Conveyance System Improvements Project Area..... 10

Figure 8. North Beach CSO Control Project Area 12

Figure 9. South Magnolia CSO Control Project Area..... 13

Figure 10. Murray CSO Control Project Area 14

Figure 11. Barton CSO Control Project Area and New Roadside Rain Garden 15

Figure 12. Area Served by Rainier Valley Wet Weather Storage Project..... 16

Figure 13. Georgetown Wet Weather Treatment Station Project Area 17

Figure 14. Green Stormwater Infrastructure Area for the T115/West Michigan CSO Control Project 18

List of Tables

Table 1. Odor Complaints in 2014..... 20

Table 2. Comparison of 2013 and 2014 RWSP Cost Estimates, 1999–2030 24

Table 3. Expenditures for Completed RWSP Projects..... 25

Table 4. RWSP Projects in Design or Construction 26

Table 5. RWSP Projects Planned for the Future..... 26

Executive Summary

The Regional Wastewater Services Plan (RWSP) 2014 Annual Report summarizes progress during 2014 to implement the plan's major programs and projects. The report complies with the RWSP reporting policies in King County Code Chapter 28.86.165. This is the 15th RWSP annual report.¹

Highlights of RWSP implementation in 2014 are as follows:

- The South Treatment Plant and the West Point Treatment Plant each received Platinum Peak Performance awards from the National Association of Clean Water Agencies (NACWA). Platinum-level awards recognize multiple consecutive years of compliance with effluent limits established by National Pollutant Discharge Elimination System (NPDES) permits under the federal Clean Water Act and the state's Water Pollution Control Law. To date, South Plant has attained 17 years of 100 percent permit compliance, and the West Point Plant has attained 13 years of 100 percent compliance. In addition, the Brightwater, Vashon, and Carnation treatment plants each received a NACWA gold award for 100 percent compliance in 2014.
- Progress was made on six RWSP conveyance system improvement projects, including completion of Phase A of the Kent-Auburn Conveyance System Improvements project.
- Seven combined sewer overflow (CSO) control projects were underway. As of December 31, 2014, all the CSO control projects are on schedule to meet the milestones outlined in the 2013 consent decree that the County entered into with the U.S. Department of Justice, the U.S. Environmental Protection Agency (EPA), and the Washington State Department of Ecology (Ecology).
- Work to improve water quality in the Lower Duwamish Waterway Superfund site continued, including completing the County's five-year (2014–2018) Lower Duwamish Waterway Source Control Implementation Plan and completing a study on sediment quality in the Green River Watershed.
- West Point, South, and Brightwater treatment plants produced 119,325 wet tons of Loop biosolids, all of which were recycled and used as a fertilizer and soil amendment for forestry and agricultural applications or to make compost.
- The Waste-to-Energy cogeneration system at the West Point Treatment Plant began operations in 2014; the system will produce about 18,000 megawatt hours of "green" electricity each year.
- Over 770 million gallons (MG) of reclaimed water produced at the South, West Point, Brightwater, and Carnation treatment plants were used for landscape irrigation, wetland enhancement, and industrial processes.

Background

King County adopted the RWSP in 1999, by Ordinance 13680, to ensure that the regional wastewater system would keep pace with growth, protect public health needs, protect the environment, and support the economy. The RWSP outlines programs and projects through 2030 to increase system capacity and function; guides the use of beneficial resources from the wastewater treatment process; and provides direction on protecting and monitoring water quality and meeting permit conditions. The

¹Previous RWSP annual reports are available at <http://www.kingcounty.gov/environment/wtd/Construction/planning/rwsp/Library/AnnualReport.aspx>.

policies that guide RWSP implementation are in King County Code Chapters 28.86.010 through 28.86.180.

The 2014 RWSP Annual Report summarizes the progress made during 2014 in implementing the plan's major programs and projects.

More information on the RWSP is available at

<http://www.kingcounty.gov/environment/wtd/Construction/planning/rwsp.aspx>.

Conveyance System Improvement Program

In accordance with RWSP policies, the Conveyance System Improvement (CSI) Program works to provide capacity in areas of the separated conveyance system (i.e., stormwater and wastewater are conveyed in separate pipes) in order to meet the RWSP 20-year peak flow design standard. This standard was adopted by the King County Council to serve as an objective measure for designing and building conveyance facilities intended to meet NPDES permit requirements. A 20-year peak flow consists of both storm flow (infiltration and inflow) and base flow (wastewater from homes and businesses) and has a 5 percent chance of occurring in any year. The King County Executive and King County Council recognize that this is a stringent standard and that it will require time to upgrade the entire conveyance system to meet the standard.

In 2014, work continued on updating the CSI Program. Six projects were underway. In addition, WTD acquired the Vasa Park Trunk sewer line from the City of Bellevue.² The following sections summarize the CSI Program update and capital project efforts in 2014.

Conveyance System Improvement Program Update Project

RWSP policies call for regular program updates new conveyance system needs. WTD is working with the Engineering and Planning Subcommittee of the Metropolitan Water Pollution Abatement Advisory Committee (MWPAAC) and individual sewer agencies on the update. It is expected to be complete in early 2017.

Highlights of activities in 2014 are as follows:

- Documented the methodology and results of the process to review and update the planning assumptions that WTD uses to forecast future wastewater flows.
- Completed an initial needs assessment that summarizes capacity needs of the separated portion of the regional wastewater conveyance system through 2060 (Figure 1). The assessment used data from WTD's decennial flow monitoring effort conducted between 2009 and 2011, the 2013 Puget Sound Regional Council's population and employment forecast, and local sewer comprehensive plans to determine future conveyance needs.
- Held meetings with local sewer agencies to discuss the initial results of the needs assessment and further refine regional growth and capacity projections as needed. Information from these meetings will be used in 2015 to finalize the regional needs assessment.

More information on the CSI Program update is available at

<http://www.kingcounty.gov/environment/wastewater/CSI/ProgramUpdate.aspx>.

² The purchase conformed with RWSP Conveyance Policy-5, which calls for applying uniform criteria throughout the regional wastewater service area for the financing, development, ownership, operation, maintenance, repair, and replacement of all conveyance facilities; the criteria are provided in King County Code 28.86.060.

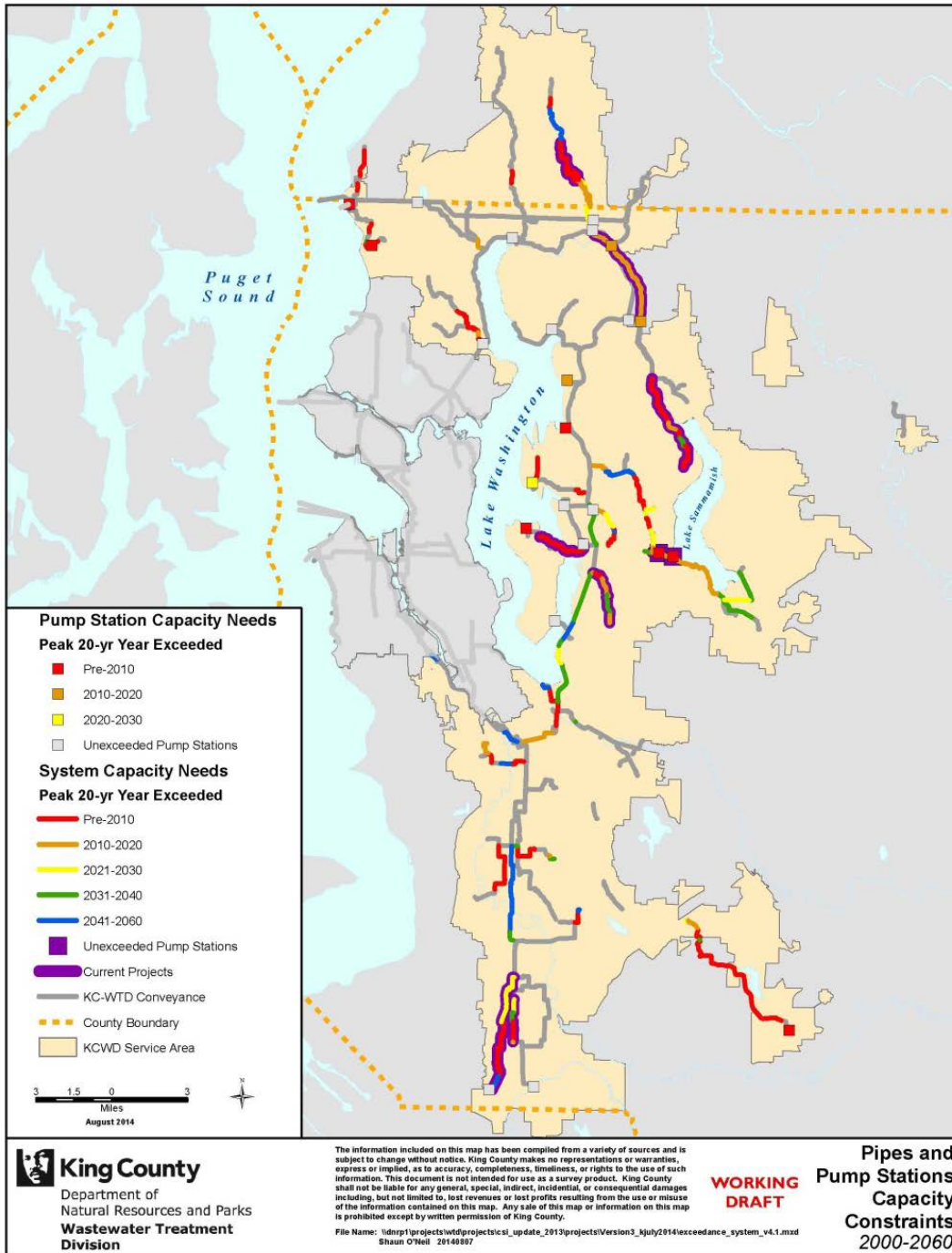


Figure 1. Locations of Conveyance System Capacity Needs Identified in the Initial Regional Needs Assessment

Sunset and Heathfield Pump Stations and Force Main Upgrade Project

The Sunset and Heathfield Pump Stations and Force Main Upgrade project in Bellevue will upgrade these facilities (Figure 2). The upgraded system will convey a peak flow of 30 million gallons per day (mgd), compared to current capacity of 18 mgd. The pump stations and associated sewer pipes convey wastewater flows from Sammamish, Issaquah, and Bellevue to the South Treatment Plant in Renton.

Preliminary project design was completed in 2014, final design is scheduled to be completed in 2016, and construction is expected to begin in 2017. More information on the Sunset and Heathfield Pump Stations and Force Main Upgrade project is available at <http://www.kingcounty.gov/environment/wtd/Construction/East/SunsetHeathfield.aspx>.



Figure 2. Sunset and Heathfield Pump Stations and Force Main Upgrade Project Area

North Creek Interceptor Project

The North Creek Interceptor project will replace a pipeline that serves parts of Bothell and unincorporated Snohomish County. The project includes constructing approximately 10,000 feet of new sewer line and connecting it to previously constructed pipe. This new pipeline will range from 30 to 48 inches in diameter. Construction will take place in both Bothell and unincorporated Snohomish County (Figure 3). Work in 2014 focused on acquiring permits and easements and advertising the construction contract. Construction is scheduled to begin in 2015 and should take about two years to complete.

More information on the North Creek Interceptor project is available at <http://www.kingcounty.gov/environment/wtd/Construction/North/NCI.aspx>.

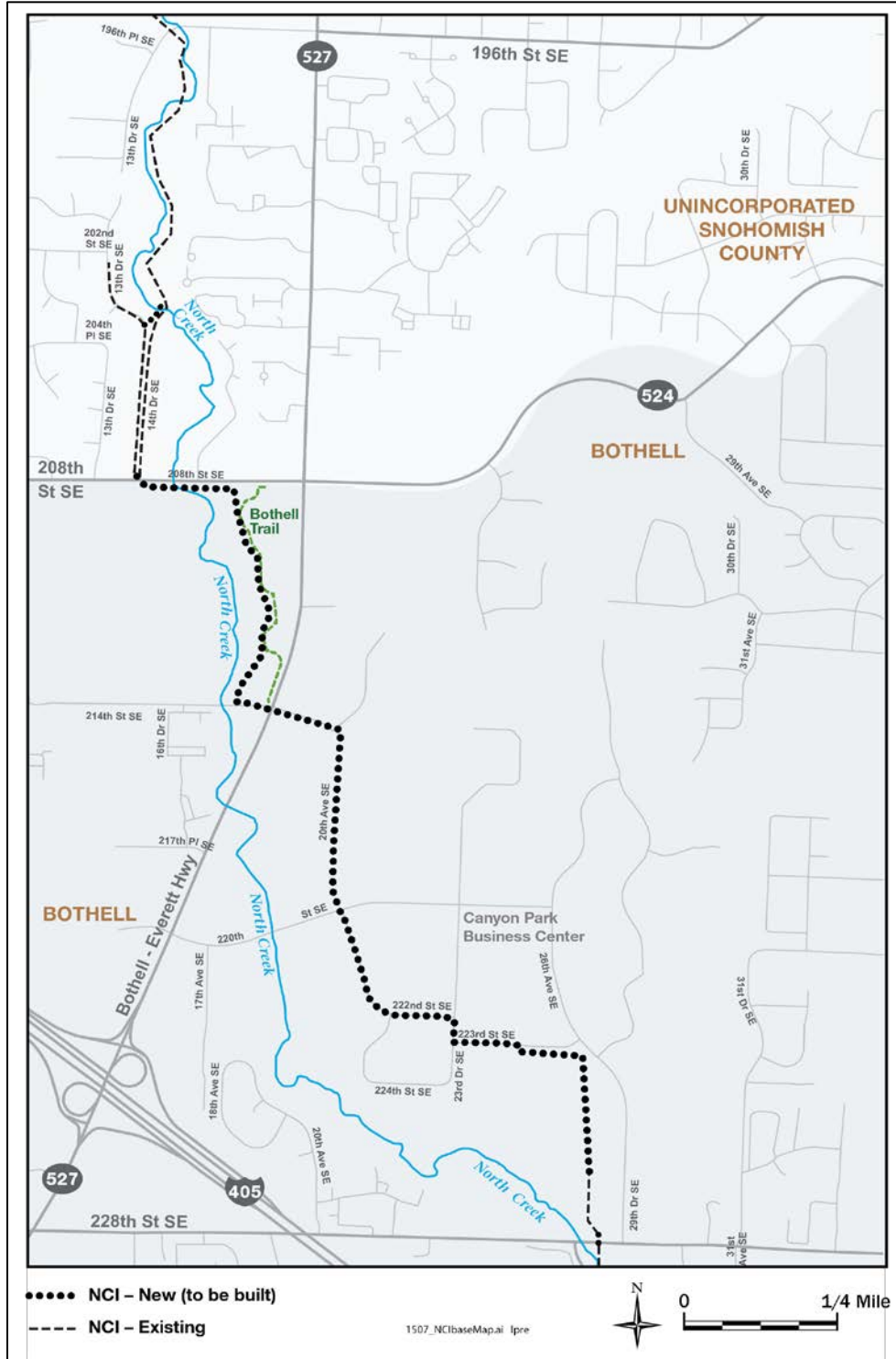


Figure 3. North Creek Interceptor Project Area

North Lake Sammamish Flow Diversion Project

The North Lake Sammamish Flow Diversion project will divert wastewater flows from the North Lake Sammamish basin to the Brightwater Treatment Plant to increase capacity in the East Side Interceptor (ESI) (Figure 4). The first phase of the project will divert up to 29 mgd of peak flow by 2021; the second phase will divert up to 43 mgd of peak flow by 2050. Work in 2014 focused on analysis of alternatives.

More information on the North Lake Sammamish Flow Diversion project is available at <http://www.kingcounty.gov/environment/wtd/Construction/East/NLkSamFlowDiversion.aspx>.

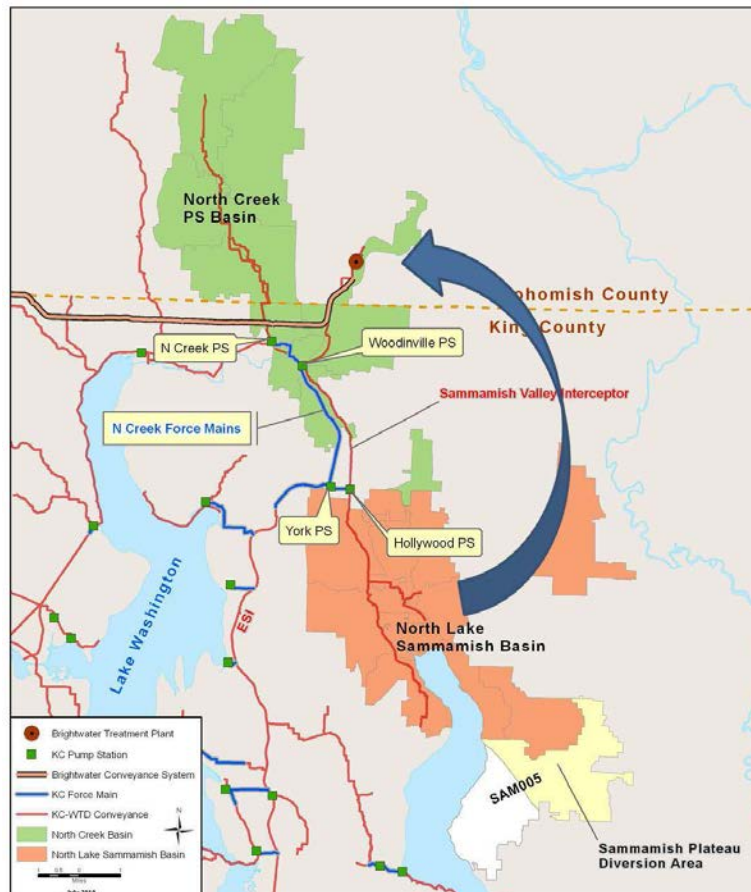


Figure 4. North Lake Sammamish Flow Diversion Project Area

North Mercer Island and Enatai Sewer Upgrade Project

The North Mercer Island and Enatai interceptors serve areas in North Mercer Island, southwest Bellevue, and Beaux Arts Village (Figure 5). The North Mercer Island Interceptor and Enatai Interceptor Upgrade project will construct a new pipeline from the North Mercer Island Pump Station along the northeast side of Mercer Island, a new siphon across Lake Washington East Channel, and a new pipe in south Bellevue to the Sweyolocken Pump Station. Analysis of alternatives began in 2014. Project design and construction are scheduled to begin in 2016 and 2019, respectively.

More information on the North Mercer Island and Enatai Sewer Upgrade project is available at <http://www.kingcounty.gov/environment/wtd/Construction/East/NMIEnatai.aspx>.



Figure 5. North Mercer Island and Enatai Interceptors Upgrade Project Area

Lake Hills and Northwest Lake Sammamish Sewer Upgrade Project

The Lake Hills and Northwest Lake Sammamish Sewer Upgrade project will replace the existing Lake Hills Trunk and upgrade the Northwest Lake Sammamish Interceptor to meet the RWSP conveyance design standard (Figure 6). The existing gravity pipelines are about 4.5 miles long and are located in Redmond. The project team will develop alternatives in 2015, and design is expected to begin in 2016.

More information on the Lake Hills and Northwest Lake Sammamish Sewer Upgrade project is available at <http://www.kingcounty.gov/environment/wtd/Construction/East/LkHillsNWLkSam.aspx>.



Figure 6. Lake Hills and Northwest Lake Sammamish Sewer Upgrade Project Area

Kent-Auburn Conveyance System Improvements Project (Phases A and B)

Phase A of the Kent-Auburn Conveyance System Improvements project was completed in 2014. The project included construction of two new pipelines: the Kent East Hill Diversion in Kent and the Stuck River Trunk in Auburn.

Phase B includes installation of new sewer lines in Pacific, Algona, and Auburn and modifications to the Pacific Pump Station discharge piping in Pacific (Figure 7). Portions of Phase B predesign and easement acquisition work was done during Phase A. Activities in 2014 focused on updating this work and coordinating with the cities of Pacific, Auburn, and Algona. Final design is expected to be complete in 2016, and construction is expected to begin in 2017.

More information on the Kent-Auburn Conveyance System Improvements project is available at <http://www.kingcounty.gov/environment/wtd/Construction/South/KentAuburn.aspx>.

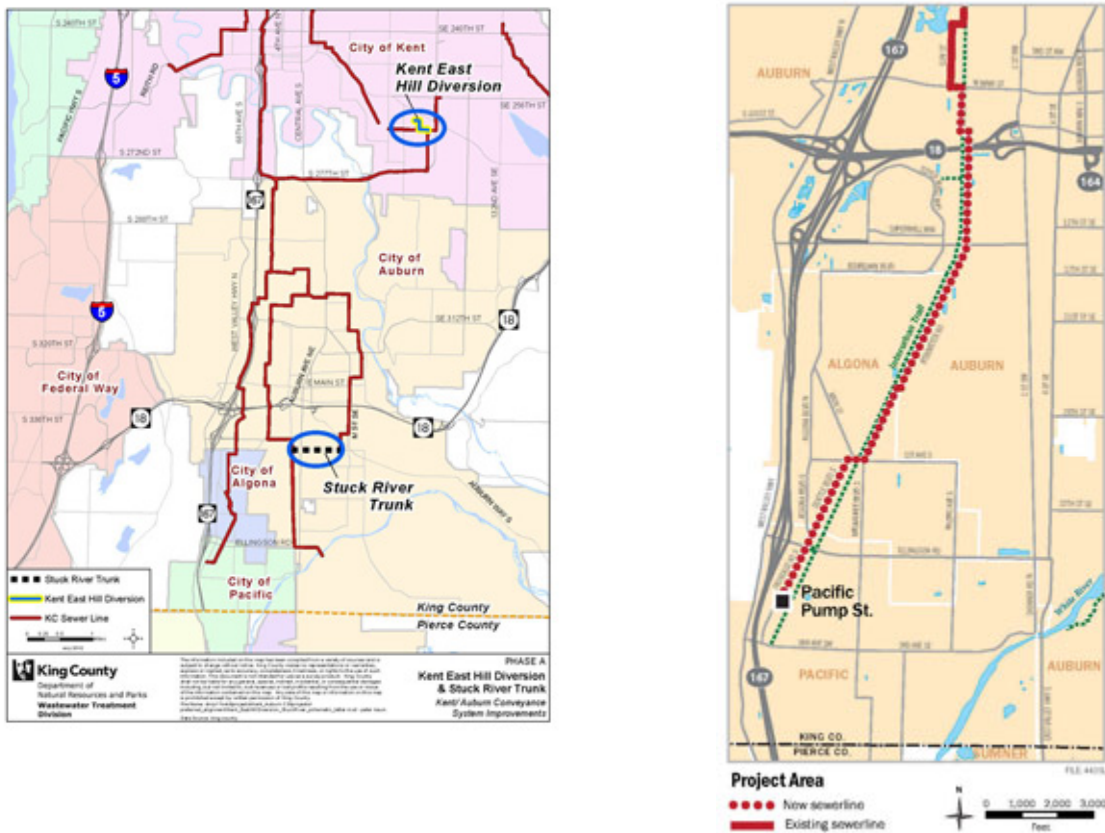


Figure 7. Phase A and Phase B Kent-Auburn Conveyance System Improvements Project Area

Infiltration and Inflow Control Program

WTD continues to implement the Executive's Recommended Infiltration and Inflow (I/I) Control Program approved in May 2006 by the King County Council through Motion 12292.

Work in 2014 focused on completing the evaluation report for the Skyway Infiltration and Inflow Reduction Demonstration project and reviewing the results with MWPAAC's Engineering and Planning

Subcommittee. The report summarizes the history of the Skyway I/I demonstration project, follow-up investigations, and findings. It is available at <http://www.kingcounty.gov/services/environment/wastewater/ii/resources.aspx>.

As reported in the RWSP 2013 Comprehensive Review report, reductions in I/I achieved by the Skyway demonstration project were less than anticipated. WTD will work with the Engineering and Planning Subcommittee to use lessons learned from the project to develop recommendations for long-term I/I reduction and control. This work is scheduled to begin in January 2015.

More information on the I/I Control Program is available at <http://www.kingcounty.gov/environment/wastewater/II.aspx>.

Protecting Our Waters Program

Work continued in 2014 to implement the County's CSO Control Program, called Protecting Our Waters. RWSP policies and the 2013 consent decree, which the County entered into with the U.S. Department of Justice, the U.S. Environmental Protection Agency (EPA), and the Washington State Department of Ecology (Ecology), call for control of all CSO locations by 2030. Control means that each location meets the Washington State standard of no more than one untreated discharge per year on a 20-year moving average. Seventeen of the County's 38 CSOs are currently controlled. Projects are under way or planned to control the other CSOs.

In 2014, seven CSO control projects were underway. Work continued on the Water Quality Assessment and Monitoring Study, the Sediment Management Program, and the Lower Duwamish Waterway Superfund cleanup. These efforts are summarized in the following sections.

More information on the Protecting Our Waters Program is available at <http://www.kingcounty.gov/environment/wastewater/CSO.aspx>.

CSO Control Projects

CSO control projects that were under way in 2014 are described below. The County continues to coordinate closely with Seattle Public Utilities (SPU), other affected agencies, and residents and businesses in the project areas. As of December 31, 2014, all projects are on schedule to meet the milestones outlined in the consent decree.

North Beach CSO Control Project

The North Beach CSO control project includes construction of a new underground storage tank in the right-of-way in NW Blue Ridge Drive and Triton Drive NW (Figure 8). The facility will store peak flows during heavy rains when the North Beach Pump Station reaches maximum capacity. After storms have passed and capacity is available, an underground pump will send stored flows to the pump station for conveyance to the Carkeek Wet Weather Treatment Facility either for treatment or for transfer to the West Point Treatment Plant. Construction began in 2014 and is expected to be complete in 2015.

More information on the North Beach CSO control project is available at <http://www.kingcounty.gov/environment/wtd/Construction/Seattle/NBeachCSOStorage.aspx>.

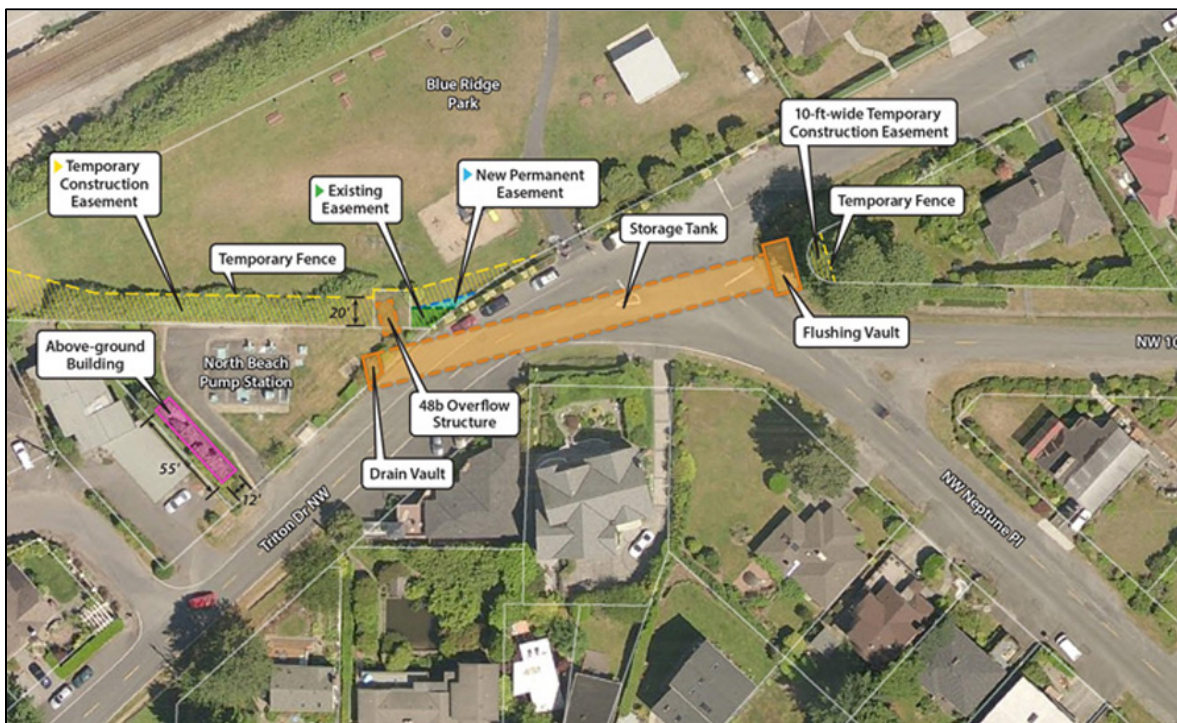


Figure 8. North Beach CSO Control Project Area

South Magnolia CSO Control Project

The South Magnolia CSO control project includes construction of an underground storage tank on 23rd Avenue West in the Smith Cove area south of the Magnolia Bridge (Figure 9). When heavy rains fill the sewer pipes, a new underground diversion structure at 32nd Avenue West will send excess sewer flows to a pipeline extending over one-half mile under Magnolia Bluff to the storage tank. When room is available in the sewer pipes, stored flows will be sent to the Interbay Pump Station for transfer to the West Point Treatment Plant.

More information on the South Magnolia CSO control project is available at <http://www.kingcounty.gov/environment/wtd/Construction/Seattle/SMagnoliaCSOStorage.aspx>.



Figure 9. South Magnolia CSO Control Project Area

Murray CSO Control Project

The Murray CSO control project consists of a 1-MG underground storage tank beneath property across the street from Lowman Beach Park in West Seattle (Figure 10). The facility will store peak flows during heavy rains when the Murray Pump Station reaches maximum capacity. After storms are passed, and capacity is available, stored flows will be sent to the Murray Pump Station for conveyance to the West Point Treatment Plant. Construction began in 2014 and is expected to be complete in 2016.

More information on the Murray CSO control project is available at <http://www.kingcounty.gov/environment/wtd/Construction/Seattle/MurrayCSOStorage.aspx>.



Figure 10. Murray CSO Control Project Area

Barton CSO Control Project

The Barton CSO control project consists of roadside rain gardens, which are a type of green stormwater infrastructure (GSI), in the City of Seattle’s planting strips in the Sunrise Heights and Westwood neighborhoods in West Seattle (Figure 11). The rain gardens divert stormwater runoff away from the combined sewer system. Stormwater filters through rain gardens to a drain pipe, which takes the water to a deep well for slow infiltration underground. Keeping stormwater out of the sewer system will reduce CSOs into Puget Sound near the Fauntleroy ferry dock. Sixty-three roadside rain gardens on 10 blocks were completed in 2014. Construction will begin on the remaining rain gardens in 2015.

More information on the Barton CSO control project is available at <http://www.kingcounty.gov/environment/wtd/Construction/Seattle/BartonCSO-GSI.aspx>.



Figure 11. Barton CSO Control Project Area and New Roadside Rain Garden

Rainier Valley Wet Weather Storage Project

The Rainier Valley Wet Weather Storage project will install a new sewer pipe near the intersection of Rainier Avenue South and South Bayview Street in Seattle to convey flow from a pipe that fills during

storms to another pipe that has more capacity (Figure 12). Excess flows will be routed to a new storage tank at the intersection of South Hanford Street and South 27th Avenue for eventual transfer to the West Point Treatment Plant when capacity is available. The completed project will reduce CSOs in the Duwamish River.

Activities in 2014 focused on final design, property acquisition, and community outreach. Final design is expected to be complete in 2015, and construction is expected to begin in 2016.

More information on the Rainier Valley Wet Weather Storage project is available at <http://www.kingcounty.gov/environment/wtd/Construction/Seattle/HanfordCSO.aspx>.

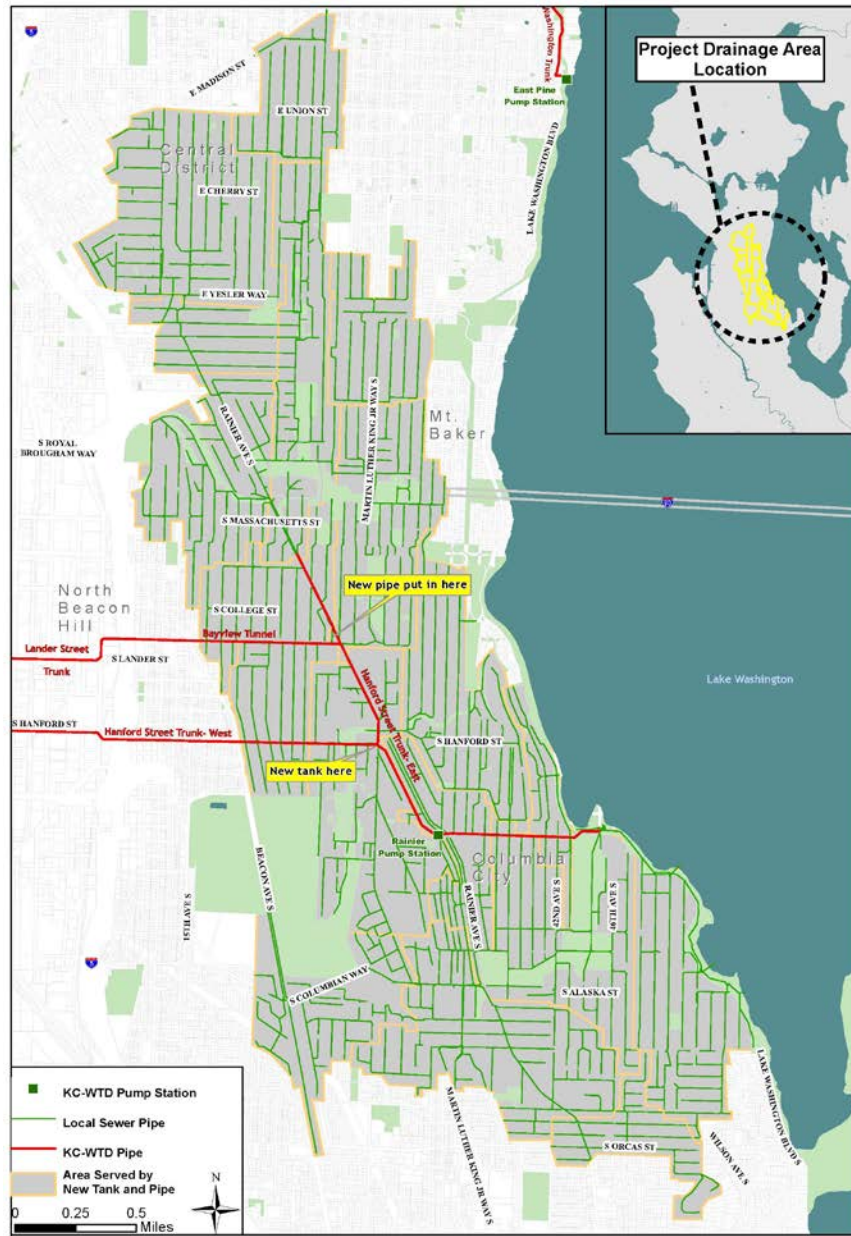


Figure 12. Area Served by Rainier Valley Wet Weather Storage Project

Georgetown Wet Weather Treatment Station Project

The Georgetown Wet Weather Treatment Station project includes construction of a CSO treatment facility between the Brandon Street and South Michigan Street regulator stations, pipelines, and a new outfall structure to release the treated water into the Duwamish River. The station will have the capacity to treat up to 70 MG of combined rain and wastewater that would otherwise have discharged directly to the Duwamish River without treatment during storm events.

Work in 2014 focused on site selection (Figure 13), community outreach, and initiating design work. A preferred site for the facility was selected and design work will continue in 2015. Final design is expected to be complete in 2016, and construction is expected to begin in 2017.

More information on the Georgetown Wet Weather Treatment Station project is available at <http://www.kingcounty.gov/environment/wtd/Construction/Seattle/BrandonMichiganCSO.aspx>

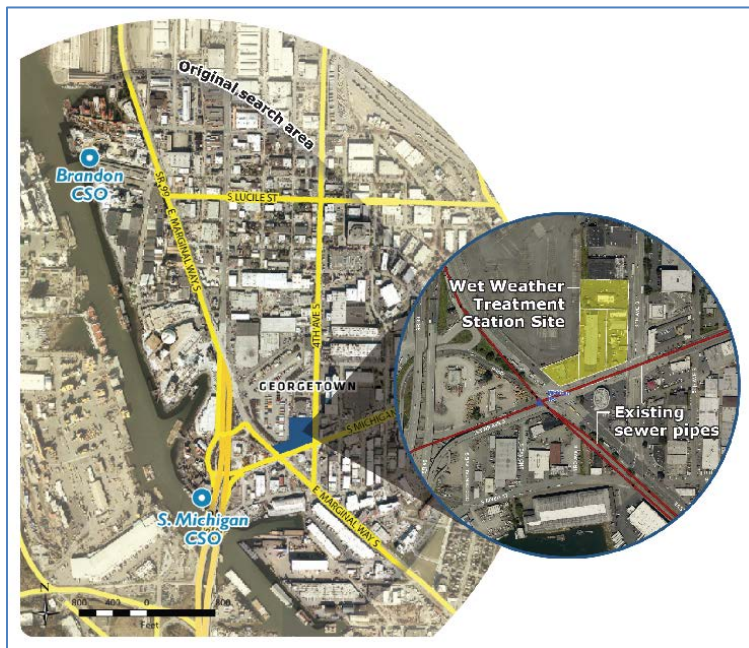


Figure 13. Georgetown Wet Weather Treatment Station Project Area

T115/West Michigan CSO Control Project

In 2014, WTD started a feasibility analysis at the Terminal 115 and West Michigan CSO locations on the Duwamish River by using GSI or a combination of GSI and storage. The South Park and Highland Park neighborhoods in Seattle are possible GSI areas because of their relatively flat streets, wide planter strips or roads, and soil (Figure 14). Activities in 2014 focused on studying the soils and groundwater levels in these neighborhoods and meeting with residents and businesses on streets identified for roadside rain gardens.

More information on the T115/West Michigan CSO control project is available at <http://www.kingcounty.gov/environment/wtd/Construction/Seattle/WMichT115CSO.aspx>.

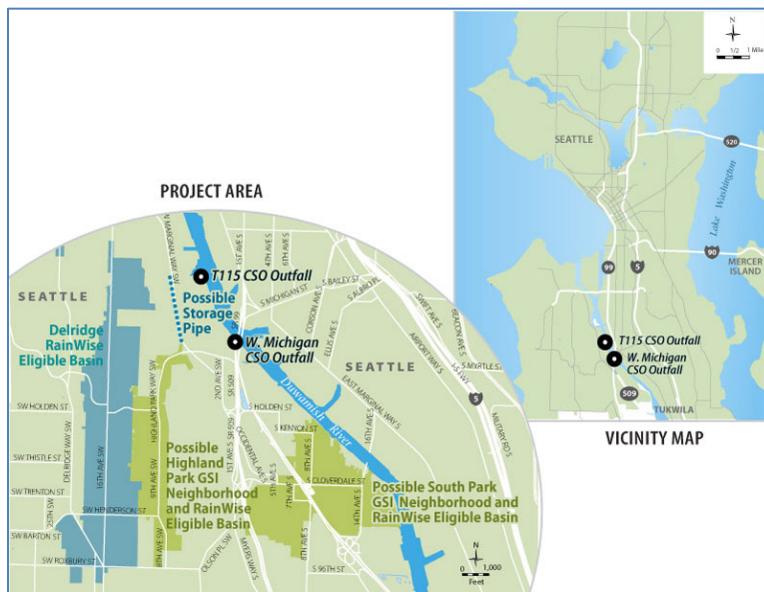


Figure 14. Green Stormwater Infrastructure Area for the T115/West Michigan CSO Control Project

Water Quality Assessment and Monitoring Study

Work continued in 2014 on the Water Quality Assessment and Monitoring Study (assessment) as specified in Ordinance 17413. The assessment examines local water quality issues near King County CSOs in Elliott Bay, Lake Union/Ship Canal, and the Duwamish River. It will also examine how upcoming Protecting Our Waters projects can best be sequenced and integrated. Results from the assessment will be used to inform the next CSO control plan update in 2019. Highlights of work in 2014 are as follows:

- Convened a science and technical review team. The group will ensure that the assessment's methods and results are high quality, thorough, and objective and that they address the required issues.
- Examined existing scientific research to identify data gaps. In response, the project team designed a study to define the locations where bacteria are a problem, including taking water samples during three storms and three dry periods in Elliott Bay, Lake Union/Ship Canal, and the Duwamish River.
- Provided briefings to the Regional Water Quality Committee and MWPAAC on the status of the assessment.

Assessment findings will be published in seven documents scheduled to be released in 2015 and 2016.

More information on the Water Quality Assessment and Monitoring Study is available at <http://www.kingcounty.gov/environment/wastewater/CSO/WQstudy.aspx>.

Sediment Management Program

As a part of RWSP implementation, WTD is carrying out a Sediment Management Program (SMP) to clean up contaminated sediments near CSO outfalls. Most of the contamination occurred in the early to mid-1900s. The SMP undertakes cleanups that are required under the federal Comprehensive Environmental Response, Compensation, and Liability Act (Superfund) and state Model Toxic Control Act regulations.

Activities in 2014 included the following:

- Continued post-cleanup monitoring of sediment quality at the former Denny Way CSO site off of Myrtle Edwards Park in Seattle. The monitoring is expected to continue through 2018.
- Completed a draft feasibility study that presents remedial alternatives for the East Waterway portion of the Harbor Island Superfund site. The East Waterway Group (Port of Seattle, the City of Seattle, and King County) was responsible for the study. After receiving comments on the study from the EPA, the group will prepare a final feasibility study, which will be used by the EPA to select a cleanup plan.
- Continued work on an update to the SMP to address any cleanup needs at CSO outfalls not included in the 1999 plan. In 2014, sampling to inform the update was completed, analysis and modeling of individual site data were under way, and preparation of a draft update was initiated.

More information on the SMP is available at <http://www.kingcounty.gov/environment/wastewater/SedimentManagement.aspx>.

Lower Duwamish Waterway Superfund Cleanup

King County is working to improve water quality in the Lower Duwamish Waterway Superfund site through actions such as controlling CSOs, restoring habitat, capping and removing sediments, and controlling pollution from industries and stormwater runoff. Since the 1960s, regional source control efforts have reduced flows of industrial waste and sewage into the Lower Duwamish by 98 percent, or 27 billion gallons per year.

The County is also partnering with the City of Seattle, the Port of Seattle, and The Boeing Company as part of the Lower Duwamish Waterway Group (LDWG). The LDWG has been working with EPA and Ecology since 2001 to study contamination and determine the best and most effective alternatives to clean up the Lower Duwamish Waterway. In November 2014, the EPA issued its Record of Decision (ROD) on a cleanup plan. The ROD directs cleanup actions and long-term monitoring. The process to allocate cleanup costs among potentially responsible parties, including King County, was under way in 2014.

Other work in 2014 included the following:

- Completed and submitted the County's five-year (2014–2018) Lower Duwamish Waterway Source Control Implementation Plan to Ecology.
- Completed a study on sediment quality in the Green River Watershed to assist in understanding upstream sources of pollution to the Lower Duwamish Waterway.

- Awarded \$102,000 in Green Grants for projects to improve air and water quality in the Lower Duwamish basin. The projects include helping lower-income residents install rain gardens, removing unnecessary pavement, and more.
- Began a survey to ask people who fish or collect shellfish from the Lower Duwamish Waterway about their fishing habits. Survey results will help support better communication with communities and guide outreach to help fishers make healthy choices about catching and eating seafood. The LDWG is sponsoring the study.
- Began a voluntary pilot study, at the direction of the EPA and Ecology, to test the effectiveness of using activated carbon as a tool to clean up historic contamination in Lower Duwamish Waterway sediment. Study results will help determine where activated carbon could be used to help reduce exposure to contaminants from consuming seafood. The LDWG is sponsoring the study.

More information on the County’s efforts to clean up the Lower Duwamish Waterway is available at <http://www.kingcounty.gov/environment/wastewater/Duwamish-waterway.aspx>.

Odor Prevention and Control Program

RWSP policies provide direction on implementing an Odor Prevention and Control Program for all WTD wastewater treatment plants and associated conveyance facilities that goes beyond traditional odor control. RWSP policies also call for including a summary of odor complaints in annual reports.

WTD received and investigated 86 odor complaints in 2014 (Table 1). When investigating an odor complaint, the source is not always identifiable. For example, some complaints were from areas where there are no WTD facilities, and other complaints were associated with odor from low tides.

Of the 86 complaints received, 51 were determined to be attributable to WTD facilities. No odor complaints were attributed to any of the County’s treatment plants. Complaints attributable to WTD facilities were resolved through replacing carbon in odor control facilities, sealing manhole covers, replacing equipment such as fan belts, and restoring power after a power outage. As of December 2014, an investigation was under way to identify and resolve the source of more than 25 complaints from four residences in the Alki Beach area (included in the West Point conveyance facilities portion of Table 1). In response, WTD operations staff replaced the carbon and improved the odor control system for the 63rd Ave pump station. WTD will also install flap gates on the side sewer in 2015 to reduce odors while it explores a long-term resolution.

Table 1. Odor Complaints in 2014

Location	Complaints Received	Complaints Attributed to WTD Facilities
South Treatment Plant	0	0
South Plant conveyance facilities	18	15
West Point Treatment Plant	12	0
West Point conveyance facilities	52	36
Brightwater Treatment Plant	1	0
Brightwater conveyance facilities	2	0
Vashon Treatment Plant	1	0
Carnation Treatment Plant	0	0
Total	86	51

More information on the Odor Prevention and Control Program is available at <http://www.kingcounty.gov/environment/wtd/Response/OdorControl/GoodNeighbor.aspx>.

Biosolids Recycling Program

Biosolids are the nutrient-rich organic material produced by treating wastewater solids. After being processed and treated, biosolids are used beneficially as a fertilizer and soil amendment. RWSP biosolids policies encourage the 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.^{3,4}

In 2014, a total of 119,325 wet tons of Loop[®] biosolids (Class B biosolids) were produced at the West Point, South, and Brightwater treatment plants, all of which were recycled and used beneficially as a soil amendment for forestry and agricultural applications or were used to make compost. The sale of Loop[®] generated \$186,917 in revenue.

Loop[®] biosolids were used as a fertilizer and soil amendment for a variety of applications in 2014:

- About 6,657 acres of dryland wheat, canola, sunflowers, and hay in Douglas County as part of the Boulder Park Soil Improvement Project
- Over 2,000 acres of dryland wheat, triticale, sudangrass, and silage corn at Natural Selection Farms projects in the Yakima Valley
- Over 1,000 acres of Douglas-fir plantations on state forestlands and on Hancock's Snoqualmie Forest as part of the Mountains to Sound Greenway Biosolids Forestry Program

Carbon sequestered from the use of Loop[®] in agriculture, forestry, and composting totaled 35,243 MtCo2e (metric tons of carbon dioxide equivalents—the standard measure of carbon storage) after subtracting diesel emissions for transport and land application.

More information on the Biosolids Recycling Program is available at <http://www.kingcounty.gov/environment/wastewater/Biosolids.aspx>.

Energy Efficiency and Recovery Program

RWSP policies call for the County to use digester gas, an energy-rich methane gas naturally produced as a byproduct of solids treatment, for energy and other purposes when it is cost-effective to do so. In addition, the County's Strategic Climate Action Plan includes goals to implement energy efficiencies and increase renewable energy production.

The South, West Point, and Brightwater treatment plants use digester gas to produce heat, electricity, and natural gas. At South Plant, digester gas that is not used for in-plant purposes is "scrubbed" to the quality required for pipeline natural gas and then sold to Puget Sound Energy.

³Class B biosolids refer to biosolids that have been treated to significantly reduce pathogens to levels that are safe for beneficial use in land application.

⁴Class 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.

Highlights of achievements in 2014 are as follows:

- The Waste-to-Energy cogeneration system at the West Point Plant came online. The cogeneration system creates electricity from digester gas and captures the heat generated from the process. The system supplies a significant portion of the plant's heat demand. It produces about 18,000 megawatt hours of "green" electricity each year. Seattle City Light purchases some of the electricity produced, including renewable energy credits. About \$1.4 million in annual revenue is generated from the sale of green electricity.
- Energy audits were performed on three pump stations, and as a result, WTD began to implement energy efficiency measures at these facilities.
- WTD received energy efficiency grants totaling over \$376,000.

More information on the Energy Efficiency and Recovery Program is available at <http://www.kingcounty.gov/services/environment/wastewater/resource-recovery/Energy.aspx>.

Reclaimed Water Program

The RWSP encourages the County to explore ways to increase the use of reclaimed water at its wastewater treatment plants. The following sections describe the production and use of reclaimed water at each plant in 2014.

More information on the Reclaimed Water Program is available at <http://www.kingcounty.gov/services/environment/wastewater/resource-recovery/recycled-water.aspx>.

South Treatment Plant

The South Treatment Plant produced 97.7 MG of reclaimed water in 2014. The majority of the water was used at the plant for process water and landscape irrigation. Using potable water for these uses would have increased the plant's operational costs by \$155,380.

About 2.7 MG of reclaimed water was distributed and used offsite by reclaimed water customers, including the City of Tukwila. The city uses reclaimed water for irrigation of the Starfire Sports Complex and a wetland plants nursery and for city public works uses such as street sweeping and sewer flushing.

West Point Treatment Plant

The West Point Treatment Plant produced 185 MG of reclaimed water in 2014. All of the reclaimed water was used at the plant for process water and landscape irrigation. Using potable water for these uses would have increased the plant's operational costs by \$1.8 million.

Carnation Treatment Plant

All of the effluent produced at the Carnation Treatment Plant is reclaimed water quality. In 2014, the plant discharged 32.6 MG of reclaimed water to enhance a wetland in the County's Chinook Bend Natural Area.

Brightwater Treatment Plant

In 2014, about 40 MG of reclaimed water from the Brightwater Treatment Plant was distributed to the Brightwater Education and Community Center, the Influent and North Creek pump stations, and the Willows Run Golf Course. The water was used for irrigation, toilets/urinals, and water features in public art. In addition, 419 MG of reclaimed water was used for process water at the plant. Using potable water for these uses would have increased the facility's operational costs by \$2.3 million.

RWSP Policy Review

In 2014, a task force of MWPAAC's Engineering and Planning Subcommittee was formed to review RWSP policies. The task force is reviewing policy implementation and effectiveness and making recommendations for policy amendments for consideration by the County Executive and the County Council.

RWSP Cost Estimates

This section presents an update of the RWSP cost estimates through the year 2030. The estimates range in accuracy from planning level to final construction level because they are for projects in various stages of development, including planning, predesign, final design, and construction, and for completed RWSP projects.

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.⁵

Table 2 compares 2013 and 2014 RWSP cost estimates. A challenge to providing a comparison of costs is that the RWSP is an ongoing plan that includes both incurred and planned expenditures. Expenditures that have occurred through 2014 are included in Table 2 at their original value, and future expenditures planned for 2015 to 2030 are adjusted for inflation to a base year of 2014.

Tables 3 through 5 present cost estimates by three categories: (1) completed RWSP projects; (2) RWSP projects in design or construction; and (3) RWSP projects planned for the future. Presenting costs this way provides a means to track incurred, current, and future costs separately.

Comparison of 2013 and 2014 RWSP Cost Estimates

As shown in Table 2, the 2014 estimate for implementing the projects and programs associated with the RWSP from 1999 through 2030 is approximately \$4.1 billion in 2014 dollars, an increase of \$51 million from the 2013 RWSP cost estimate. The increase is largely attributed to the net results of more developed scopes of work for CSI and CSO projects that were transferred from planning to project development and to more developed scopes of work for projects that entered the design phase in 2013.

⁵Accuracy of cost estimates for projects in planning can range from -50 to +100 percent.

Table 2. Comparison of 2013 and 2014 RWSP Cost Estimates, 1999–2030 (million dollars)

RWSP Element	2013 RWSP Estimates (2013\$)	2013 RWSP Estimates (2014\$)	2014 RWSP Estimates (2014\$)	Cost Change (2014\$)
Total RWSP	\$4,036	\$4,081	\$4,132	\$51
Total Brightwater Treatment System (completed)	\$1,862	\$1,862	\$1,862	--
Total Treatment & Odor Control Improvements	\$72	\$72	\$72	--
Phase I & II Odor Control at South Plant (completed)	\$8	\$8	\$8	--
West Point Odor Control (completed)	\$1	\$1	\$1	--
West Point Digestion Improvements (completed)	\$8	\$8	\$8	--
King Street Regulator Odor Control (completed)	\$7	\$7	\$7	--
Vashon Treatment Plant Upgrade (completed)	\$23	\$23	\$23	--
Carnation Treatment Plant (completed)	\$21	\$21	\$21	--
Chinook Wetlands Enhancement (completed)	\$3	\$3	\$3	--
Total Conveyance System Improvements (CSI)^a	\$979	\$998	\$1,027	\$30
Completed CSI projects, acquisitions, and planning	\$311	\$311	\$342	\$31
CSI projects in design or construction	\$265	\$271	\$320	\$48
Planned CSI projects, acquisitions, and planning	\$403	\$415	\$366	(\$49)
Total Infiltration/Inflow (I/I) Reduction^b	\$42	\$42	\$42	--
Total Combined Sewer Overflow (CSO) Control^c	\$1,013	\$1,039	\$1,059	\$20
Planned CSO control projects	\$604	\$622	\$605	(\$17)
CSO planning and updates	\$21	\$22	\$22	--
CSO control projects in design or construction	\$312	\$317	\$335	\$18
Water Quality Assessment/Monitoring Study	\$5	\$5	\$5	--
Sediment Management/Lower Duwamish Superfund	\$71	\$73	\$91	\$19
Total Reclaimed Water	\$42	\$42	\$42	--
Technology Demonstration (completed)	\$1	\$1	\$1	--
Existing Reclaimed Water Program (RWSP portion)	\$8	\$8	\$8	--
Water Reuse Satellite Facility (canceled)	\$5	\$5	\$5	--
Brightwater Reclaimed Water Pipeline (completed)	\$24	\$24	\$24	--
RWSP Water/Wastewater Conservation (completed)	\$1	\$1	\$1	--
Reclaimed Water Comprehensive Plan (completed)	\$3	\$3	\$3	--
Water Quality Protection: Freshwater Assessment Program and Reporting (completed)	\$16	\$16	\$16	--
Habitat Conservation Plan (HCP)/ Programmatic Biological Assessment (completed)	\$8	\$8	\$8	--
RWSP Planning and Reporting	\$3	\$3	\$4	\$1

Note: Totals may not add because of rounding to the nearest million.

^a The cost change reflects the net results of (1) projects transferred from planning to project development and more developed scopes of work for those projects and (2) more developed scopes of work of projects that began design in 2013.

^b Costs for the Skyway Initial I/I reduction project are funded by the CSI Program in accordance with the Recommended I/I Control Program approved by the King County Council in 2006.

^c The cost change reflects the net results of (1) CSO control projects transferred from planning to project development and more developed scopes of work for those projects; (2) increases in the Sediment Management Program to escalate project costs from 2006 dollars; and (3) increases in the Lower Duwamish Waterway Superfund project costs due to revisions to allocation cost estimates and new costs associated with the fishers survey and pilot carbon study.

Completed RWSP Projects

Table 3 summarizes the expenditures associated with completed RWSP projects through December 31, 2014, compared to expenditures through December 31, 2013. The change of \$31 million from 2013 reflects the addition of the costs associated with closeout of the North Creek Pipeline project and acquisition of the Vasa Park Trunk from the City of Bellevue and a decrease in the final closeout costs from the 2013 costs associated with Phase A of the Kent-Auburn Conveyance System Improvement project. The costs are shown in actual dollars.

Table 3. Expenditures for Completed RWSP Projects (million dollars)

	Expenditures through Dec. 31, 2013	Expenditures through Dec. 31, 2014	Change from 2013
Total completed projects	\$2,343	\$2,374	\$31
CSI projects, acquisitions, planning	\$311	\$342	\$31
Treatment and odor control projects	\$72	\$72	--
Reclaimed water projects	\$34	\$34	--
I/I pilot study projects/program	\$40	\$40	--
Water Quality Protection: Freshwater Assessment Program and Reporting	\$16	\$16	--
Habitat Conservation Plan (HCP)/ Programmatic Biological Assessment	\$8	\$8	--
Brightwater Treatment System	\$1,862	\$1,862	

Note: Totals may not add because of rounding to the nearest million. For recently completed projects, costs reflect the costs estimated at substantial completion. Any changes that may occur during project closeout will be included in future RWSP cost estimates.

RWSP Projects in Design or Construction

Table 4 shows cost estimates of RWSP projects in design or construction as of December 31, 2013 and as of December 31, 2014. These projects were included as part of the 2014 and 2015 - 2016 King County adopted budgets, respectively. The cost estimates are shown in inflated dollars for both actual expenditures and projected costs. The expenditures are included at their original value.

The total cost estimate for projects in design or construction in 2014 is \$801 million, a change of \$50 million from the 2013 estimate of \$750 million. This change is the net result of moving costs of projects that were completed in 2013 to the completed projects table, moving costs of projects that began project development in 2014 from the projects planned for the future table, and updating the cost estimates of some of the projects in design or construction.

Table 4. RWSP Projects in Design or Construction (million dollars, inflated)

	2013 Cost Estimates ^a	2014 Cost Estimates ^b	Change from 2013
Total Costs for RWSP Projects in Design or Construction	\$751	\$859	\$108
Total Conveyance Projects	\$290	\$357	\$67
Kent-Auburn Conveyance System Improvements (Phase B)	\$33	\$41	\$8
North Creek Pipeline ^d	\$32	--	(\$32)
North Creek Interceptor ^d	\$56	\$58	\$2
Sunset/Heathfield Pump Station Replacement and Force Main Replacement	\$78	\$100	\$22
North Lake Sammamish Flow Diversion	\$26	\$29	\$3
North Mercer and Enatai Interceptors	\$65	\$82	\$17
North Hills and Northwest Lake Sammamish Interceptor	--	\$47	\$47
Total I/I^c	\$2	\$2	--
Total CSO Control Program	\$448	\$488	\$40
Sediment Management/Lower Duwamish Superfund	\$74	\$97	\$23
CSO planning and updates	\$23	\$23	--
Murray CSO Control Project	\$50	\$50	--
Barton CSO Control Project	\$22	\$21	(\$1)
South Magnolia CSO Control Project	\$46	\$49	\$3
North Beach CSO Control Project	\$21	\$22	\$1
Rainier Valley Wet Weather Storage Project	\$27	\$33	\$6
Georgetown Wet Weather Treatment Station Project	\$180	\$177	(\$3)
T115/West Michigan CSO Control Project	--	\$11	\$11
Water Quality Assessment/Monitoring Study	\$5	\$5	--
Reclaimed Water	\$8	\$8	--
Existing Reclaimed Water Program (RWSP related)	\$8	\$8	--
RWSP Planning and Reporting	\$3	\$4	\$1

Note: Totals may not add because of rounding to the nearest million.

^a This column lists project costs reported in the 2014 adopted WTD Capital Improvement Plan (CIP) spending plan.

^b Project costs in this column reflect costs reported in the 2015-2016 adopted WTD CIP spending plan.

^c These costs reflect projected costs related to ongoing modeling, planning, and other regional I/I control program-related costs. The expenditures associated with the I/I pilot programs that were completed in 2006 are reflected in Table 3, Expenditures for Completed RWSP Projects.

RWSP Projects Planned for the Future

Table 5 shows 2013 and 2014 planning-level cost estimates for RWSP projects planned for the future. The costs are presented in constant dollars. The change in costs is a result of moving projects that were planned for the future in 2013 to project development in 2014.

Table 5. RWSP Projects Planned for the Future (million dollars)

	2013 Cost Estimate (2013\$)	2013 Cost Estimate (2014\$)	2014 Cost Estimate (2014\$)	Cost Change (2014\$)
Total Planned Projects	\$1,007	\$1,037	\$972	(\$65)
CSI projects ^a	\$403	\$415	\$366	(\$49)
CSO control projects ^b	\$604	\$622	\$605	(\$17)

^aCSI project costs reflect the planning-level cost estimates that were developed as part of the 2007 CSI Program Update and adjusted for inflation to 2013 and 2014 dollars, using an assumed rate of 3 percent per year.

^bThe 2013 and 2014 estimates for the planned CSO control projects reflect the 2012 CSO Control Program review planning-level estimate (which was in 2010 dollars) adjusted for inflation to 2013 and 2014 dollars, respectively, using an assumed rate of 3 percent per year.

Permit Compliance

On average, the County's treatment plants processed about 186 MG of wastewater each day in 2014. All of the plants operated without a single violation of their NPDES permit effluent limits.

The South Treatment Plant and the West Point Treatment Plant each received Platinum Peak Performance awards from NACWA. Platinum level awards are given for multiple consecutive years of compliance with effluent limits established by NPDES permits under the federal Clean Water Act and the state's Water Pollution Control Law. To date, South Plant has attained 17 years of 100 percent permit compliance, and West Point Plant has attained 13 years of compliance.

The Brightwater, Vashon, and Carnation treatment plants each received gold awards from NACWA for 100 percent compliance with effluent limits in 2014.

In addition, Ecology awarded the South, Vashon, and Carnation plants a Wastewater Treatment Plant Outstanding Performance award for full compliance with their NPDES permits.

More information on WTD's NPDES permits is available at <http://www.kingcounty.gov/environment/wtd/About/System/NPDES.aspx>.

Water and Sediment Monitoring

To protect public health and King County's significant investment in water quality improvements, the County regularly monitors treatment plant effluent, marine water, fresh water, and sediments. The 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. Monitoring results for the previous year are presented as environmental indicators on the County's Department of Natural Resources and Parks KingStat website at <http://your.kingcounty.gov/dnrp/measures/>.

Overall water and sediment quality conditions observed in 2014 were largely consistent with those observed in 2013 and in previous years. (No new sediment data were collected in 2014.)

Key findings in 2014 included the following:

- Treatment plant effluent consistently met permit requirements.
- Waters in most urban streams are frequently warmer, have more fecal coliform bacteria, and less dissolved oxygen than Washington State standards allow.
- The health of streams, as measured by the diversity and abundance of the invertebrate community that lives on the stream bottom, is generally better in streams that have less urban development.
- One beach in Lake Sammamish and five beaches in Lake Washington had incidents of high bacteria that did not meet standards for swimming beaches. A total of 58 beaches were resampled because of exceedances of the standards. Matthews Beach was closed for one weekend, Gene Coulon Beach was closed for three weekends, Lake Wilderness was closed for one weekend, and Houghton Beach was closed for one weekend. Warmer than usual summer temperatures may have contributed to more swimmers using the swimming beach areas and less "flushing" of the areas, particularly at Gene Coulon beach.
- The unusually warm Pacific Ocean waters that were previously observed off the Washington Coast entered inland Puget Sound in 2014, resulting in anomalously high water temperatures (coupled with low dissolved oxygen) at most stations in the fall months through the remainder

of the year. This event, along with anomalous weather conditions, contributed to abnormal water column stratification.

- Most monitoring stations (57 percent) in the Puget Sound Central Basin were at a low level of concern in 2014. Exceptions were as follows:
 - Similar to previous years, two stations in Quartermaster Harbor were at a high level of concern because of low dissolved oxygen and dissolved inorganic nitrogen levels over consecutive months.
 - Uncharacteristically, three ambient stations (Pt. Jefferson, Elliott Bay, and East Passage) had a high level of concern because of abnormally strong and persistent stratification.
 - One station (South Plant Outfall) had a moderate level of concern because of two months with low dissolved oxygen and strong intermittent density stratification.
- No exceedances of the standards for fecal coliform bacteria levels occurred at the County's treatment plant marine outfalls.

Investigations to locate sources of bacteria in Juanita Creek, Thornton Creek, Boise Creek, and the stormwater drainage infrastructure in White Center continued in 2014. A comparative investigation using canines and human DNA markers was conducted in the Thornton and Juanita creek basins. When sources are identified, county staff will work with other entities, such as county and local stormwater programs, local sewer districts, and Public Health—Seattle & King County, to ensure that identified sources are controlled.

Data and reports are available at the Water and Land Resources Division's Science and Technical Support Section website at <http://www.kingcounty.gov/environment/wlr/sections-programs/science-section/doing-science.aspx>.

Conclusion

WTD continued to implement the RWSP in 2014. Highlights are as follows:

- The South Treatment Plant and the West Point Treatment Plant each received Platinum Peak Performance awards from NACWA. Platinum level awards indicate multiple consecutive years of compliance with effluent limits established by NPDES permits under the federal Clean Water Act and the state's Water Pollution Control Law. To date, South Plant has attained 17 years of 100 percent permit compliance and West Point Plant has attained 13 years of compliance. In addition, the Brightwater, Vashon, and Carnation treatment plants each received gold awards from NACWA for 100 percent compliance with their NPDES permit effluent limits.
- Progress was made on six RWSP CSI projects, including completion of Phase A of the Kent-Auburn Conveyance System Improvements project.
- Seven CSO control projects were in project development, design, or construction.
- Work continued to improve water quality in the Lower Duwamish Waterway Superfund site through actions such as controlling CSOs, restoring habitat, capping and removing sediments, and controlling pollution from industries and stormwater runoff.
- WTD continued to beneficially recycle the products of wastewater treatment—biosolids, digester gas, and reclaimed water.