

Regional Wastewater Services Plan 2017 Annual Report

Prepared in accordance with
Ordinance 15384, Section 6, as amended, and King County Code 28.86.165

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King County

Department of Natural Resources and Parks
Wastewater Treatment Division

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Introduction

King County Ordinance 15384, Section 6, as amended, and King County Code 28.86.165 require the King County Executive to transmit a report to the King County Council in September each year to cover the previous year's implementation of the Regional Wastewater Services Plan (RWSP). The RWSP outlines programs and projects through 2030 to increase wastewater system capacity and function; gives guidance on recovering and recycling beneficial resources from the wastewater treatment process; and provides direction on protecting and monitoring water quality and meeting permit conditions.

Specifically, the Ordinance, as amended, and the King County Code, require the report to:

- Summarize activities for the major components and plan elements of the RWSP;
- Include a summary of odor complaints;
- Summarize the results for the water quality monitoring program; and
- Provide an update of anticipated RWSP program costs through the year 2030.

This report addresses each requirement under a separate heading that corresponds to the particular requirement. This is the 18th and final RWSP Annual Report that the Wastewater Treatment Division (WTD) of the Department of Natural Resources and Parks has prepared.¹ As changes in WTD projects and programs before 2030 will now be considered in the systemwide planning process, the RWSP 2017 Annual Report is the final RWSP annual report.

Executive Summary

The RWSP 2017 Annual Report summarizes the progress made during 2017 in implementing the plan's major programs and projects. Highlights are as follows:

- Progress was made on capital projects associated with the Conveyance System Improvement Plan and the Long-term Combined Sewer Overflow (CSO) Plan;
- West Point, South, and Brightwater treatment plants produced 117,195 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;
- Carbon sequestered from the use of Loop in agriculture, forestry, and composting totaled 38,427 MtCO₂e (metric tons of carbon dioxide equivalents—the standard measure of carbon storage). This amount is equivalent to taking 8,000 cars off the road;
- The South, West Point and Brightwater treatment plants continued to use digester gas to produce heat, electricity and natural gas;
- The WTD distributed 107 million gallons (MG) of reclaimed water to off-site uses.

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

In addition, 621 MG of filtered effluent was produced and used for on-site process water and irrigation at South, West Point and Brightwater treatment plants; and

- South, Vashon, and Carnation treatment plants received Platinum Peak Performance Awards from the National Association of Clean Water Agencies. Platinum-level awards are given for five or more consecutive years of compliance with effluent limits established by National Pollutant Discharge Elimination System (NPDES) permits.

RWSP Components and Plan Elements

This section summarizes activities in 2017 for the following major components and plan elements of the RWSP:

- Conveyance System Improvement Program
- Infiltration and Inflow Program
- Combined Sewer Overflow Control Program
- Treatment Plant Flows and Loads Study
- Biosolids Recycling Program
- Energy Efficiency and Recovery Program
- Reclaimed Water Program
- Permit Compliance

Conveyance System Improvement Program

In accordance with RWSP policies, the Conveyance System Improvement (CSI) Program identifies capacity needs in areas of the separated conveyance system to meet the RWSP 20-year peak flow design standard. The King County Council adopted this standard to serve as an objective measure for designing and building conveyance facilities intended to meet NPDES permit requirements that there be no overflows from the separated system. A 20-year peak flow consists of both storm flow (infiltration and inflow) and base flow (wastewater from homes and businesses) and has a five percent chance of occurring in any year.

Seven CSI projects were underway in 2017:

- Sunset and Heathfield Pump Stations and Force Main Upgrade Project:
<http://www.kingcounty.gov/depts/dnrp/wtd/capital-projects/active/sunset-heathfield.aspx>;
- North Creek Interceptor Project:
<http://www.kingcounty.gov/depts/dnrp/wtd/capital-projects/active/north-creek-interceptor.aspx>;

- North Mercer Island and Enatai Sewer Upgrade Project:
<http://www.kingcounty.gov/depts/dnrp/wtd/capital-projects/active/north-merc-island-enatai-sewer-upgrade.aspx>;
- Lake Hills and Northwest Lake Sammamish Sewer Upgrade Project:
<http://www.kingcounty.gov/depts/dnrp/wtd/capital-projects/active/lake-hills-nw-lake-sammamish.aspx>;
- Kent Auburn Conveyance System Improvements Project (Phase B):
<http://www.kingcounty.gov/depts/dnrp/wtd/capital-projects/active/kent-auburn.aspx>;
- North Lake Sammamish Flow Diversion Project:
<https://www.kingcounty.gov/depts/dnrp/wtd/capital-projects/active/north-lake-sammamish-flow-diversion.aspx>; and
- Coal Creek Sewer Upgrade Project:
<https://www.kingcounty.gov/depts/dnrp/wtd/capital-projects/active/coal-creek-sewer-upgrade.aspx>.

The RWSP conveyance policies call for regular program updates to verify, modify or identify new conveyance system needs. The most recent CSI Program Update was completed in 2017. The WTD worked with the Engineering and Planning Subcommittee of the Metropolitan Water Pollution Abatement Advisory Committee (MWPAAC) and individual sewer agencies on the update. The update verifies, adjusts, and identifies new CSI projects needed for increasing capacity in the conveyance system to accommodate future flow from both the projected growth in population and infiltration and inflow (I/I) through 2060.

The 2017 CSI Program Update is available at <https://www.kingcounty.gov/services/environment/wastewater/csi/updates-history/2017.aspx>.

Infiltration and Inflow Control Program

The Infiltration and Inflow (I/I) Control Program was created in 1999 as part of the RWSP to reduce the amount of I/I that enters the regional wastewater system, as I/I affects the capacity needs of sewer pipes and treatment plants. I/I is excess water that flows into sewer pipes from groundwater and stormwater. Groundwater (infiltration) seeps into sewer pipes through holes, cracks, joint failures, and faulty connections. Stormwater (inflow) rapidly flows into sewers via roof drain downspouts, foundation drains, storm drain cross-connections, and through holes in maintenance hole covers.

Activities in 2017 included working with MWPAAC's Engineering and Planning Subcommittee to explore concepts and develop frameworks for further evaluation to reduce I/I programmatically, with a focus on private side sewers. Concepts include region-wide side sewer standards and inspection training, interagency coordination to identify and manage I/I, side sewer inspection and repair programs, and side sewer grant/loan programs. In addition, WTD staff met with staff from the local agencies to

learn more about each agency's sanitary and side sewer standards and inspection programs.

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

Combined Sewer Overflow Control Program

Work continued in 2017 to implement the Combined Sewer Overflow (CSO) Control Program. The 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, and the Washington State Department of Ecology, require 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.

Seven CSO control projects and a water quality assessment and monitoring study were under way in 2017:

- Rainier Valley Wet Weather Storage Project:
<http://www.kingcounty.gov/depts/dnrp/wtd/capital-projects/active/rainier-valley-wet-weather-storage.aspx>;
- Georgetown Wet Weather Treatment Station Project:
<https://www.kingcounty.gov/depts/dnrp/wtd/capital-projects/active/georgetown.aspx>;
- West Duwamish CSO Control Project:
<http://www.kingcounty.gov/depts/dnrp/wtd/capital-projects/active/west-duwamish-cso-control.aspx>;
- Joint City of Seattle and King County Ship Canal Water Quality Project:
<http://www.seattle.gov/util/EnvironmentConservation/Projects/ShipCanalWaterQuality/index.htm>;
- Chelan CSO Control Project: <http://www.kingcounty.gov/depts/dnrp/wtd/capital-projects/active/chelan-cso-control.aspx>;
- South Magnolia CSO Control Project (pipe repair project²):
<https://www.kingcounty.gov/depts/dnrp/wtd/capital-projects/active/south-magnolia-cso-storage.aspx>;
- University Green Stormwater Project:
<https://www.kingcounty.gov/depts/dnrp/wtd/capital-projects/active/university-gsi.aspx>; and

² In the fall of 2016, WTD crews discovered that the pipe that carries flows to the storage tank was broken beneath the intersection of West Galer Street and Thorndike Avenue. In December 2017, construction began to repair the pipe.

- Water Quality Assessment and Monitoring Study (completed in 2017): <http://www.kingcounty.gov/services/environment/wastewater/cso/projects/water-quality-study.aspx>.

In 2017, work was underway to prepare an update to the CSO Long-term Control Plan. This effort is looking at what has changed since the last time the plan was updated in 2012. It will reflect environmental, social, and financial goals to meet current needs. Updates to the CSO Long-term Control Plan are required as part of the NPDES permit renewal process for the West Point Treatment Plant. Information on the process to update the CSO Long-term Control Plan is available at <http://kingcounty.gov/services/environment/wastewater/cso/projects/system-plan.aspx>.

Treatment Plant Flows and Loads Study

The RWSP calls for ongoing long-term assessments of wastewater system needs. In general, WTD updates its treatment plant influent flow and loading forecasts every 10 years using population and employment forecasts provided by the Puget Sound Regional Council (PSRC). The 2013 RWSP Comprehensive Review used PSRC's 2013 Land Use Forecast to update influent flow and loadings forecasts through 2060 for WTD's three regional treatment plants. The 2013 comprehensive review noted that it is possible that the plants' loadings capacity could be reached in the 2030s and recommended further study to determine future needs. Because of this, WTD initiated the Treatment Plant Flows and Loadings Study in 2017.

The purpose of the study is to assess the flows and loadings capacity and the timing of capacity needs of each process within each regional treatment plant. The study will determine current capacity and performance of each major process, forecast when a process will reach capacity, and potential constraints that could affect meeting future capacity needs.

Activities in 2017 focused on consultant procurement and selection for the project. The consultant team conducted site visits and data collection in fall 2017. The WTD expects the study to be complete at the end of 2018.

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. The 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}

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

In 2017, a total of 117,195 wet tons of Loop® 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.

Carbon sequestered from the use of Loop® in agriculture, forestry, and composting totaled 38,427 MtCO₂e after subtracting diesel emissions for transport and land application. This amount is equivalent to taking 8,000 cars off the road.

In 2017, the Biosolids Program initiated an internal strategic planning process to re-evaluate WTD's biosolids management strategies, including marketing, production, further product development, technology, regulations, and cost.

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

Energy Efficiency and Recovery Program

The 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 (SCAP) includes goals to implement energy efficiencies and increase renewable energy production.

In 2017, 12.10 million kilowatt-hours (kWh) of electricity were produced at South (1.17 million kWh) and West Point (10.93 million kWh) treatment plants. South Treatment Plant sold 2.25 million therms of scrubbed natural gas to a third party who will in turn use that gas in vehicle fleets using compressed natural gas (CNG). This will offset using fossil fuel-based diesel, generating valuable renewable identification numbers (RINs) for WTD. The resulting revenue will help to offset some of the energy operating costs and fund future efficiency, renewables, and other carbon neutrality-related efforts.

The WTD is making progress toward meeting the SCAP's energy reduction targets. The targets include reducing normalized energy use in County-owned facilities by at least 7.5 percent by 2020 and 10 percent by 2025, as compared to a baseline year of 2014. Projects completed or underway in 2017 that will help to meet these targets include replacement of raw sewage pumps at South Treatment Plant with more energy efficient pumps, lighting upgrades at treatment plants, and the West Point Treatment Plant aeration mixer replacement project. In addition, work on a WTD Energy Plan was underway to identify strategies and recommendations through 2025 to sustainably improve the division's overall use and production of energy and its carbon footprint.

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.

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

Recycled Water Program

The RWSP encourages the County to explore ways to increase the use of reclaimed water from its wastewater treatment plants. In 2017, 107 MG of reclaimed water was distributed to off-site uses. In addition, 621 MG of filtered effluent was produced and used at the treatment plants for on-site process water and irrigation. Information on reclaimed water production and use by treatment plants in 2017 is summarized below.

- The South Treatment Plant produced and used about 55 MG of filtered effluent for process water at the plant. About 3.2 MG of Class A reclaimed water was distributed and used offsite by reclaimed water customers. The reclaimed water was used for irrigation of the Starfire Sports Complex, a wetland plants nursery, City Soil Community Farm Project, City of Tukwila landscaping irrigation, and for city public works uses such as street sweeping and sewer flushing;
- The West Point Treatment Plant produced and used about 114 MG of filtered effluent for process water and landscape irrigation at the plant;
- The Brightwater Treatment Plant produced and used about 450 MG of filtered effluent for process water at the plant. In addition, about 69 MG of Class A reclaimed water was distributed to the Brightwater Education and Community Center; the Brightwater Influent, North Creek, York, and Hollywood pump stations; Willows Run Golf Course; 60 Acres Park, and to King County's Water and Land Resources Division for mitigation plantings from the York reclaimed water fill station. The water was used for irrigation, toilets/urinals, and public art that includes water features; and
- All of the effluent produced at the Carnation Treatment Plant is Class A reclaimed water quality; 35.7 MG of reclaimed water was used to beneficially enhance a wetland in the County's Chinook Bend Natural Area.

In 2017, the Recycled Water Program initiated an internal strategic planning process to guide the program's efforts and decision-making and to facilitate the timeliness and reliability of serving existing and future recycled water customers.

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

Permit Compliance

On average, the County's wastewater treatment plants processed about 179 MG of wastewater each day. In 2017, four of the County's treatment plants—South, Brightwater, Vashon, and Carnation—operated without a violation of their NPDES permit effluent limits. South, Vashon, and Carnation each received a Platinum Peak

Performance Award from the National Association of Clean Water Agencies, and Brightwater received a Gold Award. Platinum-level awards are given for five or more consecutive years of compliance with effluent limits established by NPDES permits, and Gold-level awards are presented to facilities with no permit violations for the entire calendar year.

The West Point Treatment Plant had exceedances of its permit effluent limits in 2017, resulting from electrical and equipment failures that led to flooding during a storm in February 2017. The WTD immediately focused on restoration and repair activities, and the plant was able to resume normal operations in May 2017.

More information on WTD's NPDES permits is available at <http://www.kingcounty.gov/depts/dnrp/wtd/system/npdes.aspx>.

Odor Prevention and Control Program

The RWSP policies provide direction on implementing an odor prevention and control program that goes beyond traditional odor control for the County's wastewater treatment plants and associated conveyance facilities. The RWSP policies also call for including a summary of odor complaints in annual reports.

The WTD received and investigated 46 odor complaints in 2017 (Table 1). When investigating an odor complaint, the source of the odor is not always identifiable. For example, some complaints were from areas where there are no WTD facilities.

Of the 46 complaints received in 2017, 28 were determined to be attributable to WTD facilities. No odor complaints were attributed to the Brightwater and Carnation treatment plants.

The two complaints attributed to the West Point Treatment Plant resulted from the odor control units being offline due to the flooding incident that occurred in February 2017. The complaints attributable to South Treatment Plant occurred during cleaning of tanks and doors being open in the dewatering process area due to buildup of ammonia odors. Staff intend to use odor-neutralizing chemicals during future cleaning of the tanks, and are working to resolve the ammonia odors in order to keep the doors closed to the dewatering process area.

The complaints attributable to the conveyance facilities in the West Point, East, and Vashon service areas were resolved through replacing fans, changing out filters in odor control facilities, and cleaning and sealing maintenance hole covers.

Table 1. Odor Complaints in 2017

Location	Complaints Received	Complaints Attributed to WTD Facilities
West Point Treatment Plant	3	2
Conveyance facilities in the West Point service area	14	4
South Treatment Plant	6	4
Brightwater Treatment Plant	1	0
Conveyance facilities in the East Service Area (serving South and Brightwater Treatment Plant service areas)	21	17
Vashon Treatment Plant/Pump Station	1	1
Carnation Treatment Plant	0	0
Total	46	28

Water Quality Monitoring

The RWSP policies call for a comprehensive water quality monitoring program of streams and water bodies. The policies guide the County in identifying and resolving regional water quality issues, protecting public and environmental health, and protecting the public's investment in the regional wastewater system and water resource management.

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/>.

Key findings in 2017 included the following:

- 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;
- In 2017, there were six beaches monitored in Lake Washington and one beach in Lake Sammamish that had short-term incidents of high bacteria. Juanita Beach was closed for 13 days in August due to high bacteria levels. No beaches were closed in Lake Sammamish, and bacteria levels were low in Green Lake for the 14th year in a row;

- Twenty-five lakes were sampled in 2017 for cyanotoxins. One site on Lake Washington and five small lakes had algal blooms with toxin concentrations above guidance values;
- Typical Puget Sound marine water temperatures were observed in the first half of 2017, followed by slightly warmer than typical conditions for the second half of the year;
- Based on the Marine Water Quality Index, most offshore monitoring stations, including those at the County's treatment plant marine outfalls, were at a low level of concern in 2017. Elliott Bay was at a moderate level of concern in 2017 due to low dissolved oxygen and strong water column stratification. Both Quartermaster Harbor stations were at a high level of concern in 2017 due to low dissolved oxygen levels and very low surface dissolved inorganic nitrogen, an indicator of potential sensitivity to additional inputs of nutrients;
- No exceedances of fecal coliform bacteria standards occurred at the County's treatment plant marine outfalls or at other offshore stations;
- Slightly more than half (55 percent) of marine beaches in 2017 had high bacteria concentrations that exceeded state water quality standards. Most of the stations with exceedances of the bacteria standards are located near freshwater sources such as creek outflows;
- Ambient subtidal sediment samples were collected in 2017 from Elliott Bay and the mainstem of Puget Sound's Central Basin. Half of the stations exceeded state sediment quality standards for mercury and/or benzoic acid. Concentrations of all other chemicals met state standards;
- The West Point Treatment Plant flooding incident in February 2017 caused short-term increases in bacteria levels at nearby marine beaches. Beaches were closed for 12 days until the bacteria levels returned to normal;
- West Point Treatment Plant effluent quality was worse than typical during the period of reduced treatment from February to May 2017, which occurred after the flooding-related overflow ended. Several metals were present at higher levels than in typical secondary treated effluent; and
- No substantial differences in ambient Puget Sound receiving water quality was observed from March through June 2017 compared to previous years. The potential accumulation of metals and organic chemicals in sediments and tissues is being investigated.

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

RWSP Cost Estimates

The RWSP reporting policies call for an update of anticipated RWSP program costs through the year 2030. In accordance with Section 110, Proviso P1 in Budget Ordinance 17941 and Motion 14384, WTD began work in 2015 to review and make recommendations regarding the processes the division uses to establish and update planning-level cost estimates for capital projects. The cost-estimating improvements

resulting from this work was used in 2017 to develop planning-level cost estimates associated with the 2017 CSI Program Update.

The CSI Program Update identified 41 conceptual projects to meet identified capacity needs through 2060, based on a 50-year planning period. The planning-level AACE Class 5 cost estimate for these projects is \$1.7 billion.⁵ Class 5 cost estimates are considered to have an accuracy range of -50 percent to +100 percent for the known scope at the time of the estimate. The level of project definition is minimal or near a zero percent level of engineering development. More information on the individual conceptual projects and cost estimates is provided in the CSI program update and supporting documents available at <https://www.kingcounty.gov/services/environment/wastewater/csi/updates-history/2017.aspx>.

The cost-estimating improvements will also be applied during the process to update the CSO Long-term Control Plan. Cost estimates for RWSP projects that are underway and have been baselined are provided on a monthly basis in the financial section of WTD's Operational Performance Metrics website: <https://www.kingcounty.gov/depts/dnrp/wtd/system/performance-metrics.aspx>.

Conclusion

The WTD continues to implement programs and projects in accordance with the RWSP. Highlights of efforts in 2017 are as follows:

- Seven CSI projects were underway;
- Seven CSO Control projects were underway;
- The CSI Program Update was completed;
- The Water Quality Assessment and Monitoring Study was completed;
- Work continued to update the 2018 CSO Long-term Control Plan;
- The WTD initiated a Treatment Plant Flows and Loads Study; and
- The WTD continued to recycle and beneficially use wastewater treatment products, which also help to meet the County's SCAP energy and greenhouse gas emissions reduction targets.

Many of the major projects outlined in the RWSP have been completed, are underway, or are planned for the future. Information related to RWSP major components, elements, costs, and programs is provided on WTD's website, through regular briefings to the King County Council's Regional Water Quality Committee, and through the King County budget process. In addition, in 2018, WTD will initiate a wastewater systemwide planning effort that is expected to result in a new plan that sets direction for WTD beyond 2030 (see Next Steps). Changes in WTD projects and programs before 2030 will also be considered in the systemwide planning process. For these reasons, the

⁵ AACE International has been serving the total cost management community since 1956. The legal name since 1992 is AACE International. In 1956, the organization was established as the American Association of Cost Engineers.

RWSP 2017 Annual Report is the final RWSP annual report.

Next Steps

Billions of dollars will be invested in the County's regional wastewater treatment system over the next few decades. With many pressing priorities arising, WTD is initiating a systemwide planning effort in 2018 so that the right investments are made at the right time through and beyond 2030.

The systemwide planning effort will consider the following topics:

- Aging infrastructure and increased asset management
- Increasing demand for treatment in a growing region
- Requirements to reduce the amount of untreated sewage and polluted stormwater sent to Puget Sound during storms
- Changing climate resulting in more extreme weather events
- Potential new requirements for additional wastewater treatment

At the same time as regional wastewater improvements are needed, people in the Puget Sound region are being asked to help fund other important regional efforts, such as improvements to stormwater systems, transit options, roads, and affordable housing through other rates, fees and taxes. Understanding how these costs affect people as the region becomes increasingly expensive is important, and will also be considered in the planning process.