SEATTLE PUBLIC UTILITIES AND

KING COUNTY
DEPARTMENT OF NATURAL RESOURCES AND PARKS

# JOINT OPERATIONS AND SYSTEM OPTIMIZATION PLAN

FEBRUARY 2016


Seattle Public Utilities | Protecting Seattle's Waterways

King County
Department of
Natural Resources and Parks
**WasteWater Treatment Division**

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# 1.0 Introduction and Purpose

This Joint Operations and System Optimization Plan (Joint Plan) documents the initial foundational effort of how Seattle Public Utilities (SPU) and King County Department of Natural Resources and Parks Wastewater Treatment Division (WTD) have started working closely together to understand each agency's facilities and operations to optimize overall system performance. This extensive collaboration has influenced a shift from operating two individual, connected systems to operating a single dynamic system that is owned and operated by two agencies committed to working together to improve operational performance. The goals of system optimization are to ensure compliance, maximize the capture and treatment of flows, and reduce the overall operating costs for SPU and WTD ratepayers. These initial efforts resulted in SPU and WTD establishing joint commitments related to data sharing, establishing committees to share operational information, and coordination during startup and commissioning—all of which provide the foundational framework for long-term coordination to improve operational performance. This Joint Plan will be updated every three years to document any new information, joint commitments, and operational improvements that arise from this ongoing coordination.

This Joint Plan satisfies the requirements of Appendix D of the King County Consent Decree[1] and Appendix F of the City of Seattle Consent Decree[2].

# 2.0 Background

While SPU and WTD own and operate discrete systems, SPU's drainage and wastewater collection system is interconnected with portions of WTD's regional wastewater conveyance and treatment system and functions as one integrated system (where the operation of one impacts the operation of the other). Separated and combined sewage collected in SPU's wastewater collection system is conveyed to WTD-owned interceptors for transport to one of WTD's wastewater treatment plants. In addition, SPU manages 86 National Pollutant Discharge Elimination System (NPDES)-permitted combined sewer overflow (CSO) outfalls, and WTD manages 38 NPDES-permitted CSO outfalls. Though the SPU and WTD systems are hydraulically connected and function as one integrated system, SPU and WTD have independent Supervisory Control and Data Acquisition (SCADA) systems to perform monitoring and control functions.

SPU and WTD jointly prepared this Joint Plan to review SPU's wastewater collection system and the portion of WTD's regional wastewater conveyance and treatment system that is hydraulically connected to SPU's system. This Joint Plan is consistent with both agencies' operational objectives, sets up a framework to ensure the optimal level of coordination and information sharing is maintained, and optimizes operations between both agencies.

This Joint Plan documents the three-year planning effort and resulting joint commitments to optimize current system operations. The planning effort included educational activities, in-depth study of system performance at operable facilities, and development of a set of joint commitments to improve system

[1] United States of America and the State of Washington, Plaintiffs, v. King County, Washington, Defendant. Consent Decree. Case 2:13-cv-00677-JCC. Document 6, Filed July 3, 2013.

[2] United States of America and the State of Washington, Plaintiffs, v. The City of Seattle, Washington, Defendant. Consent Decree. Case 2:13-cv-00678-JCC. Document 6, Filed July 3, 2013.

operations and coordination. This planning effort has resulted in the following benefits for both agencies:

- Understanding of each other's systems, operations, and staff
- More proactive rather than reactive collaboration
- Development of a joint vocabulary for operational collaboration
- Improved collaboration on all phases of projects and all organizational levels
- Establishment of dedicated teams to meet joint commitments

This Joint Plan will be updated every three years to document any new information, operational improvements, and joint commitments that arise from this long-term operational coordination. The agencies' goals are that coordination will improve overall system performance with reduced operating costs, and better communication and data sharing will help manage risk and uncertainty. Furthermore, operational coordination during the capital improvement project planning and design phases may lead to more cost-effective projects in the future.

Table 2-1 lists the Consent Decree requirements for both agencies associated with this Joint Plan and provides references to the sections or chapters in the Joint Plan that address the corresponding Consent Decree requirements.

**Table 2-1. Consent Decree Requirements for Joint Plan**

| Consent Decree Requirement for Joint Plan | Addressed in Joint Plan |
|---|---|
| (2.a) Overview of those interdependent portions of King County's regional wastewater, conveyance, and treatment system and the City of Seattle's wastewater collection system | Section 3.1 and Section 3.2 |
| (2.b) Methods to accommodate each agency's operational objectives while complying with their contractual obligations | Section 3.4 and Section 5.2 |
| (2.c) Shared operational objectives for the City of Seattle and King County's combined systems | Section 5.2 |
| (2.d) Organizational structure | Chapter 4.0 |
| (2.e) Modes of operation (dry, wet, transition) for identified CSO control facilities | Section 3.3 |
| (2.f) Each agency's operational decision hierarchy | Section 3.4 |
| (2.g) Identified CSO control facilities, if any, that may be beneficial to jointly operate and/or monitor | Chapter 7.0 |
| (2.h) Real-time communication plans/protocols | Section 3.3 and Section 6.2 |
| (2.i) Emergency and special operations protocols | Section 3.3 |
| (2.j) A process for incorporating the Joint Plan into the design of new capital projects for the combined system, including the City of Seattle and King County CSO Long-term Control Plans | Chapter 7.0 |
| (2.k) A process for updating the Joint Plan every three years | Chapter 8.0 |

# 3.0 Current System and Facilities

This chapter gives an overview of the SPU and WTD system service areas and facilities; flow monitoring and control of systems and reporting; and operations of typical facilities under various flow conditions. Understanding the other agency's facilities and operations provided the foundational framework to explore potential improvements to optimize overall system performance.

## 3.1 Overview of Agencies and Systems

This section gives an overview of the SPU and WTD systems, satisfying requirement (2.a) of the City of Seattle and King County Consent Decrees, which requires an "overview of those interdependent portions of King County's regional wastewater, conveyance, and treatment system and the City of Seattle's wastewater collection system."

SPU is responsible for collecting wastewater from homes and businesses within the City of Seattle and is responsible for the wastewater collection system serving areas up to 1,000 acres. WTD collects wastewater from SPU's system and other local systems in the region, serving areas greater than 1,000 acres, and treats these flows at regional wastewater treatment plants. Most of SPU's flows are treated at WTD's West Point Treatment Plant in the City of Seattle. Basins served by both agencies and locations of major facilities are shown in Figure 3-1.

Portions of SPU's system include combined sewer pipelines that carry both wastewater and stormwater. Whenever the capacity for conveyance, storage, and treatment is exceeded as the result of heavy storms, CSOs may occur at SPU or WTD CSO outfalls. WTD manages 38 NPDES-permitted CSO outfalls, and SPU manages 86 NPDES-permitted CSO outfalls (Figure 3-2).

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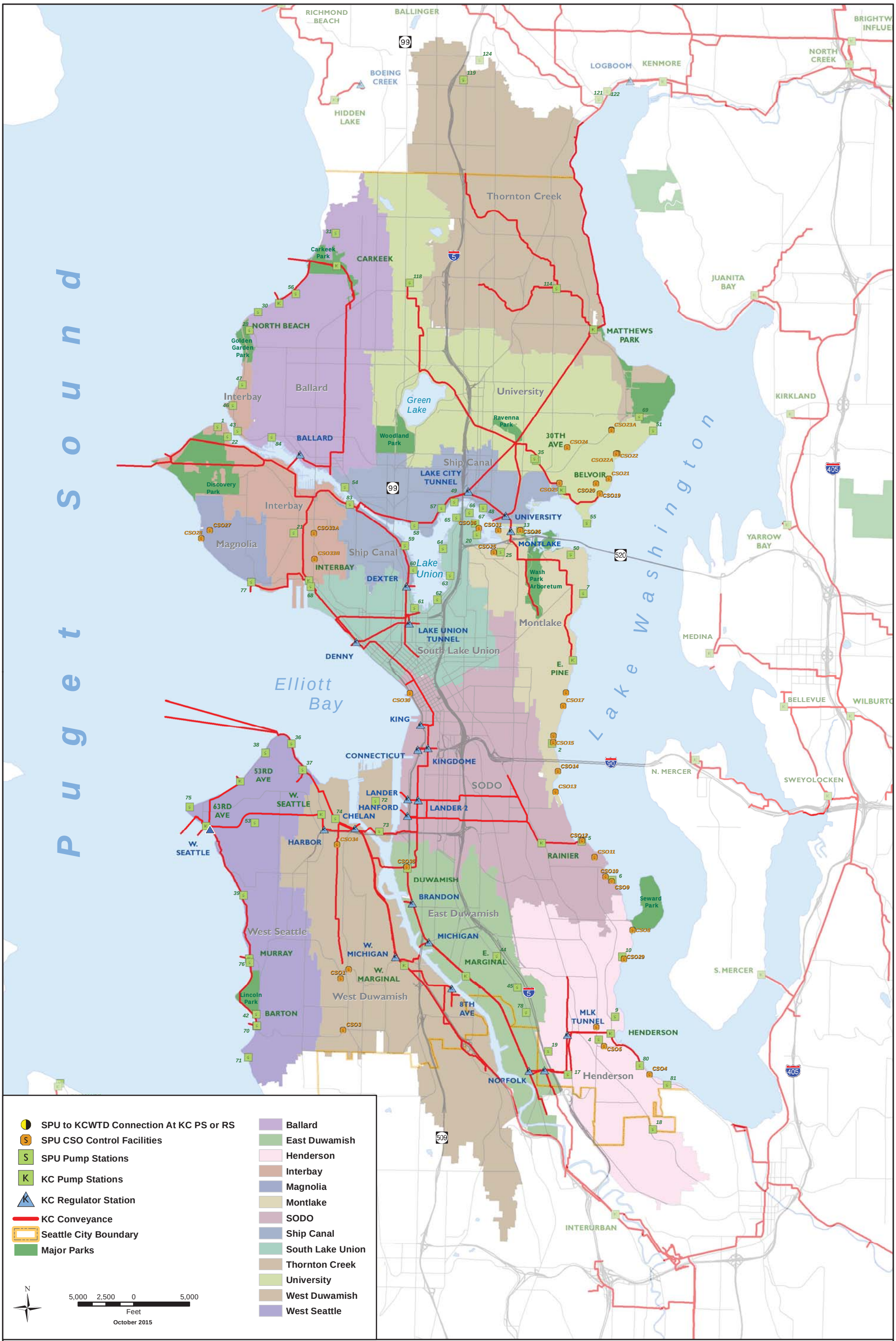


**Figure 3-1. WTD and SPU Service Area Basins and Facilities**

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**Figure 3-2. Locations of SPU and WTD CSO Outfalls**

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## 3.2 Service Area and Facilities

This section describes the service area and facilities of SPU's drainage and wastewater collection system and WTD's regional wastewater conveyance and treatment system. This section satisfies requirement (2.a) of the City of Seattle and King County Consent Decrees, which requires an "overview of those interdependent portions of King County's regional wastewater, conveyance, and treatment system and the City of Seattle's wastewater collection system."

### 3.2.1 Seattle Public Utilities

SPU serves about 660,000 people within the Seattle city limits by collecting and conveying wastewater to WTD's regional wastewater conveyance and treatment system for treatment at the West Point Treatment Plant. SPU also has regulatory authority over stormwater, managing stormwater flows to reduce downstream flow peaks. Approximately one-third of the system is combined, one-third partially separated, and one-third fully separated.

SPU's drainage and wastewater collection system includes pipelines (gravity and force main), pump stations, CSO control facilities and outfalls, stormwater detention/treatment ponds, and storm drain outfalls:

- Approximately 450 miles of sanitary sewer pipelines
- Approximately 1,000 miles of combined sewer pipelines
- Approximately 5.5 miles of force mains
- Approximately 480 miles of storm drain pipelines
- 68 wastewater pump stations
- 38 CSO storage tanks/pipes
- 27 HydroBrakes[3]
- 10 motor-operated gates
- 86 NPDES-permitted CSO outfalls
- 30 stormwater detention/treatment ponds
- 295 storm drain outfalls

SPU's drainage and wastewater collection system is shown in Figure 3-3. The following sections describe the facilities located in SPU's drainage and wastewater collection system, which convey combined sewage from SPU's system to WTD's system and are the subject of this Joint Plan.

**Pipelines**

SPU's drainage and wastewater collection system contains over 1,800 miles of gravity pipelines ranging from 4 to 144 inches in diameter, of which approximately 62 percent are 8 inches in diameter. The average age of the pipelines is approximately 75 years.

**Pump Stations**

SPU owns, operates, and maintains 68 wastewater pump stations. Most of the pump stations were constructed during the 1960s, with some being built during the late 1980s and early 1990s. The pump

[3] HydroBrake® Flow Control is a proprietary self-activating device that uses vortex principles to control and attenuate stormwater and wastewater flow without the need for moving parts or external power requirements.

stations are predominately wetwell/drywell type with 10 submersible and 13 airlift type stations. The pump station capacities range from approximately 0.05 to 4.3 million gallons per day (MGD).

Twenty six of the pump stations have onsite generators for emergency power. SPU also owns three portable generators that can be towed to stations to provide emergency power for the stations without onsite generators. During pump station failures, power outages, or force main breaks, large portable pumps are used for bypass pumping. Four pump stations have grease control units on site.

All SPU wastewater pump stations are designed to have redundant pumps. One pump station has a three-pump system with only two pumps typically in operation. Thirteen are airlift pump stations which use compressed air to move wastewater to higher elevations. These stations have two compressors that function as pumps.

**CSO Control Facilities and Outfalls**

SPU's 86 NPDES-permitted CSO outfalls are regulated by the Washington State Department of Ecology (Ecology) under NPDES Waste Discharge Permit WA0031682, issued October 27, 2010 and modified September 13, 2012. The current permit went into effect on December 1, 2010 and will remain in effect until Ecology issues a new permit, most likely in 2016. To date, 50 of SPU's CSO outfalls are controlled to the State standard of no more than one untreated discharge per year, based on a 20-year moving average. Projects at 14 other CSO locations are underway. The *Plan to Protect Seattle's Waterways*[4] calls for completing the remaining CSO control projects by 2030 to bring the remaining 22 CSO outfalls under control and into compliance.

Flows are monitored at 99 locations in SPU's combined system[5]. Twenty four NPDES-permitted CSO outfalls serve as emergency overflows for combined sewage pump stations.

Thirty six CSO control structures include devices, such as HydroBrakes and orifices, to constrict flow and, in most cases, direct it to storage through active flow control systems (gates) or passive systems (weirs) during storms. When storage capacity is exceeded, the nearby CSO overflow structures typically include elevated side weirs or pipelines leading directly to a storm drain pipeline or receiving water body for excess combined sewage to overflow.

**Stormwater Detention/Treatment Ponds**

The 30 stormwater detention/treatment ponds are designed to store and detain stormwater flows. Three of these facilities reduce peak flows in the combined system.

[4] Available at http://www.seattle.gov/util/EnvironmentConservation/Projects/SewageOverflowPrevention/IntegratedPlan/index.htm.

[5] There are more monitoring locations than CSO outfalls because SPU monitors at CSO overflow structures (to measure frequency and volume of overflows at CSO outfalls) as well as monitors other key areas of its system (e.g., CSO control structures to understand when storage is being utilized at HydroBrake/gate locations).


**Figure 3-3. Seattle Public Utilities Drainage and Wastewater Collection System**

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### 3.2.2 King County Wastewater Treatment Division

This section describes general information about WTD's conveyance and treatment facilities that comprise the regional wastewater conveyance and treatment system, and more specific information for the west portion of WTD's system that receives combined sewage flows from SPU's system, referred to as the West Operations Section. It is this combined system area where the interconnections associated with this Joint Plan occur.

WTD serves about 1.5 million people in the central Puget Sound region by collecting and treating wastewater from 34 local sewer agencies in an approximate 420-square-mile wastewater service area (Figure 3-4). The service area includes most urban areas of King County and parts of south Snohomish County and northeast Pierce County.

WTD's regional wastewater conveyance and treatment system includes the following facilities:

- Approximately 400 miles of conveyance pipelines
- 47 pump stations
- Three large regional wastewater treatment plants: West Point Treatment Plant in the City of Seattle, South Treatment Plant in the City of Renton, and Brightwater Treatment Plant in south Snohomish County near Woodinville
- Two small wastewater treatment plants, one on Vashon Island and one in the City of Carnation
- One community septic system (Beulah Park and Cove on Vashon Island)
- 25 regulator stations
- Four wet-weather treatment facilities (Alki, Carkeek, Elliott West, and Henderson/MLK—all in the City of Seattle)
- 38 NPDES-permitted CSO outfalls

The service area is divided according to where flows are sent for treatment. Figure 3-4 shows the service areas for each of WTD's wastewater treatment plants. WTD's West Operations Section operates and maintains the West Point Treatment Plant, three wet-weather treatment facilities (Alki, Carkeek, and Elliott West) and associated conveyance system; the East Operations Section is responsible for the Carnation, Vashon, South, and Brightwater Treatment Plants, the Henderson/MLK wet-weather treatment facility, and associated conveyance systems.

The following sections describe the facilities located in WTD's West Operations Section (Figure 3-5), which convey combined and separated sewage from SPU's system to the West Point Treatment Plant and are the subject of this Joint Plan.

#### Pipelines

Most of WTD's conveyance pipelines collect wastewater from local separated systems that send wastewater to sanitary sewer pipelines and stormwater to storm drain pipelines. Approximately 21 percent of WTD's conveyance system serves the City of Seattle, in which one-third of the local wastewater collection system is separated, one-third is partially separated, and one-third is combined.

#### Pump Stations

The West Operations Section's 23 pump stations range in size from small package stations handling about 5 MGD to the largest pump station at Interbay that moves up to 133 MGD to the West Point Treatment Plant. Most of the pump stations were built in the 1960s when the regional wastewater treatment system was first constructed. The West Seattle Pump Station came on line in summer 1998;

the North Creek Pump Station came on line in fall 1999; and the Henderson/MLK and Elliott West wet-weather treatment facilities came on line in spring 2005.

Operators at the West Point Treatment Plant monitor the pump stations 24 hours per day via the SCADA system to quickly respond to power outages and equipment failures. Crews inspect each pump station weekly to ensure that equipment is functioning normally. They regularly lubricate and perform preventive maintenance on equipment and flush the wet well where wastewater enters the station.

### Wastewater Treatment Plant

The West Point Treatment Plant, the only regional wastewater treatment plant in the West Operations Section, is dedicated almost completely (approximately 90 percent) to the treatment of SPU's flows, including all flows from the combined portion of the system. The West Point Treatment Plant receives flows from trunks, interceptors, tunnels, pump stations, and regulator stations (Figure 3-5). On average, the plant treats 100 MGD of wastewater. On days when there are heavy storms, the plant receives and treats approximately 300 MGD through the secondary process, with primary treatment available for an additional 140 MGD for a total of up to 440 MGD of treatment capacity. Excess volumes in the West Operations Section not reaching the treatment plant overflow at the various CSO outfalls operated by SPU and WTD. The treatment plant includes additional primary treatment capacity to provide wet-weather treatment to reduce overflows at CSO outfalls.

The West Point Treatment Plant has been operating for almost 50 years, with the secondary treatment processes in operation for almost 20 years. Wastewater entering the plant undergoes preliminary, primary, and secondary treatment, and disinfection before the effluent is released through the outfall pipe and diffuser into Puget Sound. The West Point Treatment Plant uses high-purity oxygen activated sludge for its biological treatment. An oxygen generation system provides high-purity oxygen to the secondary aeration tanks. Using high-purity oxygen instead of ambient air accelerates the rate at which aerobic bacteria can consume organic pollutants.

Primary and secondary scum and sludge are blended and thickened in a gravity-belt thickening process. The solids are then pumped to digester tanks where anaerobic bacteria at 98 degrees Fahrenheit break down organic material and kill pathogens. The activity of the bacteria creates digester gas and reduces the solids mass by 50 percent. The digested solids are then pumped from digesters to equipment that uses centrifuges to remove excess water from the solids.

The treatment process produces byproducts—biosolids, reclaimed water, and energy—that are reused in the plant and throughout the region.

### Regulator Stations

The West Operations Section's 21 regulator stations manage flow from trunks into interceptors and from interceptors downstream to the West Point Treatment Plant, with excess combined sewage sent to wet-weather treatment facilities and CSO outfalls when downstream system capacity is exceeded. Regulator stations are designed to allocate conveyance capacity between upstream and downstream connections to maximize use of storage in the conveyance system and to transfer all possible flow to the West Point Treatment Plant for treatment.

### Wet-Weather Treatment Facilities and CSO Outfalls

In addition to the West Point Treatment Plant, the West Operations Section includes three wet-weather treatment facilities: Alki, Carkeek, and Elliott West[6]. These facilities provide primary treatment (solids settling) to excess combined sewage flows and either store these flows and send them to the West Point Treatment Plant when conveyance capacity allows or, if the flows cannot be conveyed downstream, the facilities disinfect and discharge treated flows into a receiving water body. They also serve as CSO discharge locations for flows in excess of storage and treatment capacity. Unlike the West Point Treatment Plant, these facilities only operate during heavy storms.

In addition to the wet-weather treatment facilities, WTD manages 38 NPDES-permitted CSO outfalls. To date, sixteen of King County's CSO outfalls are controlled to the State standard of no more than one untreated discharge per year, based on a 20-year moving average. Operations at facilities associated with another three CSO outfalls are being adjusted to complete control; and CSO control projects at five other CSO outfalls are underway to achieve control. The *2012 Long-term CSO Control Plan Amendment*[7] calls for completing nine projects by 2030 to bring the remaining 14 CSO outfalls under control and into compliance.

[6] WTD has a fourth wet-weather treatment facility located outside of the West Operations Section, Henderson/MLK, that provides primary treatment (solids settling) and either stores the treated flows and sends them to the South Treatment Plant in Renton when conveyance capacity allows or, if the flows cannot be conveyed downstream, the facility disinfects and discharges treated flows into the Duwamish River.

[7] Available at http://www.kingcounty.gov/environment/wastewater/CSO/Library/PlanUpdates/2012Plan.aspx. King County, Department of Natural Resources and Parks, Wastewater Treatment Division, Combined Sewer Overflow Program; Seattle, Washington. October 2012.

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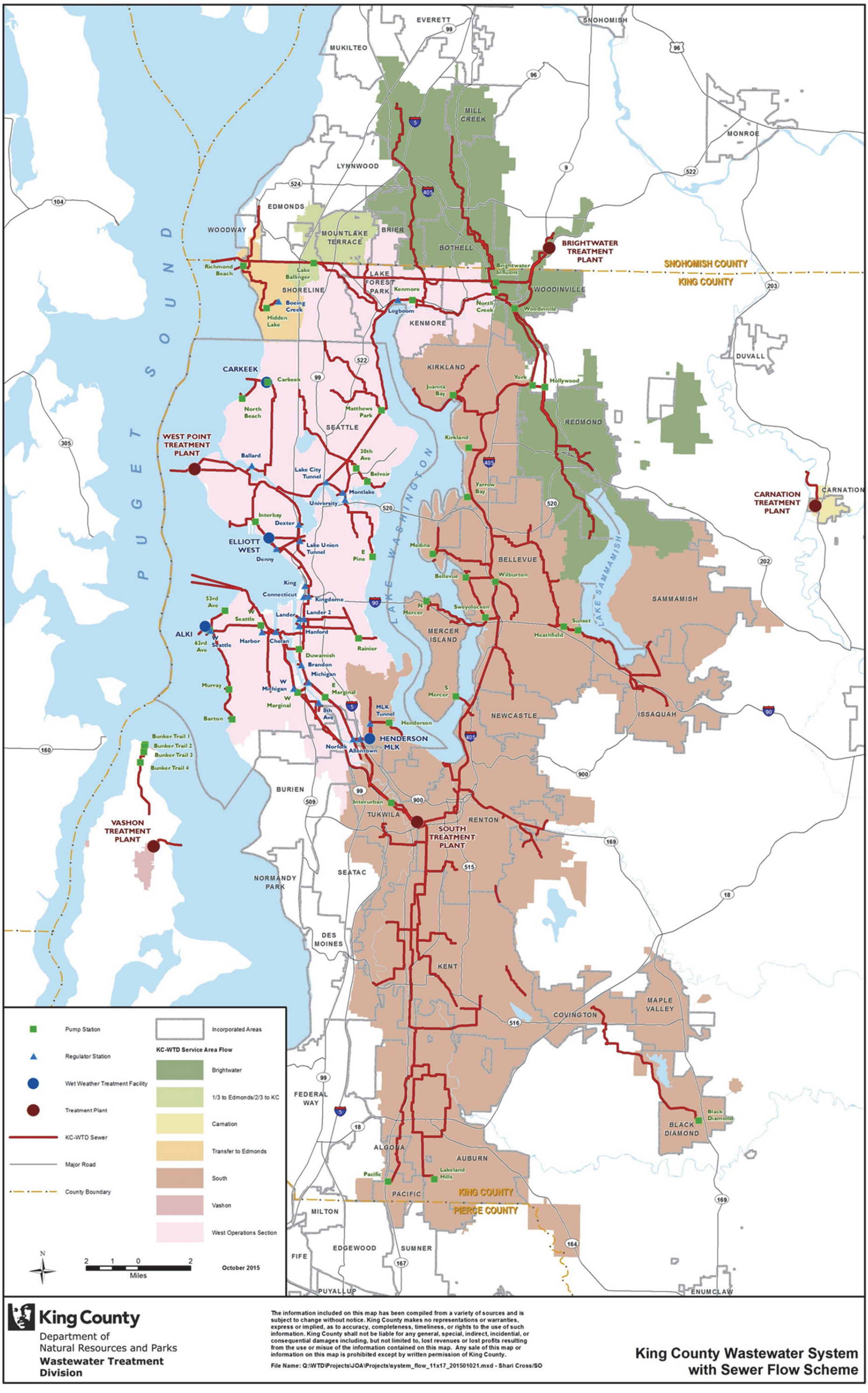


**Figure 3-4. King County Wastewater Treatment Division System**

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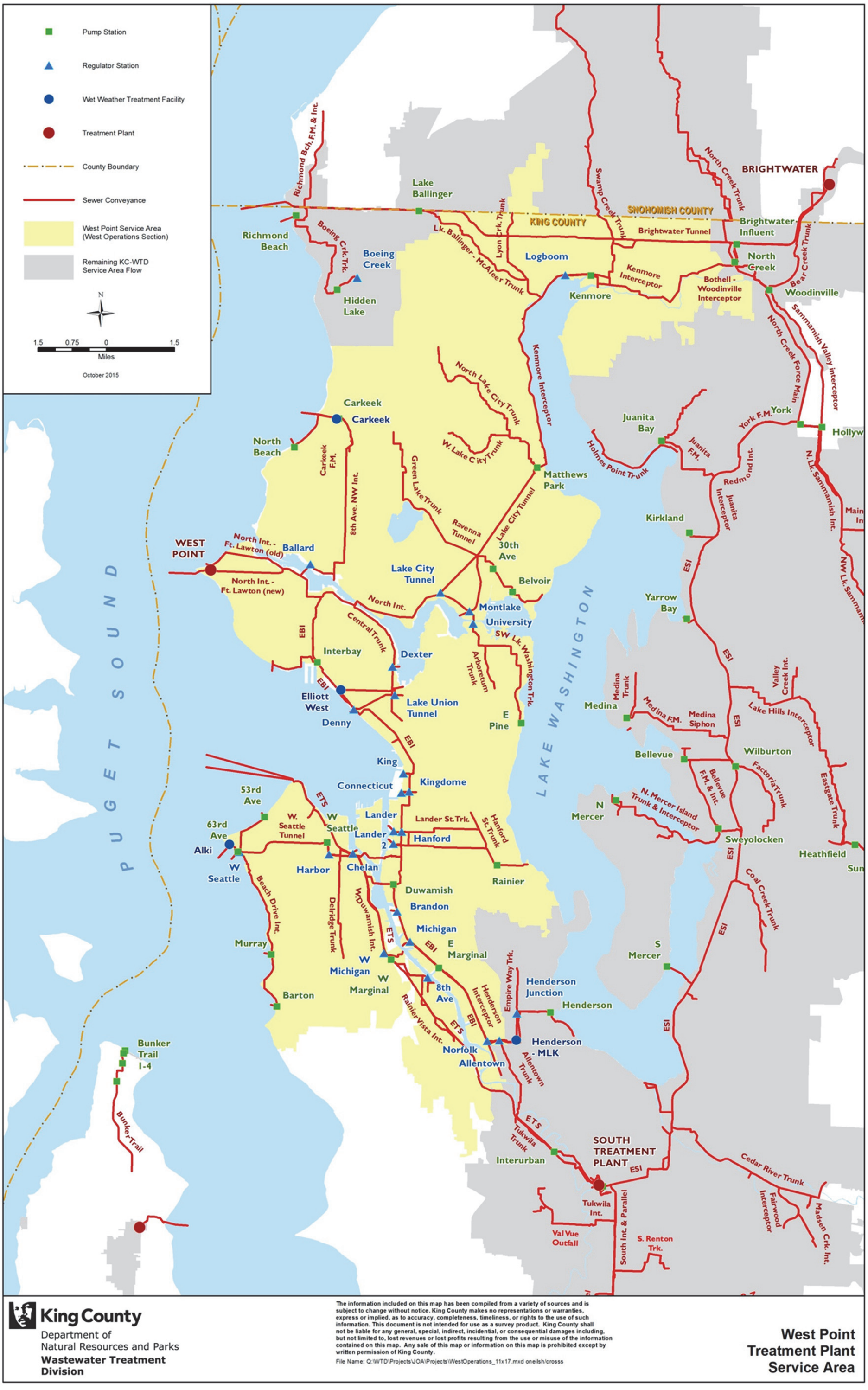


**Figure 3-5. West Operations Section Conveyance and Treatment System**

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# 3.3 Operations of Existing Facilities

This section gives an overview of SPU and WTD flow monitoring, control of systems, reporting, and operations of CSO control facilities and the West Point Treatment Plant. This section satisfies the following requirements of the City of Seattle and King County Consent Decrees:

(2.e) Modes of operation (dry, wet, transition) for identified CSO control facilities;

(2.h) Real-time communication plans/protocols;

(2.i) Emergency and special operations protocols.

## 3.3.1 Seattle Public Utilities

SPU's wastewater collection system is designed to send flows to WTD's regional wastewater conveyance and treatment system. Generally, SPU uses gravity to carry wastewater. Pump stations lift wastewater so that it can continue downstream by gravity. CSO control facilities store and control flows to reduce the frequency and volume of overflows to water bodies. Flows are monitored and controlled automatically by SPU's SCADA system at pump stations and CSO control facilities throughout the system. Programmable automation controllers (PACs) operate gates, valves, pumps, and other mechanical devices. Most of the stormwater detention facilities are passively operated, incorporating weirs or orifices to control storage and release.

### Monitoring and Control

The wastewater pump stations are monitored and operated via SCADA. The SPU Operations Control Center (OCC) operators have 24/7 real-time remote access via SCADA and can override automated control, either locally or remotely, if necessary. The pump stations operate in a lead/lag configuration, but operational modes can be modified through SCADA.

New and retrofitted CSO control facilities with operable assets are operated by onsite automation and monitored in real time via SCADA. Instrumentation at each location monitors levels, mechanical devices, and flows as appropriate. Data is available via the SCADA system in real time to the SPU OCC, and in near real time to other users of the data. At most CSO storage facilities, HydroBrakes control flow to storage. For the active flow control facilities (gates or valves), flows to and from storage are controlled by the PAC. Flows are released from storage when sensors indicate available capacity in the downstream system. At some locations, real-time downstream conditions are used in operational decisions via the SCADA system.

Currently, SPU contracts with ADS Environmental to monitor 65 of the CSO outfalls. SPU monitors the remaining CSO outfalls via SCADA.

SPU develops a facility operating plan for each monitored CSO location, each CSO control facility, and wastewater pump station. A facility operating plan documents the control strategy and provides detailed information about the monitoring, control, and instrumentation, so the CSO control facility can be configured in SCADA and understood and operated by SPU OCC operators. Facility operating plans also include alarm response protocols, roles and responsibilities, and detailed schematics.

### Data Storage, Modeling, and Reporting

Operating time series and configuration data is brought into a corporate information management system (IMS) for warehousing and retrieval. The System Operations Planning and Analysis (SOPA)

section reviews all operational and metrological data and closely evaluates system performance after large storm events.

SPU also performs modeling to optimize system performance. Models simulating wet weather hydrology and hydraulics of the system are calibrated using monitoring data and operating time series. The calibrated models are used to support design and operation of facilities. For instance, a calibrated model may be used to test system performance resulting from a proposed control strategy modification.

SPU submits a discharge monitoring report (DMR) each month to Ecology on the previous month's number of CSO events, event discharge volume, event duration, and rainfall measured during each event.

### Regulatory Framework for CSO Control

The operation of SPU's wastewater collection system, including CSO outfalls, is regulated by NPDES Permit WA0031682. Ecology, as delegated by the U.S. Environmental Protection Agency (EPA), administers this permit. The permit is renewed approximately every five years.

As of July 3, 2013, SPU's wastewater collection system operation is also regulated by a Consent Decree[8] with EPA, Ecology, and the U.S. Department of Justice (DOJ). On May 29, 2015, SPU submitted its *Plan to Protect Seattle's Waterways*[9] to EPA and Ecology for approval. The plan included the following four volumes: *Volume 1 Executive Summary*; *Volume 2 Long-Term Control Plan* (LTCP); *Volume 3 Integrated Plan*; and *Volume 4 Final Environmental Impact Statement* (FEIS). The plan was subsequently approved by EPA and Ecology on August 26, 2015.

Additionally, SPU submitted to EPA and Ecology the *Post-Construction Monitoring Plan* (PCMP) for approval in accordance with the City of Seattle's Consent Decree. The PCMP documents SPU's plan to measure the effectiveness of CSO controls and to demonstrate attainment of water and sediment quality standards. On August 26, 2015, the PCMP was approved subject to SPU submitting detailed Quality Assurance Project Plans (QAPPs) for review and approval and sediment data reports for each of the 14 CSO outfalls to be analyzed as part of implementing the PCMP.

### Operation of Typical CSO Control Facilities

Depending on volume, combined sewage flows move through SPU CSO control facilities directly to downstream pipelines, are stored and later sent downstream, or overflow to CSO outfalls when system or storage capacity is exceeded. SPU's wastewater collection system includes 38 CSO storage tanks or storage pipes. To optimize capacity, use of storage is delayed as long as possible by controlling the rates at which flows enter and leave storage. Flows are released from storage either by reopening flow control gates or valves, by pumping from the storage tank or storage pipe back into the conveyance system, or passively through a HydroBrake or flap gate.

Figure 3-6 shows a typical SPU CSO control facility during wet-weather conditions when storage is utilized. A typical SPU CSO control facility includes storage, a CSO control structure, and a CSO overflow structure. CSO control structures include devices, such as HydroBrakes and orifices, to constrict flow and, in most cases, direct it to storage through active flow control systems (gates) or passive systems (weirs) during storms. When storage capacity is exceeded, the nearby CSO overflow structures typically

[8] United States of America and the State of Washington, Plaintiffs, v. The City of Seattle, Washington, Defendant. Consent Decree. Case 2:13-cv-00678-JCC. Document 6, Filed July 3, 2013.

[9] Available at http://www.seattle.gov/util/EnvironmentConservation/Projects/SewageOverflowPrevention/IntegratedPlan/index.htm.

include elevated side weirs or pipelines leading directly to a storm drain pipeline or receiving water body for excess combined sewage to overflow.

The following sections describe the typical operation of the facilities under dry-weather, wet-weather, and heavy (or severe) conditions.

***Dry-Weather Conditions***

During dry-weather conditions, flow passes through a CSO control structure either through a fully open automated gate (default position) or through passive control to the downstream system.

If the CSO control facility includes offline storage, flow will bypass the offline storage pipes.

If the CSO control facility includes inline storage, flow may first enter the inline storage pipes before entering the CSO control structure.

***Wet-Weather Conditions***

If flow exceeds the capacity of the downstream system, some of the flow in the CSO control structure that backs up, with or without passive control devices, will enter the storage tank or storage pipe. For active control, the automated gate will partially close in response to flow sensor signals, allowing some of the flow to enter storage. When the storm subsides, flow will leave storage and continue downstream, either passively or through other means (e.g., automatically reopening the gate in response to signals indicating available downstream capacity).

***Heavy (or Severe) Conditions***

When flow continues to back up during a heavy storm, either with or without a HydroBrake and/or through automatic full closure of the gate (if present), it may exceed storage capacity, overtop the weir in the CSO overflow structure, and discharge to a receiving water body. Flow remaining in storage after the storm will be sent downstream, as in smaller storms.

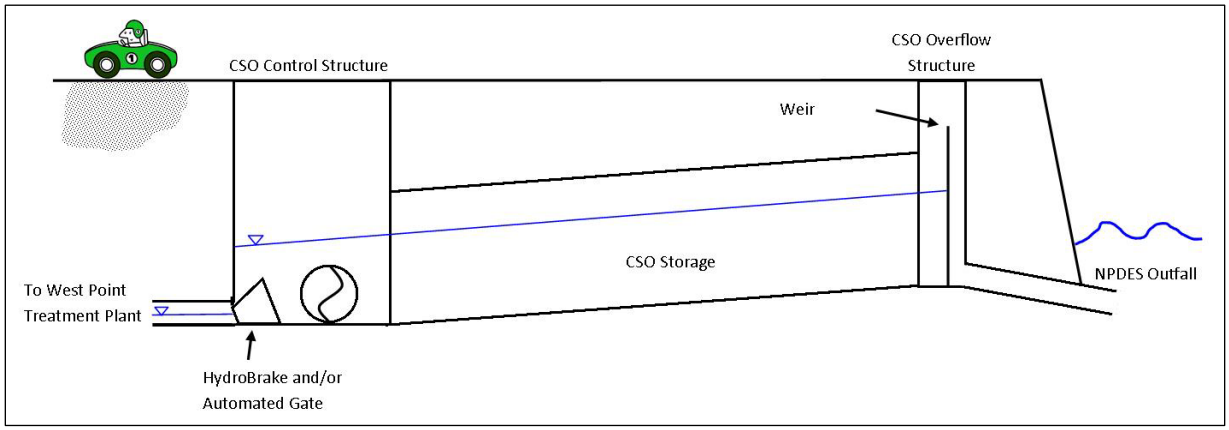


**Figure 3-6. Typical SPU CSO Control Facility During Wet-Weather Conditions**

## 3.3.2 King County Wastewater Treatment Division

Wherever possible, WTD uses gravity to carry wastewater from local basins to treatment plants. Pump stations lift wastewater so that it can continue downstream by gravity. These stations automatically regulate their pumping rates to match station inflows, which vary depending on time of day and rainfall. Regulator stations regulate flows between pump stations, wet-weather treatment facilities, and the

West Point Treatment Plant. This regulation is necessary because of the combined system in the older parts of Seattle that handle wastewater and stormwater. Regulator stations are designed to allocate conveyance capacity between upstream and downstream connections. Operational controls at the regulator stations and pump stations maximize the use of existing conveyance systems and facilities. This active management often includes controls that dynamically operate gates and weirs in response to field measurements of flows and levels and uses inline or offline storage to reduce or eliminate CSOs. Maximizing flows in the existing conveyance system requires a thorough understanding of the wastewater conveyance system and how it functions during wet weather. This approach frequently includes a concurrent assessment of the conveyance system and treatment plant operations, so that increased flows do not have adverse consequences, such as backups within the system or at the treatment plant.

### Monitoring and Control

Flows through WTD's regional wastewater conveyance and treatment system are monitored by SCADA and controlled by local Programmable Logic Controllers (PLCs) and backup controllers, with the option of remote control via the SCADA system when operators intervene, typically before, during, or after a storm event. The local PLCs monitor levels and flows, adjusting gate positions and pump motor speeds to suit the conditions. Many of the controls are governed by set points that have been established over the years by hydraulic analysis and modeling to maximize conveyance to the West Point Treatment Plant and storage in pipelines and offline storage facilities while minimizing CSOs and backups. The automatic control of the regulator stations reduces CSOs by maximizing storage during a storm and then conveying the flows to the West Point Treatment Plant for treatment when the storm subsides. When needed, the automatic controls can be overridden by experienced certified operators at the West Point Treatment Plant main control center.

In 2003, WTD embarked on a division-wide effort to improve and optimize operations by developing instrumentation and control standards that would be applied to all of its existing facilities. After developing the standards, Ovation by Emerson Process Management was selected as the SCADA system. The Brightwater Treatment Plant was designed and constructed using the Ovation system. It is anticipated that the South Treatment Plant and the West Point Treatment Plant will be on the Ovation system by the end of 2016. While the Ovation system is being brought on line, the existing and new systems are running in parallel to enable fine-tuning of Ovation.

PLCs at pump stations and other offsite facilities are connected to the SCADA system to monitor, control, and optimize conveyance to the treatment plants and the use of system storage capacity. Critical alarms and process data are communicated to the plant operators using monitoring systems that report data in independent communication pathways from the control system.

WTD uses three types of control strategies—set point control, equipment control, and system control. Each strategy presents the operator with a specific set of control options and requirements.

**Set point control** includes all strategies used to maintain a process variable. A sensor/transmitter measures the variable (pressure, flow, level, temperature, and pH) and transmits a signal to the PLC and to the Moore controller. (If the PLC fails, the Moore controller continues to receive the signal and takes control.) The PLC compares the backup signal to a pre-programmed set point and, based on the difference, transmits a signal to a controlled field device (pump, valve, or gate). The device responds to bring the process variable in line with the set point. The set point control options available to the operator are limited to modifying the set point or manually controlling the output of the controlled device. These options can be implemented at a SCADA console or from a local control panel.

**Equipment control** includes strategies that exercise discrete control over field devices, such as starting and stopping a pump or opening and closing a gate or valve. The equipment control options available to the operator are limited to manually starting, stopping, opening, or closing equipment and changing equipment modes between AUTO and MANUAL. Equipment control employs permissives, or interlocks, whereby a piece of equipment is controlled according to the status of another piece of equipment or the status of a process. These interlocks can be either PLC-based or hardwired. PLC-based interlocks rely on logic or programming in the PLC. Hardwired interlocks use electro-mechanical switches.

**System control** refers to control strategies that enable multiple pieces of equipment to operate in a coordinated fashion. System control strategies must often be set up and then initiated by an operator using the SCADA displays. Once initiated, the control strategy is executed by the PLC using the operator-entered criteria and according to PLC programming. The range of options available to the operator include the ability to start and stop a sequence, jog through sequence steps, change set points, and determine pump (lead/lag) and valve sequences.

### Data Collection and Modeling

WTD uses several models in combination with long-term data to optimize system operations. Models simulate flow contributions (wastewater, stormwater, inflow, and infiltration) to the system under various conditions and control strategies. The model is calibrated to match measured data. A range of simulations, combined with field data and engineering judgment, is used to design and operate facilities. Simulations can also be used to evaluate performance under wet-weather or heavy (or severe) conditions.

Models are also used for the following:

- Assessing system performance after storms that may lead to changes in operational settings to improve system management and optimization.
- Analyzing how new facilities, including those in local systems, will interact with other parts of the system and developing strategies to improve coordination.
- Analyzing the control algorithms for existing and new facilities to find the most efficient methods of operation so as to maximize use of existing facilities and minimize the sizing of new facilities.

The OSI PI process data historian collects and saves all key WTD process, operational, and monitoring data to identify trends. The OSI PI system has been in service since 2005; data from previous historian systems is available.

### Regulatory Framework for CSO Control

The operation of WTD's regional wastewater conveyance and treatment system is regulated by NPDES permits, one for each of the wastewater treatment plants. WTD's CSO outfalls and wet-weather treatment facilities are regulated under the West Point Treatment Plant's NPDES Permit WA0029181. Ecology, as delegated by EPA, administers the permits. These permits are renewed approximately every five years.

In 2012, WTD completed a major review and amendment of its CSO control plan, which was approved by Ecology as the *2012 Long-term CSO Control Plan Amendment*[10]. As of July 3, 2013, WTD's regional

[10] Available at http://www.kingcounty.gov/environment/wastewater/CSO/Library/PlanUpdates/2012Plan.aspx. King County, Department of Natural Resources and Parks, Wastewater Treatment Division, Combined Sewer Overflow Program; Seattle, Washington. October 2012.

wastewater conveyance and treatment system operation is also regulated by a Consent Decree[11] with EPA, Ecology, and DOJ. WTD will complete its next review and amendment of its CSO control plan in 2018.

## Operation of Typical Regulator Stations and Wet-Weather Treatment Facilities

Depending on volume, combined sewage flows move through WTD's pump stations and regulator stations downstream to the West Point Treatment Plant, are sent to wet-weather treatment facilities, or overflow to CSO outfalls when conveyance, storage, or treatment capacity is exceeded.

Wet-weather treatment facilities reduce the frequency and volume of overflows to water bodies. Wet-weather treatment facilities either store or treat combined sewage depending on the size and duration of the storm.

- For smaller storms, wet-weather treatment facilities provide primary treatment (solids settling) and store combined sewage until the storm passes and flows return to normal. The stored combined sewage is then released downstream to the West Point Treatment Plant for secondary treatment.
- For larger storms, wet-weather treatment facilities provide primary treatment (solids settling) and disinfection of combined sewage prior to discharging it to receiving water bodies.

Set points are configured to send as much flow as possible to the West Point Treatment Plant and to store excess flows in the upstream conveyance system or wet-weather treatment facilities until the West Point Treatment Plant can accept them, or treat excess flows at the wet-weather treatment facilities. Figure 3-7 shows a side view schematic of a regulator station, and Figure 3-8 shows the functions of a regulator station under various flow conditions to display various modes of operation of typical regulator stations at CSO outfall locations. The operation of these regulator stations optimizes upstream storage capacity in the system prior to sending flows to wet-weather treatment facilities or discharging excess combined sewage to CSO outfalls.

The following sections describe the typical operation of the existing regulator stations and wet-weather treatment facilities under dry-weather, wet-weather, and heavy (or severe) conditions.

### *Dry-Weather Conditions*

Under dry-weather conditions, flow passes through the regulator station through a fully open automated gate (default position of the regulator gate being open), and the outfall gate is closed; see Figure 3-7 and Figure 3-8.

Flows will bypass offline wet-weather treatment facilities.

### *Wet-Weather Conditions*

If flow exceeds the capacity of the downstream system and levels in the interceptor reach a set point, the regulator gate closes, providing some storage upstream of the regulator gate; see Figure 3-8.

When levels in the interceptor continue to rise, flows will either be diverted to a CSO outfall or a wet-weather treatment facility (via gates or weir) for storage or treatment.

When the storm subsides, stored combined sewage will be released downstream to the West Point Treatment Plant for secondary treatment (if excess combined sewage was stored).

[11] United States of America and the State of Washington, Plaintiffs, v. King County, Washington, Defendant. Consent Decree. Case 2:13-cv-00677-JCC. Document 6, Filed July 3, 2013.

***Heavy (or Severe) Conditions***

When flow continues to back up during a heavy storm and exceeds conveyance, storage, and treatment capacity, flows overtop a weir or an outfall gate opens to allow the release of excess combined sewage at a CSO outfall; see Figure 3-8.

When the storm subsides, stored combined sewage will be released downstream to the West Point Treatment Plant for secondary treatment (for excess combined sewage that was stored).

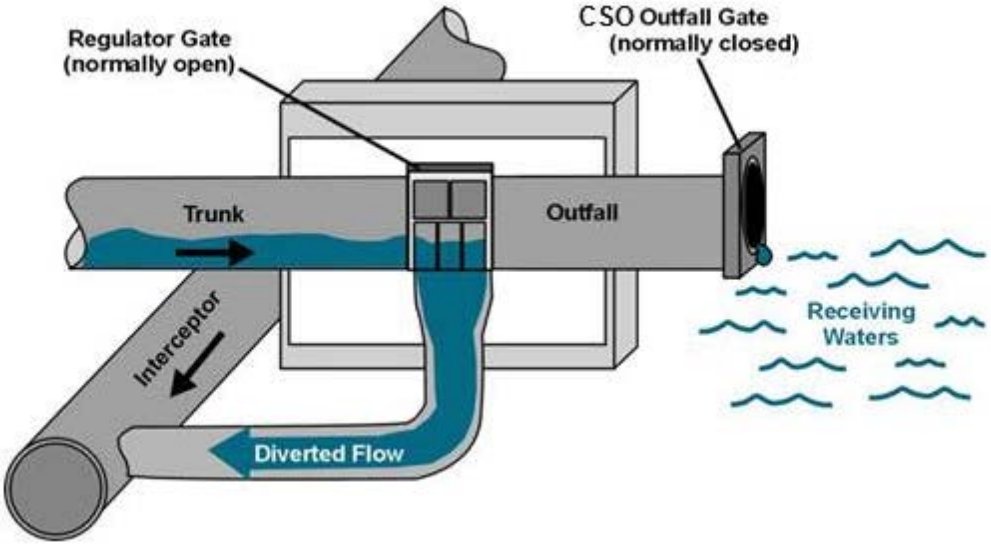


**Figure 3-7. Side View of a Regulator Station**

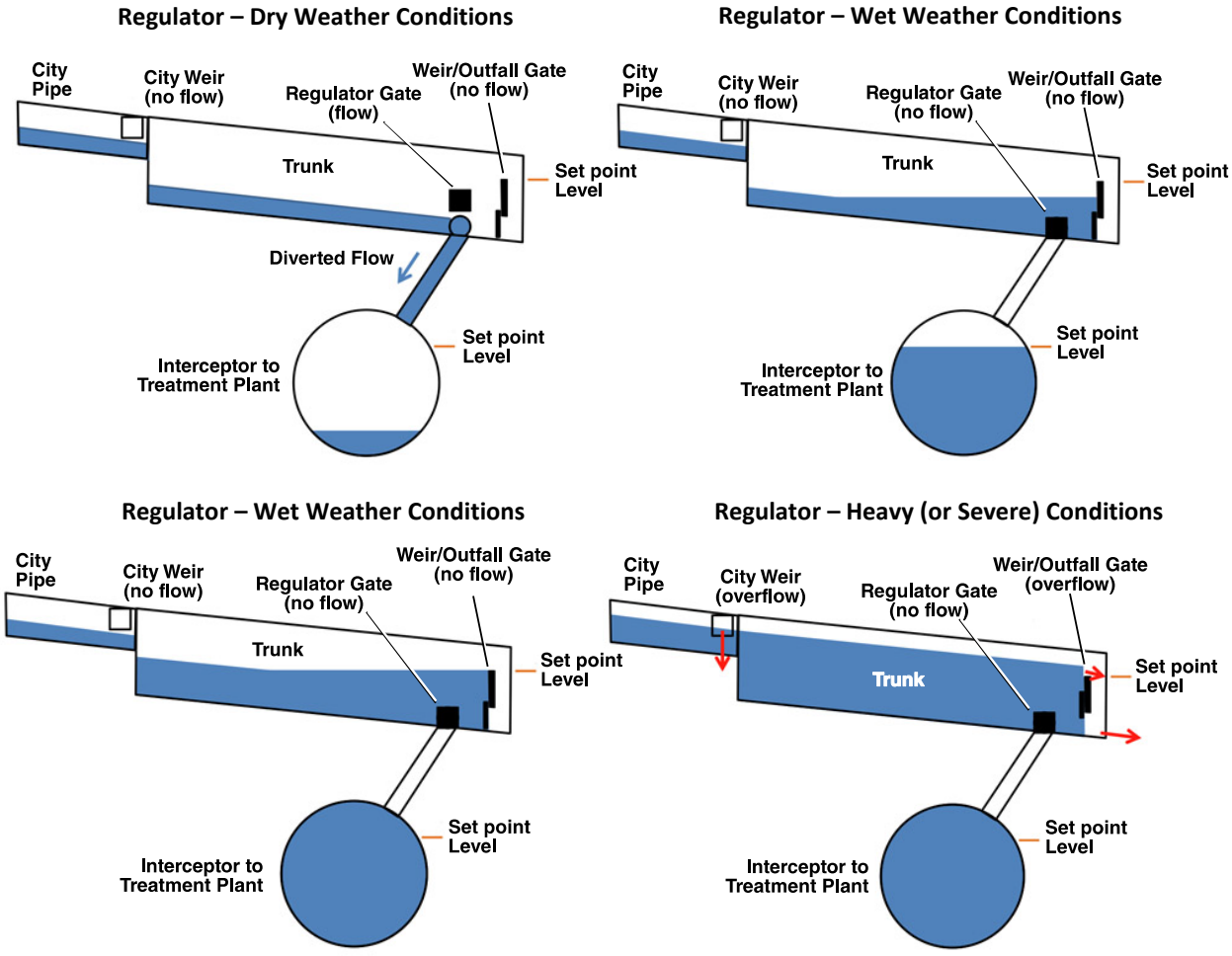


**Figure 3-8. Functions of Regulator Under Various Flow Conditions**

## Operation of West Point Treatment Plant

WTD operates its West Operations Section to maximize conveyance of wastewater and combined sewage to the West Point Treatment Plant for secondary treatment. The three flow scenarios at the West Point Treatment Plant are as follows:

- **Normal flow conditions—**West Point Treatment Plant provides secondary treatment of up to 300 MGD, defined as base flow (2.25 times the average dry-weather flow of 133 MGD).
- **Transitional flow conditions—**Flows over 300 MGD and up to a peak of 440 MGD that would otherwise overflow at points throughout the combined system are transferred to the West Point Treatment Plant for wet-weather treatment (equivalent to primary treatment). After receiving wet-weather treatment, these flows are mixed with secondary effluent for disinfection, dechlorination, and discharge from the deep marine outfall. The resulting effluent must meet secondary effluent quality limits; however, during wet-weather months the NPDES permit allows a small reduction in total suspended solids (TSS) and 5-day carbonaceous biochemical oxygen demand ($CBOD_5$) percent removal requirements.
- **Emergency bypass flow conditions—**Flows can be discharged directly to Puget Sound without receiving primary treatment, secondary treatment, or chlorination under existing conditions such as

extreme high flow from storm events where upstream storage and CSO discharge do not sufficiently control the flows coming to the treatment plant.

During high flows, there is limited wastewater storage capacity inside or outside the plant. The limited storage capacity is described as follows:

- The primary sedimentation tanks can store wastewater. (They can store wastewater only if empty before an event.) When flows are below 150 MGD, retention time is approximately 20 minutes. During high flows (400 MGD), retention time is approximately 3 to 4 minutes.
- The Fort Lawton Parallel Tunnel, Old Fort Lawton Tunnel, and other conveyance facilities can also store wastewater. When flows are below 150 MGD, these facilities provide storage time of approximately 1 to 4 hours. During high flows (400 MGD), the tunnels are full.

Local PLCs monitor local and remote conditions and adjust gate positions and pump speeds to predetermined set points and control algorithms. The set points and control algorithms have been determined over the years by hydraulic analysis and modeling to maximize conveyance to the West Point Treatment Plant and storage in pipelines and offline storage facilities while minimizing CSOs and backups.

When needed, operators at the West Point Treatment Plant's main control center can override automatic controls of certain facilities—primarily Interbay Pump Station and West Seattle Pump Station—to manage flows to and through the plant to avoid surges and oscillations and thus to protect the biological system and avoid plant shutdown. Senior operators assess a range of system factors before deciding whether to begin manual control. Factors include the direction storms come from, the speed at which flows are changing, and antecedent conditions. For example, the decision to reduce Elliott Bay Interceptor flows to the West Point Treatment Plant by manually controlling the Interbay Pump Station may be based on the following factors:

- Fremont Siphon flow is at 150 MGD and increasing.
- Either north-end rain or remaining service area rain is at or above 0.2 inch in 10 minutes.
- Weather radar indicates that rainfall will hold steady for at least 4 hours.

These factors allow the decision to manually control Interbay Pump Station to be made 3 to 4 hours before the Fremont Siphon experiences peak flows.

# 3.4 Operational Decision Hierarchy

This section describes SPU's and WTD's respective operational objectives based on their overarching principles (e.g., mission and goals). The operational objectives are used for prioritization of operational decisions of each agency's respective systems. (The joint operational objectives developed by both agencies are described later in Section 5.2.) This section satisfies the following requirements of the City of Seattle and King County Consent Decrees:

> (2.b) Methods to accommodate each agency's operational objectives while complying with their contractual obligations;
>
> (2.f) Each agency's operational decision hierarchy.

## 3.4.1 Seattle Public Utilities

Table 3-1 lists SPU's operational objectives, in order of priority and organized in the following three categories: Protect Human Health, Protect the Environment, and Convey Wastewater Flows. SPU's

operational objectives align with the joint operational objectives developed by both agencies (described in Section 5.2).

**Table 3-1. SPU's Operational Objectives**

| Category | Operational Objectives |
|---|---|
| **Protect Human Health** | |
| | 1. Prevent sanitary sewer overflows to maximum extent possible in the following priority: |
| | a. Repeat locations |
| | b. Buildings |
| | c. Streets |
| | d. Non-permitted outfalls |
| | 2. Prevent stormwater flooding that endangers health/safety in the following priority: |
| | a. Buildings |
| | b. Arterial streets and access to critical facilities |
| | c. Private property |
| | d. Residential streets |
| **Protect the Environment** | |
| | 3. Meet NPDES permit requirements. |
| | 4. Prevent overflows to the environment (sanitary sewer overflows, dry-weather overflows, CSOs, stormwater). |
| | 5. Protect sensitive areas in the following priority: |
| | a. Fresh water near swimming beaches |
| | b. All other fresh water locations |
| | c. Salt water |
| **Convey Wastewater Flows** | |
| | 6. Protect and maintain City of Seattle's infrastructure. |
| | 7. Maintain specified levels of service for drainage and wastewater to our customers. |
| | 8. Meet terms of King County agreements. |
| | 9. Minimize odors. |

### 3.4.2 King County Wastewater Treatment Division

WTD's goal is to protect public health and the environment by operating its treatment plants and conveyance system as one dynamic system to maximize the capture and treatment of service area flows, including combined sewage flow, while promoting worker and public safety. Table 3-2 lists WTD's operational objectives to meet this goal. WTD allows the system to operate based on established set points and real-time controls with manual operator intervention capabilities when needed. WTD's

operational objectives align with the joint operational objectives developed by both agencies (described in Section 5.2).

**Table 3-2. WTD's Operational Objectives**

| Operational Objectives |
|---|
| **Higher Priorities** |
| • Protect and maintain treatment plant equipment and biological system. |
| • Prevent sewage backups or overflows to buildings. |
| • Prevent sewage flows into streets. |
| • Prevent sewage flows from non-permitted overflow locations (sanitary sewer overflows [SSOs]) |
| • Meet plant NPDES permit requirements including CSO discharge requirements and effluent discharge requirements. |
| • Prevent CSOs by capturing and conveying the maximum volume of wet-weather flow, giving priority to environmentally sensitive needs. |
| • Capture and convey all dry-weather flow and prevent dry-weather overflows and SSOs. |
| • Minimize stormwater surface flooding to ensure public safety. |
| • Optimize wet-weather treatment capacity at the West Point Treatment Plant. |
| **Lower Priorities** |
| • Minimize odor problems using operations. |
| • Minimize energy (electricity) usage. |
| • Minimize settling and sedimentation in conveyance and storage facilities. |

# 4.0 Current Organizations

This chapter describes SPU and WTD organizational structures with respect to their CSO control responsibilities. This chapter also describes the roles and responsibilities of the Joint Plan team that supported the Joint Plan efforts associated with optimizing system operations and coordination. This chapter satisfies requirement (2.d) of the City of Seattle and King County Consent Decrees that requires a description of each agency's "organizational structure."

## 4.1 Seattle Public Utilities

SPU is divided into nine branches that report to the SPU director. The Drainage and Wastewater (DWW) Line of Business (LOB), Project Delivery and Engineering, and Shared Services branches are directly involved in the planning, design, construction, maintenance, and operation of SPU's drainage and wastewater collection system.

SPU has implemented a "one team" approach to project implementation to ensure that staff from each of the three branches has shared project objectives, a desire for the team as a whole to be successful, and is involved throughout the life of a project. A core member from each branch is assigned at project onset (during planning). The core members define the problem, develop the solution, deliver the project, and monitor operation. Throughout the project, they communicate about the project within their branch, so that staff at all levels can have input in the project implementation process.

Specific responsibilities of the three branches are as follows:

- **DWW LOB—**This branch is responsible for identifying, planning, and establishing budgets for SPU's drainage and wastewater capital projects. This branch is also responsible for establishing interagency agreements and coordination related to capital projects. A regulatory specialist in DWW LOB tracks SPU's compliance with permits and federal orders (such as the NPDES permit and Consent Decree requirements). DWW LOB is also responsible for the ongoing operations and maintenance of drainage and wastewater collection systems. Field crews work as teams to respond quickly to emergencies, locate and use appropriate resources, and carry out critical maintenance programs and capital improvements to keep infrastructure and assets working efficiently. DWW LOB consists of four divisions, as indicated in orange in Figure 4-1.
- **Project Delivery and Engineering—**This branch is responsible for the design and construction of the facilities identified through DWW LOB planning efforts. Project Delivery and Engineering works closely with DWW LOB throughout the design, construction, commissioning, and startup of facilities to ensure that project elements can be maintained and operated by field crews.
- **Shared Services—**This branch is responsible for supporting all three LOBs: Solid Waste, Drinking Water, and Drainage and Wastewater. Shared Services consists of the following three divisions, as indicated in orange in Figure 4-2: Planning and System Support, Emergency Management, and Utility Operations and Maintenance. The Utility Operations and Maintenance Division contains a diverse set of skills including physical maintenance of electrical infrastructure, instrumentation and control engineering, and 24/7 SPU OCC and the 24/7 Operations Response Center (ORC).

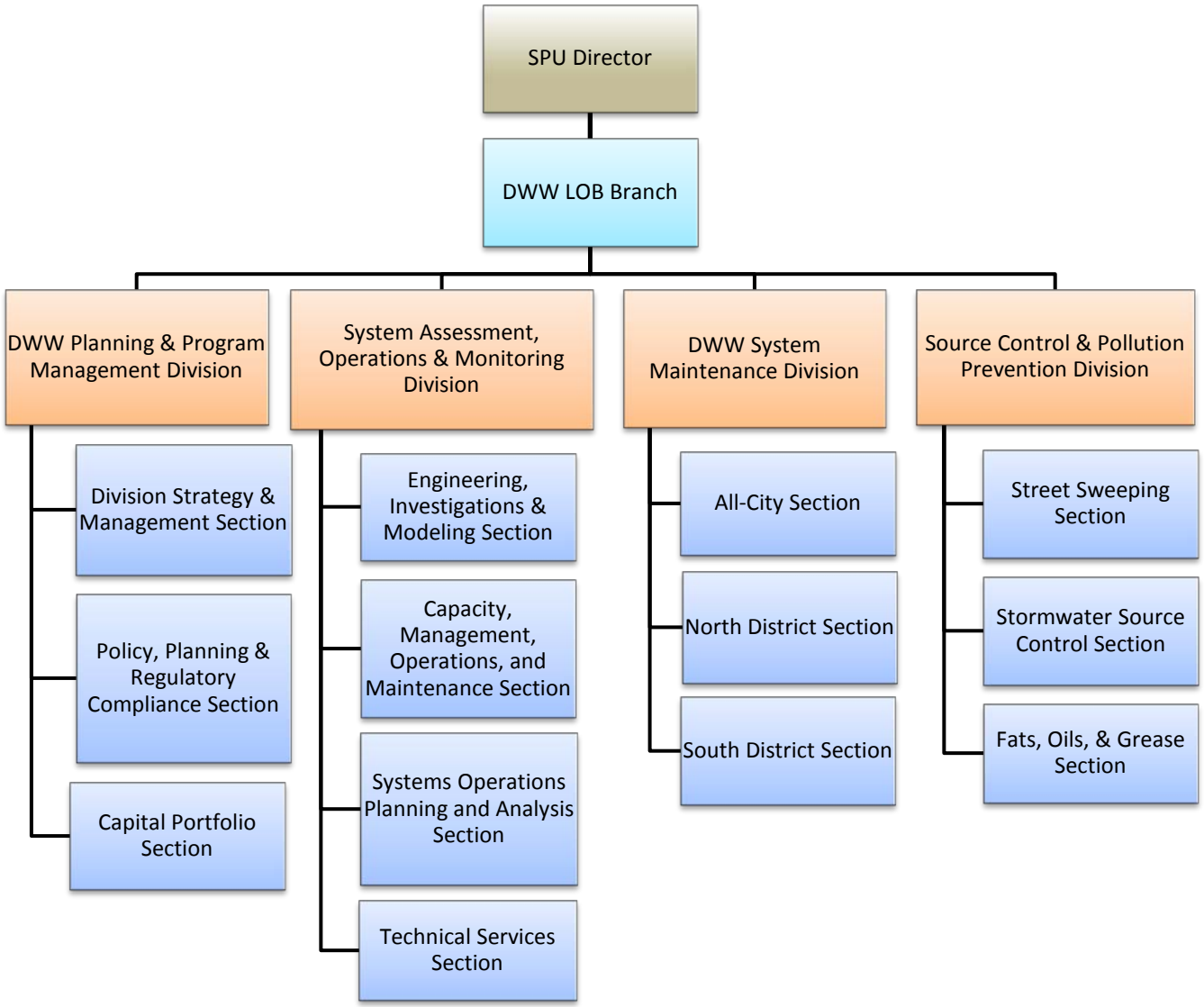


**Figure 4-1. Organization of SPU's DWW LOB Branch**

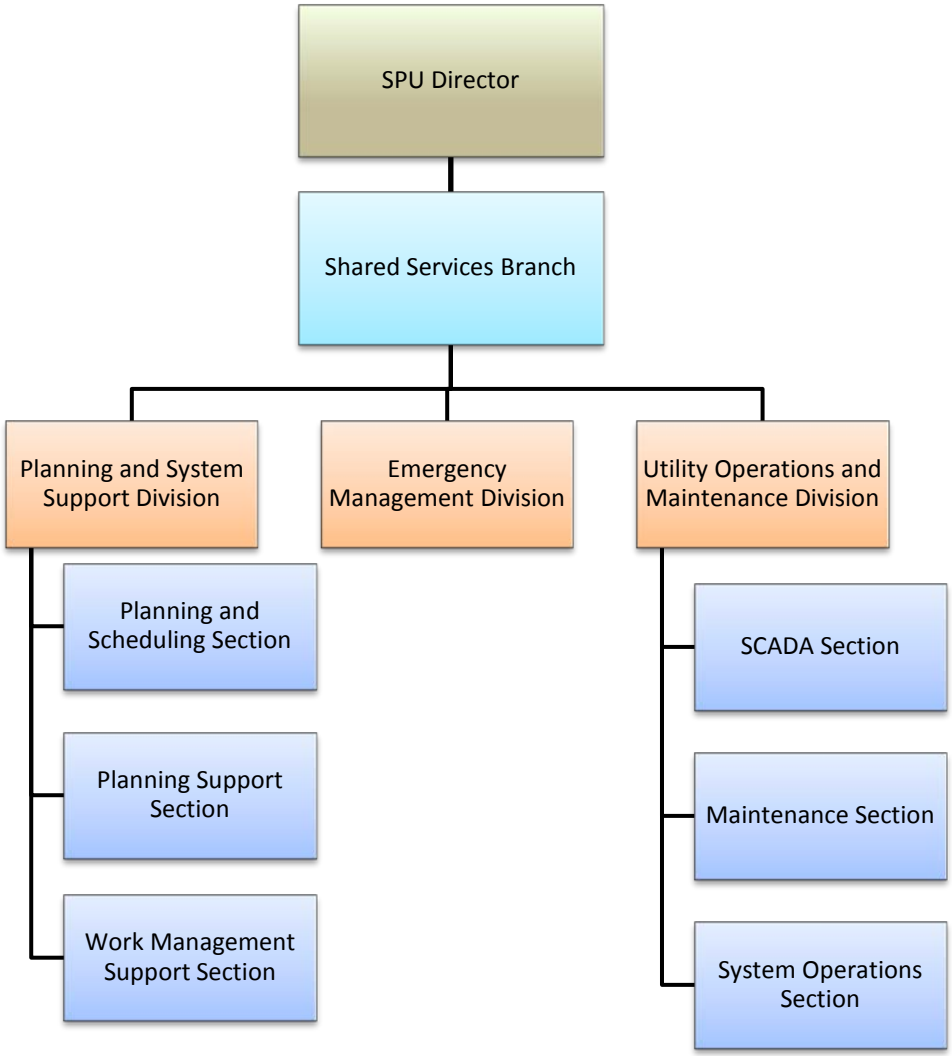


**Figure 4-2. Organization of SPU's Shared Services Branch**

Key responsibilities of the DWW LOB branch applicable to the operations and maintenance of the wastewater collection system are as follows:

- **System Assessment, Operations, and Monitoring—**This division operates CSO, stormwater, and wastewater pump station facilities. This division is responsible for operational engineering, flow monitoring, performance analysis, and operational planning.
    - **Engineering, Investigations, and Modeling**—This section focuses on developing and maintaining system models to support design and operation of SPU-owned facilities.
    - **Capacity, Management, Operations, and Maintenance—**This section focuses on eliminating sewer overflows. The section is responsible for analyzing the drainage and wastewater collection system, enhancing its understanding of the underlying reasons for system backups, and designing programs and solutions to reduce the occurrence of sewer overflows.
    - **System Operations Planning and Analysis (SOPA)—**This section focuses on assessing the performance of the DWW system. This section is responsible for the monthly and annual NPDES reporting as well as monitoring the operation of wastewater pump stations and CSO control facilities.
- **DWW System Maintenance—**This division contains managers, crew chiefs, and staff who are responsible for maintaining the drainage and wastewater assets in SPU's service area. Separate crews are responsible for each of the following activities:
    - Underground storage facilities
    - Stormwater management
    - Line and grade (pipeline maintenance)
    - First response (responds to customer complaints and emergencies)
    - Closed circuit television
    - Rehabilitation
    - Ground maintenance (landscaping)
- **Source Control & Pollution Prevention**—This division focuses on fats, oil, and grease (FOG) prevention, spill reporting, and real-time CSO notification.

Key responsibilities of the Shared Services branch applicable to the operations and maintenance of the wastewater collection system are as follows:

- **SCADA—**This section provides SPU with safe, secure and reliable 24/7 SCADA operation. This section manages and continues to develop the SCADA line of service. It is dedicated to achieving milestones on key capital improvement projects and core service delivery.
- **System Operations—**This section operates the SPU OCC and the ORC. The OCC provides 24/7 monitoring and operations of the drainage and wastewater collection system and dispatches crews to address issues that arise in the system. The ORC receives calls from customers or utility staff and dispatches the proper crew to investigate the situation. The ORC is a vital link between SPU and the public at all times.
- **Maintenance—**This section contains managers, crew chiefs, and staff who are responsible for maintaining the drainage and wastewater assets in SPU's service area. Separate crews are responsible for each of the following activities:
    - Wastewater pump stations
    - Electrical
    - Facilities maintenance
    - Machinists

- Storage maintenance
- Mechanical maintenance

- **Planning and Scheduling Section**—This section focuses on developing maintenance work orders for the wastewater collection system.
- **Work Management Support Section**—This section focuses on maintaining and using data from Maximo to help prioritize maintenance work for the wastewater collection system.

## 4.2 King County Wastewater Treatment Division

WTD's overall organization is divided into five sections (sections indicated in blue in Figure 4-3).

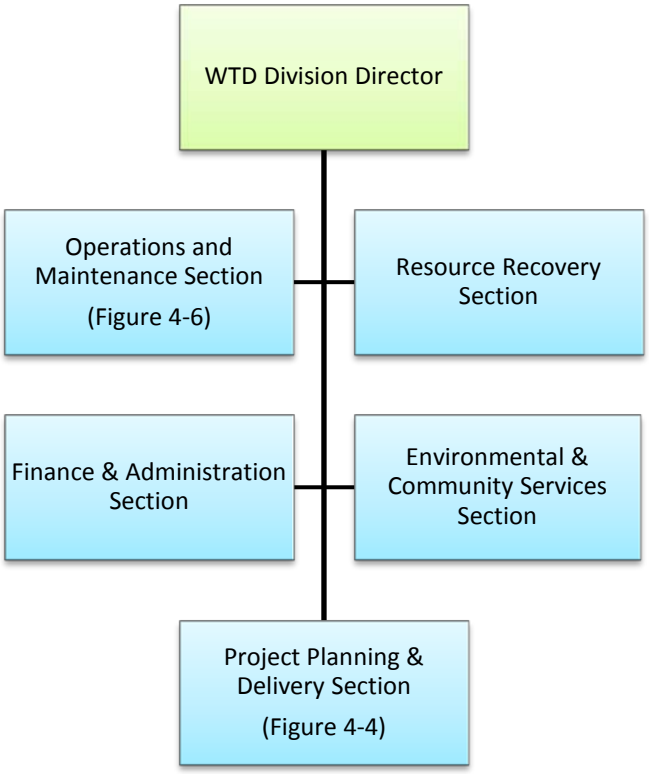


**Figure 4-3. Sections in the WTD Organization**

The Planning, Inspection, Monitoring, Modeling, and Mapping (PIM3) unit is part of the Project Planning and Delivery section (Figure 4-4). The Comprehensive Planning & GIS group in the PIM3 unit (Figure 4-5) manages the CSO Control Planning, Conveyance System Improvements, and Regional Infiltration and Inflow Control programs, defining long-range needs, developing plans, and defining individual capital improvement projects by working with staff across the division. The group reports on these programs and on the Regional Wastewater Services Plan (RWSP). Their work is supported by the other groups in the PIM3 unit (Figure 4-5).

The Environmental and Community Services section of the division has an NPDES coordinator who works with WTD operations staff on NPDES regulatory and compliance management with Ecology and EPA.

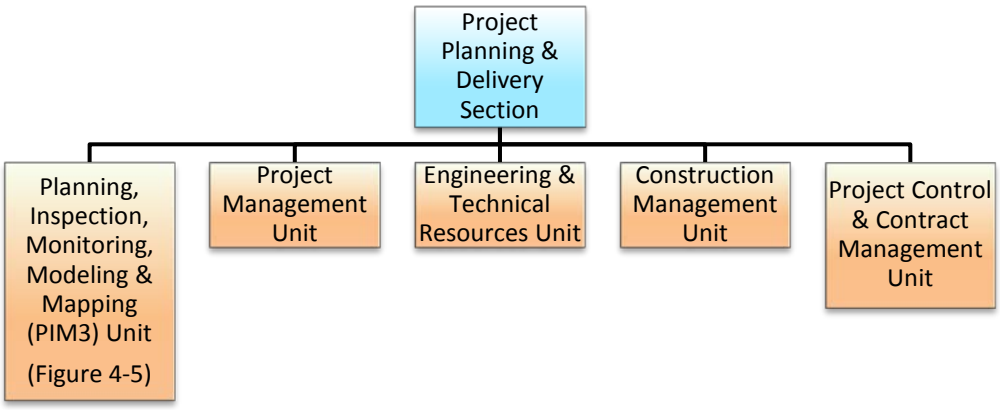


**Figure 4-4. Units in WTD's Project Planning and Delivery Section**

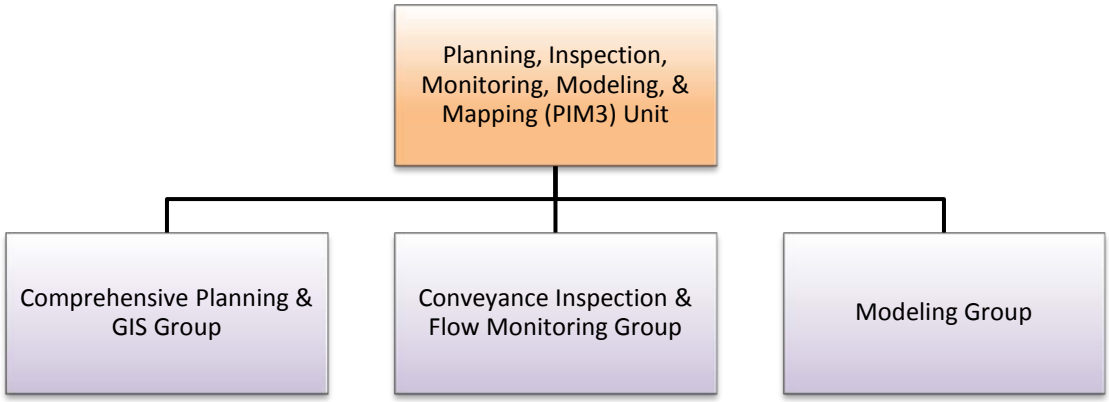


**Figure 4-5. Groups in the Planning, Inspection, Monitoring, Modeling, and Mapping (PIM3) Unit**

The Operations and Maintenance Section is responsible for the operation and maintenance of the West Point Treatment Plant and associated conveyance facilities, including WTD wet-weather treatment facilities in Seattle, as well as is responsible for operation and maintenance of other treatment plants in the system (the South, Brightwater, Vashon, and Carnation Treatment Plants), the Henderson/MLK wet-weather treatment facility, and associated conveyance facilities.

The organizational structure for the Operations and Maintenance Section is indicated in Figure 4-6. The plant managers and assistant plant managers are responsible for different functions. Plant managers are responsible for the implementation of NPDES permits and monthly and annual regulatory reporting. Offsite crews and supervisors are responsible for the operation of the wet-weather treatment facilities. The Comprehensive Planning & GIS group writes the annual reports submitted to Ecology and EPA.

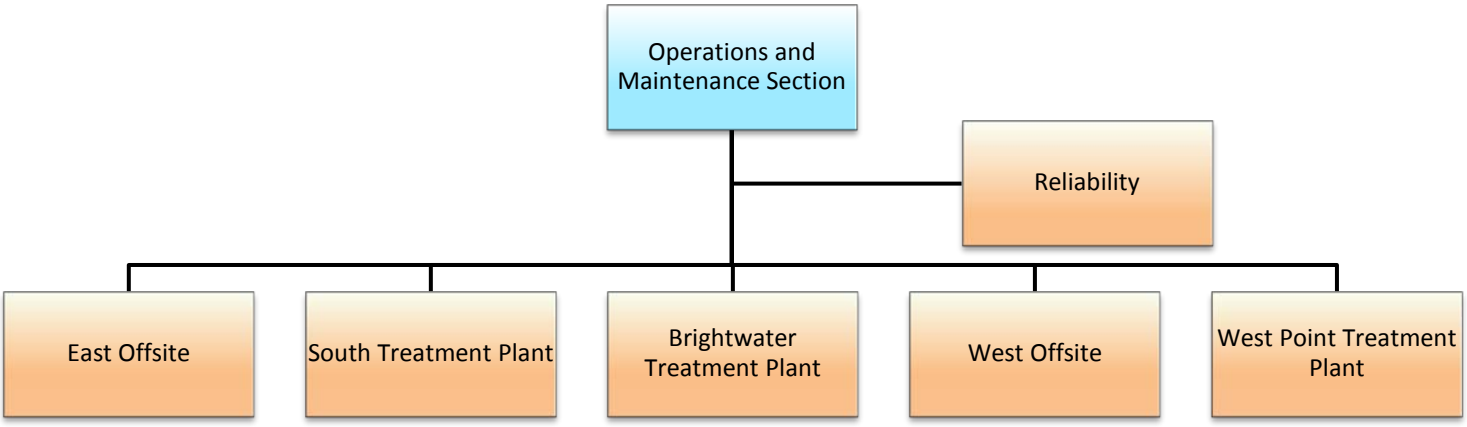


**Figure 4-6. Groups in the Operations and Maintenance Section**

## 4.3 Joint Plan Team

SPU and WTD formed a Joint Plan team, with core members assigned to deliver the work, stakeholder groups to serve as reviewers and advisors to the core members, and a joint management structure to provide direction, guidance, review, and approval of supporting efforts and deliverables. Table 4-1 includes general descriptions of the roles and responsibilities. Each agency has provided staff to support each role.

**Table 4-1. Joint Plan Team Roles and Responsibilities**

| Roles | Responsibilities |
|---|---|
| **Core Members** | |
| Project Managers | Manage scope, schedule, and budget. Regularly meet with management to discuss project status, technical challenges, and any changes necessary to the scope, schedule, and budget. |
| Technical Leads | Coordinate the recommendations and progress of the technical work to the stakeholder groups (with the Project Managers). Lead the technical aspects of the work (e.g., modeling, strategy development). |
| **Stakeholder Groups** | |
| Planning and Engineering | Assist and provide guidance to the core members. This group includes expertise related to CSO control program planning, engineering, facilities inspection, and regulatory compliance. |
| Modeling | Assist and provide guidance to the core members. This group includes expertise related to modeling efforts of each agency's systems. |
| Operations | Provide the operational expertise to inform the educational elements and development and feasibility of the operational improvements. This role is vital to the success of the project because this is an operating plan and implementation of this work will influence the future operation of both agencies' systems.<br>This group includes expertise related to systems operations, process control, conveyance, and maintenance. |

| Roles | Responsibilities |
|---|---|
| **Levels of Management Oversight** | |
| Project Directors | Provide guidance and direction to the core members. |
| Management Steering Committee | Provide direction and guidance related to project policy and resourcing and provide approval of joint commitments. |
| Agency Directors | Provide review and approval of deliverables associated with the Joint Plan effort, governance approval for changes to project scope, schedule and budget, and signatures for regulatory deliverables. |

# 5.0 Joint Operational Improvements

The intent of the joint operations planning process was for SPU and WTD to review their current structures, facilities, and operations, and assess how system operations can be improved by working together. With this goal in mind, the two agencies developed a three-year planning process to understand the interconnections between each agency's systems and operable facilities and to identify operational improvements for optimization and efficiency gains. The three-year process included the following:

- **Educational Activities**—More than 60 SPU and WTD staff (management, planners, engineers, modelers, and operators) participated in 10 educational activities. The educational activities involved facility tours and technical presentations of key operable facilities in each agency's system; see Section 5.1 for more details.
- **Joint Operational Objectives**—SPU and WTD developed a set of prioritized joint operational objectives based on each agency's overarching principles. The objectives were used to select basins to develop joint operational improvements; see Section 5.2 for more details.
- **Basin Selection**—SPU and WTD divided the combined system managed by both agencies into 13 planning basins. These basins were used as the basis of developing and evaluating joint operational improvements. SPU and WTD identified four basins with the greatest potential for optimization to identify operational improvements as part of this Joint Plan; see Section 5.3 for more details about basin selection.
- **Development of Joint Operational Improvements**—SPU and WTD developed and identified joint operational improvements to implement within the four selected basins; however, these joint operational improvements can apply to multiple basins and can be considered system-wide improvements. The identified joint operational improvements are referred to as joint commitments (described in Chapter 6.0). See Section 5.4 for more details about the development of joint operational improvements.

The joint operations planning process, as outlined above, is described in further detail in the following sections. The outcome of this planning process resulted in the SPU and WTD joint commitments described in Chapter 6.0.

## 5.1 Educational Activities

SPU and WTD facilitated and participated in numerous educational activities in 2013. These educational activities allowed both agencies to understand each other's systems, build relationships among the staff, and develop a common vocabulary. Educational activities included:

- Site visits to key facilities owned and operated by SPU and WTD (included visits to operable facilities to understand how the systems are connected and operated)
- Sharing of operational protocols and decision-making hierarchy
- Review of real-time data systems, available data, and analysis tools
- Review of historical operational performance during past storm events
- Virtual tours
- Videotaping operations of existing facilities during storms, when possible

Over 60 staff from both agencies participated in one or more of the educational activities. Participants included management, technical staff (planners, engineers, modelers), and operators. These

educational activities built relationships between SPU and WTD staff at multiple levels of their respective organizations and initiated a process to maintain these relationships.

SPU and WTD educational activities are summarized in Table 5-1.

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**Table 5-1. Educational Activity Summary**

| Educational Activity | Purpose of Activity | Participants | Photographs from Educational Activity |
|---|---|---|---|
| WTD West Point Treatment Plant, 1/30/13 | Joint Plan project kickoff meeting and site visit to share information. SPU and WTD presented an overview of their respective systems, including major interceptors, pump stations, treatment plants, CSO control facilities, and future CSO control projects. WTD operations staff also provided an overview of the WTD's upgrades within the control room, including demonstrations. | SPU and WTD operations, modeling, and planning stakeholder groups | |
| WTD Carkeek Wet-Weather Treatment Facility and Pump Station, 2/27/13 | Site visit to share information and investigate potential joint operational improvements. SPU is currently working on a project located upstream of these facilities to reduce the frequency of sanitary sewer overflows and backups (Broadview Project). WTD currently has a CSO control project in construction to the south of Carkeek Park at North Beach. | SPU and WTD operations, modeling, and planning stakeholder groups | Figure 5-1 |
| CSO Control Facility Design Standards, 3/21/13 | Technical workshop to discuss lessons learned and design challenges related to designing and constructing CSO control facilities. | SPU and WTD operations, modeling, and planning stakeholder groups | |
| SPU Madison Valley Stormwater Facilities, 3/27/13 | Site visit to share information and investigate potential joint operational improvements. The SPU Madison Valley Stormwater Facilities (East John Detention Pond, Washington Park Tank, and Harrison Street Tank) were constructed to prevent stormwater from flooding homes in this neighborhood. There may be opportunities for detaining additional stormwater in the upstream basins to potentially reduce the size of the future downstream SPU and WTD CSO control facilities. | SPU and WTD operations, modeling, and planning stakeholder groups | Figure 5-2 |
| Commissioning Coordination, 4/30/13 | Technical workshop to share WTD's facility commissioning process with SPU, discuss lessons learned, and build cross-agency relationships to support commissioning efforts for future CSO control facilities. | SPU and WTD operations, modeling, and planning stakeholder groups | |
| WTD Elliott West Wet-Weather Treatment Facility and Pump Station, 4/30/13 | Site visit to the WTD's Elliott West Wet-Weather Treatment Facility and Pump Station to understand its function within the SPU and WTD systems. This facility is the most recent example of a large SPU/WTD joint facility operated by WTD. | SPU and WTD operations, modeling, and planning stakeholder groups | Figure 5-3 |
| Outfalls Coordination, 5/15/13 | Technical workshop for SPU and WTD to share their experiences with CSO outfall rehabilitation and maintenance, discuss lessons learned, and build cross-agency relationships to support future challenges with the permitting and execution of in-water work. | SPU and WTD operations, modeling, and planning stakeholder groups | |
| SCADA Data Sharing and Control Center, 6/5/13 | Technical workshop to discuss data sharing between existing and planned SPU and WTD SCADA systems and how data and information could be used in joint operational decision making. | SPU and WTD operations, modeling, and planning stakeholder groups | |
| WTD King Street Odor Control Facility, 7/10/13 | Site visit to WTD's King Street Odor Control Facility. SPU is in the process of designing and constructing odor control facilities for the Windermere, Genesee, and Henderson CSO control projects; this activity provided an opportunity to share information and gain lessons learned from WTD related to odor control and other operational challenges at its King Street Odor Control Facility. | SPU and WTD operations, modeling, and planning stakeholder groups | |
| SCADA Data Sharing and Control Center, 8/22/13 | Technical workshop to further discuss strategies for sharing of operational information between SPU and WTD, including description of concepts, benefits and constraints, and staff resources. | SPU and WTD operations, modeling, and planning stakeholder groups | |
| SPU Delridge, Genesee, and Windermere CSO Control Projects, 8/27/13 | Site visit to the Delridge, Genesee, and Windermere project sites to discuss changes to the system, construction challenges, and impacts to WTD. Delridge, Genesee, and Windermere are three in-progress SPU CSO control projects. | SPU and WTD operations, modeling, and planning stakeholder groups | Figure 5-4 |

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**Figure 5-1.** Stakeholders inside the motor room of the Carkeek Pump Station

**Figure 5-2.** SPU Madison Valley Stormwater Facilities

**Figure 5-3.** WTD Elliott West Wet-Weather **Treatment Facility and Pump Station**

**Figure 5-4.** **SPU Genesee Construction Site**

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## 5.2 Joint Operational Objectives

SPU and WTD produced a shared set of prioritized operational objectives based on the agencies' overarching principles, such as mission and goals. These joint operational objectives were developed by a team of stakeholders from both agencies and were approved by each agency's division directors. These objectives represent a common understanding and appreciation for each agency's objectives, goals, and challenges which provides a framework for operational decision making. This section satisfies the following requirements of the City of Seattle and King County Consent Decrees:

(2.b) Methods to accommodate each agency's operational objectives while complying with their contractual obligations;
(2.c) Shared operational objectives for the City of Seattle and King County's combined systems.

The prioritized joint operational objectives are listed in Table 5-2.

**Table 5-2. Joint Operational Objectives**

| Category | Joint Operational Objective [a] |
|---|---|
| **Protect human health** | |
| | Objective #1 – Prevent sewage backups (SSOs) into buildings. |
| | Objective #2 – Prevent sewage overflows into non-permitted locations (e.g., SSOs, streets, parks), which includes dry-weather overflows, which are not permitted. |
| | Objective #3 – Protect West Point Treatment Plant and its biological systems so that it remains operational at all times. |
| | Objective #4 – Prevent stormwater surface flooding that endangers public health and safety. |
| **Protect and enhance the environment** | |
| | Objective #5 – Prevent CSOs by maximizing the capture and conveyance of wet-weather flow, giving priority to environmentally sensitive areas. |
| | Objective #6 – Maximize the volume of wet-weather flow exposed to secondary treatment while protecting West Point Treatment Plant's biological system and meeting effluent discharge requirements. [b] |
| | Objective #7 – Maximize the volume of wet-weather flow exposed to primary treatment (West Point Treatment Plant and wet-weather treatment facilities) and meet effluent discharge requirements. [b] |
| **Manage ratepayer investments wisely** | |
| | Objective #8 – Protect and maintain SPU's collection system, WTD's regional wastewater conveyance system, West Point Treatment Plant equipment, and wet-weather treatment facilities equipment. |
| | Objective #9 – Minimize energy usage in the collection, conveyance, and treatment of combined sewage flows. |

[a] Sources of information for joint operational objectives include WTD's Balanced Score Card, SPU's Strategic Business Plan 2009-2014, WTD's Operational Plan Objectives, and past communication with agency operations staff.
[b] Other permit requirements are not included because there are many permit requirements that are not related to joint operations. The team identified elements of the permit requirements that relate to joint operations.

## 5.3 Basin Selection

SPU and WTD selected four basins in the SPU and WTD systems as the basis for developing joint operational improvements. SPU and WTD delineated 13 basins to prepare for basin evaluation (Figure 3-1). Basins were delineated based on WTD's conveyance system because it collects all SPU flows. Basin delineation was also based on hydrologic and hydraulic parameters, potential for operational improvements, location of significant operable facilities, and input from technical staff. SPU and WTD prioritized the basins based on alignment with joint operational objectives (Section 5.2) and the following evaluation criteria:

- Are there benefits to both agencies?
- Are there operable facilities through 2016?
- Are there community issues that are not addressed by other projects?
- Are there any projects in planning?
- Are there models built and ready to implement?
- Freshwater or saltwater receiving water body?
- Potential for improvement that could most easily maximize flow to wastewater treatment plant?

From this process, SPU and WTD selected the following four basins in October 2013 to prioritize development of joint operational improvements (shown in Figure 3-1):

- West Duwamish
- SODO
- Montlake
- University

In an effort to optimize resources and achieve the greatest benefit for operational optimization, SPU and WTD initially focused on these four basins. The initial intent was that the remaining basins would be evaluated as part of future updates of the Joint Plan; however, during the development of the joint operational improvements, it became evident that the operational improvements identified in the four basins applied to multiple basins and were considered system-wide operational improvements. These joint operational improvements (described further in Chapter 6.0) will improve overall system operations and coordination. In the future, additional basin-specific and system-wide operational improvements will be identified through implementation of the joint commitments identified in this plan and the extensive SPU and WTD coordination efforts.

## 5.4 Development of Joint Operational Improvements

Early in 2014, the team held four workshops to brainstorm joint operational improvements in each of the four basins. Representatives from planning, modeling, operations, and other areas of SPU and WTD attended. The purposes of the workshops were to:

- Understand the historical performance of the wastewater collection system in the basin during peak flow conditions with respect to the joint operational objectives (Section 5.2). The team reviewed existing challenges (e.g., CSOs, and SSOs) and how the existing facilities and systems performed during specific historical storms to identify potential joint operational improvements.
- Brainstorm operational changes and improvements that may improve the performance of the wastewater collection system in the basin during peak flow conditions.

The core members, modelers, and operations staff from both agencies evaluated and selected joint operational improvements by considering level of benefit (to be achieved by implementation of the

improvement) and effort (to analyze the improvement, not implement). Based on the evaluation, the core members identified joint operational improvements to include as part of this Joint Plan. The operational improvements were presented to the Joint Plan management steering committee and to SPU and WTD directors in August 2014 for review and approval. The process resulted in a list of six joint operational improvements, referred to as joint commitments. These joint commitments are multi-basin/system-wide operational improvements and are described in further detail in Chapter 6.0.

# 6.0 Joint Commitments

This chapter describes the joint commitments that SPU and WTD are planning to or already have begun implementing as part of this Joint Plan. These represent areas of collaboration to improve or optimize operations for both agencies. The work and collaboration described below has already begun and will continue into the next Joint Plan cycle.

## 6.1 Joint System Event Debrief Committee

SPU and WTD formed an interagency committee for preparing for the wet season and debriefing after major storm events to exchange information, review and update emergency communication protocols between the agencies, discuss meteorological data, evaluate CSO performance, and assess operational decision impacts on the combined system. While each agency currently has its own internal processes for debriefing after storms, the joint committee leverages the staff expertise at SPU and WTD for evaluating major storms, hydraulic connections, and associated operational impacts to understand the performance of the system and identify actions that can improve system coordination and performance during storm events.

The committee is comprised of SPU and WTD staff with expertise in flow monitoring, NPDES permit compliance, meteorology, operations, modeling, and the CSO control program. The committee began meeting following major storm events in 2014.

This committee also meets annually prior to the wet season to prepare SPU and WTD staff for the upcoming wet season. Topics at the pre-season meeting may include the following:

- Updating and exchanging general information on staffing (confirming staff and contact information)
- Reviewing and updating emergency communication protocols between the agencies
- Sharing meteorological forecasting methods
- Developing strategies for interagency operations communication
- Describing equipment or facility/technology changes that have recently occurred that may impact system operations during the upcoming wet season
- Summarizing lessons learned during prior wet season to inform strategies for upcoming wet season
- Sharing designs, operational strategies, and monitoring data available from any new or retrofitted CSO control facilities (and any planned improvements)

## 6.2 Data Sharing

Data sharing is essential to joint operations and system optimization. To support the implementation of data sharing, SPU and WTD have formed the Joint Operations Information Sharing Team (JOIST), implemented a pilot project for sharing real-time SCADA data in one basin, developed data sharing protocols, and have committed to improve regional ability to forecast storms and rainfall intensities. These initiatives are expanded upon in subsequent sections. This section satisfies requirement (2.h) of the City of Seattle and King County Consent Decrees, which requires that the agencies describe “real-time communication plan/protocols.”

### 6.2.1 Joint Operations Information Sharing Team (JOIST)

As part of the development of the Joint Plan, SPU and WTD established the JOIST, a joint committee that meets regularly (approximately quarterly) to share information. This committee was established to fill the need for ongoing communication about operational efforts and planned changes. The committee discussions include:

- Existing activities by SPU and WTD that affect operations of the wastewater and stormwater systems (e.g., pump station set points and operation)
- Planned activities by SPU and WTD that affect the operations of the wastewater and stormwater systems (e.g., pump replacement, HydroBrake adjustments)
- Integrating joint operational considerations into capital projects (e.g., proposed changes in flow rates, proposed changes in storage or flow transfer volumes)

This committee is an open forum where questions can be asked, expert knowledge shared, and ideas discussed to inform operational components of existing and planned activities. The intended operational benefit from the JOIST is that potential adverse impacts of one agency's activities on the other can be minimized; and opportunities for improved system operations can be identified, evaluated, and incorporated into existing operations or capital projects.

### 6.2.2 Data Sharing Protocols

Currently, SPU and WTD have their own specifications, standardization, and protocols related to how data collection equipment is selected, calibrated, maintained, and reviewed, and each agency has its own SCADA system, protocols, and quality requirements.

As part of the development of this Joint Plan, SPU and WTD have a committee that works together to understand the process and procedures currently implemented by each agency for data collection, standards, reporting, data use, and quality assurance/quality control (QA/QC). SPU and WTD continue to explore potential levels of data sharing with the goal of increasing data sharing between the agencies. SPU and WTD currently collect the following types of data; both agencies are committed to establishing protocols for sharing of these data:

- Precipitation and rain gauges
- Wastewater pump stations and treatment plants
- CSO monitoring
- Temporary flow monitoring in systems

SPU and WTD have defined the following related to data sharing protocols:

- Identified "gate keepers" at each agency that are responsible for formalizing, prioritizing, and tracking data requests.
- Researched feasibility of using SharePoint website to exchange data files.

Sharing data will help improve data-driven decisions and improve monitoring and modeling efforts, which will lead to improved operational performance and communications.

### 6.2.3 Real-Time Data Sharing

SPU and WTD implemented a pilot project for sharing of real-time SCADA data in the SPU Windermere CSO basin and WTD's Belvoir Pump Station. This is the first time that the two agencies' SCADA systems

have been connected, and the first time that staff has had access to real-time data from both systems. The data is exchanged through each agency's SCADA system from a shared line. The project framework and agreements were defined in a memorandum of agreement (MOA) between SPU and WTD for a pilot trial period of approximately three years, beginning in 2014. This data consists of near real-time SCADA data from level sensors, flow monitors, rain gauges, and pump run indicators. Although there are a few small technical issues to resolve, the project is considered a success because both agencies are benefitting from the shared data.

Each agency has expressed a desire to advance the pilot to the next level to allow use of the information to inform real-time operational decisions, and to consider adding more basins or facilities. SPU and WTD are committed to allowing the pilot project to continue for three more years to test the protocols and improve data communications and quality. If agreed to, SPU and WTD will expand the MOA to allow for sharing of real-time SCADA data in other basins and pump stations as new facilities come online.

### 6.2.4 Rainfall and Other Data

SPU and WTD are committed to improve the regional ability to forecast storms and rainfall intensity. Continuing support and increased data will allow for improved forecasting and potential use of data by operations centers at SPU and West Point Treatment Plant main control to optimize system capacity prior to a higher intensity cell moving over specific portions of the service area. Improved forecasting will allow tailoring operations to specific storm forecasts and will likely lead to better timing of storage utilization and release to reduce CSOs in both the SPU and WTD systems.

Improved short-term predictive forecasting can be achieved by increasing the density of rain gauges in the region and expanding the use of computer modeling. Improved forecasting will provide the following benefits:

- Increased forecasting accuracy of where and when storms will impact the regional and local wastewater systems
- Ability to predict where and when to store flows in the system
- Advance warning of storms with enough time to deploy staff to start up key facilities, such as stormwater and wet-weather treatment facilities
- Increased ability and reliability of real-time predictive controls for storage facilities

## 6.3 Joint Modeling Coordination Committee

SPU and WTD established the Joint Modeling Coordination Committee, which meets regularly to review modeling efforts by both WTD and SPU, share tools, and provide feedback on whether and how models might be improved. The purpose of the committee is to:

- Improve and inform each agency's modeling efforts to enable a common understanding of projects, modeling assumptions, and predicted flows/ impacts to the SPU and WTD systems;
- Improve understanding of each agency's modeling methodologies, assumptions, results and, where required, reach agreement on key modeling approaches;
- Discuss current modeling efforts to build on each agency's knowledge and expertise;
- Develop stronger working relationships between agency modeling staff; and
- Improve efficiencies through better coordination efforts and sharing information.

## 6.4 Coordination during Startup and Commissioning of CSO Control Facilities

SPU and WTD developed an approach to coordinate and share knowledge and information regarding the commissioning of CSO control facilities. SPU and WTD identified the following activities to support startup and commissioning of CSO control facilities:

- **Document review**—Provide relevant documents for the other agency to review during the planning and design phases of the CSO control project, as appropriate. Documents will be available on the JOIST SharePoint site.
- **Attendance at commissioning meetings**—Invite other agency to attend meetings to provide opportunities for sharing of experiences and knowledge and to improve communication regarding operation of these new facilities.
- **Implementation**—SPU and WTD will implement data sharing and coordination once new CSO control facilities are operational to optimize system operations.

This approach has already been used during the startup and commissioning of SPU's Windermere, Genesee, Delridge, and South Henderson CSO control facilities. This approach will be used for the startup and commissioning of future SPU and WTD CSO control facilities.

## 6.5 Real-Time CSO Notification

SPU and WTD will update and expand their current practices for providing real-time CSO notification to the public, including both onsite and website notifications. The agencies are committed to improving notifications for the following reasons:

- Protecting public health and safety by improving SPU and WTD's ability to communicate CSO discharge status to the public in real-time
- Increasing public awareness of CSOs, so that recreational contact can be reduced during CSO discharges
- Increasing social equity as a result of simplified website language and providing language translations on signage
- Improving real-time CSO discharge status data sharing between SPU and WTD
- Consistent messaging to the public across both agencies

Currently, SPU and WTD have signs located near all CSO outfalls that identify the CSO outfall and provide phone numbers to call for more information or to determine current CSO discharge status. WTD also hosts a notification website that provides the real-time status of SPU and WTD CSO outfalls.

### 6.5.1 Onsite Notification

SPU and WTD will explore the following strategies for improving onsite notifications near CSO outfalls:

- Updating sign content to include a link to the real-time CSO notification website
- Including written content on signs with up to two additional languages
- Including double-sided signs (or two signs) where the public is likely to access the water near a CSO outfall by either land or water
- Determining if phone number contact information is useful

  - If a phone number is still used, determining if there is a more cost-effective automatic system for the phone number listed on the sign that can either (1) link the phone call to a specific CSO outfall location and/or (2) provide a text response on CSO discharge status

- Determining if posters can be placed in local shops and areas tied to water recreational activities

SPU and WTD will replace all signage based on the outcome of strategies evaluated.

### 6.5.2 Website Notification

Website notification covers the web-based real-time CSO discharge status notification currently hosted by WTD. The current website is a static map showing all SPU and WTD CSO outfall locations and whether they are overflowing, not overflowing, or have overflowed within the last 48 hours.

SPU and WTD will explore the following strategies for improving website notifications:

- Developing a new interactive map that includes details about each CSO outfall location, information technology (IT) requirements, and additional text and language translations
- Determining the cause of lag in CSO discharge status information from SPU and how to provide real-time SPU CSO discharge status data for integration into the interactive map
- Determining usefulness of an email notification system
- Developing a smartphone application for CSO discharge notification

## 6.6 Reduce Saltwater Intrusion

SPU and WTD will continue to work together to update their analyses and plans to reduce saltwater intrusion into the combined system and will meet every three years to collaborate on this effort. The update will identify vulnerable locations, level of risk, and recommended corrective actions to prevent intrusion. Identifying and reducing saltwater intrusion into the local and regional system will reduce expenses by decreasing unintended inflow, reducing corrosion to infrastructure, and protecting the West Point Treatment Plant.

# 7.0 Joint Operations in Capital Planning

This chapter describes the efforts and framework that the agencies have established to satisfy requirement (2.j) of the City of Seattle and King County Consent Decrees, which requires that the agencies develop "a process for incorporating the Joint Plan into the design of new capital projects for the combined system, including the City of Seattle and King County CSO Long-term Control Plans."

This chapter also satisfies requirement (2.g) of the City of Seattle and King County Consent Decrees, which requires that the Joint Plan describe "identified CSO control facilities, if any, that may be beneficial to jointly operate and/or monitor."

Currently, each agency operates its own facilities. There are no existing or proposed facilities that are jointly operated by both agencies, but SPU and WTD have a long history of coordinating on capital improvement projects as part of their CSO long-term control plan efforts. This capital coordination will continue as WTD updates and amends its CSO long-term control plan, and each agency conducts project-specific planning of the projects in its approved CSO long-term control plan. Consideration of joint operations is part of this coordination. For example, agencies have shared data and information to support operational decisions associated with the other agency's existing facilities and capital improvement projects. The agencies have developed a framework for incorporating joint operations into new capital improvement projects. The framework includes the following:

- Established the JOIST, which is one of the joint commitments described in Section 6.2.1. This team meets regularly (approximately quarterly) to discuss existing and planned activities that affect the operations of existing facilities and integrating joint operational considerations into capital improvement projects (e.g., proposed changes in flow rates, storage, or flow transfer volumes). Meeting topics have included operational considerations in the design of CSO storage tanks, odor control facilities, tipping bucket design, and SCADA systems. The JOIST is now an established team where design and operational information is regularly shared and documented.
- Established a joint startup and commissioning team that leverages expertise from both agencies, which is one of the joint commitments described in Section 6.4. This operational team works with the capital improvement project team as the project nears construction completion to review the operational manuals, operational logic, and training to ensure a coordinated startup and commissioning of all CSO control facilities.
- Collaboration on joint capital improvement projects, such as the Ship Canal Water Quality Project, through a joint operations task force that reviews project designs, flow management strategies, operational control strategies, and equipment selection to ensure that operational consideration is incorporated.
- Collaboration on agency-specific capital improvement projects as both agencies implement their respective CSO long-term control plans. Coordination and communication will occur from planning through operations at project-specific and subject matter expert meetings. Operations from both agencies will be involved in the review of appropriate documents to ensure coordinated operations planning is included in agency-specific capital improvement projects.

# 8.0 Process for Future Updates of Joint Plan

This chapter satisfies requirement (2.k) of the City of Seattle and King County Consent Decrees, which requires "a process for updating the Joint Plan every three years."

This Joint Plan documents the initial efforts and joint commitments identified by SPU and WTD to optimize current system operations. Implementation of these joint commitments improves overall SPU and WTD coordination. Rather than limiting identification and evaluation of potential operational improvements to a three-year planning cycle, SPU and WTD will continue to identify and evaluate basin-specific and system-wide operational improvements through the Joint System Event Debrief Committee, JOIST, startup and commissioning, and other joint commitments and coordination efforts.

SPU and WTD will continue to coordinate and improve system operations by implementing the joint commitments and will review the Joint Plan every three years and update the plan as necessary with new information and any new joint commitments identified (e.g., evaluations of new initiatives or operational improvements). In addition to updating this Joint Plan every three years, SPU and WTD will:

- Include a status update of joint commitments and initiatives in the annual CSO reports submitted to Ecology and EPA required by both agencies' Consent Decrees.
- Create a tracking system to document the progress and status of all joint commitments between the two agencies.
- Educate staff from both agencies on the joint commitments defined in this Joint Plan, as well as any new initiatives and operational improvements identified through the continued, long-term coordination.
- Coordinate and work together to fulfill their Consent Decree requirements.