King County
Department of Natural Resources and Parks
Wastewater Treatment Division
King Street Center, KSC-NR-0500
201 South Jackson Street
Seattle, WA 98104-3855

July 31, 2020

Laura Fricke
Municipal Unit Supervisor
Washington State Department of Ecology
Northwest Regional Office
3190 160th Avenue, SE
Bellevue, WA 98008

Thomas Mariani
Chief, Environmental Enforcement Section
Environmental and Natural Resources Division
U.S. Department of Justice
P.O. Box 7611
Washington, D.C. 20044

Robert Grandinetti
NPDES Compliance
U.S. Environmental Protection Agency, Region 10
Office of Compliance and Enforcement
309 Bradley Blvd., Suite 115
Richland, WA 99352

Ronald Lavigne
Assistant Attorney General, Ecology Division
Office of the Attorney General of Washington
P.O. Box 40117
Olympia, WA 98504

Edward Kowalski
Director, Office of Compliance and Enforcement
U.S. Environmental Protection Agency, Region 10
1200 Sixth Ave., Suite 900
Seattle, WA 98101

Kevin Wright
Chief of the Civil Division
King County Prosecuting Attorney's Office
King County Courthouse
516 Third Avenue, Room W400
Seattle, WA 98104

Mark Pollins
Director, Water Enforcement Division
Office of Civil Enforcement
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue NW
Mail Code: 2243-A
Washington, D.C. 20460

Shawn McKone
Municipal Facility Manager
Washington State Department of Ecology
Northwest Regional Office
3190 160th Avenue SE
Bellevue, WA 98008

RE: King County 2019 Combined Sewer Overflow (CSO) Control Program Consolidated Annual Consent Decree and NPDES Report

Dear Sir/Madam:

In accordance with the reporting requirements in Section VIII of the Consent Decree, Civil Action No. 2:13-cv-677, enclosed is King County's CSO Control Program Consent Decree Annual Report, dated July 2020. The report addresses the County's CSO control project and compliance activities from January through December 2019.

Under King County's National Pollutant Elimination Discharge System (NPDES) permit WA-002918-1 S18.B.2. and Washington Administrative Code (WAC) 173-245-090(1)(a)-(c), the County also submits a CSO control program annual report to the Washington State Department of Ecology. This report documents CSO control program activities for calendar year 2019.

Previous reports are available on the County's CSO control program website at: http://www.kingcounty.gov/services/environment/wastewater/cso/library/annual-reports.aspx

With agreement of the U.S. Environmental Protection Agency and Washington State Department of Ecology, this report responds to the reporting requirements of the Consent Decree (§ VIII, paragraph 43), WAC, and NPDES permit in a single document.

Thank you for your review of the King County 2019 Annual CSO and Consent Decree Report. If you have any questions or would like additional information, please contact me at 206-477-4601 or Mark.Isaacson@kingcounty.gov.

Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision, in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

DocuSigned by:
Mark Isaacson
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7/30/2020

Mark Isaacson, Division Director
Wastewater Treatment Division
King County Department of Natural Resources and Parks

Date

cc: Verna Bromley, Senior Deputy Prosecuting Attorney, King County Prosecuting Attorney's Office
Jeff Lafer, NPDES Permit Administrator, Wastewater Treatment Division (WTD), Department of Natural Resources and Parks (DNRP)
Susan Kaufman-Una, Project Resources Unit Manager, WTD, DNRP
Janice Johnson, CSO Program Manager, WTD, DNRP

Combined Sewer Overflow Control Program

2019 Annual CSO and Consent Decree Report

July 2020

For comments or questions, contact:
Janice Johnson
King County Wastewater Treatment Division
201 S Jackson St.
KSC-NR-0503
Seattle, WA 98104-3855
206-477-5624
janice.johnson@kingcounty.gov

Alternative Formats Available
206-684-1280 TTY Relay: 711

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List of Abbreviations and Acronyms

BMPs	best management practices
CD	consent decree
County	King County
CSO	combined sewer overflow
DNRP	Department of Natural Resources and Parks
DOJ	Department of Justice
DSN	discharge serial number
DWO	dry weather overflow
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ERTS	Environmental Report Tracking System
FOG	fats, oils, and grease
GSI	green stormwater infrastructure
HLKK	Hanford/Lander/King/Kingdome
hr	hour
HWMP	Hazardous Waste Management Program
JOIST	Joint Operations Information Sharing Team
JPA	joint project agreement
L	liter
LTCP	long-term control plan
Metro	Municipality of Metropolitan Seattle
MG	million gallons
MGD	million gallons per day
µg/L	Micrograms per liter
ml	milliliter

MLK	Martin Luther King
MOA	memorandum of agreement
WQA/MS	water quality assessment/monitoring study
NPDES	National Pollutant Discharge Elimination System
NTP	notice to proceed
O&M	operations and maintenance
PCMP	Post-Construction Monitoring Plan
Plan	Clean Water Plan
PS	Pump station
RCW	Revised Code of Washington
RWSP	Regional Wastewater Services Plan
SBS	sodium bisulfite
SCADA	supervisory control and data acquisition
SCIP	Source Control Implementation Plan
Seattle	City of Seattle
Ship Canal	Lake Washington Ship Canal
SMP	Sediment Management Plan
South Plant	South Treatment Plant
SPU	Seattle Public Utilities
SS	settleable solids
SSO	sewer overflow
SSOP	Sewer System Operations Plan
TRC	total residual chlorine
TSS	total suspended solids
TEPS	tunnel effluent pump station
UIC	underground injection control

VFD	Variable frequency drive
WAC	Washington Administrative Code
WTD	Wastewater Treatment Division
WWTS	wet weather treatment station

1 Introduction

King County's (County) Wastewater Treatment Division (WTD) is responsible for managing the County's regional wastewater system, which consists of both separate and combined systems. WTD prepares annual reports for the combined portion of its system, which includes its Combined Sewer Overflow (CSO) Control Program. This annual report fulfills requirements under the National Pollutant Discharge Elimination System (NPDES) permit for the County's West Point Treatment Plant (WA0029181) in Seattle and requirements in Washington Administrative Code (WAC) 173-245-090. King County submits these reports to the Washington State Department of Ecology (Ecology). The NPDES permit for West Point Treatment Plant (West Point) was renewed on December 19, 2014 and became effective on February 1, 2015. The application for renewal of the NPDES permit for West Point was submitted in January 2019. The current NPDES permit expired on January 31, 2020, and Ecology has not yet completed renewal of the permit. The current permit has been administratively extended until renewal occurs.

On July 3, 2013, a Consent Decree (CD), Civil Action No. 2:13-cv-677, between the U.S. Department of Justice (DOJ), U.S. Environmental Protection Agency (EPA), Ecology, and King County was finalized. Section VIII of the CD requires submittal of an annual report detailing implementation of the CD. With agreement from EPA and Ecology, beginning with the 2014 annual report, the CSO and CD annual reports were consolidated into one report. This annual report meets the CD, WAC, and NPDES requirements.

CSO control is important to King County because CSOs are a recognized source of water pollution that can result in temporary increases in bacterial counts, aesthetic degradation of shorelines, long-term adverse impacts on sediment quality at discharge points, and raised public health concerns in areas where there is potential for human contact. Protection of water quality and compliance with environmental regulations are top priorities for King County.

WTD staff are provided with ongoing trainings and briefings to ensure they are able to fully meet the required milestones and actions of the CD. WTD has a team dedicated to coordinating the completion of the required milestones, and to provide division-wide communication on the CD to ensure everyone works together to achieve these priorities.

This report documents King County CSO Control Program and CD implementation activities and information for the 2019 calendar year on the following topics:

- Implementation of early action and long-term CSO control plan measures
- CSO volumes and frequency of overflows (including overflow durations and associated rainfall data)
- Information on any CSO-related bypasses at West Point
- Information on any dry weather overflows (DWOs)
- Updates on the implementation of the CD
- Sewer System Operations Plan (SSOP) implementation
- Revision of the Joint Operations and System Optimization Plan between WTD and Seattle Public Utilities (SPU) based on comments from Ecology
- Implementation of the Joint Operations and System Optimization Plan between WTD and SPU
- Coordination between WTD and SPU on CSO control programs and projects
- NPDES permit compliance for King County wet weather treatment stations (WWTSs)
- Coordination with SPU on implementation of source control best management practices (BMPs) in King County CSO basins

The following sections provide background on King County's wastewater system, its CSO Control Program, and NPDES and CD requirements.

1.1 King County CSO System

King County provides wholesale wastewater conveyance and treatment of flows from 17 cities, 16 local sewer utilities, and one tribal government.

Wastewater flows to WTD's regional system from the City of Seattle and 33 other constituent agencies. The newer parts of WTD's service area use separate pipes to convey wastewater to WTD's system and stormwater to local receiving water bodies. Much of Seattle is served by a combined sewer system that conveys wastewater and stormwater runoff in the same pipes. WTD's responsibility begins where Seattle's pipes have collected sewage from areas of 1,000 acres. WTD conveys most of the flow from Seattle (including most of the combined sewage flows) to West Point, located in Discovery Park. A small amount of sewage from Seattle is treated at WTD's South Treatment Plant (South Plant) in Renton.

When large storms occur, and flows exceed the capacity of the County conveyance system, CSOs may occur at any of the 39 County CSO locations that discharge to Lake Washington, Lake Union, the Lake Washington Ship Canal (Ship Canal), the Duwamish River, Elliott Bay, and Puget Sound (Figure 1). CSOs may also occur at Seattle's 82 CSO locations in their local sewer system. SPU is responsible for separately managing and reporting on those locations.

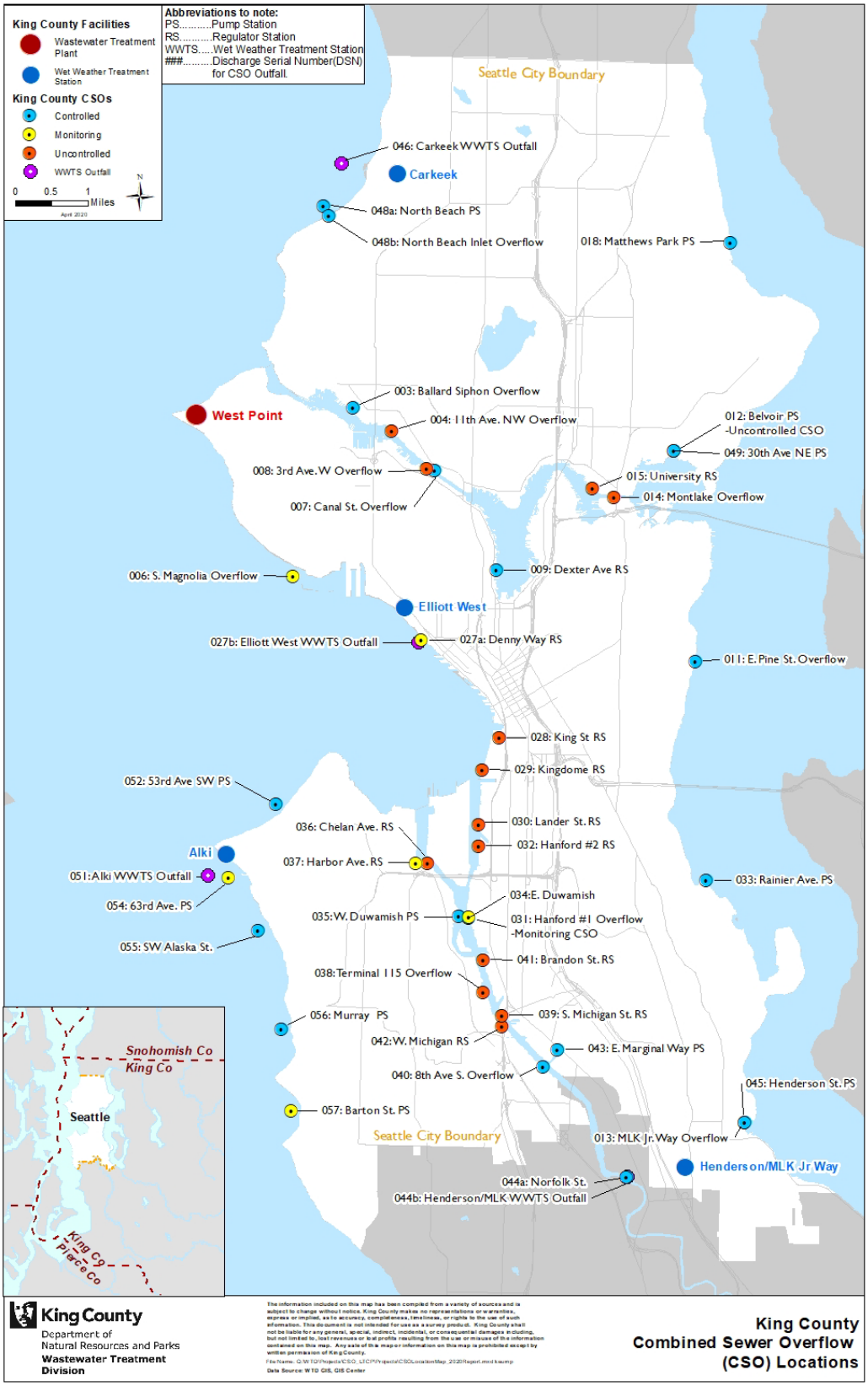

Figure 1. King County CSO Locations

1.2 CSO Control Plans, Amendments, and Updates

Since the 1970s, the Municipality of Metropolitan Seattle (Metro) and its successor, King County, have been implementing CSO control projects to improve water quality in the Seattle area. King County does this under a CSO Control Plan that is amended or updated with each renewal of West Point's NPDES permit. Prior to each CSO Control Plan update, the County reviews the plan and progress made toward CSO control and compares its existing program against conditions that may have changed since the last update (e.g., flow patterns, scientific developments, changed regulations, new technologies, and public priorities). Significant changes may require adjustment of the CSO Control Plan and, potentially, the CD.

1.2.1 CSO Control Plans, 1979–2012

In 1968, the Forward Thrust Bond issue was approved, and extensive sewer separation was completed through 1977 in the Seattle area

Metro first formalized CSO control with the 1979 CSO Control Program, which was developed in cooperation with EPA and Seattle. The 1979 program identified nine Metro projects to reduce the number of CSO events into fresh water (Lake Washington, Lake Union, and the Ship Canal). In 1985, the Washington State Water Pollution Control Act (Chapter 90.48 RCW [Revised Code of Washington]) introduced new regulations that required all municipalities with CSOs to develop plans for "the greatest reasonable reduction at the earliest possible date." Metro prepared the 1986 Final Supplemental Plan for Secondary Treatment Facilities and Combined Sewer Overflow Control to meet this requirement.

Before the 1986 Plan could be implemented, Ecology promulgated new regulations (WAC 173-245-020) that defined "greatest reasonable reduction" to mean "control of each CSO such that an average of one untreated discharge may occur per year." Metro worked with Ecology to develop an interim goal of 75 percent reduction of CSO volumes system-wide by the end of 2005. Metro's Final 1988 Combined Sewer Overflow Control Plan identified 11 CSO control projects designed to meet this interim goal.

King County took over responsibility for operating and maintaining the regional wastewater system from Metro in 1994. As part of the 1995 NPDES permit renewal for West Point, King County prepared an update and amendment to the 1988 Plan. The 1995 CSO Control Plan Update assessed the effectiveness of CSO reduction efforts to date, reevaluated priorities for control of CSO sites, and identified three control projects for completion between 1995 and 2000.

In the late 1990s, King County developed a major update to its comprehensive sewerage plan, including both the combined and separated systems, called the 1999

Regional Wastewater Services Plan (RWSP). During that period, Ecology agreed to discontinue the 75 percent volume reduction interim target for County CSO control to allow prioritization of control projects according to public health and environmental benefit rather than volume. The final RWSP adopted by the King County Council in 1999 included a revision to the 1995 Plan Update that consisted of 21 control projects to complete system control by 2030. The revision was included with the June 2000 submission of the West Point Treatment Plant NPDES permit renewal application as the Year 2000 CSO Control Plan Update. The 2000 Plan Update described King County's progress in CSO control, documented its compliance with CSO control requirements, and identified two large control projects—Denny Way/Lake Union and Henderson/Martin Luther King (MLK)/Norfolk CSO control projects—for completion in the next five-year NPDES permit cycle. The resulting Elliott West Wet Weather Treatment Station (Elliott West WWTS)/Mercer Street Treatment Tunnel (Mercer St. Treatment Tunnel) and Henderson/Martin Luther King Jr. Way Wet Weather Treatment Station (Henderson/MLK Jr. Way WWTS) came online in spring 2005.

In the RWSP, the King County Council called for a review of the County's CSO Control Program ahead of the NPDES permit renewal application and update to the 2000 Plan Update that was expected to be due in 2005. Issuance of the NPDES permit took longer than expected, pushing back the due date for the next application to 2008. King County completed the review in 2006 as the basis for the 2008 CSO Control Plan Update, which was then submitted as a part of the NPDES permit renewal application in 2008. The 2008 Plan Update described the County's wastewater system, control status of its CSOs, and overall progress toward CSO control; how the County met EPA's Nine Minimum Controls; and summarized the scientific studies that have shaped the control program over time. The 2008 Plan Update also described planned, in-progress, and completed CSO control projects. No changes to the 1999 RWSP CSO Control Plan were recommended and King County committed to implementing the first four of the RWSP CSO projects: Barton Street, Murray Street, South Magnolia, and North Beach, collectively known as the "Puget Sound Beach Projects."

In 2012, the County completed a three-year review of the CSO Control Program. The 2012 Long-term Control Plan Amendment (LTCP) was approved by the King County Council in September 2012. The 2012 LTCP was submitted to Ecology and EPA on November 20, 2012, ahead of the June 2013 application date for the NPDES permit renewal and as part of the CD negotiations. The approved projects in the 2012 LTCP emerged from an evaluation of new conditions, opportunities, science, regulations, and community input since the last major CSO plan update in 1999. Project alternatives were developed for all uncontrolled CSOs to determine which were the most cost effective.

The approved 2012 LTCP is the County's current plan to construct nine projects to control 14 CSOs by the end of 2030. The approved plan includes conducting green stormwater infrastructure (GSI) early, ahead of traditional CSO control projects, for four projects, to reduce the size of the gray infrastructure needed to control CSOs.

1.2.2 2018 CSO Control Program Update and CSO Control Planning

In 2015, King County began a comprehensive review and update of the CSO Control Program including the 2012 LTCP approved in 2013. Updates to the LTCP are required in conjunction with the application for renewal of the NPDES permit by WAC 173-245-090 which typically occurs on a five year cycle, West Point's NPDES permit, and King County Code 28.86.080. The resulting 2018 CSO Program Update was submitted to Ecology and EPA with the West Point NPDES permit renewal application in January 2019.

The 2018 CSO Program Update documented the status of 2012 LTCP implementation, progress on projects underway, planning-level control volume updates for future projects, and ongoing implementation of CSO Program public involvement activities. The Program Update also reported on environmental studies completed since the 2012 LTCP that inform the CSO Control Program, including the Water Quality Assessment / Monitoring Study, a Climate Change study completed with the University of Washington Climate Impact Group, and the County's ongoing water and sediment monitoring programs. WTD did not recommend any revisions to the LTCP at this time. In its current phase of LTCP implementation and CSO control planning, WTD is working to identify opportunities for further project refinement, facility optimization, and new water quality projects. WTD will quantify the potential water quality benefits and costs of these opportunities and evaluate their merits with regional values, countywide initiatives, and planning efforts.

Concurrent with LTCP implementation, King County has initiated the Clean Water Plan (Plan), a planning process to update its comprehensive wastewater system plan. The purpose of the Plan is to assess all the demands on the regional wastewater utility, including CSOs, and determine a future direction for the regional system that makes the right investments at the right time. Because CSO investments are among the demands considered in the planning effort, the CSO Control Program will continue its evaluation of CSO control alternatives and additional water quality improvement opportunities to inform the Clean Water Plan. WTD will continue to work with Ecology and EPA, along with many other community members and interested parties, as these planning processes unfold.

1.2.3 Water Quality Assessment/Monitoring Study (WQA/MS)

The WQA/MS, requested by King County Council, was completed in October 2017. The WQA/MS informed the 2018 CSO Program Update and will also inform future activities undertaken by King County and other entities to improve water quality in the region. The study assessed past and present water quality conditions in the waterbodies where the County's remaining uncontrolled CSOs discharge more than an average of once per year: Lake Union/Ship Canal, Elliott Bay, and the Lower Duwamish Waterway. The study also estimated annual contaminant loadings to these study areas from different pollutant pathways, reviewed planned projects to understand how contaminant loadings may change, and identified potential water quality impairments that may remain in 2030. Twelve reports describe different aspects of water quality in the study areas and include summary reports and a report from the peer review team that reviewed the science. The information from the WQA/MS was used to assess the timing and sequence of the remaining CSO control projects.

The findings indicate that actions over the past 50 years have improved water quality; nutrient and bacteria levels have decreased in surface waters and sediment cleanups have improved sediment quality. Despite improvements, some water quality is still impaired in the three study areas. Pathways contributing to impairments to receiving water bodies include CSO discharges, stormwater discharges, leaching from boat-bottom vessel paint, and leaching from creosote-treated wood pilings. Planned actions in the region will reduce some contaminant loadings by 2030. Reduction in frequency of untreated CSO discharges will reduce bacteria loadings. Stormwater management and treatment will reduce loadings from stormwater. Laws limiting copper content in antifouling vessel bottom paint and automobile brake pads will reduce copper. Creosote-treated wood piling removal will reduce organic chemical loading, and contaminated sediment cleanup will reduce sediment contamination levels. However, water quality challenges will remain in 2030 and beyond. Recommended next steps for the region include the following: reduce the frequency of untreated CSO discharges by completing the Georgetown Wet Weather Treatment Station by 2022 and Joint Ship Canal Water Quality Project by 2025, implement planned water quality improvement projects and programs, monitor changes, and add to the body of knowledge over time.

Links to the 12 reports are available at:
https://www.kingcounty.gov/services/environment/wastewater/cso/projects/water-quality-study.aspx

1.2.4 Clean Water Plan

King County is facing critical decisions that will shape the scope and focus of water quality investments in the coming decades. The purpose of the Clean Water Plan is

to guide decisions on future water quality investments. The planning process is underway for the Plan and has been moving systematically through a series of steps to lay the foundation for a thoughtful and transparent evaluation to inform these decisions.

In 2020, the Plan will explore individual investment actions and their associated water quality outcomes in the following areas:

- Treatment plant capacity and level of treatment
- Capacity in sewer pipes and pumps
- Aging sewer systems, natural disasters and climate change
- Recycling resources from wastewater
- Stormwater and combined sewer overflows
- Preventing pollution at the source
- Pollution from historical activities
- Paying for clean water investments

After characterizing Actions individually, King County intends to combine and shape the various Actions into a handful of potential Strategies. Strategies are complete investment approaches to our wastewater and water quality challenges. Strategies address multiple Decision Areas and consider the timing, sequencing, and interrelationships of the Actions. Work on Strategies will commence in 2021.

The King County Executive will recommend a preferred Clean Water Plan including an implementation sequence to the King County Council which is anticipated to begin their review in 2022. Review of the Clean Water Plan under the State Environmental Policy Act will be incorporated into the planning process. The Clean Water Plan will amend the RWSP and will require approval by Ecology per RCW 90.48.110 and WAC Chapter 173-240.

In developing the Clean Water Plan, King County is committed to a fair and inclusive planning process to deliver the best water quality, economic, social, and health outcomes. Extensive engagement with Ecology, partner utilities, and interested parties in the region will occur throughout the process. This has been and will continue to be done through in person engagement and online activities, consistent with the COVID 19 guidelines.

1.3 Consent Decree

After King County Council approval of the 2012 LTCP, King County submitted the LTCP to Ecology and EPA for approval. EPA and Ecology approved the County's LTCP as meeting federal requirements on March 7, 2013. This approved version became the basis for settlement of ongoing negotiations with EPA, Ecology, and DOJ to finalize a negotiated CD between King County, EPA, DOJ, and Ecology. The CD was formally filed in U.S. District Court on July 3, 2013.

The CD commits King County to implement various CSO control measures and compliance activities to achieve full compliance with the Clean Water Act, applicable state law and regulations, and terms and conditions of the West Point NPDES permit, and meet the requirements of EPA's CSO control policy. The CD also commits King County to complete construction of all CSO control projects by December 31, 2030. Compliance activities described in the CD include:

- Implementation of CSO control projects in accordance with milestones established in the CD (Section 3)
- Development of a Sewer System Optimization Plan and Joint Operations and System Optimization Plan (described in Sections 3.2.1 and 3.2.2, respectively)
- Establishment of conditions for developing supplemental compliance plans to implement remedial measures for CSO control projects (Section 3.1)
- Establishment of requirements for proposals to substitute, in part, GSI control measures for gray infrastructure control measures

Meeting the conditions set forth in the CD is a high priority for King County. To date, the County has met all conditions outlined in the CD with one exception, that is, for a milestone associated with the Chelan CSO control project.

On October 28, 2019, King County submitted a formal request to EPA and Ecology to delay the interim CD milestones for the Chelan CSO control project (specifically, Completion of Bidding and Construction Completion milestones) to match the milestones in the CD for Hanford #2, Lander, King, and Kingdome Wet Weather Station (HLKK), while still committing to complete the project within the overall deadline of the CD (i.e., December 31, 2030). In conjunction with the request to delay the interim CD milestones for the Chelan CSO control project, the County requested to initiate negotiations to modify the CD to accommodate changed conditions from 2013 when the CD was filed.

1.4 Sediment Sampling and Analysis

In 1999, King County prepared a sediment management plan for addressing contaminated sediment at County CSO locations. The plan was updated and the King County Sediment Management Plan (SMP) 2018 Update was sent to Ecology on November 2, 2018. The SMP update proposes a strategy for assessing and managing potential or determined sediment impacts related to the County's CSOs, in order to meet permit obligations as well as to provide information needed to plan for required or anticipated future cleanup actions. The SMP update also describes all the King County CSO discharge locations, summarizes ongoing and previously performed sediment cleanup work, summarizes the results of CSO discharge modeling, and provides the status of existing sediment quality. As part of the update process, a predictive sediment contamination model for CSO discharges was developed. Supplemental sediment sampling data at CSO outfall locations were collected in 2012 (10 locations), 2014 (six locations), and 2016 (one location).

The NPDES permit (§S13.B, p. 41) requires post-construction monitoring once CSO control projects are completed. The County's approved Post-Construction Monitoring Plan (PCMP) requires characterization by sampling or modeling to calibrate and verify model performance. The post-construction monitoring results for several overflows per the approved quality-assurance project plan were provided to Ecology in December 2018.

When the County determined that a second overflow point at North Beach went to a separate overflow location, a sampling plan specific to the North Beach PS Inlet Overflow site was developed in accordance with the PCMP. Sampling was completed in late 2018. The sediment quality data report was sent to Ecology in December 2019 to complete post-construction monitoring for this overflow.

1.5 Organization of this Report

This report presents the following information in subsequent sections and appendices:

- Report on implementation of EPA's Nine Minimum Controls (Section 2)
- Status of CSO control projects in design or construction (Section 3)
- Discussion of 2019 rainfall and untreated and treated CSO events (Section 4)
- Detailed individual event-based table for unpermitted overflows in 2019 (Table 4)
- Summary of CD violations in 2019 (Section 5)
- Table showing the 20-year average frequency of untreated CSO events (Section 6)
- Description of post-construction monitoring (Section 7)

- Detailed individual event-based tables for untreated CSOs in 2019 (Appendix A)
- Detailed individual event-based tables for treated CSOs in 2019 (Appendix B)
- Annual reports for the four satellite Wet Weather Treatment Stations (WWTSs): Alki Wet Weather Treatment Station (Alki WWTS), Carkeek Wet Weather Treatment Station (Carkeek WWTS), Elliott West Wet Weather Treatment Station (Elliott West WWTS), and Henderson/MLK Jr. Way Wet Weather Treatment Station (Henderson/MLK Jr. Way WWTS) (Appendices C through F)

This report meets the requirements of annual reporting as defined by the CD, WAC, and the NPDES permit. The crosswalks shown in Table 1 indicate where information meeting the requirements of each can be found in this report.

Table 1. Consent Decree, Washington Administrative Code, and National Pollutant Discharge Elimination System Permit Crosswalks

Consent Decree Section	Content	Annual Report Location
VIII.43.a	(i) the status of all CD compliance measures, including Currently Underway and Early Action CSO Control Measures, the implementation of all CSO Control Measures in Appendix B, Post-Construction Monitoring Plan, SSOP, and Information Sharing/Coordination Program Plan Between County and the City of Seattle. (ii) any problems anticipated or encountered, along with the proposed or implemented solutions. (iii) any anticipated or ongoing operation and maintenance activities relating to all CSO Control Measures. (iv) remedial activities that will be performed in the upcoming year to comply with the requirements of this CD.	(i) 3.1 Project Summaries 3.2.1 Sewer System Operations Plan 3.2.2 Joint Operations and System Optimization Plan 3.2.3 WTD Coordination with SPU on CSO Control Projects 7.0 Post-construction monitoring (ii) Included in sections above, 4.4, and Appendices C–F for WWTSs (iii) 2.1 Reducing CSOs Through Operations and Maintenance Appendices C–F for WWTSs (iv) All of the above
VIII.43.b	A description of any non-compliance with the requirements of this CD and an explanation of the likely cause and duration of the violation and any remedial steps taken, or to be taken, to prevent or minimize such violation.	5.0 Summary of CD Violations 2.1 Reducing CSOs Through Operations and Maintenance Appendices C–F for WWTSs

WAC Section	Content	Annual Report Location
WAC 173-245-090(1)(a)	Details the past year's frequency and volume of combined sewage discharged from each CSO site, or group of CSO sites in close proximity. The report shall indicate whether a CSO site or group of sites has increased over the baseline annual condition.	4.0 Summary of Rainfall and CSO Events 6.2 Changes to Control Status of CSO locations Appendix A Untreated CSO Events Appendix B Treated CSO Events Appendices C–F for WWTSs
WAC 173-245-090(1)(b)	Explains the previous year's CSO reduction accomplishments.	3.1 Project Summaries
WAC 173-245-090(1)(c)	Lists the projects planned for the next year.	3.1 Project Summaries

NPDES Permit WA0029181	Content	Annual Report Location
S11.C.2	The CSO Annual Report must include the following information: a. A summary of the number and volume of untreated discharge events per outfall for that year. b. A summary of the 20-year moving average number of untreated discharge events per outfall, calculated once annually. c. An event-based reporting form (provided by Ecology) for all CSO discharges for the reporting period, summarizing all data collected according to the monitoring schedule in Special Condition S11.B.9. d. An explanation of the previous year's CSO reduction accomplishments. e. A list of CSO reduction projects planned for the next year. f. A list of which permitted CSO outfalls can be categorized as meeting the one untreated discharge per year on a 20-year moving average performance standard. This annual assessment may be based on historical long-term discharge data, modeling, or other reasonable methods as approved by Ecology. The Permittee must submit paper and electronic copies of the report, and Excel spreadsheet copies of significant spreadsheets.	6.1 Twenty-Year Moving Average of Event Frequencies Electronic Template submitted electronically with annual report; hardcopy of content in Appendices A and B
S11.B	The Permittee must document compliance with the nine minimum controls in the annual CSO report as required in Special Condition S11.C.	2.0 Programs to Meet EPA's Nine Minimum Controls
S11.F.b	The Permittee must report the running 20-year average number of overflow events per year during this permit term from these existing controlled CSO outfalls in the CSO annual report required in Section S11.C.	6.1 Twenty-year Moving Average of Event Frequencies

2 Programs to Meet EPA's Nine Minimum Controls

The EPA's Nine Minimum Controls are actions that can be taken to minimize CSO impacts while long-term capital projects are underway. King County has implemented a number of programs to satisfy the requirements of the Nine Minimum Controls, which are part of EPA's codified CSO Control Policy and included in the West Point NPDES permit. The following sections describe King County's programs and activities regarding each of the Nine Minimum Controls, with emphasis on activities undertaken in 2019.

2.1 Control 1—Reducing CSOs through Operation and Maintenance

Implement proper operation and maintenance programs for the sewer system and all CSO outfalls to reduce the magnitude, frequency, and duration of CSOs. The program must consider regular sewer inspections; sewer, catch basin, and regulator cleaning; equipment and sewer collection system repair or replacement, where necessary; and disconnection of illegal connections.

West Point and South Plant staff manage proper facility operation using King County's supervisory control and data acquisition (SCADA) system. The SCADA system provides monitoring and control capabilities for the treatment plant collection systems. See Control 2 (Section 2.2) for information on King County's use of the SCADA system.

Under the Asset Management Program, King County employs asset management tools, including a standardized inventory system and condition rating systems, and is developing long-range asset replacement and renewal forecasts, including action plans, to replace assets. The Asset Management Program, implemented by West Point, South Plant, and Conveyance Inspection staff, ensures regular maintenance of CSO outfalls, regulator stations, and pump stations. Conveyance inspection staff inspect sewers on a specified schedule and perform corrective actions when deficiencies are found. Maintenance schedules and records of visits are available for inspection on request.

In 2017, King County performed a review of the WTD Asset Management Program, including the Strategic Asset Management Plan (SAMP). The review identified strengths and opportunities for improvements to the SAMP and Asset Management Program. One of the recommendations of the review was to update the SAMP and asset management work plan in 2018 as well as early action recommendations to complete in 2018. Work began in 2018 to update the SAMP and was completed April 2019. The 2018 SAMP Update set the priorities of the program and work plan and incorporates the findings from the 2017 review of the asset management program. Following the update to the SAMP, the WTD Asset Management Program began working to implement the recommendations, work that will continue into 2020 and beyond.

2.2 Control 2—Storing CSOs in Collection System

Implement procedures that will maximize use of the collection system for wastewater storage that can be accommodated by the storage capacity of the collection system in order to reduce the magnitude, frequency, and duration of CSOs.

The West conveyance system is essentially a deep in-line tunnel system that conveys and stores a wide range of flows. The sizing of the largest in-line tunnels is shown in Figure 2. Maximizing storage in the conveyance system works in concert with maximizing conveyance to West Point to minimize overflows and obtain high quality treatment for service area flows. The system has been built to operate as much as possible based on gravity flow and levels in the interceptors and trunks, with little operator intervention.

When levels reach pre-determined set points, programmable logic controllers automatically adjust gates and pumps to manage the flows. These set points have been determined over the years by operational experience, hydraulic analysis, and modeling to balance conveyance to the treatment plant while maximizing storage in the pipelines and off-line storage facilities and minimizing overflows and backups. Critical alarms and process data are communicated to the treatment plant operators using monitoring systems that report data in independent communication pathways from the control system. Operators at West Point's Main Control will remotely take control of certain facilities—primarily Interbay Pump Station to force storage in the Mercer St. Treatment Tunnel and the West Seattle Pump Station to force storage in the West Seattle Tunnel—to manage flows to and through West Point. The intent of this operations strategy is to avoid surges and oscillations in the plant, protect the biological system and avoid plant shutdown, optimize conveyance of flows to the plant for treatment, and maximize the use of system storage capacity.

Senior operators assess a range of system factors in making decisions to begin manual control. Important factors taken into consideration include rainfall forecasts, the direction storms come from, how fast flows are changing, and antecedent conditions. Decisions require extensive senior operator experience, a sense for antecedent conditions, and the ability to anticipate changing flows.

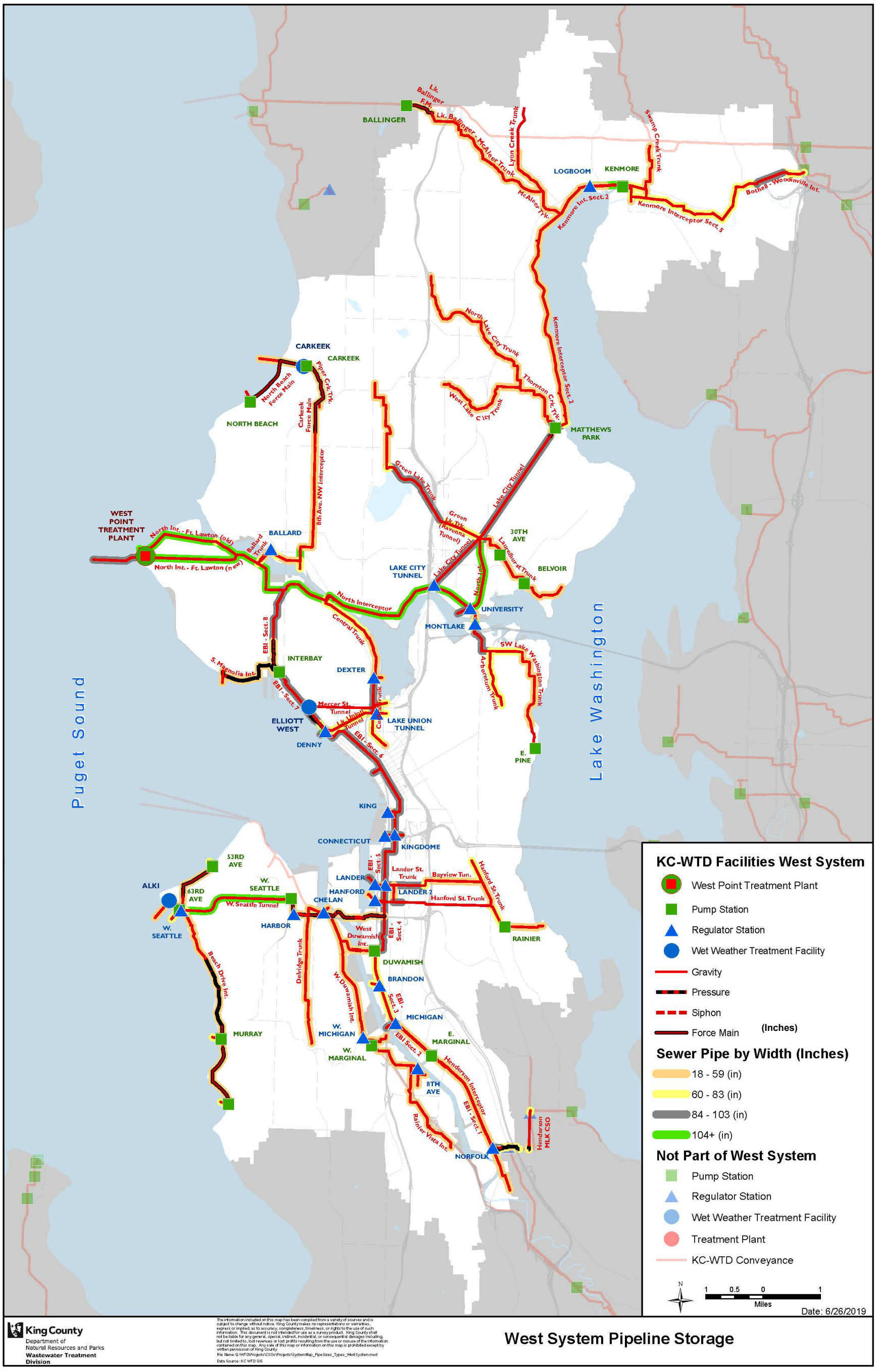

Figure 2. King County Wastewater West System Pipeline Storage

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2.3 Control 3—Optimizing Pretreatment Program

Review and modify, as appropriate, existing pretreatment program to minimize CSO impacts from discharges due to nondomestic users.

King County's Industrial Waste Program issues permits that set limits on the chemical contents of industrial discharges. The program includes monitoring and permit enforcement, education, and technical assistance to businesses on appropriate waste pretreatment and disposal techniques. King County works with the local sewer agencies during the permit approval and renewal process. Local discharge limits are reviewed on a regular basis according to Ecology requirements. The County submits an annual pretreatment report to Ecology detailing permitting, monitoring and inspections, and enforcement actions taken during the year, as well as an evaluation of influent, effluent, and biosolids, focusing on loading and removal rates.

Influent and effluent quality at West Point are assessed for trends that would suggest concurrent changes in CSO discharges. In addition, biosolids quality data from West Point are tracked as an indicator of changed loading to the system that could influence CSO quality. No specific new trends were observed in 2019 in pollutant concentrations. Biosolids concentrations are relatively stable and well within EPA's standards.

Beginning in 2016, WTD began to include the downstream CSO to which each permitted industrial discharger contributes in the annual pretreatment report submitted to Ecology.

King County also administers and helps fund the Hazardous Waste Management Program (HWMP). The Business Services Team of the HWMP provides site visits to businesses that typically fall below the threshold for receiving a discharge authorization or permit from the Industrial Waste Program, but generate small quantities of hazardous waste. Their efforts focus on on-site technical assistance visits to businesses for hazardous material and waste management, including discharges to sanitary and storm drains. The HWMP issues vouchers to reimburse businesses 75 percent of their costs (up to $599) for purchasing and installing pollution prevention equipment, if needed.

In 2019, King County worked with Ecology to update the County's Source Control Implementation Plan (SCIP) for the Lower Duwamish Waterway. The draft was submitted to Ecology for review in March 2019 and the SCIP was finalized in October 2019. King County is currently implementing the plan, which covers activities from 2019 to 2023. Per the SCIP, King County submits Source Control Annual Reports documenting source control activities for that period. The Source Control Annual report documenting 2018 activities was submitted to Ecology in December 2019. The Source Control Annual Report for 2019 activities will be submitted in 2020.

The Industrial Waste Program participates in the Lower Duwamish Waterway Source Control Work Group, which was formed to promote discussion of source control issues that may affect sediment remediation of the Lower Duwamish Waterway. The group is primarily composed of the three members of the Lower Duwamish Waterway Group (King County, Port of Seattle, and City of Seattle) and the two agencies with regulatory responsibility for different aspects of Lower Duwamish Waterway sediment remediation (Ecology and EPA). Ecology is the lead agency for this group, which has been meeting regularly for several years.

2.4 Control 4—Maximizing Flow to Treatment Plant

Operate the POTW [publicly owned treatment works] at maximum treatable flow during all wet weather flow conditions to reduce the magnitude, frequency, and duration of CSOs. The Permittee must deliver all flows to the treatment plant within the constraints of the treatment capacity of the POTW.

The 2014 SSOP describes how maximizing storage in the conveyance system works in concert with maximizing conveyance to the treatment plant to minimize CSOs and obtain high quality treatment for service area flows. As described in Control 2 (Section 2.2) and shown in Figure 2, the West conveyance system is essentially a deep in-line tunnel system that can convey a wide range of flows to West Point. SCADA is used to maximize flow to the secondary treatment plant while protecting the biological treatment system via operation of regulators and pump stations. The parallel Fort Lawton Tunnel was built in 1992 to convey up to 440 million gallons per day (MGD) to West Point. West Point provides secondary treatment for all base flows (defined by Ecology as 2.25 times the average wet weather flow) up to 300 MGD and primary treatment for all flows between 300 MGD and the designed instantaneous peak hydraulic capacity of 440 MGD. CSO/primary treated 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, with a small reduction in total suspended solids (TSS) removal requirements (i.e., 80 percent instead of 85 percent removal) during the wet season months of November through April.

Up to 24 MGD of combined flows are conveyed to South Plant from southeast Seattle to receive full secondary treatment. This conveyance reduces CSOs to the Duwamish River along the Elliott Bay Interceptor.

Where captured CSOs cannot be conveyed to secondary treatment plants because of conveyance system limitations, flows are conveyed to WWTSs, where the flows are treated and discharged. King County currently operates four WWTSs: Alki WWTS, Carkeek WWTS, Elliott West WWTS, and Henderson/MLK Jr. Way WWTS.

Treatment process stability is monitored and optimized to manage flows based on information from automatic sensors and an array of analytical tests. Process control laboratories at each plant conduct testing and analysis, and then recommend adjustments to the processes, if necessary, to ensure that quality treatment is provided.

2.5 Control 5—Preventing Dry Weather Overflows

Dry weather overflows from CSO outfalls are prohibited. The Permittee must report each dry weather overflow to the permitting authority as soon as it becomes aware of the overflow. When it detects a dry weather overflow, the Permittee must begin corrective action immediately and inspect the dry weather overflow each subsequent day until it has eliminated the overflow.

The County provides enough capacity in the combined sewer system to transfer 2.25 times the average wet weather flow to secondary treatment, as negotiated with Ecology. As a result, overflows during dry weather are not the result of a lack of capacity. During dry weather, the County only experiences overflows in the combined system when problems such as power outages, mechanical failures, or human error occur. Similarly, during wet weather, CSOs occurring as a result of precipitation may be exacerbated by power outages, mechanical failures, or human error. King County takes each of these overflows seriously, and they are immediately corrected and reported to Ecology (see Section 4.2). King County's ongoing Asset Management Program is working to reduce the likelihood of these kinds of failures.

To minimize the risk of a DWO due to power loss at a pump station, generators and automatic power transfer systems were installed at pump stations throughout the system, greatly reducing the risk of overflows associated with a loss of power.

To minimize the risk of mechanical failure, the King County Asset Management Program maintains a Strategic Asset Management Plan that is updated on a five-year cycle and an annual work plan to implement the plan. The plan was updated in 2018 and includes an assessment to determine the criticality of pump station equipment. This assessment identifies assets essential to pumping sewage, and inspection and maintenance routines have been developed to increase service time and reduce failures for these assets. Assessments and evaluations are continuously updated to reduce the likelihood of system failure. These efforts will contribute to reducing overflows by decreasing the probability of mechanical failures.

O&M programs, as described for Control 1 (Section 0), focus on eliminating DWOs and exacerbated CSOs. The conveyance system is monitored through SCADA and direct inspection, and corrective action is taken immediately if a problem occurs. Equipment

problems are immediately reviewed, and repair or replacement is undertaken in a timely manner.

2.6 Control 6—Controlling Solids and Floatables

Implement measures to control solid and floatable materials in CSOs.

The majority of floatables in the King County system are captured in the large volume of wastewater transferred to the treatment plants before overflows occur.

The County routinely engages in the following practices to control floatables:

- Capturing the "first flush" (maximizing flow to treatment plants) so that most solids and floatables that do enter the sewer are conveyed to the secondary treatment plants for removal and disposal before pipelines reach overflow conditions.
- Constructing facilities with gates and weirs that retain and minimize the release of solid and floatable materials. Gates are set to maximize flow containment. Baffles are used in front of weirs to help hold back all but the smallest items in the flow that passes over them.
- Coordinating with SPU on measures to reduce the washing of street solids and trash into sewers via stormwater and to promote proper disposal of trash so that it is not flushed down toilets. SPU's catch basin maintenance program limits the introduction of floatable materials to sewers.
- Educating the public on keeping trash and grease out of the sewers (http://www.kingcounty.gov/services/environment/wastewater/education/protect-environment/flush-trouble.aspx).

2.7 Control 7—Preventing Pollution

Implement a pollution prevention program focused on reducing the impact of CSOs on receiving waters.

The following section describes the programs that comprise King County's pollution prevention program to reduce sources of flows and contaminant loading within the combined basins. It also describes ongoing efforts in 2019 to coordinate with SPU programs to ensure pollution prevention programs align, cover the geographic area fully, and are comprehensive in addressing all pollution types (solid waste, wastewater, stormwater, etc.). This section is divided into subsections that describe existing industrial and commercial programs, community programs, and stormwater programs.

Programs to Support Pollution Prevention with Industrial and Commercial Discharges

King County's Industrial Waste Program, along with the County's Hazardous Waste Management Program (HWMP), contributes to source control within the combined sewer system. Industrial facilities throughout Seattle that are permitted through the Industrial Waste Program, are required to limit the discharge of chemicals and other substances to sanitary sewers that might adversely impact the environment and the wastewater treatment process. The Industrial Waste Program also manages construction dewatering permits within Seattle that propose to discharge wastewater to the sanitary sewer system.

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

King County also prohibits discharge to the sewer of materials such as ashes, sand, grass, and gravel. Industrial wastewater must contain less than 7 milliliters per liter of solids capable of settling. Food waste, including food-grinder waste, must be capable of passing through a 0.25-inch sieve. Discharge rates and maximum volumes are also set for construction dewatering projects, with strict restrictions during the wet season.

King County completed the implementation of its first five-year Source Control Implementation Plan for the Lower Duwamish Waterway in 2018. The activities conducted under the Plan are summarized in a series of source control annual reports that are submitted to Ecology. The 2018 activities report was prepared in 2019 and submitted to Ecology in December 2019. The County has also developed its second five-year plan for the 2019 to 2023 period. The Plan includes working with Lower Duwamish businesses and residents on pollution prevention as well as County-performed source tracing activities and compliance with water quality permits and regulations at County-owned and operated facilities. The 2019 source control activities associated with this second five-year plan will be summarized in a report developed in 2020.

The HWMP is a multi-jurisdictional effort of King County, SPU, two tribal governments, and 37 local towns and cities that is implemented through a "Management Coordination Committee" and enabled by the King County Board of Health. The HWMP provides outreach to smaller facilities through a non-regulatory business inspection program, which includes partial-reimbursement vouchers for purchase of source control

equipment or services. The HWMP creates plans to manage hazardous wastes produced by households and in small quantities by businesses and other organizations. The HWMP is funded by local hazardous waste fees on solid waste (garbage) and sewer accounts.

Programs to Support Community Pollution Prevention

King County and Seattle manage a number of general public education and outreach efforts and specific waste collection/reduction programs for the purpose of reducing contaminant discharges to the sewer and stormwater systems in combined basins (e.g., water conservation programs, Adopt-a-Road, Adopt-a-Street, recycling resources). Both King County's Industrial Waste Program and HWMP maintain extensive online program information and availability of resources and events. The County's HWMP manages free hazardous waste collection services for household and business wastes (e.g., mobile collection, hazardous waste collection/drop-off sites). The King County Board of Health passed the Secure Medicine Return Regulation in 2013 (also known as the "Drug Take Back" Program) that generates tax revenues from pharmaceutical sales for the HWMP to facilitate the collection and disposal of prescription and over-the-counter medicines at pharmacies and law enforcement offices at no cost to residents. King County and Seattle also collaborate with the Stormwater Outreach for Regional Municipalities (STORM) coalition on various campaigns, including "Puget Sound Starts Here" and "Don't Drip and Drive," that provide free clinics to educate owners on how to inspect and repair automotive fluid leaks (e.g., oil and antifreeze). The agencies also promote proper pet waste disposal and Seattle maintains "Mutt Mitt" plastic bag stations throughout the city. Seattle also stencils facilities or posts other signs to prevent dumping or discharge of wastes in the storm drainage systems. Educational materials on controlling trash disposal to sewers are also addressed as part of the larger public information programs described in Control 6 (Section 2.6). King County, Seattle, and STORM are committed to completing our NPDES Stormwater permit obligations.

In partnership with SPU, WTD has administered the RainWise Program since 2010. This program provides rebates to homeowners living in specific combined sewer areas for installing rain gardens and cisterns on their own property. RainWise helps to slow, detain, or retain stormwater, which reduces both the volume and timing of combined sewer flows and reduces sources of pollution into the combined system.

WTD funds and administers the WaterWorks competitive grant program and Council-allocated funding to help residents and small businesses implement small-scale projects to improve air and water quality and to support the success of King County's CSO projects by controlling new and ongoing sources of pollution that could harm the environment or re-contaminate cleaned-up areas in receiving waterbodies. The projects also help promote partnerships around source control, develop local expertise in water

quality protection, and enhance small-scale environmental and economic opportunities in the community. The projects are all within the sewer service area and help King County residents protect their long-term investment in water quality.

In 2019, organizations that were funded through WaterWorks grants or the Council-allocated awards for the 2017-2018 biennium continued their work. Funding for 23 projects under WaterWorks grants totaled $1,860,000, and 32 projects through Council-directed funds totaled $2,141,168, not including administration.

In December 2019, the WaterWorks program completed the application process and selected another 69 projects through the competitive grants and Council-allocated with funding totaling $4,651,840. The projects will be implemented in the 2020-2022 timeframe and are expected to protect water quality, control pollution, and build healthy communities.

Implementation of Source Control Actions in CSO Basins

WTD and SPU staff coordinate the mutual tracking and sharing of information on stormwater pollution prevention BMPs that are implemented within combined basins consistent with the provisions of each agency's NPDES permit. Because all of King County's CSOs serve areas within the City's boundaries, the City's management and maintenance activities under their Stormwater Code and Side Sewer Code provide many of the source control actions commonly recognized as most effective for reducing contaminant discharges in CSO systems. Seattle provides area-wide services for solid waste collection, street sweeping, spill response, water quality complaint investigations, stormwater system maintenance, and catch basin cleaning. At WTD-owned facilities within Seattle, operations and maintenance staff also perform spill response, drainage facility maintenance, and catch basin cleaning. Both King County and SPU maintain hotlines for reporting of illegal dumping; the County routes reports to the appropriate jurisdictional entity for cleanup of sites.

Seattle Municipal Code Chapters 22.800 through 22.808 contains the City's Stormwater Code, which is the City's primary means of implementing the following requirements: (1) to practice stormwater pollution prevention during construction; (2) to reduce the introduction of pollutants into stormwater runoff as close to the source as possible; and (3) to install flow control, stormwater treatment facilities, or both depending on the size and nature of a project. The Stormwater Code is implemented through the Directors' Rule, promulgated jointly by the Director of SPU and the Director of the Seattle Department of Construction and Inspections. The Code and Manual establish SPU's authority to implement mandatory City-wide BMPs requirements as follows:

- Illicit Connection Identification and Elimination: Under this provision, sanitary side sewer systems must be inspected for illicit connections of sanitary or

process wastewater flows. In addition, SPU and WTD also conduct inspections for illicit connections when they are suspected or determined to exist within a basin.

- Routine Maintenance: This program requires property owners to inspect, maintain, and periodically clean approved stormwater facilities such as collection, conveyance, catch basins, and treatment systems (e.g., oil/water separator), and properly dispose of wastes.
- Proper Disposal of Fluids and Wastes: Seattle requires all real property to implement proper liquid waste storage, disposal, and runoff prevention measures.
- Proper Storage of Solid Wastes: Seattle requires all real property to implement proper solid waste storage and disposal practices.
- Spill Prevention and Cleanup: This provision requires businesses and real properties that load, unload, store, or manage liquids or erodible materials (e.g., stockpiles) to maintain spill plans, equipment, and practices to prevent and clean spills as well as notification procedures for spills to the drainage and sewer systems.
- Provide Oversight and Training for Staff: Businesses and public entities that have activities requiring BMPs are required to have trained personnel for their implementation.
- Site Maintenance: Businesses and public entities that involve materials or wastes that may come into contact with stormwater are required to implement proper housekeeping practices to minimize discharge of contaminants such as inspections, avoidance measures (containment, covering, or locating activities away from drainage systems), and sweeping and cleaning procedures.

Ecology has determined that the City's 2016 Stormwater Code and Manual are equivalent to Ecology's Surface Water Design Manual for Western Washington. This equivalency establishes the City's legal authority to control discharges to and from municipal stormwater systems. The City is currently updating the Stormwater Code and Manual for equivalency with the 2019 Stormwater Management Manual for Western Washington and changes will be incorporated into the 2020 King County CSO Control Program Annual Report.

SPU has a city-wide pollution prevention program and actions such as spill response, catch basin inspection and cleaning. These actions are conducted in WTD CSO basins in the spirit of coordination. Finally, both WTD and SPU conduct stormwater drainage and mapping programs to document the boundaries of separated, partially separated, and combined basins.

In reviewing the pollution prevention programs in combined basins described above, both WTD and SPU have determined that existing legal authorities are sufficient to effectively administer and implement these programs. Accordingly, WTD and SPU will implement the pollution prevention program that is consistent with each agency's NPDES permits and provides benefits to each agency's combined sewer system.

To meet NPDES permit obligations, the King County Department of Natural Resources and Parks (DNRP) relies on SPU to implement pollution prevention actions (e.g., spill response, water quality complaint response, and street sweeping) in areas of the City served by DNRP CSO facilities. SPU currently provides these pollution prevention actions but is not responsible for DNRP's NPDES permit compliance. At DNRP's request, SPU tracks and reports to DNRP on the limited set of BMPs identified above. SPU and DNRP will explore whether to continue this arrangement and, if so, how to document costs and responsibilities.

During 2019, SPU tracked the following pollution prevention BMPs in combined sewer areas served by King County:

- Water Quality Complaints: SPU inspectors respond to complaints as they are received through the water quality hotline, web page, or agency referrals. This program provides outreach and education on proper BMPs to residents and businesses within the City. In 2019, SPU responded to 143 water quality complaints in these basins.
- Spill Response: Spills are dispatched through the SPU Operations Response Center to on-call spill coordinators as they are received. In 2019, SPU responded to 237 spills within these basins.
- Street Sweeping: SPU coordinates with the Seattle Department of Transportation (SDOT) to conduct street sweeping on arterials in Seattle using high-efficiency regenerative air street sweepers. In 2019, SDOT swept 10,016 lane miles in these basins.

2.8 Control 8—Notifying the Public

King County operates a CSO Notification and Posting Program as a joint project with the City of Seattle and Public Health–Seattle & King County. This program includes signs at publicly accessible CSO locations, an information phone line, websites, and other public outreach activities. In 2017, SPU and DNRP developed a new CSO outfall sign design with more languages, a link to the CSO overflow website, and a new phone number that is staffed 24 hours a day. DNRP fabricated and installed the new signs in 2019. SPU will install new signs in 2020.

A website providing real-time notification of recent and current CSO discharges went live in December 2007 (http://www.kingcounty.gov/environment/wastewater/CSOstatus.aspx).

In April 2011, King County completed the process to incorporate City of Seattle near-real-time overflow information on this website. The website presents overflow status for the majority of Seattle and County CSOs with links to and from each agency's independent website. The community has access to consolidated information to assist in making choices about use of local waters. In late 2015, the website was upgraded to be more usable on mobile devices and allows users to zoom in and out to get more details. This upgrade "redesigned" the site from a set of five pages (an overview map and four submaps) to a single-page map.

In 2019, the CSO Status Web pages had 6,668 page views (representing 5,631 unique page views, with 81 percent of users viewing and then leaving the page [bounce rate]). This represented an 18 percent increase in page views from 2018, during which there were 5,697 page views.

2.9 Control 9—Monitoring CSO Outfalls

Monitor CSO outfalls to characterize CSO impacts and the efficacy of CSO controls. This must include collection of data that will be used to document the existing baseline conditions, evaluate the efficacy of the technology-based controls, and determine the baseline conditions upon which to base the long-term control plan. This data must include:

A. Characteristics of the combined sewer system, including the population served by the combined portion of the system and locations of all CSO outfalls in the combined sewer system.
B. Total number of CSO events and the frequency and duration of CSOs for a representative number of events.
C. Locations and designated uses of receiving waterbodies.
D. Water quality data for receiving waterbodies.
E. Water quality impacts directly related to CSOs (e.g., beach closing, floatables, wash-up episodes, fish kills).

In 1986, Metro began a sampling program to characterize each CSO and identify high-priority sites for early control. The program included collecting overflow quality data for five CSO sites per year and collecting sediment samples at each site. In the 1990s, sampling was expanded to assess compliance with Washington State Sediment Management Standards. The County's extensive monitoring for its 1999 CSO Water Quality Assessment of the Duwamish River and Elliott Bay found that the majority of

risks to people, wildlife, and aquatic life would not be reduced by removal of CSOs because most risk-related chemicals come from sources other than CSOs.

Under the previous NPDES permit for West Point effective July 1, 2009, King County developed a comprehensive sediment quality summary report for all CSO discharge locations (submitted December 2009 and supplemented in December 2018).

The report includes discussion of receiving water characteristics based on sampling results from the County's long-term marine ambient and point source monitoring program. Overall, the study showed that ambient water in the Duwamish area did not exceed the Washington State water quality criteria for aquatic life or EPA's recommended human health criteria for metals.

The report can be found at:
http://your.kingcounty.gov/dnrp/library/wastewater/cso/docs/SedQuality/0912_CompSedQualSumRptCSODischargeLoc.pdf.
https://www.kingcounty.gov/~/media/services/environment/wastewater/cso/docs/sed-qual/2018-Comprehensive-Sediment-Quality-Summary-Report.ashx?la=en

King County's Post-Construction Monitoring Plan (PCMP) is designed to assess, document, and report on the effectiveness of its CSO Control Program in achieving performance requirements and complying with state water and sediment quality standards. (See also Chapter 7 for additional information.) The King County PCMP was submitted to Ecology in July 2010 and was approved on September 28, 2012. It can be found at:
http://your.kingcounty.gov/dnrp/library/wastewater/cso/docs/ProgramReview/2012/AppH_CSO_PostConstructionMonitoringPlan,Sept2012.pdf.

King County published a comprehensive study of the water quality in Elliott Bay, Lake Union, the Ship Canal, and the Duwamish Estuary in 2017 with the WQA/MS (see Section 1.2.3). The study's Synthesis Report presents the following findings, including the following:

- Some long-term water quality trends show improvements—even as the Puget Sound region has grown. The region's water quality investments over the last 40 years have paid off.
    - Less bacteria that can make people sick
    - Fewer nutrients that can cause toxic algae blooms
    - More dissolved oxygen for fish to breath
- There is more to do to achieve water quality improvement.
    - Water temperature is getting warmer, which is worse for fish
    - Even with the long-term improvements, water does not always meet state water quality standards for bacteria, dissolved oxygen,

    - temperature, or human health standards for banned industrial chemicals called polychlorinated biphenyls or PCBs
    - Historically contaminated sediments need to be cleaned up or contained
- Controlling all CSOs in the Seattle area will protect water quality.
    - This will reduce the amount of fecal coliform bacteria entering the waterbodies by 80 percent
    - It will take more than CSO control to achieve desired water quality improvement
- Stormwater runoff and upstream watersheds carry many pollutants to waterbodies.
    - Many jurisdictions are developing new stormwater rules and regulations. A regional commitment and investment to address stormwater runoff, similar to wastewater treatment, will be needed

More details of the study can be found at the following link: (https://www.kingcounty.gov/services/environment/wastewater/cso/projects/water-quality-study.aspx).

3 CSO Control Measures Currently Underway

This section describes the progress made implementing current CSO control projects and other projects that affect CSO control. It includes project-specific summaries of progress made in 2019, planned activities for 2020, and the status of each project relative to the schedule of CD milestones.

The CD requires the County to report on projects underway and the status of early action CSO control measures. The CD milestone statuses through 2019 are summarized in Table 2. The locations of the CSOs and the status of the related project(s) are included in Figure 3.

Table 2. Summary of King County Consent Decree Milestones through 2019

CSO Name (Project Name)	DSN	Current Consent Decree Commitment	Current Status
Barton Street Pump Station (Barton Street Roadside Raingardens)	057	Did not meet control performance standard; Supplemental Compliance Plan submitted April 23, 2018; and monitoring to demonstrate control status due in 2019 Annual Report.	Supplemental Compliance Plan commitments have been completed; ongoing monitoring for control status. See Section 3.1 for more updates
Ballard Siphon Regulator (Ballard Siphon Project)	003	CSO outfall controlled by December 31, 2014	Outfall Controlled December 2014
Chelan Ave. Regulator Station (Chelan Ave. CSO Project)[a]	036	Completion of bidding by December 31, 2020	Request to modify milestones submitted 10/28/2019
Brandon St. Regulator Station/S. Michigan St. Regulator Station (Georgetown Wet Weather Treatment Station)[a]	039, 041	Construction completion by December 31, 2022	N/A

CSO Name (Project Name)	DSN	Current Consent Decree Commitment	Current Status
Hanford #2 Regulator Station/Lander St. Regulator Station/King St. Regulator Station/ Kingdome Regulator Station (Project Name TBD)[a]	032 030 028 029	Submit Facility Plan by December 31, 2024	N/A
Montlake Regulator Station (Project Name TBD)[a]	014	Submit Facility Plan by December 31, 2023	N/A
Murray Street Pump Station (Murray St. Wet Weather Storage Project)	056	CSO controlled by December 31, 2017	Outfall Controlled December 2017
North Beach Pump Station (North Beach Wet Weather Storage Project)	048a, 048b	CSO outfall controlled by December 31, 2016	Outfall Controlled December 2016
Hanford #1 (Rainier Valley Wet Weather Storage Project)[a]	031	Construction Completion by December 31, 2019	Construction Completed June 2018
11th Ave. NW/3rd Ave W (Ship Canal Water Quality Project)[b]	004, 008	(For King County) construction completion by December 31, 2025	N/A
South Magnolia (South Magnolia Wet Weather Storage Project)	006	Supplemental Compliance Plan required the corrective action be final by December 31, 2018; monitoring to demonstrate control status due in 2019 Annual Report.	Corrective action completed December 2018, and project operational. See Section 3.1 for more updates
University Regulator Station (Project Name TBD)[a]	015	Submit Facility Plan by December 31, 2023	N/A

CSO Name (Project Name)	DSN	Current Consent Decree Commitment	Current Status
West Michigan St. Regulator/Terminal 115 (West Duwamish CSO Control Project)[a]	038, 042	Submit Facility Plan by December 31, 2020	N/A
Dexter Ave. Regulator Station (Dexter Ave. Supplemental Compliance Plan)	009	Supplemental Compliance Plan submitted August 2013; control status to be reported in 2016 Annual Report.	Outfall controlled July 2016
Denny Way Regulator Station (Denny Way Supplemental Compliance Plan)	027a	Revised Supplemental Compliance Plan submitted to Ecology August 31, 2016; Completion of modifications by December 2018 and monitoring to demonstrate control status due in 2019 Annual Report.	Modifications completed May 2018. See Section 3.1 for more updates
Harbor Ave. Regulator Station (Harbor Ave. Supplemental Compliance Plan)	037	Submit to Ecology & EPA within 30 days of CD (July 3, 2013) Revised Plan submitted to Ecology August 31, 2016 Completion of modification and monitoring for control to be achieved by December 2018, and monitoring to demonstrate control status due in 2019 Annual Report.	Modifications were completed in January 2019; See Section 3.1 for more updates

[a] Capital project set forth in Appendix B of the CD

[b] Per October 25, 2016, Non-Material CD Modification. CD Appendix A refers to two stand-alone CSO outfalls, East Ballard (a.k.a. 11th Ave. NW) and 3rd Ave. W and Ewing St. (a.k.a. 3rd Ave. NW). The referenced CD modification allows these two outfalls to be controlled as part of the Ship Canal Water Quality Project in collaboration with the City of Seattle. SPU interim CD milestones will be used to measure progress but are not part of the King County CD modification, because SPU is the project lead and their dates are earlier than the County's CD dates for a joint project in the nonmaterial CD modification.

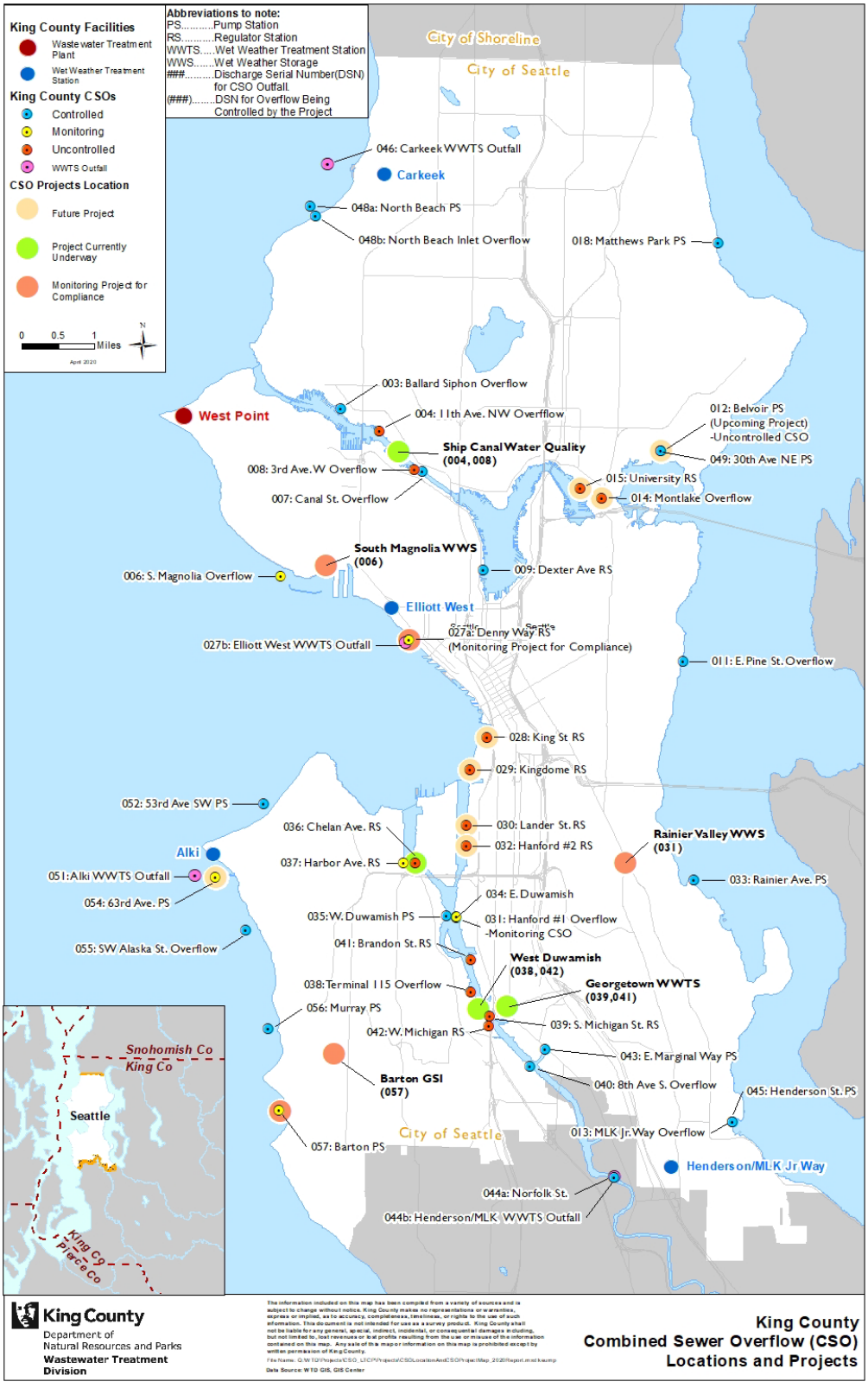

Figure 3. King County CSO Control Projects

Project Summaries

A summary project status page for 2019 for each active project follows. These project summaries do not include past completed projects or upcoming projects.

Projects in progress include:

- Georgetown Wet Weather Treatment Station
- Ship Canal Water Quality Project
- West Duwamish
- University GSI
- Chelan Ave. CSO Project

CD/CSO Report Project Status

Georgetown Wet Weather Treatment Station

CSO(s): DSN 041 (Brandon St. RS Overflow) and DSN 039 (S. Michigan St. Overflow)

Project Description: Construct a WWTS, associated conveyance, and marine outfall. For more information see:

http://www.kingcounty.gov/environment/wtd/Construction/Seattle/BrandonMichiganCSO.aspx.

Milestones	CD Milestone Date (Actual Date)	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Submission of Facilities Plan	12/31/2015 (draft submitted 11/2/2015)											
Completion of Bidding	12/31/2017 (11/30/2017)											
Construction Completion	12/31/2022 (N/A)											
Achievement of Performance Standard	12/31/2024 (N/A)											

2019 Accomplishments:

- Remobilized outfall contractor to complete work initiated in 2018.
- Continued construction of the treatment station and equalization basin structure.
- Continued construction of the conveyance pipeline.

2019 Challenges and Corrections:

- Treatment Plant construction contract – Various changes to the contract were executed in 2019 to account for design changes/clarifications, differing site conditions, and delays due to significant weather events.
- Conveyance construction contract – More contaminated soil discovered than estimated in the contract documents.
- Outfall construction contract – Due to numerous differing site conditions, the contractor was not able to complete the outfall in one fish window.

2020 Activities in Progress or Expected:

- Complete work on the outfall.
- Complete construction of conveyance pipeline.
- Continue construction of treatment plant structures and buildings.

CD/CSO Report Project Status

Ship Canal Water Quality Project

CSO(s): DSN 008 (3rd Ave. W Outfall) and DSN 004 (11th Ave. NW Outfall)

Project Description: The Ship Canal Water Quality Project (Ship Canal Project) is a joint SPU-WTD project that will control CSOs from SPU's Wallingford, Fremont and Ballard areas (Outfalls 147, 150, 151, 152, and 174) and WTD's 3rd Avenue West (DSN 008) and 11th Avenue Northwest (DSN 004) outfalls.

SPU is the lead agency for design and construction, and will own, operate, and maintain the tunnel and its related structures. (WTD will continue to own its two outfall structures.) WTD is coordinating with SPU on the project through a Joint Project Agreement (JPA) approved by the Seattle and County Councils in July 2016. The JPA guides implementation, operation, and cost-sharing of the Ship Canal Project. The County is providing funding and technical expertise and participates in the JPA mandated Joint Oversight and Project Review and Change Management Committees. This project is in both King County and the City of Seattle's CDs. For more information see: https://www.seattle.gov/utilities/environment-and-conservation/projects/ship-canal-water-quality

As project lead, more detail is also provided in SPU's Annual CD/CSO Report.

Milestones	CD Milestone Date (Actual Date)	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Submission of Draft Facilities Plan	3/31/2017 (1/15/2016)[1]												
Completion of Bidding	7/1/2021 (12/26/2019)[2]												
Construction Completion	12/31/2025 [3] (N/A)												
Achievement of Performance Standard	12/31/2026 (N/A)												

Note: CD Milestones and Actual Dates are SPU's except for Construction Completion, which is the same for both agencies. WTD's CD does not have interim milestones for the joint city–county storage tunnel.

[1] The formal County submittal date was 1/22/2016.

[2] This was the completion of bidding for the tunnel construction contract, which per Ecology qualified as achieving this CD milestone. Bidding (Notice to Proceed) for the remaining major portions (pump station, conveyance, etc.) is projected to be completed by 2023.

[3] Date represents completion of all substantial construction and ability to accept CSO flow diversion.

2019 Accomplishments

- Submitted the final design plans and specifications for the storage tunnel, the largest single subproject within the overall Ship Canal Project and received approval from Ecology.
- Advertised, bid and executed the storage tunnel contract with the Lane Construction Corporation.
- Substantially completed the Ballard Early Works construction package, which prepared the site for the future construction activities for the tunnel and pump station to be located on the site.
- Completed the 24th Ave Pier Construction, which will allow barging of tunnel construction spoils and provide a public pier with art after the project is completed.
- Finalized all necessary property easements for the Storage Tunnel subproject.
- Completed refinements to the Integrated Model and incorporated necessary resultant design changes to the project. This model will also be used for evaluating design performance and developing operational strategies. It includes the tunnel system, the County's North Interceptor, upstream flows from University and Montlake basins, and conveyance to West Point.
- Continued progress towards the 60 percent design milestone for the Tunnel Effluent Pump Station (TEPS), the second largest component of the overall project.
- Continued with developing a joint TEPs operational strategy to coordinate effective communications and operations between agencies once the project is completed and reached agreement on the initial operational strategy to mutually benefit both agencies and minimize environmental impacts of CSO's.
- Integrated the selected construction management (and program support services) consultant into the project team to ensure quality and coordination throughout construction, holding partnering and tunnel construction kickoff meetings and regular briefings and coordination amongst the agency and contracted partners.
- Continued efforts to meet the requirements for a Platinum award level for environmental design using the Envision Rating System.
- Continued with substantial community outreach.
- The project received final approval of an overall Construction Quality Assurance Plan from Ecology,
- Both agencies executed 2019 State Revolving Fund (SRF) loans with Ecology, and WTD prepared a Federal WIFIA application to qualify for loans for their cost share.

2019 Challenges and Corrections:

- A significant scope change resulting in project savings was approved, eliminating the earlier planned conveyance line ("Shilshole pipe") from the TEPS to the existing Ballard regulator structure. Thorough modeling and engineering analysis ultimately proved that there was sufficient storage capacity in the tunnel as designed to allow drainage through an existing parallel local conveyance pipe in good condition. The analysis demonstrated that while there would be a marginal increase in tunnel holding times during the larger storms, all outfalls would remain controlled. Interagency cooperation successfully resolved all technical and other issues to achieve this.
- The project's budgeted engineer's estimate and inflation reserves for the tunnel construction contract were significantly exceeded, in part due to market conditions in the heated Seattle construction market. Even the accepted low bid from Lane Construction will require use of the project's management reserves. A comprehensive effort in 2020 will apply the lessons learned from this as the project budget is updated.

2020 Activities in Progress or Expected:

- Continue design progress on all remaining aspects of the project, including TEPS and Ballard and Wallingford Conveyance (other conveyance contributing to the tunnel is included in the tunnel contract).
- Complete cost containment and cost evaluation efforts in order to reduce project/program costs by offering alternatives (while ensuring that quality, reliability and other critical factors meet or exceed project or program expectations).
- Complete necessary support activities for tunnel construction, including advance utility relocation and temporary power.
- Complete mobilization and construction activities by the tunnel contractor and begin constructing tunnel shafts in five neighborhoods along the project alignment to allow placement of the tunnel boring machine and future conveyance lines bringing CSO flows to the tunnel.
- Complete the order of, and begin fabrication of, the tunnel boring machine that will be used to excavate the tunnel alignment.
- Continue work on the Operations and Maintenance (O&M) Manual and O&M Plan.
- Complete and submit King County's WIFIA loan application.

CD/CSO Report Project Status

West Duwamish CSO Control

CSO(s): DSN 038 (Terminal 115 Overflow) and DSN 042 (West Michigan Regulator Overflow)

Project Description: Construct a storage tank. For more information see:

https://www.kingcounty.gov/depts/dnrp/wtd/capital-projects/active/west-duwamish-cso-control.aspx.

Milestones	CD Milestone Date (Actual Date)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Submission of Facilities Plan	12/31/2020 (N/A)											
Completion of Bidding	12/31/2022 (N/A)											
Construction Completion	12/31/2025 (N/A)											
Achievement of Performance Standard	(N/A)											

2019 Accomplishments:

- Continued Preliminary Design - Baseline Design process.
- Pursued acquisition of proposed storage tank property.
- Continued community briefings through project website and mailings.

2019 Challenges and Corrections:

- None.

2020 Activities in Progress or Expected:

- Continue Preliminary Design - Baseline Design process.
- Planned submittal of facilities plan consistent with CD milestone.
- Complete acquisition of proposed storage tank property.
- Continue community briefings through project website and mailings.

CD/CSO Report Project Status

University Green Stormwater Infrastructure

CSO(s): DSN 015 (University RS Overflow)

Project Description: Construct GSI to minimize the gray infrastructure demands needed to achieve full CSO control. The timeline below corresponds to the CD's timeline for complete control of the University RS Overflow. For more information see: https://www.kingcounty.gov/depts/dnrp/wtd/capital-projects/active/university-gsi.aspx.

Milestones	CD Milestone Date (Actual Date)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Submission of Facilities Plan [1]	12/31/2023 (N/A)												
Submission of Final Plans & Specifications	12/31/2025 (N/A)												
Construction Completion	12/31/2028 (N/A)												
Achievement of Performance Standard	N/A												

[1] An optional Green for Gray substitution report would be required by 12/31/22.

2019 Accomplishments:

- Completed Maximum Extent Practicable (MEP)[1] Alternatives Analysis completed in May 2019
- Completed development of Sub-Alternative in November 2019.

2019 Challenges and Corrections:

- Received direction from WTD management to develop Sub-Alternative to MEP to better align with available funding capabilities.

2020 Activities in Progress or Expected:

- Additional green infrastructure project implementation will proceed as informed by the Clean Water Plan.
- Continued funding for RainWise in the University basin, and development of a GSI BMP modeling tool and manual.

[1]Maximum Extent Practicable: GSI to the MEP consists of maximum implementation of GSI that is feasible, provides efficient CSO reduction and considers additional non-monetary co-benefits and challenges.

CD/CSO Report Project Status

Chelan Avenue CSO Control Project

CSO(s): DSN 036 (Chelan Ave. RS Overflow)

Project Description: This project will control the Chelan Avenue combined sewer overflow to one event per year on a 20-year rolling average. It includes the siting, design, and construction of a buried storage tank or tunnel to hold approximately 4.3 MG of combined sewage; a pump station of approximately 7.7 MGD; and above-grade support facilities likely to include a facilities building, odor control, emergency power generation, flow diversion, and discharge.

For more information see: https://www.kingcounty.gov/depts/dnrp/wtd/capital-projects/active/chelan-cso-control.aspx.

Milestones	CD Milestone Date (Actual Date)	2017	2018	2019	2020	2021	2022	2023	2024
Submission of Facilities Plan	12/31/2018 (12/31/2018)								
Completion of Bidding[1]	12/31/2020 (N/A)								
Construction Completion[2]	12/31/2023 (N/A)								
Achievement of Performance Standard[3]	12/31/2024 (N/A)								

[1] The new requested deadline for the Completion of Bidding Milestone is 12/31/2026.

[2] The new requested deadline for the Construction Completion Milestone is 12/31/2030.

[3]The new requested deadline for the Achievement of Performance Standard Milestone is 12/31/2032.

2019 Accomplishments:

- On October 28, 2019, the County sent a letter to EPA and Ecology to formally request initiation of negotiations to modify the CD. The letter also requested extension of two interim milestone dates associated with the Chelan Avenue CSO control project to be consistent with the HLKK project, Completion of Bidding by December 31, 2026 and Construction Completion by December 31, 2030.

2019 Challenges and Corrections:

- None.

2020 Activities in Progress or Expected:

- Continue discussion regarding potential CD modification.

3.1 Supplemental Compliance Plan Summaries

Supplemental Compliance Plans are documents that describe remedial measures King County will take to achieve CSO control for completed CSO control projects. According to the 2013 CD, Supplemental Compliance Plans are required when:

- CSO control projects are not constructed in accordance with design criteria set forth in the CD,
- King County is not complying with all requirements of its NPDES permit pertaining to CSOs, or
- The CSO control project does not result in meeting the CSO control performance standard of no more than one overflow event per year on a 20-year moving average.

To date, King County has only developed supplemental compliance plans for CSO control projects that did not result in meeting the CSO control performance standard.

A status page for each project under a Supplemental Compliance Plan follows. Table 3 provides updates for each of King County's past Supplemental Compliance Plans. A Supplemental Compliance Plan was submitted for the Dexter CSO outfall in 2013. That plan is complete, and Dexter is now in control.

A Supplemental Compliance Plan for Hanford #1 will be completed in 2020.

Projects with active Supplemental Compliance Plans include:

- Barton Street CSO
- Denny Way RS Overflow
- Harbor Avenue RS Overflow
- South Magnolia Wet Weather Storage and Pipeline

Projects with Pending Supplemental Compliance Plans include:

- Hanford #1

In December 2017, King County submitted a CSO compliance actions letter to Ecology acknowledging that Belvoir PS outfall does not meet the CSO control performance standards as specified in the NPDES permit and consent decree. WTD is committed to working closely with SPU to support completion of operational and capital improvements underway. All necessary steps needed to bring Belvoir PS into compliance will be completed by December 31, 2030. The County also submitted a letter to Ecology in May 2018 acknowledging that the 63rd Ave SW PS outfall does not meet the CSO control performance standard. The letter provided information on actions

the County will be taking so that 63rd Ave SW PS will meet the performance standard by December 31, 2030.

Table 3. Summary of King County Supplemental Compliance Plans

CSO Name (Project Name)	DSN	Supplemental Compliance Plan Background	Outfall Status
Barton Street Pump Station	057	Did not meet control performance standard; Supplemental Compliance Plan submitted April 23, 2018 and monitoring to demonstrate compliance due in this Annual Report. Supplemental Compliance Plan commitments completed June 2019	Monitoring for achievement of performance standard
South Magnolia (South Magnolia Wet Weather Storage Project)[2]	006	Supplemental Compliance Plan required the corrective action be final by December 31, 2018. Corrective action completed December 2018, and project operational	Monitoring for achievement of performance standard
Dexter Ave. Regulator Station (Dexter Ave. Supplemental Compliance Plan)	009	Supplemental Compliance Plan submitted August 2013; control to be achieved by July 31, 2017	Outfall controlled in 2016
Denny Way Regulator Station (Denny Way Supplemental Compliance Plan)	027a	Revised Supplemental Compliance Plan submitted to Ecology August 31, 2016 Completion of modifications by May 2018.	Monitoring for achievement of performance standard

CSO Name (Project Name)	DSN	Supplemental Compliance Plan Background	Outfall Status
Harbor Ave. Regulator Station (Harbor Ave. Supplemental Compliance Plan)	037	Submit to Ecology & EPA within 30 days of CD (July 3, 2013) Revised Plan submitted to Ecology August 31, 2016 Completion of modification in January 2019	Monitoring for achievement of performance standard

CD/CSO Report Project Status

Barton Street Pump Station CSO

CSO(s): DSN 057 (Barton St. PS Overflow)

Project Description: Construct GSI (bioretention swales and associated drainage structures) and underground injection control (UIC) wells for CSO control. The project did not initially meet the performance standard (an average of one uncontrolled CSO event per year on a 20-year moving average), and King County submitted a supplemental compliance plan in April 2018. For more information see:

http://www.kingcounty.gov/environment/wtd/Construction/Seattle/BartonCSO-GSI.aspx.

2019 Accomplishments:

- Completed commitments in the 2018 Supplemental Compliance Plan.
- Adjustments to control strategy completed June 2019.
- Continued to monitor for compliance.

2019 Challenges and Corrections:

- Operational adjustments concluded June 2019, which allowed for a partial year of monitoring data using the current operation.
- Additional modeling was completed with different levels of pump station capacity. Uncertainty in peak pump station capacity required additional modeling for multiple potential pump capacities.

2020 Activities in Progress or Expected:

- Continue monitoring for achievement of performance standard.
- Perform operational adjustments as necessary to maximize pump capacity. Operations staff will explore overspeeding pumps to achieve control status.
- Continue modeling using updated pump performance.
- Report actual and modeled performance in 2020 CSO/CD Annual Report.

CD/CSO Report Supplemental Compliance Plan Status

Denny Way Regulator Station Overflow

CSO(s): DSN 027a (Denny Way RS Overflow)

Project Description: Adjust facilities built in 2005 to achieve final control per the Supplemental Compliance Plan included in the 2011 TM 970 and updated to Ecology and EPA in 2012. Investigation suggested that two of the inputs—Denny Local and Denny Lake Union—were overflowing more than intended. The investigation recommended removal of the lower Denny local weir and modification of the Elliott West pump ramp-up strategy to drop the lead pump start set point by 2.25 feet and improve flow into the Elliott West facility. The weir modifications were completed in July 2011 and pumping strategy modifications were completed on November 17, 2011. Additional work on the pumping strategy was completed in the fall of 2015. Monitoring in 2016 still showed control issues with Denny Way and additional adjustments to pumping strategy were made in December 2016 and monitored over two wet-seasons. Model updates were completed in 2019. Current model of the facility indicated that it is very close to being in control, however more modeling and monitoring is planned in 2020 to confirm control status.

2019 Activities:

- Completed model updates.
- Monitored compliance at Denny Way RS.

2019 Challenges and Corrections:

- More monitoring information is needed to gain certainty and confirm achievement of the performance standard.

2020 Activities in Progress or Expected:

- Continue monitoring for achievement of performance standard.
- Additional modeling is planned to confirm the model is calibrated and validated as well as possible to reflect operational strategy and observed conditions.

CD/CSO Report Supplemental Compliance Plan Status

Hanford #1

CSO(s): DSN 031 (Hanford #1 Overflow - Hanford @ Rainier Overflow, Bayview North Overflow, and Bayview South Overflow)

Project Description: The project achieved substantial completion in 2018 and has completed its first full year of monitoring. The project has recorded two events in 2019, and modeling indicates the project did not achieve the performance standard. WTD will be submitting a Supplemental Compliance Plan. For more information see: https://www.kingcounty.gov/depts/dnrp/wtd/capital-projects/completed/rainier-valley-wet-weather-storage.aspx

2019 Accomplishments:

- Monitored for achievement of performance standard.
- Completed operational changes to drain pump control to optimize facility performance.

2019 Challenges and Corrections:

- None

2020 Activities in Progress or Expected:

- Monitoring and modeling results reviewed during preparation of 2019 CSO Annual Report indicated that the project did not achieve performance standard.
- Submission of a Supplemental Compliance Plan to Ecology is scheduled for August 2020, including timing and determination of additional commitments to achieve performance standard and add to the path towards compliance.

CD/CSO Report Supplemental Compliance Plan Status

Harbor Avenue Regulator Station Overflow

CSO(s): DSN 037 (Harbor Ave. RS Overflow)

Project Description: A Revised Supplemental Compliance Plan was submitted October 15, 2016 (and approved by Ecology December 14, 2016). This committed WTD to construction and installation of a new gate actuator, modifications to electrical system and structural changes. WTD met the substantial completion date of January 31, 2019. King County completed all commitments in the Revised Supplemental Compliance Plan. Current model of the facility indicated that it is very close to being in control, however more modeling is planned in 2020 to confirm control status.

2019 Activities:

- Installation of a faster gate actuator on the Harbor CSO gate to the West Seattle Tunnel, electrical system modifications, and structural changes were completed in January 2019.
- Achieved substantial completion and final acceptance on January 31, 2019.

2019 Challenges and Corrections:

- More monitoring information is needed to gain certainty and confirm achievement of the performance standard.

2020 Activities in Progress or Expected

- Continue monitoring for achievement of performance standard.
- Additional modeling is planned to confirm the model is calibrated and validated as well as possible to reflect actual inflow conditions and gate operation.
- Report actual and modeled performance in 2020 CSO/CD Annual Report.

CD/CSO Report Supplemental Compliance Plan Status

South Magnolia Wet Weather Storage and Pipeline

CSO(s): DSN 006 (S. Magnolia Overflow)

Project Description: Investigate solution to pipe break in the CSO conveyance pipe that was first discovered in fall 2016. A Supplemental Compliance Plan was submitted in January 2017 to comply with the CD deadline for notifications.

King County completed all commitments in the Revised Supplemental Compliance Plan. Current model of the facility indicated that it is very close to being in control, however more modeling is planned in 2020 to confirm control status.

For more information see:
http://www.kingcounty.gov/environment/wtd/Construction/Seattle/SMagnoliaCSOStorage.aspx.

2019 Accomplishments: • Monitored for compliance at South Magnolia. • Updated modeling using 2019 actual data and 19 years of historic rainfall.
2019 Challenges and Corrections: • More monitoring information is needed to gain certainty and confirm achievement of the performance standard.
2020 Activities in Progress or Expected: • Continue monitoring for achievement of performance standard. • Additional modeling is planned to confirm the model is calibrated and validated as well as possible to reflect operational strategy and observed conditions. Report actual and modeled performance in 2020 CSO/CD Annual Report.

3.2 Program Plan Summaries

The CD required development and implementation of two plans: the SSOP and the Joint Operations and System Optimization Plan with the City of Seattle.

3.2.1 Sewer System Operations Plan

WTD submitted the SSOP on September 27, 2013. Ecology and EPA approved the SSOP on May 29, 2014 and July 29, 2014, respectively. The SSOP is an electronic, interactive document with embedded links to the most current base documents, such as O&M manuals, plant manuals, safety plans, and maps. King County staff typically access the SSOP from the County's intranet site. Portable storage device (thumb drive) versions are also provided to key staff for access in the field or from home. Representatives from Operations, Offsite, and the CSO control planning program continue to review the plan regularly to ensure the electronic links still work and base documents are being updated as needed. Staff are exploring putting the document online instead of using thumb drives.

3.2.2 Joint Operations and System Optimization Plan

The City of Seattle's and King County's CDs direct both agencies to work together to develop a single Joint Operations and System Optimization Plan. Staff from King County's DNRP and SPU focused on areas in the system that have the greatest potential for operational optimization and developed a set of multi-basin joint commitments. These commitments were approved by the Director of SPU's Drainage and Wastewater Line of Business and the Director of DNRP's WTD and were included in the Joint Operations and System Optimization Plan submitted to EPA and Ecology on February 10, 2016. Comments were received from EPA and Ecology and a revised plan was submitted on February 23, 2017.

The CD requires that the Joint Operations and System Optimization Plan is reviewed every three years and updated as necessary to ensure the optimal level of coordination and information sharing between SPU and DNRP. In 2018, SPU and DNRP worked together to update the Joint Operations and System Optimization Plan through a series of meetings and internal reviews. The update includes new or revised information on each agency's organization, the addition of the System Operations Oversight Committee chartered in 2017, progress and accomplishments related to all joint commitments, and minor revisions to the JOIST commitment to allow discussion of technical resource sharing and voluntary job shadowing. The update was reviewed by DNRP and SPU management and was submitted to Ecology and EPA in January 2019.

The following describes each commitment and the progress SPU and DNRP made in 2019:

- The Joint System Debrief Committee commitment is to evaluate performance of the SPU and DNRP systems, identify interconnections to improve operations, and share information after major storm events. To coordinate for the 2019/2020 wet season, a meeting was held in October 2019 to discuss pre-season maintenance activities, system changes, meteorological information, and emergency communication protocols.
- The Data Sharing commitment is supported by four activities: the formation of the Joint Operations Information Sharing Team (JOIST), implementation of a pilot project for sharing real-time SCADA data, development of data sharing protocols, and the improvement of regional ability to forecast storms and rainfall intensities.
    - JOIST held four meetings during which SPU and DNRP staff conducted tours of both SPU and DNRP facilities and shared information on the operation of existing facilities, progress of capital projects, and coordination of Joint Plan commitments.
    - The SPU and DNRP data sharing committee established standard operating procedures for sharing information and to facilitate data transfer as requested. An annual data review workshop was held in June to review flow monitoring data collected by each agency and provide recommendations for future monitoring.
    - A Real-Time Data Sharing Pilot established a framework for real-time data sharing and resulted in development of a secure connection between DNRP's and SPU's Supervisory Control and Data Acquisition (SCADA) systems for the Windermere/ University basin where both DNRP and SPU have pump stations and CSO control facilities. A joint project team completed an options analysis of a permanent data sharing platform. SPU and DNRP are coordinating on the timing for the design and implementation of the permanent platform.
    - SPU and DNRP staff have developed an online mapping tool identifying the location of flow monitoring equipment deployed in the collection system. The map is currently hosted on a DNRP data sharing extranet site shared with SPU.
    - DNRP and SPU exchanged internal operational weather forecasts and impacts information. Both agencies worked together to incorporate climate change model output, including new projections of changing heavy precipitation, to better understand future impacts of intense rainfall on the wastewater systems. SPU and DNRP continued to engage the research

community and co-develop predictive tools to enable operational adjustments to mitigate CSO and flooding events.

- The Joint Modeling Coordination Committee commitment is to share modeling tools and increase understanding of modeling analyses and system operation while developing stronger working relationships between DNRP and SPU modeling staff and improving efficiencies through better coordination efforts. Members of the Joint Modeling Coordination Committee held meetings in 2019 to review modeling results and coordinate model developments between each agency. Work activity continued to focus on development and application of the MIKE URBAN model of the North Interceptor system incorporating the proposed joint Ship Canal Water Quality Project Facility. A joint modeling work plan initially developed by the Joint Modeling Coordination Committee in 2018, was updated to reflect current and future work. This plan will continue to provide a framework for coordination and communication for upcoming modeling work.
- The coordination during Startup and Commissioning of CSO Control Facilities commitment is to conduct document review, attend commissioning meetings, and implement data sharing for SPU and DNRP CSO control facilities. In 2019, SPU commissioned the Delridge Basin 99 CSO sewer system improvement project and provided an overview to DNRP during a JOIST meeting.
- The Real Time CSO Notification commitment is to improve both onsite signs and website information to improve notification of CSO events and communication with customers. SPU and DNRP finished an updated design for signs identifying CSO outfalls. The design includes the website address to obtain CSO status, multiple languages, a larger size for visibility, and a new phone number directed to SPU's Operations Response Center, which will serve as a single point of contact for both SPU and DNRP CSO outfalls located in the City of Seattle. Installation at DNRP CSO locations was completed in 2019 and is expected to be completed at SPU's CSO outfalls in 2020.
- The Reduce Saltwater Intrusion commitment is continuing to work together on studies, data and solutions for reducing intrusion. In 2019, DNRP presented findings of recent saltwater monitoring at a JOIST meeting. DNRP will continue to monitor saltwater in the conveyance system to monitor progress and identify any new sources of saltwater intrusion.

3.2.3 WTD and SPU Coordination on CSO Control Projects

WTD and SPU have been working together for many years to identify joint project and operational opportunities to improve each agency's efforts and better protect public health and the environment. The two agencies have agreed to guiding principles to ensure that neither agency will adversely impact the compliance of the other.

Given that SPU's combined sewers are upstream of King County's system, new or improved CSO control facilities in one agency's system have the potential to affect flows in the other agency's system. For this reason, SPU and WTD coordinate before and after construction of capital projects. Below is a list of SPU projects completed in recent years:

- Delridge Basin 99 CSO Sewer System Improvement Project – SPU commissioned the project in 2019 and provided an overview to DNRP during a JOIST meeting.
- North Central Waterfront (Basin 69) – SPU completed an evaluation of alternatives to control the basin, submitted a Draft Engineering Report on June 26, 2019, and submitted a Final Engineering Report on December 20, 2019. The preferred alternative would send flows north from the basin to DNRP's Elliott Bay Interceptor.

WTD and the City of Seattle have flow monitoring in place for those Seattle projects with the potential to impact flows in the regional system. Flow data is collected and reviewed annually to determine if flow monitoring adjustments need to occur. WTD will continue working with SPU on control and operational strategies as SPU starts up any new facilities and continues operating its existing facilities.

SPU and WTD continue to work together to ensure GSI projects in the City of Seattle use a consistent approach, per the GSI Memorandum of Agreement signed by the two agencies in 2013. The term *GSI* describes a variety of measures that use soil to absorb stormwater or slow the rate of stormwater entering the combined sewer system. GSI solutions control the sources of pollution by slowing, detaining, or retaining stormwater so that it does not carry runoff into nearby waterways. GSI projects reduce the volume and timing of flows into the combined sewer system. GSI facilities also are referred to as "natural drainage systems" and can be a component of low impact development. Collaborative work between WTD and SPU in 2019 included:

- Upgrading the joint www.700milliongallons.org website, including improving user access to RainWise materials. The platform is continuing to become more mobile friendly and RainWise information will be easier to access and understand.
- Finalizing Volume III (Design Phase), issuing a draft final of Volume II (Options Analysis), issuing a draft of Volume IV (Construction and Commissioning) to document procedures and practices and help ensure the quality of projects based on lessons learned from recent projects, and issuing a draft final of Volume V (Operations & Maintenance) to address issues identified during finalization of Volume III of the joint SPU/DNRP Green Stormwater Infrastructure (GSI) Manuals.

- Holding a series of six workshops with SPU and DNRP representatives and subject matter experts to develop and document guidance for design, construction and maintenance of underground injection control (UIC) facilities that may be included as part of bioretention projects to help achieve volume reduction.

In 2020, planned collaborative work includes:

- Finalizing Volume II (Options Analysis), Volume IV (Construction and Commissioning), and Volume V (Operations & Maintenance) of the joint GSI Manuals, including incorporating the UIC guidance.

Lastly, SPU and WTD are working closely on the Ship Canal Water Quality Project, a joint project that will control WTD's 11th Ave. NW and 3rd Ave. W. CSOs and SPU Basins 147, 150/151, 152, and 174. Coordination for this project is ongoing, and the status of this joint project is described in Section 3.1 of this report.

4 Summary of Rainfall and CSO Events

King County measures rainfall in the Seattle area at many of its regulator stations, pump stations, overflow locations, and at West Point. It also monitors the frequencies and volumes of both untreated and treated CSOs at all of its permitted CSO locations.

This section describes rainfall data and reports on unpermitted overflows and summarizes frequency and volume for all untreated and treated CSO discharges in 2019. Additional information can be found in the appendices.

4.1 Annual Rainfall

Rainfall data are reported for each CSO event as measured by the nearest King County-owned rain gauge. Rainfall data for 2019 are included in Appendices A and B. The annual rainfall for 2019, as an average over local rain gauges, was 24.54 inches. The annual rainfall at Sea-Tac Airport was 33.88 inches, which is below the 20-year Sea-Tac Airport annual average of 37.40 inches. This broke the streak of four consecutive years of above average rainfall. Long-term, WTD will be looking at how storms over the last 20 years may compare to storms of the next 60 years. WTD is funding work at the University of Washington Climate Impacts Group to analyze impacts on precipitation over the next century.

4.2 Unpermitted Overflows

Overflows can occur from CSO structures and outfalls, broken pipelines, and maintenance holes. Unpermitted overflows can be of three types: DWOs, exacerbated CSOs, or sewer overflows (SSOs).

Overflows in the combined system to CSO outfalls that occur beyond 24 hours after rainfall has ceased are called DWOs. In King County's system, when DWOs occur, they are usually a result of mechanical failures, power outages, or human error. Per the EPA's Nine Minimum Controls and the West Point NPDES permit, DWOs are prohibited.

Overflows in controlled or uncontrolled basins to CSO outfalls that are increased or extended in duration as a result of mechanical failures, power outages, or human error, are referred to as "exacerbated CSOs."

The release of sanitary or combined flows at any location in the conveyance system other than the designated CSO outfalls, regardless of the basin's "control" status, presence/absence of precipitation or existing high flow events, or causes due to mechanical failures, power outages, or human error, are referred to as *SSOs*.

Additionally, the CD defines an SSO as “any overflow, spill, diversion, or release of wastewater from or caused by the Sanitary Sewer System or the Combined Sewer System” to surface waters of the state or United States, or to land. However, it is not considered an SSO when a wastewater release occurs on land where the overflow is completely contained in a system designed for the purpose of wastewater containment during construction activity.

Table 4 shows that in 2019, there was an emergency bypass overflow event in July at the West Point wastewater treatment plant which was triggered by a utility power interruption. There also were two small SSOs within the combined system associated with faulty equipment.

Table 4. Summary of Unpermitted Overflows in 2019

Date of Event	Facility	Description of Violation(s)
7/19/19	West Point	Emergency Bypass Overflow: power interruption caused shutdown of effluent and intermediate pumps; approximate 2.1 million gallons overflow to Puget Sound
8/2/19	Barton PS	DWO: Leak from air/vacuum relief valve; overflow to beach; leak caused by debris blockage which has been fixed. 400 gallons overflowed into Puget Sound.
9/13/19	Interbay PS	SSO: Leaking force main #2 from Interbay caused a sinkhole under Magnolia Bridge that was reported by a passerby. Small amount of overflow contained to immediate site (no runoff). Force main isolated and leak repaired w/in 28hr. Exact volume undetermined.

4.3 Annual Untreated CSO Events

West Point’s SCADA system monitors the volume and frequency of CSOs at regulator and pump stations. Portable flow meters are deployed at 12 CSO locations not currently monitored by SCADA or to supplement SCADA monitoring: 11th Ave. NW Overflow, 3rd Ave. W and Ewing Street Overflow, 30th Ave. NE Overflow, Southwest Alaska Street Overflow (SW Alaska St. Overflow), Bayview North Overflow (Bayview N Overflow), Bayview South Overflow (Bayview S Overflow), East Duwamish Pump Station Overflow (E Duwamish PS Overflow), W Duwamish Overflow, Hanford @ Rainier Overflow, S Magnolia Overflow, North Beach PS Inlet Overflow, and Terminal 115 Overflow.

Hydraulic modeling predicts that King County CSOs will discharge 800 MG of untreated CSO in an average year of rainfall. In 2019, there were 18 storm events resulting in untreated CSO discharges. Some storm events spanned multiple days and, at times, there were multiple discharges on the same day. Conditions in 2019 resulted in 74 untreated CSO events discharging about 752 MG and 20 treated CSO events discharging 330 MG, including West Point CSO events. This volume is near the predicted volume during a normal rainfall year. The highest precipitation occurred in December (7.96 inches) and resulted in 24 untreated events and 645 MG. The second highest precipitation occurred in February (4.62 inches), resulting in nine untreated events and an overflow volume of 47 MG.

Appendix A lists the untreated events from County CSOs during 2019. These data are also provided in electronic form to Ecology with this report.

4.4 CSO Treatment

King County provides CSO treatment, defined in Chapter 173-245 WAC as “equivalent to primary” treatment and disinfection at four satellite facilities: Alki, Carkeek, Elliott West, and Henderson/MLK Jr. Way WWTSs. West Point also provides primary treatment for CSO flow, and blending with secondary treated flows, when the total inflow at West Point exceeds its secondary treatment capacity of 300 MGD.

The following sections summarize performance and compliance at each facility during 2019. Appendix B of this report provides more detail on volumes and events. Appendices C through F contain the annual reports for each WWTS.

4.4.1 West Point Treatment Plant CSO-related Events

In addition to secondary treatment of up to 300 MGD of base wastewater flows (defined as 2.25 times the average wet weather flow of 133 MGD), West Point provides CSO treatment plus disinfection/dechlorination for flows above 300 MGD and up to a designed instantaneous peak of 440 MGD. Where captured flows into King County’s conveyance system cannot be conveyed to regional treatment plants because of conveyance system limitations, flows are conveyed to WWTSs or are discharged untreated. West Point flows in excess of 300 MGD and up to 440 MGD receive primary treatment and are blended with full secondary treated flows (up to 300 MGD), followed by disinfection, dechlorination, and discharge of the final effluent from the deep marine outfall. The resulting effluent must meet secondary effluent quality limits, with a small reduction (i.e., 80 percent instead of 85 percent) in the monthly removal requirements of TSS during the typical wet season months of November through April. This practice is accepted by Ecology, provides a high level of treatment to wet weather flows, and reduces program costs and impact to local waterbodies. West Point had 16 CSO

treatment events during 2019 where peak flows received primary treatment prior to blending with secondary treated flows, disinfection, dichlorination, and discharge. The total volume of flows that exceeded 300 MGD and received primary treatment only was 129.64 MG. All occurrences are listed in Appendix B.

Occasionally during either dry or wet weather conditions, power and equipment failures can result in secondary diversions that occur via CSO gates at West Point. During such events, flow from the primary treatment bypasses the secondary treatment system directly to the chlorine disinfection basins, and all final effluent is dechlorinated as usual. Secondary diversions are necessary to prevent exposure of workers to safety hazards and facility damage. In 2019, there were four secondary diversions. These secondary diversions were short duration events where the bypassed flow mixes with substantial ongoing secondary treated flows entering the disinfection basin. The secondary diversion events did not result in exceedances of permit effluent limits in the final effluent that was discharged to Puget Sound.

4.4.2 Alki Wet Weather Treatment Station

The transfer of Alki area base flows to West Point was completed in 1998, and conversion of the Alki Treatment Plant from a continuously operating primary plant to a WWTS was completed in 2001. In 2019, there were three filling events and 1 discharge event. The Alki WWTS received 50.9 MG and discharged 47.7 MG.

Overall, TSS removal was 42.8 percent for 2019, which did not meet the annual 50 percent TSS removal limit. The annual average settleable solids (SS) was 0.10 milliliter per liter per hour (ml/L/hr), which met the SS limit of 0.3 ml/L/hr. The Alki WWTS did not meet the instantaneous minimum pH less than 6.0 for one discharge day out of three days of discharges. In addition, Alki's effluent met the daily maximum average total residual chlorine (TRC) permit limit of 234 micrograms per liter (µg/L) on all three discharge days. Alki WWTS met the monthly fecal coliform geomean permit limit of 400 counts/ 100 ml during one month of discharge at Alki WWTS. More detail is available in Appendix C.

4.4.3 Carkeek Wet Weather Treatment Station

The transfer of Carkeek area base flows to West Point and the conversion of the Carkeek Treatment Plant from a continuously operating primary plant to a WWTS was completed in 1994. In 2019, Carkeek WWTS had four filling events and one discharge event. The Carkeek WWTS received 13.3 MG and discharged 13.73 MG. The influent volume should exceed the effluent volume by approximately 0.6 MG. King County staff are currently evaluating the flow metering. There are several possible explanations for the flow difference. For example, the differences could be caused by site drainage going

back into the station's process tanks and level sensor instrumentation differences contributing to weir flow calculations. Carkeek WWTS performed well in 2019.

Overall, TSS percent removal was 55.2 percent in 2019, thereby meeting the NPDES permit limit of 50 percent for annual removal. Carkeek WWTS met its annual average SS limit with the average measured as 0.20 ml/L/hr, with the NPDES permit limit being 0.3 ml/L/hr. All remaining NPDES permit limits were met at Carkeek WWTS. More details are available in Appendix D.

4.4.4 Elliott West Wet Weather Treatment Station

The Elliott West WWTS was brought online in May 2005 as a joint project with Seattle's East Lake Union CSO control projects. In 2019, there were 39 inflow events totaling 222 MG and one discharge event totaling 122 MG that were treated and discharged through the Elliott West Outfall at the Denny Way RS.

Overall, TSS removal was 62 percent for the year, thereby meeting the NPDES 50 percent annual average TSS removal limit. Elliott West WWTS did not meet the SS annual event average limit, with the average measured as 0.7 ml/L/hr and the NPDES permit limit being 0.3 ml/L/hr. Elliott West WWTS met fecal coliform NPDES permit limit of 400/100 mL for December, the only month with a treatment and discharge event. The highest fecal coliform measured was 170 MPN per 100 mL and the geomean for the month of December was 3.6

Elliott West WWTS had permit violations for maximum daily average TRC on each of the three discharge days of the single 2019 event. During the December 19 event, the final effluent sample pump failed resulting in King County operators collecting grab samples to run total chlorine residual and pH measurements using portable field instruments and conducting manual composite sampling throughout the 3-day event. Complete information on Elliott West WWTS can be found in Appendix E.

4.4.5 Henderson/MLK Jr. Way Wet Weather Treatment Station

The Henderson/MLK Jr. Way WWTS was brought online in May 2005. The Henderson/MLK Jr. Way WWTS had one filling event and one discharge event during 2019. This was in response to a three-day rainfall of 4.76 inches, with 2.8 inches falling on December 20. The Henderson/MLK Jr. Way WWTS received a total inflow of 20.58 MG and discharged 16.90-MG of treated water through the Norfolk Street Overflow to the Duwamish Waterway.

Overall, TSS removal was 60 percent for the year, thereby meeting the NPDES 50 percent annual average TSS removal limit. The annual average effluent SS was below the permit limit of 0.1 ml/L/hr.

There were no violations to the minimum pH limit, the maximum daily TRC limit, nor the monthly fecal coliform bacteria. Improvement projects have been in progress to increase the consistency in meeting NPDES permit requirements. More details are available in Appendix F.

5 Summary of Consent Decree and NPDES Violations in 2019

Section VIII. 43 of the CD requires the listing of any violations of the CD in the annual report. Table 5 identifies CD violations in 2019 and related exceedances of NPDES wet-weather permit requirements for the CSO system.

2019 was a drier than normal year which resulted in a much smaller number of filling events at the CSO treatment stations, and only one multi-day discharge event in December 2019 at the Alki, Carkeek, and Elliott West plants. There was one treatment and discharge event at the Henderson/MLK facility during 2019. Details on causes and corrective actions are provided in Appendices C through F. All notifications to Ecology were made in a timely manner.

Table 5. Summary of Effluent Limitation* and Consent Decree Violations in 2019

Date of Event	Facility	Description of Violation(s)
12/19/19	Alki WWTS	pH
12/19/19	Elliott West WWTS	Total chlorine residual
12/20/19	Elliott West WWTS	Total chlorine residual
12/21/19	Elliott West WWTS	Total chlorine residual
2019 annual	Alki WWTS	Annual average TSS removal
2019 annual	Elliott West WWTS	Annual average SS

* pH effluent limits and disinfection failures are specified in the NPDES permit but are not specified as violations subject to stipulated penalties under the CD.
* Henderson/MLK Jr. Way WWTS was in full compliance with all of the effluent permit limits in 2019.

6 Control Status of CSO Locations

6.1 Twenty-year Moving Average of Event Frequencies

The NPDES permit for West Point, effective July 1, 2009, implemented a new interpretation of the performance standard for CSO control, which is derived from the Washington state regulatory requirements for "greatest reasonable reduction" as specified in WAC 173-245-022(22). The CD recognizes this performance level. This standard of "not more than one untreated discharge event per year per outfall on average" is based on a 20-year moving average. The number of untreated discharges that occurred over each of the previous 20 years is reported for each CSO site and then averaged (Table 66), using the 24-hour dry period definition of an event starting in 2000. This moving average is used each year to assess compliance with the performance standard. However, since the upgraded SCADA system was fully brought online in 2005 and began to report data for all sites over time, a full 20 years of data are not available for all sites. Locations lacking the full 20 years of measured data are noted. For sites where new control facilities have been built and lack the 20 years of measured data, the table substitutes modeled data of the new facilities simulated performance with the historic rainfall over those years for the unavailable measured data.

The following 19 CSOs, with the corresponding DSN, were identified as controlled through the monitoring and modeling data:

1. 30th Avenue Northeast Overflow, 049 (30th Ave. NE)
2. 53rd Avenue Southwest Pump Station Overflow, 052 (53rd Ave. SW PS)
3. 8th Avenue South Overflow, 040 (8th Ave. S)
4. Ballard Siphon Overflow, 003
5. Canal Street Overflow, 007 (Canal St.)
6. Dexter Ave. Regulator Station Overflow, 009 (Dexter Ave. RS)
7. East Duwamish Pump Station Overflow, 034 (E Duwamish PS)
8. East Marginal Way Pump Station Overflow, 043 (E Marginal Way PS)
9. East Pine Street Pump Station Overflow, 011 (E Pine St. PS)
10. Henderson Street Pump Station Overflow, 045 (Henderson St. PS)
11. Martin Luther King Junior Way Overflow, 013 (MLK Jr. Way)
12. Matthews Park Pump Station Overflow, 018 (Matthews Park PS)
13. Murray Pump Station Overflow, 056 (Murray PS)
14. Norfolk Street Overflow, 044a (Norfolk St.)
15. North Beach Pump Station Inlet Overflow, 048a (North Beach PS Inlet)
16. North Beach Pump Station Wet Well Overflow, 048b (North Beach PS Wet Well)
17. Rainier Avenue Pump Station Overflow, 033 (Rainier Ave. PS)

18. Southwest Alaska Street Overflow, 055 (SW Alaska St.)
19. West Duwamish Overflow, 035 (W Duwamish)

The following 14 CSOs, with the corresponding DSN, were identified as uncontrolled through the monitoring and modeling data:

1. 11th Avenue Northwest Overflow, 004 (11th Ave NW)
2. 3rd Avenue West Overflow, 008 (3rd Ave W)
3. Brandon Street Regulator Station Overflow, 041 (Brandon St. RS)
4. Chelan Avenue Regulator Station Overflow, 036 (Chelan Ave RS)
5. Hanford #1 Overflow, 031a (Hanford #1)
6. Hanford #2 Regulator Station Overflow, 032 (Hanford #2 RS)
7. King Street Regulator Station Overflow, 028 (King St RS)
8. Kingdome Regulator Station Overflow, 029 (Kingdome RS)
9. Lander Street Regulator Station Overflow, 030 (Lander St. RS)
10. Montlake Regulator Station Overflow, 014 (Montlake RS)
11. South Michigan Street Regulator Station Overflow, 042 (S Michigan St. RS)
12. Terminal 115 Overflow, 038
13. University Regulator Station Overflow, 015 (University RS)
14. West Michigan Street Regulator Station Overflow, 039 (W Michigan St. RS)

The following four CSOs, with the corresponding DSN, were identified as needing further monitoring to determine their control status:

1. Denny Way Regulator Station Overflow, 027a (Denny Way RS)
2. Barton Street Pump Station Overflow, 057 (Barton St. PS)
3. Harbor Avenue Regulator Station Overflow, 037 (Harbor Ave RS)
4. South Magnolia Overflow, 006 (S Magnolia)

The following outfalls, with the corresponding DSN, were in control when the CD was signed, but were identified as needing supplemental compliance activities and further monitoring. A letter was submitted to Ecology in December 2017 acknowledging that Belvoir PS Overflow fell out of control in 2016. Another letter was submitted to Ecology in May 2018 acknowledging that 63rd Ave. SW PS Overflow fell out of control in 2017. WTD is working to bring these outfalls into control by 2030.

1. 63rd Avenue Southwest Overflow, 054 (63rd Ave SW)
2. Belvoir Pump Station Overflow, 012 (Belvoir PS)

6.2 Changes to Control Status of CSO Locations

In a letter submitted to DOE in December 2017, WTD outlined the status of compliance for the Belvoir PS Overflow. Belvoir PS Overflow, which is within King County's CSO system, has historically been reported as controlled. However, updated modeling indicated that the CSO frequency has increased due to hydraulic and hydrologic changes upstream of the pump station. As of 2016, Belvoir PS Overflow (No. 012) does not meet the CSO control performance standard.

WTD and SPU recognize that hydraulic and hydrologic changes have affected compliance at the Belvoir PS Overflow. WTD is committed to coordinating and developing mutually beneficial solutions with SPU. This includes working with SPU to meet the approach and schedule included in SPU's approved Windermere Basins 13 and 15 Supplemental Compliance Plans, dated December 7, 2016, and April 18, 2018, respectively. In addition, SPU and King County are working together to develop strategies for controlling Belvoir as part of WTD's LTCP planning. SPU is a team member on WTD's planning team. The goal is to develop a preferred strategy and implementation schedule as part of WTD's next LTCP Update. WTD is working closely with SPU to bring this outfall into compliance by December 31, 2030.

In a letter submitted to Ecology in May 2018, WTD outlined the control status for the 63rd Ave. SW PS Outfall. The 63rd Avenue Southwest Pump Station (63rd Ave. SW PS) Outfall, which is within King County's CSO system, has historically been reported as controlled. However, in 2017, monitoring data indicated that the CSO frequency increased because of hydraulic changes. As of 2017, the 63rd Ave. SW PS Outfall (No. 054) does not meet the CSO control performance standard.

Actions to improve compliance include the optimizing of the West Seattle portion of CSO system, which includes operating the Alki WWTS more frequently. Recent improvements have also been made to the 63rd Ave. SW PS, including changing two constant speed pumps to variable speed pumps as well as electrical and control upgrades. These upgrades will increase operating flexibility and improve performance of the 63rd Ave. SW PS and the Alki WWTS when optimization is complete. A comprehensive computer model of the West Seattle System was completed in 2018, and it is being used to optimize operations by 2020. Operations staff will continue to monitor and work to maintain control of the 63rd Ave. SW PS during the optimization period.

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Table 6. King County Untreated CSO Events, Averages, and Baselines, 2000–2019

Overflow Name	Discharge Serial Number (DSN)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	20-Year Average[1]	1983 Baseline
Ballard Siphon	003	***0***	***0***	***0***	***0***	***0***	***1***	***0***	***0***	***0***	***0***	***0***	***1***	***0***	***0***	2	0	0	0	0	0	**0.2**	13
11th Ave. NW[2]	004	14	14	8	8	6	11	22	10	7	16	19	16	20	12	25	17	22	21	13	10	**14.6**	16
S Magnolia[2]	006	***0***	***1***	***0***	***2***	***1***	***0***	***0***	***1***	***0***	***1***	***2***	***2***	***1***	***3***	***1***	***4***	***1***	***0***	***0***	2	**1.1**	25
Canal St.	007	1	0	0	0	0	0	0	1	0	1	1	0	1	0	1	1	0	0	0	1	**0.4**	1
3rd Ave. W[3]	008	1	11	4	6	4	5	13	6	3	9	8	7	13	5	12	7	5	6	7	2	**6.7**	17
Dexter Ave. RS	009	***0***	***1***	***0***	***0***	***1***	***0***	***1***	***1***	***0***	***0***	***0***	***0***	***0***	***0***	***1***	***3***	0	0	0	0	**0.4**	15
E Pine St.	011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0.0**	1
Belvoir PS	012	0	0	0	4	0	0	1	1	0	5	1	2	2	2	2	5	2	2	1	1	**1.6**	1
MLK Jr. Way[4]	013	***0***	***0***	***0***	***0***	***0***	***0***	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0.0**	16
Montlake RS	014	2	0	5	11	5	6	NM	0	1	3	10	8	18	7	20	15	16	12	7	6	**8.0**	6
University RS	015	3	5	4	4	4	3	12	5	3	9	8	6	13	4	14	11	9	7	7	2	**6.7**	13
Matthews Park PS	018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0.0**	1
Denny Way RS	027a	***0***	***1***	***0***	***1***	***1***	***0***	***2***	***2***	***0***	***1***	***2***	***1***	***1***	***1***	***2***	***4***	***2***	***1***	***0***	0	**1.1**	32
King St. RS	028	10	14	12	16	15	20	27	7	3	15	18	15	13	2	23	19	14	3	4	3	**12.7**	16
Kingdome RS	029	1	0	0	0	2	5	4	5	1	8	6	2	11	6	22	17	12	16	15	5	**6.9**	29
Lander St. RS	030	11	10	10	12	9	8	28	8	6	19	17	15	25	8	29	17	25	21	19	9	**15.3**	26
Hanford #1[2]	031	***0***	***2***	***1***	***2***	***0***	***0***	***4***	***1***	***0***	***3***	***2***	***2***	***2***	***3***	***3***	***3***	***2***	***3***	***1***	2	**1.8**	30
Hanford #2 RS	032	17	13	10	12	16	15	26	12	8	17	17	15	23	9	27	16	24	18	17	9	**16.1**	28

[1] Blue 20-year averages are those that meet the no more than one event per year on a 20-year average and, therefore, are in control.
[2] Portable monitors are used at 11th Ave. NW, 30th Ave NE, SW Alaska St., Bayview North and South, E Duwamish, W Duwamish, Hanford #1, S Magnolia, North Beach PS Inlet, and Terminal 115. The Bayview North monitor was installed in 2010; the Bayview South monitor was installed in 2011.
[3] The 3rd Ave. W monitor was down June 2006 through November 2006.
[4] Henderson, MLK Jr. Way, and Norfolk St. were controlled as of 2006. Modeled data through 2005 (in italics) have been substituted to simulate how current facilities would have performed under historic rain patterns during that time.

Control Status of CSO Locations

Overflow Name	Discharge Serial Number (DSN)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	20-Year Average[1]	1983 Baseline
Rainier Ave. PS	033	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	1
E Duwamish PS[2]	034	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0.2	1
W Duwamish[2,5]	035	NM	NM	NM	NM	NM	1	0	1	0	0	1	0	0	1	0	0	0	1	0	1	0.4	1
Chelan Ave. RS	036	2	7	2	3	1	2	5	2	0	0	3	4	13	4	13	13	9	10	8	2	**5.2**	7
Harbor Ave. RS	037	***0***	***0***	***2***	***2***	***0***	***1***	***1***	***2***	***0***	***1***	***2***	***1***	***1***	***0***	***1***	***3***	***1***	***2***	***0***	1	**1.1**	30
Terminal 115[2,6]	038	NM	NM	NM	2	0	2	7	4	0	3	3	0	1	1	0	1	1	2	1	1	**1.7**	4
S Michigan St. RS	039	8	12	8	9	6	5	13	5	3	10	12	14	16	8	26	17	16	13	17	6	**11.2**	5
8th Ave. S	040	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0.2	6
Brandon St. RS[7]	041	30	30	21	28	21	27	11	NM	3	16	11	7	12	7	16	14	12	6	3	2	**14.6**	36
W Michigan St.	042	2	7	5	4	1	3	8	4	0	8	9	3	5	2	3	6	9	6	4	1	**4.5**	34
E Marginal Way PS	043	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	1
Norfolk St.	044a	***0***	***0***	***0***	***0***	***0***	***0***	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.1	20
Henderson St. PS	045	***0***	***0***	***0***	***0***	***0***	***0***	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	12
North Beach PS Wet Well	048a	***0***	***1***	***0***	***2***	***0***	***0***	***0***	***1***	***0***	***0***	***1***	***2***	***1***	***1***	***1***	***2***	1	3	1	1	0.9	18
North Beach PS Inlet[2]	048b	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	0	1	1	1	0.2	18
30th Ave. NE[2]	049	0	0	0	0	0	0	0	0	0	5	0	3	1	1	2	3	1	0	1	0	0.9	1
53rd Ave. SW PS[8]	052	0	0	0	0	0	0	2	1	0	0	0	0	1	0	0	0	0	1	0	0	0.3	<1
63rd Ave. SW[8]	054	0	0	0	2	0	1	0	0	0	0	1	1	3	2	2	4	5	4	1	1	**1.4**	2
SW Alaska St[2]	055	0	0	0	0	0	0	1	1	1	0	1	1	1	0	0	0	0	0	0	1	0.4	1
Murray St. PS	056	***0***	***1***	***0***	***2***	***0***	***0***	***2***	***1***	***1***	***1***	***1***	***0***	***1***	***2***	***1***	***2***	***0***	1	1	1	0.9	5

[5] Monitoring began at W Duwamish in June 2005.
[6] Monitoring began at Terminal 115 in June 2003.
[7] The monitor at Brandon St. RS was down June 2006 to March 2008. A portable monitor was installed in March 2008. Monitoring by SCADA was restored beginning with the 2009 period.
[8] Monitoring began in June 2000 at 53rd Ave. SW PS and 63rd Ave. SW.

Control Status of CSO Locations

Overflow Name	Discharge Serial Number (DSN)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	20-Year Average[1]	1983 Baseline
Barton St. PS	057	***0***	***2***	***0***	***0***	***0***	***2***	***1***	***3***	***2***	***2***	***0***	***0***	***1***	***3***	***1***	***2***	***0***	***0***	***1***	2	**1.1**	9

Notes: All events use 24-hour inter-event dry period as the basis for an event. Modeled numbers are shown in ***shaded bold italics***.

7 Post-construction Monitoring

King County's PCMP was approved by Ecology on September 28, 2012. Monitoring volume and frequency of overflows at the controlled untreated discharge locations listed above is ongoing, reported monthly to Ecology, and summarized in each CSO Annual Report (Appendix A). Volume, frequency, and NPDES permit effluent monitoring and effluent compliance for the WWTS are reported monthly and summarized in Appendix B.

King County's ongoing ambient monitoring program provides data for post-construction monitoring as described in the PCMP. Additional details can be found in the PCMP's Appendix D (Receiving Water Characterization Study Sampling and Analysis Plan and Quality Assurance Project Plan), Appendix E (Major Lakes Sampling and Analysis Plan), and Appendix F (Freshwater Swimming Beach Monitoring Sampling and Quality Assurance Project Plan).

Sediment monitoring for controlled sites is being performed as described in the PCMP. Details can be found in the PCMP's Appendix C (Sampling and Analyses Plan). All monitoring is currently up to date. Sediment characterization data completed in this reporting period are summarized below.

Sampling under a sampling plan specific to the North Beach Pump Station Inlet Overflow site was completed in September 2018. The North Beach PS Inlet Overflow Sediment Quality Data Report was sent to Ecology July 9, 2019.

A post-construction monitoring report required under NPDES permit condition S11.F(d) was submitted to Ecology November 26, 2019. The report demonstrates how CSO outfalls that were controlled prior to permit issuance, as well as CSOs brought under control during the permit term, achieve performance requirements and comply with the state's water quality and Sediment Management Standards (SMS). For outfalls with SMS exceedances associated with CSO discharges, the report describes clean-up activities in the vicinity including clean-up actions planned or that have been performed, targeted chemicals, any available pre- and post-cleanup monitoring results, clean-up project schedule, post-project monitoring schedule, and a list of parties involved.

Appendices

Appendix A. Untreated CSO Events, January–December 2019

Appendix B. Treated CSO Events, January–December 2019

Appendix C. Alki Wet Weather Treatment Station 2019 Annual Report

Appendix D. Carkeek Wet Weather Treatment Station 2019 Annual Report

Appendix E. Elliott West Wet Weather Treatment Station 2019 Annual Report

Appendix F. Henderson/MLK Jr. Way Wet Weather Treatment Station 2019 Annual Report

Appendix A
Untreated CSO Events

January–December 2019

DSN #	Overflow Name	Receiving Water	Event Starting Date & Time	Event Ending Date & Time	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)	Note if DWO/SSO
1	West Point	Puget Sound	7/19/19	7/19/19	2.85	2,100,000	N/A	N/A	DWO
1	West Point (Interbay PS)	N/A	9/13/19	9/13/19	N/A	N/A	N/A	N/A	SSO
003	Ballard Siphon Regulator via Seattle Storm Drain	Lake Washington Ship Canal	N/A	N/A	0.00	0	N/A	N/A	
004	East Ballard (AKA 11th Ave NW)	Lake Washington Ship Canal	1/22/19 9:10 PM	1/22/19 9:47 PM	0.62	20,625	0.38	6.85	
004	East Ballard (AKA 11th Ave NW)	Lake Washington Ship Canal	2/16/19 6:36 PM	2/16/19 7:22 PM	0.77	67,486	0.52	9.7	
004	East Ballard (AKA 11th Ave NW)	Lake Washington Ship Canal	2/20/19 12:11AM	2/20/19 12:31AM	0.33	9,899	0.17	0.92	
004	East Ballard (AKA 11th Ave NW)	Lake Washington Ship Canal	3/12/19 4:37 AM	3/12/19 5:24 AM	0.78	54,589	0.66	7.75	
004	East Ballard (AKA 11th Ave NW)	Lake Washington Ship Canal	6/20/19 1:24 AM	6/20/19 2:23 AM	0.98	114,458	0.51	5.38	
004	East Ballard (AKA 11th Ave NW)	Lake Washington Ship Canal	8/10/19 8:00 AM	8/10/19 8:41 AM	0.68	52,149	0.48	3.12	
004	East Ballard (AKA 11th Ave NW)	Lake Washington Ship Canal	9/7/19 8:39 PM	9/7/19 9:04 PM	0.42	424,189	0.35	0.98	
004	East Ballard (AKA 11th Ave NW)	Lake Washington Ship Canal	9/10/19 7:23 AM	9/10/19 8:07 AM	0.73	429,638	0.92	59.33	
004	East Ballard (AKA 11th Ave NW)	Lake Washington Ship Canal	9/15/19 2:49 AM	9/15/19 3:07 AM	0.30	26,179	0.29	5.67	
004	East Ballard (AKA 11th Ave NW)	Lake Washington Ship Canal	12/19/19 2:15 PM	12/21/19 4:09 AM	37.90	5,545,129	4.63	57.35	

DSN #	Overflow Name	Receiving Water	Event Starting Date & Time	Event Ending Date & Time	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)	Note if DWO/SSO
006	Magnolia Overflow	Elliott Bay/Puget Sound	2/12/19 1:50 AM	2/12/19 6:00 AM	4.17	76	2.15	36.23	
006	Magnolia Overflow	Elliott Bay/Puget Sound	12/19/19 9:20 PM	12/21/19 10:20AM	37.00	329,796	4.32	63.72	
007	Canal Street Overflow	Lake Washington Ship Canal	12/20/19 11:21AM	12/20/19 11:50AM	0.48	29,547	2.93	41.1	
008	3rd Ave W and Ewing St	Lake Washington Ship Canal	8/10/19 9:26 AM	8/10/19 10:04AM	0.63	30,009	0.57	4.27	
008	3rd Ave W and Ewing St	Lake Washington Ship Canal	12/19/19 5:48 PM	12/21/19 1:15 PM	43.45	18,533,901	5.07	65.88	
009	Dexter Ave Regulator	Lake Union	N/A	N/A	0.00	0	N/A	N/A	
011	E Pine St. Pump Station Emergency Overflow	Lake Washington	N/A	N/A	0.00	0	N/A	N/A	
012	Belvoir Pump Station Emergency Overflow	Lake Washington	12/20/19 9:49 AM	12/20/19 7:02 PM	9.22	996,394	3.78	48.25	
013	Martin Luther King Way Trunkline Overflow	Lake Washington via storm drain	N/A	N/A	0.00	0	N/A	N/A	
014	Montlake Overflow	Lake Washington Ship Canal	1/22/19 9:34 PM	1/22/19 9:54 PM	0.33	272,419	0.45	7.52	
014	Montlake Overflow	Lake Washington Ship Canal	7/18/19 7:45 PM	7/18/19 8:13 PM	0.47	805,039	0.28	37.68	
014	Montlake Overflow	Lake Washington Ship Canal	8/10/19 8:09 AM	8/10/19 9:07 AM	0.97	1,008,582	0.68	3.97	
014	Montlake Overflow	Lake Washington Ship Canal	9/7/19 8:44 PM	9/7/19 9:13 PM	0.48	2,023,995	0.48	0.9	
014	Montlake Overflow	Lake Washington Ship Canal	10/19/19 12:52AM	10/19/19 1:09AM	0.28	299,502	0.4	8.38	

DSN #	Overflow Name	Receiving Water	Event Starting Date & Time	Event Ending Date & Time	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)	Note if DWO/SSO
014	Montlake Overflow	Lake Washington Ship Canal	12/19/19 5:41 PM	12/20/19 6:52 PM	25.18	27,358,186	3.77	47.83	
015	University Regulator	Lake Washington Ship Canal	9/7/19 9:01 PM	9/7/19 9:19 PM	0.30	629,743	0.5	1.03	
015	University Regulator	Lake Washington Ship Canal	12/19/19 9:37 PM	12/21/19 11:20AM	37.72	61,314,980	4.7	64.62	
018	Matthews Park Pump Station Emergency Overflows	Lake Washington	N/A	N/A	N/A	0	N/A	N/A	
027a	Denny Way Regulator	Elliott Bay	N/A	N/A	0.00	0	N/A	N/A	
028	King Street Regulator	Elliott Bay	9/7/19 8:24 PM	9/7/19 8:38 PM	0.23	191,839	0.3	0.27	
028	King Street Regulator	Elliott Bay	10/19/19 12:18AM	10/19/19 12:27AM	0.15	56,832	0.41	11.92	
028	King Street Regulator	Elliott Bay	12/19/19 3:14 PM	12/21/19 2:56 PM	47.70	12,576,648	3.97	66.92	
029	Connecticut St. Regulator (AKA Kingdome)	Elliott Bay	1/22/19 9:50 PM	12/21/19 2:56 PM	1.10	151,382	0.42	8.72	
029	Connecticut St. Regulator (AKA Kingdome)	Elliott Bay	2/12/19 4:13 PM	2/12/19 6:07 PM	1.90	162,074	1.66	40.88	
029	Connecticut St. Regulator (AKA Kingdome)	Elliott Bay	3/12/19 5:04 AM	3/12/19 6:15 AM	1.18	436,518	0.68	8.78	
029	Connecticut St. Regulator (AKA Kingdome)	Elliott Bay	8/10/19 9:20 AM	8/10/19 9:37 AM	0.28	23,600	0.46	4.45	
029	Connecticut St. Regulator (AKA Kingdome)	Elliott Bay	12/19/19 10:38PM	12/20/19 5:01 PM	18.38	2,929,119	3.05	46.12	
030	Lander St Regulator	Elliott Bay	1/3/19 8:47 AM	1/3/19 9:47 AM	1.00	680,240	0.48	9.25	
030	Lander St Regulator	Elliott Bay	1/22/19 10:03PM	1/23/19 3:10 AM	5.12	1,634,135	0.70	12.17	
030	Lander St Regulator	Elliott Bay	2/12/19 8:02 AM	2/12/19 8:42 PM	12.67	7,719,968	2.23	29.12	

DSN #	Overflow Name	Receiving Water	Event Starting Date & Time	Event Ending Date & Time	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)	Note if DWO/SSO
030	Lander St Regulator	Elliott Bay	2/16/19 8:30 PM	2/16/19 8:36 PM	0.10	6,895	0.24	11.22	
030	Lander St Regulator	Elliott Bay	3/12/19 3:29 AM	3/12/19 6:33 AM	3.07	5,075,652	0.73	9.37	
030	Lander St Regulator	Elliott Bay	4/12/19 2:53 AM	4/12/19 3:05 AM	0.20	4,287	0.90	33.48	
030	Lander St Regulator	Elliott Bay	9/7/19 10:50PM	9/7/19 11:04PM	0.23	11,729	0.40	1.78	
030	Lander St Regulator	Elliott Bay	10/19/19 2:08AM	10/19/19 10:27AM	8.32	5,432,753	1.33	77.15	
030	Lander St Regulator	Elliott Bay	12/19/19 3:41 PM	12/21/19 3:21 PM	47.67	159,275,754	4.58	67.02	
031	Hanford #1	Duwamish River via Diagonal Storm Drain	9/7/19 8:30 PM	9/7/19 9:02 PM	0.53	339,662	0.31	1	
031	Hanford #1	Duwamish River via Diagonal Storm Drain	12/19/19 10:35PM	12/21/19 1:44 PM	39.15	28,255,190	4.58	67.02	
032	Hanford #2 Regulator	Duwamish River - East Waterway	1/3/19 8:45 AM	1/3/19 10:43 AM	1.97	3,984,515	0.49	10.45	
032	Hanford #2 Regulator	Duwamish River - East Waterway	1/22/19 10:04PM	1/23/19 3:39 AM	5.58	8,941,325	0.70	12.17	
032	Hanford #2 Regulator	Duwamish River - East Waterway	2/12/19 6:14 AM	2/13/19 6:23 PM	36.15	37,307,996	2.23	29.12	
032	Hanford #2 Regulator	Duwamish River - East Waterway	2/16/19 8:27 PM	2/16/19 9:27 PM	1.00	1,508,867	0.25	12.85	
032	Hanford #2 Regulator	Duwamish River - East Waterway	3/12/19 3:29 AM	3/12/19 7:40 AM	4.18	11,841,033	0.73	9.37	
032	Hanford #2 Regulator	Duwamish River - East Waterway	4/12/19 2:48 AM	4/12/19 4:26 AM	1.63	1,842,591	0.92	34.80	
032	Hanford #2 Regulator	Duwamish River - East Waterway	9/7/19 10:45PM	9/7/19 11:47PM	1.03	1,652,543	0.40	1.78	

DSN #	Overflow Name	Receiving Water	Event Starting Date & Time	Event Ending Date & Time	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)	Note if DWO/SSO
032	Hanford #2 Regulator	Duwamish River - East Waterway	10/19/19 2:07 AM	10/19/19 9:30 AM	7.38	9,649,265	1.30	76.17	
032	Hanford #2 Regulator	Duwamish River - East Waterway	12/19/19 3:44 PM	12/21/19 9:04 PM	53.33	185,664,879	4.58	67.02	
033	Rainier Ave. Pump Station	Lake Washington	N/A	N/A	0.00	0	N/A	N/A	
034	East Duwamish	Duwamish River	N/A	N/A	0.00	0	N/A	N/A	
035	West Duwamish	Duwamish River	12/20/19 1:05 PM	12/20/19 2:08 PM	1.05	15,157	3.29	43.45	
036	Chelan Ave. Regulator	West Waterway of Duwamish River	2/12/19 3:19 PM	2/12/19 4:46 PM	1.45	2,355	2.07	25.95	
036	Chelan Ave. Regulator	West Waterway of Duwamish River	12/19/19 5:40 PM	12/21/19 4:29 PM	46.82	6,178,409	4.58	67.02	
037	Harbor Avenue Regulator	Duwamish River into Elliott Bay	1/9/19 7:52 AM	1/9/19 8:03 AM	0.18	6,733	0.31	23.87	
038	Terminal 115 Overflow	Duwamish River	12/20/19 10:00AM	12/21/19 1:05 AM	15.08	941,764	4.26	66.35	
039	Michigan Regulator (AKA S. Michigan Regulator)	Duwamish River	1/22/19 9:14 PM	1/22/19 10:06PM	0.87	182,651	0.52	8.92	
039	Michigan Regulator (AKA S. Michigan Regulator)	Duwamish River	4/12/19 12:32AM	4/12/19 1:59 AM	1.45	459,886	0.84	31.02	
039	Michigan Regulator (AKA S. Michigan Regulator)	Duwamish River	9/7/19 8:38 PM	9/7/19 9:32 PM	0.90	442,410	0.36	1.43	
039	Michigan Regulator (AKA S. Michigan Regulator)	Duwamish River	10/18/19 5:55PM	10/19/19 5:32AM	11.62	848,144	1.58	70.62	
039	Michigan Regulator (AKA	Duwamish River	10/20/19 8:08 PM	10/20/19 8:51 PM	0.72	57,661	0.12	7.93	

DSN #	Overflow Name	Receiving Water	Event Starting Date & Time	Event Ending Date & Time	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)	Note if DWO/SSO
	S. Michigan Regulator)								
039	Michigan Regulator (AKA S. Michigan Regulator)	Duwamish River	12/19/19 5:19 PM	12/21/19 10:24AM	41.08	34,852,573	4.81	63.58	
040	8th Ave South Regulator (AKA W. Marginal Way Pump Station)	Duwamish River	12/20/19 11:28AM	12/20/19 2:56 PM	3.47	1,197,014	3.69	44.23	
041	Brandon Street Regulator	Duwamish River	10/20/19 7:42 PM	10/20/19 8:14 PM	0.53	63,283	0.35	7.35	
041	Brandon Street Regulator	Duwamish River	12/19/19 10:46PM	12/20/19 4:29 PM	17.72	2,123,822	3.63	45.77	
042	West Michigan (AKA SW Michigan St regulator)	Duwamish River	12/20/19 4:10 AM	12/20/19 8:24 PM	16.23	2,242,003	4.06	49.65	
043	East Marginal Pump Station	Duwamish River	N/A	N/A	0.00	0	N/A	N/A	
044a	Norfolk local drainage	Duwamish River	N/A	N/A	0.00	0	N/A	N/A	
045	Henderson Pump Station	Lake Washington	N/A	N/A	0.00	0	N/A	N/A	
048a	North Beach Pump Station (wet well)	Puget Sound	12/20/19 11:21AM	12/21/19 12:11PM	24.82	2,360,654	5.68	65.5	
048b	North Beach Pump Station (inlet structure)	Puget Sound	12/20/19 1:25 PM	12/20/19 1:48 PM	0.38	84,987	3.63	43.11	
049	30th Avenue NE Pump Station	Lake Washington	N/A	N/A	0.00	0	N/A	N/A	
052	53rd Avenue SW Pump Station	Puget Sound	N/A	N/A	0.00	0	N/A	N/A	
054	63rd Avenue SW Pump Station	Puget Sound	12/19/19 10:45PM	12/20/19 7:46 PM	21.02	91,883,606	2.75	113.25	
055	SW Alaska Street Overflow	Puget Sound	12/20/19 11:22AM	12/20/19 4:31 PM	5.15	15,534	4.48	46.03	
056	Murray Street Pump Station	Puget Sound	12/20/19 2:42 PM	12/20/19 4:47 PM	2.08	313,467	4.51	46.3	
057	Barton Street Pump Station	Puget Sound	1/6/19 2:10 AM	1/6/19 2:33 AM	0.38	51,886	0.18	8.70	

DSN #	Overflow Name	Receiving Water	Event Starting Date & Time	Event Ending Date & Time	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)	Note if DWO/SSO
057	Barton Street Pump Station	Puget Sound	8/2/19 5:00 PM	8/2/19 9:00 PM	0.08	400	N/A	N/A	DWO
057	Barton Street Pump Station	Puget Sound	9/7/19 8:07 PM	9/7/19 8:22 PM	6:00	101,950	0.44	0.23	
	Total Volume					**752,159,751**			

Appendix B
Treated CSO Events

January–December 2019

DSN #	Overflow Name	Receiving Water	Event Ending Date/Time	Event Starting Date/Time	Event Duration (hours)	Volume (million gallons)	Precipitation (inches)	Storm Duration (hours)	Note if DWO
051b	Alki WWTS	Puget Sound	12/21/2019 2:06:00 PM	12/19/2019 22:41:00 PM	40.50	47.70	5.57	67.15	
046b	Carkeek WWTS	Puget Sound	12/21/2019 8:24:00 PM	12/20/2019 10:46:00 AM	33.68	13.73	5.07	65.88	
027b	Elliott West WWTS	Puget Sound	12/21/2019 5:15:00 PM	12/19/2019 5:38:00 PM	46.60	121.58	4.11	67.83	
044b	MLK/Henderson CSO Treatment Facility Outfall	Duwamish River	12/21/2019 3:33:00 PM	12/20/2019 7:00:00 AM	32.6	16.9	4.76	55.4	
1	West Point[1]	Puget Sound	1/3/2019 9:34 AM	1/3/2019 7:11PM	2.81	1.07	0.83	18.15	
1	West Point[1]	Puget Sound	1/22/2019 10:16 PM	1/22/2019 11:55PM	1.66	0.70	0.51	9.27	
1	West Point[1]	Puget Sound	2/12/2019 2:35PM	2/12/19 6:05PM	3.46	0.58	0.49	29.25	
1	West Point[1]	Puget Sound	2/16/2019 8:16:00 PM	2/16/2019 10:15:00 PM	1.99	1.05	0.39	11.48	
1	West Point[1]	Puget Sound	3/12/2019 4:02:00 AM	3/12/2019 7:59:00 PM	3.94	5.88	0.55	16.22	
1	West Point[2]	Puget Sound	3/17/2019 2:28 PM	3/17/2019 3:13:00 PM	0.62	1	0.00	N/A	
1	West Point[3]	Puget Sound	4/11/2019 1:31:00 PM	4/11/2019 1:35:00 PM	0.04	<0.1	00.23	N/A	
1	West Point[2]	Puget Sound	7/19/2019 1:07:00 AM	7/19/2019 1:54:00 AM	0.14	0.1	0.08	N/A	
1	West Point[1]	Puget Sound	8/10/2019 9:00:00 AM	8/10/2019 12:15:00 PM	3.32	2.5	0.39	4.27	
1	West Point[1]	Puget Sound	9/7/2019 8:23:00 PM	9/7/2019 11:59:00 PM	2.33	3.05	0.43	2.03	
1	West Point[1]	Puget Sound	9/8/2019 12:00:00 AM	9/8/2019 12:33:00 AM	0.55	0.44	0.05	N/A	
1	West Point[1]	Puget Sound	10/19/2019 2:48:00 AM	10/19/2019 4:00:00 AM	1.21	0.06	0.69	10.63	
1	West Point[2]	Puget Sound	11/15/2019 4:47:00 PM	11/15/2019 4:53:00 PM	0.09	0.04	0.19	N/A	

Appendix B Treated CSO Events

DSN #	Overflow Name	Receiving Water	Event Ending Date/Time	Event Starting Date/Time	Event Duration (hours)	Volume (million gallons)	Precipitation (inches)	Storm Duration (hours)	Note if DWO
1	West Point[1,4]	Puget Sound	12/19/2019 3:27:00 PM	12/19/2019 11:59:00 PM	8.56	21.76	1.27	65.88	
1	West Point[1,4]	Puget Sound	12/20/2019 12:00:00 AM	12/20/2019 11:59:00 PM	19.56	55.64	2.29	N/A	
1	West Point[1,4]	Puget Sound	12/21/2019 12:00:00 AM	12/21/2019 4:31:00 PM	16.51	35.77	0.78	N/A	
Total Volume						**329.55**			

Notes:
[1] Flow at West Point exceeded 300 MGD
[2] Secondary diversion caused by power outage at West Point Treatment Plant
[3] Secondary diversion caused by IPS pump failure at West Point Treatment Plant
[4] This event is part of a 3-day-long storm and CSO event

Appendix C
Alki Wet Weather Treatment Station
Annual Report

January–December 2019

Executive Summary

This 2019 annual report summarizes the performance of King County's Alki Wet Weather Treatment Station (Alki WWTS). The Alki WWTS came online for CSO treatment in 1998; it operates under the NPDES permit for the West Point Treatment Plant (WA-0029181-1).

2019 was a drier than normal year which resulted in only one treatment and discharge event at Alki WWTS. A total of 29.08 inches of rain fell in calendar year 2019, as measured at the rain gauge located at the Chelan Avenue Pump Station. In late 2019, King County switched to use the Murray pump station rain gauge to report the Alki WWTS rainfall data. The total rainfall reported here is from Chelan data. Subsequent reporting will be from Murray pump station. The 2019 annual rainfall recorded at Sea-Tac is 33.88 inches, and the 20-year average at Sea-Tac is 39.13 inches. There were three filling events and one discharge event during 2019. The Alki WWTS received 50.9 million gallons (MG) and discharged 47.7 MG.

Alki's performance in 2019 is summarized in Table C-1. Total suspended solids (TSS) removal average was 42.8 percent in 2019 thereby not meeting the NPDES permit limit of 50 percent for annual removal. Alki WWTS met its annual average settleable solids (SS) limit with the average measured as 0.10 milliliters/liter/hour (ml/L/hr.) the NPDES permit limit being 0.3 ml/L/hr. The Alki WWTS did not meet the instantaneous minimum pH of less than 6.0 for one discharge day out of three days of discharges. In addition, Alki's effluent had met the daily maximum average total residual chlorine (TRC) permit limit of 234 µg /L the three discharge days. Alki WWTS met the monthly fecal coliform geomean permit limit of 400 counts/ 100 mL during the one month of discharge. The performance for 2019 has been summarized below in Table C-1.

Table C-1. Alki WWTS Permit Performance in 2019

Parameter	Performance	Permit Conditions
Discharge events (number)[a]	**1**	**29**
Discharge volume million gallons (MG)[a]	**47.7**	**108**
Annual average SS (ml/L/hr)	**0.10**	**0.3**
Annual average TSS removal- including all discharge events (%)	**42.8**	**50**
Instantaneous minimum effluent pH, frequency of discharge days with pH < 6.0	**1 out of 3 discharge days**	**≥ 6.0**
Instantaneous maximum effluent pH, frequency of discharge days with pH > 9.0	**0 out of 3 discharge days**	**≤ 9.0**
Total residual chlorine (TRC), maximum of daily averages (µg/L), frequency of discharge days with TRC >234 µg/L	**0 out of 3 discharge days**	**≤ 234 µg/L**
Monthly fecal coliform geomean, frequency of months with monthly geomean >400/100mL	**0 out of 1 discharge months**	**400/ 100 ml**

[a] Compliance assessed over a 5-year average.
Numbers in red indicate a permit exceedance.

Suspended and Settleable Solids

The annual total suspended solids (TSS) removal was calculated to be 42.8 percent, which did not meet its annual average TSS removal permit level of 50 percent. The annual event average SS was 0.10 ml/L/hr; therefore, meeting the annual average NPDES permit level of 0.3 ml/L/hr.

Solids removal at Alki WWTS has not met the 50 percent limit in the past, and past operational changes to improve the removal were not effective. These changes included changing the set point to start the solids flights in the sedimentation tanks earlier as the sedimentation tanks fill, so that as solids settle the flights will move the solids to the sump to be removed sooner and avoid any potential solid wash out or carry over to the effluent flow. In addition, King County operators cleaned out and removed accumulated solids and debris from the effluent channel as part of the summer dry weather work. In late 2019, after the one 2019 discharge event, the operation of the six sedimentation tank inlet gates was placed in manual and kept open to allow simultaneously filling of the sedimentation tanks. This change in operations should slow the flows entering the sedimentation tanks thus allowing more solids to settle out and be removed by the sludge removal system.

As part of the CSO Control Program, King County brought in consultants in early 2016 to evaluate plant performance and make recommendations on how to improve solids removal. The consultant review and recommendations were available by 2018. The

consultants recommended converting the existing digester tanks for temporary solids storage to reduce potential for recirculation of solids collected in the clarifiers. The County is preparing to evaluate the feasibility of the conversion.

Fecal Coliform Bacteria

The one month of discharge in 2019 had a monthly fecal coliform geomean of 3.4 counts/100 ml, which is below the permit limit of 400 counts/100 ml.

Total Residual Chlorine

Alki WWTS is in compliance with the daily average total residual chlorine (TRC) permit limit of 234 μg/L on all three discharge days of 2019. The 2019 annual TRC average was 3 μg/L with the annual maximum daily average of 3 μg/L occurring during the December 19, 2019 discharge event.

Instantaneous Minimum and Maximum Effluent pH

The permit limit of a daily instantaneous minimum pH below 6.0 occurred once out of the three discharge days in 2019. The minimum pH exceedances occurred on the first day of the three-day discharge event on December 19-21, 2019. It appears that this low pH exceedance is not representative of the effluent discharges and may be related to issues with the sample pump in a stilling well. The sample pump draws from the bottom of the stilling well which is closer to the floor of the effluent channel. It is believed that the initial sample flow has higher concentration of sodium bisulfite (SBS) and this can be the source of the low pH value. As the effluent discharge continues, greater flow within still well allows the pH to rise above 6.0. Staff will modify the stilling well so that the samples are more representative of what is going over the discharge weir. This work is dry weather dependent so that entry into the effluent channel can be done safely and is scheduled for 2020.

Operation and Maintenance

Major upgrades to the Alki WWTS were completed in recent years; staff evaluated and made adjustments as needed in 2019. Highlights of O&M activities during 2019 include:

- Conducted annual CSO refresher training for the operators in October 2019.
- Quarterly/monthly testing of hypochlorite and bisulfite solution strength; set point changes made to chemical feed pumps based on solution strength; shipments of full-strength solutions ordered as necessary.
- Continued to conduct debriefings with O&M staff after discharge events to review and discuss the discharge and treatment performance and make any needed operational adjustments for subsequent events.
- Periodic cleaning of the effluent channel of accumulated solids and debris to improve treatment including solids removal.

- Ongoing, routine preventive maintenance practice to exercise the chemical feed pumps on a monthly basis.
- Work on the final effluent sampling pump stilling well to improve effluent flow through the stilling well and prevent low pH exceedances.
- Offsite Instrumentation and Electrical staff will continue to fine tune and monitor the 63rd Avenue Pump Station pump VFD controls.
- Continue preventative maintenance by Offsite Instrumentation and Electrical staff of online chlorine and pH analyzers including weekly calibration and replacement of probes and other instrumentation components as necessary.

Hypochlorite Feed System Improvement Project

A project was initiated in 2016 to improve the hypochlorite feed system at Alki. This project was completed in summer 2018. The project involved replacement of the aging pumps and chemical piping. The project changed the hypochlorite feed system from one feed pump per force main to a manifold system with three chemical feed pumps - lead, lag and standby pumps, a chemical feed flow meter, and hypochlorite feed diffuser. New hypochlorite feed piping and venting was included in the project. The initial results using the new hypochlorite feed system have indicated a reliable hypochlorite feed. Staff will continue to monitor the hypochlorite feed system and make adjustments as needed.

Near Future Operation

As with all wet weather treatment stations, opportunities to operate and then to optimize are very limited. Challenges may be identified during an event in the wet season, but any major projects to address the challenge would likely have to occur during the following dry season. Then, after the completion of these projects, the opportunities to test the improvements would likely occur in the following wet season. WTD staff will continue to investigate issues and make any necessary adjustments in the O&M. In addition, WTD staff responding to Alki WWTS will:

- Continue with the evaluation, testing and adjustments of the new Variable Frequency Drives for the 63rd Avenue pumps.
- Continue with the evaluation, testing and adjustments of the new hypochlorite feed system.
- Evaluate the TSS removal performance by switching the operation of the sedimentary tanks to all six tanks filling simultaneously.
- Follow up and review consultant recommendations to improve Alki CSO treatment performance.

Table C-2. Alki WWTS 2019 Annual Event Data Summary

Month	Day	Alki Inflow Event Number	Alki Inflow Volume (MG)	Alki Discharge Event Number	Alki Discharge Volume (MG)	Total Influent TSS (lb)	Total Effluent TSS Discharged @ Alki + WP (lb)	% removal	Alki Effl. Daily Settl Solids (ml/L/hr)	Alki Effl. Settl Solids Event Avg (ml/L/hr)	Alki Effl. Fecal Coliforms (#/100 ml)	Alki Effl. Residual Chlorine Daily Average (µg/L)	Daily Min/Max pH
January	28	1	0.59	ND	ND	1,087	38				ND	ND	ND
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**1**	**0.59**	**0**	**0.0**	**1,087**	**38**	**96.5%**			**ND**		
February	No Inflow/No Disch.												
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**0**	**0.00**	**0**	**0.0**	**-**	**-**	**-**			**ND**		
March	No Inflow/No Disch.												
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**0**	**0.0**	**0**	**0.0**	**-**	**-**	**-**			**ND**		
April	No Inflow/No Disch.												
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**0**	**0.00**	**0**	**0.0**	**-**	**-**	**-**			**ND**		
May	No Inflow/No Disch.												
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**0**	**0.0**	**0**	**0.0**	**-**	**-**	**-**			**ND**		
June	No Inflow/No Disch.												
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**0**	**0.0**	**0**	**0.0**	**-**	**-**	**-**			**ND**		
July	No Inflow/No Disch.												
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**0**	**0.0**	**0**	**0.0**	**-**	**-**	**-**			**ND**		

August	No Inflow/No Disch.												
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**0**	**0.0**	**0**	**0.0**	**-**	**-**	**-**			**ND**		
September	No Inflow/No Disch.												
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**0**	**0.0**	**0**	**0.0**	**-**	**-**	**-**			**ND**		
October	24	1	0.62	ND	ND	926	59						
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**1**	**0.62**	**0**	**0.0**	**926**	**59**	**93.6%**			**ND**		
November	No Inflow/No Disch.												
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**0**			**0.0**	**-**	**-**	**-**			**ND**		
December	19	1	10.02	1	8.46	8,858	4,339		0.1		130/1	3	3.8/6.8
	20	1	32.25	1	32.25	9,414	6,993		0.1		1	3	6.5/6.8
	21	1	7.40	1	6.99	2,901	1,839		0.1	0.1	1	3	6.7/6.8
	Instant. Min/Max pH												**3.8/6.8**
	Event/Daily Max									**0.1**		**3**	
	Monthly Total/Avg/GeoMean	**1**	**49.67**	**1**	**47.7**	**21,173**	**13,171**	**37.8%**			**3.4**		
Total		**3**	**50.88**	**1**	**47.70**	**23,186**	**13,269**						
Inst. pH Min/Max													**3.8/6.8**
Max (GEM, SS, TRC)											**3.4**	**3**	
Annual Average							by mass:	**42.8%**		**0.10**	**3.4**	**3**	

Notes:
ND = No discharge.
Red = NPDES permit exceedance.
%NS = No sample collected
^ED = End of discharge; fecal coliform samples were collected for 0-3 and 4-8 hour grabs then discharge ended before next grab sample was required.

Appendix D
Carkeek Wet Weather Treatment Station
Annual Report

January–December 2019

Executive Summary

This 2019 report summarizes the performance of Carkeek Wet Weather Treatment Station (Carkeek WWTS). The Carkeek WWTS began to operate as a CSO treatment facility on November 1, 1994. The Carkeek WWTS operates under the NPDES permit for the West Point Treatment Plant, Washington State Department of Ecology permit number WA-0029181-1.

2019 was a drier than normal year which resulted in only one treatment and discharge event at Carkeek WWTS. The total rainfall for the reporting period was 29.51 inches, as measured by the Ballard Station rain gauge. The 2019 annual rainfall recorded at Sea-Tac is 33.88 inches, and the 20-year average at Sea-Tac is 39.13 inches. There were four filling events and one discharge event during 2019. Carkeek WWTS received 13.3 million gallons (MG) and discharged 13.73 MG. The influent volume should exceed the effluent volume by approximately 0.6 MG. King County staff are currently evaluating the flow metering. There are several possible explanations for the flow difference. For example, site drainage going back into the station's process tanks and level sensor instrumentation differences contributing to weir flow calculations. Carkeek WWTS performed well in 2019.

The annual average total suspended solids (TSS) removal was 55.2 percent for the year thereby meeting the NPDES permit limit of 50 percent for annual removal. Carkeek WWTS met its annual average settleable solids (SS) limit with the average measured as 0.20 milliliters/liter/hour (ml/L/hr) less than the NPDES permit limit of 0.3 ml/L/hr. The Carkeek WWTS met all NPDES permit limits. The performance for 2019 has been summarized below in Table D-1.

Table D-1. Carkeek WWTS Permit Performance in 2019

Parameter	Performance	Permit Conditions
Discharge events (number)[a]	**1**	**10**
Discharge volume million gallons (MG)[a]	**13.7**	**46**
Annual average SS (ml/L/hr)	**0.2**	**0.3**
Annual average TSS removal- including all discharge events (%)	**55.2**	**50**
Instantaneous minimum effluent pH, frequency of discharge days with pH < 6.0	**0 out of 2 discharge days**	**≥ 6.0**
Instantaneous maximum effluent pH, frequency of discharge days with pH> 9.0	**0 out of 2 discharge days**	**≤ 9.0**
Total residual chlorine (TRC), maximum of daily averages (µg/L), frequency of discharge days with TRC >490 µg/L	**0 out of 2 discharge days**	**≤ 490 µg/L**
Monthly fecal coliform geomean, frequency of months with monthly geomean >400/100mL	**0 out of 1 discharge months**	**400/100 ml**

[a] Compliance assessed over a 5-year average.
Numbers in red indicate a permit exceedance.

Suspended and Settleable Solids

TSS removal averaged 55.2 percent, thereby meeting the annual TSS removal NPDES permit limit of 50 percent. The annual SS for the year averaged 0.20 ml/L/hr, thereby meeting the NPDES Permit limit annual average of 0.3 ml/L/hr.

Fecal Coliform Bacteria

Carkeek met the permit limit for monthly geomean for fecal coliform during the one discharge month in 2019. The annual average of the monthly geomean was 9.5 counts/100 ml.

Instantaneous Minimum/Maximum pH

The instantaneous minimum and maximum pH during the 2019 reporting period was 6.3 and 7.7, respectively, thereby meeting the NPDES permit limits for instantaneous minimum pH equal to or greater than 6.0 and for the maximum pH permit limit of equal to or less than 9.0.

Total Residual Chlorine

Carkeek met the daily maximum average TRC on all two discharge days during 2019. The annual average of the TRC was 84 µg/L. The maximum daily average effluent TRC during the 2019 reporting year was 157 µg/L, thereby meeting the NPDES permit limit of 490 µg/L. The final effluent sampling system was upgraded in 2017 with two sampling pumps: duty and standby pumps. Operators will need to manually valve in the standby pump in the event the duty pump fails.

Operation and Maintenance

Highlights of O&M activities during 2019 include:

- Conducted annual CSO refresher training for the operators in October 2019.
- Received shipments of both sodium hypochlorite and sodium bisulfite treatment chemicals.
- Continued to conduct debriefings with O&M staff after discharge events to review and discuss the discharge and treatment performance and make any needed operational adjustments for subsequent events.
- Periodic cleaning out the sedimentation tanks and effluent channel of accumulated solids and debris to improve solids removal.
- Continued monthly testing of the treatment chemicals' concentrations (sodium hypochlorite and sodium bisulfite solutions) and made necessary changes to the feed programs or ordered fresh chemicals.
- Continued a preventive maintenance practice to exercise the chemical feed pumps on a monthly basis.
- Continue preventative maintenance by Offsite Instrumentation and Electrical staff of online chlorine and pH analyzers including weekly calibration and replacement of probes and other instrumentation components as necessary.
- Carkeek Pump Station evaluation and adjustments of the VFD is ongoing.

Dechlorination Improvement Project

In late 2019, a new capital project was initiated to improve the reliability of the dechlorination system at Carkeek WWTS. This project entails upgrading the storage of sodium bisulfite (SBS) chemical solution from a single 1000-gallon tank to two 500-gallon tanks, upgrading the HVAC system, new chemical feed pumps and remodel a dedicated separate instrumentation and sampling room with upgraded amperometric chlorine analyzers. The project will provide a safer workspace for staff during process monitoring and maintenance by separating the sampling and instrumentation equipment from the SBS chemical storage into a dedicated room. The project team has set a potential start of construction for fall 2021.

Near Future Operation

As with all wet weather treatment stations, opportunities to operate and then to optimize are very limited. Challenges may be identified during an event in the wet season, but any major projects to address the challenge would likely have to occur during the following dry season. Then, after the completion of these projects, the opportunities to test the improvements would likely occur in the following wet season. Given the "normal" challenges of an intermittently operated facility, WTD has essentially had to make improvements continuously, and a number of improvements have been identified to be addressed during subsequent dry seasons.

- Continued to conduct debriefings with O&M staff after discharge events to review and discuss the discharge and treatment performance and make any needed operational adjustments for subsequent events.
- Continued monthly or quarterly testing of the treatment chemicals' concentrations (sodium hypochlorite and sodium bisulfite solutions) and made necessary changes to the feed programs or ordered fresh chemicals.
- Continued a preventive maintenance practice to exercise the chemical feed pumps on a monthly basis, weekly calibration, and preventive maintenance of online instrumentation.
- Continued to monitor and evaluate the completed flow measurement improvements.
- Support the Dechlorination Improvement capital project to upgrade the sodium bisulfite chemical storage and feed system.

Table D-2. Carkeek WWTS Annual Plant Performance 2019

Month	Day	Carkeek Inflow Event Number	Carkeek Inflow Volume (MG)	Carkeek Discharge Event Number	Carkeek Discharge Volume (MG)	Total Influent TSS (lb)	Total Effluent TSS Discharged @ Carkeek + WP (lb)	% removal	Carkeek Effl. Daily Settl Solids (ml/L/hr)	Carkeek Effl. Settl Solids Event avg (ml/L/hr)	Carkeek Avg daily Effl. Fecal Coliforms (#/100 ml)	Carkeek Effl. Residual Chlorine Daily Average (µg/L)	Daily Min/Max pH
January	No Inflow/No Disch.												
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	Monthly Total/Avg/GeoMean	**0**	**0.0**	**ND**	**0.00**	**-**	**-**	**-**			**ND**		
February	16	1	0.131	ND	ND	96	11						
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	Monthly Total/Avg/GeoMean	**1**	**0.13**	**ND**	**0.0**	**96**	**11**	**88.7%**			**ND**		
March	No Inflow/No Disch.												
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	Monthly Total/Avg/GeoMean	**0**	**0.0**	**ND**	**0.0**	**-**	**-**	**-**			**ND**		
April	No Inflow/No Disch.												
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	Monthly Total/Avg/GeoMean	**0**	**0.0**	**ND**	**0.0**	**-**	**-**	**-**			**ND**		
May	No Inflow/No Disch.												
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	Monthly Total/Avg/GeoMean	**0**	**0.0**	**ND**	**0.0**	**-**	**-**	**-**			**ND**		
June	No Inflow/No Disch.												
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	Monthly Total/Avg/GeoMean	**0**	**0.0**	**ND**	**0.0**	**-**	**-**	**-**			**ND**		
July	No Inflow/No Disch.												
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	Monthly Total/Avg/GeoMean	**0**	**0.0**	**ND**	**0.0**	**-**	**-**	**-**			**ND**		

August	1	1	0.001	ND	0	0.97	0.03						
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**1**	**0.0**	**ND**	**0.0**	**0.97**	**0.03**	**97.4%**			**ND**		
September	7	1	0.12	ND	0.00	296	31						
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**1**	**0.12**	**ND**	**0.0**	**296**	**31**	**89.4%**			**ND**		
October	No Inflow/No Disch.			ND	ND								
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**0**	**0.00**	**ND**	**0.00**	**-**	**-**	**-**			**ND**		
November	No Inflow/No Disch.												
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**0**	**0.00**	**ND**	**0.00**	**-**	**-**	**-**			**ND**		
December	19	1	0.05	ND	ND	56	9		ND				
	20	1	9.72	1	10.00	15895	7227		0.30		1/20	157	6.3/7.7
	21	1	3.26	1	3.73	898	444		0.10	0.2	20/20	10	6.4/6.7
	Instant. Min/Max pH												**6.3/7.7**
	Event/Daily Max									**0.2**		**157**	
	Monthly Total/Avg/GeoMean	**1**	**13.0**	**1**	**13.73**	**16,850**	**7,679**	**54%**			**9.5**		
Total		**4**	**13.29**	**1**	**13.7**	**17,243**	**7,721**						
Inst. pH Min/Max													**6.3/7.7**
Max (GEM, SS, TRC)											**9.5**	**157**	
Annual Average								**55.2%**		**0.20**	**9.5**	**157**	

Notes:
ND= No discharge.
^ED= End of discharge; fecal coliform samples were collected for 0-3 and 4-8 hour grabs then discharge ended before next grab sample was required.
Red= NPDES permit exceedance.
%NS= No sample collected; No online instrumentation values to report
* NR= Not Reported due to lab error.

Appendix E
Elliott West Wet Weather Treatment Station
Annual Report

January–December 2019

Executive Summary

This 2019 annual report summarizes the performance of the Elliott West Wet Weather Treatment Station (Elliott West WWTS). Elliott West WWTS began operating in July 2005. The facility operates under the permit for the West Point Treatment Plant, Washington State Department of Ecology permit number WA-0029181-1. The current permit went into effect on February 1, 2015.

2019 was a drier than normal year which resulted in only one treatment and discharge event at Elliott West for the entire year. Total rainfall recorded in 2019 was 27.9 inches as measured at the Denny Way rain gauge station which is located at 3165 Alaskan Way in Seattle. The 2019 annual rainfall recorded at Seattle Tacoma International Airport (Sea-Tac) was 33.9 inches. In comparison, the 20-year average at Sea-Tac is 39.1 inches. There were 39 inflow events and one discharge event in 2019. Elliott West WWTS received a total of 222 million gallons (MG) out of which 122 MG were treated and discharged through the Elliott West Outfall at the Denny Way Regulator Station located in Myrtle Edwards Park. Most of the inflows occurred during the one treatment and discharge event on December 19-21, 2019.

The average total suspended solids (TSS) removal for all events during the year was 62 percent thereby meeting the NPDES 50 percent annual average TSS removal limit. Elliott West WWTS did not meet the settleable solids (SS) annual event average limit with the average measured as 0.7 milliliters/liter/hour (ml/L/hr) and the NPDES permit limit being 0.3 ml/L/hr. Elliott West WWTS had permit violations for maximum daily average total residual chlorine (TRC) on each of the three discharge days of the single 2019 event. In the December 19 event the final effluent sample pump failed resulting in King County operators collecting grab samples to run total chlorine residual and pH measurements using portable field instruments and manually composite sampling throughout the three-day event. The performance for 2019 has been summarized below in Table E-1

Performance in 2019

Table E-1 summarizes NPDES permit performance in 2019.

Table E-1. Elliott West WWTS Permit Performance in 2019

Parameter	Performance	Permit Conditions
Discharge events (number)	**1**	**NA**
Discharge volume million gallons (MG)	**121.6**	**NA**
Annual average SS (ml/L/hr)	**0.7**	**0.3**
Annual average TSS removal- including all discharge events (%)	**62**	**50**
Instantaneous minimum effluent pH, frequency of discharge days with pH < 6.0	**0 out of 3 discharge days**	**≥ 6.0**
Instantaneous maximum effluent pH, frequency of discharge days with pH > 9.0	**0 out of 3 discharge days**	**≤ 9.0**
Total residual chlorine (TRC), maximum of daily averages (µg/L), frequency of discharge days with TRC >109 µg/L	**3 out of 3 discharge days**	**≤ 109 µg/L**
Monthly fecal coliform geomean, frequency of months with monthly geomean >400/100mL	**0 out of 1 discharge months**	**400/100 ml**

Numbers in red indicate a permit exceedance.

Suspended and Settleable Solids

In 2019, the annual TSS removal was calculated to be 62 percent; therefore, Elliott West WWTS met the NPDES permit limit of 50 percent. The current NPDES permit effective February 1, 2015 removed the SS event maximum limit and kept the annual average of 0.3 ml/L/hr. Meeting the SS NPDES permit limit continues to be a challenge. The annual SS concentration for the 2019 discharge events averaged 0.7 ml/L/hr., exceeding the NPDES permit limit of 0.3 ml/L/hr. The event maximum in 2019 was 1.10 ml/L/hr., occurring on December 20, 2019. With the ongoing challenges of meeting the NPDES permit limits, King County has started a project to perform an alternatives analysis to identify the best alternative(s) to improve compliance.

Fecal Coliform Bacteria

In 2019, there was only one treatment and discharge event occurring on December 19-21, 2020. Elliott West WWTS did meet the fecal coliform NPDES permit limit of 400/100 mL monthly geomean for month of December, the only month with a treatment and

discharge event. The highest fecal coliform measured was 170 MPN per 100 mL and the geomean for the month of December was 3.6

Hypochlorite dosing set point have been increased in response to high fecal coliform values in the past events. To date, fecal coliforms values have improved. However, the increased hypochlorite dose will require additional diligence to assure compliance with the effluent Cl2 and/or pH limits. Additional steps to improve fecal coliform inactivation include review of the hypochlorite and dechlorination chemical feed system pumps and program controls as part of the 2016 Elliott West WWTS assessment and improvement project by King County.

Total Residual Chlorine

During 2019, all three discharge days exceeded the maximum daily average total residual chlorine (TRC) NPDES permit level of 109 µg/L. Please refer to Table E-2 for the discharge events that exceeded the TRC limits. The annual average of all daily TRC values was 480 µg/L and the maximum value of 1059 µg/L was measured by the online effluent chlorine analyzer. With only one event spanning three discharge days it is difficult to draw conclusions regarding outcomes contributed to previous actions and improvements to the chlorination-dechlorination systems. These past actions include feeding a diluted sodium bisulfite (SBS) solution to aid in dispersion, increased C2 water capacity for reliable SBS carrier water, the use of an in-pipe SBS diffuser in place of flash mixers and the use of the “semi-auto” mode for SBS feed control during times of questionable pre-dechlorination analyzer output. King County staff will continue to monitor and adjust the hypochlorite and sodium bisulfite (SBS) dosing and further investigate areas to improve the chemical feed control.

Instantaneous Minimum and Maximum Effluent pH

Instantaneous minimum and maximum effluent pH in 2019 was measured as 6.6 and 7.6, respectively, thereby meeting the instantaneous minimum and maximum effluent pH limit for the three discharge days in 2019. The NPDES pH limit is greater than pH 6.0 and less than pH 9.0. As in the effluent residual chlorine limits, any changes in chlorination-dechlorination can impact the effluent pH. Some projects to improve treatment chemical feed controls and SBS mixing mentioned in the previous section on final chlorine residual permit performance will also help the facility meet discharge pH permit limits. Further analysis of the data trends of discharge events is ongoing.

Operation and Maintenance

Highlights of O&M activities at EWCSO during 2019:

- Conducted annual CSO refresher training for the operators in September 2019.
- Provide remote monitoring support team in anticipation of a treatment and discharge event, and during the event.
- Received shipments of both sodium hypochlorite and sodium bisulfite treatment chemicals as needed.
- Continued monthly testing of the treatment chemicals' concentrations (sodium hypochlorite and sodium bisulfite solutions) and made necessary changes to the feed programs or ordered fresh chemicals.
- Continued the automated Mercer Tunnel flushing program at the East Portal flushing gate as an attempt to flush and capture the solids settled in the Mercer Tunnel.
- Continued to monitor the effectiveness of the automated Mercer Tunnel flushing by taking additional samples from the return flows and running laboratory solids analyses on those samples.
- Continued to run the dewatering pumps during discharges in order to remove additional solids, which takes advantage of the turbulence and re-suspension of solids in the wet well caused by the larger main pumps and increases the amount of solids in the return flows to the West Point.
- Continued to conduct debriefings with O&M staff after discharge events to review and discuss the discharge and treatment performance and make any needed operational adjustments for subsequent events.
- Continued with additional procedures to the post-discharge event routines including equipment testing, cleaning and de-ragging within the dechlorination and final effluent vaults/structures. Equipment includes both pre-dechlorination and final effluent sample pumps and sample.
- Continued to exercise the hypochlorite chemical feed pumps on a monthly basis as a preventive maintenance measure.
- Made changes to main pump control program with the goal to minimize large pump flow swings impacting treatment and impacts to upstream conveyance.
- Continued to evaluate the SBS diffuser that was installed in summer 2018.
- Installed in summer 2018 and currently operating a post – inline SBS dilution system at Elliott West WWTS to dilute the 38 percent SBS to 20 percent solution.
- Implemented a "semi-auto" mode for SBS feed control which would disable the input from the pre-dechlorination chlorine analyzer to the SBS feed program during times when the analyzer is not working properly.
- Repaired the Elliott West WWTS Drop Structure Drain Gate (wet well drain grate) in September 2019.

Improvement Projects at Elliott West Wet Weather Station

A project to improve the reliability of the dechlorination system, the SBS post-dilution system was started in 2016 and was completed in September 2018. This project involved the design and installation of an in-line SBS dilution system. The stored SBS concentration of 38 percent is diluted to 20 percent solution during the transfer of SBS from storage tanks at Elliott West facility to the day tank at Denny Station. Use of a more dilute SBS will minimize freezing and crystallization of SBS in the transfer line and will aid in SBS dispersion at the dechlorination vault located at Denny Station. It is anticipated that the SBS feed pumps will perform better when pumping at higher speeds to adjust for a more dilute SBS chemical, as well.

In late October 2017, it was discovered that the Elliott West WWTS effluent pipe drain gate (a.k.a. wet well drain gate) failed to close. This drain gate is normally closed during discharge events, but will open after events, to allow the facility to drain the treated flow in the effluent pipeline that was not discharged, back into the facility where it can be transferred to West Point for treatment. The partially open gate allows recycling of some flow that has already been disinfected and dechlorinated, so proper dosing becomes more of a challenge. The work to address the failed drain gate was performed in September 2019; however, more work is needed and is scheduled for summer 2020.

Near Future Operation

During the 14 years of operation, opportunities to operate and then to optimize have been very limited since this is a wet weather facility. Challenges may be identified during an event in the wet season, but any major projects to address the challenge would likely have to occur during the following dry season. Then, after the completion of these projects, the opportunities to test the improvements would likely occur in the following wet season. Given the complexity of Elliott West WWTS's design and operation and the “normal” challenges of an intermittently operated facility, WTD has essentially had to make improvements continuously, and a number of improvements have been identified to be addressed during subsequent dry seasons. WTD staff will continue to fine-tune the chlorination-dechlorination controls and assess and improve the facility performance using these additional tools.

In late October 2017 it was discovered that the Elliott West WWTS wet well drain gate failed to close. This drain gate is normally closed during discharge events, but will open after events, to allow the facility to drain the treated flow in the effluent pipeline that was not discharged, back into the facility where it can be transferred to West Point for treatment. The partially open gate allows recycling of some flow that has already been disinfected and dechlorinated, so proper dosing becomes more of a challenge. In

September 2019 the drain gate was repaired; however, the contractor, during the repair work discovered that the rails and frame of the gate were seriously corroded and damaged and in need of repair or replacement. The repair of the corroded rails and frame is scheduled for summer 2020. Currently the gate is operated automatically as intended.

In early 2016, King County hired a consultant engineering team to address issues of solids capture and removal, screenings of CSO flows, and improve compliance at Elliott West WWTS. Workshops led by the consultants to define constraints to potential solutions and the challenges at meeting compliance at Elliott West WWTS are scheduled in 2020. A timeline for the work will also be developed in 2020.

The following observations were made:

- Improvements were made to influent sampling, flow measurement locations and methodology to better characterize WWTS performance, but this is a relatively complex system. It will be hard to improve the current practice.
- Installation of a baffle/weir wall within the wet well to improve solids removal was found to be not feasible.
- Modifications to influent pumping controls to prevent large oscillations that impact downstream disinfection and dechlorination controls were made and tested, but further improvements should be investigated.
- Modifications to improve screening will be investigated but are likely to incur a large capital cost.
- Modifications to improve solids resuspension in the wet well are being investigated.

In addition, WTD staff will:

- Continue to investigate and if possible, correct the cause(s) of the instantaneous minimum pH exceedances.
- Continue to implement the remote monitoring response team to Elliott West WWTS as the wet well fills and in anticipation of a discharge.
- Continue evaluation and fine-tuning of the chlorination and dechlorination controls.
- Continue evaluation and fine-tuning of systems after completing the sample and instrumentation relocation project.
- Continue to sample and monitor copper and dissolved oxygen of Elliott West WWTS flow per NPDES permit requirement.
- Continue with laboratory solids analyses on all flows sampled at Elliott West WWTS as part of the monitoring of the automated Mercer Tunnel flushing program.
- The SBS post-dilution system was implemented in summer 2018 and fine-tuning will continue to occur as necessary.
- Continue evaluation and fine-tuning of changes in the main pump control program.

- Begin an alternatives analysis for Elliott West WWTS to determine the best alternative(s) to achieve compliance.

Table E-2. Elliott West WWTS Annual Plant Performance 2019

Month	Day	EWCSO Inflow Event Number	EWCSO Inflow Volume (MG)	EWCSO Discharge Event Number	EWCSO Discharge Volume (MG)	Total Influent TSS (lb)	Total Effluent TSS Discharged @ EW + WP (lb)	% removal	EWCSO Effl. Daily Settl Solids (ml/L/hr)	EWCSO Effl. Settl Solids Event Average (ml/L/hr)	EWCSO Effl. Fecal Coliforms (#/100 ml)	EWCSO Effl. Residual Chlorine Daily Average (µg/L)	Daily Min/Max pH
January	3	1	2.67	ND	ND	1,213	61		ND		ND	ND	ND
	4	1	1.19	ND	ND	3,002	190		ND		ND	ND	ND
	6	2	1.18	ND	ND	808	62		ND		ND	ND	ND
	7	2	0.60	ND	ND	1,260	63		ND		ND	ND	ND
	9	3	2.00	ND	ND	5,650	238		ND		ND	ND	ND
	18	4	0.68	ND	ND	1,630	55		ND		ND	ND	ND
	22	5	2.46	ND	ND	1,479	52		ND		ND	ND	ND
	23	5	1.67	ND	ND	585	34		ND		ND	ND	ND
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**5**	**12.46**	**ND**	**ND**	**15,626**	**756**	**95.2%**			**ND**		
February	1	1	0.85	ND	ND	767	30		ND		ND	ND	ND
	11	2	0.60	ND	ND	462	25		ND		ND	ND	ND
	12	2	4.79	ND	ND	2,402	309		ND		ND	ND	ND
	13	2	1.71	ND	ND	527	74		ND		ND	ND	ND
	14	2	0.57	ND	ND	1,778	172		ND		ND	ND	ND
	16	3	1.40	ND	ND	559	63		ND		ND	ND	ND
	17	3	0.54	ND	ND	749	109		ND		ND	ND	ND
	19	4	0.67	ND	ND	450	41		ND		ND	ND	ND
	20	4	0.37	ND	ND	380	26		ND		ND	ND	ND
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**4**	**11.50**	**ND**	**ND**	**8,073**	**849**	**89.5%**			**ND**		
March	7	1	0.35	ND	ND	839	28		ND		ND	ND	ND
	11	2	0.69	ND	ND	11673	347		ND		ND	ND	ND
	12	2	6.14	ND	ND	1384	98		ND		ND	ND	ND
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**2**	**7.18**	**ND**	**ND**	**13,897**	**472**	**96.6%**			**ND**		
April	5	1	0.67	ND	ND	369	15		ND		ND	ND	ND
	7	2	0.71	ND	ND	392	15		ND		ND	ND	ND
	9	3	0.54	ND	ND	273	8		ND		ND	ND	ND
	11	4	0.60	ND	ND	835	28		ND		ND	ND	ND
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**4**	**2.52**	**ND**	**ND**	**1,869**	**65**	**96.5%**			**ND**		

May	16	1	**0.68**	**ND**	**ND**	**1,731**	**51**		ND		ND	ND	ND
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**1**	**0.68**	**ND**	**ND**	**1,731**	**51**	**97.1%**			**ND**		
June	19	1	0.69	ND	ND	357	12						
	20	1	0.38	ND	ND	466	86						
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**1**	**1.07**	**ND**	**ND**	**822**	**99**	**88.0%**			**ND**		
July	8	1	0.13	ND	ND	469	22						
	10	2	0.23	ND	ND	632	33						
	18	3	5.94	ND	ND	2,880	107						
	19	3	1.32	ND	ND	463	73						
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**3**	**7.62**	**ND**	**ND**	**4,444**	**236**	**94.7%**			**ND**		
August	1	1	0.14	ND	ND	65	2						
	2	1	1.31	ND	ND	3573	131						
	10	2	6.73	ND	ND	3879	369						
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**2**	**8.18**	**ND**	**0.00**	**7,516**	**502**	**93.3%**			**ND**		
September	7	1	3.00	ND	ND	1,791	189						
	8	1	1.10	ND	ND	722	84						
	10	2	0.88	ND	ND	580	30						
	12	3	0.67	ND	ND	22,284	807						
	15	4	0.35	ND	ND	335	8						
	17	5	0.15	ND	ND	960	17						
	18	5	0.18	ND	ND	361	9						
	27	6	1.16	ND	ND	405	18						
	28	6	0.13	ND	ND	218	15						
	29	6	1.64	ND	ND	273	16						
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**6**	**9.25**	**ND**	**ND**	**27,930**	**1,193**	**95.7%**			**ND**		
October	9	1	0.11	ND	ND	382	15						
	16	2	0.59	ND	ND	423	13						
	18	3	2.28	ND	ND	741	25						
	19	3	5.43	ND	ND	1530	122						
	20	3	0.08	ND	ND	71	2						
	21	3	0.45	ND	ND	2320	73						
	22	3	0.23	ND	ND	1027	58						
	25	4	0.32	ND	ND	776	54						
	Instant. Min/Max pH												**ND**

	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**4**	**9.48**			**7,271**	**361**	**95.0%**			**ND**		
November	12	1	0.89	ND	ND	320	11						
	15	2	0.44	ND	ND	281	8						
	17	3	0.88	ND	ND	2278	104						
	18	3	1.58	ND	ND	661	52						
	19	3	0.30	ND	ND	633	40						
	25	4	1.71	ND	ND	742	23						
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**4**	**5.80**			**4,913**	**238**	**95.2%**			**ND**		
December	11	1	0.90	ND	ND	530	25						
	14	2	1.06	ND	ND	586	25						
	18	3	0.22	ND	ND	1079	34						
	19	3	25.55	1	23.09	17434	16531		0.80		1/1	268	6.6/7.4
	20	3	90.59	1	87.50	36428	35925		1.10		170	1059	6.8/7.6
	21	3	19.47	1	10.99	4416	2517		0.10	0.7	1	113	6.9/7.2
	22	3	4.08	ND	ND	1514	95						
	23	3	2.99	ND	ND	1087	58						
	24	3	0.82	ND	ND	736	25						
	25	3	0.01	ND	ND	129	5						
	26	3	0.11	ND	ND	42	1						
	Instant. Min/Max pH												**6.6/7.6**
	Event/Daily Max									**0.7**		**1059**	
	Monthly Total/Avg/GeoMean	**3**	**145.80**	**1**	**121.58**	**63,983**	**55,240**	**13.7%**			**3.6**		
Total		**39**	**221.54**	**1**	**121.58**	**158,074**	**60,061**						
Inst. pH Min/Max													**6.6/7.6**
Max (GEM, SS, TRC)										**1.10**	**3.6**	**1059**	
Annual Average							by mass:	**62.0%**		**0.70**	**3.6**	**490**	

Notes:
ND= No Discharge.
ED= End of discharge; fecal coliform samples were collected for 0-3 and 3-8 hour grabs then discharge ended before next grab sample was required.
NS= No Sample.
%NR= Not Reported due to lab error
Red= NPDES permit exceedance

Appendix F
Henderson/MLK Jr. Way Wet Weather Treatment Station Annual Report

January–December 2019

Executive Summary

This 2019 annual report summarizes the performance of King County's Henderson/ Martin Luther King Junior Way Wet Weather Treatment Station (Henderson/MLK Jr. Way WWTS). The Henderson/MLK Jr. Way WWTS came online in 2005 and operates under the National Pollutant Discharge Elimination System (NPDES) permit for the West Point Treatment Plant (WA-0029181-1).

There was one discharge event in 2019: December 20-21. This was in response to a three-day rainfall of 4.76-inches, with 2.8-inches falling on December 20 (Henderson Pump Station Rain Gauge). The one discharge event resulted in two discharge or "compliance" days based on a 7a.m. to 7a.m. clock. The Henderson/MLK Jr. Way WWTS received a total inflow of 20.58 million gallons (MG) and discharged 16.90 MG of treated effluent to the Duwamish Waterway. There were no separate filling events in 2019.

2019 was a dry year with a rainfall total of 33.9-inches (SeaTac); the 20-year annual average is 39.1 inches. If not for a very rainy December, 2019 would have been a very dry year as only 25.9 inches of rain fell from January through November (SeaTac). In additional to the low rainfall total for the year, there were few heavy rainfall days except for the December 19-21 event. In fact, there was only one day outside of December 19-21 that had a rainfall greater than 1.0 inches. 27.32 inches of rain fell in 2019, as measured at the Henderson Street Pump Station.

Performance in 2019

Table F-1 summarizes NPDES permit performance in 2019. Henderson/MLK Jr. Way WWTS was in full compliance with effluent permit limits in 2019.

Table F-1. Henderson/MLK Jr. Way WWTS Permit Performance in 2019

Parameter	Performance	Permit Conditions
Annual average effluent settleable solids (ml/L/hr)	0.1	0.3
Annual average total suspended solids removal (%) - all	60	50
Instantaneous minimum effluent pH: number of days with pH <6.0	0 of 2 discharge days	≥ 6.0
Instantaneous maximum effluent pH: number of days with pH >9.0	0 of 2 discharge days	≤ 9.0
Daily average total residual chlorine (TRC, µg/L): number of days with TRC >39 µg/L	0 of 2 discharge days	39
Monthly geomean fecal coliform (cfu/100 ml): number of months with >400 cfu/100-mL	0 of 1 discharge month	400

Annual Suspended Solids Removal and Settleable Solids

The 2019 annual average total suspended solids (TSS) removal was 60 percent; the minimum permit limit is 50 percent. The annual average effluent settleable solids was 0.1 milliliters/liter/hour (ml/L/hr); the maximum permit limit is 0.3 ml/L/hr.

Monthly Fecal Coliform Bacteria and Daily Total Residual Chlorine

There were no exceptions to the maximum monthly fecal coliform limit of 400 colony forming units (cfu)/100 ml and the maximum daily total residual chlorine (TRC) limit of 39 μg/L. The maximum monthly effluent fecal coliform concentration in 2019 was <10-cfu/100 ml. The maximum daily effluent TRC in 2019 was 34 ug/L.

Instantaneous Minimum/Maximum pH

There were no exceptions to the minimum and maximum pH limits. The lowest and highest effluent pH measured in 2019 was pH 6.5 and pH 7.3, respectively.

Operation and Maintenance

Though significant equipment modifications and improvements were made in 2019, the equipment and facilities of the Henderson/MLK Jr. Way WWTS were always available throughout 2019. Most of the modifications and improvements occurred in spring and summer when the chance would be very small that Henderson/MLK Jr. Way WWTS would need to operate. Improvements made to equipment at the tunnel influent (e.g., new hypochlorite disinfection pumps) were tested several times before the 2019-2020 wet weather season by forcing flow into the tunnel (without discharge). This included verification of the inlet weir level measurement for inlet flow calculation. Improvements made to equipment at the tunnel outlet (e.g., new sodium bisulfite pumps) were tested by simulating flow over the effluent weir in the programable logic controller as we could not actually discharge flow for testing.

Routine operation and maintenance (O&M) activities included weekly operator inspections, checklists, equipment and sampler testing, alarm checks, weekly analyzer preventive maintenance and calibrations, quarterly lubrication, quarterly preventive maintenance of mechanical equipment, annual training and preparation for winter wet weather operation, post-event cleaning of the combined sewer overflow facilities, and post-event debriefs and corrective work orders, as appropriate.

All permit-required samples were collected and analyses performed. Priority pollutant samples were collected and analyzed for the single 2019 discharge event. More details are available in the monthly discharge monitoring reports.

Henderson/MLK Jr. Way WWTS Improvements Project

Major equipment modifications and improvements were made to Henderson/MLK Jr. Way WWTS from 2017 through 2019 to address challenges with consistently meeting NPDES permit requirements for disinfection and dechlorination. Project tasks were separated into two phases. Phase 1, completed in late 2017, focused on improving the flow-pacing ability of the then-existing sodium hypochlorite (NaOCl) and sodium bisulfite (SBS) pumps. Phase 2, substantially completed in 2019, was based on "right-sizing" the chemical dosing pumps to better match required doses, and improving control of the dechlorination process by installing a chlorine residual analyzer for SBS pump control. Phase 1 improvements included:

- Re-leveled the existing inlet and outlet rectangular weirs. Leveling the inlet and outlet weirs (both very long weirs) have provided a more accurate inlet outlet flow calculation which in turn provided better control of chemical dosing.
- Installed new fine-range bubbler sensors at the tunnel's inlet and outlet weirs. These sensors provide greater accuracy at the small incremental level changes that occur over these very long weirs. The existing level sensors will be retained for redundancy and full-depth readings.
- Installed flow meters on the NaOCl and SBS chemical dosing lines. These meters verify that the applied chemical dose is equal to the dose set point (e.g., lbs/MG) in the control system.
- Improved venting of the chemical supply lines by removing and relocating pressure-relief valves at various locations on the NaOCl and SBS supply lines.

The Phase 2 Improvements, completed in early September 2019, were based on "right-sizing" the chemical dosing pumps and installing tools to improve control of the dechlorination process. Right-sizing the chemical pumps was needed given that actual flows have been far lower than the 146 million gallons per day (MGD) peak design flow. The largest inflow recorded at the facility thus far is only 55 MGD; current modeling suggests that peak flows will only reach about 75 MGD in the foreseeable future.

Right-sizing the chemical pumps was also needed because actual doses have been much lower than the dose assumed during initial design. Hypochlorite doses required to meet the 400 cfu/100 ml have usually been near 3 to 4 milligrams per liter (mg/L) as chlorine (Cl_2), while the initial design assumed 10 mg/L. Thus, the previous hypochlorite pump capacity was nearly five times the demand required during most events. The three new hypochlorite metering pumps, while providing the lower doses with more accuracy, have sufficient capacity to dose a flow of 80 MGD at 3 mg/L, assuming a hypochlorite strength of 6 percent (i.e., to account for long term storage degradation of the original 12 percent concentration).

The new sodium bisulfite metering pumps in the Outlet Regulator are the same size and model as the hypochlorite metering pumps in the Inlet Regulator. The two new sodium bisulfite metering pumps also provide lower dose accuracy, and a single pump has sufficient capacity to treat a flow of 146 MGD having a 2.7 mg/L chlorine residual. This should be sufficient to treat most, if not all, future CSO events, based on historical flows and strengths.

The project team produced a Basis of Design report for Ecology review (Henderson/MLK Jr. Way Wet Weather Treatment Station Improvements Basis of Design, April, 2018) to document and support the decision to lower the design operating range of the chemical metering system to provide much improved control for operating at the lower flows and strengths that have been experienced at the Henderson/MLK Jr. Way WWTS. Ecology accepted the revised metering pump capacities and control systems outlined in the Basis of Design Report (December 14, 2017).

Construction on the Phase 2 Improvements began in April 2019, and was completed in August 2019. The Phase 2 improvements include:

- Replaced the three existing NaOCl chemical feed pumps. The new hypochlorite dosing pumps in the Tunnel Inlet Regulator were installed in July and August 2019. These smaller capacity pumps will better match the range of actual and expected doses. The new pumps are self-venting and provide much more accurate dosing control over the wide and fluctuating flows entering the Tunnel Inlet Regulator.
- Replaced the two existing SBS chemical feed pumps. The new SBS dosing pumps in the Tunnel Outlet Regulator were installed in July and August 2019. These smaller capacity pumps will provide more accurate dosing control over the wide and fluctuating CSO flows exiting the tunnel during a CSO event. These SBS pumps will also use a new pre-dechlorination TRC analyzer to trim their dose rates.
- Installed a new pre-dechlorination TRC monitoring system. A new "pre-dechlor" total chlorine residual analyzer was installed in the Tunnel Outlet structure in June 2019. It is used, along with the CSO discharge rate, to provide "feed-forward" control of the SBS metering pumps to achieve the appropriate amount of dechlorination. A new submersible pump in the Tunnel Outlet structure and a series of filters provide a clean "pre-dechlor" effluent sample to the new analyzer via a sample feed tank in the Flow Control Room.
- Installed a strainer on the SBS metering pump suction lines to remove impurities, debris, and chemical residues to avoid interference with the metering pumps.

- Modified the exhaust ventilation intake duct in the SBS Chemical Room to provide more efficient collection and removal of potential chemical fumes in this room, and to comply with chemical safety codes.

As with all wet weather treatment stations, and especially the Henderson/MLK Jr. Way WWTS, opportunities to optimize operations are limited because of the infrequent number of events; there was only one event in 2019. Fortunately, the December 2019 event extended over several days which allowed for extended monitoring, evaluation and tweaking of the improvements. Given the complexity and "normal" challenges of an intermittently operated WWTS facility, King County Wastewater Treatment Division staff will continue to monitor, evaluate, and make necessary adjustments in the station's operation and maintenance. Similarly, equipment improvements will follow a design-construct-operate-monitor-adjust cycle. Additional improvements will be made as necessary.

Table F-2. Henderson/MLK Jr. Way WWTS Annual Plant Performance 2019

Month	Day/Parameter	Inflow Event Number	Inflow Volume (MG)	Discharge Event Number	Discharge Volume (MG)	Total Influent TSS (lb)	Effl. TSS @ MLK + WP (lb)	TSS Removal (%)	Effl. Daily SS (mlLl/hr)	Effl. SS Event Max (ml/L/hr)	Effl. Fecal Coliforms (#/100 ml)	Effl. TRC Daily Average (µg/L)	Daily Min/Max pH
January - November	**No Inflow/ No discharge**												
	Instant. Min/Max pH												ND
	Event/Daily Max								ND	ND		ND	
	Monthly Sum/Avg/GeoMean			ND	ND	ND	ND				ND		
December		1	20.58	1	16.90	12,690	3,010 + WP	60%	0.1	0.1	<10	22	6.5/7.3
	Instant. Min/Max pH												6.5/7.3
	Event/Daily Max									0.1		34	
	Monthly Total/Avg/GeoMean	1	20.58	1	16.90	12,690	3,010+WP	60%	0.1		<10		
Annual Total – All events		1	20.58	1	16.90	12,690	3,010+WP						
Inst. pH Min/Max – All events													6.5/7.3
Max (GEM, SS, TRC) – All events										0.1	<10	34	
Annual Average – All events								60%	0.1		<10	22	

Notes:
N/A = Not applicable
ND = No discharge
Red = NPDES permit exceedance