Seattle Public Utilities

Protecting Seattle's Waterways

# Wastewater Collection System: 2016 Annual Report

March 28, 2017

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# List of Abbreviations

| Term | Definition |
|---|---|
| CMOM | Capacity, Management, Operations, and Maintenance |
| CSO | Combined Sewer Overflow |
| DOJ | U.S. Department of Justice |
| DNRP | King County Department of Natural Resources and Parks |
| DWO | Dry Weather Overflow |
| Ecology | Washington State Department of Ecology |
| EPA | U.S. Environmental Protection Agency |
| FSE | Food Service Establishment |
| GSI | Green Stormwater Infrastructure (see also NDS, LID) |
| LID | Low Impact Development (see also NDS, GSI) |
| LTCP | Long-Term Control Plan |
| MG | million gallons |
| MGD | million gallons per day |
| NDS | Natural Drainage Systems (see also GSI, LID) |
| NPDES | National Pollutant Discharge Elimination System |
| PACP | Pipeline Assessment and Certification Program |
| Public Health | Public Health - Seattle & King County |
| RCM | Reliability Centered Maintenance |
| SCADA | Supervisory Control and Data Acquisition |
| SDOT | Seattle Department of Transportation |
| SOP | Standard Operating Procedure |
| SPU | Seattle Public Utilities |
| SSO | Sewer Overflow |

**SECTION 1**

# Introduction

This annual report was prepared to meet state and federal regulatory requirements and to share information with the public on activities Seattle Public Utilities (SPU) is undertaking to improve its wastewater collection system. The report provides updates on the Combined Sewer Overflow (CSO) Reduction Program and the Capacity, Management, Operations and Maintenance (CMOM) Program. The report is organized as follows:

- Section 1: Introduction
- Section 2: Planning Activities
- Section 3: Operation and Maintenance Activities
- Section 4: Capital Activities
- Section 5: Monitoring Programs and Results

Additional information is available at www.seattle.gov/cso.

## 1.1 The Wastewater Collection System

The City of Seattle's (City's) wastewater collection system is one of the largest in Washington State. It includes sanitary, partially separated, and combined sewers, as shown in Figure 1-1. In areas of the City served by sanitary sewers, stormwater runoff flows to a storm drainage system, and sewage is conveyed through sewers to transmission and treatment facilities owned and operated by King County Department of Natural Resources and Parks (DNRP). In areas of the City with combined sewers, stormwater runoff and sewage flow into the sewers and are conveyed to the DNRP facilities. In areas of the City served by partially separated sewers, storm drain separation projects were built during the 1960s and 1970s to divert street runoff to the storm drainage system while allowing rooftop and other private property drainage to flow into the sewers.

During storm events, sometimes the amount of stormwater in the combined sewers exceeds the collection system's capacity. When this happens, the collection system can overflow through structures designed for this purpose. These wet weather overflows are called Combined Sewer Overflows (CSOs), and the structures where these overflows can occur are called CSO outfalls. There are currently 85 CSO outfalls in the City of Seattle. As shown in Figure 1-1, they are located along Lake Washington, the Ship Canal, Puget Sound, Elliott Bay, and Longfellow Creek. The goal of SPU's CSO Reduction Program is to reduce the number of CSOs to no more than one per outfall per year on a 20-year moving average.

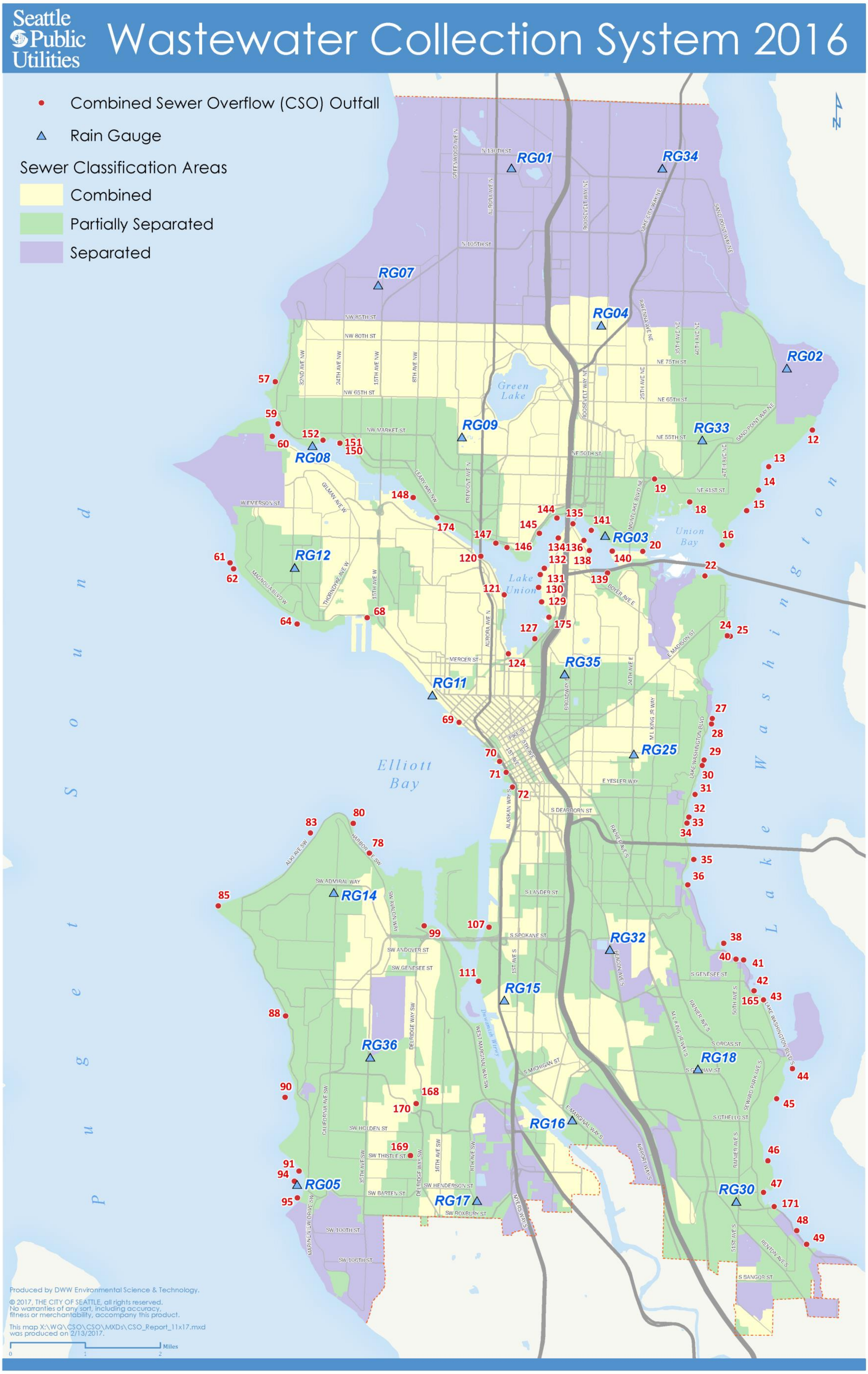


Figure 1-1. 2016 Combined Sewer Outfalls

## 1.2 Collection System NPDES Permit

The City's wastewater collection system is regulated by the Washington State Department of Ecology (Ecology), through a National Pollutant Discharge Elimination System (NPDES) Permit. Ecology first issued the City an NPDES permit for CSO discharges in 1975. The permit has been reissued periodically, most recently as NPDES Permit WA0031682 issued on March 30, 2016, with an effective date of May 1, 2016. The current permit expires on April 30, 2021.

The NPDES permit:

- Authorizes CSOs at the 85 outfalls shown in Figure 1-1. Outfall 33, which formerly served the Leschi area, was removed from CSO service on July 22, 2016;
- Requires that SPU limit the number of CSOs from each "controlled" outfall to no more than one event per outfall per year, assessed on a twenty-year moving average;
- Includes a compliance schedule for CSO control projects and other activities that must be completed by the permit expiration date;
- Prohibits overflows from the CSO outfalls during dry weather. Such overflows (e.g., caused by mechanical failure, blockage, power outage, and/or human error alone) are called dry weather overflows (DWOs). Based on guidance from Ecology, if the volume of a wet weather overflow is increased because of a mechanical failure, blockage, power outage, and/or human error, the event is called an exacerbated CSO;
- Requires SPU to report sewer overflows (SSOs) within specific timeframes; and
- Requires SPU to apply for permit renewal six months before the permit expires.

SPU works to prevent SSOs, DWOs and exacerbated CSOs by providing appropriate system maintenance, backup generators for key facilities, and employee training.

## 1.3 Collection System Consent Decree

The City also must meet the requirements of a Consent Decree with the United States Department of Justice (DOJ), United States Environmental Protection Agency (EPA), and Ecology (Civil Action No. 2:13-cv-678; July 3, 2013). The Consent Decree achieves the following:

- Resolves EPA's and Ecology's complaints that the City has violated the Clean Water Act and its collection system NPDES permit;
- Sets a schedule for the City to come into compliance with state and federal requirements, including milestones for development of certain plans, construction of necessary capital improvements for controlling CSOs, and implementation of a performance based adaptive management approach to system operation and maintenance (O&M);
- Requires the City to report annually on Consent Decree required activities; and
- Establishes penalties for non-compliance.

## 1.4 Other Collection System Enforcement

On October 26, 2010, Ecology and SPU signed Agreed Order 8040, requiring SPU to control all CSO outfalls by December 31, 2025. On January 22, 2016, SPU requested that Ecology rescind the Agreed Order because it was not consistent with the schedule in the Plan to Protect Seattle's Waterways, which was approved by Ecology and EPA in 2015. By letter dated February 1, 2016, Ecology rescinded Agreed Order 8040.

## 1.5 Collection System Reporting Requirements

SPU's NPDES permit requires submittal of the following types of reports:

- Monthly discharge monitoring reports. These document the volume, duration, precipitation, and storm duration for each CSO event and are due by the 28th of the following month.
- Reports of SSOs and DWOs. SPU must report any DWOs and certain types of SSOs (those that reach surface waters, the municipal storm system, or other areas with public access) immediately, by phone, to Ecology and Public Health – Seattle & King County (Public Health). Other SSOs must be reported to Ecology online or by phone within 24 hours after they are confirmed by SPU. SPU must also file a written follow-up report within five days of each DWO or SSO, except those SSOs that are contained within buildings. SSOs that are contained within buildings are reported quarterly in a summary spreadsheet.
- Engineering reports, plans, specifications, and construction quality assurance plans. These are required for specific CSO reduction projects. Due dates are specified in the permit.

Each of the 2016 monthly discharge monitoring reports was complete and submitted on time. All required engineering reports, plans, specifications, and construction quality assurance plans were submitted by their respective deadlines, and most were submitted in advance of deadlines. Most SSOs and DWOs were reported by their respective deadlines, and most of the follow-up written reports were submitted on time. Timely reporting is sometimes difficult during intense storm events, which is when SSOs often occur.

In addition, both the NPDES permit and the Consent Decree include annual reporting requirements. This report meets these annual reporting requirements. Table 1-1 lists the requirements and identifies where the information is provided.

| Table 1-1. 2016 Annual Reporting Requirements | | |
|---|---|---|
| **Source** | **Requirement** | **Report Location** |
| **NPDES permit** | | |
| S4.B | Detail the past year's frequency and volume of combined sewage discharged from each CSO outfall | Table 5-4 |
| S4.B | For each CSO outfall, indicate whether the number and volume of overflows has increased over the baseline condition and, if so, propose a project and schedule to reduce the number and volume of overflows to baseline or below | Table 5-5,<br>Section 5.3 |
| S4.B | Explain the previous year's CSO reduction accomplishments | Section 4 |
| S4.B | List the CSO reduction projects planned for the next year | Table 4-1, Section 4 |
| S4.B | Document compliance with the Nine Minimum Controls | Section 3.1 |
| S4.B | Include a summary of the number and volume of untreated discharge events per outfall | Table 5-6 |
| S4.B | Determine and list which outfalls are controlled (no more than one overflow per year on average), using up to 20 years of past and present data, modeling, and/or other reasonable methods | Table 5-8 |
| S4.B | Summarize all event-based reporting for all CSO discharges for the year | Tables 5-4, 5-6, 5-7 |
| **Consent Decree** | | |
| V.C.26 | Report the metrics regarding sewer overflow (SSO) performance included in Appendix D, Paragraph E (1-7):<br>SSO performance;<br>Number of miles of sewer that were cleaned, inspected, and repaired/replaced/rehabilitated;<br>Number of pump station inspections and the capacity of each pump station;<br>Number of maintenance holes and force mains inspected and repaired/replaced/rehabilitated;<br>Number and type of CSO regulators inspected;<br>Summaries of inspections and cleanings of each CSO control structure; and<br>Summaries of Fats Oil and Grease (FOG) inspections and enforcement actions taken the preceding year. | <br><br>a. Tables 3-3, 3-4, A-1<br>b. Table 3-1<br>c. Tables 3-1, A-2, A-3<br>d. Table 3-1<br>e. Table 3-1<br>f. Section 3-1<br>g. Section 3.3 |
| V.D.28 | Submit summaries of FOG inspections and enforcement actions taken during the previous year. | Section 3.3 |
| VII.43.a.i | Describe the status of any work plan or report development | Section 2 |

**Table 1-1. 2016 Annual Reporting Requirements**

| | | |
|---|---|---|
| VII.43.a.ii | Describe the status of any design and construction activities | Section 4 |
| VII.43.a.iii | Describe the status of all Consent Decree compliance measures and specific reporting requirements for each program plan, including:<br>The CSO control measures for the Early Action CSO Control Program (Henderson Basins 44, 45, 46, and 47/171);<br>The Long-Term Control Plan;<br>The Post-Construction Monitoring Program Plan;<br>The CMOM Performance Program Plan;<br>The FOG Control Program Plan; and<br>The Joint Operations and System Optimization Plan between the City of Seattle and King County | a. Sections 4.5 and 4.6<br>b. No changes<br>c. Section 5.4<br>d. Sections 2.2, 3.2<br>e. Section 3.3<br>f. Section 2.1 |
| VII.43.a.iv | Provide the project costs incurred during the reporting period | Table 4-1 |
| VII.43.a.v | Describe any problems anticipated or encountered, along with the proposed or implemented solutions | Sections 4.3, 4.4, 4.6.1, and 4.8 |
| VII.43.a.vi | Describe the status of any wastewater collection system permit applications | Section 1.2 |
| VII.43.a.vii | Describe any wastewater collection system reports submitted to state or local agencies | Section 1.5 |
| VII.43.a.viii | Describe any anticipated or ongoing collection system O&M activities | Section 3 |
| VII.43.a.ix | Describe any remedial activities that will be performed in the upcoming year to comply with the Consent Decree | Sections 4.3, 4.4, 4.6.1, and 4.8 |
| VII.43.b | Describe any non-compliance with the requirements of the Consent Decree and include an explanation of the likely cause, the duration of the violation, and any remedial steps taken (or to be taken) to prevent or minimize the violation | NA |
| Appendix D, Paragraph E | Include the listed CMOM performance metrics. | Tables 3-1, 3-3, 3-4, A-1, A-2, and A-3, and Sections 3.1 and 3.3 |

**SECTION 2**

# Planning Activities

In 2016, SPU continued planning efforts to help ensure SPU meets Clean Water Act, NPDES permit, and consent decree requirements in a way that is cost-effective and provides the most value to our customers. Section 2 describes progress made in 2016 as well as forecasted 2017 work on each of the following plans:

- Joint City of Seattle/King County Operations and System Optimization Plan, and
- Capacity, Management, Operations & Maintenance (CMOM) Performance Program Plan

## 2.1 Joint City of Seattle/King County Operations and System Optimization Plan

The City of Seattle's and King County's consent decrees direct both agencies to work together to develop a single Joint Operations and System Optimization Plan (Joint Plan). Staff from King County's Department of Natural Resources and Parks (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 Directors of SPU's Drainage and Wastewater Line of Business and DNRP's Wastewater Treatment Division and were included in the Joint Plan, submitted to EPA and Ecology on February 10, 2016. Comments were received from EPA and Ecology and a revised plan will be submitted in March 2017. The following describe each commitment and the progress SPU and DRNP made in 2016:

- 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. SPU and DNRP conducted a post storm debrief meeting in February, 2016 to review the operation of each agency's system during two major storm events occurring in November and December of 2015. A meeting was held in October to discuss maintenance activities, system changes, meteorological information, and inter-agency communications to be better coordinated for the 2016/2017 wet season.
- 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 three meetings during which SPU and DNRP staff shared information on the operation of existing facilities, progress of capital projects, and coordination of Joint Plan commitments and conducted tours of both SPU and DNRP facilities.

- The SPU and DNRP data sharing committee developed standard operating procedures for sharing information. The first 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. SPU and DNRP are committed to allowing the pilot project to continue for three more years to test the protocols and improve data communications and quality, while the agencies work on a permanent solution. In August, both agencies signed a Memorandum of Agreement to conduct options analysis on an expanded platform for a permanent joint operational real-time data sharing. This analysis was initiated with a project kick-off in November. When complete, the expanded platform will replace the pilot project.
- Improved Rainfall Data for Forecasting with additional gauges. DNRP and SPU met with the Regional Modeling Consortium to discuss upgrades to the regional weather forecasting model. In addition, SPU and DNRP are working together on analyzing climate change models to better understand future impacts of intense rainfall on the wastewater systems. Part of the work with the University of Washington Climate Impacts Group is funded by a grant from the Department of Ecology.
- SPU and DNRP exchanged internal operational weather forecasts, rain gage data, and impacts information for the past few years. Staff shared post-storm analyses that led to the identification of thresholds, which are currently being incorporated into weather modeling and forecasting. Through SPU's membership in the Northwest Regional Modeling Consortium, SPU and DNRP are co-developing forecast alerts that will enable advance operational adjustments to mitigate CSO and flooding event.

- The Joint Modeling Coordination Committee commitment is to share tools and modeled information to improve operational strategies. Members of the Joint Modeling Coordination Committee held several meetings in 2016 to review modeling results and coordinate model developments between each agency. A major work activity in progress is the development of a MIKE URBAN model of the North Interceptor system that combined elements of SPU's system with DNRP's regional system.
- The Coordination during Startup and Commissioning of CSO Control Facilities commitment is to conduct document review, attend commissioning meetings, and implement data sharing for during SPU and DNRP CSO control facilities. In 2016, DNRP reviewed the construction plans for the Leschi Phase 2 improvements and North Union Bay retrofit. SPU also hosted facility tours for DNRP staff.

- The Real Time CSO Notification commitment is to improve both onsite (signs) and website information to improve customer communication. In 2016, SPU and DNRP updated the CSO notification website with more dynamic interface. CSO overflow data is now updated on an hourly basis.
- The Reduce Saltwater Intrusion commitment is continuing to work together on studies, data and solutions for reducing intrusion. In 2016, DNRP measured saltwater in their system during King tide events and is currently evaluating that data. The results will be shared between agencies upon completion.

## 2.2 CMOM Performance Program Plan

Capacity, Management, Operations, and Maintenance (CMOM) programs are intended to help municipalities identify and implement activities needed to:

- Better manage, operate, and maintain collection systems;
- Reduce the number and volume of sewer overflow events; and
- Prevent dry weather overflow (DWO) events.

The goal of CMOM planning is to identify current performance gaps, select performance goals, and design activities to meet the goals. Data is gathered and analyzed to determine how well each activity is meeting the performance goals, and whether overall system efficiency has improved. Activities are adjusted as needed to better meet the performance goals.

In 2012, SPU developed a CMOM Performance Program Plan (Plan) that included groups of activities with a common focus for improving operation and maintenance of the wastewater collection system (the CMOM Roadmap). The Plan also set a sewer overflow performance threshold (the SSO Performance Threshold) and identified appropriate performance-based follow-up activities if the threshold is exceeded. The Plan was submitted to EPA and Ecology on December 31, 2012. After the Consent Decree was filed in U.S. District Court, the Plan was conditionally approved by EPA on September 5, 2013, approved by Ecology on September 9, 2013, resubmitted with the revisions requested by EPA on October 8, 2013, and approved by EPA on January 10, 2014.

SPU continues to report all sewer overflows and assess SSO Performance annually (see Section 3.2.6 of this report). To ensure that the CMOM Program focuses on activities that provide the greatest opportunity for sewer overflow prevention, sewer overflows caused by others (Other Agency Construction, Private Construction, Capacity – King County, Vandalism, and Extreme Weather Events) are not included in the SSO Performance calculation.

In addition, SPU reviews the CMOM Performance Plan annually and adjusts its sewer overflow prevention activities based on SSO performance. After completing the activities in the first

CMOM Roadmap, SPU conducted a progress review and self-assessment, the results of which were used to identify the following areas of focus for 2016-2020:

- Sewer cleaning;
- Sewer condition assessment;
- Sewer repair, rehabilitation, and renewal; and
- Sewer capacity planning.

**SECTION 3**

# Operation & Maintenance Activities

This section describes the operation and maintenance (O&M) activities SPU undertakes to reduce the number and volume of sewer overflows, dry weather overflows (DWOs), and combined system overflows (CSOs).

## 3.1 Nine Minimum Control Activities

The Federal CSO Control Policy requires municipalities with combined sewer systems to implement nine measures that help reduce the number and volume of sewage overflows without extensive engineering studies or significant construction costs. The following paragraphs describe the work that was performed in 2016 on each of these nine control measures.

### 3.1.1 Control 1: Provide System Operations & Maintenance (O&M)

*Reduce the magnitude, frequency, and duration of CSOs through proper operation and maintenance (O&M) of the combined sewer system.*

Each year SPU performs extensive system O&M activities to reduce the frequency and volume of preventable overflows. Routine maintenance activities include sewer inspections, cleaning, and non-emergency point repairs; catch basin inspection, cleaning, and repairs; control structure and storage structure cleaning; valve and flap gate inspection, cleaning, lubricating, and servicing; and pump station electrical, mechanical, and facilities inspection and servicing.

SPU uses the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment and Certification Program (PACP) defect coding system to identify and prioritize pipes to be scheduled for maintenance or rehabilitation. Once a sewer has been identified as having a maintenance-related problem, the sewer is placed on a routine cleaning schedule to prevent future overflows. The initial cleaning frequency is based on the cause of the initial overflow, and the cleaning frequency is increased or decreased over time as appropriate. Corrective activities include:

- Jetting, for light to medium debris;
- Hydrocutting, for roots and/or grease;
- Rodding, for pipes with an active blockage; and
- Chemical root treatment, when roots are present and no grease.

SPU's preventive sewer maintenance frequencies range from once a month to once every six years. The challenge for sewer utilities is to clean sewers as frequently as necessary to maintain system capacity but no more than necessary, as cleaning sewers shortens the sewer's functional life span.

SPU inspects each of its 85 CSO control structures one to four times per year. During these inspections, crews make observations about flow, water level, sediment, debris, signs of infiltration, whether the structure is operating as intended and structural integrity. Those observations lead to recommendations for cleaning, repair, and rehabilitation. The crews also perform any needed cleaning and make any necessary repairs.  The 2016 inspections showed that the structures were generally in good working condition and did not require any extensive repair.

Pump station electrical and mechanical components are replaced as necessary during pump station maintenance. Since 2008 SPU has used Reliability Centered Maintenance (RCM) at its wastewater pump stations. The objective of RCM is to ensure the right maintenance is performed at the right intervals, which in turn optimizes life cycle costs while increasing system reliability. In addition, RCM ensures the right data is collected and evaluated, adding discipline to decision-making around operations, spare parts inventory, maintenance strategies, and data collection. SPU continues to use and adjust its RCM-based strategies.

SPU's 2016 O&M accomplishments are summarized in Table 3-1.

### 3.1.2 Control 2: Maximize Storage of Flows

*Maximize the use of the collection system for wastewater storage, in order to reduce the magnitude, frequency, and duration of CSOs.*

SPU maximizes storage in its collection system through a multi-faceted approach that includes:

- Regular collection system maintenance, so that existing capacity is available during storm events;
- Modification of storage facilities whose existing capacity is not fully utilized;
- Increasing the height of overflow weirs, when doing so increases collection system storage capacity without creating backups; and
- Eliminating excessive inflow and infiltration.

In 2016, SPU continued to design and construct system sewer system improvements to better utilize existing sewer system capacity.  Work on these improvements is described in Section 4.1 of this report.  SPU is also working to optimize the operation of recently constructed storage facilities, as described in Sections 4.3 and 4.6.1.

| Table 3-1. 2016 O&M Accomplishments | |
|---|---|
| **Activity** | **Quantity** |
| Miles of mainline pipe cleaned | 569 |
| Miles of mainline pipe inspected via CCTV | 208 |
| Miles of mainline pipe repaired/replaced/rehabilitated | 2.7 |
| Number of pump station inspections [1] | 1,879 |
| Number of maintenance holes inspected | 477 |
| Number of force mains inspected | 63 |
| Number of force mains repaired/replaced/rehabilitated | 2 |
| Number of CSO structure inspections | 269 |
| Number of CSO structure cleanings | 109 |
| Number of CSO HydroBrake inspections | 231 |
| Number of CSO HydroBrake cleanings | 34 |
| Linear feet of pipe receiving chemical treatment to inhibit root growth | 88,136 |
| Number of catch basins inspected | 13,877 |
| Number of catch basins cleaned | 2,327 |
| Number of catch basins repaired | 11 |
| Number of catch basins replaced | 0 |
| Number of catch basin traps replaced | 171 |

*1. See Tables A-2 and A-3 for pump station capacity and inspection details.*

### 3.1.3 Control 3: Control Nondomestic Sources

*Implement selected CSO controls to minimize CSO impacts resulting from nondomestic discharges.*

Two important programs are implemented to help control nondomestic discharges into the Seattle sewer system: the FOG Control Program and the Industrial Pretreatment Program.

SPU administers the City's FOG Control Program, enforcing Seattle Municipal Code requirements to pretreat FOG-laden wastewater before it is discharged to the sewer system. FOG has a deleterious effect on the sewer system as it combines with calcium and grease in wastewater to form hardened calcium deposits that adhere to the inside of sewers, decreasing their capacity. Examples of FOG Program educational materials are shown in Figure 3-1. FOG Control inspection and enforcement activities conducted in 2016 are summarized in Section 3.3.

The industrial Pretreatment Program is administered by King County DNRP. DNRP issues industrial waste pretreatment permits that include appropriate discharge limits. DNRP also provides regular site inspections and periodic permit reviews. SPU and DNRP work together if permittees are found to have a negative impact on the sewer system.

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**Figure 3-1. FOG Control Program Educational Materials**

### 3.1.4 Control 4: Deliver Flows to the Treatment Plant

*Operate the collection system to maximize flows to the treatment plant, within the treatment plant's capacity.*

SPU maximizes flow to the treatment plant by implementing the measures described in Controls 1 and 2 and by providing ongoing system performance monitoring and analysis.

In 2010, SPU integrated its former water and wastewater control centers into a single Control Center. The Control Center is staffed 24 hours a day and receives real-time Supervisory Control & Data Acquisition (SCADA) information. Initially, the Control Center received SCADA information only from SPU's 68 wastewater pump stations. Control Center staff respond to any alarms at the pump stations that indicate a drop in performance or other problem. In addition, SPU monitors pump station, overflow structure, and outfall flow data as it is collected and uses the data to detect maintenance issues that may be affecting system performance.

In 2011, monitoring and controls for SPU's first sewer system facility with active controls and SCADA connectivity also were brought into the Control Center. In 2012, a second control project (a motor-operated gate valve in the Windermere Area [Basin 13]) was completed and brought into the Control Center for full operation.

In November 2014, SPU started the on-boarding process for several additional CSO control projects. On-boarding brings new facilities into the SPU SCADA system and into the Control Center for remote monitoring and operation. Temporary flow monitoring was installed to understand the new facility performance and to inform operational changes during facility start-up. In 2015, SPU completed on-boarding two storage projects located within the Windermere and Genesee areas, conveyance facilities and a pump station rehabilitation project in the South Henderson Area, and sewer system improvements in the Delridge area. As of the end of 2016 the CSO control facilities in the Windermere Basin are not meeting expectations, and SPU has begun evaluating operational optimization opportunities to optimize storage in the basin and delivery of flows to the treatment plant (see Section 4.3). SPU is continuing to collect data in the Genesee and Delridge basins to complete the stabilization process (see Sections 4.4 and 4.1.2). The additional data will be used to determine compliance of these basins.

Several CSO control facilities entered a stabilization period in 2016: an upgraded pump station in Fauntleroy (Pump Station 70 in Basin 94), a storage facility improvement in the North Union Bay area (Basin 18), and sewer system improvements in the Leschi area (Basins 26-36). Stabilization includes monitoring and analysis to ensure a facility is functioning as intended. Stabilization of these facilities is expected to be complete in 2017.

Two additional CSO control facilities will be completed and brought into the Control Center in 2017: a rehabilitated pump station in Madison Park (Pump Station 50 in Basin 22) and a combined sewage storage facility in Henderson North (Basin 44). Additional temporary flow monitoring will be installed in 2017 to understand the performance of these new facilities and to inform operational changes during facility start-up.

### 3.1.5 Control 5: Prevent Dry Weather Overflows

*Prevent dry weather overflows; they are not authorized. Report any dry weather overflows within 24 hours and take prompt corrective action.*

SPU experienced two DWOs in 2016. The first DWO began on April 8 at Outfall 29, in the Leschi area. It occurred when an SPU sewer lining contractor installed a smaller pump and bypass system than SPU had approved and did not adequately monitor flow conditions. The DWO lasted 6 minutes and a total of 336 gallons overflowed. SPU notified Public Health and the State Department of Public Health Shellfish Program. Public Health did not require SPU to post signs due to the low risk of public contact at the Outfall 29 location.

The second DWO occurred on May 21 and 22 as Outfall 68, near Pier 91. The overflow started shortly after a period of rain, so SPU's flow monitoring contractor initially thought it was a CSO. After the rain ended, the contractor determined the overflow was a DWO and reported it to SPU. SPU field crews set up a pump and bypass system and reported the event to Ecology, Public Health, the Department of Health Shellfish Program, and the Seattle Parks Duty Officer. SPU posted beach closure notices along the Elliott Bay shoreline between the Pier 91 access road and Smith Cove area and collected daily water quality samples from May 23 to 26. Although there are no swimming beaches in this area, SPU posted the shoreline until bacteria levels were within Ecology's BEACH Program saltwater recreational swimming standards.

The overflow was caused by an obstruction in the HydroBrake that regulates flows from Sub-Basin 68A.  On May 23, SPU field crews followed confined space entry procedures to remove the obstruction and restore normal operations. The overflow lasted 22 hours and 12 minutes and approximately 113,013 gallons of wastewater was discharged to Elliott Bay. To prevent recurrence, SPU is reviewing the protocols for HydroBrake inspection and cleaning.

SPU also experienced six exacerbated CSOs in 2016.  The first of these occurred January 21 at Outfall 22 in Madison Park (1,002 gallons) due to underperforming air lift pumps at Wastewater Pump Station 50.  SPU constructed a pump station rehabilitation project that replaced the air lift pumps with more reliable submersible pumps.  Construction was completed in December 2016.

The second exacerbated CSO occurred on March 1 at Outfall 18 (273,721 gallons) in North Union Bay.  The exacerbated CSO occurred during startup and commissioning of an operable gate valve.  SPU determined that the level control needed to be recalibrated, so that the actual level would match the programmed level.  The problem was corrected by SPU staff on March 4.

Three exacerbated CSOs occurred at Outfall 43 in the Genesee area on October 13, 20, and 26 (1,122,472 gallons total), when roots and debris in the downstream Lake Line reduced storage capacity in the sewer system.  Lake Line cleaning was completed on December 1, 2016.

One exacerbated CSO occurred at Outfall 169 in Delridge on October 14 (664,680 gallons), when debris and sediment entered the storage tank diversion structure, causing premature utilization of the storage tank and clogging the tank drain valve.  The debris and sediment were subsequently removed.

To help prevent DWOs and exacerbated CSOs, each combined sewer system overflow location is configured with an alarm that is triggered if there are likely overflow conditions.  The alarms alert analysts and/or field crews to assess the situation and take corrective action if possible.  In addition, whenever SPU experiences a DWO or exacerbated CSO, SPU investigates to identify the cause and takes action to reduce the possibility of recurrence.

A summary of the DWOs and exacerbated CSOs from 2007-2016 is included in Table 3-2.

**Table 3-2. Dry Weather Overflows (DWOs) and Combined Sewer Overflows (CSOs) Exacerbated by System Maintenance Issues 2007 – 2016**

| Year | DWOs | | CSOs Exacerbated by System Maintenance Issues[1] | |
|---|---|---|---|---|
| | No. of Overflows | Volume (gallons) | No. of Overflows | Volume (gallons) |
| 2007 | 7 | 499,264 | -- | -- |
| 2008 | 1 | 148,282 | 8 | 470,444 |
| 2009 | 1 | 3,509 | 3 | 156,153 |
| 2010 | 0 | 0 | 13 | 12,320,400 |
| 2011 | 0 | 0 | 10 | 2,317,068 |
| 2012 | 0 | 0 | 11 | 5,846,647 |
| 2013 | 3[2] | 123,670 | 5 | 12,894 |
| 2014 | 1 | 4,767 | 16 | 9,349,549 |
| 2015 | 3[3] | 77,598 | 3 | 10,825 |
| 2016 | 2 | 113,349 | 6 | 2,061,875 |

*[1] CSOs exacerbated by system maintenance issues were not reported prior to 2008. The 'exacerbated CSOs' listed in this table are listed as CSO discharges in Table 5-4 and are included in the discharges summarized in Tables 5-5, 5-6, 5-7, and 5-8.*

*[2] None of these DWOs were caused by SPU or any other City entity.*

*[3] One of these DWOs was caused by a non-City entity.*

### 3.1.6 Control 6: Control Solids and Floatable Materials

*Implement measures to control solid and floatable materials in CSOs.*

SPU implements several measures to control floatables:

Catch basins are designed to prevent floatables from entering the system. Specifically, SPU's catch basins are designed to overflow only when the water level in the catch basin is well above the overflow pipe opening. Because floatables remain on the water surface, they are trapped in the catch basins. Catch basins are inspected and cleaned regularly to remove debris and potential floatables. Catch basin inspection, cleaning, and rehabilitation metrics are included in Table 3-1.

SPU continued its Make It a Straight Flush pilot outreach campaign to educate customers that only toilet paper and human waste should be flushed down the toilet. This campaign focuses on areas where SPU's crews perform extra maintenance because of flushed trash.

In addition, the City of Seattle runs several solid waste and city cleanup programs to prevent and reduce the amount of street litter, including:

- Street sweeping, including increased efforts for Fall leaf pickup,
- Spring clean,
- Storm drain stenciling,
- Event recycling,
- Public litter and recycling cans,
- Waste free holidays,
- Product bans, and
- Illegal dumping investigation and response.


**Figure 3-2. Make It a Straight Flush Campaign Poster**

### 3.1.7 Control 7: Prevent Pollution

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

SPU conducts multiple pollution prevention programs to keep contaminants from entering the sewer system and subsequently being discharged in sewage overflows. Pollution prevention programs performed by SPU in 2016 include:

- Public education programs,
- Solid waste collection and recycling,
- Product ban/substitution,
- Control of product use such as cleaning and yard care recommendations,
- Illegal dumping response,
- Bulk refuse disposal,
- Hazardous waste collection,
- Commercial/industrial pollution prevention,

- Spill response,
- Business inspections, and
- Water quality complaint response.

The City of Seattle Department of Transportation (SDOT) performs street sweeping, including street sweeping downtown streets every night and cleaning alleys three nights per week. In 2016, SDOT street sweeping crews swept 10,250 miles in the combined sewer system area, removing approximately 1,686 short wet tons of dirt and debris from City streets.

The City of Seattle has made it easier for anyone to report illegal dumping among other issues via the Find It, Fix it app available for Android and Apple mobile phones. In 2016 SPU received 13,500 illegal dumping complaints from customers. More than 519,000 pounds of debris was removed from Seattle's public property. 75 percent of complaints were removed in 10 days or less. Thanks to new ways of using technology, customer engagement, and process improvements SPU reduced the average time for removing illegal dumping from 21 days in 2015 to under 10 days in 2016.

SPU also supports public education programs on pollution prevention, such as:

- Spring Clean,
- Green Cleaning,
- Adopt-a-Street,
- Adopt-a-Drain,
- Storm Drain Stenciling,
- Surface Water Pollution Report Line,
- Pet Waste Disposal,
- Natural Yard Care,
- Car tips (to decrease automobile leaks),
- Event recycling, and
- Reduce, Reuse, and Recycle tips.

SPU also has reduced the potential for pollution by reducing the volume of sewage entering the sewer system. For years, SPU has been a leader in potable water conservation through the Saving Water Partnership. As a result of these efforts, the regional water system annual demand has decreased while the population has increased. The total Seattle regional water system demand has dropped from a base (winter) flow of approximately 150 MGD in the late 1980s to a current base flow of 100 MGD, thus reducing the capacity demands on the regional sewer system by approximately 50 MGD.

SPU and King County DNRP are both utilizing green stormwater infrastructure (GSI) to reduce the volume of stormwater entering the combined sewer system. SPU encourages installation of rain gardens and cisterns on private properties and is installing roadside rain gardens in street rights-of-way. Please see Section 4.2 for more information on these GSI programs.

Finally, if sewage contamination of surface waters occurs due to side sewer breaks or illicit connections or discharges, SPU uses regulatory tools such as Notices of Violation and associated penalties to help remedy the problem in a timely manner.

### 3.1.8 Control 8: Notify the Public

*Implement a public notification process to inform the citizens of when and where CSOs occur.*


SPU, together with Public Health - Seattle & King County, maintains a sewage overflow notification and posting program for Seattle's CSO outfalls. Signs at each outfall identify the outfall and warn of possible sewage overflows. The signs include the phone number for the CSO Hotline, staffed and managed by Public Health. Public Health also provides a website with detailed information about CSOs, potential public health hazards, and precautions the public may take to protect themselves. If sewage overflows occur due to side sewer breaks or illicit connections or discharges, SPU posts additional warning signs at impacted waterways until the problem is resolved.

**Figure 3-3. Example of Outfall Signage**

In addition, King County DNRP has hosted an overflow website since December 2007, providing a map of recent and current DNRP CSO overflows. In 2009, SPU and DNRP worked together to incorporate City of Seattle information on the DNRP website. In 2015, SPU and DNRP worked together as part of their Joint Operations and System Optimization Plan activities to make the map more user-friendly and interactive and to increase the map information refresh rate. Now the community is able to access near real-time information to assist them in making choices about use of local waters. The screen shots that comprise Figure 3-4 show the simplified website language and the zoomable map the public sees when they access the website.

In 2017 SPU and DNRP will start working on updating the CSO outfall signs with more languages and a link to the CSO overflow website.

Home » Services » Environment » Wastewater services » Combined sewer overflow status

# Combined sewer overflow status

Check the map below to see if a combined sewer overflow, or CSO, is occurring before going swimming, wading, fishing, or boating near a CSO warning sign. These overflows take place within the City of Seattle.

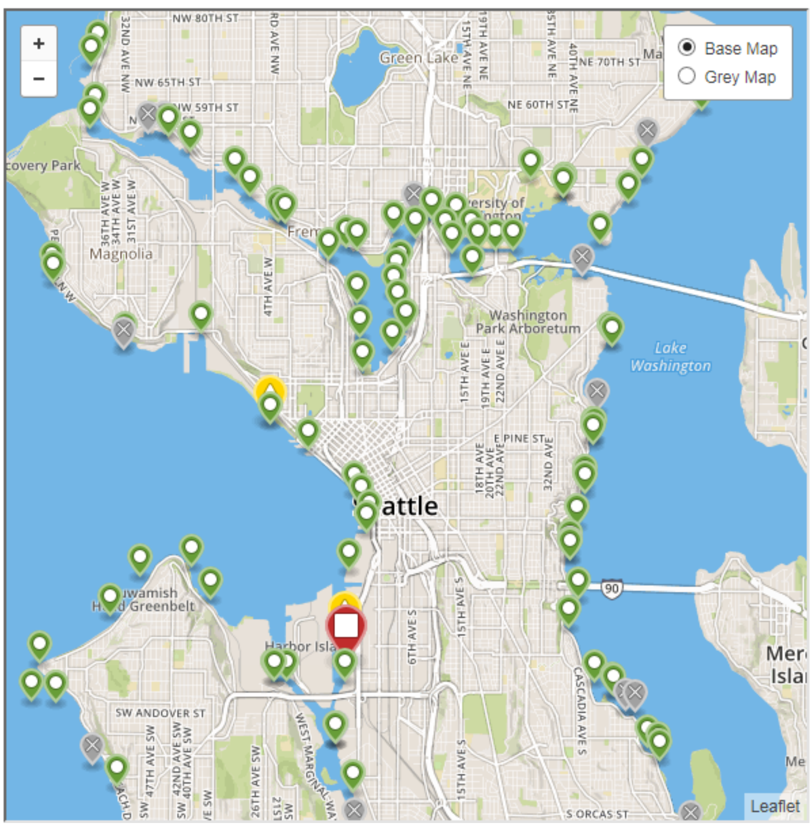
**Warning**

Stay out of the water for 48 hours after a combined sewer overflow; contact with polluted water can make you sick.

Learn more
Más información
進一步瞭解
Hãy tìm hiểu thêm


Example of a posted warning sign

Click on each CSO outfall symbol to learn more. Click on the [+] or [-] symbols to zoom in or out.




## Legend

- Overflowing now
- Overflowed in the last 48 hrs
- No recent overflow
- Data not available

**Health Questions?**

Public Health Seattle & King County answers questions about CSOs

206-205-1151

Frequently asked questions about public health and CSOs

**Figure 3-4. DNRP/SPU Real-Time Overflow Website Screen Shots**

### 3.1.9 Control 9: Monitor CSOs

*Monitor CSO outfalls to characterize CSOs and the effectiveness of CSO controls.*

SPU monitors each of its CSO outfalls to detect sewage overflows. SPU also tracks the performance of its flow monitors to ensure consistent, high quality measurements. The flow, precipitation, and flow monitor performance monitoring programs and results are summarized in Section 5 of this report.

## 3.2 CMOM Performance Program Activities

The CMOM Performance Program Plan included a 2011-2016 CMOM Roadmap and an SSO Performance Threshold. The CMOM Roadmap committed SPU to completing performance, productivity, and efficiency initiatives in each of the following program areas:

- Planning and scheduling;
- Sewer cleaning;
- FOG control;
- Repair, rehabilitation, and replacement;
- Condition assessment; and
- SSO response.

These initiatives have been completed as of 2016 and a summary of the work is included in Sections 3.2.1 through 3.2.5 and Section 3.3 (FOG control). Beginning in 2017, SPU will report on activities from the updated 2016-2020 CMOM Roadmap in the following program areas:

- Sewer cleaning;
- Sewer condition assessment;
- Sewer repair, rehabilitation, and renewal; and
- Sewer capacity planning.

### 3.2.1 Planning and Scheduling Initiatives

The purpose of the planning and scheduling initiatives was to improve the quality and efficiency of maintenance tasks by standardizing the approach, business rules, and system requirements needed to perform each type of task (for example, sewer cleaning, catch basin pumping, CCTV inspections); centralizing the planning of tasks; and using software to support work order life cycles management. Work completed to date includes:

- Risk Based Scheduling - SPU implemented risk based scheduling of sewer cleaning in 2012, refined the scheduling in 2013, and trained additional staff in 2013 and 2014. In Fall 2014, SPU began developing a similar approach for scheduling sewer CCTV work, which was implemented in 2015. In 2016, SPU began incorporating risk-based scheduling into new comprehensive strategies for sewer cleaning and condition assessment. These strategies are discussed further in sections 3.2.2 and 3.2.4.

### 3.2.2 Sewer Cleaning Initiatives

The purpose of the sewer cleaning initiatives is to improve the quality and efficiency of sewer cleaning by standardizing the procedures, providing ongoing crew training, measuring and tracking the quality of cleaning efforts, providing feedback to the crews, and using technology to help identify where changes in cleaning frequency should be considered. Work completed in 2016 and planned for 2017 includes:

- Increased Sewer Cleaning – In 2016 SPU increased sewer system cleaning, prioritizing areas with a history of root intrusion. SPU plans to continue the increased sewer cleaning activities into 2017.
- Chemical Root Control – In 2016, SPU increased application of chemical root control agents in areas with known root intrusion issues. The same investment in chemical root control measures is planned for 2017.
- Sewer Cleaning Strategy – In 2016, SPU began developing a comprehensive wastewater collection system Cleaning Strategy that documents the goals, approach, processes, and measurements of success for SPU’s system maintenance activities. Strategy development is expected to be completed in 2017 with implementation of the strategy occurring in 2018.
- Sewer Cleaning Optimization Tool Enhancement - The effectiveness of COTools was evaluated in 2016 and several data integrity issues were identified. The necessity of COTools is being determined in 2017 during development of the new Cleaning Strategy.
- Sewer Cleaning Crew Training – SPU committed to performing a minimum of two training sessions annually from 2013-2016. In 2013, SPU provided two, three-week training sessions and one, two-week training session on mainline cleaning. Two, three-week training sessions and one, one-week training session were conducted in 2014. The 2014 training sessions emphasized use of new jet nozzle technology and effective capture of debris while jetting. Two trainings were conducted in 2015 and 2016 and used a combination of classroom and field training.

### 3.2.3 Repair, Rehabilitation, and Replacement Initiatives

The purpose of the repair, rehabilitation, and replacement (also known collectively as “renewal”) initiatives is to prioritize and complete sewer renewal in a timely, efficient, and cost-effective manner. Work completed in 2016 and planned for 2017 includes:

- Increased Budget for Renewal Projects – Beginning in 2016, SPU increased spending on sewer collection system renewal projects. The need for increased spending was identified in response to a rising trend in SSOs due to the structural integrity and capacity of the collection system. Increased investment levels are planned to continue through 2018.
- Renewal Strategy – In 2016, SPU began developing a comprehensive wastewater collection system Renewal Strategy that documents SPU's priorities, our approach to making system renewal investments, and process improvements to improve efficiency. Strategy development is expected to be completed late 2017 with implementation of the strategy occurring in 2018.

### 3.2.4 Condition Assessment Initiatives

The purpose of the condition assessment initiatives is to reduce risk of sewer overflows through greater understanding of the wastewater collection system condition, leading to more efficient and effective decisions about the maintenance and renewal of its components. Work completed in 2016 and planned for 2017 includes:

- Increased Condition Assessment via CCTV – SPU increased wastewater collection system condition assessment via CCTV in 2016, prioritizing areas with a higher risk of failure (based on likelihood and consequence of failure) and where no CCTV data exists. SPU plans to continue increased condition assessment activities in 2017.
- Condition Assessment Strategy – In 2016, SPU began developing a comprehensive wastewater collection system Condition Assessment Strategy that documents the goals, approach, processes, and measurements of success for SPU's condition assessment activities. Strategy development is expected to be completed by mid-2017 with implementation of the strategy occurring in 2018.

### 3.2.5 SSO Response Initiatives

The purpose of the SSO response initiatives was to minimize the duration and effects of SSOs by standardizing response procedures, providing training, and ensuring the crews use the most appropriate and best available tools to contain and cleanup SSOs. Work completed to date includes:

- SSO Response, Investigation and Reporting – Since 2014, SPU has updated Sewer Overflow (SSO) Response Standard Operating Procedures and SSO Response Tools and Equipment Usage Plans, as well as trained staff on those plans and procedures. In 2016, SPU developed a new SSO Tracking software application to improve SSO investigation and reporting. SPU also modified the SSO investigation and reporting process to reflect new NPDES permit requirements.

### 3.2.6 SSO Performance

There were 48 sewer overflows in 2016, and they are summarized by cause in Table 3-3. Factors causing the greatest number of sewer overflows were roots in the sewer, which led to 8 sewer overflows, and structural failures, which caused 12 sewer overflows. Substantial reductions from 2015 numbers were seen in SSOs caused by capacity and extreme weather events.

**Table 3-3. 2016 Sewer Overflows by Category**

| Category | Primary Cause of Sewer Overflows | Number of 2016 Sewer Overflows |
|---|---|---|
| 1 | Roots | 8 |
| 2 | FOG | 3 |
| 3 | Debris | 4 |
| 4 | Structural Failure – Gravity | 12 |
| 5 | Structural Failure – Force Main | 3 |
| 6 | Capacity - Gravity | 1 |
| 7 | Pump Station – Mechanical | 1 |
| 8 | Pump Station - Capacity | 0 |
| 9 | Power Outage | 0 |
| 10 | Operator Error | 0 |
| 11 | Maintenance Error | 1 |
| 12 | Pressure Release | 2 |
| 13 | City Construction | 1 |
| 14 | New Facility Startup | 0 |
| 15 | Private Side Sewer Issue | 2 |
| 16 | Capacity – King County | 1 |
| 17 | Private Construction | 6 |
| 18 | Other Agency Construction | 3 |
| 19 | Vandalism | 0 |
| 20 | Extreme Weather Event (≥25year) | 0 |
| | Total for Categories 1 – 20 | 48 |
| | Total for Categories 1 – 15 | 38 |

SSO performance for the years 2013 through 2016 is summarized in Table 3-4. SSO performance measures the effectiveness of SPU's CMOM Performance Program Plan and helps ensure SPU is focusing its efforts on activities that help prevent sewer overflows. For these reasons, the SSO performance calculation excludes sewer overflows that are beyond SPU's ability to control, including sewer overflows caused by extreme weather events (for example, rainfall with a recurrence interval of 25 years or more), other agency construction, private construction, King County capacity and vandalism. This table shows that SPU is continuing to operate in the high-performing band of utilities (less than or equal to 4 SSOs per 100 miles per year).

**Table 3-4. 2013-2016 SSO Performance**

| Year | Number of SSOs[1] | SSOs/100 Miles of Sewer[2] | 2-Year Average SSOs/ 100 Miles of Sewer |
|---|---|---|---|
| 2013 | 40 | 2.8 | 3.3 |
| 2014 | 36 | 2.5 | 2.7 |
| 2015 | 72 | 5.1 | 3.8 |
| 2016 | 38 | 2.7 | 3.8 |

1. *Numbers in this column include only the sewer overflows included in the SSO performance calculation and exclude sewer overflows caused by extreme weather events, other agency construction, private construction, King County capacity constraints, and vandalism.*
2. *SPU has 1,422 miles of sewers.*

In order to remain in the high-performing utility band and continue reducing the annual number of SSOs, SPU analyzes each SSO and identifies appropriate follow-up actions, including system modifications and/or increased maintenance where appropriate. SPU also reviews SSO data on an ongoing basis, looking for any patterns or trends that can be addressed through adaptive management of the CMOM Program. Roughly half of the SSOs in 2016 were caused by roots and the structural condition of the pipe, so in 2017 we are continuing to focus on our Chemical Root Control Program and increased investment in our Renewal Program.

## 3.3 FOG Control Program Activities

The purpose of the Fats, Oils, and Grease (FOG) Control Program is to reduce the number of FOG-related SSOs by developing and implementing a FOG Control Plan. FOG Control Plan activities include standardizing procedures, training FOG inspectors, providing outreach and education to FOG-generating dischargers, and utilizing risk-based assessments to help prioritize inspections, FOG-related sewer cleaning, and FOG-related enforcement. Work completed in 2016 and planned for 2017 is described in the following sections.

### 3.3.1 Risk Assessments and Regulatory Compliance Inspections

In 2016, FOG Control Program staff completed 976 FOG discharge risk assessments and regulatory compliance inspections. These inspections include FOG education, data collection, an evaluation of FOG discharge risk, and an assessment of compliance with Seattle Municipal Code. Completed risk assessments allow program staff to assign each FSE an overall priority, which is then used to designate an inspection frequency based on the amount of FOG production and the condition of the collection system. The risk assessment and inspection frequency criteria are displayed in Table 3-5 below.

**Table 3-5. FOG Risk Assessment and Inspection Frequency Criteria**

| Hotspot/Discharge Risk Assessment Matrix | | | | |
|---|---|---|---|---|
| | FOG Discharge Risk | | | |
| Hotspot Risk | High | Medium | Low | Minimal |
| Category 1 | 1 | 2 | 3 | 4 |
| Category 2 | 2 | 3 | 4 | 5 |
| Category 3 | 3 | 4 | 5 | 6 |
| Category 4, 5, 6 | 4 | 5 | 6 | 7 |

| Inspection Frequencies | | |
|---|---|---|
| Map Category | Inspection Frequency Code | Years |
| Priority 1 | Semiannual | 2/year |
| Priority 2 | Annual | 1 year |
| Priority 3 | Annual | 1 year |
| Priority 4 | Biennial | 2 years |
| Priority 5 | Triennial | 3 years |
| Priority 6 | Quadrennial | 4 years |
| Priority 7 | Quinquennial | 5 years |

In accordance with the risk-based strategy in the approved FOG Control Program Plan, all 2016 regulatory compliance inspections were conducted at facilities connected to a sewer mainline assigned a Priority 1 or Priority 2 hotspot designation. These designations are assigned whenever FOG is the primary or secondary cause of a sewer overflow, or when CCTV inspections find excessive FOG accumulation.

2017 efforts will include the following activities:

- Regulatory compliance inspections of Priority 1 and 2 facilities as described in Table 3-5 above.
- Initial risk assessments for facilities connected to Category 3 hotspot mainlines.
- Continued focused enforcement at facilities that discharge to high priority sewer mainlines and that have a high risk for discharging high levels of FOG. This includes working with the 64 FSEs located at the historic Pike Place Market.

### 3.3.2 FOG Outreach

Inspectors also conducted door to door residential outreach in residential areas with Priority 1 and Priority 2 hotspots. In 2016, the team conducted outreach to 1,974 single family dwellings and multi-family properties. Additionally, 6,722 residential FOG fliers were distributed in response to customer service inquiries primarily initiated by multi-family housing property owners and managers.

Specific 2016 commercial and residential outreach activities included the following:

***Commercial***

- Conducted 976 FSE site visits with an outreach component;
- Delivered FOG messaging to 90 FSEs and delivered free spill kits to 85 FSEs, as part of a Seattle Green Business Program multi-faceted conservation, pollution prevention, and recycling campaign;
- Completed a high-level outreach and education project focused on regulatory compliance and kitchen BMPs to 98 non-English speaking businesses in Seattle's International District.
- Maintained and updated a commercial FOG messaging website: http://www.seattle.gov/util/ForBusinesses/DrainageSewerBusinesses/FatsOilsGreaseDisposal/index.htm.

***Residential***

- Distributed education and outreach materials to 1,974 residential units on 235 parcels that discharge to FOG hotspot associated sewer mainlines;
- Attended and distributed FOG control materials at multiple community events including: Trends – Rental Property Management conference and Tradeshow, which was attended by over 1,500 rental property owners and managers; Influence of the Confluence attended by approximately 500 area residents; and the Duwamish River Festival attended by approximately 700 area residents.
- Through our customer service web portal and individual inquires, distributed 6,722 FOG educational brochures;
- As a member of the Seattle Multi-Family Conservation Initiative team, developed a single resource for multi-family property owners and managers to use to obtain information on a wide variety of programs affecting their properties;
- Maintained and updated residential FOG messaging website: http://www.seattle.gov/util/MyServices/DrainageSewer/FatsOilsGrease/index.htm.

All outreach materials were reviewed in 2016 and no modifications were needed.

2017 outreach efforts will include continued expansion of the commercial and residential outreach initiatives.

### 3.3.3 FOG Planning and Program Management

SPU staff review the FOG Control Program Plan each year and update it as appropriate to continue focusing efforts on areas most heavily impacted by FOG discharges. The 2016 annual review did not result in any plan revisions.

The FSE Inventory Management Plan describes SPU's approach for collecting, using, and managing FSE data. As part of its 2016 review, SPU upgraded the FSE database to periodically upload an updated listing of FSEs permitted through Public Health. An ongoing and automated quarterly subscription was initiated with Public Health to ensure FSE information in the FOG database remains current.

In 2017, SPU plans to initiate modification of the existing City Side Sewer Code through the development of a Directors Rule and maintenance reporting program.

SPU reviewed all FOG Standard Operating Procedures (SOPs) in 2016. As a result of this review, the Regulatory Inspection and Linko Database SOPs were updated to reflect minor procedural changes. Additionally, a process was developed to facilitate annual SOP review and assessment by all FOG inspectors. This process was developed with the following goals in mind:

- Ensure field staff are familiar with and are utilizing SOPs;
- Ensure SOPs accurately reflect actual field activity processes;
- Empower and expand the capabilities, ownership and buy-in of field inspectors by providing them with a voice in the program process development.

FOG Inspector training in 2016 included the following:

- In-house FOG inspector training included informal discussions concerning procedural changes brought about by technology improvement projects and program improvements. These sessions occur weekly during FOG Team meetings;
- Monthly online training webinar training sessions were offered by the FOG program software provider, Linko Technologies, and attended by FOG inspectors as appropriate;
- FOG Team members attended two offsite training workshops and interagency collaboration meetings;
- In April, FOG Team members attended at presented at the Western States Alliance FOG Forum Workshop in Bend, Oregon; and
- FOG Team members actively participated in quarterly meetings of the APWA PREFOG Sub-Committee in February, May, August and November.

## 3.4 Annual Review of Operations and Maintenance Manuals

In 2015, SPU submitted O&M manuals to Ecology and EPA for the new operable CSO storage facilities at Windermere and Genesee. In 2016, SPU reviewed and updated the O&M Manuals for Windermere and Genesee. The updates mainly consisted of modifications to control logic made to the facilities operations during the stabilization phase. In 2017, SPU will submit an O&M Manual for Henderson North CSO storage facility.

**SECTION 4**

# Capital Activities

This section describes activities SPU is undertaking to reduce the number and volume of sewage overflows and implement the Plan to Protect Seattle's Waterways. Included is a summary of progress made in 2016 and work that we plan to complete in 2017. During 2016, SPU used the Project Control System (PCS) to proactively monitor and control scope, schedule, and budget on each of its major projects. In addition, SPU applied considerable attention to managing cost and schedule and applying lessons learned across capital projects. 2016 project spending is summarized in Table 4-1.

**Table 4-1. 2016 Plan Development & Implementation Spending**

| Project Name | Amount Spent |
|---|---|
| Delridge Retrofit | $542,361 |
| Leschi Retrofits | $4,123,002 |
| Magnolia Retrofit | $139,031 |
| Montlake Area Retrofits | $264,473 |
| Other Retrofits | $176,441 |
| Ballard Roadside Raingardens | $3,234,242 |
| Delridge Roadside Raingardens | $2,631,981 |
| RainWise | $982,708 |
| Windermere CSO Reduction Project | $280,842 |
| Genesee CSO Reduction Project | $336,284 |
| North Henderson CSO Reduction Project | $18,328,628 |
| 52nd Ave S Conveyance Project | $105,726 |
| Pump Station 9 Rehabilitation Project | $96,802 |
| Pump Station 50 Rehabilitation Project | $1,319,719 |
| South Henderson CSO Reduction Project | $4,788 |
| Central Waterfront CSO Reduction Project | $395,210 |
| Ship Canal Water Quality Project | $9,827,455 |
| NDS Partnering | $718,999 |
| South Park Water Quality Facility | $761,216 |
| Expanded Street Arterial Sweeping | $1,676,171 |
| Total | $45,946,079 |

## 4.1 Sewer System Improvement Projects

SPU made significant progress on a variety of combined sewer system improvement projects in 2016, as summarized in the following paragraphs.

### 4.1.1 North Union Bay (Basin 18)

The North Union Bay Area is located in the University District near the Burke-Gilman Trail. Retrofit work in this area has occurred in two different sub-basins: 18A and 18B. Retrofit work in Sub-Basin18A was completed in 2012 and is performing as intended (see 2014 Annual Report). In Sub-Basin 18B, SPU replaced the HydroBrake with an automated slide gate to restore the original design performance of the system. This is the sewer system improvement project identified in the approved Plan to Protect Seattle's Waterways. Design of the project was completed in early 2015 and construction was completed first quarter 2016. The new slide gate went into operation in the second quarter 2016. Post project performance monitoring data indicate that the gate has operated close to the design intent. One operational set point adjustment was made to adjust the hydraulic behavior for full design conformance. SPU will continue to monitor performance data from this facility in 2017 and make minor set point adjustments if necessary.

### 4.1.2 Delridge (Basins 168, 169)

During 2012, SPU completed a detailed analysis of sewer system improvements in the Delridge Area (Basins 168 and 169). SPU selected improvements that optimize the performance of CSO Storage Facilities 2 and 3 by replacing existing HydroBrakes with improved upstream diversion structures, actively controlled valves, and an upstream and downstream flow monitoring system. These improvements are anticipated to reduce the frequency of surcharging in the downstream sewer system, reduce CSOs at Outfalls 168 and 169, and reduce the need for preventive maintenance and the frequency of unscheduled maintenance in addition to providing long term hydraulic flexibility.

Design was completed in 2014 and construction was completed by November 2015. SPU monitored the performance of the improved facilities in 2016 and made operational adjustments based on performance data to operate the facilities as designed and to adjust for the influences of unforeseen issues such as a hydraulic jump within the sewer system that affects operations. To date, the facilities are operating more closely to design and additional operational improvements have been identified to optimize the system further. In 2017, SPU will continue to optimize operations to utilize the flexibility provided by the diversion structures and automated valves to balance flows across the basin and improve storage utilization through smart flow regimes.

### 4.1.3 Henderson (Basins 47, 49)

The 2010-2015 NPDES permit required that SPU complete construction of sewer system improvements in Basins 47 and 49 by November 30, 2015. SPU completed design and construction of retrofits in Sub-Basin 47C and Basin 49 in in 2013. Both retrofits are discussed in detail in the 2014 Annual Report. Post-project performance monitoring indicates that the Basin 49 Retrofit is performing as intended. The Sub-Basin 47C retrofit needs additional flow monitoring and analysis to determine its effectiveness and to further optimize its performance. More information on Sub-Basin 47C optimization is provided in Section 4.6.1 of this report.

### 4.1.4 Leschi (Basins 26 – 36)

The Leschi Area is in east Seattle bordering Lake Washington and comprises Basins 26 through 36. Over a dozen individual sewer system improvement are being implemented in this area as part of the LTCP planning efforts. The sewer system improvements are being managed as a single project because each basin is connected hydraulically with upstream and downstream basins, and the impact of each individual improvement will need to be considered in the context of other connected basins. The project is divided into two phases: Phase 1, which began construction during 2014 and was completed in the first quarter of 2015, and Phase 2, which was completed in 2016. Phase 1 improvements are discussed in the 2014 Annual Report. Phase 2 improvements included the following:

- Replace approximately 1,500 linear feet of combined sewer,
- Reline approximately 3,000 linear feet of combined sewer,
- Install a low flow diversion structure in Basin 35,
- Seal the overflow structure to CSO Outfall 33 and remove CSO Outfall 33 from CSO service,
- Remove the HydroBrakes in Basins 33 and 29, and
- Remove the HydroBrake in Basin 35 and replace it with an orifice.

Post-project performance monitoring began in 2016. The results will be analyzed in 2017 to determine if any operational adjustments are needed at the pump station, orifices, or automated gates in order to balance flows throughout this interconnected area. Adjustments will be made in 2017 if necessary.

### 4.1.5 Duwamish (Basin 111)

The Duwamish Basin (111) is located in industrial south Seattle in the Duwamish River valley. The sewer system improvement project for this basin consisted of raising the overflow weirs at Overflow Structures 111B and 111C. These improvements were constructed in 2014 and are performing as expected. Post-project performance monitoring will continue into 2017.

### 4.1.6 Madison Park (Basin 22) Pump Station 50 Rehabilitation Project

Basin 22 is located in the Madison Park area. Combined sewage from the basin flows by gravity to Pump Station 50, located at the north end of 39th Avenue East. Pump Station 50 was an airlift-type pump station that in recent years underperformed and had recurring reliability and maintenance issues resulting in SSOs and CSOs. In 2016, the air lift pump station was upgraded to include submersible pumps, new piping, valves, and new electrical and SCADA equipment. The project also included upgrades to the overflow structure and new valve vaults. Construction was completed in December 2016. SPU will monitor the performance of the pump station in 2017 to ensure conformance to design intent.

### 4.1.7 Magnolia (Basin 60) Pump Station 22 Rehabilitation Project

In late 2016, SPU kicked off the design phase of the Magnolia (Basin 60) sewer system improvement. The project will consist of upsizing the pump station in Basin 60 (Pump Station 22) and replacing the associated force main with a larger force main. This will enable SPU to send more flows to King County's Fort Lawton Tunnel, which delivers flows to the West Point Wastewater Treatment Plant. Design of this project is planned for completion in the first quarter of 2018 with construction estimated to be completed by the end of 2018.

### 4.1.8 Montlake Basin 139

In the 2015 Annual Report, SPU indicated that the preferred sewer system improvement for Basin 139 was to upsize the capacity of Pump Station 25 to move more flow to DNRP. In July 2016, SPU increased the pumping capacity of the station by approximately 20 percent by installing new pumps and motors. SPU will continue to monitor the performance of the pump station to refine the remaining control volume estimate ahead of possible partnership with DNRP on a Montlake area CSO storage project.

### 4.1.9 Future Sewer System Improvement Projects

***Portage Bay Basin 138 and Montlake Basins 20 and 140***

Sewer System Improvement options for Portage Bay Basin 138, Montlake Basin 139/140, and Montlake Basin 20 were revisited in 2016 to explore possible efficiencies to be gained from basin-to-basin flow transfers in addition to options that better adhere to asset management principles. SPU has chosen sewer system improvements that will improve the performance of the existing sewer system while allowing for opportunities to partner with DNRP on regional storage. The following subsections describe the previously reported (2015 Annual Report) preferred sewer system improvement as well as the current preferred improvements, and the rationale for the change in direction.

**Montlake Basin 20**: In the 2015 Annual Report, SPU identified a CSO weir height adjustment as the preferred sewer system improvement for this basin. In 2016, SPU conducted an options analysis which recommended the rehabilitation of Wastewater Pump Station (WWPS) 13 and replacement of the force main to DNRP's trunk sewer. The force main is 86 years old and needs to be replaced, so the options analysis recommended an increase in WWPS 13's pumping capacity in tandem with the force main replacement in order to pump more flow out of the basin. The design of this sewer system improvement is anticipated to begin in early 2017.

**Montlake Basin 140**: In the 2015 Annual Report, SPU identified a complete overhaul of WWPS 15 and construction of a new force main from the pump station to DNRP's trunk as the preferred sewer system improvement for this basin. Options analysis concluded that a weir height adjustment in Montlake 140 will better utilize existing offline storage, particularly in high intensity rainfall events. SPU will raise the CSO weir in 2017 and monitor basin performance.

**Portage Bay 138**: The options analysis for Portage Bay 138 identified a gate retrofit as the preferred sewer system improvement. The existing HydroBrake will be replaced by an automated gate to more efficiently utilize existing offline storage and better utilize WWPS 20 peak pumping capacity. Design of this sewer system improvement is anticipated to begin in early 2017.

### *Delridge Basin 99*

SPU conducted an options analysis in this basin in 2016 and concluded that the preferred sewer system improvement is a project to remove the existing HydroBrake and replace it with an automated gate. This approach will allow SPU to remove the leaking flap gate on the existing offline storage tank to more efficiently use that storage during wet weather. Furthermore, this approach will improve debris management with upgraded remote sensing of levels and flowrates, ensuring that SPU achieves the target discharge flowrate out of the basin more consistently. SPU will begin the design phase of this improvement in 2017.

### *East Waterway (Basin 107)*

The East Waterway 107 basin is located in the industrial area of south Seattle near the mouth of the Duwamish River. CSOs at this location are largely driven by flow levels in DNRP's Elliot Bay Interceptor. SPU will conduct an options analysis for this basin in 2017 and engage DNRP in the study to identify a preferred sewer system improvement.

## 4.2 Green Stormwater Infrastructure

The term green stormwater infrastructure (GSI) describes a variety of measures that use soil to absorb stormwater or slow the rate of stormwater entering the sewer system. Green solutions control the sources of pollution by slowing, detaining, or retaining stormwater so that it does not carry runoff into nearby waterways. This reduces the volume and timing of flows into the system. GSI facilities also are referred to as natural drainage systems (NDS) and they are a type of low impact development (LID). Examples of GSI include:

- RainWise – A program that provides homeowners with rebates for installing rain gardens and cisterns on their own property.
- Roadside bioretention – Deep-rooted native plants and grasses planted in a shallow depression in the public right-of-way, such as the planting strip adjacent to homes.

SPU's goal is to use green solutions to the maximum extent feasible to reduce CSOs.

SPU and DNRP continue to work together to ensure GSI projects in the City of Seattle use a consistent approach. Collaborative work in 2016 included:

- Integrating multiple web resources into a single internet site, www.700milliongallons.org.
- Finalizing design concepts for curbless roadway typologies.

In 2017, the GSI design manual will be updated:

- To include procedures for designing curbless roadway typologies, which are the primary focus for SPU's NDS Partnering Program (see Section 4.11), and
- To incorporate lessons learned from recent SPU and DNRP projects to ensure future project designs are learning from past projects.

### 4.2.1 RainWise Program

Since 2010, RainWise has offered rebates to property owners in the combined sewer areas of Seattle. Eligible property owners are alerted about the program through regular mailings, public meetings, and media events. By visiting the RainWise website at www.700milliongallons.org, property owners are able to learn about green stormwater technologies and are presented with solutions appropriate for their property. Through this site, they are also able to find trained contractors.

Over 600 contractors, landscape designers and similar professionals have been trained in the program since 2009. Each year, the program offers two training opportunities for interested contractors to enter the program. There are currently 53 active contractors listed on the RainWise website that are available to bid and install systems for RainWise customers. In 2016, contractor fairs were offered to connect interested participants with participating contractors.

Additionally, SPU and its community partners held several information workshops for potential RainWise customers to learn about the program, talk with satisfied participants, and meet contractors.

Upon completion, installations are inspected by a RainWise inspector and property owners apply for the rebate. RainWise rebates for rain gardens are currently three dollars and fifty cents per square foot of roof area controlled. Rebates for cisterns equal 64 percent or more of the rain garden rate, depending on the size of the cistern and contributing area. The average 2016 installation now controls the runoff from nearly 1,300 square feet of roof area. Typical RainWise installations are shown in Figure 4-5.

**Figure 4-2. Raingarden (left) and Cistern (right)**

In 2016, the RainWise Program completed 123 projects in the Ballard, North Union Bay, Delridge, Fremont, Genesee, Henderson, Leschi, Montlake, and Windermere basins. Since program inception, 636 installations have been completed. These installations control approximately 18.8 acres of impervious roof area and an estimated 10.3 million gallons (MG) per year of stormwater, and they provide an estimated 168,000 gallons of CSO control volume.

In an effort to reach historically underserved communities, SPU has undertaken equity inclusion pilots in the Delridge, Genesee, and Henderson basins to explore best practices for involving these communities in RainWise. In 2016, the pilot provided outreach to Vietnamese, Filipino and Chinese homeowners. Additionally, six Vietnamese contractors were recruited and trained.

The RainWise Program continues to operate under a memorandum of agreement with DNRP to make RainWise rebates available to customers whose properties are located in the City of Seattle and within CSO basins served by DNRP, in Ballard/West Phinney, Highland Park, Barton, and South Park. DNRP completed 189 installations in 2016, bringing their total installations since joining the program in 2013 to 564. DNRP's installations control approximate 15.5 acres of impervious roof area and 8 MG per year of stormwater.

SPU will continue to offer its RainWise Program in 2017.

### 4.2.2 Ballard Natural Drainage System

In 2012, SPU began developing and analyzing alternatives for the next Ballard Natural Drainage System Project (Ballard NDS 2015). The intent of this project was to build on the experience from the first Ballard NDS project, constructed in 2010, and provide roadside bioretention along 17 blocks.

SPU awarded the construction contract in September 2015, then suspended the contract until April 2016 to minimize construction impacts on the Loyal Heights School community, minimize the number of construction mobilizations, and provide more favorable weather conditions for construction. In April 2016, construction began on non-school street blocks and then move over to the school blocks after school closed for the summer. Construction was completed in December 2016.

The completed construction uses the new design concept of modular soil cells under the sidewalk. The modular soil cells provide sidewalk structural support while allowing water to flow under the sidewalk, so that the bottom of the bioretention cells can be extended under the sidewalk. This allows the project to be built in a more constrained area without having to bulb out into the street or remove on-street parking spaces. It also maximizes the efficiency of each raingarden, resulting in a reduced number of cells required along each block and lower overall impact to the community.

Work in 2017 includes the first year of plant establishment, a phase in which more extensive maintenance efforts help ensure the plantings become established and meet the design intent.

Figure 4-3. Ballard NDS 2015 Modular Soil Cells

### 4.2.3 Delridge Natural Drainage System

In 2012, SPU also began developing and analyzing alternatives for the Delridge Natural Drainage System Project (Delridge NDS 2015). The intent of this project is to help prevent CSOs to Longfellow Creek by providing roadside bioretention in the public right-of-way on 16 blocks in the Delridge area of West Seattle. The project manages runoff from approximately 5.7 acres of impervious surface, capturing and infiltrating 4.4 MG of stormwater runoff annually.

The project includes bioretention cells to treat stormwater; underground injection controls (UICs), connected to the bioretention cells via underdrains, that increase the amount of stormwater that can be captured; curb ramps at multiple intersections to improve pedestrian accessibility in the neighborhood; and curb bulbs to shorten the crossing of SW Henderson St., a busy arterial, as well as SW Elmgrove St. and 17th Ave. New street trees were planted on project blocks, and the project was sited and designed to enhance the Neighborhood Greenway routes on 17th Ave. SW.

Work completed in 2016 includes:

- Completed construction of roadside bioretention, including installation of 23 UICs.
- Installed plants in bioretention cells.

- Removed 42 trees to make room for the bioretention cells and installed 97 new trees in the right-of-way.
- Took water quality samples during flushing period.
- Continued to monitor end of basin flow.

Work to be completed in 2017 includes:

- Provide landscape establishment maintenance for plants.
- Monitor plant and tree health.
- Continue monitoring basin flow.


**Figure 4-4. Delridge NDS 2015**

## 4.3 Windermere CSO Reduction Project

The Windermere CSO Reduction Project reduced the number and volume of sewage overflows from Outfall 13. The completed facility is located near Magnuson Park on the south side of NE 65th Street. It includes a 2.05 million gallon (MG) storage tank, facility vault, and motor-operated gates to control the flow of wastewater into the tank. Flow is diverted to the storage tank through a 2,250-foot-long gravity sewer located in NE 65th Street and Sand Point Way NE. After a storm has passed, the wastewater is pumped back to the sewer system through a parallel discharge force main.

Construction began in 2012 and the facility was completed in July 2015. Post construction performance monitoring began in August 2015 and is ongoing. Hydraulic modeling to assess the performance of the facility was completed in Summer 2016. The modeling shows that, although the project has significantly reduced the occurrence of overflows in Basin 13, the modelled 20-year average number of overflows is 1.6, which exceeds the State CSO performance standard. Therefore, on August 23, 2016, SPU submitted a Supplemental Compliance Plan to Ecology and EPA outlining the steps SPU plans to take to meet the State standard. These steps are as follows:

- Evaluate the Windermere Area and, by September 2017, identify operational improvements that optimize the performance of facilities in the basin;
- Submit a technical memorandum to Ecology and EPA by December 2017, summarizing the results of the operational improvements evaluation;
- Implement the operational improvements by September 2019. This will most likely require construction or installation of additional control and/or monitoring equipment;
- Update the basin model to reflect the new operational improvements and to address recent changes in weather patterns;
- Monitor basin performance through December 2020, use the flow monitoring and modeling results to determine whether the area meets the State CSO performance standard, and report the results in the 2020 Annual Report (due March 2021);
- If operational improvements alone do not control the Windermere Area to the State CSO performance standard, initiate planning activities to identify potential capital options for controlling the area. SPU will consider SPU owned and managed options as well as options that involve partnering with DNRP on downstream improvements;
- Identify and implement the preferred option(s), working with DNRP as appropriate;
- Once the Windermere Area is controlled, prepare and submit for Ecology and EPA approval a plan to conduct post-construction monitoring of Outfall 13; and
- Conduct the post-construction monitoring and submitting a post-construction monitoring report to Ecology and EPA.

**Figure 4-5. Completed Windermere CSO Storage Facility**


**Figure 4-6. Completed Windermere Facility Vault – Mechanical Room**

## 4.4 Genesee CSO Reduction Project

The Genesee CSO Reduction Project will reduce the number and volume of sewage overflows from Outfalls 40, 41, and 43. The project was constructed in two parking lots along Lake Washington Boulevard S at 49th Avenue S and at 53rd Avenue S. The project includes a 380,000 gallon storage tank and a 120,000 gallon storage tank. Each has a facility vault, diversion sewer, and a force main with motor-operated gates to control the flow of wastewater similar to the Windermere storage facility.

In October 2015, SPU completed construction of the new facilities, including testing and commissioning activities. The new facilities have been in SPU's "stabilization phase" since construction completion. Stabilization phase consists of monitoring and adjusting operation of the facilities to optimize performance.

In February 2016, SPU found significant root intrusion in the Lake Line that conveys combined sewage from the two newly constructed CSO storage tanks to Wastewater Pump Station 5. This root intrusion had two detrimental effects on the operation of the Genesee CSO facilities:

- It caused the tanks to fill up prematurely during storms, and
- It caused the tanks to drain too slowly after each storm.

SPU has since cleaned the Lake Line and submitted a Supplemental Compliance Plan to Ecology and EPA on December 12, 2016. Ecology and EPA sent comments via email on January 23, 2017, and SPU submitted a revised Supplemental Compliance Plan on March 8, 2017. The revised Supplemental Compliance Plan includes the following steps:

- Perform additional flow monitoring through 2017,
- Recalibrate the Genesee model in 2017,
- Use the flow monitoring results and recalibrated model to determine whether the Genesee Area meets the State CSO performance standard, and
- Submit a technical memorandum summarizing the results in June 2018.

**Figure 4-7. Completed Genesee CSO Storage Facility 9A**

**Figure 4-8. Completed Genesee CSO Storage Facility 11A**

## 4.5 North Henderson CSO Reduction Project (Basins 44, 45)

The North Henderson CSO Reduction Project will reduce the number and volume of combined sewage overflows from Outfalls 44 and 45. The project includes a new 2.65 MG storage facility in Seward Park and more modest improvements adjacent to Martha Washington Park. The storage facility will include a facility vault, diversion structures with motor-operated gates, and a force main to control the flow of wastewater.

Construction of the project began in 2015. Significant 2016 accomplishments occurred at the Seward Park site, including excavation and completion of the below grade storage tank and facility vault structure, partial completion of the mechanical and electrical components, completion of shoreline enhancements, and partial completion of site grading and landscaping.

Planned 2017 activities include completion of the mechanical and electrical work, site finishing and landscaping, and facility startup and commissioning. SPU expects to stabilize facility operations in 2018 and reach the Construction Complete milestone by December 2018.


**Figure 4-9. North Henderson CSO Storage Facility during Construction**

**Figure 4-10. North Henderson CSO Storage Facility during Construction**

**Figure 4-11. North Henderson CSO Storage Facility during Construction**

## 4.6 South Henderson CSO Reduction Projects

### 4.6.1 52nd Ave S Conveyance Project (Basins 47, 171)

The 52nd Ave S Conveyance Project has reduced the number and volume of combined sewage overflows from Outfalls 47 and 171 in the South Henderson area. The project includes a new diversion system and pipeline to convey peak flows to DNRP's Henderson Pump Station.

Construction began in 2014 and was completed in August 2015. The new pipeline has been in SPU's "stabilization phase" since construction completion. The stabilization phase consists of monitoring and adjusting operation of the facility to optimize performance.

Hydraulic modeling of this project and the Henderson 47C retrofit (discussed in Section 4.1.3) was completed in late 2016 and used to assess the performance of these improvements. The modeling shows that, although these projects have significantly decreased the frequency of overflows in Basins 47 and 171, they have not conveyed as much flow downstream as was intended and therefore have not reduced CSOs from Basins 47 and 171 to the Consent Decree performance standard. Prior to construction of these improvements, Basin 47 averaged 15.7 CSOs per year and Basin 171 averaged 7.4 CSOs per year. Based on modeling, the completed projects decreased the average frequency to 4.1 CSOs per year from Basin 47 and 3.3 CSOs per year from Basin 171.

**Figure 4-12. Completed 52nd Ave S Combined Sewage Conveyance Project**

Because the two basins are not yet meeting the State CSO performance standard, SPU submitted a Supplemental Compliance plan to Ecology and EPA on January 12, 2017. Ecology and EPA sent comments via email on January 23, 2017, and SPU plans to submit a revised Supplemental Compliance Plan in Spring 2017. The revised plan will outline the steps SPU plans to take to meet the CSO performance standard, which are as follows:

- Submit a technical memorandum in September 2017 identifying proposed control structure adjustments to send the intended design flows downstream;
- Implement the control structure adjustments by December 2017, in close coordination with DNRP;
- Conduct flow monitoring through 2018 and conducting hydraulic modeling of the adjustments;
- Determine whether Outfalls 47 and 171 are controlled to the State performance standard and submit a technical memorandum by March 2019 summarizing the modeling and monitoring results; and
- Complete construction of capital improvements, if needed. If capital improvements are required, SPU will complete construction of those improvements by the end of 2025.

### 4.6.2 Pump Station 9 Rehabilitation Project (Basin 46)

In 2015, SPU replaced the existing pumps at Wastewater Pump Station 9 with two higher capacity pumps, and upgraded the electrical and mechanical systems. In 2016, SPU monitored the performance of this improvement and updated the basin model. The results of flow monitoring and modeling performed in late 2016 show that Basin 46 meets the State CSO performance standard.


**Figure 4-13. Completed Pump Station 9 Rehabilitation Project**

## 4.7 Ship Canal Water Quality Project

The Ship Canal Water Quality Project (Ship Canal Project) will control CSOs from SPU's Wallingford, Fremont and Ballard areas (Outfalls 147, 150, 151, 152, and 174) and King County DNRP's 3rd Avenue West and 11th Avenue Northwest outfalls.

On July 27, 2016, the City of Seattle and King County signed a Joint Project Agreement (JPA) to guide implementation, operation, and cost-sharing of the Ship Canal Project. The City will be the lead for construction and implementation of the tunnel, and will own, operate, and maintain the tunnel and its related structures. SPU and DNRP have also chartered Joint Oversight and Project Review and Change Management Committees to provide policy guidance and senior level management oversight, support and direction to the project.

Once the JPA was signed, DOJ, EPA, and Ecology approved a modification to King County's Consent Decree (Civil Action No. 2:13-cv-677) to allow this joint project between the City and King County. The Non-Material Modification (Civil Action no. 2:13-cv-677, Document 7) was signed in September and filed with the United States District Court on October 25, 2016.

In the meantime, a draft Facility Plan was prepared for the Ship Canal Project and was submitted on behalf of SPU and DNRP to EPA and Ecology for review in January 2016. Comments were received in April 2016 and will be addressed in the Final Facility Plan.

As the lead agency, SPU issued a draft Ship Canal Project Supplemental EIS for public comment on September 22, 2016 and held a public hearing on October 18, 2016. Comments were received through October 24. The Final Supplemental EIS was issued on January 26, 2017 and included responses to all comments received on the Draft Supplemental EIS. The appeal period ended on February 9, 2017, and there were no appeals. This completed the SEPA process for the Ship Canal Project.

The Final Facility Plan and Final Supplemental EIS will be submitted to EPA and Ecology in Spring 2017.

In mid-2016, the project team completed 30 percent design of the Storage Tunnel, Tunnel Effluent Pump Station (TEPS), and 3$^{rd}$ Ave and 11$^{th}$ Ave NW Conveyance packages. The project team also completed Value Engineering (VE) for the Storage Tunnel and TEPS. Storage Tunnel VE results were incorporated in the Storage Tunnel 60 percent design, which was completed in late 2016. TEPS VE results will be incorporated in the TEPS 60 percent design, which is scheduled for completion in 2017. The project team completed 30 percent design of the Fremont Conveyance package in late 2016 and will complete 60 percent design in 2017.

The project team also completed 90 percent design of the Ballard Early Works Package, which includes Ballard site remediation, replacement of the pedestrian pier at the 24$^{th}$ Ave NW street end, and temporary power and utility relocations at the Ballard site. Construction of this package is planned for 2017 and 2018, in advance of tunnel construction.

Tunnel sizing will be finalized and final design will begin in 2017, incorporating results of an integrated SPU/DNRP hydrologic and hydraulic model. The integrated model will provide a common platform for both agencies to evaluate design and operation of CSO control facilities in the north end of Seattle, including the Ship Canal Project. SPU and DNRP are working together to develop and calibrate common standardized “MIKE URBAN” models for both agencies’ CSO Basins and facilities tributary to the Ship Canal Water Quality Project and the West Point Treatment Plant. Individual component models will be integrated into a single model that can be used to simulate the North Interceptor, define operational strategies, and evaluate the performance of the Ship Canal Project.

In 2016, SPU continued to acquire the property needed for tunnel construction in Ballard and Wallingford. SPU obtained ownership of the Yankee Grill property in Ballard in 2015 and continued with the condemnation process to obtain ownership of the adjoining undeveloped Salmon Bay Hotel site. In March 2016, SPU engaged in alternative dispute resolution with the property owner and settled on a purchase price. SPU took ownership of the undeveloped Salmon Bay Hotel Site in July 2016. SPU worked with the City’s Department of Finance and Administrative Services (FAS) to develop an MOA that would allow SPU to lease FAS property in Wallingford that is needed for the east tunnel portal. SPU will lease the entire site during construction and purchase the portion needed for tunnel operations and maintenance after the project is completed. Finalization of the MOA is expected in 2017, in advance of tunnel construction.

SPU is also working to obtain necessary property easements along the tunnel alignment. Properties are being appraised and easements are expected to be finalized in 2017 and 2018.

SPU continued with community outreach for the Ship Canal WQ Project during 2016, as summarized below:

- Staffed information booths at the Fremont Fair and Ballard Seafood Fest in June and July 2016, resulting in approximately 320 contacts and 41 listserv signups.
- Delivered project briefings at 6 regional chambers, organizations, councils and boards, totaling over 87 participants.
- Held 3 working sessions about project impacts with neighbors adjacent to the Ballard project site.
- Conducted outreach with 7 properties impacted by City Council Ordinance for temporary and permanent property rights.

- Held a public meeting in conjunction with the October 18, 2016 public hearing for the Draft SEIS. Outreach included online notification in blogs, on the City's website, and on SPU's listserv.
- Recruited and convened a stakeholder advisory group to inform the design of the pump station in Ballard.
- Conducted other stakeholder briefings with property owners and businesses along the proposed project sites and tunnel alignment.
- Businesses and residents were contacted (226 flyers) along the tunnel alignment to coordinate geotechnical investigations, site fence construction, and soil and groundwater investigations.

SPU's planned 2017 outreach activities include:

- Staff information booths at the Fremont Fair and Ballard Seafood Fest.
- Deliver project briefings at organizations and boards focused on bicycles, pedestrians, street ends, and freight.
- Deliver notices and mailers along the tunnel alignment, as necessary.
- Conduct easement outreach to properties along the tunnel alignment, as necessary.
- Continue stakeholder briefings and attending community meetings.
- Provide project information via fact sheets, website and listserv.
- Conduct additional working sessions about project impacts with neighbors adjacent to the Ballard project site.
- Conduct construction outreach to impacted parties, including neighbors adjacent to the pump station site.
- Conduct 4-5 stakeholder advisory group meetings to inform the design of the pump station.
- Begin outreach about Wallingford and Ballard conveyance options and plans.
- Conduct specific outreach to neighbors and stakeholders about Fremont and Wallingford site designs.

## 4.8 Central Waterfront CSO Reduction Project

To control combined sewer overflows from the south end of the Central Waterfront, SPU is planning to install approximately 2,000 linear feet of new 24 to 36-inch diameter sewer; and connect combined sewer basins 70, 71, and 72. The completed project will limit CSOs from outfalls 70 (University Street Outfall), 71 (Madison Street Outfall) and 72 (Washington Street Outfall) to no more than one per year on average.

SPU and the Seattle Department of Transportation (SDOT) are coordinating the design and construction of the Central Waterfront sewer system modifications and the Alaskan Way, Promenade, and Overlook Walk Project (AWPOWP), because critical portions of both City projects are located under the existing Alaskan Way Viaduct and neither of these City projects can be completed until the Alaskan Way Viaduct is demolished. Attempting to complete the CSO control project prior to demolition of the Viaduct would result in significant additional cost, additional disruption to businesses and motorists, additional risk of failure of the currently compromised viaduct structure itself, and risk that the completed improvements would be damaged during subsequent demolition work. In addition, the Viaduct cannot be demolished until the new SR-99 tunnel is complete, or there would be major additional disruption to businesses and motorists. WSDOT is solely responsible for completing the new SR-99 tunnel and funding the Viaduct demolition; the City is not able to direct the activities of WSDOT or its tunneling contractor, Seattle Tunnel Partners (STP), and therefore is not able to accelerate WSDOT's schedule for completing SR-99 and demolishing the Viaduct.

In the Plan to Protect Seattle's Waterways, SPU indicated that construction of the Basin 70, 71, 72 CSO control project would be complete by the end of 2020. This completion date was based on construction beginning in 2017, which coincided with WSDOT's original schedule for completion of SR-99 and demolition of the Viaduct. On October 22, 2015, WSDOT and STP notified the Washington State Legislature's Joint Transportation Committee that resumption of the tunneling on SR-99 was delayed until December 23, 2015. This delay in tunneling resumption pushed the SR-99 completion and Viaduct demolition schedules beyond the point where the City can assure that the CSO control project will be completed by 2020. Consequently, SPU submitted notification of this force majeure event the same day. Unfortunately, the City cannot determine the full extent of the delay until WSDOT and its construction contractor have a firm completion schedule. In the meantime, SPU is continuing to complete the design of the Basin 70, 71, 72 CSO control project so that it is ready to construct as soon as the SR-99 tunnel is complete and the Viaduct is demolished.

The WSDOT-caused delay is not expected to cause or contribute to endangerment of public health, welfare, or the environment. Outfalls 70 and 72 already discharge less than once per year on average, and the discharge from Outfall 71 is a relatively small portion of the City's CSO volume.

In 2016, SPU conducted Value Engineering, completed the 60 percent design, and began assessing the impact of hydraulic grade line changes on customers. In 2017, SPU plans to complete 90 percent design, complete the assessment of impacts on customers, and begin implementing any necessary measures to mitigate customer impacts.

## 4.9 Outfall Rehabilitation Projects

Per the approved 2015 Outfall Rehabilitation Plan, Outfall 44 was replaced in 2015 as part of the North Henderson CSO Storage Project (see Section 4.5), and the replacement of the land portion of Outfall 174 was completed in 2015. In 2016 SPU completed the design for the replacement of Outfall 151 as part of the work on the Ship Canal Water Quality Project (see Section 4.7). Construction of Outfall 151 is anticipated to start in mid to late 2017. Work is on schedule to meet the other commitments in SPU's 2015 Outfall Rehabilitation Plan.

## 4.10 South Park Water Quality Facility

The South Park Water Quality Facility is one of the stormwater improvements included in the approved Plan to Protect Seattle's Waterways. The intent of the facility is to treat stormwater runoff from the existing 7th Ave S drainage basin, a highly industrial basin in the City's South Park neighborhood, and discharge treated water to the Lower Duwamish Waterway.

In 2016, SPU completed a consultant procurement process and began pilot (field) testing of candidate technologies at the project site. The piliot testing is ongoing. Work planned for 2017 includes completion of treatment technology field testing plus creation and evaluation of alternatives for the final water quality facility. SPU is coordinatng closely with Ecology staff on this important stormwater project.

**Figure 4-14. South Park Water Quality Facility Pilot Testing**

## 4.11 NDS Partnering

In 2015, the Natural Drainage System (NDS) Partnering Program developed the methodology, budget, and schedule required to achieve the NDS Partnering Program commitments in the approved Plan to Protect Seattle's Waterways. In 2016, the Program continued work to develop templates and standardization tools for bioretention in the right-of-way (ROW) for areas of the city where there is no formal drainage system and where the bulk of the NDS Partnering work will occur. The Program also continued working on design of the 30th Ave NE Sidewalk and NDS Project, the first partnership project with SDOT. This project will be constructed in late 2017.

Work in 2016 also included outreach to potential project partners to identify project blocks in the Longfellow and Thornton Creek Basins for construction in 2019. Options Analysis work for the Longfellow and Thornton Creek Basins began in late 2016 and is anticipated to take approximately a year. Part of this early work includes developing basin outreach plans and identifying stategies for reaching underserved communities.

In 2017, the NDS Partnering Program plans to construct the 30th Ave NE Sidewalk and NDS Project with SDOT and complete options analysis for the first set of project streets in the Longfellow and Thornton Basins. We are on schedule to meet our regulatory milestones and do not anticipate any significant problems for implementation.

## 4.12 Expanded Arterial Streetsweeping Program

This program expands the City's arterial streetsweeping program, per commitments in the Plan to Protect Seattle's Waterways.

During 2016, the team began implementing the expanded program. Key tasks completed included:

- Signed a 5-year Memorandum of Agreement with SDOT for street sweeping services to meet the regulatory commitments;
- Began sweeping new routes;
- Expanded the daytime SDOT sweeping crew from a half-time to one dedicated operator. SDOT was unable to expand the night sweeping crew from five to six operators due to a tight labor market and high turnover on the night shift;
- Gathered specifications and prepared a purchase order to purchase a new sweeper;
- Developed a Post Construction Monitoring Quality Assurance Project Plan (QAPP); and
- Captured 155 dry tons of total suspended solids (TSS) equivalent (127 percent of the 122 tons/year target).

During 2017, the team will continue to implement the expanded program and adapt as needed to meet the regulatory targets. The key tasks planned for this year include:

- Continue sweeping new routes.
- Utilize SDOT's day shift staff as available to alleviate the current difficulty maintaining a night crew of six.
- Receive delivery of a new sweeper.
- Begin Post Construction Monitoring in early January.

SPU is on schedule to meet the annual commitment of capturing 122 tons of total suspended solids (TSS) equivalent.

**SECTION 5**

# Monitoring Programs and Monitoring Results

This section provides a brief overview of SPU's precipitation and flow monitoring programs and presents 2016 results, including CSO overflow details, 5-year average overflow frequencies, and a summary of the outfalls meeting the CSO control standard.

## 5.1 Precipitation Monitoring Program

SPU collects precipitation data from a network of 22 rain gauges located throughout the City of Seattle, as shown in Figure 1. After the September 2, 2014 rain event, SPU determined that the network as configured was missing pockets of rainfall and additional rain gauges were needed to improve our claims response and modeling efforts. In late 2015, SPU added three additional rain gauges to the network: one in West Seattle, one in Capital Hill, and one in South Seattle. Two additional rain gauges were installed in 2016, one in Lake City and one in Laurelhurst. SPU is calibrating these gauges and will place them in service in 2017.

Also in 2015, Rain Gauge (RG) 30 was temporarily removed due to roof repairs at Rainier Beach Library, where it is housed. These repairs were completed January 2017 and the rain gauge was re-installed. No additional changes to the network of permanent rain gauges were made in 2016.

SPU anticipates one additional rain gauge located in Ballard will be added to the network in 2017. Its status will be included in next year's annual report.

Two tables summarizing 2016 precipitation monitoring results are included in this report:

- Table 5-1 provides precipitation by gauge and by month; and
- Table 5-2 summarizes the last 5 years of precipitation monitoring results by year and by month.

In stark contrast to recent years, 2016 in Seattle passed without a single extreme rainfall event. It was a wet year, however, and 9 significant rainfall events were recorded. Total rainfall across the City of Seattle reached 45.43 inches, which is well above the long-term average. The majority of the extra annual precipitation fell in October, when a record-setting ten inches were recorded. (Note: 30-day rainfall frequency statistics for Seattle do not exist but are under development, and it is very likely that October 2016 will be eventually be classified as an extreme event.)

Across Seattle, almost 9 inches separated the year's rainiest location (SPU RG01, Haller Lake, 49.99 inches) from its driest location (SPU RG05, Fauntleroy, 41.05 inches). SPU's rain gauges recorded 0 extreme events (equal to or greater than a 25-year recurrence interval) and 9 storms with heavy rainfall (intensity equal to or greater than a two-year recurrence interval). 2016’s two most intense events (10-year recurrences) each occurred during the record-setting month of October.

## 5.2 Flow Monitoring Program

During 2016, SPU’s flow monitoring consultant operated and maintained 84 monitoring points. An additional 22 monitoring points were operated and maintained by SPU staff, for a total of 106 continuous monitoring sites.

Dedicated monitoring program staff review flow monitoring results on a regular basis and evaluate data quality and flow monitor performance. If emerging problems are identified during these reviews (such as data showing slow storage tank drainage or missing data), the issues are rapidly addressed by requesting field service from the monitoring consultant or from the SPU Drainage and Wastewater crews. The consultant and SPU staff also perform site-specific troubleshooting.

Each month, the consultant's lead data analyst and senior engineer and SPU monitoring staff review and analyze any apparent overflows that occurred the previous month, taking into consideration rainfall, knowledge of site hydraulics, and the best available monitoring data. When needed, SPU meets with consultant staff via WebEx and telephone to make a final determination regarding whether an overflow occurred, and any necessary follow-up actions are documented.

## 5.3 Summary of 2016 Monitoring Results

Several tables summarizing 2016 flow monitoring and flow monitor performance are included in the following pages of this report:

- Table 5-3 show the 2016 flow monitor performance by outfall and month;
- Table 5-4 provides the details of all 2016 CSOs by outfall and date;
- Table 5-5 includes the most recent 5-year overflow frequency for each outfall and compares 2016 and baseline CSO conditions;
- Table 5-6 compares 2012-2016 CSOs by outfall;
- Table 5-7 compares 2012-2016 CSOs by receiving water body;
- Table 5-8 shows which outfalls met the performance standard for controlled outfalls in 2016.

Observations and conclusions from these tables include:

- All of the flow monitoring stations were in service, detecting and quantifying any CSOs, over 99% of the time.
- Although 2016 precipitation was 15 percent higher than the previous year, the number of CSOs was comparable and the 2016 CSO volume was 43 percent lower.
- Almost one-half of the 2016 CSO volume was from Outfall 152 (Ballard), which serves the largest combined sewer area of any of the outfalls. Not surprisingly, the water body receiving the greatest CSO volume in 2016 was Salmon Bay (Ballard).
- The five outfalls that will be controlled by the Ship Canal WQ Project contributed over 50 percent of the 2016 CSOs (164 of the 314 CSOs) and over 75 percent of the 2016 CSO volume: Outfall 152 in Ballard (42.1 MG), Outfalls 150 and 151 in Ballard (2.2 MG), Outfall 174 in Fremont (9.1 MG), and Outfall 147 in Wallingford (13.1 MG).

One outfall that was reported to be controlled in SPU's baseline report and has been uncontrolled in recent years is Outfall 139 in the Montlake Area. As noted in Section 4.1.8, in July 2016 SPU increased the pumping capacity of Wastewater Pump Station 25 by approximately 20 percent to increase the rate of flow to DNRP. SPU will continue to monitor the performance of the pump station to refine the remaining control volume estimate ahead of possible partnership with DNRP on a Montlake area CSO storage project.

All outfalls identified as controlled in SPU's NPDES Permit met the State CSO performance standard in 2016. In addition, Outfall 46 is now controlled, and SPU is monitoring several other outfalls to determine whether they are controlled (including Outfall 22, some of the outfalls in the Leschi Area, and Outfall 95).

## 5.4 Post-Construction Monitoring Program & Sediment Sampling and Analysis Plan

In 2016, Quality Assurance Project Plans (QAPPs) and Sediment Sampling and Analysis Plans (SAPs) were prepared for Outfalls 95 and 68. These were submitted to Ecology for review in March and June 2016, respectively. No sediment sampling or analysis was required or performed during 2016.

The approved Supplemental Compliance Plan for the Windermere Area (see Section 4.X) includes a revised schedule for post-construction monitoring of Outfall 13.

In 2017, SPU plans to submit a proposed QAPP for Outfall 18, per the schedule in the approved Final Post Construction Monitoring Plan.

**Table 5-1. 2016 Precipitation by Gauge and by Month (inches)**

| Rain Gauge | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RG01** | 8.22 | 4.05 | 6.02 | 1.60 | 1.40 | 1.63 | 0.61 | 0.34 | 1.85 | 10.91 | 8.66 | 4.70 |
| **RG02** | 6.89 | 3.80 | 4.89 | 1.45 | 1.79 | 1.53 | 0.52 | 0.03 | 1.50 | 10.78 | 7.80 | 3.94 |
| **RG03** | 7.25 | 4.14 | 5.49 | 1.33 | 1.43 | 1.75 | 0.58 | 0.03 | 1.37 | 10.23 | 7.70 | 3.85 |
| **RG04** | 7.47 | 3.70 | 5.55 | 1.56 | 1.86 | 1.64 | 0.57 | 0.22 | 1.47 | 10.25 | 7.16 | 4.35 |
| **RG05** | 7.39 | 4.06 | 5.19 | 1.29 | 0.70 | 1.26 | 0.66 | 0.04 | 0.70 | 10.11 | 6.33 | 3.32 |
| **RG07** | 8.43 | 4.10 | 5.93 | 1.39 | 1.05 | 1.57 | 0.72 | 0.14 | 1.59 | 10.81 | 8.02 | 4.35 |
| **RG08** | 7.60 | 3.66 | 5.49 | 1.32 | 0.72 | 1.40 | 0.62 | 0.09 | 1.34 | 9.52 | 7.19 | 4.04 |
| **RG09** | 8.37 | 4.32 | 4.80 | 1.36 | 1.30 | 1.34 | 0.62 | 0.17 | 1.27 | 9.44 | 7.08 | 4.33 |
| **RG11** | 7.24 | 4.31 | 5.52 | 1.65 | 1.36 | 1.09 | 0.53 | 0.12 | 0.98 | 10.15 | 7.47 | 3.50 |
| **RG12** | 8.25 | 4.40 | 6.08 | 1.39 | 1.01 | 1.17 | 0.75 | 0.13 | 1.29 | 10.70 | 7.76 | 3.90 |
| **RG14** | 7.91 | 4.75 | 6.07 | 1.69 | 0.75 | 1.22 | 0.64 | 0.06 | 0.97 | 11.45 | 7.67 | 3.89 |
| **RG15** | 7.24 | 4.60 | 5.29 | 1.46 | 0.88 | 1.41 | 0.54 | 0.01 | 0.95 | 10.73 | 7.16 | 3.65 |
| **RG16** | 7.07 | 5.34 | 5.82 | 1.38 | 0.88 | 1.73 | 0.47 | 0.02 | 0.87 | 10.73 | 7.19 | 3.69 |
| **RG17** | 6.68 | 4.45 | 5.24 | 1.34 | 1.02 | 1.37 | 0.59 | 0.04 | 0.68 | 10.73 | 7.19 | 3.63 |
| **RG18** | 7.11 | 5.50 | 5.52 | 1.43 | 1.23 | 1.91 | 0.48 | 0.08 | 1.07 | 10.89 | 7.62 | 3.89 |
| **RG25** | 7.85 | 4.68 | 5.89 | 1.86 | 1.86 | 1.76 | 0.63 | 0.03 | 1.07 | 11.53 | 7.21 | 3.70 |
| **RG30** | 7.07 | 5.34 | 5.82 | 1.38 | 0.88 | 1.73 | 0.47 | 0.02 | 0.87 | 10.73 | 7.19 | 3.69 |
| **Monthly Average** | 7.53 | 4.42 | 5.57 | 1.46 | 1.18 | 1.50 | 0.59 | 0.09 | 1.17 | 10.57 | 7.44 | 3.91 |

| Table 5-2. 2012-2016 Average Precipitation by Month (inches) | | | | | |
|---|---|---|---|---|---|
| **Month/Year** | **2012** | **2013** | **2014** | **2015** | **2016** |
| **January** | 5.40 | 3.95 | 4.05 | 2.63 | 7.53 |
| **February** | 2.97 | 1.67 | 5.67 | 4.51 | 4.42 |
| **March** | 6.61 | 2.67 | 8.62 | 4.61 | 5.57 |
| **April** | 2.27 | 4.58 | 3.12 | 1.60 | 1.46 |
| **May** | 2.32 | 1.63 | 2.57 | 0.58 | 1.18 |
| **June** | 3.03 | 1.64 | 0.88 | 0.17 | 1.50 |
| **July** | 1.53 | 0.04 | 0.93 | 0.25 | 0.59 |
| **August** | 0.00 | 1.06 | 1.35 | 2.88 | 0.09 |
| **September** | 0.16 | 5.30 | 2.73 | 1.46 | 1.17 |
| **October** | 6.12 | 1.25 | 6.73 | 3.67 | 10.57 |
| **November** | 9.36 | 2.92 | 4.61 | 6.83 | 7.44 |
| **December** | 7.89 | 1.22 | 5.50 | 10.41 | 3.91 |
| **Annual Total** | **47.66** | **27.93** | **46.76** | **39.59** | **45.43** |

## Table 5-3. 2016 Flow Monitor Performance by Outfall and Month

| Outfall Number | Jan | | Feb | | Mar | | Apr | | May | | Jun | | Jul | | Aug | | Sept | | Oct | | Nov | | Dec | | 2016 Cumulative | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) |
| 12 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 13 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 13.6 | 98.1 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 13.6 | 99.8 |
| 14 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 15 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 16 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 18 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 19 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 17.9 | 97.6 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 47.0 | 93.5 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 64.9 | 99.3 |
| 20 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 22 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 73.7 | 90.1 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 73.7 | 99.2 |
| 24 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 25 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 27 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 28 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 4.1 | 99.4 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 4.1 | 100.0 |
| 29 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.9 | 99.9 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.9 | 100.0 |
| 30 | 14.6 | 98.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 14.6 | 99.8 |
| 31 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 32 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 50.9 | 92.9 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 32.0 | 95.7 | 0.0 | 100.0 | 45.1 | 93.9 | 128.0 | 98.5 |
| 33 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 0.0 | 100.0 |
| 34 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 104.1 | 86.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 104.1 | 98.8 |
| 35 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 36 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |

| Outfall Number | Jan | | Feb | | Mar | | Apr | | May | | Jun | | Jul | | Aug | | Sept | | Oct | | Nov | | Dec | | 2016 Cumulative | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) |
| **38** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **40** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 11.1 | 98.5 | 0.0 | 100.0 | 11.1 | 99.9 |
| **41** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 11.1 | 98.5 | 0.0 | 100.0 | 11.1 | 99.9 |
| **42** | 0.0 | 100.0 | 3.3 | 99.6 | 44.4 | 94.0 | 13.6 | 98.1 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 61.3 | 99.3 |
| **43** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **44** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **45** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 2.5 | 99.7 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 2.5 | 100.0 |
| **46** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **47** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 6.2 | 99.2 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 6.2 | 99.9 |
| **48** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **49** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **57** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **59** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **60** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **61** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **62** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **64** | 25.9 | 96.5 | 0.0 | 100.0 | 0.0 | 100.0 | 6.5 | 99.1 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 32.4 | 99.6 |
| **68** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **69** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **70** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **71** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **72** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **78** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |

| Outfall Number | Jan | | Feb | | Mar | | Apr | | May | | Jun | | Jul | | Aug | | Sept | | Oct | | Nov | | Dec | | 2016 Cumulative | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) |
| 80 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 1.0 | 99.9 | 1.0 | 100.0 |
| 83 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 85 | 15.0 | 98.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 15.0 | 99.8 |
| 88 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 6.6 | 99.1 | 0.0 | 100.0 | 6.6 | 99.9 |
| 90 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 91 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 1.2 | 99.8 | 1.1 | 99.8 | 7.5 | 99.0 | 1.6 | 99.8 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 11.4 | 99.9 |
| 94 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 95 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.6 | 99.9 | 17.4 | 97.7 | 18.0 | 99.8 |
| 99 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 107 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 111 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 1.7 | 99.8 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 1.7 | 100.0 |
| 120 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 121 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 124 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 127 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 129 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 130 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 131 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 132 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 134 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 1.0 | 99.9 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 1.0 | 100.0 |
| 135 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 136 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 138 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |

| Outfall Number | Jan | | Feb | | Mar | | Apr | | May | | Jun | | Jul | | Aug | | Sept | | Oct | | Nov | | Dec | | 2016 Cumulative | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) |
| 139 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 140 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 141 | 0.0 | 100.0 | 0.0 | 100.0 | 55.5 | 92.5 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 55.5 | 99.4 |
| 144 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 17.1 | 97.7 | 0.0 | 100.0 | 0.0 | 100.0 | 21.6 | 97.1 | 0.0 | 100.0 | 0.0 | 100.0 | 38.7 | 99.6 |
| 145 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 146 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 147 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 148 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 1.5 | 99.8 | 1.5 | 100.0 |
| 150/151 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 152 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 161 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.6 | 99.9 | 0.0 | 100.0 | 0.6 | 100.0 |
| 165 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 1.3 | 99.8 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 1.3 | 100.0 |
| 168 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 169 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 170 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 171 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 174 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| 175 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| TOTAL: | 55.4 | 99.9 | 3.3 | 100.0 | 99.9 | 99.8 | 36.6 | 99.9 | 130.2 | 99.8 | 63.8 | 99.9 | 21.2 | 100.0 | 74.7 | 99.9 | 47.0 | 99.9 | 53.6 | 99.9 | 30.0 | 100.0 | 65.0 | 99.9 | 680.7 | 99.9 |

| Table 5-4. 2016 CSO Details by Outfall and Date | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Permit No | Outfall No | Facility Name | Receiving Water | CSO Events | | | | |
| | | | | Starting Date | Volume (gallons) | Duration (hours) | Storm Duration (hours) | Precipitation (inches) |
| WA0031682 | **12** | City of Seattle | Lake Washington | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **13** | City of Seattle | Lake Washington | 01/21/2016 | 263,703 | 20.98 | 166.83 | 3.43 |
| | | | | 10/27/2016 | 125,442 | 1.95 | 19.70 | 1.63 |
| | | | | Total | 389,145 | 22.93 | 186.53 | 5.06 |
| | | | | Average | 194,573 | 11.47 | 93.27 | 2.53 |
| WA0031682 | **14** | City of Seattle | Lake Washington | 10/26/2016 | 14 | 0.42 | 16.82 | 1.36 |
| | | | | Total | 14 | 0.42 | 16.82 | 1.36 |
| | | | | Average | 14 | 0.42 | 16.82 | 1.36 |
| WA0031682 | **15** | City of Seattle | Lake Washington | 01/21/2016 | 25,183 | 4.53 | 146.32 | 2.79 |
| | | | | 02/12/2016 | 2 | 0.07 | 39.28 | 0.75 |
| | | | | 10/26/2016 | 18,480 | 0.70 | 17.30 | 1.40 |
| | | | | Total | 43,665 | 5.30 | 202.90 | 4.94 |
| | | | | Average | 14,555 | 1.77 | 67.63 | 1.65 |
| WA0031682 | **16** | City of Seattle | Union Bay | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **18** | City of Seattle | Union Bay | 01/21/2016 | 1,264,833 | 22.70 | 165.38 | 3.43 |
| | | | | 01/28/2016 | 165,171 | 5.97 | 50.10 | 1.44 |
| | | | | 03/01/2016 | 273,721 | 50.50 | 105.13 | 1.28 |
| | | | | Total | 1,703,726 | 79.17 | 320.62 | 6.15 |
| | | | | Average | 567,909 | 26.39 | 106.87 | 2.05 |

| Permit No | Outfall No | Facility Name | Receiving Water | CSO Events | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Starting Date | Volume (gallons) | Duration (hours) | Storm Duration (hours) | Precipitation (inches) |
| WA0031682 | **19** | City of Seattle | Union Bay | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **20** | City of Seattle | Union Bay | 01/21/2016 | 187,360 | 10.73 | 153.65 | 3.27 |
| | | | | 01/28/2016 | 45,499 | 3.50 | 48.75 | 1.41 |
| | | | | 10/20/2016 | 30,758 | 3.23 | 14.48 | 1.35 |
| | | | | 10/26/2016 | 13,760 | 1.03 | 18.40 | 1.41 |
| | | | | Total | 277,377 | 18.50 | 235.28 | 7.44 |
| | | | | Average | 69,344 | 4.63 | 58.82 | 1.86 |
| WA0031682 | **22** | City of Seattle | Union Bay | 01/21/2016 | 1,002 | 0.73 | 143.85 | 2.67 |
| | | | | Total | 1,002 | 0.73 | 143.85 | 2.67 |
| | | | | Average | 1,002 | 0.73 | 143.85 | 2.67 |
| WA0031682 | **24** | City of Seattle | Lake Washington | 10/26/2016 | 39,762 | 0.67 | 17.68 | 1.88 |
| | | | | Total | 39,762 | 0.67 | 17.68 | 1.88 |
| | | | | Average | 39,762 | 0.67 | 17.68 | 1.88 |
| WA0031682 | **25** | City of Seattle | Lake Washington | 10/26/2016 | 48,394 | 0.60 | 17.62 | 1.88 |
| | | | | Total | 48,394 | 0.60 | 17.62 | 1.88 |
| | | | | Average | 48,394 | 0.60 | 17.62 | 1.88 |
| WA0031682 | **27** | City of Seattle | Lake Washington | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **28** | City of Seattle | Lake Washington | 10/14/2016 | 187 | 0.07 | 30.05 | 2.30 |
| | | | | 10/15/2016 | 18 | 0.03 | 65.82 | 4.07 |
| | | | | 10/20/2016 | 391 | 0.10 | 25.32 | 1.21 |
| | | | | 10/26/2016 | 3,579 | 0.33 | 16.98 | 1.81 |
| | | | | Total | 4,174 | 0.53 | 138.17 | 9.39 |
| | | | | Average | 1,043 | 0.13 | 34.54 | 2.35 |

| Permit No | Outfall No | Facility Name | Receiving Water | CSO Events | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Starting Date | Volume (gallons) | Duration (hours) | Storm Duration (hours) | Precipitation (inches) |
| WA0031682 | **29** | City of Seattle | Lake Washington | 01/21/2016 | 1,571 | 3.80 | 149.88 | 2.90 |
| | | | | 01/23/2016 | 1,577 | 0.80 | 199.58 | 4.42 |
| | | | | 02/12/2016 | 115 | 0.23 | 39.18 | 0.89 |
| | | | | 03/09/2016 | 8,526 | 2.27 | 21.03 | 0.93 |
| | | | | 03/27/2016 | 232 | 0.17 | 21.02 | 0.90 |
| | | | | 04/08/2016 | 336 | 0.10 | 0.00 | 0.00 |
| | | | | 10/14/2016 | 4,662 | 5.00 | 35.98 | 3.10 |
| | | | | 10/20/2016 | 1,591 | 0.97 | 26.38 | 1.35 |
| | | | | 10/26/2016 | 2,373 | 0.87 | 18.05 | 1.89 |
| | | | | 11/15/2016 | 2,396 | 1.23 | 76.77 | 1.33 |
| | | | | Total | 23,379 | 15.43 | 587.88 | 17.71 |
| | | | | Average | 2,332 | 1.58 | 56.79 | 1.82 |
| WA0031682 | **30** | City of Seattle | Lake Washington | 01/21/2016 | 587 | 1.48 | 149.72 | 2.89 |
| | | | | 02/12/2016 | 946 | 0.73 | 39.88 | 0.89 |
| | | | | 03/09/2016 | 444 | 1.20 | 20.53 | 0.92 |
| | | | | 10/14/2016 | 368 | 0.30 | 35.62 | 3.09 |
| | | | | 10/20/2016 | 35 | 0.13 | 25.65 | 1.27 |
| | | | | Total | 2,380 | 3.85 | 271.40 | 9.06 |
| | | | | Average | 362 | 0.53 | 54.28 | 1.81 |
| WA0031682 | **31** | City of Seattle | Lake Washington | 01/21/2016 | 255,426 | 23.77 | 170.05 | 3.64 |
| | | | | 01/23/2016 | 22,171 | 1.37 | 200.55 | 4.44 |
| | | | | 01/27/2016 | 195,914 | 12.97 | 51.98 | 1.56 |
| | | | | 02/12/2016 | 31,630 | 9.98 | 48.82 | 1.34 |
| | | | | 03/09/2016 | 28,192 | 2.57 | 21.30 | 0.93 |

| Permit No | Outfall No | Facility Name | Receiving Water | CSO Events | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Starting Date | Volume (gallons) | Duration (hours) | Storm Duration (hours) | Precipitation (inches) |
| | | | | 03/27/2016 | 196 | 0.03 | 21.42 | 0.90 |
| | | | | 10/14/2016 | 66,309 | 6.00 | 36.28 | 3.10 |
| | | | | 10/20/2016 | 49,415 | 4.17 | 26.92 | 1.36 |
| | | | | 10/26/2016 | 18,044 | 0.93 | 18.05 | 1.89 |
| | | | | 11/15/2016 | 22,114 | 1.47 | 76.90 | 1.33 |
| | | | | Total | 689,411 | 63.25 | 672.27 | 20.49 |
| | | | | Average | 68,941 | 6.33 | 67.23 | 2.05 |
| WA0031682 | **32** | City of Seattle | Lake Washington | 01/21/2016 | 9,424 | 2.10 | 150.42 | 2.96 |
| | | | | 10/14/2016 | 2,000 | 0.30 | 35.58 | 3.09 |
| | | | | 10/20/2016 | 8,489 | 0.47 | 26.08 | 1.33 |
| | | | | 10/26/2016 | 543 | 0.20 | 17.62 | 1.88 |
| | | | | Total | 20,456 | 3.07 | 229.70 | 9.26 |
| | | | | Average | 5,114 | 0.77 | 57.42 | 2.32 |
| WA0031682 | **33** | City of Seattle | Lake Washington | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **34** | City of Seattle | Lake Washington | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **35** | City of Seattle | Lake Washington | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **36** | City of Seattle | Lake Washington | 01/21/2016 | 5,481 | 1.60 | 150.65 | 2.97 |
| | | | | 01/28/2016 | 2,734 | 1.10 | 48.58 | 1.50 |
| | | | | Total | 8,214 | 2.70 | 199.23 | 4.47 |
| | | | | Average | 4,107 | 1.35 | 99.62 | 2.24 |
| WA0031682 | **38** | City of Seattle | Lake Washington | *No combined sewer overflow during 2016* | | | | |

| Permit No | Outfall No | Facility Name | Receiving Water | CSO Events | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Starting Date | Volume (gallons) | Duration (hours) | Storm Duration (hours) | Precipitation (inches) |
| WA0031682 | **40** | City of Seattle | Lake Washington | 01/21/2016 | 271,914 | 50.70 | 202.43 | 3.59 |
| | | | | 01/28/2016 | 183,423 | 16.52 | 64.43 | 1.74 |
| | | | | Total | 455,337 | 67.22 | 266.86 | 5.33 |
| | | | | Average | 227,669 | 33.61 | 133.43 | 2.67 |
| WA0031682 | **41** | City of Seattle | Lake Washington | 01/21/2016 | 271,914 | 50.70 | 202.43 | 3.59 |
| | | | | 01/28/2016 | 183,423 | 16.52 | 64.43 | 1.74 |
| | | | | Total | 455,337 | 67.22 | 266.86 | 5.33 |
| | | | | Average | 227,669 | 33.61 | 133.43 | 2.67 |
| WA0031682 | **42** | City of Seattle | Lake Washington | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **43** | City of Seattle | Lake Washington | 01/21/2016 | 113,903 | 10.25 | 160.28 | 2.67 |
| | | | | 01/28/2016 | 451,090 | 11.50 | 55.35 | 1.74 |
| | | | | 10/13/2016 | 377,760 | 14.33 | 37.72 | 3.02 |
| | | | | 10/20/2016 | 345,160 | 8.08 | 16.40 | 1.38 |
| | | | | 10/26/2016 | 399,552 | 13.00 | 58.87 | 1.70 |
| | | | | Total | 1,687,465 | 57.17 | 328.62 | 10.51 |
| | | | | Average | 337,493 | 11.43 | 65.72 | 2.10 |
| WA0031682 | **44** | City of Seattle | Lake Washington | 01/13/2016 | 345,907 | 7.87 | 55.65 | 1.34 |
| | | | | 01/16/2016 | 14,055 | 1.63 | 25.73 | 0.35 |
| | | | | 01/19/2016 | 33,404 | 2.57 | 110.00 | 1.20 |
| | | | | 01/21/2016 | 1,203,432 | 67.60 | 206.43 | 3.59 |
| | | | | 01/26/2016 | 1,935 | 0.37 | 4.50 | 0.25 |
| | | | | 01/27/2016 | 820,290 | 39.30 | 77.60 | 1.92 |
| | | | | 02/01/2016 | 43,666 | 2.13 | 5.02 | 0.36 |

| Permit No | Outfall No | Facility Name | Receiving Water | CSO Events | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Starting Date | Volume (gallons) | Duration (hours) | Storm Duration (hours) | Precipitation (inches) |
| | | | | 02/03/2016 | 10,075 | 7.13 | 26.70 | 0.55 |
| | | | | 02/05/2016 | 1,006 | 0.37 | 1.73 | 0.15 |
| | | | | 02/11/2016 | 564,019 | 28.03 | 64.70 | 1.57 |
| | | | | 02/17/2016 | 106,952 | 4.03 | 9.30 | 0.44 |
| | | | | 02/19/2016 | 33,183 | 10.10 | 56.12 | 1.01 |
| | | | | 02/28/2016 | 123,137 | 4.47 | 20.53 | 0.75 |
| | | | | 03/01/2016 | 33,224 | 21.40 | 70.37 | 1.67 |
| | | | | 03/06/2016 | 26,760 | 21.20 | 68.25 | 1.04 |
| | | | | 03/09/2016 | 182,759 | 25.93 | 146.58 | 2.36 |
| | | | | 03/13/2016 | 2,744 | 9.47 | 221.32 | 3.29 |
| | | | | 04/24/2016 | 8,345 | 0.67 | 16.15 | 0.24 |
| | | | | 06/20/2016 | 278,299 | 4.10 | 3.18 | 0.79 |
| | | | | 07/22/2016 | 8,200 | 0.63 | 1.03 | 0.11 |
| | | | | 10/06/2016 | 3,205 | 0.43 | 5.73 | 0.36 |
| | | | | 10/08/2016 | 8,428 | 5.40 | 54.47 | 1.28 |
| | | | | 10/13/2016 | 1,037,312 | 49.83 | 66.72 | 3.93 |
| | | | | 10/20/2016 | 911,259 | 10.87 | 16.40 | 1.38 |
| | | | | 10/26/2016 | 910,748 | 19.20 | 58.70 | 1.70 |
| | | | | 10/31/2016 | 166,415 | 24.07 | 43.25 | 1.29 |
| | | | | 11/02/2016 | 124 | 0.03 | 82.92 | 1.88 |
| | | | | 11/05/2016 | 448,094 | 24.70 | 27.95 | 1.32 |
| | | | | 11/15/2016 | 800,961 | 20.03 | 92.40 | 1.76 |
| | | | | 11/22/2016 | 88,310 | 4.03 | 10.38 | 0.61 |
| | | | | 11/24/2016 | 640,568 | 20.77 | 63.18 | 1.96 |
| | | | | 11/26/2016 | 6,953 | 1.20 | 92.58 | 2.35 |
| | | | | 11/27/2016 | 81,783 | 3.47 | 125.72 | 2.94 |
| | | | | 12/23/2016 | 183,774 | 9.43 | 30.22 | 1.09 |

| Permit No | Outfall No | Facility Name | Receiving Water | CSO Events | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Starting Date | Volume (gallons) | Duration (hours) | Storm Duration (hours) | Precipitation (inches) |
| | | | | Total | 9,129,325 | 452.47 | 1961.52 | 46.83 |
| | | | | Average | 268,510 | 13.31 | 57.69 | 1.38 |
| WA0031682 | **45** | City of Seattle | Lake Washington | 01/13/2016 | 1,361 | 0.43 | 51.08 | 1.31 |
| | | | | 01/21/2016 | 26,024 | 21.67 | 169.40 | 2.96 |
| | | | | 01/27/2016 | 60,689 | 11.63 | 51.83 | 1.73 |
| | | | | 02/12/2016 | 34,088 | 9.90 | 48.80 | 1.39 |
| | | | | 03/09/2016 | 7,437 | 2.33 | 126.32 | 1.95 |
| | | | | 03/13/2016 | 46,975 | 3.30 | 223.48 | 3.29 |
| | | | | 06/20/2016 | 3,294 | 0.70 | 2.27 | 0.69 |
| | | | | 10/14/2016 | 53,739 | 4.93 | 35.68 | 3.01 |
| | | | | 10/20/2016 | 38,752 | 6.07 | 15.70 | 1.37 |
| | | | | 10/26/2016 | 3,892 | 6.00 | 54.17 | 1.68 |
| | | | | 11/15/2016 | 41,621 | 1.43 | 77.03 | 1.48 |
| | | | | 11/24/2016 | 4,318 | 0.45 | 56.58 | 1.96 |
| | | | | Total | 322,189 | 68.85 | 912.35 | 22.82 |
| | | | | Average | 26,849 | 5.74 | 76.03 | 1.90 |
| | | | | Average | 1.33 | 16,053 | 3.08 | 46.57 |
| WA0031682 | **46** | City of Seattle | Lake Washington | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **47** | City of Seattle | Lake Washington | 10/14/2016 | 8,825 | 0.42 | 35.62 | 2.99 |
| | | | | 11/15/2016 | 100,723 | 1.50 | 76.40 | 1.44 |
| | | | | Total | 109,548 | 1.92 | 112.02 | 4.43 |
| | | | | Average | 54,774 | 0.96 | 56.01 | 2.22 |

| Permit No | Outfall No | Facility Name | Receiving Water | CSO Events | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Starting Date | Volume (gallons) | Duration (hours) | Storm Duration (hours) | Precipitation (inches) |
| WA0031682 | **48** | City of Seattle | Lake Washington | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **49** | City of Seattle | Lake Washington | 01/21/2016 | 45,347 | 1.63 | 148.07 | 2.45 |
| | | | | 01/28/2016 | 583,998 | 10.73 | 53.30 | 1.70 |
| | | | | 10/20/2016 | 12,287 | 0.77 | 15.58 | 1.35 |
| | | | | 11/15/2016 | 178,161 | 2.07 | 77.52 | 1.44 |
| | | | | Total | 819,793 | 15.20 | 294.47 | 6.94 |
| | | | | Average | 204,948 | 3.80 | 73.62 | 1.74 |
| WA0031682 | **57** | City of Seattle | Puget Sound | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **59** | City of Seattle | Salmon Bay | 01/21/2016 | 76,208 | 0.42 | 150.72 | 3.28 |
| | | | | Total | 76,208 | 0.42 | 150.72 | 3.28 |
| | | | | Average | 76,208 | 0.42 | 150.72 | 3.28 |
| WA0031682 | **60** | City of Seattle | Salmon Bay | 01/21/2016 | 17,887 | 4.37 | 151.02 | 3.30 |
| | | | | 03/10/2016 | 2,926 | 0.33 | 30.10 | 1.14 |
| | | | | Total | 20,813 | 4.70 | 181.12 | 4.44 |
| | | | | Average | 10,407 | 2.35 | 90.56 | 2.22 |
| WA0031682 | **61** | City of Seattle | Elliott Bay | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **62** | City of Seattle | Elliott Bay | 01/21/2016 | 1,868 | 4.42 | 150.62 | 3.55 |
| | | | | Total | 1,868 | 4.42 | 150.62 | 3.55 |
| | | | | Average | 1,868 | 4.42 | 150.62 | 3.55 |
| WA0031682 | **64** | City of Seattle | Elliott Bay | *No combined sewer overflow during 2016* | | | | |

| Permit No | Outfall No | Facility Name | Receiving Water | CSO Events | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Starting Date | Volume (gallons) | Duration (hours) | Storm Duration (hours) | Precipitation (inches) |
| WA0031682 | **68** | City of Seattle | Elliott Bay | 01/21/2016 | 134,668 | 2.10 | 151.22 | 3.59 |
| | | | | 05/21/2016 | 113,013 | 15.20 | 3.72 | 0.13 |
| | | | | Total | 247,681 | 17.30 | 154.94 | 3.72 |
| | | | | Average | 123,840 | 8.65 | 77.47 | 1.86 |
| WA0031682 | **69** | City of Seattle | Elliott Bay | 02/12/2016 | 1,182 | 0.13 | 38.97 | 0.82 |
| | | | | 05/19/2016 | 30,470 | 0.33 | 20.67 | 0.41 |
| | | | | 10/26/2016 | 28,571 | 0.27 | 53.97 | 1.47 |
| | | | | 11/15/2016 | 5,057 | 0.17 | 74.73 | 1.16 |
| | | | | Total | 65,281 | 0.90 | 188.33 | 3.86 |
| | | | | Average | 16,320 | 0.23 | 47.08 | 0.97 |
| WA0031682 | **70** | City of Seattle | Elliott Bay | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **71** | City of Seattle | Elliott Bay | 04/24/2016 | 48,278 | 0.87 | 16.15 | 0.27 |
| | | | | 10/26/2016 | 91,767 | 0.90 | 54.20 | 1.49 |
| | | | | Total | 140,046 | 1.77 | 70.35 | 1.76 |
| | | | | Average | 70,023 | 0.88 | 35.17 | 0.88 |
| WA0031682 | **72** | City of Seattle | Elliott Bay | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **78** | City of Seattle | Elliott Bay | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **80** | City of Seattle | Elliott Bay | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **83** | City of Seattle | Puget Sound | *No combined sewer overflow during 2016* | | | | |

| Permit No | Outfall No | Facility Name | Receiving Water | CSO Events | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Starting Date | Volume (gallons) | Duration (hours) | Storm Duration (hours) | Precipitation (inches) |
| WA0031682 | **85** | City of Seattle | Puget Sound | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **88** | City of Seattle | Puget Sound | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **90** | City of Seattle | Puget Sound | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **91** | City of Seattle | Puget Sound | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **94** | City of Seattle | Puget Sound | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **95** | City of Seattle | Puget Sound | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **99** | City of Seattle | West Waterway - Duwamish | 01/21/2016 | 627,065 | 13.90 | 160.47 | 3.07 |
| | | | | 01/28/2016 | 206,516 | 4.97 | 51.18 | 1.58 |
| | | | | 10/14/2016 | 84,391 | 1.37 | 54.00 | 3.20 |
| | | | | 10/20/2016 | 63,812 | 1.37 | 27.23 | 1.36 |
| | | | | 10/26/2016 | 71,758 | 1.40 | 56.05 | 1.69 |
| | | | | Total | 1,053,542 | 23.00 | 348.93 | 10.90 |
| | | | | Average | 210,708 | 4.60 | 69.79 | 2.18 |
| WA0031682 | **107** | City of Seattle | East Waterway - Duwamish | 01/21/2016 | 15,844 | 1.55 | 147.13 | 2.37 |
| | | | | 10/13/2016 | 191,662 | 18.13 | 37.30 | 3.02 |
| | | | | 10/20/2016 | 100,368 | 5.70 | 16.05 | 1.34 |
| | | | | 10/26/2016 | 73,683 | 14.50 | 55.58 | 2.02 |
| | | | | 11/15/2016 | 45,674 | 2.70 | 77.30 | 1.39 |
| | | | | Total | 427,231 | 42.58 | 333.37 | 10.14 |
| | | | | Average | 85,446 | 8.52 | 66.67 | 2.03 |

| Permit No | Outfall No | Facility Name | Receiving Water | CSO Events | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Starting Date | Volume (gallons) | Duration (hours) | Storm Duration (hours) | Precipitation (inches) |
| WA0031682 | **111** | City of Seattle | Duwamish River | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **116** | City of Seattle | Duwamish River | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **120** | City of Seattle | Lake Union | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **121** | City of Seattle | Lake Union | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **124** | City of Seattle | Lake Union | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **127** | City of Seattle | Lake Union | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **129** | City of Seattle | Lake Union | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **130** | City of Seattle | Lake Union | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **131** | City of Seattle | Lake Union | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **132** | City of Seattle | Lake Union | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **134** | City of Seattle | Lake Union | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **135** | City of Seattle | Lake Union | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **136** | City of Seattle | Lake Union | *No combined sewer overflow during 2016* | | | | |

| Permit No | Outfall No | Facility Name | Receiving Water | CSO Events | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Starting Date | Volume (gallons) | Duration (hours) | Storm Duration (hours) | Precipitation (inches) |
| WA0031682 | **138** | City of Seattle | Portage Bay | 01/21/2016 | 72,206 | 2.63 | 146.65 | 3.00 |
| | | | | 10/15/2016 | 2,215 | 0.20 | 66.18 | 3.69 |
| | | | | 11/15/2016 | 10,635 | 0.40 | 92.28 | 1.79 |
| | | | | Total | 85,056 | 3.23 | 305.12 | 8.48 |
| | | | | Average | 28,352 | 1.08 | 101.71 | 2.83 |
| WA0031682 | **139** | City of Seattle | Portage Bay | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **140** | City of Seattle | Portage Bay | 01/16/2016 | 318 | 0.07 | 29.32 | 0.59 |
| | | | | 01/21/2016 | 28,249 | 1.90 | 146.75 | 3.00 |
| | | | | 06/15/2016 | 3,470 | 0.20 | 0.15 | 0.06 |
| | | | | 06/23/2016 | 7,781 | 0.25 | 20.48 | 0.42 |
| | | | | 09/02/2016 | 598 | 0.12 | 12.78 | 0.27 |
| | | | | 10/13/2016 | 269 | 0.07 | 20.58 | 1.61 |
| | | | | 10/15/2016 | 3,896 | 0.17 | 65.55 | 3.69 |
| | | | | 10/26/2016 | 806 | 0.30 | 16.80 | 1.35 |
| | | | | 11/06/2016 | 1,756 | 0.12 | 42.92 | 1.11 |
| | | | | 11/15/2016 | 991 | 0.10 | 74.62 | 1.12 |
| | | | | Total | 48,134 | 3.28 | 429.95 | 13.22 |
| | | | | Average | 4,813 | 0.33 | 43.00 | 1.32 |
| WA0031682 | **141** | City of Seattle | Portage Bay | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **144** | City of Seattle | Lake Union | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **145** | City of Seattle | Lake Union | *No combined sewer overflow during 2016* | | | | |

| Permit No | Outfall No | Facility Name | Receiving Water | CSO Events | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Starting Date | Volume (gallons) | Duration (hours) | Storm Duration (hours) | Precipitation (inches) |
| WA0031682 | **146** | City of Seattle | Lake Union | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **147** | City of Seattle | Lake Union | 01/12/2016 | 72,840 | 14.42 | 47.13 | 1.18 |
| | | | | 01/16/2016 | 160,076 | 37.08 | 56.73 | 1.19 |
| | | | | 01/19/2016 | 51,965 | 3.25 | 105.73 | 1.75 |
| | | | | 01/21/2016 | 3,147,177 | 32.08 | 166.32 | 4.37 |
| | | | | 01/23/2016 | 358,476 | 4.58 | 197.48 | 4.88 |
| | | | | 01/26/2016 | 198 | 0.17 | 4.62 | 0.13 |
| | | | | 01/27/2016 | 1,523,958 | 14.58 | 52.37 | 1.58 |
| | | | | 01/29/2016 | 1,236 | 0.50 | 76.87 | 1.78 |
| | | | | 02/03/2016 | 16,365 | 2.25 | 26.13 | 0.66 |
| | | | | 02/05/2016 | 3,528 | 0.25 | 1.45 | 0.13 |
| | | | | 02/10/2016 | 5,243 | 0.33 | 0.88 | 0.13 |
| | | | | 02/11/2016 | 586,149 | 25.83 | 62.72 | 1.39 |
| | | | | 02/17/2016 | 201,368 | 3.50 | 8.52 | 0.44 |
| | | | | 02/19/2016 | 14,806 | 0.42 | 46.77 | 0.89 |
| | | | | 02/29/2016 | 3,851 | 0.17 | 21.52 | 0.19 |
| | | | | 03/01/2016 | 25,042 | 8.58 | 57.02 | 0.56 |
| | | | | 03/02/2016 | 57,330 | 14.17 | 103.68 | 0.95 |
| | | | | 03/06/2016 | 52,663 | 21.50 | 196.48 | 1.98 |
| | | | | 03/09/2016 | 851,681 | 12.25 | 25.50 | 0.82 |
| | | | | 03/11/2016 | 56,628 | 16.42 | 26.97 | 0.45 |
| | | | | 03/13/2016 | 90,365 | 2.25 | 55.88 | 1.03 |
| | | | | 03/22/2016 | 2,378 | 0.17 | 44.60 | 0.51 |
| | | | | 03/27/2016 | 21,750 | 2.00 | 14.85 | 0.36 |
| | | | | 04/04/2016 | 115 | 0.08 | 4.17 | 0.24 |
| | | | | 04/12/2016 | 10,944 | 0.83 | 2.47 | 0.26 |

| Permit No | Outfall No | Facility Name | Receiving Water | CSO Events | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Starting Date | Volume (gallons) | Duration (hours) | Storm Duration (hours) | Precipitation (inches) |
| | | | | 04/24/2016 | 23,628 | 8.25 | 21.65 | 0.50 |
| | | | | 05/18/2016 | 28,993 | 0.75 | 1.18 | 0.23 |
| | | | | 05/29/2016 | 854 | 0.17 | 0.62 | 0.08 |
| | | | | 06/17/2016 | 42,146 | 19.08 | 25.95 | 0.47 |
| | | | | 06/23/2016 | 214,931 | 23.50 | 43.73 | 0.79 |
| | | | | 07/22/2016 | 34,990 | 0.50 | 1.07 | 0.11 |
| | | | | 08/07/2016 | 5,372 | 0.17 | 1.27 | 0.11 |
| | | | | 09/02/2016 | 166,736 | 2.58 | 15.33 | 0.45 |
| | | | | 09/19/2016 | 135,656 | 0.58 | 1.42 | 0.21 |
| | | | | 10/01/2016 | 37,389 | 0.25 | 16.95 | 0.11 |
| | | | | 10/06/2016 | 19,990 | 0.33 | 75.58 | 0.36 |
| | | | | 10/08/2016 | 22,851 | 30.00 | 143.92 | 1.18 |
| | | | | 10/13/2016 | 1,929,031 | 73.17 | 78.80 | 4.04 |
| | | | | 10/19/2016 | 1,095,399 | 12.00 | 14.85 | 1.38 |
| | | | | 10/24/2016 | 12,924 | 0.33 | 0.77 | 0.10 |
| | | | | 10/26/2016 | 210,372 | 3.92 | 6.07 | 0.61 |
| | | | | 10/31/2016 | 188,132 | 48.67 | 67.72 | 1.46 |
| | | | | 11/02/2016 | 1,344 | 15.08 | 82.55 | 1.83 |
| | | | | 11/05/2016 | 135,677 | 18.83 | 43.30 | 1.12 |
| | | | | 11/15/2016 | 540,885 | 21.67 | 92.25 | 1.79 |
| | | | | 11/19/2016 | 1,632 | 0.17 | 0.85 | 0.11 |
| | | | | 11/22/2016 | 249,066 | 4.17 | 10.13 | 0.75 |
| | | | | 11/24/2016 | 504,549 | 19.00 | 57.80 | 2.22 |
| | | | | 11/26/2016 | 52,420 | 1.67 | 89.55 | 2.62 |
| | | | | 11/27/2016 | 49,153 | 2.17 | 124.55 | 3.22 |
| | | | | 11/30/2016 | 59 | 0.17 | 1.95 | 0.14 |
| | | | | 12/02/2016 | 715 | 0.33 | 3.68 | 0.13 |

| Permit No | Outfall No | Facility Name | Receiving Water | CSO Events | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Starting Date | Volume (gallons) | Duration (hours) | Storm Duration (hours) | Precipitation (inches) |
| | | | | 12/05/2016 | 163 | 0.25 | 82.68 | 0.64 |
| | | | | 12/09/2016 | 13,559 | 0.50 | 16.15 | 0.61 |
| | | | | 12/19/2016 | 13,649 | 2.92 | 20.78 | 0.51 |
| | | | | 12/23/2016 | 1,111 | 2.08 | 22.88 | 0.74 |
| | | | | 12/29/2016 | 681 | 0.25 | 6.77 | 0.17 |
| | | | | 12/31/2016 | 18,229 | 0.50 | 53.85 | 0.38 |
| | | | | Total | 13,068,417 | 531.67 | 2633.45 | 57.02 |
| | | | | Average | 225,318 | 9.17 | 45.40 | 0.98 |
| WA0031682 | **148** | City of Seattle | Lake Washington - Ship Canal | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **150/151** | City of Seattle | Salmon Way | 01/12/2016 | 11,028 | 15.80 | 47.85 | 1.15 |
| | | | | 01/16/2016 | 3,001 | 36.17 | 60.65 | 1.00 |
| | | | | 01/19/2016 | 2,567 | 3.33 | 109.65 | 1.52 |
| | | | | 01/21/2016 | 568,231 | 25.30 | 168.32 | 3.99 |
| | | | | 01/23/2016 | 2,156 | 1.12 | 198.68 | 4.43 |
| | | | | 01/27/2016 | 11,439 | 7.13 | 46.08 | 1.06 |
| | | | | 02/03/2016 | 674 | 0.60 | 18.97 | 0.30 |
| | | | | 02/12/2016 | 184,631 | 10.37 | 48.55 | 1.06 |
| | | | | 02/17/2016 | 14,498 | 1.55 | 7.40 | 0.32 |
| | | | | 02/19/2016 | 1,653 | 0.20 | 46.90 | 0.75 |
| | | | | 03/03/2016 | 225 | 0.07 | 103.82 | 1.28 |
| | | | | 03/09/2016 | 142,170 | 7.52 | 26.37 | 1.14 |
| | | | | 03/13/2016 | 6,093 | 1.15 | 106.83 | 2.35 |
| | | | | 04/24/2016 | 40,024 | 0.20 | 15.27 | 0.58 |
| | | | | 06/17/2016 | 2,631 | 1.23 | 8.42 | 0.30 |
| | | | | 06/23/2016 | 116,497 | 0.40 | 21.10 | 0.30 |

| Permit No | Outfall No | Facility Name | Receiving Water | CSO Events | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Starting Date | Volume (gallons) | Duration (hours) | Storm Duration (hours) | Precipitation (inches) |
| | | | | 07/22/2016 | 1,757 | 0.10 | 0.48 | 0.04 |
| | | | | 08/07/2016 | 31,756 | 0.27 | 0.45 | 0.04 |
| | | | | 09/02/2016 | 75,571 | 1.03 | 12.45 | 0.45 |
| | | | | 09/19/2016 | 3,486 | 0.10 | 2.25 | 0.22 |
| | | | | 10/06/2016 | 217 | 0.20 | 3.40 | 0.23 |
| | | | | 10/13/2016 | 245,096 | 52.37 | 60.55 | 3.13 |
| | | | | 10/19/2016 | 222,083 | 9.77 | 13.20 | 1.21 |
| | | | | 10/26/2016 | 302,676 | 14.23 | 17.38 | 1.48 |
| | | | | 10/31/2016 | 34,289 | 25.07 | 73.83 | 1.44 |
| | | | | 11/05/2016 | 37,303 | 0.47 | 5.45 | 0.41 |
| | | | | 11/15/2016 | 143,437 | 3.27 | 76.55 | 1.17 |
| | | | | 11/24/2016 | 3,671 | 10.97 | 58.23 | 1.83 |
| | | | | 11/26/2016 | 5,358 | 0.90 | 95.77 | 2.58 |
| | | | | 11/27/2016 | 10,250 | 0.77 | 130.57 | 3.24 |
| | | | | 12/09/2016 | 1,708 | 17.43 | 31.93 | 0.92 |
| | | | | Total | 2,226,175 | 249.07 | 1617.35 | 39.92 |
| | | | | Average | 71,812 | 8.03 | 52.17 | 1.29 |
| WA0031682 | **152** | City of Seattle | Salmon Bay | 01/11/2016 | 833,924 | 47.30 | 50.42 | 1.25 |
| | | | | 01/16/2016 | 784,230 | 45.97 | 69.02 | 1.07 |
| | | | | 01/19/2016 | 509,784 | 5.20 | 110.35 | 1.53 |
| | | | | 01/20/2016 | 10,737,061 | 79.52 | 215.42 | 4.53 |
| | | | | 01/26/2016 | 1,976 | 1.18 | 4.72 | 0.10 |
| | | | | 01/27/2016 | 3,025,657 | 43.17 | 77.27 | 1.51 |
| | | | | 02/01/2016 | 9,661 | 0.50 | 0.58 | 0.05 |
| | | | | 02/03/2016 | 376,217 | 10.10 | 25.80 | 0.57 |
| | | | | 02/05/2016 | 88,287 | 1.13 | 1.88 | 0.14 |

| Permit No | Outfall No | Facility Name | Receiving Water | CSO Events | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Starting Date | Volume (gallons) | Duration (hours) | Storm Duration (hours) | Precipitation (inches) |
| | | | | 02/10/2016 | 33,189 | 0.67 | 1.32 | 0.12 |
| | | | | 02/11/2016 | 1,561,824 | 41.97 | 79.02 | 1.24 |
| | | | | 02/15/2016 | 1,260 | 7.58 | 138.43 | 1.53 |
| | | | | 02/17/2016 | 435,756 | 42.30 | 47.10 | 0.76 |
| | | | | 02/21/2016 | 1,985 | 0.53 | 0.57 | 0.05 |
| | | | | 02/26/2016 | 42 | 0.17 | 1.55 | 0.09 |
| | | | | 02/28/2016 | 1,860 | 2.18 | 4.85 | 0.13 |
| | | | | 03/01/2016 | 316,276 | 9.70 | 57.35 | 0.79 |
| | | | | 03/02/2016 | 225,367 | 18.52 | 104.02 | 1.28 |
| | | | | 03/04/2016 | 353,603 | 67.23 | 196.85 | 2.25 |
| | | | | 03/09/2016 | 2,807,348 | 20.35 | 33.87 | 1.19 |
| | | | | 03/11/2016 | 1,581,160 | 55.77 | 117.70 | 2.44 |
| | | | | 03/21/2016 | 78,248 | 0.85 | 16.42 | 0.21 |
| | | | | 03/23/2016 | 312 | 0.55 | 79.12 | 0.57 |
| | | | | 03/26/2016 | 76,137 | 11.55 | 14.73 | 0.36 |
| | | | | 04/03/2016 | 70,908 | 0.68 | 1.27 | 0.13 |
| | | | | 04/12/2016 | 6,119 | 34.62 | 34.97 | 0.33 |
| | | | | 04/24/2016 | 60,382 | 15.63 | 15.53 | 0.59 |
| | | | | 05/08/2016 | 8,104 | 0.23 | 16.73 | 0.09 |
| | | | | 05/18/2016 | 938 | 0.17 | 0.48 | 0.08 |
| | | | | 06/14/2016 | 17 | 0.08 | 0.37 | 0.12 |
| | | | | 06/17/2016 | 135,103 | 1.65 | 8.48 | 0.30 |
| | | | | 06/20/2016 | 20,229 | 0.60 | 1.03 | 0.16 |
| | | | | 06/23/2016 | 250,978 | 0.68 | 21.17 | 0.30 |
| | | | | 07/22/2016 | 51,688 | 1.10 | 0.95 | 0.12 |
| | | | | 08/07/2016 | 8,842 | 0.27 | 0.45 | 0.04 |
| | | | | 09/02/2016 | 468,133 | 6.80 | 17.95 | 0.46 |

| Permit No | Outfall No | Facility Name | Receiving Water | CSO Events | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Starting Date | Volume (gallons) | Duration (hours) | Storm Duration (hours) | Precipitation (inches) |
| | | | | 09/19/2016 | 126,537 | 0.62 | 2.50 | 0.22 |
| | | | | 10/01/2016 | 19,519 | 0.40 | 16.85 | 0.19 |
| | | | | 10/06/2016 | 67,308 | 0.58 | 3.60 | 0.23 |
| | | | | 10/08/2016 | 125,242 | 9.73 | 51.33 | 0.89 |
| | | | | 10/13/2016 | 3,235,071 | 92.33 | 93.98 | 3.77 |
| | | | | 10/18/2016 | 924 | 0.23 | 124.88 | 3.92 |
| | | | | 10/19/2016 | 2,303,320 | 11.93 | 15.07 | 1.26 |
| | | | | 10/24/2016 | 52,097 | 0.52 | 5.93 | 0.13 |
| | | | | 10/26/2016 | 2,483,992 | 16.10 | 18.05 | 1.49 |
| | | | | 10/29/2016 | 38,166 | 3.23 | 5.27 | 0.24 |
| | | | | 10/30/2016 | 832,054 | 75.60 | 112.47 | 1.97 |
| | | | | 11/05/2016 | 696,206 | 16.05 | 18.28 | 0.87 |
| | | | | 11/09/2016 | 29,640 | 0.62 | 5.63 | 0.14 |
| | | | | 11/13/2016 | 1,583,101 | 60.62 | 92.12 | 1.49 |
| | | | | 11/19/2016 | 149 | 0.17 | 1.38 | 0.07 |
| | | | | 11/22/2016 | 621,724 | 8.48 | 16.77 | 0.68 |
| | | | | 11/24/2016 | 3,758,709 | 87.38 | 131.83 | 3.25 |
| | | | | 11/30/2016 | 50,372 | 1.33 | 2.75 | 0.15 |
| | | | | 12/02/2016 | 28,571 | 6.83 | 9.75 | 0.18 |
| | | | | 12/04/2016 | 21,062 | 3.97 | 8.50 | 0.21 |
| | | | | 12/05/2016 | 16,313 | 0.55 | 44.83 | 0.43 |
| | | | | 12/09/2016 | 198,499 | 26.88 | 32.23 | 0.92 |
| | | | | 12/19/2016 | 158,985 | 18.57 | 20.93 | 0.52 |
| | | | | 12/22/2016 | 419,286 | 16.88 | 28.87 | 1.02 |
| | | | | 12/26/2016 | 223,521 | 5.93 | 6.78 | 0.42 |
| | | | | 12/29/2016 | 20,089 | 10.23 | 12.37 | 0.25 |
| | | | | 12/31/2016 | 28,996 | 0.60 | 4.98 | 0.10 |

| Permit No | Outfall No | Facility Name | Receiving Water | CSO Events | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Starting Date | Volume (gallons) | Duration (hours) | Storm Duration (hours) | Precipitation (inches) |
| | | | | Total | 42,062,056 | 1052.88 | 2455.67 | 51.49 |
| | | | | Average | 667,652 | 16.71 | 38.98 | 0.82 |
| WA0031682 | **161** | City of Seattle | Lake Washington | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **165** | City of Seattle | Lake Washington | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **168** | City of Seattle | Longfellow Creek | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **169** | City of Seattle | Lake Washington | 10/14/2016 | 664,680 | 6.27 | 37.20 | 2.26 |
| | | | | Total | 664,680 | 6.27 | 37.20 | 2.26 |
| | | | | Average | 664,680 | 6.27 | 37.20 | 2.26 |
| WA0031682 | **170** | City of Seattle | Longfellow Creek | *No combined sewer overflow during 2016* | | | | |
| WA0031682 | **171** | City of Seattle | Lake Washington | 10/14/2016 | 8,990 | 0.23 | 35.45 | 2.99 |
| | | | | 11/15/2016 | 81,104 | 1.30 | 76.22 | 1.44 |
| | | | | Total | 90,094 | 1.53 | 111.67 | 4.43 |
| | | | | Average | 45,047 | 0.77 | 55.83 | 2.22 |
| WA0031682 | **174** | City of Seattle | Lake Washington Canal | 01/21/2016 | 4,293,897 | 24.75 | 165.98 | 4.36 |
| | | | | 01/23/2016 | 460,274 | 2.92 | 197.07 | 4.87 |
| | | | | 01/27/2016 | 2,049,765 | 12.00 | 51.62 | 1.56 |
| | | | | 02/12/2016 | 452,107 | 11.25 | 50.13 | 1.32 |
| | | | | 02/17/2016 | 145,547 | 1.58 | 8.43 | 0.44 |
| | | | | 03/09/2016 | 1,059,265 | 5.50 | 22.40 | 0.69 |
| | | | | 10/13/2016 | 242,639 | 16.08 | 36.35 | 2.59 |

| Permit No | Outfall No | Facility Name | Receiving Water | CSO Events | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Starting Date | Volume (gallons) | Duration (hours) | Storm Duration (hours) | Precipitation (inches) |
| | | | | 10/20/2016 | 325,778 | 6.33 | 14.43 | 1.24 |
| | | | | 10/26/2016 | 21,669 | 0.58 | 5.33 | 0.55 |
| | | | | 11/15/2016 | 48,161 | 1.67 | 77.52 | 1.22 |
| | | | | 11/22/2016 | 358 | 0.17 | 8.88 | 0.65 |
| | | | | 11/24/2016 | 7,226 | 0.50 | 54.88 | 1.97 |
| | | | | Total | 9,106,686 | 83.33 | 693.03 | 21.46 |
| | | | | Average | 758,891 | 6.94 | 57.75 | 1.79 |
| WA0031682 | **175** | City of Seattle | Lake Union | *No combined sewer overflow during 2016* | | | | |

**Table 5-5. Comparison of 2016 and Baseline Flows by Outfall**

| Outfall Number | 2012 - 2016 Average CSO Frequency (No./year) | 2016 CSO Discharge Events | | | Receiving Waters of Overflow | 2010 Baseline CSO | | 2016 CSOs Compared to 2010 Baseline CSOs |
|---|---|---|---|---|---|---|---|---|
| | | Frequency (No./year) | Duration (hours) | Volume (gallons) | | Frequency (No./year) | Volume (MG/year) | |
| **012** | 0.8 | 0 | 0.00 | 0 | Lake Washington | 0 | 0 | Equals |
| **013** | 6.6 | 2 | 22.93 | 389,145 | Lake Washington | 12 | 6.7 | Below |
| **014** | 0.4 | 1 | 0.42 | 14 | Lake Washington | 0 | 0 | Above |
| **015** | 3.2 | 3 | 5.30 | 43,665 | Lake Washington | 1.2 | 0.3 | Frequency Above, Volume Below |
| **016** | 0 | 0 | 0.00 | 0 | Lake Washington | 0 | 0 | Equals |
| **018** | 4 | 3 | 79.17 | 1,703,725 | Union Bay | 6.6 | 0.5 | Frequency Below, Volume Above |
| **019** | 0.2 | 0 | 0.00 | 0 | Union Bay | 0.2 | 0 | Frequency Below, Volume Equals |
| **020** | 4.2 | 4 | 18.50 | 277,377 | Union Bay | 2.6 | 0.1 | Above |
| **022** | 2.8 | 1 | 0.73 | 1,002 | Union Bay | 0.7 | 0.1 | Frequency Above, Volume Below |
| **024** | 0.6 | 1 | 0.67 | 39,762 | Lake Washington | 0.2 | 0 | Above |
| **025** | 0.6 | 1 | 0.60 | 48,394 | Lake Washington | 2.8 | 1.6 | Below |
| **026** | 0 | 0 | 0.00 | 0 | Lake Washington | 0.3 | 0 | Frequency Below, Volume Equals |
| **027** | 0 | 0 | 0.00 | 0 | Lake Washington | 0 | 0 | Equals |
| **028** | 4.2 | 4 | 0.53 | 4,174 | Lake Washington | 15 | 0.4 | Below |
| **029** | 8.8 | 10 | 13.43 | 23,379 | Lake Washington | 4.7 | 0.3 | Frequency Above, Volume Below |
| **030** | 3.2 | 5 | 3.85 | 2,380 | Lake Washington | 5.4 | 0.7 | Below |
| **031** | 4.4 | 10 | 63.26 | 689,411 | Lake Washington | 9.3 | 0.5 | Above |
| **032** | 2.2 | 4 | 3.07 | 20,455 | Lake Washington | 8.4 | 0.3 | Below |
| **033** | 0.2 | 0 | 0.00 | 0 | Lake Washington | 0.2 | 0 | Frequency Below, Volume Equals |
| **034** | 0.8 | 0 | 0.00 | 0 | Lake Washington | 1.4 | 0.5 | Below |
| **035** | 1.8 | 0 | 0.00 | 0 | Lake Washington | 2 | 0.3 | Below |
| **036** | 2.6 | 2 | 2.70 | 8,215 | Lake Washington | 2.7 | 0.1 | Below |
| **038** | 1 | 0 | 0.00 | 0 | Lake Washington | 0.7 | 0.4 | Below |
| **040** | 5.8 | 1 | 67.22 | 455,337 | Lake Washington | 6 | 0.8 | Below |
| **041** | 11 | 3 | 67.22 | 455,337 | Lake Washington | 7.5 | 0.9 | Below |
| **042** | 2.6 | 0 | 0.00 | 0 | Lake Washington | 0.6 | 0.02 | Below |
| **043** | 9.2 | 5 | 57.17 | 1,687,465 | Lake Washington | 7 | 0.7 | Frequency Below, Volume Above |
| **044** | 22 | 34 | 452.47 | 9,129,326 | Lake Washington | 13 | 9.3 | Frequency Above, Volume Below |
| **045** | 12.8 | 12 | 68.85 | 322,189 | Lake Washington | 5.9 | 1.1 | Frequency Above, Volume Below |

| Outfall Number | 2012 - 2016 Average CSO Frequency (No./year) | 2016 CSO Discharge Events | | | Receiving Waters of Overflow | 2010 Baseline CSO | | 2016 CSOs Compared to 2010 Baseline CSOs |
|---|---|---|---|---|---|---|---|---|
| | | Frequency (No./year) | Duration (hours) | Volume (gallons) | | Frequency (No./year) | Volume (MG/year) | |
| **046** | 1.6 | 0 | 0.00 | 0 | Lake Washington | 6.5 | 0.9 | Below |
| **047** | 8.4 | 2 | 1.92 | 109,548 | Lake Washington | 5.6 | 1.8 | Below |
| **048** | 0 | 0 | 0.00 | 0 | Lake Washington | 0 | 0 | Equals |
| **049** | 4.4 | 4 | 15.19 | 819,793 | Lake Washington | 1.6 | 0.8 | Above |
| **057** | 0 | 0 | 0.00 | 0 | Puget Sound | 0 | 0 | Equals |
| **059** | 0.8 | 1 | 0.42 | 76,208 | Salmon Bay | 0.2 | 0.4 | Frequency Above, Volume Below |
| **060** | 3 | 2 | 4.70 | 20,813 | Salmon Bay | 1.7 | 0.8 | Frequency Above, Volume Below |
| **061** | 0 | 0 | 0.00 | 0 | Elliott Bay | 0 | 0 | Equals |
| **062** | 2 | 1 | 4.42 | 1,868 | Elliott Bay | 0.7 | 0 | Above |
| **064** | 0 | 0 | 0.00 | 0 | Elliott Bay | 0.1 | 0 | Frequency Below, Volume Equals |
| **068** | 2 | 2 | 17.30 | 247,681 | Elliott Bay | 1.4 | 1.3 | Frequency Above, Volume Below |
| **069** | 3.2 | 4 | 0.90 | 65,281 | Elliott Bay | 4.4 | 1.4 | Below |
| **070** | 0.4 | 0 | 0.00 | 0 | Elliott Bay | 0.9 | 0.2 | Below |
| **071** | 3.8 | 2 | 1.77 | 140,046 | Elliott Bay | 4.3 | 1.3 | Below |
| **072** | 0.2 | 0 | 0.00 | 0 | Elliott Bay | 1.2 | 0.3 | Below |
| **078** | 0 | 0 | 0.00 | 0 | Elliott Bay | 0.3 | 0.2 | Below |
| **080** | 0 | 0 | 0.00 | 0 | Elliott Bay | 0 | 0 | Equals |
| **083** | 0 | 0 | 0.00 | 0 | Puget Sound | 0 | 0 | Equals |
| **085** | 0 | 0 | 0.00 | 0 | Puget Sound | 0 | 0 | Equals |
| **088** | 0 | 0 | 0.00 | 0 | Puget Sound | 0.3 | 0.2 | Below |
| **090** | 0 | 0 | 0.00 | 0 | Puget Sound | 0.2 | 0 | Frequency Below, Volume Equals |
| **091** | 0 | 0 | 0.00 | 0 | Puget Sound | 0 | 0 | Equals |
| **094** | 0 | 0 | 0.00 | 0 | Puget Sound | 0.1 | 0 | Frequency Below, Volume Equals |
| **095** | 0.4 | 0 | 0.00 | 0 | Puget Sound | 3 | 0.4 | Below |
| **099** | 4.2 | 5 | 23.00 | 1,053,542 | West Waterway - Duwamish | 0.5 | 2.8 | Frequency Above, Volume Below |
| **107** | 5.4 | 5 | 42.58 | 427,231 | East Waterway - Duwamish | 3.8 | 1.9 | Frequency Above, Volume Below |
| **111** | 2 | 0 | 0.00 | 0 | Duwamish River | 3 | 7.9 | Below |
| **120** | 0 | 0 | 0.00 | 0 | Lake Union | 0 | 0 | Equals |
| **121** | 0 | 0 | 0.00 | 0 | Lake Union | 0.1 | 0 | Frequency Below, Volume Equals |
| **124** | 0 | 0 | 0.00 | 0 | Lake Union | 0 | 0 | Equals |
| **127** | 0.2 | 0 | 0.00 | 0 | Lake Union | 0.7 | 0.1 | Below |

| Outfall Number | 2012 - 2016 Average CSO Frequency (No./year) | 2016 CSO Discharge Events | | | Receiving Waters of Overflow | 2010 Baseline CSO | | 2016 CSOs Compared to 2010 Baseline CSOs |
|---|---|---|---|---|---|---|---|---|
| | | Frequency (No./year) | Duration (hours) | Volume (gallons) | | Frequency (No./year) | Volume (MG/year) | |
| **129** | 0.4 | 0 | 0.00 | 0 | Lake Union | 0.1 | 0 | Frequency Below, Volume Equals |
| **130** | 0.6 | 0 | 0.00 | 0 | Lake Union | 0 | 0 | Equals |
| **131** | 0 | 0 | 0.00 | 0 | Lake Union | 0.1 | 0 | Frequency Below, Volume Equals |
| **132** | 1 | 0 | 0.00 | 0 | Lake Union | 0.7 | 0 | Frequency Below, Volume Equals |
| **134** | 0 | 0 | 0.00 | 0 | Lake Union | 0 | 0 | Equals |
| **135** | 0.4 | 0 | 0.00 | 0 | Lake Union | 0.3 | 0 | Frequency Below, Volume Equals |
| **136** | 0 | 0 | 0.00 | 0 | Lake Union | 0 | 0 | Equals |
| **138** | 3.4 | 3 | 3.23 | 85,056 | Portage Bay | 2.3 | 2 | Frequency Above, Volume Below |
| **139** | 2.2 | 0 | 0.00 | 0 | Portage Bay | 0.7 | 1.4 | Below |
| **140** | 8.4 | 10 | 3.29 | 48,134 | Portage Bay | 4.1 | 0.3 | Frequency Above, Volume Below |
| **141** | 0 | 0 | 0.00 | 0 | Portage Bay | 0.1 | 0 | Frequency Below, Volume Equals |
| **144** | 0 | 0 | 0.00 | 0 | Lake Union | 0.1 | 0.2 | Below |
| **145** | 0 | 0 | 0.00 | 0 | Lake Union | 0 | 0 | Equals |
| **146** | 0 | 0 | 0.00 | 0 | Lake Union | 0 | 0 | Equals |
| **147** | 42.6 | 58 | 531.66 | 13,068,417 | Lake Union | 33 | 19 | Frequency Above, Volume Below |
| **148** | 0.2 | 0 | 0.00 | 0 | Lake Washington Ship Canal | 0 | 0 | Equals |
| **150/151** | 27.6 | 31 | 249.07 | 2,226,176 | Salmon Bay | 15 | 2 | Above |
| **152** | 50.2 | 63 | 1052.89 | 42,062,058 | Salmon Bay | 15 | 9.7 | Above |
| **161** | 0 | 0 | 0.00 | 0 | Lake Washington | 0 | 0 | Equals |
| **165** | 1.2 | 0 | 0.00 | 0 | Lake Washington | 1.1 | 0.02 | Below |
| **168** | 1 | 0 | 0.00 | 0 | Longfellow Creek | 3.9 | 1.6 | Below |
| **169** | 1 | 1 | 6.27 | 664,680 | Longfellow Creek | 2.2 | 49 | Below |
| **170** | 0.2 | 0 | 0.00 | 0 | Longfellow Creek | 0.4 | 0.1 | Below |
| **171** | 8.6 | 2 | 1.53 | 90,094 | Lake Washington | 4.1 | 0.75 | Below |
| **174** | 14.2 | 12 | 83.34 | 9,106,686 | Lake Washington Ship Canal | 11 | 5.9 | Above |
| **175** | 1.2 | 0 | 0.00 | 0 | Lake Union | 0.7 | 0 | Frequency Below, Volume Equals |
| **Total** | **322** | **314** | **2,972** | **85,614,065** | | **252** | **140** | |

## Table 5-6. 2012-2016 Summary Comparison of Overflows by Outfall

| Outfall No. | Frequency | | | | | Overflow Duration (Hours) | | | | | Overflow Volume (Gallons per Year) | | | | | Receiving Water |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2012 | 2013 | 2014 | 2015 | 2016 | 2012 | 2013 | 2014 | 2015 | 2016 | 2012 | 2013 | 2014 | 2015 | 2016 | |
| **012** | 1 | 1 | 2 | 0 | 0 | 10.87 | 0.30 | 0.87 | 0.00 | 0.00 | 58,966 | 590 | 2,612 | 0 | 0 | Lake Washington |
| **013** | 7 | 2 | 15 | 7 | 2 | 60.87 | 8.42 | 139.42 | 80.15 | 22.93 | 4,471,990 | 889,232 | 12,376,374 | 10,406,831 | 389,145 | Lake Washington |
| **014** | 0 | 0 | 0 | 1 | 1 | 0.00 | 0.00 | 0.00 | 0.03 | 0.42 | 0 | 0 | 0 | 136 | 14 | Lake Washington |
| **105** | 2 | 2 | 2 | 7 | 3 | 14.78 | 2.53 | 6.41 | 5.69 | 5.30 | 188,231 | 28,466 | 66,045 | 130,433 | 43,665 | Lake Washington |
| **016** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Lake Washington |
| **018** | 8 | 2 | 5 | 2 | 3 | 70.93 | 6.43 | 38.75 | 12.53 | 79.17 | 9,541,486 | 1,635,247 | 3,350,103 | 2,821,975 | 1,703,725 | Union Bay |
| **019** | 0 | 1 | 0 | 0 | 0 | 0.00 | 1.03 | 0.00 | 0.00 | 0.00 | 0 | 902 | 0 | 0 | 0 | Union Bay |
| **020** | 2 | 2 | 5 | 8 | 4 | 14.36 | 6.13 | 18.60 | 28.73 | 18.50 | 762,481 | 209,475 | 562,408 | 939,125 | 277,377 | Union Bay |
| **022** | 4 | 3 | 3 | 3 | 1 | 46.23 | 8.42 | 4.02 | 6.75 | 0.73 | 23,146 | 11,402 | 16,765 | 10,825 | 1,002 | Union Bay |
| **024** | 1 | 1 | 0 | 0 | 1 | 11.00 | 1.73 | 0.00 | 0.00 | 0.67 | 1,179,613 | 184,519 | 0 | 0 | 39,762 | Lake Washington |
| **025** | 1 | 1 | 0 | 0 | 1 | 10.77 | 1.53 | 0.00 | 0.00 | 0.60 | 1,214,977 | 97,238 | 0 | 0 | 48,394 | Lake Washington |
| **026** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Lake Washington |
| **027** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Lake Washington |
| **028** | 2 | 3 | 7 | 5 | 4 | 0.35 | 6.33 | 0.77 | 10.68 | 0.53 | 3,931 | 4,761 | 3,781 | 15,141 | 4,174 | Lake Washington |
| **029** | 11 | 7 | 7 | 9 | 10 | 43.45 | 21.73 | 23.68 | 79.00 | 13.43 | 299,426 | 107,553 | 134,427 | 163,604 | 23,379 | Lake Washington |
| **030** | 3 | 2 | 2 | 4 | 5 | 18.53 | 10.60 | 8.53 | 47.70 | 3.85 | 360,739 | 103,602 | 149,342 | 68,875 | 2,380 | Lake Washington |
| **031** | 2 | 0 | 5 | 5 | 10 | 9.76 | 0.00 | 28.69 | 108.95 | 63.26 | 8,170 | 0 | 152,897 | 1,292,158 | 689,411 | Lake Washington |
| **032** | 3 | 1 | 2 | 1 | 4 | 19.46 | 6.42 | 10.08 | 1.40 | 3.07 | 237,856 | 88,300 | 111,411 | 21,463 | 20,455 | Lake Washington |
| **033** | 1 | 0 | 0 | 0 | 0 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 360 | 0 | 0 | 0 | 0 | Lake Washington |
| **034** | 1 | 0 | 2 | 1 | 0 | 11.13 | 0.00 | 4.97 | 1.70 | 0.00 | 229,082 | 0 | 79,864 | 36,871 | 0 | Lake Washington |
| **035** | 1 | 1 | 2 | 5 | 0 | 1.07 | 0.08 | 0.16 | 2.82 | 0.00 | 5,893 | 802 | 851 | 26,232 | 0 | Lake Washington |
| **036** | 2 | 3 | 2 | 4 | 2 | 12.65 | 4.72 | 8.40 | 92.02 | 2.70 | 40,092 | 8,389 | 26,931 | 129,992 | 8,215 | Lake Washington |
| **038** | 1 | 0 | 2 | 2 | 0 | 10.38 | 0.00 | 2.53 | 8.08 | 0.00 | 433,405 | 0 | 55,731 | 424,286 | 0 | Lake Washington |
| **040** | 10 | 2 | 11 | 5 | 1 | 83.74 | 14.70 | 97.27 | 133.60 | 67.22 | 3,602,239 | 728,493 | 2,502,735 | 2,079,022 | 455,337 | Lake Washington |
| **041** | 13 | 8 | 22 | 9 | 3 | 189.40 | 54.07 | 269.17 | 233.73 | 67.22 | 1,747,947 | 400,178 | 2,745,644 | 6,552,815 | 455,337 | Lake Washington |

| Outfall No. | Frequency | | | | | Overflow Duration (Hours) | | | | | Overflow Volume (Gallons per Year) | | | | | Receiving Water |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2012 | 2013 | 2014 | 2015 | 2016 | 2012 | 2013 | 2014 | 2015 | 2016 | 2012 | 2013 | 2014 | 2015 | 2016 | |
| 042 | 3 | 1 | 6 | 3 | 0 | 26.43 | 7.13 | 46.80 | 10.67 | 0.00 | 453,768 | 125,525 | 489,133 | 161,845 | 0 | Lake Washington |
| 043 | 14 | 6 | 14 | 7 | 5 | 135.33 | 17.02 | 117.08 | 113.98 | 57.17 | 2,693,671 | 517,740 | 1,541,559 | 3,237,045 | 1,687,465 | Lake Washington |
| 044 | 22 | 11 | 25 | 18 | 34 | 399.66 | 91.27 | 319.81 | 419.69 | 452.47 | 12,327,310 | 2,873,135 | 11,257,313 | 17,584,437 | 9,129,326 | Lake Washington |
| 045 | 14 | 7 | 21 | 10 | 12 | 199.56 | 53.33 | 95.72 | 188.83 | 68.85 | 889,798 | 243,619 | 520,482 | 1,047,926 | 322,189 | Lake Washington |
| 046 | 2 | 1 | 4 | 1 | 0 | 16.00 | 0.33 | 27.88 | 1.33 | 0.00 | 27,595 | 281 | 51,982 | 16,053 | 0 | Lake Washington |
| 047 | 12 | 10 | 15 | 3 | 2 | 89.47 | 70.75 | 55.72 | 57.00 | 1.92 | 10,000,932 | 2,377,107 | 2,475,920 | 1,859,583 | 109,548 | Lake Washington |
| 048 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Lake Washington |
| 049 | 5 | 2 | 6 | 5 | 4 | 35.25 | 9.27 | 44.28 | 86.64 | 15.19 | 1,984,105 | 1,056,726 | 2,452,672 | 5,220,691 | 819,793 | Lake Washington |
| 057 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Puget Sound |
| 059 | 2 | 1 | 0 | 0 | 1 | 5.51 | 0.44 | 0.00 | 0.00 | 0.42 | 95,408 | 11,666 | 0 | 0 | 76,208 | Salmon Bay |
| 060 | 6 | 1 | 2 | 4 | 2 | 10.76 | 1.17 | 4.30 | 8.08 | 4.70 | 727,910 | 47,234 | 86,372 | 200,834 | 20,813 | Salmon Bay |
| 061 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Elliott Bay |
| 062 | 1 | 2 | 2 | 4 | 1 | 6.80 | 0.41 | 0.64 | 3.70 | 4.42 | 237 | 7,285 | 1,584 | 75,305 | 1,868 | Elliott Bay |
| 064 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Elliott Bay |
| 068 | 1 | 1 | 2 | 4 | 2 | 7.00 | 2.10 | 3.84 | 5.48 | 17.30 | 2,801,197 | 331,236 | 188,263 | 559,251 | 247,681 | Elliott Bay |
| 069 | 2 | 3 | 3 | 4 | 4 | 10.70 | 2.18 | 1.09 | 2.52 | 0.90 | 277,093 | 439,013 | 206,238 | 435,845 | 65,281 | Elliott Bay |
| 070 | 0 | 1 | 0 | 1 | 0 | 0.00 | 0.60 | 0.00 | 0.13 | 0.00 | 0 | 65,550 | 0 | 22,849 | 0 | Elliott Bay |
| 071 | 5 | 4 | 2 | 6 | 2 | 14.47 | 11.08 | 1.01 | 3.20 | 1.77 | 600,682 | 369,332 | 81,675 | 225,540 | 140,046 | Elliott Bay |
| 072 | 0 | 1 | 0 | 0 | 0 | 0.00 | 0.47 | 0.00 | 0.00 | 0.00 | 0 | 14,783 | 0 | 0 | 0 | Elliott Bay |
| 078 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Elliott Bay |
| 080 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Elliott Bay |
| 083 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Puget Sound |
| 085 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Puget Sound |
| 088 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Puget Sound |
| 090 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Puget Sound |
| 091 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Puget Sound |
| 094 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Puget Sound |
| 095 | 1 | 1 | 0 | 0 | 0 | 0.22 | 1.58 | 0.00 | 0.00 | 0.00 | 4,276 | 803 | 0 | 0 | 0 | Puget Sound |

| Outfall No. | Frequency | | | | | Overflow Duration (Hours) | | | | | Overflow Volume (Gallons per Year) | | | | | Receiving Water |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2012 | 2013 | 2014 | 2015 | 2016 | 2012 | 2013 | 2014 | 2015 | 2016 | 2012 | 2013 | 2014 | 2015 | 2016 | |
| 099 | 5 | 1 | 6 | 4 | 5 | 30.00 | 5.07 | 72.67 | 74.23 | 23.00 | 2,494,862 | 405,700 | 3,827,730 | 4,855,651 | 1,053,542 | W Waterway - Duwamish River |
| 107 | 4 | 3 | 6 | 9 | 5 | 14.02 | 9.33 | 30.10 | 82.20 | 42.58 | 352,041 | 232,587 | 288,804 | 673,362 | 427,231 | E Waterway - Duwamish River |
| 111 | 1 | 3 | 3 | 3 | 0 | 26.23 | 6.37 | 16.59 | 6.57 | 0.00 | 314,968 | 11,507 | 146,654 | 1,056,402 | 0 | Duwamish River |
| 120 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Lake Union |
| 121 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Lake Union |
| 124 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Lake Union |
| 127 | 0 | 0 | 0 | 1 | 0 | 0.00 | 0.00 | 0.00 | 70.60 | 0.00 | 0 | 0 | 0 | 64,878 | 0 | Lake Union |
| 129 | 0 | 2 | 0 | 0 | 0 | 0.00 | 49.97 | 0.00 | 0.00 | 0.00 | 0 | 64,910 | 0 | 0 | 0 | Lake Union |
| 130 | 0 | 0 | 0 | 3 | 0 | 0.00 | 0.00 | 0.00 | 0.82 | 0.00 | 0 | 0 | 0 | 268,332 | 0 | Lake Union |
| 131 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Lake Union |
| 132 | 0 | 2 | 0 | 3 | 0 | 0.00 | 0.23 | 0.00 | 1.58 | 0.00 | 0 | 3,986 | 0 | 1,014,884 | 0 | Lake Union |
| 134 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Lake Union |
| 135 | 0 | 0 | 0 | 2 | 0 | 0.00 | 0.00 | 0.00 | 0.90 | 0.00 | 0 | 0 | 0 | 9,889 | 0 | Lake Union |
| 136 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Lake Union |
| 138 | 2 | 2 | 3 | 7 | 3 | 12.25 | 3.50 | 8.00 | 17.48 | 3.23 | 649,289 | 119,989 | 264,644 | 721,977 | 85,056 | Portage Bay |
| 139 | 2 | 1 | 2 | 6 | 0 | 10.60 | 1.43 | 3.33 | 16.38 | 0.00 | 320,403 | 47,561 | 47,515 | 1,171,445 | 0 | Portage Bay |
| 140 | 4 | 5 | 13 | 10 | 10 | 17.96 | 8.05 | 9.72 | 28.25 | 3.29 | 437,331 | 147,407 | 341,627 | 695,688 | 48,134 | Portage Bay |
| 141 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Portage Bay |
| 144 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Lake Union |
| 145 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Lake Union |
| 146 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Lake Union |
| 147 | 47 | 27 | 49 | 32 | 58 | 672.19 | 238.15 | 589.00 | 495.17 | 531.66 | 14,636,073 | 4,800,690 | 12,316,618 | 16,682,352 | 13,068,417 | Lake Union |
| 148 | 0 | 0 | 0 | 1 | 0 | 0.00 | 0.00 | 0.00 | 1.30 | 0.00 | 0 | 0 | 0 | 1,400 | 0 | Lake Washington Ship Canal |
| 150/ 151 | 31 | 14 | 34 | 28 | 31 | 378.01 | 114.80 | 268.14 | 387.00 | 249.07 | 4,871,447 | 1,737,206 | 3,543,723 | 2,539,871 | 2,226,176 | Salmon Bay |
| 152 | 57 | 44 | 53 | 34 | 63 | 1098.59 | 440.30 | 900.65 | 713.68 | 1052.89 | 52,382,276 | 13,192,217 | 41,104,401 | 36,195,281 | 42,062,058 | Salmon Bay |
| 161 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Lake Washington |
| 165 | 2 | 1 | 2 | 1 | 0 | 10.43 | 0.25 | 1.34 | 1.48 | 0.00 | 54,470 | 4,387 | 8,970 | 16,634 | 0 | Lake Washington |

| Outfall No. | Frequency | | | | | Overflow Duration (Hours) | | | | | Overflow Volume (Gallons per Year) | | | | | Receiving Water |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2012 | 2013 | 2014 | 2015 | 2016 | 2012 | 2013 | 2014 | 2015 | 2016 | 2012 | 2013 | 2014 | 2015 | 2016 | |
| **168** | 2 | 0 | 1 | 2 | 0 | 47.24 | 0.00 | 13.73 | 84.33 | 0.00 | 5,364,038 | 0 | 1,092,208 | 7,718,986 | 0 | Longfellow Creek |
| **169** | 1 | 0 | 1 | 2 | 1 | 16.03 | 0.00 | 23.15 | 105.93 | 6.27 | 2,587,257 | 0 | 604,990 | 6,162,245 | 664,680 | Longfellow Creek |
| **170** | 1 | 0 | 0 | 0 | 0 | 0.90 | 0.00 | 0.00 | 0.00 | 0.00 | 12,286 | 0 | 0 | 0 | 0 | Longfellow Creek |
| **171** | 13 | 10 | 15 | 3 | 2 | 97.47 | 79.75 | 57.62 | 24.05 | 1.53 | 2,199,443 | 970,469 | 1,544,026 | 287,884 | 90,094 | Lake Washington |
| **174** | 17 | 7 | 20 | 15 | 12 | 267.09 | 24.95 | 89.35 | 113.37 | 83.34 | 10,262,141 | 2,775,594 | 8,763,659 | 13,555,680 | 9,106,686 | Lake Washington Ship Canal |
| **175** | 0 | 2 | 0 | 4 | 0 | 0.00 | 1.40 | 0.00 | 1.43 | 0.00 | 0 | 3,062 | 0 | 243,126 | 0 | Lake Union |
| **Total** | **355** | **219** | **406** | **318** | **314** | **4296.00** | **1407.85** | **3463.88** | **3981.56** | **2971.55** | **154,232,337** | **37,497,456** | **115,586,683** | **149,702,955** | **85,614,065** | |

| Table 5-7. 2012-2016 Summary Comparison of CSOs by Receiving Water | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Receiving Water of Overflow | Overflow Frequency (No. per Year) | | | | | Overflow Event Duration (Hours) | | | | | Overflow Volume (Gallons per Year) | | | | |
| | 2012 | 2013 | 2014 | 2015 | 2016 | 2012 | 2013 | 2014 | 2015 | 2016 | 2012 | 2013 | 2014 | 2015 | 2016 |
| Duwamish River | 1 | 3 | 3 | 3 | | 26 | 11 | 17 | 7 | 0 | 314,968 | 11,507 | 146,654 | 1,056,402 | 0 |
| East Waterway | 4 | 3 | 6 | 9 | 5 | 14 | 9 | 30 | 82 | 43 | 352,041 | 232,587 | 288,804 | 673,362 | 427,231 |
| Elliott Bay | 9 | 12 | 4 | 19 | 9 | 39 | 12 | 5 | 15 | 24 | 3,679,209 | 1,227,201 | 269,938 | 1,318,790 | 454,875 |
| Lake Union | 47 | 33 | 49 | 45 | 58 | 672 | 290 | 589 | 571 | 532 | 14,636,073 | 4,872,642 | 12,316,618 | 18,283,461 | 13,068,417 |
| Lake Washington | 149 | 84 | 191 | 116 | 106 | 1,518 | 462 | 1,367 | 1,709 | 848 | 44,714,009 | 11,216,814 | 38,750,702 | 50,779,955 | 14,338,085 |
| Lake Washington - Ship Canal | 17 | 7 | 20 | 16 | 12 | 267 | 25 | 89 | 115 | 83 | 10,262,141 | 2,775,594 | 8,763,659 | 13,557,080 | 9,106,686 |
| Longfellow Creek | 4 | 0 | 2 | 4 | 1 | 64 | 0 | 37 | 190 | 6 | 7,963,581 | 0 | 1,697,198 | 13,881,231 | 664,680 |
| Portage Bay | 8 | 8 | 18 | 23 | 13 | 41 | 13 | 21 | 62 | 7 | 1,407,023 | 314,957 | 653,786 | 2,589,110 | 133,190 |
| Puget Sound | 1 | 1 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 4,276 | 803 | 0 | 0 | 0 |
| Salmon Bay | 96 | 60 | 94 | 66 | 97 | 1,493 | 561 | 1,175 | 1,108 | 1,307 | 58,077,041 | 14,988,321 | 44,942,318 | 38,935,987 | 44,385,255 |
| Union Bay | 14 | 8 | 13 | 13 | 8 | 132 | 22 | 61 | 48 | 98 | 10,327,113 | 1,857,024 | 3,929,276 | 3,771,925 | 1,982,104 |
| West Waterway | 5 | 0 | 6 | 4 | 5 | 30 | 0 | 73 | 74 | 23 | 2,494,862 | 0 | 3,827,730 | 4,855,651 | 1,053,542 |
| TOTAL: | 355 | 219 | 406 | 318 | 314 | 4,296 | 1,407 | 3,464 | 3,981 | 2,972 | 154,232,337 | 37,497,450 | 115,586,683 | 149,702,956 | 85,614,065 |

**Table 5-8. Outfalls Meeting Performance Standard for Controlled CSOs Based on Flow Monitoring Results and Modeling**

| Outfall Number | Number of Combined Sewer Overflows Per Year [1] | | | | | | | | | | | | | | | | | | | | Average Annual Overflow Frequency | Meets Performance Standard? [2] | Long-Term Simulation Source | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | | | | |
| **12** | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 2 | 0 | 0 | 0.3 | Yes | N/A | 3,7 |
| **13** | 1 | 2 | 1 | 0 | 1 | 0 | 2 | 0 | 3 | 3 | 1 | 0 | 1 | 1 | 1 | 2 | 1 | 5 | 5 | 2 | 1.6 | No | InfoWorks results, July 2016 | 8 |
| **14** | | | | | | | | | | | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0.4 | Yes | N/A | 4,7 |
| **15** | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 2 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 5 | 3 | 1.0 | Yes | InfoWorks results, July 2016 | 8 |
| **16** | | | | | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | Yes | N/A | 3,7 |
| **18** | 5 | 5 | 2 | 0 | 3 | 2 | 3 | 4 | 4 | 11 | 2 | 3 | 8 | 5 | 4 | 8 | 2 | 5 | 2 | 3 | 4.1 | No | LTCP Long Term Simulation Results February 2013 | 5,9 |
| **19** | | | | | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0.2 | Yes | N/A | 3,7 |
| **20** | 2 | 1 | 1 | 0 | 0 | 0 | 2 | 1 | 0 | 3 | 1 | 0 | 3 | 3 | 3 | 2 | 2 | 5 | 8 | 4 | 2.1 | No | LTCP Long Term Simulation Results February 2013 | 5 |
| **22** | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 3 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 4 | 3 | 3 | 3 | 1 | 1.3 | No | LTCP Long Term Simulation Results February 2013 | 5,10 |
| **24** | 1 | 1 | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 4 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0.8 | Yes | LTCP Long Term Simulation Results February 2013 | 5 |
| **25** | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 3 | 1 | 1 | 2 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0.7 | Yes | LTCP Long Term Simulation Results February 2013 | 5,11 |
| **27** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | Yes | LTCP Long Term Simulation Results February 2013 | 5 |
| **28** | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 2 | 1 | 26 | 8 | 2 | 2 | 2 | 3 | 7 | 5 | 4 | 3.4 | No | LTCP Long Term Simulation Results February 2013 | 5 |
| **29** | 1 | 1 | 1 | 0 | 3 | 1 | 2 | 2 | 0 | 5 | 1 | 5 | 4 | 2 | 3 | 11 | 7 | 7 | 9 | 9 | 3.7 | No | LTCP Long Term Simulation Results February 2013 | 5 |
| **30** | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 2 | 1 | 0 | 1 | 3 | 2 | 2 | 4 | 5 | 1.4 | No | LTCP Long Term Simulation Results February 2013 | 6 |
| **31** | 11 | 21 | 14 | 2 | 17 | 13 | 18 | 13 | 19 | 32 | 10 | 4 | 12 | 11 | 11 | 2 | 0 | 5 | 5 | 10 | 11.5 | No | LTCP Long Term Simulation Results February 2013 | 5 |
| **32** | 5 | 7 | 4 | 1 | 13 | 4 | 4 | 4 | 4 | 15 | 5 | 1 | 7 | 3 | 4 | 3 | 1 | 2 | 1 | 4 | 4.6 | No | LTCP Long Term Simulation Results February 2013 | 5 |
| **33** | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0.2 | Yes | LTCP Long Term Simulation Results February 2013 | 5 |
| **34** | 1 | 1 | 1 | 0 | 1 | 1 | 2 | 1 | 0 | 3 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 2 | 1 | 0 | 0.9 | Yes | LTCP Long Term Simulation Results February 2013 | 5,12 |

| Outfall Number | Number of Combined Sewer Overflows Per Year [1] | | | | | | | | | | | | | | | | | | | | Average Annual Overflow Frequency | Meets Performance Standard? [2] | Long-Term Simulation Source | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | | | | |
| 35 | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 2 | 0 | 1 | 1 | 0 | 3 | 0 | 1 | 1 | 1 | 2 | 5 | 0 | 1.1 | No | LTCP Long Term Simulation Results February 2013 | 5,13 |
| 36 | 0 | 3 | 2 | 0 | 3 | 1 | 2 | 2 | 1 | 6 | 1 | 0 | 5 | 2 | 1 | 2 | 3 | 2 | 4 | 2 | 2.1 | No | LTCP Long Term Simulation Results February 2013 | 5 |
| 38 | 0 | 1 | 0 | 0 | 1 | 0 | 2 | 1 | 0 | 2 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 2 | 2 | 0 | 0.8 | Yes | InfoWorks V9.5 H&HI Model - Extracted Data Set From Long Term Simulation Run | 5 |
| 40 | 6 | 5 | 2 | 3 | 9 | 4 | 6 | 4 | 4 | 12 | 7 | 1 | 6 | 5 | 4 | 10 | 2 | 11 | 5 | 2 | 5.4 | No | InfoWorks V9.5 H&HI Model - Extracted Data Set From Long Term Simulation Run | 5 |
| 41 | 8 | 9 | 3 | 3 | 11 | 5 | 7 | 5 | 9 | 15 | 7 | 9 | 14 | 5 | 5 | 13 | 8 | 22 | 9 | 2 | 8.5 | No | InfoWorks V9.5 H&HI Model - Extracted Data Set From Long Term Simulation Run | 5 |
| 42 | 0 | 1 | 0 | 0 | 1 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 3 | 1 | 6 | 3 | 0 | 1.2 | No | InfoWorks V9.5 H&HI Model - Extracted Data Set From Long Term Simulation Run | 5,14 |
| 43 | 7 | 8 | 3 | 3 | 11 | 5 | 7 | 4 | 5 | 13 | 7 | 3 | 11 | 9 | 7 | 14 | 6 | 14 | 6 | 5 | 7.4 | No | InfoWorks V9.5 H&HI Model - Extracted Data Set From Long Term Simulation Run | 5 |
| 44 | 22 | 20 | 12 | 8 | 14 | 10 | 18 | 16 | 13 | 29 | 9 | 12 | 16 | 16 | 17 | 22 | 11 | 25 | 18 | 34 | 17.1 | No | InfoWorks V9.5 H&HI Model - Extracted Data Set From Long Term Simulation Run | 5 |
| 45 | 15 | 20 | 10 | 6 | 16 | 11 | 18 | 22 | 17 | 21 | 19 | 5 | 11 | 10 | 11 | 14 | 7 | 20 | 10 | 12 | 13.8 | No | InfoWorks V9.5 H&HI Model - Extracted Data Set From Long Term Simulation Run | 5 |
| 46 | 1 | 0 | 0 | 0 | 2 | 0 | 3 | 1 | 0 | 1 | 1 | 0 | 3 | 1 | 1 | 2 | 0 | 1 | 2 | 0 | 1.0 | Yes | InfoWorks results, December 2016 | 15 |
| 47 | 5 | 4 | 1 | 0 | 5 | 3 | 7 | 3 | 4 | 6 | 4 | 2 | 9 | 5 | 2 | 6 | 4 | 7 | 3 | 2 | 4.1 | No | InfoWorks results, December 2016 | 16 |
| 48 | | | | | | | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | Yes | N/A | 5,7 |
| 49 | 1 | 1 | 0 | 0 | 1 | 1 | 2 | 0 | 4 | 11 | 2 | 1 | 6 | 4 | 2 | 5 | 2 | 6 | 5 | 4 | 2.9 | No | InfoWorks V9.5 H&HI Model - Extracted Data Set From Long Term Simulation Run | 5 |
| 57 | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | Yes | N/A | 3,7 |
| 59 | | | | | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 2 | 1 | 0 | 0 | 1 | 0.4 | Yes | N/A | 3,7 |

| Outfall Number | Number of Combined Sewer Overflows Per Year [1] | | | | | | | | | | | | | | | | | | | | Average Annual Overflow Frequency | Meets Performance Standard? [2] | Long-Term Simulation Source | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | | | | |
| **60** | 3 | 1 | 4 | 1 | 2 | 0 | 2 | 1 | 4 | 4 | 3 | 0 | 3 | 4 | 2 | 6 | 1 | 2 | 4 | 2 | 2.5 | No | LTCP Long Term Simulation Results February 2013 | 5 |
| **61** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | Yes | InfoWorks Long Term Simulation September 2013 | 3 |
| **62** | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 2 | 2 | 4 | 1 | 0.8 | Yes | InfoWorks Long Term Simulation September 2013 | 3 |
| **64** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | Yes | InfoWorks Long Term Simulation September 2013 | 3 |
| **68** | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 2 | 4 | 1 | 0.9 | Yes | LTCP Long Term Simulation Results February 2013 | 5 |
| **69** | 2 | 3 | 0 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 3 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 1.9 | No | LTCP Long Term Simulation Results February 2013 | 5 |
| **70** | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0.5 | Yes | AWWSRP Modeling Support Alternative Modeling Report May 2012, Appendix D | 5 |
| **71** | 2 | 1 | 0 | 0 | 1 | 0 | 3 | 1 | 1 | 2 | 1 | 2 | 9 | 7 | 3 | 5 | 3 | 2 | 5 | 2 | 2.5 | No | AWWSRP Modeling Support Alternative Modeling Report May 2012, Appendix D | 5 |
| **72** | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0.3 | Yes | AWWSRP Modeling Support Alternative Modeling Report May 2012, Appendix D | 5 |
| **78** | | | | | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.2 | Yes | N/A | 3,7 |
| **80** | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | Yes | N/A | 3,7 |
| **83** | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | Yes | N/A | 3,7 |
| **85** | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | Yes | N/A | 3,7 |
| **88** | | | | | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0.3 | Yes | N/A | 3,7 |
| **90** | | | | | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | Yes | N/A | 3,7 |
| **91** | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | Yes | N/A | 3,7 |
| **94** | | | | | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | Yes | N/A | 3,7 |
| **95** | | | | | 3 | 1 | 2 | 0 | 4 | 6 | 1 | 3 | 7 | 3 | 1 | 1 | 1 | 0 | 0 | 0 | 2.1 | No | N/A | 3,7, 17 |
| **99** | 1 | 2 | 2 | 0 | 3 | 0 | 1 | 1 | 2 | 1 | 1 | 0 | 1 | 2 | 3 | 5 | 1 | 6 | 4 | 5 | 2.1 | No | LTCP Long Term Simulation Results February 2013 | 5 |

| Outfall Number | Number of Combined Sewer Overflows Per Year [1] | | | | | | | | | | | | | | | | | | | | Average Annual Overflow Frequency | Meets Performance Standard? [2] | Long-Term Simulation Source | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | | | | |
| **107** | 4 | 5 | 6 | 1 | 6 | 5 | 3 | 7 | 5 | 7 | 1 | 2 | 11 | 12 | 5 | 4 | 3 | 6 | 9 | 5 | 5.4 | No | LTCP Long Term Simulation Results January 2014 | 5 |
| **111** | 3 | 2 | 0 | 0 | 2 | 1 | 3 | 1 | 3 | 2 | 1 | 0 | 6 | 3 | 2 | 1 | 3 | 3 | 3 | 0 | 2.0 | No | LTCP Long Term Simulation Results February 2013 | 5 |
| **120** | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | Yes | N/A | 3, 7 |
| **121** | | | | | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | Yes | N/A | 3, 7 |
| **124** | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | Yes | N/A | 3, 7 |
| **127** | | | | | 0 | 0 | 0 | 1 | 0 | 3 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.4 | Yes | N/A | 3, 7 |
| **129** | | | | | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | Yes | N/A | 3, 7 |
| **130** | | | | | | | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0.3 | Yes | N/A | 5, 7 |
| **131** | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | Yes | N/A | 3, 7 |
| **132** | | | | | | | | | | | | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 3 | 0 | 0.7 | Yes | N/A | 5, 7 |
| **134** | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | Yes | N/A | 3, 7 |
| **135** | | | | | | | | | | | | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0.3 | Yes | N/A | 5, 7 |
| **136** | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | Yes | N/A | 3, 7 |
| **138** | 2 | 1 | 0 | 0 | 1 | 0 | 2 | 3 | 0 | 3 | 1 | 1 | 2 | 1 | 3 | 2 | 2 | 3 | 7 | 3 | 1.9 | No | LTCP Long Term Simulation Results February 2013 | 5 |
| **139** | 4 | 2 | 0 | 0 | 1 | 0 | 1 | 3 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 2 | 1 | 2 | 6 | 0 | 1.5 | No | LTCP Long Term Simulation Results February 2013 | 5 |
| **140** | 7 | 3 | 0 | 2 | 2 | 3 | 6 | 5 | 6 | 5 | 1 | 1 | 7 | 8 | 2 | 4 | 5 | 13 | 10 | 10 | 5.0 | No | LTCP Long Term Simulation Results February 2013 | 5 |
| **141** | | | | | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | Yes | N/A | 3, 7 |
| **144** | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | Yes | N/A | 3, 7 |
| **145** | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | Yes | N/A | 3, 7 |
| **146** | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | Yes | N/A | 3, 7 |
| **147** | 41 | 32 | 32 | 27 | 26 | 29 | 31 | 29 | 37 | 45 | 35 | 50 | 45 | 63 | 40 | 47 | 27 | 49 | 32 | 58 | 38.8 | No | LTCP Long Term Simulation Results February 2013 | 5 |
| **148** | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 1 | 0 | 0.3 | Yes | N/A | 3, 7 |
| **150/151** | 29 | 15 | 19 | 11 | 16 | 10 | 14 | 6 | 15 | 23 | 11 | 2 | 22 | 29 | 25 | 31 | 14 | 34 | 28 | 31 | 19.3 | No | LTCP Long Term Simulation Results February 2013 | 5 |
| **152** | 52 | 49 | 49 | 57 | 47 | 39 | 53 | 44 | 46 | 42 | 43 | 11 | 29 | 63 | 48 | 57 | 44 | 53 | 34 | 63 | 46.2 | No | LTCP Long Term Simulation Results February 2013 | 5 |
| **161** | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | Yes | N/A | 3, 7 |
| **165** | | | | | | | | | | | | 1 | 1 | 1 | 0 | 2 | 1 | 2 | 1 | 0 | 1.0 | Yes | N/A | 5, 7, 18 |

| Outfall Number | Number of Combined Sewer Overflows Per Year [1] | | | | | | | | | | | | | | | | | | | | Average Annual Overflow Frequency | Meets Performance Standard? [2] | Long-Term Simulation Source | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | | | | |
| **168** | 1 | 2 | 6 | 0 | 5 | 1 | 2 | 1 | 2 | 8 | 3 | 0 | 6 | 2 | 0 | 2 | 0 | 1 | 2 | 0 | 2.2 | No | LTCP Long Term Simulation Results February 2013 | 5 |
| **169** | 1 | 2 | 6 | 0 | 5 | 1 | 2 | 1 | 2 | 8 | 3 | 1 | 1 | 2 | 2 | 1 | 0 | 1 | 2 | 1 | 2.1 | No | LTCP Long Term Simulation Results February 2013 | 5 |
| **170** | | | | | | | | | | | | 0 | 2 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0.4 | Yes | N/A | 5,7 |
| **171** | 4 | 4 | 1 | 0 | 1 | 2 | 5 | 0 | 4 | 6 | 3 | 2 | 7 | 5 | 2 | 6 | 3 | 7 | 4 | 2 | 3.4 | No | InfoWorks results, December 2016 | 15 |
| **174** | 10 | 9 | 6 | 1 | 8 | 3 | 5 | 6 | 10 | 21 | 6 | 6 | 14 | 13 | 10 | 17 | 7 | 20 | 15 | 12 | 10.0 | No | LTCP Long Term Simulation Results February 2013 | 5 |
| **175** | | | | | | | | | | | | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 4 | 0 | 0.8 | Yes | N/A | 5,7 |

Notes:
1. Per Section S4.B of the NPDES Permit, the determination of whether an outfall is meeting the performance standard for controlled outfalls has been made based on up to 20 years of data and modeling. Numbers in the colorless cells were obtained from flow monitoring. Numbers in blue-shaded cells were obtained using precipitation data and basin-specific models and are used in the long-term average annual overflow calculation for years when flow monitoring data either is not available or the accuracy of the flow monitoring data cannot be confirmed.
2. Responses in this column are "Yes" if the calculated Average Annual Overflow Frequency is no more than 1 per year and "No" if the calculated Average Annual Overflow Frequency is >1 per year. Some outfalls have higher than expected calculated Average Annual Overflow Frequencies because of impacts from uncontrolled adjacent basins, exacerbated CSOs, or recently completed system retrofits. Examples of these situations are explained in Notes 7 through 13. SPU will continue to monitor these outfalls to confirm that they are controlled and, if not, to plan additional control actions.
3. The flow monitoring configuration prior to 2001 cannot be confirmed and the pre-2001 data accuracy is questionable, so the calculated Average Annual Overflow Frequency uses data from flow monitoring conducted between 2001 and 2016.
4. The flow monitoring configuration prior to 2007 cannot be confirmed and the pre-2007 data accuracy is questionable, so the calculated Average Annual Overflow Frequency uses data from flow monitoring conducted between 2007 and 2016.
5. The flow monitoring configuration prior to 2008 cannot be confirmed and the pre-2008 data accuracy is questionable, so the calculated Average Annual Overflow Frequency uses data from flow monitoring conducted between 2008 and 2016.
6. The flow monitoring configuration prior to 2009 cannot be confirmed and the pre-2008 data accuracy is questionable, so the calculated Average Annual Overflow Frequency uses data from flow monitoring conducted between 2009 and 2016.
7. The Average Annual Overflow Frequency was calculated based on the number of years of reliable data.
8. SPU completed the Windermere CSO Reduction Project in 2015 and subsequently updated the hydraulic model for Basins 13 and 15 to reflect the constructed facilities.
9. SPU completed two separate retrofit projects in Basin 18 in 2012 and 2016, reducing the frequency of CSOs in subsequent years.
10. Several exacerbated CSOS occurred at Outfall 22 in recent years because of the deteriorating performance of WWPS50. The pump station was rehabilitated and existing air-lift style pumps replaced with submersible pumps in 2016.
11. SPU raised the weir at Outfall 25 in early 2008, so the calculated Average Annual Overflow Frequency uses flow modeling through 2008 and flow monitoring for subsequent years.
12. As part of the Leschi Phase I retrofit project, the weir height at Outfall 34 was raised a foot in August 2014, reducing the frequency of CSOs in subsequent years.
13. Basin 35 CSOs in 2009 were likely exacerbated by a clogged HydroBrake; the inspection frequency has since been increased.
14. Several exacerbated CSOs occurred from Outfall 42 in 2014 due to the historic wet weather (March 2014) and construction of the Genesee CSO reduction project (Basins 40/41 and 43). SPU will monitor the performance of Basin 42 to ensure it is controlled.
15. SPU completed the Pump Station 9 Rehabilitation Project in 2016 and subsequently updated the hydraulic model for Basin 46 to reflect the constructed facilities.
16. SPU completed the South Henderson CSO Reduction Projects (weir retrofits and 52nd Ave Conveyance Project) in 2015 and subsequently updated the hydraulic model for Basins 47 and 171 to reflect the constructed facilities.
17. The Basin 95 retrofit project was completed in 2013, reducing the frequency of CSOs in subsequent years.
18. Basin 165 is in the Genesee area and is pumped into the Lake Line upstream of the other Genesee basins. Based on modeling, control of the other Genesee basins (Basins 40/41, 42, and 43) should bring Basin 165 in control.

# Appendix A:  Additional CMOM Information

| Table A-1. 2016 Sewer Overflow (SSO) Details | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **2016 SSO Number[1]** | **ERTS Number** | **Date** | **Address** | **SSO Volume (gallons)** | **Volume to Surface Water (gallons)** | **Surface Water** | **Primary Cause** | **Secondary Cause, if Any** |
| **1** | 661889 | 1/1/16 | 87 Yesler Way | 400 | | | FOG | Debris |
| **2** | 662160 | 1/6/16 | 600 Malden Ave E | Unknown | | | Roots | |
| **3** | 662143 | 1/8/16 | 9258 Evanston Ave N | Unknown | | | Pressure Release | |
| **4** | 662170 | 1/8/16 | 9216 View Ave NW | Unknown | | | Structural failure-gravity main | |
| **5** | 662211 | 1/12/16 | 5817 18th Ave S | Unknown | | | Capacity-gravity main | |
| **6** | 662259 | 1/14/16 | Carkeek Park | 22,800 | 22,800 | Piper's Creek | Structural failure-gravity main | |
| **7** | 662292 | 1/15/16 | 124 11th Ave E | Unknown | | | Roots | FOG |
| **8** | 662365 | 1/21/16 | 2534 39th Ave E | 10 | | | Pump Station-Mechanical | |
| **9** | 662384 | 1/21/16 | 7740 Seward Park Ave S | 100 | | | Structural failure-gravity main | |
| **10** | 662735 | 1/21/16 | 11040 35th Ave NE | Unknown | | | FOG | |
| **11** | 662744 | 2/7/16 | 2028 NE 96th St | 40 | | | Roots | |
| 11 | 662744 | 2/7/16 | 2030 NE 96th St | 10 | | | Roots | |
| **12** | 663061 | 2/19/16 | 4150 41st Ave SW | 150 | | | Structural failure-gravity main | Debris |
| **13** | 663251 | 2/29/16 | 3010 NW Esplanade | 20 | | | Structural failure-force main | |
| **14** | 663309 | 3/2/16 | Government Parcel Pin# 1025039047 | 50 | | | Structural failure-gravity main | |
| 14 | 663309 | 3/15/16 | 3201 W Commodore Way | Unknown | | | Structural failure-gravity main | |
| 14 | 663309 | 3/2/16 | 3251 W Commodore Way | Unknown | | | Structural failure-gravity main | |
| 14 | 663309 | 3/2/16 | 3253 W Commodore Way | Unknown | | | Structural failure-gravity main | |
| 14 | 664306 | 4/13/16 | 3251 W Commodore Way | 10 | | | Structural failure-gravity main | |

| 2016 SSO Number[1] | ERTS Number | Date | Address | SSO Volume (gallons) | Volume to Surface Water (gallons) | Surface Water | Primary Cause | Secondary Cause, if Any |
|---|---|---|---|---|---|---|---|---|
| **15** | 663949 | 3/9/16 | 9800 40th Ave S | Unknown | | | Structural failure-gravity main | - |
| **16** | 663693 | 3/15/16 | 3026 NW Esplanade | 5 | | | Structural failure-force main | - |
| **17** | 663730 | 3/17/16 | 1016 Madison St | 30 | | | Private side sewer issue | Debris |
| **18** | 663866 | 3/23/16 | 3030 NW Esplanade | 1 | | | Structural failure-force main | - |
| **19** | 664061 | 4/2/16 | 163 N 145th St | Unknown | | | FOG | Debris |
| **20** | 664121 | 4/5/16 | 2502 NE 92nd St | 3 | | | Roots | |
| **21** | 664769 | 5/4/16 | Martin Luther King Jr Way S and Beacon Ave S | 30 | | | Debris | |
| **22** | 664941 | 5/13/16 | 9732 4th Ave NW | 2 | | | Pressure Release | |
| 22 | 664941 | 5/13/16 | 9734 4th Ave NW | 2 | | | Pressure Release | |
| **23** | 665751 | 6/22/16 | 1614 Edgewood Ave SW | Unknown | | | Maintenance error | Roots |
| **24** | 665906 | 6/29/16 | 8623 Ravenna Ave NE | 100 | 100 | Lake Washington | Debris | |
| 24 | 665906 | 6/29/16 | 8625 Ravenna Ave NE | Unknown | | | Debris | |
| **25** | 666042 | 7/5/16 | 7756 57th Ave NE | 30 | | | Structural failure-gravity main | |
| 25 | 666042 | 7/5/16 | 7760 57th Ave NE | Unknown | | | Structural failure-gravity main | |
| **26** | 666145 | 7/11/16 | 3213 S Washington St | 150 | 150 | Lake Washington | Debris | |
| **27** | 666909 | 8/13/16 | 2656 42nd Ave SW | 30 | | | Roots | FOG |
| **28** | 667068 | 8/18/16 | 1934 Pike Pl | 5,000 | | | Structural failure-gravity main | |
| **29** | 667400 | 9/2/16 | 617 Eastlake Ave E | 1,800 | | | Private Construction | |
| **30** | 667697 | 9/15/16 | 3605 Airport Way S | Unknown | | | City Construction | |
| **31** | 667997 | 10/1/16 | 607 N 35th St | 400 | 400 | Lake Washington-Ship Canal | Private Construction | |
| 31 | 667997 | 10/1/16 | 3417 Evanston Ave N | 2,000 | | | Private Construction | |

| 2016 SSO Number[1] | ERTS Number | Date | Address | SSO Volume (gallons) | Volume to Surface Water (gallons) | Surface Water | Primary Cause | Secondary Cause, if Any |
|---|---|---|---|---|---|---|---|---|
| **32** | 668085 | 10/6/16 | Lakeside Ave S and S Irving St | 40 | | | Other Agency Construction | |
| **33** | 668138 | 10/7/16 | 3417 Evanston Ave N | 20 | | | Private Construction | |
| **34** | 668219 | 10/13/16 | 9281 56th Ave S | 6,100 | | | Roots | |
| **35** | 668269 | 10/14/16 | 4865 20th Ave S | 50 | | | Roots | |
| **36** | 668439 | 10/20/16 | 3863 42nd Ave NE | Unknown | | | Roots | Debris |
| **37** | 668411 | 10/14/16 | 4115 Beach Dr SW | Unknown | | | Capacity-King County | |
| **38** | 668371 | 10/19/16 | 617 Eastlake Ave E | 100 | 100 | Lake Union | Private Construction | |
| **39** | 668495 | 10/22/16 | 2323 NE 95th St | 12,000 | 12,000 | Thornton Creek | Private Construction | |
| **40** | 668594 | 10/27/16 | NE 65th and Sand Pt Way NE | 3,500 | | | Debris | |
| **41** | 668637 | 10/29/16 | 7756 57th Ave NE | 20 | | | Structural failure-gravity main | |
| 41 | 668637 | 10/29/16 | 7760 57th Ave NE | Unknown | | | Structural failure-gravity main | |
| **42** | 668576 | 10/26/16 | 450 S Spokane St | 75 | | | Structural failure-gravity main | |
| **43** | 669089 | 11/18/16 | 11756 16th Ave NE | 1 | | | Private side sewer issue | |
| **44** | 669320 | 12/1/16 | 36th Ave S and S Day St | 5 | | | Other Agency Construction | |
| **45** | 669393 | 12/5/16 | 5144 S Orcas St | 5 | | | Structural failure-gravity main | |
| **46** | 669516 | 12/10/16 | 708 N 64th St | 100 | | | Structural failure-gravity main | |
| 46 | 669516 | 12/10/16 | 712 N 64th St | 100 | | | Structural failure-gravity main | |
| **47** | 669577 | 12/15/16 | Lakeside Ave S & S Day St | Unknown | | | Other Agency Construction | |
| **48** | 669744 | 12/23/16 | 230 8th Ave N | 1,000 | | | Private Construction | |

1. Rows with the same SSO Number represent multiple customers affected by the same sewer system constraint during a sewer overflow event.

**Table A-2. Pump Station Location and Capacity**

| Number | Name | Address | Type [1] | Basin Area (acres) | Average Inflow (gpm) | Number of Pumps and Rating | Static Head (feet) | Storage Time (hours) |
|---|---|---|---|---|---|---|---|---|
| 1 | Lawton Wood | 5645 45th Ave West | WW/DW | 31.8 | 36 | 2 at 350 gpm each | 60.5 | 9.4 |
| 2 | Charles Street | 901 Lakeside Dr | WW/DW | 108.1 | 262 | 2 at 450 gpm each | 20 | 4+ |
| 4 | South Director Street | 5135 South Director St | Air Lift | 3.1 | 4 | 2 at 150 gpm each | 28.5 | 10.7 |
| 5 | 46th Avenue South | 3800 Lake Washington Blvd | WW/DW | 198.2 | 1147 | 2 at 1000 gpm each | 13.9 | 4+ |
| 6 | South Alaska Street | 4645 Lake Washington Blvd | WW/DW | 10.2 | 439 | 2 at 300 gpm each | 14 | 4+ |
| 7 | East Lee Street | 4214 East Lee St | WW/DW | 227 | 209 | 2 at 2800 gpm each | 50 | 5.75 |
| 9 | South Grattan Street | 8400 55th Ave South | WW/DW | 422.2 | 1293 | 2 at 2700 gpm each | 13.9 | 2 |
| 10 | South Holly Street | 5711 South Holly St | WW/DW | 188.4 | 1064 | 2 at 1000 gpm each | 13.5 | 2 |
| 11 | North Sand Point | 63rd Ave NE and NE 78th St | Submersible | | 10 | 2 at 800 gpm each | 23 | 1 |
| 13 | Montlake | 2160 East Shelby St | WW/DW | 64.9 | | 2 at 600 gpm each | 29.7 | 4+ |
| 15 | West Park Drive East | West Park Dr East and East Shelby St | Submersible | | 10 | 2 at 800 gpm each | 12 | 1 |
| 17 | Empire Way | 42nd Ave South and South Norfolk St | WW/DW | 395 | 1341 | 2 at 2000 gpm each | 27.7 | 5 |
| 18 | South 116th Place | 6700 South 116th Pl | Submersible | | 18 | 2 at 800 gpm each | 45 | 12+ |
| 19 | Leroy Place South | 9400 Leroy Pl South | Submersible | | 22 | 2 at 800 gpm each | 45 | 12+ |
| 20 | East Shelby Street | 1205 East Shelby St | WW/DW | 48.6 | 541 | 2 at 600 gpm each | 45 | 4+ |
| 21 | 21st Avenue West | 2557 21st Ave West | Submersible | | 19 | 2 at 800 gpm each | 45 | 12+ |
| 22 | West Cramer Street | 5400 38th Ave West | WW/DW | 26.9 | 444 | 2 at 750 gpm each | 62 | 6.64 |
| 25 | Calhoun Street | 1812 East Calhoun St | WW/DW | 52.2 | 371 | 2 at 850 gpm each | 36 | 3.63 |
| 28 | North Beach | 9001 View Ave NW | Submersible | 4.8 | 7 | 2 at 800 gpm each | 40.7 | 4 |
| 30 | Esplanade | 3206 NW Esplanade St | Submersible | 5.7 | 9 | 2 at 800 gpm each | 63 | 11.88 |
| 31 | 11th Avenue NW | 12007 11th Ave NW | Submersible | 2 | 10 | 2 at 800 gpm each | 20 | 12+ |
| 35 | 25th Avenue NE | 2734 NE 45th St | WW/DW | 71 | 436 | 3 at 850 gpm each | 39.8 | 1 |
| 36 | Maryland | 1122 Harbor Ave SW | Air Lift | 12.2 | 18 | 2 at 150 gpm each | 10 | 10.25 |
| 37 | Fairmont | 1751 Harbor Ave SW | WW/DW | 281.5 | 1491 | 2 at 3500 gpm each | 12.8 | 2 |
| 38 | Arkansas | 1411 Alki Ave SW | Air Lift | 46.5 | 188 | 2 at 150 gpm each | 10 | 13.15 |

| Number | Name | Address | Type [1] | Basin Area (acres) | Average Inflow (gpm) | Number of Pumps and Rating | Static Head (feet) | Storage Time (hours) |
|---|---|---|---|---|---|---|---|---|
| 39 | Dawson | 5080 Beach Dr SW | WW/DW | 55 | 622 | 2 at 1100 gpm each | 36.7 | 4.6 |
| 42 | Lincoln Park | 8617 Fauntleroy Way SW | WW/DW | 6.5 | 64 | 2 at 200 gpm each | 55.5 | 12.4 |
| 43 | Seaview No. 1 | 5635 Seaview Ave NW | WW/DW | 177.4 | 1693 | 2 at 1500 gpm each | 40.4 | 4.85 |
| 44 | Boeing No. 1 | 6820 Perimeter Rd S | WW/DW | 168.5 | 334 | 2 at 600 gpm each | 19 | 1.68 |
| 45 | Boeing No. 2 | 7609 Perimeter Rd S | WW/DW | 133.5 | 293 | 2 at 300 gpm each | 16.5 | 2.91 |
| 46 | Seaview No. 2 | 6541 Seaview Ave NW | Air Lift | 52.6 | 68 | 2 at 150 gpm each | 14.6 | 2.45 |
| 47 | Seaview No. 3 | 7242 Seaview Ave NW | Air Lift | 11 | 14 | 2 at 150 gpm each | 9.5 | 5.87 |
| 48 | Brooklyn | 3701 Brooklyn Ave NE | WW/DW | 31.4 | 156 | 2 at 1000 gpm each | 53.3 | 4.01 |
| 49 | Latona | 3750 Latona Ave NE | WW/DW | 22.4 | 257 | 2 at 250 gpm each | 33.3 | 4+ |
| 50 | 39th Avenue East | 2534 39th Ave East | Submersible | 10.6 | 14 | 2 at 100 gpm each | 17 | 6 |
| 51 | NE 60th Street | 6670 NE 60th St | WW/DW | 44.5 | 59 | 2 at 325 gpm each | 126.3 | 1.71 |
| 53 | SW Hinds Street | 4951 SW Hinds St | WW/DW | 10.6 | 41 | 2 at 150 gpm each | 66 | 2 |
| 54 | NW 41st Street | 647 NW 41st St | WW/DW | 24.5 | 169 | 2 at 350 gpm each | 27 | 1.52 |
| 55 | Webster Street | 3021 West Laurelhurst NE | Air Lift | 2.4 | 5 | 2 at 150 gpm each | 31 | 2.15 |
| 56 | Bedford Court | 10334 Bedford Ct NW | Air Lift | 1.6 | 3 | 2 at 150 gpm each | 30.3 | 0.75 |
| 57 | Sunnyside | 3600 Sunnyside Ave North | WW/DW | 16.3 | 57 | 2 at 300 gpm each | 31.5 | 2.66 |
| 58 | Woodlawn | 1350 North Northlake Way | WW/DW | 33.4 | 290 | 2 at 600 gpm each | 30 | 3.5 |
| 59 | Halliday | 2590 Westlake Ave North | WW/DW | 21.2 | 53 | 2 at 325 gpm each | 17.7 | 9.7 |
| 60 | Newton | 2010 Westlake Ave North | WW/DW | 57.6 | 77 | 2 at 250 gpm each | 67.4 | 4.38 |
| 61 | Aloha | 912 Westlake Ave North | WW/DW | 26.3 | 59 | 2 at 450 gpm each | 19.1 | 4.9 |
| 62 | Yale | 1103 Fairview Ave North | WW/DW | 12.2 | 211 | 2 at 350 gpm each | 18.4 | 4.63 |
| 63 | East Blaine | 140 East Blaine St | WW/DW | 33.1 | 251 | 2 at 600 gpm each | 31 | 2.43 |
| 64 | East Lynn Street No. 2 | 2390 Fairview Ave East | WW/DW | 9.4 | 253 | 2 at 300 gpm each | 16.2 | 7.05 |
| 65 | East Allison Street | 2955 Fairview Ave East | WW/DW | 19.2 | 111 | 2 at 300 gpm each | 47.2 | 3.96 |
| 66 | Portage Bay No. 1 | 3190 Portage Bay Pl East | WW/DW | 6.5 | 200 | 2 at 200 gpm each | 12.2 | 18.6 |
| 67 | Portage Bay No. 2 | 1209 East Shelby St | WW/DW | 14.7 | 176 | 2 at 250 gpm each | 17 | 9.08 |

| Number | Name | Address | Type [1] | Basin Area (acres) | Average Inflow (gpm) | Number of Pumps and Rating | Static Head (feet) | Storage Time (hours) |
|---|---|---|---|---|---|---|---|---|
| 69 | Sand Point | 6451 65th Ave NE | WW/DW | 15.5 | 124 | 2 at 300 gpm each | 79 | 2.03 |
| 70 | Barton No. 2 | 4890 SW Barton St | WW/DW | 73 | 136 | 2 at 290 gpm each | 29 | 0.4 |
| 71 | SW 98th Street | 5190 SW 98th St | WW/DW | 36.3 | 155 | 2 at 450 gpm each | 16 | 6.79 |
| 72 | SW Lander Street | 2600 13th Ave SW | WW/DW | 203.5 | 428 | 3 at 2000 gpm each | 22.8 | 4+ |
| 73 | SW Spokane St | 1190 SW Spokane St | WW/DW | 336.5 | 45 | 3 at 2500 gpm each | 16.3 | 4+ |
| 74 | 26th Avenue SW | 2799 26th Ave SW | Submersible | 144 | | 2 at 800 gpm each | 30 | 3.21 |
| 75 | Point Place SW | 3200 Point Pl SW | Air Lift | 4.9 | 9 | 2 at 150 gpm each | 12.2 | 10 |
| 76 | Lowman Park | 7025 Beach Dr SW | WW/DW | 20.4 | 27 | 2 at 100 gpm each | 34 | 17.8 |
| 77 | 32nd Avenue West | 1499 32nd Ave West | WW/DW | 206.5 | 601 | 2 at 1400 gpm each | 48 | 5.17 |
| 78 | Airport Way South | 8415 Airport Way South | Air Lift | 18.4 | 41 | 2 at 150 gpm each | 14.5 | 5.5 |
| 80 | South Perry Street | 9724 Rainier Ave South | Air Lift | 4.6 | 5 | 2 at 150 gpm each | 22 | 10 |
| 81 | 72nd Avenue South | 10199 Rainier Avenue South | WW/DW | 11 | 60 | 2 at 200 gpm each | 53.3 | 24.3 |
| 82 | Arroyo Beach Place | 11013 Arroyo Beach Pl SW | Air Lift | 6 | 8 | 2 at 150 gpm each | 19.8 | 10 |
| 83 | West Ewing Street | 390 West Ewing St | Air Lift | 6.1 | 39 | 2 at 150 gpm each | 19 | 4.24 |
| 84 | 28th Avenue NW | 5390 28th Ave NW | WW/DW | 691.4 | 128 | 2 at 500 gpm each | 24.4 | 3.43 |
| 114 | 35th Avenue NE | 10701 36th Ave NE | Submersible | 3.2 | 47 | 2 at 800 gpm each | 5.6 | 2 |
| 118 | Midvale Avenue North | 1200 North 107th St | WW/DW | 22.4 | 103 | 2 at 300 gpm each | 11.5 | 3.5 |

*1. WW/DW = Wet Well/Dry Well*

| Table A-3. 2016 Pump Station Work Order Summary | | | |
|---|---|---|---|
| **WWPS Number** | **Inspection** | **Maintenance** | **Total Work Orders** |
| WWPS001 | 31 | 11 | 42 |
| WWPS002 | 31 | 22 | 53 |
| WWPS004 | 28 | 10 | 38 |
| WWPS005 | 52 | 20 | 72 |
| WWPS006 | 20 | 9 | 29 |
| WWPS007 | 31 | 32 | 63 |
| WWPS009 | 22 | 17 | 39 |
| WWPS010 | 23 | 11 | 34 |
| WWPS011 | 28 | 7 | 35 |
| WWPS013 | 29 | 17 | 46 |
| WWPS017 | 27 | 49 | 76 |
| WWPS018 | 20 | 5 | 25 |
| WWPS019 | 33 | 46 | 79 |
| WWPS020 | 25 | 24 | 49 |
| WWPS021 | 25 | 10 | 35 |
| WWPS022 | 41 | 30 | 71 |
| WWPS025 | 25 | 9 | 34 |
| WWPS028 | 23 | 13 | 36 |
| WWPS030 | 32 | 23 | 55 |
| WWPS031 | 26 | 9 | 35 |
| WWPS035 | 31 | 81 | 112 |
| WWPS036 | 28 | 7 | 35 |
| WWPS037 | 30 | 21 | 51 |
| WWPS038 | 38 | 6 | 44 |
| WWPS039 | 38 | 19 | 57 |
| WWPS042 | 34 | 9 | 43 |
| WWPS043 | 27 | 23 | 50 |
| WWPS044 | 31 | 8 | 39 |
| WWPS045 | 29 | 12 | 41 |
| WWPS046 | 36 | 13 | 49 |
| WWPS047 | 25 | 5 | 30 |
| WWPS048 | 20 | 35 | 55 |
| WWPS049 | 23 | 58 | 81 |
| WWPS050 | 30 | 9 | 39 |
| WWPS051 | 24 | 36 | 60 |
| WWPS053 | 25 | 4 | 29 |
| WWPS054 | 26 | 9 | 35 |
| WWPS055 | 20 | 4 | 24 |
| WWPS056 | 42 | 5 | 47 |

| WWPS Number | Inspection | Maintenance | Total Work Orders |
|---|---|---|---|
| WWPS057 | 34 | 32 | 66 |
| WWPS058 | 30 | 3 | 33 |
| WWPS059 | 25 | 15 | 40 |
| WWPS060 | 21 | 8 | 29 |
| WWPS061 | 24 | 28 | 52 |
| WWPS062 | 26 | 63 | 89 |
| WWPS063 | 23 | 17 | 40 |
| WWPS064 | 18 | 7 | 25 |
| WWPS065 | 14 | | 14 |
| WWPS066 | 27 | 12 | 39 |
| WWPS067 | 27 | 11 | 38 |
| WWPS069 | 20 | 17 | 37 |
| WWPS070 | 32 | 34 | 66 |
| WWPS071 | 18 | 5 | 23 |
| WWPS072 | 28 | 5 | 33 |
| WWPS073 | 34 | 7 | 41 |
| WWPS074 | 39 | 24 | 63 |
| WWPS075 | 27 | 4 | 31 |
| WWPS076 | 40 | 50 | 90 |
| WWPS077 | 23 | 10 | 33 |
| WWPS078 | 29 | 9 | 38 |
| WWPS080 | 24 | 7 | 31 |
| WWPS081 | 16 | 3 | 19 |
| WWPS082 | 26 | 8 | 34 |
| WWPS083 | 28 | 14 | 42 |
| WWPS084 | 16 | 11 | 27 |
| WWPS114 | 30 | 3 | 33 |
| WWPS118 | 21 | 3 | 24 |
| **Grand Total** | **1849** | **1148** | **2997** |