Seattle Public Utilities

Protecting Seattle's Waterways

Wastewater Collection System: 2015 Annual Report

March 28, 2016

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List of Abbreviations

Term	Definition
AG	Washington State Office of the Attorney General
CMMS	Computerized Maintenance Management System
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
GC/CM	General Contractor/Construction Manager
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
MODA	Multi Objective Decision Analysis
NDS	Natural Drainage Systems (see also GSI, LID)
NPDES	National Pollutant Discharge Elimination System
PACP	Pipeline Assessment and Certification Program
PMP	Project Management Plan
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 to improve Seattle Public Utilities' (SPU's) wastewater collection system, including work conducted as part of SPU's Combined Sewer Overflow (CSO) Reduction Program and SPU's 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 Monitoring Results

Additional information about the program may be found at www.seattle.gov/cso.

1.1 The City of Seattle Wastewater Collection System

The City of Seattle's (City's) wastewater collection system is one of the largest in Washington State and includes sanitary, partially separated, and combined sewers, as shown in Figure 1-1. In the areas of the City served by sanitary sewers, stormwater runoff flows to a storm drainage system, while sewage is conveyed through the sanitary sewers to wastewater transmission and treatment facilities owned and operated by King County Department of Natural Resources and Parks (DNRP). In the 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. In the areas of the City with combined sewers, sewage and stormwater runoff are conveyed in combined sewers to the DNRP wastewater transmission and treatment facilities.

During storm events, the quantity of stormwater runoff flowing into the collection system sometimes exceeds the capacity of the partially separated and combined sewers. When this happens, the collection system overflows at outfall structures designed for this purpose. There are currently 86 outfalls in the City of Seattle where combined sewer overflows (CSOs) can occur, as shown in Figure 1-1.

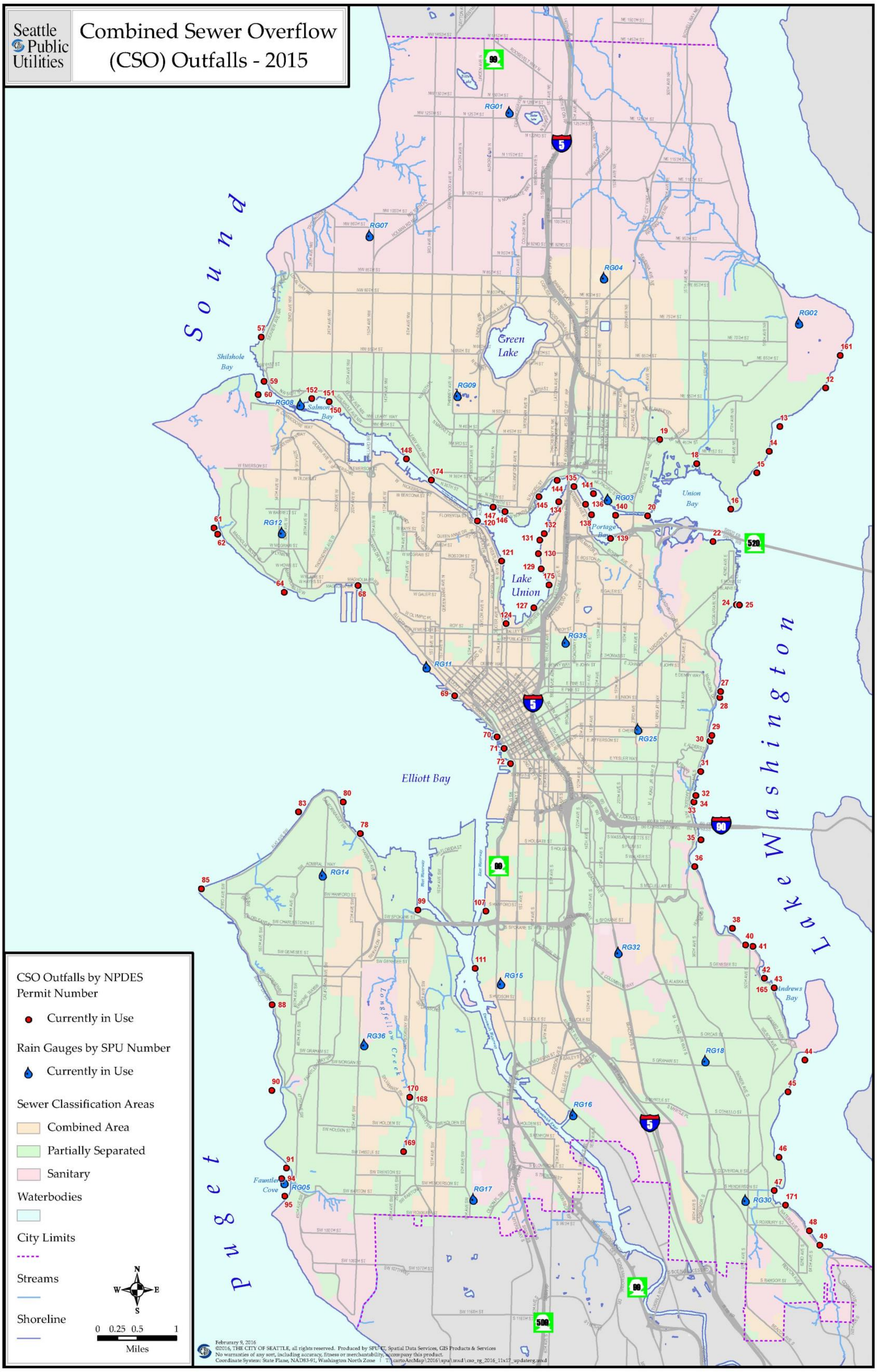


Figure 1-1. 2015 Combined Sewer Outfalls

1.2 Collection System NPDES Permit

The City's wastewater collection system is regulated by the Washington State Department of Ecology (Ecology), via National Pollutant Discharge Elimination System (NPDES) Permit WA0031682. The current permit went into effect on December 1, 2010 and was modified on September 13, 2012. SPU submitted an application for a new permit on May 22, 2015, and a draft permit was issued for public review on February 16, 2016. The current permit has been administratively extended and will remain in effect until Ecology issues a new permit, in accordance with the Washington State Administrative Procedures Act (RCW 34.05.422(3)) and Washington Administrative Code 173-220-180(5).

The NPDES permit:

- Authorizes CSOs at the 86 outfalls shown in Figure 1-1.
- Requires that SPU limit the number of CSOs from each "controlled" outfall to no more than one event per outfall per year on 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 periods of non-precipitation. Such overflows (e.g., caused by mechanical failure, blockage, power outage, and/or human error alone) are called dry weather overflows (DWOs). Note that, 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 spills and sewer overflows (SSOs).
- Requires SPU to submit an application 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 entered into with the United States Department of Justice (DOJ), EPA, the State of Washington Attorney General (AG), 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.
- Establishes penalties for non-compliance.

DOJ, EPA, AG, and Ecology negotiated a similar Consent Decree with King County.

1.4 Other Collection System Enforcement

On October 26, 2010, Ecology and SPU entered into 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 its completion deadline was not consistent with the new compliance schedule in the Plan to Protect Seattle's Waterways, which was approved by Ecology and EPA in 2015 in accordance with the process described in the Consent Decree (see Section 2.1 of this report). By letter dated February 1, 2016, Ecology rescinded the Agreed Order.

1.4 Collection System Reporting Requirements

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

Monthly discharge monitoring reports documenting the volume, duration, precipitation, and storm duration for each CSO event, due by the 28th of the following month.

Reports of any sewer overflows (SSOs) or dry weather overflows (DWOs), with the initial report due within 24 hours following SPU's discovery of an SSO or DWO and a follow-up written report due within five days.

Engineering reports, plans, specifications, and construction quality assurance plans for each specific CSO reduction construction project, due by individual deadlines specified in the permit.

Each of the 2015 monthly precipitation and discharge monitoring reports was complete and submitted on time. All of the required engineering reports, plans, specifications, and construction quality assurance plans were submitted by the required deadlines, and most were submitted in advance of deadlines. Most of the SSOs and DWOs were reported within 24 hours following SPU's discovery of these incidents, and the majority of the follow-up written reports were submitted on time. Timely 24-hour reporting is sometimes difficult during intense storm events, which is when the majority of the SSOs occur, and some follow-up letters were late because of difficulty determining the underlying cause.

In addition, both the NPDES permit and the Consent Decree require submittal of an annual report. Annual reporting requirements are listed in Table 1-1, together with an indication of where the required information is provided in this report. This report meets all NPDES permit and Consent Decree annual reporting requirements.

Table 1-1. 2015 Annual Reporting Requirements		
Source	**Requirement**	**Report Location**
NPDES permit		
S6.A	Detail the past year's frequency and volume of combined sewage discharged from each CSO outfall	Table 5-4
S6.A	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, Section 5.3
S6.A	Explain the previous year's CSO reduction accomplishments	Section 4
S6.A	List the CSO reduction projects planned for the next year	Table 4-1, Section 4
S6.A	Document compliance with the Nine Minimum Controls	Section 3.1
S6.A.1	Include a summary of the number and volume of untreated discharge events per outfall	Table 5-6
S6.A.2	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
S6.A	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): SSO performance; Number of miles of sewer that were cleaned, inspected, and repaired/replaced/rehabilitated; Number of pump station inspections and the capacity of each pump station; Number of maintenance holes and force mains inspected and repaired/replaced/rehabilitated; Number and type of CSO regulators inspected; Summaries of inspections and cleanings of each CSO control structure; and Summaries of Fats Oil and Grease (FOG) inspections and enforcement actions taken the preceding year.	a. Tables 3-3, 3-4, A-1 b. Table 3-1 c. Tables 3-1, A-2, A-3 d. Table 3-1 e. Table 3-1 f. Section 3-1 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. 2015 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: The CSO control measures for the Early Action CSO Control Program (Henderson Basins 44, 45, 46, and 47/171); The Long-Term Control Plan; The Post-Construction Monitoring Program Plan; The CMOM Performance Program Plan; The FOG Control Program Plan; and The Joint Operations and System Optimization Plan between the City of Seattle and King County	a. Sections 4.5 and 4.6 b. Section 2.1 c. Section 5.4 d. Sections 2.5, 3.2 e. Sections 2.6, 3.3 f. Section 2.3
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	Section 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 1.4
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	NA
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 2015, 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. Sections 2.1, 2.2, 2.3, and 2.4 describe progress made in 2015 as well as forecasted 2016 work on each of the following plans:

- The Plan to Protect Seattle's Waterways
- The Final Post Construction Monitoring Plan
- The Joint City of Seattle/King County Operations and System Optimization Plan
- The 2015 Outfall Rehabilitation Plan

In addition, SPU reviews previously approved plans annually, to identify any modifications needed to ensure their effectiveness. Sections 2.5 and 2.6 describe this year's review of the following previously approved plans:

- The Capacity, Management, Operations & Maintenance (CMOM) Performance Program Plan
- The FOG Control Program Plan

2.1 The Plan to Protect Seattle's Waterways

In 2015, SPU completed the Plan to Protect Seattle's Waterways (the Plan), which comprised the following four volumes:

- Volume 1 – Executive Summary – This short document includes a high level summary of the need for the Plan, the alternatives considered, the recommended alternative, a rates analysis, and the implementation schedule.
- Volume 2 - CSO Long-Term Control Plan (LTCP) – This volume describes the development of, and the options and projects comprising, the LTCP Alternative. The LTCP Alternative would control all remaining uncontrolled combined sewer basins and would limit CSO discharges to no more than one overflow per outfall per year.
- Volume 3 – Integrated Plan – This volume describes the development of, and the projects comprising, the Integrated Plan Alternative. The Integrated Plan Alternative would direct investments in stormwater and CSO control projects so that benefits to water quality would be greater and achieved earlier than would occur if SPU focused exclusively on the CSO control projects identified in the LTCP. The stormwater projects, which would be implemented in addition to all of the CSO reduction projects, include Natural Drainage

Systems (NDS) Partnering, the South Park Water Quality (WQ) Facility, and expansion of the Arterial Street Sweeping Program.

- Volume 4 – Final Plan EIS – Volume 4 describes the programmatic environmental impacts of the LTCP Alternative, the Integrated Plan Alternative, and the No Action Alternative.

SPU submitted a draft Final Plan to EPA and Ecology on February 2, 2015, so that EPA and Ecology could provide feedback on the recommended LTCP Option (the Shared West Ship Canal Tunnel option) and the recommended Plan alternative (the Integrated Plan Alternative). This submittal also satisfied an NPDES permit requirement to update the City's CSO Reduction Plan by May 30, 2015.

SPU continued to brief stakeholder groups, the Mayor's Office, City Councilmembers and Council's Central Staff. SPU prepared an Ordinance for the Final Plan to Protect Seattle's Waterways which was presented to Seattle Public Utilities and neighborhoods Council Committee on April 28, 2015. The Ordinance was subsequently approved by the Mayor and City Council on May 8, 2015, and on May 29, 2015, SPU submitted the Final Plan to Protect Seattle's Waterways to EPA and Ecology for approval.

On June 17, 2015, SPU issued an errata sheet to correct typographical errors and implementation schedule dates in the Final Plan, and on August 26, 2015, EPA and Ecology approved the Final Plan.

In 2016, SPU began implementing the CSO control projects and Integrated Plan projects included in the Final Plan. Additional detail on the implementation of these projects can be found in Section 4 of this report.

2.2 Final Post Construction Monitoring Plan

On April 1, 2010, SPU submitted a Post Construction Monitoring Plan (PCMP) per NPDES permit requirements, that was conditionally approved by Ecology in letters dated June 3, 2010 and August 10, 2010. In 2015, in accordance with the City's consent decree, SPU prepared a Final PCMP, which was submitted for approval on May 29, 2015 and corrected with an errata sheet dated July 1, 2015. The Final PCMP is an update of the approved 2010 PCMP and includes an updated analysis of planned CSO outfall sampling locations using 2010-2014 outfall monitoring data. The Final PCMP also includes an implementation schedule based on the City's Consent Decree requirements and proposed milestone compliance dates presented in the approved Plan to Protect Seattle's Waterways. On August 26, 2015, Ecology conditionally approved the Final PCMP subject to submittal of detailed Quality Assurance Project Plans (QAPPs) for each outfall where sampling will be conducted, for review and approval prior to initiating sampling.

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

The City of Seattle's and King County's consent decrees each contain language directing both agencies to work together to develop a single Joint Operations and System Optimization Plan (Joint Plan), to be submitted no later than March 1, 2016. In 2015, the Joint Plan team built on the work completed in 2014 by focusing on areas in the system that have greatest potential for operational optimization. Over the course of the year, staff from both King County's Department of Natural Resources and Parks (DNRP) and SPU participated in a detailed analysis and developed a set of multi-basin joint commitments that were included in the final plan, submitted to Ecology and EPA on February 10, 2016. The recommendations were approved by the Directors of SPU's Drainage and Wastewater Line of Business and DNRP's Wastewater Treatment Division. These commitments include:

- Establishing a Joint System Debrief Committee to look at performance of the systems, identify interconnections to improve operations, and share information
- Data Sharing
  - Continue the Joint Operations Information System Team (JOIST) to share operational information and include operational considerations in capital projects in design
  - Continue Real Time Data Sharing Pilot in selected basin and explore permanent real time data sharing
  - Improve Rainfall Data for Forecasting with additional gauges
- Establish a Joint Modeling Coordination Committee to share tools and modeled information to improve operational strategies
- Startup/Commissioning Coordination of CSO Control Facilities to work together to optimize facilities
- Real Time CSO Notification to improve both onsite (signs) and website information to improve customer communication
- Reduce Saltwater Intrusion by continuing to work together on studies, data and solutions for reducing intrusion

Developed and approved Early Action No. 3 for implementation: Operational Data Sharing Pilot. This Early Action 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. This is the first time that the two agencies' SCADA systems have shared data, and the first time that staff has had access to real-time data from both systems. Data shared in the pilot is from the University/Windermere basin where both DNRP and SPU have pump stations and CSO control facilities, and the potential for operational optimization and reduction of CSOs and sewer overflows is significant.

2.4 Outfall Rehabilitation Plan

The current NPDES permit requires SPU to submit an outfall rehabilitation plan by October 31, 2015, that describes outfalls to be repaired or replaced during the next NPDES permit cycle. In 2014, SPU reviewed previous consultant assessments, existing record drawings and CCTV investigations, and conducted additional diving inspections and a criticality analysis in order to identify the highest priority outfalls for rehabilitation. On August 13, 2015, SPU submitted the CSO Outfall Rehabilitation Plan for approval. The Plan describes the approach used to identify high priority outfall rehabilitation work and includes a schedule for completion of the repairs or replacements. The Plan was subsequently approved on September 16, 2015.

2.5 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.

SPU began developing and implementing its CMOM Program in 2004. That year, SPU performed its first gap analysis and proceeded to address prioritized gaps. Work included:

- Implementing data collection improvements;
- Documenting maintenance processes and procedures;
- Hiring a full-time Fats, Oils and Grease (FOG) Control Program Inspector;
- Revising and re-implementing a chemical root control program;
- Implementing a geographic based system for scheduling preventive pipe cleaning maintenance; and
- Adopting the Pipeline Assessment and Certification Program (PACP) coding system for pipe condition assessment.

In 2009, SPU performed its second gap analysis, to quantify progress and adjust priorities. This provided an opportunity to integrate SPU's asset management business model and asset management-based decision-making into the CMOM Program. It also provided an opportunity to use improved data management tools, including the improved Computerized Maintenance

Management System (CMMS) software and the expanded Geographic Information System (GIS) data and software. As a result, dozens of initiatives were identified that would allow SPU to become more effective, efficient, and productive in the operation and maintenance of its wastewater collection system.

SPU worked to prioritize initiatives, identify the level of effort required to implement each initiative and identify initiative dependences and the appropriate sequencing of the initiatives. The result was a 6-year roadmap for improving operation and maintenance of the wastewater collection system. SPU also set a sewer overflow performance (SSO Performance) threshold and identified appropriate performance-based follow-up activities if the threshold is exceeded. Together, the 6-year roadmap and the SSO performance threshold and performance-based follow-up activities comprise the CMOM Performance Program Plan (Plan).

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 3.2.8 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, 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. During 2015, SPU also conducted a progress review and self-assessment, the results of which are being used to identify 2016-2020 CMOM activities.

2.6 FOG Control Program Plan

SPU began its Fats Oils and Grease (FOG) Control Program in 2005, with the overall goal of reducing the number of FOG-related sewer overflows. SPU's initial efforts focused on characterizing the FOG problem by identifying FOG hot spots (locations where FOG was contributing to sewer overflows, or where pipe segments were scheduled for cleaning every 6 months or less due to FOG accumulation), assessing below-ground FOG impacts at the hot spots (including the relative influence of FOG sources, physical sewer system factors, and the effectiveness of cleaning efforts), and assessing how well Food Service Establishments (FSEs) in the vicinity of the hot spots managed their FOG waste. At the same time, SPU began inventorying FSEs to determine the extent of the FOG problem.

In 2012, SPU completed development and began implementation of a FOG Control Program Plan. SPU used the results of the FOG characterization efforts and the FSE inventory to develop short- and long-term program goals, location-specific strategies, an approach for focusing resources, a workload forecast and staffing plans, and an approach for monitoring and reporting program performance. These items comprise SPU's FOG Control Program Plan, which was submitted to EPA and Ecology on December 31, 2012. After the Consent Decree was filed in U.S. District Court, the FOG Control Plan was approved by EPA on September 5, 2013 and by Ecology on September 9, 2013.

SPU is implementing the approved plan. Each year, SPU also reviews FOG Program efforts and results in order to continue focusing on the worst FOG problems. In 2014, SPU began evaluating the tradeoffs between several alternatives to FOG control, including but not limited to:

- Using preventive maintenance (sewer cleaning) by SPU crews,
- Expanding on-site FOG control at local FSEs, and
- Using a mix of preventive maintenance and on-site regulatory control at the FSE level (the status quo).

To help review these alternatives, the FOG Program identified three target goals:

- Change FSE customer relationships from adversary to partner by increasing awareness of FOG code requirements before FSEs open for business or undertake a major kitchen remodel.
- Reduce sewer cleaning costs and sewer overflow risk by taking actions to reduce the amount of grease projected to enter the sewer system.
- Increase FOG Program efficiency and effectiveness by reducing the time it takes to complete enforcement actions.

Potential program improvements that meet these goals are being identified for consideration and possible implementation in 2016.

Actual 2015 and planned 2016 Plan activities are described in Section 3.3 of this report.

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 2014 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) 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 backups. The initial cleaning frequency is based on the cause of the initial backup, 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 routine sewer maintenance frequencies range from as short as once a month to as long as 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. In 2011, SPU launched the use of a cleaning optimization tool (COTools) to analyze sewer pipe cleaning data and recommend appropriate cleaning frequencies. SPU staff review these software-generated recommendations and implement those that provide the right balance between sewer capacity and sewer lifespan.

SPU inspects each of its 86 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 2015 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 2015 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 2015, 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.

Table 3-1. 2015 O&M Accomplishments	
Activity	**Quantity**
Miles of mainline pipe cleaned	331
Miles of mainline pipe inspected via CCTV	173
Miles of mainline pipe repaired/replaced/rehabilitated	2.4
Number of pump station inspections [1]	1,158
Number of maintenance holes inspected	561
Number of force mains inspected	0
Number of force mains repaired/replaced/rehabilitated	2
Number of CSO structure inspections	269
Number of CSO structure cleanings	69
Number of CSO HydroBrake inspections	296
Number of CSO HydroBrake cleanings	39
Linear feet of pipe receiving chemical treatment to inhibit root growth	60,795
Number of catch basins inspected	2,910
Number of catch basins cleaned	2,026
Number of catch basins repaired	11
Number of catch basins replaced	2
Number of catch basin traps replaced	202

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 which adhere to the inside of sewers, decreasing their capacity. Examples of FOG Program educational materials are shown in Figure 3-1. FOG Control Plan development activities are summarized in Section 2.5 of this report. FOG Control inspection and enforcement activities conducted in 2015 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.

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 also through a program of routine system performance monitoring and analysis.

In 2010, SPU integrated its former water and wastewater control centers into a single Control Center (CC). The Control Center is staffed 24 hours a day and receives real-time SCADA (Supervisory Control & Data Acquisition) information.

Initially, the Control Center received SCADA information only from SPU's 68 wastewater pump stations. SPU continues to regularly analyze performance of the 68 pump stations to ensure that they are operating at their design capacity during storm events. Control Center staff respond to any alarms at the pump stations or the CSO facilities that would 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 was completed and brought into the Control Center for full operation. The project, located in the Windermere Area (Basin 13), consisted of a motor-operated gate valve. The valve is programmed to fill or evacuate storage based on water levels in the downstream sewer (the Lake Line).

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 area, and sewer system improvements in the Delridge area. These facilities have now entered a stabilization period that is expected to be completed in 2016. Stabilization includes monitoring and analysis to ensure the facility is functioning as intended. It is anticipated that adequate data will be collected in 2016 to complete the stabilization process.

Several additional CSO control facilities will be completed and on boarded in 2016: upgraded pump stations in Fauntleroy (Pump Station 70 in Basin 94) and Madison Park (Pump Station 50 in Basin 22), a storage facility improvement in the North Union Bay area (Basin 18), and sewer system improvements in the Leschi area (Basins 26-36). Additional temporary flow monitoring will be installed in 2016 to understand the performance of these new facilities and to inform operational changes during start-up of these facilities.

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 three dry weather overflows (DWOs) in 2015. The first DWO began on February 27th at Outfall 127, in the South Lake Union area. It was caused by a grease blockage in a short 8-inch diameter sewer that conveys combined sewage to Wastewater Pump Station 62, and was exacerbated by 0.7 inches of rain.

Because the overflow began when it was raining, the overflow did not trigger a “dry weather alarm” with the vendor who monitors this outfall under contract to SPU. On Monday, March 2nd, SPU staff reviewed each outfall hydrograph, saw that Outfall 127 was overflowing during a period of non-precipitation, and immediately submitted a high priority work order request. SPU field crews responded, determined that there was a grease blockage in the 8-inch diameter sewer, mobilized two vactor trucks to draw down flows in the overflow maintenance hole, removed the grease, cleaned the pipe, and used CCTV inspection to verify that the pipe was clean and normal flow had resumed.

SPU staff notified Ecology, Public Health - Seattle & King County, and the Washington State Department of Health. To prevent recurrence, SPU has increased the frequency of sewer cleaning from every 12 months to every 6 months, and is continuing to inspect South Lake Union food service establishments quarterly to help ensure grease traps are being cleaned and maintained. Based on flow monitoring data, an estimated 64,878 gallons flowed through Outfall 127 to Lake Union over a period of 70.6 hours. To provide earlier detection of DWOs, two additional actions have being taken:

- SPU’s flow monitoring vendor has reconfigured their alarm system to identify any outfall overflow that lasts more than 6 hours, so that an analyst can determine whether it is a CSO and notify SPU as appropriate.
- SPU staff have identified outfalls that should trigger an alarm whenever they approach overflow conditions and have shared that information with the flow monitoring vendor.

The second DWO occurred on August 26th as SPU SCADA technicians were relocating a new Programmable Automated Controller (PAC) in an attempt to address recurring overheating problems. The technicians were using drawings submitted by the Genesee CSO Storage Project electrical subcontractor. The drawings indicated that the gate valve upstream of storage facility CSO 9 was controlled by an actuator, the actuator included built-in emergency shutdown (ESD) circuitry, the ESD was wired to a normally open contact, and therefore, when the PAC wires were removed, the gate valve would remain open, allowing sewage to flow through CSO 9 into the Lake Line and north to Pump Station 5.

Unfortunately, the drawings were outdated. Updated drawings from the subcontractor show that the ESD circuit was wired to a normally closed contact. When the technician removed the PAC wires, it caused the ESD to engage and the gate valve to close, causing sewage to back up in the sewer until it reached the top of the overflow weir and flowed through Outfall 43 into Lake Washington. Approximately 25 minutes after the gate valve closed, SPU’s contract flow monitoring vendor received an alarm indicating a dry weather overflow in progress and alerted SPU staff. SPU field crews responded and manually opened the gate valve as quickly as possible.

Additional SPU staff consulted with Public Health - Seattle & King County and Seattle Department of Parks and Recreation (Parks), began posting the shoreline and collecting daily water quality samples at multiple locations extending from the Genesee area on the north end to the Seward Park swimming beaches on the south end, and alerted the media. Based on flow monitoring data, an estimated 11,842 gallons flowed through Outfall 43 to Lake Washington over a period of 2.5 hours. To prevent recurrence, SPU has evaluated its control system and eliminated similar control configurations wherever feasible. SPU has also reviewed its contractor submittal processing procedures to ensure SCADA technicians have the most up-to-date drawings.

The third DWO occurred on September 21st and was caused by the SR-99 construction project. In July 2014, as part of constructing the SR 99 Tunnel Project Access Shaft (commonly known as the Bertha emergency access shaft), Seattle Tunnel Partners (STP) removed a portion of SPU's 21-inch diameter sewer and installed bypass pumps to convey sewage around the access shaft (which is located upstream of Overflow Structure 71B). The DWO occurred when STP's flow level sensing equipment failed. SPU received a high water alarm from its flow monitoring vendor, confirmed surcharge conditions at Overflow Structure 71B, and alerted WSDOT and STP. STP switched the bypass pump operation from automatic to manual and began cleaning the flow level sensing equipment so that it would work as intended. Once the equipment was cleaned, bypass pump operations returned to normal.

SPU consulted with Public Health - Seattle & King County, who advised that posting of the waterfront was not necessary. Based on flow monitoring data, an estimated 878 gallons flowed through Outfall 71 to Elliott Bay over a period of 12 minutes. To discourage recurring noncompliance, SPU issued STP a Notice of Violation (NOV) and a $1,500 penalty.

SPU also experienced 3 known exacerbated CSOs in 2015 (wet weather overflows at CSO outfalls that, while already discharging as a result of precipitation, were worsened by mechanical failures, blockages, equipment outages, or power outages). These three overflows (a 5,162 gallon overflow on January 18, a 3,431 gallon overflow on March 15, and a 2,232 gallon overflow on November 15) were at Outfall 22 in Madison Park and were exacerbated by underperforming air lift style pumps at Wastewater Pump Station 50. Design is underway on a pump station rehabilitation project that will replace the air lift style pumps with more reliable submersible pumps. Construction is scheduled for completion in 2016.

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 address the overflow and reduce or eliminate the probability of recurrence. Investigation includes manual inspection of the site where the overflow occurred, CCTV inspection of adjacent pipe, and review of SCADA data. Whenever possible, the outfall structure and adjacent pipes are cleaned immediately following the event, and SPU reviews and analyzes the cleaning results.

SPU holds monthly "after action" review meetings to learn from our experiences and apply any lessons learned toward preventing additional SSOs, DWOs, and exacerbated CSOs. SPU also looks at the rolling history of DWOs and exacerbated CSOs to determine if there are any patterns and if a systematic solution is required. For example, in past years pump station electrical outages contributed to DWOs, so SPU implemented projects to ensure that each pump station has either an on-site backup generator or an emergency plug that allows a portable generator to be easily placed in service.

A summary of the DWOs and exacerbated CSOs from 2007-2015 is included in Table 3-2.

Table 3-2. Dry Weather Overflows (DWOs) and Combined Sewer Overflows (CSOs) Exacerbated by System Maintenance Issues 2007 – 2015

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

[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 recently launched a Make It a Straight Flush pilot outreach campaign to educate customers that only toilet paper and human waste should be flushed down the toilet.

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 2014 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 prevention,
- 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 2015, SDOT street sweeping crews swept 9,940 miles in the combined sewer system area, removing approximately 1,910 short wet tons of dirt and debris from City streets.

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, actually reducing the regional water system annual demand while the population has increased. As a result of these efforts, 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

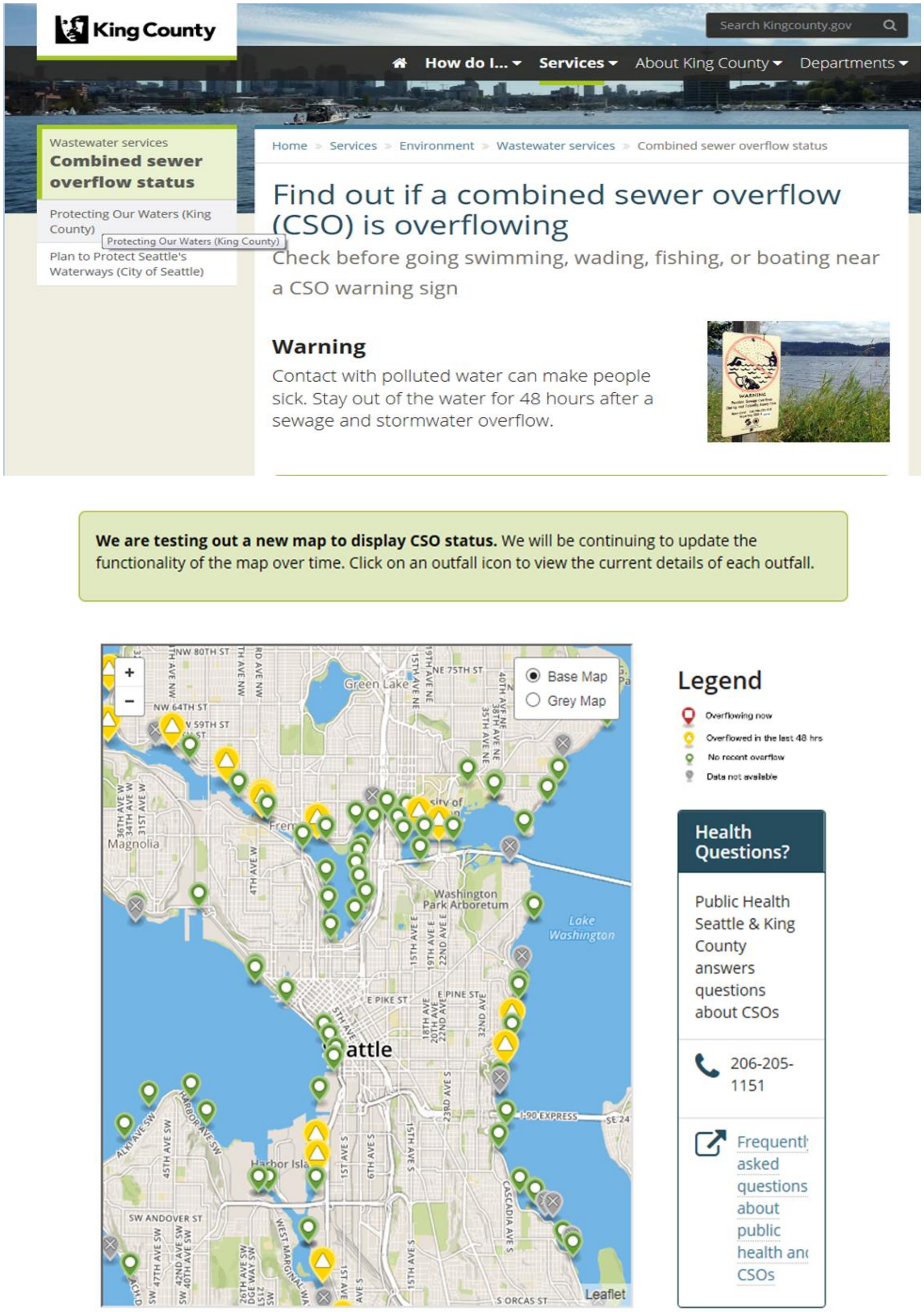
Implement a public notification process to inform the citizens of when and where CSOs occur.

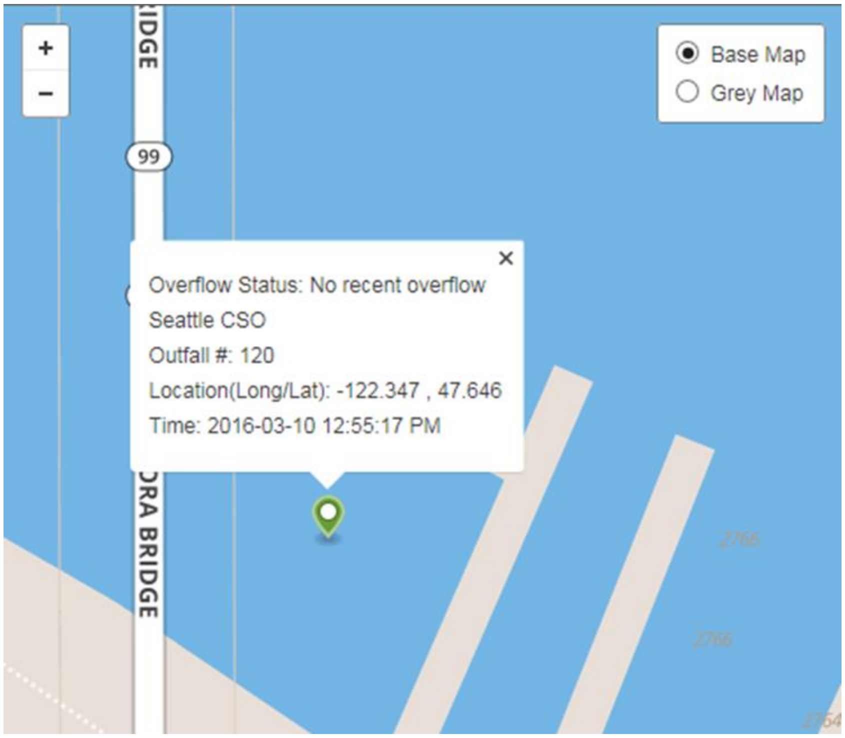
SPU, together with Public Health - Seattle & King County, maintains a sewage overflow notification and posting program for Seattle's CSO outfalls. Signs at each outfall identify the outfall and warn of possible sewage overflows. The signs include the phone number for the CSO Hotline, staffed and managed 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 three screen shots that comprise Figure 3-3 show the simplified website language, the zoomable map, and the type of information the public sees when they click on an individual outfall on the map.

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 described and summarized in Section 5 of this report.

3.2 CMOM Performance Program Activities

The CMOM Performance Program Plan 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.

Work in each of these program areas is described in the following sections.

3.2.1 Planning and Scheduling Initiatives

The purpose of the planning and scheduling initiatives is 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 and planned for 2016 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 is incorporating risk based scheduling into a new comprehensive maintenance strategy for sewer CCTV and cleaning. This comprehensive strategy will increase the portion of the sewer system that has undergone a condition assessment, improve crew efficiency by grouping work geographically, and enable staff to meet preventive maintenance commitments.

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 the sewer cleaning efforts, providing feedback to the crews, and using technology to help identify where changes in cleaning frequency should be considered. Work completed to date and planned for 2016 includes:
- Sewer Cleaning Optimization Tool Enhancement - SPU modified its Cleaning Optimization Tool (COTools) in the fourth quarter of 2013 to integrate with Maximo 7. In 2014, after working with this tool for several years, SPU identified several software upgrades needed to improve the user interface, improve the work flow and data review, and better integrate with SPU's Maximo 7 system. The upgrade of COTools will occur in 2016, in conjunction with development of the new comprehensive maintenance strategy.
- Sewer Cleaning Crew Training - 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 used a combination of classroom and field training. In 2016, the training program will be evaluated and revised as necessary.

3.2.3 FOG Control Program Initiatives

The purpose of the 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 FOGgenerating dischargers, and utilizing risk-based assessments to help prioritize inspections, FOG-related sewer cleaning, and FOG-related enforcement. Work completed in 2015 and planned for 2016 includes:

- Annual Plan Review – SPU review the plan each year and updates it as appropriate in order to continue focusing efforts on the worst FOG problems. The 2015 annual review did not result in any plan revisions.
- Food Service Establishment (FSE) Inventory Management Plan –SPU completed a Food Service Establishment (FSE) Inventory Management Plan in September 2015, per Section 3.2.3(b) of the approved CMOM Performance Program Plan. The FSE Inventory Management Plan describes SPU's approach for collecting, using, and managing FSE data.

  In accordance with this plan, FOG inspectors completed 307 regulatory FSE inspections and 1,587 inventory FSE inspections in 2015. These inspections include FOG education, data collection and an evaluation of FOG discharge risk. The completion of these inventory inspections concludes the effort initiated in 2012 to conduct an educational outreach and field audit of all FSEs within the SPU service area. Between 2012 and 2015, 5,679 inventory inspections were conducted by the FOG Inspection Team. Going forward, newly identified facilities will receive an initial regulatory inspection geared towards educational outreach and site assessment.

  In addition to the field activities listed above, SPU received a complete updated listing of FSEs from Public Health – Seattle & King County and incorporated this information into the SPU FOG Database. An ongoing and automated quarterly subscription was initiated with Public Health to ensure FSE information stored within the SPU FOG database remains current.
- Standard Operating Procedures (SOPs) –SPU reviewed all FOG Control Program SOPs in 2015. As a result of this review, the Regulatory Inspection and Linko Database SOPs were updated. Additionally, a process was developed to facilitate annual SOP review and assessment by all field 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.
- Outreach - All outreach materials were reviewed in 2015. No modifications are needed at this time. In late 2015, five sets of new FOG messaging panel truck banners were created to replace aging messaging on three existing SPU CCTV trucks and apply FOG messaging on two new SPU CCTV units coming in service in 2016. 2015 commercial and residential outreach activities included the following:

Commercial

- Conducted 1,894 FSE site visits with an outreach component;
- Delivered FOG messaging to 135 FSEs and delivered free spill kits to 93 FSEs, as part of a Seattle Green Business Program multi-faceted conservation, pollution prevention, and recycling campaign;
- 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 1,185 residential units on 496 parcels that discharge to FOG Hotspot associated sewer mainlines;
- Attended and distributed FOG control materials at the Trends – Rental Property Management conference and Tradeshow, which was attended by over 1,400 rental property owners and managers;
- Through our customer service web portal and individual inquires, distributed 19,760 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 in order 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/foodyard/fatsoilsgrease/.

▪ FOG Inspector Training – FOG Program training needs were assessed in June 2015. A more structured training program will be developed through the third and fourth quarters of 2016. Training in 2015 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;
- In September, FOG Team members attended the Pacific Northwest Pretreatment Workshop and Western States Alliance FOG Workshop ;
- In October, FOG Team members attended the Linko Technology User Group Workshop.

3.2.4 Repair, Rehabilitation, and Replacement Initiatives

- The purpose of the repair, rehabilitation, and replacement initiatives is to complete sewer repair, rehabilitation, and replacement work in a timely and efficient manner. Work completed in 2015 and planned for 2016 includes:
- Repair, Rehabilitation and Replacement (3R) Process and Tool –SPU developed and uses the 3R Process and Tool to prioritize sewers based on CCTV inspections. The 3R Tool uses condition information to assess the risk of failure and also tracks final 3R decisions and the status of decision execution. SPU has identified several upgrades needed to improve the user interface, work flow between SPU branches, and integration with SPU's Maximo 7 system. SPU also completed a sewer pipe criticality rating project in 2015 and those ratings need to be integrated into the 3R Tool. Upgrades to the 3R Tool are planned for 2016 and 2017.
- Capital Improvement Plan and Workload Forecasting – SPU continues to implement its Sewer Mainline Rehabilitation Program. In 2015, SPU completed a business case for sewer rehabilitation that led to budgeting of over $14M annually for rehabilitation projects in 2016-2020. Priority projects are chosen based on 3R Tool risk scores.

3.2.5 Condition Assessment Initiatives

The purpose of the condition assessment initiatives is to improve the quality and efficiency of force main assessments and sewer inspections by standardizing the procedures, providing crew training, measuring and tracking the quality of the work, and providing feedback to the crews. Work completed in 2015 and planned for 2016 includes:

- Force Main Assessment Strategy – SPU developed a Force Main Assessment Strategy in the first quarter of 2014 and began implementing the strategy in the second quarter of 2014. The strategy recommended the development of a business case evaluation to determine which force mains will benefit most from internal inspection technologies. This business case evaluation was completed second quarter 2015.
- Acoustic Sewer Inspection Pilot Program – In 2014, SPU began piloting a new acoustic technology to assist in condition assessment. SPU evaluated the pilot program in 2015 and determined not to adopt the use of the technology to assess pipe condition.

3.2.6 SSO Response Initiatives

The purpose of the SSO response initiatives is 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. Since 2014, SPU has updated Sanitary 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 plans to develop a new SSO Tracking software application to improve SSO investigation and reporting. SPU will also modify the SSO investigation and reporting process to reflect new NPDES permit requirements.

3.2.8 SSO Performance

There were 102 sewer overflows in 2015, and they are summarized by cause in Table 3-3. Factors causing the greatest number of sewer overflows were extreme weather events (storms with recurrence intervals of at least 25 years), which caused 28 sewer overflows; roots in the sewer, which led to 18 sewer overflows; and capacity-related overflows, which caused 20 sewer overflows. Factors causing zero or very low numbers of sewer overflows were system operator error, power outages, other agency construction, pump station capacity, private construction and vandalism.

Table 3-3. 2015 Sewer Overflows by Category

Category	Primary Cause of Sewer Overflows	Number of 2015 Sewer Overflows
1	Roots	18
2	FOG	4
3	Debris	4
4	Structural – gravity	6
5	Structural – force main	2
6	Capacity	20
7	Pump Station – mechanical	2
8	Pump Station - capacity	1
9	Power Outages	0
10	Operator Error	0
11	Maintenance Error	6
12	City Construction	5
13	New Facility Startup	2
14	Private Side Sewer Issue	2
15	Private Construction	1
16	Other Agency Construction	0
17	Vandalism	1
18	Extreme Weather Event	28
	Total for Categories 1 – 18	102
	Total for Categories 1 – 14	72

SSO performance for the years 2013 through 2015 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, 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. 2013-2015 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

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, and vandalism.*
2. *SPU has 1,421 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 2015 were caused by roots and capacity related issues, so in 2016 we are increasing our focus on our Chemical Root Control and Capacity Assessment programs.

3.3 FOG Control Program Activities

In 2015, FOG Control Program staff worked with both residential and commercial customers to reduce the amount of FOG discharged into the sewer system. Inspectors completed the Food Service Establishment (FSE) inventory inspection effort launched in 2012. The primary goal of this activity was to inventory FSEs within the SPU service area and assess the FOG discharge risk and grease removal device installations. The secondary goal was to provide education and outreach information and messaging in order to expand FSE's knowledge of the issues caused by FOG and best management practices they can put in place to reduce FOG discharge from their facilities. In 2015, 1,587 inventory inspections were completed bringing the total number of assessments to 5,679.

In addition to these inventory inspections, 307 regulatory compliance inspections were completed in 2015. In accordance with the risk-based strategy in the approved SPU Fats, Oils, and Grease Control Program Plan, 70 percent of these 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. (If more than 50 percent of the sewer is obstructed, it is a Priority 1 hotspot. If more than 20 percent and less than 50 percent of the sewer is obstructed, it is a Priority 2 hotspot.) The 307 regulatory compliance inspections resulted in 140 enforcement actions:

- 55 requiring grease interceptor maintenance,
- 82 requiring installation of grease interceptors and plumbing modifications, and
- 3 requiring a plumbing modification.

Inspectors also conducted door to door residential outreach in residential areas with Priority 1 and Priority 2 hotspots. In 2015, the team conducted outreach to 1,185 single family dwellings and multi-family properties. Additionally, 19,760 residential FOG fliers were distributed in response to customer service inquiries primarily initiated by multi-family housing property owners and managers. These inquiries were a result of an expanded effort to educate this group through the FOG program interaction with the City of Seattle multifamily conservation initiative and by attending events such as the Seattle Trends, Rental Housing Management Conference and Tradeshow. As a result of these efforts, the number of requests increased significantly in 2015, from 6,442 in 2014 and 2,594 in 2012.

2016 FOG Control Program efforts will include the following activities:

- Regulatory compliance inspections of facilities connected to Priority 1, 2, and 3 hotspots.
- Focused enforcement at facilities that discharge to high priority sewer mainlines and that have a high risk of discharging high levels of FOG. This includes working with the 64 FSEs located at the historic Pike Place Market.
- Clarification of existing City code through the development of a Directors Rule.
- Continued expansion of the residential outreach initiative.

3.4 Annual Review of Operations and Maintenance Manuals

In 2014, SPU reviewed all Drainage and Wastewater (DWW) Operation and Maintenance (O&M) SOPs and Job Plans and revised the Sewer Overflow Response SOPs. In 2015, SPU finalized a CCTV SOP, provided sewer cleaning training for all crews, provided refresher training on the Sewer Overflow Response SOP, and provided Sewer Overflow Response pump and bypass training for the crew chiefs. In addition, SPU submitted O&M manuals to Ecology and EPA for the new operable CSO storage facilities at Windermere and Genesee.

SECTION 4

Capital Activities

This section describes capital projects and other 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 2015 and work that we plan to complete in 2016. SPU is continuing to apply a program management model to oversee and direct the delivery of capital projects. During 2015, 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. 2015 project spending is summarized in Table 4-1.

Table 4-1. 2015 Plan Development & Implementation Spending

Project Name	Amount Spent
Long-Term Control Plan	$284,812
Integrated Plan	$168,600
Delridge Retrofit	$6,997,372
Leschi Retrofits	$1,701,680
Other Retrofits	$719,289
Ballard Roadside Raingardens	$520,864
Delridge Roadside Raingardens	$901,113
RainWise	$1,125,121
Windermere CSO Reduction Project	$768,127
Genesee CSO Reduction Project	$4,157,493
North Henderson CSO Reduction Project	$18,628,588
Ship Canal Water Quality Project	$20,258,490
52nd Ave S Conveyance Project	$246,154
Pump Station 9 Rehabilitation Project	$1,620,765
Pump Station 50 Rehabilitation Project	$354,598
South Henderson CSO Reduction Project	$166,344
Central Waterfront CSO Reduction Project	$125,247
NDS Partnering	$421,236
South Park Water Quality Facility	$281,891
Expanded Street Arterial Sweeping	$3,749
Total	$59,451,533

4.1 Sewer System Improvement Projects

SPU made significant progress on a variety of combined sewer system improvement projects in 2015, 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, flow monitoring data indicated that the HydroBrake in the basin was not operating according to its design performance curve, which resulted in underutilization of existing CSO storage. To remedy the situation, SPU decided to replace 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 began in mid-2015. The project is anticipated to be completed and operational by mid-2016, ahead of the previously projected December 31, 2017 completion date. Post project performance monitoring will commence upon completion of construction Figures 4-1 and 4-2 show the HydroBrake that was removed and the newly installed gate.

Figure 4-1. Former North Union Bay HydroBrake

Figure 4-2. New North Union Bay Automated Gate

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. Design was completed in 2014. Construction started in February 2015 and was substantially completed by the NPDES permit deadline of November 1, 2015. SPU will be monitoring the performance of the improved facilities starting in 2016. Figure 4-3 shows the construction of one of the new diversion structures the finished surface after the installation of the diversion structures and piping.

Figure 4-3. New Delridge Diversion Structure (upper) and Finished Appearance (lower)

4.1.3 Henderson (Basins 47, 49)

The current NPDES permit requires that SPU complete construction of sewer system improvements in Henderson Basins 47 and 49 by November 30, 2015. SPU completed design and construction of retrofits at Overflow Structure 47C and Outfall 49 in in 2013. Both retrofits are discussed in detail in the 2014 Annual Report. Post-project performance monitoring of each retrofit will proceed through 2016.

4.1.4 Leschi (Basins 26 – 36)

The Leschi Area is in east Seattle bordering Lake Washington and is comprised of 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 is currently in construction and will be completed in 2016. Phase 1 improvements are discussed in the 2014 Annual Report. Phase 2 improvements include 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 service, and
- Remove the HydroBrakes in Basins 33 and 29.

Figure 4-4. Combined Sewer Replacement in Leschi

Figure 4-4 shows combined sewer pipe being replaced as part of Phase 2.

4.1.5 Duwamish (Basin 111)

The Duwamish Basin (111) sewer system improvement project consisted of raising the overflow weirs located in MH 056-270 (Overflow Structure 111B) and MH 056-365 (Overflow Structure 111C). These improvements were constructed in 2014 and post-project performance monitoring will be conducted until late 2016.

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 is an airlift-type pump station that in recent years has underperformed and had recurring reliability and maintenance issues. In 2014 the decision was made to replace the airlift-type pumps with submersible pumps. The project will include new pumps, piping, valves, and new electrical and SCADA equipment. The project will also include upgrades to the overflow structure and new valve vaults. Design was initiated in mid-2014 and completed in 2015. Construction is anticipated to be completed in 2016.

4.1.7 Future Sewer System Improvement Projects

Magnolia Basin 60

In 2015 SPU selected the preferred alternative for the Magnolia Basin 60 sewer system improvement project. 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 WWTP. Per the approved Plan to Protect Seattle's Waterways, design of this project will be completed in 2017 and construction will be completed in 2018.

Portage Bay 138 and Montlake Basins 20, 139, 140

Options analysis for Montlake Basins 20, 139 and 140 was completed in 2014. The improvements in these basins will consist of the following: Basin 20 – weir raising, Basin 139 – upsizing the capacity of Wastewater Pump Station 25, Basin 140 – upsizing Wastewater Pump Station 15 and providing a new force main to the DNRP trunk line. Design of these preferred sewer system improvements will commence in 2016. Options analysis for Portage Bay 138 was initiated in late 2015 and will be completed in 2016.

Delridge Basin 99 and East Water Way Basin 107

SPU will be conducting an options analysis in these basins in 2016 to determine the preferred sewer system alternatives.

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 2015 included:

- Integrating multiple web resources into a single internet site, www.700milliongallons.org.
- Updating the GSI design manual to reflect lessons learned on completed projects. The GSI design manual serves as the "go-to" resource for SPU and DNRP staff working on GSI improvements in the City of Seattle public right-of-way.
- Initiating design concepts for curbless roadway typologies.

In 2016, 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).

4.2.1 RainWise Program

Since 2010, RainWise has offered rebates to residents living in the combined sewer areas of Seattle. Eligible homeowners 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 contact a trained contractor marketplace.

Since 2009, over 500 contractors, landscape designers and similar professionals have been trained in the program. Each year, the program offers two training opportunities for interested contractors to enter the program. There are currently 50 active contractors listed on the RainWise website that are available to bid and install systems for RainWise customers. In 2015, contractor fairs were offered to connect interested participants with participating contractors.

Additionally, SPU and its community partners offered several opportunities to talk with satisfied participants and meet contractors.

Upon completion, installations are inspected by a RainWise inspector and homeowners 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 2015 installation now controls the runoff from nearly 1,300 square feet of roof area. Typical RainWise installations are shown in Figure 4-5.

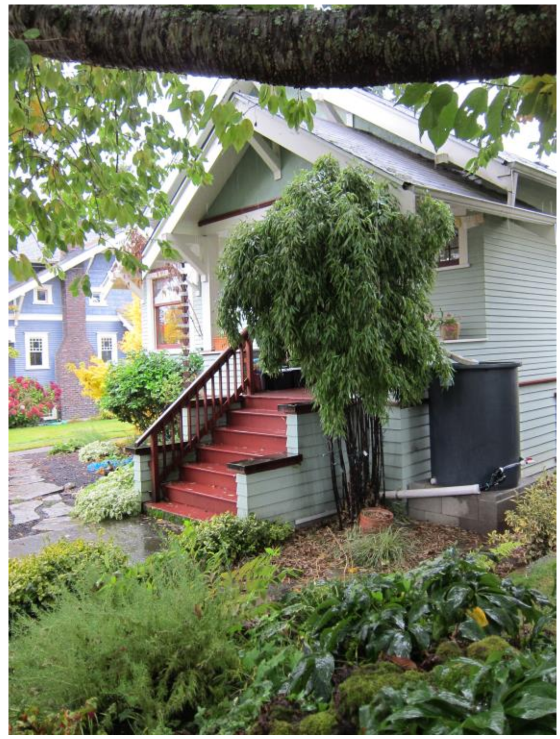


Figure 4-5. Raingarden (left) and Cistern (right)

In 2015, the RainWise program completed 104 projects in the Ballard, North Union Bay, Delridge, Fremont, Genesee, Henderson, Leschi, Montlake, and Windermere basins. Since program inception, 511 installations have been completed. These installations control approximately 15.1 acres of impervious roof area and an estimated 8.1 million gallons (MG) per year of stormwater, as well as provide an estimated 140,000 gallons of CSO control volume.

In an effort to reach historically underserved communities, equity inclusion pilots have been undertaken in the Delridge, Genesee and Henderson basins to explore best practices for involving these communities in RainWise. Eighteen RainWise installation have resulted from this work. Sixteen customers also received additional follow-up regarding how to maintain their cisterns and/or rain gardens.

The RainWise program continues to operate under a memorandum of agreement with King County to make RainWise rebates available to customers located in CSO basins that are within the City of Seattle and under the County's jurisdiction in Ballard/West Phinney, Highland Park, Barton, and South Park. King County completed 170 installations in 2015, bringing their total installations since joining the program in 2013 to 364. King County's installations control approximate 10.4 acres of impervious roof area and 5.1 MG per year of stormwater.

4.2.2 Ballard Roadside Bioretention

In August of 2012, SPU began developing and analyzing alternatives for the Ballard Natural Drainage System 2015 (Ballard NDS 2015) project. This project is the next NDS project in Ballard, building on the experience from the first Ballard NDS project constructed in 2010, and providing roadside bioretention on up to 17 blocks.

Work completed in 2015 includes the following:

- Completed the Engineering Report, which was submitted and approved by Ecology.
- Completed the project design, which includes a new concept using modular soil cells (see Figure 4-6). These maximize the efficiency of each raingarden, resulting in a reduced number of cells required along each block.
- Advertised and awarded the construction contract before the October 31, 2015 regulatory deadline.

To minimize construction impacts on the Loyal Heights school community, minimize the number of construction mobilizations, and provide more favorable weather conditions for construction, the construction contract has been suspended until April 2016, at which time construction will begin on non-school street blocks and then move over to the school blocks after school is out for the summer. Construction of the entire project is planned to be completed by December 2016.

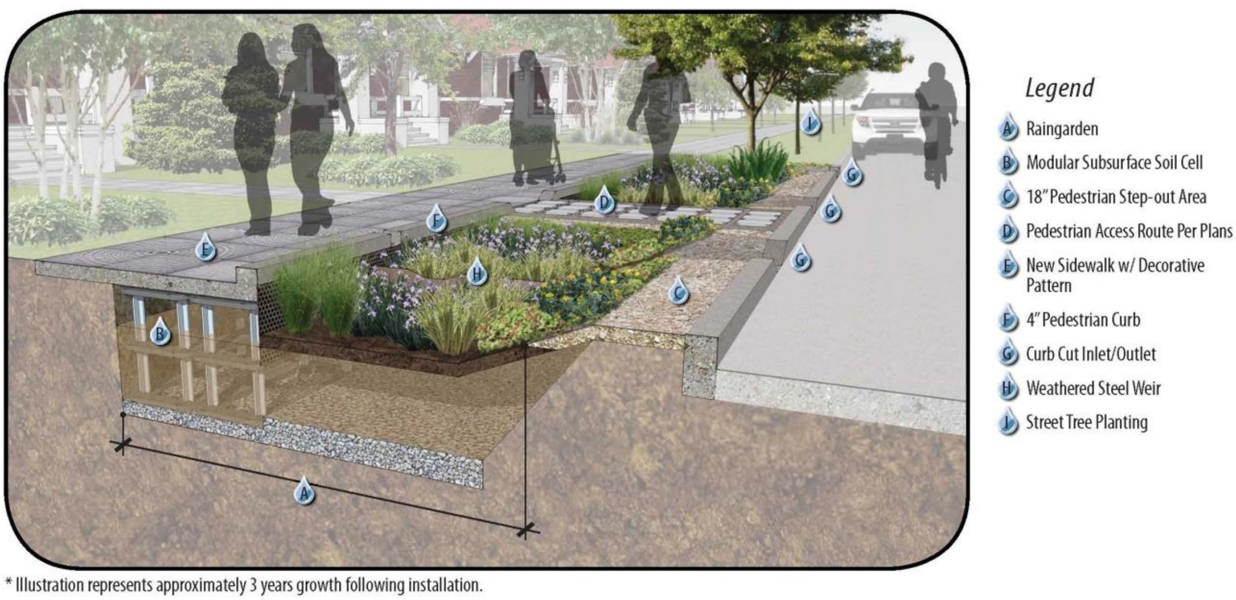


Figure 4-6. Ballard NDS 2015 Modular Soil Cells

4.2.3 Delridge Roadside Bioretention

SPU began developing and analyzing alternatives for the Delridge NDS 2015 project in August 2012. This project will use roadside bioretention in the public right-of-way to help reduce combined sewer overflows into Longfellow Creek. Public engagement efforts and extensive geotechnical analyses in 2012 and 2013, along with coordination with Seattle Department of Transportation (SDOT) to co-locate neighborhood greenways, allowed the alignment of the raingardens to be identified in early 2014. The majority of the work in 2015 focused on completing and submitting the Engineering Report to Ecology, completing design, advertising for bids, awarding the construction contract, issuing notice to proceed, and beginning construction.

In 2016, the Delridge NDS project will complete construction of 23 underground injection control (UIC) wells, including pretreatment via bioretention cells connected with underdrains.

Figure 4-7. Delridge NDS 2015 Conceptual Drawing

4.3 Windermere CSO Reduction Project

The Windermere CSO Reduction Project will reduce 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 October 2012 and the work was substantially complete in March 2015. The facility went through a stabilization process in Spring 2015 and project reached construction complete on July 31, 2015. Post Project Performance Monitoring began August 1st.

Monitoring and hydraulic modeling will be performed in 2016 to confirm that the Windermere basins are controlled. The project is on schedule to meet all regulatory deadlines.

Figure 4-8. Completed Windermere CSO Storage Facility

Figure 4-9. 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.

Construction began in April 2013 using the General Contractor / Construction Manager delivery method. In 2015, SPU completed construction of the new facilities, including testing and commissioning activities. Upon placing the facilities in service, SPU encountered an issue with the electrical cabinets overheating. Modifications were made to the electrical cabinets by SPU crews. These modifications were completed prior to the regulatory deadline for construction completion.

The new facilities have been in SPU's "stabilization phase" since construction completion in October 2015. Stabilization phase consists of monitoring and adjusting operation of the facilities to maximize performance. Hydraulic modeling will be performed in 2016 to confirm that the basins are in compliance with regulatory requirements. The project is on schedule to meet the deadline for achieving controlled status.

Figure 4-10. Completed Genesee CSO Storage Facility 9A

Figure 4-11. 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 million gallon 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.

In 2015, construction began on the project. Significant accomplishments include completion of the sewer system improvements adjacent to Martha Washington Park, replacement of Outfall 44 at Seward Park, completion of site piping, and construction of the shoring system for the new storage facility in Seward Park.

Planned 2016 construction activities include excavation and construction of the new storage facility (including structural, mechanical, and electrical work) and completion of shoreline improvements in Seward Park. Construction completion is anticipated in the second quarter of 2017, well ahead of the regulatory requirement.

Figure 4-12. North Henderson CSO Storage Facility during Construction

Figure 4-13. CSO Outfall 44 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 will reduce 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, prior to the regulatory deadline. The new pipeline has been in SPU's "stabilization phase" since construction completion. Stabilization phase consists of monitoring and adjusting operation of the facility to optimize performance. Hydraulic modeling will be performed in 2016 to confirm that the basins are in compliance with regulatory requirements. The project is on schedule the meet the deadline for achieving controlled status.

Figure 4-14. Completed 52nd Ave S Combined Sewage Conveyance Project

4.6.2 Pump Station 9 Rehabilitation Project (Basin 46)

The Pump Station 9 Rehabilitation Project will reduce the number and volume of combined sewage overflows from Outfall 46 in the South Henderson area. In 2015, SPU replaced the existing pumps with two higher capacity pumps, and upgraded the electrical and mechanical systems. The project reached construction completion on December 15.

Figure 4-15. Completed Pump Station 9 Rehabilitation Project

4.7 Ship Canal Water Quality Project

The approved Plan to Protect Seattle's Waterways (the Plan) identified a shared storage option at the west end of the Ship Canal as the recommended option for controlling CSOs from SPU's Wallingford, Fremont and Ballard areas as well as CSOs from DNRP's 3rd Avenue West and 11th Avenue Northwest outfalls. During 2015, SPU and DNRP worked to negotiate a Joint Project Agreement (JPA) for the project, which identified SPU as the lead agency who will own and operate the completed facility. DNRP will be an active partner during design, construction and operation of the storage tunnel. SPU prepared an Ordinance and obtained Mayor and Council approval to authorize SPU's Director to sign the JPA. DNRP is working to obtain Executive and Council approval to authorize DNRP's Waste Treatment Division Director to sign the JPA. Approval of the Ordinance is expected in the second quarter of 2016.

Due to the complexity of the Ship Canal WQ Project, the Project will be managed as a Program, with multiple activity numbers to facilitate cost tracking, improved project control and reporting for the Shared Project. The program format will allow certain project activities to be completed in a timelier manner and will provide additional assurance that regulatory milestone dates are met. The Project Management Plan that was prepared for the project is being converted to a Program Execution Plan, which will be issued in March 2016.

During 2015, SPU initiated Phase 1, 2 and 3 geotechnical investigations along the proposed tunnel alignment to determine soil conditions, which were documented in a Geotechnical Data Report and Geotechnical Interpretive Report (GIR). A Phase 4 geotechnical investigation is planned for 2016 which will be based on additional input from the design consultant. The GIR will be used by the design consultant to develop a Geotechnical Baseline Report (GBR) for construction.

SPU issued a Determination of Significance in July 2015 and requested comments on the scope of a project-specific Supplemental EIS supplementing the programmatic EIS for the Plan to Protect Seattle's Waterways. The scoping effort was completed by September 2015 and a preliminary draft Supplemental EIS was developed.

A draft Facility Plan was prepared for the Ship Canal WQ Project and was submitted (with the preliminary draft Supplemental EIS) to EPA and Ecology for review in January 2016. SPU prepared a facility plan instead of an engineering report, in anticipation of seeking federal and state grants or loans. SPU anticipates that the draft Supplemental EIS will be issued for public comment and a public hearing will be held in June 2016. We anticipate that the Final Supplemental EIS will be issued in the third quarter of 2016, and the Final Facility Plan and Final Supplemental EIS will be submitted to EPA and Ecology in the fourth quarter of 2016.

Because the Ship Canal WQ Project is a joint SPU/King County DNRP project that is sized to control DNRP's 3rd Ave W and 11th Ave NW Basins (DSN 008 and DSN 004, respectively) in addition to SPU Basins 147, 150/151, and 174, the Draft and Final Facility Plans also are anticipated to fulfill requirements in Section V.B.15 of King County's Consent Decree.

DNDRP's participation as a partner on the Ship Canal WQ Project is contingent on the United States Department of Justice (DOJ), United States Environmental Protection Agency (EPA) and Washington State Department of Ecology's (Ecology's) approval of a modification to King County's Consent Decree (Civil Action No. 2:13-cv-677) to allow a joint project between the City and King County. On April 27, 2015, SPU and King County met with DOJ, EPA and Ecology to initiate discussions on modifying King County's consent Decree. A draft modification was prepared by DOJ for review on May 4, 2015 and a final draft was distributed with input from all parties on June 29, 2015. Following approval of a Joint Project Agreement by SPU and DNRP, the Consent Decree Modification will be finalized and routed for approval signatures, most likely in mid-2016.

In the meantime, SPU negotiated and procured consultant design services for the Ship Canal WQ Project Tunnel, Tunnel Effluent Pump Station, and the 3rd Ave and 11th Ave NW conveyance lines. The contract was approved in November 2015 and is currently in the 30 percent design phase, which will be completed in early Summer 2016. Completion of 60 percent design is expected by the end of 2016.

SPU also completed in-water soils investigation work and procured design consultant services to design a replacement pier at 24th Ave NW in Ballard, for use as a barging facility for removal of tunnel spoils. The consultant completed 60 percent design of the pier during 2015 and will finalize the design in 2016. SPU also negotiated a draft memorandum of agreement (MOA) with the Seattle Department of Transportation (SDOT) for use of the pier and will transfer ownership of the new pier to SDOT after completion of the project.

Also in 2015, SPU continued negotiating the purchase of property needed for tunnel construction in Ballard and Wallingford. A voluntary sale of The Yankee Grill property in Ballard was completed in March 2015, and the property is now under SPU ownership. The adjoining undeveloped Salmon Bay Hotel site is proceeding through a condemnation process which will likely extend into May 2016. SPU filed a petition for condemnation with the Superior Court of the State of Washington for King County in May 2015 and obtained immediate use and possession of the property in July 2015. In December 2015, SPU issued a letter to the City's Department of Finance and Administrative Services (FAS) in response to Excess Property Notice for PMA 91 (the site of the east tunnel portal in Wallingford), indicating its desire to transfer ownership of the property to SPU for the construction of the Ship Canal WQ Project. FAS has commenced preparing an Ordinance to transfer ownership of the property to SPU by Spring 2016.

SPU continued with its community outreach for the Ship Canal WQ Project during 2015, as summarized below:

- Information booths were staffed at the Fremont Fair, Ballard Seafood Fest and Wallingford Farmers markets from June to July 2015, with a total attendance of 436.
- Project briefings were presented at 12 regional chambers, councils and boards, totaling over 120 participants.
- SEIS Scoping outreach was conducted in July 2015 and included formal SEPA notification, including posting to the Washington State SEPA Register and the Department of Planning and Development Land Use Information Bulletin, and direct mailing of the Scoping Notice to agencies with jurisdiction, Tribes and the public. Additional outreach included postcard mailings to individuals and stakeholder groups, display advertisements in several local newspapers and publications, online notification in numerous blogs, notification on the City's website, posting on the City's online pubic outreach and engagement calendar, and direct email to numerous individuals and stakeholders.
- Stakeholder interviews were conducted along the proposed 2.7 mile tunnel alignment from April through December 2015.
- Businesses and residents were contacted (856 flyers) along the tunnel alignment to coordinate geotechnical investigations.
- A project website was established, which includes contact information, a project video, project fact sheet and answers to frequently asked questions (FAQs).

In 2016, similar outreach activities will be conducted, including booths at fairs and farmers markets, continued project briefings, Draft and Final SEIS outreach, website updates, mailers and outreach for advanced utility work.

4.8 Central Waterfront CSO Reduction Project

To control combined sewer overflows from the south end of the Central Waterfront, Seattle Public Utilities (SPU) is planning to install approximately 2,000 lineal feet of new 24 to 36 inch diameter sewer; connect combined sewer basins 70, 71, and 72; and seal and remove from service Outfalls 70 and 72. The completed project will eliminate combined sewer overflows (CSOs) from Outfalls 70 (Washington Street) and 72 (University Street) and limit CSOs from Outfall 71 (Madison Street) 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 of these 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.

This 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.

4.9 Outfall Rehabilitation Projects

The current NPDES permit requires that SPU complete repairs on Outfalls 150 by December 31, 2014 and complete repairs on Outfalls 31 by November 1, 2015. Construction of Outfall 150 was completed in December 2014 and construction of Outfall 31 was completed in February 2015.

Per the approved 2015 Outfall Rehabilitation Plan, Outfall 44 also was replaced in 2015 as part of the North Henderson CSO Storage Project (see Section 4.5), replacement of the land portion of Outfall 174 was completed in 2015, and design has commenced on a replacement for Outfall 151 as part of the work on the Ship Canal WQ Project (see Section 4.7). 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 facility will 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 2015, the project team completed planning and project initiation work, created an execution plan for the Options Analysis phase of work, and conducted a consultant procurement process. Work planned for 2016 includes field testing of candidate treatment technologies. The project is on schedule to meet regulatory milestones for starting and completing construction.

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. This work included reaching out to potential partner agencies and developing a decision framework for evaluating potential partnering projects. Other agency coordination included focused coordination with SDOT to understand their upcoming projects and identify upcoming opportunities for including natural drainage systems (bioretention) above what they would be required to install to meet the City's stormwater code. Work in 2015 also included development of tools and standardization of information that all projects would use to help streamline the design and construction phases of NDS Partnering projects, such as standard concepts, details, and specifications. Staff were also busy evaluating all potential streets, ranking them for feasibility, and documenting this information in GIS so that potential partners can more easily assess if their street may be eligible for partnering. The first partnering project, with SDOT in the Thornton Creek Basin, is providing a good opportunity to pilot the NDS Partnering concepts and work out design and partnering issues.

In 2016, the NDS Partnering Program plans to complete options analysis for the first set of project streets in the Longfellow and Thornton Basins. The pilot project with SDOT will also complete its design in 2016, for construction in 2017. 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 will expand the City's arterial streetsweeping program, per commitments in the Plan to Protect Seattle's Waterways.

During 2015, the team finalized an implementation plan and worked to secure funding and interagency agreements. Key tasks completed included:

- Evaluated options to optimize water quality benefits.
- Developed 45 routes covering 550 street miles.
- Developed a sweeping route schedule.
- Coordinated funding and agreements.

During 2016, the team will implement the plan and adapt as needed to meet the regulatory targets. The key tasks planned for this year include:

- Sign a 5-year Memorandum of Agreement with SDOT for street sweeping services to meet the regulatory commitments.
- Begin sweeping new routes.
- Hire 1.5 sweeper operators (SDOT).
- Purchase a new sweeper.
- Develop and submit a Post Construction Monitoring Quality Assurance Project Plan (QAPP) by December 31.

We are on schedule to meet the annual commitment of capturing 23 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 2014 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 17 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. SPU is calibrating these gauges and will place them in service in 2016.

Also in 2015, Rain Gauge (RG) 30 was temporarily removed due to roof repairs at Rainier Beach Library, where it is housed. These repairs have an expected completion date of first quarter 2016 and RG30 will be re-installed once the repairs are complete. No additional changes to the network of permanent rain gauges were made in 2015.

SPU anticipates three additional rain gauges will be added to the network in 2016: one in Ballard, one in Lake City, and one in Laurelhurst. Their status will be included in next year's annual report.

Two tables summarizing 2015 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.

While 2015 will most likely be remembered for its record heat and snow drought, it was also a year of rainfall extremes. Total rainfall across the City of Seattle reached 39.59 inches, which is only slightly above the long term average. However, half of the months in 2015 were wetter than normal, and half were drier than normal. Two months were among the wettest on record (August, December) and a few were among the driest ever (May, June, July). More than five inches separated the year's rainiest, hilltop location (SPU RG14, West Seattle, 42.51 inches) from its driest, rain-shadowed location (SPU RG17 Georgetown, 37.11 inches).

SPU's rain gauges recorded an above average 12 storms with heavy rainfall (intensity equal to or greater than a two-year recurrence interval) in 2015. Of those events, 3 were extreme (equal to or greater than a 25-year recurrence interval). And each extreme event also contained embedded 100-year rainfall, which places 2015 among the most extreme precipitation years in SPU's 38-year record.

5.2 Flow Monitoring Program

During 2015, 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 or not an overflow occurred, and any necessary follow-up actions are documented.

5.3 Summary of 2015 Monitoring Results

Several tables summarizing 2014 flow monitoring and flow monitor performance are included in the following pages of this report:

- Table 5-3 show the 2015 flow monitor performance by outfall and month;
- Table 5-4 provides the details of all 2015 CSOs by outfall and date;
- Table 5-5 includes the most recent 5-year overflow frequency for each outfall and compares 2015 and baseline CSO conditions;
- Table 5-6 compares 2011-2015 CSOs by outfall;
- Table 5-7 compares 2011-2015 CSOs by receiving water body;
- Table 5-8 shows which outfalls met the performance standard for controlled outfalls in 2015.

Observations and conclusions from these tables include:

- 2015 cumulative average system-wide “up-time” and cumulative average individual “up-times” of all flow monitoring stations were over 99%.
- 2015 had the third highest number of CSOs in the last five years (318 CSOs) and the second highest CSO volume (approximately 150 MG). This is not surprising given the precipitation patterns experienced in 2015.
- Almost one-fourth of the 2015 CSO volume is from Outfall 152 (Ballard), which serves the largest combined sewer area of any of the outfalls.
- The five outfalls that will be controlled by the Ship Canal WQ Project contributed almost 50 percent of the 2015 CSO volume: Outfall 152 in Ballard (36.2 MG), Outfalls 150 and 151 in Ballard (2.5 MG), Outfall 174 in Fremont (13.6 MG), and Outfall 147 in Wallingford (16.7 MG).

The water body receiving the greatest CSO volume in 2015 was Lake Washington, most likely because of this year’s unique rainfall patterns and possibly exacerbated by CSO construction activities. The water body receiving the second greatest CSO volume was Salmon Bay (Ballard).

A total of 41 outfalls did not meet the performance standard for controlled outfalls. SPU expects that these outfalls will be controlled once the CSO control projects included in the approved Plan to Protect Seattle’s Waterways are complete. Each of these CSO control projects will be completed per the schedule in the approved Plan.

Three of the outfalls that did not meet the performance standard in 2015 were previously reported to have achieved the numeric performance standard (no more than 1 CSO per year based on up to 20 years of modeling and monitoring data): Outfalls 22, 30, and 35. Outfall 22 is experiencing exacerbated CSOs caused by the deteriorating performance of Pump Station 50. The air-lift style pumps will be replaced with submersible pumps as part of a pump station rehabilitation project that is in design and projected to be complete in 2016. Basins 30 and 35 are in the Leschi area and are hydraulically connected to the other Leschi basins (Basins 26-36). As described in Volume 2 of the approved Plan to Protect Seattle’s Waterways, SPU’s approach for controlling the Leschi basins is to complete the Leschi Sewer System Improvements by 2017, assess whether the Leschi area is controlled and, if not, implement additional storage as needed to control the Leschi area.

One outfall that was reported to be controlled in SPU’s baseline report is still uncontrolled: Outfall 139 in Portage Bay. SPU plans to construct a sewer system improvement in this basin by 2020 and, if necessary, offline storage pipes by 2030.

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

In 2014 and 2015, SPU completed in-situ sediment sampling and analysis at Outfall 62 and in-pipe sediment sampling and analysis at uncontrolled Outfalls 107, 147, and 152. A combined Interim PCMP Report for Outfall 62 and Sediment Report for all four outfalls was submitted to Ecology and EPA on November 25, 2015.

During completion of the Interim PCMP Report for Outfall 62, SPU learned that Oufall 62 was blocked and damaged, leading to operational changes in Basin 61/62 while SPU unblocks the outfall and determines the best course of action. SPU will update the Basin 61/62 model to ensure it accurately reflects the system configuration before confirming that Outfall 62 is controlled.

On August 27, 2015, a combined Quality Assurance Project Plan (QAPP) and Sediment Sampling and Analysis Plan (SAP) was submitted for Windermere Basin 13. In-situ sediment sampling will be conducted following approval of the QAPP/SAP by Ecology and confirmation that Outfall 13 is controlled.

In 2016, QAPPs and SAPs are being drafted for Outfalls 95 and 68, per the schedule in the approved Final Post Construction Monitoring Plan.

Table 5-1. 2015 Precipitation by Gauge and by Month (inches)												
Rain Gage	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**
RG01	2.54	4.60	4.38	1.46	0.50	0.28	0.35	3.02	1.35	3.70	6.76	10.46
RG02	2.65	4.21	4.28	1.48	0.87	0.20	0.94	2.63	1.04	3.63	6.57	8.93
RG03	2.72	4.10	4.41	1.78	0.65	0.12	0.25	3.42	2.20	3.51	6.37	10.12
RG04	2.38	4.18	4.43	1.46	0.73	0.13	0.31	2.61	1.42	3.57	6.67	10.02
RG05	2.47	4.37	4.69	1.52	0.51	0.15	0.13	3.72	0.77	3.53	6.63	10.09
RG07	2.61	4.52	5.24	1.46	0.54	0.33	0.24	2.58	1.13	3.52	6.40	10.54
RG08	2.27	3.91	3.85	1.21	0.77	0.15	0.18	2.57	1.77	3.07	6.33	9.90
RG09	2.66	4.46	4.40	1.55	0.79	0.21	0.27	2.96	2.03	3.76	7.27	11.18
RG11	2.73	4.18	4.61	1.42	0.52	0.10	0.15	2.83	1.83	3.35	6.28	9.92
RG12	2.70	4.32	4.57	1.42	0.66	0.13	0.17	2.96	1.73	3.47	6.94	11.37
RG14	3.04	4.61	5.01	1.44	0.48	0.14	0.19	3.03	1.63	3.90	7.24	11.80
RG15	2.35	4.50	4.82	1.59	0.49	0.09	0.18	2.67	1.67	3.41	6.52	10.08
RG16	2.36	4.68	4.52	1.77	0.31	0.12	0.16	2.67	1.01	3.97	7.48	10.87
RG17	2.36	4.68	4.53	1.56	0.40	0.12	0.07	2.60	0.85	3.65	6.50	9.79
RG18	2.67	5.10	4.81	2.01	0.49	0.23	0.29	3.00	1.27	4.30	7.78	10.43
RG25	3.01	5.10	5.10	2.11	0.57	0.17	0.22	2.76	1.78	4.01	6.84	10.64
RG30	3.20	5.10	4.68	1.98	0.57	0.17	0.14	3.00	1.27	3.97	7.48	10.87
Monthly Average	2.63	4.51	4.61	1.60	0.58	0.17	0.25	2.88	1.46	3.67	6.83	10.41

Table 5-2. 2011-2015 Average Precipitation by Month (inches)					
Month/Year	**2011**	**2012**	**2013**	**2014**	**2015**
January	5.04	5.40	3.95	4.05	2.63
February	3.42	2.97	1.67	5.67	4.51
March	6.73	6.61	2.67	8.62	4.61
April	3.59	2.27	4.58	3.12	1.60
May	3.10	2.32	1.63	2.57	0.58
June	1.34	3.03	1.64	0.88	0.17
July	0.78	1.53	0.04	0.93	0.25
August	0.06	0.00	1.06	1.35	2.88
September	1.12	0.16	5.30	2.73	1.46
October	2.94	6.12	1.25	6.73	3.67
November	5.91	9.36	2.92	4.61	6.83
December	1.80	7.89	1.22	5.50	10.41
Annual Total	**35.83**	**47.66**	**27.93**	**46.76**	**39.59**

Table 5-3. 2015 Flow Monitor Performance by Outfall and Month																										
Outfall No.	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sept		Oct		Nov		Dec		2015 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	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	2.4	99.7	0.0	100.0	2.4	100.0
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	2.7	99.6	0.0	100.0	0.0	100.0	0.0	100.0	2.7	100.0
16	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	50.8	93.2	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.5	99.9	0.0	100.0	51.3	99.4
18	18.8	97.5	0.0	100.0	23.2	96.9	0.0	100.0	0.0	100.0	6.1	99.2	4.5	99.4	0.0	100.0	2.5	99.7	0.0	100.0	0.0	100.0	0.0	100.0	55.1	99.4
19	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
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	16.0	97.8	12.9	98.3	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	28.9	99.7
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	6.4	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	6.4	99.9
26	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	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	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
29	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	5.8	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	5.8	99.9
30	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	66.0	91.1	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	28.3	96.2	0.0	100.0	94.3	98.9
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	34.3	95.4	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	34.3	99.6
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	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
34	0.0	100.0	0.0	100.0	0.0	100.0	4.5	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	0.0	100.0	0.0	100.0	4.5	99.9
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

Outfall No.	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sept		Oct		Nov		Dec		2015 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 (%)
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
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	0.0	100.0	0.0	100.0	0.0	100.0
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	0.0	100.0	0.0	100.0	0.0	100.0
42	0.0	100.0	56.3	92.4	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	56.3	99.4
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	4.7	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	0.0	100.0	4.7	99.9
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	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	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	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	1.3	100.0
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	38.3	94.8	34.0	95.4	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	72.3	99.2
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	0.0	100.0	25.5	96.6	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	99.8	1.3	99.8	0.0	100.0	0.0	100.0	28.5	99.7
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	25.6	96.6	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	25.6	99.7
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

Outfall No.	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sept		Oct		Nov		Dec		2015 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 (%)
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	2.7	99.6	0.0	100.0	0.0	100.0	0.0	100.0	2.7	100.0
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	2.0	99.7	0.0	100.0	0.0	100.0	0.0	100.0	2.0	100.0
83	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.5	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	0.5	100.0
85	3.3	99.6	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	2.0	99.7	0.0	100.0	0.0	100.0	0.0	100.0	5.3	99.9
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	1.1	99.8	0.0	100.0	1.1	100.0
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	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	1.7	100.0
94	5.2	99.3	0.0	100.0	0.0	100.0	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	99.8	0.0	100.0	0.0	100.0	6.5	99.9
95	2.8	99.6	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	6.1	99.2	0.9	99.9	0.0	100.0	2.3	99.7	0.0	100.0	0.0	100.0	0.0	100.0	12.1	99.9
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	1.2	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	0.0	100.0	0.0	100.0	0.0	100.0	1.2	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	43.3	94.2	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	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	43.3	99.5
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	1.8	99.8	0.0	100.0	2.7	99.6	0.0	100.0	0.0	100.0	0.0	100.0	0.6	99.9	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	5.1	99.9
135	11.2	98.5	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	0.0	100.0	0.0	100.0	11.2	99.9
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

Outfall No.	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sept		Oct		Nov		Dec		2015 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 (%)
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
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	0.9	99.9	0.0	100.0	1.3	99.8	0.0	100.0	2.2	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	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
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	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
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	1.7	99.8	0.0	100.0	0.0	100.0	0.0	100.0	1.7	100.0
146	0.0	100.0	0.0	100.0	1.9	99.7	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	1.9	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	2.1	99.7	0.0	100.0	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	4.6	99.9
150 /151	0.0	100.0	0.0	100.0	0.0	100.0	3.6	99.5	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	3.6	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	13.7	98.2	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	0.0	100.0	0.0	100.0	13.7	99.8
165	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	37.7	94.9	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	37.7	99.6
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	23.6	96.8	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	0.0	100.0	0.0	100.0	1.2	99.8	24.8	99.7
170	2.8	99.6	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	11.1	98.5	0.0	100.0	0.0	100.0	1.9	99.7	0.0	100.0	0.0	100.0	0.0	100.0	15.8	99.8
171	0.0	100.0	0.0	100.0	43.4	94.2	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	0.0	100.0	0.0	100.0	43.4	99.5
174	0.0	100.0	25.3	96.6	8.4	98.9	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	0.0	100.0	0.0	100.0	33.7	99.6
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:	154.4	99.8	141.1	99.8	93.3	99.9	49.7	99.9	121.3	99.8	121.1	99.8	9.0	100.0	0.0	100.0	23.0	100.0	2.6	100.0	33.6	99.9	1.2	100.0	750.1	99.9

Table 5-4. 2015 CSO Details by Outfall and Date

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)
WA0031682	**012**	City of Seattle	Lake Washington	*No combined sewer overflow during 2015*				
WA0031682	**013**	City of Seattle	Lake Washington	01/17/2015	15.08	637,417	1.36	18.17
				02/06/2015	21.50	432,010	2.65	145.50
				03/15/2015	15.50	3,876,649	2.73	50.40
				08/14/2015	4.42	8,455	0.88	5.75
				11/11/2015	0.88	4,891	0.41	4.27
				11/15/2015	8.15	1,954,220	2.80	60.33
				12/08/2015	14.62	3,493,190	3.73	98.85
				Total	80.15	10,406,831	14.56	383.27
				Average	11.45	1,486,690	2.08	54.75
WA0031682	**014**	City of Seattle	Lake Washington	01/18/2015	0.03	136	1.32	20.20
				Total	0.03	136	1.32	20.20
				Average	0.03	136	1.32	20.20
WA0031682	**015**	City of Seattle	Lake Washington	01/18/2015	0.55	21,161	1.35	20.77
				03/15/2015	2.50	67,015	2.65	45.95
				08/14/2015	0.67	26,979	0.70	4.02
				08/29/2015	0.27	538	1.22	23.47
				12/08/2015	0.90	11,731	3.41	84.90
				12/10/2015	0.17	646	4.31	124.13
				12/18/2015	0.63	2,363	0.99	18.43

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)
				Total	5.69	130,434	14.63	321.67
				Average	0.81	18,633	2.09	45.95
WA0031682	**016**	City of Seattle	Lake Washington	*No combined sewer overflow during 2015*				
WA0031682	**018**	City of Seattle	Union Bay	03/15/2015	8.53	2,598,333	2.70	48.40
				12/08/2015	4.00	223,642	3.67	88.47
				Total	12.53	2,821,975	6.37	136.87
				Average	6.27	1,410,988	3.19	68.43
WA0031682	**019**	City of Seattle	Union Bay	*No combined sewer overflow during 2015*				
WA0031682	**020**	City of Seattle	Union Bay	01/18/2015	1.20	45,410	1.48	24.65
				03/15/2015	11.77	537,512	2.95	49.20
				08/14/2015	0.67	32,451	1.28	9.83
				09/05/2015	0.50	10,534	1.10	1.43
				11/15/2015	5.87	100,062	3.13	62.82
				12/07/2015	0.87	8,449	2.23	54.77
				12/08/2015	6.33	176,365	3.93	90.70
				12/18/2015	1.53	28,342	1.28	51.50
				Total	28.73	939,125	17.38	344.90
				Average	3.59	117,391	2.17	43.11
WA0031682	**022**	City of Seattle	Union Bay	01/18/2015	3.00	5,162	1.49	24.97
				03/15/2015	2.32	3,431	1.84	39.90

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)
				11/15/2015	1.43	2,232	2.92	59.52
				Total	6.75	10,825	6.25	124.38
				Average	2.25	3,608	2.08	41.46
WA0031682	**024**	City of Seattle	Lake Washington	*No combined sewer overflow during 2015*				
WA0031682	**025**	City of Seattle	Lake Washington	*No combined sewer overflow during 2015*				
WA0031682	**026**	City of Seattle	Lake Washington	*No combined sewer overflow during 2015*				
WA0031682	**027**	City of Seattle	Lake Washington	*No combined sewer overflow during 2015*				
WA0031682	**028**	City of Seattle	Lake Washington	03/15/2015	0.83	625	3.22	45.13
				08/14/2015	0.20	2,132	0.37	8.53
				09/05/2015	0.17	1,336	0.14	1.08
				09/17/2015	0.18	4,503	0.41	16.95
				12/08/2015	9.30	6,545	4.63	93.40
				Total	10.68	15,142	8.77	165.10
				Average	2.14	3,028	1.75	33.02
WA0031682	**029**	City of Seattle	Lake Washington	01/18/2015	0.10	809	1.54	25.03
				02/07/2015	0.20	196	3.17	141.20
				03/15/2015	10.97	43,878	3.44	47.70
				08/14/2015	0.10	2,254	0.36	8.50
				08/29/2015	0.13	997	1.38	42.17

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)
				10/31/2015	1.00	13,168	1.13	65.58
				11/14/2015	25.47	88,105	3.74	63.00
				12/08/2015	40.60	13,916	4.63	93.77
				12/18/2015	0.43	282	1.26	50.22
				Total	79.00	163,603	20.65	537.17
				Average	8.78	18,178	2.29	59.69
WA0031682	**030**	City of Seattle	Lake Washington	03/15/2015	1.77	7,767	3.39	46.37
				11/15/2015	2.10	551	3.64	61.00
				12/07/2015	42.80	59,492	4.63	95.33
				12/18/2015	1.03	1,065	1.30	50.95
				Total	47.70	68,875	12.96	253.65
				Average	11.93	17,219	3.24	63.41
WA0031682	**031**	City of Seattle	Lake Washington	02/06/2015	22.25	28,397	3.26	143.95
				03/15/2015	15.10	423,899	3.47	49.30
				11/14/2015	24.53	149,014	3.74	63.27
				12/07/2015	45.63	664,737	4.63	97.03
				12/18/2015	1.43	26,110	1.30	51.25
				Total	108.95	1,292,157	16.40	404.80
				Average	21.79	258,431	3.28	80.96
WA0031682	**032**	City of Seattle	Lake Washington	03/15/2015	1.40	21,463	3.36	46.00
				Total	1.40	21,463	3.36	46.00
				Average	1.40	21,463	3.36	46.00

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)
WA0031682	**033**	City of Seattle	Lake Washington	*No combined sewer overflow during 2015*				
WA0031682	**034**	City of Seattle	Lake Washington	03/15/2015	1.70	36,871	3.39	46.40
				Total	1.70	36,871	3.39	46.40
				Average	1.70	36,871	3.39	46.40
WA0031682	**035**	City of Seattle	Lake Washington	03/15/2015	1.47	7,820	3.37	46.07
				03/24/2015	0.27	2,748	0.88	118.37
				08/14/2015	0.22	3,500	0.35	8.47
				09/05/2015	0.30	3,043	0.39	2.05
				12/09/2015	0.57	9,121	4.63	94.00
				Total	2.82	26,232	9.62	268.95
				Average	0.56	5,246	1.92	53.79
WA0031682	**036**	City of Seattle	Lake Washington	03/15/2015	3.47	18,969	3.44	47.90
				10/31/2015	1.10	1,624	1.13	65.55
				11/13/2015	45.12	48,724	3.74	65.87
				12/07/2015	42.33	60,675	4.63	95.57
				Total	92.02	129,991	12.94	274.88
				Average	23.00	32,498	3.24	68.72
WA0031682	**037**	City of Seattle	Lake Washington	*No combined sewer overflow during 2015*				
WA0031682	**038**	City of Seattle	Lake Washington	03/15/2015	5.75	398,738	3.17	48.73

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)
				12/09/2015	2.33	25,548	4.57	90.47
				Total	8.08	424,286	7.74	139.20
				Average	4.04	212,143	3.87	69.60
WA0031682	**040**	City of Seattle	Lake Washington	02/06/2015	0.90	18,530	2.22	72.58
				03/15/2015	3.30	127,408	3.14	47.80
				11/14/2015	36.35	699,678	4.30	73.67
				12/07/2015	78.72	1,192,329	5.30	133.53
				12/18/2015	14.33	41,078	1.57	70.40
				Total	133.60	2,079,022	16.53	397.99
				Average	26.72	415,804	3.31	79.60
WA0031682	**041**	City of Seattle	Lake Washington	01/17/2015	7.30	33,583	0.98	17.52
				02/05/2015	64.87	212,000	3.06	104.25
				02/27/2015	3.83	14,934	1.15	42.82
				03/15/2015	27.33	4,356,538	3.18	49.35
				03/31/2015	0.63	2,187	0.46	23.67
				04/10/2015	0.37	489	0.42	4.60
				11/14/2015	36.35	699,678	4.30	73.67
				12/07/2015	78.72	1,192,329	5.30	133.53
				12/18/2015	14.33	41,078	1.57	70.40
				Total	233.73	6,552,815	20.42	519.81
				Average	25.97	728,091	2.27	57.76
WA0031682	**042**	City of Seattle	Lake Washington	03/15/2015	2.40	29,233	3.14	47.77

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)
				11/15/2015	4.83	65,958	4.29	62.75
				12/09/2015	3.43	66,654	4.57	91.13
				Total	10.67	161,845	12.00	201.65
				Average	3.56	53,948	4.00	67.22
WA0031682	**043**	City of Seattle	Lake Washington	01/17/2015	5.33	46,634	0.98	16.80
				02/06/2015	24.12	211,008	2.83	92.72
				02/27/2015	2.37	29,497	1.15	41.95
				03/15/2015	11.50	700,080	3.18	49.35
				08/26/2015	2.60	11,842	0.00	0.00
				11/14/2015	25.47	912,316	4.30	63.82
				12/07/2015	42.60	1,325,668	4.66	96.07
				Total	113.98	3,237,045	17.10	360.70
				Average	16.28	462,435	2.44	51.53
WA0031682	**044**	City of Seattle	Lake Washington	01/17/2015	18.92	457,921	1.19	28.63
				02/05/2015	67.83	2,048,488	3.08	106.77
				02/27/2015	7.58	252,464	1.17	45.67
				03/14/2015	55.08	3,191,722	3.18	49.35
				03/31/2015	1.83	8,319	0.47	24.65
				08/12/2015	0.57	6,658	0.22	0.78
				08/14/2015	0.90	953	0.89	14.33
				08/29/2015	25.17	253,283	1.74	49.73
				09/17/2015	0.77	4,199	0.49	20.05
				10/10/2015	4.90	22,390	0.70	7.42

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)
				10/12/2015	1.40	1,807	0.38	4.73
				10/30/2015	3.27	187,051	1.12	66.72
				11/13/2015	58.90	3,413,523	4.30	68.82
				11/17/2015	3.37	1,747	5.03	118.15
				12/05/2015	125.47	6,288,175	5.30	129.83
				12/12/2015	4.07	100,292	0.42	7.97
				12/17/2015	26.77	938,657	1.57	69.32
				12/21/2015	12.90	406,787	2.52	136.10
				Total	419.69	17,584,438	33.77	949.02
				Average	23.32	976,913	1.88	52.72
WA0031682	**045**	City of Seattle	Lake Washington	01/17/2015	10.95	4,830	1.10	21.08
				02/05/2015	64.83	65,554	3.05	103.77
				02/27/2015	2.80	4,583	1.14	41.55
				03/15/2015	18.25	233,741	3.18	49.35
				08/29/2015	2.20	18,301	1.38	42.20
				10/10/2015	3.57	5,366	0.61	6.22
				10/31/2015	0.33	5,125	1.04	64.85
				11/13/2015	42.27	295,153	4.30	64.02
				12/07/2015	42.87	411,169	4.66	94.43
				12/18/2015	0.77	4,104	1.34	51.45
				Total	188.83	1,047,925	21.80	538.92
				Average	18.88	104,793	2.18	53.89
WA0031682	**046**	City of Seattle	Lake Washington	03/15/2015	1.33	16,053	3.08	46.57

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)
				Total	1.33	16,053	3.08	46.57
				Average	1.33	16,053	3.08	46.57
WA0031682	**047**	City of Seattle	Lake Washington	03/15/2015	10.40	1,069,817	3.17	48.93
				11/15/2015	5.92	174,269	4.29	62.93
				12/07/2015	40.68	615,497	4.58	91.28
				Total	57.00	1,859,583	12.04	203.15
				Average	19.00	619,861	4.01	67.72
WA0031682	**048**	City of Seattle	Lake Washington	*No combined sewer overflow during 2015*				
WA0031682	**049**	City of Seattle	Lake Washington	01/18/2015	0.90	15,574	1.06	17.08
				02/06/2015	2.10	82,762	2.58	128.85
				03/15/2015	12.27	991,456	3.03	49.13
				11/14/2015	27.53	1,324,489	4.14	63.53
				12/07/2015	43.83	2,806,409	5.72	184.23
				Total	86.64	5,220,691	16.53	442.83
				Average	17.33	1,044,138	3.31	88.57
WA0031682	**057**	City of Seattle	Puget Sound	*No combined sewer overflow during 2015*				
WA0031682	**059**	City of Seattle	Salmon Bay	*No combined sewer overflow during 2015*				
WA0031682	**060**	City of Seattle	Salmon Bay	03/15/2015	3.27	157,258	2.76	46.23
				09/05/2015	0.22	15,654	0.62	0.62

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)
				10/10/2015	0.50	14,461	0.78	23.03
				12/08/2015	4.10	13,461	5.21	200.80
				Total	8.08	200,835	9.37	270.68
				Average	2.02	50,209	2.34	67.67
WA0031682	**061**	City of Seattle	Elliott Bay	*No combined sewer overflow during 2015*				
WA0031682	**062**	City of Seattle	Elliott Bay	03/15/2015	0.27	2,670	1.84	37.37
				08/14/2015	2.50	9,895	1.13	3.63
				09/05/2015	0.33	47,935	0.74	1.60
				10/10/2015	0.60	14,805	0.85	20.07
				Total	3.70	75,305	4.56	62.67
				Average	0.92	18,826	1.14	15.67
WA0031682	**064**	City of Seattle	Elliott Bay	*No combined sewer overflow during 2015*				
WA0031682	**068**	City of Seattle	Elliott Bay	03/15/2015	2.47	395,108	3.18	46.33
				08/14/2015	0.10	746	0.50	1.08
				09/05/2015	1.22	108,511	0.75	2.07
				12/09/2015	1.70	54,886	4.61	88.77
				Total	5.48	559,251	9.04	138.25
				Average	1.37	139,813	2.26	34.56
WA0031682	**069**	City of Seattle	Elliott Bay	01/18/2015	0.60	169,490	1.51	25.13
				03/15/2015	1.37	152,925	3.10	44.97

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)
				08/14/2015	0.27	69,385	0.75	1.43
				09/05/2015	0.28	44,045	0.81	2.13
				Total	2.52	435,844	6.17	73.67
				Average	0.63	108,961	1.54	18.42
WA0031682	**070**	City of Seattle	Elliott Bay	01/18/2015	0.13	22,849	1.48	24.67
				Total	0.13	22,849	1.48	24.67
				Average	0.13	22,849	1.48	24.67
WA0031682	**071**	City of Seattle	Elliott Bay	01/18/2015	0.65	94,370	1.51	25.27
				08/29/2015	1.05	46,141	1.35	42.47
				09/05/2015	0.63	56,985	0.82	2.40
				09/21/2015	0.20	878	0.00	0.00
				10/10/2015	0.43	19,545	1.01	29.05
				12/09/2015	0.23	7,621	4.06	93.50
				Total	3.20	225,539	8.75	192.68
				Average	0.53	37,590	1.46	32.11
WA0031682	**072**	City of Seattle	Elliott Bay	*No combined sewer overflow during 2015*				
WA0031682	**078**	City of Seattle	Elliott Bay	*No combined sewer overflow during 2015*				
WA0031682	**080**	City of Seattle	Elliott Bay	*No combined sewer overflow during 2015*				
WA0031682	**083**	City of Seattle	Puget Sound	*No combined sewer overflow during 2015*				

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)
WA0031682	**085**	City of Seattle	Puget Sound	*No combined sewer overflow during 2015*				
WA0031682	**088**	City of Seattle	Puget Sound	*No combined sewer overflow during 2015*				
WA0031682	**090**	City of Seattle	Puget Sound	*No combined sewer overflow during 2015*				
WA0031682	**091**	City of Seattle	Puget Sound	*No combined sewer overflow during 2015*				
WA0031682	**094**	City of Seattle	Puget Sound	*No combined sewer overflow during 2015*				
WA0031682	**095**	City of Seattle	Puget Sound	*No combined sewer overflow during 2015*				
WA0031682	**099**	City of Seattle	Duwamish River	03/15/2015	13.40	1,245,355	3.32	48.57
				11/14/2015	16.67	1,570,390	3.69	64.08
				12/07/2015	43.77	2,036,366	5.52	207.95
				12/18/2015	0.40	3,541	1.27	51.60
				Total	74.23	4,855,651	13.80	372.20
				Average	18.56	1,213,913	3.45	93.05
WA0031682	**107**	City of Seattle	Duwamish River	01/17/2015	4.20	52,931	0.90	15.43
				02/27/2015	0.67	5,369	0.78	39.12
				03/15/2015	1.77	99,328	3.16	45.80
				08/14/2015	2.13	110,330	0.92	6.03
				08/29/2015	0.57	26,953	1.24	42.40

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)
				10/31/2015	1.07	4,290	0.96	0.00
				11/14/2015	27.67	124,885	3.69	64.08
				12/07/2015	44.07	248,940	5.52	205.88
				12/10/2015	0.07	336	5.99	235.98
				Total	82.20	673,362	23.16	654.73
				Average	9.13	74,818	2.57	72.75
WA0031682	**111**	City of Seattle	Duwamish River	03/15/2015	3.50	129,110	3.31	48.30
				12/07/2015	0.50	510	3.56	165.88
				12/09/2015	2.57	926,783	5.44	202.05
				Total	6.57	1,056,402	12.31	416.23
				Average	2.19	352,134	4.10	138.74
WA0031682	**116**	City of Seattle	Duwamish River	*No combined sewer overflow during 2015*				
WA0031682	**120**	City of Seattle	Lake Union	*No combined sewer overflow during 2015*				
WA0031682	**121**	City of Seattle	Lake Union	*No combined sewer overflow during 2015*				
WA0031682	**124**	City of Seattle	Lake Union	*No combined sewer overflow during 2015*				
WA0031682	**127**	City of Seattle	Lake Union	02/27/2015	70.60	64,878	0.00	0.00
				Total	70.60	64,878	0.00	0.00
				Average	70.60	64,878	0.00	0.00

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)
WA0031682	**129**	City of Seattle	Lake Union	*No combined sewer overflow during 2015*				
WA0031682	**130**	City of Seattle	Lake Union	01/18/2015	0.22	3,121	1.46	23.28
				08/14/2015	0.47	256,462	1.20	9.13
				09/05/2015	0.13	8,749	1.01	0.77
				Total	0.82	268,332	3.67	33.18
				Average	0.27	89,444	1.22	11.06
WA0031682	**131**	City of Seattle	Lake Union	*No combined sewer overflow during 2015*				
WA0031682	**132**	City of Seattle	Lake Union	01/18/2015	0.35	113,422	1.47	23.42
				08/14/2015	0.73	746,075	1.25	9.37
				09/05/2015	0.50	155,387	1.03	1.03
				Total	1.58	1,014,884	3.75	33.82
				Average	0.53	338,295	1.25	11.27
WA0031682	**134**	City of Seattle	Lake Union	*No combined sewer overflow during 2015*				
WA0031682	**135**	City of Seattle	Lake Union	08/14/2015	0.50	3,776	1.16	9.07
				09/05/2015	0.40	6,113	1.01	0.83
				Total	0.90	9,889	2.17	9.90
				Average	0.45	4,944	1.09	4.95
WA0031682	**136**	City of Seattle	Lake Union	*No combined sewer overflow during 2015*				

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)
WA0031682	**138**	City of Seattle	Portage Bay	01/18/2015	0.52	15,519	1.48	23.92
				03/15/2015	6.63	288,059	2.91	46.47
				08/14/2015	2.57	78,694	1.62	11.57
				08/29/2015	0.27	8,109	1.40	42.15
				09/05/2015	1.00	122,869	1.11	1.70
				11/15/2015	1.20	72,902	3.09	61.48
				12/08/2015	5.30	135,825	3.91	88.63
				Total	17.48	721,977	15.52	275.92
				Average	2.50	103,140	2.22	39.42
WA0031682	**139**	City of Seattle	Portage Bay	01/18/2015	0.83	135,502	1.48	23.92
				03/15/2015	2.27	173,451	2.88	45.87
				08/14/2015	0.80	129,370	1.25	9.37
				09/05/2015	0.38	51,077	1.03	1.05
				10/10/2015	7.67	512,732	1.03	27.00
				11/15/2015	4.43	169,313	3.06	61.02
				Total	16.38	1,171,446	10.73	168.22
				Average	2.73	195,241	1.79	28.04
WA0031682	**140**	City of Seattle	Portage Bay	01/18/2015	0.33	6,782	1.46	23.32
				03/15/2015	3.23	169,300	2.91	46.70
				03/31/2015	0.12	1,975	0.35	16.07
				08/14/2015	3.10	122,539	1.61	11.55
				08/29/2015	2.93	43,418	1.40	42.22
				09/05/2015	1.53	86,765	1.11	1.73

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)
				10/10/2015	8.77	34,141	1.03	27.00
				10/31/2015	0.17	379	0.85	23.82
				11/15/2015	4.10	186,308	3.13	62.48
				12/08/2015	3.97	44,081	3.91	88.57
				Total	28.25	695,689	17.76	343.45
				Average	2.83	69,569	1.78	34.34
WA0031682	**141**	City of Seattle	Portage Bay	*No combined sewer overflow during 2015*				
WA0031682	**144**	City of Seattle	Lake Union	*No combined sewer overflow during 2015*				
WA0031682	**145**	City of Seattle	Lake Union	*No combined sewer overflow during 2015*				
WA0031682	**146**	City of Seattle	Lake Union	*No combined sewer overflow during 2015*				
WA0031682	**147**	City of Seattle	Lake Union	01/15/2015	0.08	21	0.38	8.68
				01/17/2015	18.15	527,965	1.15	23.73
				02/02/2015	0.67	24,799	0.23	22.47
				02/05/2015	59.83	660,424	2.95	150.13
				02/08/2015	0.50	21,930	3.25	181.13
				02/27/2015	3.67	160,296	0.73	35.92
				03/14/2015	1.20	38,632	0.33	3.57
				03/15/2015	17.93	2,136,469	3.14	49.63
				03/31/2015	0.35	10,865	0.18	14.78
				04/01/2015	12.62	120,394	0.45	53.88

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)
				04/13/2015	0.52	9,069	0.20	3.75
				05/05/2015	12.60	21,911	0.41	12.83
				08/14/2015	5.22	2,950,327	1.33	5.98
				08/29/2015	24.00	729,361	1.50	47.88
				09/05/2015	1.67	360,069	0.80	1.90
				09/17/2015	2.17	8,688	0.45	16.47
				10/10/2015	9.00	496,913	1.07	26.68
				10/30/2015	43.00	466,736	1.39	47.12
				11/07/2015	39.83	166,545	1.81	74.02
				11/11/2015	0.33	21,538	0.27	5.00
				11/12/2015	57.83	2,473,896	3.47	63.98
				11/17/2015	8.75	20,517	0.60	31.35
				12/01/2015	0.75	28	0.41	30.83
				12/03/2015	1.75	35,618	0.82	57.92
				12/04/2015	0.67	31,865	1.37	84.85
				12/05/2015	128.83	4,128,587	5.52	129.77
				12/12/2015	3.17	160,872	0.40	7.40
				12/13/2015	1.08	21,094	0.75	36.40
				12/17/2015	23.25	545,580	1.33	33.87
				12/21/2015	14.50	314,285	1.05	38.10
				12/22/2015	0.25	62	0.15	1.55
				12/24/2015	1.00	16,997	0.50	51.55
				Total	495.17	16,682,352	38.39	1353.13
				Average	15.47	521,323	1.20	42.29

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)
WA0031682	**148**	City of Seattle	Lake Washington - Ship Canal	09/05/2015	1.30	1,400	0.08	1.77
				Total	1.30	1,400	0.08	1.77
				Average	1.30	1,400	0.08	1.77
WA0031682	**150/151**	City of Seattle	Salmon Way	01/17/2015	94.33	6,996	0.54	9.38
				02/05/2015	0.25	55	0.24	22.45
				02/05/2015	59.72	15,029	2.33	99.65
				02/05/2015	1.23	38	0.70	34.83
				03/15/2015	9.17	470,769	2.73	45.90
				03/31/2015	0.87	232,189	0.14	17.12
				04/01/2015	0.17	14,343	0.30	43.75
				04/10/2015	0.15	1,133	0.20	3.62
				08/14/2015	2.67	324,421	0.92	3.65
				08/29/2015	18.10	212,640	1.29	42.90
				09/05/2015	0.30	130,557	0.67	0.68
				10/10/2015	1.07	463,601	0.83	23.57
				10/31/2015	24.33	12,267	1.27	88.63
				11/08/2015	29.33	10,849	1.53	73.45
				11/11/2015	0.10	54	1.78	116.53
				11/12/2015	0.48	2,235	0.25	6.97
				11/14/2015	27.17	2,808	2.88	61.17
				11/17/2015	1.23	692	0.35	25.48
				12/03/2015	2.13	1,615	0.78	58.57
				12/05/2015	87.57	426,903	5.22	201.57
				12/10/2015	9.17	63,344	5.94	237.17

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)
				12/12/2015	1.90	6,175	0.29	5.43
				12/13/2015	0.60	5,774	0.65	35.17
				12/17/2015	6.68	94,353	1.03	18.45
				12/20/2015	0.23	536	0.15	4.10
				12/21/2015	5.80	39,040	0.89	36.57
				12/22/2015	0.10	606	0.18	1.90
				12/24/2015	1.70	849	0.40	51.50
				Total	386.56	2,539,872	34.48	1370.14
				Average	13.81	90,710	1.23	48.93
WA0031682	**152**	City of Seattle	Salmon Bay	01/05/2015	1.67	44,015	0.33	31.70
				01/15/2015	5.00	194,901	0.45	10.47
				01/17/2015	13.85	1,165,749	0.96	19.35
				02/02/2015	1.92	141,622	0.29	23.78
				02/04/2015	126.17	3,029,719	2.75	154.35
				02/27/2015	6.97	448,150	0.67	39.27
				03/14/2015	49.17	5,684,403	2.82	50.33
				03/24/2015	3.83	32,225	0.49	42.52
				03/31/2015	4.87	282,546	0.19	20.92
				04/01/2015	0.40	95,319	0.30	43.95
				04/10/2015	3.98	78,235	0.32	7.30
				04/13/2015	2.63	16,453	0.24	5.05
				04/24/2015	0.30	4,568	0.11	34.07
				05/05/2015	14.73	18,658	0.49	14.95
				08/14/2015	4.73	1,049,156	1.08	5.62

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)
				08/29/2015	18.47	1,544,857	1.29	43.10
				09/05/2015	0.63	467,081	0.72	0.95
				09/17/2015	9.88	51,530	0.40	16.48
				10/10/2015	6.63	1,724,178	0.89	24.63
				10/25/2015	2.47	148,857	0.32	35.32
				10/30/2015	41.37	946,598	1.52	103.33
				11/07/2015	46.70	943,219	1.58	74.52
				11/11/2015	3.67	24,376	1.78	116.53
				11/12/2015	57.47	3,726,987	2.90	61.98
				11/17/2015	8.28	223,976	0.52	31.95
				12/01/2015	2.53	97,819	0.36	30.97
				12/03/2015	29.27	562,976	1.18	85.10
				12/05/2015	131.77	10,678,297	6.04	245.23
				12/12/2015	33.90	399,042	0.68	35.92
				12/17/2015	19.85	1,346,331	1.04	20.62
				12/20/2015	35.50	770,621	0.93	38.03
				12/22/2015	1.93	88,693	0.18	2.27
				12/24/2015	13.75	99,778	0.53	63.33
				12/27/2015	9.40	64,344	0.44	10.42
				Total	713.68	36,195,279	34.79	1544.30
				Average	20.99	1,064,567	1.02	45.42
WA0031682	**161**	City of Seattle	Lake Washington	*No combined sewer overflow during 2015*				
WA0031682	**165**	City of Seattle	Lake Washington	03/15/2015	1.48	16,634	3.04	46.13

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)
				Total	1.48	16,634	3.04	46.13
				Average	1.48	16,634	3.04	46.13
WA0031682	**168**	City of Seattle	Longfellow Creek	03/15/2015	14.07	1,891,795	3.09	48.87
				12/07/2015	70.27	5,827,191	4.79	130.42
				Total	84.33	7,718,986	7.88	179.28
				Average	42.17	3,859,493	3.94	89.64
WA0031682	**169**	City of Seattle	Longfellow Creek	11/14/2015	29.98	1,561,043	3.72	64.17
				12/07/2015	75.95	4,601,201	4.79	129.43
				Total	105.93	6,162,245	8.51	193.61
				Average	52.97	3,081,122	4.26	96.80
WA0031682	**170**	City of Seattle	Longfellow Creek	*No combined sewer overflow during 2015*				
WA0031682	**171**	City of Seattle	Lake Washington	03/15/2015	2.15	105,121	3.02	48.52
				11/15/2015	2.80	26,758	4.08	62.23
				12/08/2015	19.10	156,005	5.72	181.17
				Total	24.05	287,883	12.82	291.92
				Average	8.02	95,961	4.27	97.31
WA0031682	**174**	City of Seattle	Lake Washington Canal	01/17/2015	4.75	381,140	0.88	13.00
				02/05/2015	1.45	37,989	1.18	93.83
				02/07/2015	3.38	350,880	2.86	143.93
				03/15/2015	14.03	2,670,738	3.14	49.47

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)
				08/14/2015	4.25	656,772	1.28	5.35
				08/29/2015	3.25	481,869	1.39	43.22
				09/05/2015	0.58	171,034	0.72	0.98
				10/10/2015	2.67	259,637	0.94	24.85
				10/31/2015	1.92	326,804	0.99	25.12
				11/14/2015	26.67	2,934,539	3.47	63.48
				12/07/2015	42.17	3,839,550	4.46	91.93
				12/10/2015	3.33	766,127	5.40	126.68
				12/12/2015	0.58	24,251	0.39	6.98
				12/18/2015	2.42	386,920	1.21	20.12
				12/21/2015	1.92	267,430	1.05	37.93
				Total	113.37	13,555,680	29.36	746.88
				Average	7.56	903,712	1.96	49.79
WA0031682	**175**	City of Seattle	Lake Union	01/18/2015	0.47	71,811	1.15	23.73
				03/15/2015	0.27	983	2.76	44.33
				08/14/2015	0.53	164,535	0.63	1.52
				09/05/2015	0.17	5,797	0.75	1.15
				Total	1.43	243,125	5.29	70.73
				Average	0.36	60,781	1.32	17.68

Table 5-5. Comparison of 2015 and Baseline Flows by Outfall

Outfall Number	2011 - 2015 Average CSO Frequency (#/year)	2015 CSO Discharge Events			Receiving Waters of Overflow	2010 Baseline CSO		2015 CSO Compared to 2010 Baseline CSO
		Frequency (#/year)	Duration (hours)	Volume (gallons)		Frequency (#/year)	Volume (MG/year)	
012	0.8	0	0.00	0	Lake Washington	0	0	Above
013	7	7	80.15	10,406,831	Lake Washington	12	6.7	Frequency Below, Volume Above
014	0.2	1	0.03	136	Lake Washington	0	0	Above
015	3.4	7	5.69	130,433	Lake Washington	1.2	0.3	Frequency Above, Volume Below
016	0	0	0.00	0	Lake Washington	0	0	Equals
018	4.2	2	12.53	2,821,975	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	8	28.73	939,125	Union Bay	2.6	0.1	Above
022	2.8	3	6.75	10,825	Union Bay	0.7	0.1	Frequency Above, Volume Below
024	0.4	0	0.00	0	Lake Washington	0.2	0	Frequency Below, Volume Equals
025	0.4	0	0.00	0	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	3.8	5	10.68	15,141	Lake Washington	15	0.4	Below
029	7.4	9	79.00	163,604	Lake Washington	4.7	0.3	Frequency Above, Volume Below
030	2.4	4	47.70	68,875	Lake Washington	5.4	0.7	Below
031	4.6	5	108.95	1,292,158	Lake Washington	9.3	0.5	Frequency Below, Volume Above
032	2.2	1	1.40	21,463	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	1	1.70	36,871	Lake Washington	1.4	0.5	Below
035	2	5	2.82	26,232	Lake Washington	2	0.3	Frequency Above, Volume Below
036	2.4	4	92.02	129,992	Lake Washington	2.7	0.1	Above
038	1	2	8.08	424,286	Lake Washington	0.7	0.4	Above
040	6.4	5	133.60	2,079,022	Lake Washington	6	0.8	Frequency Below, Volume Above
041	11.4	9	233.73	6,552,815	Lake Washington	7.5	0.9	Above
042	3	3	10.67	161,845	Lake Washington	0.6	0.02	Above
043	9.6	7	113.98	3,237,045	Lake Washington	7	0.7	Frequency Equals, Volume Above
044	18.6	18	419.69	17,584,437	Lake Washington	13	9.3	Above

Outfall Number	2011 - 2015 Average CSO Frequency (#/year)	2015 CSO Discharge Events			Receiving Waters of Overflow	2010 Baseline CSO		2015 CSO Compared to 2010 Baseline CSO
		Frequency (#/year)	Duration (hours)	Volume (gallons)		Frequency (#/year)	Volume (MG/year)	
045	12.6	10	188.83	1,047,926	Lake Washington	5.9	1.1	Frequency Above, Volume Below
046	2.4	1	1.33	16,053	Lake Washington	6.5	0.9	Below
047	9.4	3	57.00	1,859,583	Lake Washington	5.6	1.8	Frequency Below, Volume Equals
048	0	0	0.00	0	Lake Washington	0	0	Equals
049	4	5	86.64	5,220,691	Lake Washington	1.6	0.8	Above
057	0	0	0.00	0	Puget Sound	0	0	Equals
059	0.8	0	0.00	0	Salmon Bay	0.2	0.4	Below
060	3	4	8.08	200,834	Salmon Bay	1.7	0.8	Frequency Above, Volume Below
061	0	0	0.00	0	Elliott Bay	0	0	Equals
062	2.4	4	3.70	75,305	Elliott Bay	0.7	0	Above
064	0	0	0.00	0	Elliott Bay	0.1	0	Frequency Below, Volume Equals
068	1.6	4	5.48	559,251	Elliott Bay	1.4	1.3	Frequency Above, Volume Below
069	2.8	4	2.52	435,845	Elliott Bay	4.4	1.4	Below
070	0.4	1	0.13	22,849	Elliott Bay	0.9	0.2	Frequency Above, Volume Below
071	4	6	3.20	225,540	Elliott Bay	4.3	1.3	Frequency Above, Volume 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	0.6	0	0.00	0	Puget Sound	3	0.4	Below
099	3.8	4	74.23	4,855,651	W Waterway - Duwamish River	0.5	2.8	Above
107	5.4	9	82.20	673,362	E Waterway - Duwamish River	3.8	1.9	Frequency Above, Volume Below
111	2.4	3	6.57	1,056,402	Duwamish River	3	7.9	Frequency Equals, Volume 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

Outfall Number	2011 - 2015 Average CSO Frequency (#/year)	2015 CSO Discharge Events			Receiving Waters of Overflow	2010 Baseline CSO		2015 CSO Compared to 2010 Baseline CSO
		Frequency (#/year)	Duration (hours)	Volume (gallons)		Frequency (#/year)	Volume (MG/year)	
127	0.2	1	70.60	64,878	Lake Union	0.7	0.1	Frequency Above, Volume Below
129	0.4	0	0.00	0	Lake Union	0.1	0	Frequency Below, Volume Equals
130	0.6	3	0.82	268,332	Lake Union	0	0	Above
131	0	0	0.00	0	Lake Union	0.1	0	Frequency Below, Volume Equals
132	1.2	3	1.58	1,014,884	Lake Union	0.7	0	Above
134	0	0	0.00	0	Lake Union	0	0	Equals
135	0.4	2	0.90	9,889	Lake Union	0.3	0	Above
136	0	0	0.00	0	Lake Union	0	0	Equals
138	3.4	7	17.48	721,977	Portage Bay	2.3	2	Frequency Above, Volume Below
139	2.4	6	16.38	1,171,445	Portage Bay	0.7	1.4	Frequency Above, Volume Below
140	6.8	10	28.25	695,688	Portage Bay	4.1	0.3	Above
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	39	32	495.17	16,682,352	Lake Union	33	19	Below
148	0.6	1	1.30	1,400	Lake Washington Ship Canal	0	0	Above
150/151	26.4	28	387.00	2,539,871	Salmon Bay	15	2	Above
152	47.2	34	713.68	36,195,281	Salmon Bay	15	9.7	Above
161	0	0	0.00	0	Lake Washington	0	0	Equals
165	1.2	1	1.48	16,634	Lake Washington	1.1	0.02	Below
168	1	2	84.33	7,718,986	Longfellow Creek	3.9	1.6	Frequency Below, Volume Above
169	1.2	2	105.93	6,162,245	Longfellow Creek	2.2	49	Below
170	0.2	0	0.00	0	Longfellow Creek	0.4	0.1	Below
171	9.4	3	24.05	287,884	Lake Washington	4.1	0.75	Below
174	13.8	15	113.37	13,555,680	Lake Washington Ship Canal	11	5.9	Above
175	1.2	4	1.43	243,126	Lake Union	0.7	0	Above
Total	**312**	**318**	**3,982**	**149,702,955**		**252**	**140**	

Table 5-6. 2011-2015 Summary Comparison of Overflows by Outfall																
Outfall No.	Frequency					Overflow Duration (Hours)					Overflow Volume (Gallons per Year)					Receiving Waters
	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	
012	0	1	1	2	0	0.00	10.87	0.30	0.87	0.00	0	58,966	590	2,612	0	Lake Washington
013	4	7	2	15	7	49.66	60.87	8.42	139.42	80.15	1,397,291	4,471,990	889,232	12,376,374	10,406,831	Lake Washington
014	0	0	0	0	1	0.00	0.00	0.00	0.00	0.03	0	0	0	0	136	Lake Washington
015	4	2	2	2	7	4.03	14.78	2.53	6.41	5.69	22,529	188,231	28,466	66,045	130,433	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	4	8	2	5	2	20.39	70.93	6.43	38.75	12.53	1,772,295	9,541,486	1,635,247	3,350,103	2,821,975	Union Bay
019	0	0	1	0	0	0.00	0.00	1.03	0.00	0.00	0	0	902	0	0	Union Bay
020	3	2	2	5	8	17.03	14.36	6.13	18.60	28.73	189,159	762,481	209,475	562,408	939,125	Union Bay
022	1	4	3	3	3	2.23	46.23	8.42	4.02	6.75	6,285	23,146	11,402	16,765	10,825	Union Bay
024	0	1	1	0	0	0.00	11.00	1.73	0.00	0.00	0	1,179,613	184,519	0	0	Lake Washington
025	0	1	1	0	0	0.00	10.77	1.53	0.00	0.00	0	1,214,977	97,238	0	0	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	2	3	7	5	0.11	0.35	6.33	0.77	10.68	1,204	3,931	4,761	3,781	15,141	Lake Washington
029	3	11	7	7	9	38.41	43.45	21.73	23.68	79.00	24,029	299,426	107,553	134,427	163,604	Lake Washington
030	1	3	2	2	4	0.03	18.53	10.60	8.53	47.70	13	360,739	103,602	149,342	68,875	Lake Washington
031	11	2	0	5	5	99.19	9.76	0.00	28.69	108.95	356,655	8,170	0	152,897	1,292,158	Lake Washington
032	4	3	1	2	1	44.43	19.46	6.42	10.08	1.40	368,002	237,856	88,300	111,411	21,463	Lake Washington
033	0	1	0	0	0	0.00	0.10	0.00	0.00	0.00	0	360	0	0	0	Lake Washington
034	0	1	0	2	1	0.00	11.13	0.00	4.97	1.70	0	229,082	0	79,864	36,871	Lake Washington
035	1	1	1	2	5	0.25	1.07	0.08	0.16	2.82	1,815	5,893	802	851	26,232	Lake Washington
036	1	2	3	2	4	14.43	12.65	4.72	8.40	92.02	16,852	40,092	8,389	26,931	129,992	Lake Washington
038	0	1	0	2	2	0.00	10.38	0.00	2.53	8.08	0	433,405	0	55,731	424,286	Lake Washington
040	4	10	2	11	5	48.06	83.74	14.70	97.27	133.60	814,849	3,602,239	728,493	2,502,735	2,079,022	Lake Washington
041	5	13	8	22	9	84.48	189.40	54.07	269.17	233.73	557,594	1,747,947	400,178	2,745,644	6,552,815	Lake Washington
042	2	3	1	6	3	6.86	26.43	7.13	46.80	10.67	82,769	453,768	125,525	489,133	161,845	Lake Washington
043	7	14	6	14	7	76.79	135.33	17.02	117.08	113.98	1,136,935	2,693,671	517,740	1,541,559	3,237,045	Lake Washington

Outfall No.	Frequency					Overflow Duration (Hours)					Overflow Volume (Gallons per Year)					Receiving Waters
	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	
044	17	22	11	25	18	270.03	399.66	91.27	319.81	419.69	7,331,324	12,327,310	2,873,135	11,257,313	17,584,437	Lake Washington
045	11	14	7	21	10	85.31	199.56	53.33	95.72	188.83	159,235	889,798	243,619	520,482	1,047,926	Lake Washington
046	4	2	1	4	1	28.50	16.00	0.33	27.88	1.33	88,604	27,595	281	51,982	16,053	Lake Washington
047	7	12	10	15	3	67.29	89.47	70.75	55.72	57.00	1,044,960	10,000,932	2,377,107	2,475,920	1,859,583	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	2	5	2	6	5	19.15	35.25	9.27	44.28	86.64	634,667	1,984,105	1,056,726	2,452,672	5,220,691	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	1	2	1	0	0	0.17	5.51	0.44	0.00	0.00	915	95,408	11,666	0	0	Salmon Bay
060	2	6	1	2	4	25.03	10.76	1.17	4.30	8.08	174,145	727,910	47,234	86,372	200,834	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	3	1	2	2	4	0.24	6.80	0.41	0.64	3.70	239	237	7,285	1,584	75,305	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	0	1	1	2	4	0.00	7.00	2.10	3.84	5.48	0	2,801,197	331,236	188,263	559,251	Elliott Bay
069	2	2	3	3	4	0.46	10.70	2.18	1.09	2.52	57,940	277,093	439,013	206,238	435,845	Elliott Bay
070	0	0	1	0	1	0.00	0.00	0.60	0.00	0.13	0	0	65,550	0	22,849	Elliott Bay
071	3	5	4	2	6	39.08	14.47	11.08	1.01	3.20	129,452	600,682	369,332	81,675	225,540	Elliott Bay
072	0	0	1	0	0	0.00	0.00	0.47	0.00	0.00	0	0	14,783	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	1	0	0	0.03	0.22	1.58	0.00	0.00	744	4,276	803	0	0	Puget Sound
099	3	5	1	6	4	29.97	30.00	5.07	72.67	74.23	715,775	2,494,862	405,700	3,827,730	4,855,651	W Waterway - Duwamish River
107	5	4	3	6	9	64.33	14.02	9.33	30.10	82.20	767,499	352,041	232,587	288,804	673,362	E Waterway - Duwamish River

Outfall No.	Frequency					Overflow Duration (Hours)					Overflow Volume (Gallons per Year)					Receiving Waters
	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	
111	2	1	3	3	3	17.85	26.23	6.37	16.59	6.57	723	314,968	11,507	146,654	1,056,402	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	0	1	0.00	0.00	0.00	0.00	70.60	0	0	0	0	64,878	Lake Union
129	0	0	2	0	0	0.00	0.00	49.97	0.00	0.00	0	0	64,910	0	0	Lake Union
130	0	0	0	0	3	0.00	0.00	0.00	0.00	0.82	0	0	0	0	268,332	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	1	0	2	0	3	0.08	0.00	0.23	0.00	1.58	2,559	0	3,986	0	1,014,884	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	0	2	0.00	0.00	0.00	0.00	0.90	0	0	0	0	9,889	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	3	2	2	3	7	15.05	12.25	3.50	8.00	17.48	124,027	649,289	119,989	264,644	721,977	Portage Bay
139	1	2	1	2	6	0.03	10.60	1.43	3.33	16.38	2,638	320,403	47,561	47,515	1,171,445	Portage Bay
140	2	4	5	13	10	0.15	17.96	8.05	9.72	28.25	3,107	437,331	147,407	341,627	695,688	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	40	47	27	49	32	391.91	672.19	238.15	589.00	495.17	9,748,238	14,636,073	4,800,690	12,316,618	16,682,352	Lake Union
148	2	0	0	0	1	0.69	0.00	0.00	0.00	1.30	6,883	0	0	0	1,400	Lake Washington Ship Canal
150/151	25	31	14	34	28	208.64	378.01	114.80	268.14	387.00	2,497,818	4,871,447	1,737,206	3,543,723	2,539,871	Salmon Bay
152	48	57	44	53	34	640.68	1098.59	440.30	900.65	713.68	40,634,362	52,382,276	13,192,217	41,104,401	36,195,281	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	0	2	1	2	1	0.00	10.43	0.25	1.34	1.48	0	54,470	4,387	8,970	16,634	Lake Washington
168	0	2	0	1	2	0.00	47.24	0.00	13.73	84.33	0	5,364,038	0	1,092,208	7,718,986	Longfellow Creek
169	2	1	0	1	2	6.50	16.03	0.00	23.15	105.93	614,501	2,587,257	0	604,990	6,162,245	Longfellow Creek
170	0	1	0	0	0	0.00	0.90	0.00	0.00	0.00	0	12,286	0	0	0	Longfellow Creek

Outfall No.	Frequency					Overflow Duration (Hours)					Overflow Volume (Gallons per Year)					Receiving Waters
	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	
171	6	13	10	15	3	68.67	97.47	79.75	57.62	24.05	828,364	2,199,443	970,469	1,544,026	287,884	Lake Washington
174	10	17	7	20	15	93.30	267.09	24.95	89.35	113.37	5,877,361	10,262,141	2,775,594	8,763,659	13,555,680	Lake Washington Ship Canal
175	0	0	2	0	4	0.00	0.00	1.40	0.00	1.43	0	0	3,062	0	243,126	Lake Union
Total	**260**	**355**	**219**	**406**	**318**	**2,580**	**4,296**	**1,408**	**3,464**	**3,982**	**78,194,356**	**154,232,337**	**37,497,456**	**115,586,683**	**149,702,955**	

Table 5-7. 2011-2015 Summary Comparison of CSOs by Receiving Water															
Receiving Waters of Overflow	Overflow Frequency (# per Year)					Overflow Event Duration (Hours)					Overflow Volume (Gallons per Year)				
	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015
Duwamish River	2	1	3	3	3	18	26	11	17	7	723	314,968	11,507	146,654	1,056,402
East Waterway	5	4	3	6	9	64	14	9	30	82	767,499	352,041	232,587	288,804	673,362
Elliott Bay	8	9	12	4	19	40	39	12	5	15	187,631	3,679,209	1,227,201	269,938	1,318,790
Lake Union	41	47	33	49	45	392	672	290	589	571	9,750,797	14,636,073	4,872,642	12,316,618	18,283,461
Lake Washington	96	149	84	191	116	1,006	1,518	462	1,367	1,709	14,867,691	44,714,009	11,216,814	38,750,702	50,779,955
Lake Washington - Ship Canal	12	17	7	20	16	94	267	25	89	115	5,884,244	10,262,141	2,775,594	8,763,659	13,557,080
Longfellow Creek	2	4	0	2	4	7	64	0	37	190	614,501	7,963,581	0	1,697,198	13,881,231
Portage Bay	6	8	8	18	23	15	41	13	21	62	129,772	1,407,023	314,957	653,786	2,589,110
Puget Sound	1	1	1	0	0	0.03	0.22	2	0	0	744	4,276	803	0	0
Salmon Bay	76	96	60	94	66	875	1,493	561	1,175	1,108	43,307,240	58,077,041	14,988,321	44,942,318	38,935,987
Union Bay	8	14	8	13	13	40	132	22	61	48	1,967,739	10,327,113	1,857,024	3,929,276	3,771,925
West Waterway	3	5	0	6	4	30	30	0	73	74	715,775	2,494,862	0	3,827,730	4,855,651
TOTAL:	260	355	219	406	318	2,581	4,296	1,407	3,464	3,981	78,194,356	154,232,337	37,497,450	115,586,683	149,702956

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

Outfall Number	Number of Overflows Per Year [1]																				Average Annual Overflow Frequency	Meets Performance Standard? [2]	Long-Term Simulation Source	Notes
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015				
12						0	0	0	0	0	0	0	0	0	1	0	1	1	2	0	0.3	Yes	N/A	3,7
13	16	19	15	15	8	10	5	14	8	9	25	4	2	4	5	4	7	2	15	7	9.7	No	Windermere H&H Report, July 2010	5
14												1	0	1	0	0	0	0	0	1	0.3	Yes	N/A	4,7
15	3	1	2	0	0	0	0	2	0	1	4	1	0	8	4	4	2	2	2	7	2.2	No	Windermere H&H Report, July 2010	5
16						0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0.1	Yes	N/A	3,7
18	7	5	5	2	0	3	2	3	4	4	11	2	3	8	5	4	8	2	5	2	4.3	No	LTCP Long Term Simulation Results February 2013	5
19						0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0.2	Yes	N/A	3,7
20	3	2	1	1	0	0	0	2	1	0	3	1	0	3	3	3	2	2	5	8	2.0	No	LTCP Long Term Simulation Results February 2013	5
22	2	1	0	0	0	0	0	2	3	0	1	1	0	1	1	1	4	3	3	3	1.3	No	LTCP Long Term Simulation Results February 2013	5,8
24	4	1	1	0	0	0	0	2	2	0	4	1	0	1	1	0	1	1	0	0	1.0	Yes	LTCP Long Term Simulation Results February 2013	5
25	3	0	0	0	0	0	0	2	1	0	3	1	1	2	1	0	1	1	0	0	0.8	Yes	LTCP Long Term Simulation Results February 2013	5,9
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 2014	5
28	3	1	0	0	0	1	1	1	1	0	2	1	26	8	2	2	2	3	7	5	3.3	No	LTCP Long Term Simulation Results February 2013	5
29	4	1	1	1	0	3	1	2	2	0	5	1	5	4	2	3	11	7	7	9	3.5	No	LTCP Long Term Simulation Results February 2013	5
30	2	0	1	0	0	1	1	1	1	0	1	1	2	1	0	1	3	2	2	4	1.2	No	LTCP Long Term Simulation Results February 2013	6
31	22	11	21	14	2	17	13	18	13	19	32	10	4	12	11	11	2	0	5	5	12.1	No	LTCP Long Term Simulation Results February 2013	5
32	10	5	7	4	1	13	4	4	4	4	15	5	1	7	3	4	3	1	2	1	4.9	No	LTCP Long Term Simulation Results February 2013	5
33	1	0	0	0	0	0	1	0	0	0	1	0	0	1	0	0	1	0	0	0	0.3	Yes	LTCP Long Term Simulation Results February 2013	5
34	4	1	1	1	0	1	1	2	1	0	3	1	0	1	1	0	1	0	2	1	1.1	No	LTCP Long Term Simulation Results February 2013	5,10

Outfall Number	Number of Overflows Per Year [1]																				Average Annual Overflow Frequency	Meets Performance Standard? [2]	Long-Term Simulation Source	Notes
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015				
35	3	0	0	0	0	1	1	2	2	0	1	1	0	3	0	1	1	1	2	5	1.2	No	LTCP Long Term Simulation Results February 2013	5,11
36	6	0	3	2	0	3	1	2	2	1	6	1	0	5	2	1	2	3	2	4	2.3	No	LTCP Long Term Simulation Results February 2013	5
38	2	0	1	0	0	1	0	2	1	0	2	1	0	1	1	0	1	0	2	2	0.9	Yes	InfoWorks V9.5 H&H Model – Extracted Data Set From Long Term Simulation Run.	5
40	10	6	5	2	3	9	4	6	4	4	12	7	1	6	5	4	10	2	11	5	5.8	No	InfoWorks V9.5 H&H Model – Extracted Data Set From Long Term Simulation Run.	5
41	11	8	9	3	3	11	5	7	5	9	15	7	9	14	5	5	13	8	22	9	8.9	No	InfoWorks V9.5 H&H Model – Extracted Data Set From Long Term Simulation Run.	5
42	3	0	1	0	0	1	2	1	1	0	0	0	0	1	1	2	3	1	6	3	1.3	No	InfoWorks V9.5 H&H Model – Extracted Data Set From Long Term Simulation Run.	5,12
43	10	7	8	3	3	11	5	7	4	5	13	7	3	11	9	7	14	6	14	7	7.7	No	InfoWorks V9.5 H&H Model – Extracted Data Set From Long Term Simulation Run.	5
44	18	22	20	12	8	14	10	18	16	13	29	9	12	16	16	17	22	11	25	18	16.3	No	InfoWorks V9.5 H&H Model – Extracted Data Set From Long Term Simulation Run.	5
45	24	15	20	10	6	16	11	18	22	17	21	19	5	11	10	11	14	7	21	10	14.4	No	InfoWorks V9.5 H&H Model – Extracted Data Set From Long Term Simulation Run.	5
46	11	12	9	4	3	13	4	8	7	8	13	5	9	9	12	4	2	1	4	1	7.0	No	InfoWorks V9.5 H&H Model – Extracted Data Set From Long Term Simulation Run.	5
47	19	11	10	8	9	10	17	28	32	27	39	34	3	12	8	7	12	10	15	3	15.7	No	InfoWorks V9.5 H&H Model – Extracted Data Set From Long Term Simulation Run.	5
48													0	0	0	0	0	0	0	0	0.0	Yes	N/A	5,7
49	3	1	1	0	0	1	1	2	0	4	11	2	1	6	4	2	5	2	6	5	2.9	No	InfoWorks V9.5 H&H 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	Yes	N/A	3,7

Outfall Number	Number of Overflows Per Year [1]																				Average Annual Overflow Frequency	Meets Performance Standard? [2]	Long-Term Simulation Source	Notes
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015				
59						0	0	1	0	0	0	1	0	0	0	1	2	1	0	0	0.4	Yes	N/A	3,7
60	8	3	1	4	1	2	0	2	1	4	4	3	0	3	4	2	6	1	2	4	2.8	No	LTCP Long Term Simulation Results February 2013	5
61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0.1	Yes	InfoWorks Long Term Simulation September 2013	3
62	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	2	2	4	0.8	Yes	InfoWorks Long Term Simulation September 2013	3
64	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.1	Yes	InfoWorks Long Term Simulation September 2013	3
68	3	0	0	0	0	1	0	2	0	1	1	1	0	1	1	0	1	1	2	4	1.0	Yes	LTCP Long Term Simulation Results February 2013	5,13
69	3	2	3	0	1	1	1	2	1	1	2	1	1	3	1	2	2	3	3	4	1.9	No	LTCP Long Term Simulation Results February 2013	5
70	2	1	1	0	0	1	0	0	1	0	1	1	0	1	0	0	0	1	0	1	0.6	Yes	AWWSRP Modeling Support Alternative Modeling Report May 2012, Appendix D	5
71	4	2	1	0	0	1	0	3	1	1	2	1	2	9	7	3	5	4	2	6	2.7	No	AWWSRP Modeling Support Alternative Modeling Report May 2012, Appendix D	5
72	2	1	0	0	0	0	0	2	0	0	1	1	0	0	0	0	0	1	0	0	0.4	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	0.2	Yes	N/A	3,7
80						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	Yes	N/A	3,7
85						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	0.3	Yes	N/A	3,7
90						0	0	0	0	1	1	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	Yes	N/A	3,7
94						0	0	1	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	2.2	No	N/A	3,7
99	3	1	2	2	0	3	0	1	1	2	1	1	0	1	2	3	5	1	6	4	2.0	No	LTCP Long Term Simulation Results February 2013	5
107	7	4	5	6	1	6	5	3	7	5	7	1	2	11	12	5	4	3	6	9	5.5	No	LTCP Long Term Simulation Results January 2014	5

Outfall Number	Number of Overflows Per Year [1]																				Average Annual Overflow Frequency	Meets Performance Standard? [2]	Long-Term Simulation Source	Notes
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015				
111	3	3	2	0	0	2	1	3	1	3	2	1	0	6	3	2	1	3	3	3	2.1	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	Yes	N/A	3, 7
121						0	0	0	1	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	Yes	N/A	3, 7
127						0	0	0	1	0	3	0	1	1	0	0	0	0	0	1	0.5	Yes	N/A	3, 7
129						0	1	0	0	0	0	0	0	0	0	0	0	2	0	0	0.2	Yes	N/A	3, 7
130													0	0	0	0	0	0	0	3	0.4	Yes	N/A	5, 7
131						0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0.1	Yes	N/A	3, 7
132													0	0	0	1	0	2	0	3	0.8	Yes	N/A	5, 7
134						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	0.4	Yes	N/A	5, 7
136						0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	Yes	N/A	3, 7
138	5	2	1	0	0	1	0	2	3	0	3	1	1	2	1	3	2	2	3	7	2.0	No	LTCP Long Term Simulation Results February 2013	5
139	2	4	2	0	0	1	0	1	3	1	2	1	0	1	2	1	2	1	2	6	1.6	No	LTCP Long Term Simulation Results February 2013	5
140	7	7	3	0	2	2	3	6	5	6	5	1	1	7	8	2	4	5	13	10	4.9	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	0.1	Yes	N/A	3, 7
144						0	0	0	0	0	0	1	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	Yes	N/A	3, 7
146						0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	Yes	N/A	3, 7
147	50	41	32	32	27	26	29	31	29	37	45	35	50	45	63	40	47	27	49	32	38.4	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	0.3	Yes	N/A	3, 7
150/151	24	29	15	19	11	16	10	14	6	15	23	11	2	22	29	25	31	14	34	28	18.9	No	LTCP Long Term Simulation Results February 2013	5
152	52	52	49	49	57	47	39	53	44	46	42	43	11	29	63	48	57	44	53	34	45.6	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	Yes	N/A	3, 7
165													1	1	1	0	2	1	2	1	1.1	No	N/A	5, 7, 14
168	5	1	2	6	0	5	1	2	1	2	8	3	0	6	2	0	2	0	1	2	2.5	No	LTCP Long Term Simulation Results February 2013	5

Outfall Number	Number of Overflows Per Year [1]																				Average Annual Overflow Frequency	Meets Performance Standard? [2]	Long-Term Simulation Source	Notes
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015				
169	5	1	2	6	0	5	1	2	1	2	8	3	1	1	2	2	1	0	1	2	2.3	No	LTCP Long Term Simulation Results February 2013	5
170													0	2	1	0	1	0	0	0	0.5	Yes	N/A	5,7
171	10	9	8	2	4	4	10	6	3	8	12	6	4	10	5	6	13	10	15	3	7.4	No	InfoWorks V9.5 H&H Model – Extracted Data Set From Long Term Simulation Run	5
174	12	10	9	6	1	8	3	5	6	10	21	6	6	14	13	10	17	7	20	15	10.0	No	LTCP Long Term Simulation Results February 2013	5
175													0	1	0	0	0	2	0	4	0.9	Yes	N/A	5,7

Notes:

1. Per Section S6.A.2 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 actual 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 and/or exacerbated CSOs. Examples of these situations are explained in Notes 9 through 15. 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 is based on flow monitoring conducted between 2001 and 2015.
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 is based on flow monitoring conducted between 2007 and 2015.
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 is based on flow monitoring conducted between 2008 and 2015.
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 is based on flow monitoring conducted between 2008 and 2015.
7. The Average Annual Overflow Frequency was calculated based on the number of years of reliable data.
8. Several exacerbated CSOs occurred at Outfall 22 in recent years because of the deteriorating performance of WWPS 50. The pump station will be rehabilitated and existing air-lift style pumps replaced with submersible pumps in 2016.
9. 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.
10. Two phases of retrofits are being implemented in the Leschi Area (Basins 26-36). As part of Phase I, the weir height at Outfall 34 was raised a foot in August 2014, and consequently, this outfall is believed to be controlled. The Phase II retrofits will be completed in 2016 and should bring additional Leschi basins into control.
11. CSOs at Outfall 35 in 2009 were likely due to a clogged HydroBrake; inspection frequency was subsequently increased.
12. 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.
13. Overflow frequency at Outfall 68 affected by clogged HydroBrake (2005, 2007) and leaky flap gate leading to offline storage.
14. Basin 165 is in the Genesee area 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. 2015 Sanitary Sewer Overflow (SSO) Details								
2014 SSO Number[1]	**ERTS Number**	**Date**	**Address**	**SSO Volume (gallons)**	**Volume in Receiving Water (gallons)**	**Receiving Water**	**Primary Cause**	**Secondary Cause, if Any**
1	654072	1/7/15	1423 10th Ave E	1			FOG	
2	655196	1/18/15	502 Lee St	Unknown			Capacity-gravity main	
3	655196	1/18/15	1207 19th Ave E	Unknown			Extreme Weather Event	
4	655196	1/18/15	1516 18th Ave	Unknown			Extreme Weather Event	
5	655196	1/18/15	1117 Minor Ave	Unknown			Extreme Weather Event	
6	655196	1/18/15	920 E Newton St	Unknown			Extreme Weather Event	
7	655196	1/18/15	1624 Shenandoah Dr	Unknown			Extreme Weather Event	
8	655196	1/18/15	500 5th Ave W	Unknown			Roots	
9	655196	1/18/15	509 10th Ave E	Unknown			Extreme Weather Event	
10	655196	1/18/15	510 6th Ave S	Unknown			Debris	
11	656756	1/18/15	9802 35th Ave SW	Unknown			Debris	
12	656758	1/18/15	2502 26th Ave W	Unknown			Capacity-gravity main	
13	654218	1/20/15	9201 Rainier Ave S	100			Roots	
14	654583	2/5/15	53rd Ave S and Lake WA Blvd S	300	250	Lake Washington	City Construction	

2014 SSO Number[1]	ERTS Number	Date	Address	SSO Volume (gallons)	Volume in Receiving Water (gallons)	Receiving Water	Primary Cause	Secondary Cause, if Any
15	654976	2/10/15	4710 S Bond St	Unknown			Vandalism	
16	655066	2/19/15	12003 33rd Ave NE	Unknown			Maintenance error	
17	655092	2/24/15	Pike St and 6th Ave	600			FOG	
18	655338	3/7/15	816 NE 43rd St	3,000			Roots	FOG
19	655505	3/13/15	523 NE 95th St	12	4	Thornton Creek	Roots	
20	655503	3/13/15	510 6th Ave S	Unknown			Capacity-gravity main	
21	655503	3/15/15	5817 18th Ave S	Unknown			Capacity-gravity main	
21	655503	3/15/15	5821 18th Ave S	Unknown			Capacity-gravity main	
21	655503	3/15/15	5927 18th Ave S	Unknown			Capacity-gravity main	
22	655503	3/15/15	1703 E Union St	Unknown			Capacity-gravity main	
23	655503	3/15/15	4115 Beach Dr SW	Unknown			Capacity-gravity main	
24	655503	3/15/15	2307 SW Myrtle St	Unknown			Capacity-gravity main	
25	656830	3/15/15	3003 NW 67th St	Unknown			Capacity-gravity main	
26	656832	3/15/15	3120 Furhman Ave E	Unknown			Capacity-gravity main	
27	655500	3/15/15	1244 S Concord St	20,000			Capacity-gravity main	
28	655502	3/15/15	53rd Ave S and Lake WA Blvd S	9,320	9,320	Lake Washington	New facility startup	

2014 SSO Number[1]	ERTS Number	Date	Address	SSO Volume (gallons)	Volume in Receiving Water (gallons)	Receiving Water	Primary Cause	Secondary Cause, if Any
29	655694	3/15/15	6059 S Roxbury St	Unknown			Roots	
30	656752	3/16/15	9016 46th Ave S	100			FOG	
31	655792	3/20/15	8107 22nd Ave SW	Unknown			Roots	
32	656587	4/24/15	10424 11th Ave NE	Unknown			Roots	
33	656528	5/3/15	3225 S Holden St	10			Private side sewer issue	FOG
34	656834	5/16/15	9044B 18th Ave SW	12			Roots	Debris
35	656882	5/18/15	3131 NW 93rd St	10			Structural failure-gravity main	Debris
36	657425	6/5/15	1007 14th Ave E	Unknown			Roots	
37	657639	6/19/15	Alaskan Way and University St	Unknown			Structural failure-gravity main	
38	658492	7/6/15	1000 Denny Way	Unknown			Maintenance error	
39	658470	7/25/15	10806 23rd Ave NE	1			Maintenance error	
40	658622	8/5/15	4005 E Highland Dr	10			Private Construction	
41	658856	8/14/15	2307 SW Myrtle St	30,000	30,000	Longfellow Creek	City Construction	
42	658875	8/14/15	5121 27th Ave NE	Unknown			Extreme Weather Event	
42	658875	8/14/15	5123 27th Ave NE	Unknown			Extreme Weather Event	
43	658875	8/14/15	1520 NE Ravenna Blvd	Unknown			Extreme Weather Event	

2014 SSO Number[1]	ERTS Number	Date	Address	SSO Volume (gallons)	Volume in Receiving Water (gallons)	Receiving Water	Primary Cause	Secondary Cause, if Any
43	658875	8/14/15	1602 NE Ravenna Blvd	Unknown			Extreme Weather Event	
43	658875	8/14/15	1612 NE Ravenna Blvd	Unknown			Extreme Weather Event	
44	658875	8/14/15	3615 Burke Ave N	Unknown			Extreme Weather Event	
44	658875	8/14/15	3612 Burke Ave N	Unknown			Extreme Weather Event	
44	658875	8/14/15	3628 Burke Ave N	Unknown			Extreme Weather Event	
44	658875	8/14/15	3701 Burke Ave N	Unknown			Extreme Weather Event	
44	658875	8/14/15	1911 N 37th St	Unknown			Extreme Weather Event	
45	658875	8/14/15	3120 Fuhrman Ave E	Unknown			Extreme Weather Event	
45	658875	8/14/15	3126 Fuhrman Ave E	Unknown			Extreme Weather Event	
46	658875	8/14/15	802 Newton St	Unknown			Extreme Weather Event	
47	658875	8/14/15	2706 Boyer Ave E	Unknown			Extreme Weather Event	
48	658875	8/14/15	2250 39th Ave E	Unknown			Extreme Weather Event	
49	658969	8/14/15	3002 27th Ave W	Unknown			Capacity-gravity main	
50	658969	8/14/15	3rd Ave and W Dravus St	Unknown			Capacity-gravity main	
51	659091	8/25/15	2918 Avalon Way SW	140	40	West Waterway	City Construction	
52	659398	9/1/15	12335 Lake City Way NE	Unknown			Maintenance error	

2014 SSO Number[1]	ERTS Number	Date	Address	SSO Volume (gallons)	Volume in Receiving Water (gallons)	Receiving Water	Primary Cause	Secondary Cause, if Any
53	659516	9/5/15	7545 25th Ave NW	Unknown			Roots	
54	659516	9/5/15	1115 NW Market St	Unknown			Capacity-gravity main	
55	659516	9/5/15	3220 W Government Way	Unknown			Extreme Weather Event	
55	659516	9/5/15	3222 W Government Way	Unknown			Extreme Weather Event	
55	659516	9/5/15	3223 W Government Way	Unknown			Extreme Weather Event	
56	659516	9/5/15	4332 36th Ave W	Unknown			Extreme Weather Event	
56	659516	9/5/15	4342 36th Ave W	Unknown			Extreme Weather Event	
57	659516	9/5/15	2816 W Jameson St	Unknown			Extreme Weather Event	
58	659516	9/5/15	3711 27th Pl W	Unknown			Extreme Weather Event	
59	659516	9/5/15	3006 27th Ave W	Unknown			Extreme Weather Event	
60	659516	9/5/15	3516 31st Ave W	Unknown			Extreme Weather Event	
61	659516	9/5/15	4000 24th Ave W	Unknown			Extreme Weather Event	
62	659516	9/5/15	3rd Ave W & W Dravus St	Unknown			Extreme Weather Event	
63	659467	9/5/15	4238 Thackeray Pl	Unknown			Capacity-gravity main	
64	659467	9/5/15	3120 Fuhrman Ave E	Unknown			Extreme Weather Event	
64	659467	9/5/15	3126 Fuhrman Ave E	Unknown			Extreme Weather Event	

2014 SSO Number[1]	ERTS Number	Date	Address	SSO Volume (gallons)	Volume in Receiving Water (gallons)	Receiving Water	Primary Cause	Secondary Cause, if Any
65	659516	9/5/15	2461 Queen Anne Ave N	Unknown			Extreme Weather Event	
66	659467	9/5/15	802 Newton St	Unknown			Extreme Weather Event	
67	659516	9/5/15	1218 3rd Ave W	Unknown			Extreme Weather Event	
68	659516	9/5/15	2597 Perkins Ln W	Unknown	Unknown	Puget Sound	Structural failure-gravity main	
69	659467	9/5/15	2706 Boyer Ave E	Unknown			Extreme Weather Event	
70	659516	9/5/15	315 W Roy St	Unknown			Roots	
71	659516	9/5/15	3600 Gilman Ave W	Unknown			Extreme Weather Event	
72	659516	9/5/15	5918 15th Ave NW	Unknown			FOG	
73	659516	9/5/15	4522 32nd Ave W	Unknown			Capacity-gravity main	
74	659467	9/5/15	7515 Brooklyn Ave NE	Unknown			Capacity-gravity main	
75	659467	9/5/15	3131 Western Ave W	Unknown			Capacity-gravity main	
76	659516	9/5/15	3301 W Fort St	Unknown			Extreme Weather Event	
77	659560	9/11/15	5808 3rd Ave NW	900			Roots	
78	659847	10/1/15	9582 1st Ave NE	180			Roots	
79	660007	10/10/15	1105 9th Ave W	100			Roots	
80	660008	10/10/15	1004 Nob Hill Ave N	200			City Construction	

2014 SSO Number[1]	ERTS Number	Date	Address	SSO Volume (gallons)	Volume in Receiving Water (gallons)	Receiving Water	Primary Cause	Secondary Cause, if Any
81	660022	10/10/15	10334 Bedford Ct NW	1,776	1,776	Puget Sound	Pump Station-Mechanical	
82	660029	10/10/15	2597 Perkins Lane W	Unknown	Unknown	Puget Sound	Structural failure-gravity main	
83	660053	10/10/15	8027 17th Ave NW	Unknown			Capacity-gravity main	
84	660053	10/10/15	2325 Hobart Ave SW	Unknown			City Construction	
85	660053	10/10/15	3254 40th Ave SW	Unknown			Roots	
85	660053	10/10/15	3255 40th Ave SW	Unknown			Roots	
86	660053	10/10/15	6302 37th Ave SW	Unknown			Roots	
87	660082	10/13/15	3231 40th Ave SW	Unknown			Maintenance error	
88	660248	10/22/15	7148 Martin Luther King Jr Way S	Unknown			Maintenance error	
89	660443	10/30/15	1415 NE 45th St	32,500	32,000	Lake Washington-Ship Canal	Private side sewer issue	Roots
90	660475	11/2/15	1 Dravus St	Unknown			Structural failure-gravity main	
90	660475	11/2/15	7 Dravus St	100			Structural failure-gravity main	
90	660475	11/2/15	15 Dravus St	Unknown			Structural failure-gravity main	
91	660743	11/15/15	Delridge Way SW/SW Orchard St	504,000	234,000	Longfellow Creek	New facility startup	
92	660744	11/15/15	2534 39th Ave E	200			Pump Station-Mechanical	
93	660794	11/15/15	818 NE 84th St	Unknown			Capacity-gravity main	

2014 SSO Number[1]	ERTS Number	Date	Address	SSO Volume (gallons)	Volume in Receiving Water (gallons)	Receiving Water	Primary Cause	Secondary Cause, if Any
94	660839	11/13/15	1018 SW Henderson St	Unknown			Debris	
95	660901	11/14/15	11438 71st Pl S	Unknown			Roots	
95	660901	11/13/15	11450 71st Pl S	Unknown			Roots	
96	None	11/15/15	5245 40th Ave NE	Unknown			Capacity-gravity main	
97	661193	12/3/15	620 5th Ave W	500			Roots	
98	661381	12/6/15	3025 NW Esplanade	7,200	7,200	Puget Sound	Structural failure-force main	
99	661341	12/8/15	4115 Beach Dr SW	100			Pump Station-Capacity	
100	661576	12/16/15	3046 NW Esplanade	300	300	Puget Sound	Structural failure-force main	
101	662038	12/27/15	9512 13th Ave NW	Unknown			Debris	
102	662237	12/3/15	7723 26th Ave NW	Unknown			Structural failure-gravity main	

1. Rows with the same SSO Number represent multiple customers affected by the same sewer system constraint during an extreme weather-caused 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 900 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	Air Lift	10.6	14	2 at 150 gpm each	20.5	10
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 300 gpm each	29	5.34
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. 2015 Pump Station Work Order Summary			
WWPS Number	Inspection	Maintenance	Total Work Orders
WWPS001	8	6	15
WWPS002	11	33	44
WWPS004	5	7	12
WWPS005	10	13	23
WWPS006	5	13	18
WWPS007	14	15	29
WWPS009	13	23	36
WWPS010	18	27	45
WWPS011	4	35	39
WWPS013	12	20	32
WWPS017	12	20	32
WWPS018	4	18	22
WWPS019	2	21	23
WWPS020	17	38	55
WWPS021	11	25	36
WWPS022	8	8	16
WWPS025	27	45	72
WWPS028	15	21	36
WWPS030	3	31	34
WWPS031	5	10	15
WWPS035	18	168	186
WWPS036	11	12	23
WWPS037	5	22	27
WWPS038	17	13	30
WWPS039	7	11	18
WWPS042	10	16	26
WWPS043	8	16	24
WWPS044	10	17	27
WWPS045	18	14	32
WWPS046	19	6	25
WWPS047	7	8	15
WWPS048	5	11	16
WWPS049	10	32	42
WWPS050	21	9	30
WWPS051	12	3	15
WWPS053	13	8	21
WWPS054	15	18	33
WWPS055	13	5	18

WWPS Number	Inspection	Maintenance	Total Work Orders
WWPS056	73	27	100
WWPS057	12	12	24
WWPS058	8	10	18
WWPS059	7	16	23
WWPS060	9	11	20
WWPS061	7	8	15
WWPS062	14	26	40
WWPS063	13	21	34
WWPS064	4	7	11
WWPS065	9	15	24
WWPS066	4	5	9
WWPS067	6	3	10
WWPS069	11	13	24
WWPS070	26	17	43
WWPS071	10	12	22
WWPS072	8	14	22
WWPS073	10	24	34
WWPS074	2	15	17
WWPS075	5	6	11
WWPS076	7	12	19
WWPS077	12	19	31
WWPS078	4	7	11
WWPS080	4	11	15
WWPS081	4	3	7
WWPS082	4	9	13
WWPS083	13	5	18
WWPS084	5	4	9
WWPS114	8	27	35
WWPS118	6	10	16
Grand Total	**728**	**1189**	**1917**