



# Sewer System Management Plan

## Internal Audit for FY 13/14 - FY 14/15

December 2015

Prepared By:



**WATERWORKS**  
ENGINEERS

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# CITY OF SACRAMENTO DEPARTMENT OF UTILITIES

## Sewer System Management Plan (SSMP)

### Internal Audit for FY 13/14 – FY 14/15

**December 2105**

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## SECTION 1 Audit Objectives

This report summarizes the findings of the required Sewer System Management Plan (SSMP) internal audit process (SSMP Audit) for the areas served by the City of Sacramento's separated sewer system. This SSMP Audit covers the Fiscal Year (FY) 13/14 and FY 14/15 evaluation period. The purpose of the SSMP is to provide a written framework for sanitary sewer collection system management, operation, and maintenance programs executed by the City of Sacramento (City) Department of Utilities (DOU) with the ultimate goal of minimizing sanitary sewer overflows (SSOs) and sustaining compliance with California State Water Resources Control Board (SWRCB) Order No. 2006-0003-DWQ, the Statewide General Waste Discharge Requirements for Sanitary Sewer Systems (SSS WDR). The SSMP Audit is based on a review of performance measures established by the City to evaluate the City's success in achieving compliance with various requirements of the SSS WDRs and implementing programs as stated in the SSMP. The SSMP Audit process allows the SSMP document to evolve over time through the identification of potential enhancements and the implementation of changes to address any deficiencies in the management, operation and maintenance of the sanitary sewer collection system.

The City DOU is committed to completing biennial SSMP Audits of the SSMP consistent with the procedure outlined in Section 5 Chapter 10 of the SSMP. The City had its first biennial SSMP Audit completed by RMC Water and Environment (May 2011), while HDR Inc. completed its second biennial SSMP Audit (June 2013). The City has contracted with Water Work Engineers to perform this, the City's third internal SSMP Audit. The key objective of this SSMP Audit is to review implementation of City's SSMP compliance and effectiveness. The following tasks were performed as part of this internal SSMP Audit:

1. Review records from previous internal audits, to confirm deficiencies have been addressed (see **Section 2.1**).
2. Analyze the City's historical SSO data and the performance measures listed in the City's SSMP (see **SECTION 3**).
3. Establish a standardized procedure for this and potentially future SSMP Audits (see **SECTION 4**).
4. Review the City's performance in achieving compliance with all of the various requirements of the SSS WDRs (see **SECTION 5**).
5. Analyze the City's preventative maintenance program and Rehabilitation and Replacement (R&R) plan as it relates to the operation and maintenance of the separated sewer system (see **Section 5.4**).
6. Review Emergency Response Plan (ERP) for SSOs and identify improvements if needed (see **Section 5.6**).
7. Record all findings during the audit process and retain the SSMP Audit on file (see **SECTION 6**).

## SECTION 2 Agency Background / System Information

The City of Sacramento is situated at the confluence of the Sacramento River and the American River in the northern Central Valley area. As the cultural and economic core of the Sacramento metropolitan area, Sacramento has previously been named one of the most diverse cities in the nation. The City covers approximately 100 square miles, 98% of which is land with the other 2% being water. The terrain of Sacramento is relatively flat throughout.

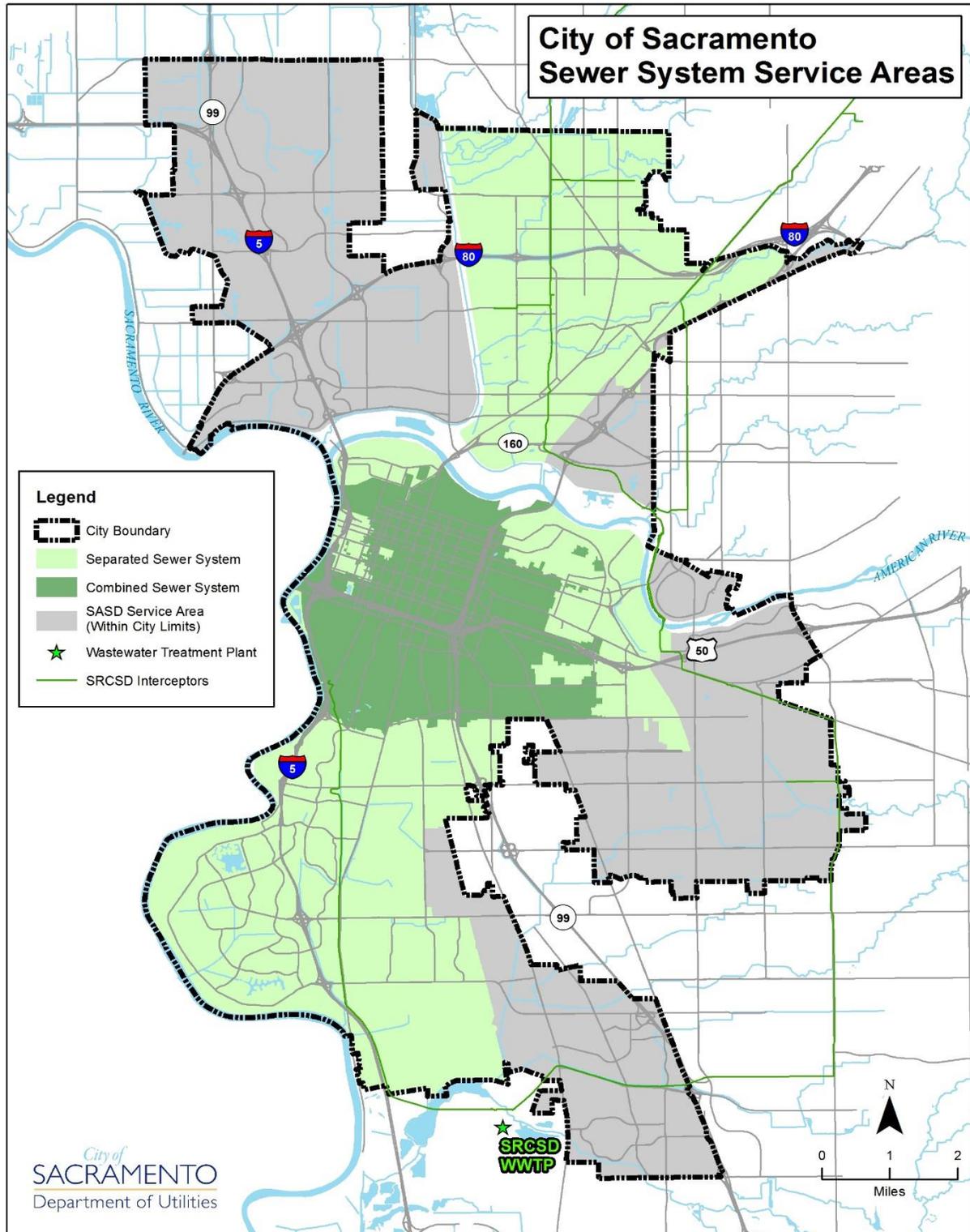
The collection of wastewater in the City is provided by both the City and the Sacramento Area Sewer District (SASD), as shown in **Figure 1**. The SASD maintains about 35 percent of the public collection system within City limits and the City DOU maintains the remaining 65 percent. The portion of the collection system managed by the City DOU is comprised of a Combined Sewer System (CSS), which resides in the older central portion of the City and encompasses a total service area of about 7,545 acres. The CSS is unique in California, and its collection and treatment system is covered under an individual National Pollutant Discharge Elimination System (NPDES) permit issued by the Central Valley Regional Water Quality Control Board (Region 5) (WDR No. R5-2015-0045, NPDES No. CA0079111). The separated sewer system, which resides primarily in the northeast, east, and southwest sections of the City, encompasses a service area of about 25,435 acres. **Table 1** provides additional information about the separated sewer system over the current SSMP Audit time period. This SSMP Audit covers compliance activities related to the separated sewer system only.

**Table 1. Overview of System Indicators**

Audit	FY 13/14 – 14/15
Miles of Mainline	545
Pump stations	40
Population served	180,124
Dedicated Sewer Maintenance Staff	74
Category 1 SSOs (FY1 / FY2)	1 / 0
Category 2 SSOs (FY1 / FY2)	1 / 0
Category 3 SSOs (FY1 / FY2)	27 / 18

Wastewater is conveyed from the City’s separated sewer system to the Sacramento Regional County Sanitation District’s (SRCSD) treatment plant known as the Sacramento Regional Wastewater Treatment Plant (SRWTP). The City’s wastewater is routed to the SRWTP via an interceptor system (also owned by SRCSD) consisting of large diameter pipes and pump stations. There are also portions of the SSS that about the CSS on the north and east, which connect to, and flow through the CSS to the SRCSD interceptor system.

Figure 1: City of Sacramento Service Areas



## 2.1 Review of Last SSMP Audit

The previous internal audit of the City's SSMP was conducted and concluded on June 30, 2013, and reviewed the activities and performance related to the SSMP from January 1, 2011 to June 30, 2013. This internal SSMP Audit was organized to correspond with the SSMP document section for ease of reference. **Table 2** summarizes the identified deficiencies, the recommended corrective actions outlined in the previous SSMP audit, and show the current status of the corrective actions per City tracking efforts.

**Table 2. Summary of Findings from the Last SSMP Internal Audit**

Element	Action Item	Status
2 – Organization	Update the SSMP to reflect the City’s reorganization as well as include updated contact information and responsibilities of operations and maintenance supervisors responsible for implementing key SSMP initiatives or programs.	Completed April 22 2014
	Review and revise sewer overflow response procedure and notification flow charts in the SSMP that identifies the chain of communication from receipt of the complaint to applicable notifications. Ensure flow charts developed for the emergency overflow SOP also incorporates the changes within the organizational structure.	Completed December 2014
3 – Legal Authority	Consider expansion of the City’s legal authority to provide additional tools for FOG enforcement related issues.	In Progress
	Update references within the SSMP to include 2013 changes to the SRCSD ordinance.	Completed April 22 2014
4 – O&M Program	Provide further QA/QC of pipe attribute information, such as pipe material, that is being identified with CCTV inspection activities.	Ongoing
	Update the SSMP to reflect actual business process for evaluation of the Targeted Maintenance Program.	Completed April 22 2014
	Implement a data capture process, CMMS system configuration, and data QA/QC process resulting in more accurate maintenance history data capture.	Completed
	Develop and implement a cleaning schedule for every pipe in the system so that findings are documented and tracked.	Completed
	Implement a process and information system to capture and store coded maintenance feedback for sewer cleaning when the new CMMS is implemented in 2014. This should result in an electronic database of coded maintenance feedback history by specific asset. Continue to build on this process with the implementation of a risked based approach for updating frequency and schedule dates.	Completed / Ongoing Updates
	Fully implement the root control program. The root control program should focus on pipes with an elevated risk for a root related SSOs and should schedule root control treatment for elevated risk pipes.	Ongoing
	Coordinate pump station work orders such that they can be scheduled on a station by station basis. Pump stations are shut down for quarterly wet well cleaning, coordinate electrical and mechanical work orders and inspections to coincide with the pump station shut down.	No Progress
	Update the SSMP to reference the CIP Programming Guide (Guide) and annually adopted CIP to provide information on the projected CIP project lists and anticipated funding levels. The Guide will include the CIP projects and their priority based on, but not limited to, condition assessment, work order history, criticality, and design life.	Completed April 22 2014
	Update the SSMP to reflect the current inspection plan and schedule.	Completed April 22 2014
Consider the development of a manhole inspection program using NASSCO’s MACP defect coding system.	Considered	

**Table 2 (continued). Summary of Findings from the Last SSMP Internal Audit**

Element	Action Item	Status
4 – O&M Program	Develop and implement an automated pipe re-inspection process through CMMS.	Completed
	Provide further QA/QC of Granite XP pipe inspection data.	Ongoing
	Update the SSMP to include a description of the newly developed training program as well as a description of the SSO emergency overflow response training program.	Completed April 22 2014
	Identify critical spare parts required at pump stations. Include a plan to either acquire spare parts in the replacement parts inventories or a timely means for fabricating or acquiring critical spare parts in the event of a failure.	No Progress
	Implement the condition assessment program for pump station mechanical parts and equipment. The condition assessment comments should be tracked in CMMS. Update the SSMP to reflect the condition assessment program implementation.	Ongoing
5 – Design and Performance Provisions	Update the Design and Procedures Manual.	Ongoing
	Update the SSMP to reference the updated Standard Specifications and Design Procedures Manual when they are completed and post the updated documents online.	In Progress
6 – OERP	Update SSMP to adequately incorporate descriptions of the most current SSO response and notification procedures.	Completed April 22 2014
	Develop pump station failure contingency standard procedures indicating each pump station's: location, wet well capacity, estimate of how much storage time the wet wells would provide under different flow conditions, alarm capacities, on-site back-up pumps, back-up power generators, and an operations or bypass approach in the case of a force main failure. For any stations that lack back-up pumps and generators, the plan should specify a protocol for prompt delivery of portable pumps or generators in the event of a station failure. The procedures should also identify where an SSO will occur if a station fails and where bypass intake and discharge should be set up.	In Progress
7 – FOG Control Program	Update the SSMP to reflect the current FOG Source Control Program being implemented by the FROG group.	Completed April 22 2014
	Implement a process and information system to capture and store coded maintenance feedback for sewer cleaning when the new CMMS is implemented in 2014. See Section IV.b. Preventative Operations & Maintenance for more information.	Completed
	Consider expansion of the City's legal authority to provide additional tools for FOG enforcement related issues. Add language in the legal authority to require FSEs to install interceptors as well as language that clearly identify FOG BMPs and FSE inspection procedures.	In Progress
	Develop "FOG Program Rules and Regulations" and refer to these guidelines within the SSMP when discussing FOG related items.	In Progress

**Table 2 (continued). Summary of Findings from the Last SSMP Internal Audit**

Element	Action Item	Status
7 – FOG Control Program	Develop a process to routinely transmit data regarding building permits involving new or modified grease removal equipment to Department of Utilities for use in updating the FSEs inspection inventory.	No Progress
	Refer to the proper use of interceptor and grease removal terminology such that the language within the City Code and the SSMP are compatible.	In Progress
	Develop formalized interceptor inspection procedures.	In Progress
	Develop standardized interceptor sizing requirements in design codes and interceptor requirements for specific locations.	In Progress
	Develop servicing/maintenance requirements of interceptors by FSEs.	In Progress
	Develop an enforcement response guide.	In Progress
8 – SECAP	Expand flow monitoring and implement an I/I Reduction Program in 2014.	Ongoing
	Utilize the collected flow data to compare against the previously completed spreadsheet analysis capacity assessments and identify any projects that are needed to address capacity needs.	Ongoing
	Update the Design and Procedures Manual to include design criteria used for hydraulic analysis.	In Progress
9 – MMM	Remove the Update Schedule page from the SSMP.	Completed April 22 2014
	Update the SSMP to indicate the most current preventative maintenance and inspection programs.	Completed April 22 2014
10 – SSMP Program Audits	Conduct the 2 year audit frequency and annually evaluate the effectiveness and compliance of the operations and maintenance programs.	Ongoing
11 – Communication Program	The City should update the City of Sacramento public website to return a link related to the Sewer System Management Plan if a search is performed for “SSMP” or “Sewer System Management Plan”. The City should remove the information on the Sewer webpage indicating that a draft SSMP is available for viewing at 1395 35th Ave and update the information to indicate the final version is available and provide a link to the pdf. The DOU website should also indicate a process for the public to provide comment that is directed to the appropriate City contact person.	Completed

## 2.2 Review of FY13/14 and FY14/15

Over the past two fiscal years it has been a priority of the City to reduce the number of SSOs as well as identify and address the prime SSO causes. A few of the key improvements made related to this priority are:

- Conducted an analysis to identify pipes at an elevated risk of root-related SSOs resulting in 250 miles of pipe being chemically treated in FY 13/14.
- Implemented and improved a FOG program through new practices and guiding documents leading to a decrease in FOG-related SSOs since the last audit.
- Completed flow monitoring in preparation for hydraulic modeling efforts as part of upcoming master planning efforts for various sewer basins identified for assessment.

## SECTION 3 SSO Trends

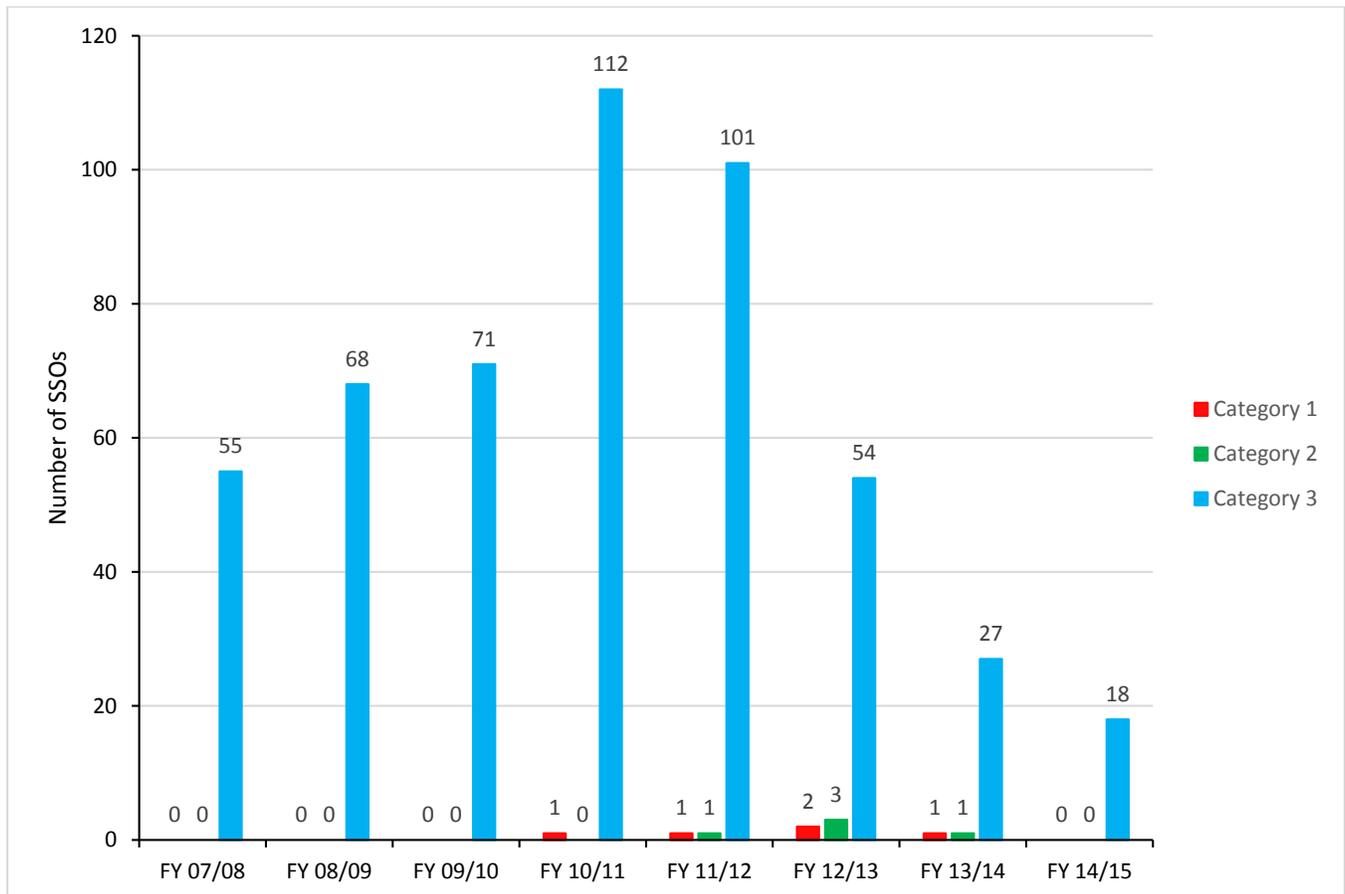
### 3.1 Historical SSO Data

A total of 47 spills occurred during fiscal years 2013/14 (27 SSOs) and 2014/15 (18 SSOs). Information regarding these SSOs is located in **Section 7.1** and includes information such as date, location, spill type, spill volume, spill volume recovered, spill recovery percentage of total spill volume, and spill cause.

The City strives to maintain quality data regarding historical SSOs so that trends in the occurrences and potential causes of SSOs can be investigated. The following discussion investigates the City’s historical SSO data to identify potential SSO trends so that future efforts can be targeted to reduce SSOs.

**Figure 2:** Number and Type of SSOs per Fiscal Year shows that since FY 11/12, the number of SSOs per year has decreased significantly every year. For FY 13/14 and FY 14/15, the City’s number of SSOs per 100 miles of collection system piping is lower than the average of all municipal agencies in Region 5 (to which the City belongs ) per the SWRCB’s Annual Performance Reports. These reports and their related data can be found online at the following link: [http://www.waterboards.ca.gov/about\\_us/performance\\_report\\_1415/](http://www.waterboards.ca.gov/about_us/performance_report_1415/). The particular data for this discussion can be found in **Table 3**.

**Figure 2: Number and Type of SSOs per Fiscal Year**



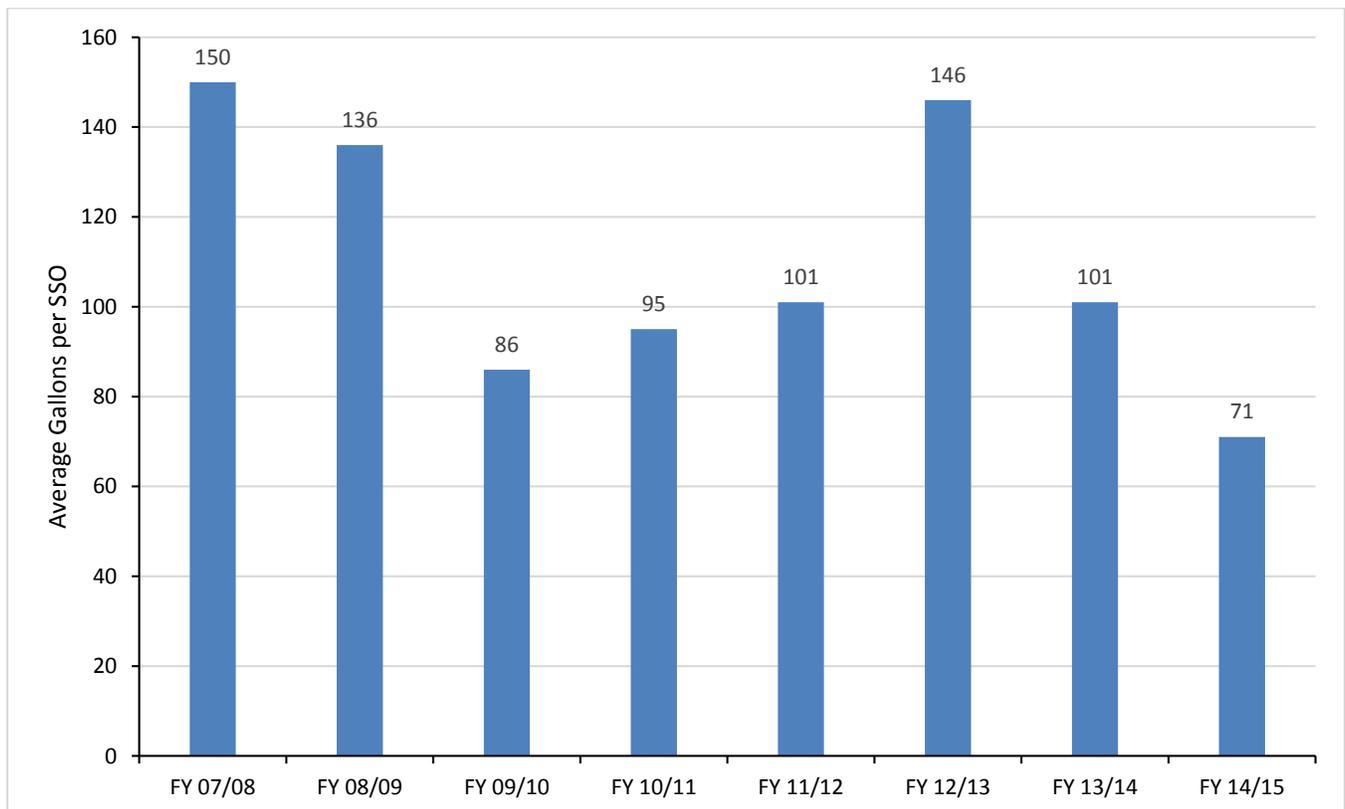
The SWRCB defined new three SSO categories as of September 13<sup>th</sup>, 2013. A Category 1 SSO is currently defined as a spill of any volume that reaches surface water. A Category 2 SSO is currently defined as a spill greater than or equal to 1,000 gallons that does not reach surface water. A Category 3 SSO is currently defined as a spill less than 1,000 gallons that does not reach surface water.

**Table 3. Comparison of SSO Data**

Fiscal Year	Average # of SSOs per 100 miles (number)		Average Spill Volume per 100 miles (gallons)		
	City	Region 5	City	Region 5	State
10/11	20.73	5.23	1,883	7,637	66,705
11/12	18.90	10.25	1,822	3,678	15,788
12/13	10.83	10.84	1,506	15,020	10,074
13/14	5.32	9.84	513	5,280	5,097
14/15	3.30	9.91	224	6,324	11,484

**Figure 3:** Average Spill Volume per SSO shows that since FY 12/13, the average spill volume per SSO has decreased every year. From FY 10/11 to FY 14/15, the City’s average spill volume per 100 miles of collection system piping is significantly lower than the average of other municipal agencies in the State and Region 5 per the SWRCB’s Annual Performance Reports. The summary of this data can be found in **Table 3**.

**Figure 3: Average Spill Volume per SSO**



The City’s California Integrated Water Quality System (CIWQS) SSO records were queried to identify the leading causes of SSOs. **Table 4** shows the leading causes of SSOs in the City by 1) the number of SSOs, 2) the spill volume of SSOs, and 3) the average spill volume per SSO.

**Table 4. Leading Causes of SSOs in FY 13/14 and FY 14/15**

By Number		By Volume		By Average Volume per SSO	
Cause	Number	Cause	Gallons	Cause	Gallons
FOG	20	Pipe Failure	1986	Pipe Failure	993
Roots	12	FOG	701	Debris & FOG	169
Debris	9	Roots	440	Pump Station Failure	150
Pipe Failure	2	Debris	557	Debris	62
Debris & FOG	2	Debris & FOG	337	Roots	37
Roots & FOG	1	Pump Station Failure	150	FOG	35
Pump Station Failure	1	Roots & FOG	28	Roots & FOG	28

**Table 4** shows that Fats, Oils, and Grease (FOG) and root growth have been the leading causes of SSO occurrences, and pipe failures have been the major cause for SSOs with large spill volumes. The actions planned as a result of this SSMP Audit will target the leading causes to most effectively reduce the number and spill volume of SSOs.

### 3.2 Performance Measures

The City utilizes multiple performance measures to assess the performance and effectiveness of its SSMP in achieving proper management and operation of the separated sewer system, thereby helping to reduce and/or prevent SSOs. While the City may use other performance measures during its evaluation, the following measures are typically used:

- SSO Rate (SSOs per 100 miles of collection system piping per year)
- Number of SSOs for each cause (roots, FOG, debris, pipe failure, capacity, pump station failures, etc.)
- Median SSO volume (gallons)
- Percentage of SSOs greater than 100 gallons (%)
- Percentage of SSOs reported as Category 1 (%)
- Percentage of SSO volume recovered (%)
- Percentage of SSO volume reaching a surface water (%)

The City’s CIWQS SSO records were queried to analyze each performance measure from FY 07/08 to FY 14/15, and the data can be found in **Table 5**.

**Table 5. Performance Measures**

Performance Measure		FY 07/08 Value	FY 08/09 Value	FY 09/10 Value	FY 10/11 Value	FY 11/12 Value	FY 12/13 Value	FY 13/14 Value	FY 14/15 Value
SSO Rate, SSOs/100 miles		10.09	12.48	13.03	20.73	18.90	10.83	5.32	2.57
SSO Cause	FOG	37	41	39	62	49	33	13	8
	Roots	14	24	24	35	43	12	9	3
	Debris	2	3	5	7	9	6	4	5
	Debris & FOG	0	0	0	0	2	1	0	1
	Debris & Roots	0	0	0	1	0	1	0	0
	Roots & FOG	1	0	2	2	0	2	1	0
	Pipe Failure	0	0	0	1	0	1	2	0
	Pump Station Failure	0	0	1	2	0	0	0	1
	Vandalism	1	0	0	0	0	0	0	0
	Capacity	0	0	0	1	0	0	0	0
	Contractor	0	0	0	0	0	1	0	0
Unknown/Other	0	0	0	2	0	2	0	0	
Median SSO Volume, gallons		85	78	60	50	30	27	19	26
% of SSOs greater than 100 gallons, %		41.8	36.8	21.1	18.6	26.2	13.6	17.2	16.7
Category 1 % of Total SSOs, %		0.0	0.0	0.0	0.9	1.0	3.4	3.4	0.0
% of Spill Volume Recovered, %		100	100	100	100	96	84	83	94
% of Spill Volume Reaching Surface Water, %		0.0	0.0	0.0	4.7	1.0	10.0	1.3	0.0

Currently, the City’s SSO Rate has decreased significantly over the current audit time period. As was previously discussed in **Section 3.1**, the City’s SSO Rate is much smaller than the Region 5 average for FY 13/14 and continues to decrease as shown for FY 14/15. Historically, FOG and root growth have been the leading causes of SSO occurrences. While that is still the case for the current audit time period, a more focused approach on dealing with FOG issues and root growth has helped in reducing the number of SSOs related to these causes. The City’s median SSO volume has continually decreased since FY 07/08 up until FY 14/15, when a modest upswing in volume is seen. The percentage of SSOs greater than 100 gallons in volume has increased from FY 12/13, but still remains at an acceptable level when compared to the City’s performance in previous years. Also, the percentage of SSOs reported as Category 1 has decreased during the current audit time period, which goes hand in hand with the decrease in percentage of spill volume reaching surface waters. Lastly, the City has continued to maintain its efficiency in recovering a high percentage of total spill volume. Overall, the City has improved their performance on most of the performance measures found in **Table 5**.

## SECTION 4 Audit Procedure

Per SSS WDR Section D.13.x, the objective of this SSMP Audit is to focus on evaluating the effectiveness of implementing the SSMP and the City's compliance with the SSMP requirements identified in the SSS WDR Order. This section describes the procedure used to accomplish this objective.

### 4.1 Review of SSMP Compliance

An assessment of the City DOU's SSMP against the requirements outlined in the SSS WDR was conducted as part of the audit. The subsections of **SECTION 5** below are organized by SSMP element. Each subsection contains a table which lists the requirements of section D.13 of the SSS WDR and indicates the level of compliance of the SSMP against that requirement. The compliance status of the City's SSMP is indicated with one of the following ratings: **Yes** - *in compliance*, **No** - *not in compliance*, or **N/A** – *not applicable with a written justification in the SSMP*. If there are deficiencies with regard to compliance, an explanation of the deficiency is given. Each deficiency will have associated SSMP enhancements which may include action items, SSMP adjustments, and/or timelines of planned completion.

### 4.2 Review of SSMP Effectiveness

Subsequent to the indication of the level of compliance of the SSMP in relation to the requirements of the SSS WDR, an evaluation of the effectiveness of the SSMP elements has been conducted to comply with the requirements for SSMP audits per subsection D.13.x of the SSS WDR. The discussion reviews if the plan outlined for each section is being followed, and how effective the plan is at reaching the desired objectives. Where appropriate, recommendations will be made based on the results of this SSMP Audit to identify tasks to improve the effectiveness of SSMP activities. Wherever possible, performance metrics will be used to measure the effectiveness of SSMP elements.

This section will not repeat the information and plans presented in each section of the SSMP. The focus of these sections is to evaluate the effectiveness of the stated plans for each SSMP element. The reader should reference the City's SSMP to obtain the information reviewed by this SSMP Audit.

A summary of the recommended modifications made throughout this SSMP Audit is included in **SECTION 6** – Audit Summary.

## SECTION 5 Audit of SSMP Elements

This chapter evaluates all elements of the City’s SSMP. Each section of this chapter is associated with one of the eleven elements of the SSMP required by SSS WDR section D.13. Each element is evaluated for compliance and effectiveness using the procedure described above in **Sections 4.1** and **4.2**, respectively.

### 5.1 Goals

#### 5.1.1 Compliance

**Table 6. Compliance with SSS WDR D.13.i - Goals**

SSMP Requirement	Compliance	Deficiencies
i Properly manage, operate, and maintain all portions of the District’s wastewater collection system.	Yes	-

#### 5.1.2 Effectiveness of SSMP Elements and Recommended Modifications

##### Goals (SSMP Section V Chapter 1.2)

- Level of Effectiveness: The City currently has five general goals identified in the SSMP. The SSMP references the City DOU’s Strategic Plan as the source of the goals. Four actions that the Operations and Maintenance (O&M) Division implement align with the SSS WDR and the Strategic Plan. All of the goals that the City DOU recorded in the SSMP and Strategic Plan have been effective in guiding the activities of the City to properly manage, operate, and maintain all parts of the sanitary sewer system.
- Recommendations: No recommended modifications at this time.

### 5.2 Organization

#### 5.2.1 Compliance

**Table 7. Compliance with SSS WDR D.13.ii - Organization**

SSMP Requirement	Compliance	Deficiencies
ii(a) Identify Legally Responsible Official (LRO)	Yes	-
ii(b) SSMP responsibility and organization chart	Yes	-
ii(c) Chain of communication for reporting SSOs	Yes	-

#### 5.2.2 Effectiveness of SSMP Elements and Recommended Modifications

##### Identify Legally Responsible Official (LRO) (SSMP Section V Chapter 2.2)

- Level of Effectiveness: Both the O&M Division Manager (Mike Malone) and the O&M Division Superintendent – Wastewater Maintenance (Rob Jack) are designated Legally Responsible Officials (LROs) for the City’s separated sewer system. Those positions are authorized to certify all CIWQS electronic

reports. However, in the City SSMP's Section IV SSMP Contact List, the O&M Division Superintendent – Drainage Collection (William Roberts) is also described as an LRO. The current organization of LROs and Data Submitters has proven effective in appropriately reporting SSOs to meet the requirements of the Monitoring and Reporting Program.

- Recommendations:
  - Update the text in Chapter 2.2 of Section V of the City SSMP to state that the O&M Division Superintendent – Drainage Collection position is an LRO.

### **SSMP Responsibility Organization Chart (SSMP Section V Chapter 2.2)**

- Level of Effectiveness: Section IV SSMP Contact List of the City SSMP is referenced in this chapter. Section IV contains a table that provides the title, name, phone number, e-mail address, and a short description of each individual's job responsibilities. The SSMP also includes an organization chart to identify lines of authority. The combination of the table and the chart in the SSMP effectively outlines individuals responsible for implementing the SSMP and their names and contact information.
- Recommendations:
  - Either add a table to the SSMP that lists all of the elements of the SSMP and the responsible party or amend the existing table in Section IV SSMP Contact List to include a column for "SSMP Element(s)" that are applicable to each position.

### **Chain of Communication Reporting Chart (SSMP Section V Chapter 2.2)**

- Level of Effectiveness: The SSMP outlines the chain of communication for reporting all three SSO Categories from the receipt of a complaint to CIWQS reporting. The figures in the SSMP that show the chain of communication for SSO reporting delineate which position within the City's organizational structure is responsible for each action. The City's chain of communication for SSO reporting appears to be effective based on the completeness and thoroughness of the information documented on the CIWQS database.

The City currently does not consistently perform quality assurance / quality control (QA/QC) of SSO data between CIWQS and City records.

The City's internal SSO data is currently tracked through an Excel spreadsheet entitled "SSO TRACK REPORTING." However, the City does not track all of the information required to be entered into CIWQS. The City can benefit from ensuring consistency between the internal SSO records and the CIWQS database. The City should consider tracking the following pieces of data in the "SSO TRACK REPORTING" spreadsheet:

- Spill volume reaching land.
- Spill volume recovered.
- Spill volume reaching surface water.
- Final spill destination.

- SSO start time.
- Agency notification time.
- Operator arrival date and time.
- SSO end date and time.

- **Recommendations:**

- Develop a process to periodically perform QA/QC to ensure consistency between CIWQS and City records pertaining to SSOs.
- Consider tracking the pieces of SSO data listed above to ensure consistency between internal SSO records and the CIWQS database.

## 5.3 Legal Authority

### 5.3.1 Compliance

**Table 8. Compliance with SSS WDR D.13.iii – Legal Authority**

SSMP Requirement	Compliance	Deficiencies
iii(a) Prevent illicit discharges	Yes	-
iii(b) Properly designed and constructed sewers	Yes	-
iii(c) Ensure access to laterals owned/maintained by District	Yes	-
iii(d) Limit the discharge of FOG and other debris	Yes	-
iii(e) Enforce any violation of District ordinances	Yes	-

### 5.3.2 Effectiveness of SSMP Elements and Recommended Modifications

#### Prevent Illicit Discharges Authority (SSMP Section V Chapter 3.2)

- **Level of Effectiveness:** City Municipal Code 13.08.040 lists the various substances that are prohibited from being discharged to the sewer system. City Municipal Code 13.08.130 prohibits cross connections between sanitary sewer pipes and the storm drain system. City Municipal Code 13.08.160 requires property owners to repair any leak or defect found in a private sewer line and gives the City the power to perform the repair at the cost of the property owner if the property owner fails to do so.
- **Recommendations:** No recommended modifications at this time.

#### Design and Construction Standards (SSMP Section V Chapter 3.2)

- **Level of Effectiveness:** City Municipal Code 13.08.360 requires that the application requesting City sewer service contain plans and specifications for the proposed sewer facilities that conform to the City Standard Specifications. City Municipal Code 13.08.380 gives the City the right to inspect all work performed, and all work must be approved by the City before connection to the sewer system can be completed.
- **Recommendations:** No recommended modifications at this time.

### **Sewer Access Authority (SSMP Section V Chapter 3.2)**

- Level of Effectiveness: City Municipal Code 13.08.240 prohibits the construction of any permanent structure on top of public water, sewer or drainage pipelines. City Municipal Code 13.08.290 provides the City with the legal authority to inspect private sewer or storm drain facilities to enforce any provision in the sewer service system chapter of the City’s Municipal Code.
- Recommendations: No recommended modifications at this time.

### **Limit FOG Discharges Authority (SSMP Section V Chapter 3.2)**

- Level of Effectiveness: City Municipal Code 13.08.040 lists the various substances that are prohibited from being discharged to the sewer system. City Municipal Code 13.08.090 requires that all Food Service Establishments (FSEs) comply with best management practices (BMPs) that the City Council establishes from time to time by resolution. City Municipal Code 13.08.100 gives the City the legal authority to require businesses other than FSEs to install interceptors of a type and capacity approved by the City.
- Recommendations: No recommended modifications at this time.

### **Enforcement Authority (SSMP Section V Chapter 3.2)**

- Level of Effectiveness: City Municipal Code 13.08.060 describes the City’s legal authority to enforce any violation(s) of its sewer ordinances. City Municipal Code 13.08.340 describes what is considered a violation of its sewer ordinances.

The City’s previous audit included a recommendation to “consider expansion of the City’s legal authority to provide additional tools for FOG enforcement related issues.” The City has drafted proposed edits to the pertinent code sections, and these proposed edits are currently being reviewed by the FOG Program Team. If these edits are accepted and adopted in the City’s Municipal Code, ensure the SSMP is updated to reflect the changes.

- Recommendations:
  - The FOG Program Team should determine if the proposed edits to pertinent code sections are to be accepted and adopted.
  - If the edits to the City’s Municipal Code sections are accepted and adopted by the City, ensure the SSMP is updated to reflect the changes.

## 5.4 Operation and Maintenance Program

### 5.4.1 Compliance

**Table 9. Compliance with SSS WDR D.13.iv – O&M Program**

SSMP Requirement	Compliance	Deficiencies
iv(a) Collection system maps	Yes	-
iv(b) Preventative O&M activities	Yes	-
iv(c) Rehabilitation and Replacement (R&R) plan	Yes	The City does have an R&R plan in place but additional improvements should be implemented (see below).
iv(d) Training	Yes	The City provides regular training but additional improvements to the training program should be implemented (see below).
iv(e) Equipment and critical replacement parts	No	List of critical parts for pump stations still needed.

### 5.4.2 Effectiveness of SSMP Elements and Recommended Modifications

#### Collection System Maps (SSMP Section V Chapter 4.2)

- Level of Effectiveness:** The City maintains an updated ArcGIS mapping system that contains the entire separated sewer collection system, the storm drainage system, and applicable sewer appurtenances (e.g. pump stations, valves, etc.). The maps are continually updated by the GIS staff through map corrections from field visits, data review, internal review, and new utility projects.

The electronic (PDF) sewer and drainage map book pages are available through the DOU intranet site. While Wastewater Maintenance crews from the O&M Division can access the intranet map books via the mobile laptop computers provided to them, they (and any other pertinent staff member) can print hard copy map book pages as seen fit.

The City’s Facilities Operations Information System (FOIS), which is maintained by the DOU Engineering and Water Resources Division, is a web-based application on the City’s intranet that serves as the repository for record drawings; improvement plans prepared by staff, outside consultants, and other agencies; specifications; O&M manuals; and facility photographs, etc., as they relate to the collection system. When record drawings or improvement plans are entered into the FOIS, the Engineering Technician determines whether or not a change or revision to the GIS map data is necessary. A map correction request is sent to a GIS staff member, who then makes changes to the GIS data. This process typically takes two to three weeks to complete.

Currently, field identified map corrections are recorded using a simple redline markup tool that is included in CityWorks Computerized Maintenance Management System (CMMS). The redline markup tool provides

a snapshot of the reline which is attached to the work order. If the map correction is complex, and cannot clearly be depicted using the redline tool, a scanned hand drawings may be attached to the work order to provide better clarity. DOU GIS staff updates the GIS data from the work orders that have map corrections. DOU is pilot testing alternative field data collection software that could simplify workflow for this activity.

- **Recommendations:**
  - Develop an SOP (Standard Operating Procedure) for the process of updating the collection system maps. Currently there is no written SOP for this process.

### **Preventative Operations & Maintenance Activities (SSMP Section V Chapter 4.3)**

- **Level of Effectiveness:** The City engages in programs to complete routine preventative maintenance activities, which include jet cleaning, root control, FOG inspections, CCTV inspections, and pump station maintenance. Over this audit period, the City has modified these programs.
  - The City's CityWorks CMMS has been configured to schedule daily cleaning and CCTV work orders through unique algorithms within the CMMS. The CMMS also documents cleaning findings for each pipe as they are cleaned.
  - The Root Control Program consists of mechanical and chemical methods. Mechanical rodding is performed on pipes that have been identified as having a potential for root-related blockages, with their frequencies modified based on previous mechanical rodding results and historical knowledge. The City conducted an analysis that identified approximately 250 miles of pipe that had an elevated risk of root-related SSOs. These pipes were chemically treated in FY 13/14.
  - With regard to the use of chemicals in other applications, this SSMP Audit verified that the City no longer uses chemicals to remove FOG buildup in areas prone to accumulation.
  - Lastly, the City continues to perform monthly inspections of pump stations. However, the City's previous SSMP Audit included a recommendation to "...coordinate electrical and mechanical work orders and inspections to coincide with the pump station shut down." Pump stations are shut down for quarterly wet well cleaning, and coordinating the regular electrical and mechanical work orders and inspections with this cleaning will increase the City's efficiency as it relates to pump station preventative maintenance.

The City is currently in the process of developing new SOPs as they relate to the current and developing preventative maintenance activities. This is an important step to take to increase efficiency and consistency of the work product across the entire DOU.

The City's previous SSMP Audit included a recommendation to "provide further QA/QC of pipe attribute information, such as pipe material, that is being identified with CCTV inspection activities." The City currently does not consistently perform QA/QC of CCTV data collected as a part of the preventative maintenance program. Quality data is a foundational element of effective asset management programs.

Overall, the City's preventative maintenance activities have been effective in maintaining the condition of the separated sewer system, which correlates the reduction of in both volume and the frequency of SSOs. This is evidenced by the City's significant reduction in SSOs caused by FOG, roots, debris, and combinations of these factors.

- Recommendations:
  - Finalize the new SOPs that are currently being developed and ensure consistency between them and the SSMP.
  - Update the SSMP to reflect the changes in preventative maintenance activities as previously discussed.
  - Develop an SOP that describes how the CityWorks CMMS decides daily work orders, specifically as it pertains to the newly developed algorithms for daily cleaning and CCTV inspections. As an alternative, the City could describe these algorithms within their respective new SOPs (Scheduled Maintenance and CCTV Survey).
  - Develop a process to periodically perform QA/QC of CCTV data, such as pipe material, to ensure consistency and accuracy across all inspections.
  - Continue implementing the City's Root Control Program, with a focus on pipes with an elevated risk for root-related SSOs. Continue to schedule root control chemical treatment as determined through future analyses.
  - Consider coordinating electrical and mechanical work orders and inspections to coincide with the quarterly pump station shut down for wet well cleaning (recommendation carried over from 2013 audit).

#### **Rehabilitation and Replacement Plan (SSMP Section V Chapter 4.4)**

- Level of Effectiveness: The City regularly CCTV inspects pipelines using the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment Certification Program (PACP) coding standard. The O&M Division reviews the CCTV inspection reports and determines what type of work is required to address the defects found. This work may entail a re-inspection, a spot repair, or a capital improvement project (CIP).
  - If it is determined that a re-inspection is warranted, condition assessment scores of 1, 2, or 3 are analyzed and scheduled for re-inspection through a pipe assessment decision matrix.
  - With regard to spot repairs, PACP score 5s are immediately scheduled for repair. Score 4s are subject to the afore-mentioned pipe assessment decision matrix in which pipe size and number of defects are evaluated to determine a next inspection date, referral to engineering, and/or whether it makes sense to conduct a field spot repair (resulting in some score 4s being placed into the scheduled repair queue).
  - If it is determined that a CIP is warranted, a CIP work order is created and submitted to the Engineering Division for review. These potential CIPs are then analyzed and prioritized as described in the Capital Improvement Programming Guide (Programming Guide). The Programming Guide includes short-term (5-year) and long-term (30-year) plans for R&R actions.

The funding of these CIPs is assessed by the Integrated Planning and Asset Management (IPAM) Division. If funding is secured, the CIP is put out for bid and constructed. If funding is not secured, the CIP is left on the Approved Funding List for consideration in the next FY. The City's R&R plan appears effective in identifying and planning the projects to be completed in the short- and long-term to address high risk areas of the system.

After discussions with the three DOU disciplines involved with the R&R plan (O&M, Engineering, and IPAM), there were improvements identified that may prove beneficial to the City. The City could benefit from conducting periodic meetings between the aforementioned disciplines to ensure staff are aware of and understand the entire R&R plan and their role within it. These meetings could eliminate confusion and misunderstandings so that the City can more efficiently implement and potentially modify the R&R plan for the betterment of the separated sewer system.

After meeting with Engineering staff, it appears that the analysis and prioritization process for potential CIPs is based on a technical memorandum entitled "CIP Prioritization System." While this document has some similarities with the Programming Guide in regard to ranking and prioritizing CIPs, there are enough differences to warrant an update of the SSMP to reflect the actual methodology used in this process.

The City has developed a flowchart entitled "CIP Project Initiation Workflow" that illustrates how a potential CIP is initiated through its completion. There have been changes in the actual overall process that differ from the flowchart description, but the flowchart has not been updated to reflect these changes. The City can benefit from updating the CIP Project Initiation Workflow and incorporating it within the SSMP itself.

Talks with staff from the IPAM Division revealed that there are work orders that contain multiple condition assessment scores of 4 that are not submitted by the O&M Division specifically as a CIP work order (as noted above). The IPAM Division is planning on analyzing these particular work orders, but has not established a protocol to do this as of yet.

The City is planning on integrating their CCTV inspection software Granite XP with their CityWorks CMMS. Having CityWorks contain CCTV inspection data alongside other data such as cleaning findings and preventative maintenance history will help the City to be more efficient in utilizing the CMMS for processes such as modifying assets' planned preventative maintenance or deciding if an asset is worthy of a CIP.

The City's CIP Prioritization System technical memorandum does not appear to incorporate a capacity-based parameter in its evaluation of CIPs. The City should consider modifying the technical memorandum to include capacity-based scores/parameters in one of the three models (Defect, Vulnerability, and Criticality). Capacity analyses are intended to identify hydraulic deficiencies in the system that should have

short and/or long-term alternative solutions. These alternatives should be prioritized and scheduled for implementation, with the City's CIP Prioritization System suitable for this evaluation.

The City's last internal SSMP Audit recommended that the City "consider the development of a manhole inspection program using NASSCO's Manhole Assessment Certification Program (MACP) defect coding system." The City has stated that consideration was conducted, but that the "development of this type of inspection program is currently low on the priority list." The City should continue to monitor the priority of developing a manhole inspection program that uses NASSCO's MACP defect coding system. The City also stated that summary-level manhole inspections are conducted on a routine basis with CCTV and maintenance programs. However, the SSMP does not include discussion on this process.

The City's last internal SSMP Audit recommended that the City "provide further QA/QC of Granite XP pipe inspection data." This particular recommendation is not being carried over to the current audit because this issue is covered in another recommendation for SSMP requirement iv(b). The recommendation for SSMP requirement iv(b) is as follows: Develop a process to periodically perform QA/QC of CCTV data, such as pipe material, to ensure consistency and accuracy across all inspections.

The City does not have a program in place to perform condition assessment of force mains in the system. The development and implementation of such a program is recommended to ensure the City remains in compliance with this SSMP requirement. The City can begin this program by performing a paper assessment in which all force mains' age, pipe material, maintenance history, etc. is recorded. Further internal discussion is warranted to determine a path forward for procedures to allow for CCTV condition assessment of force mains. Potential options include constructing parallel force mains to allow for temporary shutdown during condition assessment or performing temporary bypass operations during condition assessment. Results shall be recorded in the City's current CMMS.

- Recommendations:
  - Conduct periodic meetings between the O&M, Engineering, and IPAM to ensure that everyone is aware of and understands the entire R&R plan and their role within it.
  - Update the SSMP to reflect the actual methodology used from the CIP Prioritization System technical memorandum to rank and prioritize potential CIPs.
  - Update the flowchart entitled "CIP Project Initiation Workflow" and reference this document within the SSMP as an overall view of a CIP's lifespan.
  - Establish a periodic basis to analyze work orders with multiple condition assessment scores of 4 to determine what type of work is required to address the defects.
  - Consider integrating Granite XP with CityWorks such that CCTV inspection data is accessible through the CMMS.
  - Consider modification of the CIP Prioritization System technical memorandum to incorporate capacity-based scores/parameters.

- Consider development of a manhole inspection program using NASSCO's MACP defect coding system (recommendation carried over from 2013 audit).
- Update the SSMP to reflect the City's current process for summary manhole inspections.
- Consider the development and implementation of a force main condition assessment program.

### **Training (SSMP Section V Chapter 4.5)**

- Level of Effectiveness: The City requires its crews to receive annual maintenance training by an industry professional. This particular training program is focused around best practices for the cleaning, inspection, operation, and maintenance of the City's mainline sewer pipes.

Training on the operation of equipment used by the O&M Division is initially provided by the vendor or manufacturer of the equipment. Continual training afterwards is provided through on-the-job training and rotation among the different maintenance crews and equipment.

The City tracks training mostly through sign-in sheets. The supervisors turn in these sheets to the City Typist Clerk, who then files them away for record-keeping.

Within the last year, the City has begun using a training management software program called TargetSolutions. After talks with staff from the O&M Division, it was found that there is a push for tracking data electronically, including training records. TargetSolutions seems to be a suitable software for this effort.

- Recommendations:
  - Identify the required training for each employee and document that each employee has received their required training in an electronic manner, whether through TargetSolutions or a spreadsheet.
  - Develop a process where pertinent supervisors are notified when required training is coming due for an employee. Either a person needs to be assigned this task, or DOU should investigate if this functionality is programmed within TargetSolutions.
  - Develop a schedule for regular training on the specific equipment that the City owns. The scheduled equipment training should identify the frequency of training, the proposed instructors, appropriate referencing of SOPs and manuals, and the individuals required to take the training.
  - Utilize the newly developed SOPs as a training tool for the City staff. The SOPs should be developed so that they 1) provide a framework for the consistent delivery of required information, skills, and familiarity with equipment and 2) can be used to demonstrate competence of an individual in the particular subject.

### **Equipment and Critical Replacement Parts (SSMP Section V Chapter 4.6)**

- Level of Effectiveness: The Logistics section of the O&M Division is responsible for managing the inventory of major sewer maintenance equipment and critical parts.

While the City maintains multiple spare submersible pumps in its inventory in the event of a pump station failure, the DOU is still in the process of identifying and compiling a list of critical parts for pump stations. The City aims to acquire and store these critical parts in inventory for future use.

The City is capable of quickly fabricating nearly all hard replacement parts for pumps and pump station equipment through their fabrication shops.

In addition, the City is currently making an effort to expand their Condition Assessment efforts to cover pump station mechanical parts and equipment. It is anticipated that CityWorks will track condition assessment comments. The City is planning on sending out an RFP (Request for Proposal) for consultant services to assist with the development and methodology for the Condition Assessment effort as it relates to pump stations.

- Recommendations:
  - Identify critical replacement parts for pump stations. Include a plan to either acquire spare parts in the replacement parts inventories or a timely means for fabricating or acquiring critical spare parts in the event of a failure (outstanding 2011 and 2013 Audit Actions).
  - Implement the Condition Assessment Program for pump stations once it has been finalized. Update the SSMP to reflect this implementation.

## 5.5 Design and Performance Provisions

### 5.5.1 Compliance

**Table 10. Compliance with SSS WDR D.13.v – Design and Performance Provisions**

SSMP Requirement	Compliance	Deficiencies
v(a) Sanitary sewer design and construction specifications	Yes	-
v(b) Procedures and standards for inspecting and testing new and R&R projects	Yes	-

### 5.5.2 Effectiveness of SSMP Elements and Recommended Modifications

#### Sanitary Sewer Design and Specifications (SSMP Section V Chapter 5.2)

- Level of Effectiveness: The City DOU’s Standard Specifications and the Design and Procedure Manual (DPM) are effective in ensuring that new or rehabilitated infrastructure is designed and constructed in an acceptable manner. Both of these documents are accessible to interested parties on the City DOU’s website.

The Standard Specifications are periodically updated through addenda as changes are developed, and these addenda are consolidated with the main document every five years. The DPM is currently undergoing major revisions, with the City is planning on completing the updated DPM in 2016.

- **Recommendations:**
  - Update the DPM, post the updated DPM on the City DOU’s website, and ensure the SSMP is updated to reflect this change (carried over from 2013 audit).
  - Continue to post any updated version(s) of the Standard Specifications on the City DOU’s website (carried over from 2013 audit).

**Sanitary Sewer Inspection and Testing Provisions (SSMP Section V Chapter 5.3)**

- **Level of Effectiveness:** The City DOU’s Standard Specifications include procedures for the testing of new/rehabilitated assets and has been effective in ensuring that recently constructed assets perform as expected.
- **Recommendations:** No recommended modifications at this time.

**5.6 Overflow Emergency Response Plan**

**5.6.1 Compliance**

**Table 11. Compliance with SSS WDR D.13.vi - OERP**

SSMP Requirement	Compliance	Deficiencies
vi(a) Proper notification procedures	Yes	-
vi(b) Program for appropriate SSO response	No	Complete development of pump station failure contingency standard procedures.
vi(c) Procedure for prompt notification to regulatory agencies	Yes	-
vi(d) Procedures for appropriate training of staff and contractors	Yes	-
vi(e) Procedures to address emergency operations (e.g., traffic, crowd control)	Yes	-
vi(f) Program to ensure containment of SSO to prevent discharge and minimize adverse impacts on the environment	Yes	-

**5.6.2 Effectiveness of SSMP Elements and Recommended Modifications**

**Notification Procedures (SSMP Section V Chapter 6.3)**

- **Level of Effectiveness:** The average SSO response time (*i.e.*, notification of SSO to operator arrival time) over the period of this SSMP Audit is 43 minutes. The average SSO response time since September of 2007 is 37 minutes. This indicates that the notification procedures employed by the City are effective in facilitating a rapid response from the City’s first responders (Specialists and On Call personnel).

The City's SOP for Sewer Overflow/Outflow Emergency Response clearly outlines the notification procedures for the various situations that may be encountered and lists the contact information of all potentially applicable agencies and City staff. These resources have proven effective for notifying appropriate agencies in response to an SSO.

- Recommendations: No recommended modifications at this time.

#### **Response Program (SSMP Section V Chapter 6.4)**

- Level of Effectiveness: The City's SOP for Sewer Overflow/Outflow Emergency Response effectively outlines the program that the City uses to appropriately respond to an SSO event. This SOP has been recently updated and encapsulates the best practices of the City in responding to an SSO. Section II of the SOP for Sewer Overflow/Outflow Emergency Response contains the procedures employed by the City. These procedures include an investigation and debriefing on the spill event after the spill has been appropriately responded to by City staff. This is effective in documenting the level of effectiveness of the SOP, the solutions to unique problems encountered during the response, and suggested improvements to the SOP while the information from the spill event is still fresh in the responders' minds. The SOP for Sewer Overflow/Outflow Emergency Response has been effective in responding to SSOs appropriately.

The City is currently in the process of developing emergency operating procedures for sewer pump station failures. The goal of this SOP is to ensure that pertinent information that is needed for an SSO emergency is available at each sewer pump station.

- Recommendations:
  - Complete the development of pump station failure contingency standard procedures indicating each pump station's location, wet well capacity, estimate of how much storage time the wet wells would provide under different flow conditions, alarm capacities, on-site back-up pumps, back-up power generators, and an operations or bypass approach in the case of a force main failure. For any stations that lack back-up pumps and generators, the procedures should specify a protocol for prompt delivery of portable pumps or generators in the event of a station failure. The procedures should also identify where an SSO will occur if a station fails and where bypass intake and discharge should be set up (outstanding 2011 and 2013 Audit Actions).

#### **Regulatory Notification Procedure (SSMP Section V Chapter 6.5)**

Level of Effectiveness: The O&M Division Manager, Wastewater Superintendent, and Drainage Superintendent are the legally responsible officials (LROs) for certification of SSO reports submitted to the CIWQS database. The current arrangement of LROs has met the needs of the City in effectively reporting to the CIWQS database in a timely manner.

The regulatory notification procedure has proven effective because to date, the City has not encountered a situation in which notification information for a required party was not available to City staff responding to an SSO.

- Recommendations: No recommended modifications at this time.

### **Staff and Contractors Training (SSMP Section V Chapter 6.6)**

- Level of Effectiveness: Any new City employee will be trained on the contents of the City's SOP for Sewer Overflow/Outflow Emergency Response prior to being placed in a position that may need to respond to a spill event. Current employees receive annual refresher training on the SOP as well.

The SOP for Sewer Overflow/Outflow Emergency Response will be trained on for all contractor personnel that may have to respond to a spill event, report to the City, and/or mitigate a spill.

Overall, the implementation of the training program has been effective as indicated in recent SSO trends.

- Recommendations:
  - Update SSMP text to state that pertinent contractor personnel will also be trained on the SOP for Sewer Overflow/Outflow Emergency Response.

### **Emergency Response Coordination (SSMP Section V Chapter 6.7)**

- Level of Effectiveness: The City's SOP for Sewer Overflow/Outflow Emergency Response addresses emergency operations such as traffic and crowd control. The measures outlined in the SOP have proven effective for the situations that the City has encountered to date.
- Recommendations: No recommended modifications at this time.

### **Spill Mitigation and Containment Procedure (SSMP Section V Chapter 6.8)**

- Level of Effectiveness: The City's SOP for Sewer Overflow/Outflow Emergency Response includes procedures for activities such as estimating spill volumes, containing and mitigating spills, and an SSO Water Quality Monitoring Plan (Attachment 1 of the SOP). The SOP has been effective in defining the steps to be taken to contain and prevent an SSO from discharging to waters of the United States and to minimize any adverse impact on the environment. This is evidenced by the City's relatively low number of Category 1 SSOs and high rate of spill volume recovery since 2007.
- Recommendations: No recommended modifications at this time.

## 5.7 FOG Control Program

### 5.7.1 Compliance

**Table 12. Compliance with SSS WDR D.13.vii – FOG Control Program**

SSMP Requirement	Compliance	Deficiencies
vii(a) Public education plan	Yes	-
vii(b) FOG disposal plan	Yes	-
vii(c) Legal authority to prohibit SSOs and blockages caused by FOG discharges	Yes	-
vii(d) Grease removal devices, design standards, BMPs, maintenance, recordkeeping, and reporting requirements	Yes	-
vii(e) Authority to inspect and enforce FOG ordinance	Yes	-
vii(f) FOG Characterization Assessment and Associated Cleaning Schedule	Yes	-
vii(g) FOG Source Control Measures	Yes	-

The City is currently in the process of developing the documents that comprise its FOG control program. These documents include a FOG Program Manual, FOG/Collection System Interaction Process Flow Diagram, FSE Conditional Waiver, FOG Inspection SOP, and the FOG Enforcement Response Guide (FOG ERG).

- Recommendations: Complete and finalize the FOG program documents and update the SSMP to reference these documents and their implementation. Ensure consistency between the SSMP and the FOG program documents.

The City’s last internal SSMP Audit included multiple recommendations which are listed below:

- “Develop “FOG Program Rules and Regulations” and refer to these guidelines within the SSMP when discussing FOG related items.”
- “Develop formalized grease interceptor inspection procedures.”
- “Develop standardized grease interceptor sizing requirements in design codes and interceptor requirements for specific locations.”
- “Develop servicing/maintenance requirements of grease interceptors by FSEs.”
- “Develop an enforcement response guide.”

These particular recommendations are not being carried over to the current audit because these issues are covered in the recommendation above that reads: Complete and finalize the FOG program documents and update the SSMP to reference these documents and their implementation. Ensure consistency between the SSMP and the FOG program documents.

## 5.7.2 Effectiveness of SSMP Elements and Recommended Modifications

### Public Education Plan (SSMP Section V Chapter 7.3)

- Level of Effectiveness: The City developed the “Sacramento Fat Free Drains” website ([www.sacramentofatfreedrains.com](http://www.sacramentofatfreedrains.com)) that provides restaurant owners and managers with useful information and documents that could benefit training programs within these restaurants. There are even multiple versions of videos in different languages to aid City inspectors in explaining the process and reason for their visit. This website is also an important part of the residential outreach program. In addition to the website, the City places informational brochures that show proper FOG disposal techniques in City utility bills annually in the fall. Any apartment complex and/or home that has a FOG-related SSO has a door tag placed on their door to inform them of this problem. Door tags are also placed on the doors of homes that are upstream of the location of a FOG-related SSOs. The City’s commercial and residential FOG outreach and educational programs appear to be effective as evidenced by the City’s significant yearly decrease in FOG-related SSOs since FY 2010/11.
- Recommendations: No recommended modifications at this time.

### FOG Disposal Plan (SSMP Section V Chapter 7.4)

- Level of Effectiveness: The City informs the public of multiple FOG disposal options and their respective schedules through the public outreach efforts previously discussed. Examples of these options include landfills for small quantities of grease, Household Hazardous Waste Facilities for larger quantities of grease, and commercial grease hauling companies. Information on disposal can also be found on the “Sacramento Fat Free Drains” website. The City’s FOG disposal plan appears effective as evidenced by the decreasing trend in FOG-related SSOs.
- Recommendations: No recommended modifications at this time.

### Legal Authority to Prevent SSOs/Blockages Caused by FOG Discharges (SSMP Section V Chapter 7.5)

- Level of Effectiveness: City Municipal Code 13.08.040 lists the various substances that are prohibited from being discharged to the sewer system. City Municipal Code 13.08.090 requires that all Food Service Establishments (FSEs) comply with best management practices (BMPs) that the City Council establishes from time to time by resolution. City Municipal Code 13.08.100 gives the City the legal authority to require businesses other than FSEs to install interceptors of a type and capacity approved by the City. These City Municipal Codes appear effective in organizing the type of equipment required to reduce FOG discharges from FSEs, as well as indicating the authority of the City to prohibit SSOs and blockages due to FOG.

The City’s previous internal SSMP Audit included a recommendation to “consider expansion of the City’s legal authority to provide additional tools for FOG enforcement related issues. Add language in the legal authority to require FSEs to install grease interceptors as well as language that clearly identify FOG BMPs and FSE inspection procedures.” This particular recommendation is not being carried over to the current audit because this issue is covered in two other recommendations for SSMP requirement iii(e). The

recommendations for SSMP requirement iii(e) are as follows: The FOG Program Team should determine if the edits to pertinent code sections are to be accepted and adopted. If the edits to the City's Municipal Code sections are accepted and adopted by the City, ensure the SSMP is updated to reflect the changes.

- Recommendations:
  - Ensure that grease interceptor and grease removal terminology is consistent between the City Municipal Code and the SSMP.

### **Grease Removal Device Requirements (SSMP Section V Chapter 7.6)**

- Level of Effectiveness: Requirements for the installation of grease removal devices, design standards for the devices, maintenance requirements, BMP requirements, record keeping requirements, and reporting requirements are covered in Title 15 of the City Municipal Code. As it pertains to the FOG program, Title 15 adopts and incorporates into the City Municipal Code the 2013 California Plumbing Code (CPC). The City's Community Development Department, Building Division, is responsible for implementing these requirements and standards. The City's efforts to disseminate information regarding these requirements appear effective as can be seen by the continual decrease in FOG-related SSOs in recent years.
- Recommendations:
  - Develop a process to routinely transmit data regarding building permits involving new or modified grease removal equipment to the DOU for use in updating the FSEs inspection inventory (outstanding 2011 and 2013 Audit Actions).

### **Inspection and Enforcement Authority – FOG Producers (SSMP Section V Chapter 7.7)**

- Level of Effectiveness: City Municipal Code 13.08.290 provides City staff right of entry to inspect FSEs and the proper authority to enforce provisions of pertinent sewer-related ordinances. The City DOU allocated dedicated FOG inspection staff to implement this part of the FOG program. This allocation of staff appears sufficient to inspect and enforce FOG ordinances. The FOG program has a goal to inspect every FSE at least once a year, with 609 FSEs discharging to the combined system and the remaining 500 FSEs discharging to the separated sewer system. The appropriate City Municipal Codes and dedicated FOG inspection staff appear effective in inspecting FSEs and enforcing FOG ordinances if necessary.
- Recommendations: No recommended modifications at this time.

### **FOG Characterization Assessment and Associated Cleaning Schedule (SSMP Section V Chapter 7.8)**

- Level of Effectiveness: The City uses Service Requests, historical knowledge, experience, CCTV inspection, and CMMS data to prioritize its preventative maintenance activities. In regards to FOG-related maintenance, O&M staff analyzes the previously mentioned data along with weekly cleaning findings to adjust scheduled maintenance cleaning frequencies. In principle, finding medium and/or heavy amounts of grease will trigger that pipe asset to be placed on a higher frequency. In contrast, clear findings will trigger that pipe asset to be placed on a lower frequency. The cleaning maintenance schedules for sections

of the separated sewer system subject to FOG blockages appears to be effective, as evidenced by the significant decrease in FOG-related SSOs in recent years.

- Recommendations:
  - Develop an SOP describing the process of how pipeline cleaning frequencies are modified as a result of FOG-related analysis.

**FOG Source Control Measures (SSMP Section V Chapter 7.9)**

- Level of Effectiveness: The City’s FOG source control measures are comprised of the various elements of the FOG program as a whole, which include public/FSE educational outreach efforts, FSE inspections and enforcement actions, and disposal options.
- Recommendations: No recommended modifications at this time.

**5.8 System Evaluation and Capacity Assurance Plan**

**5.8.1 Compliance**

**Table 13. Compliance with SSS WDR D.13.viii - SECAP**

SSMP Requirement	Compliance	Deficiencies
viii(a) Evaluate hydraulic deficiencies	Yes	-
viii(b) Establish design criteria	Yes	-
viii(c) Establish short- and long-term CIP	Yes	-
viii(d) Develop schedule of completion dates for CIP	Yes	-

**5.8.2 Effectiveness of SSMP Elements and Recommended Modifications**

**Evaluation of Hydraulic Deficiencies (SSMP Section V Chapter 8.3)**

- Level of Effectiveness: The City performed a capacity evaluation for each of the 54 separated sewer system basins using a spreadsheet analysis. This analysis differentiated between existing and future land use conditions.

For the existing conditions analysis, 15 basins were found to have potential capacity deficiencies but there was no documented or anecdotal field data to indicate that these basins are experiencing surcharging. This, combined with the fact that the City has had no capacity-related spills in the past four years (and only one total since 2007) and the spreadsheet static models were developed with conservative (high flow) values, the City has implemented a flow monitoring and ongoing analysis program to confirm the spreadsheet results and intend to continue with this approach before constructing improvements that are potentially not needed.

For the future conditions analysis, 12 of these same 15 basins still exhibited potential capacity deficiencies after taking into account future infill and redevelopment (including potential pipe improvements to support increased use) while the other three did not continue to exhibit limitations after development. In addition to the 12, two additional (not part of the original 15) basins were found to have potential future capacity deficiencies. For all of these basins, the City plans to develop hydraulic models through outside consultants to confirm potential future deficiencies and identify required upgrades. To aid the modeling efforts, the City has already performed flow monitoring in several of the identified basins to ensure accurate dry and wet weather flow calibration of the models. The City plans to continue flow monitoring on an as-needed basis to prepare for future models.

The City's efforts in evaluating the separated sewer system for hydraulic deficiencies are ongoing and appear to be effective in determining basins with a potential for capacity issues.

- Recommendations:
  - Continue flow monitoring and development of hydraulic models to confirm and update spreadsheet results. Continue to communicate with field staff on a frequent basis (after every storm) that there are no documented field conditions or anecdotal comments indicating any of the 15 basins identified in the spreadsheet analysis as having "current" capacity limitation are surcharging or showing similar signs of capacity deficiency. If these efforts identify a basin, move that basin immediately to the top of the priority list for evaluation with hydraulic modeling and begin process for making upgrades to system to eliminate deficiency.
  - Continue long-term evaluation process of developing hydraulic models for all basins where the future conditions spreadsheet and/or flow monitoring analysis indicate capacity deficiencies. Utilize hydraulic models to identify/confirm future hydraulic deficiencies and plan, design and construct improvements as needed to eliminate them.

#### **Design Criteria (SSMP Section V Chapter 8.4)**

- Level of Effectiveness: Table 8.2 in the City's SSMP shows the proposed design criteria for determining the various flow rates that were used by the spreadsheet analysis. Once these design criteria are adopted in the City DOU's Design and Procedures Manual, they will be used in the development of future hydraulic models. The City established a 10-year 6-hour peak wet weather design storm, which appears to be an appropriate design storm to effectively account for the impact of wet weather events on the separated sewer system for current and future system capital improvement planning.

- Recommendations:
  - Update the Design and Procedures Manual to include design criteria used for hydraulic analysis. (Outstanding 2013 Audit Action.) Ensure the SSMP text reflects the adoption of the updated Design and Procedures Manual.

### **Short-term and Long-term Capital Improvement Plan (SSMP Section V Chapter 8.5)**

- Level of Effectiveness: The City has identified short and long-term CIPs based on sewer basin master plans previously prepared by outside consultants. The SSMP states that the Engineering and Water Resource Division of the DOU will study various CIP alternatives to correct identified hydraulic deficiencies. In addition, the Asset Management Section of the DOU will assist in prioritizing the proposed CIPs. However, the processes used by these divisions/sections to develop the proposed CIPs have not been documented. The City should consider the development of an SOP or Technical Memorandum that documents the procedure(s) used to create and/or modify the capacity-related CIP list. This should include how projects are prioritized, an alternatives analysis, implementation schedules, and sources of funding.
- Recommendations:
  - Develop an SOP to document the procedure(s) used to create and/or modify the list of potential CIPs to address capacity-related deficiencies in the separated sewer system.

### **Capital Improvement Program Schedule (SSMP Section V Chapter 8.6)**

- Level of Effectiveness: Table 8.3 in the City's SSMP shows a schedule for completion of all portions of the Capital Improvement Program. This schedule appears effective in identifying the timing with which certain portions of the Capital Improvement Program are to be completed.
- Recommendations: No recommended modifications at this time.

## 5.9 Monitoring, Measurement, and Program Modifications

### 5.9.1 Compliance

**Table 14. Compliance with SSS WDR D.13.ix – MMM**

SSMP Requirement	Compliance	Deficiencies
ix(a) Maintain information to establish and prioritize SSMP activities	Yes	-
ix(b) Measure effectiveness of SSMP elements	No	The City currently does not maintain a set of clear measurable goals that can be used as performance indicators for specific elements of the SSMP.
ix(c) Assess preventative maintenance program	No	The City currently does not track measures/metrics specific to the activities of the preventative maintenance program.
ix(d) Update elements based on evaluations	Yes	-
ix(e) Identify and illustrate SSO trends	Yes	-

### 5.9.2 Effectiveness of SSMP Elements and Recommended Modifications

#### Relevant Information to Establish and Prioritize SSMP Activities (SSMP Section V Chapter 9.2)

- Level of Effectiveness: The City tracks a number of measures to prioritize SSMP activities and assess the associated production and level of effort. The measures listed in the City’s SSMP appear effective in gauging the level of performance and the efficiency of the work completed throughout the year, while also aiding the City to prioritize future activities as they relate to the SSMP.
- Recommendations: No recommended modifications at this time.

#### Measure Effectiveness of SSMP Elements (SSMP Section V Chapter 9.2)

- Level of Effectiveness: The City currently tracks performance using a number of measures. However, none of these measures are associated with specific SSMP elements. None of these measures have identified targets or goals. These measures can be used to gauge the level of effort, but without associating measures to specific SSMP elements and without setting goals for each measure it is difficult to monitor the effectiveness of the SSMP.

The City may want to consider incorporating the various goals from the California Sportfishing Protection Alliance (CSPA) Consent Decree (CD) with the targets/goals for the performance measures tracked by the City. This would help to ensure that the City continues to maintain the separated sewer system in a proactive manner even after the CSPA CD has ended.

- Recommendations:
  - Identify measures/metrics that correspond with specific elements of the SSMP and develop numerical goal ranges so the data collected and monitored by the City can be used as performance indicators (PIs) to quantitatively monitor SSMP effectiveness. The ultimate measure of SSMP effectiveness is the limiting of SSOs. However, setting goals for activities related to various SSMP elements and measuring performance against those goals will help determine how success in those elements relates to the overall effectiveness of limiting SSOs. Associating measures/metrics with specific SSMP elements will allow for direct assessment of those elements and provide consistency in their evaluation in future audits. Assign the individuals responsible for the various elements of the SSMP to complete the Performance Indicator Assessment Forms that are developed for their SSMP elements. A sample Performance Indicator Assessment Form is included in **Appendix 7.2** of this internal SSMP Audit. Performance Indicator Assessment Forms can be developed for each measure/metric and assessed periodically by the person responsible, according to the suggested audit frequency for that measure/metric. At the time of the next internal SSMP Audit, the completed Performance Indicator Assessment Forms can be used to evaluate the effectiveness of SSMP elements and included as attachments to the audit findings.
  - Evaluate and consider incorporation of various goals established in the CSPA CD with the numerical goals for identified measures/metrics as mentioned above.

### Assess Preventative Maintenance Program (SSMP Section V Chapter 9.5)

- Level of Effectiveness: The City's currently-tracked measures/metrics allow for a limited quantitative evaluation of the performance of preventative maintenance activities. The City may benefit from expanding the tracked measures/metrics to include specific preventative maintenance activities such as the miles of sewer main flushed every year or the miles of sewer main CCTV-inspected every year. Setting identified numerical targets or goals for each of these measures/metrics, including those that are already being tracked, will help the City to quantitatively determine how successful the preventative maintenance program has been. This will also allow the City to monitor the performance of particular activities against other measures/metrics (*e.g.*, SSO trends, number of SSOs per cause) to determine correlations between the data.
- Recommendations:
  - Expand the specific measures/metrics tracked by the City to include activities of the preventative maintenance program.
  - Develop numerical goals for the measures/metrics that track preventative maintenance activities and identify the person/position responsible for tracking data against those goals.

### SSMP Performance Monitoring and Update Process (SSMP Section V Chapter 9.6)

- Level of Effectiveness: The City performs a comprehensive review and update of the SSMP at least every five years. Based on biennial audits and the annual performance evaluation, the City may determine an increased frequency is required for reviewing and updating the SSMP.

The City’s SSMP has undergone one five-year (major) revision, but does not seem to document changes made to the SSMP, either in the interim or between major revisions. Documenting pertinent information such as the date of the revision, the SSMP element that was changed, a brief description of the change, who made the change, etc., via a “change log” or similar instrument will allow the City to monitor the evolution of the SSMP.

- Recommendations:
  - Develop and document a process for responsible parties to suggest changes to the electronic version of the SSMP through Microsoft Word’s Track Changes and provide training to all responsible parties on how to add Track Changes so that more individuals are involved with the SSMP modification process. The process may also include identifying the individual who maintains the most current version of the SSMP, the steps in which suggested modifications are received (by internal staff or the public), how suggestions are routed to the individual/position responsible for the SSMP element associated with suggested modification(s), the process for review, and the process for updating the SSMP on the City website and archiving prior SSMP versions.

**SSO Trends – Frequency, Location and Volume (SSMP Section V Chapter 9.7)**

- Level of Effectiveness: The City tracks a number of key pieces of information to identify trends in SSO data. The SSMP contains multiple figures and tables that illustrate these trends through information such as SSO frequency, SSO causes, and SSO volumes. These SSO trends appear effective in communicating the highest priorities for attempting to minimize the number of severity of SSOs.
- Recommendations: No recommended modifications at this time.

**5.10 SSMP Program Audits**

**5.10.1 Compliance**

**Table 15. Compliance with SSS WDR D.13.x – SSMP Program Audits**

SSMP Requirement	Compliance	Deficiencies
x Conduct periodic audits	Yes	-

**5.10.2 Effectiveness of SSMP Elements and Recommended Modifications**

**Periodic SSMP Internal Audits (SSMP Section V Chapter 10.2)**

- Level of Effectiveness: The City conducts an internal SSMP Audit biennially to maintain an effective SSMP in order to properly manage, operate, and maintain all parts of the separated sewer system. The internal SSMP Audits are helpful in identifying areas of improvement. The regular review of the SSMP assures the usefulness of the planned activities.

The City has posted the most current version of the SSMP with the previous two internal audits on the DOU’s website.

The first internal biennial SSMP Audit was conducted in FY 2011/12 and the second internal biennial SSMP Audit was conducted in FY 2012/13. The City should consider setting a specified time to complete the biennial audits moving forward so as to ensure consistency between the audits over time.

The City’s last internal SSMP Audit generated a recommendation that the City “conduct the 2 year audit frequency and annually evaluate the effectiveness and compliance of the operations and maintenance programs.” This particular recommendation is not being carried over to the current audit because this issue is covered in another recommendation for SSMP requirement x. The recommendation can be seen below.

- Recommendations:
  - Schedule the next internal SSMP Audit for October-November 2017 so that the entire two previous fiscal years’ data is available. Continue using this time frame for all subsequent internal SSMP Audits for consistency (*i.e.*, the next audit would be completed October-November 2019, then October-November 2021, and so on).

## 5.11 Communication Program

### 5.11.1 Compliance

**Table 16. Compliance with SSS WDR D.13.xi – Communications Program**

SSMP Requirement	Compliance	Deficiencies
xi(a) Communicate on a regular basis with the public and tributary/satellite systems regarding SSMP	Yes	-

### 5.11.2 Effectiveness of SSMP Elements and Recommended Modifications

#### Internal Communication – Staff and Board of Directors (SSMP Section V Chapter 11.2)

- Level of Effectiveness: The City communicates information about the SSMP and its related programs to the public on a regular basis using print media, social media, public hearings, and the City DOU’s website. This website contains the most up-to-date version of the SSMP, with both of the previous internal SSMP Audits attached. There is also a contact provided if the public would like to make comments/suggestions regarding the SSMP and billing inserts are distributed by the City to inform its customers of upcoming issues related to the SSMP.

The City also continually participates in the regional State WDRs’ coordinating committee that includes SASD and SRCSD. SASD provides sewer service to residents inside the City, while SRCSD delivers City flows

to the wastewater treatment plant. In addition, the City attends quarterly coordination meetings at SRCSD. These meetings appear effective in discussing both regional and local collection system issues.

- Recommendations: No recommended modifications at this time.

## SECTION 6 Audit Summary

This section summarizes the level of compliance of the SSMP with the SSMP requirements identified in subsection D.13 and the identified deficiencies as described in **Section 4.1**. **Table 17** is a summary of the results of that evaluation.

**Table 17. Summary of SSMP Compliance Deficiencies**

SSMP Requirement	Compliance	Deficiencies
iv(e) Equipment and critical replacement parts	No	The City is still in need of a list of critical parts for pump stations.
vi(b) Program for appropriate SSO response	No	The City needs to complete the development of pump station failure contingency standard procedures.
ix(b) Measure effectiveness of SSMP elements	No	The City currently does not maintain a set of clear measurable goals that can be used as performance indicators for specific elements of the SSMP.
ix(c) Assess preventative maintenance program	No	The City currently does not track measures/metrics specific to the activities of the preventative maintenance program.

**Table 18** summarizes the particular recommendations that will mitigate the City’s non-compliance with the SSMP requirements noted in **Table 17** above.

**Table 18. Summary of Recommendations to Mitigate Non-Compliance**

SSMP Section V Chapter	Recommendation	Timeline for Completion
4.6	Identify critical replacement parts for pump stations. Include a plan to either acquire spare parts in the replacement parts inventories or a timely means for fabricating or acquiring critical spare parts in the event of a failure (outstanding 2011 and 2013 Audit Actions).	June 2016
6.4	Complete the development of pump station failure contingency standard procedures indicating each pump station’s location, wet well capacity, estimate of how much storage time the wet wells would provide under different flow conditions, alarm capacities, on-site back-up pumps, back-up power generators, and an operations or bypass approach in the case of a force main failure. For any stations that lack back-up pumps and generators, the procedures should specify a protocol for prompt delivery of portable pumps or generators in the event of a station failure. The procedures should also identify where an SSO will occur if a station fails and where bypass intake and discharge should be set up (outstanding 2011 and 2013 Audit Actions).	June 2016

SSMP Section V Chapter	Recommendation	Timeline for Completion
9.2	Identify measures/metrics that correspond with specific elements of the SSMP and develop numerical goal ranges so the data collected and monitored by the City can be used as performance indicators (PIs) to quantitatively monitor SSMP effectiveness. The ultimate measure of SSMP effectiveness is the limiting of SSOs. However, setting goals for activities related to various SSMP elements and measuring performance against those goals will help determine how success in those elements relates to the overall effectiveness of limiting SSOs. Associating measures/metrics with specific SSMP elements will allow for direct assessment of those elements and provide consistency in their evaluation in future audits. Assign the individuals responsible for the various elements of the SSMP to complete the Performance Indicator Assessment Forms that are developed for their SSMP elements. A sample Performance Indicator Assessment Form is included in <b>Appendix 7.2</b> of this internal SSMP Audit. Performance Indicator Assessment Forms can be developed for each measure/metric and assessed periodically by the person responsible, according to the suggested audit frequency for that measure/metric. At the time of the next internal SSMP Audit, the completed Performance Indicator Assessment Forms can be used to evaluate the effectiveness of SSMP elements and included as attachments to the audit findings.	December 2016
9.5	Expand the specific measures/metrics tracked by the City to include activities of the preventative maintenance program.	December 2016
9.5	Develop numerical goals for the measures/metrics that track preventative maintenance activities and identify the person/position responsible for tracking data against those goals.	December 2016

This section also summarizes the recommended enhancements made during the process of evaluating each SSMP element’s effectiveness as described in **Section 4.2**. **Table 19** is a summary of those recommendations. This table is inclusive of recommendations from previous audits that should continue.

**Table 19. Summary of Audit Recommendations**

SSMP Section V Chapter	Recommendation	Timeline for Completion
2.2	Update the text in Chapter 2.2 of Section V of the City SSMP to state that the O&M Division Superintendent – Drainage Collection position is an LRO.	April 2016
2.2	Either add a table to the SSMP that lists all of the elements of the SSMP and the responsible party or amend the existing table in Section IV SSMP Contact List to include a column for “SSMP Element(s)” that are applicable to each position.	April 2016
2.2	Develop a process to periodically perform QA/QC to ensure consistency between CIWQS and City records pertaining to SSOs.	December 2016

SSMP Section V Chapter	Recommendation	Timeline for Completion
2.2	Consider tracking the pieces of SSO data listed above to ensure consistency between internal SSO records and the CIWQS database.	April 2016
3.2	The FOG Program Team should determine if the edits to pertinent code sections are to be accepted and adopted.	June 2016
3.2	If the edits to the City’s Municipal Code sections are accepted and adopted by the City, ensure the SSMP is updated to reflect the changes.	July 2016
4.2	Develop an SOP (Standard Operating Procedure) for the process of updating the collection system maps.	December 2016
4.3	Finalize the new SOPs that are currently being developed and ensure consistency between them and the SSMP.	June 2016
4.3	Update the SSMP to reflect the changes in preventative maintenance activities as previously discussed.	July 2016
4.3	Develop an SOP that describes how the CityWorks CMMS decides daily work orders, specifically as it pertains to the newly developed algorithms for daily cleaning and CCTV inspections. As an alternative, the City could describe these algorithms within their respective new SOPs (Scheduled Maintenance and CCTV Survey).	December 2016
4.3	Develop a process to periodically perform QA/QC of CCTV data, such as pipe material, to ensure consistency and accuracy across all inspections.	December 2016
4.3	Continue implementing the City’s Root Control Program, with a focus on pipes with an elevated risk for root-related SSOs. Continue to schedule root control chemical treatment as determined through future analyses.	Ongoing
4.3	Consider coordinating electrical and mechanical work orders and inspections to coincide with the quarterly pump station shut down for wet well cleaning. (Carried over from 2013 audit.)	December 2016
4.4	Conduct periodic meetings between O&M, Engineering, and IPAM to ensure that everyone is aware of and understands the entire R&R plan and their role within it.	June 2016
4.4	Update the SSMP to reflect the actual methodology used from the CIP Prioritization System technical memorandum to rank and prioritize potential CIPs.	April 2016
4.4	Update the flowchart entitled “CIP Project Initiation Workflow” and reference this document within the SSMP as an overall view of a CIP’s lifespan.	April 2016
4.4	Establish a periodic basis to analyze work orders with multiple condition assessment scores of 4 to determine what type of work is required to address the defects.	June 2016
4.4	Consider integrating Granite XP with CityWorks such that CCTV inspection data is accessible through the CMMS.	December 2016
4.4	Consider the modification of the CIP Prioritization System technical memorandum to incorporate capacity-based scores/parameters.	December 2016
4.4	Consider the development of a manhole inspection program using NASSCO’s MACP defect coding system (carried over from 2013 audit).	December 2017
4.4	Update the SSMP to reflect the City’s current process for summary manhole inspections.	April 2016

SSMP Section V Chapter	Recommendation	Timeline for Completion
4.4	Consider the development and implementation of a force main condition assessment program.	December 2017
4.5	Identify the required training for each employee and document that each employee has received their required training in an electronic manner, whether through TargetSolutions or a spreadsheet.	December 2016
4.5	Develop a process where pertinent supervisors are notified when required training is coming due for an employee. Either a person needs to be assigned this task, or DOU should investigate if this functionality is programmed within TargetSolutions.	December 2016
4.5	Develop a schedule for regular training on the specific equipment that the City owns. The scheduled equipment training should identify the frequency of training, the proposed instructors, appropriate referencing of SOPs and manuals, and the individuals required to take the training.	December 2016
4.5	Utilize the newly developed SOPs as a training tool for the City staff. The SOPs should be developed so that they 1) provide a framework for the consistent delivery of required information, skills, and familiarity with equipment and 2) can be used to demonstrate competence of an individual in the particular subject.	December 2016
4.6	Identify critical replacement parts for pump stations. Include a plan to either acquire spare parts in the replacement parts inventories or a timely means for fabricating or acquiring critical spare parts in the event of a failure (outstanding 2011 and 2013 Audit Actions).	June 2016
4.6	Implement the Condition Assessment Program for pump stations once it has been finalized. Update the SSMP to reflect this implementation.	December 2017
5.2	Update the DPM, post the updated DPM on the City DOU's website, and ensure the SSMP is updated to reflect this change (carried over from 2013 audit).	July 2016
5.2	Continue to post any updated version(s) of the Standard Specifications on the City DOU's website (carried over from 2013 audit).	As Needed
6.4	Complete the development of pump station failure contingency standard procedures indicating each pump station's location, wet well capacity, estimate of how much storage time the wet wells would provide under different flow conditions, alarm capacities, on-site back-up pumps, back-up power generators, and an operations or bypass approach in the case of a force main failure. For any stations that lack back-up pumps and generators, the procedure should specify a protocol for prompt delivery of portable pumps or generators in the event of a station failure. The procedure should also identify where an SSO will occur if a station fails and where bypass intake and discharge should be set up (outstanding 2011 and 2013 Audit Actions).	June 2016
6.6	Update SSMP text to state that pertinent contractor personnel will also be trained on the SOP for Sewer Overflow/Outflow Emergency Response.	April 2016
7	Complete and finalize the FOG program documents and update the SSMP to reference these documents and their implementation. Ensure consistency between the SSMP and the FOG program documents.	June 2016

SSMP Section V Chapter	Recommendation	Timeline for Completion
7.5	Ensure that interceptor and grease removal terminology is consistent between the City Municipal Code and the SSMP.	July 2016
7.6	Develop a process to routinely transmit data regarding building permits involving new or modified grease removal equipment to the DOU for use in updating the FSEs inspection inventory (outstanding 2011 and 2013 Audit Actions).	December 2016
7.8	Develop an SOP describing the process of how pipeline cleaning frequencies are modified as a result of FOG-related analysis.	December 2016
8.3	Continue flow monitoring and development of hydraulic models to confirm and update spreadsheet results. Continue to communicate with field staff on a frequent basis (after every storm) that there are no documented field conditions or anecdotal comments indicating any of the 15 basins identified in the spreadsheet analysis as having “current” capacity limitation are surcharging or showing similar signs of capacity deficiency. If these efforts identify a basin, move that basin immediately to the top of the priority list for evaluation with hydraulic modeling and begin process for making upgrades to system to eliminate deficiency.	Ongoing
8.3	Continue long-term evaluation process of developing hydraulic models for all basins where the future conditions spreadsheet and/or flow monitoring analysis indicate capacity deficiencies. Utilize hydraulic models to identify/confirm future hydraulic deficiencies and plan, design and construct improvements as needed to eliminate them.	Ongoing
8.4	Update the Design and Procedures Manual to include design criteria used for hydraulic analysis (outstanding 2013 Audit Action). Ensure the SSMP text reflects the adoption of the updated Design and Procedures Manual.	July 2016
8.5	Develop an SOP to document the procedure(s) used to create and/or modify the list of potential CIPs to address capacity-related deficiencies in the separated sewer system.	December 2016

SSMP Section V Chapter	Recommendation	Timeline for Completion
9.2	Identify measures/metrics that correspond with specific elements of the SSMP and develop numerical goal ranges so the data collected and monitored by the City can be used as performance indicators (PIs) to quantitatively monitor SSMP effectiveness. The ultimate measure of SSMP effectiveness is the limiting of SSOs. However, setting goals for activities related to various SSMP elements and measuring performance against those goals will help determine how success in those elements relates to the overall effectiveness of limiting SSOs. Associating measures/metrics with specific SSMP elements will allow for direct assessment of those elements and provide consistency in their evaluation in future audits. Assign the individuals responsible for the various elements of the SSMP to complete the Performance Indicator Assessment Forms that are developed for their SSMP elements. A sample Performance Indicator Assessment Form is included in <b>Appendix 7.2</b> of this internal SSMP Audit. Performance Indicator Assessment Forms can be developed for each measure/metric and assessed periodically by the person responsible, according to the suggested audit frequency for that measure/metric. At the time of the next internal SSMP Audit, the completed Performance Indicator Assessment Forms can be used to evaluate the effectiveness of SSMP elements and included as attachments to the audit findings.	December 2016
9.2	Consider the incorporation of the CSPA CD's various goals with the numerical goals for identified measures/metrics as mentioned above.	December 2016
9.5	Expand the specific measures/metrics tracked by the City to include activities of the preventative maintenance program.	December 2016
9.5	Develop numerical goals for the measures/metrics that track preventative maintenance activities and identify the person/position responsible for tracking data against those goals.	December 2016
9.6	Develop and document a process for responsible parties to suggest changes to the electronic version of the SSMP through Microsoft Word's Track Changes and provide training to all responsible parties on how to add Track Changes so that more individuals are involved with the SSMP modification process. The process may also include identifying the individual who maintains the most current version of the SSMP, the steps in which suggested modifications are received (by internal staff or the public), how suggestions are routed to the individual/position responsible for the SSMP element associated with suggested modification, the process for review, and the process for updating the SSMP on the District website and archiving SSMP versions.	June 2016
10.2	Schedule the next internal SSMP Audit for October-November 2017 so that the entire two previous fiscal years' data is available. Continue using this time frame for all subsequent internal SSMP Audits for consistency ( <i>i.e.</i> , the next audit would be completed October-November 2019, then October-November 2021, and so on).	October 2017

## **SECTION 7    Appendices**

7.1 Appendix – Historical SSO Data

7.2 Appendix – Sample Performance Indicator Assessment Form

## **7.1 Appendix – Historical SSO Data**

<b>Date of SSO</b>	<b>Address of SSO</b>	<b>Spill Type</b>	<b>Spill Volume (gal)</b>	<b>Spill Volume Recovered (gal)</b>	<b>Spill Recovery Percentage (%)</b>	<b>Spill Cause</b>
9/20/2013	1000 Front Street, Sacramento, CA	Category 3	136	106	78	Grease Deposition (FOG)
9/25/2013	3736 Schutt Way, Sacramento, CA	Category 3	17	17	100	Root Intrusion
10/4/2013	7079 Remo Way, Sacramento, CA	Category 3	30	30	100	Grease Deposition (FOG)
10/24/2013	6661 Fordham Way, Sacramento, CA	Category 3	28	28	100	Grease Deposition & Root Intrusion
10/31/2013	695 Plaza Ave, Sacramento, CA	Category 3	119	119	100	Grease Deposition (FOG)
11/2/2013	6589 Demaret Dr, Sacramento, CA	Category 3	140	140	100	Root Intrusion
11/8/2013	5011 South Land Park Dr, Sacramento, CA	Category 3	6	6	100	Root Intrusion
11/14/2013	5352 Karbet Way, Sacramento CA	Category 3	14	14	100	Debris-General
11/20/2013	2101 Catskill Way, Sacramento, CA	Category 3	10	8	80	Grease Deposition (FOG)
11/23/2013	2101 Catskill Way, Sacramento, CA	Category 3	5	5	100	Grease Deposition (FOG)

<b>Date of SSO</b>	<b>Address of SSO</b>	<b>Spill Type</b>	<b>Spill Volume (gal)</b>	<b>Spill Volume Recovered (gal)</b>	<b>Spill Recovery Percentage (%)</b>	<b>Spill Cause</b>
12/1/2013	15 Don Merlino Ct, Sacramento, CA	Category 3	19	19	100	Grease Deposition (FOG)
12/9/2013	100 Lindley Dr, Sacramento, CA	Category 3	34	34	100	Grease Deposition (FOG)
12/26/2013	2924 Marysville Blvd, Sacramento, CA	Category 3	20	20	100	Pipe Structural Problem/Failure
1/7/2014	2922 Marysville Blvd, Sacramento, CAs	Category 2	1966	1966	100	Pipe Structural Problem/Failure
1/11/2014	1430 27th Ave, Sacramento, CA	Category 3	5	2	40	Grease Deposition (FOG)
1/18/2014	7020 Wilshire Cir, Sacramento, CA	Category 3	15	15	100	Root Intrusion
1/19/2014	2401 34th Ave, Sacramento, CA	Category 3	19	18	95	Root Intrusion
1/27/2014	6000 Belleau Wood Lane, Sacramento, CA	Category 3	6	4	67	Grease Deposition (FOG)
2/3/2014	135 Baxter Ave, Sacramento, CA	Category 3	35	5	14	Debris-General
2/5/2014	2629 Evergreen St, Sacramento, CA	Category 3	18	10	56	Debris-General

<b>Date of SSO</b>	<b>Address of SSO</b>	<b>Spill Type</b>	<b>Spill Volume (gal)</b>	<b>Spill Volume Recovered (gal)</b>	<b>Spill Recovery Percentage (%)</b>	<b>Spill Cause</b>
2/18/2014	1806 Los Robles Blvd, Sacramento, CA	Category 3	21	21	100	Grease Deposition (FOG)
2/22/2014	1371 Munger Way, Sacramento, CA	Category 3	3	2	67	Root Intrusion
3/28/2014	883 Parklin Ave, Sacramento, CA	Category 3	52	52	100	Grease Deposition (FOG)
4/1/2014	7266 Amherst St, Sacramento, CA	Category 1	38	0	0	Grease Deposition (FOG)
4/9/2014	4428 Euclid Ave, Sacramento, CA	Category 3	13	13	100	Root Intrusion
5/11/2014	641 45th St, Sacramento, CA	Category 3	17	17	100	Root Intrusion
6/3/2014	3701 Ivy St, Sacramento, CA	Category 3	3	3	100	Debris-General
6/15/2014	5241 25th St, Sacramento, CA	Category 3	115	115	100	Root Intrusion
6/19/2014	3329 Belden St, Sacramento, CA	Category 3	19	0	0	Grease Deposition (FOG)
7/14/2014	6725 Demaret Dr, Sacramento, CA	Category 3	62	62	100	Root Intrusion

Date of SSO	Address of SSO	Spill Type	Spill Volume (gal)	Spill Volume Recovered (gal)	Spill Recovery Percentage (%)	Spill Cause
10/23/2014	3812 Taylor Ave, Sacramento, CA	Category 3	334	317	95	Grease Deposition (FOG)
10/29/2014	3846 Kern Street, Sacramento, CA	Category 3	23	23	100	Grease Deposition (FOG)
11/17/2014	181 Loveland Way, Sacramento, CA	Category 3	12	12	100	Grease Deposition (FOG)
11/19/2014	1109 2nd St, Sacramento, CA	Category 3	3	3	100	Debris-Rags & Grease Deposition
1/11/2015	4290 Warren Ave, Sacramento, CA	Category 3	28	28	100	Root Intrusion
1/23/2015	567 Garden St, Sacramento, CA	Category 3	15	13	87	Debris-General
2/10/2015	2398 Cambridge St, Sacramento, CA	Category 3	4	4	100	Grease Deposition (FOG)
1/13/2015	4507 Bollenbacher Ave, Sacramento, CA	Category 3	212	212	100	Debris-General
2/13/2015	3253 O'Farrell Dr, Sacramento, CA	Category 3	15	11	73	Grease Deposition (FOG)

<b>Date of SSO</b>	<b>Address of SSO</b>	<b>Spill Type</b>	<b>Spill Volume (gal)</b>	<b>Spill Volume Recovered (gal)</b>	<b>Spill Recovery Percentage (%)</b>	<b>Spill Cause</b>
2/17/2015	2347 67th Ave, Sacramento, CA	Category 3	10	10	100	Grease Deposition (FOG)
3/11/2015	2011 Oregon Dr, Sacramento, CA	Category 3	85	85	100	Debris-General
3/15/2015	66 Taylor Way, Sacramento, CA	Category 3	5	2	40	Root Intrusion
3/23/2015	1 Capitol Mall, Sacramento, CA	Category 3	150	150	100	Instrumentation Equipment Failure
4/28/2015	1405 Claremont Way, Sacramento, CA	Category 3	48	48	100	Debris-Rags
6/3/2015	1090 Rio Lane, Sacramento, CA	Category 3	127	127	100	Debris-General
6/7/2015	320 South Ave, Sacramento, CA	Category 3	128	118	92	Grease Deposition (FOG)
6/21/2015	7409 Mooncrest Way, Sacramento, CA	Category 3	15	15	100	Grease Deposition (FOG)

## **7.2 Appendix – Sample Performance Indicator Assessment Form**

<b>Goal:</b>		<b>O&amp;M PM – SSS WDR-D.iv.b</b>		
<b>Responsible Person (RP):</b>		O&M Superintendent – WWC		
<b><u>Description of Performance Indicator(s) (PIs):</u></b>				
The PIs listed below will be used to measure the effectiveness of the activities outlined in the City SSMP related to the requirements of section D.iv.b of the SSS WDR.				
<b><u>PIs and Data Analysis Methods:</u></b>				
1. <i>Miles of sewer main flushed each year.</i> <b>Discussion &amp; Scoring Criteria:</b> This PI measures the miles of separated sewer system flushed with high velocity vacuum cleaning as part of the preventative maintenance program. Cleaning the entire sewer system (~550 miles) every 5 years is acceptable per industry standards, every 3 years is good, and every 2 years is excellent. Query the CityWorks CMMS database to determine the total length of the separated sewer system that was flushed during the previous fiscal year.				
2. <i>Miles of sewer main CCTV inspected each year.</i> <b>Discussion &amp; Scoring Criteria:</b> This PI measures the miles of separated sewer system CCTV inspected as part of the preventative maintenance program. CCTV inspecting the entire sewer system (~550 miles) every 10 years is acceptable per industry standards, every 6 years is good, and every 4 years is excellent. Query the CityWorks CMMS database to determine the total length of the separated sewer system that was inspected during the previous fiscal year.				
<b>PI</b>	<b>Excellent</b>	<b>Good</b>	<b>Acceptable</b>	<b>Below Goal</b>
1	> 275	> 180	> 110	< 110
2	> 135	> 90	> 55	< 55

<b>Performance Tracking</b>		
<b>PI</b>	<b>Measured Value</b>	<b>Performance Assessment Comments / Related Information / Justification</b>
1		
2		

