San Antonio Water System

Sanitary Sewer Overflow Reduction Program

Capacity Assessment Report

Submitted January 19, 2018
II. CERTIFICATION DECLARATION

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

Jeffrey J. Hady, P.E.
Vice President, Production & Treatment

1-19-2018

(Date)
Capacity Assessment Report

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IV. ACRONYMS AND ABBREVIATIONS

CCTV Closed-Circuit Television
CD Consent Decree
CMOM Capacity, Management, Operation, and Maintenance
GIS Geographic Information System
PACP Pipeline Assessment Certification Program
SAWS San Antonio Water System
TCEQ Texas Commission on Environmental Quality
TPDES Texas Pollutant Discharge Elimination System
SSO Sanitary Sewer Overflow
V. INTRODUCTION

A. Purpose

On October 15, 2013 a Consent Decree (CD) between San Antonio Water System (SAWS) and the United States of America and the State of Texas was entered in Civil Action No. 5:13-cv-00666-DAE in the United States District Court for the Western District of Texas, San Antonio Division. This Capacity Assessment Report was prepared and is submitted pursuant to Paragraph 39 of the CD. That paragraph states that within four (4) and a half (1/2) years of the Date of Lodging, SAWS shall submit to EPA for review and comment a Capacity Assessment Report that summarizes the Capacity Assessment activities undertaken as of four (4) years after the Date of Lodging.

B. Regulatory Requirements

This Report summarizes Capacity Assessment activities pursuant to Paragraphs 33 through 38 of the Consent Decree. These Capacity Assessment requirements include Wet Weather SSO Verification, Hydraulic Modeling Evaluation and Field Investigation activities.
VI. WET-WEATHER RELATED SSO CATEGORIZATION

A. Guidelines

Wet-weather SSOs are summarized on a daily basis, including date, location, volume, and cause. Wet-weather SSOs are further reviewed using the following data sources:

- Operations reports
- Closed-circuit television (CCTV) and cleaning data
- Modeling results
- Design requests
- Maintenance history
- Area SSO history
- Texas Commission of Environmental Quality (TCEQ) reports of anomalous occurrences, such as unauthorized discharges into the sanitary sewer system

Pursuant to Consent Decree Appendix D (Capacity Assessment and Remediation Process and Guidelines), this information was used to categorize each SSO as either A, B or C.

SSOs were classified as Category A SSOs if there were no reports of large, unauthorized discharges into the system where the SSO occurred, maintenance data did not indicate the SSO was likely to have occurred due to a lack of maintenance or cleaning, and there were no capacity design requests planned downstream.

Category B and C wet-weather SSOs were identified using the following criteria:

- Locations of wet-weather SSOs with a clear indication that condition, operational, or other non-capacity related issues caused an overflow were labeled Category C
  - Condition issues included: broken pipe, voids in pipe, offset joints, large root balls, large cracks, and significant sags in the main
  - Operational issues included: large grease deposits, large debris deposits, vandalism, and other foreign objects (manhole inflow insert, construction debris, etc.) in the main
  - Other non-capacity related issues included: non-permitted discharge from cooling towers or other large discharge at volumes that exceeded the City of San Antonio Pre-treatment Ordinance limits, and storm drains connected to the sanitary sewer system
- SSOs were assigned a Category B if operation or maintenance data indicated that a lack of maintenance or cleaning significantly contributed to the overflow
- Data sets referenced to identify these issues included: SAWS maintenance history database, design requests, work order history, televising observations, Pipeline Assessment Certification Program (PACP) scoring data, and TCEQ reports.

B. Wet-Weather SSO Categorization Summary

Table VI-I: Wet-Weather SSO Categorization Summary

<table>
<thead>
<tr>
<th>Category</th>
<th>Number of SSOs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category A – Most likely a capacity-related SSO</td>
<td>233</td>
</tr>
<tr>
<td>Category B – Most likely maintenance-related</td>
<td>199</td>
</tr>
<tr>
<td>Category C – Clearly not a capacity related SSO</td>
<td>40</td>
</tr>
<tr>
<td>Total</td>
<td>472</td>
</tr>
</tbody>
</table>

C. Map of Wet-Weather SSOs

Maps of Wet Weather SSO Categories have been included as Maps VI-I, VI-II, VI-III, and VI-IV.
VI-I. Wet-Weather SSO Categorization Summary Map
Category A, B and C
VI-II. Wet-Weather SSO Categorization Summary Map

Category A

Legend

SSO Category

- Category A - One SSO at this location
- Category A - Two SSOs at this location
- Category A - Three SSOs at this location
- Category A - Four SSOs at this location
- Category A - Five SSOs at this location
- Category A - Eight SSOs at this location
- Category A - Nine SSOs at this location
- Category A, B and C SSOs at this location

SAWS Boundary
Low Income Census Tracts

January 19, 2018
VI-III. Wet-Weather SSO Categorization Summary Map

Category B

Legend

- Category A - One SSO at this location
- Category B - Two SSOs at this location
- Category B - Four SSOs at this location
- Category A and B SSOs at this location
- Category B and C SSOs at this location
- Low Income Census Tracts

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VI-IV. Wet-Weather SSO Categorization Summary Map

Category C

Legend

SSO Category
- Category C - One SSO at this location
- Category C - Two SSOs at this location
- Category B and C SSOs at this location
- Category A, B and C SSOs at this location

SAWS Boundary
Low Income Census Tracts
VII. SYSTEM-WIDE HYDRAULIC MODELING EVALUATION

A. Model Overview

The hydraulic models were developed using Innovyze Infoworks version 5.5. The pipe geometry was imported from Geographic Information System (GIS) for pipes 12-inches in diameter and larger. Some sections of smaller pipe were added to complete model continuity. The models were developed in approximately 180 metersheds, each approximately 2.7 square miles in size. Metersheds were then grouped into four major sewershed models.

Domestic flow was added using water consumption data as a representation for population. Water consumption data for the year 2013 provided on a parcel by parcel basis was used as the existing population scenario to simulate dry weather flow generated by the population in 2013. The dry weather flow model was then calibrated using flow and level data obtained from approximately 180 flow meters deployed at various locations throughout the collection system.

B. Model Maps

A map of location pipes in SAWS system-wide hydraulic model has been included as Map VII-I.
VII-I. Location of Pipes in SAWS System Wide Hydraulic Model

Legend
- Modeled Mains
- SAWS Boundary
- Low Income Census Tracts

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C. Model Calibration and Updates

SAWS collected field verification data and used that data to perform additional calibration on portions of the system to improve the accuracy of the model. This field verification was also used to confirm or correct the model geometry and pipe sizes. Model parameters generating wet weather flow were adjusted during calibration so that the hydrograph generated in the model was similar to the actual flow measured. Rain patterns from other actual storm events were entered into the model to verify that the model results reasonably replicated the system’s response to varying rain events.

D. Prioritization of Potential Capacity Constraints

The capacity assessment was completed by applying the 5-year, 6-hour assessment storm event to the model. Potential Capacity Constraints were identified where any pipe or contiguous run of pipes had insufficient pipe full gravity capacity to carry the flow generated by the model. Potential Capacity Constraints were combined where only one unconstrained pipe segment separated two runs of constrained pipe.

Potential Capacity Constraints were prioritized in accordance with the prioritization criteria stated in Appendix D of the Consent Decree. Priority 1 was assigned to locations where a wet weather SSO occurred and the model also predicted an SSO. If there was a Category A wet weather SSO but the model did not predict an SSO, the potential Capacity Constraint was assigned a Priority 2. Priority 2 was also assigned to any other potential Capacity Constraints where the model predicted an SSO but no wet weather SSO was observed. If the hydraulic model indicated that backwater from a downstream constraint could have caused the SSO, then the SSO was associated with the downstream constraint. Priority 3 was assigned to any potential Capacity Constraint that caused the hydraulic grade line (HGL) to reach within three feet of the ground. Priority 4 was set for any Category B (likely maintenance related) SSO that was not confirmed by the model. Many Priority 4 locations occurred on 8-inch and 10-inch pipes. The expected flow and capacity of these pipes was analyzed using a spreadsheet model. Priority 5 was assigned to any potential Capacity Constraint where the modeled HGL was not near the ground elevation during the peak hour flow, but the capacity of the pipe was exceeded for a minimum duration of 60 minutes.
### Table VII-I: Potential Capacity Constraints Summary

<table>
<thead>
<tr>
<th>Category</th>
<th>Number of Potential Capacity Constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td>Priority 1 – Category A SSO per Wet-Weather SSO Categorization and where model also predicts an SSO</td>
<td>45</td>
</tr>
<tr>
<td>Priority 2 – Where model predicts SSO, but with no observed SSO, or a Category A SSO per Wet-Weather SSO Categorization, but model does not predict an SSO</td>
<td>130</td>
</tr>
<tr>
<td>Priority 3 – Where model predicts HGL near ground elevation</td>
<td>87</td>
</tr>
<tr>
<td>Priority 4 – Category B SSO per Wet-Weather SSO Categorization</td>
<td>137</td>
</tr>
<tr>
<td>Priority 5 – Where pipe design capacity is exceeded for sustained 60 minutes or more but the HGL is not near the ground elevation</td>
<td>139</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>538</strong></td>
</tr>
</tbody>
</table>

### E. Map of Potential Capacity Constraints

Maps of potential Capacity Constraints including all priorities have been included as Maps VII-II, VII-III, VII-IV, VII-V, VII-VI and VII-VII.
VII-II Map of Potential Capacity Constraints
All Priorities

Legend
Priority
1
2
3
4
5

SAWS Boundary
Low Income Census Tracts

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VII-III Map of Potential Capacity Constraints

Priority 1

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VII-IV Map of Potential Capacity Constraints
Priority 2

Legend
Priority
2
SAWS Boundary
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VII-V Map of Potential Capacity Constraints
Priority 3

Legend
Priority
3
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VII-VI Map of Potential Capacity Constraints
Priority 4

Legend
Priority
4
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VIII. FIELD INVESTIGATIONS OF POTENTIAL CAPACITY CONSTRAINTS

A. Guidelines

The purpose of field verification was to determine if a potential Capacity Constraint had significantly contributed to an SSO or was likely to significantly contribute to an SSO in the future.

The field verification process considered all available data at each potential Capacity Constraint location with a priority of 1-4. The following data gathered in the field were considered collectively when assessing system performance:

- Observed wet weather SSOs
- Flow meter and level data from meters at the Capacity Constraint or nearby
- Visual inspection for evidence of SSOs at locations where model predicts SSOs
- Smart Cover data where available; Smart Covers are sensors that measure the depth of the water level below the manhole cover
- SSO history evaluation
- Location of projects that were already in progress or planned to address system capacity

Flow metering was generally used to field verify Priority 1 and 2 constraints. Smart Covers were generally used to field verify Priority 3 and Priority 4 potential Capacity Constraints. Flow meter data and Smart Cover data were supplemented by visual inspection and SSO history. All of this data was used for initial field investigation findings. If there was available existing data, then a verification conclusion was reached. However, where data was not available, then a flow meter was installed to gather both dry and wet weather flows for the specific Capacity Constraint. Once available wet weather data was gathered, the model was “micro-calibrated” using the new data. The assessment storm was then rerun to verify whether the pipes were still constrained.

Potential Capacity Constraints that had significantly contributed to an SSO, or were likely to significantly contribute to an SSO in the future, were confirmed where any one of the following conditions were met:

- Flow metering data, the hydraulic model with any micro-calibrations applied indicated that the system has the ability to generate flow sufficient to cause an SSO and an SSO was observed, or field evidence such as debris indicated that an SSO was likely to have occurred upstream of the constraint location
Flow metering data, or level data, confirmed that the system’s wet weather response was sufficient to generate the peak flow forecasted in the model and that an SSO due to a Capacity Constraint was likely to occur in the future or could have occurred without being observed.

Potential Capacity Constraints were not confirmed as Capacity Constraints if they had not significantly contributed to an SSO, nor were likely to significantly contribute to a future SSO, where field evidence did not indicate that an SSO had occurred (level data or evidence of debris at the predicted SSO manhole) or the field flow data did not indicate that the system was likely to generate peak flow sufficient to cause an SSO.

SAWS performed spreadsheet analysis modeling on Priority 4 potential Capacity Constraints associated with Category B SSOs that occurred on 8-inch or 10-inch mains. Eighty-seven (87) of the small diameter Priority 4 potential Capacity Constraints were determined through the spreadsheet modeling to not be Capacity Constraints and were removed from the field investigation program. These areas were referred to the condition assessment program for condition and maintenance evaluation.
B. Field Investigation Status

<table>
<thead>
<tr>
<th>Technique</th>
<th>Number of Potential Capacity Constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Priority 1</td>
</tr>
<tr>
<td>Flow Metering</td>
<td>24</td>
</tr>
<tr>
<td>Smart Covers</td>
<td>5</td>
</tr>
<tr>
<td>Chalking</td>
<td></td>
</tr>
<tr>
<td>Visual Inspection – Smoke Testing</td>
<td></td>
</tr>
<tr>
<td>Visual Inspection – Mechanical Proofing</td>
<td></td>
</tr>
<tr>
<td>Visual Inspection – Sewer</td>
<td>7</td>
</tr>
<tr>
<td>Cleaning Findings</td>
<td></td>
</tr>
<tr>
<td>Visual Inspection – Dye Testing</td>
<td></td>
</tr>
<tr>
<td>Other (if applicable)*</td>
<td>14</td>
</tr>
<tr>
<td>Monitor in Future per Capacity Assessment and</td>
<td></td>
</tr>
<tr>
<td>Remediation Process and Guidelines Appendix (CMOM)</td>
<td>27</td>
</tr>
<tr>
<td>Total</td>
<td>45</td>
</tr>
</tbody>
</table>

*Includes SSO history evaluation, spreadsheet evaluation, review of downstream condition data, or the potential Capacity Constraint is impacted by an active or planned project to increase pipe capacity.
All field investigations required under the Consent Decree have been completed; see Table VIII-I.

<table>
<thead>
<tr>
<th>Technique</th>
<th>Number of Potential Capacity Constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Priority 1</td>
</tr>
<tr>
<td>Flow Metering</td>
<td></td>
</tr>
<tr>
<td>Smart Covers</td>
<td></td>
</tr>
<tr>
<td>Chalking</td>
<td></td>
</tr>
<tr>
<td>Visual Inspection – Smoke Testing</td>
<td></td>
</tr>
<tr>
<td>Visual Inspection – Mechanical Proofing</td>
<td></td>
</tr>
<tr>
<td>Visual Inspection – Sewer</td>
<td></td>
</tr>
<tr>
<td>Cleaning Findings</td>
<td></td>
</tr>
<tr>
<td>Visual Inspection – Dye Testing</td>
<td></td>
</tr>
<tr>
<td>Other (if applicable)</td>
<td></td>
</tr>
<tr>
<td>Monitor in Future per Capacity Assessment and Remediation Process and Guidelines Appendix (CMOM)</td>
<td>0</td>
</tr>
</tbody>
</table>

C. Map of Completed Field Investigations

A map of completed field investigations has been included as Map VIII-I.

D. Map of In-Progress Field Investigations

There are no in-progress field investigations. All field investigations required under the Consent Decree have been completed; see Table VIII-I.
VIII-I Map of Completed Field Investigations

Legend

1. Flow Metering
2. Smart Cover
3. Flow Metering
4. Other
5. Monitor in Future
1. Visual Inspection
2. Visual Inspection
3. Visual Inspection
4. Monitor in Future
1. Other
2. Other
3. Other
2. Monitor in Future
3. Monitor in Future

SAWS Boundary
Low Income Census Tracts

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IX. CAPACITY ASSESSMENT RESULTS

A. Capacity Assessment Guidelines

Field data including SSO observations, maintenance reports, rain gauge and flow meter data, and field observations documented by photographs were used to assign field verified Capacity Constraints for future action.

- All Priority 1 field verified Capacity Constraints were referred to Remedial Measures Alternatives Analysis.
- Generally, most Priority 2 field verified Capacity Constraints went to Remedial Measures Alternatives Analysis. Priority 2 constraints that did not go to Remedial Measures Alternatives Analysis were determined on a case by case basis to be monitored in the future, or were recent wet weather SSOs where further monitoring will occur.
- Generally, most Priority 3 field verified Capacity Constraints went to Monitoring. Priority 3 constraints that did not go to Monitoring were those that were part of an active or planned project to increase pipe capacity.
- Generally, most Priority 4 Capacity Constraints went to Monitoring, unless spreadsheet analysis and field verification confirmed the location as a Capacity Constraint. These field verified Priority 4 Capacity Constraints were referred to Remedial Measures Alternatives Analysis. If the spreadsheet analysis indicated the Priority 4 SSO was not caused by a Capacity Constraint, the constraint was determined to be Not a Constraint.
- All Priority 5 potential Capacity Constraints were referred to Monitoring, unless part of an active project to increase pipe capacity, or determined to be Not a Capacity Constraint.

During Remedial Measures Alternatives Analysis, SAWS will utilize the guidelines in the CD, including Appendix D, SAWS Capacity Assessment and Remediation Program Process and Guidelines. Outcomes from the Alternatives Analysis could include a capacity remediation project, inflow reduction, sewer rerouting or relief, and/or further monitoring.
B. Capacity Assessment Results

<table>
<thead>
<tr>
<th>Capacity Assessment Result</th>
<th>Number of Potential Capacity Constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remedial Measures Alternatives Analysis</td>
<td>170</td>
</tr>
<tr>
<td>Monitor in the Future per Capacity Assessment and Remediation Process and Guidelines Appendix (CMOM)</td>
<td>273</td>
</tr>
<tr>
<td>Not a Capacity Constraint</td>
<td>95</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>538</strong></td>
</tr>
</tbody>
</table>

During the Remedial Measures Alternatives Analysis process, SAWS may group individual Capacity Constraints into larger project areas.

C. Map of Capacity Assessment Results

A map of capacity assessment results has been included as Map IX-I.
IX-I Map of Capacity Assessment Results

Legend
Capacity Assessment Results

- Remedial Measures Alternatives Analysis
- Monitor in the Future
- Not a Capacity Constraint

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