Houston’s Successful Implementation of an Agreed Order for Sanitary Sewer Overflows

April 22, 2015

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Introduction

- Houston at a Glance
- Information
- Planning
- Implementation
Houston at a Glance

- Fourth largest City
- Founded in 1836
- 48 inches of rain
- Unstable soils
- Flat terrain
- 2.2 million people served
- 669 square miles
- 590 square served

Unstable Soils = Pipe Leaks
Houston Area: 669 Square Miles

The land area of all these cities COMBINED would fit within Houston’s land area.
Collection System Monitoring / Alerting

- Causes

- Power Failure - 11%
- Insufficient System Capacity - 7%
- I/I - 27%
- Pipe Breaks - 12%
- Pipe Blockages - 43%

Source - EPA website
Collection System Monitoring / Alerting

- Causes - continued

![Cause Chart (2012-2013)]

- Grease: 51%
- UNK Blockage: 15%
- Lift Station: 12%
- Structural: 12%
- Force Main: 4%
- Capacity: 1%
- Debris: 1%
- Roots: 1%
- ARV: 1%
- Rags: 1%
- Cross Connection: 0%
Collection System Monitoring / Alerting

- Causes - continued
Collection System Monitoring / Alerting

- Protection - Technical Solution
  - Leverage existing wireless broadband network WiMax
  - Leverage Automatic Meter Reading (AMR) System

- Protection - Technical Component
  - AMR System / Repeater
    - Covers approx. 80% of existing wastewater manholes
Collection System Monitoring / Alerting
# Collection System Monitoring / Alerting

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Criteria</th>
<th>Utility</th>
<th>EPA</th>
</tr>
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<tbody>
<tr>
<td><strong>Dry</strong></td>
<td>Dry weather condition ≤ Design Storm</td>
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<tr>
<td><strong>Wet</strong></td>
<td>&gt; Design Storm</td>
<td>Unavoidable</td>
<td>$$$ to eliminate all unavoidable</td>
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</tbody>
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- Conditions: **Dry** and **Wet**
- Criteria: 
  - Dry weather condition ≤ Design Storm
  - > Design Storm
- Utility: 
  - Avoidable
  - Unavoidable
- EPA: **All are avoidable unless demonstrated otherwise**
Collection System Monitoring / Alerting

- Benefits
  - Quickly identify source of overflow based on monitoring data
  - Improve responsiveness
  - Ability to analyze data collected
Asset Management

- Existing Assets
- Current Condition
- Rainfall
Public Utilities - Wastewater Operations

Public Education

- Corral the Grease
  - Public education program about proper disposal of Fats, Oil, and Grease (FOG)

- City Council approved revision to Chapter 47 “Grease Ordinance” on May 2, 2007
Planning Process

- Analyzed SSO data from 2001 to 2003:
  - 98% occurred in dry weather
  - 97% occurred in small diameter sewers (<24–in)
  - Temporary blockages, grease build up and structural failure

- Creation of SSO Severity Levels (Tiers)
  - First Tier: Basins with more than 1 RSSO during the 3-yr period
  - Second Tier: Basins with >1 SSO/yr during the 3-yr period
  - Third Tier: Basins with <1 SSO/yr during the 3-yr period
  - Fourth Tier: Basins with 0 SSO/yr during the 3-yr period
Public Utilities - Wastewater Operations

Planning Process

<table>
<thead>
<tr>
<th>Tier</th>
<th>Number of Basins</th>
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<tr>
<td>First Tier</td>
<td>140</td>
</tr>
<tr>
<td>Second Tier</td>
<td>338</td>
</tr>
<tr>
<td>Third Tier</td>
<td>474</td>
</tr>
<tr>
<td>Fourth Tier</td>
<td>512</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,464</strong></td>
</tr>
</tbody>
</table>

478 basins selected for Scheduled Pipe Renewal
Total Estimated Rehabilitation: 6,731,000 feet

Since then have grown to 1,562 basins
Planning Process

- Tier classification based on formula

\[
\text{Priority} = 0.4 \left( \frac{\text{Basin SSO}}{\text{Citywide MAX SSO}} \right) + 0.3 \left( \frac{\text{Basin CSSO}}{\text{Citywide MAX CSSO}} \right) + 0.2 \left( \frac{\text{Basin Stoppages}}{\text{Citywide MAX Stoppages}} \right) + 0.1 \left( \frac{\text{Basin RSSO}}{\text{Citywide MAX RSSO}} \right)
\]

Using the Priority rating (which is based on a scale of 0 to 1, higher the number the worse the basin).

- Tier I = \( \left( \frac{140}{1464} \right) \) * (Total Basins) = # of Basins assigned this Tier

- Tier II = \( \left( \frac{338 + 140}{1464} \right) \) * (Total Basins)

- Tier III = \( \left( \frac{474 + 338 + 140}{1464} \right) \) * (Total Basins)

- Tier IV = the remaining Basins
Planning Tools

**Guide for Evaluating Capacity, Management, Operation, and Maintenance (CMOM) Programs at Sanitary Sewer Collection Systems**
Implementation Plan

Plan Period
- FY 2005 thru FY 2014 – Issue work orders
- All construction complete by end of FY 2016 (June 30th)

Two Components

Structural
- Pipe Renewal – 9.5 Mil LF
- 7.0 Mil LF from scheduled basins
- 2.5 Mil LF from unscheduled basins

Non-Structural
- Pipe Cleaning – 20.0 Mil LF
- Fats, Oil and Grease (FOG)
- Lift Station Maintenance
Implementation Plan

- Changed staffing from contractors to primarily employees
- Developed SOP and trained staff
- In-house staff
  - Planning, analysis & engineering
  - Contract preparation, bidding & RCA documents
  - Work orders

PROCEDURE MANUAL FOR SEWER MAINTENANCE AND REHABILITATION CONTRACTS

April 2007
Implementation Plan - *continued*

- Large work orders – approximately 25,000 LF
- Work order grouped by geographic area
- Constructability
- Construction Management
Benefits of Approach

- Flexible contracts
- Proactive approach
- Address entire area
- Minimize change orders
- Fast paced
- Special situations
Implementation in Practice

- Analysis of Collected Data
  - Identify root cause
  - Use IMS, WMS, WIMS, ETS
  - Define corrective action

- Renewal Rate
  - Approximately 600,000 LF / FY

- Cleaning Rate
  - Goal 3.5M LF / FY

- Optimal Solution
  - Clean and renew 6–inch to 24–inch sewers
Implementation in Practice

WASTEWATER COLLECTION SYSTEM SSOs - Mid-FY15

- Public SSOs: 56
- Private SSOs: 46
- Total SSOs: 102

Monthly Average

- Total SSOs: 120
Implementation in Practice

- American Public Works Association
  - 84th Accredited Agency
  - Full Compliance on June 15th 2013
  - 442 Applicable Practices
  - 35 Model Practices
Collection and Conveyance Management Plan

November 2012

Prepared for:
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