Essential Elements of an Effective O&M Program

- Program Development
- Program Implementation
- Local Enforcement (sump pumps, grease control, sewer use ordinances, etc)
- Public Education
COLLECTION SYSTEMS:

METHODS FOR EVALUATING AND IMPROVING PERFORMANCE

Office of Water Programs
California State University, Sacramento
Collection System Performance
Goal!

“KEEP IT IN THE PIPE”
“With use, a sewer’s capacity is reduced and can only be maintained or restored by regularly scheduled maintenance”

CSU- Sacramento (1998)
“While infiltration and inflow (I/I) are major contributors to SSO problems, inadequate sewer maintenance is also a major factor”

CSU- Sacramento (1998)
“Operation and maintenance of a wastewater collection system can be defined as those O&M activities that result in conveying wastewater safely and efficiently to the wastewater treatment facility”

CSU- Sacramento (1998)
“The purpose of O&M programs is to maintain design functionality (capacity) through maintenance and restoration”

CSU- Sacramento (1998)
“Effective O&M programs are based on knowing what components make up the collection system, where they are located (mapping) and their condition”

CSU- Sacramento (1998)
“O&M of a collection system affects compliance therefore adequate resources need to be provided to support the O&M program”

JgS Advice: Separate line-item budget for collection system O&M and restoration
Benefits of Collection System O&M

- Safety and Health To The Public!
- Environmental Protection
- Conveyance capacity (as designed) is maintained
- Obtaining full use of the system through its design life
- Reliability of collection system & service to customers
- Asset Management (maintaining the value of the investment)
- Cost-effective use of utility resources
- Regulatory Compliance
Types of Maintenance

• Corrective
• Predictive
• Preventative
Corrective Maintenance

Emergency maintenance is reactive……something fails or breaks and you wait until then to fix it.

Crisis Management Is Stressful!
Predictive Maintenance

A method of establishing baseline performance data, monitoring performance criteria over time, and observing changes in performance so that failure can be predicted and maintenance can be performed on a planned, scheduled basis.

(examples: manhole inspections; sewer televising)
Preventative Maintenance

Proactive and a programmed, systematic approach to maintenance activities based usually on time intervals (examples: lubrication of pump motors based on run times; sewer cleaning a percentage of the system every year, etc.)
Preventative Maintenance Benefits

- Maintenance can be planned and scheduled and is not reactionary
- Budgeting resources to support the O&M Program
- Capital Improvement Program can be identified and budgeted
- Human and materials resources best utilized
OPTIMIZATION OF COLLECTION SYSTEM MAINTENANCE FREQUENCIES AND SYSTEM PERFORMANCE

American Society of Civil Engineers  
EPA Cooperative Agreement #CX 824902-01-0  
February 1999
Maintenance Activities Showing Improved Performance Correlation

- Cleaning
- Root Removal
- Flow Monitoring
- Smoke Testing
- Sewer Line Televising
- Manhole Inspections
- Manhole Rehabilitation
Maintenance Activities Showing Improved Performance Correlation Continued

- Mainline Rehabilitation
- Lift Station O&M
- Private Sewer Inspections
- Private Sewer I/I Removal
- Grease Control Programs
Compliance, Maintenance, Operation & Management (CMOM)

- Goals
- Organization
- Legal Authority
- Design & Performance Stds
- O&M
  - Cleaning
  - Root Removal
  - Flow Monitoring
  - Smoke Testing
  - Televising
  - Manhole Inspections
  - Manhole Rehab
  - Lift Stn O&M
  - Sewer Rehabs
- Overflow Emergency Response Plan
- Capacity Assurance
- Annual Self-Auditing
- Sewer Use Ordinances
- Special Studies
- SECAP
- Private Sewer I/I Removal
“Collection system managers throughout the U.S. have often expressed the need for performance indicators for collection system O&M program management that would provide criteria for evaluating the performance of their systems”

CSU- Sacramento (1998)
“It is possible to establish performance indicators which provide insight into the performance of the collection system and the effectiveness of the O&M program”
High-performing utilities have all developed performance measurements of their O&M program and track the information necessary to evaluate performance.”

Collection Systems: Methods For Evaluating and Improving Performance
Office of Water Programs, California State University, Sacramento (1998)
Compliance Maintenance Annual Report

Sanitary Sewer Collection System Section
4. Did your sanitary sewer collection system maintenance program include the following maintenance activities? Complete all that apply and indicate the amount maintained:

<table>
<thead>
<tr>
<th>Activity</th>
<th>% of system/year</th>
<th>% of system/year</th>
<th>% of system/year</th>
<th>% of system/year</th>
<th># per L.S/year</th>
<th>% of manholes rehabed</th>
<th>% of sewer lines rehabed</th>
<th>% of system/year</th>
<th>% of private services</th>
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<tbody>
<tr>
<td>Cleaning</td>
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<td>Root Removal</td>
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<td>Sewer Line Televising</td>
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<td>Manhole Inspections</td>
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<td>Lift Station O&amp;M</td>
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<td>Private Sewer I/I Removal</td>
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</tbody>
</table>

Please include additional comments about your sanitary sewer collection system below:
5. Provide the following collection system and flow information for the past year:

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Total Actual Amount of Precipitation Last Year</td>
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<tr>
<td>Annual Average Precipitation (for your location)</td>
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<tr>
<td>Miles of Sanitary Sewer</td>
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<tr>
<td>Number of Lift Stations</td>
<td></td>
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<tr>
<td>Number of Lift Station Failures</td>
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<tr>
<td>Number of Sewer Pipe Failures</td>
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<tr>
<td><strong>Number of Sanitary Sewer Overflow (SSO) Occurrences:</strong> (10 points per occurrence)</td>
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<tr>
<td>Number of Basement Backup Occurrences</td>
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<td>Number of Complaints</td>
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<tr>
<td>Average Daily Flow in MGD</td>
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<tr>
<td>Peak Monthly Flow in MGD (if available)</td>
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<tr>
<td>Peak Hourly Flow in MGD (if available)</td>
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</tr>
</tbody>
</table>

**PERFORMANCE INDICATORS**

- Lift Station Failures (failures/ps/year)
- Sewer Pipe Failures (pipe failures/sewer mile/yr)
- Sanitary Sewer Overflows (number/sewer mile/yr)
- Basement Backups (number/sewer mile)
- Complaints (number/sewer mile)
- Peaking Factor Ratio (Peak Monthly:Annual Daily Average)
- Peaking Factor Ratio (Peak Hourly:Annual Daily Average)
“Data that is used as performance indicators can be tracked over time to observe trends. Utilities can track trends of their own performance indicators over time to assess O&M success and target levels of service.”

CSU- Sacramento (1998)
6. Was infiltration/inflow (I/I) significant in your community last year?
Collection System O&M Performance Indicators:
LSF - Lift Station Failures

Facility: Blanchardville Wastewater Treatment Facility
Years of CMAR Data: 2004 - 2008
Linear Equation used for Trend Line: LSF: \( y = 0.000922x + 0.22 \)
Collection System O&M Performance Indicators:
SPF - Sewer Pipe Failures

Year

Collection System O&M Performance Indicators:
SSO - Sanitary Sewer Overflows

SSO (number/sewer mile/yr)

Year

Collection System O&M Performance Indicators:
Complaints

Complaints (number/sewer mile)

Year

Collection System Information & Education Sources

- Water Environment Federation
- University of California - Sacramento Training Manuals
- UW-Madison Professional Development Classes
- WRWA
- WWOA
- DNR
JACK G. SALTES, M.S., P.E.
Wastewater Operations Engineer
Bureau of Watershed Management

101 S. Webster St., P.O. Box 7921
Madison, WI 53707-7921
(608) 264-6045
FAX (608) 267-2800
Jack.Saltes@dnr.state.wi.us