"CMOM Plus" – How CMOM Can Be Used as a Platform for Asset Management and Utility Management

By Cari Ishida, Ph.D., PE, LEED AP, ENV SP and Matt Larson, PE
Aurora University – Perry Theater

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Out of sight, out of mind…
...Until

Sanitary Sewer Overflow (SSO)

Sink Hole
Then, environmental regulations kick in...
IEPA has recently added NPDES Permit Requirements for Capacity, Management, Operations and Maintenance Plans

Special Condition: Develop, implement, and submit CMOM Plan, including Asset Management strategy to IEPA

CMOM Plus
“CMOM Plus” is leveraging components of the CMOM plan to better manage your utility.

When life serves you lemons, make lemonade, then calculate your fixed and variable costs and add a reasonable markup in order to create a profit.
Intensification: The need to “do more with less”

- Higher expectations and increasing regulatory requirements
- Limited resources
  - People
  - Time
  - Financial

WITH LESS!
CMOM’s Major Components

- People
- Policies
- Regulations

- Capacity Model
- System Evaluation
- CIP

- People
- SOP’s
- Monitoring

- People
- SOP’s
- Responses

CAPACITY
MANAGEMENT
OPERATIONS
MAINTENANCE
CMOM touches many areas of your organization

- Master Plan
- CMMS/GIS
- Asset Management Plan
- SCADA
- Capacity Analysis
- Financial Plan
“CMOM Plus” is leveraging components of the CMOM plan to better manage your utility

CMOM Plus

CMMS/GIS

Master Plan

Asset Management Plan

Capacity Analysis

SCADA

Financial Plan
CMOM Plus Trivia!
GIS – Leveraging your GIS Data
CMOM vs. CMOM Plus – Why build a GIS database?

<table>
<thead>
<tr>
<th>CMOM</th>
<th>CMOM Plus</th>
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<tbody>
<tr>
<td>Requirements:</td>
<td>Build a GIS database to develop and maintain the maps</td>
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<tr>
<td>• Complete map and system inventory</td>
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<tr>
<td>• Summarize historical SSOs and problem areas</td>
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</table>

**Benefits:**

- **✓** GIS database provides a central storage location for various utility data
- **✓** GIS data are the foundation of hydraulic models
- **✓** Application of additional GIS tools for utility planning purposes beyond CMOM
GIS can be used to map historical collection system issues for your CMOM plan.
Example of GIS web applications: California SSOs

**SANITARY SEWER OVERFLOWS: 02/05/2016 - 06/05/2016**

- **Note:** Map does not include spills from sewage treatment plants.
- **Filter by volume (gallons):**
  - Minimum: 0
  - Maximum: 1,000,000+
  - Set Volume
- **Filter by date:**
  - Start: Feb 05 2016
  - End: Jun 05 2016
  - Set Dates
- **Filter by Agency:** (All)
  - Set Agency
  - Show All
Benefit #1: Geographic Information System (GIS) provides an easily accessible database.
Benefit #2: GIS data are the foundation of hydraulic models

- Land Use Data
- Sewer Basins
- Dry and Wet Weather Flows
- Hydraulic Model Software
- Sewer System Evaluation
- Collection System
Benefit #3: Application of additional GIS tools for utility planning purposes beyond CMOM

- ESRI’s ArcGIS Tool for CIP planning
- Can be used during master planning process, **AND** can be turned over at the end of the project so that client can further track CIP projects
- Customized tool specific to agency needs
Benefit #3: (continued)
Water utility capital improvement planning application

- ESRI add-in to ArcGIS 10.2 for desktop
- For water, sewer and stormwater
- ArcGIS local governments schema geodatabase
- Utilize for Master Plan CIP and deliver dynamic CIP that can be updated after MP
Mapping interface with database inputs
There are various GIS tools to coordinate field maintenance with hydraulic models.
CMOM Trivia!

A GIS database can provide:

a) An easily accessible database for real-time and various types of data

b) Base layers that act as the foundation for hydraulic models

c) A means to utilize additional tools for applications to capital planning and other utility management functions

d) All of the above
Capacity Assessments – What else can you do with your sewer capacity assessments?
CMOM vs. CMOM Plus – Why develop a hydraulic model?

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<td>Requirements: Capacity assessment at critical junctions and immediately upstream of likely overflows and backups</td>
<td>Develop a hydraulic model of your system</td>
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</tbody>
</table>

**Benefits:**
- ✔ Hydraulic models help troubleshoot problem areas
- ✔ Hydraulic model as a robust tool that can help to manage growth
- ✔ Hydraulic model can help to understand system trends
Purpose of capacity assessment is to identify areas of concern

- Based on historical overflows & backups
- Capacity Assessment Methods:
  - Hand calculations or Excel spreadsheet
  - Hydraulic Modeling
Benefit #1: Hydraulic model helps to troubleshoot problem areas

- Pipeline improvements
  - Prevent surcharging
  - Additional capacity
- Lift station improvements
  - Upgrades
  - Decommissioning
- System diversions
- WWTP capacity expansion
Benefit #2: Hydraulic model as a robust tool to help manage growth
Sewer connection evaluation criteria

- Historical and modeled wet weather SSOs
- O&M issues
- Development size
- Peak daily flow
- Manhole depth
- Peak wet weather surcharge and severity
- Pump station and treatment plant deficiencies
Have there been any historical wet weather SSOs downstream?

Does the model predict 5-year LOS peak wet weather SSOs downstream?

Are there any potential operations and/or maintenance issues?
- PM frequency
- PM activity
- Dry weather spills

Consult with Maintenance

Approve

Deny

Evaluate deficient pipe segments.

Are there any operations and/or maintenance issues that significantly increase spill risk?

Is the number of EDUs > 3?

Is the pipe diameter < 12-inches?

Is the peak dry weather flow (PDWF) d/D > 0.75?

Is the number of EDUs >=500?

Is there surcharge during the 5-year LOS peak wet weather flow?

Is the 5-year LOS peak wet weather flow (PWWF) surcharge > 3 ft or freeboard < 8 ft?

Are deficiencies not backwater related (i.e. surcharge = 1, PS wetwell backup, pipe diameter changes)?
- Is number of consecutive, deficient pipe (surcharge =2) segments > 3?
- Is headloss > 1 foot/1,000 ft?

Are there capacity deficiencies at downstream pump stations and/or treatment facilities?
Have there been any historical wet weather SSOs downstream?

- Yes
  - Deny
- No

Does the model predict 5-year LOS peak wet weather SSOs downstream?

- Yes
  - No
- No

Are there any potential operations and/or maintenance issues?
- PM frequency
- PM activity
- Dry weather spills

- Are deficiencies not backwater related (i.e. surcharge = 1, PS wetwell backup, pipe diameter changes)?
- Is number of consecutive, deficient pipe (surcharge = 2) segments > 3?
- Is headloss > 1 foot/1,000 ft?

- No
  - Evaluate deficient pipe segments.
- Yes
  - Consult with Maintenance

Are there any operations and/or maintenance issues that significantly increase spill risk?

- Yes
  - Deny SCA
- No

Are there any operations and/or maintenance issues that significantly increase spill risk?

- Yes
  - Consult with Maintenance
- No

Are there capacity deficiencies at downstream pump stations and/or treatment facilities?

- Yes
  - Deny SCA
- No

Are there any operations and/or maintenance issues that significantly increase spill risk?

- Yes
  - Consult with Maintenance
- No

Are there capacity deficiencies at downstream pump stations and/or treatment facilities?

- Yes
  - Deny SCA
- No

Evaluate deficient pipe segments.
Have there been any historical wet weather SSOs downstream?

Yes  
Deny  
No

Does the model predict 5-year LOS peak wet weather SSOs downstream?

Yes  
Deny  
No

Are there any operations and/or maintenance issues that significantly increase spill risk?

Yes  
Deny  
No

Is the peak dry weather flow (PDWF) d/D > 0.75?

Yes  
Deny  
No

Is the number of EDUs > 3?

Yes  
Deny  
No

Is the pipe diameter < 12-inches?

Yes  
Deny  
No

Is the 5-year LOS peak wet weather flow (PWWF) surcharge > 3 ft or freeboard < 8 ft?

Yes  
Deny  
No

Are deficiencies not backwater related (i.e. surcharge = 1, PS wetwell backup, pipe diameter changes)?

Yes  
Deny  
No

Is number of consecutive, deficient pipe (surcharge = 2) segments > 3?

Yes  
Deny  
No

Is headloss > 1 foot/1,000 ft?

Yes  
Deny  
No

Are there capacity deficiencies at downstream pump stations and/or treatment facilities?

Yes  
Deny  
No

Evaluate deficient pipe segments.

Yes  
Deny  
No

Is the maximum freeboard (distance from crown to ground) <= 4 feet?

Yes  
Deny  
No

Input population/flows and re-run model.

Yes  
Deny  
No

Are there any potential operations and/or maintenance issues?

PM frequency  
PM activity  
Dry weather

Yes  
Deny  
No

Are there any operations and/or maintenance issues that significantly increase spill risk?

Yes  
Deny  
No

Is the number of EDUs >=500?

Yes  
Deny  
No

Consult with CSM

Yes  
Deny  
No

Are there any operations and/or maintenance issues that significantly increase spill risk?

Yes  
Deny  
No

Approve
Leveraging your hydraulic model to manage your risk

- “Level of comfort” based on evaluation criteria
- Assists permitting department communications with developers
  - Justification for sewer connection denial
  - Potential negotiation support
Benefit #3: Hydraulic model can help understand system trends
CMOM Trivia!

A hydraulic model can:

a) Help to troubleshoot problem areas of your collection system
b) Act as a robust tool to help manage growth
c) Help to understand trends within your collection system
d) All of the above
Asset Management –
How to make your asset Management program work for you
CMOM vs. CMOM Plus – How will asset management help utility management?

<table>
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<th>CMOM Plus</th>
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| Requirements:  
• Asset Inventory  
• Level of Service  
• Critical Asset Identification  
• Life Cycle Cost  
• Long-Term Funding Strategy | Same! But, develop a standard procedure so you can update your Asset Management Program regularly. |

**Benefits:**

- Integration of CIP and Operations & Maintenance
- Creates a deeper understanding of your system
- Assists with Financial Planning
Asset Management

• Plan for Costs of Replacing Assets as they Approach Useful Life
Risk = Criticality x Vulnerability

<table>
<thead>
<tr>
<th>Vulnerability</th>
<th>Criticality</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1A</td>
<td>1B</td>
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<td>4A</td>
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</table>

Legend:
- Green: Maintenance
- Yellow: Priority
- Red: Critical
# Asset Management - Criticality ranking system

<table>
<thead>
<tr>
<th>Criticality Factor</th>
<th>Criticality Ranking</th>
<th>Scoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Health and Safety</td>
<td>Multiple illness or injury</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Illness or injury due to seasonal effects</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Single illness or injury</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No effect</td>
<td>Low</td>
</tr>
<tr>
<td>Effect on Customers</td>
<td>Major or repeat occurrence</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Minor</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>No effect</td>
<td>Low</td>
</tr>
<tr>
<td>Environmental</td>
<td>Major</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Minor</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>No effect</td>
<td>Low</td>
</tr>
<tr>
<td>Cost of Repair</td>
<td>More than $20,000</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Between $5,000 and $20,000</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Less than $5,000</td>
<td>Low</td>
</tr>
</tbody>
</table>
Asset Assessment – Vulnerability

- Probability or likelihood of an asset to fail
- Directly linked to condition and evaluated remaining useful life
Benefit #1: Integration of CIP and Operations and Maintenance

- Utilize CMMS, GIS, SCADA
- Repair vs. replace vs. retire decisions
- Corrective vs. preventative/predictive maintenance
- Cost optimization – O&M vs. capital
Integration of CIP and Operations and Maintenance (continued)

Without Asset Management

Performance

Time

With Asset Management

Performance

Time
Run to failure: Pump example

"Run to Failure"
Rehabilitation Cost = $80 + $10 = $90K
Run to Failure: Pump example

- Run to Failure Savings = $50K
- "Optimum" Rehabilitation Cost = $40K
- 8 years
Benefit #2: Creates a deeper understanding of your system
Benefit #3: Assists with financial planning for pipe replacement
Funding strategies for the Interceptor Fund

- Hydraulic Modeling
- Funding Plan
- Financial Analysis
- Strategic CIP
What are the key factors that influence the Financial Analysis and Funding Plan?

Physical Factors
- Development by area
- Expected flows

CIP Plan
- Area specific development costs
- Financial magnitude of projects
- Project and development timing

Financial Factors and Constraints
- Revenues from development fees
- Other funding sources (general capital reserve, debt)
- Policy and legal obligations
- Rate increases, debt coverage, cash flows, minimum reserves
“CMOM Plus” is leveraging components of the CMOM plan to better manage your utility
Conclusions

- CMOM vs. CMOM Plus
  - Intensification!
  - Doing more with less
Why build a GIS database?

✓ GIS database provides a central storage location for various utility data
✓ GIS data are the foundation of hydraulic models
✓ Application of additional GIS tools for utility planning purposes beyond CMOM
Why develop a hydraulic model?

✓ Hydraulic models help troubleshoot problem areas
✓ Hydraulic model as a robust tool that can help to manage growth
✓ Hydraulic model can help to understand system trends
How will asset management help utility management?

✓ Integration of CIP and Operations and Maintenance
✓ Creates a deeper understanding of your system
✓ Assists with financial planning
Acknowledgements

- Shawn Dent, PE
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- Matt Sokolowski

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CMOM Trivia!

Which of the following is false about an Asset Management Plan (AMP)?:

a) AMP components are required in a CMOM Plan
b) An AMP does not assist with financial planning
c) An AMP helps to integrate CIP and O&M planning
d) An AMP can help to create a deeper understanding of your collection system
Questions and Answers