Utilizing Asset Management to Achieve Sustainable Stormwater Systems
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Outline

• Introduction
• Literature Review Analysis
  ✓ City of Grand Rapids, United States
  ✓ City of San Diego, United States
• Pipe Condition Assessment (PCA) Objectives
• Pipe Condition Methodology: History and Application
• Differences between Storm and Sanitary Systems
• Example Pipe Condition Rating Practices - Virginia Phase I MS4 Communities and District of Columbia
• Lessons Learned
• Questions
Introduction

In the United States, the majority of the underground infrastructure pipeline network system was built more than 100 years ago. The D rating of drinking water, wastewater & stormwater infrastructure in the American Society of Civil Engineering (ASCE) report card of 2013 demonstrates the fact that the majority of this complex infrastructure is deteriorated and needs emergency response. “Capital investment needs for the nation’s wastewater and stormwater systems are estimated to total $298 billion over the next twenty years”.
Introduction

The Certification of Training in Asset Management (CTAM)-200 manual on Developing Buried Asset Management Programs (BAMI-I, 2013) envisions a “Total Asset Management Plan” (TAMP) consisting of three levels:

- strategic plan,
- tactical plan,
- operational plan.
### TOTAL ASSET MANAGEMENT PLAN (TAMP)

#### Level 1 - Strategic Planning

**Long-range 10 to 30 year timeline**

1. Define Utility’s Mission
2. Define Organizational Functions
3. Establish Level of Service Commitment
4. Establish and Maintain Best Practices
5. Set Benchmarks to Monitor Performance
6. Perform Periodic Updates-Revisions

#### Level 2 - Tactical Planning

**Establish and Maintain Best Practices.**

1. Organization Structure - Functions
2. Staff Evaluation
3. Level of Service Commitment
4. Assets - Adequacy & Utilization

#### Level 3 - Operations Planning

**Evaluate Assets**

1. WHAT do we have?
2. WHERE is it located?
3. WHAT is its condition?
4. WHAT is it worth?
5. WHAT action is required?
6. WHEN is action required?
7. HOW much will it cost?
8. HOW will it be funded?

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Key elements for each level of a TAMP (CTAM-200)
Literature Review Analysis

City of Grand Rapids, United States

The general scope established that an asset management plan consists of three major items:

- Assessment of the existing stormwater assets;
- Evaluation of levels of service the stormwater asset will meet; and
- Summary of efforts necessary to meet the desired level of service.
City of Grand Rapids, United States

City of Grand Rapids has defined a process approach toward stormwater asset management through identifying the following points:

- What are the assets? (Inventory)
- What are the assets worth? (Valuation)
- Where are the assets located? (Geographic Information System)
- How is the system operated? (Level of Service)
- What is the condition? (Probability and Consequence of Failure)
- What is needed to be done? (Construct, Maintain or Replace)
- How much will it cost? (Financial Plan)
## Literature Review Analysis

### Definitions of COF categories (City of San Diego 2013)

<table>
<thead>
<tr>
<th>Category</th>
<th>Subcategory</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social</td>
<td>Public Perception</td>
<td>Public perception of City’s performance declines. This includes external or non-quantifiable potential economic costs associated with a decline in public perception of City performance.</td>
</tr>
<tr>
<td></td>
<td>Public Health and Safety</td>
<td>Injuries, death, or property damage occurs. This includes external or non-quantifiable potential economic costs associated with increased health or safety risks to citizens.</td>
</tr>
<tr>
<td>Environmental</td>
<td>Regulatory</td>
<td>Regulators take action. This includes external or non-quantifiable economic costs associated with deterioration in trust of the regulators for which the City is taking appropriate actions to achieve compliance with a permit that is not explicit.</td>
</tr>
<tr>
<td></td>
<td>Environmental Quality</td>
<td>Measurements of environmental quality show declines (e.g. ecosystem health declines, standards are no longer met). This includes external or non-quantifiable economic costs associated with a degrading or degraded environmental quality or condition. Such economic costs could include reduction in property values, reductions in tourism, loss of jobs, and resulting reductions in tax revenues.</td>
</tr>
<tr>
<td>Economic</td>
<td>Short-term Financial</td>
<td>Fines, settlements.</td>
</tr>
<tr>
<td></td>
<td>Long-term Financial</td>
<td>Increased regulatory compliance costs, increased City of San Diego Storm Water Division requirements, increased costs to rebuild public trust, capital outlays, and for other reasons.</td>
</tr>
</tbody>
</table>
### Literature Review Analysis

#### Consequence of Failure Categories and Weight (City of San Diego, 2013)

<table>
<thead>
<tr>
<th>Category</th>
<th>Sub-Category</th>
<th>Weight</th>
<th>% Overall Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social</td>
<td>Public Perception</td>
<td>0.2</td>
<td>6.67</td>
</tr>
<tr>
<td></td>
<td>Public Health and Safety</td>
<td>0.8</td>
<td>26.67</td>
</tr>
<tr>
<td>Environment</td>
<td>Regulatory</td>
<td>0.7</td>
<td>23.33</td>
</tr>
<tr>
<td></td>
<td>Environmental Quality</td>
<td>0.3</td>
<td>10.0</td>
</tr>
<tr>
<td>Economic</td>
<td>Short-term Financial</td>
<td>0.6</td>
<td>20.0</td>
</tr>
<tr>
<td></td>
<td>Long-term Financial</td>
<td>0.4</td>
<td>13.33</td>
</tr>
<tr>
<td>Sum of Weight</td>
<td></td>
<td>3</td>
<td>100</td>
</tr>
</tbody>
</table>
City of San Diego, United States

Seven Core Elements of Asset Management (City of San Diego, 2013)
## Core Elements and Goals of Asset Management (City of San Diego, 2013)

<table>
<thead>
<tr>
<th>Core Asset Management Elements</th>
<th>Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lifecycle Processes and Practices</td>
<td>Enhance the efficiency, transparency, and consistency of the business decision-making process.</td>
</tr>
<tr>
<td>Information Systems</td>
<td>Increase the system integration, functionality, and support capabilities.</td>
</tr>
<tr>
<td>Data and Knowledge</td>
<td>Capture, organize, and document asset information.</td>
</tr>
<tr>
<td>People</td>
<td>Provide a platform for managing and sharing information and knowledge.</td>
</tr>
<tr>
<td>Commercial Tactics</td>
<td>Focus on effective delivery of projects and services.</td>
</tr>
<tr>
<td>Organization</td>
<td>Establish sound, strategic support for asset management practices.</td>
</tr>
<tr>
<td>Asset Management Plan</td>
<td>Document the current state of the City of San Diego Storm Water Division’s assets and future requirements.</td>
</tr>
</tbody>
</table>
Literature Review Analysis

10 Steps process to reach stormwater asset management program (City of San Diego, 2013)
Risk-Based Condition Assessment Approach (City of San Diego, 2013)
Municipal stormwater management programs in the U.S. are essentially the same and differ by their extent and magnitude. In the U.S., the Federal Environmental Protection Agency (US EPA) uses the 1972 Clean Water Act (CWA) and its amendments to impose regulatory controls on wet weather programs.
PIPE CONDITION METHODOLOGY: History and Application

Simple Flow Path

Collect/Record Internal Pipe Defects

Evaluate Internal Pipe Defects; Assign PACP Defect Codes

Apply PACP “QuickScore” to Defect Code Results

Review “QuickScore” Pipe Rating Results

Prioritize and Program for CIP and O&M

Structural

O & M

Prioritize and Program for CIP and O&M

Review “QuickScore” Pipe Rating Results

Apply PACP “QuickScore” to Defect Code Results

Evaluate Internal Pipe Defects; Assign PACP Defect Codes

Collect/Record Internal Pipe Defects
## Differences between Storm and Sanitary Systems

Trenchless Technology (Pipe Rehabilitation) Differences between Storm and Sanitary Pipe Systems (Eyre, Fortin, 2014)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Wastewater Collection System</th>
<th>Stormwater Conveyance System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lateral connections</td>
<td>Many</td>
<td>None to few</td>
</tr>
<tr>
<td>Bypass flows</td>
<td>Requires on-site pump operations during installation; may need a pipe decommissioning and sanitizing step prior to disassembly</td>
<td>Rehab installation can be scheduled during 'dry' days, eliminating need for pump and bypass</td>
</tr>
</tbody>
</table>
Example Pipe Condition Rating Practices - Virginia Phase I MS4 Communities and District of Columbia

<table>
<thead>
<tr>
<th>5.1 – Immediate Action</th>
<th>• Portions have failed and will continue to fail if left un-corrected</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 – Urgent Attention</td>
<td>• Infrastructure in failure; high consequence of failure</td>
</tr>
<tr>
<td>4 – Poor</td>
<td>• Severe defects that will become Grade 5 defects in near future; critical assets</td>
</tr>
<tr>
<td>3 – Fair</td>
<td>• Moderate defects that will continue to deteriorate; moderate criticality</td>
</tr>
<tr>
<td>2 – Good</td>
<td>• Infrastructure defects that have not begun to deteriorate; low criticality</td>
</tr>
<tr>
<td>1 – Acceptable</td>
<td>• Minor defects with little consequence of failure</td>
</tr>
</tbody>
</table>

DC Water pipe defect condition rating - based on NASSCO PACP Defect Coding and Rating Approach (Eyre, Fortin, 2014)
Example Pipe Condition Rating Practices - Virginia Phase I MS4 Communities and District of Columbia

Example of Spatial Distribution of Priority Pipes (based on NASSCO PACP “QuickScore” (Eyre, Fortin, 2014))
Lessons Learned

The Roadmap to accomplishing the needs for storm water asset management must seek sustainable & resilient technical solutions. This requires a commitment to:

- Innovation
- Validation
- Education
Forest Parkway Culvert Rehabilitation

“Quality Water, Quality Service”
66” existing CMP

Grouted Annular Space

Steel Tunnel Liner Plates
6 ft width x 6 ft height x 12 ft length = 432 cf
or
16 CY

8 cubic yards of concrete grout injected at point repair

43 cubic yards of concrete grout injected
EPA Grant for Developing Water Utility Infrastructure Management Best Practice
CTAM Program

Certification of Training in Asset Management
• Online Asset Management Training for Water Utility Professionals
CTAM Courses

• Exclusive Four-Part Series in Asset Management Certification:
  
• **CTAM-100** – Overview of Asset Management

• **CTAM-200** – Developing an Asset Management Program

• **CTAM-300** – Managing an Asset Management Program (Launching in April 2015)

• **CTAM-400** – Funding an Asset Management Program (Launching April 2015)
Why offer courses in Asset Management?

- To increase awareness and train utility personnel on the best way to implement and use asset management principles & practices

Levels of Certification

- **Certificate of Completion** – after the completion of each of the four courses

- **Associate Water Asset Manager (AWAM)** – requires completion of CTAM 100-400 and an application submitted to BAMI-I Asset Management Certification Board

- **Professional Water Asset Manager (PWAM)** – requires completion of CTAM 100-400, four years of relevant asset management experience and an application submitted to BAMI-I Asset Management Certification Board
CTAM Highlights

• CTAM-100 & CTAM-200 registrations have exceeded 400 from 12 countries

• Is reaching the target market
CTAM Participants: Level of Education, Job Titles

- **Doctorate**: 8, 3%
- **Masters**: 77, 24%
- **Bachelors**: 112, 34%
- **Associates**: 24, 7%
- **High School**: 30, 9%
- **No Answer**: 76, 23%

**Job Titles**

- **City/County Manager**: 72, 2%
- **Owner/President/CEO/Principal**: 16, 5%
- **Executive/VP/Sr. VP**: 10, 3%
- **Gen Mgr/Project Manager**: 101, 31%
- **Engineer/Consultant**: 130, 40%
- **CFO/Treasurer/Comptroller/Finance Director**: 1, 0%
- **Other/Blanks**: 61, 19%
- **Mayor**: 1, 0%

**Total**: 837 participants
Thanks for your attention!

Questions?

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