Asset Management for Stormwater Infrastructure
Asset Management

**Goal**

Preserve and extend service life of infrastructure assets by making data-driven decisions

1. System Inventory
2. Performance Criteria
3. Prioritization
4. Budget & Scheduling
5. Communication & Reporting
6. Repeat
Outline

- Asset Management Overview
- Inventory
  - Data needs
  - Collection methods
  - Technology tools
- Operations and Maintenance
- Illicit Discharge Detection & Elimination
- Water Quality Tracking
1. System Inventory

**Location**

**Characteristics**
- Data structure

**Condition**

Collect all data you need to answer big questions
2. Determine Needs

Goal **Pristine System**

Define level of service desired for each asset type

**LEVEL OF SERVICE**

- **Good**–No maintenance required
- **Fair**–No maintenance required, increase inspection frequency
- **Poor**–Corrective maintenance required
- **Failing**–Immediate corrective action and follow up maintenance required
## 3. Prioritize

<table>
<thead>
<tr>
<th>Condition</th>
<th>Outfalls</th>
<th>Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Containing illicit discharges</td>
<td>Discharges to nutrient impaired waters</td>
</tr>
<tr>
<td>Failing</td>
<td>A1</td>
<td>B1</td>
</tr>
<tr>
<td>Completely buried or compromised</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor</td>
<td>A2</td>
<td>B2</td>
</tr>
<tr>
<td>Significant sedimentation, erosion, or structural damage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fair</td>
<td>A3</td>
<td>B3</td>
</tr>
<tr>
<td>Minor sedimentation or erosion and good structural condition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>A4</td>
<td>B4</td>
</tr>
<tr>
<td>Recently replaced with no maintenance needs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4. Budget and Schedule

Complete backlog
- Known issues
- Routine work

Anticipate future needs
- Deterioration rates
- Sediment accumulation rates
5. Reporting

Communicate with stakeholders
- Tax/rate payers
- Municipal leadership

Transparency

Data backed decisions

Permit Compliance
6. Repeat

1. Refine inventory
2. Update needs
3. Update priorities
4. Create new budgets and schedules
5. Annual report
6. Repeat
Illicit Discharge Detection and Elimination

- Report Progress
- Rank & Prioritize Assets
- Remove Illicit Discharges
- Develop Yearly Work Plan & Budget
- Develop System Map
- Perform Field Work
System Inventory

Framework of asset management system

- Data organization
- Efficient data collection
- Simple communication through reports and dashboards
- Basis for decision making
- Data Collection and Mapping
- Summary Characteristics
- Historical Knowledge
- Emergency Response (flooding, spill prevention)

- Budgeting
- Planning
- MS4 Annual Reporting
- Querying
- Water Quality Control

- Work Orders
- CB/MH/Pipe Cleaning
- Street Sweeping
- IDDE Inspections
- BMP Inspections
- IDDE Investigations
Sample MS4 Data Structure

- Impaired Waters
- Projects
- BMPs
- CBs
- MHs
- Outfalls
- Good Housekeeping Inspections
- Network Connectivity
- Infrastructure Datalayers
- IDDE
- Related Event Tables
- Program Support Datalayers
Smart Data Structure

• Where are the assets that are in poor condition?
• Where are the catch basins that haven't been cleaned recently?
• Where are the catch basins that are full whenever we visit them?
• Where are the catch basins that we clean every year and they’re not full? Can we reduce the frequency of cleaning them?
• How much does cleaning a single catch basin cost?
• How much time does it take on average to repair an outfall or conduct sampling?
• Which catch basins discharge to impaired waters?
• Where are the outfalls with WQ samples exceeding limits?
System Inventory Options

Desktop Data Collection
- Mobile LiDAR
- Drones
- GeoReferencing Plans

Field Data Collection
System Inventory—Mobile LiDAR

Collect 1,000x data in less than 10% of the time

Accurate location and extent of road features

Desktop environment
- Accessible, safe, and cost saving

Line-of-sight collection
- Canopies, overheads, low cloud ceiling, and light rain
LiDAR Sample
System Inventory - Drones

**Locate** features outside of roadway limits

**Collect** topography of distinct areas

**Investigate** hard to access locations
Plan Georeferencing
System Inventory—Field, Web, and Desktop

Collect and update data in the field

Customize inspection forms

View maps in web browser

Edit and analyze data in desktop
System Inventory—Tools
System Inventory—Drainage System
System Inventory—MCM 6

Buildings and Facilities

Parks and Open Space

Vehicles and Equipment

Construction Sites
Condition Assessment

- Sedimentation
- Structural Damage
- Erosion
- Corrosion
- Undercutting
- Clogging
Asset Management Objectives

- Develop baseline inventory of assets within the right-of-way
- Assess Inventory
- Prepare criteria for prioritizing improvements

Inventory | Identify | Rate | Recommend

Eliminate pollutant loads to water resources
Asset Management for Good Housekeeping

**Perform Maintenance**
- BMP maintenance
- Facility maintenance
- Street sweeping
- Catch basin cleaning

**Establish and Optimize Maintenance and Operational Procedures**
- Develop SWPPs

**Develop Yearly Work Plan and Budget for Maintenance Activities**

**Report Progress**
- Amount of catch basins cleaned
- Amount of streets swept

**Develop & Update Inventory**
- Buildings and facilities
- Parks and open spaces
- Vehicles and equipment
- Stormwater system map

**Perform Condition Assessment**
- Structural conditions
- Sediment load
- Pollutant load potential
Asset Management for Good Housekeeping

SAMIS Asset Management and Inventory System

Legend
- Detention Pond Sediment
  - High
  - Moderate
  - Low
  - No Sediment
- Asset
- Collect - Storm Inlets
- Collect - Storm Open Drains
- Collect - Storm Detention Areas

Charts
- Catch Basin Condition
  - null
  - Failing: Requires Immediate Action
  - Fair: Inspect Within 1 Year
  - Good: Inspect Within 2 Years
  - Poor: Requires Maintenance

Detention Ponds Needing Cleaning
- 0

Catch Basins Needing Cleaning
- 13

Stormwater Map
- Storm Controls Valves
- Storm Manholes
- Storm Inlets
- Storm Fittings
- Stormwater Weirs
- Storm Discharge Points
- Storm System Valves
- Storm Clean Outs
Please select a feature from the map to continue.

- **Catch Basin Clean-Outs**: 68
- **Valve Flush**: 76
- **Illicit Discharge Inspections**: 14

**Graph:**

**Catch Basin Clean-Outs**

- Year: 2013 to 2017
- Values: 60 to 80
Asset Management for IDDE

**Report Progress**
- Illicit discharges removed
- Progress of system map
- Catchment investigations completed
- Volume of sewage removed
- Sampling results

**Remove Illicit Discharges**
- Identify source of discharge
- Send Notice of Violation Letter
- Confirm discharge is removed or initiate enforcement

**Illicit Discharge Detection & Elimination**

**Rank & Prioritize Assets**
- Priority rank outfalls and interconnections
- Prioritize catchment investigations based on # of SVFs

**Develop System Map**
- Inventory stormwater assets
- Identify illicit discharges
- Identify SSOs

**Develop Yearly Work Plan & Budget**
- Schedule for elimination of illicit discharges
- Schedule for outfall inspections
- Schedule for catchment investigations
- Develop budget
- Create work orders

**Perform Field Work**
- Catchment investigations
- Dry weather screening
- Wet weather screening (if necessary)
- **Condition assessment**
Asset Management for IDDE
Asset Management for Water Quality & BMPs

Report Progress
» Pollutant load(s) reduction
» Change in impervious area
» BMPs implemented

Prioritize Catchments
» Evaluate catchments for impaired waters & TMDLs
» Evaluate feasible sites for BMPs
» Calculate current pollution reduction credits

BMP Design & Implementation
» Develop potential BMPs
» Construction of BMPs
» Calculate potential pollutant reduction credits
» Conduct BMP maintenance

Develop & Revise Pollutant Reduction Plan
» Plan for TMDL catchments
» Plan for annual municipal projects

Develop Annual Budget for BMP Design and Construction

Water Quality
Benefits of Asset Management

Centralized data and document management system
  - Consistent between field and office data collection

Framework for planning and budgeting

Consistent decision making methodology

Transparent communication and buy-in

Increased efficiency to reduce costs

Simplified reporting capabilities

Integrate with other municipal department tools