

US EPA ARCHIVE DOCUMENT



CASE STUDY

City of Grand Rapids Stormwater Asset Management Program

Overview

With increasing pressure to meet water quality targets, address population growth, meet regulatory requirements, and account for the effects of climate change, municipalities have a growing obligation to manage their aging infrastructure with a limited budget and resources. Asset management planning is a popular tool in maintaining levels of service and managing infrastructure capital assets to effectively maximize the value of capital as well as minimize total cost of ownership and maintain system sustainability. The City of Grand Rapids (City) is implementing an asset management program including planning, design, construction, operation and maintenance, and stormwater quality management. The main purpose of the City's asset management program is to maintain a desired level of service at the lowest life cycle cost.

The City has developed a 20-year asset management program for the public stormwater infrastructure system. By developing this program, the City is taking a proactive long-term approach to stormwater asset management to ensure a sustainable system for the well-being of the community and environment for future generations.

Background

In water systems an "asset" is a component of the system with an independent physical and functional identity (e.g., manholes, catch basins, pump stations, outfalls).

City of Grand Rapids

By the Numbers...

Population
190,411

Area
45 Square Miles

Valuation of Stormwater System
\$528 Million

Replacement Cost of SW System
\$1.34 Billion



As part of the Green Grand Rapids planning process in 2008 – 2009, the City committed to a number of outcomes to promote the integrity of the natural environment. These include energy reduction, climate protection, improved environmental quality and natural systems, as well as smart sustainable land use, urban design, and transportation.

Through a citizen's stakeholder group facilitated by the West Michigan Environmental Action Council, the City established a multi-year three phase transformation. Voters approved an income tax increase in 2010 to fund this initiative, providing the City with the necessary investment to achieve Sustainable Asset Management without a specific stormwater fee.



As part of second phase of this initiative, the City completed a Stormwater Asset Management Plan and Capital Improvement Plan, dated May 2013, updated January 2014. The City invested approximately \$382,000 out of a Commission approved \$450,000 to complete the asset management plan which is the foundation for the stormwater infrastructure and capital program. Phase II is a 5-year projection for fiscal years 2014 through 2019 focused on sustainable asset management addressing such assets as stormwater, streets, sidewalks, and parks.

Stormwater Asset Management Program Development and Approach

The City's primary goal in developing the stormwater asset management program is to deliver a level of service at the lowest life-cycle cost to ensure quality community facilities, services and amenities. The general scope of the asset management program consists of these components:

- Assessment of existing stormwater assets.
- Evaluation of levels of service the stormwater asset will meet.
- Summary of efforts necessary to meet desired level of service.
- Develop Capital Improvement Plan to provide additional level of detail for projects and activities.

Existing geographic information system (GIS) information was utilized for the stormwater asset management plan development along with condition assessment, risk analysis, and cost information.

Assets

The City’s existing GIS for the stormwater system included components for storm sewers, pump stations, manholes, catch basins, stream crossings, detention basins, floodwall penetrations, open ditches, green infrastructure, streams, and storm discharge points. GIS was utilized as the foundation for an inventory and location of assets. The approach in defining assets included 1) Inventory with location, 2) Valuation and rating, and 3) GIS location. Table 1 summarizes the quantity and baseline costs of each of the City’s stormwater assets.

Table 1: Asset Summary and Costs

System Component	Quantity (unit)	Baseline System Value (Current Cost)	Baseline Future System Value (Replacement Cost at Failure)
Gravity Mains	2,030,660 feet	\$365,757,000	\$933,842,000
Manholes	10,748 each	\$39,051,000	\$105,349,000
Laterals	514,583 feet	\$43,065,000	\$113,942,000
Catch Basins	17,054 each	\$55,910,000	\$136,594,000
Pressurized Mains	664 feet	\$131,000	\$505,000
Siphons	339 feet	\$250,000	\$618,000
Culverts	3,600 feet	\$1,649,000	\$3,530,000
Outfalls	356 each	\$1,669,000	\$3,530,000
Open Channels	39.63 mile	NA	\$2,570,000
Ditches	72 mile	\$5,703,000	\$1,223,000
Detention Basins	5 each	\$1,725,000	\$4,614,000
Pump Stations	11 each	\$12,051,000	\$26,236,000
Green Infrastructure	13 each	\$1,842,000	\$8,451,000
Total		\$528,803,000	\$1,341,004,000

Source: City of Grand Rapids Stormwater Asset Management and Capital Improvement Plan, May 2013 updated January 27, 2014

Methodology

The City used several variables in assessing their assets including estimated effective life (EEL), remaining useful life (RUL), probability of failure (PoF), and consequence of failure (CoF).

EEL is a City-defined value based on asset type and material of construction. The City used the installation date of the asset to track the percent consumed of that particular asset; however, the EEL value may be adjusted based on available information (e.g., actual condition assessment information and preventative maintenance activities) for each individual asset. Based on the information available City software calculates the RUL and required service date for each asset. The City has completed this assessment and has prioritized rehabilitation and replacement objectives accordingly.

PoF is a City software-defined value based on an asset's age, condition, performance, and maintenance history. CoF is the financial or health and human safety cost resulting from asset failure. The mathematics of CoF software defined value is same as for the PoF. CoF factors consider proximity of assets to critical facilities (e.g., hospitals) and the proximity to other infrastructure (e.g., under roadways/buildings, near wetlands, etc.) which affects overall replacement costs in the event of an asset failure.

Level of Service

The City considers level of service as a major component of the stormwater asset management program for the quality of community facilities, services, and amenities. City level of service goals include 1) healthy natural resources (e.g., river, streams, lakes), 2) improved recreational opportunities, 3) a stronger economy, and 4) making Grand Rapids a more desirable place to live. The City has proposed four levels of services (A through D, with Level A being the highest level of service). The City calculated a cost of achieving each level of service accounting for asset replacement at the end of the EEL, street sweeping, maintenance, studies and planning projects, and NPDES regulatory and development compliance. A brief description with key elements of the four levels of service is outlined below (Source: City of Grand Rapids Stormwater Asset Management and Capital Improvement Plan, May 2013 updated January 27, 2014):

Level of Service A – Funding increases and comprehensive system inspection and preventative/corrective maintenance activities. A system renewal rate of 100 years.

- Funding would increase for operation and maintenance (O&M) to allow for the assessment of the entire collection system every 10 years performing corrective maintenance where necessary and preventative maintenance on 10 percent of all inspected assets.
- Inspection of all culverts annually, replacing or renewing the worst 10 percent.
- Inventory and inspection of approximately 6 miles each of open channels and ditches annually with funding for additional preventative maintenance and a comprehensive annual renewal program.
- Inspection of all discharge points every 3 years, with corrective maintenance to repair or replace the top 10 percent worst condition each year and preventative maintenance on 10 percent of inspected outfalls annually.
- Inspections and routine maintenance on other system assets would be increased and organized so that pertinent data is collected and stored immediately in the GIS database, with systematic testing and cleaning procedures incorporated with the site visits.
- 30 percent of all new capital spending would be directed towards green infrastructure applying distinct benchmarks for project performance in reducing runoff volumes and increasing water quality.

- Regulatory spending would be increased to allow for more involved public education and outreach programs, with City sponsored events such as watershed clean ups increased and attempt to incentivize public involvement.
- Capital spending would be based on an assumed system replacement every 100 years, with catch basins and laterals assigned a 50-year replacement cycle.

Level of Service B – Implementation of inspection and preventative/corrective maintenance activities with a more direct basis for tracking these activities. A system renewal rate of 125 years.

- Funding would increase for O&M to allow for the assessment of the entire collection system greater than 50 years old every 10 years performing corrective maintenance where necessary and preventative maintenance on 10 percent of all inspected assets.
- Inspection of 50 percent of culverts annually, replacing or renewing the worst 10 percent.
- Inventory and inspection of approximately 5 miles each of open channels and ditches annually with funding for additional preventative maintenance and a more robust annual renewal program.
- Inspection of all discharge points every 3 years, with corrective maintenance to repair or replace the top 10 percent worst condition each year and preventative maintenance on 5 percent of inspected outfalls annually.
- Inspections and routine maintenance on other system assets would be organized so that pertinent data are collected and stored in the GIS database, with periodic testing and cleaning incorporated with the site visits.
- 20 percent of all new capital spending would be directed towards green infrastructure with a goal of pursuing runoff reduction and improved water quality.
- Regulatory spending would be increased to allow for more involved public education and outreach programs.
- Capital spending would be based on an assumed system replacement every 125 years, with catch basins and laterals assigned a 75-year replacement cycle.

Level of Service C – Implementation of inspection and preventative/corrective maintenance activities to determine critical infrastructure, and identify high priority areas. A system renewal rate of 150 years.

- Funding increase for O&M to allow for the assessment of the entire collection system greater than 75 years old every 10 years. Funding also

- assumes performing corrective maintenance where necessary and preventative maintenance on 10 percent of all inspected assets.
- Inspection of 50 percent of culverts annually, along with replacing or renewing the worst 5 percent.
 - Inventory and inspection of approximately 4 miles each of open channels and ditches annually with funding for preventative maintenance, and establishing a minimal annual renewal program.
 - Inspection of all discharge points every 5 years, with corrective maintenance to repair or replace the top 10 percent worst condition each year. And preventative maintenance on 5 percent of inspected outfalls annually.
 - Inspections and routine maintenance on other system assets would be organized so that pertinent data are collected and stored in the GIS database.
 - 10 percent of all new capital spending would be directed towards green infrastructure.
 - Regulatory spending would be increased to establish a public education program.
 - Capital spending would be based on an assumed system replacement every 150 years, with catch basins and laterals assigned a 100-year replacement cycle.

Level of Service D – Existing level of service with minimum inspection and preventative/corrective maintenance activities (i.e., corrective maintenance only for the most critically failed portions of the system).

The City's Stormwater Asset Management Plan and Capital Improvement Plan focused on an overall goal to achieve Level of Service B; however, the City Commission approved over the next 5 years moving toward a Level of Service C (assumes doubling the effective life of infrastructure through rehabilitation and replacement and includes capital investment for green infrastructure practices).

Capital Improvement Projects

The City's capital improvement plan was based on Level of Service B costs, activities, and projects to meet an annual spending level. Capital Improvement Projects (CIPs) as a component of the asset management program were based on historical information, recent field investigations, and the results of asset inventory and risk assessment. The City also took into consideration, with CIP planning, the following components: capital projects initiated by other City departments, previously identified stormwater projects, and miscellaneous identified projects. By developing a proactive long-term plan to stormwater asset management, the City has situated itself to ensure the well-being of the community, environment, and future generations.

In May 2014, City voters and the City Commission overwhelmingly approved investing in the Vital Streets program which will be funded via an income tax continuation. Vital Streets is a

voter and City Commission backed initiative to include a total of 55 planned street restoration projects (roadways, sidewalks, and stormwater infrastructure). At least 84 percent of the estimated revenue (\$8.3 million) will be dedicated to the program. As part of the program the City's default for managing stormwater will be a low impact design approach to ensure meeting a Level of Service C investment by fiscal year 2022.

Stormwater Asset Management Program Barriers and Benefits

Barriers

In developing and implementing an asset management program, the City has experienced both social and economic barriers often experienced by municipalities developing stormwater asset management programs. These barriers included:

- Financial shortcomings for funding the program.
- Collaboration amongst various City departments and segments.

Through partnerships, stakeholder input, and voter approval the City has been able to establish a framework for ensuring their goals of a stormwater asset management program are achieved.

Current Program Benefits

Subsequent to City completing Phase I – Sustainable Operations of the asset management program, observed benefits have been realized. These benefits include:

- Inventory of stormwater assets (initially age-based approach).
- Estimated stormwater asset value.
- Mechanisms for managing and developing cost budgets for stormwater assets.
- Budgeting and costing of stormwater assets created a proactive versus reactive approach for future stormwater CIPs.
- Fewer community complaints.
- Open channel identification and cleaning activities.
- Improved communication among various City departments and segments.
- Collaboration with local and state entities (watershed groups and councils).

Future Steps

The City's stormwater asset management program is a continuous improvement process which will be proactively updated as additional information is available. This will ensure that goals are achieved and that the stormwater drainage system is effectively and efficiently managed and maintained into the foreseeable future. The next steps include the following:

- Continuous inventory and assessment updates inputted into GIS and other software.
- Further utilization of toolsets and mechanisms for planning, cost estimation, operation, maintenance, rehabilitation, and renewal projects.
- Additional long-term budgeting and fiscal planning.
- Transition to condition based asset management.
- Data management (remote access, attribute data, capacities).

The City has formed a Stormwater Oversight Commission to recommend policies, rules and regulations for public use of the stormwater system, report on stormwater performance, review expenditures and capital investment strategies, monitor achievement of stormwater outcomes, and make recommendations for achieving a stormwater management Level of Service C.

Collaboration

U.S. EPA has a strong interest in working with State regulators and municipalities to find solutions to encourage asset management planning for stormwater, wastewater, and drinking water systems. U.S. EPA is encouraged by the progress demonstrated by the City and hopes to work with other municipalities and regulators to achieve similar success.

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