IAFSM 2017

Performing a Desktop Analysis to Justify Funding a

SUSTAINABLE STORM WATER ASSET MANAGEMENT PROGRAM

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STORM WATER MANAGEMENT (SWM) SYSTEM CHALLENGES

- Municipal infrastructure is expensive to own, operate and maintain
- Evident by the failing assets, because each asset has a limited service life
- Insufficient revenue to repair, maintain, renew and improve
- ASCE 2013 National Infrastructure Report Card(1): cumulative grade is D+ (i.e., poor, at risk)

THE BIG QUESTION

Is the storm water management challenge as big as a house or a breadbox?

WHAT IS ASSET MANAGEMENT FOR SWM SYSTEMS? [2]

An integrated set of processes to minimize the life-cycle costs of SWM assets, at an acceptable level of risk, while continuously delivering the intended function, or Level of Service (LOS).

LOS: a qualitative measure of performance based on specific criteria. [3]

BENEFITS OF ASSET MANAGEMENT (3)

- Forces asset inventory
- Improved Process for Decision-Making (data driven decisions)
- Consistent criteria for making decisions and balancing competing interests
- Minimizes long-term costs of system operation and maintenance
- Defines acceptable levels of service
- Incorporate Sustainability goals
- Establishes roles, goals and metrics that focus and motivate the organization toward more cost-effective operation

CHALLENGES OF ASSET MANAGEMENT

If customer LOS expectations are not met because of frequent system failures or lack of adequate performance, complaints may lead to undesirable attention or regulatory action. (2)

- LOS Examples:
  - No illicit discharges
  - BMPs absorbing first 1" of runoff
  - Cleaning storm inlets annually

So, where to start?

DEVELOPING AN ASSET MANAGEMENT PROGRAM

CONVENTIONAL METHOD:

- Inventory assets
- Assign age
- Define service lives
- Perform condition assessment
- Build GIS
- Assign replacement value
- Document O&M costs
- Link GIS and database management program

VS.

DESKTOP ANALYSIS:

- An approximate method to estimate sewer system needs in the absence of a sophisticated database management program.
- Use the data and resources available

OTHER ASSET MANAGEMENT APPROACHES

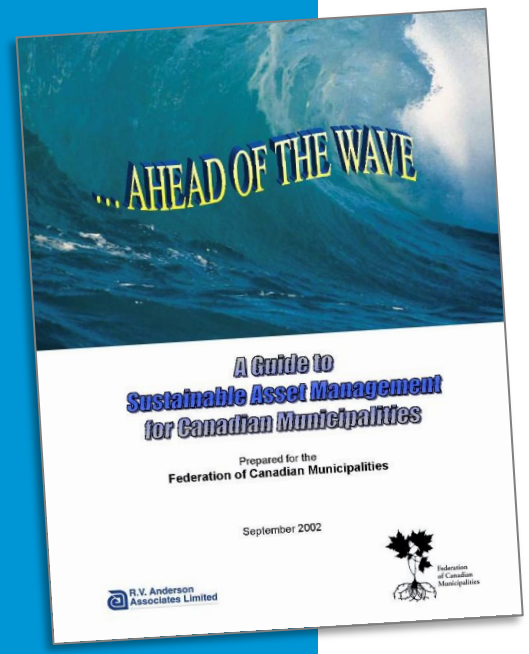
- Desktop Analysis method is very approximate (starting point)
- Asset Management Spreadsheets (basic)
- CUPSS (Check Up Program for Small Systems) by USEPA
- More sophisticated software available to implement asset management (not all inclusive):
  - AssetWorks EAM
  - Cititech
  - Cityworks
  - PubWorks

VALUE OF THE DESKTOP ANALYSIS

- Better defines the magnitude of the challenge
- Communicates annual need/cost to maintain, renew and improve the SWM assets
- Quantifies the SWM assets / identify gaps
- Helps with data collection, condition assessment, system valuation, planning and implementation
- Detailed Information = Better defined planning steps
- Can be applied to other assets: sanitary, water distribution systems, treatment plants, dams, roadways, etc.

DESKTOP ANALYSIS:

SIX STRATEGIC PLANNING STEPS



1. What do we have for assets?
2. What are the assets worth?
3. What condition are the assets in?
4. What do we need to do to the assets?
5. When do we need to take action?
6. How much will it cost?

**This is an approximation to produce a "big picture" estimate that relies on available SWM data and some basic assumptions. (4)*

CASE STUDY FOR SUSTAINABLE ASSET MANAGEMENT

Hamilton

City of Hamilton, Ontario

Population ~ 520,000

Area ~ 431 square miles

Density ~ 1,205/square mile

Length of Sewer ~ 1,553 miles

SIX STRATEGIC PLANNING STEPS (continued)

1

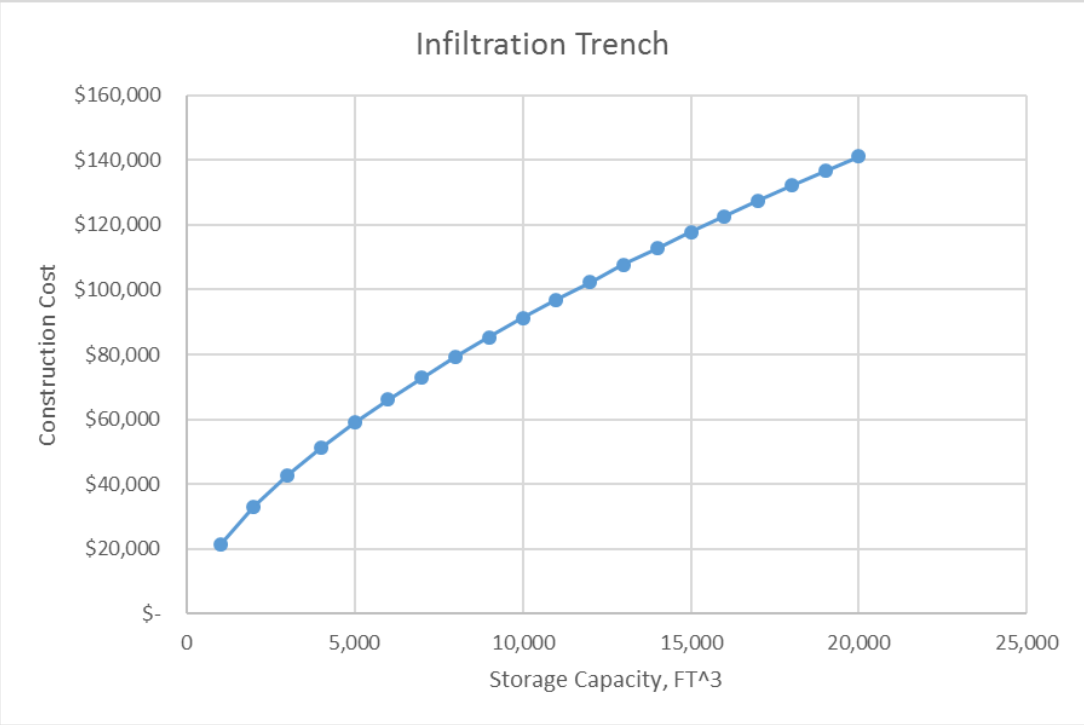
What do we have for assets and where to find it?

- Information to look for:
  - Length, size, number, age, depth, materials for sewers, manholes, inlets, pump stations, force mains, ponds, BMPs and other assets
- Sources: GIS, paper maps, construction plans, record drawings, reports, investigations and notes
- If needed, estimate pipe length and manholes using service population: 1 mile sewer serves 175 residents, 1 manhole / 300' + 2 inlets
- Import / enter into spreadsheet for tabulation and analysis

SIX STRATEGIC PLANNING STEPS (continued)

2

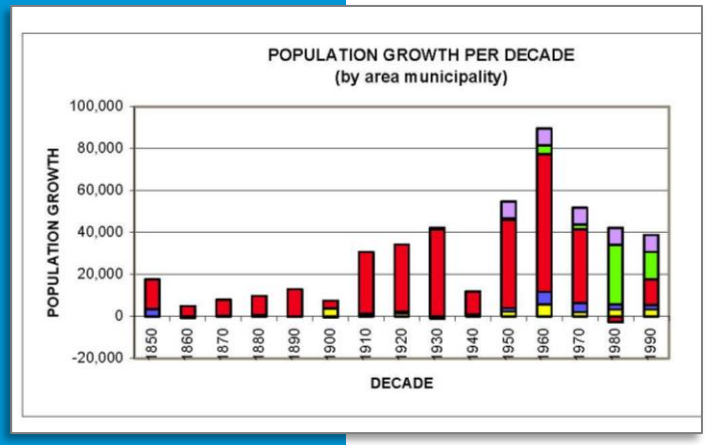
What are the assets worth?

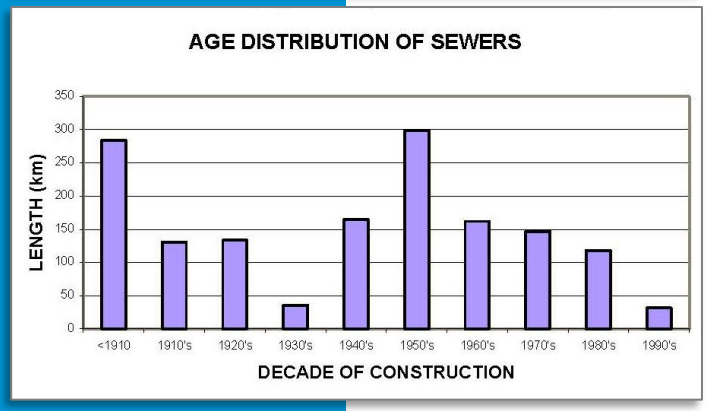


- Estimate value of replacing entire system in todays dollars
- Develop unit price summaries for replacing:
  - Sewers & culverts with new pipe based on size
  - SW pumping stations based on capacity
  - SW force mains with new pipe based on size
  - BMPs: ponds, bioswales, infiltration basins based on volume
- Include construction, engineering and contingencies

SIX STRATEGIC PLANNING STEPS (continued)

3 What are the condition of the assets?





- Characterize condition of system using age as an indicator
- Without detailed age records, use population growth from US Census Bureau per decade
- Assumption: assets built to keep pace with population growth
- Total length of sewer allocated by decade based on % of population growth
- Guideline: no brick sewers after 1910, PVC started in 1980s

SIX STRATEGIC PLANNING STEPS (continued)

4

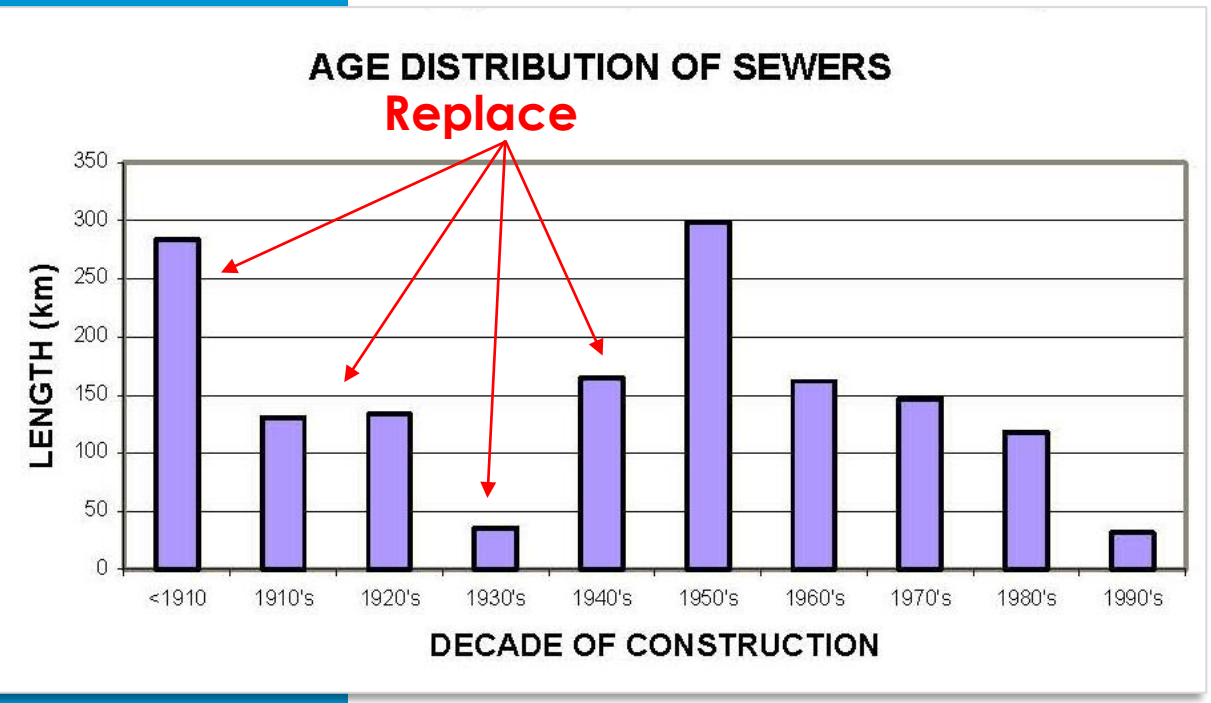
What do we need to do to the assets?

- Determine minor and major maintenance, rehabilitation and replacement costs for system
  - **Minor maintenance:** cleaning and televising the system
  - **Major maintenance:** performing point repairs – planned & unplanned
  - **Rehabilitation:** specific point in service life where asset requires renewal to extend the service life
  - **Replacement:** when asset reaches the end of service life it is replaced

SIX STRATEGIC PLANNING STEPS (continued)

5

When do we need to take action?



- Assign expected service lives
- Allocate sewer size and length for each decade of existence to assign sewer age
- Decide dividing point when sewer will be replaced vs. rehabilitated
- Totalize sewer lengths and sizes for each decade, identifying replacement or rehabilitation
- Identify desired average sewer age to maintain (e.g., 40 years)

SIX STRATEGIC PLANNING STEPS (continued)

6

How much will those actions cost?

Estimate the cost of…	Example: City of Hamilton (no historical data)
Annual Minor Maintenance (clean & TV)	Use 0.5% of value of the assets
Annual Major Maintenance (point repairs)	Use 2% of the value of assets
One-time Rehabilitate Assets (lining)	Assumed 75% of system replacement value, ¾ of service life **Circumstances may reveal different metrics needed*
One-time Replace Assets	Assumed 100% of replacement value
Combine component costs to develop an overall cost to sustain the system	

CONCEPT APPLICATION FOR SMALL SYSTEM

- Small MS4 community in need of a program to fund SWM
- Limited records available
- Must start somewhere

System Component	Storm Water System
Total Length, Miles	~8
Pipe Size Range, Inches	12 - 36
Pipe Materials	Concrete, Clay, CMP
Manholes	~130
Inlets	~215
Pumping Stations	0
Detention Ponds	14

CONCEPT APPLICATION FOR SMALL SYSTEM:

RISK SCORE CALCULATION = LoF X CoF

Decade	Pipe Age	LoF Factor
1950 –1960	58 - 67	6
1960 –1969	48 – 57	5
1970 –1979	38 – 47	4
1980 –1989	28 – 37	3
1990 –1999	18 – 27	2
2000 - 2009	0 - 17	1

Pipe Diameter	CoF Factor
Less than 8"	1
≥8" - <10"	2
≥10" - <15"	3
≥15" - <21"	4
≥21" - <30"	5
≥30"	6

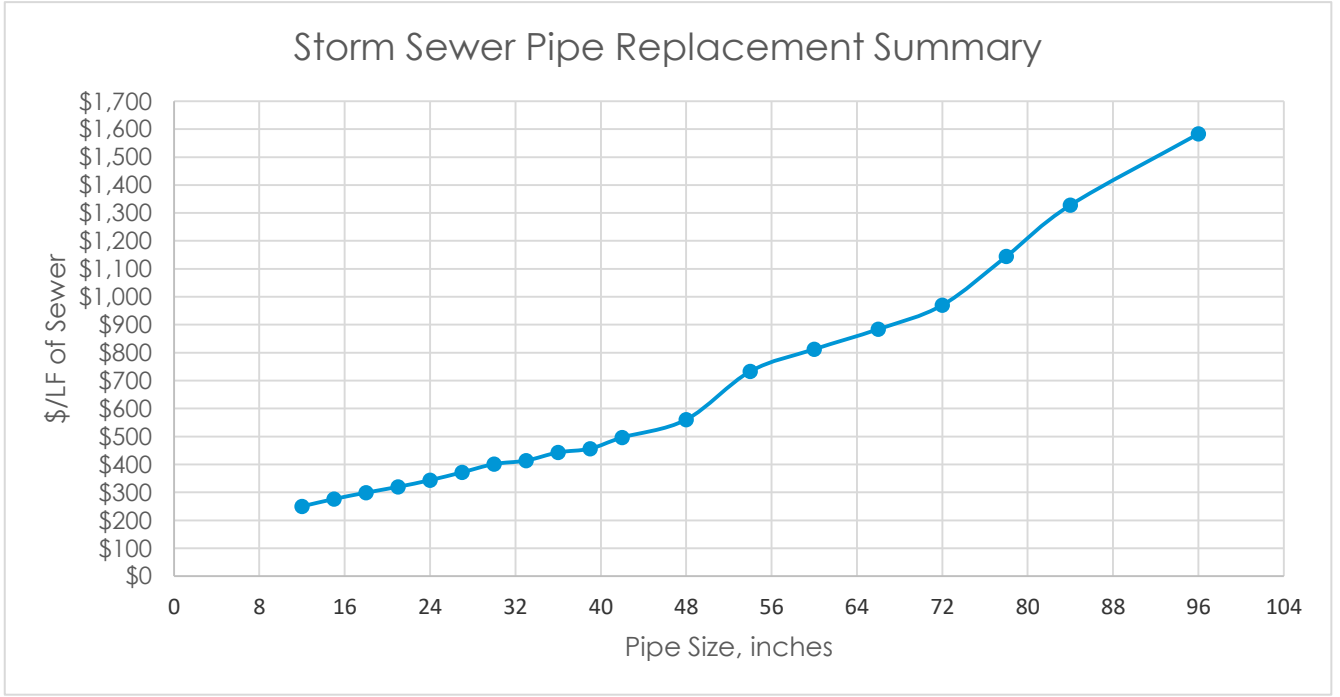
CoF Factor from National Association of Sewer Service Companies (NASSCO) [3]

Risk Score	# of Pipe Segments	Cumulative %	Action
20	13	6	Replace
16	10	11	Replace
15	8	15	Replace
12	15	23	CIPP
10	25	35	CIPP
9	3	36	CIPP
8	35	54	Defer
6	25	66	Defer
5	26	79	Defer
4	26	92	Defer
3	17	100	Defer

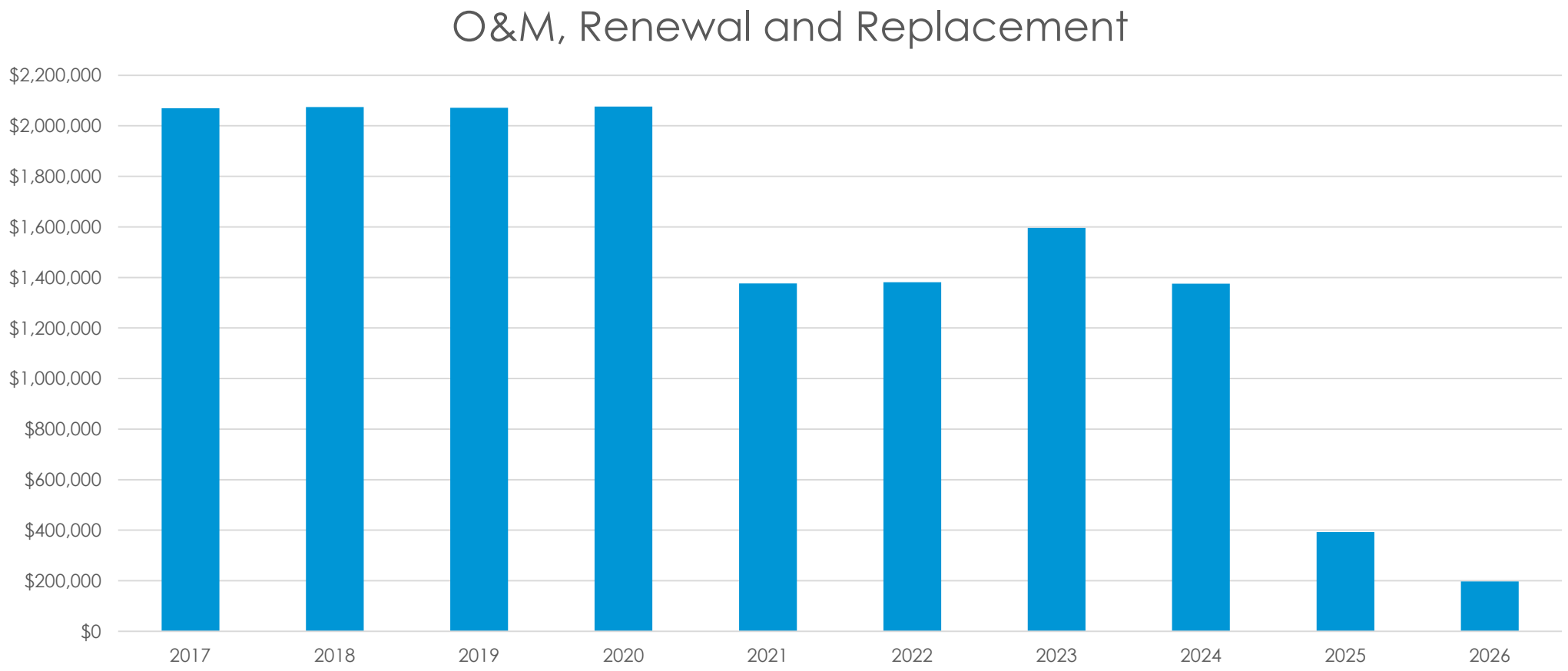
CONCEPT APPLICATION FOR SMALL SYSTEM:

ESTIMATE O&M, RENEWAL, REPLACEMENT COSTS

- Storm sewer TV & cleaning:
  - $1/LF for 8"–18",
  - 2$/LF for 21"–48",
  - 4$/LF > 48"
- Inlet & catch basin cleaning:
  - $75/each, assuming multiple
- Detention pond maintenance:
  - (e.g., weed control, embankment, outlet repairs, sediment removal) – use 0.5% of construction cost [5]



CONCEPT APPLICATION FOR SMALL SYSTEM:
ANNUAL STORM WATER COSTS



PUTTING THIS INTO PERSPECTIVE

- Relate cost of maintaining SWM system in terms that municipal leaders and the public can understand:
  - Loss of service / health & safety hazard
  - Critical facility impairment (e.g., hospital)
  - Increased repair cost (reactive)
  - Increased travel costs
  - Inconvenience / disruption
  - Business revenue loss
- We owe it to future generations to start this process, moving from reactive to proactive

IEPA / ILR40 PERMIT REQUIREMENTS

- For those with NPDES permits; SWM programs
- Six Minimum Control Measures:
  1. Public Education & Outreach on Storm Water Impacts
  2. Public Involvement / Participation
  3. Illicit Discharge Detection and Elimination
  4. Construction Site Storm Water Runoff Control
  5. **Post-Construction Storm Water Management in New Development and Redevelopment**
  6. Pollution Prevention/Good Housekeeping for Municipal Operations
- ILR40 Permit says develop long term O&M plan for facilities (control measure #5)
- Complying with the permit requires effort and data = staff, equipment and funding
- Desktop analysis is a beginning step to justify staff, equipment and funding (a SW utility?)

THANK YOU.

QUESTIONS?

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