

Tools and Software for Stormwater Asset Management

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Stormwater Asset Management and Funding



1. Develop an Asset Inventory

The asset inventory is a record of the components in your system, including their condition and the risk and consequences of failure. These records can be collected and stored using paper files, simple spreadsheets, or more specialized software. Information may come from many sources, including as-built drawings, maintenance records and contracts, GIS databases, and city parcel and tax assessor data.

Resources

- *Region 9 EFC Asset Inventory Workbook*
- *Region 9 EFC Stormwater Asset Management and Funding Guide (Coming Soon)*
- *Grand Rapids, MI, Stormwater Asset Management Report*
- *San Diego Asset Management Case Study*
- *EPA Asset Management Planning for Stormwater and Wastewater Systems (2017)*

The Steps

- 1 **Develop an Asset Inventory**
- 2 **Define Levels of Service**
- 3 **Estimate costs**
- 4 **Solicit input and listen**
- 5 **Financial capability analysis**
- 6 **Identify funding options**
- 7 **Determine funding gaps**
- 8 **Public outreach**

Software Options

- Multiple options, from free to expensive
 - Paper records
 - EFC Region 9's stormwater asset management toolkit
 - CUPSS mobile assistant & spreadsheets
 - ArcGIS Online and software suite
 - IBM's Maximo
 - InfoWorks & InfoAsset
 - Fulcrum

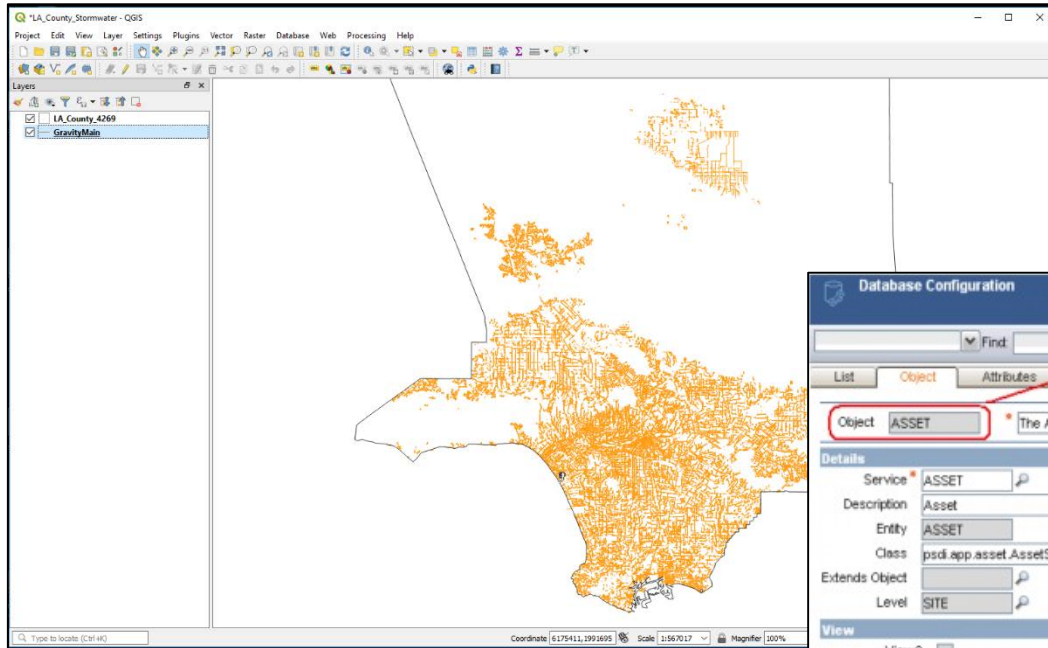
Stormwater Assets & Databases

- Some ways to categorize assets
 - Green/Grey
 - Asset Type (outlet, culvert...)
 - Location

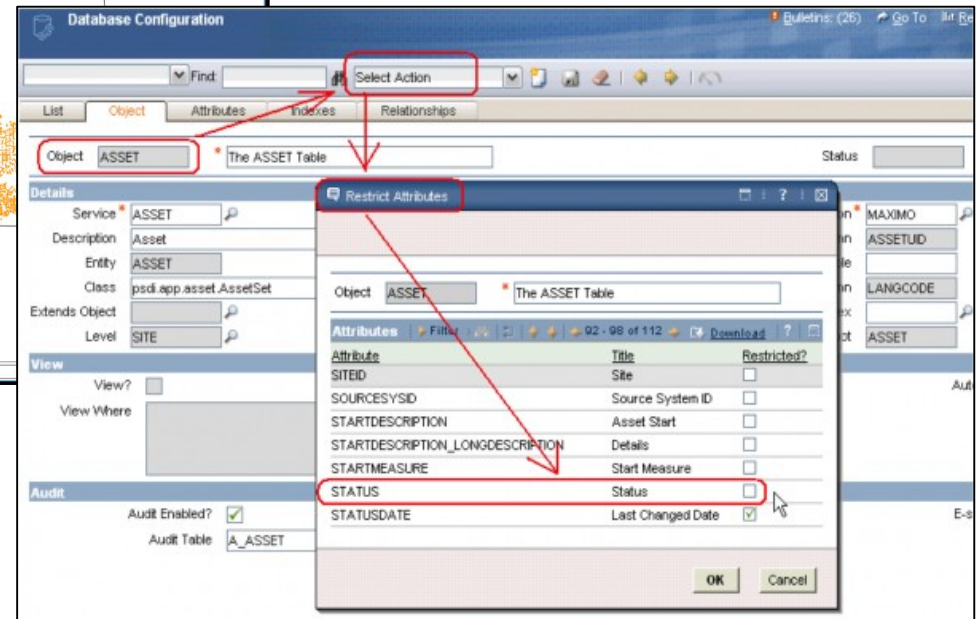
Features	Possible attributes (fields) for each asset
Asset #	Age
1	Length, depth, size
2	Location (GPS coordinates, latitude/longitude)
3	Material
...	Condition
	Cost or value
	Failure consequences
	Ownership
	Type

Storing and Using Data

Developing a
“Data Dictionary”



Mapping Storm Sewer Gravity Mains in LA County



Asset management software from IBM (2018)

An Example Asset Inventory Database

GravityMain :: Features Total: 185065, Filtered: 185065, Selected: 0

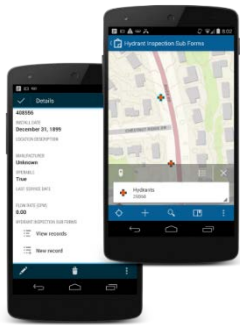
	MOD_DATE	Q_DESIGN	ASBDATE	UPDATED_BY	NAME	MAINT_BY	DIA_HGT	DWGNO	EQNUM	WIDTH	ABAND	X_SEC_SHP	MATL	SUBTYPE
1	2009-12-14	9999.000000000000	1971-02-01	HM	SYCAMORE CA...	LACFCD	168.000000000000	40-D24	F01000308	192.000000000000	No	Square or Recta...	Reinforced Con...	Standard
2	2009-12-28	9999.000000000000	1969-06-20	HM	BI 0433 U2	LACFCD	36.000000000000	275-433-D5	F01000169	0.000000000000	No	Round	Reinforced Con...	Standard
3	2009-12-28	9999.000000000000	1969-06-20	HM	BI 0433 U2	LACFCD	36.000000000000	275-433-D5	F01000169	0.000000000000	No	Round	Reinforced Con...	Standard
4	2009-12-28	9999.000000000000	1969-06-20	HM	BI 0433 U2	LACFCD	36.000000000000	275-433-D5	F01000169	0.000000000000	No	Round	Reinforced Con...	Standard
5	2009-12-28	9999.000000000000	1969-06-20	HM	BI 0433 U2	LACFCD	36.000000000000	275-433-D5	F01000169	0.000000000000	No	Round	Reinforced Con...	Standard
6	2009-12-28	9999.000000000000	1969-06-20	HM	BI 0433 U2	LACFCD	72.000000000000	275-433-D5	F01000169	0.000000000000	No	Round	Reinforced Con...	Standard
7	2009-12-28	9999.000000000000	1969-06-20	HM	BI 0433 U2	LACFCD	87.000000000000	275-433-D5	F01000169	0.000000000000	No	Round	Reinforced Con...	Standard
8	2009-12-28	9999.000000000000	1969-06-20	HM	BI 0433 U2	LACFCD	72.000000000000	275-433-D5	F01000169	0.000000000000	No	Round	Reinforced Con...	Standard
9	2009-12-28	9999.000000000000	1969-06-20	HM	BI 0433 U2	LACFCD	72.000000000000	275-433-D5	F01000169	0.000000000000	No	Round	Reinforced Con...	Standard
10	2009-12-28	9999.000000000000	1969-06-20	HM	BI 0433 U2	LACFCD	36.000000000000	275-433-D5	F01000169	0.000000000000	No	Round	Reinforced Con...	Standard
11	2009-12-28	9999.000000000000	1969-06-20	HM	BI 0433 U2	LACFCD	36.000000000000	275-433-D5	F01000169	0.000000000000	No	Round	Reinforced Con...	Standard
12	2009-12-28	9999.000000000000	1969-06-20	HM	BI 0433 U2	LACFCD	36.000000000000	275-433-D5	F01000169	0.000000000000	No	Round	Reinforced Con...	Standard
13	2010-02-25	0.000000000000	1969-11-12	MLO	PD 0896	LACFCD	24.000000000000	355-F13	F01000582	0.000000000000	No	Round	Reinforced Con...	Standard
14	2010-02-25	999.000000000000	1958-01-01	ST	MCKINLEY DRA...	LACFCD	66.000000000000	272-F1	F01003049	0.000000000000	No	Round	Reinforced Con...	Standard
15	2010-02-25	0.000000000000	1958-01-01	ST	MCKINLEY DRA...	LACFCD	102.000000000000	272-F1	F01003049	0.000000000000	No	Double Box	Reinforced Ce...	Standard
16	2009-12-28	9999.000000000000	1969-06-20	HM	BI 0433 U2	LACFCD	87.000000000000	275-433-D5	F01000169	0.000000000000	No	Round	Reinforced Con...	Standard
17	2010-02-25	999.000000000000	1958-01-01	ST	MCKINLEY DRA...	LACFCD	66.000000000000	272-F1	F01003049	0.000000000000	No	Round	Reinforced Con...	Standard
18	2010-02-25	0.000000000000	1958-01-01	ST	MCKINLEY DRA...	LACFCD	102.000000000000	272-F1	F01003049	0.000000000000	No	Double Box	Reinforced Ce...	Standard
19	2010-03-01	72.300000000000	1961-01-01	KS	PD 0263	LACFCD	33.000000000000	6-F679	F01001424	0.000000000000	No	Round	Reinforced Con...	Standard
20	2010-03-01	94.900000000000	1961-01-01	KS	PD 0263	LACFCD	42.000000000000	6-F679	F01001424	0.000000000000	No	Round	Reinforced Con...	Standard
21	2010-03-01	72.300000000000	1961-01-01	KS	PD 0263	LACFCD	42.000000000000	6-F679	F01001424	0.000000000000	No	Round	Reinforced Con...	Standard
22	2010-03-01	94.900000000000	1961-01-01	KS	PD 0263	LACFCD	42.000000000000	6-F679	F01001424	0.000000000000	No	Round	Reinforced Con...	Standard
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25	2010-03-01	150.400000000000	1961-01-01	KS	PD 0263	LACFCD	42.000000000000	6-F679	F01001424	0.000000000000	No	Round	Reinforced Con...	Standard

Show All Features

Collecting and Managing Field Data



Field Data



Database

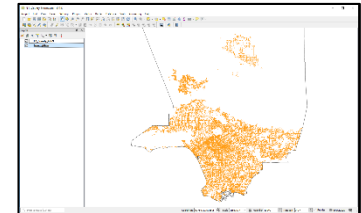


Applications

Operations
Planning

Capital
Planning

Online and
Desktop Maps



RECAP: Steps in Asset Management

❖ Develop an asset inventory

- Probability of Failure (POF)
- Consequence of Failure (COF)
- Redundancy (R)

$$\text{Risk} = \text{POF} \times \text{COF} \times \text{R}$$

❖ Define Level of Service

- Reactive
- Preventative

Stormwater Asset Management and Funding

Costs

Revenues

Collect data on stormwater system assets

Asset Inventory Workbook

Identify desired maintenance regime

Level of Service: Existing System

Permit Compliance Costs

Future Buildout Cost Estimates

Compile costs together

Total Costs Workbook

Land Use Characteristics



Average Water Costs



Household Characteristics

Rate Structure Analysis Workbook

Utility Finance Structure and Funding Gap

EFC's Open-Source Toolkit

The Asset Inventory Worksheet is a detailed spreadsheet for tracking municipal assets. It features several key sections: 'General Asset Info' with columns for Asset Category, Asset Type, Material, Length, Address, and Source; 'Character Life' with columns for Asset Age, Estimated, and Present; 'Structural Condition' with columns for Rating, Score, and Value; and 'Probability of Failure' with a POP 30 DE column. The spreadsheet includes data for various asset types like 'Sewer Main' and 'Water Main'.

Asset Inventory Worksheet

The Level-of-Service Worksheet is a spreadsheet for calculating the total cost of assets based on their condition. It is organized into sections for different asset types: 'Sewer Main', 'Water Main', 'Sanitary Sewer', and 'Stormwater'. Each section has columns for 'Asset Type', 'Condition', 'Cost Summary', and 'Total Cost'. The spreadsheet includes data for various asset types and their associated costs.

Level-of-Service Worksheet

The Rate Structure Worksheet is a spreadsheet for calculating the rate structure for stormwater programs. It includes sections for 'PROGRAM NAME', 'Rate Structure', and 'Input Variable'. The spreadsheet contains data for various programs and their associated rates. It also includes a 'TOTALS AND SUBCATEGORIES' section and a 'REVENUE & EXPENSES' section.

Rate Structure Worksheet

Toolkit to Support Financial Planning for Municipal Stormwater Programs
US EPA Region 9 Environmental Finance Center at Sacramento State
August 2018

Introduction

The EFC at Sacramento State is operated by the Office of Water Programs (OWP) at California State University, Sacramento. The EFC serves Region 9 state and local governments, tribal communities, and the private sector in the areas of financial planning and asset management. The goal of the EFC is to enable these entities to become capable of funding environmental and public health services, in the short term, and to be able to adapt to future needs as regulations, technology, and resources change.

In managing stormwater, municipalities throughout the U.S. must maintain conveyance infrastructure to mitigate urban flooding and comply with National Pollutant Discharge and Elimination System (NPDES) permits. As part of its applied research and outreach activities, the EFC developed a stormwater financing toolkit to assist communities in identifying short- and long-term municipal stormwater program expenses and developing a stormwater utility fee that may be used as (partial) revenue. The toolkit guides users in assembling costs for maintaining current assets, ensuring permit compliance, and building assets in the future. The toolkit also provides a means to record data and conduct calculations for estimating a stormwater utility rate structure, including an ability-to-pay analysis for residential property owners. The toolkit was developed as part of direct municipal assistance in the EPA Region 9 jurisdiction and has been tested in real-life planning situations for municipal stormwater.

Like most analysis and modeling efforts, data collection and integration constitutes the majority of work. Stormwater utility managers may have to update or derive from scratch system asset inventories. Unit and program cost data will need to be mined from accounting records, and property and census data will need to be assembled to estimate key factors that support utility billing systems. The toolkit and this document were developed to guide the user in not just what to do, but how to do it and where to get the necessary data.

The document is divided into the following sections:

- I. Background
- II. Assembling Program Costs and Evaluating Revenues
- III. Preview of the EFC Stormwater Financing Toolkit

Guide

Asset Inventory

General Asset Info					Effective Life							Structural Condition			Probability of Failure	
Index	Asset Category	Asset Type	Material	Length (ft)	Year of Install	Age (years)	Estimated Effective Life	Adjusted Effective Life	Percent Consumed	Weight (0-10)	Weighted Value	Rating	Score	Weight (0-10)	Weighted Value	POF (0-10)
1	Distribution	Gravity Mains	Corrugated Metal		1968	51	65	65	78%	6	4.71	3 - Fair	0.6	4	2.40	7
2	Other	Detention Basins			1872	147	50	50	100%	2	2.00	4 - Poor	0.8	8	6.40	8
3	Green	Green Street			1999	20		30	67%	8	5.33	2 - Good	0.4	2	0.80	6
4	Distribution	Culverts	Corrugated Metal		1950	69	65	70	99%	5	4.93	4 - Poor	0.8	5	4.00	9
5	Distribution	Culverts	Corrugated Metal		1986	33	65	1000	3%	10	0.33	1 - Excellent	0.2	0	0.00	0
6																
7																

Material
Age
Effective Life
Condition



Probability
of Failure

Asset Inventory

General Asset Info							Consequence of Failure					Prioritization	
Index	Asset Category	Asset Type	Material	Length (ft)	Year of Install	Age (years)	Use Single or Multi Factor COF?	Single Factor COF			Multi Factor COF (0-10)	Redundancy	Priority Score (0-100)
								Rating	Score	Weight (0-10)			
1	Distribution	Gravity Mains	Corrugated Metal		1968	51	Multi Factor				10	No	71
2	Other	Detention Basins			1872	147	Single Factor	2 - Low	0.4	10	4	No	34
3	Green	Green Street			1999	20	Single Factor	1 - Negligible	0.2	10	2	No	12
4	Distribution	Culverts	Corrugated Metal		1950	69	Multi Factor				4	No	39
5	Distribution	Culverts	Corrugated Metal		1986	33	Multi Factor				1	Yes	0
6													
7													
8													
9													
10													
11													

Location
Proximity to Infrastructure
Depth
Size
Cost



Consequence of Failure

Level of Service

Baseline LOS									
Asset Type	Inspection		Corrective Maintenance		Preventative Maintenance		Replacement		Total Cost
	Activities & Frequencies	Cost Summary	Activities & Frequencies	Cost Summary	Activities & Frequencies	Cost Summary	Activities & Frequencies	Cost Summary	
Gravity Mains	Visually Inspect 25 ft weekly; TV 25 additional 25 ft twice/month	\$ 26,452	Hydro-jet 250 ft monthly	\$ 13,476	Repair 10 ft quarterly	\$ 69,870	Replace 100 ft annually	\$ 17,064	\$ 126,862
Force Mains									\$ -
Catch Basins									\$ -
Outfalls									\$ -
Detention Basins									\$ -
Culverts									\$ -
Total		\$ 26,452		\$ 13,476		\$ 69,870		\$ 17,064	\$ 126,862
O&M (inspection, corrective and preventative maintenance)									\$ 109,798
Capital Renewal (system renewal)									\$ 17,064

For each class of assets:

Unit Cost x # Hours



Equipment + Labor + Services = **Total Cost**



Unit Cost x Asset Number/Size

Links

EPA Region 9 Environmental Finance Center:

<http://www.efc.csus.edu>

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