

# Understanding How Asset Management Works: The Steps

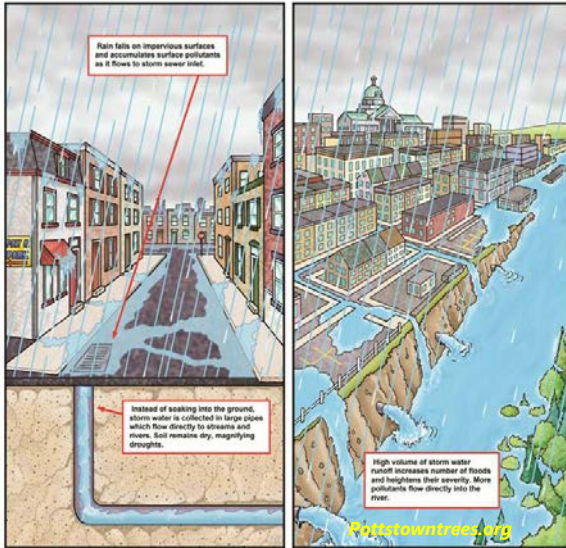
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# But First!

## Remember The Evolution of Stormwater Management?



### ❖ **Drainage**



- ❖ **Pollution Prevention**
- ❖ **Source Control**
- ❖ **Treatment BMPs**

### ❖ **A Resource for Multiple Benefits**

- Improve Water Quality
- Supplement Water Supply
- Control Flooding
- Protect Environmental Systems
- Enhance Communities

**Sustainable Communities**



- ❖ **Low Impact Development**
- ❖ **Green Infrastructure**
- ❖ **Hydromod. Management**

# Asset Management for Sustainable Communities

## ❖ Asset Management Can

- Track O&M
- Prioritize O&M Needs
- Plan for Replacements
- Estimate Costs
- Identify Funding
- Communicate
  - Intent
  - Plans
  - Progress



# The Process

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- ❖ Compile Data
- ❖ Estimate Costs
- ❖ Engage Stakeholders
- ❖ Assemble Funding



# The Steps

## 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

Today!

- 1 **Develop an Asset Inventory**
- 2 **Define Levels of Service**
- 3 **Estimate costs**
- 4 **Solicit input and listen**

Future Forum?

- 5 **Financial capability analysis**
- 6 **Identify funding options**
- 7 **Determine funding gaps**
- 8 **Public outreach**

# Step 1. Develop an Asset Inventory

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- ❖ Compile Asset Characteristics
- ❖ Evaluate Risk of Failure
- ❖ Rank Assets for Repair & Replacement

# Step 1. Develop an Asset Inventory

## ❖ Compile Asset Characteristics

- Asset Types
  - Grey infrastructure
  - Green infrastructure
  - Equipment
- Material
- Location
- Year of Install
- Estimated Effective Life
- Structural Condition
- Proximity to Key Community Features



# Step 1. Develop an Asset Inventory

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- ❖ Compile Asset Characteristics
- ❖ Evaluate Risk of Failure
- ❖ Rank Assets for Repair & Replacement



# Step 1. Develop an Asset Inventory

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## ❖ Evaluate Risk of Failure

### ➤ Probability of Failure (POF)

- Remaining life
- Structural condition

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

### ➤ Consequence of Failure (COF)

- General rating (negligible, moderate, high)
- Depth & size of asset (influences cost of replacement)
- Proximity to important community features:  
(floodplains, environmental hazards, buildings, roadways)

### ➤ Redundancy (R)

- Duplicate asset serving as back-up

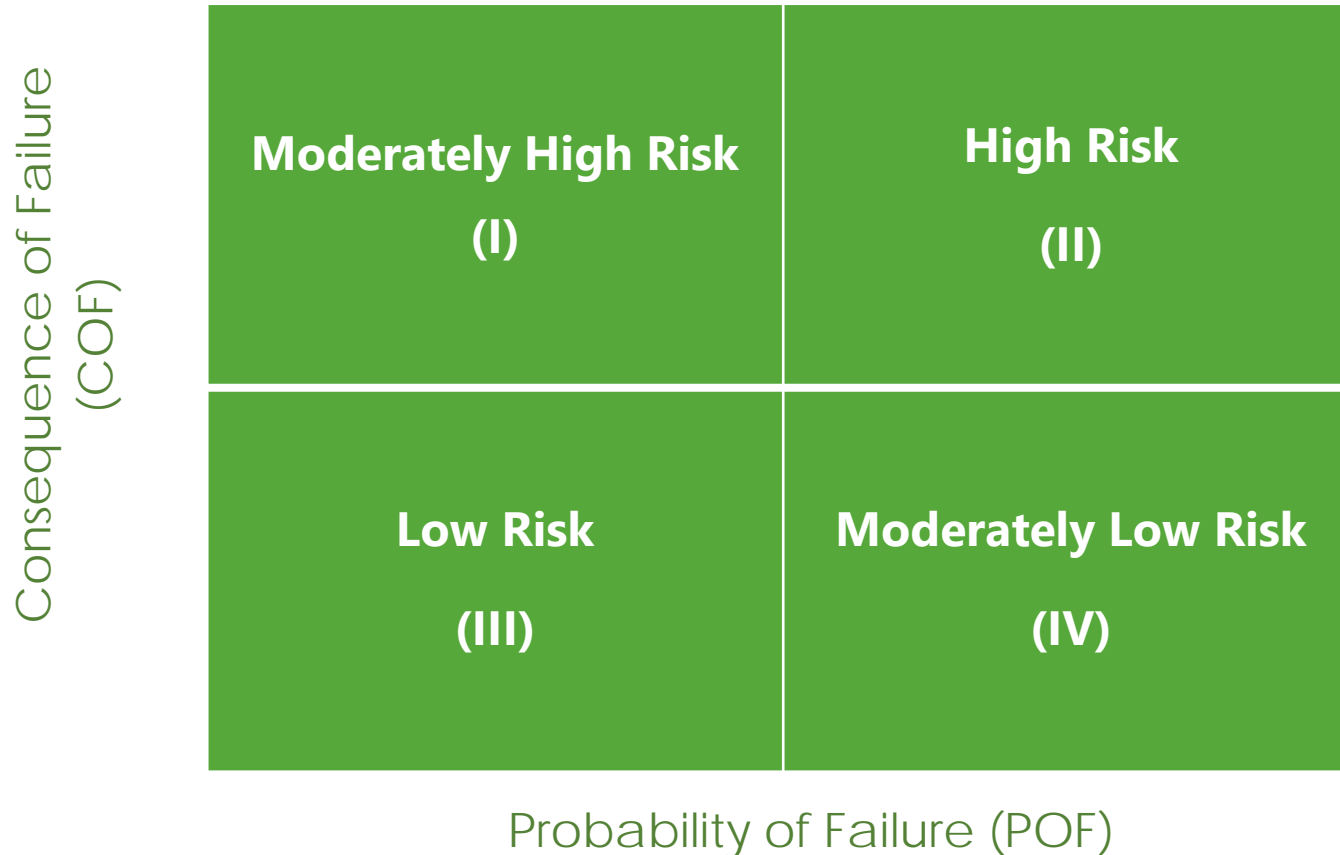
# Step 1. Develop an Asset Inventory

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- ❖ Compile Asset Characteristics
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- ❖ Rank Assets for Repair & Replacement

# Step 1. Develop an Asset Inventory

## ❖ Rank Assets for Repair & Replacement



# Step 2. Define Level(s) of Service

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## ❖ What is Level of Service?

"a measure of the quality or expected reliability that must be provided by an agency to meet a community's basic needs and expectations"

-Grand Rapids, MI 2016

"extent of O&M activities performed"

-OWP EFC at Sacramento State 2019

## ❖ Degrees of LOS

### ➤ Reactive

*Meet maintenance and repair needs as they arise*

### ➤ Preventive

*Proactively undertake system maintenance and renewal activities prior to failures*

### ➤ Mixed

*Assign some assets reactive maintenance, and others preventive*

# Step 2. Define Level(s) of Service

**Baseline level of service (Grand Rapids 2016)**

Asset	Inspection	Corrective Maintenance	Preventive Maintenance	System Renewal
Gravity Mains	---	Respond to failures and complaints for all sewer components.	---	---
Force Mains	Visual inspection every 2 weeks during pump station inspection.	---	---	---
Catch Basins	---	Clean 2,500 annually and perform corrective maintenance.	---	---
Outfalls	---	---	---	---
Detention Basins	---	---	---	---
Culverts	---	Clean debris and perform corrective maintenance.	---	---

# Step 2. Define Level(s) of Service

## Moderate level of service (Grand Rapids 2016)

Asset	Inspection	Corrective Maintenance	Preventive Maintenance	System Renewal
<b>Gravity Mains</b>	PACP <sup>1</sup> CCTV <sup>2</sup> inspect pipes greater than 75 years old over 10 years.	Replace 15% of assets that have reached end of EEL over 10 years.	Perform rehabilitation to extend EEL for 10% of inspected sewers over 10 years.	Replace every 150 years.
<b>Force Mains</b>	Visual inspection every 2 weeks during pump station inspection. PACP CCTV inspect every 15 years.	---	---	Replace every 100 years.
<b>Catch Basins</b>	Clean and inspect 25% annually (approx. 4,264). Record and monitor debris levels for cleaning	Clean 2,500 annually and perform corrective maintenance.	Replace 15% of assets that have reached end of EEL over 10 years.	Replace every 100 years.
<b>Outfalls</b>	Inspect all outfall points every 5 years per MS4 <sup>3</sup> requirements.	Replace top 10% by POF each cycle.	Stabilize bank and erosion control at 5% of assets each cycle.	Replace every 150 years.
<b>Detention Basins</b>	Complete site inspection 3 times annually including routine maintenance.	---	---	Facility renovation every 100 years. Includes regrading, seeding, renew inlet/outlet structures.
<b>Culverts</b>	CCTV/walk/inspect 50% of culverts annually.	Replace/rehabilitate top 5% by POF.	Clean 20% of all assets annually.	Replace every 150 years.

# Step 2. Define Level(s) of Service

## Advanced level of service (Grand Rapids 2016)

Asset	Inspection	Corrective Maintenance	Preventive Maintenance	System Renewal
<b>Gravity Mains</b>	PACP CCTV inspect pipes greater than 50 years old over 10-year period.	Replace 30% of assets that have reached end of EEL over 10 years.	Perform rehabilitation to extend EEL for 10% over 10 years. Clean 20% of all assets annually.	Replace every 125 years.
<b>Force Mains</b>	Visual inspection every 2 weeks during pump station inspection. PACP CCTV inspect every 10 years.	---	---	Replace every 100 years.
<b>Catch Basins</b>	Clean and inspect 35% annually (approx. 5,969). Record and monitor debris levels for cleaning	Replace 30% of assets that have reached end of EEL over 10 years.	Perform rehabilitation to extend EEL for 10% of inspected catch basins over 10 years.	Replace every 75 years.
<b>Outfalls</b>	Inspect all outfall points every 3 years to satisfy MS4 requirements.	Replace top 10% by POF each cycle.	Stabilize bank and erosion control at 10% of assets each cycle.	Replace every 125 years.
<b>Detention Basins</b>	Complete site inspection 3 times annually including routine maintenance.	---	---	Facility renovation every 75 years. Includes regrading, seeding, renew inlet/outlet structures.
<b>Culverts</b>	CCTV/walk/inspect 50% of culverts annually.	Replace/rehabilitate top 10% by POF.	---	Replace every 125 years.

## Step 3. Estimate Costs

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- ❖ O&M of existing assets
- ❖ Permit compliance activities
- ❖ Capital & O&M for future infrastructure
- ❖ Tally costs across multiple years



# Step 3. Estimate Costs

## ❖ O&M of existing assets

### Baseline LOS annual cost (Grand Rapids 2016)

Asset	Inspection	Corrective Maintenance	Preventive Maintenance	System Renewal	Total
Gravity Mains	\$0	\$200,000	\$0	\$1,537,000	\$1,737,000
Force Mains	Same as pump station inspections	\$0	\$0	\$0	\$0
Catch Basins	\$0	\$600,000	\$0	\$0	\$600,000
Outfalls	\$0	\$0	\$0	\$0	\$0
Detention Basins	\$0	\$0	\$0	\$0	\$0
Culverts	\$0	\$20,000	\$0	\$0	\$20,000
<b>Subtotal of Asset Classes</b>	<b>\$0</b>	<b>\$820,000</b>	<b>\$0</b>	<b>\$1,537,000</b>	<b>\$2,357,000</b>
O&M (inspection, corrective and preventive maintenance)					\$820,000
Capital Renewal (system renewal)					\$1,537,000
<b>Total</b>					<b>\$2,357,000</b>

# Step 3. Estimate Costs

## ❖ O&M of existing assets

### Low-moderate LOS annual cost (Grand Rapids 2016)

Asset	Inspection	Corrective Maintenance	Preventive Maintenance	System Renewal	Total
Gravity Mains	\$110,000	\$299,000	\$647,000	\$2,439,000	\$3,495,000
Force Mains	\$200			\$1,000	\$1,200
Catch Basins	\$639,000	\$24,000	\$14,000	\$560,000	\$1,237,000
Outfalls	\$28,000	\$66,000	\$1,200	\$12,000	\$107,200
Detention Basins	\$6,500			\$11,300	\$17,800
Culverts	\$9,700		\$43,000	\$11,000	\$63,700
Subtotal of asset classes	<b>\$793,400</b>	<b>\$389,000</b>	<b>\$705,200</b>	<b>\$3,034,300</b>	<b>\$4,921,900</b>
O&M (inspection, corrective and preventive maintenance)					\$1,887,600
Capital Renewal (system renewal)					\$3,034,300
<b>Total</b>					<b>\$4,921,900</b>

# Step 3. Estimate Costs

## ❖ O&M of existing assets

### Advanced LOS annual cost (Grand Rapids 2016)

Asset	Inspection	Corrective Maintenance	Preventive Maintenance	System Renewal	Total
Gravity Mains	\$482,000	\$996,000	\$3,252,000	\$8,388,000	\$13,118,000
Force Mains	\$500	\$0	\$0	\$1,800	\$2,300
Catch Basins	\$1,276,500	\$80,000	\$94,000	\$1,119,000	\$2,569,500
Outfalls	\$47,000	\$142,000	\$27,000	\$1,700	\$217,700
Detention Basins	\$6,500	\$0	\$0	\$22,500	\$29,000
Culverts	\$19,300	\$0	\$86,000	\$17,000	\$122,300
Subtotal of Asset Classes	<b>\$1,831,800</b>	<b>\$1,218,000</b>	<b>\$3,459,000</b>	<b>\$9,550,000</b>	<b>\$16,058,800</b>
O&M (inspection, corrective and preventive maintenance)					\$6,508,800
Capital Renewal (system renewal)					\$9,550,000
<b>Total</b>					<b>\$16,058,800</b>

## Step 3. Estimate Costs

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- ❖ O&M of existing assets
- ❖ Permit compliance activities
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- ❖ Tally costs across multiple years

# Step 3. Estimate Costs

## ❖ Permit Compliance Activities

- Labor & Equipment
  - MCMs
  - Water Quality Monitoring
  - Program Management



OWP at Sacramento State



LinkedIn.com



EPA Region 6, 2014 MS4 Conference

## Step 3. Estimate Costs

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- ❖ O&M of existing assets
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# Step 3. Estimate Costs

## ❖ Capitol & O&M for Future Buildout

- Projects for TMDLs, EWMPS, WMPS, SWRPs
- Infrastructure needed for future development
  - Include costs even if development fees apply
- Include inflation factors



**Legend**

- Storm Drain
- Open Channel
- Site Footprint
- Proposed Park Expansion
- Perimeter Line
- RRR Footprints

0 100 200 300 400 ft

**Site Description**

Two subsurface infiltration chambers will be considered on parcels owned by the City of South San Francisco to the west of Orange Memorial Park. Both parcels were acquired by the City of South San Francisco in 1996 and, while vacant, are included in plans for future park expansion. The first chamber (Project 1) will be located in the vacant parcel to the south of the Colma Creek channel. The second chamber (Project 2) will be located in portions of the vacant parcel to the north of the channel and the current park parcel. The Project 2 site represents the location of the future elite league baseball fields according to the Master Plan. Runoff would be diverted directly from Colma Creek and details of the diversion structures will be determined during the design phase through coordination with the San Mateo County Flood Control District. A pretreatment unit (e.g. hydrodynamic separator) will be implemented to provide trash and sediment capture. Two projects are proposed to maximize the amount of available space used for the design and to provide an option for the City of South San Francisco to implement the design in two separate phases. This would allow the City to move forward with each phase separately as funding is acquired. The Master Plan also accounts for the possible purchase of the CalWater parcels along Chestnut Avenue for future park expansion, which could be used to expand Project 2 if that land becomes available. The proposed design (both chambers) would allow for the treatment of 20% of the 85<sup>th</sup> percentile, 24-hour runoff volume (36.4 of 142.4 ac-ft) for the Colma Creek watershed. As these volumes are completely removed via storage and infiltration, this provides an equivalent 26% reduction of pollutant loads for the storm event.

**DISCLAIMER:** All elements of this conceptual design are planning level, based on desktop analysis. All assumptions and parameters must be evaluated during the detailed design process. Costs estimates are based on available data. Actual costs will vary.

**Design Criteria**

Precipitation, 85 <sup>th</sup> percentile, 24-hr storm (in)	0.83
Colma Creek Runoff Volume, 85 <sup>th</sup> percentile, 24-hr storm (ac-ft)	142.4
Colma Creek Peak Discharge, 85 <sup>th</sup> percentile, 24-hr storm (cfs)	309
Infiltration Rate (in/hr)	0.5

Project Characteristics	Project 1	Project 2
Stormwater Capture Process	Subsurface Infiltration Chamber	
Footprint (acres)	0.5	2.3
Design Height (ft)	12	12
Depth of Excavation (ft)	15	15
Pumping Requirements	Dependent on Geotechnical Investigation	
Design Volume (ac-ft)	6	27.6
24-hr Infiltration Volume (ac-ft)	0.5	2.3
<b>Total Treatment Volume (ac-ft)</b> <sup>1</sup>	<b>6.5</b>	<b>29.9</b>
<b>Percent Treated</b> <sup>2</sup>	<b>5%</b>	<b>21%</b>

<sup>1</sup> - sum of the Design Volume and 24-hr Infiltration Volume  
<sup>2</sup> - percentage the 85<sup>th</sup> percentile 24-hr storm Runoff Volume that is treated

**Example concrete infiltration chamber**

**Concept for a Multi-jurisdictional Regional Stormwater Capture Project**  
Site: Orange Memorial Park (City of South San Francisco)

## Step 3. Estimate Costs

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- ❖ O&M of existing assets
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# Step 3. Estimate Costs

## ❖ Tally All Costs Across Multiple Years

		2018	2019	2020	2021	
	Categories	Current Annual Costs	Yr 1 Costs	Yr 2 Costs	Yr 3 Costs	Yr 4
	O&M of Existing Assets	\$126,862	\$130,668	\$134,588	\$138,626	
	Permit Compliance	\$1,049,398	\$1,080,880	\$1,113,306	\$1,146,705	
	Future Buildouts	\$3,225,000	\$3,644,000	\$4,062,000	\$17,538,000	\$
	<b>TOTAL</b>	<b>\$4,401,260</b>	<b>\$4,855,548</b>	<b>\$5,309,894</b>	<b>\$18,823,331</b>	<b>\$</b>
	Yr 2 costs and beyond are based on assumed inflation factor:			3%		
	Assumes Current year is:		2018			

# Step 4. Solicit Input and Listen

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## The Steps

- 1 **Develop an Asset Inventory**
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Review and Refine these  
Decisions and Assumptions

Opportunities!

Prepare to Evaluate Funding  
Needs and Options



# What's Next?

❖ Feeling Like Don Music?

❖ Its OK! More to come:

- Case studies
- Tool examples
- Cost resources
- Practice problem



It's like beginning yoga:  
The steps are simple, but not easy.

Getting started is the hardest part...

# Links

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EPA Region 9 Environmental Finance Center:

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

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