



Smart Management for
Small Water Systems

Long-Term Capital Planning

Columbia, South Carolina
Thursday, May 12, 2016

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cooperative agreement with EPA.



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Uh oh! How Do You Pay for This?



Emergency
repair

vs.

Preventative
rehab./
replacement
(capital
planning)



Session Objectives

- Learn about two aspects of long-term system planning: asset management and capital planning
- Figure out how to pay for the future needs



In the Old Days...

- Water systems took advantage of the federal government's ambitious construction grants program of the 1970s and 1980s
- Everybody loved their “free” money



Capital Finance Today

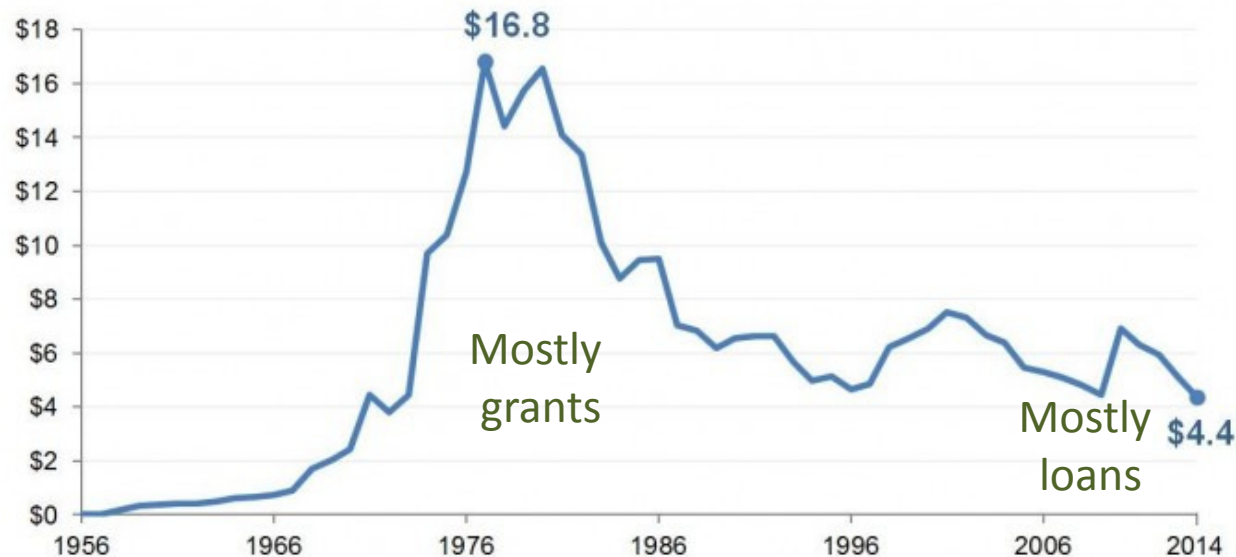
- The money never really was “free”—it came from tax dollars
- Today, the financial burden has been shifted away from federal and state tax dollars (grants) to funds raised by the water system itself (customer sales and loans). For example...



Federal funding has declined

Federal spending on water and wastewater utility infrastructure decreased in the 1980s and after 2000

Reported in billions of 2014 dollars



Source: Congressional Budget Office (March 2015), Public Spending on Transportation and Water Infrastructure, 1956 to 2014.

<http://efc.web.unc.edu/2015/05/14/federal-funding-trends-for-water-and-wastewater/>



Capital Finance Today

- In other words, you pay (no sense in sugar-coating this)
- The harsh reality is that water and wastewater infrastructure is expensive, regardless of the size of your system. Smaller or poorer systems will likely have a hard time paying for capital improvements



Two Related Concepts:

Asset Management & Capital Planning



Mike Daly, White Cliffs, NM **Video Profile**



Asset Management
Helps You Have the
Most Impact in Your
System By Spending
Your Limited Dollars in
the Best Way Possible



What you want to do....

Replace all
the assets

New tank
New pipe
New pump
New filter





\$5 Million

**Elected Officials/
Decision-Makers Say No**





Second Choice: \$3 M

Replace

Some of the

Assets



**Elected Officials/
Decision-Makers Still Say No**

W Pump





Now What?

Repair and Rehabilitate





Rehab Option: \$1 M

Rehab
Assets



Reduced
risk almost
as low as
new assets
for 1/5 the
cost



What does this type of analysis take?

- Nothing more than following a systematic approach for managing the assets
- 5 core components of Asset Management



Five Core Components of AM



Current State of the Assets



Level of Service



Criticality



Life Cycle Costing

Long-Term Funding





Current State of the Assets

- What do I own?
- Where are the assets?
- What condition are they in?
- How much useful life is remaining?
- What is the replacement value?



Example of an Asset Inventory

Asset Inventory

ID Number	Category	Type	Size	Manufacturer	Serial Number	Location	Installation Date	Condition	Energy user Y/N (if Yes, see Energy Inventory)	Comments



Example System Inventory Worksheet						
Date Worksheet Completed/Updated: 8/14/02						
Asset	Expected Useful Life	Condition	Service History	Adjusted Useful Life	Age	Remaining Useful Life
Well 1 (1993)	30	Good		30	9	21
Well 1 pump	10	Good	Rehab (1996)	10	9	1
Well 2 (1993)	30	Good		30	9	21
Well 2 pump	10	Good	Rehab (1998)	10	9	1
Pumphouse (1993)	30	Good		30	9	21
Electrical components	10	Some corrosion	Rehab (1994)	10	9	1
Chlorinator (1993)	10	Good	Rehab (1998)	5	3	2
Storage tank 1 (1993)	40	Good	Rehab (2000) - \$17,000	40	9	31
Storage tank 2 (1993)	40	Good	Rehab (2000) - \$17,000	40	9	31
Storage tank 3 (2000)	40	Almost new		40	2	38
Distribution System:						
Hydrants (15)	40	Unknown		40	9	11
Valves (45)	40	Unknown	6 valves don't work	40	9	11
6-inch (PVC)	60	Unknown		60	9	51
4-inch (PVC)	60	Unknown		60	9	51
2-inch (PVC)	60	Unknown	Repair breaks (2/year)	60	9	51



Taking Stock of Your Water System

A Simple Asset Inventory for Very Small Drinking Water Systems



http://www.epa.gov/safewater/smallsystems/pdfs/final_asset_inventory_for_small_systems.pdf



www.efc.sog.unc.edu

How Long Will it Last?

Typical Life Expectancies of Water System Equipment

Component	Worksheet	Useful Life
Wells and Springs	Drinking Water Source	25 years
Intake Structures		35 years
Pumping Equipment		10 years
Disinfection Equipment	Treatment System	5 years
Hydropneumatic Tanks	Tanks	10 years
Concrete and Metal Storage Tanks		30 years
Transmission Structures (Pipes)	Distribution System	35 years
Valves	Valves	35 years
Mechanical Valves		15 years
Computer Equipment/Software	Electrical Systems	5 years
Transformers/Switchgears/Wiring		20 years
Motor Controls/Variable Frequency Drives		10 years
Sensors		7 years
Buildings	Buildings	30 years
Service Lines	Service Lines	30 years
Hydrants	Hydrants	40 years

Note: These expected useful lives are drawn from a variety of sources. The estimates assume that assets have been properly maintained. The adjusted useful life of an asset will be equal to or less than typical useful life.

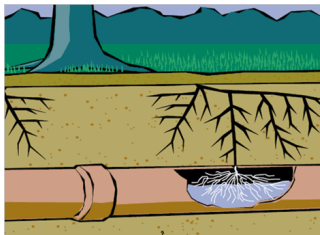


Asset Criticality – Part 1

What is the probability or **likelihood** that a given asset will fail?

How do my assets fail?

What's the condition of my assets?





Asset Criticality – Part 2

What is the **consequence** if the asset does fail?

What is the cost of the repair?

Are there legal consequences,
environmental consequences,
social consequences?

Are there redundant assets?



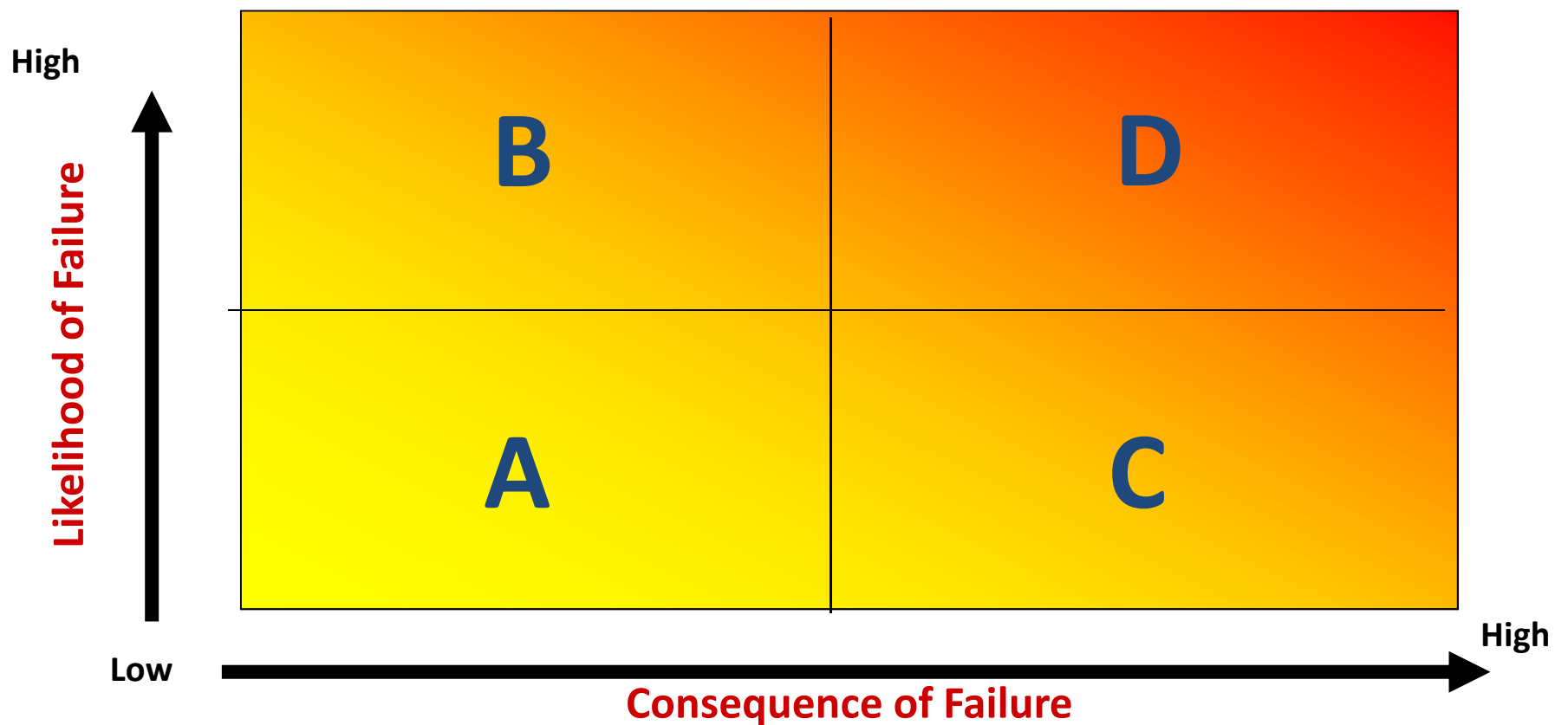


Group Exercise: Assess the condition and criticality of the following assets

- Based on description of the asset, give your opinion on its condition, thinking about how likely/soon the asset might fail
- Give your opinion on its importance, thinking about consequence or cost if failure occurs
- Mark on the handout where you would place that asset



Place the Assets on the Risk Analysis Chart





Asset 1: Elevated Storage Tank

- The only storage tank in small groundwater system.
- Installed in 1985. Inspected, sand blasted and repainted in 2002.
- Annual visual inspection shows no observable problems. No structural issues noted.
- Don't know how long it will last.
- Many customers complaining of low pressure.
- Possible to pump water directly to customers but would have problems meeting peak demands and will have no fire flow



Asset 2: Well Pump #1

- 1 of 2 well pumps. Each can supply entire system, but system uses this pump more frequently (the second pump is less reliable).
- Pump located in the well.
- Installed in 1992. No major rehab work since then.
- Manufacturer expects pump to last 25 years.
- Operating within design specifications but is not as efficient as it used to be. Operator not noticing any other visible or audible problems. Routine maintenance is being performed.



Asset 3: Water Main on Elm St.

- Main serving half of the system's customers.
- No record of when it was installed. Homes in that area were built in the 1950s.
- Operator and owner cannot recall any major rehab or replacement work since they took over in the 1990s.
- Had 5 breaks in the past 2 years, and numerous leaks.

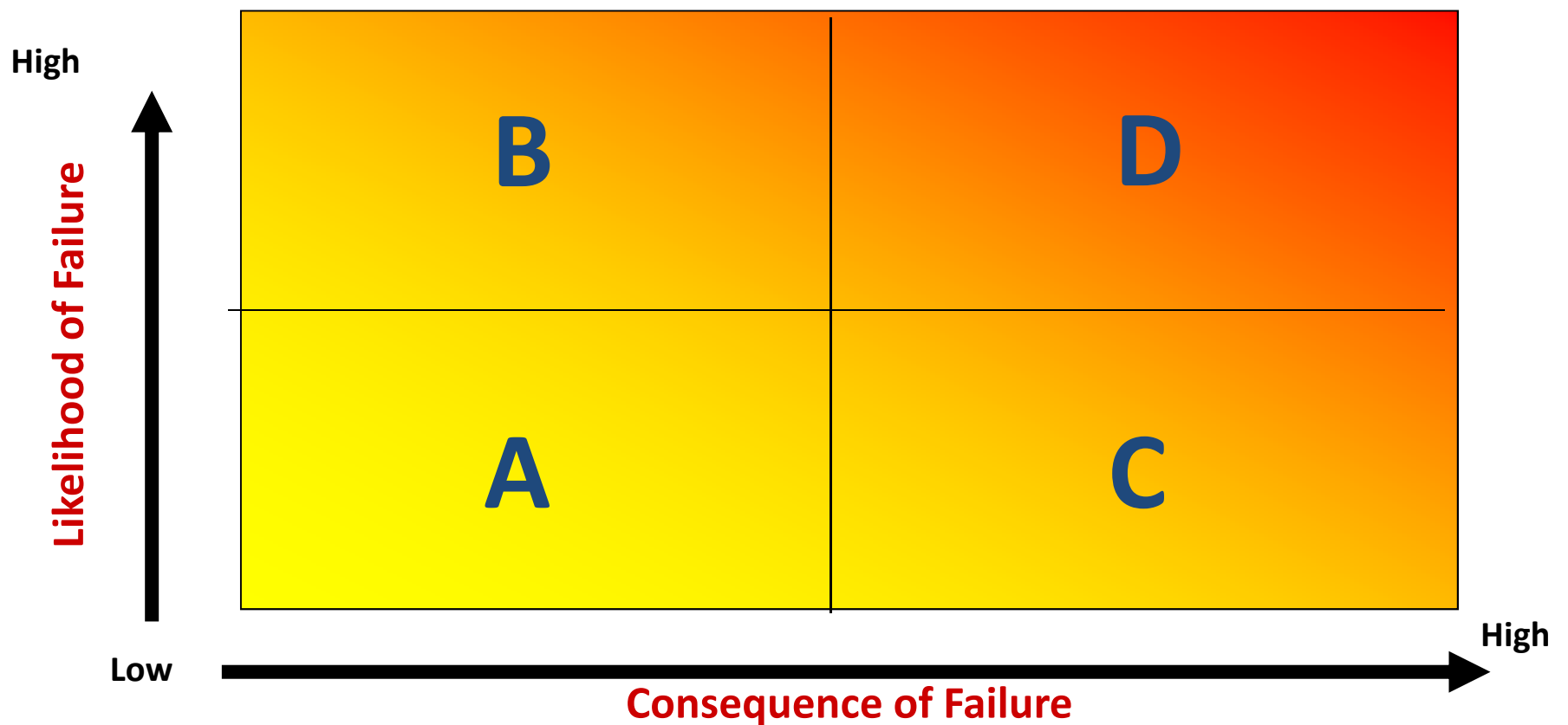


Asset 4: Your Choice!

- Pick any asset from YOUR water system. Describe it to the group and decide on an appropriate condition and criticality score.

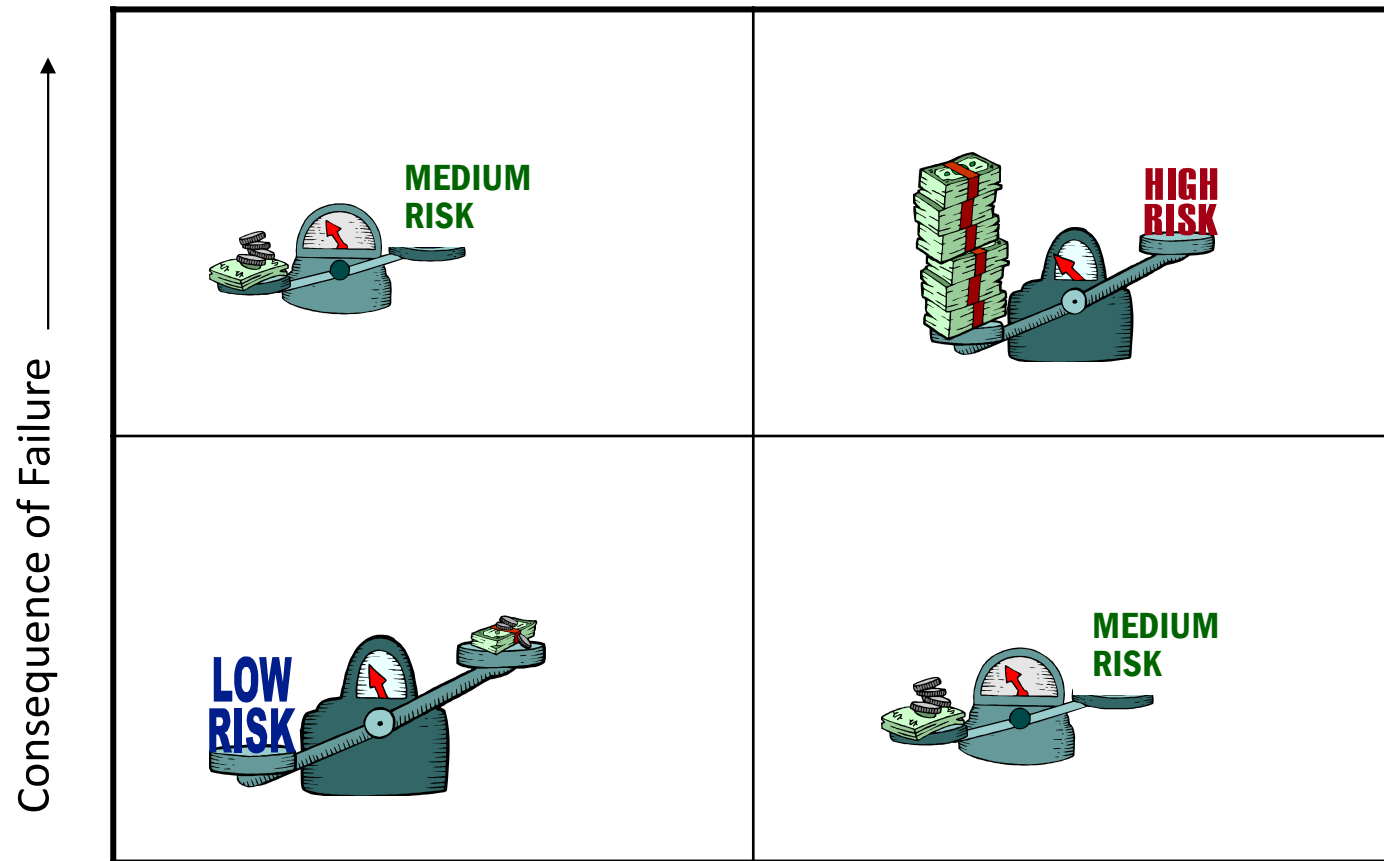


Place the Assets on the Risk Analysis Chart





Asset Criticality

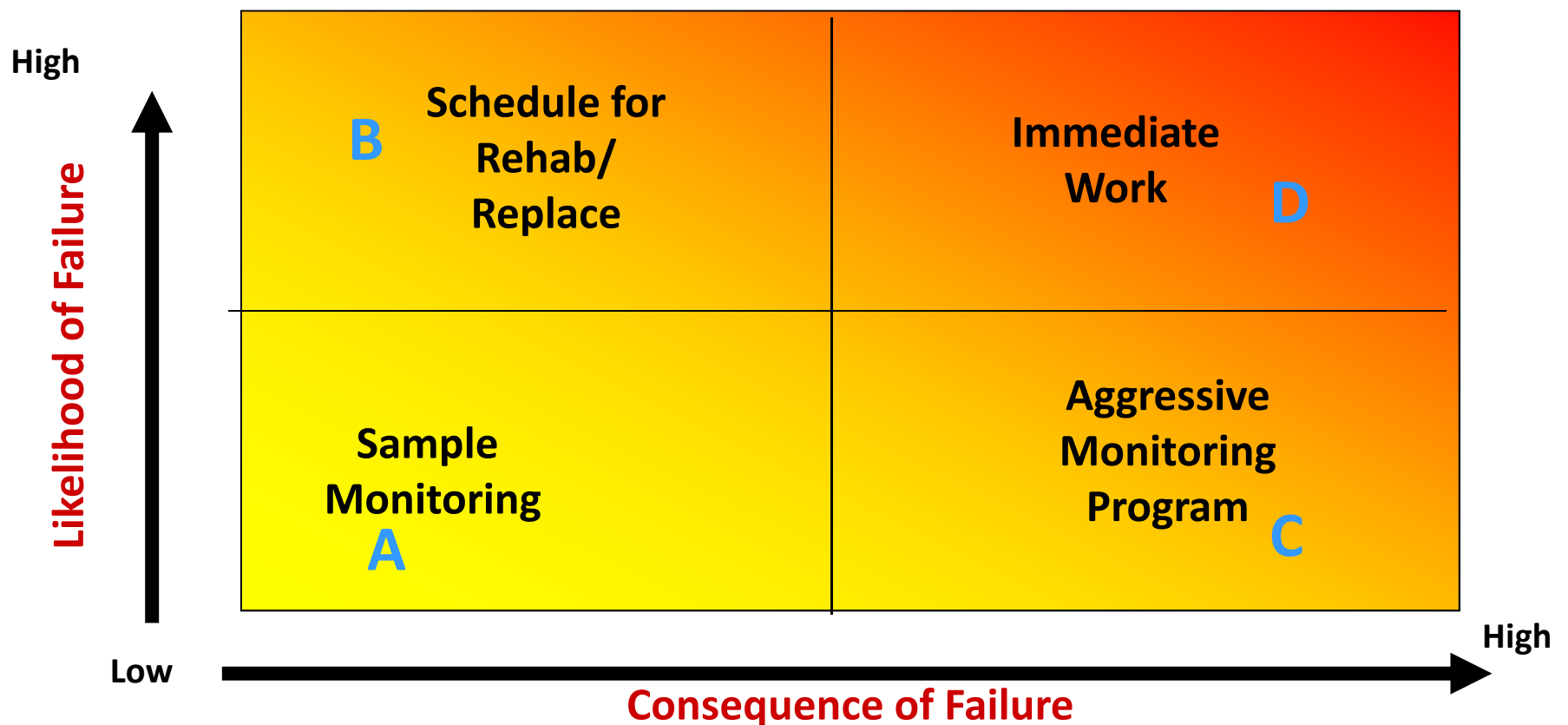


Which category of assets do I care the most about? The least?

Probability of Failure →



Risk of Failure Should Drive the Program





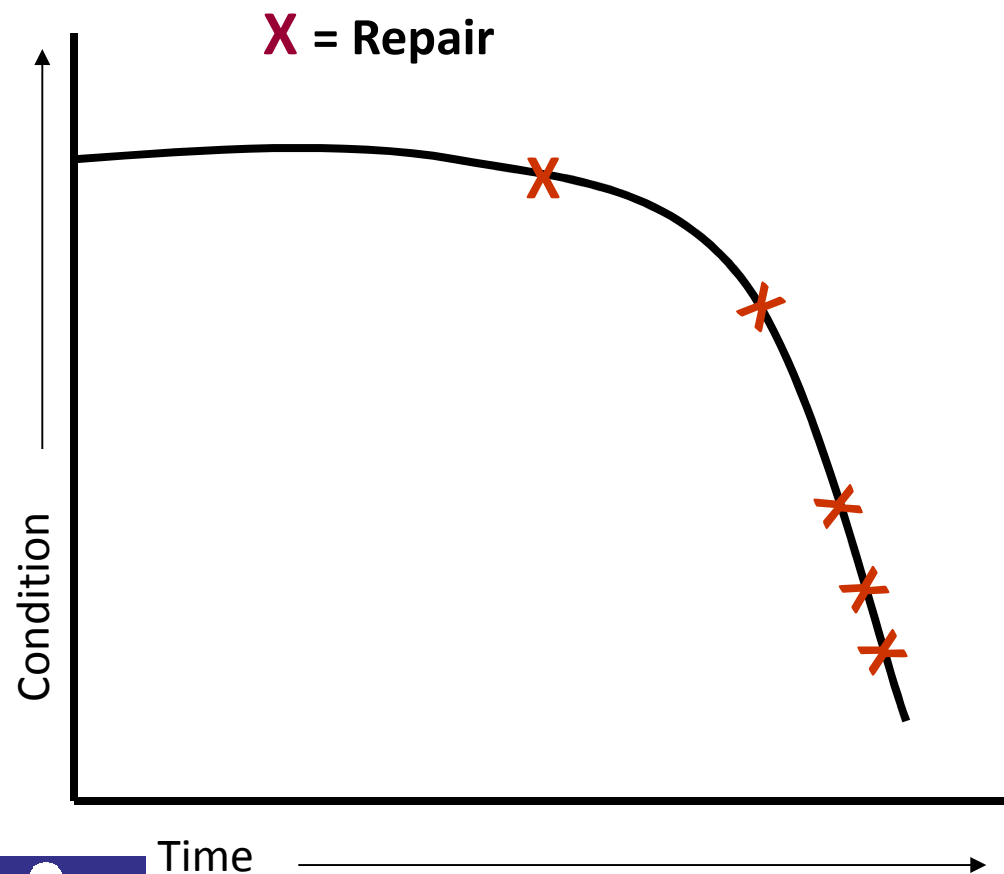
Prioritize Asset Rehab. / Replacement

EXAMPLE Prioritization Worksheet				
Date Worksheet Completed/Updated: 8/14/02				
Asset	Remaining Useful Life	Importance	Redundancy	Priority (1 is high)
Well 1 (1993)	21	Needed for service	Other well, but need backup	6
Well 1 pump	1	Needed for service	Other well, but need backup	3
Well 2 (1993)	21	Needed for service	Other well, but need backup	6
Well 2 pump	1	Needed for service	Other well, but need backup	3
Pumphouse (1993)	21	Needed for service	Other well, but need backup	6
Electrical components	1	Needed for control	No redundancy - corrosion	2
Chlorinator (1993)	2	Mandatory	No redundancy - need backup	1
Storage tank 1 (1993)	31	Need for fire flow and demand	Other tanks	6
Storage tank 2 (1993)	31	Need for fire flow and demand	Other tanks	6
Storage tank 3 (2000)	38	Need for fire flow and demand	Other tanks	6
Distribution System:				
Hydrants (15)	11	Needed for public safety	Other hydrants	5
Valves (45)	11	Needed for isolation	Other valves, but some are out of service	4
6-inch (PVC)	51	Needed for delivery	No redundancy	6
4-inch (PVC)	51	Needed for delivery	No redundancy	6
2-inch (PVC)	51	Needed for delivery	No redundancy	6

Source: EPA's "Asset Management: A Handbook for Small Systems"



Life Cycle Costing: Replacement of Assets



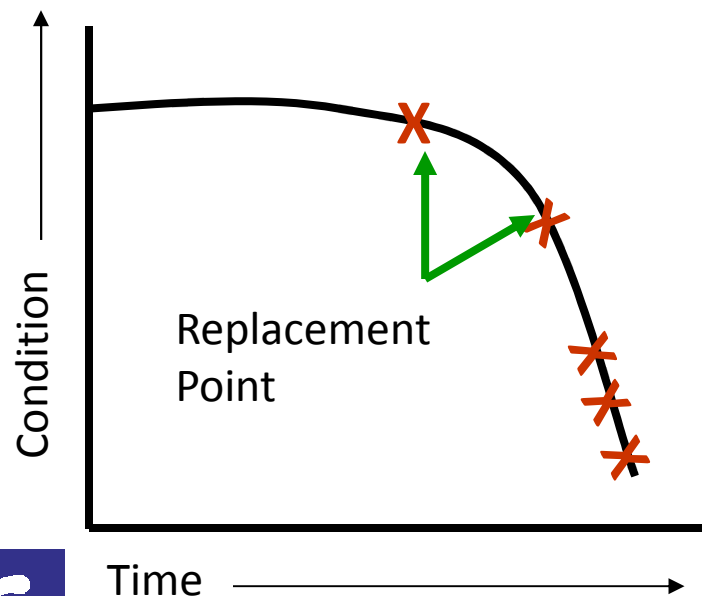
As asset ages, condition will deteriorate more rapidly, and require more (and more expensive) repairs.

So when do you replace that asset?

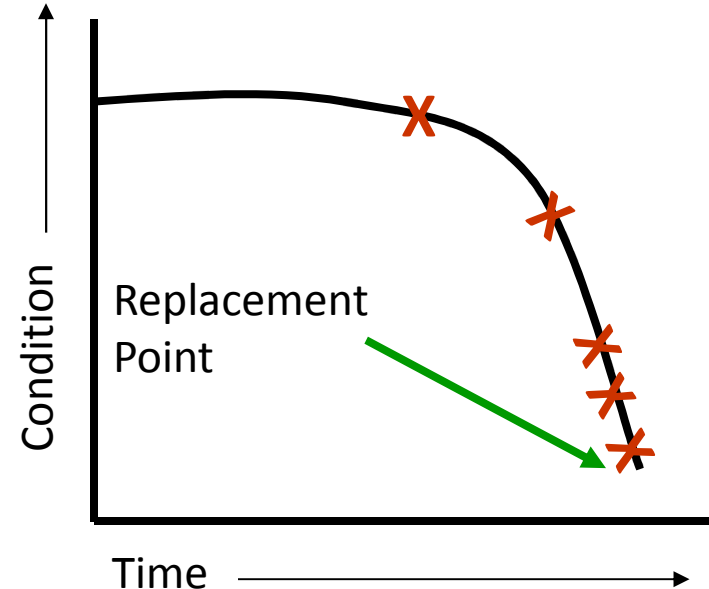


Life Cycle Costing & Risk

High risk assets:
replace assets early,
before failure



Low risk assets: run
to failure and replace
afterwards





Long Term Funding

- This is where capital planning comes in
- Once you figure out how to get the longest life out of your assets, plan to have the money you need to replace them when necessary



Comments from a Few Practitioners



Jim Smith, City of Louisville, KY



Shawn McLean, City of Somersworth, NH



Capital Improvement Plan

- This is strongly related to asset management
- An official multi-year document that identifies and prioritizes capital projects, identifies funding sources, and sets timelines



Capital Improvement Program

- Identify regulatory deficiencies (discuss with regulatory agencies, look at proposed regulations, talk to consultants), in a 10-20 year window
- Identify growth needs, expansion



Capital Improvement Program

- Identify deferred maintenance problems or where current service is inadequate
- Prioritize based on need realizing that “hidden” infrastructure tends to be ignored



Capital Improvement Program - Timelines

- Use **Asset Management Plan** to plan for infrastructure rehabilitation and replacements in the long term (20+ years)



Capital Improvement Program - Timelines

- Create a **Capital Improvement Plan** with a narrower timeline (~5 years) in more detail. Specify the projects and accurate estimates of cost. Plan where money will come from.



Capital Improvement Program - Timelines

- Create a **Capital Improvement Budget** with an even narrower timeline (1 – 2 years) committing funds for the planned capital projects. Get it approved/adopted.



Example Capital Improvement Plan (CIP)

Project Name	Planning Years (Values in 000s)					Future	Total
	FY 02	FY 03	FY 04	FY 05	FY 06		
Water Supply & Treatment							
Water Treatment Objective							
Lime pumps and slakers	740						740
Chemical Enclosures		500					500
Filter 7-18 Control			330				330
Filter Gallery Rehab	1,140						1,140
High Service Pumps		1,500					1,500
Upgrade or Replace Reclaim System Drier	200						200
New Membrane Skids				5,700			5,700
Sodium Hypochlorite Plant	2,000						2,000
Additional Storage Tanks					5,000	3,300	8,300
Repair R/O Capacity		150					150
Filter Gallery Mech Parts	300						300
MMIS						150	150
VFDs - HSP		344					344
Membrane Replacement		1,600					1,600
Painting of Water Plant						3,000	3,000
Phase II Emergency Power Generator						1,500	1,500
Portable Generator - South Well Field				150			150
Replacement of Fuel Tanks			170				170
Upgrade of Existing Control System @ WTP						580	580
Water Treatment Total	4,380	4,094	500	5,850	5,000	8,530	28,354



Where Can You Find the Prices?

- Call a vendor. Actually, call a few.
- Ask other systems
- Look at past expenses but adjust for increases in costs



Measures of Inflation

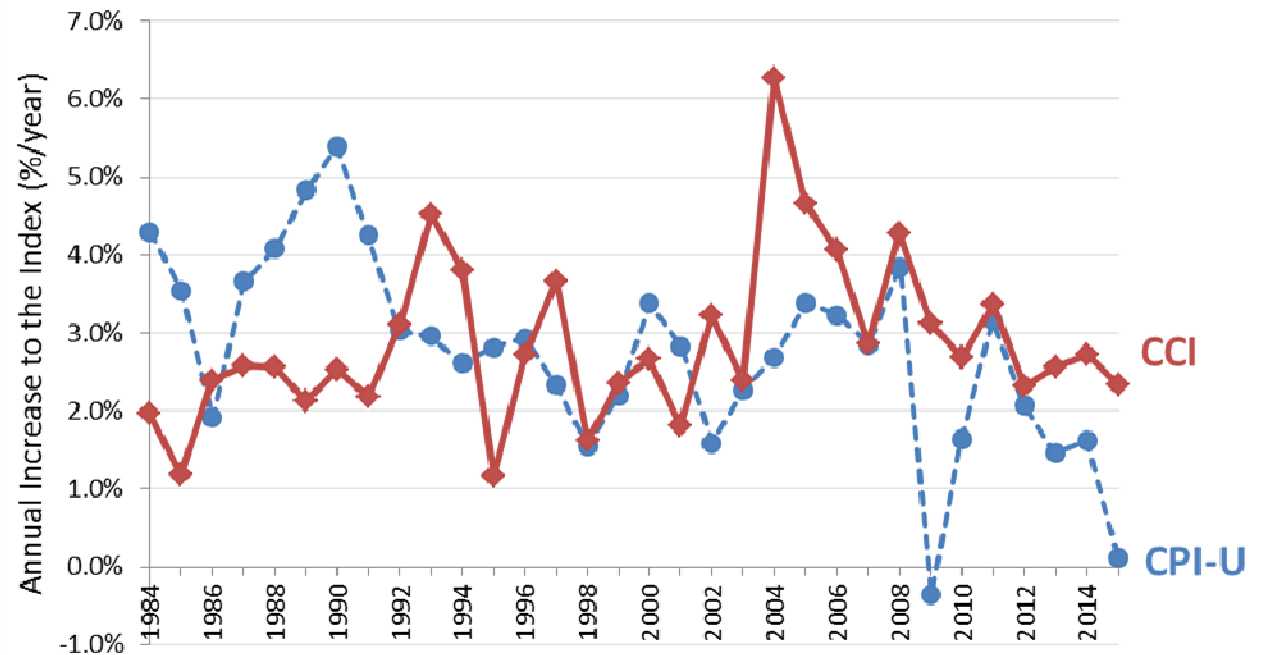
- **Consumer Price Index (CPI)**—measure of the average change over time in the prices paid by urban consumers for a market basket of consumer goods and services
- **Construction Cost Index (CCI)**—average prices for labor and key construction materials from 20 cities across the United States



The Construction Cost Index (CCI) has been rising faster than the Consumer Price Index-Urban (CPI-U) in recent years

CCI rises averaged 2.7%/year since 2010, compared to 1.7%/year for CPI-U

- Instead of looking at Consumer Price Index, look at **Construction Cost Index (CCI)**.
- ~2.75%/year.



Data analyzed by the Environmental Finance Center at the University of North Carolina, Chapel Hill.
Data Sources: Bureau of Labor Statistics, Engineering News-Record ENR.com, InflationData.com, USDA Natural Resources Conservation Services.

<http://efc.web.unc.edu/2012/09/26/using-an-index-to-help-project-capital-costs-into-the-future/>



Drive Down the CIP Cost

- Is it possible to
 - Eliminate projects?
 - Defer projects?
 - Repair or refurbish instead of replace?
 - Find a non-asset solution?
 - Find collaboration/partnerships alternatives with neighboring systems?
 - Improve balance of cash vs. debt-financed?
- Re-evaluate water demands of your customers. Many systems are now noticing that *total* demand is *decreasing* over time.



Capital Finance: Ways to Pay

- Pay as you go (current receipts)
- Save in advance and pay (fund balance, capital reserve fund)
- Pay later (someone loans you money)
- Grants (let someone else pay)

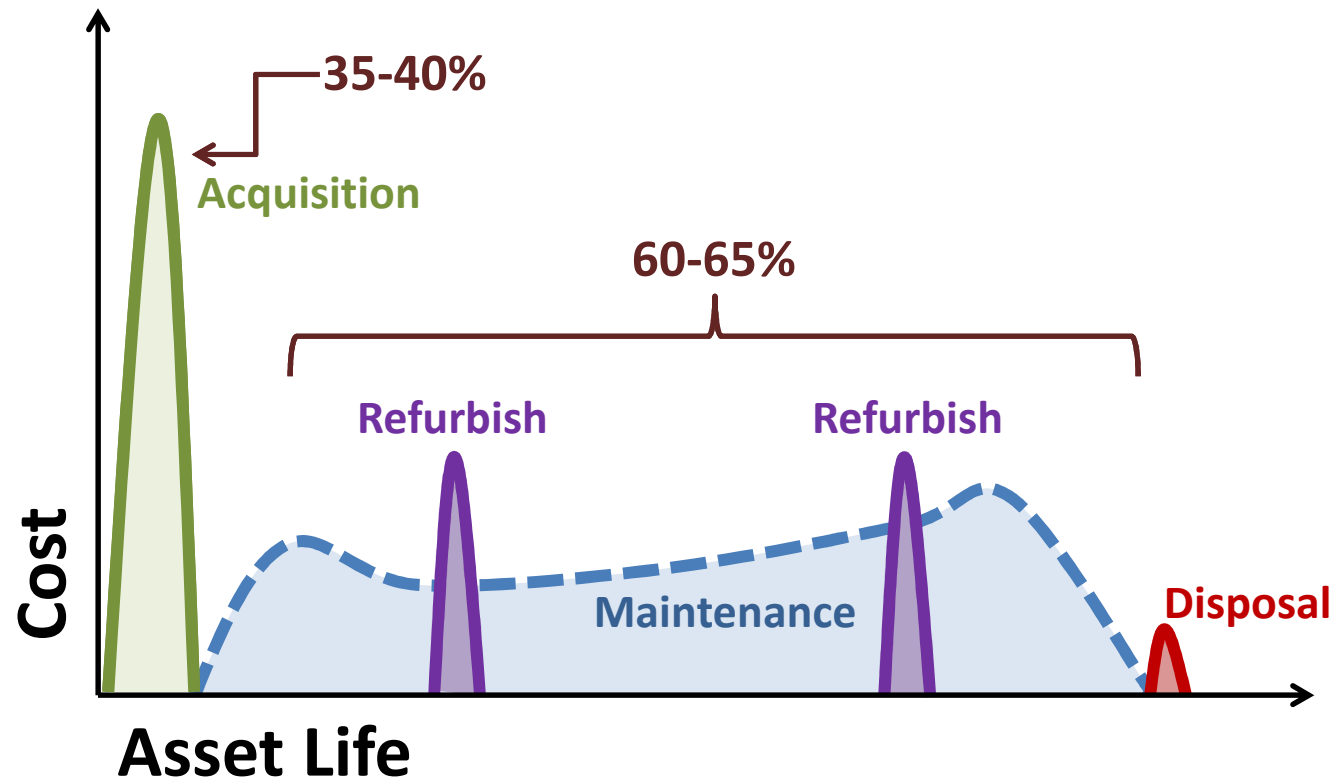


Reminder: Life Cycle Costing

- Purchase Price \neq Total Price



Capital Investments are Just the Tip of the Iceberg...



Source: Adapted from Steve Allbee, USEPA



Plan to Pay: Scenarios to Fund your C.I.P.

<http://efc.sog.unc.edu/> Find it in Resources / Tools

Free, simplified Excel tool allowing you to list your capital projects and plans for funding them, and automatically estimates rate increases

Tool developed by
UNC ENVIRONMENTAL FINANCE CENTER

Plan to Pay: Scenarios to Fund your C.I.P. (Capital Improvement Plan)

Version 2.6 (Updated November 2015)

20-year capital planning Debt and/or capital reserve financing options Guided data inputs Simple data needs

Financial dashboard outputs Estimates necessary rate increases over time to pay for capital projects

Start

1) Use tabs at bottom of screen and buttons to navigate to different pages.

2) In **"Data Input 1"**, enter utility characteristics, rates and usage information in blue cells.

3) In **"Data Input 2"**, enter details on capital improvement projects in the light blue cells. Each row is a different project.

4) In **"20-Year Projections"**, view your fund balance projections for 20 years and observe the estimated rate increases needed each year to pay for your Capital Improvement. No data entry required on this page.

5) After all your utility information and capital improvement project details are entered, go to the **"Dashboard"** to view long term trends in your financial reserves, rate increases and average bills, and capital investments.

INSTRUCTIONS

FINANCED
\$ 950,000
et \$ 750,000

Pre-Exist
Input amount incurred for

NAME OF UTILITY
Town of Anytown

Type of Water
Water

Current Fiscal Year
FY15

Water and Sewer Rates in FY15
Input the residential customer water & sewer rates at 5,000 gallons/month of use (or 2 customers). Convert to monthly rates.
Volume Rate at 5,000 gallons/month (\$/100 gallons) \$ 5.42
Monthly Rate (Charge) (Minimum Charge) \$ 17.24

Expected Revenues and Expenses in FY15
Annual Operating and Non-Operating Revenues \$ 5,015,000
Annual Non-Capital Expenses (SOG, Admin, etc.) \$ 4,525,000
Expected Annual Net of Revenues (Payable) \$ 490,000
Average Annual Interest on Revenues (Payable) 3.0%

Usage Billed to Customers in FY15
Number of Customers Residential 10,000 Non-Residential 2,000
Total Monthly Use (1,000's of gallons) 100,000 20,000
Annual Customer Rate (Growth Projection) 1.5% 1.5%

CAPITAL IMPROVEMENT PROJECTS - 20 YEARS

Project Name	Project Start Year	Project Completion Year	Project Period (Years)	Estimated Construction Cost	Annual Construction Cost (in the Start Year)	Estimated Cost in the End Year	Cost Growth Rate
Project 1: Water main replacement	2015	2017	2	\$ 2,000,000	\$ 2,000,000	\$ 2,000,000	0%
Project 2: Sewer main replacement	2015	2017	2	\$ 1,500,000	\$ 1,500,000	\$ 1,500,000	0%
Project 3: Water treatment plant upgrade	2015	2017	2	\$ 1,000,000	\$ 1,000,000	\$ 1,000,000	0%
Project 4: Sewer treatment plant upgrade	2015	2017	2	\$ 1,000,000	\$ 1,000,000	\$ 1,000,000	0%
Project 5: Water main replacement	2015	2017	2	\$ 1,000,000	\$ 1,000,000	\$ 1,000,000	0%
Project 6: Sewer main replacement	2015	2017	2	\$ 1,000,000	\$ 1,000,000	\$ 1,000,000	0%
Project 7: Water main replacement	2015	2017	2	\$ 1,000,000	\$ 1,000,000	\$ 1,000,000	0%
Project 8: Sewer main replacement	2015	2017	2	\$ 1,000,000	\$ 1,000,000	\$ 1,000,000	0%
Project 9: Water main replacement	2015	2017	2	\$ 1,000,000	\$ 1,000,000	\$ 1,000,000	0%
Project 10: Sewer main replacement	2015	2017	2	\$ 1,000,000	\$ 1,000,000	\$ 1,000,000	0%

Estimated Rate Changes Needed to Maintain the Fund Balance

	FY15	FY16	FY17	FY18
Year Increase (Decrease) in Rate Base and Revenues	N/A	0.0%	0.1%	2.0%
Increase (Decrease) in the Monthly Bill for 5,000 Gallons	N/A	\$0.00	\$1.01	\$0.79
Increase (Decrease) in the Monthly Rate Charge	N/A	\$0.00	\$0.64	\$0.34
Monthly Rate Charge ("Minimum Charge")	\$12.34	\$12.34	\$12.98	\$13.31
Volume Rate at 5,000 gallons/month (\$/100 gallons)	\$5.42	\$5.42	\$5.96	\$6.11
Volume Included with the Base Charge (1,000's of gallons)	2	2	2	2
Approximate Monthly Charge for 5,000 gallons (\$)	\$29.35	\$29.35	\$30.94	\$31.65

Projected Fund Balance

	FY15	FY16	FY17	FY18
Total Revenues	\$ 5,015,000	\$ 5,001,000	\$ 5,208,307	\$ 5,354,000
Rate Charges	\$ 1,776,960	\$ 1,795,322	\$ 1,907,280	\$ 1,970,720
Usage Charges	\$ 3,170,840	\$ 3,004,056	\$ 3,276,100	\$ 3,282,760
Interest Earned from Previous Year's Positive Balance	\$ 0	\$ 0	\$ 9,400	\$ 9,107
Revenues from Other Sources (Reserve Charges)	\$ 103,200	\$ 106,266	\$ 106,344	\$ 106,433
Total Expenses, Including Interest	\$ 4,947,000	\$ 4,905,644	\$ 5,099,024	\$ 5,069,920

Financial Reserves (End of Year)

Total Capital Expenses

Total Cumulative System Investment



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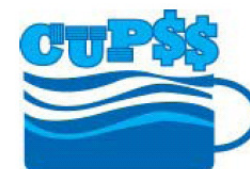


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Software: CUPSS (EPA)

<http://www.epa.gov/cupss/>



Check Up Program for Small Systems
Set-up | Switch Utility | Create User | Help | Training | Exit

My Home
 My Inventory
 My O & M
 My Finances
 My Check up
 My CUPSS Plan

Welcome Back Helen, Beauty View Acres Subdivision - DW

What would you like to do today?

[Do Some Training](#)
[Enter a New Task or Work Order](#)
[Create or Update My Schematic](#)
[Search Asset and Maintenance](#)
[Create or Update My Inventory](#)
[Enter My Finances](#)
[Print My Check Up Reports](#)
[Work on My CUPSS Plan](#)

My Calendar

April 2008						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
30	31	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	1	2	3
4	5	6	7	8	9	10

My Messages and Alerts

Popup Messages Are Off. Click To Turn On.

Reminder - Today's Tasks	8
Tasks Currently Past Due	160
Assets Needing Update	0
Number of High Risk Assets	2



For More Information

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