



# Long Term System Planning

Austin Thompson

Environmental Finance Center

The University of North Carolina at Chapel Hill

919-962-5795

[thompson@sog.unc.edu](mailto:thompson@sog.unc.edu)

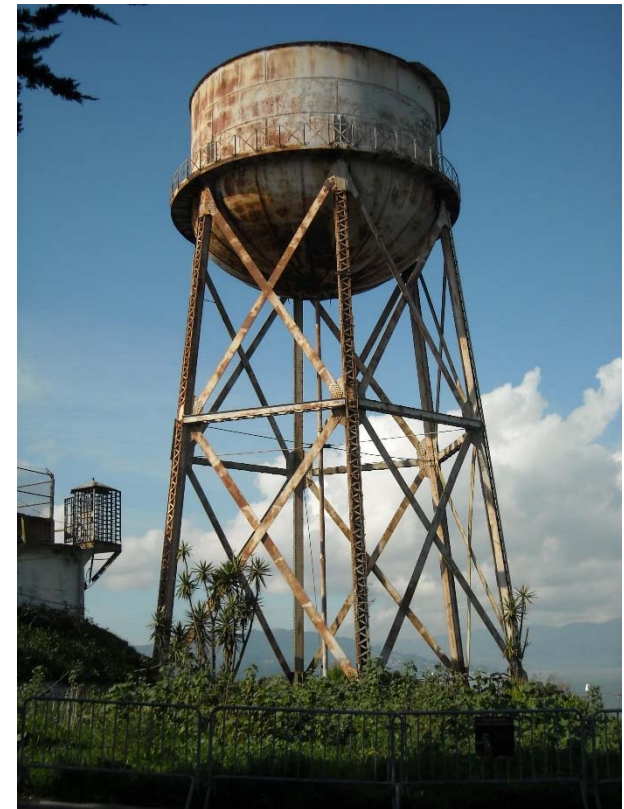
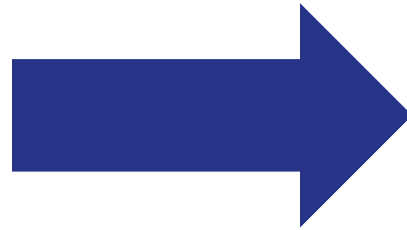


# Infrastructure or Capital Assets





# Infrastructure Wears Out



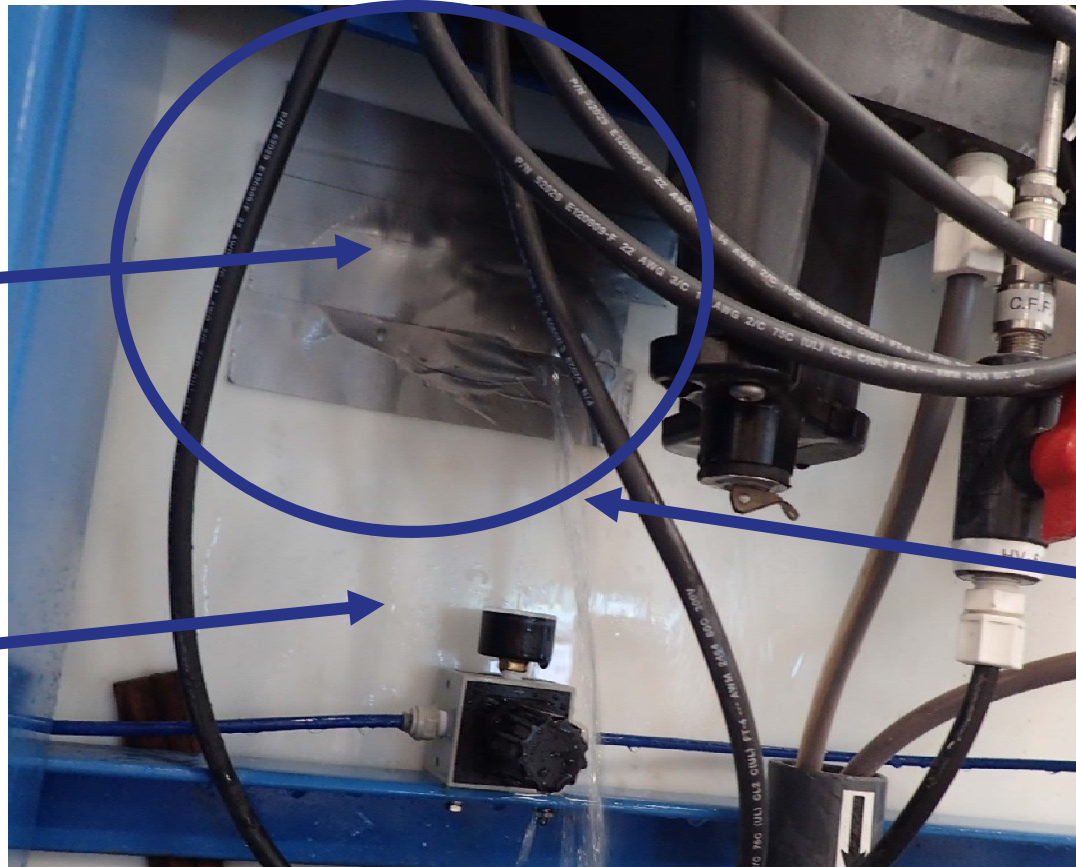




# Infrastructure Wears Out



Water  
Tank



Leak





There are two ways to keep up  
your infrastructure...



# Ways to Keep Up Infrastructure



Mike Daly · White Cliffs MDWUA, NM



# Ways to Keep Up Infrastructure



Source: <https://www.youtube.com/watch?v=rH867Y-8-VM>





# Two Ways to Fix Things



**Proactively**  
Repair, rehabilitation  
and replacement on  
a set schedule



**Reactively**  
You wait for it to  
break



# Or We Can Hope for Divine Intervention...



## Pope Francis Lays Hands On Ailing U.S. Infrastructure

NEWS IN BRIEF

September 25, 2015

VOL 51 ISSUE 38

News · Religion · World  
Leaders · Pope



NEW YORK—Treating the frail, long-overlooked structures with an unparalleled display of compassion, Pope Francis reportedly inspired a crowd of onlookers Friday by laying his hands upon the ailing United States infrastructure. “My heart just melted when I watched the pope



ONION VIDEO



# How do you handle infrastructure at your system?

110% Proactive

Mostly Proactive

Equal mix of proactive  
and reactive

Mostly Reactive

110% Reactive





# Being Proactive

- Requires long term system planning—  
Asset Management and Capital  
Planning
- Has its advantages, according to people  
in the field...



# Measuring Needs, Not Guessing



Ted Riehle · Old Forge, NY



# Better Board Communication



Chris Jacobs · Somersworth, NH





# Efficient System Management



Doug Powers · Tucumcari, NM



# Fewer Emergencies



Mike Daly · White Cliffs MDWUA, NM



# Justification for Rate Increases



Ted Riehle · Old Forge, NY





# Five Core Components of AM



Current State of the Assets



**Level of Service**



Criticality



**Life Cycle Costing**



Long-Term Funding

# Asset Management...are you doing it?

Heck yeah!

Heard of it, but not  
doing it yet!

Yeah...I don't know what  
you're talking about



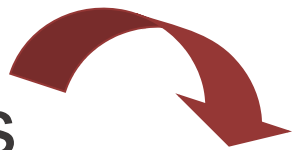
# Current State of the Assets

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



# Level of Service

Involve  
Customers



Measurable  
Goals: Internal  
and External



Track Progress  
Towards  
Meeting Goals

Involve  
Staff

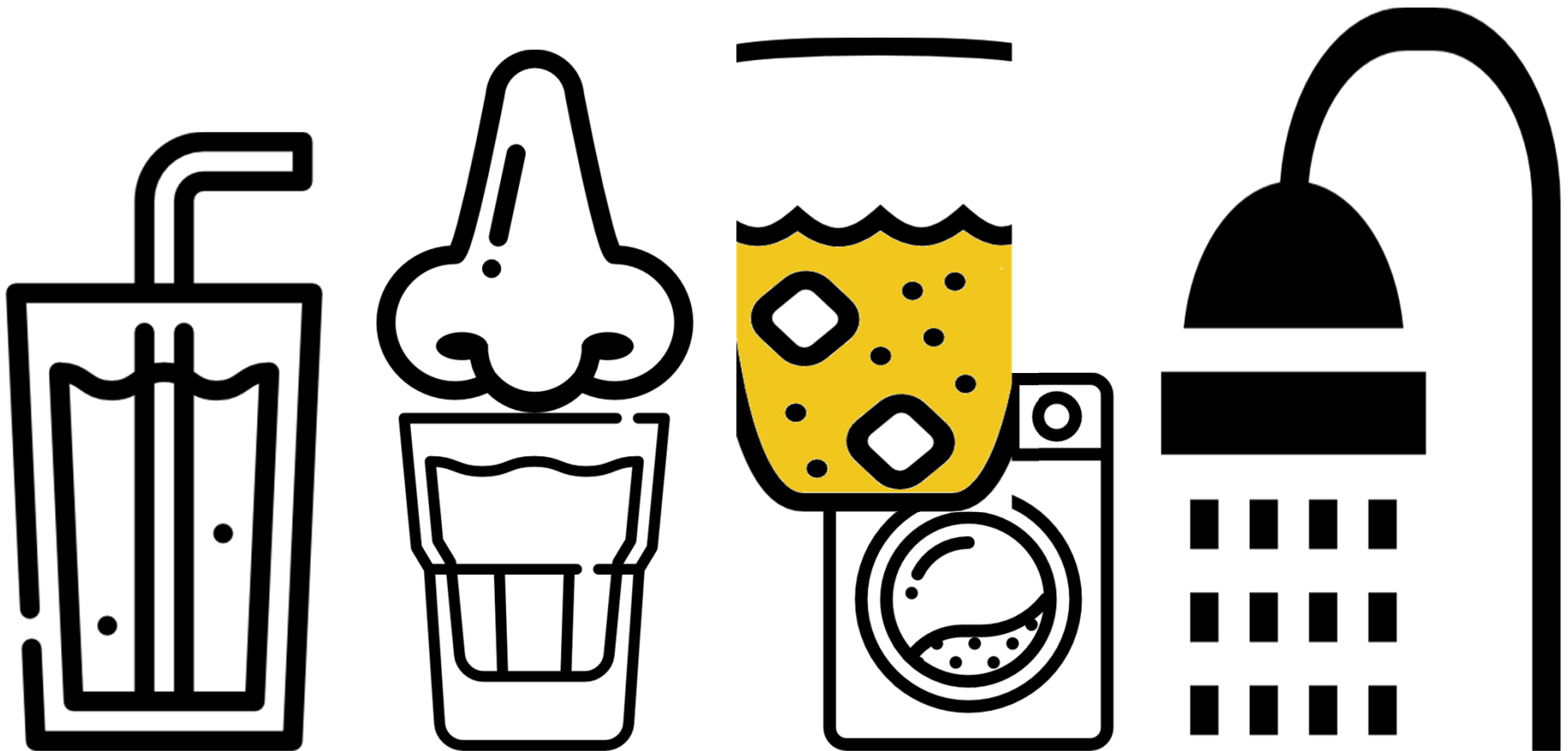


What would my customers want?





# What do customers care about?





# Level of Service



**EPA Releases Annual List Of Cities Where Tap Water  
Probably Fine To Drink But Tastes Kinda Off**



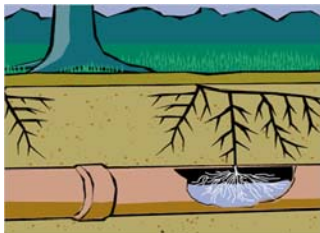


# Asset Criticality

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

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?







# Asset Criticality





# Quick Exercise—4 Assets

1. Brand new well
2. Aging portable generator used in emergencies in an area with a hospital and a neighborhood
3. 20 year old lines on Forest Drive, a typical residential neighborhood
4. 20 year old meters

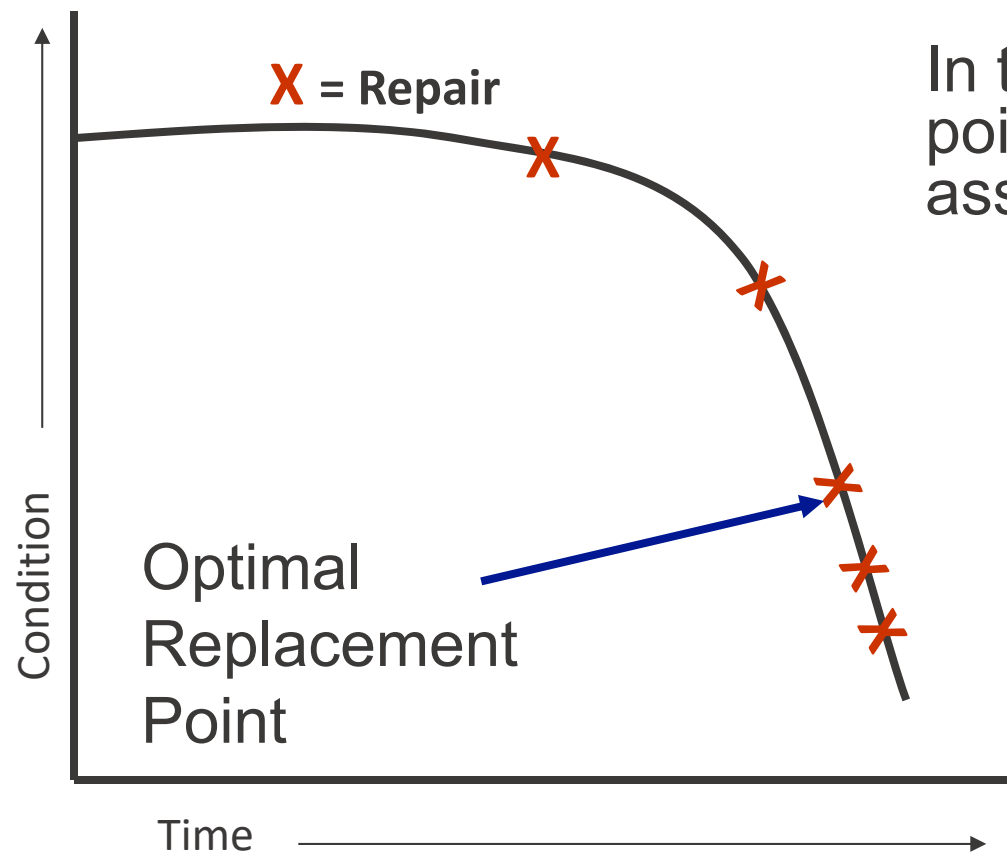


# Asset Criticality





# Life Cycle Costing: Replacement of Assets



In theory, there is an exact right point at which to replace an asset

Not possible to know the optimal time to replace every asset

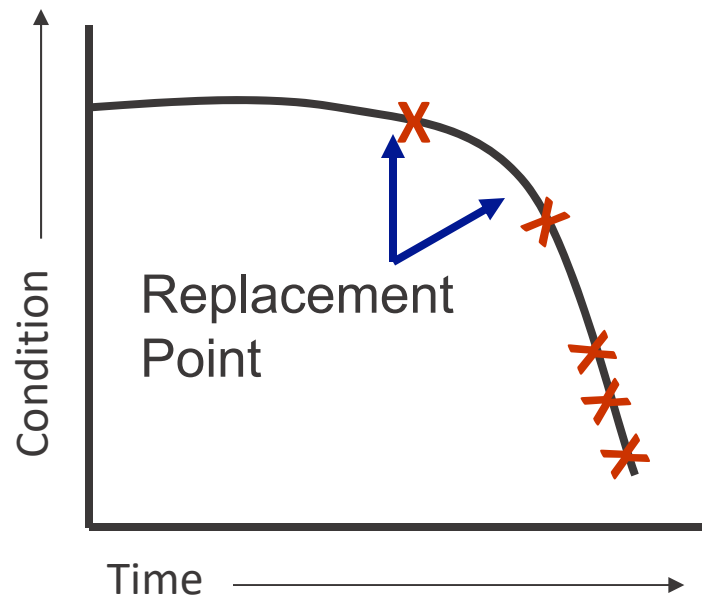
So... need to use the concept of risk



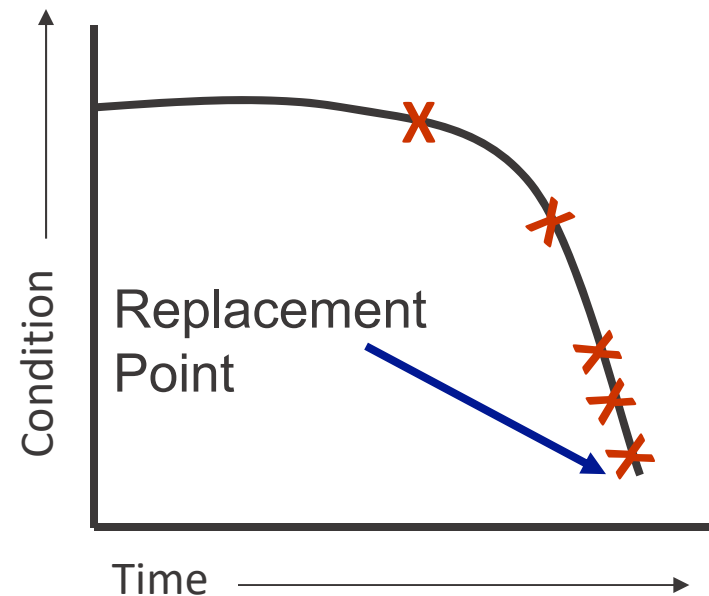


# Life Cycle Costing & Risk

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

# Capital Planning...are you doing it?

Heck yeah!

Heard of it but not  
doing it yet!

yeah...I don't know what  
you're talking about



# Long Term Capital Planning

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

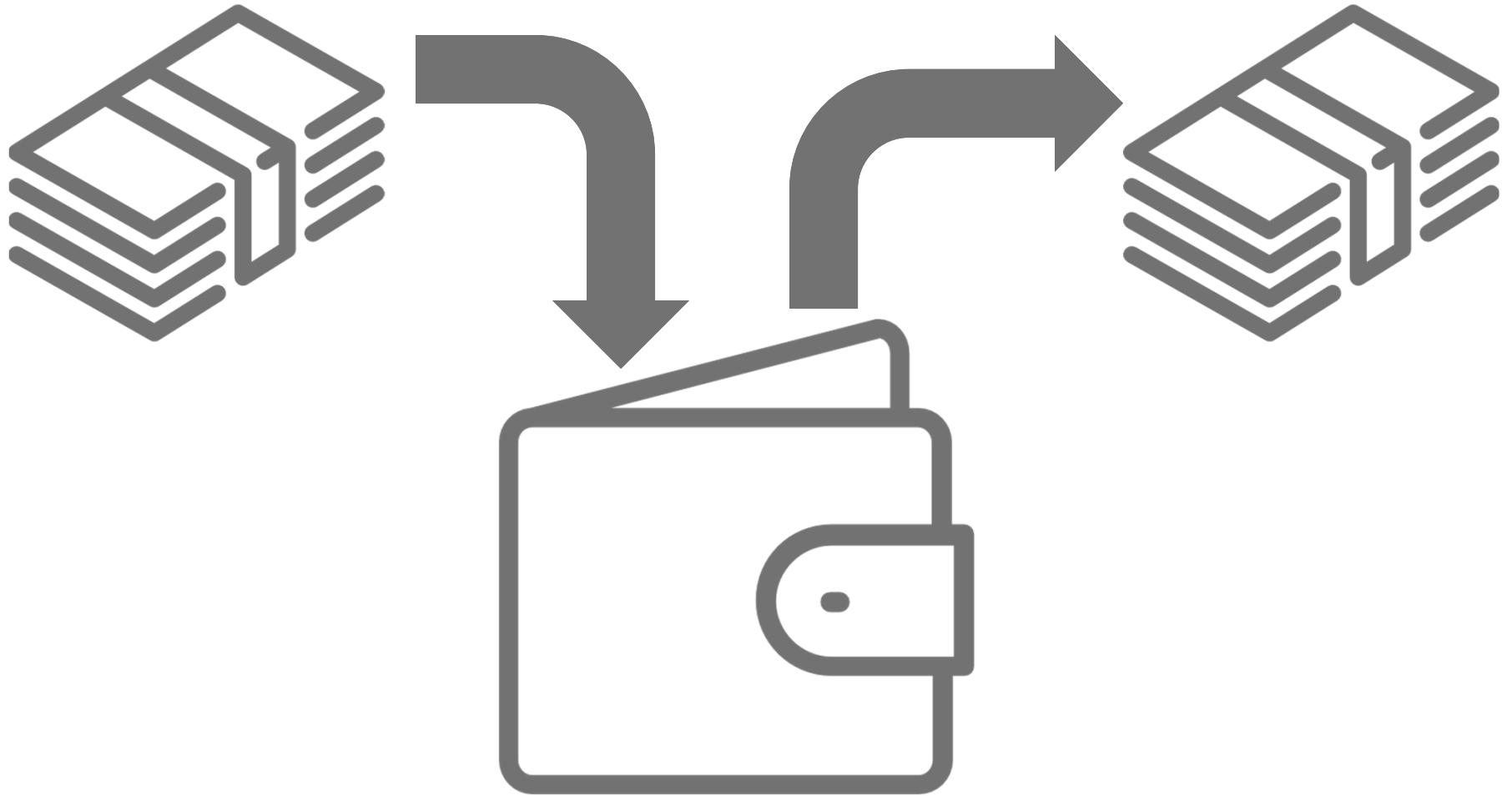




# Four approaches to paying for capital improvements

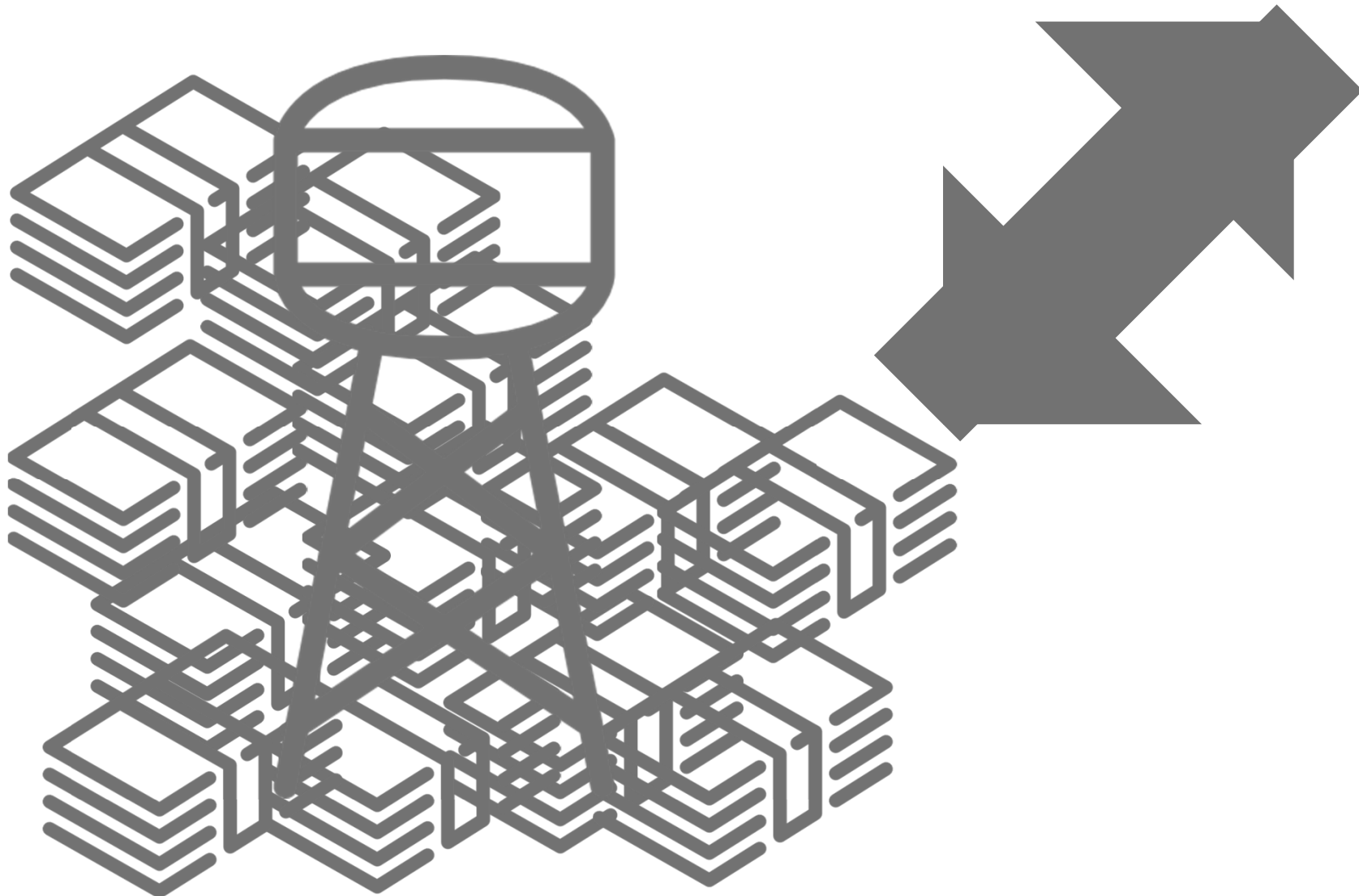


# Pay As You Go





# Save In Advance and Pay

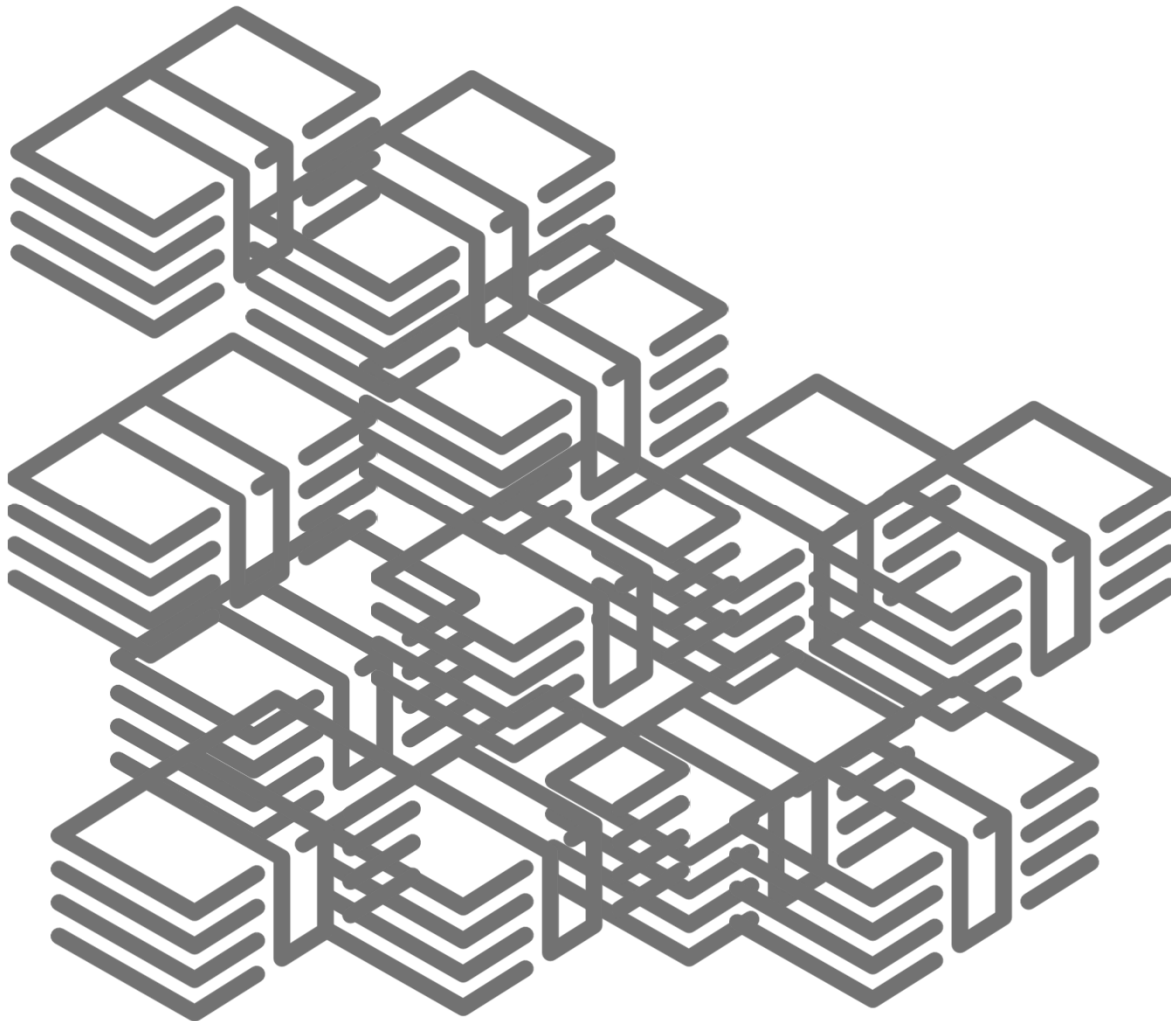




# Borrow and Pay Later

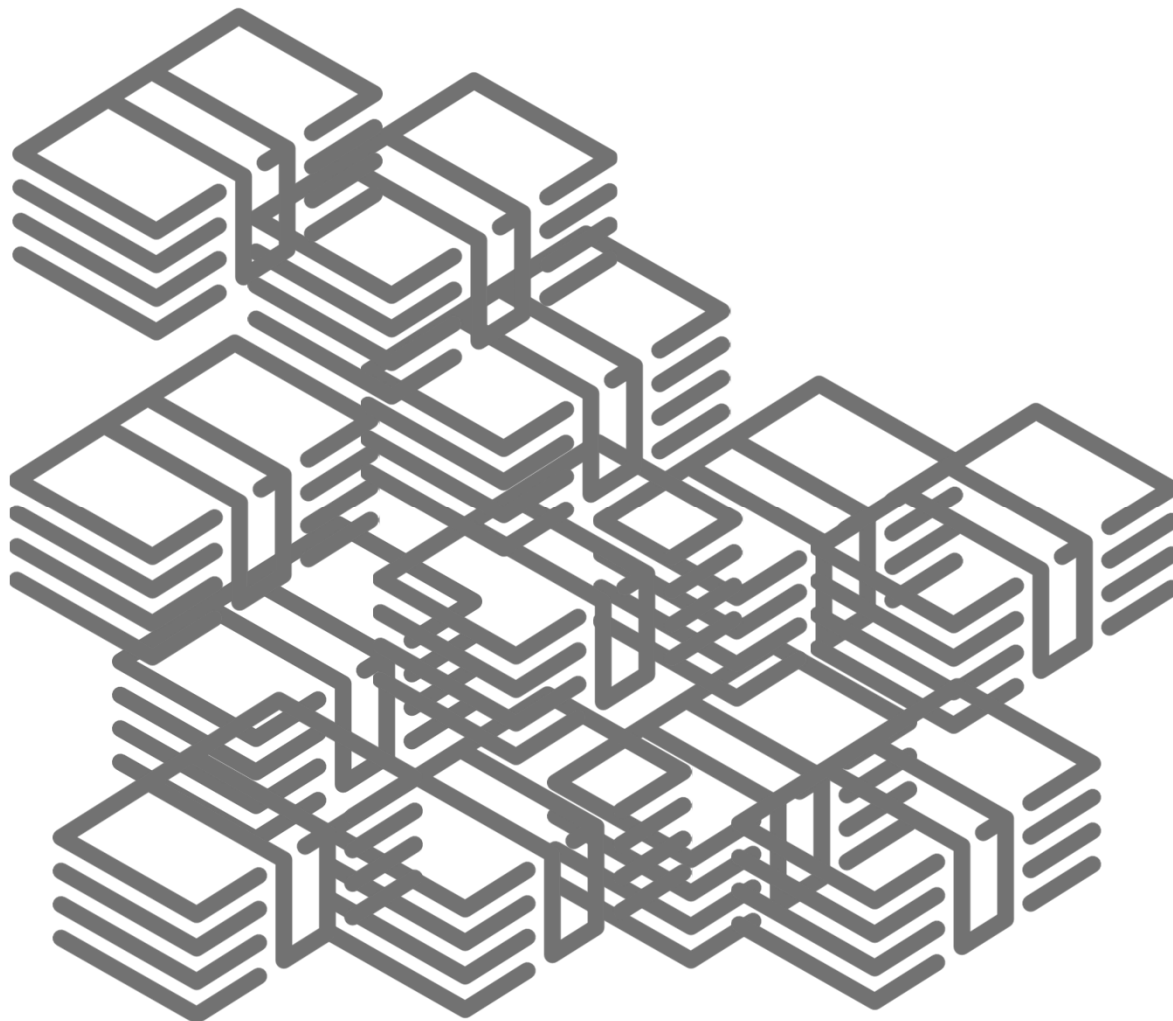


BANK





# Get a Grant



GRANT





# Ways To Pay

- Pay as you go
- Save in advance and pay
- Borrow and pay later

Money  
from your  
customers

- Grants (let someone else pay)

Not easy to come by





# Find Irvindale's Budget Expenses

What here is related to regular repair and maintenance, if anything?  
(Operating cost)

What here is related to asset rehabilitation or replacement, if anything?  
(Capital cost)

*Note: Don't include salaries*





# Repairs and Maintenance

25	30-810-07 W/S OVERTIME	\$4,500.00
26	30-810-08 MERIT BONUS	\$3,000.00
27	30-810-09 HOLIDAY/EMPLOYEE APREC	\$1,200.00
28	30-810-10 POSTAGE	\$2,700.00
29	30-810-11 Office Supplies/Repairs	\$4,700.00
30	30-810-12 PHONE	\$3,400.00
31	30-810-13 W/S UTILITES	\$30,000.00
32	30-810-14 TRAINING	\$2,400.00
33	30-810-15 Employee Screening	\$105.00
34	30-810-16 MAINT/REPAIR:SYST-EQUIP	\$30,000.00
35	30-810-17 Mayor Salary	\$1,800.00
36	30-810-18 Board Salary	\$10,500.00
37	30-810-20 W/S UNIFORMS	\$2,000.00
38	30-810-30 GAS AND OIL FOR VEHICLES	\$4,500.00
39	30-810-31 TIRES FOR VEHICLES	\$600.00
40	30-810-32 REPAIRS TO VEHICLES	\$1,000.00
41	30-810-33 SUPPLIES & MATERIALS	\$3,000.00
42	30-810-34 CHEMICALS AND SALT	\$20,000.00
43	30-810-45 CONTRACTED SERVICES	\$36,500.00



# Rehabilitation and Replacement

40	30-810-32 REPAIRS TO VEHICLES	\$1,000.00
41	30-810-33 SUPPLIES & MATERIALS	\$3,000.00
42	30-810-34 CHEMICALS AND SALT	\$20,000.00
43	30-810-45 CONTRACTED SERVICES	\$36,500.00
44	30-810-46 STATE PERMITS	\$1,700.00
45	30-810-48 DUES/SUBSCRIPTIONS	\$1,500.00
46	30-810-50 DEPRECIATION	\$0.00
47	30-810-54 INSURANCE	\$13,608.00
48	30-810-55 HOSPITAL INSURANCE	\$22,443.00
49	30-810-57 MISC EXPENSE	\$500.00
50	30-810-60 W/S - LGERS	\$9,272.00
51	30-810-70 WATER STUDY EXPENSES	\$24,000.00
52	30-810-74 Online Payments SVC	\$1,600.00
53	30-810-75 ARRA LOAN PRINCIPAL	\$8,875.00
54	30-810-76 PURCHASE WATER BILL	\$2,400.00
55	30-810-79 Banking Fees	\$500.00
56	30-810-89 CAPITAL OUTLAY NEW EQUIP	\$0.00
57	30-810-90 TRANSFER TO OTHER FUND	\$0.00
58	30-810-95 FINES AND PENALTIES	\$1,500.00





# Find Irvindale's Financial Statements

On the Statement of Cash Flows, can you see anything here related to capital expenditures?



# Debt and Grants

Customer Deposits Received	12,513
Customer Deposits Returned	(16,239)
<b>Net Cash Provided (Used) by Operating Activities</b>	<b>\$2,785</b>

## ***CASH FLOWS FROM NONCAPITAL FINANCING ACTIVITIES:***

Decrease in Due From Other Funds	\$2,417
<b>Total Cash Flows from Noncapital Financing Activities</b>	<b>\$2,417</b>

## ***CASH FLOWS FROM CAPITAL AND RELATED FINANCING ACTIVITIES:***

Acquisition and Construction of Capital Assets	(\$83,115)
Principal Paid on Bond Maturities	(8,875)
Principal Paid to Jones County	(4,800)
Capital Contributions - Grants	82,222
Other Nonoperating Revenue	2,418
<b>Net Cash Provided (Used) by Capital and Related Financing Activities</b>	<b>(\$12,150)</b>

<b>Net Increase (Decrease) in Cash and Cash Equivalents</b>	<b>(\$6,948)</b>
Cash and Cash Equivalents, July 1	42,716
<b>Cash and Cash Equivalents, June 30</b>	<b>\$35,768</b>



# Find Irvindale's Financial Statements

On the Statement of Revenues, Expenses and Changes in Net Position, what is the annual depreciation on the water system assets?



# Annual Depreciation

	Major Enterprise Fund
	Water and Sewer Fund
<b><i>OPERATING REVENUES:</i></b>	
Charges for Services	\$324,180
Water and Sewer Taps	1,500
Other Operating Revenues	13,706
<b>Total Operating Revenues</b>	<b>\$339,386</b>
<b><i>OPERATING EXPENSES:</i></b>	
Personnel	\$176,759
Water and Sewer Operations	148,499
Depreciation	140,087
<b>Total Operating Expenses</b>	<b>\$465,345</b>
<b>Operating Income (Loss)</b>	<b>(\$125,959)</b>



<https://www.youtube.com/watch?v=d8A7MJXFV1U&t=1115s>

Infrastructure Wears Out

GALVA

7:20 / 1:03:02  
www.efcnetwork.org

Webinar: Demystifying Depreciation and How to Make Use of It





# What is Depreciation?

- Loss of value of an asset not restored by current maintenance
- An economic fact for any water system
- From both physical factors and functional or non-physical factors



# Causes of Depreciation

## Physical Factors

- Wear and tear resulting from use
- Decay, rot, rust, and corrosion from the passage of time and the elements
- Related to the extent that there is regular maintenance



# Causes of Depreciation

## Functional or Non-Physical Factors

- Obsolescence due to new designs, innovations, and other improvements
- Inadequacy to meet current demand
- Changes in regulations



# Straight Line Depreciation Example



Large Hydropneumatic Tank

Purchase Price:  
**\$10,000**

Useful Life:  
**10 years**

Annual Depreciation:  
**(\$1,000)**



# “Fully Funding” Depreciation

- By the time the asset is scheduled to wear out, you will have saved the purchase price of the asset
- This isn't as good as doing asset management and capital planning, but it is better than nothing





If Irvindale were to fully fund depreciation, what would it do to the rates?

What concerns might there be?



## With Depreciation

Revenues Needed

from Rates:

~~\$344,500.00~~

\$484,532



# The Rates with Depreciation

\$89.73 ~~\$63.79~~ base

\$14.74 ~~\$10.49~~ per 1,000 gallons

\$80.02 ~~\$54.08~~ base  
\$1.59 per 1,000 gallons

\$25.00 base  
\$10.63 ~~\$6.37~~ per 1,000 gallons



# “Fully Funding” Depreciation

- At this point for Irvindale, fully funding depreciation is too little, too late since they have not been doing this
- They would not be able to save enough to pay for existing assets if they start funding depreciation now



# So What Can Irwindale Do?

- Pay as you go
- Save in advance and pay
- Borrow and pay later
- Grants (let someone else pay)
- Defer rehabilitation/replacement

Tip!  
You can  
mix and  
match  
approaches

# Which of these options do you like best (understanding the limitations of each)?

Pay as you go

Save in advance and  
pay

Borrow and pay later

Grants (let someone  
else pay)

Defer  
rehab/replacement





# Exercise

- Using the assets we discussed earlier, come up with a plan of how to pay for their replacement



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

<http://efc.sog.unc.edu> or <http://efcnetwork.org>

Find the most up-to-date version 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**

Financed	\$	950,000
at	\$	750,000

**Pre-Exist**

Input amount incurred for

**NAME OF UTILITY**

Type of Utility

Water or Sewer

**Current Fiscal Year**

FY15

Only capital projects that start next year (i.e., in FY16) for the next 20 years can be included in this Capital Improvement Plan.

**Water and Sewer Rates in FY15**

Input the residential customer water & sewer rates at 5,000 gallons/month of use for FY15. (Round to monthly rates)

Volume: Rate at 5,000 gallons/month (5,000 gallons)

Monthly Rate (Name "Maximum Name")

Volume: Rate at 5,000 gallons/month (5,000 gallons)

Monthly Rate (Name "Maximum Name")

**Expected Revenues and Expenses in FY15**

Annual Operating and Non-Operating Revenues

Annual Non-Capital Expenses (Water, Sewer, etc.)

Expected Annual Net Income (Loss)

**Usage Billed to Customers in FY15**

Residential

Non-Residential

Number of Customers

Total Monthly Use (1,000's of gallons)

Annual Customer Rate Growth Projection

**CAPITAL IMPROVEMENT PROJECTS - 20 YEARS**

Project Name	Project Construction Period	Project Construction Cost	Annual Construction Cost	Estimated Cost in the Year	Estimated Cost in the Year
Project 1	FY15 - FY16	\$1,000,000	\$500,000	\$500,000	\$500,000
Project 2	FY16 - FY17	\$1,000,000	\$500,000	\$500,000	\$500,000
Project 3	FY17 - FY18	\$1,000,000	\$500,000	\$500,000	\$500,000
Project 4	FY18 - FY19	\$1,000,000	\$500,000	\$500,000	\$500,000
Project 5	FY19 - FY20	\$1,000,000	\$500,000	\$500,000	\$500,000

**20-Year Projections**

	FY15	FY16	FY17	FY18
Estimated Rate Changes Needed to Maintain the Fund Balance				
Year Increase (Decrease) in Rate (Name and Volume)	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	\$0.61	\$0.34
Monthly Rate Charge ("Maximum Charge")	\$12.34	\$12.34	\$12.95	\$13.31
Volume: Rate at 5,000 gallons/month (5,000 gallons)	\$1.67	\$1.67	\$1.96	\$1.11
Volume Included with the Base Charge (1,000's of gallons)	2	2	2	2
Approximate Monthly Charge for 5,000 gallons (5)	\$29.35	\$29.35	\$30.96	\$31.65

**Projected Fund Balance**

	FY15	FY16	FY17	FY18
Total Assets	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000
Base Charges	\$1,176,800	\$1,176,800	\$1,176,800	\$1,176,800
Usage Charges	\$1,176,800	\$1,176,800	\$1,176,800	\$1,176,800
Interest Earned from Previous Year's Positive Balance	\$	\$1,400	\$1,400	\$1,400
Revenues from Other Sources (Reserve Charges)	\$100,000	\$100,000	\$100,000	\$100,000

**Financial Reserves (End of Year)**

**Rate Increases**

**Total Capital Expenses**

**Total Cumulative System Investment**