



Advanced Cost Allocation & Rate Design

Water

December 6, 2024

TODAY'S PRESENTER



Andy Burnham

- 24 years of management consulting, principally to local government
- Started in Electric & Gas with Consumers Energy (MI) (3 yrs)
- Heavy focus on Water Resources with Stantec (FL) (21 yrs)
- Expert witness in 7 states and at FERC
- Very active with AWWA:
 - Member of Technical & Educational Council
 - Chair of Management & Leadership Division
 - Member of Finance, Accounting & Management Controls Committee
 - Contributing author and lead for M29
 - Member of Rates & Charges Committee
 - Contributing author to MI
 - Development of Report on Cash Reserves
 - Contributing author to new SDC Manual
- Also engaged with AMWA, US Water Alliance, GFOA, WEF, NACWA, and more

UNDERSTANDING LEARNING OBJECTIVES

- A. How can you address affordability in ratemaking?
- B. How can water rates promote conservation? How do you estimate elasticity of demand?
- C. I want to know the current trends and emerging concepts in ratemaking.
- D. I would like a better understanding of cost allocation methods, like the base-extra capacity approach.
- E. How do you determine customer class peaking factors?
- F. What cost should go into fixed versus variable charges?
- G. How do you size and cost tiers of an inclining block rate structure?
- H. I want to know how to calculate other types of charges (fire protection, wholesale, capacity, etc.)

Write your desired learning objectives in the chat!

TODAY'S AGENDA

- Introductions
- Emerging Trends in Cost Allocation
- Traditional Approach to Water Cost Allocation

Break (11:20-11:40 AM)

- Developing Water Peaking Factors
- Fixed & Volumetric Rate Design

Lunch Break (1:00-2:00 PM)

- Wholesale Rates
- Fire Protection Cost Allocation

Break (3:20-3:40 PM)

- Miscellaneous Fees & Capital Charges
- Open Forum



Advanced Cost Allocation & Rate Design

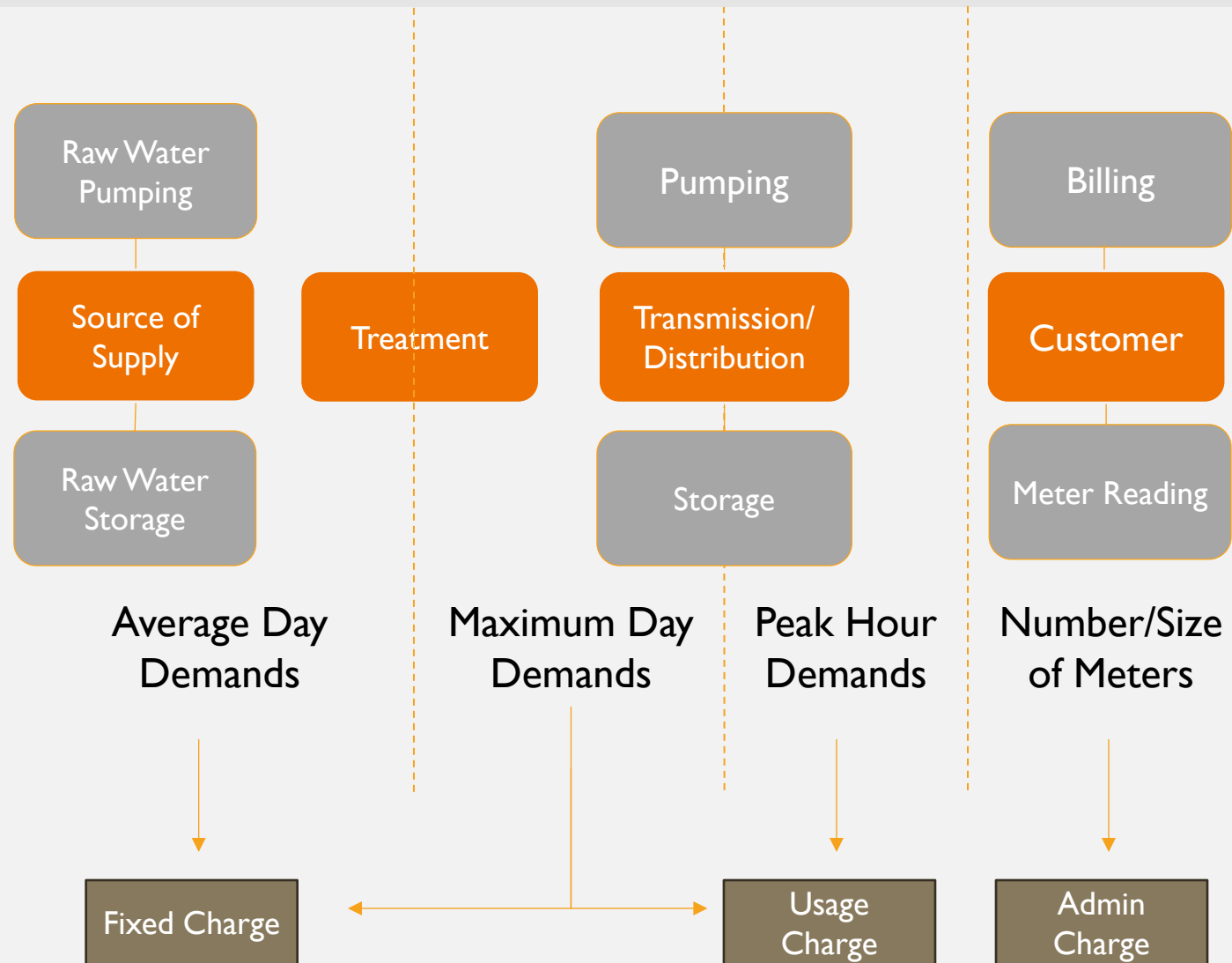
Water

Emerging Trends in Cost Allocation



Traditional Approach to Cost Allocation

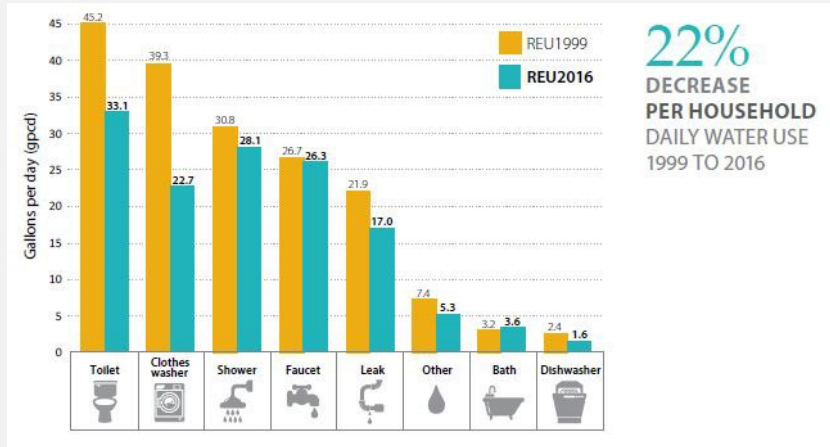
Distribute Costs by Function & Recover based on “Use” Characteristics



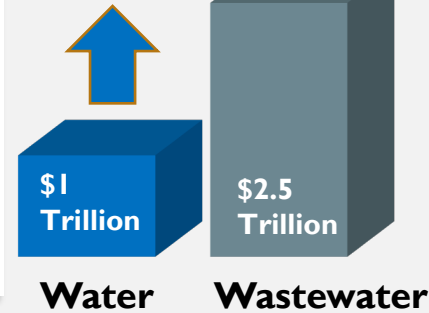
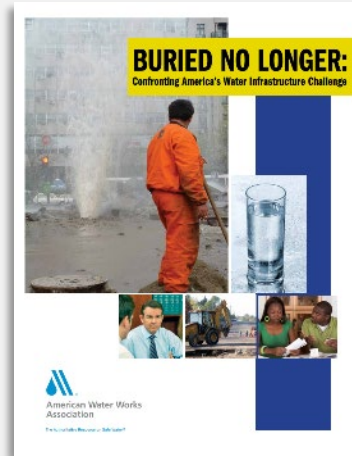


Emerging industry challenges and trends in financing

Reductions in Use / Revenue Impacts



Aging Infrastructure



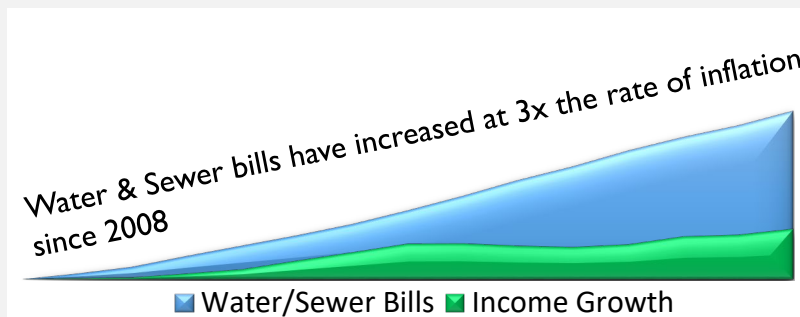
Regulatory / Resilience



PFAS, LCR, State Legislation



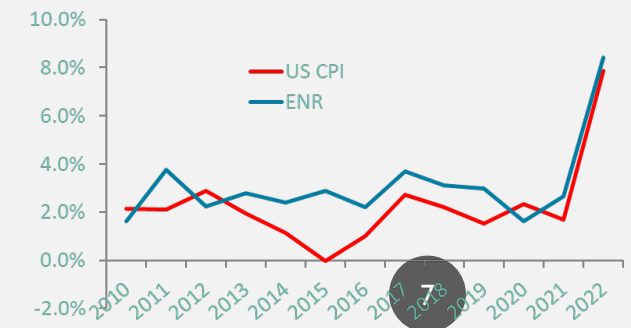
Customer Affordability



Aging Workforce



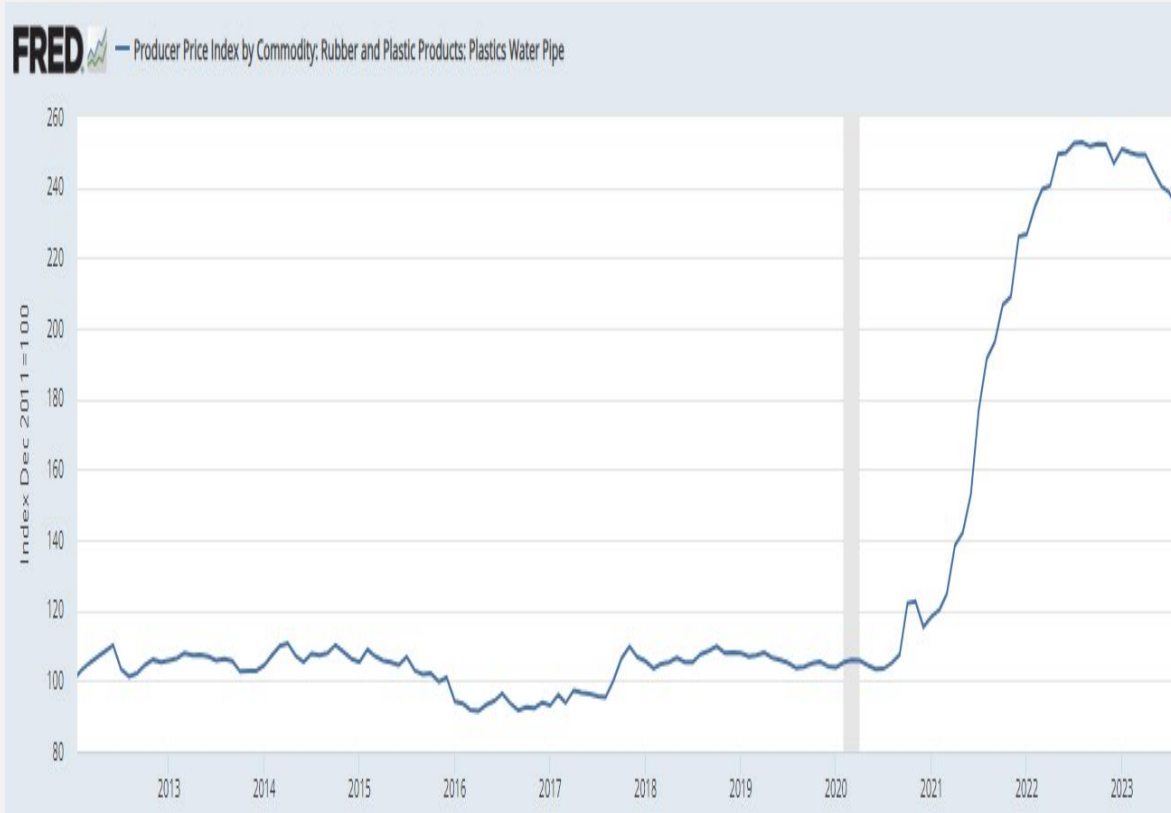
Cost Increases





Emerging industry challenges and trends in financing

Operational Cost Inflation: 2020-2024



National Commodity Index – Plastic Water Pipe

- Up 132% from Jan 2020 to June 2023



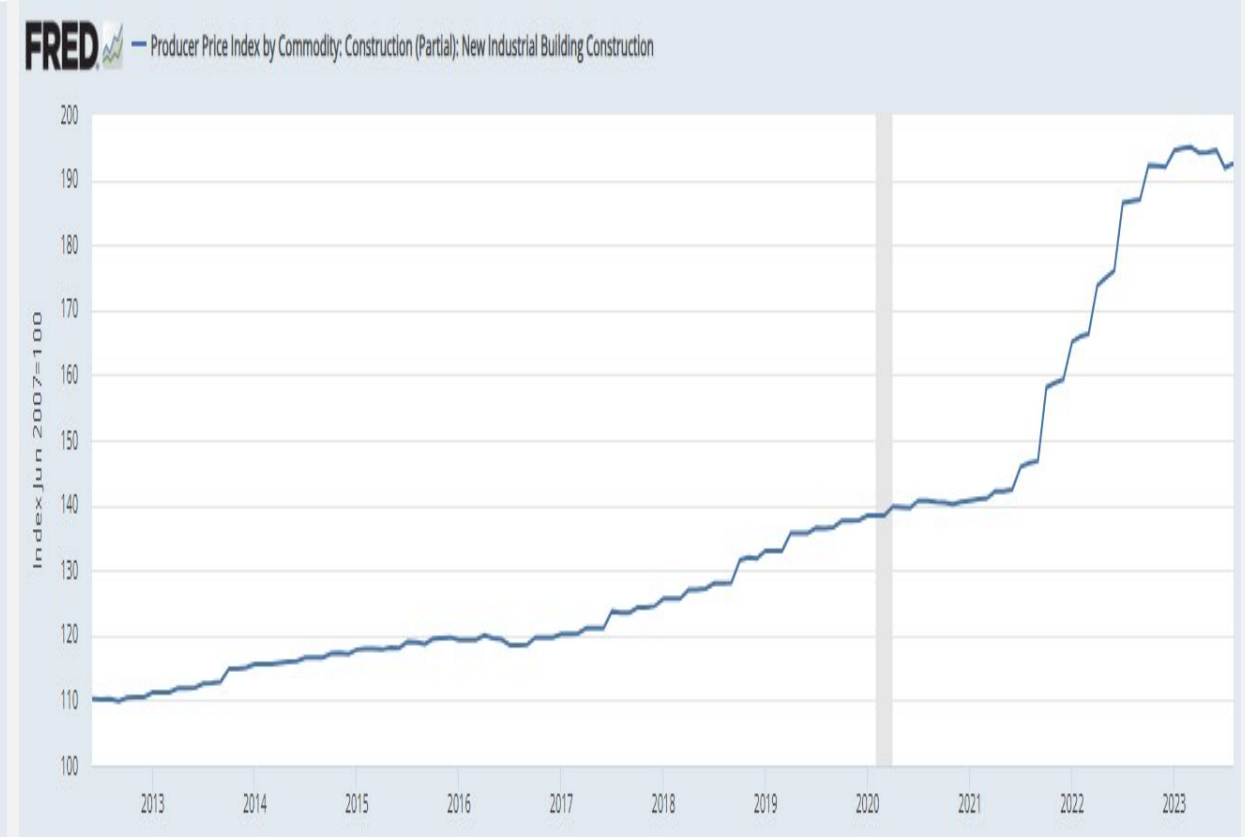
National Water Treatment Chemical Index

- Up 31% from Jan 2020 to June 2023



Emerging industry challenges and trends in financing

Construction Cost Inflation: 2020-2024



National Cost Index – Construction

- **General Construction - Up 33% from Jan 2020 to June 2023**
- **Industrial Construction - Up 40% from Jan 2020 to June 2023**



Expense of Potable Water

Compare cost of filling an average size swimming pool (10,000 gallons) with IRCDUS potable water with many other commodities in the marketplace

\$51.07 to fill with IRCDUS water

\$10,000 to fill with Zephyrhills bottled water from the grocery store

\$23,700 to fill with Coca-Cola or Pepsi from a 2L bottle

\$30,000 to fill with milk

\$40,000 to fill with gasoline

\$100,000 to fill with bottled beer

\$320,000 to fill with Starbucks coffee

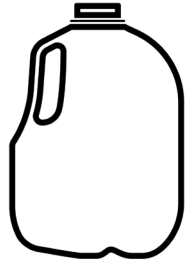
\$2,200 with topsoil from Home Depot in 40-pound bags



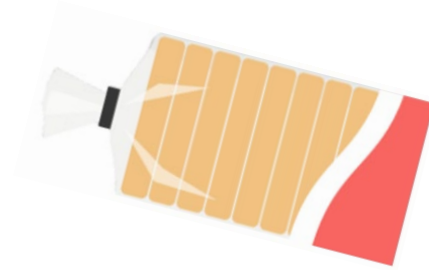
IRCDUS Potable Water is in fact cheaper than dirt



1,000 gallons = \$2.80 ... or ...



1 gallon of milk = \$3.86



1 loaf of bread = \$2.75



1 slice of pizza = \$3.50



Starbucks coffee = \$3.75

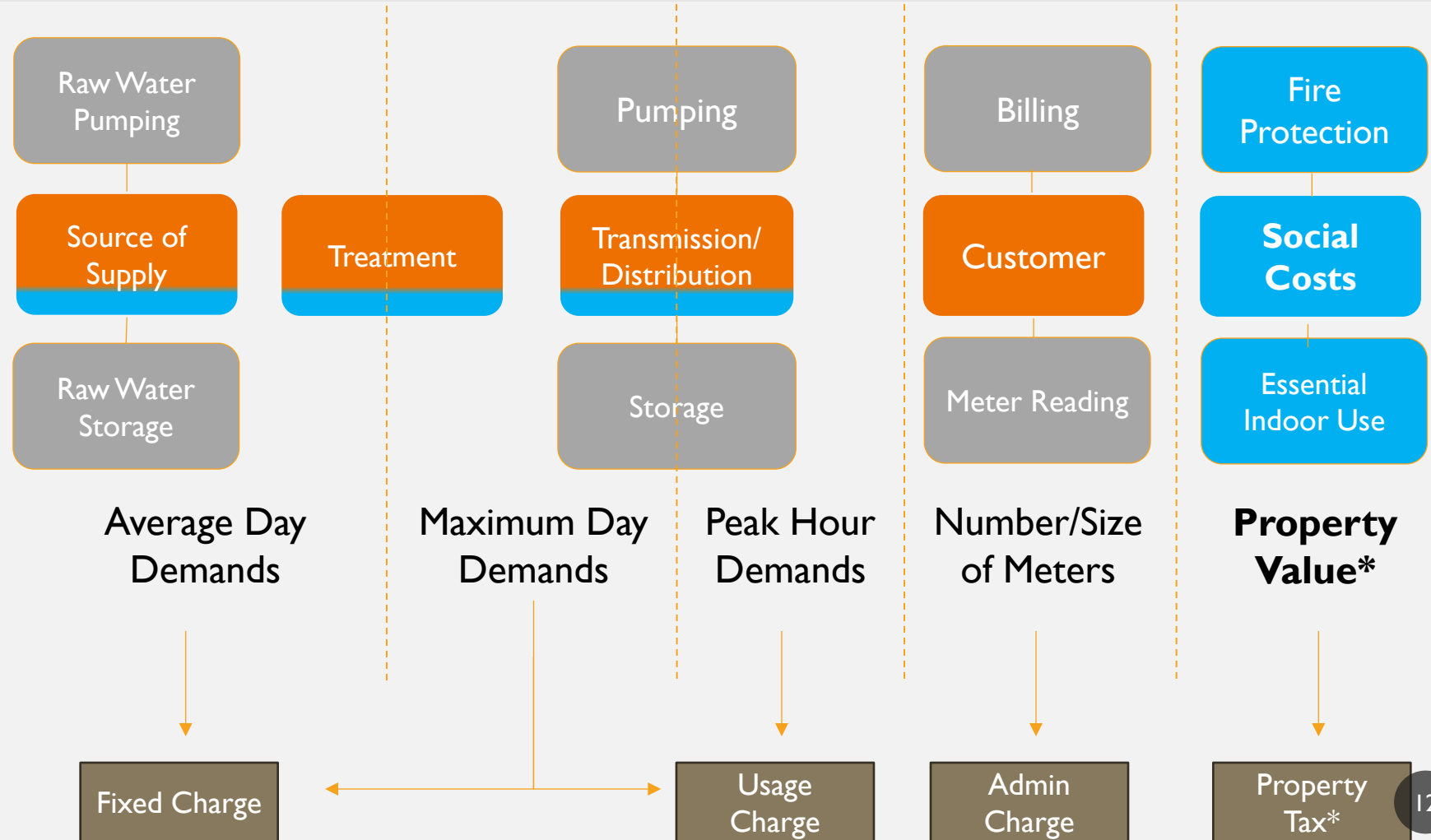


Box of cereal = \$ 3.25



Thinking Outside the Box - Social Value

Distribute Costs by Function & Recover based on “Use” Characteristics, **with portion recovered based on social value/benefit**

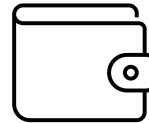


COST ALLOCATION APPROACHES



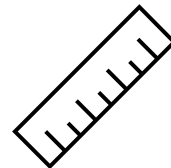
Usage-Based

- Number of Bills
- Volume of Consumption
- Demand Characteristics
- Type of Customer



Revenue-Based

- Property Taxes
- Sales Tax
- Utility Rate Rider



Parcel-Based

- Lot / Building Area
- Frontage Feet

MONTREAL, QUEBEC

Property Taxes

Water tax 0,0917

BOROUG

Boroughs ⁴	Tax concerning services	Tax concerning capital expenditures
Ahuntsic-Cartierville	0,0435	0,0349
Anjou	0,1250	0,0703
Côte-des-Neiges–Notre-Dame-de-Grâce	0,0413	0,0250
Lachine	0,0482	0,0389
<i>Lachine tax per unit</i>	\$ 51.01 / unit	n. a.
LaSalle	0,0538	0,0373
L'Île-Bizard - Sainte-Geneviève	0,0819	
<i>L'Île-Bizard sector</i>		0,0843
<i>Sainte-Geneviève sector</i>		0,0841
Mercier–Hochelaga-Maisonneuve	0,0663	0,0410
Montréal-Nord	0,1348	0,0574
Outremont	0,0452	0,0343

VOLUMETRIC WATER USER FEE

NON RESIDENTIAL IMMOVABLES ⁵			
0 to 1,000 m ³	1,000 to 10,000 m ³	10,000 to 100,000 m ³	more than 100,000 m ³
\$ 0 / m ³	\$ 0.10 / m ³	\$ 0.20 / m ³	\$ 0.60 / m ³

ATLANTA,
GEORGIA
Sales Taxes

SUMMARY OF REVENUES AND EXPENSES

Water & Wastewater Revenue Fund

Revenues	FY21 Actuals	FY22 Adopted	FY23 Budget
Intergovernmental Revenues	\$1,369,827	-	-
Charges For Services	\$446,974,411	\$482,250,955	\$485,441,687
Investment Income	\$678,792	\$1,000,000	\$700,000
Miscellaneous Revenues	\$99,666	\$80,000	\$80,000
Other Financing Sources	<u>\$154,956,507</u>	<u>\$93,925,000</u>	<u>\$123,922,916</u>
Total Revenues	<u>\$604,079,203</u>	<u>\$577,255,955</u>	<u>\$610,144,603</u>

Effective October 1, 2004, a 1% Municipal sales and use tax will be collected for retail sales and use occurring in the incorporated city limits of Atlanta. The purpose of this tax is to assist with funding renovations to the water and sewer system. Some general information pertaining to the collection and remittance of this new tax follows:

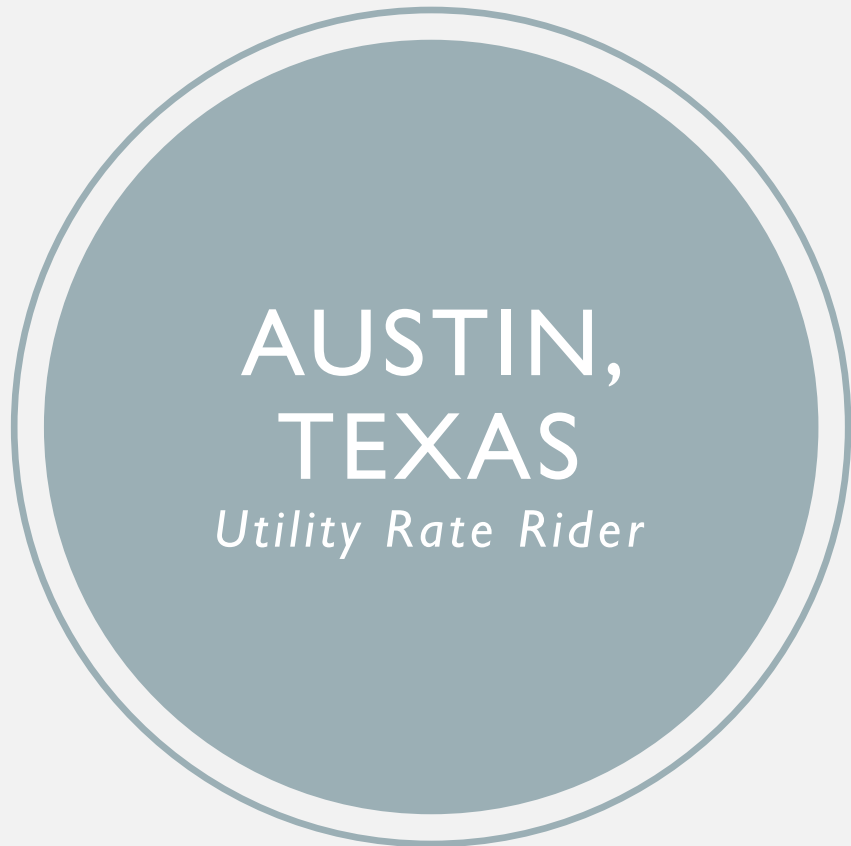
The 1% City of Atlanta municipal sales and use tax will be collected on transactions where the customer takes delivery of the item being sold or an item is used within the incorporated city limits of Atlanta.

**PHILADELPHIA,
PENNSYLVANIA**
Utility Rate Rider

10.0 PROVISIONS FOR RECOVERY OF THE TIERED ASSISTANCE PROGRAM (TAP) COSTS

The lost revenue related to TAP (the “TAP Costs”) will be recovered via a separate TAP Rate Rider Surcharge Rate (TAP-R), which would be added to the water, fire service and sewer quantity charge rate schedules. This TAP-R shall be increased or decreased for the next rate period to reflect changes in TAP costs, and will be calculated and reconciled on an annual basis in the manner set forth below.

<u>Monthly Water Usage</u>	<u>Base Charge Per Mcf</u>	<u>TAP-R Per Mcf</u>	<u>Total Charge Per Mcf</u>
First 2 Mcf (0 to 2 Mcf)	\$59.32	\$0.15	\$59.47
Next 98 Mcf (2.1 to 100 Mcf)	53.37	0.15	53.52
Next 1,900 Mcf (100.1 to 2,000 Mcf)	41.34	0.15	41.49
Over 2,000 Mcf	40.22	0.15	40.37



2023-2024

Water & Wastewater Rates

Residential Water Customers – Monthly water charges include: billing, metering, collections, customer service, and servicing / monitoring of fire hydrants.

Meter Size	Retail Meter Equivalent Charge
5/8*	\$7.45
3/4	\$10.81
1	\$13.87
1½	\$15.81
2	\$25.91
3	\$76.60
4	\$127.30
6	\$258.88
8	\$491.84
10	\$775.40
12	\$1,018.37

*5/8 is the average residential customer meter size

Five-Tier Fixed Charge – Based on total billed water consumption for the billing period.

Gallons of Water	Fixed Charge
0 - 2,000 Gallons	\$1.25
2,001 - 6,000 Gallons	\$3.55
6,001 - 11,000 Gallons	\$9.25
11,001 - 20,000 Gallons	\$29.75
20,001 - over Gallons	\$29.75

Five-Tier Volume Charge – Rate is charged per 1,000 gallons of total billed water consumption for the billing period. Customers must meet qualifications for [Community Assistance Program \(CAP\) rates](#).

Gallons of Water	Non-CAP	CAP**
0 - 2,000 Gallons	\$3.00	\$1.23
2,001 - 6,000 Gallons	\$4.99	\$3.65
6,001 - 11,000 Gallons	\$8.65	\$6.00
11,001 - 20,000 Gallons	\$13.18	\$11.51
20,001 - over Gallons	\$14.74	\$14.21

Reserve Fund Surcharge – fee goes into a restricted reserve fund to offset water service revenue shortfalls that may impact operations and services. This **\$0.05** surcharge is billed per each 1,000 gallons billed.

Community Benefit Charge – fee charged per 1,000 gallons of water billed for the billing period to Non-CAP customers to fund the Customer Assistance Program (CAP). This **\$0.15** charge is billed per 1,000 gallons.

CALGARY, ALBERTA

Lot Area / Building Area

Residential customers that do not have a water meter to measure the amount of water being used are billed on a flat rate.

Visit the [water meter installation page](#) to arrange to have a meter installed.

Water Utility rates for residences on a flat rate are calculated according to the square feet of actual lot area and gross building area based on the original development permit submitted to The City of Calgary Planning department. For detailed information on your flat rate calculation, please call 311.

The following 2023-2026 Water Utility rates are based on **30 days of service**, which means the amount on your bill may vary depending on the number of days you have been billed.

Water treatment and supply

	2023	2024	2025	2026
\$ per thousand square feet of actual lot area*	6.1240	6.1240	6.1240	6.1240
\$ per thousand square feet of gross building area*	19.0978	19.0978	19.0978	19.0978

Minimum monthly rates (for 2023-2026 is \$46.17):

If the total water charge for a flat rate customer falls below the minimum monthly water rate, the customer will be charged the monthly minimum rate for water and this amount will be used to calculate the wastewater charge.

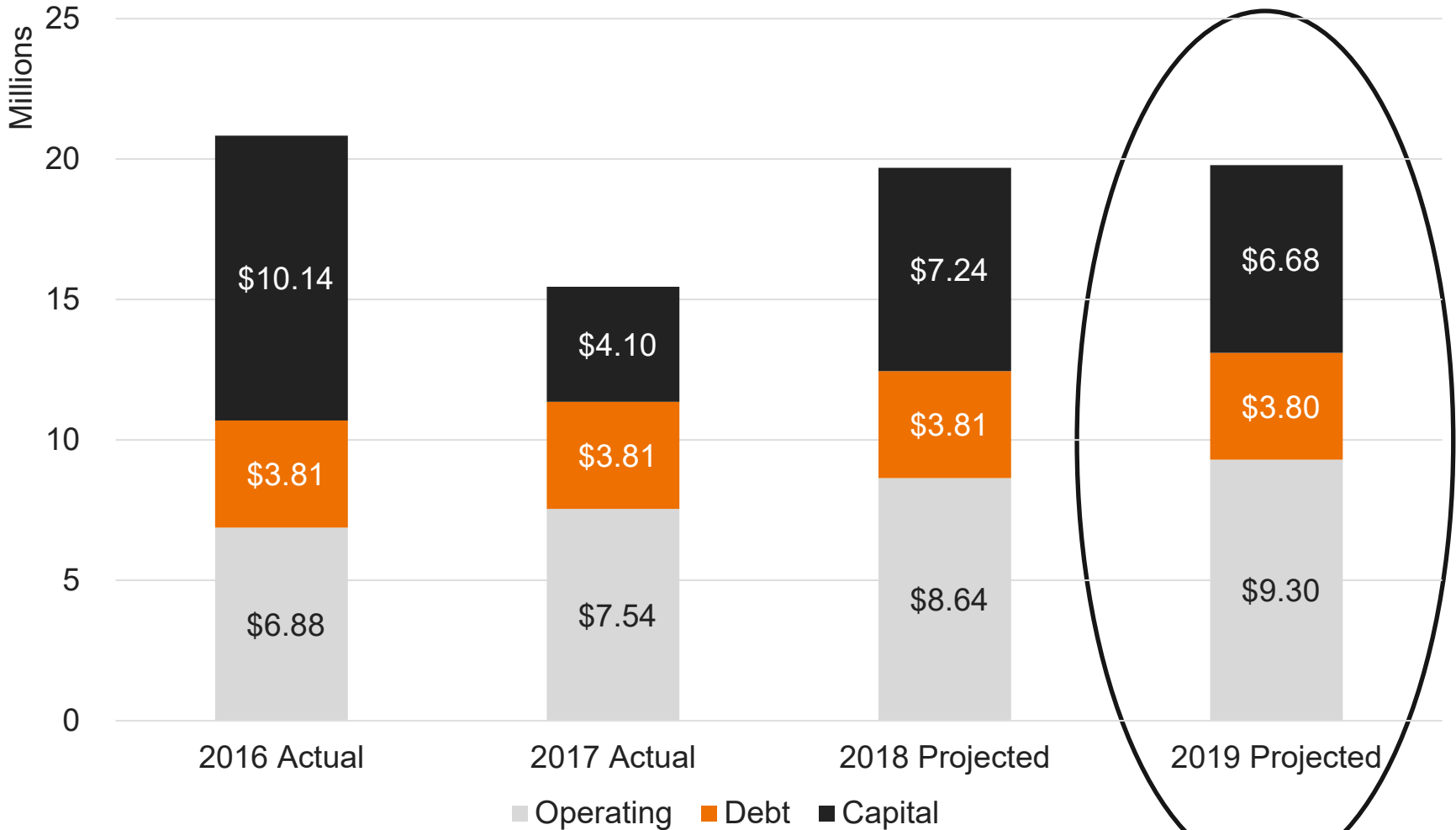
Wastewater collection and treatment

	2023	2024	2025	2026
Percentage of water charge for flat rate customers	144.46%	144.46%	144.46%	144.46%



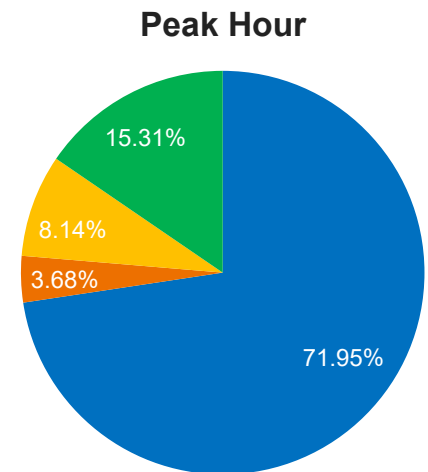
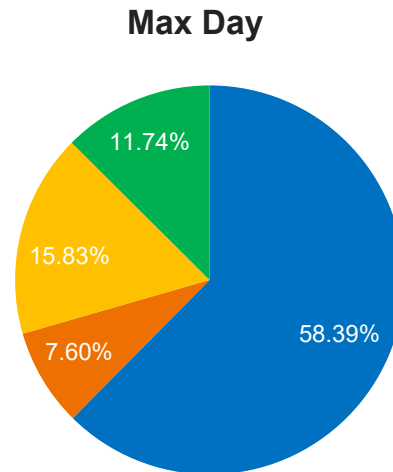
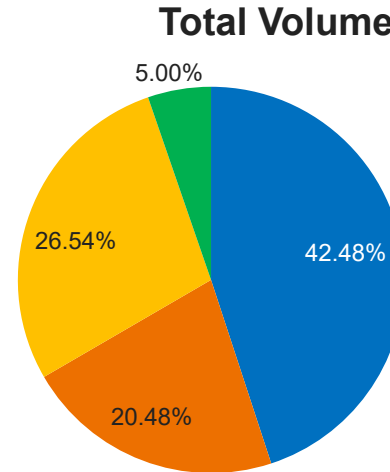
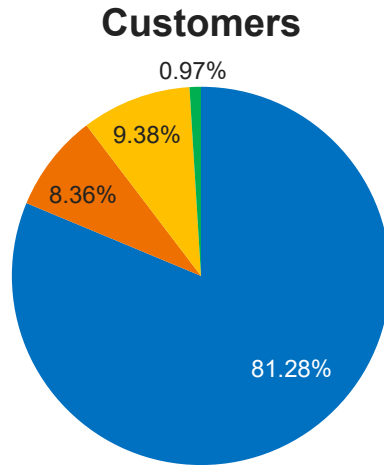
City of Bismarck, North Dakota

Total Annual Expenditures (\$ in Millions)

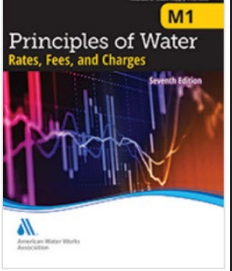


Question: How Should Costs be Allocated?

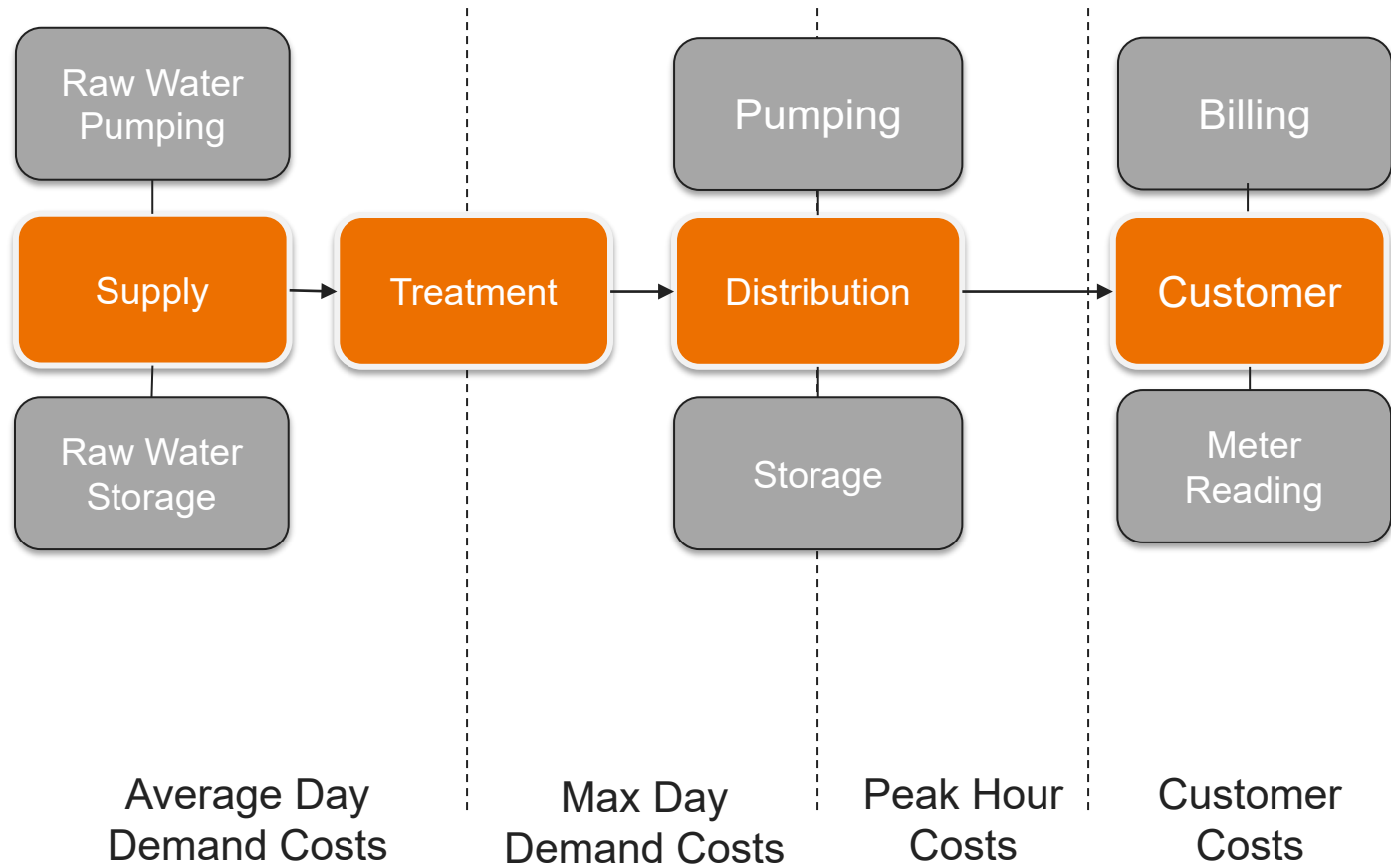
- Single Family
- Multi-Family
- Non-Residential
- Irrigation



Answer:
All of the Above



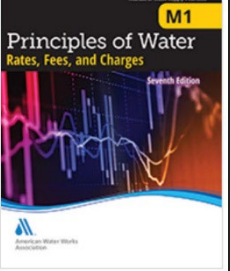
Started with a “By the Book” Process



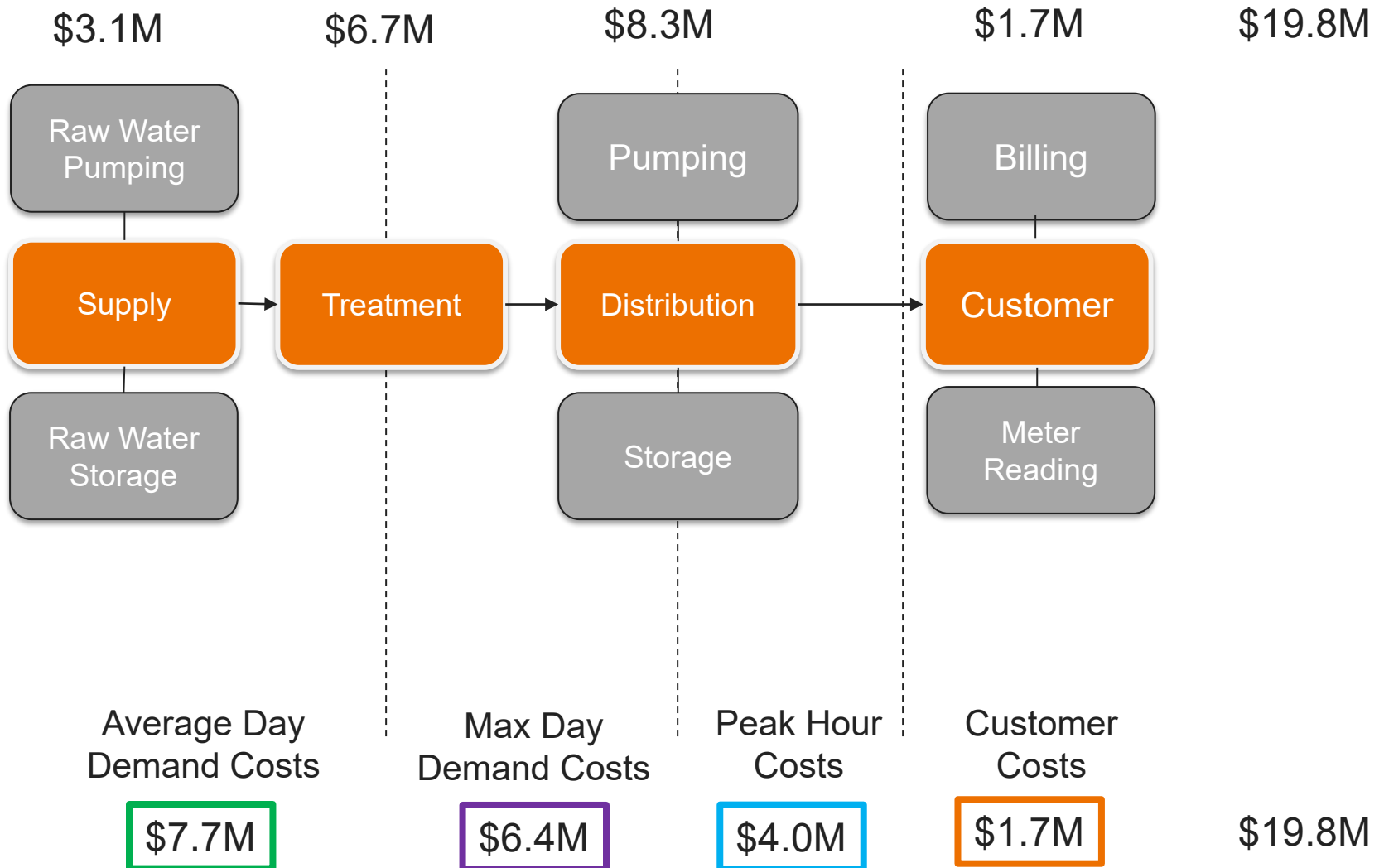
Function costs (\$ in millions) & units of service

Functions →	Supply	Treatment	Distribution	Customer	Total
2019 Cost of Service →	\$3.1	\$6.7	\$8.3	\$1.7	\$19.8
Average/Total Demands	100%	41%	21%		\$7.7
Maximum Day Demands		59%	30%		\$6.4
Peak Hour Demands			49%		\$4.0
Number of Accounts				100%	\$1.7

Allocation of costs between average day, maximum day, and peak hour based upon ratio of observed water system demands

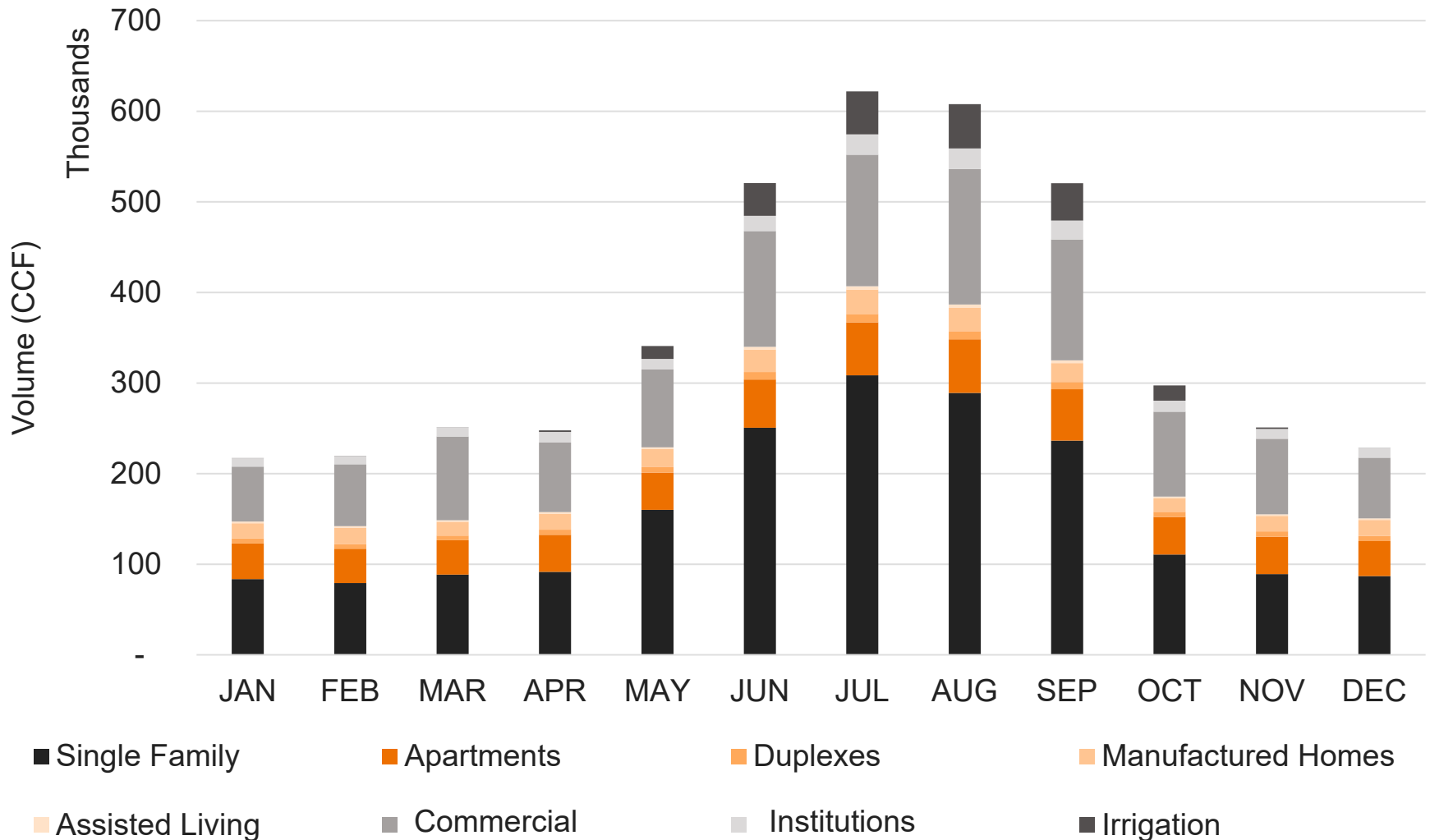


“Mapping” of functions to cost components

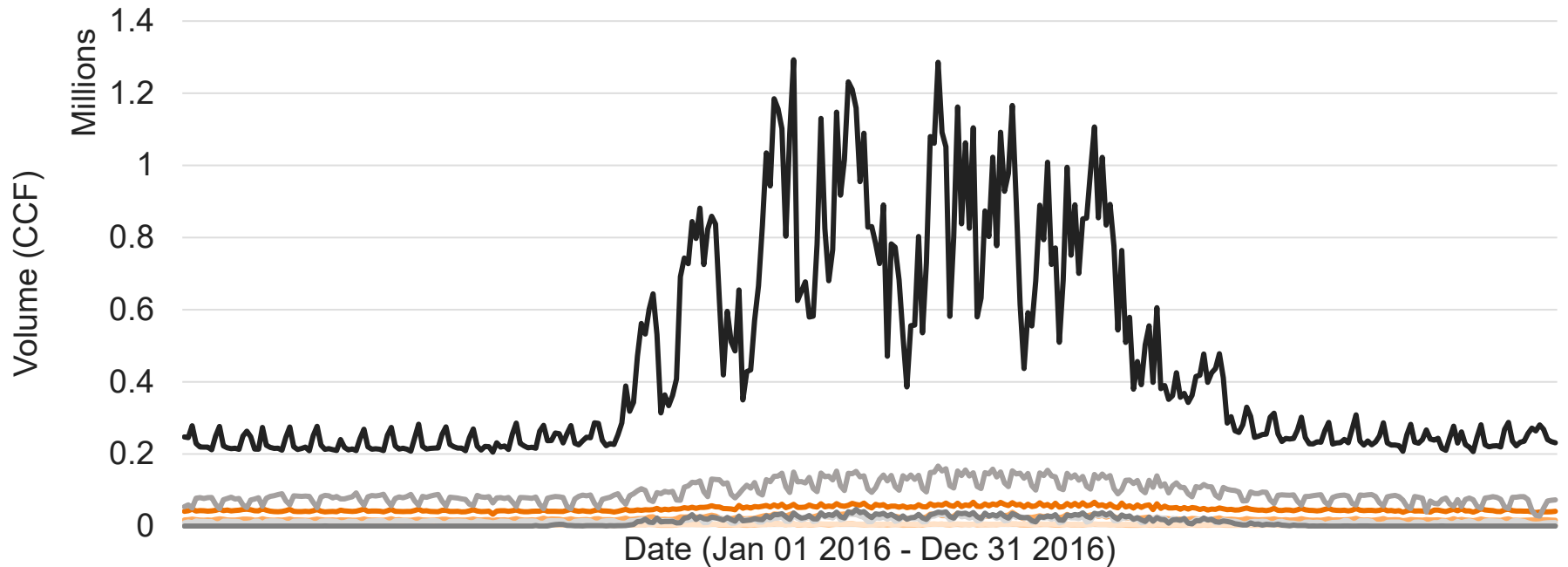


Allocating Costs to Customer Classes

Deep dive into 2016 monthly water use



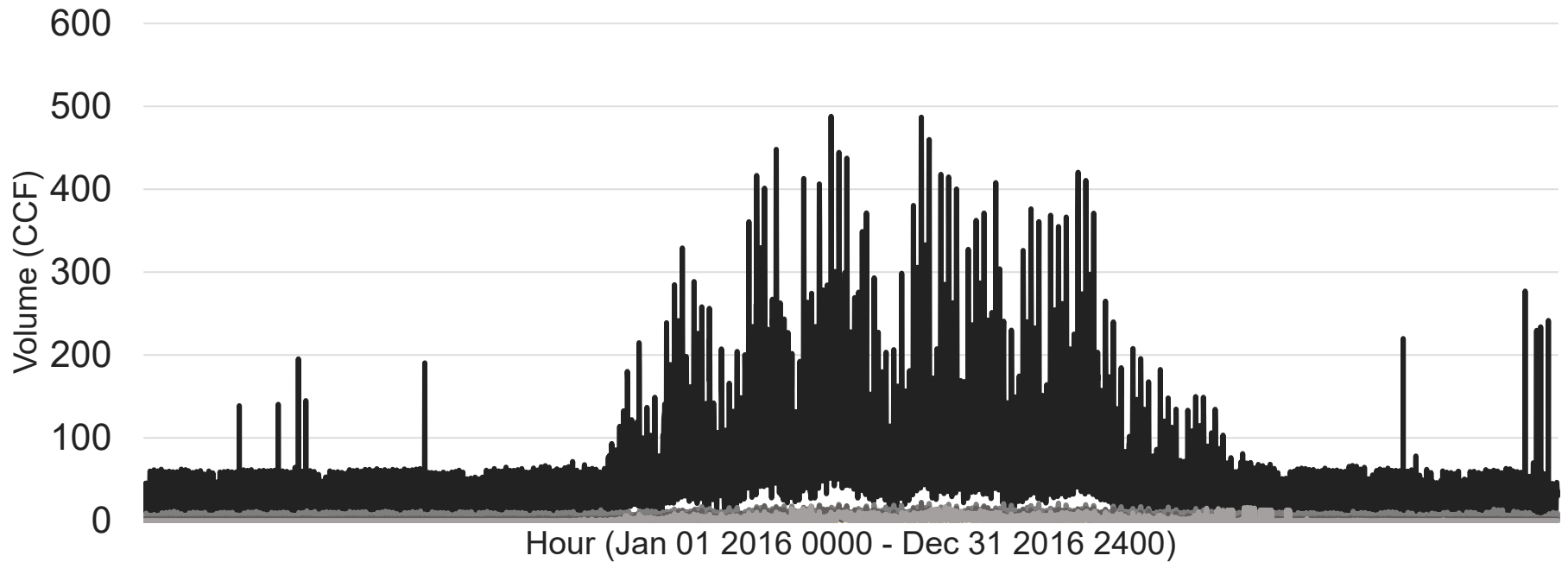
Deeper dive into customer data



- Single Family
- Duplexes
- Apartments
- Manufactured Homes
- Assisted Living
- Commercial
- Institutions
- Irrigation

7.5 million data points from the Automated Meter Infrastructure Data were used for 2016 on a **daily** basis

REALLY deep dive into customer data



- Single Family
- Duplexes
- Apartments
- Manufactured Homes
- Assisted Living
- Commercial
- Institutions
- Irrigation

175 million data points from the Automated Meter Infrastructure Data were used for 2016 on an **hourly** basis

Summary of data evaluated (tabular)

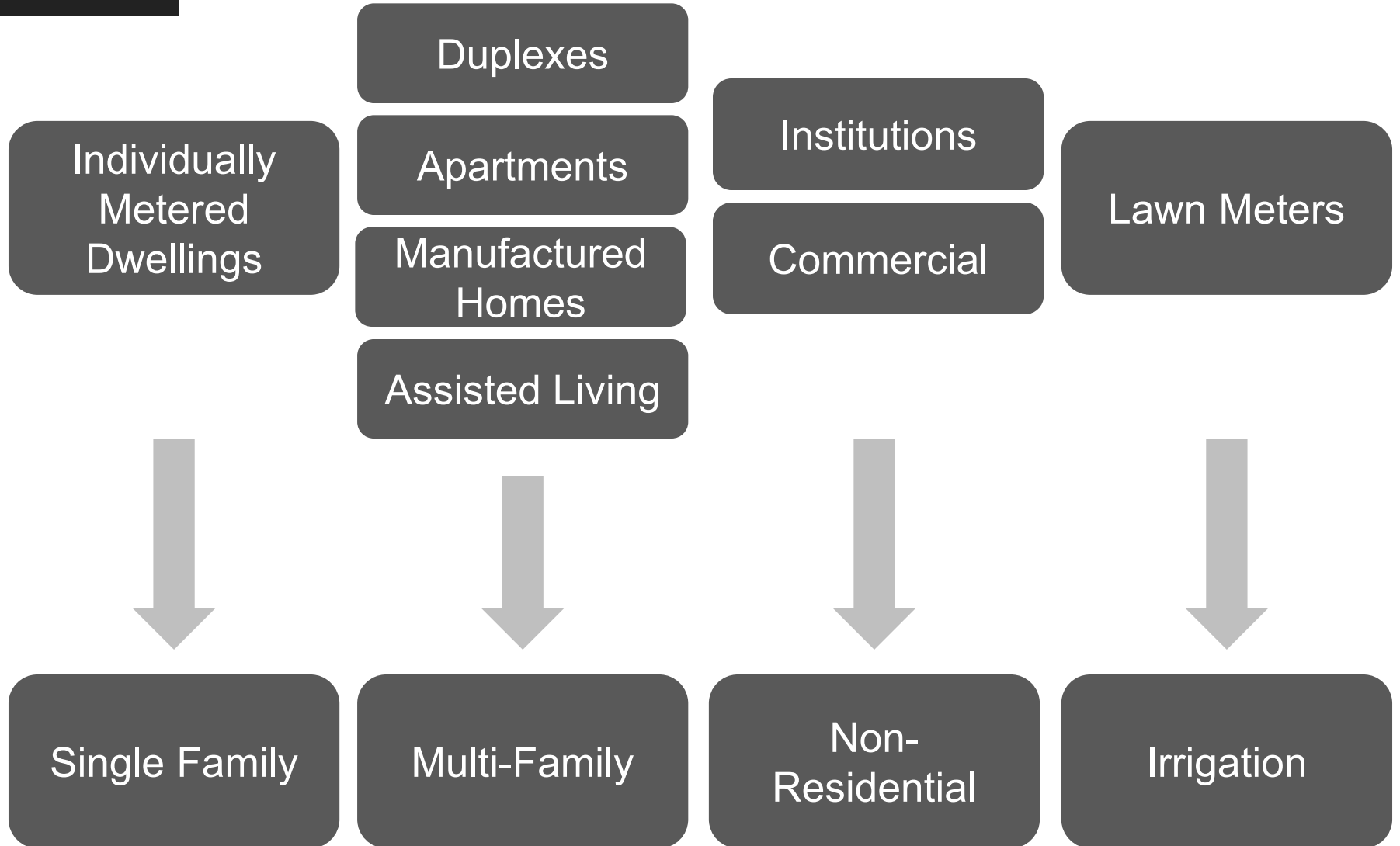
Customer Type	# of Accounts	2016 Water Use (CCF)	Peak Day Factor (Peak Day ÷ Avg Day)	Peak Hour Factor (Peak Hour ÷ Avg Hour)
Single-Family	17,306	1,964,193	2.9	9.0
Duplexes	730	84,704	1.9	3.0
Apartments	1,060	582,398	1.4	3.1
Manufactured Homes	30	251,916	1.9	2.3
Assisted Living	14	29,356	1.6	1.9
Commercial	2,066	1,121,241	1.8	3.8
Institutions	156	159,780	2.2	4.0
Irrigation	224	231,459	4.2	15.3
Lincoln	1	125,678	2.9	3.7
South Central	1	117,336	2.3	2.7

Peak day and peak hour factors presented are non-coincident and may occur during different periods.

Things to consider when establishing customer groups or classes

- Service characteristics
- Facility requirements
- Location
- Demand patterns
 - Average, maximum day, peak hour, monthly distribution
- Administrative requirements
- IT/Billing system capability
- Property uses
- Community/Stakeholder feedback

Recommended customer classes



Summary of data by customer class

Customer Class	# of Accounts	2016 Water Use (CCF)	Peak Day Factor (Peak Day ÷ Avg Day)	Peak Hour Factor (Peak Hour ÷ Avg Hour)
Single Family	17,306	1,964,193	2.9	9.0
Multi-Family	1,834	948,373	1.5	2.2
Non-Residential	2,222	1,281,021	1.8	3.0
Irrigation	224	231,459	4.2	15.3

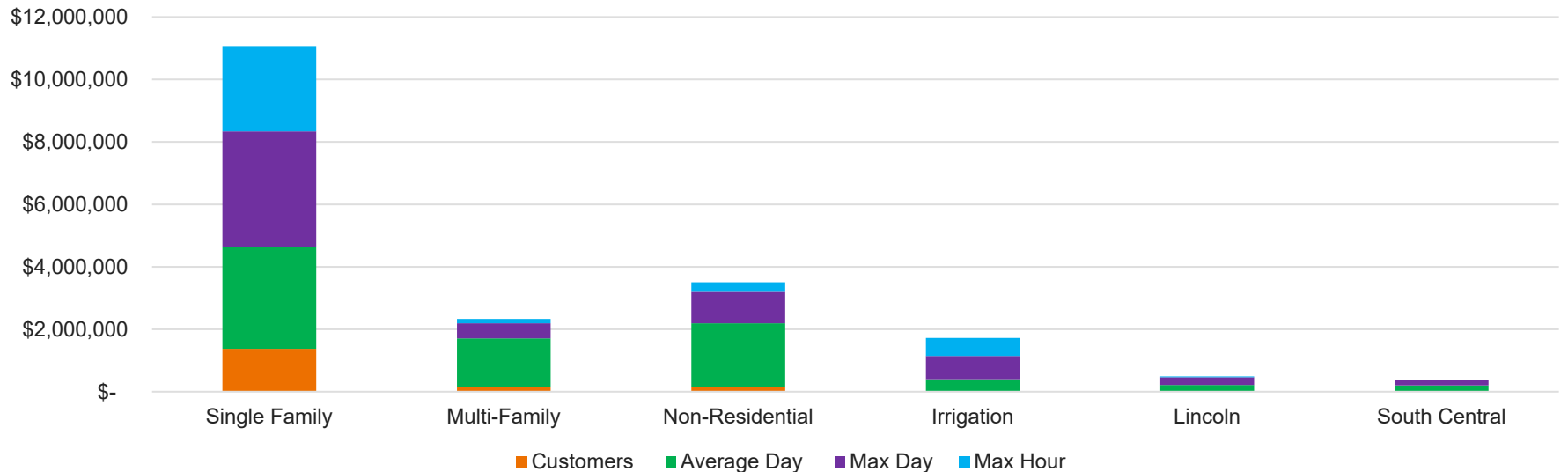
Implementation challenge: Consistent classification of same property uses with different metering configurations. Will require account auditing to identify property use in billing system and ensure equity.

Lincoln	1	125,678	2.9	3.7
South Central	1	117,336	2.3	2.7

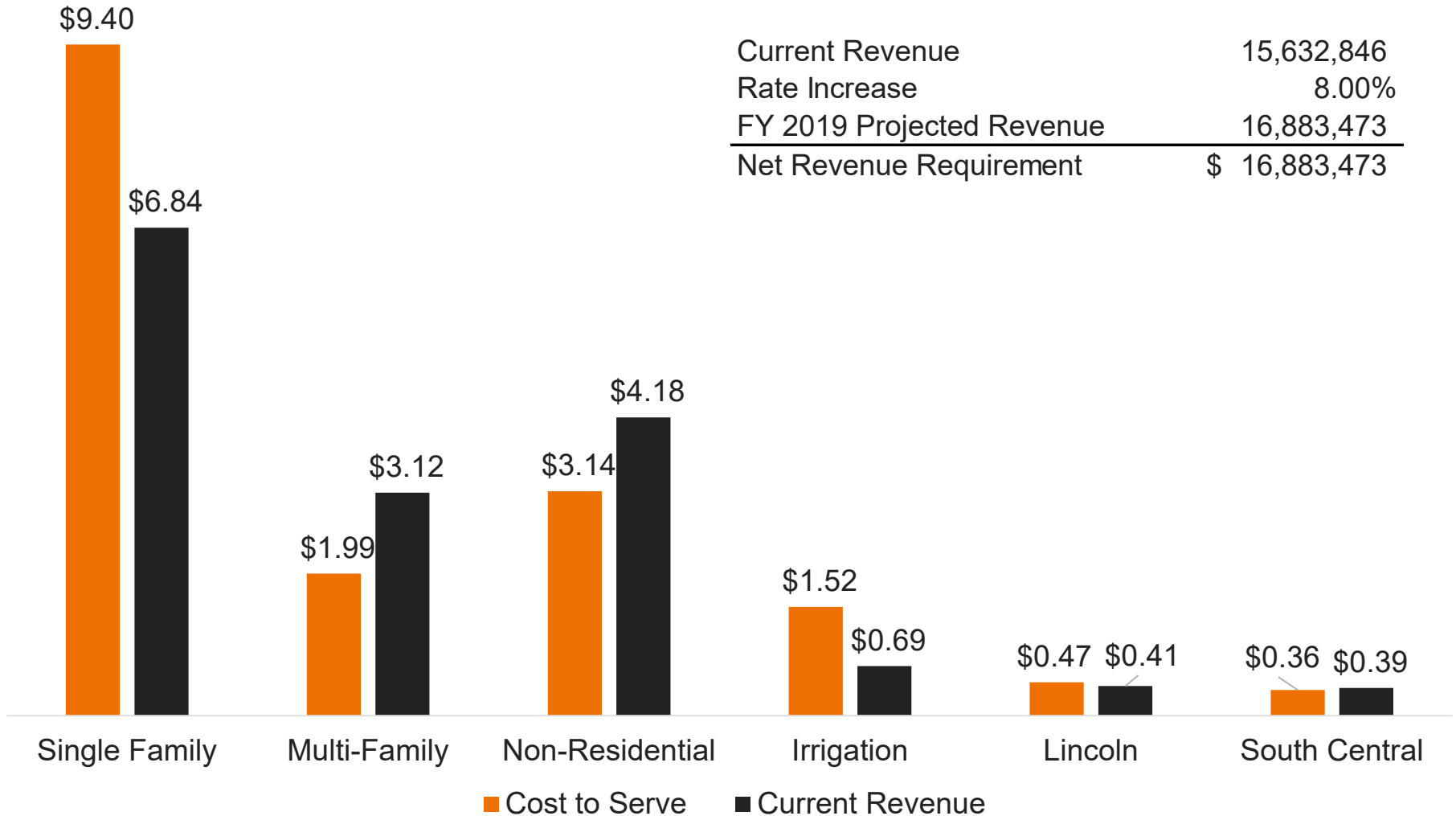
Implementation challenge: Addressing Lincoln and South Central cost of service requirements vs. pricing per current contracts.

Units of service and costs by customer class

Customer Class	# of Accounts	Avg. Day Demand (CCF)	Max Day Demand Per AMI (CCF)	Peak Hour Demand per AMI (CCF)
Single Family	17,306	5,383	15,558	48,558
Multi-Family	1,834	2,598	3,923	5,612
Non-Residential	2,222	3,510	6,388	10,283
Irrigation	224	634	2,682	9,715



Cost to serve vs. current revenue (\$M)



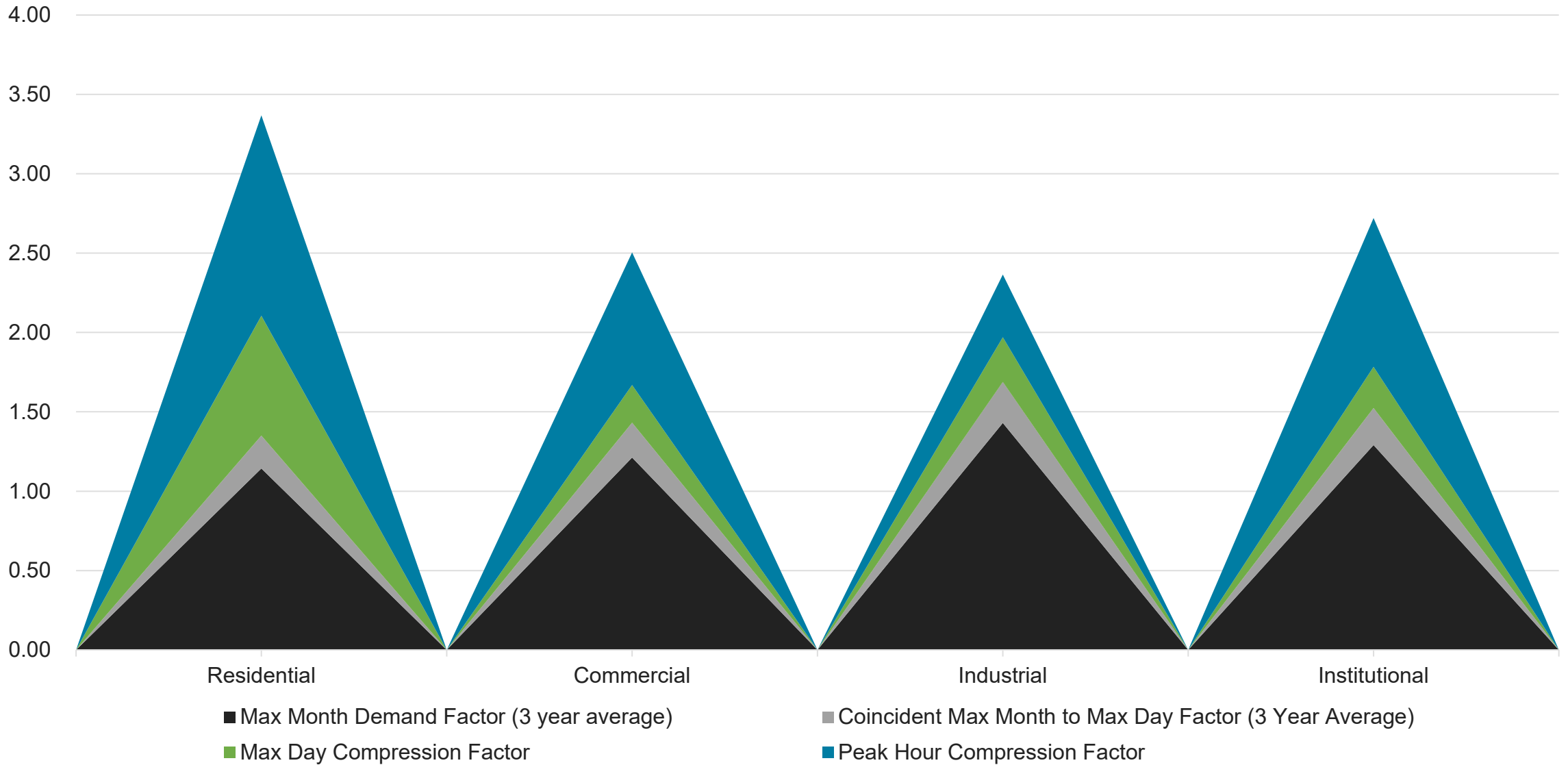
Current Revenue	15,632,846
Rate Increase	8.00%
FY 2019 Projected Revenue	16,883,473
Net Revenue Requirement	\$ 16,883,473



Developing Water Peak Factors

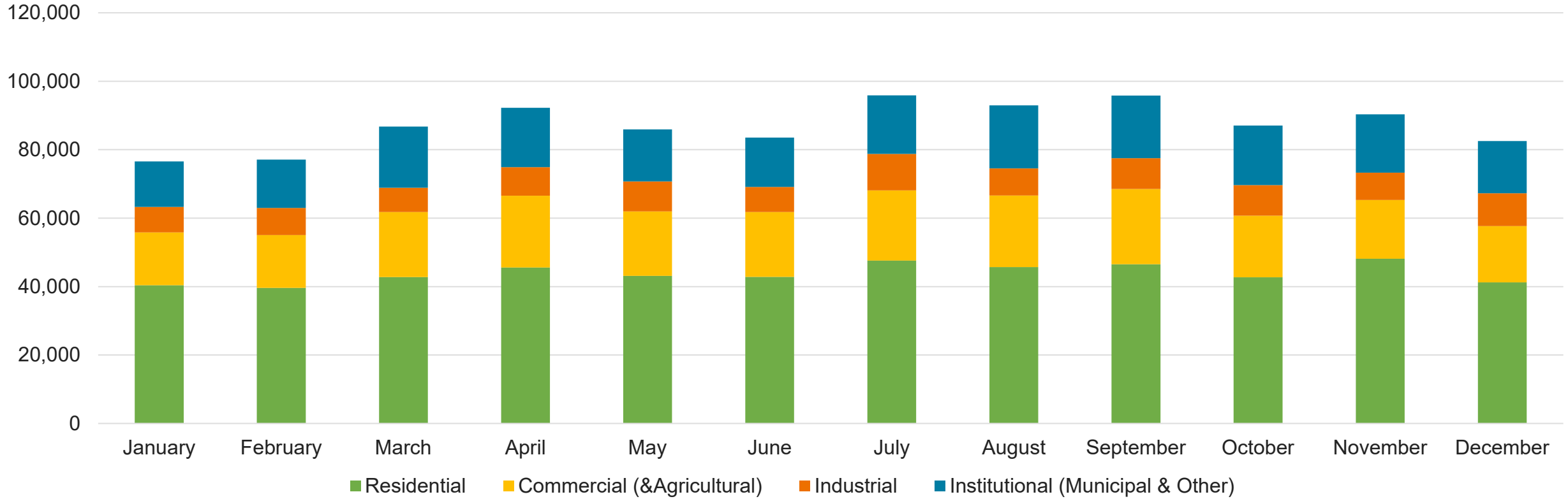


Developing Peaking Factors





Step 1: Max Month Demand Factor

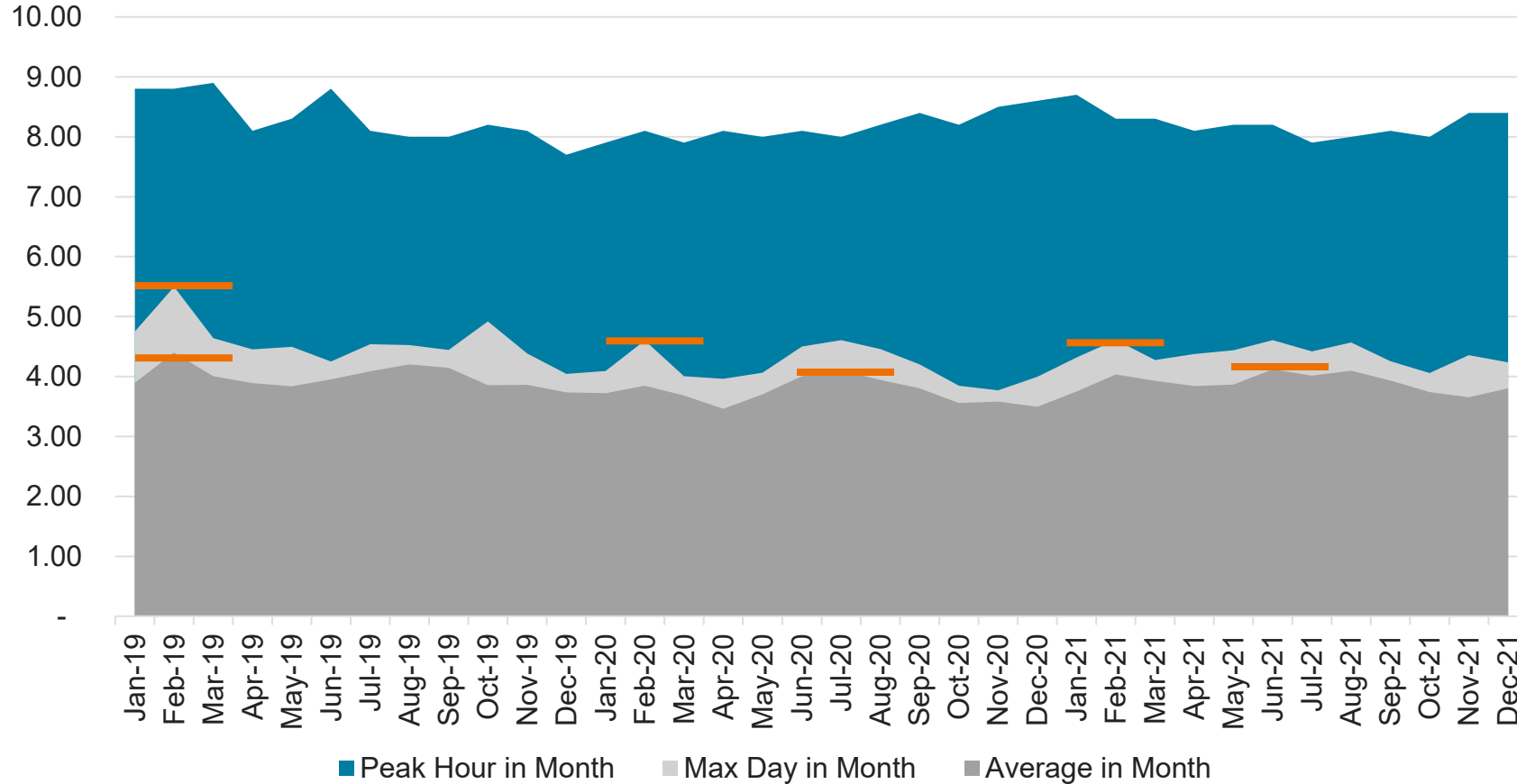


	Residential	Commercial	Industrial	Institutional
Average month	43,850	18,647	8,417	16,311
Max month	48,131	22,013	10,664	18,404
Max month ratio	1.10	1.18	1.27	1.13



Step 2: Coincident Max Day to Max Month Factor

Monthly Production Data



$$\frac{\text{Max Day in Year}}{\text{Average Day}} = \text{System Max Day Factor}$$

$$\frac{\text{Peak Hour in Year}}{\text{Average Day}} = \text{System Peak Hour Factor}$$

$$\frac{\text{Max Day in Year}}{\text{Max Month in Year}} = \text{Max Day to Max Month Factor}$$

Would be able to stop at this step if doing coincident demand factors:

$$\left(\frac{\text{Class Consumption During System MM}}{\text{Annual Average Month for Class}} \right) \times \left(\frac{\text{System Peak-Day Rate of Flow}}{\text{System MM Rate of Flow}} \right)$$

Step 3: Maximum Day Compression Factors for Non-Coincident Demands

	Residential Base Usage	Percent	Days	Average per Day
Average Household Size	2.09			
Indoor Use per person	58.60			
Annual Usage Gallons	44,703			
Base Monthly Usage	3,725			
Sprinkling Usage	6,275	37%	7	2.61
Total	10,000	63%	3	1.88
% base				4.49
Days				7
MD Factor				1.56
Commercial				
Days				6
MD Factor				1.17
Industrial				
Days				6
MD Factor				1.17



Step 4: Peak Hour Compression Factors for Non-Coincident Demands

Peak Hour Factor	Hours		
Residential and Multi Family	15	1.60	Less typical work day
Commerical	16	1.50	
Industrial	20	1.20	
Institutional	Below	1.53	

Institutional	Sales	Percent of CBU Retail	Factor	
Residential	393,622	62%	1.56	0.96
Commercial	167,384	26%	1.17	0.31
Industrial	75,560	12%	1.17	0.14
Total	636,566	100%		1.41

	Percent of Sales	Peaking Factor	Weighted Average
University			
Residential	62%	1.60	99%
Commercial	26%	1.50	39%
Industrial	12%	1.20	14%
Total			153%



Peak Factors by Class (Noncoincident)

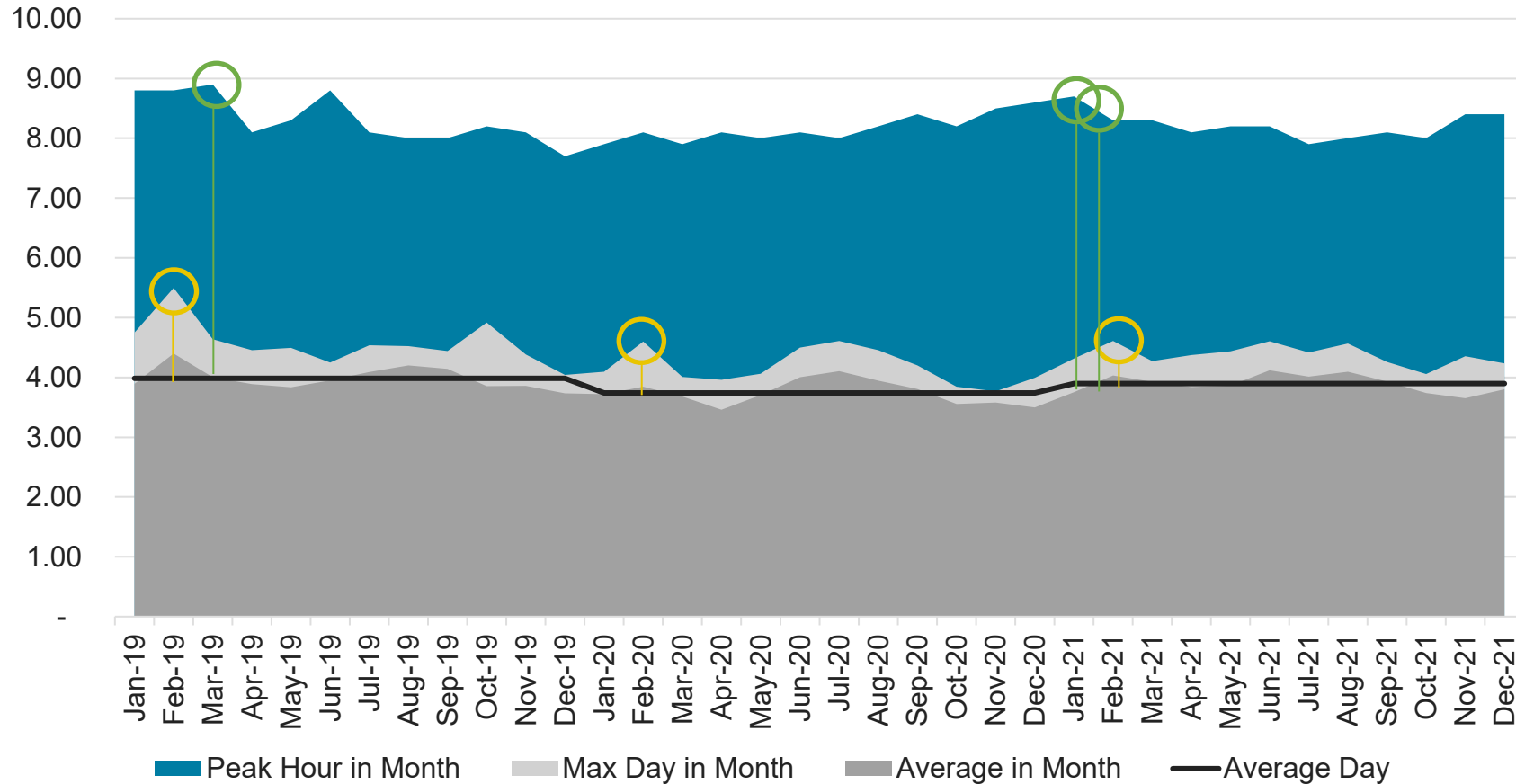
Line Base and Extra Capacity Demands by Customer Class

Line		Residential	Commercial	Industrial	Institutional	Total
1	Test Year Annual Use (kgal)	393,622	167,384	75,560	146,421	782,987
2	Average Daily Use (MGD)	1.08	0.46	0.21	0.40	2.15
3	Non-Coincident Max Month Demand Factor (3 year average)	1.14	1.21	1.43	1.29	
4	Non-Coincident Max Month Demand (MGD) (Line 2 * Line 3)	1.23	0.56	0.30	0.52	2.60
5	Coincident Max Day to Max Month Factor (3 Year Average)	1.18	1.18	1.18	1.18	
6	Max Day Compression Factor (Schedule 8)	1.56	1.17	1.17	1.17	
7	Non-Coincident Max Day Demand (MGD) (Line 4 * Line 5 * Line 6)	2.27	0.77	0.41	0.72	4.16
8	Max Day Demand Factor (Line 7 / Line 2)	2.11	1.67	1.97	1.78	
9	Non-Coincident May Day Demand Factor (Line 7 / Line 2)	1.94				
10	Coincident Max Day Demand Factor (Schedule 6, Line 5)	1.27				
11	System MM Diversity* (Line 9 / Line 10) <i>*AWWA M1: Range for System MM Diversity For Many Utility Systems is 1.10 - 1.40</i>	1.53				
12	Max Hour Compression Factor (Schedule 8)	1.60	1.50	1.20	1.53	
13	Non-Coincident Max Hour Demand (Line 7 * Line 12)	3.63	1.15	0.49	1.09	6.36
14	Max Hour Demand Factor (Line 13 / Line 2)	3.37	2.50	2.36	2.72	
15	Non-Coincident Max Hour Demand Factor (Line 13 / Line 2)	2.97				
16	Coincident Max Hour Demand Factor (Schedule 6, Line 5)	2.25				
17	System MH Diversity* (Line 14 / Line 15) <i>*AWWA M1: Range for System MH Diversity For Many Utility Systems is 1.10 - 1.40</i>	1.32				



System Peak Factors – Coincident Peak

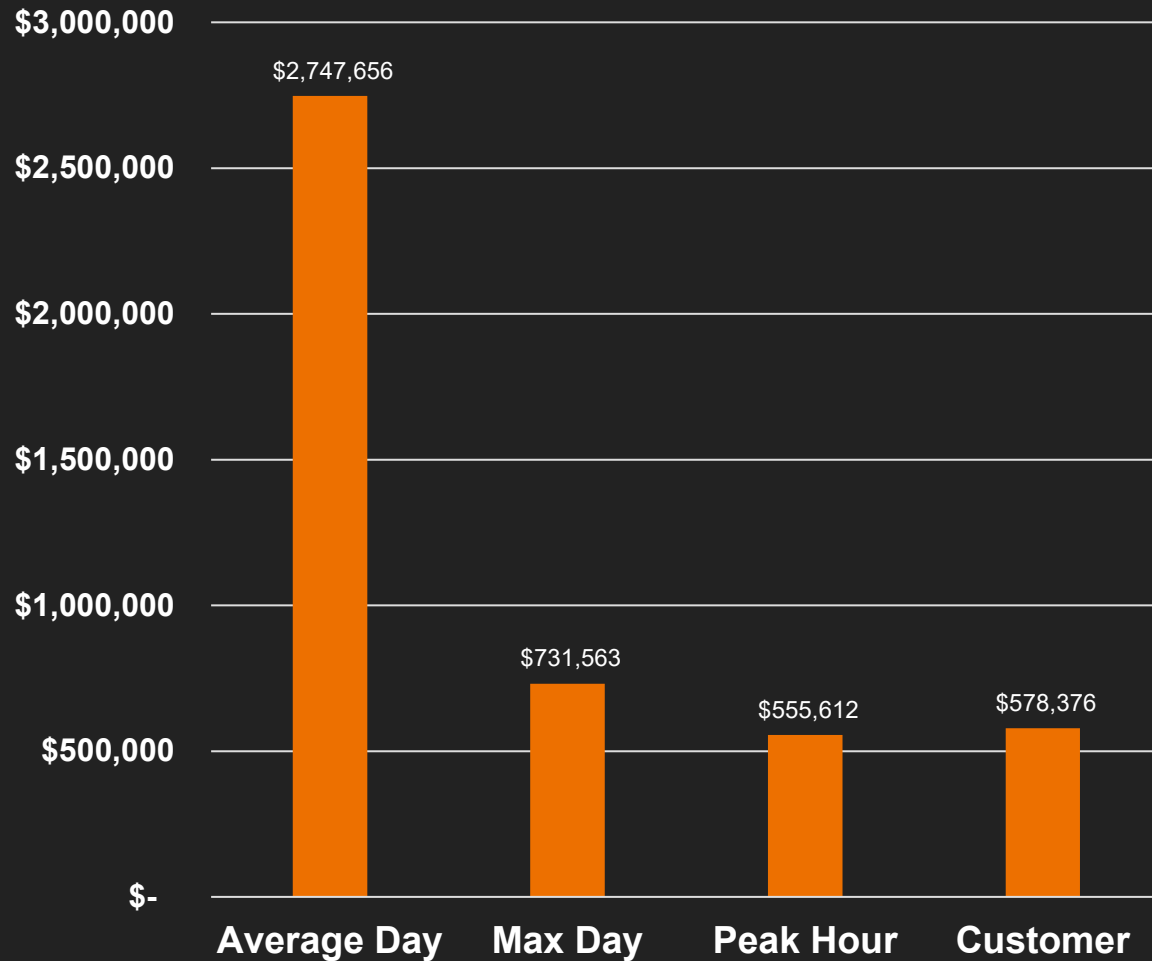
Monthly Production Data



$$\frac{\text{Max Day in Year}}{\text{Average Day}} = \text{System Max Day Factor}$$

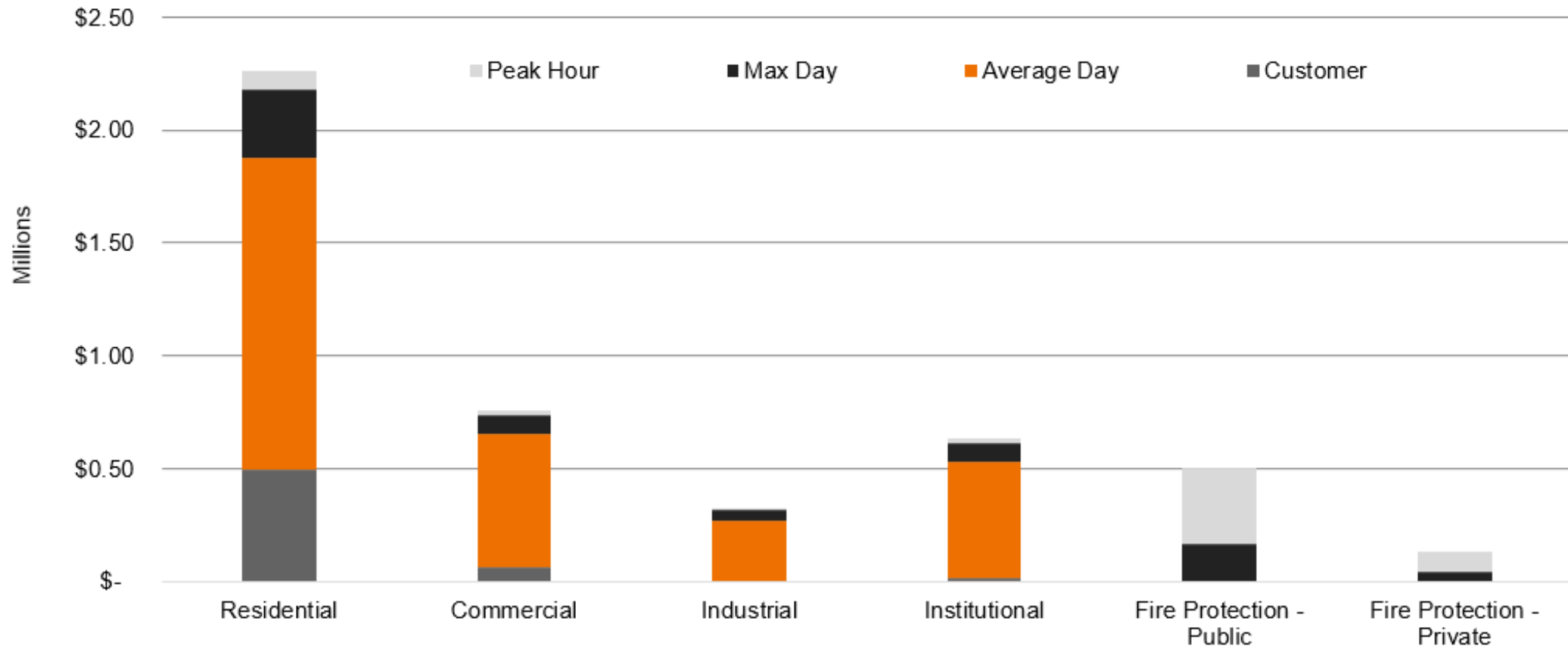
$$\frac{\text{Peak Hour in Year}}{\text{Average Day}} = \text{System Peak Hour Factor}$$

Test Year - Allocated Costs



- Total \$4.6M
- Allocated Costs Assigned to Customer Class based on Customer Behaviors
 - Less Non-Adjustable Revenue, \$103K = \$4.5M
- Monthly Billing Data
- System-wide Max Day
 - Calculated for each class using standard behaviors
 - Residential – Domestic + Irrigation
 - Others – Days of operation per week
- System-wide Peak Hour
 - Calculated for each class using standard daily behaviors
 - Hours of use per day
- Fire Protection
 - Based on required fire flow in gpm and required duration

Cost Allocation by Class





Water Rate Design



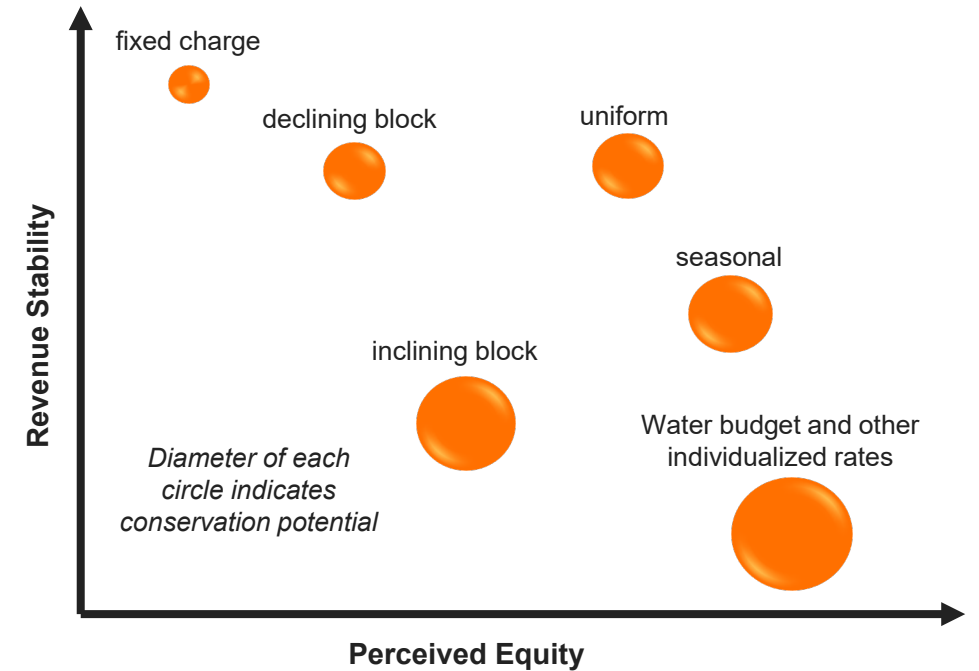
All About Balance

✓ Identify structure that meets your needs:

- Conforms to industry practice
- Meets all legal requirements
- Easy to administer/understand
- Elasticity of demand & weather
- Conservation and affordability
- Availability of data/technology
- Stakeholder input/concerns

✓ Critical considerations:

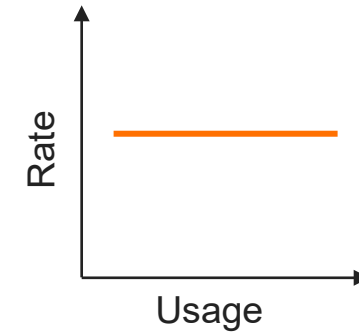
- Understanding distribution of system costs
- Integrating financial considerations
 - Reserve policies & revenue stability





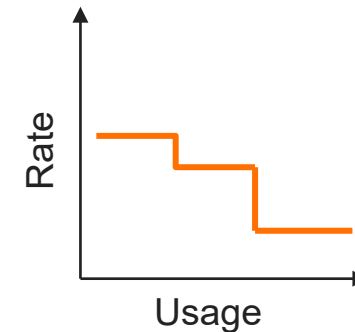
Uniform Rate Structure

- Same rate regardless of usage
- Most common rate structure for non-residential
- Simple and utilized in non-scarcity scenarios



Decreasing Block Rate Structure

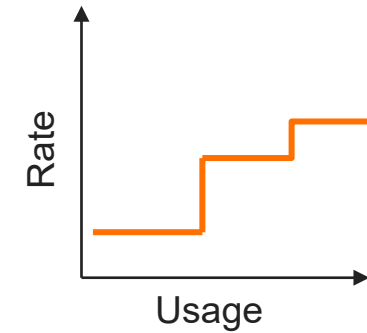
- Rate decreases for higher levels of usage
- Typically used to encourage economic development and minimize bills for large users
- Was a very common & successful way of creating cost-based rates within a single rate schedule





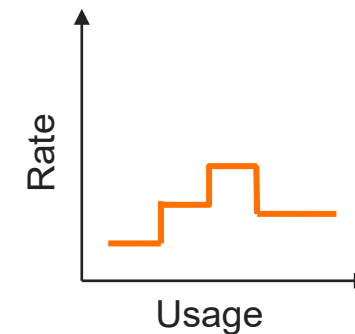
Increasing Block or “Tiered” Structure

- Rate increases for higher levels of usage
- Intended to encourage water conservation
- Now most common single-family rate structure
- Applied to single-family residential customers due to consistent usage and to irrigation-only meters
- Challenging to apply to non-residential customers



Increasing/Decreasing Structure

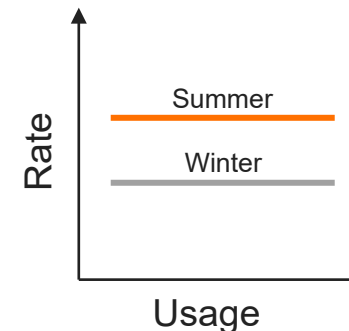
- Rate increases then decreases with higher usage
- Intended to provide water conservation at lower usage levels and reduced impact on larger users
- Single structure that accommodates large users





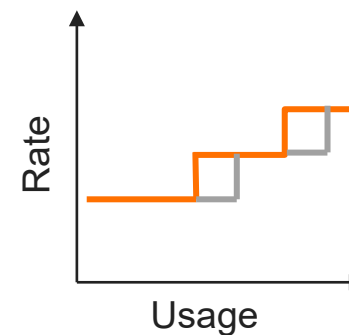
Seasonal Rate Structure

- Higher rates in peak times of year
- May be appropriate for communities with customer classes that demonstrate seasonal usage patterns or scarcity concerns
- Hard question: Why does same level of indoor use cost less in winter than summer?



Budget-Based Rates

- Individualized inclining block rate structure
- Different blocks based on usage allowance per customer, class, lot size, or other factors
- Structure used to focus higher rates on peak usage or to encourage wise use of water
- Data and resource intensive

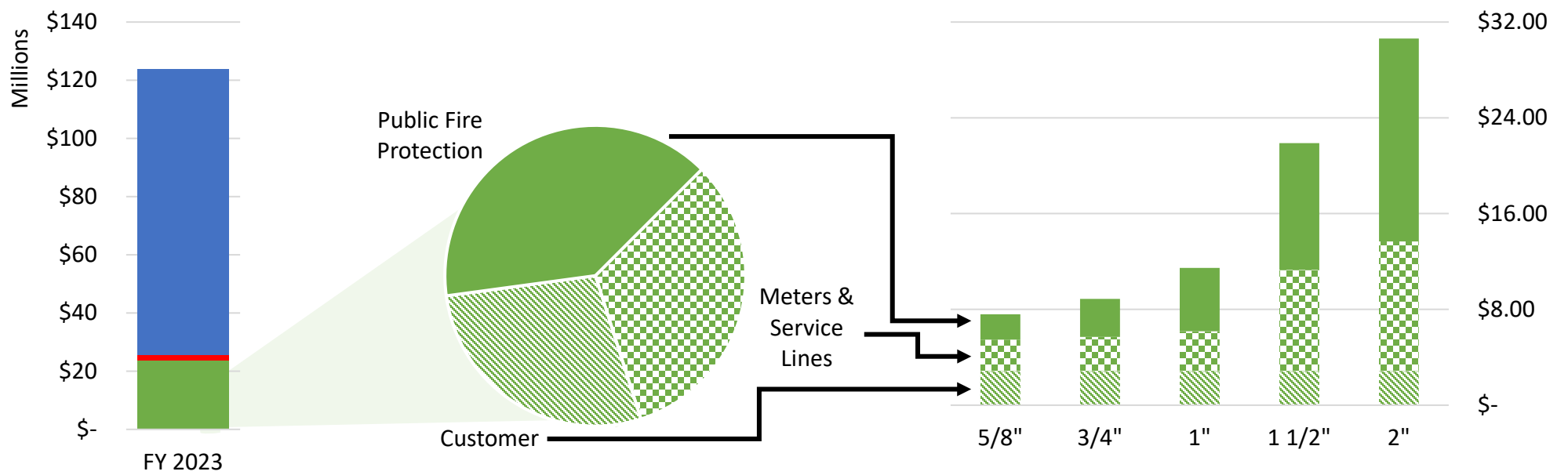
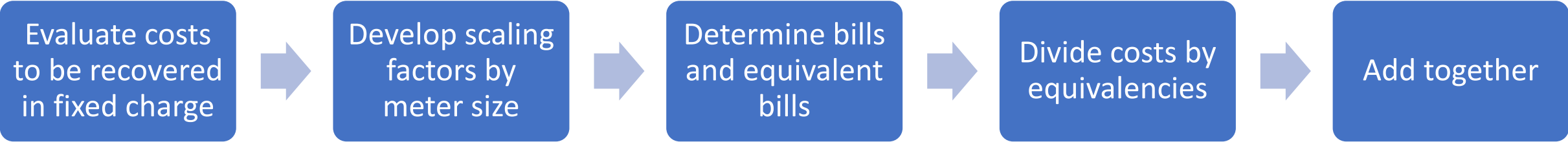




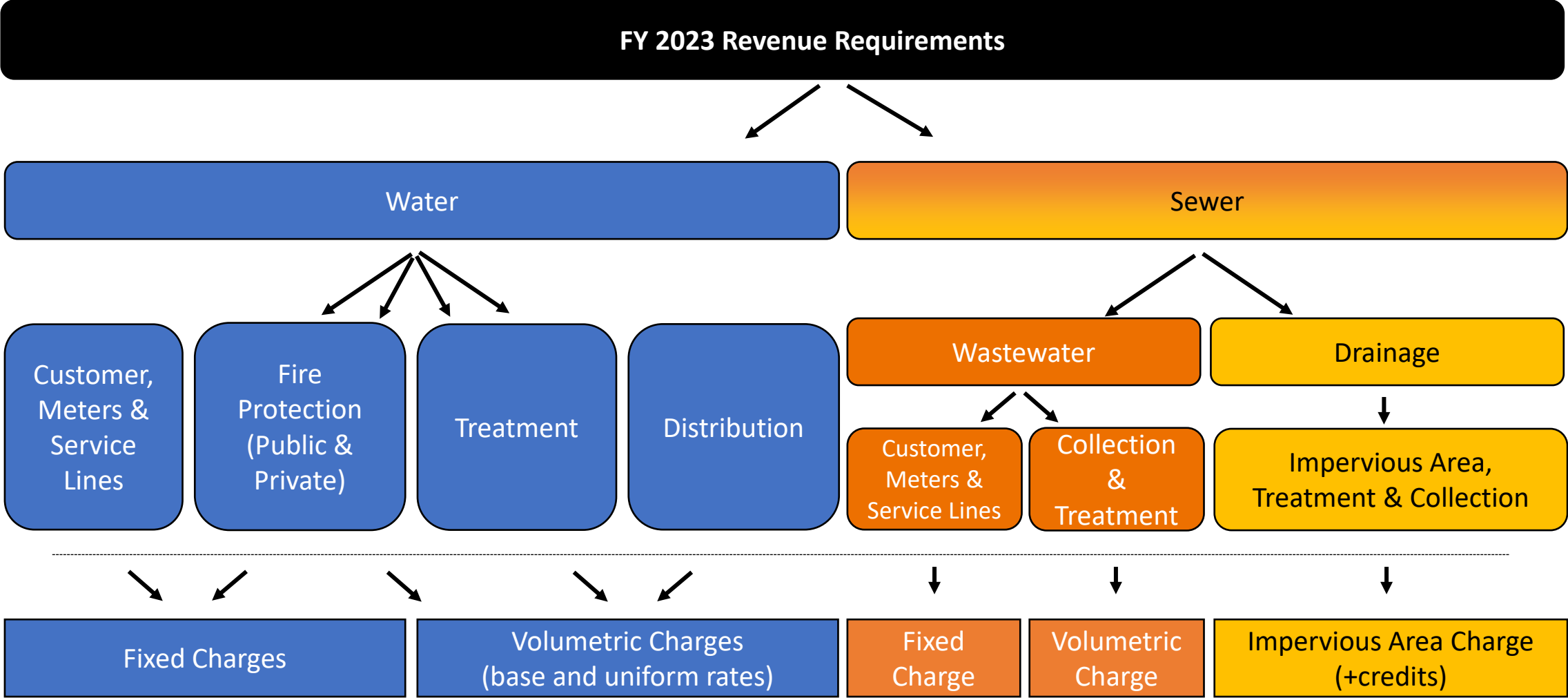
Water & Sewerage
Department

DWSD Fixed Charges

Steps to Calculating Fixed Charges



Cost Allocation & Rate Design Approach



Evaluate Water Costs to be Recovered in Fixed Charge

Apprn. Description	Cost Center	Cost Center Description	FY 2023 Water Expense for COSA	Allocation Factor	Allocations					\$	\$	\$	\$	\$
					Treatment	Distribution	Meters & Service Lines	Customer	Fire Protection					
Operating Expenses														
Administration	1001	Chief Exec Officer	\$ 802,324	Weighted Internal	0.0%	76.2%	13.2%	10.7%	0.0%	\$ -	\$ 610,981	\$ 105,882	\$ 85,461	\$ -
Administration	1601	BOWC	\$ 168,479	Weighted Internal	0.0%	76.2%	13.2%	10.7%	0.0%	\$ -	\$ 128,299	\$ 22,234	\$ 17,946	\$ -
Operations	2401	Deputy Director Administration	\$ 1,916,474	Distribution Only	0.0%	100.0%	0.0%	0.0%	0.0%	\$ -	\$ 1,916,474	\$ -	\$ -	\$ -
Operations	2411	Field Engineering	\$ 3,310,037	Distribution Only	0.0%	100.0%	0.0%	0.0%	0.0%	\$ -	\$ 3,310,037	\$ -	\$ -	\$ -
Operations	2421	Facility Oper	\$ 3,961,474	Distribution Only	0.0%	100.0%	0.0%	0.0%	0.0%	\$ -	\$ 3,961,474	\$ -	\$ -	\$ -
Operations	2422	Fleet Operations	\$ 2,418,049	Distribution Only	0.0%	100.0%	0.0%	0.0%	0.0%	\$ -	\$ 2,418,049	\$ -	\$ -	\$ -
Operations	2431	Maint & Repair	\$ 8,232,028	Maintenance & Repair	0.0%	91.3%	0.0%	0.0%	8.7%	\$ -	\$ 7,518,671	\$ -	\$ -	\$ 713,357
Operations	2432	Meter Operations	\$ 3,035,773	Meters & Service Lines Only	0.0%	0.0%	100.0%	0.0%	0.0%	\$ -	\$ -	\$ 3,035,773	\$ -	\$ -
Operations	2435	Lead Service	\$ 278,500	Meters & Service Lines Only	0.0%	0.0%	100.0%	0.0%	0.0%	\$ -	\$ -	\$ 278,500	\$ -	\$ -
Compliance	3101	General Counsel	\$ 936,948	Weighted Internal	0.0%	76.2%	13.2%	10.7%	0.0%	\$ -	\$ 713,499	\$ 123,648	\$ 99,801	\$ -
Compliance	3201	Org Development	\$ 739,416	Weighted Internal	0.0%	76.2%	13.2%	10.7%	0.0%	\$ -	\$ 563,075	\$ 97,580	\$ 78,761	\$ -
Compliance	3301	Info Technology	\$ 5,312,953	Weighted Internal	0.0%	76.2%	13.2%	10.7%	0.0%	\$ -	\$ 4,045,887	\$ 701,144	\$ 565,921	\$ -
Compliance	3411	Compliance-Security	\$ 1,820,310	Weighted Internal	0.0%	76.2%	13.2%	10.7%	0.0%	\$ -	\$ 1,386,191	\$ 240,224	\$ 193,895	\$ -
Compliance	3421	Compliance-Public Affairs	\$ 876,958	Weighted Internal	0.0%	76.2%	13.2%	10.7%	0.0%	\$ -	\$ 667,816	\$ 115,731	\$ 93,411	\$ -
Finance	4001	Chief Financial Officer	\$ 2,003,669	Weighted Internal	0.0%	76.2%	13.2%	10.7%	0.0%	\$ -	\$ 1,525,821	\$ 264,422	\$ 213,425	\$ -
Finance	4111	Finance	\$ 805,856	Weighted Internal	0.0%	76.2%	13.2%	10.7%	0.0%	\$ -	\$ 613,671	\$ 106,348	\$ 85,838	\$ -
Finance	4121	Procurement	\$ 1,502,846	Weighted Internal	0.0%	76.2%	13.2%	10.7%	0.0%	\$ -	\$ 1,144,438	\$ 198,329	\$ 160,079	\$ -
Finance	4131	Treasury	\$ 1,223,522	Weighted Internal	0.0%	76.2%	13.2%	10.7%	0.0%	\$ -	\$ 931,729	\$ 161,467	\$ 130,326	\$ -
Finance	4151	Budget	\$ 177,237	Weighted Internal	0.0%	76.2%	13.2%	10.7%	0.0%	\$ -	\$ 134,969	\$ 23,390	\$ 18,879	\$ -
Finance	4161	Billing & Collect	\$ 1,218,255	Customer Only	0.0%	0.0%	0.0%	100.0%	0.0%	\$ -	\$ -	\$ -	\$ 1,218,255	\$ -
Finance	4170	Internal Aud	\$ 280,359	Weighted Internal	0.0%	76.2%	13.2%	10.7%	0.0%	\$ -	\$ 213,497	\$ 36,999	\$ 29,863	\$ -
Customer Svc	5111	Customer Service	\$ 1,456,827	Customer Only	0.0%	0.0%	0.0%	100.0%	0.0%	\$ -	\$ -	\$ -	\$ 1,456,827	\$ -
Operations	2223	Storm Drainage	\$ 853,344	Weighted Internal	0.0%	76.2%	13.2%	10.7%	0.0%	\$ -	\$ 649,833	\$ 112,615	\$ 90,896	\$ -
			\$ 43,331,639						\$ -	\$ 32,454,412	\$ 5,624,285	\$ 4,539,585	\$ 713,357	\$ -
Non-Operating Expenses														
Non-Operating	7111	Water Pension Expense	\$ 21,015,700	Weighted Internal	0.0%	76.2%	13.2%	10.7%	0.0%	\$ -	\$ 16,003,747	\$ 2,773,417	\$ 2,238,536	\$ -
Non-Operating	7111	Water Retail Assistance Program	\$ 614,460	Weighted Internal	0.0%	76.2%	13.2%	10.7%	0.0%	\$ -	\$ 467,919	\$ 81,090	\$ 65,451	\$ -
			\$ 21,630,160						\$ -	\$ 16,471,666	\$ 2,854,507	\$ 2,303,986	\$ -	
GLWA Expenses														
Non-Operating	#N/A	GLWA Water Charge	\$ 22,985,900	Treatment Only	100.0%	0.0%	0.0%	0.0%	0.0%	\$ 22,985,900	\$ -	\$ -	\$ -	\$ -
Water - Pre-Bifurcation Debt	Debt	Water Pre-Bifurcation Debt	\$ 33,438,800	Distribution Only	0.0%	100.0%	0.0%	0.0%	0.0%	\$ -	\$ 33,438,800	\$ -	\$ -	\$ -
			\$ 56,424,700						\$ 22,985,900	\$ 33,438,800	\$ -	\$ -	\$ -	
Revenue Financed Capital														
Transfer to I&E from Revenue Fund			\$ 6,580,230	Distribution Only	0.0%	100.0%	0.0%	0.0%	0.0%	\$ -	\$ 6,580,230	\$ -	\$ -	\$ -
			\$ 6,580,230						\$ -	\$ 6,580,230	\$ -	\$ -	\$ -	
			\$ 127,966,729						\$ 22,985,900	\$ 88,945,108	\$ 8,478,792	\$ 6,843,571	\$ 713,357	
<i>Weighted Internal Allocation</i>										0.0%	76.2%	13.2%	10.7%	2.8%



Evaluate Water Costs to be Recovered in Fixed Charge

	Base Average Day	Extra Max Day	Extra Peak Hour	Meters & Service Lines	Customer	Fire Protection	Total
Treatment	69%	31%					\$22,985,900
Distribution	50%	23%	27%				\$88,945,108
Meters & Service Lines				100%			\$8,478,792
Customer					100%		\$6,843,571
Fire Protection						100%	\$713,357
Total	\$60,438,125	\$27,372,918	\$24,119,965	\$8,478,792	\$6,843,571	\$713,357	

	Average Units	Max Day Units	Peak Hour Units
Model Units (FY 2023)	7,089.8	9,506.7	11,245.9
DWSD Coincident Peaking Ratios ¹	1.00	1.34	1.59
Calculated DWSD Fire Flow Requirements	-	794.1	2,887.7
Total with Fire Flow Requirements ²	7,089.8	10,300.9	14,133.6
Calculated DWSD Peaking Ratios	1.00	1.45	1.99

- (1) Peaking factors based on Black & Veatch Phase 1 Report.
 (2) DWSD Fire Flow Requirements calculation shown in Schedule 9.

Evaluate Water Costs to be Recovered in Fixed Charge

	Base Average Day	Extra Max Day	Extra Peak Hour	Meters & Service Lines	Customer	Direct Fire Protection
Cost	\$60,438,125	\$27,372,918	\$24,119,965	\$8,478,792	\$6,843,571	\$713,357

Units	Mcf/day	Mcf/day	Mcf/day	Equivalent Meters/Services	Bills	Hydrants
Retail ¹	7,090	2,417	1,739	243,907	2,299,762	-
Public Fire ²	-	743	1,959			29,948
Private Fire ²	-	51	135	15,642	21,017	-
Total Units	7,090	3,211	3,833	259,548	2,320,779	29,948

Cost per Unit	\$23.36	\$8,524.63	\$6,293.18	\$32.67	\$2.95	\$23.82
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Allocation to Class							Total Class Cost
Retail	\$60,438,125	\$20,603,357	\$10,944,675	\$7,967,815	\$6,781,596	\$0	\$106,735,568
Public Fire	\$0	\$6,334,399	\$12,328,353	\$0	\$0	\$713,357	\$19,376,109
Private Fire	\$0	\$435,162	\$846,937	\$510,977	\$61,975	\$0	\$1,855,051

\$9,348,988
50% of public fire protection costs are capital-related

Develop Scaling Factors for Fixed Charge Costs

Meter Equivalency	Customer	Meters & Service Lines	Public Fire Protection
5/8"	1.00	1.00	1.00
3/4"	1.00	1.09	1.50
1"	1.00	1.27	2.50
1 1/2"	1.00	3.22	5.00
2"	1.00	4.12	8.00
3"	1.00	14.92	25.50
4"	1.00	17.07	46.00
6"	1.00	26.07	140.00
8"	1.00	37.16	185.00
10"	1.00	66.58	352.25
12"	1.00	98.00	550.40
14"	1.00	144.27	880.65
16"	1.00	212.37	1,144.85

Size	Type	Max Flow Rate	Capacity Equivalency - Flow Ratios
5/8"	Positive Displacement	20	1.00
3/4"	Positive Displacement	30	1.50
1"	Positive Displacement	50	2.50
1 1/2"	Displacement / Single Jet Electronic	100	5.00
2"	Displacement / Single Jet Electronic	160	8.00
3"	Magnetic Flow	510	25.50
4"	Magnetic Flow	920	46.00
6"	Magnetic Flow	2,800	140.00
8"	Magnetic Flow	3,700	185.00
10"	Magnetic Flow	7,045	352.25
12"	Magnetic Flow	11,008	550.40
14"	Magnetic Flow	17,613	880.65
16"	Magnetic Flow	22,897	1,144.85

Size	Meter Cost	Labor Cost	ARM/MXU - 200W (Time)	Van	Pipe	Adapter	Tee	Companion Flange	Restraint Rod	Total Cost w/ Meter	Total Cost w/ 5/8" Meter	Retail Meter Equivalency - Cost w/ Meter ¹
5/8"	\$59.39	\$17.00	\$78.00	\$12.91						\$167.30	\$167.30	1.00
3/4"	\$74.00	\$17.00	\$78.00	\$12.91						\$181.91	\$167.30	1.09
1"	\$104.00	\$17.00	\$78.00	\$12.91						\$211.91	\$167.30	1.27
1 1/2"	\$411.00	\$36.36	\$78.00	\$12.91						\$538.27	\$186.66	3.22
2"	\$512.00	\$54.54	\$104.00	\$19.37						\$689.91	\$237.30	4.12
3"	\$1,647.90	\$222.88	\$104.00	\$51.64	\$238.10	\$98.17	\$101.32	\$32.21	\$0.00	\$2,496.22	\$907.71	14.92
4"	\$1,943.00	\$222.88	\$104.00	\$51.64	\$221.19	\$125.61	\$135.27	\$52.47	\$0.00	\$2,856.06	\$972.45	17.07
6"	\$2,886.00	\$581.76	\$104.00	\$103.28	\$244.88	\$184.44	\$191.62	\$65.75	\$0.00	\$4,361.73	\$1,535.12	26.07
8"	\$4,307.00	\$581.76	\$104.00	\$206.56	\$344.25	\$291.49	\$289.43	\$91.82	\$0.00	\$6,216.31	\$1,968.70	37.16
10"	\$8,465.00	\$891.52	\$104.00	\$206.56	\$468.79	\$413.40	\$485.32	\$103.44	\$0.00	\$11,138.03	\$2,732.42	66.58
12"												98.00
14"												144.27
16"												212.37

(1) Equivalency for meters 10" and smaller based on actual installation and meter costs; equivalency for meters 12" and larger based on average cost increase between 3" - 10" meter sizes.

(2) Equivalency for meters 10" and smaller based on actual installation costs with 5/8" meter cost; equivalency for meters 12" and larger based on average cost increase between 3" - 10" meter sizes.

Determine Bills and Equivalent Bills

FY 2023 Equivalent Units	Customer	Meters & Service Lines	Public Fire Protection
	191,647	243,907	367,978

Meter Equivalency	Customer	Meters & Service Lines	Public Fire Protection
5/8"	1.00	1.00	1.00
3/4"	1.00	1.09	1.50
1"	1.00	1.27	2.50
1 1/2"	1.00	3.22	5.00
2"	1.00	4.12	8.00
3"	1.00	14.92	25.50
4"	1.00	17.07	46.00
6"	1.00	26.07	140.00
8"	1.00	37.16	185.00
10"	1.00	66.58	352.25
12"	1.00	98.00	550.40
14"	1.00	144.27	880.65
16"	1.00	212.37	1,144.85

FY 2021 Meters	Customer	Meters & Service Lines	Public Fire Protection
5/8"	137,605	137,605	137,605
3/4"	33,579	33,579	33,579
1"	11,024	11,024	11,024
1 1/2"	2,865	2,865	2,865
2"	2,720	2,720	2,720
3"	672	672	672
4"	539	539	539
6"	269	269	269
8"	85	85	85
10"	38	38	38
12"	4	4	4
14"	0	0	0
16"	1	1	1



Divide Costs by Equivalencies

	Customer	Meters & Service Lines	Public Fire Protection
FY 2023 Revenue Requirement	\$ 6,544,251	\$ 7,688,955	\$ 9,348,988
FY 2023 Equivalent Units	191,647	243,907	367,978
Charge per Equivalent per Month	\$ 2.85	\$ 2.63	\$ 2.12



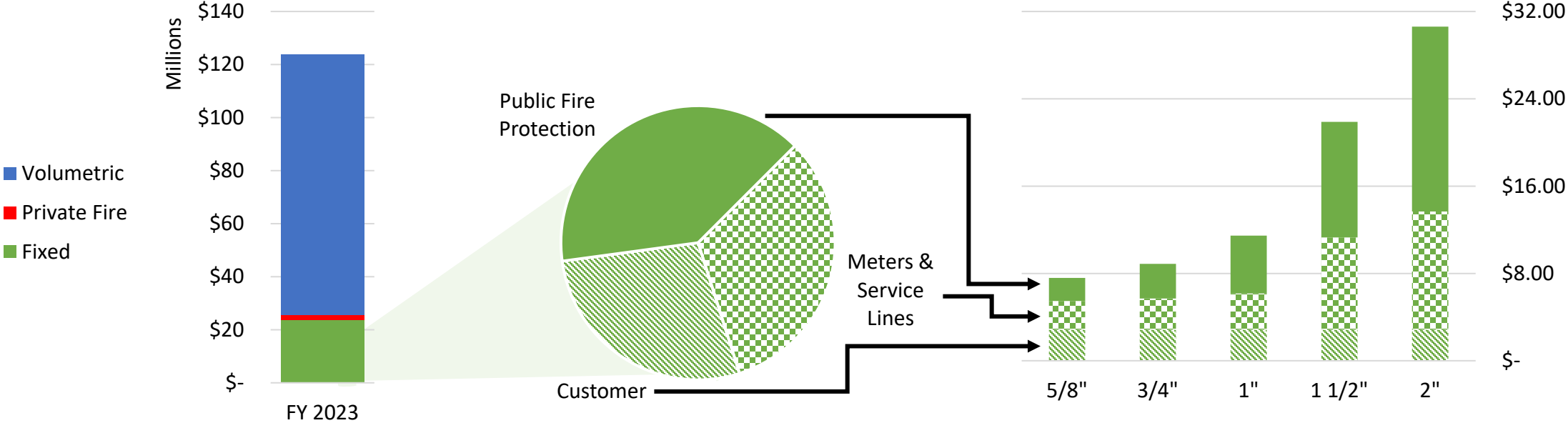
Multiply Rate by Equivalency Factor and Add Together

Meter Equivalency	Customer	Meters & Service Lines	Public Fire Protection
5/8"	1.00	1.00	1.00
3/4"	1.00	1.09	1.50
1"	1.00	1.27	2.50
1 1/2"	1.00	3.22	5.00
2"	1.00	4.12	8.00
3"	1.00	14.92	25.50
4"	1.00	17.07	46.00
6"	1.00	26.07	140.00
8"	1.00	37.16	185.00
10"	1.00	66.58	352.25
12"	1.00	98.00	550.40
14"	1.00	144.27	880.65
16"	1.00	212.37	1,144.85

Customer	Meters & Service Lines	Public Fire Protection	Proposed Meter Charge
\$ 2.85	\$ 2.63	\$ 2.12	\$ 7.59
\$ 2.85	\$ 2.86	\$ 3.18	\$ 8.88
\$ 2.85	\$ 3.33	\$ 5.29	\$ 11.47
\$ 2.85	\$ 8.45	\$ 10.59	\$ 21.88
\$ 2.85	\$ 10.83	\$ 16.94	\$ 30.62
\$ 2.85	\$ 39.20	\$ 53.99	\$ 96.03
\$ 2.85	\$ 44.85	\$ 97.39	\$ 145.08
\$ 2.85	\$ 68.49	\$ 296.41	\$ 367.74
\$ 2.85	\$ 97.61	\$ 391.68	\$ 492.14
\$ 2.85	\$ 174.89	\$ 745.78	\$ 923.52
\$ 2.85	\$ 257.46	\$ 1,165.31	\$ 1,425.61
\$ 2.85	\$ 378.99	\$ 1,864.51	\$ 2,246.35
\$ 2.85	\$ 557.90	\$ 2,423.88	\$ 2,984.63

Water Fixed Charges

Water fixed charges cover three types of costs:



1. Customer service costs allocated uniformly to all meters
2. Meter & service line costs reflect replacement costs by meter size
3. Portion of public fire protection costs (capital, debt, & GLWA expense) scaled based on hydraulic capacity

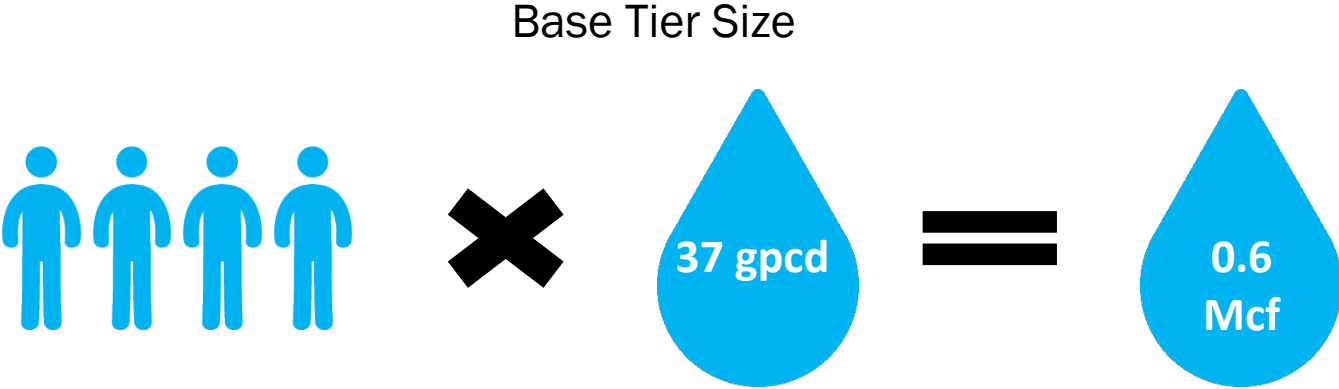




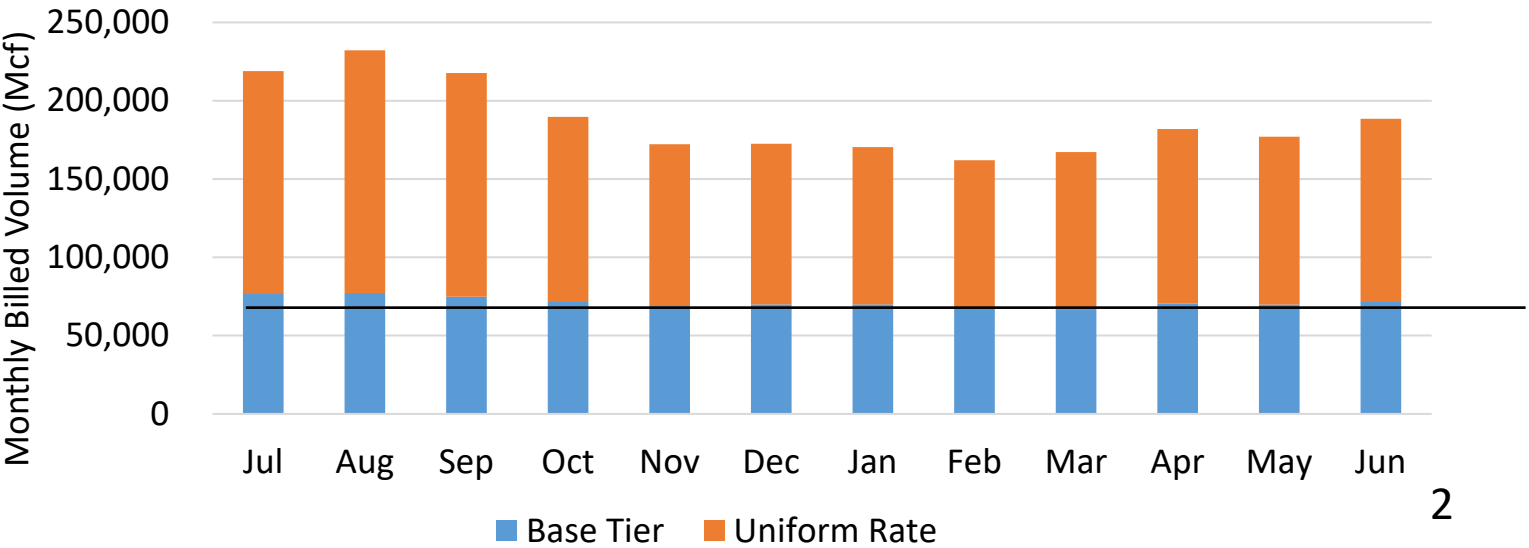
Water & Sewerage
Department

DWSD Affordability Rate Structure

Lifeline Tier Size



Amount of Water Use That Falls in Each Tier



Minimal peaking in Tier 1
 Amount of water use stays very consistent throughout the year



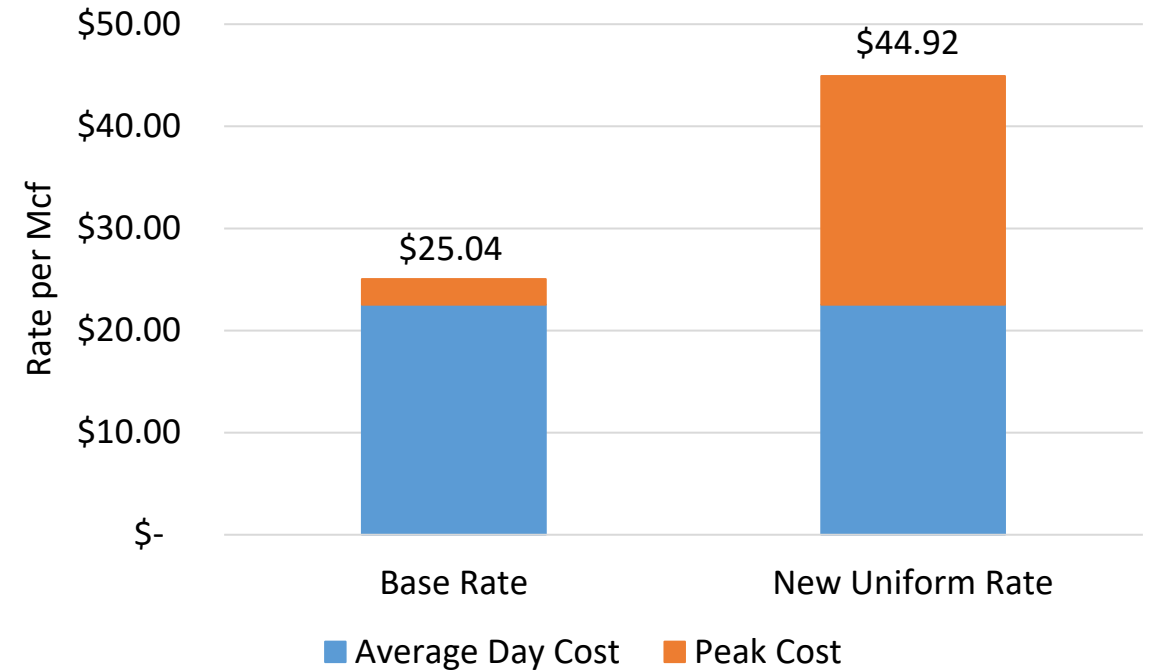
Lifeline & Uniform Tier Price

Base Rate (Lifeline Tier)

$$\frac{\text{Average Day Costs}}{\text{Total Volume}} + \frac{\text{Tier 1 Peaking Costs*}}{\text{Tier 1 Volume}}$$

New Uniform Rate (All Remaining Use)

$$\frac{\text{Average Day Costs}}{\text{Total Volume}} + \frac{\text{Tier 2 Peaking Costs*}}{\text{Tier 2 Volume}}$$

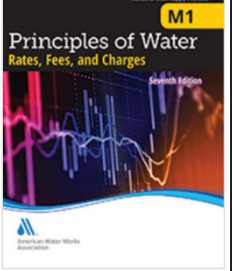


*Peaking cost allocation based on proportional change in monthly volume from lowest month to highest month of the test year

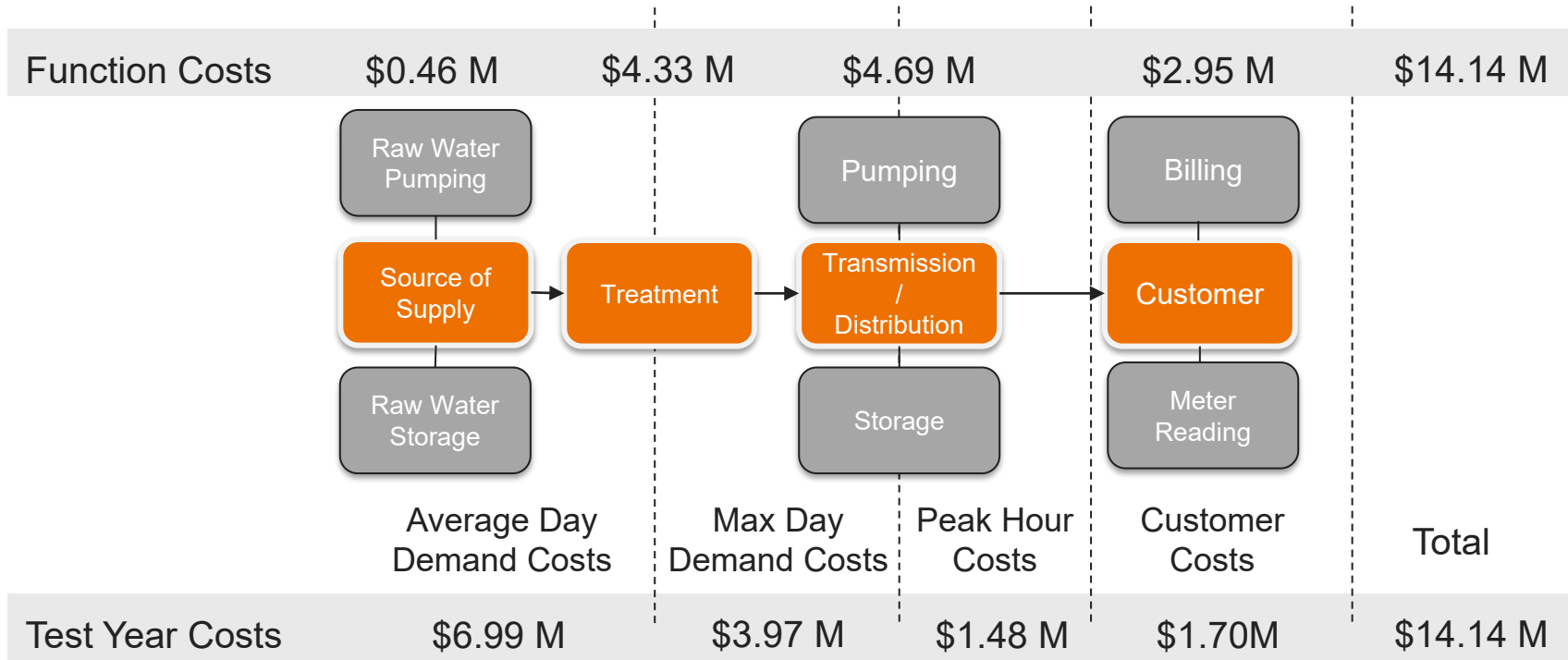




City of Tempe, Arizona



Functionalizing System Costs



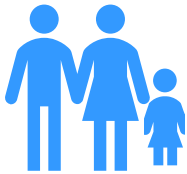
Basis of proposed water rate structure

Rate Design

Cost Component	Charge Type	How Charge is Applied
Customer Cost	Customer Charge	Per Bill
Average Day Cost	Base Charge (50%)	Scaled by Meter Size
Max Day Cost	Volume Charge	Per CCF of Metered Water Volume (different rates for each customer class)
Peak Hour Cost		

Monthly Single-Family Tier Sizing (Indoor)

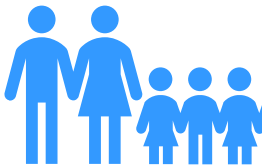
Tier 1



Average household:
2.63 people



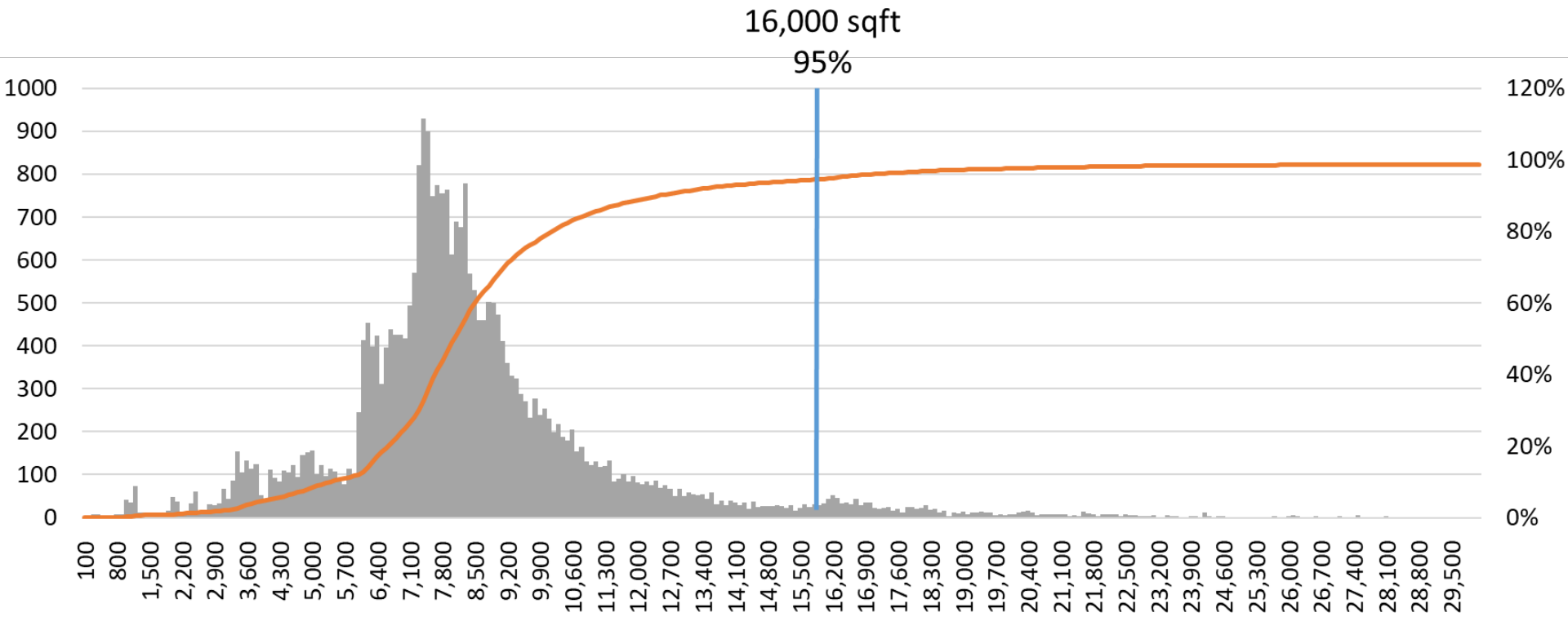
Tier 2



Large household:
5.26 people



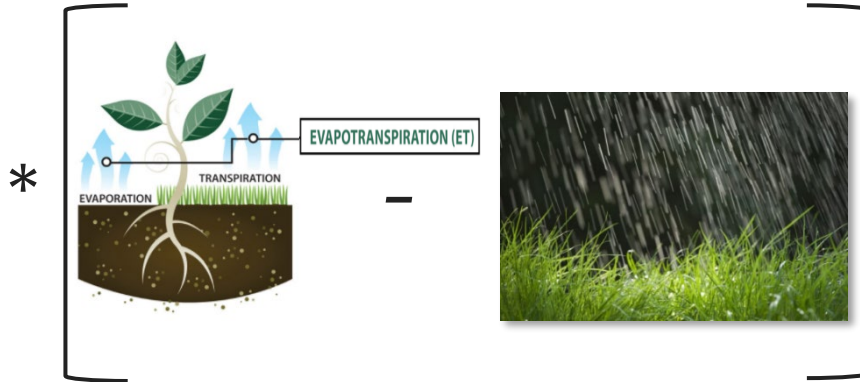
Single Family Parcel Distribution



Calculating irrigation requirements for the mean parcel (8,000 ft²)



Parcel Size: 8,000
Landscape Area: 2,000



Evapotranspiration: 81 Inches

Beneficial Rainfall: 4 Inches

Crop Type



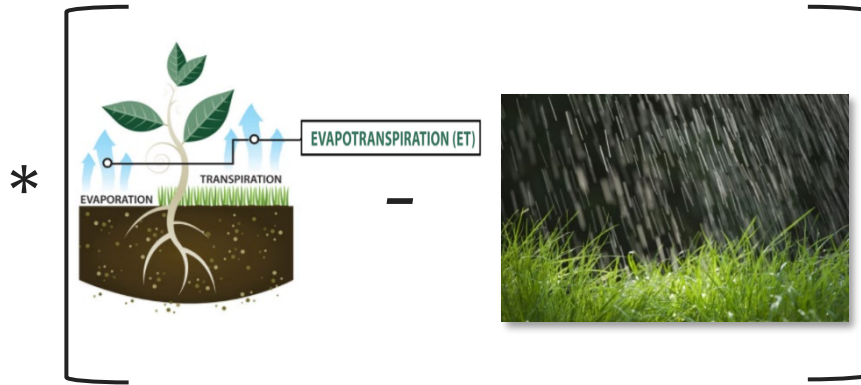
Irrigation System
Efficiency: 70%

= 8,000 GAL

Calculating irrigation requirements for the 90th percentile parcel (16,000 ft²)



Parcel Size: 16,000
Landscape Area: 6,500



Evapotranspiration: 81 Inches

Beneficial Rainfall: 4 Inches

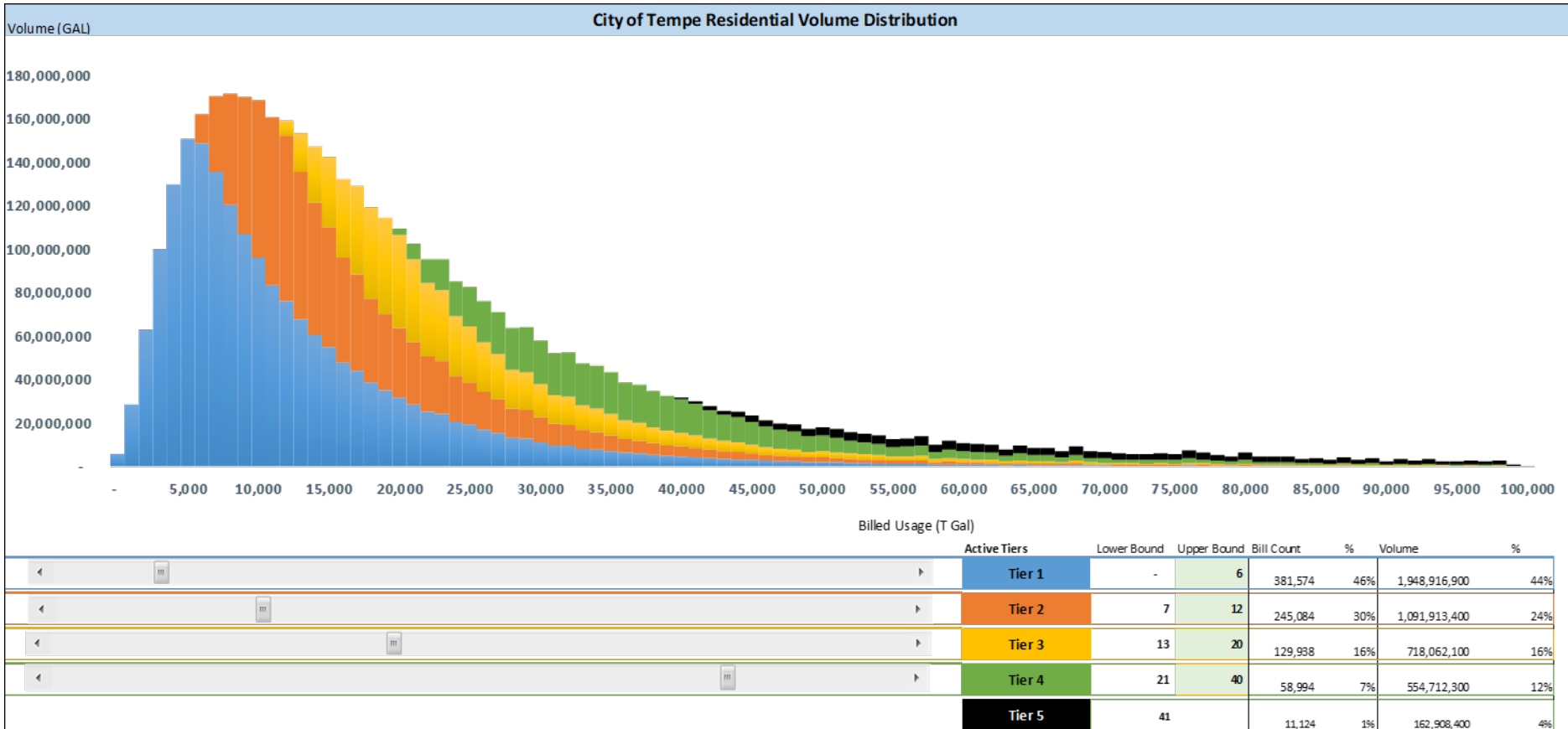
Crop Type



Irrigation System
Efficiency: 70%

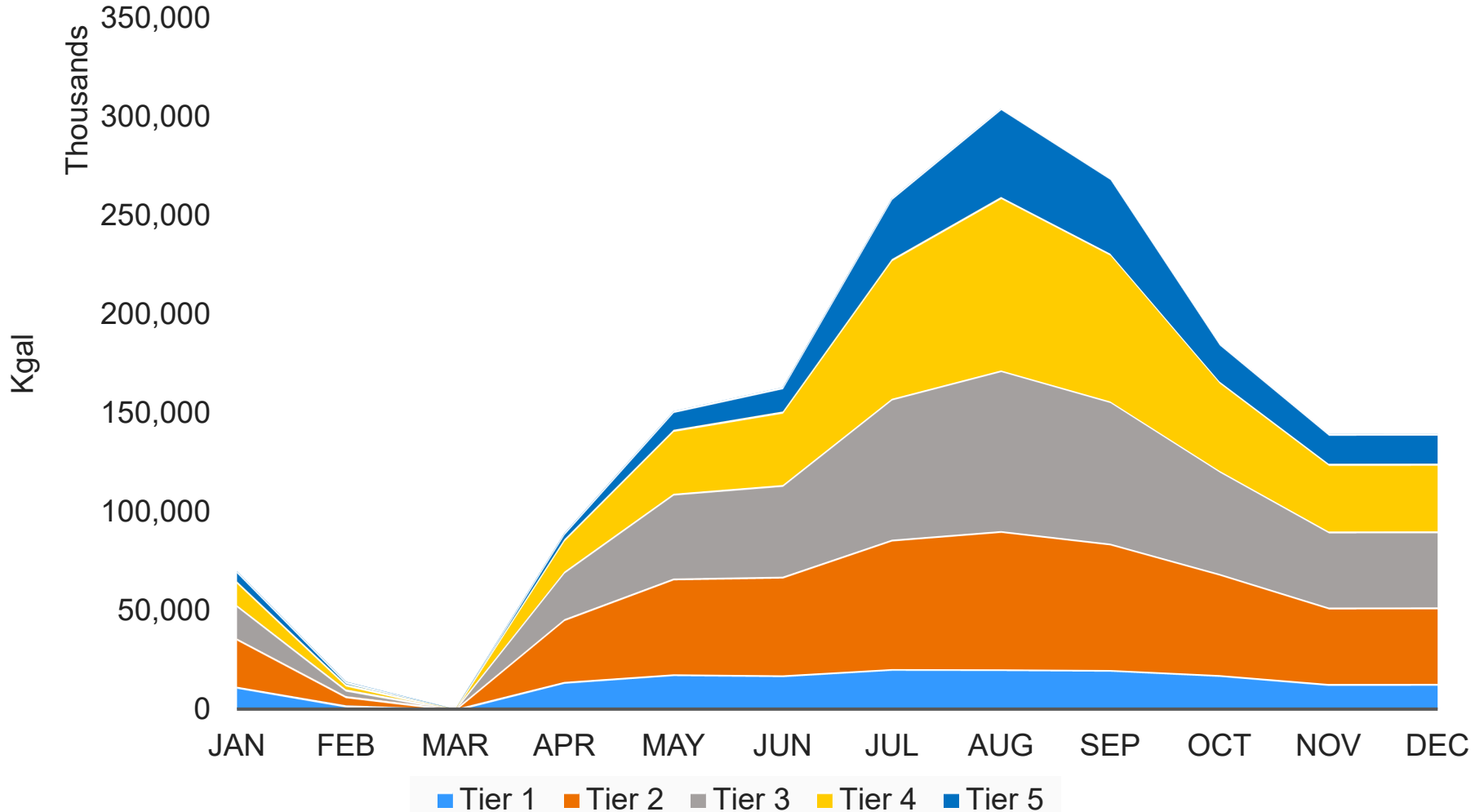
= 20,000 GAL

Single family water use by tier

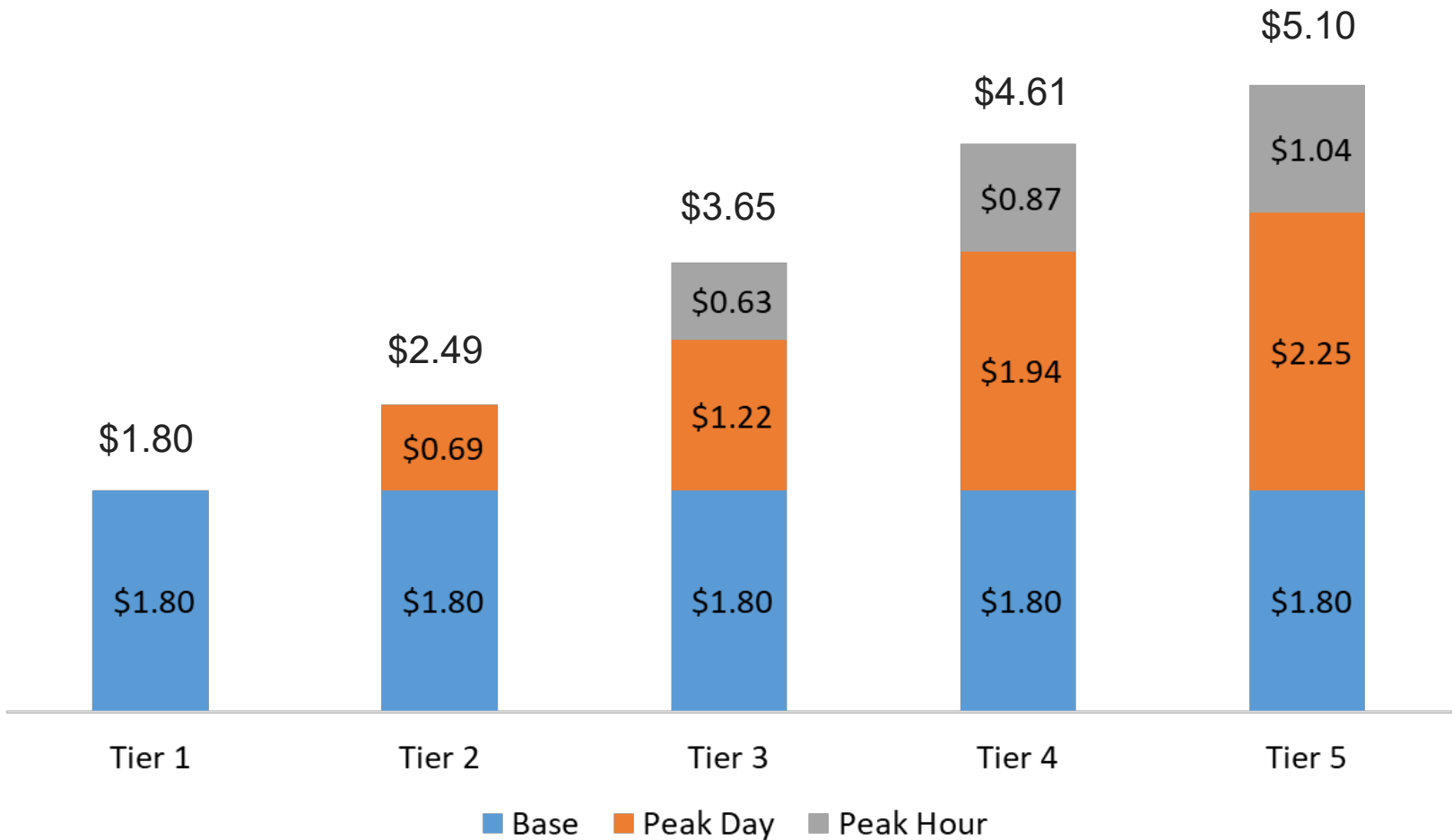


Residential Change in Water Use by Tier

Change in Res Volume by Tier



Single family tiered rate calculations (\$/1,000 gal)



Wholesale Rates: Key Issues & Considerations



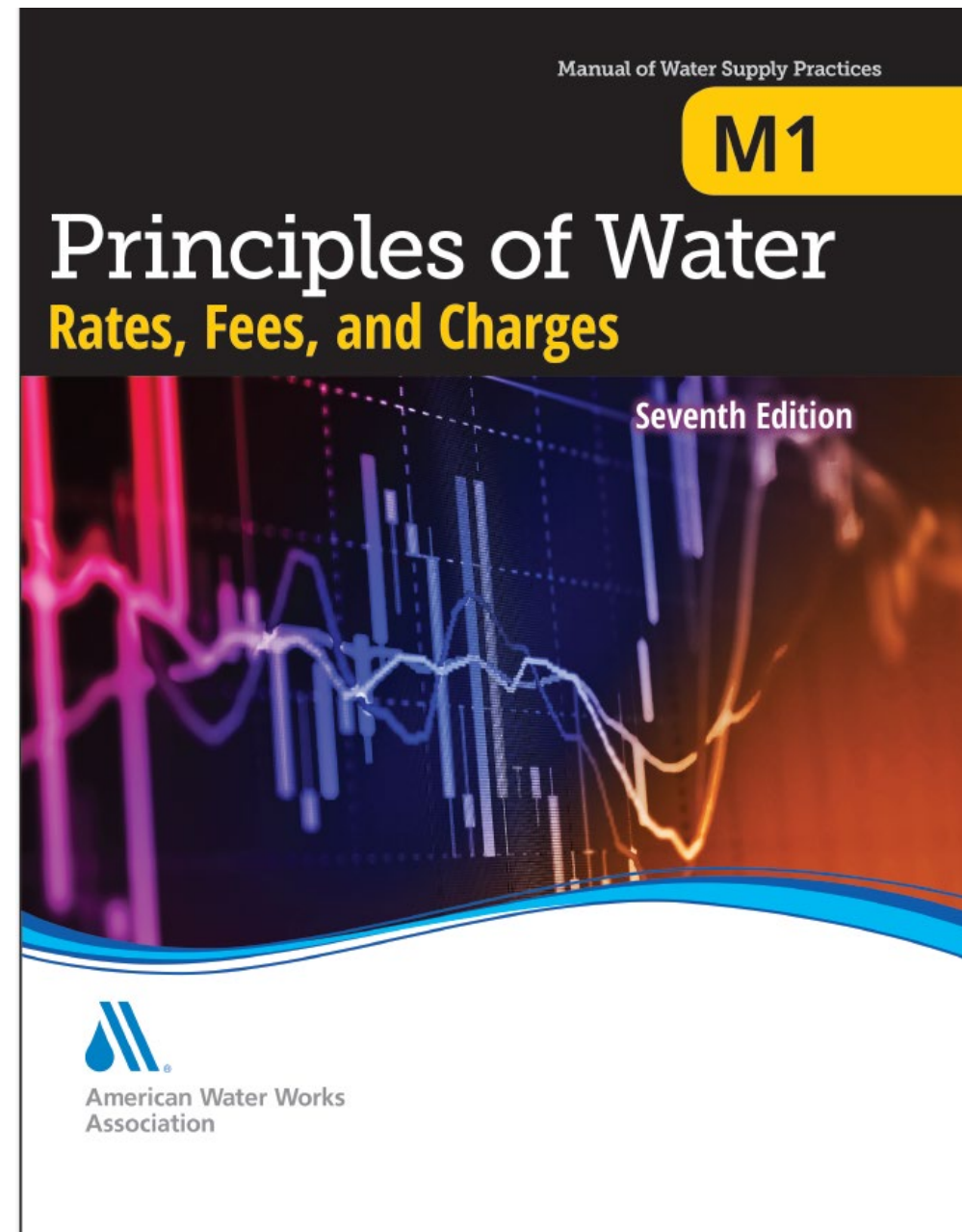


Used & Useful – Assets actively used in the provision of service to customers

Sharing the costs of “used and useful” assets:

- 1) Service to wholesale customers can take many different forms, particularly as it relates to the facilities needed to serve the customer.
- 2) In many cases, wholesale customers may not require or benefit from the entire water system, but only certain portions of it. When wholesale customers do not use or benefit from the owner’s distribution system (i.e., smaller distribution pipes), they should not be expected to pay for that part of the system.
- 3) Care should be taken to understand what parts of the system are truly “used and useful” for the wholesale customer services being considered.
- 4) Wholesale customers should be expected to pay the proportionate costs of the parts of the system used to provide them with services, but not for those components that are not used to deliver services to them.

DECEMBER 6, 2024





Water Costs Affected by Used & Useful or Shared %

Operating Expenses

Distribution Costs: \$299,042

Indirect Costs: \$234,150

Total of \$533,192 out of \$1,603,368

Shared Mains Affect 1/3 of Op Ex.

Depreciation

Distribution: \$227,234

Total Water System Depreciation is \$339,350

Shared Mains Affect 2/3 of Depreciation

Return on Investment (ROI)

Distribution ROI: \$556,572

Return on Working Capital: \$14,029

Total Return on Investment is \$764,661

Shared Mains Affect 3/4 of ROI

The amount of used and useful underground assets or shared water mains required to provide service is a significant determinant of a reasonable rate.



Sensitivity Analysis Example

DECEMBER 6, 2024

Sensitivity Analysis - Rates / TGAL	FY 2015	FY 2016	FY 2017	Avg. Rate Impact	% Increase	TWP Annual Cost Inc.	Cost to TWP Cust / Qtr
<u>Revised Township Water Rate</u>	<u>\$2.97</u>	<u>\$3.13</u>	<u>\$3.20</u>	(\$ / TGAL)	(Based on \$3.20)	(Using 3-yr Avg. Flow)	(~2,300 customers)
Rate with 33% Shared Water Mains & 8% ROR	\$3.06	\$3.22	\$3.30	\$0.10	3%	\$ 17,090	\$ 1.86
Rate with 44% Shared Water Mains & 7% ROR	\$3.24	\$3.39	\$3.48	\$0.30	9%	\$ 51,269	\$ 5.57
Rate with 61% Shared Water Mains & 7% ROR	<u>\$3.67</u>	<u>\$3.80</u>	<u>\$3.91</u>	<u>\$0.70</u>	22%	\$ 119,628	\$ 13.00
Rate with 44% Shared Water Mains & 8% ROR	\$3.34	\$3.50	\$3.59	\$0.40	13%	\$ 68,359	\$ 7.43
Rate with 61% Shared Water Mains & 8% ROR	\$3.80	\$3.93	\$4.05	\$0.80	25%	\$ 136,718	\$ 14.86



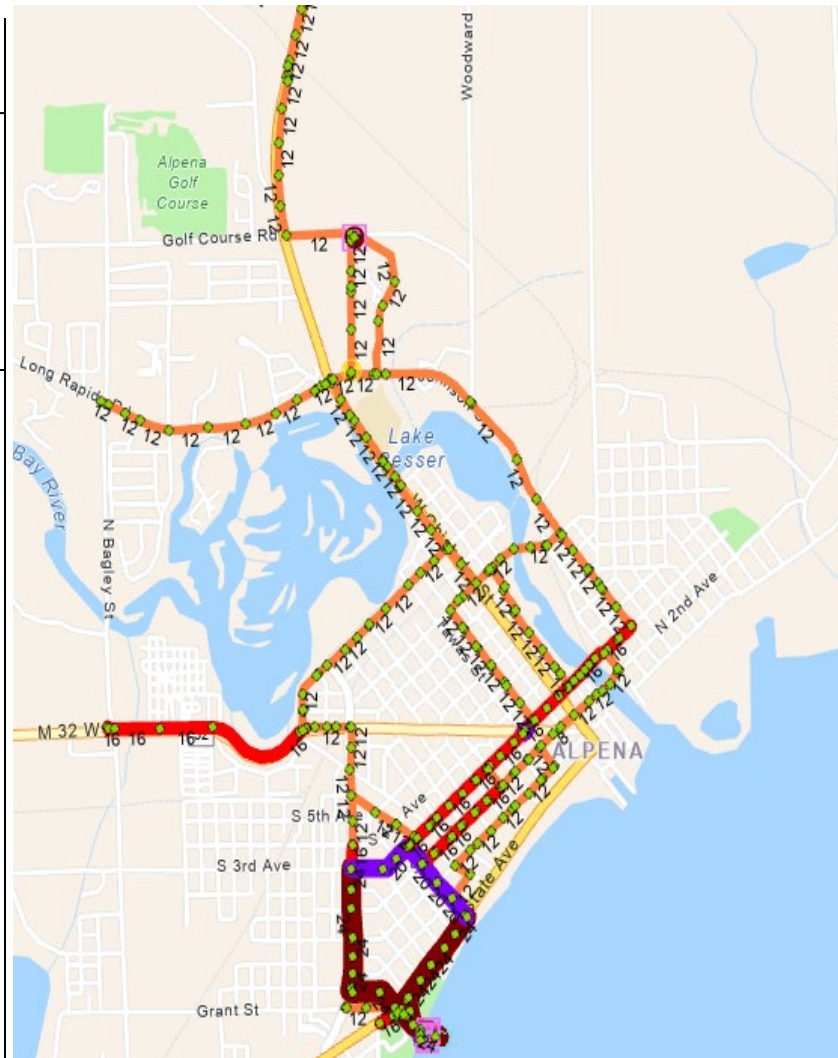
Shared Asset Approaches

Typical Approaches:

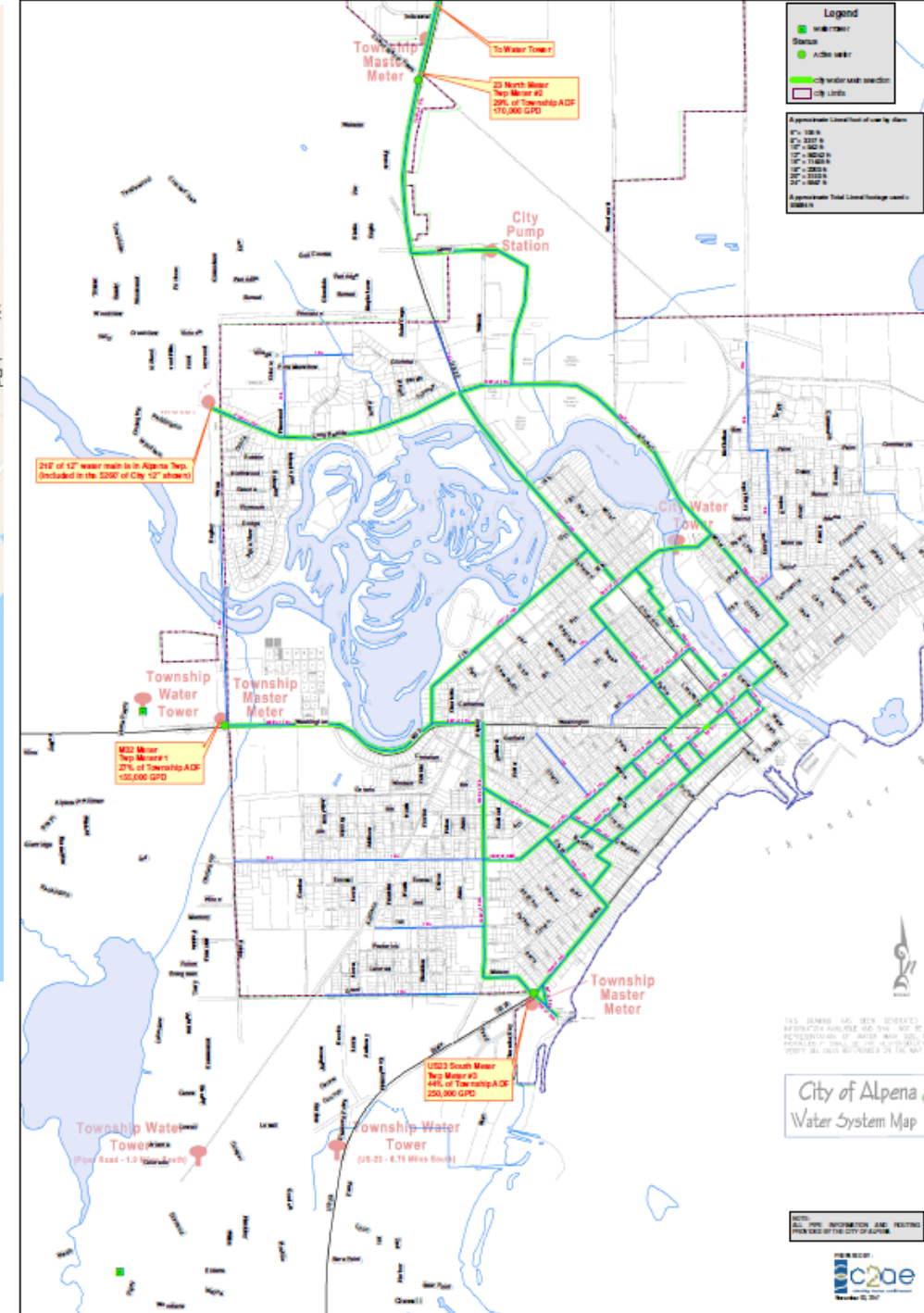
- 1) Contract Facility Listings
- 2) Pick a Pipe Method
- 3) Engineering Analysis
- 4) Hydraulic Modeling

Key Considerations:

- 1) Contracts/Tariffs
- 2) Availability of Data/Resources
- 3) Number of Customers
- 4) Complexity/Context



Diameter	Feet	Miles	Inch-Miles	Cumulative %
0.75	371	0	0	100.0%
1	268	0	0	100.0%
1.5	156	0	0	100.0%
2	336	0	0	100.0%
4	10,288	2	8	100.0%
6	178,725	34	203	98.8%
8	78,902	15	120	69.0%
10	18,716	4	35	51.5%
12	96,215	18	219	46.3%
16	17,453	3	53	14.3%
18	109	0	0	6.5%
20	3,383	1	13	6.4%
24	6,848	1	31	4.6%
	411,770	78	682	



Legend

- Watermain
- Status
- Active watermain
- City water main section
- City Limits

Approximate Condition of water main

- 1" - 100%
- 2" - 100%
- 3" - 100%
- 4" - 100%
- 6" - 100%
- 8" - 100%
- 10" - 100%
- 12" - 100%
- 16" - 100%
- 18" - 100%
- 20" - 100%
- 24" - 100%

Approximate Total Lead Service Connections

City of Alpena Water System Map

FOR MORE INFORMATION AND FEEDBACK VISIT US AT WWW.CITYOFALPENA.MI

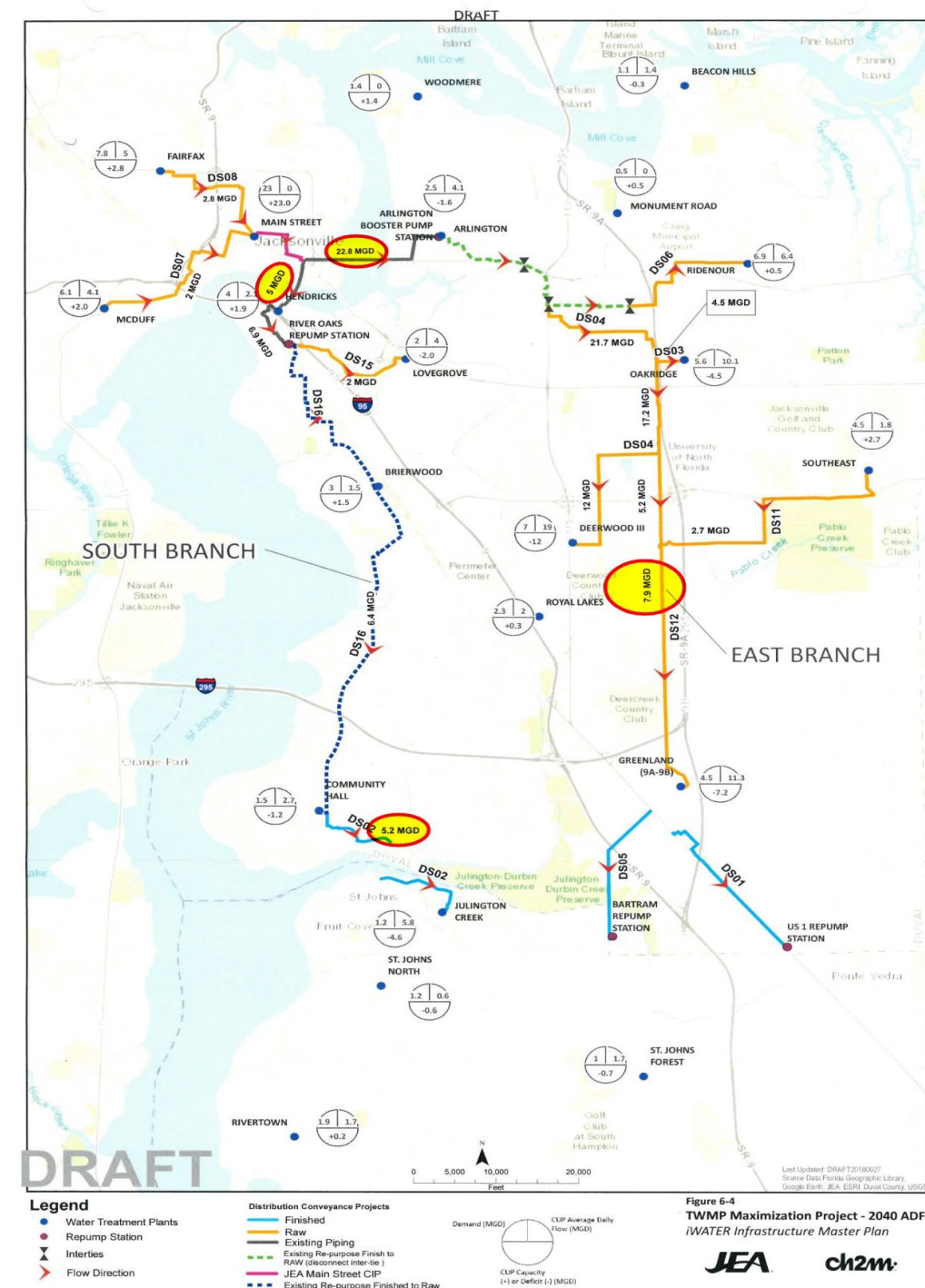




Other Things to Consider

When evaluating the costs of “used and useful” assets, also think about:

- 1) Dedicated facilities built to provide service at points of interconnection
- 2) Service provisions in contract re: pressure, quantities, curtailment, etc.
- 3) Nature of facilities of wholesale/sale for resale customer (pumping, storage, distribution network, etc.) that would affect use of system
- 4) Ownership/capacity reservations and contributions for those
- 5) Feasibility of alternative supply options and fixed vs. marginal costs
- 6) Approach that best meets needs (actual costs, easy to update, stable)





Three Very Different Examples

JEA, FL

New Rate for Multiple Customers
Specific Facility Investments
Consideration of Customer Assets



Alpena, MI

Contentious with Lots of Data/Analysis
Utility Basis of Ratemaking
Approach That Can Be Updated



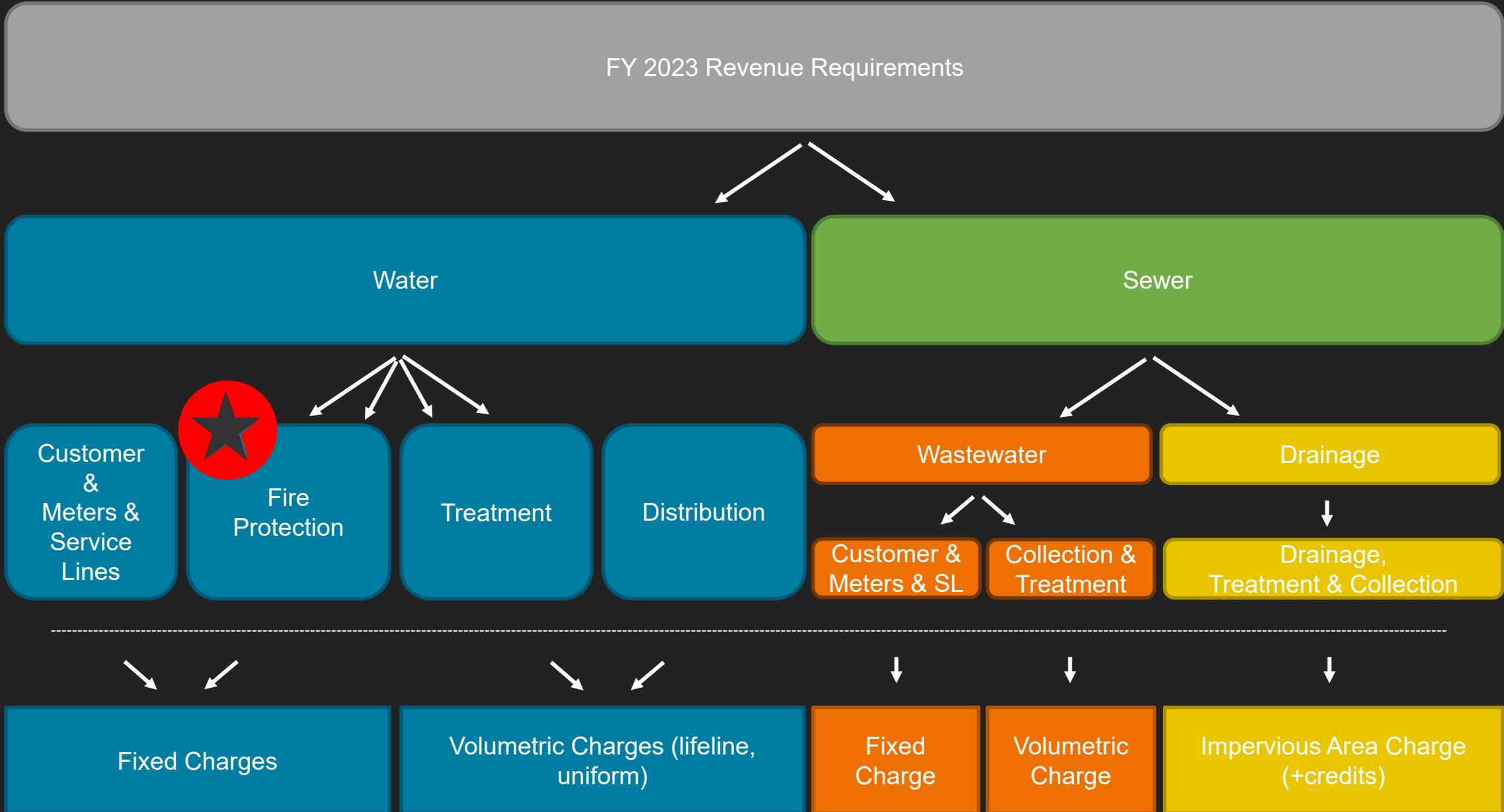
Hillsborough County, FL

Existing Agreement (but dated/not applied)
Review of Areas for Improvement
Goals of Equity & Simplicity





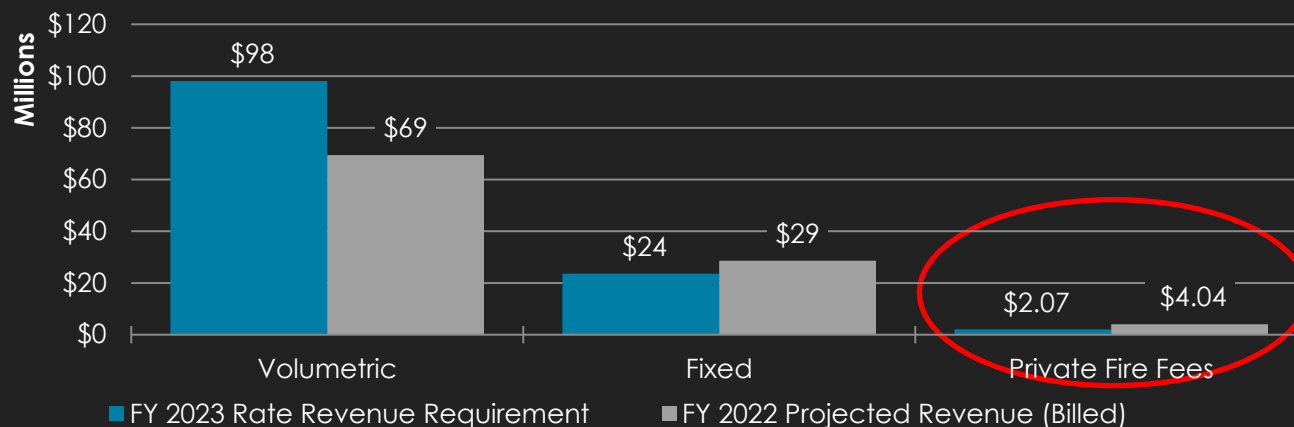
DWSD Fire Protection Charges





Water Cost Allocation

- Applied AWWA's M1 Base Extra Capacity method
- Used 3 historical years of usage and peaking factors provided by GLWA
- Stantec independently calculated fire max day and peak hour requirements





M1 Approach

Apprn. Description	Center	Cost Center Description	FY 2023 Water Expense for COSA	Allocation Factor	Allocations			
					Treatment	Distribution	Meters & Service Lines	Customer
Operating Expenses								
Administration	1001	Chief Exec Officer	\$ 799,245	Weighted Internal	0.0%	76.7%	12.9%	10.4%
Administration	1601	BOWC	\$ 167,833	Weighted Internal	0.0%	76.7%	12.9%	10.4%
Operations	2401	Deputy Director Administration	\$ 1,885,701	Distribution Only	0.0%	100.0%	0.0%	0.0%
Operations	2411	Field Engineering	\$ 3,256,889	Distribution Only	0.0%	100.0%	0.0%	0.0%
Operations	2421	Facility Oper	\$ 3,946,270	Distribution Only	0.0%	100.0%	0.0%	0.0%
Operations	2422	Fleet Operations	\$ 2,418,049	Distribution Only	0.0%	100.0%	0.0%	0.0%
Operations	2431	Maint & Repair	\$ 8,232,028	Distribution Only	0.0%	100.0%	0.0%	0.0%
Operations	2432	Meter Operations	\$ 3,035,773	Meters & Service Lines Only	0.0%	0.0%	100.0%	0.0%
Operations	2435	Lead Service	\$ 278,500	Meters & Service Lines Only	0.0%	0.0%	100.0%	0.0%
Compliance	3101	General Counsel	\$ 933,352	Weighted Internal	0.0%	76.7%	12.9%	10.4%
Compliance	3201	Org Development	\$ 736,578	Weighted Internal	0.0%	76.7%	12.9%	10.4%
Compliance	3301	Info Technology	\$ 5,300,370	Weighted Internal	0.0%	76.7%	12.9%	10.4%
Compliance	3411	Compliance-Security	\$ 1,813,324	Weighted Internal	0.0%	76.7%	12.9%	10.4%
Compliance	3421	Compliance-Public Affairs	\$ 873,592	Weighted Internal	0.0%	76.7%	12.9%	10.4%
Finance	4001	Chief Financial Officer	\$ 1,995,979	Weighted Internal	0.0%	76.7%	12.9%	10.4%
Finance	4111	Finance	\$ 802,763	Weighted Internal	0.0%	76.7%	12.9%	10.4%
Finance	4121	Procurement	\$ 1,497,078	Weighted Internal	0.0%	76.7%	12.9%	10.4%
Finance	4131	Treasury	\$ 1,218,827	Weighted Internal	0.0%	76.7%	12.9%	10.4%
Finance	4151	Budget	\$ 176,557	Weighted Internal	0.0%	76.7%	12.9%	10.4%
Finance	4161	Billing & Collect	\$ 1,218,255	Customer Only	0.0%	0.0%	0.0%	100.0%
Finance	4170	Internal Aud	\$ 279,283	Weighted Internal	0.0%	76.7%	12.9%	10.4%
Customer Svc	5111	Customer Service	\$ 1,456,827	Customer Only	0.0%	0.0%	0.0%	100.0%
Operations	2223	Storm Drainage	\$ 850,069	Weighted Internal	0.0%	76.7%	12.9%	10.4%
			\$ 43,173,140					
Non-Operating Expenses								
Non-Operating	7111	Water Pension Expense	\$ 21,015,700	Weighted Internal	0.0%	76.7%	12.9%	10.4%
Non-Operating	7111	Water Retail Assistance Program	\$ 603,344	Weighted Internal	0.0%	76.7%	12.9%	10.4%
			\$ 21,619,044					
GLWA Expenses								
Non-Operating	487111	WDWSD-R Non-Operating Exp	\$ 22,985,900	Treatment Only	100.0%	0.0%	0.0%	0.0%
Water - Pre-Bifurcation Debt	Debt		\$ 33,438,800	Distribution Only	0.0%	100.0%	0.0%	0.0%
			\$ 56,424,700					
Repair & Maintenance								
Water - Repair & Maintenance	M&R		\$ 11,544,000	Distribution Only	0.0%	100.0%	0.0%	0.0%
Contribution to (Use of) Operating Reserve:	M&R		\$ (6,766,254)	Distribution Only	0.0%	100.0%	0.0%	0.0%
			\$ 4,777,746					



M1 Approach

	Base Average Day	Extra Max Day	Extra Peak Hour	Meters & Service Lines	Customer	Fire Protection	Total
Treatment	69%	31%					\$22,985,900
Distribution	50%	23%	27%				\$88,945,108
Meters & Service Lines				100%			\$8,478,792
Customer					100%		\$6,843,571
Fire Protection						100%	\$713,357
Total	\$60,438,125	\$27,372,918	\$24,119,965	\$8,478,792	\$6,843,571	\$713,357	

	Average Units	Max Day Units	Peak Hour Units
Model Units (FY 2023)	7,089.8	9,506.7	11,245.9
DWSD Coincident Peaking Ratios ¹	1.00	1.34	1.59
Calculated DWSD Fire Flow Requirements	-	794.1	2,887.7
Total with Fire Flow Requirements ²	7,089.8	10,300.9	14,133.6
Calculated DWSD Peaking Ratios	1.00	1.45	1.99

(1) Peaking factors based on Black & Veatch Phase 1 Report.
 (2) DWSD Fire Flow Requirements calculation shown in Schedule 9.



M1 Approach

	Base Average Day	Extra Max Day	Extra Peak Hour	Meters & Service Lines	Customer	Direct Fire Protection	
Cost	\$60,438,125	\$27,372,918	\$24,119,965	\$8,478,792	\$6,843,571	\$713,357	
Units	Mcf/day	Mcf/day	Mcf/day	Equivalent Meters/Services	Bills	Hydrants	
Retail ¹	7,090	2,417	1,739	243,907	2,299,762	-	
Public Fire ²	-	743	1,959			29,948	
Private Fire ²	-	51	135	15,642	21,017	-	
Total Units	7,090	3,211	3,833	259,548	2,320,779	29,948	
Cost per Unit	\$23.36	\$8,524.63	\$6,293.18	\$32.67	\$2.95	\$23.82	
Allocation to Class							Total Class Cost
Retail	\$60,438,125	\$20,603,357	\$10,944,675	\$7,967,815	\$6,781,596	\$0	\$106,735,568
Public Fire	\$0	\$6,334,399	\$12,328,353	\$0	\$0	\$713,357	\$19,376,109
Private Fire	\$0	\$435,162	\$846,937	\$510,977	\$61,975	\$0	\$1,855,051

(1) Retail average day, max day, and peak hour units shown in Schedule 7. Retail equivalent meters and bills based FY 2021 actual billing data adjusted for FY 2022 & FY 2023 growth.

(2) Public and Private Fire max day and peak hour units calculation shown in Schedule 9. Bills and hydrants shown in Schedule 10.



Fire Protection Units of Service

Fire Type	FY 2017-21 Max Fires/Day ¹	FY 2017-21 Max Fire/Hour ²	Duration (min)	Gallons/Minute (gpm)	Peak Day Demand (MGD)	Peak Hour Demand (MGD)
Single Family ³	27	8	120	1,500	4.9	17.3
Non-Single Family ⁴	2	1	180	3,000	1.1	4.3
Total Fire (MGD)					5.9	21.6
Total Fire (Mcf)					794.1	2,887.7
Extra Capacity						2,093.6

(1) Maximum fires/day based on average of 2017-2021 maximum fire incidents in a single day for structure fires.

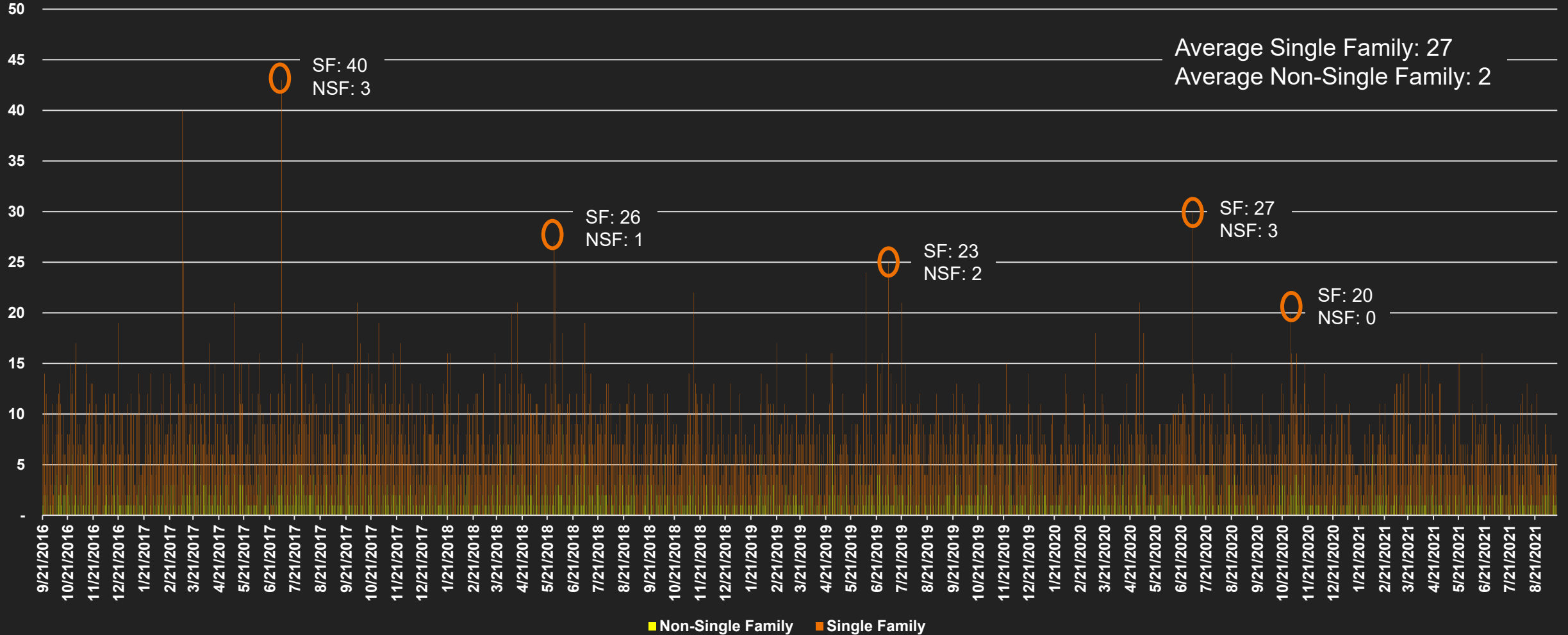
(2) Maximum fires/hour based on average of 2017-2021 maximum fire incidents in a single hour on maximum day for structure fires.

(3) Per ISO Guidelines (Chapter 7) needed fire flow is 1,500 gpm and duration for 2 hours when distance between residential dwellings is 0-10 feet. Detroit ordinance minimum setbacks are 4 feet on a side / 14 ft combined total.

(4) Needed Fire Flow Duration for commercial properties based on ISO Fire Suppression Rating Schedule.

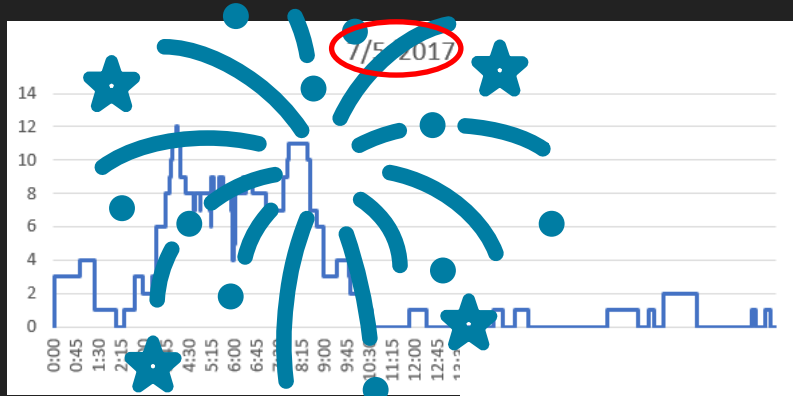


Maximum Fires per Day (Coincident Peak)

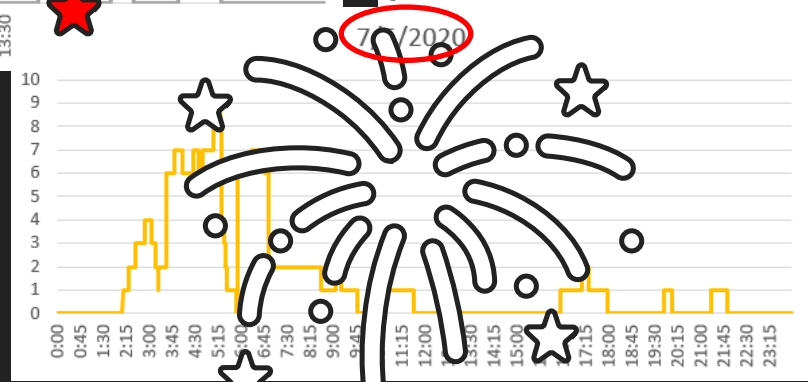
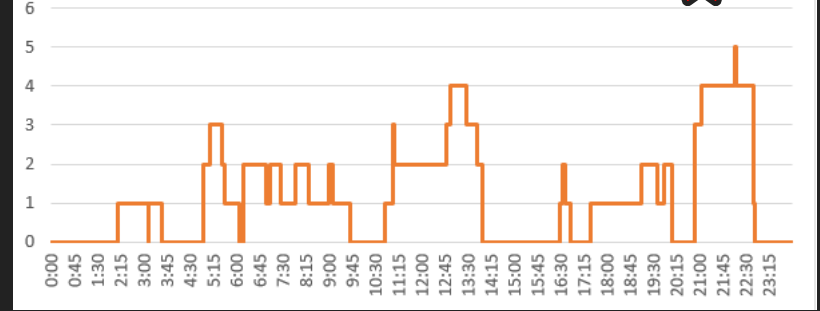
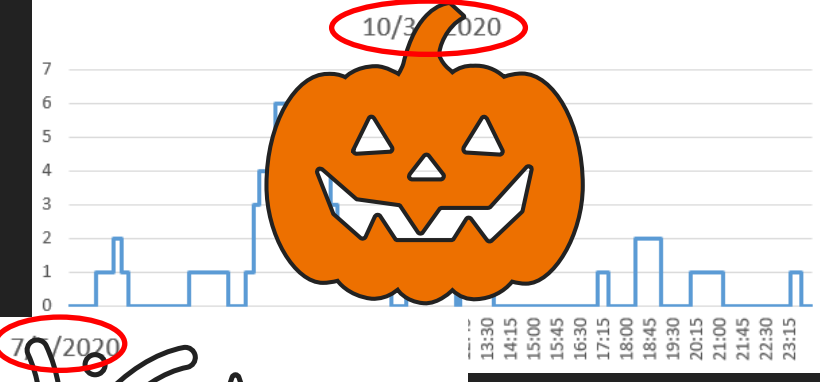
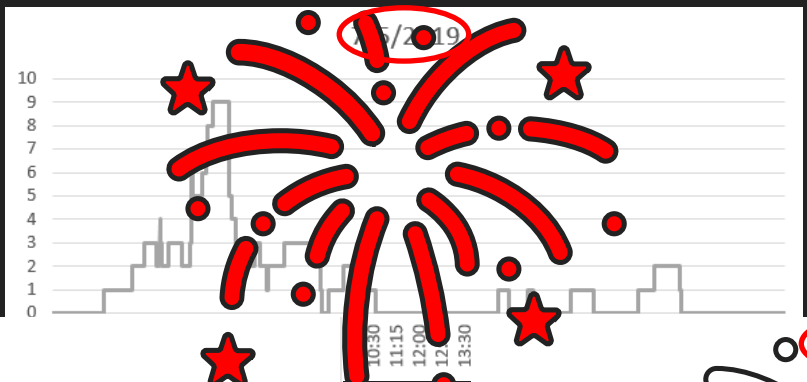




Maximum Coinciding Fires on Max Day



5/29/2018





Fire Protection Units of Service

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Single Family ³	27	8	120	1,500	4.9	17.3
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Allocating Fire Demands to Public & Private

Fire Type	6" Equivalency for Capacity¹	5/8" Equivalency for Meters & Services²	Private Fire Connections³	Public Fire⁴
4" Fireline	0.34	5.81	629	
6" Fireline	1.00	9.18	622	
8" Fireline	2.13	11.77	439	
10" Fireline	3.83	16.33	41	
12" Fireline	6.19	21.72	20	
Hydrants	1.00			29,948
Total Bills			21,017	N/A
Total Equivalent Capacity Units			2,057	29,948
Total 5/8" Equivalent for Meters & Services			15,642	N/A

(1) Assumes hydrants are on 6" line and uses Hazen Williams formula to calculate flow capacity.

(2) Based on line costs per DWSD staff by size and cost of 5/8" meter used for flow detection.

(3) Private fire meters based on FY 2021 actual billing data adjusted for FY 2022 & FY 2023 growth.

(4) Current total fire hydrants as of April 11, 2022 based on data per Detroit Fire Department.



Cost Allocation Results

	Base Average Day	Extra Max Day	Extra Peak Hour	Meters & Service Lines	Customer	Direct Fire Protection	
Cost	\$60,438,125	\$27,372,918	\$24,119,965	\$8,478,792	\$6,843,571	\$713,357	
Units	Mcf/day	Mcf/day	Mcf/day	Equivalent Meters/Services	Bills	Hydrants	
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Fire Line Equivalency Factor

Size	Meter Cost	Labor Cost	ARM/MXU - 200W (Time)	Van	Pipe	Adapter	Tee	Companion Flange	Restraint Rod	Total Cost w/ Meter	Total Cost w/ 5/8" Meter	Fire Line Equivalency - Cost w/ 5/8" Meter ²	Capacity Equivalency - Flow Ratios
5/8"	\$59.39	\$17.00	\$78.00	\$12.91						\$167.30	\$167.30	1.00	1.00
3/4"	\$74.00	\$17.00	\$78.00	\$12.91						\$181.91	\$167.30	1.00	1.50
1"	\$104.00	\$17.00	\$78.00	\$12.91						\$211.91	\$167.30	1.00	2.50
1 1/2"	\$411.00	\$36.36	\$78.00	\$12.91						\$538.27	\$186.66	1.12	5.00
2"	\$512.00	\$54.54	\$104.00	\$19.37						\$689.91	\$237.30	1.42	8.00
3"	\$1,647.90	\$222.88	\$104.00	\$51.64	\$238.10	\$98.17	\$101.32	\$32.21	\$0.00	\$2,496.22	\$907.71	5.43	25.50
4"	\$1,943.00	\$222.88	\$104.00	\$51.64	\$221.19	\$125.61	\$135.27	\$52.47	\$0.00	\$2,856.06	\$972.45	5.81	46.00
6"	\$2,886.00	\$581.76	\$104.00	\$103.28	\$244.88	\$184.44	\$191.62	\$65.75	\$0.00	\$4,361.73	\$1,535.12	9.18	140.00
8"	\$4,307.00	\$581.76	\$104.00	\$206.56	\$344.25	\$291.49	\$289.43	\$91.82	\$0.00	\$6,216.31	\$1,968.70	11.77	185.00
10"	\$8,465.00	\$891.52	\$104.00	\$206.56	\$468.79	\$413.40	\$485.32	\$103.44	\$0.00	\$11,138.03	\$2,732.42	16.33	352.25
12"												21.72	550.40
14"												28.89	880.65
16"												38.43	1,144.85

- (1) Equivalency for meters 10" and smaller based on actual installation and meter costs; equivalency for meters 12" and larger based on average cost increase between 3" - 10" meter sizes.
- (2) Equivalency for meters 10" and smaller based on actual installation costs with 5/8" meter cost; equivalency for meters 12" and larger based on average cost increase between 3" - 10" meter sizes.



Cost Allocation Results

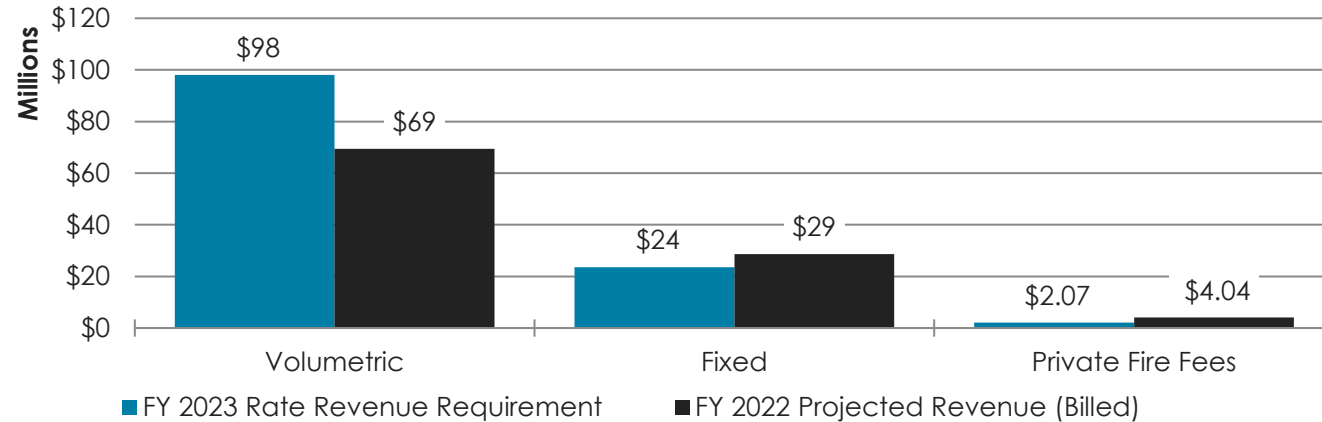
	Base Average Day	Extra Max Day	Extra Peak Hour	Meters & Service Lines	Customer	Direct Fire Protection	
Cost	\$60,438,125	\$27,372,918	\$24,119,965	\$8,478,792	\$6,843,571	\$713,357	
Units	Mcf/day	Mcf/day	Mcf/day	Equivalent Meters/Services	Bills	Hydrants	
Retail ¹	7,090	2,417	1,739	243,907	2,299,762	-	
Public Fire ²	-	743	1,959			29,948	
Private Fire ²	-	51	135	15,642	21,017	-	
Total Units	7,090	3,211	3,833	259,548	2,320,779	29,948	
Cost per Unit	\$23.36	\$8,524.63	\$6,293.18	\$32.67	\$2.95	\$23.82	
Allocation to Class							Total Class Cost
Retail	\$60,438,125	\$20,603,357	\$10,944,675	\$7,967,815	\$6,781,596	\$0	\$106,735,568
Public Fire	\$0	\$6,334,399	\$12,328,353	\$0	\$0	\$713,357	\$19,376,109
Private Fire	\$0	\$435,162	\$846,937	\$510,977	\$61,975	\$0	\$1,855,051

(1) Retail average day, max day, and peak hour units shown in Schedule 7. Retail equivalent meters and bills based FY 2021 actual billing data adjusted for FY 2022 & FY 2023 growth.

(2) Public and Private Fire max day and peak hour units calculation shown in Schedule 9. Bills and hydrants shown in Schedule 10.



Cost Allocation Results



	Volumetric	Fixed	Private Fire Fees	
FY 2023 Total Expenses	\$101,674,212	\$24,437,465	\$1,855,051	
Less: Non-Rate Revenues ⁷	(13,679,244)	(3,287,816)	0	(Indirect Retail)
Initial Rate Revenue Requirement	\$ 87,994,968	\$ 21,149,650	\$ 1,855,051	\$ 110,999,669
Bad Debt Adjustment ⁸	10,120,810	2,432,544	213,360	
FY 2023 Rate Revenue Requirement	\$ 98,115,778	\$ 23,582,193	\$ 2,068,412	\$ 123,766,383
FY 2022 Projected Rate Revenue (Billed)³	\$ 69,433,800	\$ 28,619,200	\$ 4,041,900	\$ 102,094,900
FY 2022 Projected Rate Revenue (Net)	62,225,133	25,647,934	3,622,267	91,495,334
% Cost Recovery	71%	121%	195%	82%



Union County Water

System Development Fees



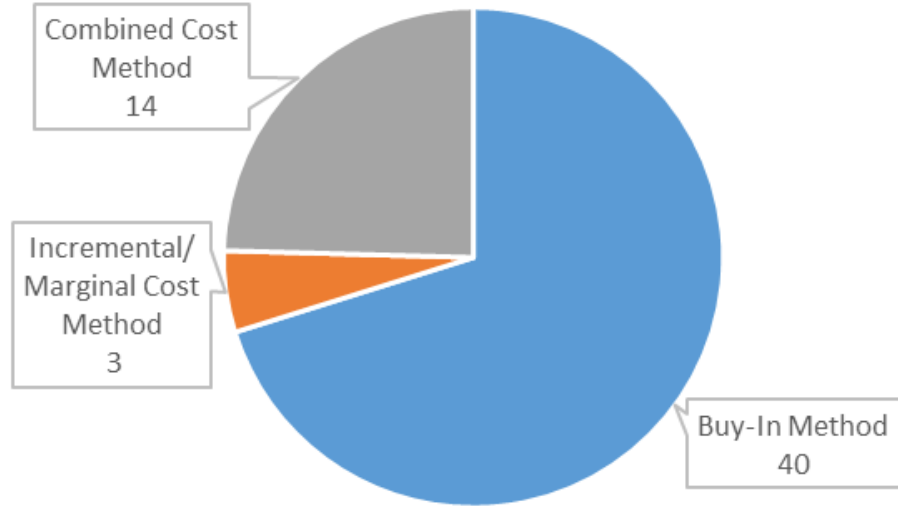
System Development Fee Methodologies

Methodology	Description	Use of System Dev. Fee Revenues	Appropriate For
Buy-In Method	Fees are based on cost of constructing existing utility system capacity	Revenues can be used for reimbursement of existing costs for improvements with capacity & rehab	System with ample existing capacity to sell
Incremental Cost Method	Fees are based on planned capital system expansion	First, expansion projects and second, debt service	System with no/very limited existing capacity to sell
Combined Method	Fees are based on cost of existing system and planned capital improvements	First expansion projects, second debt service, and also for reimbursement of existing costs for improvements with capacity & rehab	System with existing capacity to sell and with significant growth related capital projects



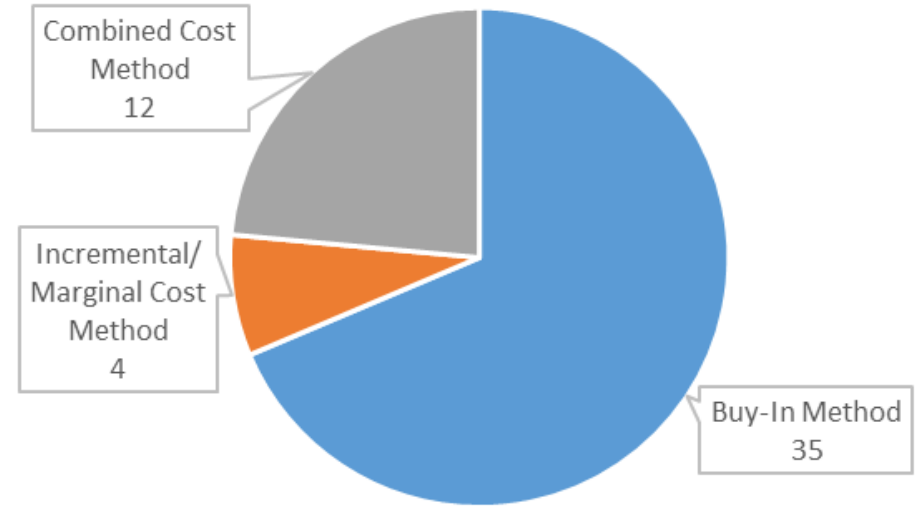
Survey of SDF Calculation Methodologies

SDF Calculation Methods - Water



n = 57

SDF Calculation Methods - Wastewater



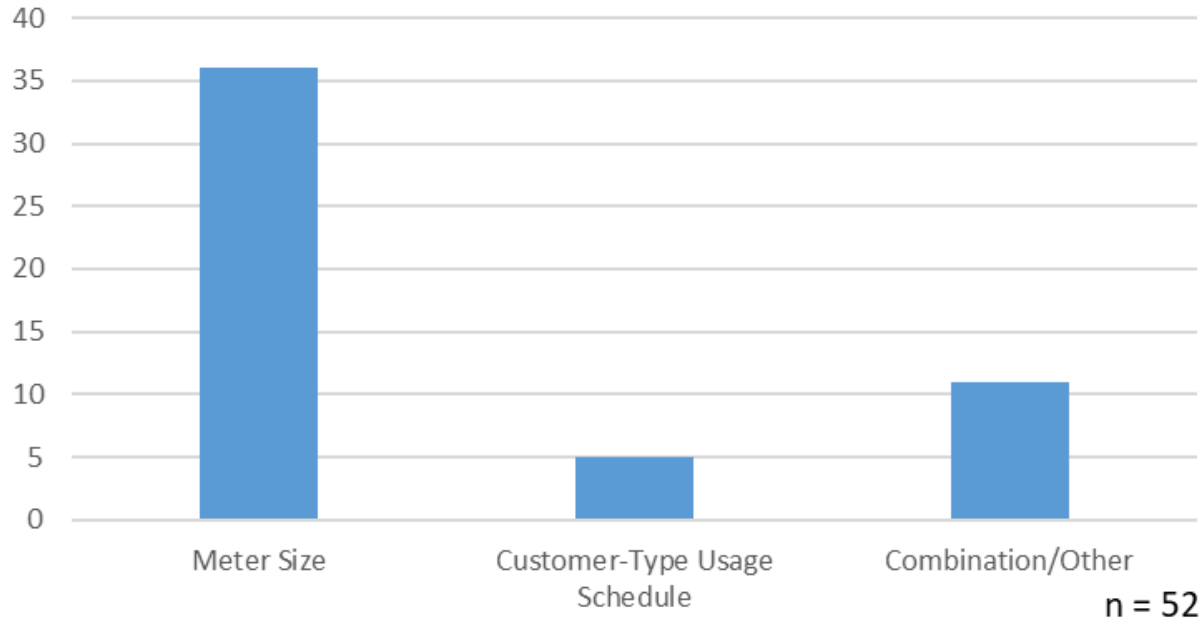
n = 51

Union County used the combined cost method

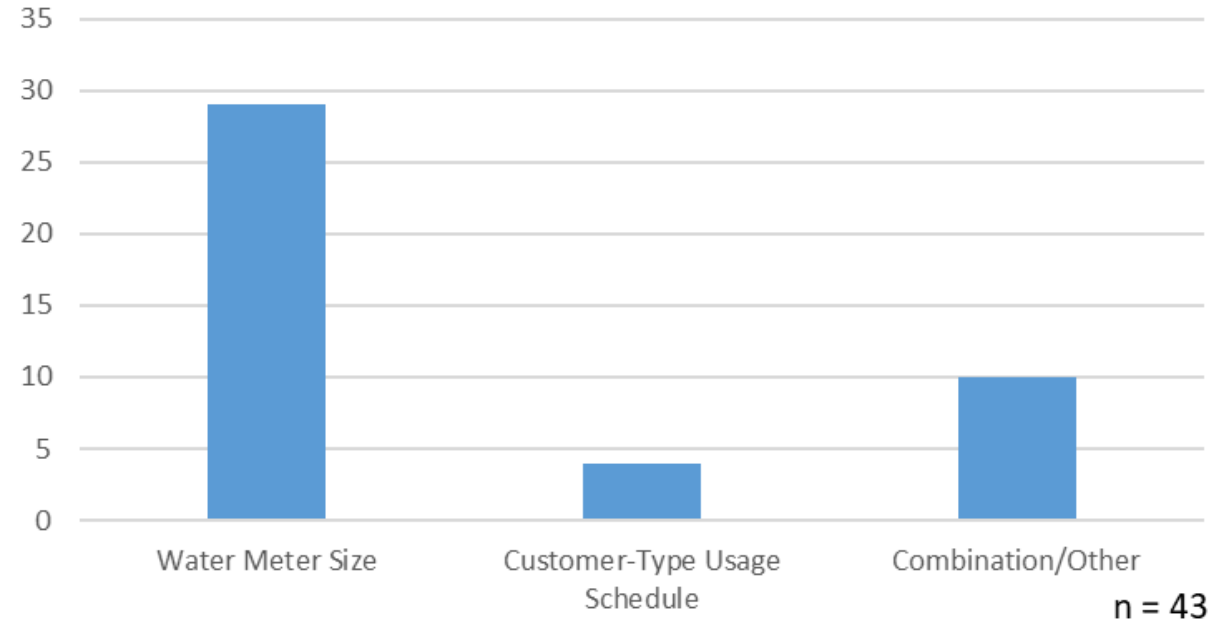


Survey of SDF Calculation Basis

Fee Basis for Water SDFs



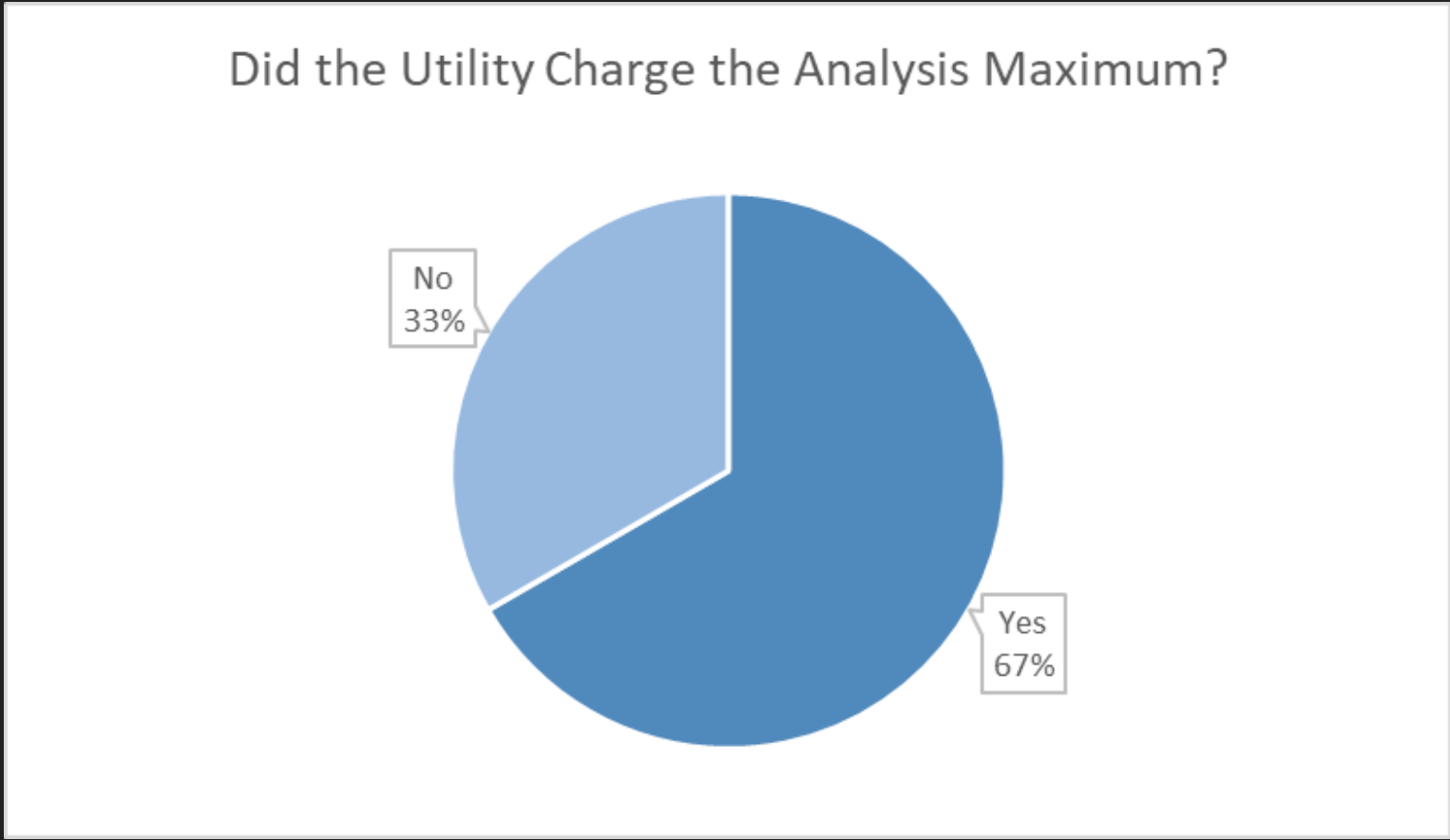
Fee Basis for Wastewater SDFs



Union County Uses Meter Size method for Water and Wastewater



Survey of SDF Maximum Charges



Union County charged the analysis maximum

$$\text{System Development Fee} = \frac{\text{Value of System} - \text{Credit}}{\text{System Capacity}}$$

1) Value of Utility System

- Depreciated value escalated to current replacement cost, and/or
- **Future capital investment**

2) Credit

- Outstanding principal on existing utility debt, grants, **contributions (including present value of revenue for same capital investment)**

3) System Capacity

- Total capacity in utility system, and/or
- Future capacity



Water SDF Calculation

	Buy-In Method	Incremental Method	Combined Method
Gross Plant in Service	\$510 M	N/A*	N/A*
Capital Improvement Program	-		
Principal Credit	(342) M		
Future Revenue Credit (min. 25%)	-		
Net System Value	\$167 M		
System Capacity (MGD)	35		
Level of Service (gpd)	328		
Equivalent Units	106,700		
Plus Escalation Factor to FY 2024	6.8%		
Calculated Fee per ERU	\$1,678		
Current Fee per ERU	\$3,200		
Change	-48%		

*No new facilities or expansion of capacity is currently planned for the water system.

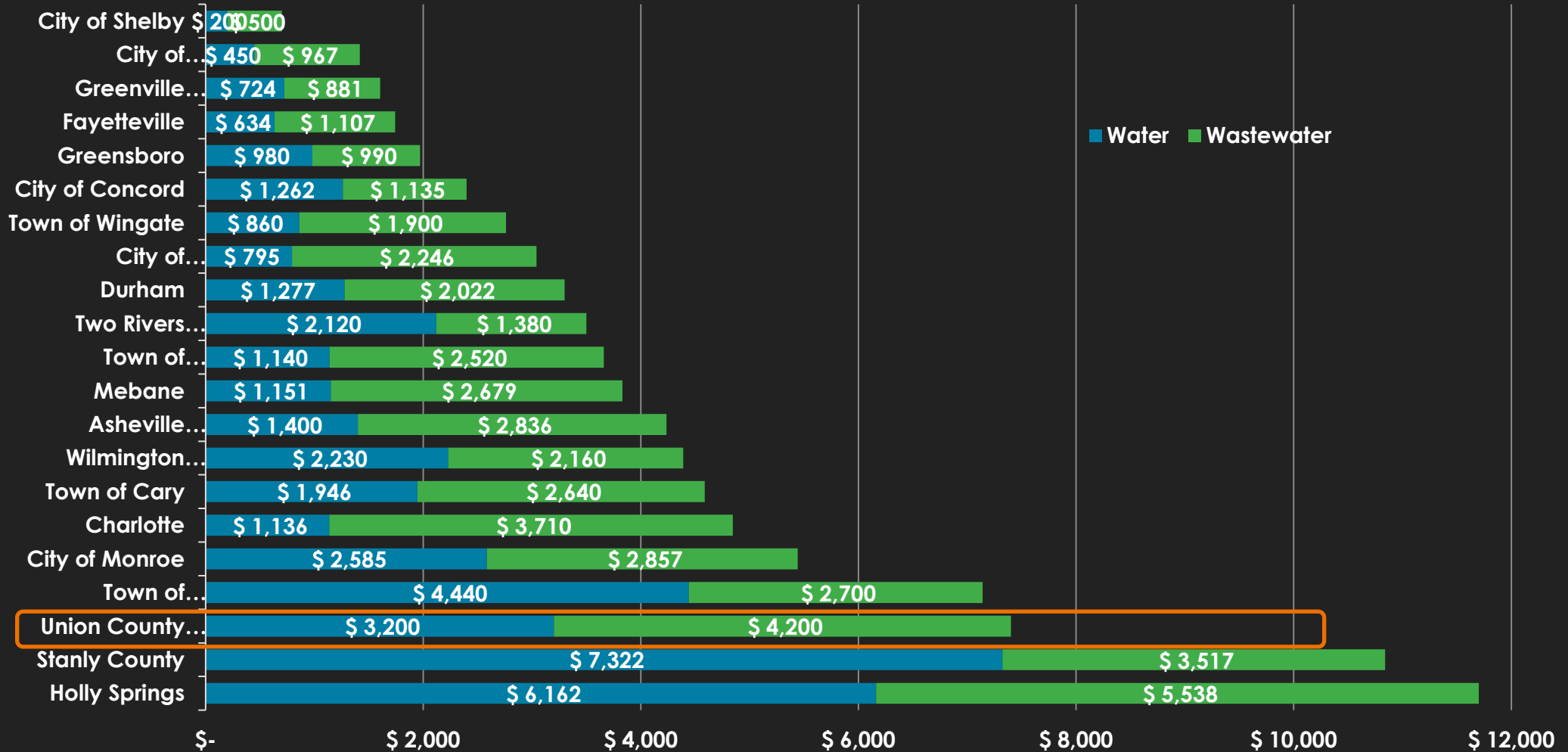


Sewer SDF Calculation – 10-Year CIP with Facility Expansion

12 Mile Expansion to 12 MGD			
	Buy-In	Incremental	Combined
Gross Plant in Service	\$223 M	-	\$223 M
Capital Improvement Program	-	102 M*	102 M*
Principal Credit	(84) M	-	(84) M
Future Revenue Credit (min. 25%)	-	(26) M	(26) M
Net System Value	\$139 M	\$76 M	\$216 M
System Capacity (MGD)	15.37	4.5	19.87
Level of Service (gpd)	255	255	255
Equivalent Units	60,200	17,600	77,800
Plus Escalation Factor to FY 2024	6.8%	6.8%	6.8%
Calculated Fee per ERU	\$2,473	\$4,634	\$2,962
Current Fee per ERU	\$4,200	\$4,200	\$4,200
Change	-41%	10%	-29%

*Expansion to 12 MGD estimate of \$55M was provided in Q1 2021.

2022 survey of local community **Water & Sewer** SDFs vs. current Union County SDFs





Common Questions/Considerations for SDFs

How should SDFs be applied to...

- Dedicated fire lines
- Non-standard demands/large industrial users
- Additional irrigation only meters
- Converting to central service
- Affordable housing
- Redevelopment

Other items to consider:

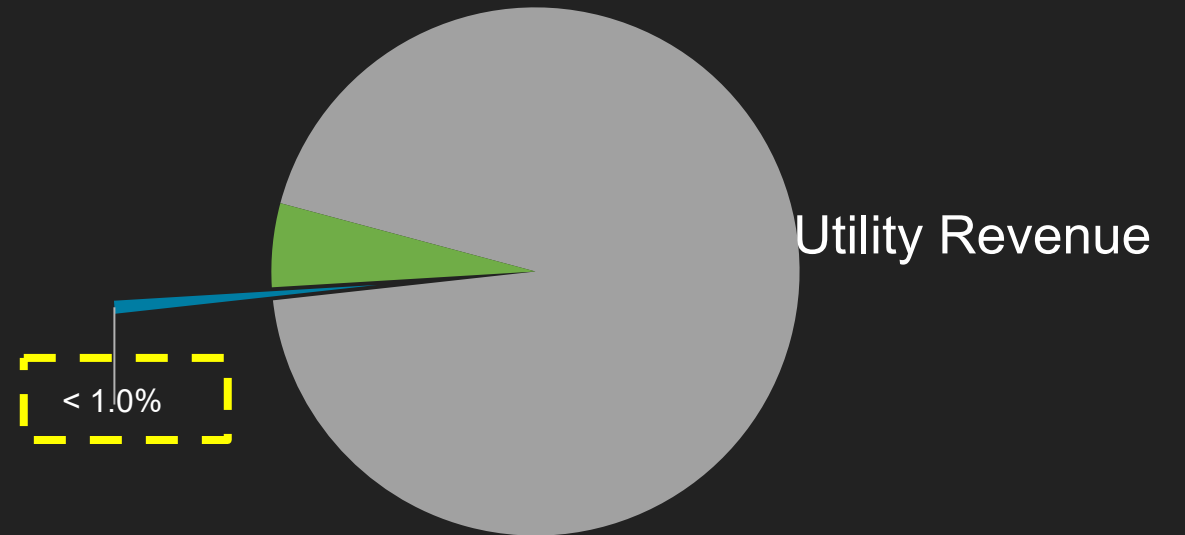
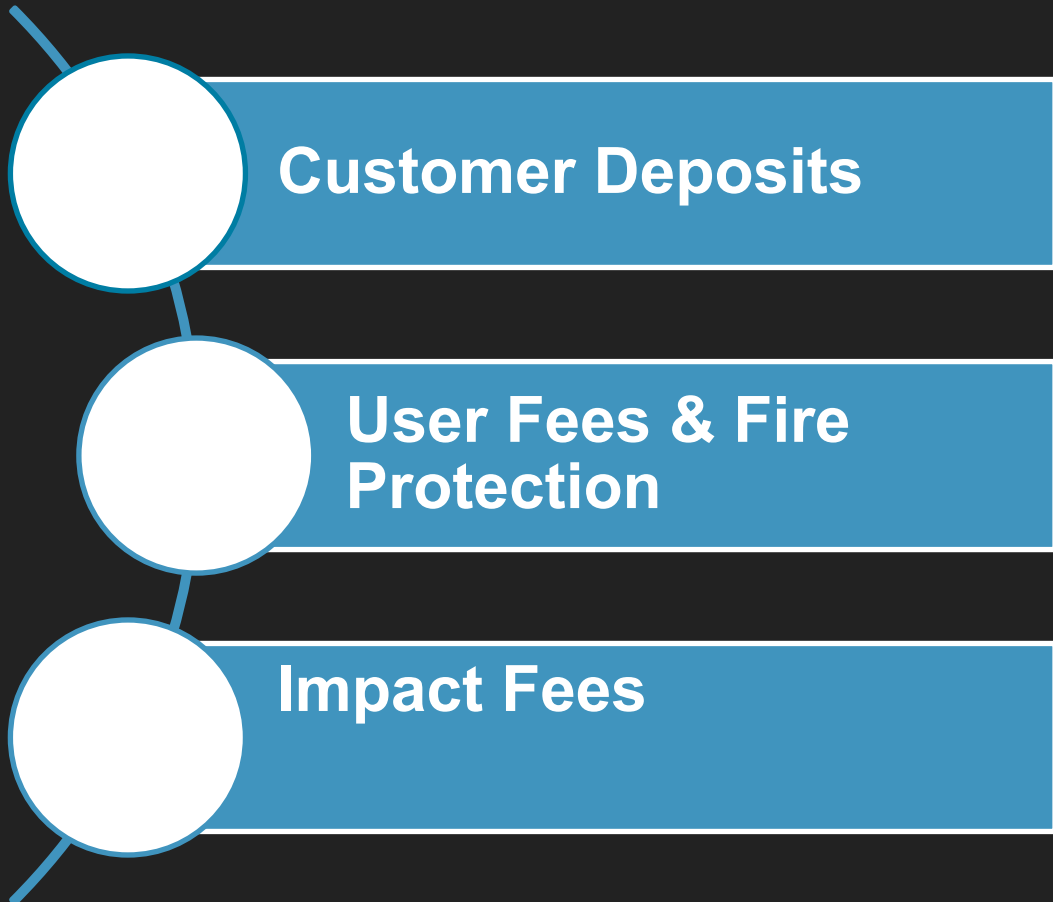
- State legislation and case law (evolving/changing)
- Methodology may need to change as capacity availability/needs change
- Rapid changes in capital costs and impacts of delays in fee increases



Miscellaneous Fees

Miscellaneous Fees

- Recover cost of services directly from the beneficiary
- Haven't been updated in several years



- Water, Sewer, Irrigation and Reclaimed Rate Revenues
- Miscellaneous Fees (User Fees, Fire Protection and Impact Fees)
- Non-Fee (Interest, Wholesale Service Charges, Other)

Overview

- Tap fees, account setup, meter installation/removal, meter verification, disconnect processing, deposits, & others
- Reflect <4% of overall system revenues
- Many fees have not been updated in several years/decades

Purpose

- Recover the cost of specific services from the customer or to promote positive customer behavior

Goal

- Identify costs associated with activities to inform fees





Staff identified costs and activities for each service and populated in Stantec's cost template

Labor

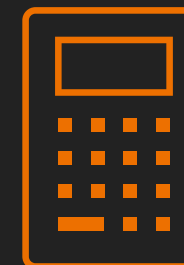
- How much time does each role spend to perform this service?

Equipment/Vehicles

- What pieces of equipment or vehicles are utilized to perform the service?

Materials

- What materials are used as part of this service?



$$\left[\begin{array}{l} \text{Hours Spent} \\ \text{(Customer Service, Utility Tech)} \end{array} \times \begin{array}{l} \text{Costs per Hour} \\ \text{(Labor, vehicles \& equipment)} \end{array} \right] + \begin{array}{l} \text{Unit Costs} \\ \text{(Materials)} \end{array} = \text{Cost of Service}$$



Benchmarking – Disconnect Processing Fees

	Disconnect Processing Fee	Notes
Charlotte Water	\$ 32.00	\$16 fee for both disconnect and reconnect
City of Concord	\$ 50.00	"Non-Payment Administration Fee" Disconnection for non-payment will require a deposit equal to two months average bill for reconnection of services.
City of Concord - After Hours	\$ 100.00	"Non-Payment Administration Fee" Disconnection for non-payment will require a deposit equal to two months average bill for reconnection of services.
City of Monroe	\$ 30.00	"Subject to Disconnection Fee"
City of Kannapolis	\$ 30.00	"Non-payment administrative service disconnect fee" After Hours Reconnect Fee = \$100
Town of Harrisburg	\$ 100.00	"Reconnect Fee"
Town of Wingate	\$ 30.00	"Delinquency Fee"
Two Rivers (City of Gastonia)	\$ 25.00	If services are disconnected for non-payment, other fees associated with reconnection or service calls may be due, in addition to the past due balance on the account, in order to have services restored.
Town of Cary, NC	\$ 33.00	Fee for processing disconnection of service due to nonpayment of utility charges.
Town of Cary, NC - After Hours	\$ 48.00	Fee for processing disconnection of service due to nonpayment of utility charges.
Union County Current	\$ 50.00	
Union County Calculated	\$ 140.00	



Proposed New Fees

Recover costs of some services being performed today by County at no charge to the customer

Fee Description	Cost of Service
After Hours Trip Fee - Reconnect	\$ 125.00
Installation / Removal of Temporary Hydrant Meter	\$ 230.00
Trip Charge for Excessive Requests	\$ 65.00
Residential Meter Test (Flow Test)	\$ 90.00
Large Meter Testing (Flow Test)	\$ 160.00



Conclusions

- Many current fees have not been updated in several years
- Most fees are not recovering the cost of service
- There are services being provided today that County is not charging for
- Calculated fees are generally within comparable range to other utilities

Recommendations

- Develop implementation plans for calculated fees (phasing may be required)
- Regularly review miscellaneous fees to ensure appropriate cost recovery

Phase-in Example

Service Fees & Charges

Activity: Customer specific or account and meter related services

At or Above Range
Within Range
At or Below Range

Description	Current Fee (\$)	Phase In Approach to Proposed Fee (\$)				Benchmarking Range (\$)
		FY 24	FY 25	FY 26	FY 27	
Turn on: Water meter / reclaimed water connection, per meter / connection	20	30	40	50	60	10 - 63
Special Reading	15	30	45	60	75	18 - 71
Collector Fee (for each collection attempt)	5	8.75	12.50	16.25	20	4 - 10
Check Reading (if correct reading has been made)	15	30	45	60	75	18 - 71
Read for change of account	15	30	45	60	75	18 - 71
Reset meter: Water	50	68.75	87.50	106.25	125	50 - 325
Water meter test, if meter is correct:						
Less than or equal to 2-inch size	50	87.50	125	162.50	200	40 - 200
Greater than 2-inch size	100	132.50	165	197.50	230	130 - 400
Turn-off: Water	No Charge (N/C)	30	40	50	60	10 - 63
Lawn meter removed	70	156.25	242.50	328.75	415	70 - 350