CITIZENS' WATER ADVISORY COMMITTEE
(CWAC)
Finance Subcommittee

1:30 p.m., Wednesday, October 12, 2016
Tucson Water La Entrada Building
3rd Floor Director's Conference Room
310 W. Alameda Street, Tucson, Arizona

Legal Action Report

1. Roll Call

The meeting was called to order by Finance Subcommittee Chair Mark Stratton at 1:35 p.m. Those present were:

Members Present:

Mark Stratton (Chair)	Representative, City Manager
Chuck Freitas	Representative, City Manager
Catlow Shipek	Representative, City Manager
Mark Taylor *	Representative, City Manager
Mark Lewis	Representative, Ward 5

* Member Taylor arrived at 1:36 p.m.

Members Absent:

Brian Wong	Representative, City Manager
Holly Lachowicz	Representative, Ward 3

Tucson Water Staff Members:

Scott Clark	Deputy Director
Pat Eisenberg	Engineering Administrator
Melodee Loyer	Planning Administrator
Steve Ritter	Financial Services Administrator
Fernando Molina	Public Information Supervisor
Daniel Ransom	Water Conservation Supervisor
Theresa Bourne	Lead Financial Accountant
Falonn Goodacre	Management Assistant
Kris LaFleur	Staff Assistant
Rebecca Lapora	Staff Assistant
Lea Castillo	Administrative Assistant

Other Attendees:

Antonio Figueroa	City of Tucson Budget Office

2. Announcements – There were no announcements.

3. Call to Audience – There were no audience comments.

4. **Review of September 14, 2016, Legal Action Report and approval of Meeting Minutes –** Members reviewed the Legal Action Report from the September 14, 2016, CWAC Finance Subcommittee meeting. Member Lewis moved to approve the Minutes; Member Freitas seconded the motion. Discussion ensued.

   Members Lewis, Taylor and Freitas requested changes to Item 6 of the LAR. Staff indicated that the changes would be incorporated in an Amended Legal Action Report.

   Member Lewis moved to amend the motion to approve the Minutes with the recommended changes incorporated; member Freitas seconded the motion.

   The amended motion was carried by a vote of 5-0.

5. **Review and approval of September Low-Income Program Discussion Summary –** Members discussed the summary of subcommittee action from the September 14, 2016, meeting. Member Lewis requested that future related information provided by staff be filed as an addendum to the summary document. Member Lewis moved to approve the summary as written; Member Taylor seconded the motion. Discussion ensued.

   Member Freitas suggested that the contents of this and future summary documents should be marked as "approved for reference for future meetings." Member Lewis moved that the motion be amended to reflect the request; the motion to amend was seconded by Member Taylor.

   The amended motion was carried by a vote of 5-0.

6. **Review of FY2018 CIP Budget –** Staff presented a review of the draft FY 2018 CIP Budget. Mr. Ritter presented an overview of changes to the 5-year CIP budget, which included an increase of $61M over the previous year's projected 5-year plan. Ms. Loyer reviewed highlights of new projects included in the draft budget. Ms. Eisenberg presented an overview of CIP work completed in FY2016. Members and staff discussed elements of the draft CIP budget at length.

   Members and staff discussed the subcommittee's role in the upcoming financial planning schedule. Staff indicated that the CIP budget was currently in draft form and the current discussion was advisory in nature. Staff indicated that future changes to the Financial Plan and the CIP budget would be brought to the subcommittee and to full CWAC. No action was taken.

   Member Shipek departed at 2:18 and returned at 2:19. Member Lewis departed at 2:25 and returned at 2:26.

7. **Discussion: Conservation Programs & Incentives –** A staff presentation included an overview of water utility industry best practices for conservation-based rate setting; a review of the conservation signal in Tucson Water's rate pricing; and common practices for tiered block rate-setting.

Discussion ensued between members and staff. Members were requested to review the materials distributed to them prior to and after the meeting, and to send comments to staff for discussion at the next subcommittee meeting. No action was taken.

8. **Future agenda items –** The next Finance Subcommittee meeting will be held on November 9, 2016. Topics for future discussion include:

- Continued Conservation & Rates review and discussion
- Discussion of utility fixed costs and fixed rates
- Final CIP review

9. **Adjournment –** The meeting was adjourned at 3:04 p.m.

TUCSON WATER - FINANCIAL WORK PLAN MATRIX - 2016 through 2018

10/17/2016

TASKS	Completion Target	PARTICIPANTS: TW Staff	RFC/GRG	CWAC	City Manager	Mayor/ Council	External Stakeholders
	2016						
Draft Work Plan List	August	P	P	I,R			
Low-Income Assistance Program	September	P	S	I,R	I,D	I,A	?
- Maintain low-income assistance while exploring base-rate alternatives that achieve long-term revenue stability							
- Maintain a strong conservation signal							
- Avoid regressive rates for low income customers							
- Offer low income plumbing repairs							
- Avoid penalties for low income customers							
- Scheduled payment date							
- Develop a means for community to contribute toward low-income subsidy on utility statement							
Conservation Programs & Incentives	October	P	S	I,R	I,D	I,A	?
- Maintaining a strong conservation signal through potential rate structure changes							
Base-rate recovery of fixed costs	November	S	P	I,R	I,D	I,A	
- Review of base-rate alternatives to achieve long-term revenue stability & reduce volume-charge volatility							
- Review of other rate-structure alternatives							
Reclaimed System & Rates		P	S	I,R	I,D	I,A	
- Analysis of program, future uses, subsidy policies							
Inside/Outside Differential Rates	December	S	P	I,R	I,D	I,A	
- Analysis of differential rate structures							
- Legal analysis							
	2017						
System Equity / Economic Development / Equity Fee	January	P	S	I,R	I,D	I,A	
- Determine if current fee is recovering appropriate revenues from new development to fund existing capacity							
- Explore implementation of system equity fees that drive redevelopment and annexation							

TASKS	Completion Target	TW Staff	RFC/GRG	CWAC	City Manager	Mayor/ Council	External Stakeholders
Financial Plan / Rate Modeling	February	P	S	I,R	I,D	I,A	
- Develop multi-year rate planning process that ensures revenue stability, but provides ability to request adjustments as circumstances require							
Volume Rate Structure (SF Blocks / Tiers & MF)	March/April	S	P	I,R	I,D	I,A	
- Analysis of optimal rate-block structures for stimulating conservation and maintaining affordability							
Summer Tier							
- Optimization of tiers to promote conservation values; currently only Commercial & Industrial							
Other developing issues							
Pay / Technology - Reviews	May	P	P	I,R	I,D		
Rate Model Improvements/Redevelopment	TBD	I,D	P				
Brief CWAC	**June**	P	P	I,R			
Start 2018 Rate Process							
CIP Budget due to Business Services	September	P					
- Department O&M due	October	P					
- CIP Budget CWAC	October	P	S	I,R			
- Consumption	November	P	P				
- O & M Budget CWAC	November	P	S	I,R			
	2018						
Financial Plan / Revenue		P	P	I,R	I,D	I,A	
- COS / Proposed Rates	January	S,I,D	P	I,R			
- Study Session / Financial Plan / COS / Proposed Rates	February	P	P	I,R	I,D	I,A	
- Sub-Committee Final - Recommendation to CWAC	February	S	S	P,I,R	I,D	I,A	
- Sub-Committee Deliberations	February	S	S	P			
- CWAC Deliberations	February	S	S	P			
- Public Notice	February	P	S				
CWAC Letter	March	P	S	P			
Public Process	March/April	P	S				I
Council Adoption New Rates	May	P	S			I,A	

P	Primary responsibility for preparing work product
S	Secondary responsibility for preparing work product
I	Provides input, advise and feedback

TASKS	Completion Target	TW Staff	RFC/GRG	CWAC	City Manager	Mayor/ Council	External Stakeholders

R	Makes recommendation
D	Makes decision or provides recommendation
A	Approval

Discussion summary: Low-Income Assistance Program

CWAC Finance Subcommittee

September 14, 2016 (*Approved for reference in future meetings, 10/12/2016)*

Members supported the Base Rate / Base + CCF concepts. However, more information is needed about the size and cost of a fully implemented low-income assistance program (LIAP) before members can make budget or spending recommendations for changes to the program. Questions to be answered include:

- What is the full size of the potential customer base that's eligible to participate in the LIAP?
- What amount would need to be budgeted for the LIAP if all eligible participants were enrolled?
- What would be the subsidy per TW customer per month for a fully budgeted program?
- Should there be a spending cap on the program?

Members support the concept that LIAP spending should reduce water waste and promote conservation. Possible approaches would include:

- Automatic enrollment in the Zanjero program for LIAP participants, to identify household leaks and low-efficiency fixtures, and to provide conservation advice
- Help customers who can't afford home plumbing repairs (leak prevention)
- Help customers upgrade to efficient fixtures (water conservation)
- Low-income grant/loan assistance (i.e., RWH program)

Members expressed support for some additional low-income assistance options:

- Fee / penalty relief
- Community contribution on utility bill (could support plumbing repairs, crisis vouchers, low-income subsidy)

Some members expressed basic disagreement with the Utility administering a LIAP subsidized by ratepayers. Reasons included:

- Written M&C policy indicates that LIAP should be supported by the General Fund
- Utilities regulated by the ACC are not permitted to operate such programs
- Low-income funding should be distributed through federal or state agencies, not through utilities

Members want clarification regarding the intent of any potential increase of the Base Rate:

- Is the intent to increase overall revenues (i.e., increase base rate and hold variable rates steady)
- Or is the intent to remain revenue neutral (i.e., increase base rates but reduce variable rates)
    - Under revenue-neutral conditions, some members believe a Base Rate increase would not be regressive under the current 50% bill-adjustment method

Tucson Water

CWAC - Finance Subcommittee

October 12, 2016

Presenters:

Pat Eisenberg, Chief Engineer
Melodee Loyer, Planning Administrator
Steven Ritter, Finance Administrator

TUCSON WATER

Bottom Line Up Front

- FY18-22 CIP budget increases $61M from previously adopted 5-year plan
- CIP budget is first step in determining revenue requirements; O&M budget review is underway and projected revenues will follow
- Possible reductions to CIP and/or O&M budget may be required after review of Financial Plan
- **<u>Goal</u>: Maintain current adopted rate structure**

TUCSON WATER

Overview

- CIP comparison
- Proposed Capital Improvement Program (CIP)
- FY 16 Accomplishments
- Reducing carry-forward



CIP COMPARISON:

Adopted FY's 2017-2021 versus Proposed FY's 2018-2022
(Amounts Rounded to 000's)

	FY17	YEAR 1 FY2018	YEAR 2 FY2019	YEAR 3 FY2020	YEAR 4 FY2021	YEAR 5 FY2022	5 Year Total
FY2017 - FY2021 Adopted CIP	**56,098**	**46,539**	**53,297**	**40,492**	**34,602**		**231,028**
New CIPs		2,462	2,863	9,567	20,690	**29,621**	**65,203**
Delayed or Deleted CIPs		(5,830)	(8,418)	(2,992)	-	**-**	**(17,240)**
Projects with Major Revisions		11,670	11,942	8,551	4,663	**16,864**	**53,690**
Other Adjustments		195	(293)	(482)	(851)	**11,998**	**10,567**
FY2018 - FY2022 Proposed CIP	**(prop. CF) 5,190**	**55,036**	**59,391**	**55,136**	**59,104**	**58,483**	**292,340**
Difference		***8,497***	***6,094***	***14,644***	***24,502***	***58,483***	***61,312***

TUCSON WATER



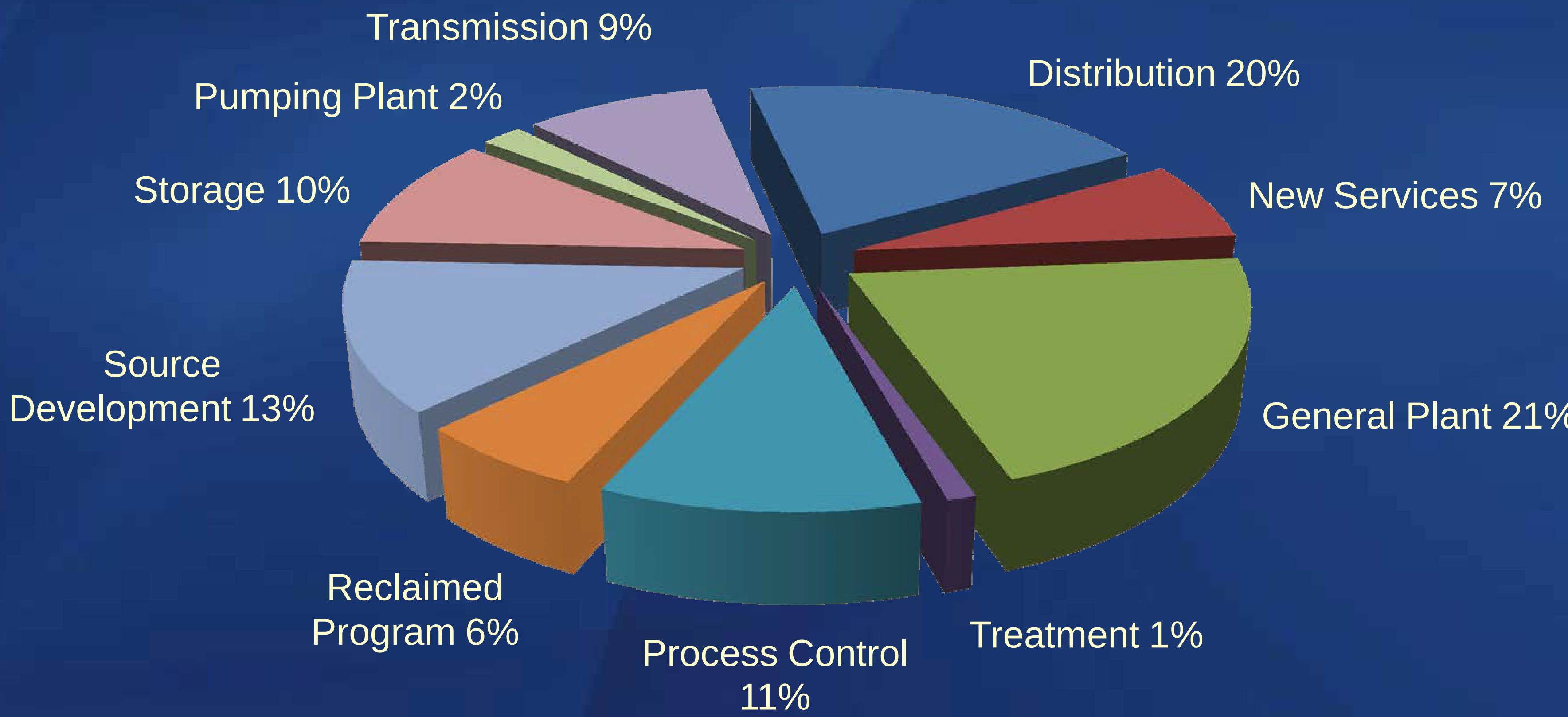
FIVE-YEAR CIP FY's 2018-2022

(1,000)

PROGRAM AREA	FY 2017 CYFWD	YEAR 1 2017-18	YEAR 2 2018-19	YEAR 3 2019-20	YEAR 4 2020-21	YEAR 5 2021-22	5 YEAR TOTAL
TOTAL POTABLE SOURCE DEVELOPMENT	769	3,961	4,388	9,114	12,310	8,605	39,147
TOTAL POTABLE STORAGE	900	7,711	505	8,211	6,603	5,963	29,893
TOTAL POTABLE PUMPING PLANT	26	170	1,448	2,752	292	302	4,990
TOTAL POTABLE TRANSMISSION MAINS	800	6,198	11,011	2,019	4,932	2,946	27,906
TOTAL POTABLE DISTRIBUTION MAINS	1,350	13,380	13,511	10,674	10,176	8,169	57,260
TOTAL POTABLE NEW SERVICES	-	3,809	3,773	3,886	3,926	4,007	19,401
TOTAL GENERAL PLANT	500	7,697	7,621	8,903	13,533	22,933	61,187
TOTAL POTABLE TREATMENT	204	2,631	-	-	-	-	2,835
TOTAL POTABLE PROCESS CONTROL	200	7,483	7,074	7,400	6,427	2,564	31,148
TOTAL POTABLE SYSTEM	4,749	53,040	49,331	52,959	58,199	55,489	273,767
TOTAL RECLAIMED SOURCE DEVELOPMENT	100	624	6,569	-	-	-	7,293
TOTAL RECLAIMED STORAGE	41	-	2,919	-	-	-	2,960
TOTAL RECLAIMED PUMPING PLANT	-	-	-	1,588	310	2,385	4,283
TOTAL RECLAIMED TRANSMISSION	-	-	-	-	-	-	-
TOTAL RECLAIMED DISTRIBUTION MAINS	-	351	348	358	362	370	1,789
TOTAL RECLAIMED NEW SERVICES	-	57	56	58	58	60	289
TOTAL RECLAIMED TREATMENT	300	794	-	-	-	-	1,094
TOTAL RECLAIMED PROCESS CONTROL	-	170	168	173	175	179	865
TOTAL RECLAIMED SYSTEM	441	1,996	10,060	2,177	905	2,994	18,573
TOTAL	**5,190**	**55,036**	**59,391**	**55,136**	**59,104**	**58,483**	**292,340**

TUCSON WATER

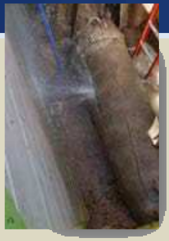
Proposed FY2018 – FY2022
Capital Budget $292.3 Million



Proposed New Work
5-Year CIP Budget Amounts

- Billing system (customer service): $26.6M
- SHARP (not new; County no longer a partner): $7.3M
- Excellence in Customer Service (relocate Call Center, plan for 311): $1.1M
- Pressure-reducing valve relocations (safety, ease of maintenance): $1.0M
- Diamond Bell production facilities (operations, system controls, customer service): $1.0M

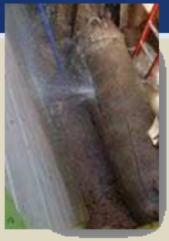
TUCSON WATER

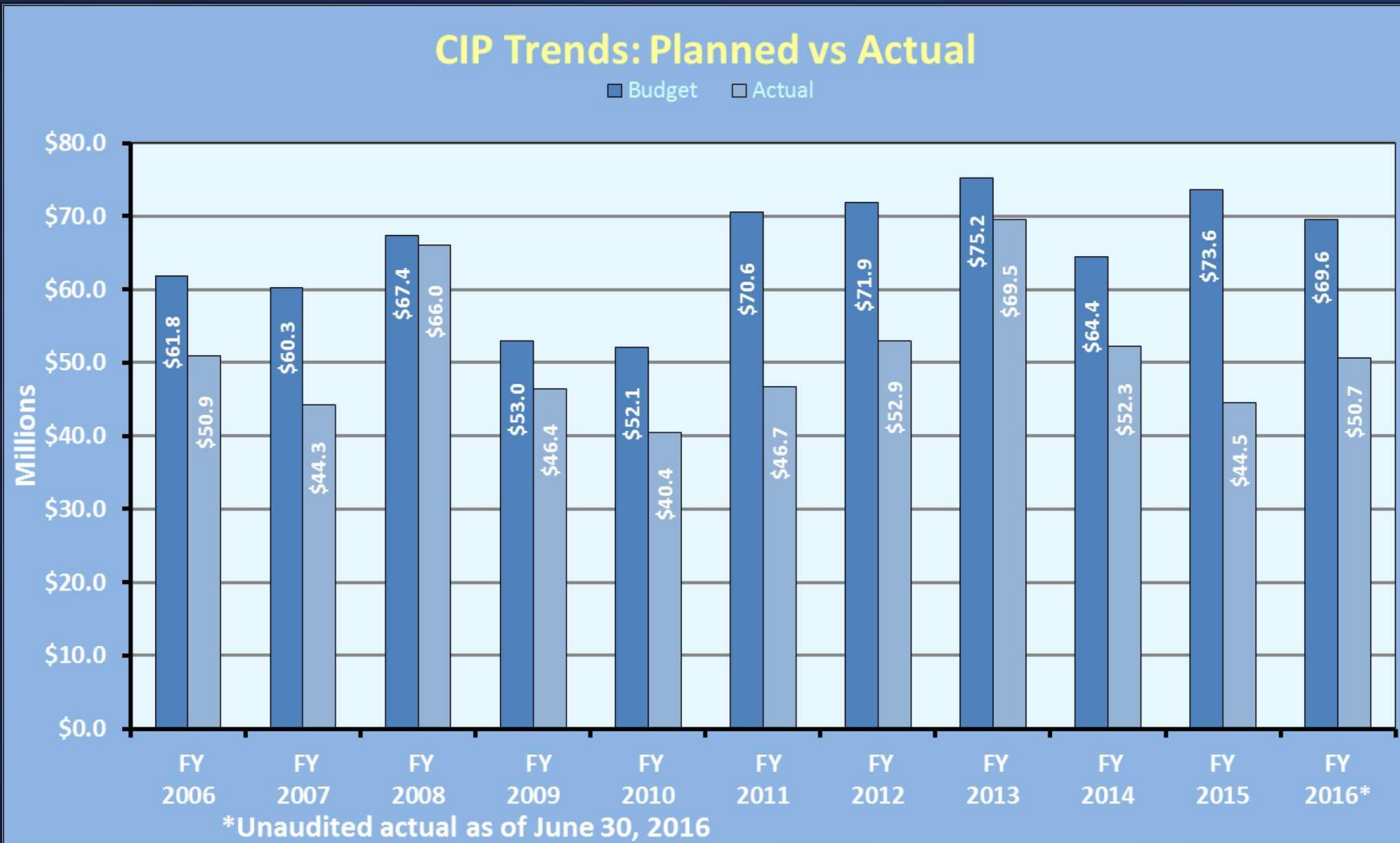




CIP: FY 16 Accomplishments

- Plant 2 Relocation (W137): $1.4M
- Meter Replacement Program (W435): $7.5M
- Clearwell Reservoir Rehabilitation (W056): $1.0M
- Bailey Sleeve Valve Replacement (W856): $1.5M
- Santa Rita Ranch/Houghton Road 12" Main (W768): $1.2M
- Cocio Road Main Replacement (W076): $0.6M
- Golf Links Main Replacement (W847): $0.8M
- Roadway Projects Water Mods (W111): $4.9M

TUCSON WATER



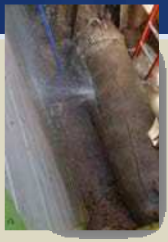


TUCSON WATER

Steps to Minimize Carry-Forward

- Strive to reduce the number of project changes in the current fiscal year
- Clarify Procurement wording prior to bid invitation, especially for projects with a limited winter construction window
- Work closely with Development Services to avoid delays in cultural clearance and permit review
- Report problems with projects as early in the fiscal year as possible

TUCSON WATER



Questions?

Tucson Water

CWAC - Finance Subcommittee

October 12, 2016

Presenters:

Pat Eisenberg, Chief Engineer
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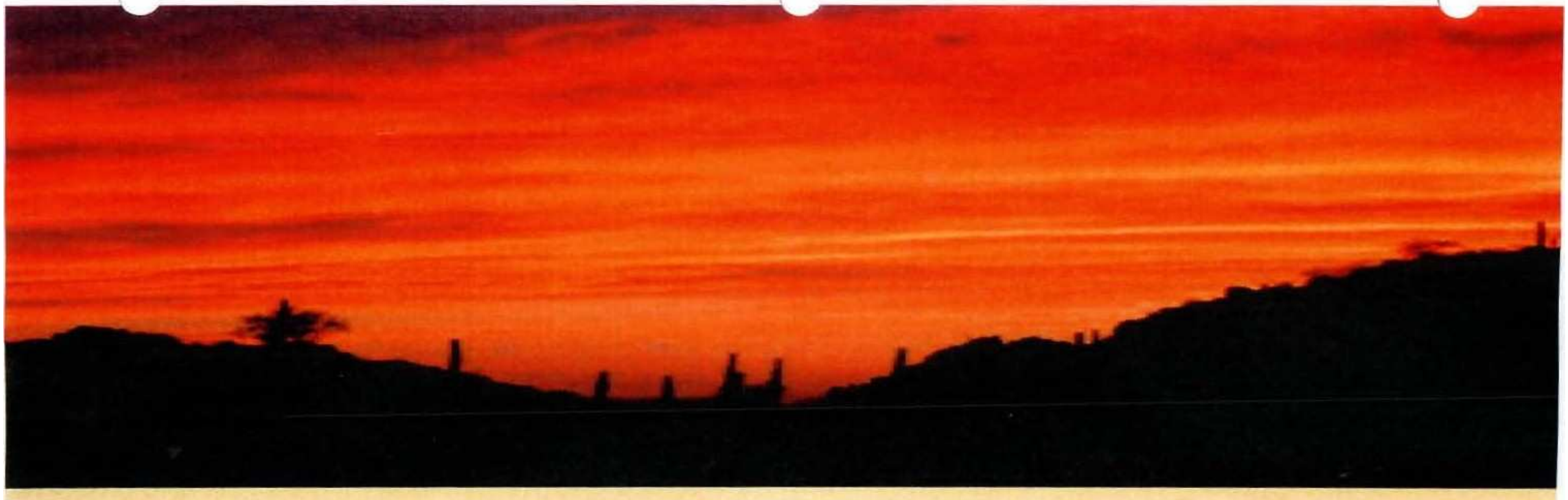
TUCSON WATER



Proposed
Five -Year Capital Budget
FY 2018 through FY 2022

CWAC Presentation

October 12, 2016

TUCSON WATER

FIVE-YEAR CIP FY's 2018-2022

(1,000)

PROGRAM AREA	FY 2017 CYFWD	YEAR 1 2017-18	YEAR 2 2018-19	YEAR 3 2019-20	YEAR 4 2020-21	YEAR 5 2021-22	5 YEAR TOTAL
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TOTAL	5,190	55,036	59,391	55,136	59,104	58,483	292,340

FIVE-YEAR CIP FY's 2018-2022

(Amounts Rounded to 000's)

POTABLE SOURCE DEVELOPMENT

CIP#		FY 2017	YEAR 1 2017-18	YEAR 2 2018-19	YEAR 3 2019-20	YEAR4 2020-21	YEARS 2021-22	SYEAR TOTAL
W199	C-049 Well Re-Equip	150						150
W553	CAVSARP Well Pump Improvements		340	337	347	351	358	1,733
W101	Drill Production Wells					1,753	1,789	3,542
W061	Equip Well A-061		397					397
W062	Equip Well W-006	69						69
W216	Equip Wells SS-021 & SS-023						179	179
W140	Gas Engines			842	867	876	894	3,479
W166	Pima Mine Rd Production Well Drilling					2,921		2,921
W195	Pima Mine Rd Well Equipping (3)						179	179
W075	Pressure Tank Replacement		510	505	520	526	537	2,598
W087	Production Well Sites		84	83	86	87	89	429
W176	Recycled Water Program		1,213	994	1,000	1,005	1,002	5,214
W239	Re-equip Well 1-001B	50	170					220
W857	Santa Cruz Wells - Re-Equipping	400						400
W167	Santa Cruz Wells SC-001/SC-004/SC-014 Drilling				2,313			2,313
W189	Santa Cruz Well SC-001/SC-004/SC-014 Equipping				173	1,402		1,575
W083	SA-016A Recovery Well Drilling				694			694
W084	SA-019A/SA-021A Recovery Well Drilling				1,322			1,322
W085	SA-023A Recovery Well Drilling				694			694
W064	SAVSARP Phase III Well Equipping					1,110	2,445	3,555
W090	TARP R-009A Replacement Well	100						100
W244	TARP Wells R-001 thru R-008 Drilling		567	561		1,169		2,297
W247	TARP Wells R-001 thru R-008 Re-Equipping		113	505	520	526	537	2,201
W077	Wellfield Upgrades		567	561	578	584	596	2,886
TOTAL	**POTABLE SOURCE DEVELOPMENT**	**7691**	**3,961 1**	**4,3881**	**9,1141**	**12,310 1**	**8,6osl**	**39,1471**

POTABLE SOURCE DEVELOPMENT

C-049 Well Re-Equip

W199

DESCRIPTION:

Existing well C-049 has been out of service due to failed, antiquated equi pment. The well site requires re-equipping of the above ground facilities in order to bring it back into production. This will involve replacing the electrical and control equipment, hydro pneumatic tank, production flow meter, disinfection equipment, modifying and upgrading the site enclosure. This project will begin in Fiscal Year 2016 and will be completed in FiscaJ Year 2018. Total project cost is $270,000.

PROPOSED 2017-2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	YEAR2 2018-19	YEARJ 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
ISO	-	ISO	-	-	-	-	150

CAVSARP WeU Pump Improvements

W553

DESCRIPTION:

This on-going project will upgrade existing line shafts on Central Avra Valley Storage and Recovery Project (CAVSARP) wells, upgrade well pumps, change product lubrication systems, and re-equip wells with new materials. Original materials of construction are not compatible with the unique aquifer and recharge conditions at CAVSARP. Evaluating and upgrading wells will reduce maintenance costs and improve operating efficiency and reliability.

PROPOSED 2017-2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	YEAR2 2018-19	YEAR J 2019-20	YEAR4 2020-21	YEAR S 2021-22	YEAR TOTAL
-	340	340	337	347	351	358	1,733

Drill Production Wells

W101

DESCRIPTION:

Drilling of 2 replacement production wells per year in wellfields other than the Central Avra Valley Storage and Recovery Project (CAVSARP), Southern Avra Valley Storage and Recovery Project (SAVSARP) and Tucson Airport Remediation Project (TARP). The focus will be on aging wells beyond repair, or which are more economical to replace by installing stainless steel constructed wells. This on-going project will equip wells to pump historic production levels of the original wells and contribute to maintaining 90 MGD of redundant wellfield pumping capacity to meet peak demands in the event of a failure of the 96-inch Clearwell pipeline.

PROPOSED 2017-Z018			PROJECTED REQU IREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	YEAR2 2018-19	YEARJ 2019-20	YEAR4 2020-21	VEARS 2021-22	YEAR TOTAL
-	-	-	-	-	1,753	1,789	3,542

POTABLESOURCE DEVELOPMENT

Eq uip Well A-061

W061

DESCRIPTION:

Design and equip weiJ A-061. Well A-061 is needed to supplement water supply in the northwest portion of Tucson Water's system. Design began in Fiscal Year 2017 and construction will be completed in Fiscal Year 2018. Total project cost is $408,000.

PROPOSED 2017-2018			PROJECTED REQUJREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR! TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	397	397	-	-	-	-	397

Eq uip Well W-006

W062

DESCRIPTION:

Design and equip well W-006. The existing WC service area is an isolated system and is supplied by only one well, W-OO1. This new well wouJd provide a level of redundancy in the event offailure or maintenance requirements of well W-001. Design began in Fiscal Year 2015 and construction will be completed in Fiscal Year 2018. Total project cost is $479,000.

PROPOSED 2017 - 2018			PROJECTED REQU IREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR! TOTAL	YEAR2 2018-19	YEARJ 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
69	-	69		-	-	-	69

Equip Wells SS-021 & SS-023

W216

DESCRIPTION:

Re-equip or replace pumps for wells SS-021 and SS-023 to pump water into the B1 water service area. Existing well discharge mains will be connected to the Bl mains. The project will begin and be completed in Fiscal Year 2022. Total project cost is $179,000.

PROPOSED 2017 - 2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR1 TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	-	-		-	-	179	17.9

Gas Engines

W140

DESCRIPTION:

Installation of 5 natural gas engines per year in the Central Avra Valley Storage and Recovery Project (CAVSARP) wellfield area. Current engines are approaching the industry standard life expectancy of 100,000 hours. Upgraded engines will have the latest technology needed to meet the emissions control permit requirements, making it more cost effective and advantageous to upgrade to new engines rather than rebuild existing engines. This project began in Fiscal Year 2016 and will be completed in Fiscal Year 2022. Total project cost is $4,985,000.

PROPOSED 2017-2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEAR S 2021-22	YEAR TOTAL
-	-	-	842	867	876	894	3,479

Pima Mine Rd Production Well Drilling

W166

DESCRIPTION:

Drilling of 3 production wells at Pima MineRd which will assist in producing 20 MGD of production capacity from the Santa Cruz Wellfield. These wells will ensure water levels remain below the alert levels for the underground storage facility permit, and help resolve water quality issues in the Santa Cruz Wellfield. Each well will be between 500 and 600 feet below land surface and will eventually be equipped to pump approximately 2,000 GPM. Construction will begin and be completed in Fiscal Year 2021. Total project cost will be $2,921,000.

PROPOSED 2017-2018			PROJECTED REQUIRI:lfEYrS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR 1 TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEAR S 2021-22	YEAR TOTAL
-	-	-	-	-	2,921	-	

Pima MineRd Well Equipping (3)

W195

DESCRIPTION:

Design and install 3 production well pumps, control buildings and surface piping in production wells at the Pima Mine Rd Recharge Project. Estimated production of each well is 2,000 GPM. These wells will assist in reaching 20 MGD of production capacity from the Santa Cruz Wellfield. This project will begin in FY 2022 and be completed in FY 2023. Total project cost will be $1,379,000.

PROPOSED 2017-2018			PROJECTED REQU IREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEARl TOTAL	YEARl 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEAR S 2021-22	\'EAR TOTAL
-	-	-	-	-	-	179	l79

Pressure Tank Replacement

W07S

DESCRIPTION:

Design and construct replacement pressure tanks at water wells and booster stations. As funds become available, on an annual basis, uncertified tanks will be replaced and the remaining uncertified tanks prioritized. Safety requ irements mandate tank replacement for those not meeting code or lacking certification from the American Society of Mechanical Engineers.

PROPOSED 2017- 2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	YEAR2 2018-19	YEARJ 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	510	**510**	505	520	526	537	2,598

Production Well Sites

W087

DESCRIPTION:

This on-going project is for the acquisition of property for new production well sites. Well sites are needed to meet future demand and to replace obsolete wells.

PROPOSED 2-017 - 2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	84	**84**	83	86	87	89	429

Recycled Water Program

W176

DESCRIPTION:

Plan development for the full utilization of the City's effluent entitlement. This program will address effluent quality and quantity, methods of treatment and existing and future uses of effluent. It will include the continued expansion of non-potable reclaimed water and recharge capital improvement projects and costs needed for implementation. The 2011-2015 Action Plan for Water Sustainability Report identified preparation and implementation of the Recycled Water Master Plan as a water resource task. This project began in Fiscal Year 2016 and will be completed in Fiscal Year 2022. Total project cost is $8,509,000.

PROPOSED 2017-2018			PROJECTED REQUIREMENTS				m'E
CARRY FORWARD	NEW FUNDING	\'EARl TOTAL	YEAR2 2018-19	YEARJ 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	1,213	1,213	994	1,000	1,005	1,002	5,214

POTABLE SOURCE DEVELOPMENT

Re-equip Well 1-00lB

W239

DESCRIPTION:

Equip well 1-00JB to replace existing well I-00 IA which is old and showing signs of deterioration. Improvements will be made to bring the site up to current standards and improve operations including control upgrades, electrical service upgrades and piping/mechanical system upgrades. This is I of 2 wells that serves the isolated !-zone water service area in the Town of Catalina. This project began in FY 2017 and will be completed in FY 2018. Total project cost is $270,000.

PROPOSED 2017-2018			PROJECTED REQUIREMENTS				FIVE YEAR TOTAL
CARRY FORWARD	NEW FUNDING	\'EAR 1 TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	
50	170	220	-	-	-	-	220

Santa Cruz Wells- Re-Equipping

W857

DESCRIPTION:

Design and construct equipping of 4 existing production wells in the Santa Cruz Wellfield. Due to the higher groundwater elevations, this wellfield provides the most cost-effective access to our renewable water resource. Returning these wells to service will help increase production from this wellfield to approximately 20 MGD. They will also help to provide a source of water for the Sonoran Corridor. This project began in Fiscal Year 2014 and will be completed in Fiscal Year 2018. Total project cost is $1,527,000.

PROPOSED 2017 • 2018			PROJECTED REQU fREMENTS				FIVE YEAR TOTAL
CARRY FORWARD	NEW FUNDL G	YEAR I TO'IAL	YEAR2 2018-19	YEAR3 2019-20	YEAR 4 2020-21	YEAR S 2021-22	
400	-	400	-	-	-	-	400

Santa Cruz Wells SC-001/SC-004/SC-014 Drilling

WJ67

DESCRIPTION:

Drilling replacement wells for inactive wells SC-001, SC-004 and SC-014. These wells are under the hydrologic influence of the Pima Mine Road Recharge Project (PMRRP) and are in an area where the aquifer transmissivity is high. These replacement wells will add to the collective production capacity necessary to deliver 20 MGD from the Santa Cruz Wellfield. Additionally, these wells will ensure water levels remain below the alert levels for the PMRRP facility permit, and will help resolve water quality issues in the Santa Cruz Wellfield. This project will begin and be completed in Fiscal Year 2020. Total project cost is $2,313,000.

PROPOSED 2017 - 2018			PROJ ECTED REQUIREMENTS				FIVE YEAR TOTAL
CARRY FORWARD	NEW FUNDING	VEAlt I TOTAL	YEAR2 2018-19	YEAR 3 2019-20	YEAR4 2020-2)	\'EAR S 2021-22	
-	-	-	-	2,313	-	-	2,313

POTABLE SOURCE DEVELOPMENT

Santa Cruz Well SC-001/SC-004/SC-014 Equipping

WI89

DESCRIPTION:

Equip production wells SC-001/SC-004/SC-014. Wells will be 16" diameter stainless steel, louvered screen and blank casing construction. Total depth will be between 500 and 600 feet below land surface. These wells will be equipped to pump approximately 1,000 GPM each and will help to deliver 20 MGD of production capacity from the Santa Cruz Wellfield. This project will begin in Fiscal Year 2020 and will be completed in Fiscal Year 2021. Total project cost is $1,575,000.

PROPOSED 2017-2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	YEAR2 2018-19	YEARJ 2019-20	YEAR4 2020-2l	YEARS 2021-22	YEAR TOTAL
-	-	-	-	173	1,402	-	1,575

SA-016A Recovery Well Drilling

W083

DESCRIPTION:

This weU will be driJied and cased to 1,000 feet below land surface and constructed with a stainless steel casing to prevent corrosion. SA-016A will enable more complete utilization of the core of the recharge mound at the Southern Avra Valley Storage and Recovery Project Project (SAVSARP) and will allow for additional withdraw! as recharge capacity increases. It will aJlow the SAVSARP wellfield to be operated more efficiently and will be ava.ilable when other wells are down for maintenance. Construction will begin and be completed in FY 2020. Total project cost is $694,000.

PROPOSED 2017 - 2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	\:"EARl TOTAL	YEAR2 2018-19	YEAR J 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	-	-	-	694	-	-	694

SA-019A/SA-021A Recovery Well Drilling

W084

DESCRIPTION:

Wells SA-019A and SA-021A will be drilled to 1,000 feet below land surface and constructed with a stain less steel casing to prevent corrosion. These wells will enable more complete utilization of the core of the recharge mound at the Southern Avra Valley Storage and Recovery Project (SAVSARP) and will allow for additional withdraw!as recllarge capacity increases. It will allow the SAVSARP wellfield to be operated more efficiently and will be available wben other wells are down for maintenance. Construction wiJl begin and be completed in FY 2020. Total project cost is $1,322,000.

PROPOSED 2017 - 2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	YEAR2 2018-19	YEARJ 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	-	..	-	1,322	-	-	1,322

SA-023A Recovery Well DriUing — W085

DESCRIPTION:

Well SA-023A will be drilled to 1,000 feet below Land surface and constructed with a stainless steel casing to prevent corrosion. It will enable more complete utilization of the core of the recharge mound at the Southern Avra Valley Storage and Recovery Project (SAVSARP) and will allow for additional withdraw!as recharge capacity increases. It will allow the SAVSARP wellfield to be operated more efficiently and will be available when other wells are down for maintenance. Construction will begin and be completed in FY 2020. Total project cost is $694,000.

PROPOSED 2017-2018			PROJECTEDREQ UW'				FIVE YEAR TOTAL
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	YF..AR 2 lOUI-19	YEAR 3 2019-20	YEAR4 2020-21	YEARS 2021-22	
-	-	-	-	694	-	-	694

SAVSARP Phase III Well Equipping — W064

DESCRIPTION:

Design and drill water recovery wells SA-002A, SA-005A, SA-007A, SA-008A and SA-OIOA. Additional wells will allow the Southern Avra Valley Storage and Recovery Project (SAVSARP) wellfield to be operated more efficiently and will enable more complete utilization of recharged Central Arizona Project (CAP) water. This will allow additional withdrawa ls as recharge capacity increases and provide reliability while other wells are down for maintenance. Design will begin in FY 2021 and construction will be completed in FY 2022. Total project cost is $3,555,000.

PROPOSED 2017-2018			PROJECTED REQUIREMENTS				FIY£ YEAR TOTAL
CARRY FORWARD	fv'NDlr-;G	YEAR I TOTAL	YEARl 2018-19	YEARJ 2019-20	YEAR4 2021)..21	YEARS 2021-22	
-	-	-	-	-	1,110	2,445	3,555

TARP R-009A Replacement Well — W090

DESCRIPTION:

Design and construct a replacement well at R-009A. The TARP remediation system is operated by Tucson Water in accordance with the 1991 Consent Decree with the US EPA to contain and treat groundwater contaminated with tricbloroethene (TCE). Well R-009A is a remediation well used to conta in the TCE plume at an original flow rate between 1,250 and 1,350 GPM. Flow rates have degraded, impeding containment. A replacemen t well with a minimum capacity of 1,000 GPM is required to ensure future capture. This project began in Fiscal Year 2015 and will be completed in Fiscal Year 2018. Total project cost is $1,290,000.

PROPOSED 2017 - 2018			PROIECTED REQUIREMENTS				FIVE YEAR TOTAL
CARRY FORWARD	NEW FUNDING	\'EARl TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	
100	-	100	-	-	-	-	100

TARP Wells R-001tbru R-008 Drilling

W244

DESCRIPTION:

Design and construct replacement wells R-OOI thru R-008 at the Tucson Airport Remediation Project (TARP). Tucson Water operates the remediation system in accordance with the 1991 Consent Decree with the US EPA to contain and treat groundwater contaminated with trichloroethene (TCE). In order to maintain the remediation process, these wells need to be replaced. A gradual deterioration of the wells has been observed, due to the end of their useful life. Each replacement well wiJJ have a 20-inch diameter, a stainless steel casing and will pump a minimum of I 000 GPM. This project will begin in Fiscal Year 2018 and will be completed in Fiscal Year 2025. Total project cost is $4,297,000.

	PROPOSED 2017-2018		PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	YEAR2 218-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	567	567	561	-	1,169	-	2,l97

TARP Wells R-001 thru R-008 Re-Equipping

W247

DESCRIPTION:

Design and equip replacement wells R-00I thru R-008 at the Tucson Airport Remediation Project (TARP), replacing electrical and control equipment and all necessary upgrades. Tucson Water operates the remediation system in accordance with the 1991 Consent Decree with the US EPA to contain and treat groundwater contaminated with trichJoroetbene (TCE). Jn order to maintain the remediation process, these wells need to be replaced. A gradual deterioration of the wells has been observed, due to the end of their useful life. Each well will pump a minimum of 1,000 GPM. This project will begin in Fiscal Year 2018 and will be completed in Fiscal Year 2026. Total project cost is $4,002,000.

	PROPOSED 2017-2018		PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEARJ TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-2J	YEARS 2021-22	YEAR TOTAL
-	113	113	505	520	526	537	1.1O1

WeUfield Upgrades

W077

DESCRIPTION:

Upgrade of pumps and motors at production wells. This on-going project will maximize efficiency and production capacity, and minimize repair and maintenance costs.

	PROPOSED 2017-2018		PROJECTED REQUIREMENTS				FfVE
CARRY FORWARD	NEW FUNDING	YEARl TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR tOTAL
-	567	567	561	578	584	596	2,886

FIVE-YEAR CIP FY's 2018-2022

(Amounts Rounded to 000's)

POTABLE STORAGE

CIP#		FY 2017	YEAR1 2017-18	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	5YEAR TOTAL
W091	Academy Reservoir	200						200
W056	Clearwell Reservoir Rehabilitation	500	7,711	135				8,346
W051	Escalante Reservoir			168	752	760		1,680
W054	Manzanita Tank Lining			34	752			786
W168	Old Vail Steel Tank Upgrades (Rehab)	200						200
W736	Reservoir and Tank Rehabilitation				5,782	5,843	5,963	17,588
W050	Trails End Reservoir Rehabilitation			168	925			1,093
TOTAL POTABLE STORAGE		9oo	1,111 1	SOSl	8,211 1	6,6031	5,9631	29,8931

POTABLE STORAGE

Academy Reservoir W091

DESCRIPTION:

Design and construct a new reservoir liner at the Police and Fire Academy Reservoir. Modifications and new operational controls will be added to well PF-OOIA so operators can turn the well on and off remotely. A billing meter, backflow assembly, and fire pump wilJ also be installed. This project began *in* Fiscal Year 2014 and will be completed in Fiscal Year 2018. Total project cost is $576,000.

PROPOSED 2017 - 2018			PROJECTED REQU REMENTS				FIVE YEAR TOTAL
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	
200	-	200	-	-	-	-	200

ClearweU Reservoir Rehabilitation W056

DESCRJPTION:

Design and construct new interior shear walls, roof and interior lining. Review of the reservoir revealed a need for structural improvements to comply with seismic code requirements; and the liner and roof have reached the end of their service life and are in need of replacement. The work will be performed on one cell at a time to minimize disruption to water system operation. Design began in Fiscal Year 2015 and construction will be completed in Fiscal Year 2019. Total project cost is $16,996,000.

PROPOSED 2017-2018			PROJECTED REQUIREMENTS				FIVE YEAR TOTAL
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	YEAR2 2018-19	VEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	
500	7,711	8,211	135	-	-	-	8,346

Escalante Reservoir W051

DESCRIPTION:

Design and construct improvements as developed through the condition assessment to bring this reservoir up to current standards, allowing for the safe and sanitary storage of potable water. This project must be completed to continue to provide long-term rei iability and prevent water loss. Design began in Fiscal Year 2015 and construction will be completed in Fiscal Year 2021. *Total* project cost is $1,704,000.

PROPOSED 2017 - 2018			PROJECTED REQUIREMENTS				FIVE YEAR TOTAL
CARRY FORWARD	NEW FUNDING	YEAR I TOTAl.	YEAR2 2018-19	YEARJ 2019-20	YEAR4 2020-21	YEARS 2021-22	
-	-	-	168	752	760	-	1,680

POTABLESTORAGE

Manzanita Tank Lining

W054

DESCRIPTION:

Re-coat and re-line the existing Manzanita steel tank. The coatings and linings of the tank have reached the end of their service life and require replacement to prevent accelerated deterioration of the tank. Design will begin in Fiscal Year 2017 and construction will be completed in Fiscal Year 2020. Total project cost is $786,000.

PROPOSED 2017-2018			PROJECTED REQUIREJ\fENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEARJ TOTAL	YEAR2 2018-19	YEARJ *2019-20*	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	-	-	34	752	-	-	786

Old Vail Steel Tank Upgrades (Rehab)

W168

DESCRIPTION:

Design and construct improvements to the Old Vail Steel Tank and design and construction of a back-up storage tank. The interior and exterior of the 200,000 gallon tank will be recoated. This project will begin in Fiscal Year 2017 and be completed in Fiscal Year 2018. Total project cost isS 915,000.

PROPOSED 2017- 2018			PROJECrED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	YEAR2 2018-19	YEARJ 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
200	-	200	-	-	-	-	200

Reservoir and Tank Rehabilitation

W736

DESCRIPTION:

Sequenced rehabilitation of32 concrete reservoirs and 29 steel storage tanks varying in age and condition. All-inclusive rehabilitation of these vessels will ensure structural and foundation integrity, sanitary, safety and security compliance. This on-going comprehensive rehabilitation program will extend the life of Tucson Water's existing reservoir assets, prioritize rehabilitation activities, reduce water loss and protect water quality and public health.

PROPOSED 2017- 2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEARl TOTAL	YEAR2 2018-19	YEARJ zm9-W	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	-	-	-	5,782	5,843	5,963	17,588

Trails End Reservoir Rehabilitation WOSO

DESCRIPTION:

Design and construct improvements as deveJoped through the condition assessment to bring this reservoir up to current standards. This project must be completed to continue to provide long-tenn reliability and prevent water loss. Design began in Fiscal Year 2017 and construction will be completed in Fiscal Year 2020. Total project cost is $1,110,000.

PROPOSED 2017-2018			PROJECTED REQUIREt\fENTS				FIVE YEAR TOTAL
CARRY FORWARD	NEW fUNDING	YEAR I TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	
-	-	-	168	925	-	-	1,093

FIVE-YEAR CIP FY's 2018-2022

(Amounts Rounded to 000's)

POTABLE PUMPING PLANT

CIP#		FY 2017	YEAR1 2017-18	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	5YEAR TOTAL
W170	Anklam Rd (2000 W) Relocate PRV					204		204
W171	Camino de Los Ranchos PRV Relocation			197				197
W172	Craycroft-Shadow Ridge Relocate PRV			11	249			260
W264	Diamond Bell Production Facilities Improvement		113	281	636			1,030
W255	H-1 Ironwood PRV Station Bailey Valve Replacements			365	52			417
W181	Magee Rd (410 E) PRV SCADA Installation					88		88
W180	Rauscher D-E Booster Station Upgrade	26						26
W198	Relocate Spencer PRV				173			173
W200	Rita Road "F2" to "G2" Zone Booster			168	1,388			1,556
W794	SAVSARP Booster Station Upgrade						302	302
W159	Silverbeli/Orange Grove 12" PRV		23	202				225
W2.35	Thunderhead Old Spanish Trail PRV			56	254			310
W174	Via Velazquez Relocate PRV		34	168				202
TOTAL POTABLE PUMPING PLANT		**261**	**110 1**	**1,4481**	**2,7521**	**2921**	**3021**	**4,99o 1**

Anklam Rd (2000 W) Relocate PRV

W170

DESCRIPTION:

Construct an above ground 6-inch C-A PRV at the La Cholla Booster Station, relocating the current PRV. The current PRV is located in a vault and the site has access issues. Relocating will improve operating efficiency, improve reliability, improve public service and resolve safety issues. The supply and discharge mains will be 8-inch. This project will begin and be completed in Fiscal Year 2021. The total project cost is $204,000.

PROPOSED 2017-2018			PROJECTED REQUIREMENTS				FIVE YEAR TOTAL
CARRY FORWARD	NEW FUNDING	YEAR1 TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	
-	-	-	-	-	204	-	204

Camino de Los Ranchos PRV Relocation

W171

DESCRIPTION:

Construct a 6" D-B zone PRV at the B-094 well site, relocating the current PRV, which is in a vault, above ground for safety reasons and access issues. 4 private PRVs will be installed on Camino Real between well site B-094 and Camino de Los Ranchos. This project will begin and be completed in Fiscal Year 2019. Total project cost is $197,000.

PROPOSED 2017 - 2018			PROJECTED REQUIREMENTS				FIVE YEAR TOTAL
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	
-	-	-	197	-	-	-	197

Craycroft-Shadow Ridge Relocate PRV

W172

DESCRIPTION:

Relocate the current PRV and construct an above ground 6-inch 1-H PRV at the Craycroft Booster Station. The current PRV is Located in a vault and the site has access and safety issues. Relocating will improve operating efficiency, reliability, public service and resolve safety issues. Supply and discharge mains will be 8-inch. Approximately 300 feet of "H4" discharge main will be needed on Craycroft. This project will begin in Fiscal Year 2019 and be completed in Fiscal Year 2020. The total project cost is $260,000.

PROPOSED 2017-2018			PROJECTED REQUIREMENTS				FIVE YEAR TOTAL
CARRY FORWARD	NEW FUNDING	YEAR1 TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	
-	-	-	11	249	-	-	260

Diamond Bell Production Facilities Improvement — W264

DESCRIPTION:

Upgrade boosters and controls to bring the system up to Tucson Water Standards and provide much better response and service to customers. The Diamond Bell area includes water service areas G5, H5, 15 and J5 and currently consists of 2 wells, 3 booster stations and 3 above-ground storage tanks which are generally old antiquated equipment and controls. Most facilities cannot be monitored or controlled by SCADA. Due to its isolated location, without upgrades, failures cannot be remedied quickly. This project will begin in Fiscal Year 2018 and will be completed in Fiscal Year 2020. Total project cost is I,030,000.

PROPOSED 2017 - 2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEARl TOTAL	YEAR2 2018-19	YEARJ 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	113	U3	281	636	-	-	1,030

B-1 Ironwood PRV Station Bailey Valve Replacements — W2SS

DESCRIPTION:

Replace two (2) PRVs which are more than 35 years old and beyond their operating expectancy. These are the last of the four (4) high PRVs that deliver renewal water to our system, wheeling Central Arizona Project (CAP) water to Inter-Governmental Agency (IGA) customers. Thls project will begin in Fiscal Year 2019 and will be completed in Fiscal Year 2020. Total project cost is $417,000

PROPOSED 2017-2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR! TOTAL	YEAR2 2018-19	YEARJ 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	-	-	365	52	-	-	417

Magee Rd (410 E) PRV SCADA Installation — W181

DESCRIPTION:

Installation of solar SCADA to monitor flow and water pressures of the new 8-inch PRY which is the sole source of water for approximately I ,300 customers. SCADA will allow quicker response to maintenance issues. This project will begin and be completed in Fiscal Year 2021. The total project cost is $88,000.

PROPOSED 2017 - 2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEARl TOTAL	YEAR2 2018-19	YEARJ 2019-20	YEAR4 2020-21	YEAR S 2021-22	YEAR TOTAL
-	-	-	-	-	88		88

Rauscher D-E Booster Station Upgrade

W180

DESCRIPTION:

Upgrade the Rauscher D-E Booster Station by adding additional booster capacity to ensure reliable distribution of direct recovered Central Arizona Project (CAP) water. Station pumping capacity will be increased by about 2,500 GPM to provide additional capacity and redundancy, and to help meet Vail Wheeling Demands. This project began in Fiscal Year 2017 and will be completed in Fiscal Year 2018. Total project cost is $46,000.

PROPOSED 2017 - 2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR1 TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR 4 2020-21	YEAR5 2021-22	YEAR TOTAL
26	-	26	-	-	-	-	26

Relocate Spencer PRV

W198

DESCRIPTION:

Construct an above ground 6-inch D-C PRV, relocating the current PRV. The current PRY is located in a vault and the site has access and safety issues. Relocating will improve operating efficiency, reliability, public service and resolve safety issues. This project will begin and be completed in Fiscal Year 2020. The total project cost is $173,000.

PROPOSED 2017 - 2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR1 TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEAR5 2021-22	YEAR TOTAL
-	-	-	-	173	-	-	173

Rita Road "F2" to "G2" Zone Booster

W200

DESCRIPTION:

Construct a booster station of 1.5 MGD capacity to provide renewable resources to meet water system demand in the Rita Ranch G-Zone area as well as to provide renewable water resources to wheel water to Vail. This project involves land acquisition, design, permitting, procurement and testing of pumps and associated equipment. Work includes, but is not limited to, pumps, motors, meters, valves, monitoring and controlling equipment, tank, control center rack, below and above ground pipe and other appurtenances. This project will begin in Fiscal Year 2019 and be completed in Fiscal Year 2020. Total project cost is $1,556,000.

PROPOSED 2017-2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR1 TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEAR5 2021-22	YEAR TOTAL
-	-	-	168	1,388	-	-	1,556

POTABLE PUMPING PLANT

SAVSARP Booster Station Upgrade

W794

DESCRIPTION:

Design and construct booster station modifications, upgrading to increase capacity from approximately 40 MGD to approximately 80 MGD. This project will begin in Fiscal Year 2022 and be completed in Fiscal Year 2024. Total project cost is $3,302,000.

PROPOSED 2017-2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR 1 TOTAL	YEAR 2 2018-19	YEAR 3 2019-20	YEAR 4 2020-21	YEAR 5 2021-22	YEAR TOTAL
-		-	-	-	-	302	302

Silverbeli/Orange Grove 12" PRV

Wt 59

DESCRIPTION:

Construct a 12-inch A-Z PRV at the current Silverbell/Orange Grove site to replace the two 8-incb PRVs at this location. Both 8-inch PRVs have reliability and maintenance issues and one is located in a vault The supply main and the discharge main will be 16-inches. This project will begin in Fiscal Year 2018 and be completed in Fiscal Year 2019. Total project cost is $225,000.

PROPOSED 2017-2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR 1 TOTAL	YEAR 2 2018-19	YEAR 3 2019-20	YEAR 4 2020-21	YEAR 5 2021-22	YEAR TOTAL
-	23	23	202	-	-	-	225

Thunderhead Old Spanish Trail PRV

W235

DESCRIPTION:

Purchase land, design and construct a 6-inch PRV at Thunderhead and Old Spanish Trail. This PRV, along with the Thunderhead Main CIP, will keep the Thunderhead Subdivision at its current water pressure of 60 PSI. The flow in the subdivision will be reversed when it is connected to Tucson Water's central system. The site will also serve as a chlorination point. Design will begin in Fiscal Year 2019 and construction will be completed in Fiscal Year 2020. Total project cost is $310,000.

PROPOSED 2017 - 2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR 1 TOTAL	YEAR 2 2018-19	YEAR 3 2019-20	YEAR 4 2020-21	YEAR 5 2021-22	YEAR TOTAL
-	-	-	56	254	-	-	310

Via Velazquez Relocate PRV

W174

DESCRIPTION:

Relocate and upgrade current PRV to an above ground 6-inch F-D PRV near the current Via Velazquez site. The current PRV is located in a vault and the site has safety issues. Relocating and upgrading will improve operating efficiency, reliabili ty, public service and resolves safety issues. Supply and discharge mains will be 8-inch. They will be connected to the 12-incb main in Via Velazquez Road. This site will need to have walls. Design will begin in Fiscal Year 2018 and construction will be completed in Fiscal Year 2019. The total project cost is $202,000.

PROPOSED 2017 - 2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR! TOTAL	YEAR 2 2018-19	YEARJ 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	34	34	168	-	-	-	202

FIVE-YEAR CIP FY's 2018-2022

(Amounts Rounded to 000's)

POTABLE TRANSMISSION MAINS

CIP#		FY 2017	YEAR1 2017-18	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	SYEAR TOTAL
W151	Calle Santa Cruz 24-inch Transmission Main Replacement		63	3,117				3,180
W160	CAP Basin Well Collection Main						60	60
W161	CAP Basin Well 24" Transmission Main, Pima Mine Rd					118	42	160
W320	Cathodic Protection for Critical Pipelines		680	674	694	701	716	3,465
W2.42	Eisenhower Rd O-Zone Transmission Main		363					363
W796	Sahuarita Supply Line Slip Liner	400	1,656	7,153	1,156			10,365
W039	Santa Cruz SC-008 Well Collector Line		1,474					1,474
W089	Santa Cruz Wellfield Pipelines		1,905					1,905
W781	SAVSARP Collector Lines Phase II	400						400
W710	SAVSARP Collector Lines Phase III					876	894	1,770
W829	SAVSARP Collector Lines Phase IV						41	41
W832	SAVSARP Collector Lines Phase V				39	2,083		2,122
W444	SAVSARP Recovered Water Pipeline					584	1,193	1,777
W183	SC-001 & SC-004 Well Collector Transmission Main		57	67	130	570		824
TOTAL POTABLE TRANSMISSION MAINS		S00 1	6,1981	11,011	2,0191	4,9321	2,946,	27,906 1

POTABLE TRANSMISSION MAINS

Calle Santa Cruz 24-incb Transmission Main Replacement — WlSl

DESCRIPTION:

Design and construct 2 miles of24-inch transmission main replacement on Calle Santa Cruz between Valencia and Jrvington. The main will be in City of Tucson property B1 water service area. The intent is to replace the existing severely deteriorated pipe to provide excellent customer service, improve reliability and operating efficiency. This replacement maintains existing water pressure in emergency situations. This project began in Fiscal Year 2015 and will be completed in Fiscal Year 2019. Total Project cost $3,269,000.

PROPOSED 2017-2018			PROJECTED R EQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR l TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	63	63	3 117	-	-	-	3,180

CAP Basin Well Collection Main — W160

DESCRIPTION:

Install 0.5 miles of24-inch collection main on Nogales Hwy Right-of-Way or Central Arizona Project (CAP) basin land and install 0.5 miles of 16-incb collection main on CAP basin land. These mains will collect well water from the CAP basin wells near Old Nogales Hwy and Pima Mine Rd. This CIP is dependent upon CIP W796, Sahuarita Supply Line Slip Liner. This project will begin in Fiscal Year 2022 and be completed in Fiscal year 2023. Total project cost is $1,210,000

PROPOSED 2017 - 2018			PROJECTED R EQUIREMEl'\'TS				FIVE
CARRY FORWARD	NEW FUNDrNG	YEAR I TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	-	-	-	-	-	60	60

CAP Basin Well 24" Transmission Main, Pima Mine Rd — W161

DESCRIPTION:

Design and install 1.75 miles of24-inch transmission main on Old Nogales Hwy Right-of-Way or purchased/leased easement. This main will convey water from the Central Arizona Project (CAP) basin wells along Old Nogales Highway starting 0.75 miles north of Pima Mine Road to Lumber Street. This project will begin in Fiscal Year 2021 and will be completed in Fiscal Year 2023. Total project cost will be $1,624,000.

PROPOSED 2017-2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	YEAR2 2018-19	YEAR3 2019-20	VEAR4 2020-21	YEARS 2021-22	YEAR TOT..U.
-	-	-	-	-	118	42	160

POTABLE TRANSMISSION MAINS

Cathodic Protection for Critical Pipelines

W320

DESCRIPTION:

Design and construct cathodic protection and corrosion monitoring faciljties. These critical pipeljnes range from 16-inches to 96-inches in ruameter and are located throughout Tucson Water's service area. This on-going project is necessary to prevent corrosion related failures of the City's largest and most critical potable water pipelines.

PROPOSED 2017-2018			PROJECfED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	680	680	674	694	701	716	3,465

Eisenhower Rd D-Zone Transmission Main

W242

DESCRIPTION:

Install approximately 2,500 feet of 16-inch water main on Eisenhower Rd from a new booster station to Hughes Access Rd. This transmission main wiiJ supply boosted Santa Cruz well water into the OR-zone water service area (WSA) from the new booster. This will provide additional water supply and fire protection and aUow the retirement of the Martin D Booster Station. This project began in Fiscal Year 2017 and wiU be completed in Fiscal year 2018. Total project cost is $413,000.

PROPOSED 2017- 2018			PROJECTED REQUCREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR! TOTA	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020·21	YEAR S 2021-22	YEAR TOTAL
-	363	363	-	-	-	-	363

Sahuarita Supply Line Slip Liner

W796

DESCRIPTION:

To increase production from the Santa Cruz wellfields and provide additional flow conveyance to the Santa Cruz treatment facility, approx. 36,300 linear feet (LF) of high-density polyethylene (HOPE) liner will be installed as follows: I,430 LF of32-inch in abandoned 36-inch line from Martin Reservoir to Medina StandS. Nogales Hwy, 4,100 LF of32-inch in abandoned 36-inch line from Medina Stto Los Reales Rd, 2,100 LF of28-iocb in abandoned 30-incb line from 32-inch HOPE Slipliner south to existing 30-inch and 28,700 LF of 32-incb from Los Reales Rd to the abandoned 30-inch line. This project began in Fiscal Year 2014 and will be completed in Fiscal Year 2020. Total project cost is $11,522,000.

PROPOSED 2017- 2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEARl TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
400	1,656	2,056	7,153	1,156	-	-	10 65

POTABLE TRANSMISSION MAINS

Santa Cruz SC-008 Well Collector Line

W039

DESCRIPTION:

Design and install I,312 linear feet of 18-inch liner in abandoned 21-inch line from SC-008 West to S Nogales Hwy. Install 3,263 liner feet of 32-inch high-density polyethylene pipe (HDPE) liner in abandoned 36-inch line at S. Nogales Hwy to Lumber St. Install a 24-inch tee For future connection to the South. This project began in Fiscal Year 2017 and will be completed in Fiscal Year 2018. Total project cost is $1,524,000.

PROPOSED 2017 – 2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEARl TOTAL	YEAR 2 2018-19	YEAR 3 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
	1,474	1,474	-	-	-	-	1,474

Santa Cruz Wellfield Pipelines

W089

DESCRIPTION:

Install suction and discharge header pipelines. Headers will consist of approximately 300 linear feet of 36-incb main that will extend from the Santa Cruz main to the treatment facility. Install two 24-inch tie-ins approximately 300 linear Feet, between the Sahuarita main and the Santa Cruz main within the S Nogales Hwy right-of-way. Next to the outlet header, install sleeve for a 16-inch main under the railroad. This project began in Fiscal Year 2014 and will be completed in Fiscal Year 2018. Total project cost is $2,097,000.

PROPOSED 2017 - 2018			PROJECTED REQUJREMEllTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	YEAR 2 2018-19	YEAR J 2019-20	YEAR4 2020-21	YEAR S 2021-22	YEAR TOTAL
	1,905	1,905	-	-	-	-	1,905

SAVSARP Collector Lines Phase II

W781

DESCRIPTION:

Install approximately 5,500 linear feet of 16-inch pipe and 2,800 linear feet of36-inch pipe and appurtenances to convey water from Southern Avra Valley Storage and Recovery Project (SAVSARP) recovery wells SA-003A, SA-017A, SA-O18A and SA-020A, to the SAVSARP Reservoir and Booster Station. This project began in Fiscal Year 2014 and will be completed in Fiscal Year 2018. Total project cost will be $1,177,000.

PROPOSED 2017- 2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	YEAR 2 2018-19	YEAR J 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
400	-	400	-	-	-	-	400

POTABLE TRANSMISSION MAINS

SAVSARP Collector Lines Phase ID

W710

DESCRIPTION:

Install approximately 300 linear feet of 16-inch pipe and 9,000 linear feet of 36-inch pipe and appurtenances to convey water from Southern Avra Valley Storage and Recovery Project (SAVSARP) recovery wells SA-002A, SA-004A, SA-005A and SA-007A, to the SAVSARP Reservoir and Booster Station. This project will begin in Fiscal Year 2021 and will be completed in Fiscal Year 2022. Total project cost will be $1,770,000.

PROPOSED 2017 - 2018			PRO.JECTED REQUmEMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YE.4.Rl TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	-	-	-	-	876	894	1,770

SAVSARP Collector Lines Phase IV

W829

DESCRIPTION:

Install approximately 3,800 Linear feet of 16-inch pipe and 5,000 Linear feet of 24-inch pipe to convey water from Southern Avra Valley Storage and Recovery Project (SAVSARP) recovery wells SA-012A, SA-Ol3A, SA-019A, SA-0021A and AV-020B to the SAVSARP Reservoir and Booster Station. This project will begin in Fiscal Year 2022 and will be completed in Fiscal Year 2023. Total project cost will be $1,394,000.

PROPOSED 2017-2018			PRO.JECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	YEAR2 2018-19	YEAR3 2019-20	VEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	-	-	-	-	-	41	41

SAVSARP Collector Lines Phase V

W832

DESCRJPTION:

Install approximately I,300 linear feet of 16-inch pipe and 5,280 Linear feet of24-inch pipe to convey water from Southern Avra Valley Storage and Recovery Project (SAVSARP) recovery wells SA-006A, SA-016A and SA-023A to the SAVSARP Reservoir and Booster Station. This project will begin in Fiscal Year 2020 and will be completed in Fiscal Year 2021. Total project cost is $2,122,000.

PROPOSED 2017-2018			PRO.JECTED REQUmEMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEARl TOTAL	YEAR2 2018-19	VEARJ 2019-20	\"EAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	-	-	-	39	2 083	-	2,122

SAVSARP Recovered Water Pipeline

W444

DESCRIPTION:

Design and construct approximately 48,000 linear feet of 64-inch diameter transmission main to convey up to 72,000 acre-feet, 11 months per year, of recovered water from the Southern Avra Valley Storage and Recovery Project (SAVSARP) and the Central Avra Valley Storage and Recovery Project (CAVSARP). Water will be conveyed from the proposed SAVSARP Reservoir and Booster Station to a proposed new reservoir/booster located at the Hayden Udall Water Treatment Plant (HUWTP). This project will begin in Fiscal Year 2021 and will be completed in Fiscal Year 2025. Total project cost is $41,012,000.

PROPOSED 2017 - 2018			PROJECTED REQUIREMENTS				FIVE YEAR TOTAL
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	YEAR2 2018-19	VEAR3 2019-20	VEAR4 2020-21	YEARS 2021-n	
-		-	-	-	584	1,193	1,777

SC-001 & SC-004 Well Collector Transmission Main

WI83

DESCRIPTION:

InstaU 2,400 feet of 12-inch and 200 feet of 16-inch PVC collector line, connecting to the 30-inch existing main. This collector line will allow wells SC-001 and SC-004 to convey water into the Tucson Water system. This project will begin in Fiscal Year 2018 and wilJ be completed in Fiscal Year 2021. Total project cost is $824,000.

PROPOSED 2017 - 2018			PROJECTED REQUIREMENTS				FIVE YEAR TOTAL
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	YEAR2 2018-19	VEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	
-	57	57	67	130	570	-	824

FIVE-YEAR CIP FY's 2018-2022

(Amounts Rounded to 000's)

POTABLE DISTRIBUTION MAINS

CIP#		FY 2017	YEAR1 2017-18	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	SYEAR TOTAL
W859	Cavalier Estates Phase I	200						200
W793	Craycroft Addition Subdivision, Phase I		454					454
W187	Drexel 119 Crossing				58	1'110		1,168
W186	Emergency Main Replacement		227	225	231	234	239	1,156
W107	Extensions for New Services		113	112	116	117	119	577
W211	Goebel Ave Distribution Main				29	103		132
W849	Golf Links Main Replacement Phase II	200						200
W791	Maryvale Manor Subdivision, Phase I		57	943				1,000
W846	Maryvale Manor Subdivision, Phase II MR			56	543			599
W175	Nebraska Rd Distribution Main				289			289
W789	Northgate Subdivision, Phase I	500	1,134					1,634
W108	Payments To Developers For Oversized Systems		113	112	116	117	119	577
W109	Review/Inspect Developer-Financed Potable Projects		1,077	1,067	1,099	1,110	1,133	5,486
W146	River Road 12-inch Main		34	674				708
W111	Road Improvement Main Replacements		7,937	7,860	5,782	5,843	5,963	33,385
W850	San Paulo Village Main Replacement Phase I		595					595
W041	San Paulo Village Main Replacement Phase II		113	1,273				1,386
W071	San Paulo Village Main Replacement Phase III		57	460				517
W241	Stallion Rd Distribution Main, Catalina		172					172
W040	Tanque Verde Wentworth Distribution Main		254					254
W236	Thunderhead Old Spanish Trail Distribution Main				58	958		1,016
W072	Tierra del Sol Main Replacement Phase I		476					476
W147	Tierra del Sol Main Replacement Phase II			56	486			542
W148	Tierra del Sol Main Replacement Phase III			56	717			773
W149	Tierra del Sol Main Replacement Phase IV			56	572			628

FIVE-YEAR CIP FY's 2018-2022

(Amounts Rounded to 000's)

POTABLE DISTRIBUTION MAINS

CIP#		FY 2017 CYFWD	YEAR1 2017-18	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	SYEAR TOTAL
W060	Valve Access Vault		567	561	578	584	596	2,886
W861	Wilmot Main Replacement	450						450
TOTAL POTABLE DISTRIBUTION MAINS		1, 3so	13,380	13,511	10,6741	10,1761	8,1&91	s7,260

POTABLE DISTRIBUTION MAINS

Cavalier Estates Phase I

W859

DESCRIPTION:

Design and install3,600 feet of8-inch pipe in Wilmot, Zuni Avenue, 31st and 29th Streets. This area has been identified as having an above average amount of main break records by Tucson Water's Customer Service and Maintenance Divisions. Much of the pipe in this neighborhood was installed in the 1950's and 1960's and has reached the end of its useful Life. Design wiU begin in Fiscal Year 2017 and construction will be completed in Fiscal Year 2018. Total project cost is $652,000.

PROPOSED 2017-2018			PROJECTED REQUIREMENTS				FIYE
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	YEAR2 2018-19	YEARJ 2019-20	VEAR4 2020-21	YEAR S 2021-22	YEAR TOTAL
200	-	:Z00	-	-	-	-	200

Craycroft Addition Subdivision, Phase I

W793

DESCRIPTION:

Due to numerous main breaks and customer outages, replace 1,320 linear feet of 6-inch water main with new 6-inch water main along the alleyway between 22nd Stand 23rd St from Van Buren Ave to Sahuara Ave. Replace 2,200 linear feet of exjsting 4-inch and 8-inch water main with 8-inch water main along the alleyway between 29th St and 30th St from Jefferson Ave to Sahuara Ave. Much of the pipe in this neighborhood was installed in the 1950's and 1960's and has reached the end of its usefuJ life. This project began in Fiscal Year 2012 and will be completed in Fiscal Year 2018. Total project cost is $576,000.

PROPOSED 2017-2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEARl TOTAL	VEAR2 2018-19	YEARJ 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	454	454	-	-	-	-	454

Drexell19 Crossing

W187

DESCRlPTlON:

Install 800 feet of 24-inch main on Drexel under 1-19, replacing the existing 8-inch main. Insta ll 50 feet of 6-inch main on Calle Pinta and connect to the 24-inch main. This project will begin in Fiscal Year 2020 and will be completed in Fiscal Year 2021. Total project cost is $1,168,000.

PROPOSED 2017-2018			PRO.JltCTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUJ\'DING	YEAR I TOTAL	YEAR 2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEAR S 2021-22	YEAR TOTAL
-	-	-	-	58	1,110	-	1,168

POTABLE DISTRIBUTION MAINS

Emergency Maio Replacement — W186

DESCRIPTION:

This on-going project is to replace approximately 3,000 feet of2-inch, 4-inch and 6-inch mains on an as-needed, emergency basis. Immediate response to requests for emergency main replacements is required to reduce water loss, ensure system reliability, and maintain water quality.

PROPOSED 2017-2018			PROJECTED REQUrREJ\'1ENTS				FIVE YEAR TOTAL
CARRY FORWARD	NEW FUNDING	YEAR1 TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEAR S 2021-22	
-	227	227	225	231	234	239	1,156

Extensions for New Services — W107

DESCRIPTION:

Design and instaJL minor extensions from the distribution system as requested by customers. Associated costs are reimbursed by the customer. Extensions allow Tucson Water to install (or upgrade piping in order to install) new services in an expedient manner. This on-going project ensures that piping is suitable in strength and durability and is available to connect to the distribution system.

PROPOSED 2017-2018			PROJECTED REQUIREMENTS				FIVE YEAR TOTAL
CARRY FORWARD	NEW FUNDING	YEARl TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	
-	113	113	112	116	117	119	577

Goebel Ave Distribution Maio — W211

DESCRIPTION:

Tap existing 24-inch D main with a new 6-incb main. Install 6-inch main across Speedway on Goebel, approximately 400 feet. Connect two existing potable water services to new 6-inch main. Connect existing ftre service to new main. All services are for a 3-story apartment complex. Speedway is under moratorium until June 2020. This project will begin in Fiscal Year 2020 and will be completed in Fiscal Year 2021. Total project cost is $132,000.

PROPOSED 2017- 2018			PROJECTED RE QUmEMENTS				FIVE YEAR TOTAL
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	
-	-	-	-	29	103	-	13.2

Golf Links Main Replacement Phase II

W849

DESCRIPTION:

Design and install I,860 feet of 8-inch water mains and abandon the 3-inch main in the alleyways. This area has been identified as having an above average amount of main break records by Tucson Water's Customer Service and Maintenance Divisions. Much of the pipe in this neighborhood was installed in the I950's and 1960's and has reached the end of its useful life. This project will relocate 93 water meters. Design began in Fiscal Year 2015 and construction will be completed in Fiscal Year 2018. Total project cost is $554,000.

PROPOSED 2017- 2018			PROJECTED REQUIREMENTS				FIVE YEAR TOTAL
CARRY FORWARD	NEW FUNDING	YEARl TOTAL	YEAR 2 2018-19	YEAR J 2019-20	YEAR 4 2020-21	YEARS 2021-22	
200	-	200	-	-	-	-	200

Maryvale Manor Subdivision, Phase I

W791

DESCRIPTION:

Design and install approximately 6,000 feet of 6-inch water main in alleyways, replacing the 3-inch mains in the Maryvale Manor Subdivision bordered by Craycroft Rd, 29th St, Sahuara Ave and Golf Links Rd. This area has been identified as having an above average amount of main break records by Tucson Water's Customer Service and Maintenance Divisions. Much of the pipe in this neighborhood was installed in the 1950's and 1960's and has reached the end of its useful life. This project will replace approximately 300 water service lines. Design began in Fiscal Year 2015 and construction will be completed in Fiscal Year 2019. Total project cost is $1,044 000.

PROPOSED 2017- 2018			PROJECfED R EQUffiEMENTS				FIVE YEAR TOTAL
CARRY FORWARD	FlJ'NDING NEW	¥EARl TOTAL	YEAR2 2018-19	YEARJ 2019-20	YEAR4 2020.21	YEAR S 2021-22	
-	57	57	943	-	-	-	1,000

Maryvale Manor Subdivision, Phase II MR.

W846

DESCRIPTION:

Design and install approximately 4,450 feet of 6-inch water maio and 1,000 feet of 8-inch water main in the Maryvale Manor neighborhood. The new mains will replace existing 4-inch, 6-inch and 8-inch diameter cement asbestos mains which are approximately 50 years old and have experienced numerous breaks. This project includes approximately 58 meter relocations with service lines and private plumbing, service renewals/tie-overs, valves, fire hydrants, pavement replacement and other appurtenances. This project will begin in Fiscal Year 2019 and be completed in Fiscal Year 2020. TotaJ project cost is $599,000.

PROPOSED 2017-2018			PROJECTED RE QUmEMENTS				FIVE YEAR TOTAL
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	
-	-	-	56	543	-	-	599

POTABLE DISTRIBUTION MAINS

Nebraska Rd Distribution Main W175

DESCRIPTION:

Installation of2,100 feet of 8-inch main on Nebraska from Sunset to 800 feet West of Spencer, connecting to the existing 2-i nch main. This distribution main will replace two vault PRVs (Spencer and Sheridan). The main will be in the Nebraska (unpaved) righ t-of-way. New customers will be added to this main. This project will begin and be completed in Fiscal Year 2020. The total project cost is $289,000.

PROPOSED 2017-2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEARl TOTAL	YEAR 2 2018-19	YEAR 3 2019-20	YEAR 4 2020-21	YEARS 2021-22	YEAR TOTAL
-	-	-	-	289	-	-	289

Nortbgate Subdivision, Phase I W789

DESCRIPTION:

Design and install approximately 8,000 feet of 6-inch pipe in the Northgate subdivision bordered by 22nd Street, Van Buren Avenue, 29th Street and Craycroft Road. This area bas been identified as having an above average amount of main break records by Tucson Water's Customer Service and Maintenance Divisions. Much of the pipe in this neighborhood was installed in the 1950's and 1960's and has reached the end of its useful life. Design began in Fiscal Year 2014 and construction will be completed in Fiscal Year 2018. Total project cost is $1,789,000.

PROPOSED 2017 - 2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR I I'OT.._	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTA,I..
500	1 134	1,634	-	-	-	-	1.634

Payments To Developers For Oversized Systems W108

DESCRIPTION:

This on-going project is to reimburse developers for the cost of oversizing water system components (pipes, mains, and boosters) when Tucson Water requests a capacity greater than needed by the development. Oversizing is sometimes required to supply future projected demands consistent with Tucson Water's long range planning and to avoid more expensive replacement in the future, after buildings and streets are constructed

PROPOSED 2017 - 2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR! TOTAL	YEAR2 2018-19	YEAR 3 2019-20	YEAR4 2020-21	YEAR S 2021-22	YEAR TOTAL
-	113	113	112	116	117	119	577

Review/Inspect Developer-Financed Potable Projects

W109

DESCRIPTION:

This on-going project is to conduct plan reviews and construction inspection of developer fmanced water system infrastructure projects to ensure compliance with Tucson Water requirements. These systems are donated to Tucson Water upon completion. Associated costs are recovered by fees paid by the developer.

PROPOSED 2017-2018			PROJECTED REQUffiEMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEARl TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR 4 2020-21	YEARS 2021-22	YEAR TOTAL
-	1,077	1,077	1,067	1,099	1'110	1,133	5,486

River Road 12-incb Main

W146

DESCRIPTION:

Design and install5,500 feet of 12-inch pipe on River Road between Craycroft and Avenida Del Cazador. This water main will serve as a redundancy C-zone distribution main and as an emergency transmission main when the Columbus 54-inch main is out of service. The main will connect to three existing main segments on River Road in its distribution capacity. In an emergency, this main will deliver C-zone well water to the Valley View Booster Station. Design will begin in Fiscal Year 2018 and construction will be completed in Fiscal Year 2019. Total project cost is $708,000.

PROPOSED 2017- 2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	\'EAR 1 TOTAL	YEAR2 2018-19	YEAR 3 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	34	34	674	-	-	-	708

Road Improvement Main Replacements

W111

DESCRIPTION:

This on-going project relocates water mains during road improvement projects of the City of Tucson, Pima County, Arizona Department of Transportation and other agencies, including Regional Transportation Authority (RTA) projects. Intergovernmental agreements determine the City of Tucson cost allocation for each project. Replacing water mains during roadway projects allows Tucson Water to maintain system capacity while saving money on the cost of pavement removal and replacement.

PROPOSED 2017 - 2018			PROJECTED REQUffiEMENTS				}WE
CARRY FORWARD	NEW FUNDING	\'EARl TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	7,937	7.937	7,860	5,782	5,843	5,963	33,385

San Paulo Village Main Replacement Phase I — W850

DESCRIPTION:

Design and install 1,600 feet of 6-inch pipe in alleyways bordered by Sylvane Street, 28th Street, Sonoita Avenue and Alamo Avenue. This area has been identified as having an above average amount of main break records by Tucson Water's Customer Service and Maintenance Divisions. Much of the pipe in this neighborhood was installed in the 1950's and 1960's and has reached the end of its useful life. This project will replace 30 service lines. Design began in Fiscal Year 2016 and construction wilJ be completed in Fiscal Year 2018. Total project cost is $676,000.

PROPOSED 2017-2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEARl TOTAL	YEAR2 2018-19	YEARJ 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	595	595	-	-	-	-	595

San Paulo Village Main Replacement Phase II — W041

DESCRIPTION:

Design and install 12,200 feet of 6-inch main in alleyways in the area of Sahuara, 28th Street, 22nd Street and Wilmot Road. This area bas been identified as having an above average amount of main break records by Tucson Water's Customer Service and Maintenance Divisions. Much of the pipe in this neighborhood was insta!Jed in the 1950's and 1960's and has reached the end of its useful life. This project will replace 3-inch water mains in alleys and 309 water service lines. Design will begin in Fiscal Year 2018 and construction will be completed in Fiscal Year 2019. Total project cost is $1,386,000.

PROPOSED 2017-2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	YEAR2 201.8-19	YEARJ 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	113	113	1,273	-	-	-	1,38(;

San Paulo Village Main Replacement Phase ID — W071

DESCRIPTION:

Design and install4,800 feet of 6-inch main in alleyways in the area of Alamo, 25th Street, 22nd Street and Wilmot Road. This area has been identified as having an above average amount of main break records by Tucson Water's Customer Service and Maintenance Divisions. Much of the pipe in this neighborhood was instaJied in the 1950's and l960's and has reached the end of its useful life. This project will replace 3-inch water mains in alleys and 113 water service lines. Design will begin in Fiscal Year 2018 and construction will be completed in Fiscal Year 2019. Total project cost is $517,000.

PROPOSED 2017-2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TO'fAL
-	57	57	460	-	-	-	517

Stallion Rd Distribution Main, Catalina

W241

DESCRIPTION:

Design and install4,800 feet of 6-incb main in alleyways in the area of Alamo, 25th Street, 22od Street and Wibnot Road. This area has been identified as having an above average amount of main break records by Tucson Water's Customer Service and Maintenance Divisions. Much of the pipe in this neighborhood was installed in the 1950's and 1960's and has reached the end of its useful life. This project will replace 3-inch water mains in alleys and 113 water service lines. Design began in Fiscal Year 2016 and construction will be completed in Fiscal Year 2019. Total project cost is $201,000.

PROPOSED 2017 - 2018			PROJECfED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEARl TOTAL	VEAR 2 2018-19	YEARJ 2019-20	VEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	172	172	-	-	-	-	172

Tanque Verde Wentworth Distribution Main

W040

DESCRIPTION:

Design and install 2,900 feet of 8-inch pipe in Redington Road from Wentworth to Camino La Cebadilla connecting to the existing 8-inch mains. This main will improve water distribution and frre flow capacity in the Eland G8 water service areas. Design will begin in Fiscal Year 2017 and construction wiJl be completed in Fiscal Year 2018. Total project cost is $278,000.

PROPOSED 2017-2018			PROJECTED REQUIREMEJ\IS				FIVE
CARRY FORWARD	NEW FUNDING	\'EARl TOTAL	YEAR2 2018-19	YEARJ 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	254	2S4	-	-	-	-	2S4

Thunderhead Old Spanish Trail Distribution Main

W236

DESCRIPTION:

Install !-mile of 8-inch potable water main on Old Spanish Trail from Saguaro Crest to Thunderhead Ranch. This project is needed to supply the Thunderhead customers with central system water. The well that currently supplies water to them is starting to fail. An above ground pressure reducing valve (PRY) is also needed. Water flow in this subdivision will be reversed. New customers can be added. If water is wheeled to Old spanish Trail Water Co., a larger main will be needed. A companion PRY (CIP W235) will also be constructed. This project will begin in Fiscal Year 2020 and will be completed in Fiscal Year 2021. Total project cost is $1,016,000.

PROPOSED 2017 - 2018			PROJECfED REQUIREMENTS				1<1VE
CARRY FORWARD	NEW FUNDING	YEARl TOTAL	YEAR2 2018-19	YEARJ 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	-	-	-	58	958	-	1,016

POTABLE DISTRIBUTION MAINS

Tierra del Sol Main Replacement Phase I — W072

DESCRIPTION:

Replace approximately 4,500 linear feet of3-inch distribution main with new 6-inch distribution mains in alleys. Project includes 85 water service renewals. This area has been identified as having an above average amount of main break records by Tucson Water's Customer Service and Maintenance Divisions. Much of the pipe in this neighborhood was installed in the 1950's and 1960's and bas reached the end of its useful life. Design will begin in Fiscal Year 2017 and construction will be completed in Fiscal Year 2018. Total project cost is $532,000.

PROPOSED 2017 -20 18			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEARl TOTAL	YEAR 2 2018-t9	YEARJ 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	476	476	-	-	-	-	47(

Tierra del Sol Main Replacement Phase II — W147

DESCRIPTION:

Design and install 3,177 feet of 8-inch pipe and 3,832 feet of 6-inch pipe in Calle Bellatrix, Avenida Regulo, Avenida Planeta, and Calle Marte. This area has been identified as having an above average amount of main break records by Tucson Water's Customer Service and Maintenance Divisions. Much of the pipe in this neighborhood was installed in the 1950's and 1960's and has reached the end of its useful life. Design will. begin in Fiscal Year 2019 and construction will be completed in Fiscal Year 2020. Total project cost is $542,000.

PROPOSED 2017 - 2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR1 TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	-	-	56	486	-	-	Y2

Tierra del Sol Main Replacement Phase ID — W148

DESCRIPTION:

Design and install 1,682 feet of 8-inch pipe and 10,000 feet of 6-incb pipe in Calle Betelgeux, Calle Canis, Avenida Planeta, and Kolb Road. This area bas been identified as having an above average amount of main break records by Tucson Water's Customer Service and Maintenance Divisions. Much of the pipe in this neighborhood was installed in the 1950's and 1960's and has reached the end of its useful life. Design will begin in Fiscal Year 2019 and construction will be completed in Fiscal Year 2020. Total project cost is $773,000.

PROPOSED 2017 - 2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR 1 TOTAL	YEAR2 2018-19	YEARJ 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	-	-	56	717	-	-	773

Tierra del Sol Main Replacement Phase IV

W149

DESCRIPTION:

Design and install 3,742 feet of8-inch pipe and 1,200 feet of 6-inch pipe in Calle Marte, Calle Denebola, Avenjda Planeta, and Kolb Road. This area has been identified as having an above average amount of main break records by Tucson Water's Customer Service and Maintenance Divisions. Much of the pipe in this neighborhood was installed in the 1950's and 1960's and has reached the end of its useful life. Design will begin in Fiscal Year 2019 and construction will be completed in Fiscal Year 2020.Total project cost is $628,000.

PROPOSED 2017-2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	VEAR2 2018-19	VEAR3 2019-20	VEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	-	-	56	572	-	-	628

Valve Access Vault

W060

DESCRIPTION:

Design and construct vaults over butterfly valve (BFV) actuators to allow safe access for BFV actuator repair, refurbishment or replacement. Installing vaults to grade will eliminate the need to excavate roadways, reduce overall maintenance costs, and improve safety. The project will install up to 5 vaults per year prioritizing the largest and most critical BFV actuators.

PROPOSED 2017-2018			PROJECTED REQUJREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEARl TOTAL	VEAR2 2018-19	VEAR3 2019-20	YEAR4 2020-21	YEAR S 2021-22	YEAR. TOTAL
-	567	567	561	578	584	596	2,886

Wilmot Main Replacement

W861

DESCRIPTION:

Design and install approximately 4,700 feet of 12-inch pipe in Wilmot, 22nd Street to Golf Links Road. This area has been identified as having an above average amount of main break records by Tucson Water's Customer Service and Maintenance Division. Much of the pipe has reached the end of its useful life. This project will replace 14 existing frre hydrants. Design began in Fiscal Year 2015 and construction will be completed in Fiscal Year 2018. Total project cost is $1,274,000.

PROPOSED 2017 - 2018			PROJECTED REQUJREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	VEAR2 2018-19	YEAR3 2019-20	VEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
450		450	-	-	-	-	450

FIVE-YEAR CIP FY's 2018-2022

(Amounts Rounded to 000's)

POTABLE NEW SERVICES

CIP#		FY 2017 CYFWD	YEAR1 2017-18	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	SYEAR TOTAL
W124	Fire Services		1,984	1,965	2,024	2,045	2,087	10,105
W163	Fire Hydrants in Annexation Areas		113	112	116	117	119	577
W114	Water Services		1,712	1,696	1,746	1,764	1,801	8,719
TOTAL POTABLE NEW SERVICES		-	3,809	3,773	3,886	3,926	4,007	19,401

POTABLE NEW SERVICES

Fire Services

W124

DESCRIPTION:

Design and install fire hydrants and fire sprinkler service connections upon customer request and payment for work and connection fees. This on-going project is required to provide for the installation of new fire hydrants and fire services to customers upon request.

PROPOSED 2017-2018			PROJECTED REQUIREMENTS				PIVE YEAR TOTAL
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	
-	1,984	1,984	1,965	2,024	2,045	2,087	10,105

Fire Hydrants in Annexation Areas

W163

DESCRIPTION:

On-going installation of fire hydrants in areas of annexation. The City of Tucson is annexing various adjacent and outlying areas, some of which do not have fire service. As a condition of annexation, fire service may be required and 6-inch fire hydrants will need to be installed at locations specified by the Tucson Fire Department.

PROPOSED 2017- 2018			PROJECTED REQUIREMENTS				FIVE YEAR TOTAL
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	
-	113	113	112	116	117	119	577

Water Services

W114

DESCRIPTION:

This on-going project is for the installation of new metered water services upon customer request and payment for work and connection fees. These services include minor main connections, extensions and meters to new services.

PROPOSED 2017 - 2018			PROJECTED REQUIREMENTS				FIVE YEAR TOTAL
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	
-	1,712	1,712	1,696	1,746	1,764	1,801	8,719

FIVE-YEAR CIP FY's 2018-2022

(Amounts Rounded to 000's)

GENERAL PLANT

CIP#		FY 2017	YEAR1 2017-18	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEAR5 2021-22	5YEAR TOTAL
W138	Advanced Metering Infrastructure	200	850	896	948	351		3,245
Wnew	Billing System				578	8,180	17,888	26,646
W2.20	Excellence in Customer Service	300	794					1,094
W381	Facility Safety and Security Infrastructure		567	561	1,156	1,169	1,193	4,646
W435	Meter Upgrade and Replacement Program		4,489	4,447	4,625	3,506	3,578	20,645
W126	Miscellaneous Land & Right-of-Way Acquisitions		11	11	12	12	12	58
W2.01	Plant 1 Building 3 Remodeling		57	225	173			455
W2.02	Plant 1 Miscellaneous Improvements			112	116	58		286
W2.03	Plant 1 New Meter Shop		113	561	463			1,137
W716	Responsive Meter Replacement		567	561	578			1,706
W715	Source Meter Replacement		249	247	254	257	262	1,269
TOTAL GENERAL PLANT		**500**	**7,697**	**7,621**	**8,903**	**13,533**	**22,933**	**61,187**

NJ

GENERAL PLANT

Advanced Metering Infrastructure							W138
DESCRIPTION: Provides for the set-up of the network software and cost of repeaters and collectors needed for an advanced metering infrastructure (AMI) to remotely collect, deliver, manage and analyze daily and hourly water usage data obtained from automatic water meters. This project will increase meter reading efficiency, red uce energy/fuel consumption and could provide customers with timely data to assist them with managing their water use and notify them if they have a leak. This project will begin in Fiscal Year 2018 and will be completed in Fiscal Year 2021. Total project cost is $3,245,000.							
PROPOSED 2017-2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR1 TOTAL	YEAR 2 2018-19	YEARJ 2019-20	YEAR4 202()-21	YEARS 2021-22	YEAR TOTAL
200	850	1,050	896	948	351	-	3,245

Billing System							Wnew
DESCRIPTION: Investigate options for billing system replacement or upgrade of existing billing system to enhance customer service. Or, create and implement comprehensive training program to ensure Customer Service Representatives (CSRs) are well trained to assist customers and properly utilize the existing billing system. This project will begin in Fiscal Year 2020 and will be completed in Fiscal Year 2023. Total project cost is $28,146,000.							
PROPOSED 2017 - 2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR! TOTAL	YEAR2 2018-19	YEARJ 2019-20	YEAR4 2020-21	YEAR S 2021-22	YEAR TOTAL
-	-	-	-	578	8,180	17,888	26,646

ExceUence in Customer Service							W220
DESCRIPTION: Relocation of Customer Service Representative (CSRs) to entranced work environment This project began in Fiscal Year 2017 and will be completed in Fiscal Year 2018. Total project cost is $1,144,000.							
PROPOSED 2017 - 2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
300	794	1,094	-	-	-	-	1,094

GENERAL PLANT

Facility Safety and Security Infrastructure

W381

DESCRIPTION:

Implementation of an enterprise-wide security system for Tucson Water. This project will include ongoing security analysis, acquisition and installation of security system hardware and software, video cameras, and sensor equipment, as well as building modifications including wiring, access card reader installations and remodel work. This long-range project will provide security for approximately 794 parcels owned by Tucson Water.

PROPOSED 2017-2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEA.Ill TOTAL	YEAR2 2018-19	YEARJ 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	567	567	561	1,156	1,169	1,193	646

Meter Upgrade and Replacement Program

W435

DESCRIPTION:

This project upgrades and installs replacement meters system-wide on an annual basis. Older meters become inefficient and tend to under-read water usage, and affect compliance with water loss regulations. This project began in Fiscal Year 2005 and wiJI be completed in Fiscal Year 2022. Total project cost is $62,823,000.

PROPOSED 2017 - 2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR! TOTAL	YEAR2 2018-19	YEARJ 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	4,489	4,489	4,447	4,625	3,506	3,578	20,645

Miscellaneous Land & Right-of-Way Acquisitions

W126

DESCRIPTION:

This on-going project provides for preliminary real estate services necessary prior to determining the feasibility of a well, booster station, reservoir or pipeline project. Services include the determination of the need for, and acquisition of, right-of-way, easements or real property.

PROPOSED 2017-2018			PROJECTED REQUIREMENTS				FM
CARRY FORWARD	NEW FUNDING	YEAR1 TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEAR S 2021-22	YEAR TOTAL
-	11	1l	11	12	12	12	58

Plant 1 Building 3 Remodeling

W201

DESCRIPTION:

Remodel and renovate all of the 4,000 interior square feet of Building 3 at Plant l to expand the office and muster space square footage, sized per City of Tucson (COT) and industry standards. Project costs include professional services to design the new spaces and to provide construction documents and construction oversight. Remodeling plans in Building 1 (W156) include a new larger assembly room eliminating the need for an assembly room in building 3, freeing up a large square footage and relieving space deficiencies through remodeling. This project will begin in Fiscal Year 2018 and wHJ be completed in Fiscal Year 2020. Total project cost is $455,000.

PROPOSED 2017 - 2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDil'iG	YEARl TOTAL	YEAR2 2018-19	YEARJ 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	57	57	225	173	-	-	455

Plant 1 Miscellaneous Improvements

W202

DESCRIPTION:

Professional services to design shade canopies for buildings I0 and 11 which will be metal structures with a metal roof with concrete footings. New parking lot layouts will be configured with secured vehicle and pedestrian gates. ADA deficiencies will be corrected for compliance. Professional services are also required for construction documents and construction oversight Other costs include permitting and construction. This project will begin in Fiscal Year 2019 and will be completed in Fiscal Year 2021. Total project cost is $286,000.

PROPOSED 2017 -2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	YEAR2 2018-19	YIARJ 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	-	-	112	116	58	-	286

Plant 1 New Meter Shop

W203

DESCRIPTION:

Design and construct a new building structure of approximately 4,800 square feet for properly sized meter shop offices, repair and testing areas, support spaces and ADA compliant restrooms. The existing 2,700 square foot Meter Shop in Building 2 at Plant l is cramped and undersized for staff and essential activities. Project costs include professional services to design the new building, provide construction documents and construction oversight. Other costs include permitting, construction, furniture and equipment. This project will begin in Fiscal Year 2018 and be completed in Fiscal Year 2020. Total project cost is $1,137,000.

PROPOSED 2017 - 2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR! TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	113	113	561	463	-	-	1,137

Responsive Meter Replacement

W716

DESCRIPTION:

This project provides for the replacement of meters that are not included in the on-going residential meter replacement program. This project will increase efficiency and revenues by replacing meters which were found to be under-reading or fail to read consumption properly. This project began in Fiscal Year 2008 and will be completed in Fiscal Year 2020. Total project cost is $14,244,000.

PROPOSED 2017-2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR1 TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEAR5 2021-22	YEAR TOTAL
-	567	567	561	578	-	-	1,706

Source Meter Replacement

W715

DESCRIPTION:

This on-going project is for the installation of new magnetic meters at the wellheads to improve the accounting of how much potable water is produced. This project will assist in determining the amount of real losses versus apparent losses of water, and improve compliance with water loss regulations.

PROPOSED 2017-2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR1 TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEAR5 2021-22	YEAR TOTAL
-	249	249	247	254	257	262	1,269

FIVE-YEAR CIP FY's 2018-2022

(Amounts Rounded to 000's)

POTABLE TREATMENT

CIP#		FY 2017 CYFWD	YEAR1 2017-18	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	SYEAR TOTAL
W152	TARP -AOP Settling Tank	104						104
W759	Santa Cruz Wellfield Facility Upgrade	100	2,631					2,731
TOTAL	POTABLE TREATMENT	2041	2,631	-	-	-	-	2,a3s

TARP - AOP Settling Tank — W152

DESCRIPTION:

Modify existing plant inlet piping to route flow through a new pressure tank and back to plant inlet pumps. The decreased velocity of the flow through the tank will allow debris to settle out prior to feed into the UV reactors. Currently the sediment and debris in the raw water from the TARP wells is damaging the Ultra-Violet reactors in the new TARP- AOP plant. This debris is of too large of volume and size to be efficiently removed by existing in-line filters, but has a sufficiently high density that it could be removed by settling. This project began in Fiscal Year 2015 and will be completed in Fiscal Year 2018. Total project cost is $613 000.

PROPOSED 2017 - 2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR 1 TOTAL	YEAR2 2018-19	YEARJ 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
104	-	104	-	-	-	-	104

Santa Cruz Wellfield Facility Upgrade — W759

DESCRIPTION:

This project consists of a land acquisition and design and construction of a Chemical Feed and Water Quality Monitoring Facility to provide pH adjustment, disinfection, and water quality monitoring through Supervisory Control and Data Acquisition (SCADA). This facility will ensure that pH adjustment, disinfection, and water quality monitoring will be perfonned in an integrated way in providing water to approximately 50,000 customers. This project began in Fiscal Year 2010 and will be completed in Fiscal Year 2018. Total project cost is $5 225,000.

PROPOSED 2017 - 2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEARl TOTAL	YEAR2 2018-19	YEARJ 2019-20	YEAR4 2020-21	YEARS 2021-22	\'EAR TOTAL
100	2,631	2,731	-	-	-	-	2,731

FIVE-YEAR CIP FY's 2018-2022

(Amounts Rounded to 000's)

POTABLE PROCESS CONTROL

CIP#		FY 2017	YEAR1 2017-18	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	SYEAR TOTAL
W668	Arc Flash System Upgrades	200	1,134	1,123	1,156	117	60	3,790
W045	Control Panel Replacements: Potable		113	112	116	117	119	577
W782	SCADA Potable Upgrades		6,236	5,839	6,128	6,193	2,385	26,781
TOTAL	POTABLE PROCESS CONTROL	200	7,483	7,074	7,400	6,427	2,564	31,148

Arc Flash System Upgrades

W668

DESCRJPTION:

Occupational Safety and Health Administration (OSHA) regulation NFPA-70£ on electrical safety, requires all non-occupied Water Department sites containing electrical breakers or switchgear to be brought into compliance. This on-going project will purchase and instaJl on-site power interrupt switches, new label plates warning of potential arc flash hazard, and new protective equipment for personnel visiting water sites. This project began in Fiscal Year 2007 and will be completed in Fiscal Year 2022. Total project cost is $5,708,000.

PROPOSED 2017-2018			PROJECTED REQUiREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR 1 TOTAL	YEAR2 2018-19	YEAR 3 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
200	1,134	1,334	1,123	1,156	117	60	3,790

Control Panel Replacements: Potable

W045

DESCRIPTION:

This on-going project will install new control panels and electronic equipment at existing production facilities such as wells, boosters, reservoirs, and pressure reducing valve facilities. The existing control panels are approaching the end of their service life and need to be replaced to ensure system reliability.

PROPOSED 2017-2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWA RD	NEW FUNDING	YEAR I TOTAL	YEAR2 2018-19	YEAR 3 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR T-oTAL
-	113	113	112	116	117	119	577

SCADA Potable Upgrades

W782

DESCRIPTION:

The Supervisory Control and Data Acquisition (SCADA) communication infrastructure has become obsolete and needs updating. This project provides for the instaUation of field instrumentation, controllers, and communjcations equipment necessary to communicate water system flow levels and pressures to system operators. Existing Master Station hardware and software will be replaced with improved technology. The Reclaimed SCADA CIP was combined into this potable SCADA CfP. This project began in Fiscal Year 2013 and will be completed in Fiscal Year 2022. Total project cost is $40,404,000.

PROPOSED 2017 - 2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEARl TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	6,236	6,236	5,839	6,128	6,193	2,385	26,781

FIVE-YEAR CIP FY's 2018-2022

(Amounts Rounded to 000's)

RECLAIMED SOURCE DEVELOPMENT

CIP#		FY 2017	YEAR1 2017-18	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	5YEAR TOTAL
Wl97	Southeast Houghton Area Recharge Project (SHARP)	100	624	6,569				7,293
TOTAL RECLAIMED SOURCE DEVELOPMENT		1oo 1	6241	6,5691	-	-	-	7,2931

Southeast Houghton Area Recharge Project (SHARP) W797

DESCRIPTION:

Tucson Water is building a reclaimed water recharge project in the southeast Houghton Road area. The project is planned to provide the capability to recharge reclaimed water that would ordinarily be discharged into the Santa Cruz River, resulting in beneficial use of this water within the metropolitan area. Preliminary investigations began in Fiscal Year 2011, construction of the facility is scheduled for Fiscal Year 2019. Total project cost is $8,883,000.

PROPOSED 2017-2018			PROJECTED REQUIREMENTS				FIVE YEAR TOTAL
CARRY FORWARD	NEW FUNDING	YEAR 1 TOTAL	YEAR 2 2018-19	YEAR 3 2019-20	YEAR 4 2020-21	YEAR 5 2021-22	
100	624	724	6,569	-	-	-	7,293

FIVE-YEAR CIP FY's 2018-2022

(Amounts Rounded to 000's)

RECLAIMED STORAGE

CIP#		FY 2017	YEAR1 2017-18	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	SYEAR TOTAL
W135	Houghton Reclaimed Reservoir Rehabilitation	41		2,919				2,960
TOTAL	RECLAIMED STORAGE	41	-	2,919	-	-	-	2,9so

Houghton Reclaimed Reservoir Rehabilitation

W135

DESCRfPTION:

Design and construct solutions to: increase site security, redesign the reservoir roof for water-tightness, add a new roof and structural upgrades. Site work will be performed to address access road repairs and general site renewal. This project began in Fiscal Year 2016 and construction will be completed in Fiscal year 2019. Total project cost is $3,151,000.

PROPOSED 2017-2018			PROJECTED REQUJREME!\TS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	YEAR 2 2018-19	YEAR J 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
41	-	41	2 919		-	-	2,960

FIVE-YEAR CIP FY's 2018-2022

(Amounts Rounded to 000's)

RECLAIMED PUMPING PLANT

CIP#		FY 2017 CYFWD	YEAR1 2017-18	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	SYEAR TOTAL
W049	Effluent Pump Station Expansion				1,588			1,588
W/61	Reclaimed Booster Expansion					310	2,385	2,695
TOTAL	RECLAIMED PUMPING PLANT	-	-	-	1,5881	31o	2,38sl	4,2831

Emuent Pump Station Expansion W049

DESCRIPTION:

This project expands the existing Tertiary / Secondary Effluent Pumping Station (T/SEPS) wetwell at Roger Road to match the filtration system upgrade (W774). Pumping capacity will be increased, a new pipeline will deliver the increased flow to the existing chlorine contact basin and a secondary gravity pipeline will be added from the basin to the existing reclaimed reservoir to reduce the likelihood of basin overflow. Design will begin in Fiscal Year 2017 and construction will be completed in Fiscal Year 2020. Total project cost is $1,788,000.

PROPOSED 2017-2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR1 TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEAR5 2021-22	YEAR TOTAL
-	-	-	-	1,588	-	-	1,588

Reclaimed Booster Expansion W761

DESCRIPTION:

Addition of booster pumps and appurtenances to increase discharge capacity from 38 MGD to 46 MGD. Modifications will be made to adjacent piping to allow for higher flow rates and mitigate excessive piping velocities. The current trend will likely result in a need for additional booster pump capacity by 2018. This project will begin in Fiscal Year 2021 and be completed in Fiscal Year 2023. Total project cost is $4,945,000

PROPOSED 2017-2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR1 TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEAR5 2021-22	YEAR TOTAL
-	-	-	-	-	310	2,385	2y(;95

FIVE-YEAR CIP FY's 2018-2022

(Amounts Rounded to 000's)

RECLAIMED DISTRIBUTION MAINS

CIP#		FY 2017	YEAR1 2017-18	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	5YEAR TOTAL
W130	Review/Inspect Developer Financed Reclaimed Projects		68	67	69	70	72	346
VV645	System Enhancements: Reclaimed		283	281	289	292	298	1,443
TOTAL	RECLAIMED DISTRIBUTION MAINS	-	351	348	358	362	370	1,789

RECLAIMED DISTRIBUTlON MAINS

Review/Inspect Developer Financed Reclaimed Projects

W130

DESCRIPTION:

This on-going project reviews plans and inspect developer constructed reclaimed systems to ensure compliance with Water Department standards. These systems are donated to the City when completed. Associated costs are recovered from fees.

PROPOSED 2017 - 2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR1 TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	68	68	67	69	70	72	346

System Enhancements: Reclaimed

W645

DESCRIPTION:

Design and construct reclaimed water mains during ci1y, county, state, and other agency road improvement projects, including Regional Transportation Authority (RTA) funded projects. Intergovernmental agreements determine City ofTucson costs. This on-going project increa$es system capacity while reducing the cost of pavement removal and replacement by coordinating construction with the roadway projects.

PROPOSED 2017- 2018			PROJECTED REQUIREME!'l'TS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	YEAR2 2018-19	YEAR3 2019-20	\'EAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	283	283	281	289	292	298	1,443

FIVE-YEAR CIP FY's 2018-2022

(Amounts Rounded to 000's)

RECLAIMED NEW SERVICES

CIP#		FY 2017 CYFWD	YEAR 1 2017-18	YEAR 2 2018-19	YEAR 3 2019-20	YEAR 4 2020-21	YEAR 5 2021-22	5 YEAR TOTAL
W131	New Metered Services		57	56	58	58	60	289
TOTAL RECLAIMED NEW SERVICES		-I		ssl	SSl	sal	so I	

RECLAIMED NEW SERVICES

New Metered Services **W131**

DESCRIPTION:

This on-going project installs new metered reclaimed water services upon customer request and payment for work and connection fees.

PROPOSED 2017 - 2018			PROJECTED REQUIREMENTS				FIVE YEAR TOTAL
CARRY FORWARD	NEW FUNDING	YEAR 1 TOTAL	YEAR 2 2018-19	YEAR 3 2019-20	YEAR 4 2020-21	YEAR 5 2021-22	
-	57	57	56	58	58	60	289

FIVE-YEAR CIP FY's 2018-2022

(Amounts Rounded to 000's)

RECLAIMED TREATMENT

CIP#		FY 2017 CYFWD	YEAR 1 2017-18	YEAR 2 2018-19	YEAR 3 2019-20	YEAR 4 2020-21	YEAR 5 2021-22	5 YEAR TOTAL
W774	Reclaimed Plant Filtration Modifications	300	794					1,094
TOTAL RECLAIMED TREATMENT				-	-	-	-1	1,0941

Reclaimed Plan t Filtration Modifications W774

DESCRiPTION:

Filters must be expanded for the reclaimed water plant at Roger Road because Pima County has permitted its new "Agua Nueva" wastewater treatment plant as a B+ facility. The existing filter plant will be reconfigured to increase the capacity from 10 MGD to 15 MGD with provision for eventual expansion to 20 MGD. This will provide additional reliability for the reclaimed plant. Needed programming upgrades will be coordinated with ongoing SCADA work, and the wetwell will be expanded as a separate project (W049). Design began in Fiscal Year 2011 and construction will be completed in Fiscal Year 2021. Total project cost $2,446 000.

PROPOSED 2017- 2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	YEAR2 2018-19	YEAR 3 2019-20	YEAR 4 2020-21	YEAR S 2021-22	YEAR TOTAL
300	794	1,094	-	-	-	-	1,094

FIVE-YEAR CIP FY's 2018-2022

(Amounts Rounded to 000's)

RECLAIMED PROCESS CONTROL

CIP#		FY 2017 CYFWD	YEAR 1 2017-18	YEAR 2 2018-19	YEAR 3 2019-20	YEAR 4 2020-21	YEAR 5 2021-22	5 YEAR TOTAL
W959	Control Panels: Reclaimed		170	168	173	175	179	865
TOTAL RECLAIMED PROCESS CONTROL		-	110			1751		

RECLAIMED PROCESS CONTROL

Control Panels: Reclaimed **W959**

DESCRIPTION:

This on-going project is for the design and construction of controls for reclaimed water facilities and modification of existing controls at booster stations, reservoirs, and storage facilities. These controls are needed to electronically monitor and transmit pressure, flow rates and other site condition data to the reclaimed water treatment plant where they are used to make operational decisions.

PROPOSED 2017-2018			PROJECTED REQUIREMENTS				FIVE
CARRY FORWARD	NEW FUNDING	YEAR I TOTAL	YEAR2 2018-19	YEAR3 2019-20	YEAR4 2020-21	YEARS 2021-22	YEAR TOTAL
-	170	170	168	173	175	179	865

FIVE-YEAR CIP FY's 2018-2022

(1,000)

PROGRAM AREA	FY 2017 CYFWD	YEAR 1 2017-18	YEAR 2 2018-19	YEAR 3 2019-20	YEAR 4 2020-21	YEAR 5 2021-22	5 YEAR TOTAL
TOTAL POTABLE SOURCE DEVELOPMENT	769	3,961	4,388	9,114	12,310	8,605	39,147
TOTAL POTABLE STORAGE	900	7,711	505	8,211	6,603	5,963	29,893
TOTAL POTABLE PUMPING PLANT	26	170	1,448	2,752	292	302	4,990
TOTAL POTABLE TRANSMISSION MAINS	800	6,198	11,011	2,019	4,932	2,946	27,906
TOTAL POTABLE DISTRIBUTION MAINS	1,350	13,380	13,511	10,674	10,176	8,169	57,260
TOTAL POTABLE NEW SERVICES	-	3,809	3,773	3,886	3,926	4,007	19,401
TOTAL GENERAL PLANT	500	7,697	7,621	8,903	13,533	22,933	61,187
TOTAL POTABLE TREATMENT	204	2,631	-	-	-	-	2,835
TOTAL POTABLE PROCESS CONTROL	200	7,483	7,074	7,400	6,427	2,564	31,148
TOTAL POTABLE SYSTEM	4,749	53,040	49,331	52,959	58,199	55,489	273,767
TOTAL RECLAIMED SOURCE DEVELOPMENT	100	624	6,569	-	-	-	7,293
TOTAL RECLAIMED STORAGE	41	-	2,919	-	-	-	2,960
TOTAL RECLAIMED PUMPING PLANT	-	-	-	1,588	310	2,385	4,283
TOTAL RECLAIMED TRANSMISSION	-	-	-	-	-	-	-
TOTAL RECLAIMED DISTRIBUTION MAINS	-	351	348	358	362	370	1,789
TOTAL RECLAIMED NEW SERVICES	-	57	56	58	58	60	289
TOTAL RECLAIMED TREATMENT	300	794	-	-	-	-	1,094
TOTAL RECLAIMED PROCESS CONTROL	-	170	168	173	175	179	865
TOTAL RECLAIMED SYSTEM	441	1,996	10,060	2,177	905	2,994	18,573
TOTAL	**5,190**	**55,036**	**59,391**	**55,136**	**59,104**	**58,483**	**292,340**

FIVE-YEAR CIP FY's 2018-2022

(Amounts Rounded to 000's)

POTABLE SOURCE DEVELOPMENT

CIP#		FY 2017 CYFWD	YEAR 1 2017-18	YEAR 2 2018-19	YEAR 3 2019-20	YEAR 4 2020-21	YEAR 5 2021-22	5 YEAR TOTAL
W199	C-049 Well Re-Equip	150	-	-	-	-	-	150
W553	CAVSARP Well Pump Improvements	-	340	337	347	351	358	1,733
W101	Drill Production Wells	-	-	-	-	1,753	1,789	3,542
W061	Equip Well A-061	-	397	-	-	-	-	397
W062	Equip Well W-006	69	-	-	-	-	-	69
W216	Equip Wells SS-021 & SS-023	-	-	-	-	-	179	179
W140	Gas Engines	-	-	842	867	876	894	3,479
W166	Pima Mine Rd Production Well Drilling	-	-	-	-	2,921	-	2,921
W195	Pima Mine Rd Well Equipping (3)	-	-	-	-	-	179	179
W075	Pressure Tank Replacement	-	510	505	520	526	537	2,598
W087	Production Well Sites	-	84	83	86	87	89	429
W176	Recycled Water Program	-	1,213	994	1,000	1,005	1,002	5,214
W239	Re-equip Well I-001B	50	170	-	-	-	-	220
W857	Santa Cruz Wells - Re-Equipping	400	-	-	-	-	-	400
W167	Santa Cruz Wells SC-001/SC-004/SC-014 Drilling	-	-	-	2,313	-	-	2,313
W189	Santa Cruz Well SC-001/SC-004/SC-014 Equipping	-	-	-	173	1,402	-	1,575
W083	SA-016A Recovery Well Drilling	-	-	-	694	-	-	694
W084	SA-019A/SA-021A Recovery Well Drilling	-	-	-	1,322	-	-	1,322
W085	SA-023A Recovery Well Drilling	-	-	-	694	-	-	694
W064	SAVSARP Phase III Well Equipping	-	-	-	-	1,110	2,445	3,555
W090	TARP R-009A Replacement Well	100	-	-	-	-	-	100
W244	TARP Wells R-001 thru R-008 Drilling	-	567	561	-	1,169	-	2,297
W247	TARP Wells R-001 thru R-008 Re-Equipping	-	113	505	520	526	537	2,201
W077	Wellfield Upgrades	-	567	561	578	584	596	2,886
TOTAL	**POTABLE SOURCE DEVELOPMENT**	**769**	**3,961**	**4,388**	**9,114**	**12,310**	**8,605**	**39,147**

FIVE-YEAR CIP FY's 2018-2022

(Amounts Rounded to 000's)

POTABLE STORAGE

CIP#		FY 2017 CYFWD	YEAR 1 2017-18	YEAR 2 2018-19	YEAR 3 2019-20	YEAR 4 2020-21	YEAR 5 2021-22	5 YEAR TOTAL
W091	Academy Reservoir	200	-	-	-	-	-	200
W056	Clearwell Reservoir Rehabilitation	500	7,711	135	-	-	-	8,346
W051	Escalante Reservoir	-	-	168	752	760	-	1,680
W054	Manzanita Tank Lining	-	-	34	752	-	-	786
W168	Old Vail Steel Tank Upgrades (Rehab)	200	-	-	-	-	-	200
W736	Reservoir and Tank Rehabilitation	-	-	-	5,782	5,843	5,963	17,588
W050	Trails End Reservoir Rehabilitation	-	-	168	925	-	-	1,093
TOTAL POTABLE STORAGE		**900**	**7,711**	**505**	**8,211**	**6,603**	**5,963**	**29,893**

FIVE-YEAR CIP FY's 2018-2022

(Amounts Rounded to 000's)

POTABLE PUMPING PLANT

CIP#		FY 2017 CYFWD	YEAR 1 2017-18	YEAR 2 2018-19	YEAR 3 2019-20	YEAR 4 2020-21	YEAR 5 2021-22	5 YEAR TOTAL
W170	Anklam Rd (2000 W) Relocate PRV	-	-	-	-	204	-	204
W171	Camino de Los Ranchos PRV Relocation	-	-	197	-	-	-	197
W172	Craycroft-Shadow Ridge Relocate PRV	-	-	11	249	-	-	260
W264	Diamond Bell Production Facilities Improvement	-	113	281	636	-	-	1,030
W255	H-1 Ironwood PRV Station Bailey Valve Replacements	-	-	365	52	-	-	417
W181	Magee Rd (410 E) PRV SCADA Installation	-	-	-	-	88	-	88
W180	Rauscher D-E Booster Station Upgrade	26	-	-	-	-	-	26
W198	Relocate Spencer PRV	-	-	-	173	-	-	173
W200	Rita Road "F2" to "G2" Zone Booster	-	-	168	1,388	-	-	1,556
W794	SAVSARP Booster Station Upgrade	-	-	-	-	-	302	302
W159	Silverbell/Orange Grove 12" PRV	-	23	202	-	-	-	225
W235	Thunderhead Old Spanish Trail PRV	-	-	56	254	-	-	310
W174	Via Velazquez Relocate PRV	-	34	168	-	-	-	202
TOTAL	**POTABLE PUMPING PLANT**	**26**	**170**	**1,448**	**2,752**	**292**	**302**	**4,990**

FIVE-YEAR CIP FY's 2018-2022

(Amounts Rounded to 000's)

POTABLE TRANSMISSION MAINS

CIP#		FY 2017 CYFWD	YEAR 1 2017-18	YEAR 2 2018-19	YEAR 3 2019-20	YEAR 4 2020-21	YEAR 5 2021-22	5 YEAR TOTAL
W151	Calle Santa Cruz 24-inch Transmission Main Replacement	-	63	3,117	-	-	-	3,180
W160	CAP Basin Well Collection Main	-	-	-	-	-	60	60
W161	CAP Basin Well 24" Transmission Main, Pima Mine Rd	-	-	-	-	118	42	160
W320	Cathodic Protection for Critical Pipelines	-	680	674	694	701	716	3,465
W242	Eisenhower Rd D-Zone Transmission Main	-	363	-	-	-	-	363
W796	Sahuarita Supply Line Slip Liner	400	1,656	7,153	1,156	-	-	10,365
W039	Santa Cruz SC-008 Well Collector Line	-	1,474	-	-	-	-	1,474
W089	Santa Cruz Wellfield Pipelines	-	1,905	-	-	-	-	1,905
W781	SAVSARP Collector Lines Phase II	400	-	-	-	-	-	400
W710	SAVSARP Collector Lines Phase III	-	-	-	-	876	894	1,770
W829	SAVSARP Collector Lines Phase IV	-	-	-	-	-	41	41
W832	SAVSARP Collector Lines Phase V	-	-	-	39	2,083	-	2,122
W444	SAVSARP Recovered Water Pipeline	-	-	-	-	584	1,193	1,777
W183	SC-001 & SC-004 Well Collector Transmission Main	-	57	67	130	570	-	824
TOTAL	**POTABLE TRANSMISSION MAINS**	**800**	**6,198**	**11,011**	**2,019**	**4,932**	**2,946**	**27,906**

FIVE-YEAR CIP FY's 2018-2022

(Amounts Rounded to 000's)

POTABLE DISTRIBUTION MAINS

CIP#		FY 2017 CYFWD	YEAR 1 2017-18	YEAR 2 2018-19	YEAR 3 2019-20	YEAR 4 2020-21	YEAR 5 2021-22	5 YEAR TOTAL
W859	Cavalier Estates Phase I	200	-	-	-	-	-	200
W793	Craycroft Addition Subdivision, Phase I	-	454	-	-	-	-	454
W187	Drexel I19 Crossing	-	-	-	58	1,110	-	1,168
W186	Emergency Main Replacement	-	227	225	231	234	239	1,156
W107	Extensions for New Services	-	113	112	116	117	119	577
W211	Goebel Ave Distribution Main	-	-	-	29	103	-	132
W849	Golf Links Main Replacement Phase II	200	-	-	-	-	-	200
W791	Maryvale Manor Subdivision, Phase I	-	57	943	-	-	-	1,000
W846	Maryvale Manor Subdivision, Phase II MR	-	-	56	543	-	-	599
W175	Nebraska Rd Distribution Main	-	-	-	289	-	-	289
W789	Northgate Subdivision, Phase I	500	1,134	-	-	-	-	1,634
W108	Payments To Developers For Oversized Systems	-	113	112	116	117	119	577
W109	Review/Inspect Developer-Financed Potable Projects	-	1,077	1,067	1,099	1,110	1,133	5,486
W146	River Road 12-inch Main	-	34	674	-	-	-	708
W111	Road Improvement Main Replacements	-	7,937	7,860	5,782	5,843	5,963	33,385
W850	San Paulo Village Main Replacement Phase I	-	595	-	-	-	-	595
W041	San Paulo Village Main Replacement Phase II	-	113	1,273	-	-	-	1,386
W071	San Paulo Village Main Replacement Phase III	-	57	460	-	-	-	517
W241	Stallion Rd Distribution Main, Catalina	-	172	-	-	-	-	172
W040	Tanque Verde Wentworth Distribution Main	-	254	-	-	-	-	254
W236	Thunderhead Old Spanish Trail Distribution Main	-	-	-	58	958	-	1,016
W072	Tierra del Sol Main Replacement Phase I	-	476	-	-	-	-	476
W147	Tierra del Sol Main Replacement Phase II	-	-	56	486	-	-	542
W148	Tierra del Sol Main Replacement Phase III	-	-	56	717	-	-	773
W149	Tierra del Sol Main Replacement Phase IV	-	-	56	572	-	-	628

FIVE-YEAR CIP FY's 2018-2022

(Amounts Rounded to 000's)

POTABLE DISTRIBUTION MAINS

CIP#		FY 2017 CYFWD	YEAR 1 2017-18	YEAR 2 2018-19	YEAR 3 2019-20	YEAR 4 2020-21	YEAR 5 2021-22	5 YEAR TOTAL
W060	Valve Access Vault	-	567	561	578	584	596	2,886
W861	Wilmot Main Replacement	450	-	-	-	-	-	450
TOTAL	**POTABLE DISTRIBUTION MAINS**	**1,350**	**13,380**	**13,511**	**10,674**	**10,176**	**8,169**	**57,260**

FIVE-YEAR CIP FY's 2018-2022

(Amounts Rounded to 000's)

POTABLE NEW SERVICES

CIP#		FY 2017 CYFWD	YEAR 1 2017-18	YEAR 2 2018-19	YEAR 3 2019-20	YEAR 4 2020-21	YEAR 5 2021-22	5 YEAR TOTAL
W124	Fire Services	-	1,984	1,965	2,024	2,045	2,087	10,105
W163	Fire Hydrants in Annexation Areas	-	113	112	116	117	119	577
W114	Water Services	-	1,712	1,696	1,746	1,764	1,801	8,719
TOTAL	**POTABLE NEW SERVICES**	**-**	**3,809**	**3,773**	**3,886**	**3,926**	**4,007**	**19,401**

FIVE-YEAR CIP FY's 2018-2022

(Amounts Rounded to 000's)

GENERAL PLANT

CIP#		FY 2017 CYFWD	YEAR 1 2017-18	YEAR 2 2018-19	YEAR 3 2019-20	YEAR 4 2020-21	YEAR 5 2021-22	5 YEAR TOTAL
W138	Advanced Metering Infrastructure	200	850	896	948	351	-	3,245
Wnew	Billing System	-	-	-	578	8,180	17,888	26,646
W220	Excellence in Customer Service	300	794	-	-	-	-	1,094
W381	Facility Safety and Security Infrastructure	-	567	561	1,156	1,169	1,193	4,646
W435	Meter Upgrade and Replacement Program	-	4,489	4,447	4,625	3,506	3,578	20,645
W126	Miscellaneous Land & Right-of-Way Acquisitions	-	11	11	12	12	12	58
W201	Plant 1 Building 3 Remodeling	-	57	225	173	-	-	455
W202	Plant 1 Miscellaneous Improvements	-	-	112	116	58	-	286
W203	Plant 1 New Meter Shop	-	113	561	463	-	-	1,137
W716	Responsive Meter Replacement	-	567	561	578	-	-	1,706
W715	Source Meter Replacement	-	249	247	254	257	262	1,269
TOTAL	**GENERAL PLANT**	**500**	**7,697**	**7,621**	**8,903**	**13,533**	**22,933**	**61,187**

FIVE-YEAR CIP FY's 2018-2022

(Amounts Rounded to 000's)

POTABLE TREATMENT

CIP#		FY 2017 CYFWD	YEAR 1 2017-18	YEAR 2 2018-19	YEAR 3 2019-20	YEAR 4 2020-21	YEAR 5 2021-22	5 YEAR TOTAL
W152	TARP - AOP Settling Tank	104	-	-	-	-	-	104
W759	Santa Cruz Wellfield Facility Upgrade	100	2,631	-	-	-	-	2,731
TOTAL	**POTABLE TREATMENT**	**204**	**2,631**	**-**	**-**	**-**	**-**	**2,835**

FIVE-YEAR CIP FY's 2018-2022

(Amounts Rounded to 000's)

POTABLE PROCESS CONTROL

CIP#		FY 2017 CYFWD	YEAR 1 2017-18	YEAR 2 2018-19	YEAR 3 2019-20	YEAR 4 2020-21	YEAR 5 2021-22	5 YEAR TOTAL
W668	Arc Flash System Upgrades	200	1,134	1,123	1,156	117	60	3,790
W045	Control Panel Replacements: Potable	-	113	112	116	117	119	577
W782	SCADA Potable Upgrades	-	6,236	5,839	6,128	6,193	2,385	26,781
TOTAL	**POTABLE PROCESS CONTROL**	**200**	**7,483**	**7,074**	**7,400**	**6,427**	**2,564**	**31,148**

FIVE-YEAR CIP FY's 2018-2022

(Amounts Rounded to 000's)

RECLAIMED SOURCE DEVELOPMENT

CIP#		FY 2017 CYFWD	YEAR 1 2017-18	YEAR 2 2018-19	YEAR 3 2019-20	YEAR 4 2020-21	YEAR 5 2021-22	5 YEAR TOTAL
W797	Southeast Houghton Area Recharge Project (SHARP)	100	624	6,569	-	-	-	7,293
TOTAL	**RECLAIMED SOURCE DEVELOPMENT**	**100**	**624**	**6,569**	**-**	**-**	**-**	**7,293**

FIVE-YEAR CIP FY's 2018-2022

(Amounts Rounded to 000's)

RECLAIMED STORAGE

CIP#		FY 2017 CYFWD	YEAR 1 2017-18	YEAR 2 2018-19	YEAR 3 2019-20	YEAR 4 2020-21	YEAR 5 2021-22	5 YEAR TOTAL
W135	Houghton Reclaimed Reservoir Rehabilitation	41	-	2,919	-	-	-	2,960
TOTAL	**RECLAIMED STORAGE**	**41**	**-**	**2,919**	**-**	**-**	**-**	**2,960**

FIVE-YEAR CIP FY's 2018-2022

(Amounts Rounded to 000's)

RECLAIMED PUMPING PLANT

CIP#		FY 2017 CYFWD	YEAR 1 2017-18	YEAR 2 2018-19	YEAR 3 2019-20	YEAR 4 2020-21	YEAR 5 2021-22	5 YEAR TOTAL
W049	Effluent Pump Station Expansion	-	-	-	1,588	-	-	1,588
W761	Reclaimed Booster Expansion	-	-	-	-	310	2,385	2,695
TOTAL	**RECLAIMED PUMPING PLANT**	**-**	**-**	**-**	**1,588**	**310**	**2,385**	**4,283**

FIVE-YEAR CIP FY's 2018-2022

(Amounts Rounded to 000's)

RECLAIMED DISTRIBUTION MAINS

CIP#		FY 2017 CYFWD	YEAR 1 2017-18	YEAR 2 2018-19	YEAR 3 2019-20	YEAR 4 2020-21	YEAR 5 2021-22	5 YEAR TOTAL
W130	Review/Inspect Developer Financed Reclaimed Projects	-	68	67	69	70	72	346
W645	System Enhancements: Reclaimed	-	283	281	289	292	298	1,443
TOTAL	**RECLAIMED DISTRIBUTION MAINS**	**-**	**351**	**348**	**358**	**362**	**370**	**1,789**

FIVE-YEAR CIP FY's 2018-2022

(Amounts Rounded to 000's)

RECLAIMED NEW SERVICES

CIP#		FY 2017 CYFWD	YEAR 1 2017-18	YEAR 2 2018-19	YEAR 3 2019-20	YEAR 4 2020-21	YEAR 5 2021-22	5 YEAR TOTAL
W131	New Metered Services	-	57	56	58	58	60	289
TOTAL	**RECLAIMED NEW SERVICES**	**-**	**57**	**56**	**58**	**58**	**60**	**289**

FIVE-YEAR CIP FY's 2018-2022

(Amounts Rounded to 000's)

RECLAIMED TREATMENT

CIP#		FY 2017 CYFWD	YEAR 1 2017-18	YEAR 2 2018-19	YEAR 3 2019-20	YEAR 4 2020-21	YEAR 5 2021-22	5 YEAR TOTAL
W774	Reclaimed Plant Filtration Modifications	300	794	-	-	-	-	1,094
TOTAL	**RECLAIMED TREATMENT**	**300**	**794**	**-**	**-**	**-**	**-**	**1,094**

FIVE-YEAR CIP FY's 2018-2022

(Amounts Rounded to 000's)

RECLAIMED PROCESS CONTROL

CIP#		FY 2017 CYFWD	YEAR 1 2017-18	YEAR 2 2018-19	YEAR 3 2019-20	YEAR 4 2020-21	YEAR 5 2021-22	5 YEAR TOTAL
W959	Control Panels: Reclaimed	-	170	168	173	175	179	865
TOTAL	**RECLAIMED PROCESS CONTROL**	**-**	**170**	**168**	**173**	**175**	**179**	**865**

CIP COMPARISON:

Adopted FY's 2017-2021 versus Proposed FY's 2018-2022

(Amounts Rounded to 000's)

	FY17	YEAR 1 FY2018	YEAR 2 FY2019	YEAR 3 FY2020	YEAR 4 FY2021	YEAR 5 FY2022	5 Year Total
FY2017 - FY2021 Adopted CIP	**56,098**	**46,539**	**53,297**	**40,492**	**34,602**		**231,028**
New CIPs		2,462	2,863	9,567	20,690	**29,621**	**65,203**
Delayed or Deleted CIPs		(5,830)	(8,418)	(2,992)	-	**-**	**(17,240)**
Projects with Major Revisions		11,670	11,942	8,551	4,663	**16,864**	**53,690**
Other Adjustments		195	(293)	(482)	(851)	**11,998**	**10,567**
FY2018 - FY2022 Proposed CIP	**(prop. CF) 5,190**	**55,036**	**59,391**	**55,136**	**59,104**	**58,483**	**292,340**
Difference		***8,497***	***6,094***	***14,644***	***24,502***	***58,483***	***61,312***

CIP COMPARISON:
Adopted FY's 2017-2021 versus Proposed FY's 2018-2022
(Amounts Rounded to 000's)

New CIPs		YEAR 1 FY2018	YEAR 2 FY2019	YEAR 3 FY2020	YEAR 4 FY2021	YEAR 5 FY2022	5 Year Total
W216	Equip Wells SS-021 & SS-023	-	-	-	-	179	**179**
W195	Pima Mine Rd Well Equipping (3)	-	-	-	-	179	**179**
W239	Re-equip Well I-001B	170	-	-	-	-	**170**
W083	SA-016A Recovery Well Drilling	-	-	694	-	-	**694**
W244	TARP Wells R-001 thru R-008 Drilling	567	561	-	1,169	-	**2,297**
W247	TARP Wells R-001 thru R-008 Re-equipping	113	505	520	526	537	**2,201**
W736	Reservoir and Tank Rehabilitation	-	-	5,782	5,843	5,963	**17,588**
W171	Camino de Los Ranchos Relocate PRV	-	197	-	-	-	**197**
W264	Diamond Bell Production Facilities Improvement	113	281	636	-	-	**1,030**
W255	H-I Ironwood PRV Station Bailey Valve Replacements	-	365	52	-	-	**417**
W198	Relocate Spencer PRV	-	-	173	-	-	**173**
W794	SAVSARP Booster Station Upgrade	-	-	-	-	302	**302**
W235	Thunderhead Old Spanish Trail PRV	-	56	254	-	-	**310**
W160	CAP Basin Well Collection Main	-	-	-	-	60	**60**
W242	Eisenhower Rd D-Zone Transmission Main	363	-	-	-	-	**363**
W710	SAVSARP Collector Lines Phase III	-	-	-	876	894	**1,770**
W829	SAVSARP Collector Lines Phase IV	-	-	-	-	41	**41**
W832	SAVSARP Collector Lines Phase V	-	-	39	2,083	-	**2,122**
W444	SAVSARP Recovered Water Pipeline	-	-	-	584	1,193	**1,777**
W211	Goebel Ave Distribution Main	-	-	29	103	-	**132**
W241	Stallion Rd Distribution Main, Catalina	172	-	-	-	-	**172**
W236	Thunderhead Old Spanish Trail Distribution Main	-	-	58	958	-	**1,016**
Wnew	Billing System	-	-	578	8,180	17,888	**26,646**
W220	Excellence in Customer Service	794	-	-	-	-	**794**
W201	Plant 1 Building 3 Remodeling	57	225	173	-	-	**455**
W202	Plant 1 Miscellaneous Improvements	-	112	116	58	-	**286**
W203	Plant 1 New Mter Shop	113	561	463	-	-	**1,137**
W761	Reclaimed Booster Expansion	-	-	-	310	2,385	**2,695**
Total New CIPs		**2,462**	**2,863**	**9,567**	**20,690**	**29,621**	**65,203**

CIP COMPARISON:
Adopted FY's 2017-2021 versus Proposed FY's 2018-2022
(Amounts Rounded to 000's)

CIPs Delayed, Deleted or Completed Ahead of Schedule - No Longer in 5-Year		YEAR 1 FY2018	YEAR 2 FY2019	YEAR 3 FY2020	YEAR 4 FY2021	YEAR 5 FY2022	5 Year Total
W194	ASR at F-008 Equipping	-	(290)	(2,478)	-	-	**(2,768)**
W173	Glenn_Campbell PRV	-	-	(248)	-	-	**(248)**
W210	Aerospace-Sonoran Corridor	(1,744)	(6,970)	-	-	-	**(8,714)**
W153	Nogales Hwy 36" Trans Main	(2,554)	-	-	-	-	**(2,554)**
W154	Santa Cruz Transmission Main Replacement Phase II	(6)	(99)	-	-	-	**(105)**
W184	SC-005 Well Collector Line	(116)	-	-	-	-	**(116)**
W185	SC-013 Well Collector Line	(105)	-	-	-	-	**(105)**
W859	Cavalier Estates Phase I	(416)	-	-	-	-	**(416)**
W858	Golf Links Main Replacement Phase V	(581)	-	-	-	-	**(581)**
W790	Northgate Subdivision	(58)	(918)	-	-	-	**(976)**
W783	SCADA Reclaimed	(250)	(141)	(266)	-	-	**(657)**
Total Delayed CIPs		**(5,830)**	**(8,418)**	**(2,992)**	**-**	**-**	**(17,240)**

CIP COMPARISON:

Adopted FY's 2017-2021 versus Proposed FY's 2018-2022

(Amounts Rounded to 000's)

CIPs with Major Revisions		YEAR 1 FY2018	YEAR 2 FY2019	YEAR 3 FY2020	YEAR 4 FY2021	YEAR 5 FY2022	5 Year Total
W061	Equip Well A-061	397	-	(62)	(457)	-	**(122)**
W140	Gas Engines	(436)	406	402	387	894	**1,653**
W075	Pressure Tank Replacement	336	331	334	330	537	**1,868**
W176	Recycled Water Program	51	(168)	(239)	(300)	1,002	**346**
W857	Santa Cruz Wells -Re-equipping	(709)	-	-	-	-	**(709)**
W167	Santa Cruz Well SC-001/04/14 Drilling	-	-	2,127	(1,566)	-	**561**
W189	Santa Cruz Well SC-001/04/14 Equipping	-	-	173	1,206	-	**1,379**
W084	SA-019A/SA-021A Recovery Well Drilling	-	-	1,322	-	-	**1,322**
W085	SA-023A Recovery Well Drilling	-	-	694	-	-	**694**
W064	SAVSARP Phase III Well Equipping	-	-	-	1,110	2,445	**3,555**
W056	Clearwell Reservoir Rehabilitation	1,531	(4)	-	-	-	**1,527**
W796	Sahuarita Supply Line Slip Liner	1,575	5,948	(5,530)	-	-	**1,993**
W050	Trails End Reservoir Rehabilitation	(12)	156	739	(1,044)	-	**(161)**
W200	Rita Rd "F2" to "G2" Zone Booster	(1,046)	168	1,388	-	-	**510**
W039	Santa Cruz SC-008 Well Collector Line	1,242	-	-	-	-	**1,242**
W089	Santa Cruz Wellfield Pipelines	1,859	(639)	-	-	-	**1,220**
W151	Calle Santa Cruz 24-in TM Replacement	63	3,117	-	-	-	**3,180**
W111	Road Improvements / Main Replacement	3,284	2,634	1,446	9	5,963	**13,336**
W850	San Paulo Village Main Replacement Phase I	430	-	-	-	-	**430**
W789	Northgate Subdivision, Phase I	1,134	-	-	-	-	**1,134**
W435	Meter Replacement Program	(2,513)	(2,407)	1,652	3,506	3,578	**3,816**
W759	Santa Cruz Wellfield Facility Upgrade	2,457	(2,788)	-	-	-	**(331)**
W668	Arc Flash System Upgrade	(28)	(39)	(83)	(1,188)	60	**(1,278)**
W797	Southeast Houghton Area Recharge Project (SHARP)	624	(808)	-	-	-	**(184)**
W135	Houghton Reclaimed Reservoir	(2,836)	2,919	-	-	-	**83**
W049	Effluent Pump Station Expansion	-	-	1,588	-	-	**1,588**
W774	Reclaimed Plant Filtration System Modifications	794	-	(619)	(913)	-	**(738)**
W782	SCADA Potable	3,473	3,116	3,219	3,583	2,385	**15,776**
Total Projects with Major Revisions		**11,670**	**11,942**	**8,551**	**4,663**	**16,864**	**53,690**

CIP COMPARISON:
Adopted FY's 2017-2021 versus Proposed FY's 2018-2022
(Amounts Rounded to 000's)

Projects with Other Budget Changes		YEAR 1 FY2018	YEAR 2 FY2019	YEAR 3 FY2020	YEAR 4 FY2021	YEAR 5 FY2022	5 Year Total
W553	CAVSARP Well Pump Improvements	(9)	(12)	(25)	(40)	358	**272**
W101	Drill Production Wells	-	-	-	(204)	1,789	**1,585**
W166	Pima Mine Rd Prod Well Drilling	-	-	-	(341)	-	**(341)**
W087	Production Well Sites	(3)	(4)	(7)	(11)	89	**64**
W077	Wellfield Upgrade	(14)	(20)	(41)	(68)	596	**453**
W051	Escalante Reservoir	(12)	(6)	(53)	(88)	-	**(159)**
W054	Manzanita Tank Lining	(12)	(1)	(53)	-	-	**(66)**
W170	Anklam Rd (2000 W) Relocate PRV	-	-	-	(24)	-	**(24)**
W172	Craycroft-Shadow Ridge Rlocate PRV	-	11	(30)	-	-	**(19)**
W181	Magee Rd (410 E) PRV SCADA	-	-	-	(10)	-	**(10)**
W159	Silverbell/Orange Grove 12" PRV	23	202	-	-	-	**225**
W174	Via Velazquez Relocate PRV	34	168	(217)	-	-	**(15)**
W161	CAP Basin Well 24" Trans Main	-	-	-	(78)	42	**(36)**
W320	Cathodic Protection for Critical Pipelines	(17)	(23)	(49)	(82)	716	**545**
W187	Drexel I19 Crossing	-	-	(4)	(130)	-	**(134)**
W186	Emergency Main Replacement	(5)	(7)	(17)	(27)	239	**183**
W107	Extensions for New Services	(3)	(4)	(8)	(13)	119	**91**
W791	Maryvale Manor Subdivision Phase I MR	(1)	25	-	-	-	**24**
W846	Maryvale Manor Subdivision Phase III MR	-	(2)	23	-	-	**21**
W108	Payment to Developer for Oversizing	(3)	(4)	(8)	(13)	119	**91**
W109	Review Developer Financed Project	(27)	(37)	(78)	(130)	1,133	**861**
W146	River Road 12 inch Main	(1)	(23)	-	-	-	**(24)**
W041	San Paulo Village Main Replacement Phase II	(3)	(44)	-	-	-	**(47)**
W071	San Paulo Village Main Replacement Phase III	(1)	(16)	-	-	-	**(17)**
W183	SC-001 & SC-004 Well Collector Lines	(1)	(177)	130	570	-	**522**
W793	Craycroft Addition Subdivision	454	-	-	-	-	**454**
W175	Nebraska Rd Distribution Main	-	(58)	41	-	-	**(17)**
W040	Tanque Verde - Wentworth	(6)	-	-	-	-	**(6)**
W072	Tierra Del Sol Main Replacement Phase I	(12)	-	-	-	-	**(12)**
W147	Tierra Del Sol Main Replacement Phase II	-	(2)	(34)	-	-	**(36)**
W148	Tierra Del Sol Main Replacement III	-	(2)	(51)	-	-	**(53)**
W149	Tierra Del Sol Main Replacement IV	-	(2)	(41)	-	-	**(43)**
W060	Valve Access Vault	(14)	(20)	(41)	(68)	596	**453**
W124	Fire Services	(50)	(68)	(144)	(238)	2,087	**1,587**
W163	Fire Hydrants in Annexation Areas	(3)	(4)	(8)	(13)	119	**91**
W114	Water Services	(43)	(58)	(125)	(206)	1,801	**1,369**
W138	Advanced Metering Infrastructure	(22)	(31)	(68)	(40)	-	**(161)**
W381	Facility Safety & Security Infrastructure	(14)	(20)	537	517	1,193	**2,213**
W126	Misc. Land & Right of Way	(1)	(1)	-	(1)	12	**9**
W716	Responsive Meter Replacement	(14)	(20)	(41)	-	-	**(75)**
W715	Source Meter Replacement	(7)	(9)	(19)	(30)	262	**197**

Projects with Other Budget Changes		YEAR 1 FY2018	YEAR 2 FY2019	YEAR 3 FY2020	YEAR 4 FY2021	YEAR 5 FY2022	5 Year Total
W045	Control Panel Replacements	(3)	(4)	(8)	(13)	119	**91**
W130	Reclaimed Review Developer Financed Project	(2)	(3)	(5)	(8)	72	**54**
W645	System Enhancements / Reclaimed Mains	(8)	(9)	(21)	(34)	298	**226**
W131	New Metered Services (Reclaimed)	(1)	(2)	(4)	(7)	60	**46**
W959	Control Panels: Reclaimed	(4)	(6)	(13)	(21)	179	**135**
Total Projects with Other Revisions		**195**	**(293)**	**(482)**	**(851)**	**11,998**	**10,567**

Tucson Water

CWAC - Finance Subcommittee

Conservation Pricing Best Practices

October 12, 2016

Presenters:

Scott Clark, Deputy Director

Steven Ritter, Finance Administrator

TUCSON WATER

Conservation Conundrum

"Water utilities struggle with the need to promote water conservation while maintaining financial solvency,

- commonly known as the New Normal."

Center for Water Energy Efficiency – University California Davis

TUCSON WATER



Bottom Line Up Front

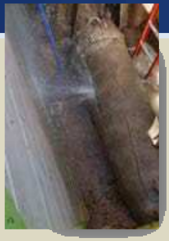
- Review of best policies for conservation pricing and compare with Tucson Water's practices
- Review (tier) block pricing recommendations for conservation signaling
- Tucson Water's pricing tiers vs. recommended practices
- Review other considerations for conservation pricing

TUCSON WATER

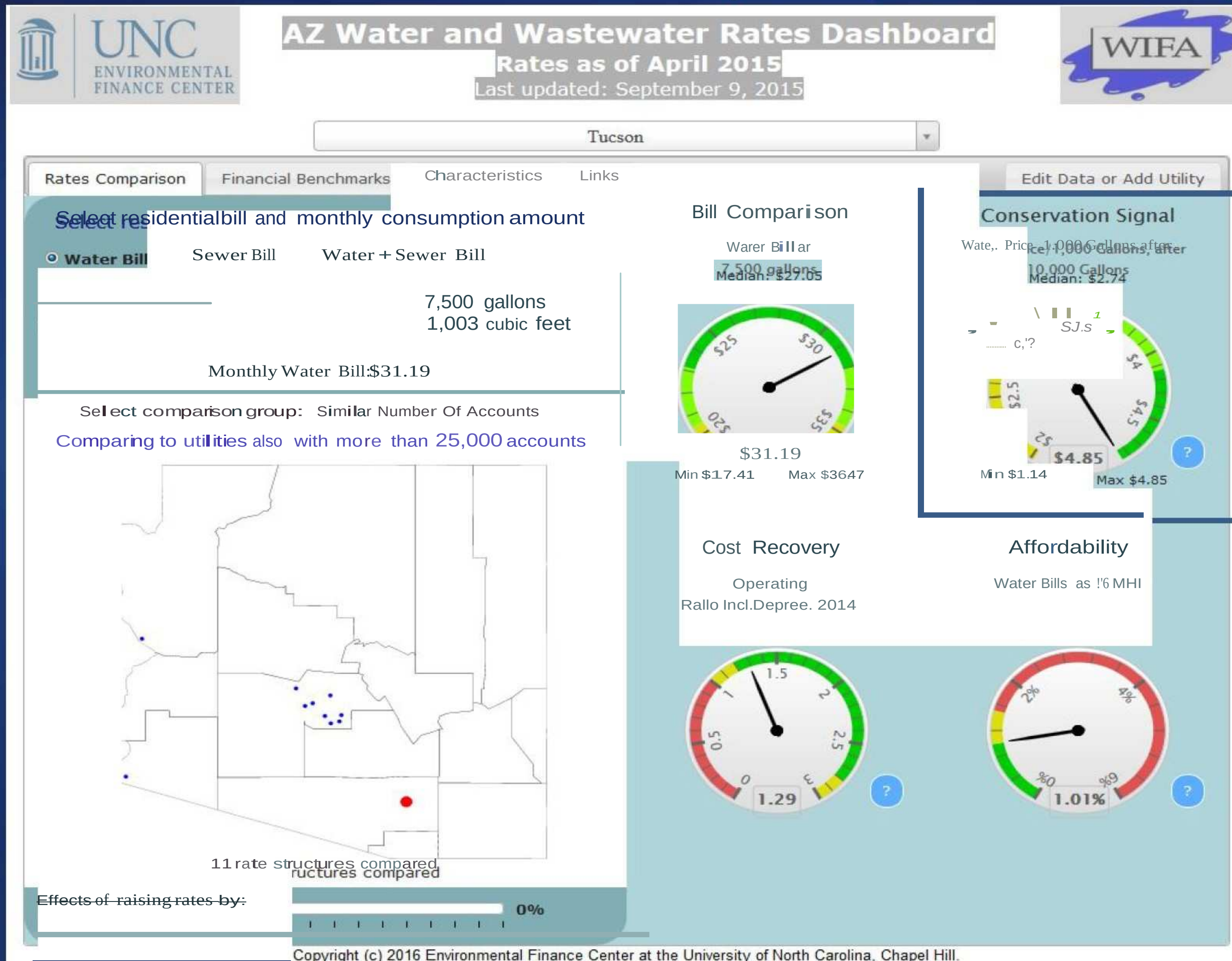
Best Policies for Conservation

- Bill customers monthly √
- Provide 12-month consumption on utility bill √
- Encourage sub-metering for apartments (multi-family residential)
- Incorporate all utility system costs in water pricing (i.e. include operating and capital costs) √
- Understand the relative price signal (ex. see EFC/UNC dashboards) √

TUCSON WATER



Tucson - Dashboard (EFC/UNC Tool)



TUCSON WATER

Revenue Stability Table

FIGURE 3 Utility's revenue instability amplification factor for a range of costs and revenue breakdowns'

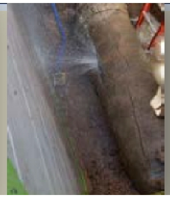
	Revenue-% *Fixed*																			
	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95
0	1.00																			
5	1.05	1.00																		
10	1.11	1.06	1.00																	
15	1.18	1.12	1.06	1.00																
20	1.25	1.19	1.13	1.06	1.00															
25	1.33	1.27	1.20	1.13	1.07	1.00														
30	1.43	1.36	1.29	1.21	1.14	1.07	1.00													
35	1.54	1.46	1.38	1.31	1.23	1.15	1.08	1.00												
40	1.67	1.58	1.50	1.42	1.33	1.25	1.17	1.08	1.00											
45	1.82	1.73	1.64	1.55	1.45	1.36	1.27	1.18	1.09	1.00										
50	2.00	1.90	1.80	1.70	1.60	1.50	1.40	1.30	1.20	1.10	1.00									
55	2.22	2.11	2.00	1.89	1.78	1.67	1.56	1.44	1.33	1.22	1.11	1.00								
60	2.50	2.38	2.25	2.13	2.00	1.88	1.75	1.63	1.50	1.38	1.25	1.13	1.00							
65	2.86	2.71	2.57	2.43	2.29	2.14	2.00	1.86	1.71	1.57	1.43	1.29	1.14	1.00						
70	3.33	3.17	3.00	2.83	2.67			2.17	2.00	1.83	1.67	1.50	1.33	1.17	1.00					
75			3 60	**3.40**	3.20				2.40	2.20	2.00	1.80	1.60	1.40	1.20	1.00				
80									3.00	2.75	2.50	2.25	2.00	1.75	1.50	1.25	1.00			
85													2.67	2.33	2.00	1.67	1.33	1.00		
90																2.50	2.00	1.50	1.00	
95																	4.00	3.00	2.00	1.00

'Calculated by dividing the percentage of variable revenue by the percentage of variable costs.

tBolded box represents an assumed 80% fixed costs and 30% fixed revenue (to send a conservation signal).

Green boxes Indicate a ratio of 1.00 or harmonized fixed and variable costs and revenues; yellow and red boxes Indicate potential revenue Instability resulting from a larger amount lost In total revenues than avoided by reduced water consumption.

TUCSON



WATER

(Tier) Block Pricing Recommendations for Conservation Signaling

- Minimum of two blocks should exist √
- Set first block near 5,000 gallons (6.7 CCFs) or near the average winter usage (8 CCFs for Tucson Water) √
- Establish 3-4 blocks for the first 20,000 gallons (26.7 CCFs)
- Prices between blocks should be no less than 25% of previous block √
- Maximum effectiveness is 50% or more increase from the lower block √

TUCSON WATER

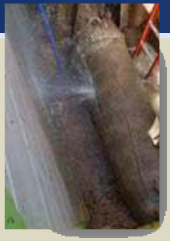


Tucson Water Tiers and Prices

(as of July 2016)

CCFs	Gallons	Rate	Price Percent Change
1 – 7	748 - 5,236	$1.55	N/A
8 - 15	5,984 - 11,220	$3.00	93.5%
16 - 30	11,968 - 22,440	$7.48	149.3%
30+	22,440+	$11.75	57.1%

1 CCF = 748 Gallons



Other Considerations

- Water price elasticity: (*Elasticity can range from 1-3%*)

  10% price increase = 2% water use reduction

- Customer assistance programs: Not applicable to conservation pricing
- Revenue stability: CUWCC recommends fixed charge maximum of 30% for revenues (Tucson Water is at 26%)
- Revenue stability: AWWA recommends matching fixed charges revenues with fixed costs (Tucson Water's fixed cost are 70-75% of total costs)



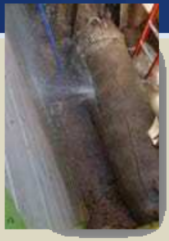
Next Subcommittee Meeting

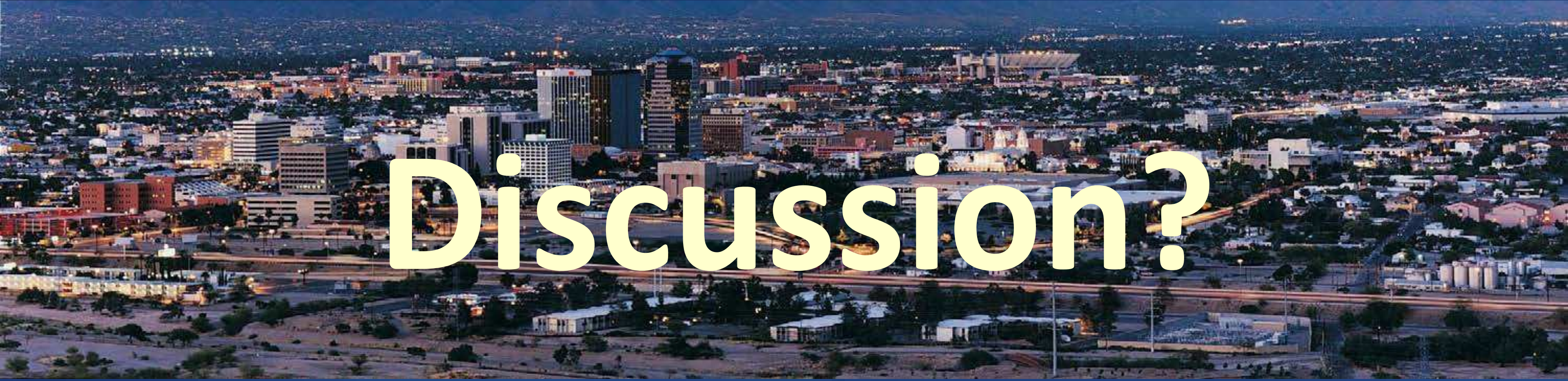
- Review background materials and studies
- Address the *New Normal:*

  "Water utilities struggle with the need to promote water conservation while maintaining financial solvency"

- Discuss the methods to:
  - Achieve revenue stability
  - Send a strong conservation signal
  - Determine if other rate structures are more suitable than current structure

TUCSON WATER

Discussion?

Tucson Water

CWAC - Finance Subcommittee

October 12, 2016

Presenters:

Scott Clark, Deputy Director

Steven Ritter, Finance Administrator

TUCSON WATER

Designing Water Rate Structures for Conservation & Revenue Stability

Mary Tiger Jeff
Hughes Shadi
Eskaf February
2014

UNC ENVIRONMENTAL FINANCE CENTER

SIERRA CLUB FOUNDED 1892

About the Environmental Finance Center

The Environmental Finance Center at the University of North Carolina, Chapel Hill is part of a network of university-based centers that work on environmental issues, including water resources, solid waste management, energy, and land conservation. The EFC at UNC partners with organizations across the United States to assist communities, provide training and policy analysis services, and disseminate tools and research on a variety of environmental finance and policy topics.

The Environmental Finance Center at the University of North Carolina, Chapel Hill works to build the capacity of governments and other organizations to provide environmental programs and services in fair, effective and financially sustainable ways.

About the Sierra Club, Lone Star Chapter

The Sierra Club is a national environmental organization, and the Lone Star Chapter is the state level entity for the Sierra Club in Texas. The Sierra Club, Lone Star Chapter is a partner with the National Wildlife Federation (NWF) in the Texas Living Waters Project. The Texas Living Waters Project works with water policy specialists, public officials, and communities in Texas to ensure adequate water for both people and the environment. The Project works to reduce future demand for water through advocating for efficient use of existing supplies. A key goal of the Project is to involve citizens in decisions about water resource management at the local and state levels.

Acknowledgements

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This report is a product of the Environmental Finance Center at the University of North Carolina, Chapel Hill. Findings, interpretations, and conclusions included in this report are those of the authors and do not necessarily reflect the views of EFC funders, the University of North Carolina, the School of Government, or those who provided review.

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Designing Water Rate Structures for Conservation and Revenue Stability

Table of Contents

Executive Summary

Water conservation is critical to meeting the water needs of Texas. Many programs may be implemented to reduce water use, and a number of utilities across the State are making strong efforts to advance water conservation. This report focuses on how a utility may use its water rates and financial policies to encourage customers to reduce their water use while maintaining the financial viability of the utility.

It is a fundamental economic theory that the more you charge, the less people use (at least for most goods). That's what makes water pricing such a compelling and convincing tool to use in advancing water conservation. The principle is simple: to achieve conservation, just charge high rates. But of course, the reality of rates is far more complex.

First and foremost, water utilities must set rates to collect the revenue they need to operate the water utility, invest in its infrastructure, and protect public health. After that, utilities can and do tweak and tailor the structure of rates to meet any number of objectives, including customer affordability, economic development, and water conservation. And this is where it can get complicated. Some of these objectives can come in direct conflict with one another and with the primary objective of balancing the budget. One common conflict is the tension that arises between promoting water conservation and ensuring a stable revenue stream to cover the predominantly fixed charges of running a water utility. The relationship is complex; the solutions numerous.

This report explores the relationship between water pricing, water use, and revenue stability in the State of Texas using water rate data predominantly collected by the Texas Municipal League. Trends show that higher water prices are associated with lower average residential water use for water utilities that:

- increase rates from one year to the next (2012 to 2013),
- charge more for water at 5,000 gallons per month, and
- charge more at higher levels of water use.

Additionally, water rates in Texas show a range of revenue vulnerability across the state, which is influenced by marginal pricing and the level of base charges.

These trends are only a cursory exploration of the relationship between water use, water pricing, and revenue stability, but they confirm trends seen in other states and studies. There are many factors that contribute to a customer's water use from one year to the next and from one water utility to another. In addition to pricing, weather, economic factors, and customer demographics influence water use, and subsequently revenue. Similarly, there are many factors that impact the revenue stability for a water utility, such as cost drivers, service area characteristics, and demand projections.

Given the range of operating environments for water utilities, this report introduces a menu of rate structure, billing, and financial practice options that can be adopted to promote conservation AND ensure revenue stability. Water utilities can use locally-appropriate combinations of these options to promote water conservation without undercutting the bottom line. The specific mix of practices appropriate for a utility will be influenced by local conditions, as explored in three hypothetical scenarios.

There is no one-size-fits-all approach to using rate structures to achieve water conservation goals, but there are some general principles to keep mind when developing such rate structures:

- **The rate level itself matters more than the rate structure.** Prices that are artificially kept low and ignore key components of cost, (such as deferred maintenance) send inaccurate and shortsighted price signals to customers. Utilities should balance short- and long-term revenue and expenditure balance in setting rates. While different rate structures target specific types of water use, the overall price level is influential on demand.
- **Small details matter.** Pricing dialogue is often dominated by what type of block pricing is used when other design decisions, such as the size of the flat charge or the way wastewater charges are calculated, can have significant impact of pricing signals and revenue generation.
- **Utility methods matter.** Rate setting of any kind should begin with accurate demand projections that take into consideration the impact of pricing on consumption. Projections for revenue and demand should be reviewed annually and recalibrated to match current thinking. Furthermore, revenue risk can be mitigated with reserves (such as a rate stabilization fund) and conservative budgeting.
- **Rate awareness matters.** A better and more frequent understanding of pricing levels and water use by utilities and their customers will assist utilities in using pricing to achieve strategic objectives, such as conservation and revenue stability.

Texas utilities are not the first and only organizations dealing with the tension between water pricing, conservation, and revenues. This report concludes with a summary of the great body of work that addresses and investigates this issue across the country and recent times. Although some reports go back to the mid-1990s, the increase of thinking and writing on the topic reflects increasing interest and need for solutions as water supply constraints demand conservation and water infrastructure needs demand revenue.

Introduction

The purpose of this guide is to explore the balance between conservation and revenue stability in Texas' water structures and introduce rate structures, billing options, and financial practices that will help utilities advance water conservation objectives without undercutting needed revenue stability. Water utilities and their stakeholders will find it useful in evaluating how water rates compare within the state and identifying additional steps that can be taken to promote conservation and ensure revenue stability for water utilities.

Part One acknowledges the myriad of considerations that water utilities undertake in setting strategic rates and the need to balance these considerations. Part Two provides an assessment of the balance between pricing and revenue stability in the State of Texas with a statewide summary of pricing and case studies on two of the state's largest utilities (San Antonio Water System and the Austin Water Utility) that have strategically used water rates to promote conservation while at the same time seeking more revenue stability. Part Three provides guidance on water utility rate structure design and billing practices that promote conservation and help ensure revenue stability, given the various operating environments for utilities across the state. Part Four summarizes the primary resources on this topic. This document is not designed to address every aspect of rate making, but the appendix does define some of the basic elements of water rate structure design.

Part I. Considerations for Strategic Pricing for Water Utilities in Texas

First and foremost, water utilities set rates to balance budgets.

Revenue sufficiency is the primary financial objective for most water utilities that operate as enterprises. They must be financially self-sufficient, recovering not only the cost of daily operations but also funding capital improvements to fulfill their central public health mission. They strive to design rate structures and set rate levels in a manner that equitably charges a customer based on the cost-of-service. However, rates and rate structures can go well beyond these main objectives and provide an excellent avenue to help a utility achieve some of its goals and policies.

Some of the more prevalent secondary objectives of water pricing are:

- ***Conservation Promotion***: The amount that customers pay for water service acts as a price signal, often encouraging the customers to decrease consumption. A utility charging high rates typically discourages large volume use among many residential customers. In fact, many utilities in Texas have adopted increasing block rate structures (where the rate increases with increasing block rates of usage). The rationale behind conservation-oriented rates is that customers using a lot of water or those with large seasonal variations in consumption should pay their fair share, since distribution networks are sized to meet peak demands.

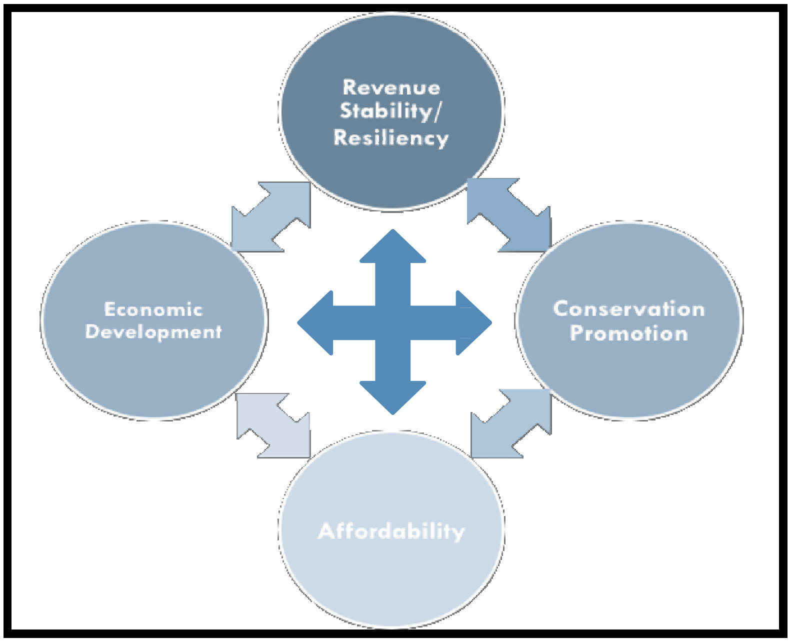
- ***Affordability:*** Ensuring that water is affordable to a community for basic services is a priority of many utilities and their governing boards. A "lifeline" rate as part of an increasing block rate structure, as well as low base charges, is a method employed by utilities to meet this objective. Maintaining "affordable" rates should almost never take precedence over charging rates that are necessary to recover the full costs of service. Artificially maintaining low rates will lead to deferring maintenance, rehabilitation and replacement, deteriorating infrastructure and creating public health hazards in the future, as well as masking the true cost (and value) of water. There are financial tools that can be used to maintain affordability for basic water needs while meeting the full cost of service.

- ***Economic Development:*** Utilities may strive to attract new or maintain existing commercial customers through water rates to foster greater community benefit. Historically, water utilities have done this with low rates targeted at very high levels of consumption that no household or average commercial customer would use.

- ***Short-Term Revenue Stability***: Year to year, most water utilities in Texas rely on revenue from water consumption charges to cover the predominantly fixed costs of the utility. Yet water consumption can vary and is on the decline for many utilities, undermining water utility revenue stability – which some are calling the "new normal."

Other objectives, such as ease of customer understanding, are explored in further detail in the "Recommended Reading" section of this report.

Striking a Balance



In setting rates, utilities must prioritize and balance objectives that are sometimes complementary and sometimes contradictory. A utility (in conjunction with its customers and stakeholders) must decide the objectives that take precedence and design a rate structure and level that reflects those priorities. For example, a utility wishing to encourage conservation and foster business-friendly practices might be conflicted over the use of a single increasing block rate structure for all its customers. A balance must also be considered when prioritizing affordability and revenue stability. A utility wishing to maintain affordability by keeping base charges and rates low for low use might have to sacrifice its need for month-to-month and year-to-year revenue stability that can be maintained through higher base charges.

One of the most notorious conflicts in balancing rate setting objectives is between the goal of revenue stability and that of customer conservation. The most prevalent retail pricing model in the industry relies on a modest base charge coupled with a much larger variable charge that is based on volumetric use. This highly variable structure provides an incentive for customer conservation and efficiency. Generally, the larger the ratio of variable revenue to fixed revenue, the greater the conservation incentive. A utility that incorporates the majority of its predominantly fixed utility costs into variable customer charges will do fine as long as sales projections are met or exceeded. But when there is an unexpected decline in sales volume (due to drought restrictions, economic recession, wet weather, etc.) and the sharp drop in revenue does not correspond to a reduction in costs, utilities expecting the majority of their revenues from variable charges will struggle to recover costs. Furthermore, if in response to gradual declines in demand, a utility continually focuses on increasing the variable portion of its charges to meet shortfalls it may very well be increasing future revenue vulnerability due to price elasticity. This phenomenon has been coined the "conservation conundrum[1]".

[1]Beecher, J. 2011. The Conservation Conundrum: How Declining Demand Affects Water Utilities. *Jour. AWWA*, 102(2): 78-80

Part II. Water Pricing in Texas

It is a fundamental challenge for water utilities (or any industry) to price a product such that it encourages customers to use less of it while at the same time recovering enough revenue to operate its business while not overcharging the customer.

Recently much has been written and studied regarding the "conservation conundrum", but it is not a new issue for the industry. (See Recommended Reading at end of report for older accounts of the conservation conundrum.) The following section provides an assessment of the balance between pricing and revenue stability in the State of Texas with a statewide summary of pricing and case studies of two of the state's largest utilities (San Antonio Water System and the Austin Water Utility) that have strategically used water rates to promote conservation while at the same time seeking more revenue stability.

Statewide Pricing

Each year, the Texas Municipal League (TML) conducts a survey of water and wastewater charges of the state's municipalities. Additionally, the Texas Water Development Board (TWDB) maintains a database of financial information on all the local governments that have outstanding debt with TWDB. The Environmental Finance Center has combined and analyzed this data to shed light on the state of rates and revenues, conservation pricing, and revenue stability with Texas water utilities.

Although this report discusses utility pricing from the perspective of the water utility engaged in supplying water, it is important to point out that the majority of wastewater utilities calculate charges based on water consumption, thereby compounding the financial impact of water consumption to the customer. Most customers are unlikely to distinguish the nuances of the charges, but rather respond to the absolute dollar impact of changes in water use.

Many utilities in Texas use a customer's average winter time water consumption to calculate monthly wastewater charges for an entire year. As a general practice, wastewater is not metered and so wastewater utilities use wintertime water consumption to equitably bill for the water that goes down the drain. This practice is likely to have two major impacts on customer demand. It reduces the price signal to customers to reduce water demand in the summer because the wastewater charge component is fixed. Nonetheless, it does enhance the pricing incentive to reduce water demand in the winter (likely indoor, less discretionary water demand) because a customer will be paying for that winter-time consumption all year long. Although the following analysis focuses on water pricing, it is important to consider that the rate for wastewater is likely to impact customer demand.

The concept of price elasticity explains why and how utilities use rates to encourage the conservation of water. Like most economic goods, there is an inverse relationship between price and the quantity of water demanded; i.e., price increases lead to reductions in demand. Price elasticity varies by geographic region, water end use, customer class, demographics, and weather, but for the most part, water demand is relatively inelastic. This means that a 10% change in price will cause less than a 10% change in demand.

Although there have been a number of studies on price elasticity of water, including one done for single-family residents in Texas[2], confounding factors make it difficult for individual utility managers to predict customer response to rates in the next year. Even harder is predicting how customers will respond to rate increases in the long-term because the long-term impacts of pricing are less known and studied[3]. Customer response to pricing could be behavioral (i.e. shorter showers or drier lawn) or structural (i.e. low-flow showerhead or replacement of lawn with xeriscape landscape), and behavioral responses are likely to diminish over time.

Although there are many other factors that influence water use, the following analysis provides narrow snapshots into the impact of water pricing on water use in the State of Texas and is introduced to provide context and explore concepts related to price elasticity. The trends shown in the analysis reiterate the impact of water pricing on water use; they do not contradict the numerous studies on price elasticity.

The data displayed in Figure 1 show the difficulty in driving revenue increases through rate increases. The utilities reflected in the graph below are those that took the Texas Municipal League's rate survey in 2007 and 2010 and have outstanding loans with the Texas Water Development Board. The change in the Consumer Price Index between 2007 and 2010 is plotted on the graph to provide scale to the degree of rate adjustments. Those utilities to the right of the vertical dotted line increased water rates more than inflation. Raising rates by a fixed percentage did not generate corresponding increases in revenues between 2007 and 2010 for all of these 103 utilities. In some cases, the divergence of rate increase percentages and revenue growth rates is severe. For some utilities, relatively significant rate increases corresponded to a period with no revenue growth or even a decline in overall revenues.

The data reveal that:

1) Revenues usually increase when rates increase, despite a downward pressure on customer demand due to elasticity;
2) Generally, larger rate increases are associated with disproportionately lower revenue increases;
3) The relationship between rate and revenue increases is complicated and varies from utility to utility.

[2] Stratus Consulting. Water Price Elasticities for Single-Family Homes in Texas. August 1999.
[3] Vista Consulting. Long-Term Effects of Conservation Rates. 1997. American Water Works Association. ISBN 0-89867-904-4

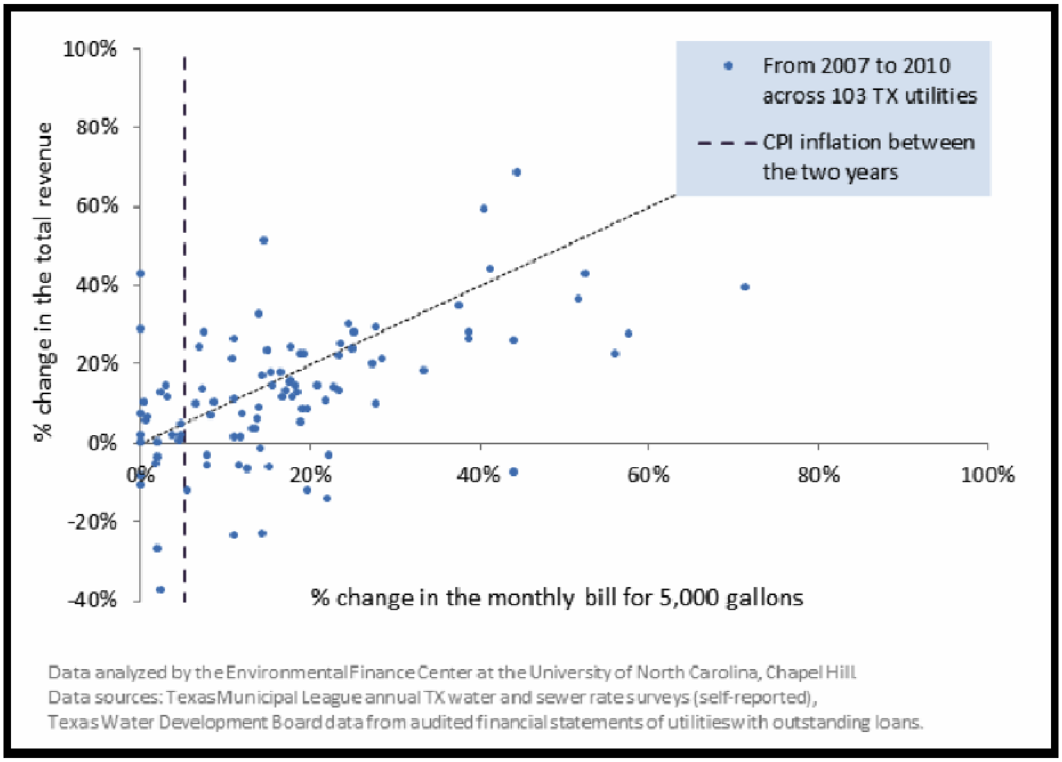


Figure 1. Driving Revenue Through Rate Increases

Of course, there are many factors beyond just price that affect this relationship (for utilities above and below the dotted line). Two utilities with identical rate increases may have very different outcomes in terms of revenue increases, even in the same state or region. **There is no single rule-of-thumb equation that utilities can use to accurately predict the effect of a rate increase on revenues, given that many other factors beyond the control of the utility will affect revenues.** Furthermore, the relationship between rate increases and revenue increases works in both directions; rate increases may drive down demand, which will lower revenue increases, and lower revenue increases may necessitate higher rate increases. **Utilities will probably find it difficult to raise rates fast enough to navigate their way out of a large revenue shortfall, since higher rate increases tend to yield disproportionately lower revenue increases[4].** As long as these trends are incorporated into revenue projections and pricing modifications, a utility should be able to maintain financial stability if they are willing to adjust rates accordingly. Problems can arise when utilities fail to consider scenarios that involve significant declines in usage and fail to set rates as realistic levels. Raising rates across-the-board is one tool to address revenue shortfalls, but this guide suggests other approaches as well.

[4] Hughes, J., and Leurig, S. 2013. Assessing Water System Revenue Risk: Considerations for Market Analysis. Ceres. http://www.ceres.org/resources/reports/assessing-water-system-revenue-risk-considerations-for-market-analysts

Figure 2 illustrates this effect by showing the change in a 5,000 gallon per month water bill between 2012 and 2013 versus the change in average household water use for the same time period. Although there are many more price points other than 5,000 gallons per month that could influence average household water use for an entire service area, **the trend shows a slight negative impact of pricing on water demand. In other words, as price increased, water use decreased.** The 512 Texas municipalities represented in the graph below are those that reported water rates in the Texas Municipal League's 2012 and 2013 water and sewer rate survey. This trend, however, is only cursory. There are many other factors that can influence water demand from one year to the next, predominantly weather.

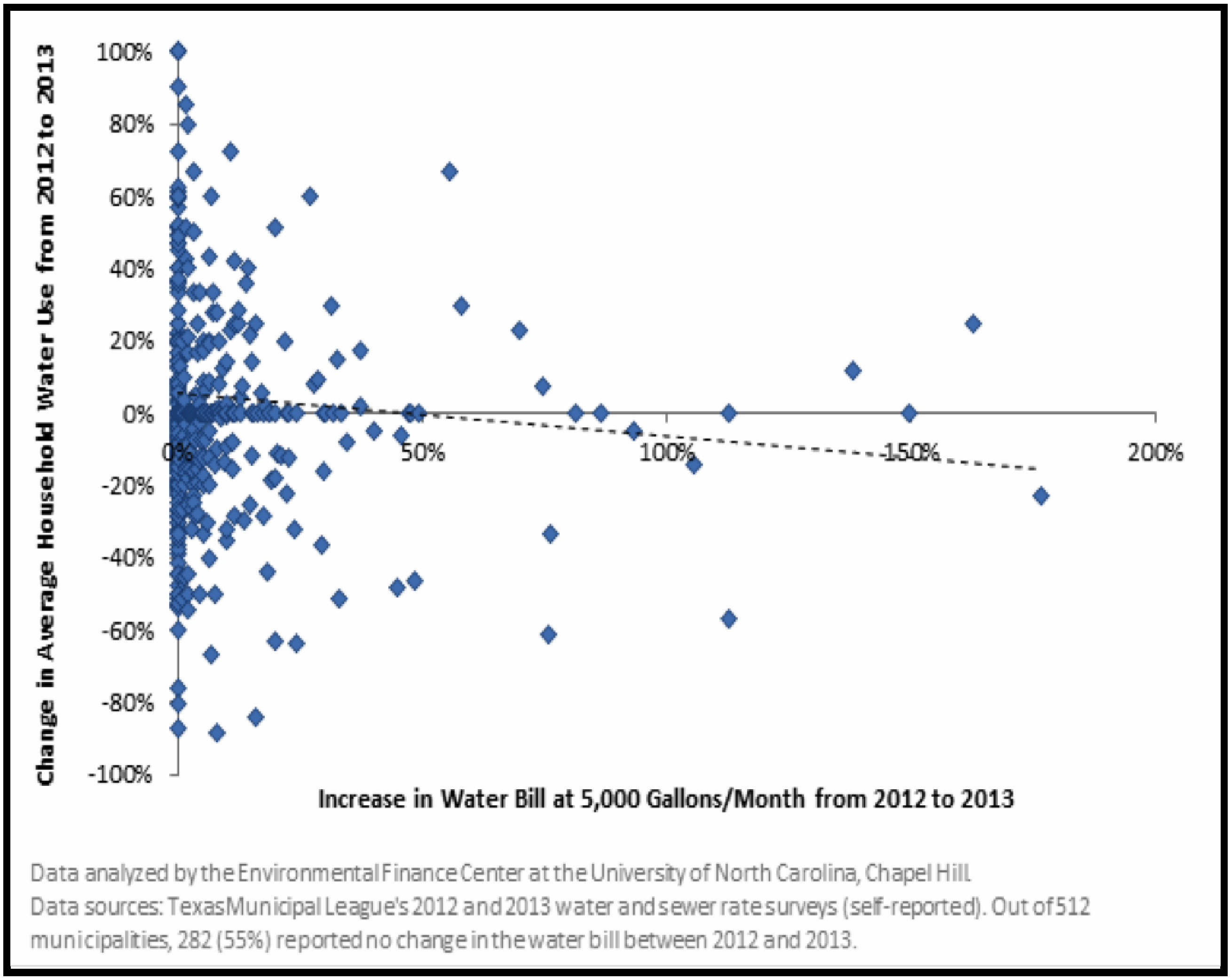


Figure 2. Changes to Water Prices and Average Household Water Use between 2012 and 2013 among 512 TX Municipalities

A simple comparison of prices versus average household water use demonstrates the pressure higher prices put on usage. Figure 3 summarizes water charges and average household water use by Texas water planning regions. The graph is arranged from highest-charging region to lowest-charging region. **Those regions with the higher charges tend to have the lowest trends in water use (i.e., Brazos G, Region B, North East Texas, and East Texas) while those that have lower charges tend to have the highest trends in water use (Rio Grande, Region H, and Panhandle).** The 528 Texas Municipalities included in the graph are those that reported water use and rates in the Texas Municipal League's 2013 water and sewer survey for which water planning region could be identified (excluding the Far West, Lavaca, and Plateau Regions due to an insufficient number of utilities with adequate data). And again, while the trend is interesting and insightful, there are many factors that influence usage beyond price including regional rainfall, economic condition, conservation ethos, etc. that may also be driving the usage differences.

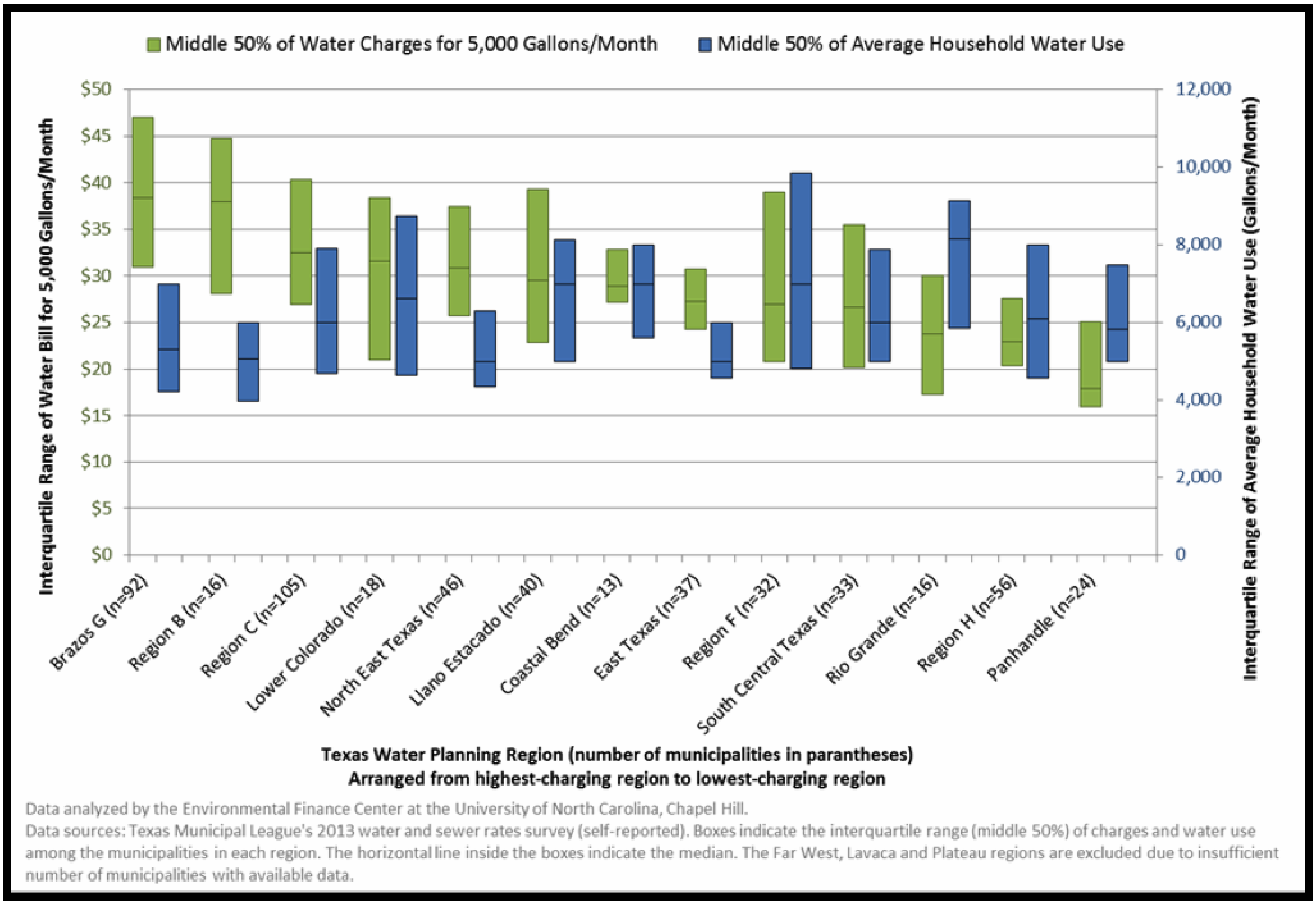


Figure 3. Water Charges and Average Household Water Use by Texas Water Planning Region Among 528 Texas Municipalities in 2013

Beyond the actual charge for a product, economists argue that it is the change in charge that a customer experiences when they use less or more of product that influences changes in use[5]. Figure 4 below shows the correlation between the change in charge between 10,000 gallons and 5,000 gallons per month (i.e. the marginal price of water between 5,000 and 10,000 gallons of use per month) versus a utility's average household water use**. It shows a downward trend between a utility's marginal price for water between these two consumption points and the average household water use for that utility, which suggests that as price increases water use decreases.** The 681 Texas Municipalities included in the graph are those that reported water rates and water use in the Texas Municipal League's 2013 water and sewer rate survey.

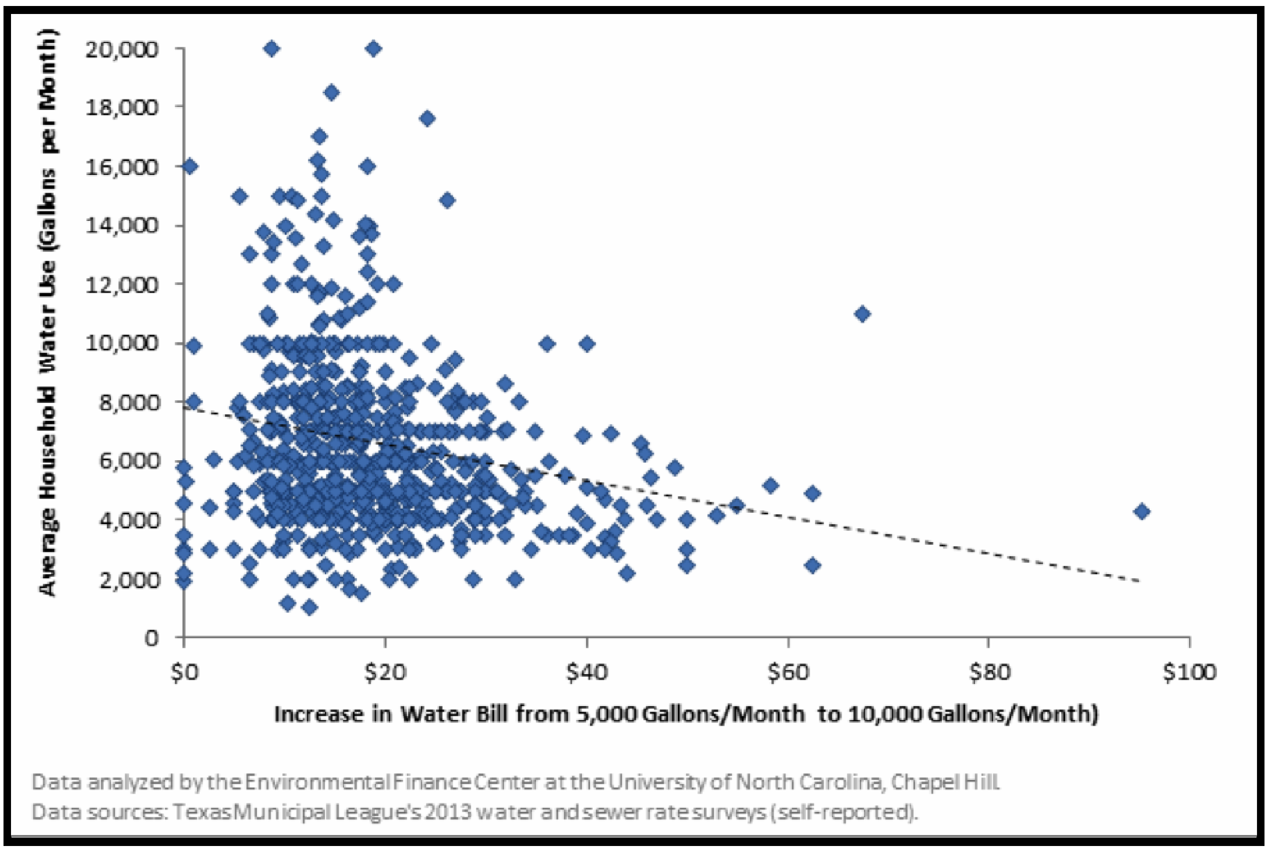


Figure 4. Correlation between Average Monthly Household Water Use and the Increase in Water Monthly Bill between 5,000 Gallons and 10,000 Gallons in 2013 (681 TX Municipalities)

[5] Howe, Charles. 2005. The Functions, Impacts and Effectiveness of Water Pricing: Evidence from the United States and Canada. Water Resources Development, Vol. 21, No. 1, 43–53, March 2005,

While a high marginal price may impact water use, it can mean more revenue volatility when customers reduce consumption. Figure 5 shows the wide range of price signals across Texas in terms of both the percent of bill and absolute expenditures. The figure reverses the marginal price metric shown in Figure 4 to show the percentage that a customer's bill is reduced when water use <u>decreases</u> by 5,000 gallons per month (from 10,000 gallons per month) along with the actual dollar amount of the decrease. For example, a customer served by Utility A will see their bill go down $24 dollars (representing 22% percent of their bill) when they reduce their water use from 10,000 to 5,000 gallons per month. Conversely, when a customer served by Utility B reduces their water use by half (from 10,000 to 5,000 gallons per month), they will see their bill go down $32 dollars which represents 62% in terms of percent of their bill. **The higher a point falls on the graph, the stronger the price signal in terms of percent change in bill and, consequently, the revenue vulnerability for the utility.** The average utility represented in the graph below will recover 36% less revenue from a customer using 5,000 gallons per month than one using 10,000 gallons per month. **But for 47 of the 693 utilities, a customer that reduces their water use by 50% (from 10,000 to 5,000 gallons per month) will reduce their bill by more than 50% signaling revenue vulnerability.**

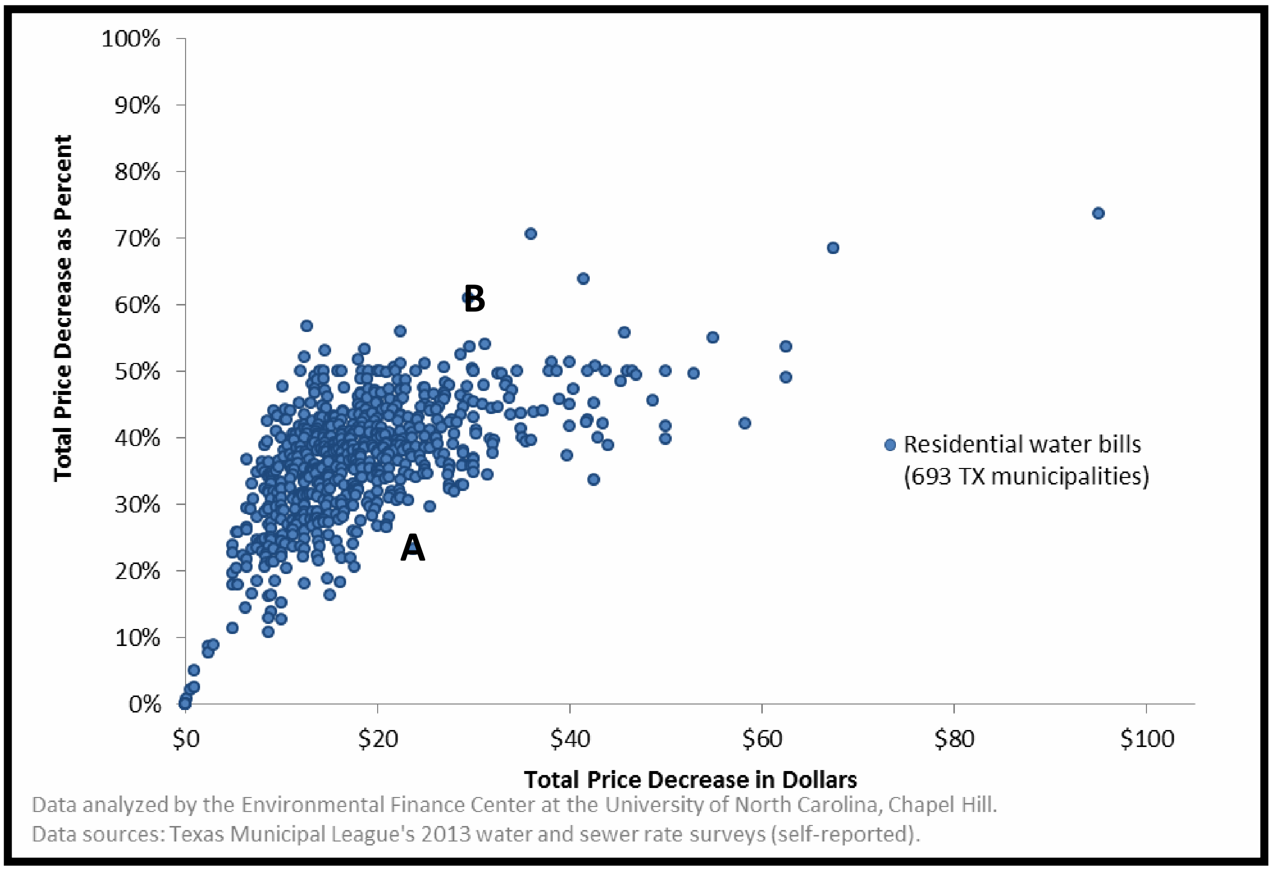


Figure 5. Reductions in Residential Monthly Water Bills for Decrease in Consumption from 10,000 to 5,000 Gallons in Texas in 2013

This can cause a revenue stability issue for utilities who derive more than 90% of their revenues from operating revenues and 80% of their operating revenues from consumption charges (a common situation for most utilities in the US)[6]. The 693 Texas utilities in the graphs are those that reported rates in the Texas Municipal League's 2013 water and sewer rates survey. Note: the 10,000 and 5,000 consumption points were chosen based on available data, but they also correspond to a realistic drop in usage that a family might see by implementing conservation initiatives particularly involving outdoor landscape irrigation.

The primary reason why this relationship between revenue and usage is not a 1:1 relationship (i.e. a 50% consumption reduction equates to a 50% bill reduction) is that volumetric rates are typically partnered with base rates (a fixed price that is charged no matter how much water used). The presence of a sizable base charge not only reduces the bill impact of conservation, but also helps to ensure a more fixed revenue stream for the utility. The 2013 Texas Municipal League rate survey did not collect base rate data. So the Environmental Finance Center collected base charge data from a geographically diverse group of fifty municipalities included in the 2013 Texas Municipal League rate survey (with an average population size of 22,707,and average household water use of 6,858 gallons per month) to compare "fixed versus variable" charges for customers and revenues for utilities. The figure below shows the range of bill (and to some extent revenue) stability at 5,000 gallons per month for each of these 50 utilities, with the median percent of residential water bill "fixed" falling between 51% and 60%. **In general, the higher the percent of residential water bill that is "fixed", the weaker the conservation signal and stronger the revenue stability.**

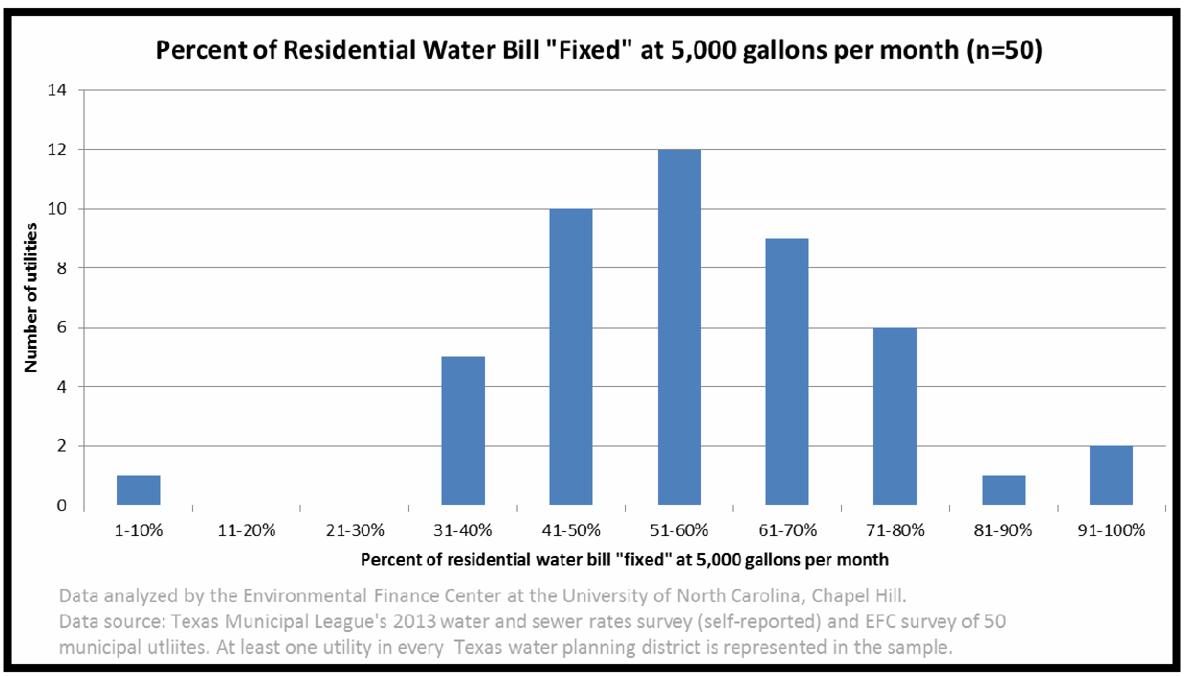


Figure 6. Percent of Residential Water Bill "Fixed" at 5,000 gallons per month (n=50)

[6] Hughes et al. Defining a Resilient Business Model for Water Utilities. Water Research Foundation Report. January 2014.

The analysis above explores the relationship between water pricing, water use, and revenue stability in the State of Texas using water rate data predominantly collected by the Texas Municipal League. Trends show that higher water prices are associated with lower average residential water use for water utilities that:

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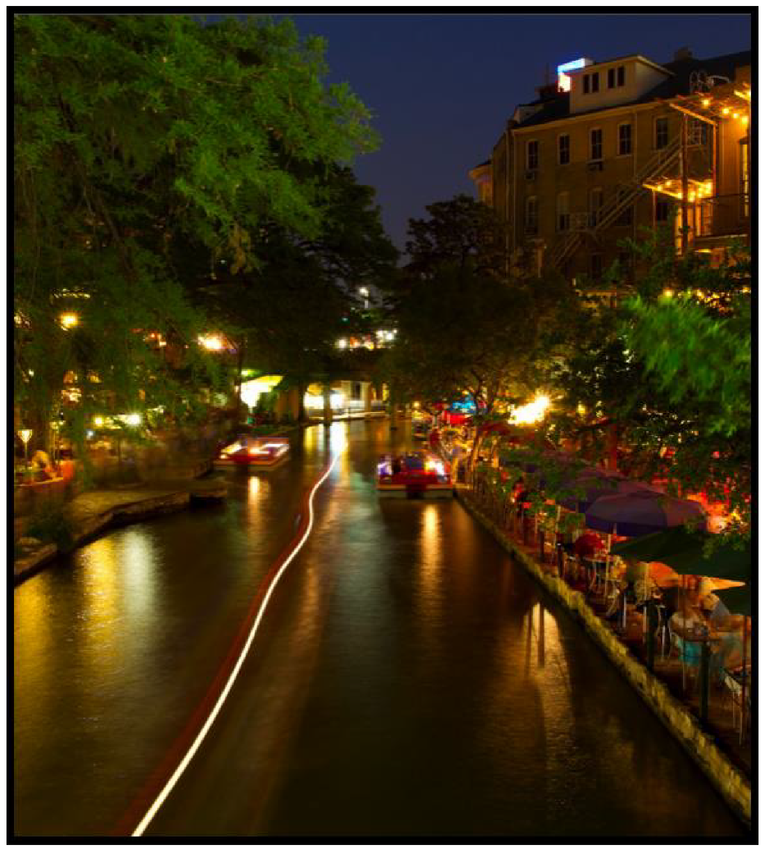
These trends are only a cursory exploration of the relationship between water use, water pricing, and revenue stability, but they confirm trends seen in other states and studies. There are many factors that contribute to a customer's water use from one year to the next and from one water utility to another. In addition to pricing, weather, economic factors, and customer demographics influence water use, and subsequently revenue. Similarly, there are many factors that impact the revenue stability for a water utility, such as cost drivers, service area characteristics, and demand projections.

A Tale of Two Texas Cities

As two of Texas' largest water utilities, the cities of San Antonio and Austin have a long history of using rates to promote customer conservation. Their backgrounds reveal a combination of large and incremental rate adjustments to drive down demand and drive up revenue stability.

San Antonio Water System



San Antonio Water System (SAWS) has been using increasing block rates to incentivize water efficiency and conservation since the 1980s. Though SAWS has maintained an increasing block rate structure, it has made modifications to encourage conservation over the years. In 1988, SAWS added a fourth block on its increasing block rate structure and a seasonal differential (i.e. higher volumetric rates in the summer) to account for fluctuations in usage at different times of the year. SAWS has also made great efforts to educate its customers on water use and the price of water. Since the 1990s, customer bills have included an individualized chart showing water use for the previous 12 months and a comparison to neighborhood and overall SAWS average residential water use for that month[7]. In addition, the utility has a policy to conduct a complete rate study every five years; the last one was performed during 2009[8]. A new study is currently underway and a Rates Advisory Committee, comprised of local stakeholders, has been appointed[9].

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7 Stratus Consulting. Water Price Elasticities for Single-Family Homes in Texas. August 1999.
8 Guz, Karen. A Rate Structure that Promotes Conservation. A PowerPoint Presentation given for the Gulf Coast Conservation Symposium on March 2, 2011 by Karen Guz, Director of Water Conservation for the San Antonio Water System.
9 Rate Advisory Committee Web site: https://www.saws.org/Who_we_are/community/rac/.

The utility uses its rate structure as a water conservation tool to:

- Send a price signal so customers become more conscious of their lawn and landscape water use
- Reward those who conserve water with lower bills
- Acknowledge that it is not fair to ask all customers to pay more for the lawn watering demands of a few. Rather, it is fairer to ask those who demand large amounts of water for irrigation purposes to pay for a higher cost of service[10].

In addition to conservation/demand management, SAWS identified two additional primary objectives for its rate structure in its 2009 rate study: financial sufficiency and rate stability[11]. The utility restructured its rates to reduce costs for low-using customers, helping to make water pricing more affordable for basic uses. Through its rate setting, the utility strives to fairly divide the "cost of service" across all customers.

SAWS funds operation and maintenance costs associated with conservation efforts through revenue generated from rates charged against the highest block of consumption, as well as a portion of the fixed monthly meter charges for general and irrigation class customers[12]. In addition, the utility has a drought surcharge that activates in stage four of drought, assessed for residential use greater than 12,717 gallons per month and commercial irrigation use greater than 5,236 gallons per month.[13] Drought surcharges are temporary charges additional to the existing rate structure. They can be effective at both promoting conservation (through increased charges for water use) and maintaining adequate revenues during times of drastic water use reductions[14]. Typically, the revenue recovered from a drought surcharge covers the revenue shortfall that occurs when customers conserve expectantly.

In 2001, SAWS added a flat water supply fee to fund the development, construction, and management of additional water supplies. Although, this helped the utility secure a more stable revenue base, it reduced the utility's conservation pricing signal. In 2010, the utility transitioned the water supply fee from a flat fee charged to all residential customers to a tiered, fixed water supply fee based on consumption. When it did this, it decreased the water delivery fee (variable rate) for residential consumption less than 12,717 gallons per month and increased the fee for consumption greater than 12,717 gallons per month. (The water supply fee is still flat for commercial customers.)[15] From its inception in 2001 through June 2013, the water supply fee has generated $862 million toward the investment in a diversified water supply portfolio.[16]

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[10] Guz, Karen. A Rate Structure that Promotes Conservation. A PowerPoint Presentation given for the Gulf Coast Conservation Symposium on March 2, 2011 by Karen Guz, Director of Water Conservation for the San Antonio Water System.

[11] Raftelis Financial Consultants. Comprehensive Cost of Service and Rate Design Study. Presentation to Rate Advisory Committee. October 30, 2008.

[12] Ibid

[13] San Antonio Water System Drought Operations Plan. Available at: http://www.sanantonio.gov/Portals/0/Files/Sustainability/DroughtOperationsPlan.pdf

[14] American Water Works Association. 2012. Principles of Water Rates, Fees and Charges (M1). 6th Edition. http://www.awwa.org/store/productdetail.aspx?productid=28731

[15] Guz, Karen. A Rate Structure that Promotes Conservation. A PowerPoint Presentation given for the Gulf Coast Conservation Symposium on March 2, 2011 by Karen Guz, Director of Water Conservation for the San Antonio Water System.

[16] San Antonio Water System. Water Management Plan Semiannual Report. January – June 2013.

Isolating the impact of SAWS' rate structure on water demand requires a detailed statistical study, but in its 2013 Water Management Plan Update, SAWS asserted that its customers would save more than 5 billion gallons of water per year by 2020 through its entire conservation program which includes rate structures[17].

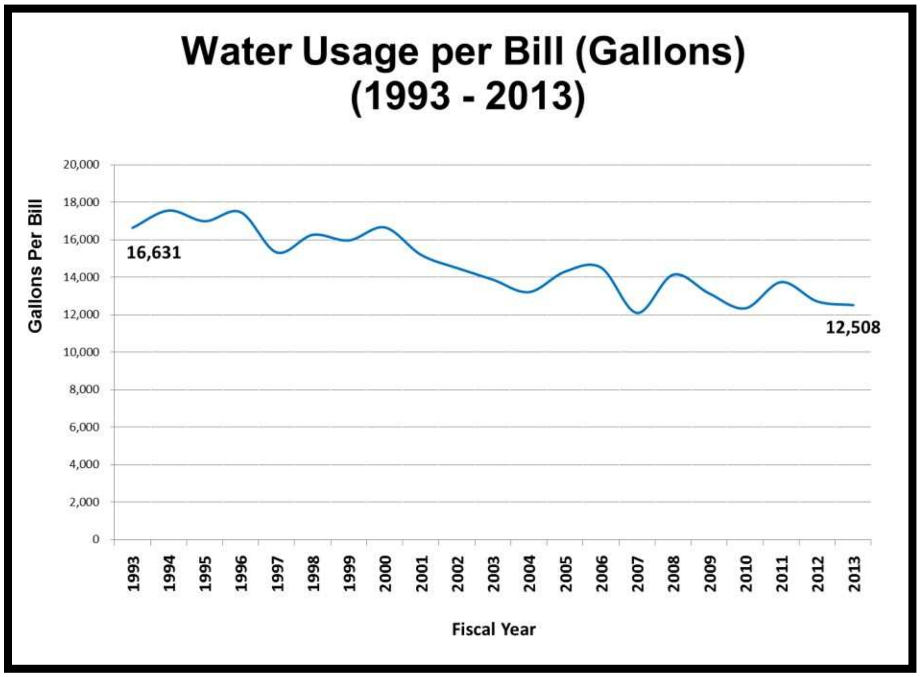

Figure 7. Changes in Water Use per Bill for the San Antonio Water System (1996 – 2013)[18]

Figure 7 shows a significant downward trend in water use per bill, volatility around that trend due to weather variation, and the downward effects of conservation drought restrictions from 1996 through 2013[19]. Average winter consumption (which is used to calculate wastewater charges) has also dramatically declined over the last decade as a result of indoor conservation efforts and growing public awareness about the winter averaging method and measurement period. In an effort to address a multitude of utility objectives through its rates, the San Antonio Water System has developed a fairly complicated rate structure over time. They are utilizing their rate structure for more than revenue recovery and have incorporated the predicted savings in response to increased rates into their water management plan. SAWS continues to grapple with the tradeoff between conservation promotion and revenue stability but have taken great strides to better align these often conflicting objectives.

[17] San Antonio Water System. Water Management Plan Semiannual Report. January – June 2013.
[18] Data provided by Doug Evanson, Chief Financial Officer for SAWS, February 14, 2014.
[19] SAWS. 2012 Annual Budget Report. Fiscal Year Ending December 31, 2012.

Austin Water Utility

Much can be learned about rate setting for conservation and revenue stability through the deliberations and recommendations of the Joint Committee on Austin Water Utility's Financial Plan that was convened in 2012[20] to "develop recommendations for short-term and long-term financial plans to strengthen the financial stability of the Austin Water Utility while continuing the city's goals of ensuring affordability of water rates and increasing water conservation."

The Joint Committee considered over 30 rate design options and compared each rate structure using a volatility, affordability and conservation ranking. This allowed the Committee members to see the impact of their recommendations.

Among the recommendations by the Joint Committee, two addressed the balance between conservation and rate stability objectives, including that the utility should:

- Increase fixed revenue goal to 20% of total water revenue requirements. Fixed revenues will be allocated to each customer class based on its relative water cost of service after the monthly minimum charge. The recommended increase will come from replacing a flat "revenue stability fee" with a tiered fixed fee based on volume of water used. *(Background: Prior to instituting a revenue stability fee in 2012, fixed revenue was about 11%. This effort was recently praised by Standard and Poor's Rating Agency[21].)*

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[20] Austin City Council Resolution that created the Joint Subcommittee. Available online at: http://www.austintexas.gov/sites/default/files/files/Water/JointSubcommittee/resolutionno20120112-063.pdf

[21] Hughes, Jeff, Peiffer Brandt, Mary Tiger, and Shadi Eskaf. 2014. Defining A Resilient Business Model for Water Utilities. Available at: http://www.waterrf.org/Pages/Projects.aspx?PID=4366

- Create an "as-needed" Revenue Stability Reserve Fund, which will be funded by a reserve fund surcharge (a volumetric surcharge charged to all customer classes in order to build or replenish the reserve fund), excess operating cash balances, and other sources. *(Background: The Revenue Stability Reserve Fund is only to be used to offset a current year water service revenue shortfall where actual water service revenue is less than the budgeted level by at least 10%. The utility can't use more than 50% of the Fund's existing balance at the time of the request.)*

Although the utility did not accept all of the committee's recommendations, it did accept these two. The utility anticipates some significant rate increases over the next few years to achieve these revenue stability objectives and manage the system's declining and fluctuating demand, as depicted in Figure 7.

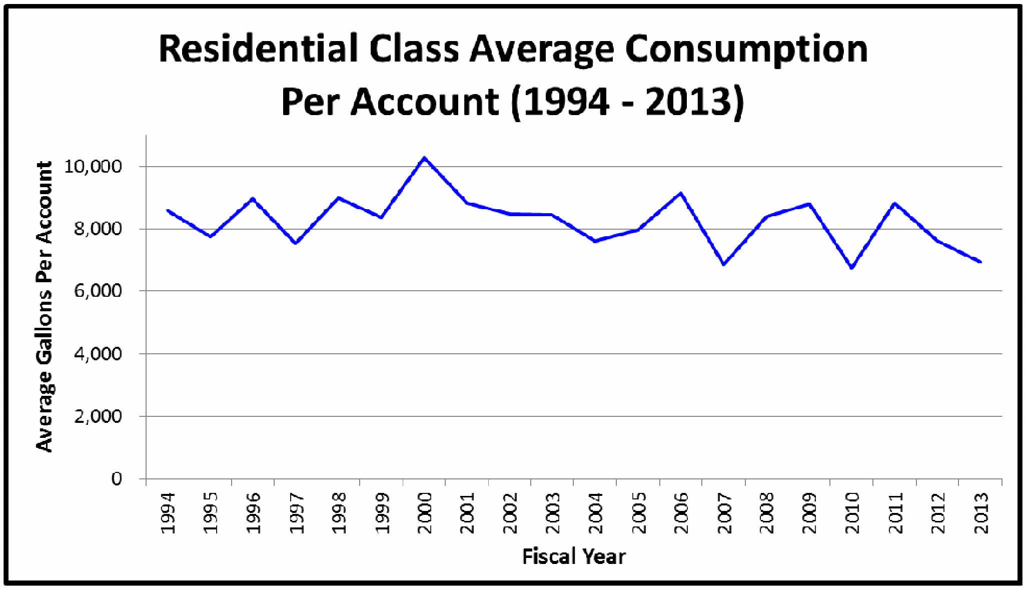

Figure 7. AWU Residential Class Average Consumption Per Account[22]

In recent years, declining demand is partially attributed to the intended and unintended water savings from watering restrictions enacted in response to drought[23]. As intended, the restrictions have helped reduce peak water use. However, an unintended consequence of the restrictions is that they (in combination with increasing water rates) have incentivized large irrigators to drill private wells to water freely from underground aquifers, further exacerbating water stresses in the region and reducing revenue for the utility. This experience highlights the fine line that water utilities walk between promoting conservation and ensuring revenue stability. As with SAWS, AWU's deliberation with and evolution of the balance between revenue stability and conservation promotion highlights both the need for and reality of financially dealing with conservation and the thoughtful considerations of the outcomes of policy and pricing.

[22] Data provided by Michael Castillo, Utility Budget and Finance Manager at Austin Water Utility, February 11, 2014
[23] Interview with Michael Castillo, Utility Budget and Finance Manager at Austin Water Utility, February 11, 2014

Part III. Recommendations and Considerations for Designing Water Rate Structures for Conservation and Revenue Stability

The following section provides guidance on rate structure design and billing practices for water utilities that are attempting to decrease water usage among primarily their residential customers. There may be additional rate structure design and billing practices that utilities can implement to encourage water conservation among non-residential customers, but these are not addressed below. In 2004, the Water Conservation Implementation Task Force created by the Texas Legislature and appointed by the Texas Water Development Board produced a guide on water conservation Best Management Practices (BMPs). Many of the conservation guidelines listed below follow suit with the water conservation pricing BMPs in that guide.[24]

Rate Structure, Billing Options, and Financial Practices for Conservation and Revenue Stability

The following rate structures, billing options, and financial practices are designed to promote customer conservation and/or revenue stability. In many cases, a combination may be necessary to meet both objectives. All utilities should determine the cost to deliver service in the short and long term, and establish a baseline revenue requirement prior to engaging in additional rate deliberations.

[24] The Texas water conservation Best Management Practices are now available online and are updated periodically. https://www.twdb.texas.gov/conservation/BMPs/index.asp

Approaches to Ensure a Pricing Signal is Being Sent

1. **Use monthly billing period.** The more frequently a customer receives utility bills, the more aware they are of their consumption and the more price-responsive they are in their conservation efforts. Utilities are encouraged to use monthly billing when fiscally feasible.

2. **Provide price and use information on customers' bills.** Use the bill itself as a document to share information with the customer. Customers that can view their current and/or historic water use along with their utility's rates on the bill itself often adjust their consumption behavior and use less water. The 2004 Texas water conservation Best Management Practices Guide recommended at least 12 months of consumption history on a bill.

3. **Encourage sub-metering in existing apartment complexes and other master-metered multi-family residential housing areas.** Customers that receive their own utility bill directly have a greater financial incentive to repair leaks and conserve on water usage.

4. **Incorporate all the costs of water into price setting.** Many utilities fail to consider the true cost of their capital in pricing leading to artificially low prices that send inaccurate signals to customers about the value of the service.

5. **Understand the relative price signal**. Texas utilities can benefit from the body of rate and pricing information collected by the Texas Municipal League to allow utilities to understand how their pricing structures and signals compare across the state. A dashboard prepared by the Environmental Finance Center allows utilities to generate customized benchmarking analyses relatively quickly[25].

[25] Available online at: http://www.efc.sog.unc.edu/project/utility-financial-sustainability-and-rates-dashboards

Evaluation of the Pricing Signal at Various Consumption Points and Targeting Specific Types of Water Use

1. **Set prices that encourage water conservation at the average as well as high levels of residential customer consumption.** A price targeted at the average level of residential customer consumption will influence the water use of many more customers.

2. **Design a rate structure that significantly reduces total bills for customers that reduce water use – marginal price consideration.** This will have a great impact on the total bill for customers and have a higher potential to change behavioral and structure water use.

3. **Use an increasing block rate structure with 3 or 4 blocks within the first 20,000 gallons/month.** Having increasing block rate structures alone does not ensure a "conservation-oriented" rate structure. The first block beyond the base charge should be set near the wintertime average residential water use at the utility, or less than 5,000 gallons/month by default. If the difference between block rates is insubstantial, the customer will likely not notice any changes to their monthly bills as they move in and out of later blocks of usage. For a block rate structure to be effective in communicating the higher (or lower) price of water at different consumption levels, the difference in the block rates should be significant.

4. **As an alternative to an increasing block rate structure, use a higher uniform rate structure or a seasonal rate structure that permanently charges higher rates in the summertime than in the wintertime.** Seasonal rate structures can also be combined with increasing block rate structures.

5. **If irrigation water is metered separately, create an irrigation meter rate structure and charge a higher volumetric price for irrigation water than for standard household water.** Although this is likely to somewhat dissuade the use of a separate irrigation meter (thereby reducing the ability of the utility to measure irrigation water use), it will target pricing to peak-day consumption. The 2004 Texas water conservation Best Management Practices Guide suggested the adoption of a rule/ordinance requiring new commercial and institutional customers to install separate irrigation meters.

6. **Consider temporary rate adjustments (e.g. "drought surcharges") that are tied to drought conditions and water storage levels.** The implementation of these temporary rate adjustments should be clearly tied to water storage triggers identified in a utility's drought contingency plan. Utilities should develop and adopt temporary rate adjustment policies and communicate them with their customers before the next drought or water shortage period. This strategy can compensate for lost revenue due to the imposition of other water conservation measures, while at the same time encourage customer conservation when a water supply most needs it.

7. **Do not charge residential customers (or usage below 20,000 gallons/month) using decreasing block rate structures.** A "decreasing block rate structure" is one where the volumetric price for water ($/1,000 gallons or $/ccf) decreases for higher levels of consumption, thereby reducing the conservation signal for the most discretionary water uses. Some utilities with one price structure for all customers will use a decreasing block rate structure for usage at high levels to incentivize commercial and industrial customers.

Complementary Practices for Revenue Stability

1. **Review rates each year and adjust rates as needed to meet both operating and long-term costs**. Rates should be reviewed at least once a year to ensure that rates meet system costs. Increases also may be used to encourage conservation actions that respond to rate structure.

2. **Improve accuracy of demand and revenue projections.** Pricing that takes into consideration potential significant demand reductions are less likely to produce unexpected revenue shortfalls. While this worse case planning may lead to short term cash surpluses, in most cases these funds can be deployed effectively and efficiently to stabilize future rate increases or fund capital improvements that otherwise would have been debt financed.

3. Repeated - **Consider temporary rate adjustments (e.g. "drought surcharges") that are tied to drought conditions and water storage levels.** The revenue generated from these temporary rate adjustments can be used to off-set revenue shortfalls as a result of drought-time water use restrictions.

4. **Consider the establishment of and funding strategy for a rate stabilization fund.** Reserve funds have become an increasingly important part of water utilities' efforts to ensure financial stability and resiliency. Reserves dedicated as "rate stabilization funds" are used to create a monetary buffer to offset the financial risks of customer consumption reduction.

5. **Consider a fixed charge based on consumption, in addition to a fixed meter charge and volumetric charge.** Both the San Antonio Water System and the Austin Water Utility have adapted their increasing block rate structures to incorporate a "tiered" base charge based on a customer's consumption. This approach helps "levelize" charges and revenues, while still sending a conservation signal. You can read more about "Alternative Rate Designs" that promote conservation and advance revenue stability in the so-named chapter in "Defining a Resilient Business Model for Water Utilities" report cited in the "Recommended Reading" Section.

6. **Consider revenue generated from consumption at the highest tiers to be more vulnerable than other revenue (especially when paired with customer conservation).** Given a stronger pricing signal and a likely more discretionary water use that can be curtailed under the right pricing signal, revenue generated from higher levels of consumption (particularly when increasing block rate structures are used) are more volatile. Utilities should consider a use for this revenue beyond operations, maintenance, and debt service expenses.

Choosing the Right Practices to Match Local Conditions

While all utilities are encouraged to promote efficient use of water resources, there are varying degrees to which utilities may need to actively promote conservation in order to ensure adequate supply to meet their demands. Furthermore, some strategies may be more or less effective given various cost-drivers, supply projections, utility size, and demand projections.

One standard rate structure or set of pricing practices will not fit all utilities in the State of Texas. Hence, these guidelines represent good practice in many circumstances but are not necessarily all suitable for all water utilities or even the same water utility at different points in time. The following utility-specific scenarios are likely to influence the degree and approach of conservation-oriented rates by an individual utility. Most importantly, they are likely to influence the revenue per account required by the utility, which will influence the overall price of water across its service area and, subsequently, the conservation signal sent via rates.

Although these are not the only considerations in rate structure and financial practice design, they will largely drive the degree and approach of conservation-oriented rates at individual utilities.

- **Cost drivers for the utility.** In the short-term, water utility costs are largely fixed regardless of how much water is delivered to customers. But, in the long-run (depending on a utility's specific water supply projections, options to increase water supply, and state of capital needed to treat and deliver the supply), conservation can be a more cost-effective option than supply and capital expansion. This is the case for a utility facing expansion of either supply or capital (or both) within their planning horizon as opposed to a utility with adequate forecasted supply and capital. Additionally, the source of water can influence the cost-drivers for a utility. Water systems that purchase treated water will likely have much more variable costs than their counterparts that treat water. Depending on the purchase contract, utilities that purchase water will not likely suffer from the "conservation conundrum" (i.e. costs will align more with consumption). However, they are also not as likely to directly benefit from the long-term financial savings associated with conservation[26]. In 2011, 69% of the utilities that submitted total municipal water use surveys to the Texas Water Development Board used self-supplied water, 19% used purchase water, and 11% used a combination[27].

- **Size and characteristics of service area.** Perhaps one of the most generalizable determinants of utility financial performance and rate setting is facility size and customer base. Larger utilities

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[26] Clarke, Margot. 2012. Thirsting for Less: Water Conservation Progress and Potential in North Central Texas. Sierra Club and theTexas Living Waters Project. Available at: http://www.texas.sierraclub.org/water/20121213ThirstingforLess.pdf
[27] Email exchange with Kevin Kluge, Acting Manager, Water Use, Projections & Planning, Texas Water Development Board. January 7, 2013.

can take advantage of economies of scale and spread their costs (which are mostly fixed) over a greater number of customers, thereby reducing costs per account. Smaller utilities have many of the same fixed costs and requirements with fewer customers to cover costs. Smaller utilities are likely to charge high base rates to their customers. Additionally, a smaller utility staff may lack time and expertise to set strategic rates. Larger systems are also more likely to have a diverse customer base (i.e. a healthy mix of residential, commercial, industrial, and wholesale customers) and are less vulnerable to revenue fluctuations as a result of individual customer behavior change.

- **Demand projections.** Demand projections, in conjunction with supply projections, drive much of the need for capital and water resource expansions. Water utilities have typically erred on the side of over-estimating customer demand for multiple reasons including:
    (1) The risk to public health of over-projecting demand are much less than of under-projecting demand;
    (2) A historic trend of increasing demand, and
    (3) Assurance that the system will have capacity to support community development and growth that may or may not have been accurately forecast[28].

[28] Hughes, Jeff, Peiffer Brandt, Mary Tiger, and Shadi Eskaf. 2014. Defining A Resilient Business Model for Water Utilities. Available at: http://www.waterrf.org/Pages/Projects.aspx?PID=4366

Although the public health risks still remain if a utility under-predicts demand, financial pressures are increasingly leading utilities to become more conservative with their sales projections. Additionally, over-predicting sales and investing in infrastructure to meet that demand can risk public health if a utility forsakes expansion over infrastructure repair and replacement. Nonetheless, demand and population growth (in conjunction with water supply projections) will impact the degree and approach of conservation-oriented rates. These projections, compiled for each Texas Water Planning Region, are summarized in Table 1 below.

Table 1. Projected Water Supply, Water Demand, and Population Growth from 2020-2030

Texas Water Planning Region	Changes in Regional Water Supply from 2020 to 2030[29]	Municipal Water Demand Growth from 2020 to 2030[30]	Population Growth from 2020 to 2030[31]
Panhandle (A)	Decrease (-8%)	Moderate (8%)	Moderate (10%)
Region B	Decrease (-1%)	Low (1%)	Low (4%)
Region C	Stable (0%)	High (13%)	High (15%)
North East Texas (D)	Decrease (-1%)	Moderate (6%)	Moderate (9%)
Far West Texas (E)	Stable (0%)	Moderate (10%)	Moderate (14%)
Region F	Stable (0%)	Moderate (7%)	Moderate (9%)
Brazos (G)	Stable (0%)	High (12%)	High (15%)
Region H	Increase (2%)	Moderate (10%)	Moderate (12%)
East Texas (I)	Stable (0%)	Moderate (4%)	Moderate (7%)
Plateau (J)	Stable (0%)	Moderate (5%)	Moderate (9%)
Lower Colorado (K)	Decrease (-1%)	High (17%)	High (19%)
South Central Texas (L)	Decrease (-1%)	High (12%)	High (16%)
Rio Grande (M)	Stable (0%)	High (18%)	High (21%)
Costal Bend (N)	Increase (2%)	Moderate (5%)	Moderate (8%)
Llano Estacado (O)	Decrease (-15%)	Moderate (7%)	Moderate (10%)
Lavaca (P)	Stable (0%)	Low (0%)	Low (3%)
Texas Total	Decrease (-12%)	Moderate (11%)	Moderate (14%)

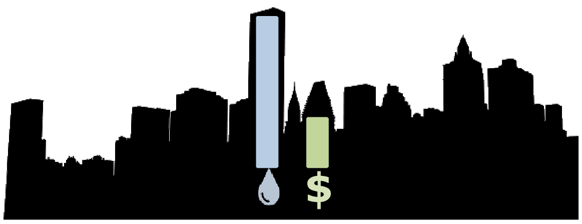
[29] Summarized from Regional Water Supply Summary and Projections in 2011 Regional Water Plans. http://www.twdb.state.tx.us/waterplanning/rwp/plans/2011/index.asp

[30] 2016 Regional Water Plan: Regional Summary of Water Demand Projections for 2020-2070 in acre-feet. Municipal Water Demand Growth calculated as the percent differences between municipal demand projections in 2020 and 2030. http://www.twdb.state.tx.us/waterplanning/data/projections/2017/demandproj.asp

[31] 2016 Regional Water Plan: State and Regional Population Projection for 2020-2070. "Population Growth" calculated as the percent differences between regional population in 2020 and 2030. http://www.twdb.state.tx.us/waterplanning/data/projections/2017/popproj.asp

Utilities with different cost drivers, customer characteristics, and supply and demand issues will come to different conclusions on the rate structure design that is most appropriate for them. Below are three hypothetical scenarios followed by a discussion of how each hypothetical utility can utilize rate setting and structure to promote conservation and ensure revenue stability.

Scenario #1: Urban Utility with Relatively Low Costs, High Demand, and Water Supply Challenges

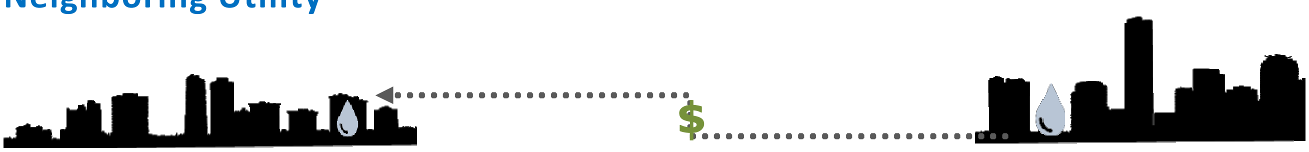


In this scenario, an urban utility with low per-customer costs of service and high peak demand wishes to encourage conservation. Their primary rate-setting objective for rates is to recover costs of service, and their second highest objective is to encourage conservation.

Urban utilities typically have a very large and diverse customer base over which they can spread more of the fixed costs of water treatment and delivery. As such, this utility can have lower base charges and build more cost recovery into the variable charge, ensuring that customer bills are sensitive to use reductions. Furthermore, larger utilities typically have the staff and billing software capacity to utilize increasing block rates, bill monthly, and provide detailed usage information.

Although they may already have increasing block rates in place, they can do more to promote conservation by making the differences in rates between the blocks greater and setting rates high for the highest level of consumption. But if they are pricing the highest tiers of consumption at levels to promote conservation, they should be financially ready for it. They will likely want to budget for the revenue from the highest tiers of consumption to be vulnerable and variable and/or maintain a rate stabilization fund to mitigate revenue fluctuations.

Scenario #2: Mid-Size Water System That Purchases Treated Water from Neighboring Utility



The water system in this scenario has about 25,000 customers and purchases treated water from a neighboring utility. While they still have the fixed costs associated with the distribution system, the majority of their costs are dependent on how much water is delivered. For this utility, there is much more of a direct relationship between costs and revenues than its counterparts that secure and treat water; conservation will have a much more immediate impact on the utility's expenses without a great deal of financial risk. As such, this mid-size purchase system can have a very low flat fee and a significant variable charge to promote conservation. It will likely want to align its customers' rate structure with the utility's rate structure for the purchased water.

Scenario #3: Rural Water Utility with Naturally High Costs That Wants to Maintain Affordability

This rural utility with naturally high rates wants to maintain water affordability, while also helping to send a signal to its customers to not waste water. In this case, water will be naturally more expensive for all users and there is much less of a need for an aggressive increasing block rate structures to send a pricing signal.

Uniform rates are simple to design and implement, and cost recovery of the naturally high costs of water will practically require a pricing level that sends a conservation signal. The tradeoff occurs between base charges and consumption allowances. Since the utility has high costs of service, it may be forced to set a high base charge. If this happens, the utility can offset some of that impact on low income customers by including a consumption allowance with the base charge. However, if possible, the utility will want to set as low a base charge as possible to keep bills low for low consumption customers and send a conservation signal. Monthly billing should be used to send out smaller bills more frequently to their customers instead of larger bimonthly or quarterly bills, which could be difficult to pay for some customers. In the case of maintaining residential affordability, utilities can look beyond their rates and rate structures and implement customer assistance programs. This would assist the customer who needs assistance the most, while also ensuring that the utility collects the revenue it needs to protect public health.

Texas utilities are not the only ones that deal with the "conservation conundrum." Utilities across the country are grappling with the same issues and there are a number of good rate setting guides and documents available that have been prepared for specific regions or states. The following resources contain material applicable to Texas utilities.

Part IV. Recommended Reading

Assessing Water System Revenue Risk: Considerations for Market Analysis

Hughes, J., and Leurig, S. 2013. Assessing Water System Revenue Risk: Considerations for Market Analysis. Ceres. http://www.ceres.org/resources/reports/assessing-water-system-revenue-risk-considerations-for-market-analysts

This report is a result of a partnership between The Environmental Finance Center at UNC and Ceres that investigates water system revenue risk and offers considerations for market analysts. The report offers an analysis of revenue risk using actual utility data in three states that are experiencing changing water use patterns: Colorado, North Carolina, and Texas. The analysis demonstrates that utilities with the same generic pricing structure can have widely variable exposure to revenue instability from changes in customer use. This report characterizes the challenges facing many utilities and identifies potential metrics that may be used by bond analysts to understand the revenue resilience of water systems' pricing structures. The report describes factors driving current pricing practices among drinking water providers, including financial requirements, public policy goals, ease of implementation, and political constraints, and offers analysis of pricing structures. Finally, the report proposes metrics for assessing rate structures, which include competitiveness, affordability, revenue sufficiency, revenue vulnerability, and conservation pricing signals.

California Water Rates and the "New Normal"

Donnelly, K., and Christian-Smith, J. 2013. California Water Rates and the "New Normal". The Pacific Institute. http://www.pacinst.org/publication/water-rates-series/

The first in a series of white papers to help water service providers cope with the "new normal" of decreased water demand and rising costs, this paper offers analysis of different rate structures that can be used to meet costs and ensure revenue resiliency. This paper is structured to support providers in evaluating common water rate structures (e.g. flat rate/fee, uniform volumetric rate, block or tiered rate) by examining rate structures and the characteristics of the new normal, which includes more uncertain water supply; new legislation, codes, and standards; and overall increasing costs to provide a safe drinking water supply. The report also prepares managers to educate their customers about how water is priced, and provides case studies highlighting challenges associated with adopting new rate structures.

Declining Water Sales and Utility Revenues: A Framework for Understanding and Adapting

Beecher, J., and Chesnutt, T. 2012. Declining Water Sales and Utility Revenues: A Framework for Understanding and Adapting. Alliance for Water Efficiency. http://www.ipu.msu.edu/research/pdfs/Summit-Summary-and-Declining-Water-Sales-and-Utility-Revenues-2012-12-16.pdf

This white paper offers a discussions of the root causes of and potential solutions to the revenue shortfalls and fiscal distress associated with declining water sales and utility revenues. The paper examines how and why water sales are declining, the degree to which water utility revenues are falling short of revenue requirements, communications strategies for water utilities and the conservation community, methods to improve fiscal stability, and the role of industry standards, practices, and policy reforms.

Defining a Resilient Business Model for Water Utilities, Water Research Foundation Project 4366

Hughes, J. et. al. 2013. Defining a Resilient Business Model for Water Utilities. Water Research Foundation. http://www.waterrf.org/Pages/Projects.aspx?PID=4366

This report provides an assessment of the revenue model and resulting financial condition of water utilities in North America, considers factors influencing financial performance, and discusses practices that have the potential to improve financial resiliency. This report primarily addresses the revenue and rates side of financial balance that utilities must navigate. It first summarizes the financial condition and state of revenues in the water industry, goes on to consider trends in the context of the factors that influence a utility’s business model, and presents option for revenue resiliency strategy, policy, and practices. Additionally, the report presents a potential methodology and tool for assessing the risk of revenue losses. The analysis shows that there is no one generalizable financial outcome for the industry, as there are clear differences between regions, states, and utilities.

Designing, Evaluating, and Implementing Conservation Rate Structures

Chestnutt, T. 1997. Designing, Evaluating, and Implementing Conservation Rate Structures. California Urban Water Conservation Council. http://www.cuwcc.org/docDetail.aspx?id=720

This report sets forth information on innovative ways to price urban water service. This handbook provides practical assistance to utilities and their rate consultants implementing rate structures that promote more efficient use of water while taking into account the other functions a rate structure must fulfill.

Forecasting Urban Water Demand, Second Edition

Billings, B. and Jones, C. 2008. Forecasting Urban Water Demand. 2nd Ed. American Water Works Association. http://www.awwa.org/store/productdetail.aspx?ProductId=6395

The American Water Works Association's *Forecasting Urban Water Demand* is a resource that provides detailed tools and strategies to assist water managers in forecasting short-, mid-, and long-term water demands. The book includes discussion on a variety of factors that impact urban water demand, including population, weather, climate, water rates, and conservation programs. It also includes guidance on how managers can tailor forecasting methods according to the purpose of the forecast, for example how forecasting for revenue may differ from forecasting for raw water supply or infrastructure improvements. In addition, the book incorporates instruction on data requirements and statistical analysis and is paired with a CD that contains daily water data, daily water use, an interactive demand curve chart, per capita water demand, and more.

Gauging the Understanding and Support of a Drought Surcharge in Mecklenburg County

Tiger, M. 2009. Gauging the Understanding and Support of a Drought Surcharge in Mecklenburg County. The Environmental Finance Center at UNC. http://www.efc.sog.unc.edu/reslib/item/gauging-understanding-and-support-drought-surcharge-mecklenburg-county

A drought threatens both water supply and a utility's primary source of revenue. Consequently, many utilities explore the use of surcharges, which temporarily increase water rates during drought, as a way to stabilize revenues and promote conservation while keeping in mind the need for affordable water. Such was the case for Charlotte-Mecklenburg Utilities during the 2007-08 drought. The purpose of this research is to gauge common themes of customer and City Council member perspectives on a proposed drought surcharge in Mecklenburg County. Insight from this research helps utilities in their consideration, development and communication about drought surcharges in their own communities. The report concludes that effective communication about surcharges is imperative, and that a drought surcharge should be a part of a portfolio of other strategies to help ensure adequate water supply.

Long-Term Effects of Conservation Rates

Long-Term Effects of Conservation Rates. 1997. American Water Works Association. ISBN 0-89867-904-4

This report from the AWWA recognizes the importance of conservation pricing and rate design in water conservation efforts. This early study examines the long-term effects of pricing for conservation on water demand and a utility's revenues. The report provides an overview of the relationship between rate design and conservation, as well as a summary of common conservation-oriented rate designs (peak/nonpeak rates, inverted rates, and seasonal rates). It includes a comprehensive discussion of price elasticity, the mathematical measure of demand response to price changes, longer-term effects of conservation rates, and analysis of different rate designs and strategies. The report also includes an example Conservation Rates Model and a User Manual that allow managers to test a variety of different rate design scenarios.

Pricing Practices in the Electricity Sector to Promote Conservation and Efficiency: Lessons for the Water Sector

Donnelly, K., Christian-Smith, J., and Cooley, H. 2013. Pricing Practices in the Electricity Sector to Promote Conservation and Efficiency: Lessons for the Water Sector. The Pacific Institute. www.pacinst.org/publication/water-rates-pricing-practices

Water utilities are increasingly faced with the challenges of adapting to the “new normal” – a world in which declining water demand and increasing costs can result in deficits. Using data from California electric utilities, this report examines how other utilities have confronted these challenges to manage fiscal instability while providing fair pricing. Although there are certainly major differences between the water and electricity sectors, the study describes a number of electricity pricing practices could be implemented in the water sector. These practices include marginal pricing, tiered pricing, time-variant pricing, demand response contracts, decoupling, lost revenue adjustment mechanisms, rate stabilization funds, and straight fixed-variable pricing. This report is part of a series by the Pacific Institute on key issues related to water pricing practices and policies in California that is accessible through the Pacific Institute website.

Principles of Water Rates, Fees, and Charges

American Water Works Association. 2012. Principles of Water Rates, Fees and Charges (M1). 6th Edition. http://www.awwa.org/store/productdetail.aspx?productid=28731

The American Water Works Association’s manual on Principles of Water Rates, Fees, and Charges is a comprehensive resource that provides water managers with information needed to evaluate and set water rate structures, fees, charges, and pricing policies. The manual provides an overview of cost-based rate making, revenue requirements, cost allocation, rate design, capacity and development charges, and implementation issues. This includes in-depth discussion on rate structure considerations and analysis of the advantages and disadvantages of a variety of common rate structures.

Revenue Instability and Conservation Rate Structures

Chestnutt, T., Christianson, J., Bamezai, A., McSpadden, C., Hanemann, W. 1995. Revenue Instability and Conservation Rate Structures. American Water Works Association. http://www.waterrf.org/PublicReportLibrary/RFR90681_1995_839.pdf

In response to the growing popularity of conservation rate structures, this report details how revenue stability is affected by changes in water demand and provides strategies to cope with revenue uncertainty in the face of changing costs. It outlines managerial strategies necessary to cope with uncertainty brought on by conservation rate structures, and illustrates how empirical analysis can support the design of better rate structures. The study focuses on the experience of and available data from Los Angeles, CA, and Phoenix, AZ, to create a conceptual framework for how to develop coping strategies. It concludes that revenue volatility can be quantified, that coping mechanisms can be developed, and that rate structures can be used as a conservation device.

Water Conservation-Oriented Rates: Strategies to Extend Supply, Promote Equity, and Meet Minimum Flow Levels

Wang, Y., Smith, W. and Byrne, J. 2004. Water Conservation-Oriented Rates: Strategies to Extend Supply, Promote Equity, and Meet Minimum Flow Levels. American Water Works Association. http://www.awwa.org/store/productdetail.aspx?productid=6544

Water conservation-oriented rates are an effective tool for reducing water use in states and cities that are faced with drought, shrinking water supplies, or other reasons to conserve water. This book discusses rate structures that encourage water conservation: drought demand rates, excess use rates or excess surcharges, inclining block rates, and seasonal rates. The book explores implementation issues, economic issues for the utility and the consumer (especially low-income consumers), advantages and disadvantages, which rate type is suitable for specific customer groups or situations, and real-world utility experiences with conservation rates.

Appendix A. Elements of Rate Structure Design

Customer Classes/ Distinction	Utilities have several options in deciding how to charge different sets of customers. However, utilities can only legally charge different rates for customers based on cost-related factors, such as usage. Hence, it is possible to set a rate structure for residential customers and a separate rate structure for commercial or industrial customers, since the non-residential customers use a lot more water and the marginal cost of providing them with additional units of water is very low. One advantage to creating different rate classes of customers is that it provides the utility with greater flexibility in targeting different objectives for different types of customers. For example, a utility could charge increasing block rate structures for residential customers to encourage conservation but also charge uniform rates for non-residential customers to avoid overburdening them with excessively high rates. Residential irrigation meters provide the utility with an ability to charge residential customers a different rate structure for their outdoor (mostly seasonal and discretionary) water use for regular, indoor household use. Before adding new rate structure classes, utility managers should first assess the ability of their billing software to handle the complexity of this switch, and also the staff's ability to make the conversion and continuously monitor, assess and correct the inevitable increase in billing errors.
Billing Period	The billing period refers the length of time between meter reads and bills. From a customer perspective, monthly billing provides greater advantages than any other billing period. A utility must evaluate the tradeoff between increased operating costs for meter reading and billing against the advantages of monthly billing, including providing a much more stable month-to-month revenue stream. Additionally, EFC research finds that customers who are billed quarterly or bimonthly use more water on average than customers who are billed monthly. Hence, to a conservation-oriented rate structure would use monthly billing when possible.
Base Charges	A base charge is the amount a customer is required to pay each billing period, regardless of the amount of water that is used. This is oftentimes called a "minimum charge." Base charges are highly stable sources of revenue for utilities, since they are immune to water use behavior. There is an incentive to charge as much of the fixed costs of running the utility in the base charge as possible, tempered only by affordability (since all customers pay this charge). The higher the base charge, the more stable the utility's revenues will be, but the less sensitive the total customer bill will be to changes in usage patterns. Hence, a customer reducing use significantly will not see a proportional decline in their bill if the base charge is a large component of the total bill. Utilities concerned about setting conservation-oriented rates by utilizing usage-sensitive rate structures are more likely to charge lower base charges (and higher volumetric rates). Also, utilities concerned about affordability may find it difficult to set high base charges. Due to the capital intensive nature of water utility costs, and because of economies of scale, large utilities are able to spread their costs over large customer bases and thus are often able to charge low base charges. Smaller utilities, however, typically rely on higher base charges to recover some of their fixed costs.

Consumption Allowance with Base Charge	In order to offset some of the burden of high base charges on their customers, utilities sometimes include a minimum consumption allowance with the base charge such that any use within the consumption allowance is "already paid for" by the base charge. As with base charges, the higher the amount included in the consumption allowance, the less sensitive the total bill will be to water use reductions, and the less conservation-oriented the rate structure will be. Unlike with base charges however, the utility has no revenue stability incentive to include higher amounts of water in the consumption allowance. In fact, the more water is included in the consumption allowance, the less revenue the utility can expect to collect from the majority of its customers if the base charge is not adjusted similarly.
Volumetric Rate Structure	Water utilities use a variety of volumetric rate structure types. Volumetric rates are those charged based on a customer's water use. The most common are uniform rates (often called flat rates), increasing block rates and decreasing block rates. Uniform rate structures charge the same rate, no matter what level of consumption. They are relatively simple to implement and communicate. Increasing block rate structures are volumetric rates that increase with increasing block rates of consumption; decreasing block rate structures are volumetric rates that decrease with increasing block rates of consumption. Water utilities should avoid using decreasing block rate structures for residential consumption. Additionally, some utilities adopt different volumetric rate structures for summer months than in the rest of the year. This discourages residents from increasing use significantly during the summer months when the majority of irrigation occurs. Seasonal rates are also appropriate for seasonal communities where demand for water is high in certain months and very low in others. The utility manager should select the type of rate structure that best fits the primary rate setting objectives.

Block Designs (If Applicable)	Increasing block rate structures, alone, are not sufficient to encourage conservation. The design of block rate structures is critical to set the appropriate price signals to the customers, not unduly overburden certain segments of the service population, and to provide sufficient revenue stability for the utility. For a utility to target residential consumption with increasing block rates, it should use at least 2 blocks within the normal range of residential use, from 0 through 15,000 gallons/month. It does not do any good to start the second block at a usage level that only a very small number of customers use. In determining the number and size of blocks, it is very useful to analyze from billing records the number of bills sent out each month for different usage levels. Increasing block rate structures for residential use should at least start the second block just over the average residential usage level. If the utility only uses one rate structure for all of its customers, the block sizes at much higher levels of use should be carefully considered from the commercial and industrial customers' perspective. Some utilities have a single decreasing block rate structure for all customers, but set the first block size to cover a large amount of water (e.g.: 50,000 gallons/month) in order to essentially charge residential use at a uniform rate, while providing decreasing block rates to commercial and industrial customers.
Frequency of rate changes	Although the frequency of rate changes is not an element of the rate structure design itself, it is an important policy objective that should be addressed by the utility. Ideally, utilities would review their rates and rate structures annually to adjust them to changes to the utility or customer characteristics. At the very least, utilities should review their financial performance indicators annually and review their rates and rate structures when any of the indicators reflect poor financing.

NEED TO KNOW

PACIFIC INSTITUTE

WATER RATES:
CONSERVATION AND REVENUE STABILITY

Supplying water to customers is a business. As in any business, water sales revenues need to be accurately forecasted and balanced against current and long-term future water supply and treatment costs. Conservation and efficiency is recognized as a way to effectively reduce long-term costs, and is often the most cost-effective "new water supply" option available. However, planning for water conservation programs must be done carefully to avoid revenue instability issues for the system.

Comprehensive water supply planning is required by law in California as well as in many other states, and is premised on the concept that water suppliers should plan water supply portfolios that guarantee long-term, sustainable delivery of safe, reliable drinking water.[i] This means prioritizing water conservation and efficiency programs in that portfolio. Water service providers can promote conservation and efficiency in a variety of ways; however, here we focus on conservation-oriented water rates.

Conservation pricing can be designed to:

- Reduce water consumption without negative impacts on utility revenues;
- Reward customers financially for choosing water-efficient appliances and changing water use behavior;
- Target inefficiency in discretionary water uses such as landscape irrigation;
- Delay costly water supply expansion projects; and
- Avoid financial hardships on low-income customers.[ii]

IMPORTANCE TO WATER RATES

Conservation pricing provides a price signal to customers to use water efficiently, and can be achieved through a variety of volumetric rate structures. Volumetric rates charge customers per unit of water used and can be structured in several ways:

- Uniform rates in which the volumetric rate is constant regardless of the quantity used.
- Seasonal rates in which the volumetric rate reflects seasonal variation in water delivery costs.
- Tiered rates in which the volumetric rate increases as the quantity used increases.
- Budget-based rates in which the tiers are based on individual customers' water use and the respective volumetric rates are based on the utility's water delivery costs.[iii]

Conservation pricing is often applied to manage a customer's demand for water by pricing discretionary water uses (such as landscape irrigation) at a higher rate than water used for basic human needs (such as drinking water and sanitation).

Despite many advantages of conservation pricing, there can be challenges. For instance, rates can go up after conservation programs are instituted, and customers may perceive these rate increases as punitive: they are being charged higher prices after "doing the right thing." In addition, water managers frequently cite the potential for revenue volatility as a top concern related to adopting conservation pricing. As consumers use less water, revenue may decline. If the water service provider is not charging the customer the amount that each additional unit of water costs to provide, this can lead to revenue instability. There are several strategies that can be implemented to address these concerns, described below.

STRATEGIES FOR SUCCESS

Demand Forecasting

Developing robust forecast scenarios of future water demand is critical to understand how implementation of conservation and efficiency measures, as well as long-term expected changes in the population and economy, will impact water sales revenue. Demand forecasters should consider incorporating a range of explanatory variables and the impacts of price effects into forecasts (see accompanying "WaterRates:DemandForecasting"). Short-term forecasting is useful for revenue and rate-setting purposes, particularly when instituting conservation rates, which can introduce more revenue volatility.

Rate Stabilization Funds

Rate-stabilization funds are a type of financial reserve that can buffer the impacts of occasional revenue shortfalls. Decreased water sales, and the associated reduction in revenues, can occur for a variety of reasons, including cool temperatures, wet weather events, mandatory drought restrictions, an economic downturn, and increased conservation and efficiency. Reserve funds can help ensure fiscal solvency during such times, and can be particularly useful if rates are steeply tiered and therefore more sensitive to changes in water demand.

Finance Policies

Finance policies can provide the guidance necessary for water service providers to quickly and easily respond to revenue shortfalls. Numeric targets can be set for a variety of financial metrics including credit ratings, debt service coverage, cash financing, and reserve balances.[iv] It is especially useful to develop financial policies that provide the Board and staff with guidance on how to set up and operate reserve funds. For example, the Contra Costa Water District's Reserve Policy describes 12 different Board-established reserve funds, including: rate-stabilization, future water supply, seismic upgrades, Clean Water Act compliance, and drought contingency funds. The rate-stabilization reserve fund policy, in particular, states how the fund should be managed to limit rate increases associated with the construction of new water supply infrastructure.

> "The Rate Stabilization Reserve Fund will be drawn down to smooth rate increases consistent with the District's Rate Setting Policy and to ensure that minimum debt service coverage of 1.25 times annual debt service is met. Specifically, they will be applied in any year where other revenues are not sufficient to meet the required debt service coverage ratio of 1.25 times. They will also be applied if meeting only minimum coverage levels could result in the District's bond ratings being downgraded."[v]

Setting quantitative targets for when to withdraw reserve funds and how to apply them can establish clear expectations for their use. Additional examples of financial policies are provided below:

- City of South Pasadena Financial Policies: http://www.ci.south-pasadena.ca.us/finance/policies.html
- Rancho California Water District's Debt and Financial Policies: https://www.ranchowater.com/files/policy_debt.pdf
- San Diego County Water Authority Long-Range Financing Plan: http://www.sdcwa.org/sites/default/files/files/longrangefinancingplan.pdf
- City of Sacramento Financial Policies: http://www.cityofsacramento.org/utilities/media-room/documents/FCSSacramentoUtilityRateReport033111.pdf
- City of San Diego Reserve Policy (for the city as whole, search the term Water for specifics): http://www.sandiego.gov/fm/pdf/reserve_policy_revised.pdf
- Interview with Orange Water and Sewer Authority's Director of Finance: http://www.youtube.com/watch?v=-jJH9FOfDco
- Case Study: Birmingham, Alabama: http://efc.web.unc.edu/2012/08/01/the-success-story-of-one-water-utilitys-financial-policies

Marginal Cost Pricing

Saving water usually saves money, as conservation means avoided operation and maintenance as well as new infrastructure costs. This is why many economists recommend marginal cost pricing: it rewards individual customers for conservation and efficiency in a way that does not burden or benefit other customers.[vi] Marginal cost pricing is simply setting the *price* of a unit of water to equal the *cost* of supplying (or saving) an extra unit of water. The goal of marginal cost pricing is to allocate goods in an economically efficient manner that serves to alert customers about the cost of using (or not using) an additional unit of water, so that usage can be adjusted accordingly.[vii]

Yet, marginal cost pricing can be complicated to implement. Calculating the marginal cost can be data-intensive and requires accurately forecasting future demand and estimating the cost of new capacity or supply.[viii] Moreover, in some cases, marginal cost pricing can fail to send the proper signal when bundled with other services, such as wastewater and refuse collection. In other cases, marginal cost pricing can lead to unaffordable water when the next available water supply is extremely expensive. Nevertheless, when water prices approximate marginal costs, revenue stability will be greater as prices more closely match actual costs.

Budget Based Water Rates

Water budget rates are a relatively new innovation, and California Assembly Bill 2882 (2009) helped pave the way for broader implementation.[ix] Under this structure, individual customers are charged for water using increasing tiers, where the tier breaks are unique to the customer. The first tier(s) is set to represent the "base use" for a household according to the unique characteristics of that property. This can include number of occupants, lot size, and local climate. Customers can apply for variances, so that a household with additional water needs can have those needs incorporated into the base use calculation. As long as the user is efficient in their use and communicates effectively with the utility, they will not be penalized for having needs beyond that of other customers.

Proponents argue that water budgets are equitable because they are based on individual household needs, with excessive use beyond the budget penalized with a higher rate. An advantage of this rate structure is that it can be structured to stabilize utility revenue, if fixed costs are recovered in the base rate. In this case, excess revenue collected in penalty tiers can be used to fund conservation programs. Criticisms of this rate structure cite the difficulty of initial data collection and maintenance, which can be particularly burdensome for a small utility without in-house expertise or adequate financial resources. Moreover, for the rate structure to work effectively, customers must directly communicate with the service provider about their living situation and personal habits, which can be viewed as intrusive. In addition, water budget allocations based on discretionary uses can be perceived by other customers as inequitable. For example, exemptions granted for large, water-intensive landscapes or larger lot sizes could be considered inequitable to those customers who have chosen xeriscaping or have smaller lots, but the water supplier can adjust the irrigated acreage amounts as a matter of policy. The most well-known example of a water budget based rate structure is Irvine Ranch Water District's; however, there are 28 others nationwide.[x]

Ongoing Customer Education and Communication

Water service providers should have an official communications strategy on all matters related to water service, water quality, and cost (see accompanying "Water Rate Recommendations: Communication and Education"). A good communications strategy is especially critical when a water service provider is proposing rate changes, particularly since water pricing can be difficult to both explain and understand. When implementing conservation rates, it is particularly important to address the customer perception that they are paying more for using less. A good communications strategy explains that increases in water rates do not always mean increasing costs for all customers, as the water bills for efficient households may stay the same or even be reduced with conservation pricing. In addition, water is a rising cost industry as a result of expanding regulations, deteriorating infrastructure, as well as increasing operations and maintenance costs. Therefore, the cost for water will increase regardless of conservation pricing. And finally, although water rates may rise in the short term, conservation pricing is meant to reduce the long-term costs associated with accessing new supplies, such as costs for building more water supply and treatment infrastructure. If the next available supply is relatively expensive, such as desalinated water or imported water, then water rates should accurately reflect the high marginal cost of those additional water supplies.

ENDNOTES

[i] Urban Water Management Planning Act, 1983 and as amended. Accessed online at: http://www.water.ca.gov/urbanwatermanagement/docs/water_code-10610-10656.pdf
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[ii] Southwest Florida Water Management District. Not dated. Water Rates: Conserving Water, Protecting Revenues. Accessed online at: http://www.swfwmd.state.fl.us/conservation/waterrates/

[iii] California Urban Water Conservation Council, BMP 11.

[iv] Water Research Foundation. 2011. Financial Management Strategy Bulletin 1: Internal Financial Policies (Metrics-driven financial policies).

[v] Contra Costa Water District. 2011. Contra Costa Water District Reserve Policy. Accessed online at: http://www.ccwater.com/files/ApprovedReservePolicy.pdf

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[viii] American Water Works Association (AWWA). 2000. Principles of Water Rates, Fees, and Charges. Manual M1. AWWA: Denver, Colorado.

[ix] Hildebrand, M., S. Gaur, and K. Salt. 2009. Water Conservation Made Legal: Water Budgets and California Law. Journal AWWA 101(4): 85-89.

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3.1 Water Conservation Pricing

Applicability

This BMP is intended for all Municipal Water User Groups ("utility") wishing to send price signals to customers to encourage water conservation. A utility may have already accomplished this BMP if it currently has a conservation price structure.

Description

Water Conservation Pricing is the use of rate structures that discourage the inefficient use or waste of water. Conservation pricing structures include increasing unit prices with increased consumption such as inverted block rates, base rates and excess use rates such as water budget rates, and seasonal rates. Seasonal rate structures may include additional charges for upper block (outdoor) usage or excess-use surcharges for commercial customers to reduce demand during summer months. The goal of conservation pricing is to develop long run consumption patterns consistent with cost. Under this BMP, utilities should consider establishing rates based upon long-run marginal costs, or the cost of adding the next unit of capacity to the system. An established cost of service methodology should be followed whenever rates are developed or proposed for change.

This BMP addresses conservation pricing structures for retail customers. For utilities supplying both water and sewer service, this BMP applies to pricing of both water and sewer service. Utilities that supply water but not sewer service should make good faith efforts to work with sewer agencies so that those sewer agencies do not provide sewer services for a declining block rate.

For conservation pricing structures to be effective, customers should be educated on the type of rate structure that the utility uses and be provided monthly feedback through the water bill on their monthly water use. Most customers do not track water use during the month because of the difficulty and inconvenience of reading the meter. When customers read their bill, they most often just look at the total amount billed. Conservation pricing has the advantage of providing stronger feedback to the customers who will see a larger percent increase in their water bill than the increase in water use. Utilities should move toward adopting billing software that allows customers to compare water use on their bill with average water use for their customer class as well as their individual water use for the last 12 months. The rate structure should be clearly indicated on the water bill.

It is not recommended that a minimum monthly water allotment be included in the minimum bill. The AWWA notes that minimum charges are often considered to work counter to conservation goals and are unfair to those who use less than the monthly minimum. A customer who does not use the entire amount included in the minimum during the billing period will be charged for the water allotment regardless, and thus may feel he should find a way to use the additional water. A customer in a house with all efficient fixtures and appliances can use 1000 gallons or less per month and may be inclined to increase their water use if a minimum bill includes more than 1000 gallons[1]. In the Residential End Use Study[2], approximately 6 percent of homes had a per capita use of less than 1000 gallons per month.

Implementation

Successful adoption of a new rate structure may necessitate developing and implementing a public involvement process in order to educate the community about the new rate structure. The new rate structure should adhere to all applicable regulatory procedures and constraints. If the conservation pricing structure to be implemented is substantially different from current practices, then a phase-in approach may be appropriate.

Public involvement in the development and implementation of conservation rates can help assure that the goals of the conservation pricing initiatives will be met and accepted by local constituents. Public meetings, advisory groups, and public announcements are among ways to generate public involvement.

Development of conservation-based rate structures is more than just selection of arbitrary usage breaks. The process requires consideration of the effect on water demand and water utility finances.

1) Basic rate structure considerations should include rates designed to recover the cost of providing service and billing for water and sewer service based on actual metered water use. Conservation pricing should provide incentives to customers to reduce average or peak use, or both. The conservation rate structure can be designed to bring in the same amount of revenue, often termed revenue neutral, as the previous rate structure.
2) Only one type of conservation pricing is required for this BMP. Conservation pricing is characterized by one or more of the following components:
    a. Seasonal rates to reduce peak demands during summer months. There are a variety of approaches including having increasing block rates only during the summer months or having a year round block rate structure with higher block rates during the summer months.
    b. Rates in which the unit rate increases as the quantity used increases (increasing block rates). For block rate structures, the rate blocks should be set so that they impact discretionary use. A utility should analyze historical records for consumption patterns of its customers. The first block should typically cover the amount of water for normal household health and sanitary needs. To increase the effectiveness of this rate structure type, the additional revenue from the higher blocks should be associated with discretionary and seasonal outdoor water use.
        - Rates for single family residential and other customer classes may be set differently to reflect the different demand patterns of the classes.

- The price difference between blocks is very important in influencing the customer's usage behavior. Price increases between blocks should be no less than 25 percent of the previous block. For maximum effectiveness, the price difference going from one block to the next highest block is recommended to be at least 50 percent of the lower block. For example if the third block of a four-block rate structure is $4.00 per 1000 gallons, the fourth and final block should have a rate of at least $6.00 (50 percent higher) per 1000 gallons. Any surcharge based on water usage should be included when calculating these percentages.

c. Rates based on individual customer water budgets in which the unit cost increases above the water budget. Water budget rate structures are based on the philosophy that a certain amount of water is adequate for all normal necessary uses, and uses above that amount are considered excessive and charged as excessive. For example, Irvine Ranch Water District in California[3] sets the excess use charges at 200 percent of the base rate. Typically there should be an indoor and an outdoor component to a water budget.

- For residential rates, the indoor component should be based upon estimates of average family use. The outdoor component is based upon landscape area. For business customers, water budgets will often be based upon historical average for indoor water use, and outdoor component based upon landscape area.
- To qualify as a conservation rate, utilities that implement water budget based rate structures typically begin excess rate charges for landscaped areas at no more than 80 percent of average annual reference evapotranspiration replacement rates.

d. Rates based upon the long-run marginal cost or the cost of adding the next unit of capacity to the system.

3) Conservation pricing should use a consumption charge based upon actual gallons metered. The minimum bill for service should be based on fixed costs of providing that service which generally includes service and meter charges. Including an allotment for water consumption in the minimum bill does not promote conservation and it is recommended that if a minimum is included, it not exceed 2000 gallons per month. Utilities including a water allotment in the minimum bill should consider eliminating that allotment within five years of implementing this BMP.

4) Adoption of lifeline rates neither qualifies nor disqualifies a rate structure as meeting the requirements of this BMP except that the minimum bill guidelines should be followed. Lifeline rates are intended to make a minimum level of water service affordable to all customers.

5) The utility should educate customers about the rate structure and use billing software that allows the customer to compare water use on their bill with average water use for their customer class as well as their individual water use

for the last 12 months. The rate structure should be clearly indicated on the water bill. The utility may want to consider implementing the Public Information BMP in conjunction with this BMP in order to provide customers information on how to reduce their water bill under a conservation rate structure.

6) In order to be able to set up an effective irrigation rate, the utility should consider adopting rules or ordinances requiring new commercial and industrial customers to install separate irrigation meters and consider retrofitting current commercial and industrial customers with irrigation meters. It is important for commercial and industrial customers to have a separate irrigation meter so they can better understand how much water they are using for irrigation. This provision is optional for this BMP.

Schedule

Utilities pursuing this BMP should begin implementing this BMP according to the following schedule:

1) The utility should follow applicable regulatory procedures and adopt a conservation oriented rate structure within the first twelve months. The conservation rate structure should be designed to promote the efficient use of water by customer classes as outlined in this BMP.
2) At least annually, a utility should review the consumption patterns (including seasonal use) and its income and expense levels to determine if the conservation rates are effective and make appropriate, regular rate structure adjustments as needed.
3) At least annually, the utility should provide information to each customer on the conservation rate structure.
4) If not already in place, within five years or when the utility changes billing software, whichever is sooner, the utility bill should provide customers with their historical water use for the last 12 months and a comparison of water use with the other customers in their customer class. The rate structure should be clearly indicated on the water bill.
5) While not required to be implemented as part of this BMP, within one year the utility should consider adopting service rules or an ordinance requiring all new commercial and industrial customers to install separate irrigation meters and the feasibility of retrofitting commercial and industrial current customers with irrigation meters.

Scope

To accomplish this BMP, the utility should implement a conservation-oriented rate structure and maintain its rate structure consistently with this BMPs definition of conservation pricing and implement the other items listed in D above.

Documentation

To track this BMP, the utility should maintain the following documentation:

1) A copy of its legally adopted rate ordinance or rate tariff that follows the guidelines of this BMP;
2) Billing and customer records which include annual revenues by customer class and revenue derived from commodity charges by customer class for the reporting period;
3) Customer numbers and water consumption by customer class at the beginning and end of the reporting period;
4) If a water allotment is included in the minimum bill, a cumulative bill usage analysis similar to Figure C-3 in the AWWA M1 Manual;
5) A copy of the education materials on the conservation rate sent to customers for each calendar year this BMP is in effect;
6) A utility bill meeting the parameters and schedule in Section D;
7) Optional provisions:
    a. A copy of the rule or ordinance requiring all new commercial and industrial customers to install separate irrigation meters; and
    b. Implementation and schedule for an irrigation meter retrofit program for current commercial and industrial customers or a feasibility analysis of an irrigation meter retrofit program for current commercial and industrial customers.

Determination of Water Savings

The effect of conservation pricing implementation is very specific to each utility. Elasticity studies have shown an average reduction in water use of 1 to 3 percent for every 10 percent increase in the average monthly water bill.[1] When implementing a conservation pricing structure, consideration should be given to the factors that influence whether the new structure results in a reduction in water use. The *Water Price Elasticities for Single-Family Homes in Texas* (*See* Section I. References for Additional Information, 1) study included several significant findings that water savings can be expected:

1) Average price is better than marginal price in explaining the quantity of water demanded by customers.
2) Customers have a general lack of awareness of their block rates.
3) The water savings that accompanies a switch to a block rate may be lost in subsequent years if water rates do not keep up with inflation.
4) Customers do not understand the link between water use and sewer billing and therefore do not tend to factor sewer prices into their water use decisions.

5) The study did find price elasticities of approximately -0.20, which translates into a reduction of 2 percent in water use for a 10 percent increase in price.

The utility should focus on a rate design that sends the appropriate price signal to customers to reduce discretionary water use. To remain effective, the rates need to be adjusted periodically to take into account inflation as well as other factors.

Cost Effectiveness Considerations

A cost effectiveness analysis can be done by comparing the cost of implementing this BMP to the anticipated water savings from adopting the conservation rate structure. The costs for implementing a rate structure change are associated with managing a stakeholder involvement process and costs for consultant services, if needed, and there may be one time only costs associated with developing and adopting ordinances and enforcement procedures. There may be significant costs associated with reprogramming the billing system if this step isnecessary.

References for Additional Information

1) *Principles of Water Rates, Fees, and Charges (M1 Manual)*, AWWA, 2000.
2) *Residential End Uses of Water,* AWWA Research Foundation, 1999
3) *Irvine Ranch Excess Use Residential Water Rate*
4) http://www.irwd.com/FinancialInfo/ResRates.html
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6) *Designing, Evaluating, and Implementing Conservation Rate Structures*, California Urban Water Conservation Council, July 1997.
7) *Effectiveness of Residential Water Price and Nonprice Programs*, AWWARF, 1998.
8) *San Antonio Sample Water Bill* http://www.saws.org/service/ebill/saws%20ebill%20sample.htm
9) *Example Rate Structures*
   - *City of Austin Water Rates* http://www.ci.austin.tx.us/water/rateswr03.htm
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Assessing WAter system revenue risk:

Considerations for market Analysts

August 2013

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Table of Contents

Executive Summary

Water utilities are on the brink of extraordinary investments to replace aging infrastructure—the Environmental Protection Agency estimates that by 2030, capital expenditures of more than $300 billion will be needed to safeguard drinking water. Yet this investment comes at a time when Americans' water use habits are changing[1]—resulting in considerable uncertainty for water systems planning capital programs to replace or expand their assets.

At the heart of the issue is the inherent mismatch between the largely fixed cost structure of drinking water service providers and the highly variable revenues they receive, which depend largely on the amount of water their customers use. This volumetric pricing model worked well in the past, when per capita water usage in the United States was much higher and more predictable than it is today. But appliance standards, conservation programs and even the price of water have changed across the nation, precipitating declines in household use that have led to much more variable—and in many cases, unexpectedly reduced—revenue streams.

Now more than ever, utilities must enact intentional pricing structures that contribute to financial stability. Yet while pricing structures can be engineered to assure revenue stability even within a volatile or declining demand environment, real political resistance may prevent water systems from implementing technically feasible solutions. In most American communities, how water services are priced is a community decision, one that is subject to political processes. Political leaders must be responsive to community concerns about resource stewardship, affordability for low-income populations and economic competitiveness. The financial necessity of implementing rate adjustments to adequately recover costs and maintain financial targets is balanced with (and sometimes pitted against) these important community priorities.

At the heart of the issue is the inherent mismatch between the largely fixed cost structure of drinking water service providers and the highly variable revenues they receive, which depend largely on the amount of water their customers use.

For municipal bond investors, the vulnerability of water systems' revenues to demand changes is a matter of credit risk. Yet the credit metrics used by most analysts in today's market may not sufficiently assess revenue vulnerability for many utilities. These metrics, which may examine the proportion of sales from the system's largest users, or benchmark the price of water services at a given level of volumetric use, do not help to illuminate how significant changes in use across a wider customer base—whether driven by technological change, weather, pricing sensitivity or policy implementation—may affect revenue sufficiency. To truly understand the revenue resilience of water systems' pricing structures to demand downturns—whether ephemeral or persistent—analysts may need additional metrics. This report characterizes the challenges facing many utilities and identifies potential metrics that may be used by bond analysts, including credit rating agencies, bond insurers and credit assurance providers and buyers.

We offer an analysis of revenue risk using actual utility data in three states that are experiencing changing water use patterns: Colorado, North Carolina and Texas. As our analysis demonstrates, utilities with the same generic pricing structure can have widely variable exposure to revenue instability from changes in customer use. This analysis reinforces the need for a continued focus by market analysts on the pricing structures of utilities and the relationship of those practices to fiscal condition and public policy imperatives including conservation and affordability.

We invite bond analysts to consider this analysis and potentially incorporate these metrics or similar metrics into their own assessment frameworks. We also encourage water systems to continue to incorporate revenue vulnerability considerations and metrics into their fiscal planning and board education efforts to help safeguard the financial stability of their communities' most critical infrastructure, for present and future generations.

1 Water Research Foundation, 2009. "Surviving or Thriving in Economic Recession: Strategies of Water Utility Leaders-4296." Denver, Colorado.

sAmple metriCs for Assessing Drinking WAter proviDer priCing struCture			
issue of Concern	**Commonly used metric**	**Alternative or Additional metrics**	**rationale**
Competitiveness. Comparison of household expenditures for water service between systems. How much does a utility charge versus another utility?	Residential customer water bill at consumption level of 7,500 gallons per month.	Residential customer water bill at consumption level of 5,000 gallons per month.	Average household use for utilities has declined significantly in recent years, and in many places is now much lower than 7,500 gal/mo. Many utilities see the vast majority of their customers using 5,000 gallons or less per month.
Affordability. Might households have trouble making payments and governing boards be under political pressure to limit price adjustments?	Typical household monthly water bill divided by Median Household Income (MHI) for community	Typical household monthly water bill divided by the poverty income for a family of four at time of analysis. Percentage of households in service area that are at or below poverty line.	As income distributions have dispersed and water service bills have increased in real and nominal terms, understanding affordability stresses requires additional metrics beyond simply the percentage of expenditure over MHI. By looking at the percentage of expenditure for an at-risk family and assessing the relative number of those types of families in a service area, an analyst would learn more about challenges facing a particular area.
revenue sufficiency. Does the pricing in place provide investors with confidence that it generates sufficient revenues to meet debt requirements?	Debt Service Coverage (DSC)—typically expect range of 1.2 to 2	Modified annual DSC that incorporates annual operating revenues plus annual drawdowns from a sufficiently funded rate stabilization fund (e.g. withdrawals in a given year never exceed more than 25% of rate stabilization fund). Alternatively, if a utility maintains a rate stabilization fund, DSC could be analyzed as a rolling three-year average to allow for natural revenue variation.	Under current pricing structures, the inherent revenue swings due to normal usage changes make maintaining high DSC year in and year out much more challenging. Utilities that take steps to cushion this variation with a rate stabilization fund are arguably reducing investor risk, while at the same time minimizing pressure to over charge to compensate for revenue variability.
revenue vulnerability. Does the utility's pricing structure expose it to excessive revenue reduction from adoption of basic water efficiency measures, such as fixture and appliance replacements?	Rate structure defined by the change in commodity price over different consumption blocks. (e.g. decreasing vs. uniform vs. increasing block)	Percent of household charge at 5,000 gallons per month attributed to fixed fee. Percent of operational revenue attributed to fixed charges.	Some simplified characterizations of pricing focus primarily on block structure. But rate structure may have less significance on pricing signals and revenue variability than does the size of the base charge or fixed fee.
revenue vulnerability. Does the utility's demand profile expose the utility to excessive revenue variability from changes in customer composition or use patterns?	Revenue from top 10 customers.	Average amount of revenue attributed to irrigation as a percentage of total revenue.	Investors should remain aware of dependence on a small number of customers and should continue to document the percent of revenue attributed to top customers. But heavy dependence on outdoor irrigation for revenue can also be a risk driver, since drought-induced watering restrictions or even pricing responsiveness in inclining block rate structure may cause significant reductions in revenue as customers reduce outdoor usage.
revenue vulnerability. Does the utility's pricing structure expose the utility to excessive revenue variability in the event of outdoor watering reductions?	Rate structure defined by the change in commodity price over different consumption blocks.	Percent of household bill at 10,000 gallons per month that is attributed to fixed fee.	Similar to above, but provides insight into vulnerability of revenues to usage changes by water users in higher tiers.
Conservation pricing signals. How strong an incentive does pricing structure create for reduced usage?	Presence of inclining block rate structure.	Percentage of household charge at a given consumption point that is attributed to variable charge. Percentage change in bill for a set change in consumption. Absolute change in charge for a set change in consumption.	Some dialogue around conservation pricing signals focuses on the general block structure of the pricing. The block structure can influence pricing signal, but these other factors can have a more significant role in influencing the price incentive for reducing usage.

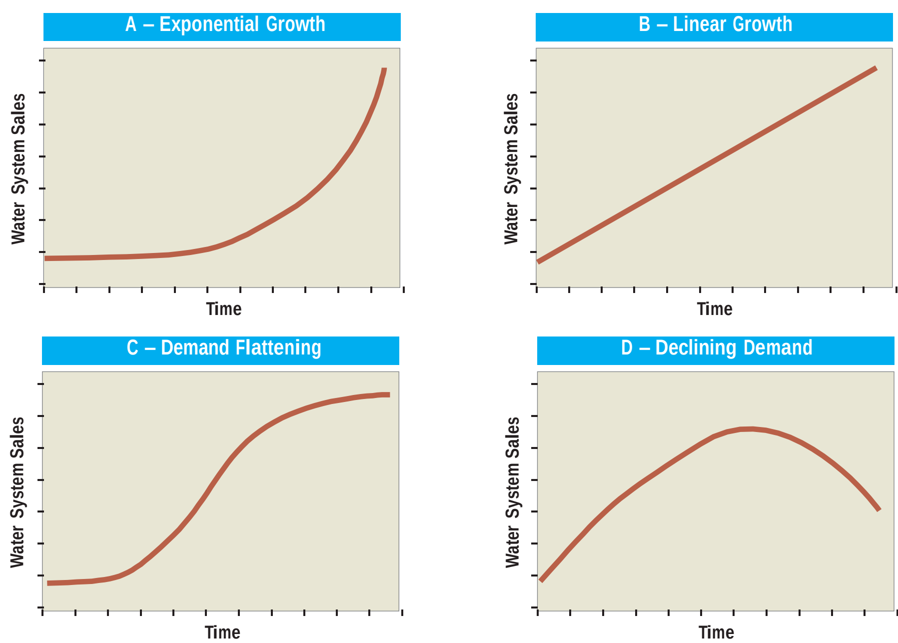
Reshaping Demand Expectations

It is nearly impossible to attend a water sector conference today without hearing about "The New Normal," a reckoning with the financial assumptions that have guided billions of dollars of water infrastructure decisions over the past few decades. What really lurks behind this phrase is something that must be acknowledged by water utility managers and the investors whose capital finances the continued improvement and expansion of their systems: the demand curve for water, in terms of system wide usage variation over time, has shifted as household demand has declined almost universally across the country.

Of course there is no single demand trend for water—the drinking water market in the United States is highly decentralized and the forces of supply and demand subject to local particularities of hydrology, weather and land use. Yet the demands of local water users are also shaped by exogenous trends, most importantly water-efficient appliance technologies mandated at the federal level that went into effect in the mid-1990s. These federal mandates have removed less water efficient options from the marketplace, nearly halving the amount of water used for each toilet flushed or load of laundry run.

On top of this shift brought by exogenous technological change, some water systems have also implemented conservation programs that have permanently altered customer behavior, creating a further shift in usage. Sometimes these programs are intended to create long-term change, and other times they are the lasting and unintended result of short-term drought response—customers who move from five day a week watering to two day a week watering, never to return. Figure 1

Figure 1: Variations in Water Sales Trends



shows a representation of shifting system wide sales trends occurring in many parts of the country. Many utilities based their infrastructure expansion plans and financial plans on assuming water sales would grow exponentially (1-a) or at least linearly (1-b), when the reality for many utilities has become a flattening of overall growth (1-c) or even a net decline (1-d).

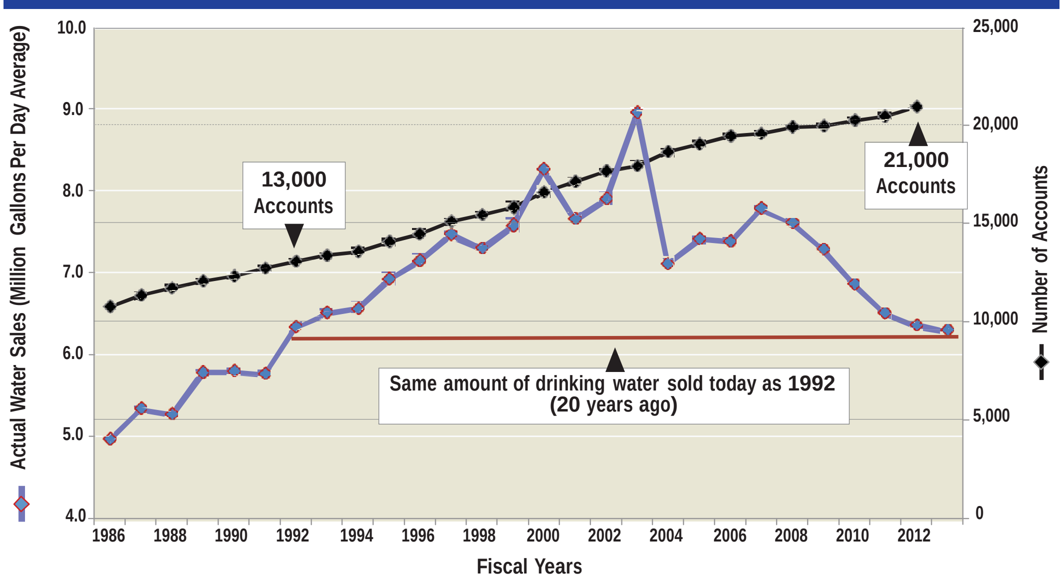
As part of this shift in demand, many water systems are seeing evidence that customers are more price-responsive. This creates a challenging environment in which to plan capital improvement programs that routinely run into the hundreds of millions or billions of dollars and require both pricing increases and reliable sales predictions for financial planning purposes.

When market changes like this have taken hold in other sectors, most industries carefully examine their historic pricing practices and shift to new approaches. Consider the market changes and evolution of pricing in sectors such as telecommunications or personal financial advising—pricing for those services today has little resemblance to how they priced 15 years ago.

There is ample evidence that such an imperative for market transformation exists in the drinking water service industry today, as illustrated by recent years of revenue volatility and shortfalls deriving from declining sales patterns. Take, for example, the disruption of predictable revenue growth experienced by the Orange Water and Sewer Authority (OWASA), a utility in the central Piedmont region of North Carolina (Figure 2). The utility sold as much water in 2012 as it did in 1991, despite seeing accounts grow from 13,000 to 21,000 during the same time period. One contributing factor to the loss of sales can be tied to the major droughts North Carolina has experienced over the past 10 years and the resulting long term impact mandatory usage restrictions and long term education campaigns have had consumer use patterns. According to the Executive Director of OWASA, it took staff 5 years to finally come to terms with the realization that demand "was not going to come back." Only then did the organization fully recalibrate its sales projections, pricing, and revenue expectations.[2]

One contributing factor to the loss of sales can be tied to the major droughts North Carolina has experienced over the past 10 years and the resulting long term impact mandatory usage restrictions and long term education campaigns have had consumer use patterns.

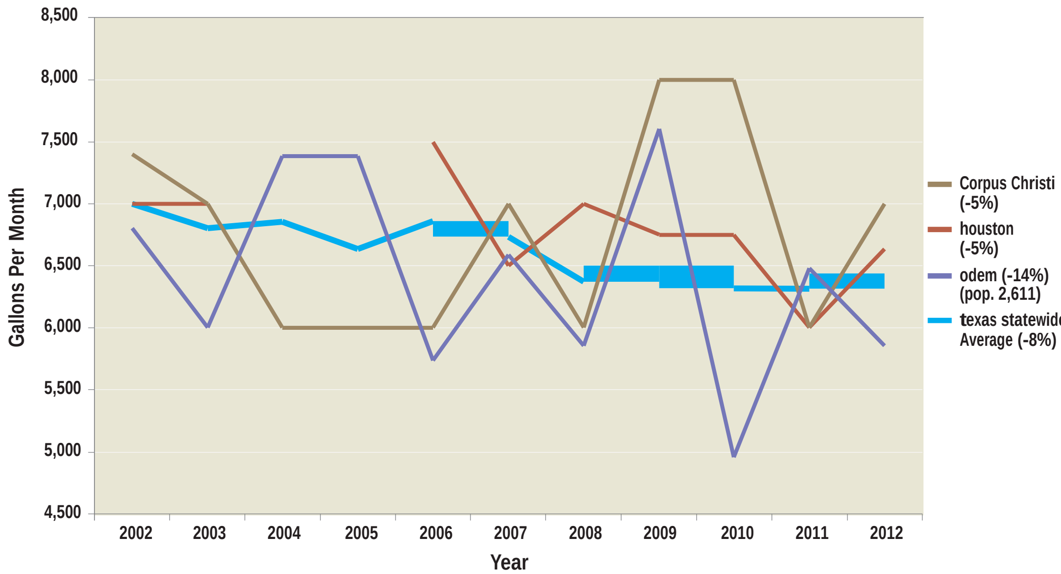
Figure 2: OWASA Water Sales & Number of Accounts Served



Source: Orange Water and Sewer Authority (NC)

2 Presentation by Ed Kerwin of Orange Water and Sewer Authority at the Utility Management Conference in Phoenix, Arizona. March 11, 2013.

Figure 3: Average Household Water Use for the State of Texas & Selected Municipal Utilities, 2002-2012 (Gallons per Month) (Texas annual n from 365 to 661)



Data analyzed by the Environmental Finance Center at the University of North Carolina, Chapel Hill.
Data source: Texas Municipal League annual TX water and sewer rate surveys (self-reported).

OWASA is not alone in seeing decreased revenue due to a drop in sales. Utilities across the nation have reported similar trends, as seen in Texas utilities' water sales over the past decade (Figure 3). While water use in Texas naturally fluctuates from year to year and is also influenced by prolonged drought (a third of the state's municipal use is for outdoor irrigation, which depends greatly on rainfall), the downward trend outlined in the figure is still pronounced. Overall, Texas utilities report an 8% drop in per-account usage over the past decade.

From one perspective, the trend in reduced water usage can be viewed as a huge success in government and industry efforts to increase water efficiency; however, the speed of the decline has caught some utilities and their investors off-guard.

From one perspective, the trend in reduced water usage can be viewed as a huge success in government and industry efforts to increase water efficiency; however, the speed of the decline has caught some utilities and their investors off-guard. Rating agencies have recognized the impact of these falling sales on some credits, citing the tension between the need for higher than planned rate increases and the political will needed to implement those increases as a factor in credit downgrades.[3] Researchers and water managers have also documented the potential financial repercussions of successful conservation programs when rate structures and financial policies are not adjusted to compensate for revenue lost to diminished water sales.[4]

At leadership forums bringing together senior managers from the nation's largest utilities in 2009 and 2011, concern over pricing and revenue dominated the discussions.[5] When asked at one of these events to assess the impact of sales drops on their business operations, over two-thirds of industry leaders from among the nation's 20 largest water utilities indicated that falling sales have had a significant negative impact on their operations.

While some utilities continue to wait for demand to return, many utilities have stopped asking whether there is a new normal and have started focusing on better understanding the nuances of pricing, the impact of changing usage trends, and the resiliency of their existing volume-based pricing and revenue structures.

3 Julie Seebach and Teri Wenck. "Fitch Downgrades Fort Worth, Texas' Water and Sewer Revs to 'AA'; Outlook Stable." Fitch Ratings. April 2013.

4 Examples include: Jeff Hughes, Peiffer Brandt, Mary Tiger, Shadi Eskaf, and Stacey Berahzer, 2014. "Defining a Resilient Business Model for Water Utilities-4366." Water Research Foundation, Denver, Colorado. Forthcoming. Edward Armatetti, 1993. "Meeting Future Financing Needs of Water Utilities-707". AwwaRF, Denver, Colorado. http://www.allianceforwaterefficiency.org/Declining-Sales-and-Revenues.aspx

5 Scott Haskins, Jeff Hughes, and Mary Tiger, 2011." Rates and Revenues: Water Utility Leadership Forum on Challenges of Meeting Revenue Gaps-4405." Water Research Foundation, Denver, Colorado.

Research Area and Methodology

In order to advance the state of knowledge on pricing and demand trends in the drinking water sector, Ceres partnered with the Environmental Finance Center at the University of North Carolina at Chapel Hill to characterize existing pricing practices and orient analysts to ways of assessing pricing structures in terms of revenue stability, conservation pricing signal and affordability.

This paper draws on original research, as well as expanding on ongoing work carried out by the research team on behalf of the Water Research Foundation.[6] While the recommendations are crafted for use by the analyst community, they are equally relevant for utilities and their advisors charged with overseeing utility pricing and financial decisions.

The majority of analysis outlined in this paper is based on studying current pricing, financial and usage data of approximately 1,400 utilities in three states: Colorado, North Carolina and Texas. These states were chosen due to the availability of key pricing and finance data for a relatively large number of diverse utilities. In all of these three states, water conservation is a policy priority, both because of the severity of drought potential and the extent of persistent supply challenges.

Table 1 summarizes the available data in each state.

Table 1: Summary of Pricing Data in Three States

state	types and Approximate number of utilities	Available Data	notes
Colorado	Municipal owned and districts (100)	Detailed pricing and basic financial data for 2012	Pricing survey completed by Colorado Municipal League for first time in 2012.
north Carolina	Government-owned and rural cooperatives (500)	Detailed pricing, finance, and usage data for multiple years	Pricing survey completed by Environmental Finance Center and the NC League of Municipalities. Finance data provided by State Treasurer. Usage data from NC Division of Water Resources.
texas	Municipal owned (800)	Basic pricing, finance, and usage data for multiple years	Pricing survey completed by Texas Municipal League, and finance data provided by Texas Water Development Board.
total	1400		

6 Jeff Hughes, Peiffer Brandt, Mary Tiger, Shadi Eskaf, and Stacey Berahzer, 2014. "Defining a Resilient Business Model for Water Utilities-4366." Water Research Foundation, Denver, Colorado. Forthcoming.

Factors Driving Current Pricing Practices Among Drinking Water Providers

How a water system prices its services is one of the most important tools for carrying out the objectives of the enterprise. Public enterprises that sell water services pursue financial and non-financial objectives that are influenced by many factors, among them:

- Financial Requirements
- Public Policy Goals
- Ease of Implementation
- Political Constraints

financial requirements

Pricing is one of the primary tools used by water service enterprises to balance their budgets. The most commonly promoted pricing methodology is the "cost-of-service" approach, which allocates the revenue required to meet financial goals among customers. Most large utilities use this approach, yet the practice is far from universal, especially among small utilities.

Pricing must be set to cover the cost of operations and capital programs, but also to cover the costs of financing those improvements. Most large systems rely primarily on debt to finance capital programs that exceed cash on hand. For this reason, their ability to honor debt payments is a critical financial indicator for market participants.

Debt service coverage is arguably the key driving financial indicator for utilities that rely on capital markets for their debt, and it plays an important role in the quantitative analysis conducted by rating agencies. Debt service coverage is the ratio of annually generated revenue available to cover debt service after paying other essential costs, divided by the debt service payments. There are variations in the types of revenue that are included in debt service coverage calculations, but typically, rating agency analysts view coverage ratios between 1.25 and 1.5 as good and above 1.5 as very strong.[7]

The pressure placed on utilities by investors to generate specific amounts of revenue dictated by loan agreements and bond covenants with high coverage requirements can be much greater (and more binding) than self-imposed revenue requirements, cost-of-service pricing policies or internal financial strategies. In other words, a utility may be quite satisfied with collecting enough revenue to meet its basic cash expenditure requirements without trying to collect excess revenue, as they would be driven to do under debt service coverage requirements. Some utilities may even have a financial strategy that involves spending down reserves for a fixed period of time such that their short-term revenue generation falls below their annual operating and capital expenditures, thereby leading to a debt service coverage ratio of less than 1.0.

7 Theodore Chapman and James Wiemken, 2008. "Key Water and Sewer Utility Credit Ratio Ranges." Standard & Poor's, Dallas, Texas.

Elevated debt service coverage ratios that drive price over a short-term period are not necessarily the only path to long-term financial sustainability or economic optimization. A utility can follow a path of lower debt service coverage ratios and still be financially sustainable as long as it adheres to other conditions and strategies. For example, a water system may target a lower coverage ratio during a limited period of time when it is drawing down a reserve fund dedicated to a planned capital improvement. Or a water system may elect to reduce its coverage ratio in order to maintain a target of annual rate adjustments, and draw down a rate stabilization fund designed and funded over time for that purpose. In these instances, a strict debt coverage ratio would not tell the whole story of a utility's financial management.

Utilities facing significant incremental water or wastewater capacity investments have a financial incentive for pricing their service in a way that puts downward pressure on capacity growth so as to manage future expenditures and debt.

Paradoxically, some financial goals require selling less, not more, product. For some utilities, conservation programs are driven as much by financial concerns as by resource stewardship concerns. Utilities facing significant incremental water or wastewater capacity investments have a financial incentive for pricing their service in a way that puts downward pressure on capacity growth so as to manage future expenditures and debt.[8] Such is the case, for example, for New York City's Department of Environmental Protection, which has pursued a long-term demand management program despite excess water supply in order to avoid the cost of expanding its wastewater treatment capacity.

public policy goals

Public enterprises intrinsically experience a tension between the desire to be financially thriving while at the same time promoting public policies. Unlike the incentive for some private businesses to strive for "low cost" as a strategy to sell more product, utilities must be concerned that their customers are not paying too much for an essential service on which public goods like public health and fire suppression depend.

In many cases, a utility's public policy goals may take priority in pricing. Though non-financial public policy goals vary based on circumstance, some type of concern for customer affordability is almost uniform among utilities. Thus, utilities may address this concern both in how they price a service for all customers (pressure to keep all prices as low as possible) and how they structure their prices for different customers, for example, for low-income customers.

Water and wastewater utilities sell an environmental good, so it is not surprising that environmental policy goals have increasingly driven service pricing in many areas. As mentioned earlier, the use of conservation pricing to drive down consumption may be a bottom-line financial concern. Yet even in areas without compelling supply-side financial reasons to drive down demand, providers may feel pressure to price their product with an eye towards promoting conservation as a component of community resource stewardship. In these areas, conservation may be driven by the belief that water is a natural resource that should be used wisely and one in which there are secondary impacts to wasteful use, such as energy use or surface water pollution from wastewater. For these reasons, some state and regional governments have banned the use of declining block rate pricing, which prices higher marginal units at lower marginal cost.[9] The tension between pricing to encourage less consumption versus pricing to encourage more sales and more revenue can lead to battles between water system managers and elected boards, and even within water systems between conservation program directors and financial directors.

8 Presentation by Ed Cebron of Cascade Water Alliance at the Bond Buyer Conference in Houston, Texas. May 12, 2013.

9 Examples: General Assembly of North Carolina. 2007. North Carolina Session Law 2008-143. Metropolitan North Georgia Water Planning District, May 2009. Water Supply and Water Conservation Management Plan. http://documents.northgeorgiawater.org/Water_Supply_Water_Conservation_Plan_May2009.pdf

Ease of Implementation

Like any of today's financial transactions, pricing is significantly influenced by technology, software and customer sentiment. Thus, the structure of a particular pricing approach, regardless of how supportive it is to other pricing criteria, must meet certain basic implementation criteria. For example, a well thought-out, carefully designed block structure that is beyond the capabilities of a utility's billing software cannot succeed. In extreme cases, utilities that wish to change some aspect of their pricing strategy (e.g., more frequent billing, different block structure) feel entrapped by existing technology and billing processes. Even for the most adept utility, it is far easier to conceive of "optimal" or improved pricing structures than it is to implement them.

With competing public policy and financial drivers, it is not surprising that pricing specialists have developed complex approaches that meet multiple objectives, but which hit a brick wall in terms of the "keep it simple" implementation criteria. Whereas other service industries such as health care, cell phones and airlines seem not to be overly hindered in their pricing by a need for simplicity, this implementation driver remains very compelling for many water utilities. If a city council member charged with approving pricing structures cannot readily understand a pricing approach, its chances for implementation diminish. From a sheer numbers standpoint, for every utility that is willing to try some type of pricing innovation, there are dozens if not hundreds that prefer much more incremental basic pricing changes.

Political Constraints

Finally, governmental utilities are often referred to as "unregulated," meaning not subject to Public Utility Commission rules. This can seem to imply that their pricing is unregulated as well. In truth, most government utilities are not unregulated, but rather self-regulated, with the "self" primarily consisting of an integrated system of customer pressure on elected governing board members, who must balance the above drivers with the political reality that water pricing decisions can lead to early "forced" retirement from public service. Political pricing pressure comes in all shapes and sizes, ranging from low-income advocacy organizations pushing for low rates, to wealthy gardeners questioning why maintaining their horticultural passion is being "penalized" by conservation standards, to members of the environmental community asking their normally pro-environment commissioners why they did not adopt an aggressive conservation pricing structure. These political forces shape not just the unit price of water but how the cost of service is allocated across user classes. And for better or worse, the short-term feedback cycle of electoral politics also determines what financial policies water managers can implement to preserve the utility's longer-term financial health.

Most government utilities are not unregulated, but rather self-regulated, with the "self" primarily consisting of an integrated system of customer pressure on elected governing board members.

Characterizing Current Pricing Structures

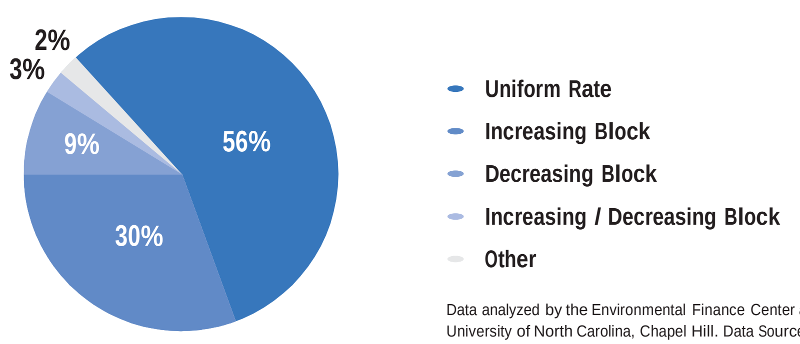
Financial analysts working in many commercial sectors pay careful attention to the role of pricing when assessing the overall health of the industry and the financial viability of entities within it. Water infrastructure investors in the municipal bond market should bring the same attention to the pricing structures of water service providers.

Examples of innovation are surfacing as a result of technological advances and business disruption trends, such as the proliferation of water-efficient appliances.

The pricing framework within the industry is largely standardized, to the extent that the industry's largest professional organization, the American Water Works Association, has produced detailed water pricing "standards" for pricing that describes industry-vetted pricing procedures and approaches.[10] Yet while the industry does not have widely divergent pricing models competing to establish an altogether new business model, examples of innovation are surfacing as a result of technological advances and business disruption trends, such as the proliferation of water-efficient appliances. The most common method of naming and distinguishing rate structures relies on how the variable charge changes as a customer uses more water. Uniform block rates include the same variable charge regardless of how much a customer consumes. Decreasing block rates see the unit price of water at higher consumption levels decline and increasing block rates have unit prices that increase as consumption increases (see distribution of block structure among North Carolina Utility rates in Figure 4). However, even among nominally similar rate structures—for example, inclining block rate structures—there is tremendous variability in the way these structures apportion fixed cost, the proportion of revenue or customers that fit within each tier, and the pricing difference between tiers. As a result, even the industry standards may give an analyst relatively little guidance in evaluating the revenue implications of a rate structure.

The vast majority of water and wastewater utilities analyzed in this three-state study adhere to a basic two-component model in which customers pay a recurring bill that includes a base charge independent of volumetric usage and a variable charge that is a function of consumption (sometimes called a commodity charge). Variations of this model exist that involve altering the base charge or volumetric unit cost at different times of the year (seasonal rates that reflect

Figure 4: Rate Structures in North Carolina



Data analyzed by the Environmental Finance Center at the University of North Carolina, Chapel Hill. Data Sources: NCLM/EFC 2012 NC Water & Wastewater Rate Survey.

10 American Water Works Association, 2012. M1 Principals of Water Rates, Fees, and Charges, 6th ed. Denver, Colorado.

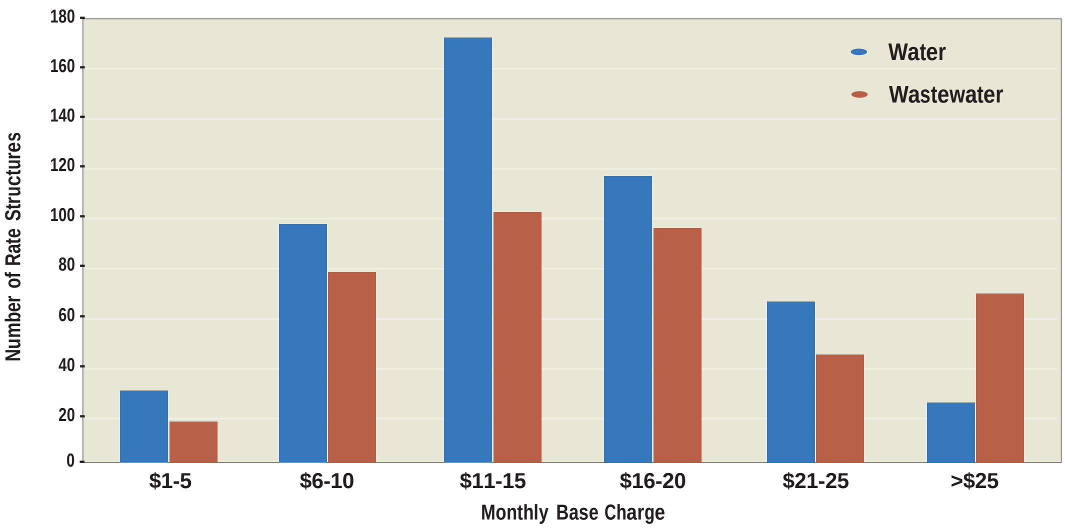
seasonal peak demand), or basing charges on property characteristics such as budget-based rates that consider yard size and grass type. But these alternative models, in terms of the number of utilities or market penetration in the study area, are extremely rare.

Analysts assessing the ability of a utility with aggressive conservation goals to repay its debts must look beyond the general characteristic of a rate structure to understand how strong a conservation pricing signal is sent to its customers, and what tools the utility has in place to stabilize revenue in response to the customers' conservation response. Despite adhering to a fairly basic pricing model, several design variations can lead to significant differences in how much customers of differing usage patterns pay and the conservation pricing signals they experience.

One of the most important design parameters that drives pricing signals relates to how high a utility sets the fixed charge component of its bills.

One of the most important design parameters that drives pricing signals relates to how high a utility sets the fixed charge component of its bills. From the vantage of a water utility manager, a high fixed component of the customer bill is highly desirable, since it reduces the volatility of revenue from one month to the next. The bar graph presented in Figure 5 outlines the significant variation in the base charges throughout North Carolina. The graph shows many utilities with base charges that are two or three times the base charges employed by their peers. Utilities with high base charges (right side of the graph) can count on a sizable revenue inflow each month, regardless of the variation in water sales.

Figure 5: Variation in Monthly Base Charge Across North Carolina

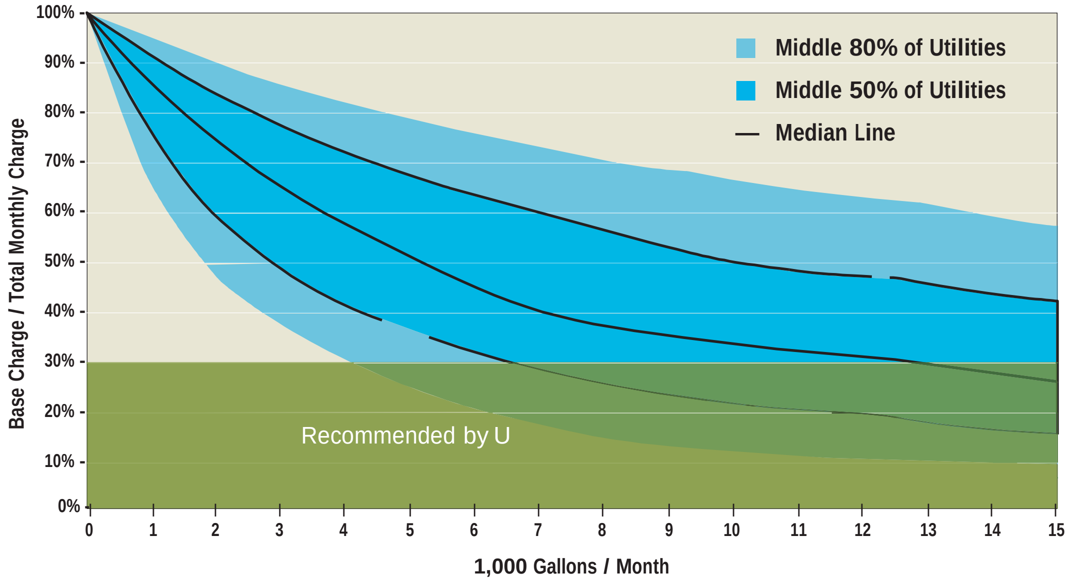


Data analyzed by the Environmental Finance Center at the University of North Carolina, Chapel Hill.
Data Sources: NCLM/EFC 2012 NC Water & Wastewater Rate Survey.

Yet from the vantage of a customer, the proportion of the monthly bill attributable to the fixed charge may not be desirable, as this structure limits the potential savings the customer can achieve by reducing water use. Figure 6 (page 14) shows the relative impact that base charges have on what customers pay for water services in California, a state which has adopted a framework for structuring rates. The figure provides insight into the wide array of approaches among different utilities; in this case, California has experienced significant water supply stress and has enacted voluntary limits on rate structure design.[11] The first thing to notice is the extreme variation in pricing as practiced; for customers that use 5,000 gallons per month—the average monthly household sale for many utilities—the proportion of the bill accounted for by the base charge varies from 35% to 65% among the median 50% utilities.

11 California Urban Water Conservation Council, 2011. Utility Operations Programs. http://www.cuwcc.org/mou/bmp1-utility-operations-programs.aspx

Figure 6: Portion of Monthly Bill that is Fixed (Base Charge) Across 84 CA Utilities in 2011



Data analyzed by the Environmental Finance Center at the University of North Carolina. Data Source: AW WA and RFC CA Rates Survey, 2011.

Unfortunately as this illustrates, the "optimal" approaches to conservation pricing and revenue stability are diametrically opposed.

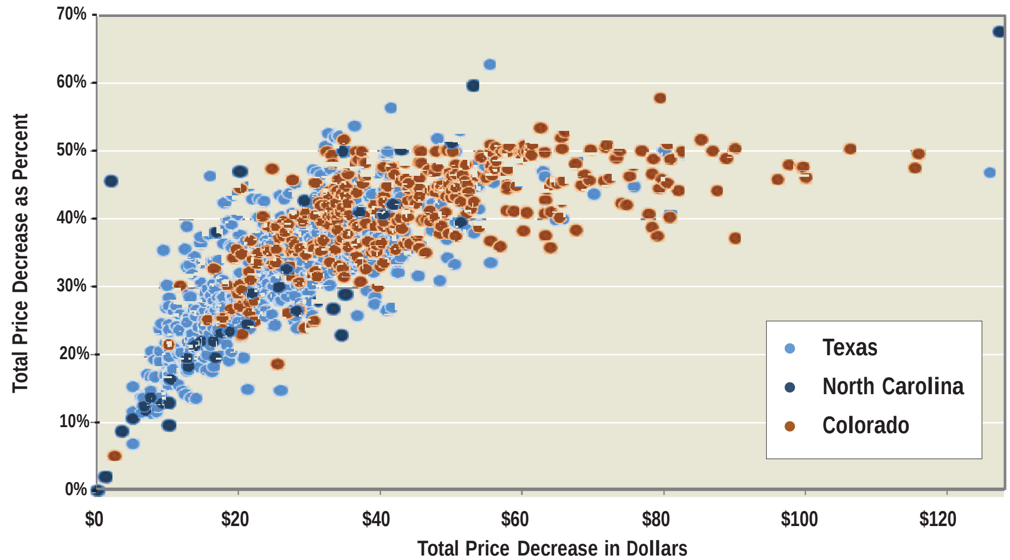
For a utility at the low end of this band, a significant change in use from year to year for a customer will result in a very significant revenue change. A utility in the higher part of this band will see variations in usage having a more diluted impact on overall revenue.

As illustrated in Figure 6 under the prevailing pricing model of almost all utilities, customers that use a lot of water pay a total bill that is almost completely dependent on the volume of water they use. This high volumetric dependence is one of the origins of sudden, and in some cases pronounced, revenue drop for utilities during a period of mandatory reduction. Unfortunately as this illustrates, the "optimal" approaches to conservation pricing and revenue stability are diametrically opposed. (Ceres and the EFC intend to analyze pricing models for jointly optimizing conservation pricing and revenue stability in a future issue paper.)

Some water utilities have sought to minimize the revenue destabilizing effects of drought-induced restrictions or persistent demand changes with fees or surcharges to stock reserve funds in advance of a probable and unavoidable downturn in demand. These funds may be called rate stabilization funds, though utilities account for them differently—some have distinct funds that appear on the balance sheet, while others keep extra days cash on hand without an earmark. Others have implemented mechanisms like drought surcharges that kick in only when the system must curtail customer use, to offset some of the revenue lost to outdoor watering reductions. These sorts of fees, funds and surcharges can certainly help to smooth the revenue effects a water system feels but do not address the larger structural issue of a highly fixed cost service that is largely priced volumetrically.

Figure 7 (page 15) shows the enormous variation in pricing signals that typical residential customers experience across utilities in North Carolina, Colorado and Texas. For each utility in the sample, the authors calculated the drop a customer would see in his or her bill if monthly usage were decreased from 10,000 gallons to 5,000 gallons. The utilities in the upper right area of the graph have the strongest conservation pricing signals, and the utilities in the lower left have some of the weakest signals.

Figure 7: Colorado, North Carolina & Texas Reductions in 2012 Water & Sewer Bill for Decrease in Consumption from 10,000-5,000 Gal/Month



Data analyzed by the Environmental Finance Center at The University of North Carolina, Chapel Hill. Data sources: Texas Municipal League annual TX water and sewer rate surveys (self-reported); NCLM/EFC 2012 NC Water & Wastewater Rate Survey; AWWA and RFC 2013 CA Rates Survey.

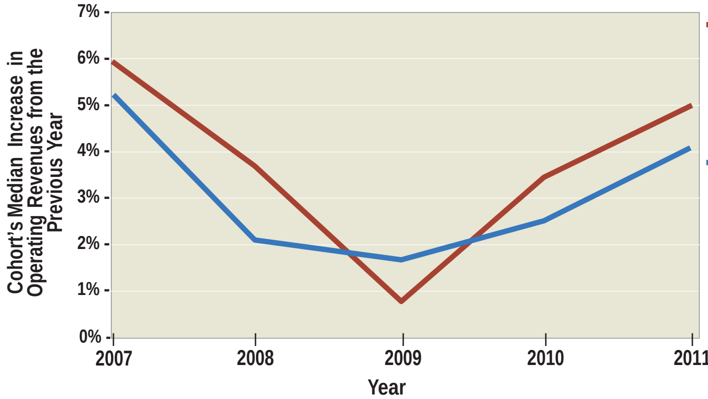
Described another way, consider the financial incentive for a family that uses 10,000 gallons per month to modify their behavior to reduce their usage to 5,000 gallons per month, which is more in line with average use in North Carolina and Texas. A drop of this magnitude could result in the family's decision to curtail irrigation or to invest in water-efficient appliances. This shift, whether over time or suddenly, would lead to a lower bill. The figure shows this drop in terms of absolute dollars versus percent of bill. For some families, knowing that a sizable amount of money can be saved ($10 rather than $3 dollars) may drive conservation, while for others, a perception that the bill is decreasing sharply in percentage terms may be enough.

The structure of pricing tiers is hugely influential on revenue variability when customers change behavior. Figure 8 (page 16) illustrates the link between pricing structure and revenue variability. For this figure, utilities were divided into two groups—those in which a significant drop in usage (from 10,000 gallons per month to 5,000 gallons per month) led to a significant drop in household charges, and those where the same change in usage was rewarded by a much more modest change in household charges. The figure shows that the revenue variability, both in terms of year-to-year increases and year-to-year decreases, was significantly greater for the utilities with stronger price signals.

priCing ConservAtion signAls AnD revenue impACts

Clearly, one of the defining pricing challenges faced by utilities is balancing the need for sufficient revenue and stability with demand management goals. Managing demand growth from population gains is a financial imperative for many systems whose long-term capital costs are driven by peak demands that dictate treatment and transmission capacity needs and which even may necessitate investment in new supplies orders of magnitude more expensive than the existing supply base.

Figure 8: Variability of Operating Revenues by Cohorts of Utilities with Varying Emphasis on Volumetric Pricing (n = 126 North Carolina & Texas Utilities)



Consistently high-variable pricing: 54 utilities that always had at least 45% reduction in water & sewer bill from 10 to 5 kgal/month.

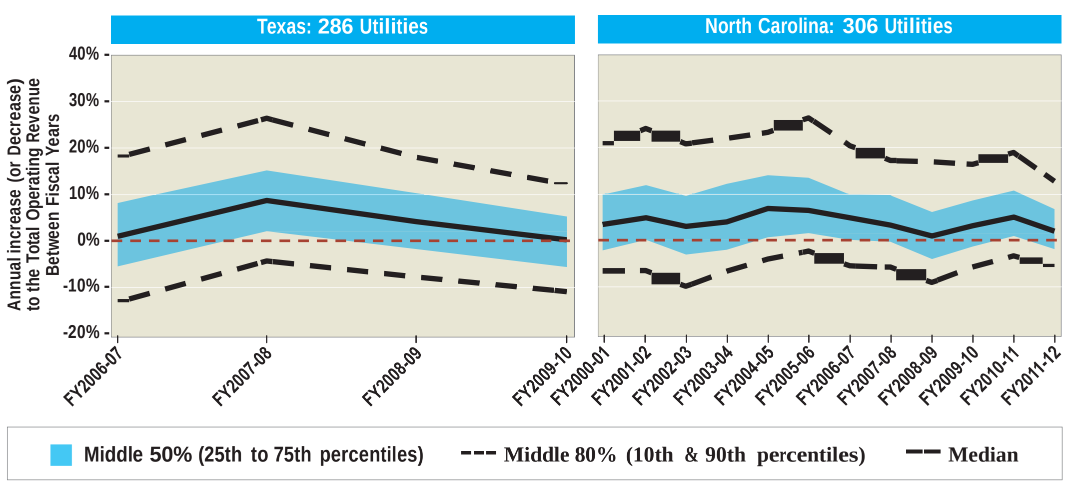
Consistently low-variable pricing: 72 utilities that never had more than 40% reduction in water & sewer bill from 10 to 5 kgal/month.

Data analyzed by the Environmental Finance Center at The University of North Carolina, Chapel Hill. Data sources: Texas Municipal League annual TX water and sewer rate surveys (self-reported); NCLM/EFC 2007 - 2012 NC Water & Wastewater Rate Surveys.

Managing growth to avoid costly capital expenditures is a compelling argument for the continued use of pricing as a method to encourage efficiency. Demand management can have the added benefit of reducing revenue instability during times of drought, smoothing the weather-induced fluctuations in usage in states like North Carolina, Texas and Colorado. Yet utility rate structures are not created equal in their ability to recover sufficient revenue in a declining demand environment, whatever the cause.

Figure 9 shows annual revenue trends for utilities in Texas and North Carolina. The figure shows the vulnerability of utilities to weather events and declining usage. Both states have experienced notable revenue downturns during drought periods (although the initial months of a drought may actually lead to revenue increases as customers increase irrigation to make up for low rainfall; this revenue surge can easily be offset by a persistent drought that necessitates emergency conservation).[12]

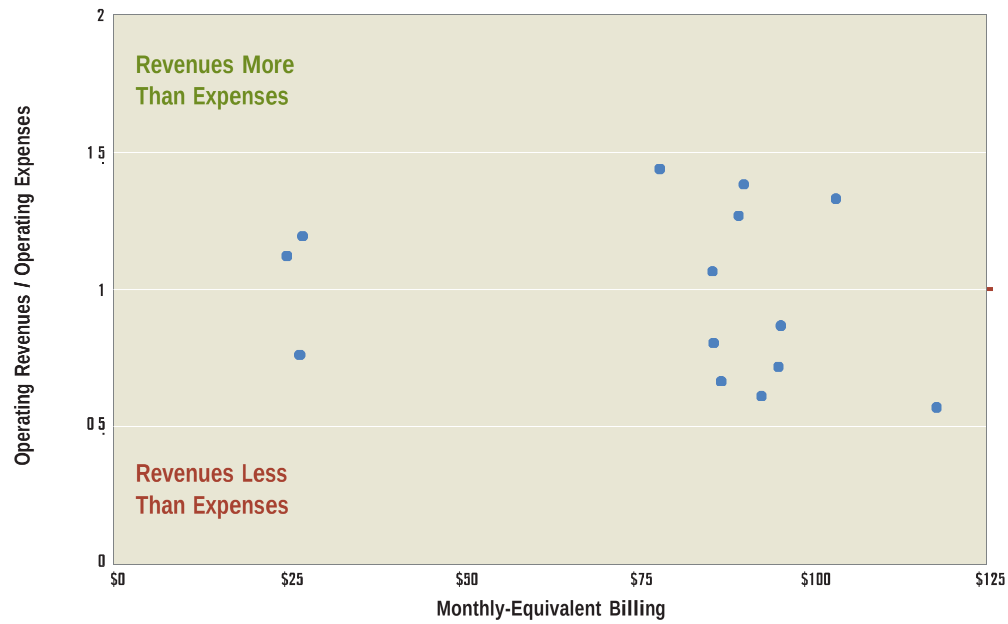
Figure 9: Revenues for Texas and North Carolina Utilities



Data analyzed by the Environmental Finance Center at The University of North Carolina, Chapel Hill.
Data sources: Texas Municipal League annual TX water and sewer rate surveys (self-reported); NCLM/EFC NC Water & Wastewater Rate Surveys.

12 Christine E. Boyle and Mary Tiger, 2012. "Shifting Baselines in Water Management: Using customer-level analysis to understand the interplay between utility policy, pricing, and household demand." Environmental Finance Center, Chapel Hill, North Carolina. http://efc.unc.edu/publications/2012/ShiftingBaselines.pdf

Figure 10: North Carolina Operating Ratios in 2012



Data analyzed by the Environmental Finance Center at The University of North Carolina, Chapel Hill.
Data sources: NCLM/EFC 2012 NC Water & Wastewater Rate Survey.

The slowed growth and, in many cases, decline in revenue being encountered by many utilities in the water sector is problematic for an industry that faces rapidly rising labor, construction and energy costs and future capital needs to replace failing infrastructure.

The slowed growth and, in many cases, decline in revenue being encountered by many utilities in the water sector is problematic for an industry that faces rapidly rising labor, construction and energy costs and future capital needs to replace failing infrastructure.[13] When considering costs, the revenue picture under existing pricing structures is troubling, particularly for smaller utilities that have deferred capital investments or have benefited from now dwindling public capital subsidies. Figure 10 shows the ratio of revenues over expenses[14] based on audited financial reports in North Carolina, one of the relatively few states where historic audited financial data for a large number of utilities is readily available in electronic form. The revenue shortfall is likely similar in many other states where statistics are less readily available.

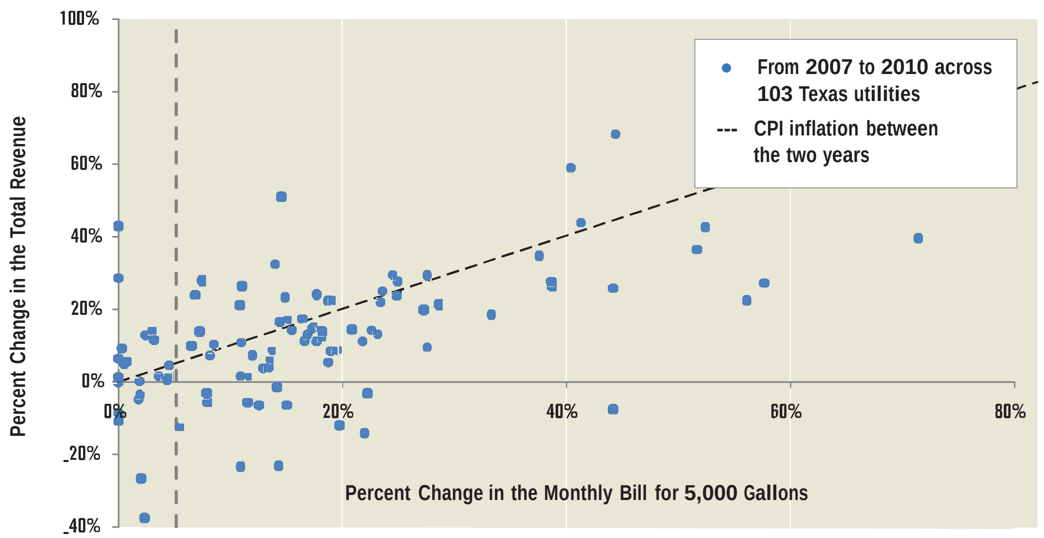
By comparing operating ratio to current average household bills, the analysis portrays the different financial challenges faced by utilities. Some utilities that are on the left-hand side of the chart likely can raise revenues by shifting rates more to statewide averages; however, the utilities in the lower right corner appear to be in fiscal despair, with rates that are some of the highest in the state and still insufficient revenue.

When water service sales followed more predictable steady growth patterns, readjusting revenue generation was typically done by some form of across-the-board rate hikes; however, the declining household usage trends that utilities are experiencing make filling the revenue gaps more challenging. Figure 11 (page 18) shows the evolution of revenue plotted against household rate adjustments in Texas. Clearly, raising rates by a fixed percentage does not generate corresponding increases in revenues for many utilities. In some cases, the divergence of rate increase percentages and revenue growth rates is severe; relatively significant upward rate adjustments occurred for utilities corresponding to a period with no revenue growth or even a decline in overall revenues. These trends could be attributed to several causes, including overall falling consumption due to the implementation of national efficiency standards and the

13 American Water Works Association, 2012. "Buried No Longer: Confronting America's Water Infrastructure Challenge." Denver, Colorado. http://www.awwa.org/Portals/0/files/legreg/documents/BuriedNoLonger.pdf

14 Expense figures include depreciation. Under NC law, utilities are required to balance their expenditure budget but are not required to set revenues at levels to cover non-cash expenses such as depreciation.

Figure 11: Driving Revenue Through Rate Increases



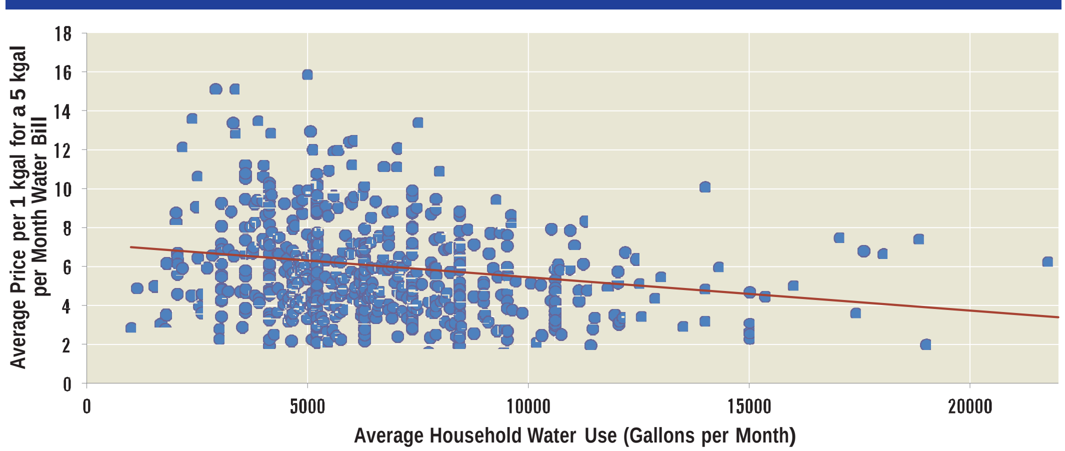
Data analyzed by the Environmental Finance Center at the University of North Carolina, Chapel Hill. Data sources: Texas Municipal League annual TX water and sewer rate surveys (self-reported), Texas Water Development Board data from audited financial statements of utilities with outstanding loans.

loss of industrial customers. The figure suggests future challenges for utilities facing increasing political pressure to avoid rate modifications and increasing revenue demands.

Rising volumetric prices also increase the incentives for customers to change usage behavior, possibly leading to a downward revenue spiral.

Rising volumetric prices also increase the incentives for customers to change usage behavior, possibly leading to a downward revenue spiral. There is an enormous amount of literature that tries to predict how customers actually respond to pricing signals. As with most social science research, while there are some compelling findings, the reliability of the findings does not lend itself to highly accurate modeling at a specific utility. However, this does not mean utilities should not consider elasticity in their planning. An analysis done in North Carolina studied the impact of average price on usage across utilities and showed a statistically significant impact, but with lots of variation among individual utilities.[15] Figure 12 shows the relationship between household price

Figure 12: Correlation between 2012 Average Monthly Household Water Use and Average Price/1,000 Gallons for a 5,000 GPM Water Bill (661 Texas Municipalities)



Data analyzed by the Environmental Finance Center at The University of North Carolina, Chapel Hill.
Data sources: Texas Municipal League annual TX water and sewer rate surveys (self-reported)

15 Shadi Eskaf, June 2009. "Utility Rate Setting for Cost Recovery and Conservation." Environmental Finance Center, Chapel Hill, North Carolina. http://efc.unc.edu/publications/2009/2009_SWIC_FullReport.pdf

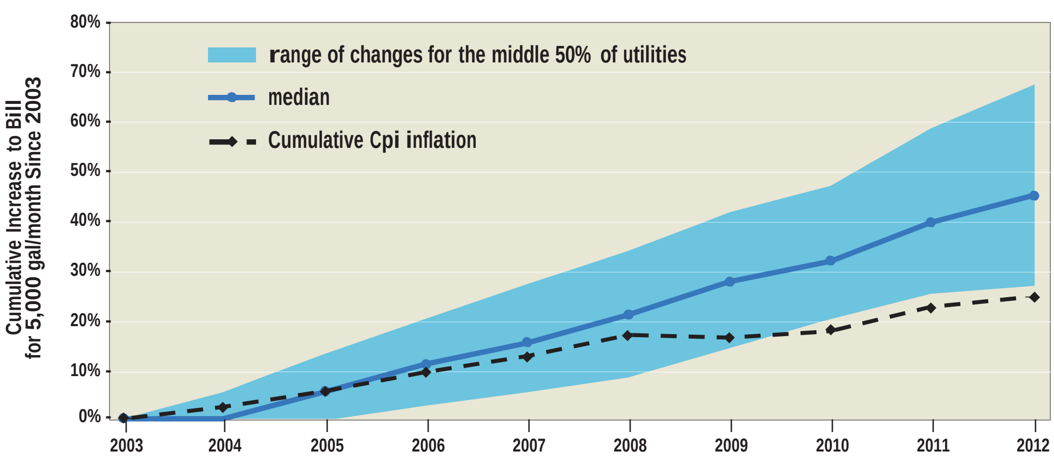
and self-reported usage by account for Texas utilities. While there is a definite inverse relationship between high prices and water use, you can see that high prices do not always bring along with them low water use. The sensitivity of customers to price changes depend on income and the availability of alternative sources of supply (such as rainfall captured and stored for later use, groundwater that can be pumped from underneath the property owner's home or in some places, water that can be trucked in and stored onsite). The sensitivity of customers to pricing also depends on whether they are using water for indoor, essential uses or outdoor uses—outdoor, discretionary uses tend to be subject to greater pricing sensitivity.

AfforDAbility

Reliably benchmarking the affordability of existing pricing structures is one of the more challenging tasks facing analysts. First, there are many interpretations of what constitutes an affordability challenge. Historically, when water bills were low, comparing the annual expenditure for an average family over the median household income for the community provided an acceptable snapshot of affordability. Conventional wisdom among many in the water utility business is that water remains undervalued and is inexpensive in relation to services such as cable television and mobile phone service. While this may be true in absolute terms, data shows that the increases in water and sewer charges have begun to surpass inflation in recent years. This is not surprising given the low rate of inflation, but in many communities where incomes have remained static and cost increases of any kind have received attention, this trend may pose problems for utilities in the future. For example, as shown in Figure 13, rates in Texas have recently begun increasing faster than inflation and have become a legitimate burden for many low-income families.

Average expenditure as a percentage of median household income (MHI) continues to be widely used to determine eligibility for public funding or relief from regulatory compliance. Yet it is an insufficient indicator of household distress in many communities for a variety of reasons, and has been criticized by the regulated utility community when it is used to determine utility financial capacity.[16] The denominator of the indicator MHI is plagued with shortcomings as an indicator—it masks income distribution within a community and discounts the low-income part of a

Figure 13: Rising Rates — Texas: 194 Utilities



Data analyzed by the Environmental Finance Center at The University of North Carolina, Chapel Hill.
Data sources: Texas Municipal League annual TX water and sewer rate surveys (self-reported)

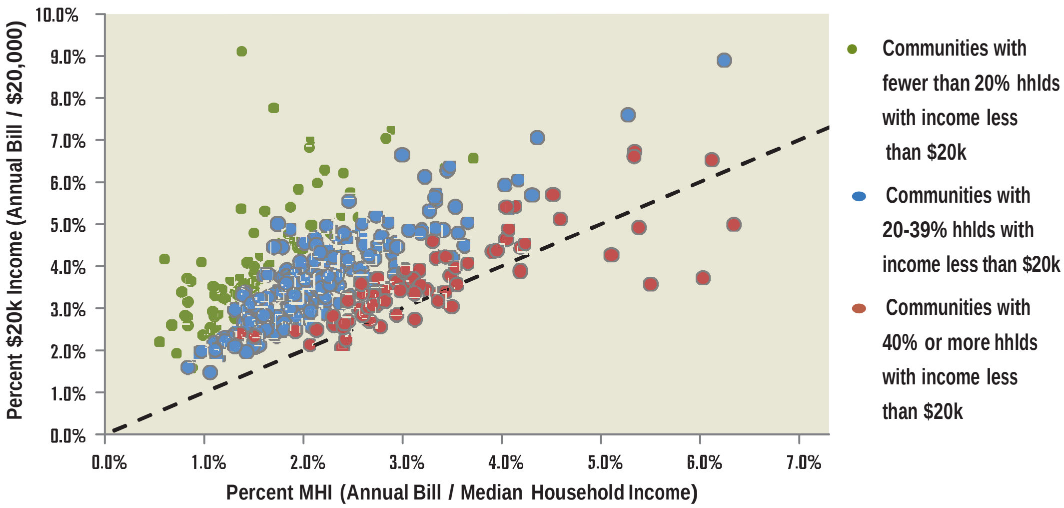
16 United States Conference of Mayors, American Water Works Association and The Water Environment Federation, 2013. Affordability Assessment Tool for Federal Water Mandates. http://www.mayors.org/urbanwater/media/2013/0529-report-WaterAffordability.pdf

community curve. A single parent family with two children earning just over minimum wage will earn less than $20,000 per year. These types of distressed families make up a percentage of almost every community, regardless of the community's median income. Both a community with an MHI of $75,000 and one with an MHI of $30,000 will experience the same affordability challenge related to this type of low-income family. Addressing the financial impacts of water service on low-income households is both a public policy issue and a financial issue; as distressed families have more difficulty paying bills, the amount of late payments and disconnections go up. In addition, as it becomes clear that some families are unable to pay for basic services, the pressure on elected boards to keep rates low for the entire customer base increases.

Addressing the financial impacts of water service on low-income households is both a public policy issue and a financial issue; as distressed families have more difficulty paying bills, the amount of late payments and disconnections go up.

Figure 14 portrays the complexity of assessing the affordability pressure in a particular service area with a single metric. The figure shows that even utilities whose average bills as a function of MHI are modest (less than 2% to 3%) have households (in some cases a large number) that are paying a significantly higher percentage of their income for services. In some communities in North Carolina, households earning $20,000 a year are paying as much as 7-9% for basic water services.

Figure 14: Annual Water & Sewer Bills at 5,000 Gallons/Month in 2012 Compared to Community's Income Levels in 2011 in North Carolina (n=365 utilities)



Analysis by the Environmental Finance Center at the University of North Carolina, Chapel Hill.
Data Sources: NCLM/EFC 2012 NC Water & Wastewater Rate Survey; U.S. Census Bureau 2007-2011 5-year American Community Survey.

Potential Metrics for Assessing Rate Structure and Pricing Effects

Rating agency and investor analysts incorporate pricing analysis into their assessments in terms of household bill at a given level of consumption, percentage of the typical household bill in comparison to median household income and generic pricing structure. Yet there are relatively few quantitative pricing and household expenditure metrics presented in standard rating criteria as compared to other types of finance and demographic data.[17]

As usage patterns continue to shift and more utilities experience revenue variability pressure, the role of pricing in understanding utility credit health will only increase.

These pricing quantitative metrics have not changed significantly as demands have changed.[18] For example, disclosure guidelines suggest a basic cost metric at a single household consumption point (7,500 gallons per month) that may have little relevance for many utilities with much lower customer usage patterns.[19] As usage patterns continue to shift and more utilities experience revenue variability pressure, the role of pricing in understanding utility credit health will only increase. For this reason, Ceres has urged utilities to disclose their pricing structures and affordability targets, and for analysts to use this information in more meaningful ways.[20] Table 2 (page 22) provides a list of possible pricing metrics that we believe can support analysts' assessments of overall utility fiscal health. Some of these metrics are already in use, while to our knowledge some are rarely, if ever, used.

While graphical analyses and suggested metrics will provide a more complete picture of utility pricing signals and potential revenue risk, the ultimate financial risk of different pricing structures depends not only on the structure but also the customer base and operating environment of a particular utility. For example, a utility pricing structure with high-volume prices for irrigation water in an area with lots of irrigators and variable weather will be more prone to swings than a similar pricing structure in an urban area with few lawns and more consistent weather. A utility with a low fixed fee in an area with older homes that use above-average amounts of water, but that are transitioning to more efficient fixtures, poses more of a risk than an area with a similar rate structure serving newer homes with lower use that have already transitioned or been constructed with efficiency fixtures and appliances.

These demographic and land use characteristics should be considered by analysts when assessing the vulnerability of pricing structures to revenue volatility. There is no singular rule of thumb to judge a resilient rate structure, but by asking these questions analysts will have a more complete picture of a water system's credit profile.

17 Fitch Ratings, August 2011. U.S. Water and Sewer Revenue Bond Criteria.— Standard & Poor's, 2008. Key Water and Sewer Utility Credit Ratio Ranges.— Moody's Research and Ratings, August 1999. Analytical Framework for Water and Sewer System Ratings.

18 Fitch Ratings, 2011. U.S. Water and Sewer Revenue Bond Rating Criteria. New York, New York, Fitch Ratings.

19 National Federation of Municipal Analysts Disclosure Guidance recommends average monthly bill for residential customers based on 7,500 gallons of usage.

20 Ceres, April 2013. Disclosure Framework for Water & Sewer Enterprises. Boston, Massachusetts.

Table 2: Sample Metrics for Assessing Drinking Water Provider Pricing Structure			
issue of Concern	**Commonly used metric**	**Alternative or Additional metrics**	**rationale**
Competitiveness. Comparison of household expenditures for water service between systems. How much does a utility charge versus another utility?	Residential customer water bill at consumption level of 7,500 gallons per month.	Residential customer water bill at consumption level of 5,000 gallons per month.	Average household use for utilities has declined significantly in recent years, and in many places is now much lower than 7,500 gal/mo. Many utilities see the vast majority of their customers using 5,000 gallons or less per month.
Affordability. Might households have trouble making payments and governing boards be under political pressure to limit price adjustments?	Typical household monthly water bill divided by Median Household Income (MHI) for community	Typical household monthly water bill divided by the poverty income for a family of four at time of analysis. Percentage of households in service area that are at or below poverty line.	As income distributions have dispersed and water service bills have increased in real and nominal terms, understanding affordability stresses requires additional metrics beyond simply the percentage of expenditure over MHI. By looking at the percentage of expenditure for an at-risk family and assessing the relative number of those types of families in a service area, an analyst would learn more about challenges facing a particular area.
revenue sufficiency. Does the pricing in place provide investors with confidence that it generates sufficient revenues to meet debt requirements?	Debt Service Coverage (DSC)—typically expect range of 1.2 to 2	Modified annual DSC that incorporates annual operating revenues plus annual drawdowns from a sufficiently funded rate stabilization fund (e.g. withdrawals in a given year never exceed more than 25% of rate stabilization fund). Alternatively, if a utility maintains a rate stabilization fund, DSC could be analyzed as a rolling three-year average to allow for natural revenue variation.	Under current pricing structures, the inherent revenue swings due to normal usage changes make maintaining high DSC year in and year out much more challenging. Utilities that take steps to cushion this variation with a rate stabilization fund are arguably reducing investor risk, while at the same time minimizing pressure to over charge to compensate for revenue variability.
revenue vulnerability. Does the utility's pricing structure expose it to excessive revenue reduction from adoption of basic water efficiency measures, such as fixture and appliance replacements?	Rate structure defined by the change in commodity price over different consumption blocks. (e.g. decreasing vs. uniform vs. increasing block)	Percent of household charge at 5,000 gallons per month attributed to fixed fee. Percent of operational revenue attributed to fixed charges.	Some simplified characterizations of pricing focus primarily on block structure. But rate structure may have less significance on pricing signals and revenue variability than does the size of the base charge or fixed fee.
revenue vulnerability. Does the utility's demand profile expose the utility to excessive revenue variability from changes in customer composition or use patterns?	Revenue from top 10 customers.	Average amount of revenue attributed to irrigation as a percentage of total revenue.	Investors should remain aware of dependence on a small number of customers and should continue to document the percent of revenue attributed to top customers. But heavy dependence on outdoor irrigation for revenue can also be a risk driver, since drought-induced watering restrictions or even pricing responsiveness in inclining block rate structure may cause significant reductions in revenue as customers reduce outdoor usage.
revenue vulnerability. Does the utility's pricing structure expose the utility to excessive revenue variability in the event of outdoor watering reductions?	Rate structure defined by the change in commodity price over different consumption blocks.	Percent of household bill at 10,000 gallons per month that is attributed to fixed fee.	Similar to above, but provides insight into vulnerability of revenues to usage changes by water users in higher tiers.
Conservation pricing signals. How strong an incentive does pricing structure create for reduced usage?	Presence of inclining block rate structure.	Percentage of household charge at a given consumption point that is attributed to variable charge. Percentage change in bill for a set change in consumption. Absolute change in charge for a set change in consumption.	Some dialogue around conservation pricing signals focuses on the general block structure of the pricing. The block structure can influence pricing signal, but these other factors can have a more significant role in influencing the price incentive for reducing usage.

Conclusion

There is no one-size-fits-all solution to pricing for drinking water services—flexibility in designing pricing structures will allow utilities to address their specific financial objectives in the ways that best suits their communities.

This paper demonstrates the complexity and variation of water utility pricing, and the relevance of pricing structure to credit health. What should be clear from our analysis is that there is tremendous variability in the pricing of water services in the United States, and a range of recent experience in the ability of water systems to increase revenue through rate adjustments. We invite bond analysts to incorporate these types of analyses and supplemental metrics into their own credit assessment frameworks. While the lack of reliable data on pricing structures and demand profiles provided to analysts in utilities' financial documents may limit integration into credit analyses, over time, persistent demand by analysts for this sort of data will help the market to undertake more consistent analysis of pricing structures and demand profiles. We also encourage water systems to use these metrics to educate their boards and elected officials on how to safeguard the financial stability of their communities' most critical infrastructure, for present and future generations.

It is also clear that there is no one-size-fits-all solution to pricing for drinking water services. In some ways this is for the best, as flexibility in designing pricing structures will allow utilities to address their specific financial objectives in the ways that best suits their communities. But even amidst this range of practice, the metrics and analyses described in this paper should help analysts and utilities better assess the resilience of water systems to demand changes, while also providing a clearer view of how well a utility is meeting their own stated goals.

The next paper in this series will look at emerging pricing models that can jointly optimize the protection of revenue and the use of pricing to manage demand.

Ceres is a nonprofit organization mobilizing business leadership on sustainability challenges such as climate change and water scarcity. It directs the Investor Network on Climate Risk (INCR), a network of more than 100 investors with collective assets totaling more than $11 trillion.

Ceres provides tools and resources to advance corporate water stewardship including the Ceres Aqua Gauge, a roadmap that helps companies assess, improve and communicate their water risk management approach and that allows investors to evaluate how well companies are managing water-related risks and opportunities. For more details, see: www.ceres.org/aquagauge

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