



***The Impacts of Water Conservation On Water Works System
Expansion Capital Expenditures
(*Less Water Demand = More Money*)***

Drinking Water 1-2-3
April 17, 2019

Presented By:

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President
Engineering Enterprises, Inc.



Presentation Overview



Background Information



Water Works System (WWS) Planning Overview



WWS Sustainable Master Plan Results



Water Conservation Impacts



Implementation Realities

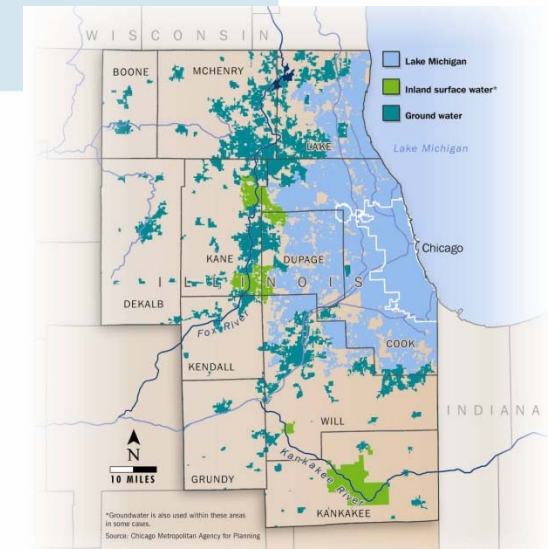
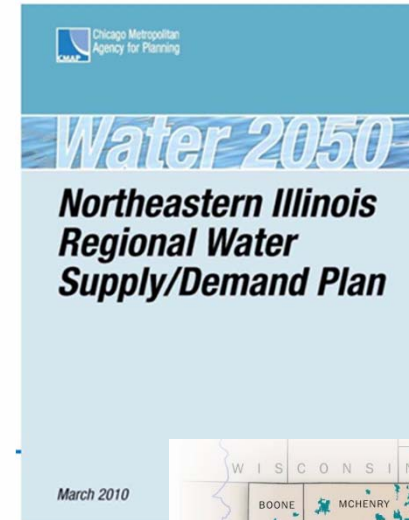


Q&A



- ◆ CMAP Coordinated Stakeholder Driven Process → 35 Delegates From NE IL
- ◆ Water Supply & Demand Analysis For 11 County NE IL Region
- ◆ Mission Statement:

To consider the future water supply needs of northeastern Illinois and develop plans and programs to guide future use that provide adequate and affordable water for all users, including support for economic development, agriculture, and the protection of our natural ecosystems
- ◆ **Recommended Water Demand Management To Stretch Capacity of Existing NE IL Water Supply Resources**





Background Information

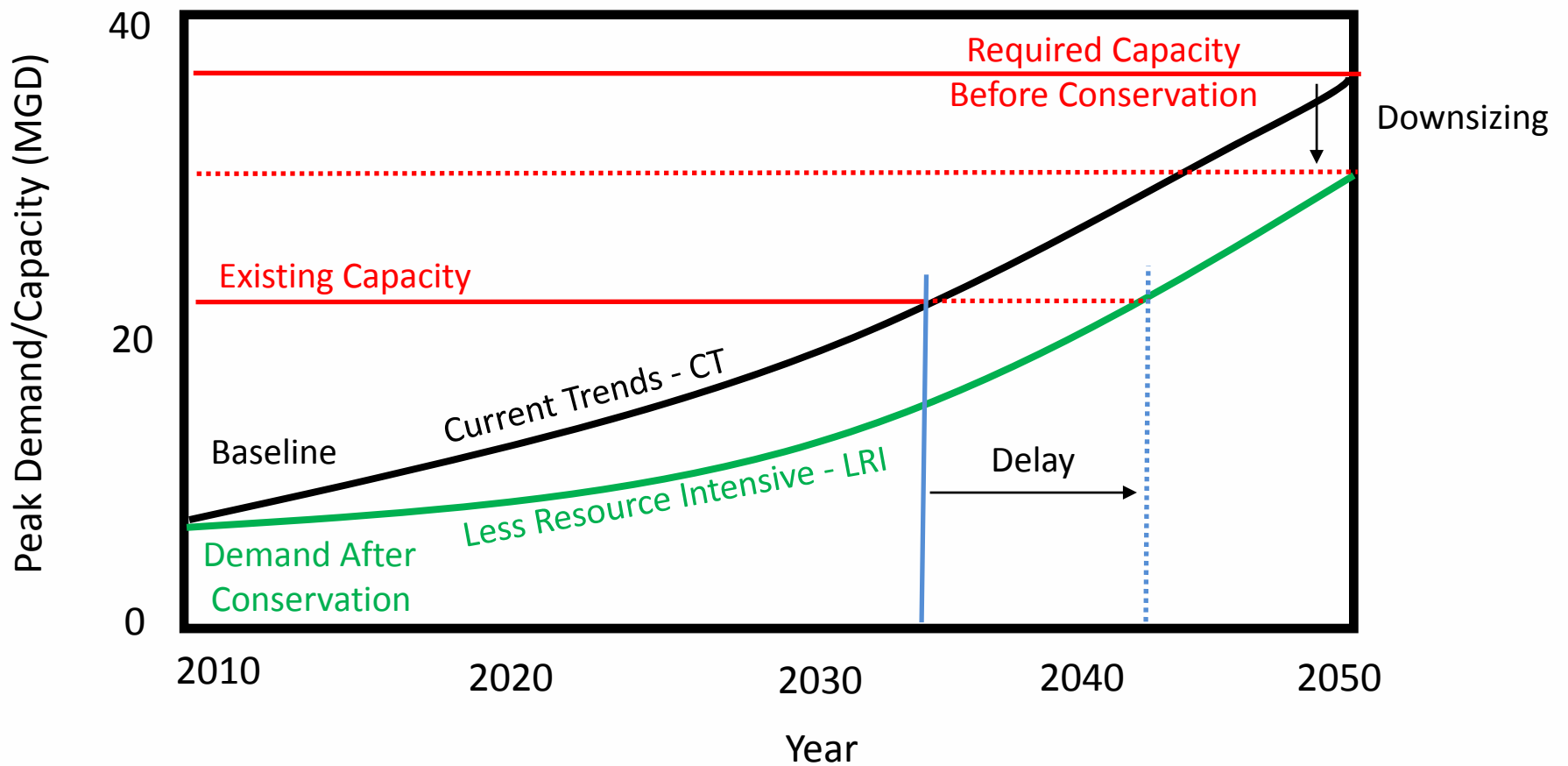
Water 2050 Water-Use Conservation Best Management Practices

- ◆ Water Conservation Coordinator
- ◆ Water Survey For Residential Customers
- ◆ Residential Plumbing Retrofit
- ◆ Residential High Efficiency Toilet Replacement Program
- ◆ High-Efficiency Clothes Washing Machine Replacement Program
- ◆ System Water Audits, Leak Detection and Repair
- ◆ Metering With Commodity Rates
- ◆ Water Waste Prohibition For Residential & Non-residential Customers
- ◆ Efficient Water Use Landscaping For Large Landscape Areas
- ◆ Conservation Programs For Commercial, Industrial, and Institutional Accounts
- ◆ Public Information Programs
- ◆ Retail Conservation Pricing
- ◆ School Education Programs



Deferred Capacity Increases Due To Water Use Reduction

Hypothetical Community

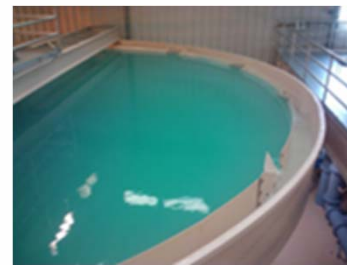


Source: AWWA

💧 Supply



💧 Treatment



💧 Storage



💧 Distribution





- ◆ **Average Day Demand (ADD)**
Total water use throughout the year divided by # of days in year
- ◆ **Maximum Day Demand (MDD)**
Maximum daily demand within a year
- ◆ **Maximum Hour Demand (MHD)**
Maximum hour of demand throughout year
- ◆ **MDD:ADD Ratio**
Ratio of MDD to ADD





WWS Planning Overview

Population Projection

Develop population projection for planning period

Current Trends (CT) Water Use Projection

Review historical water use patterns and then develop “business as usual” water use projection for planning period

Exhibit 1-2: Historical and Projected Population Summary
United City of Yorkville, IL

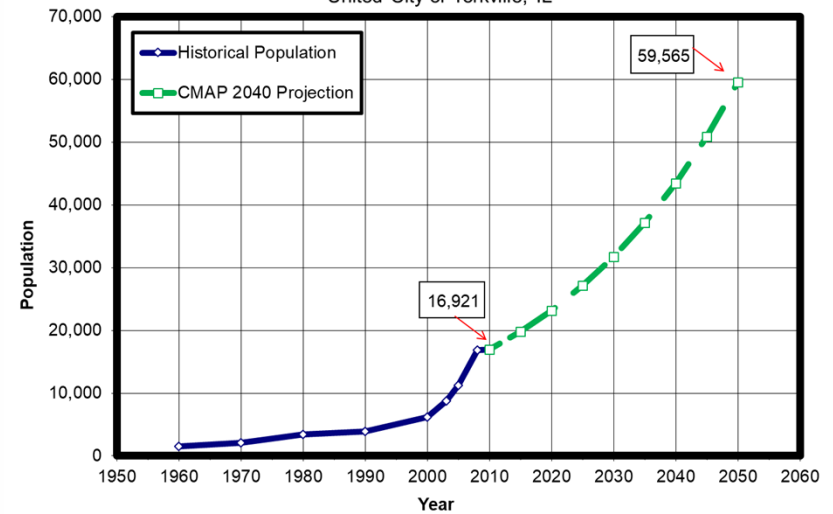
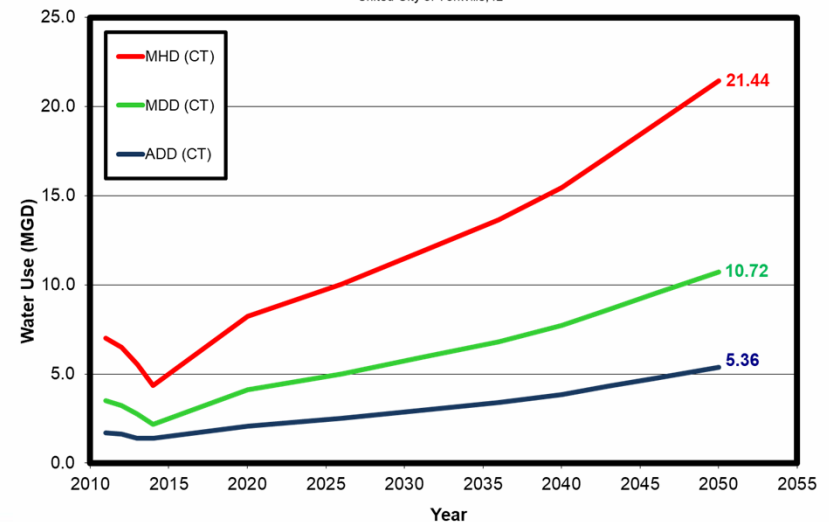


Exhibit 3-4: Historical and Projected Water Use Summary
United City of Yorkville, IL





WWS Planning Overview

💧 **Water Conservation BMP Evaluation**

- 💧 Evaluate water conservation best management practices applicable to your community
- 💧 Quantify achievable water use reduction with heightened focus on water conservation
- 💧 Identify your Planning Horizon



WWS Planning Overview

**Table No. 3-11: Potential Estimated Water Savings
From Water Conservation and Efficiency
City of Batavia, Kane Co., IL**

Category		Water Saved (MGD)	% Of Total (%)
Outdoor	All Customers	0.085	2.3%
	New Landscape	0.008	0.2%
Utility Water - System Losses		0.186	5.0%
Indoor Residential	High Efficiency Toilets (HET)	0.133	3.6%
	High Efficiency Washing Machines (HEWM)	0.077	2.1%
	Retrofits	0.132	3.5%
Commercial, Industrial, and Institutional Customers		0.084	2.3%
Total Estimated Savings =		0.706	19%



WWS Planning Overview

💧 High Efficiency Toilet (HET) Example

A. Average Day Demand	3.78 MGD
B. Pre-1994 Households	4,538
C. Flushes per Household per Day	15
D. Pre-1994 Flush Volume	3.5 Gal/Flush
E. HET Flush Volume	1.28 Gal/Flush
F. Assume Percent Upgrade	90%



WWS Planning Overview

HET Water Saved = ((D-E) x C x B x E

2.22 x 15 Flush/Day x 4,538 Houses x 0.9

= 136,000 Gal/Day Reduction

= 3.6% Reduction



POTENTIAL ESTIMATED WATER SAVINGS FROM WATER CONSERVATION AND EFFICIENCY

Village of Montgomery, Kane & Kendall Cos., IL

Village of Montgomery 2050 CT Water Demand Estimate		1,380	MG	
(a) 2050 Daily CT Water Demand Estimate		3.78	MGD	
Outdoor Water Use				
(b) Water Supply Spent on Outdoor Use		3.7%		
(c) Outdoor Water Wasted		50%		%
(d) Assumed Reduction of Outdoor Waste		50%		Reduction
(e) New Landscape Water Waste Reduction		5%		of Total
All Customers - Water Saved (a x b x c x d) =		0.035	MGD	4.5%
New Landscape - Water Saved (a x b x c x e) =		0.003	MGD	0.5%
Utility Water (System Losses)				
(f) Water Supply Loss from Unidentified Losses		20.6%		
(g) Assumed Reduction of Unidentified Losses		50%		
System Losses - Water Saved (a x f x g) =		0.389	MGD	50.1%
Indoor Residential				
(h) Population (1994)		13,615		
(i) Assumed People per Household (1994)		3		
(j) No. of Households (1994)		4,538		
(k) Assumed pre-1994 Flush Rate		3.5	gal/flush	
(l) Assumed HET Flush Rate		1.28	gal/flush	
(m) Assumed Flushes per Person per Day		5.1		
(n) Assumed Percent Household Upgrade by 2050 for HET		90%		
(o) Water Savings per Household per Year for HEWM		4,200	gal	
(p) Assumed Percent Household Upgrade by 2050 for HEWM		100%		
(q) Water Savings per Household per Day for 4 Retrofits		22	gal	
(r) Assumed Percent household upgrade by 2050 for HET		90%		
HET - Water Saved ((k - l) x m x h x n) =		0.139	MGD	17.9%
HEWM - Water Saved (o x j x p) =		0.052	MGD	6.7%
Retrofits - Water Saved (j x q x r) =		0.090	MGD	11.6%
Commercial, Industrial, and Institutional				
(s) Portion of CII That Is Nonprocess Related Water Use		15.0%		
(t) Percent of Daily Demand (Non-Residential)		24.0%		
(u) Assumed Percent Employee Participation		50.0%		
CII - Water Saved (a x s x t x u) =		0.068	MGD	8.8%
TOTAL ESTIMATED SAVINGS =		0.777	MGD	100.0%
LESS RESOURCE INTENSIVE DEMAND (2050) =		3.003	MGD	
PERCENT REDUCTION =		21.0%		

G:\Public\MONTGOME\2014\MO1438-V Water Waters System Master Plan\Eng\Water Use & Needs Assessment\MO Water Use Projection Summary.xlsx\LR1 Calculation

Notes:

Values calculated from Village Data

(c) Per EPA

(o) From California Memorandum of Understanding

HET = High Efficiency Toilets; HEWM = High Efficiency Washing Machines



WWS Planning Overview

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	New Landscape	0.008	0.2%
Utility Water - System Losses		0.186	5.0%
Indoor Residential	High Efficiency Toilets (HET)	0.133	3.6%
	High Efficiency Washing Machines (HEWM)	0.077	2.1%
	Retrofits	0.132	3.5%
Commercial, Industrial, and Institutional Customers		0.084	2.3%
Total Estimated Savings =		0.706	19%

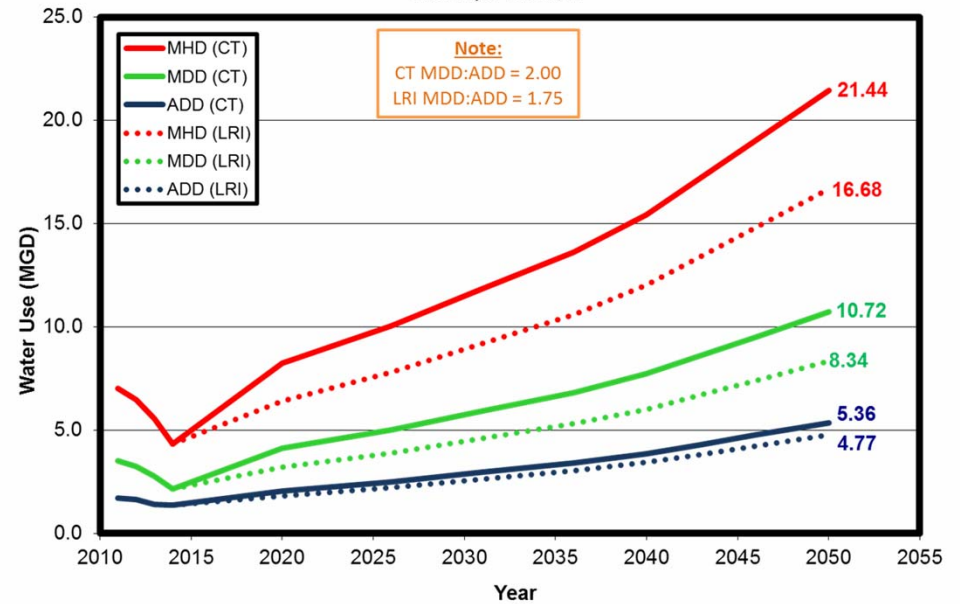


WWS Planning Overview

Less Resource Intensive (LRI) Water Use Projection

Utilize predicted water use reduction calculation to define LRI water use projection for planning period

Exhibit 3-4: Historical and Projected Water Use Summary
United City of Yorkville, IL





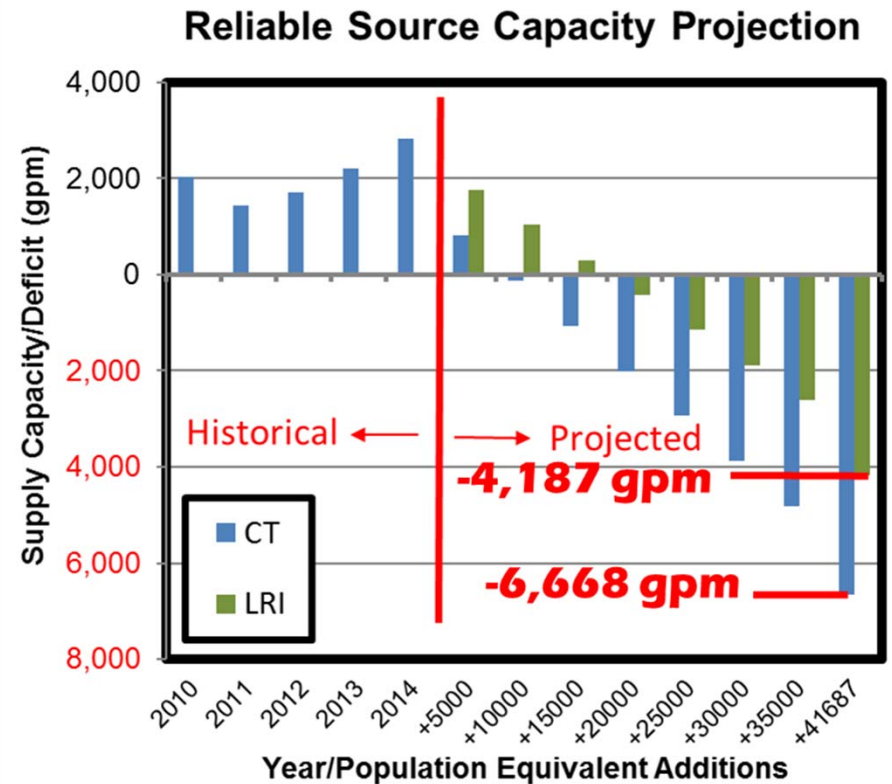
Needs Assessment Calculation

Determine supply, treatment, storage and distribution needs for CT and LRI water use projections

Cost Estimates

Develop cost estimates for CT and LRI improvements

Quantify cost savings for LRI commitment





WWS Sustainable Master Plan Results

Village of Algonquin

Population

- 2010: 30,046
- 2040: 51,656

Water Supply System: Wells With Iron Removal WTPs

Water Use

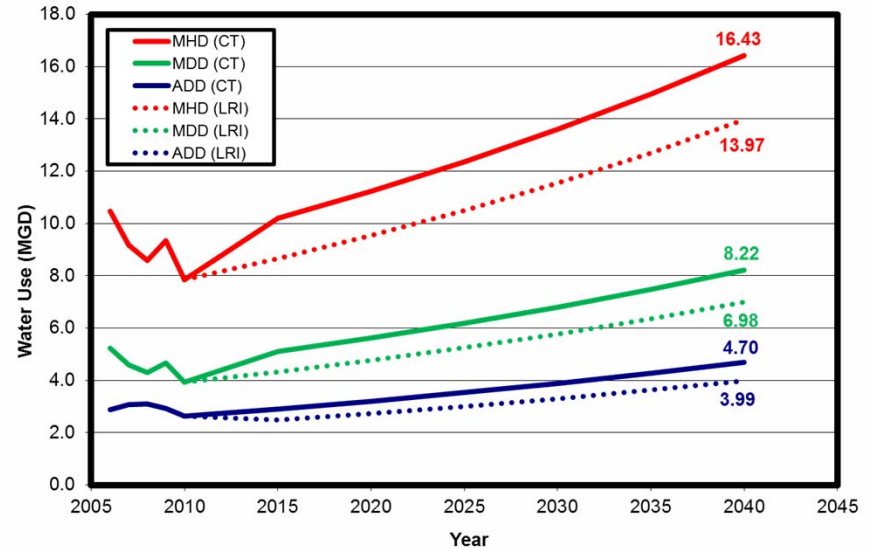
- Current MDD:ADD: 1.75
- CT: 95 gpcd
- LRI: 81 gpcd (15% Reduction)

Needs Assessment

- CT: Four (4) Wells & 2.5 MG Storage
- LRI: Two (2) Wells & 1.5 MG Storage

Computed Capital Cost Savings: \$6.4M

Historical and Projected Water Use Summary
Village of Algonquin, IL



Potential Estimated Water Savings From Water Conservation and Efficiency
Village of Algonquin, IL

Category		Water Saved (gallons per day)	% Of Total (%)
Outdoor	All Customers	69,809	1.5%
	New Landscape	6,981	0.1%
Utility Water - System Losses		234,771	5.0%
Indoor Residential	High Efficiency Toilets (HET)	163,459	3.5%
	High Efficiency Washing Machines (HEWM)	61,529	1.3%
	Retrofits	105,874	2.3%
Commercial, Industrial, and Institutional Customers		66,558	1.4%
Total Estimated Savings =		708,981	15%



WWS Sustainable Master Plan Results

City of Elgin

Population

- 2010: 108,000
- 2040: 202,500

Water Supply System: Fox River Intake, Wells & 2 – Lime Softening WTPs

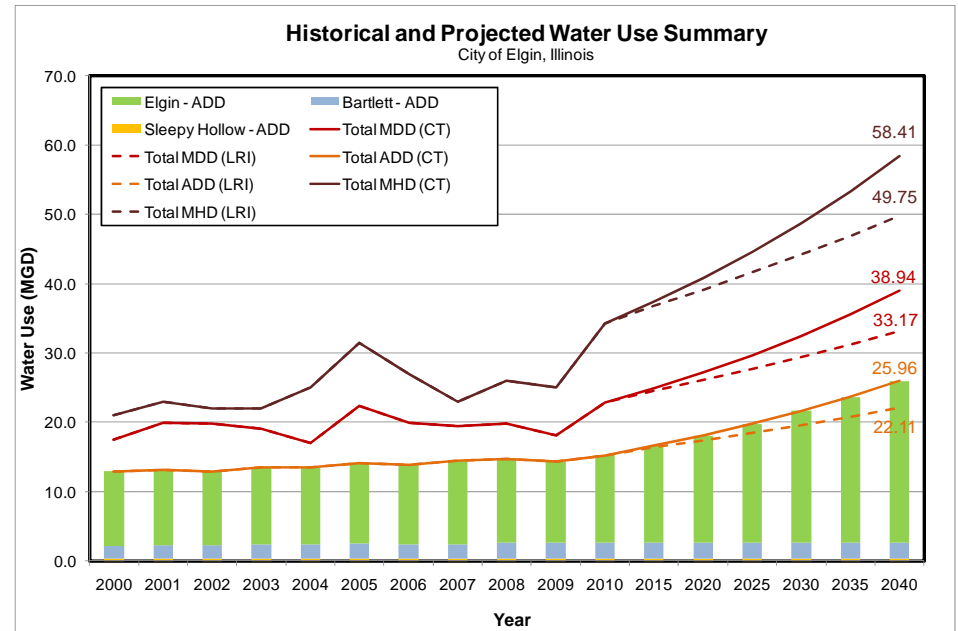
Water Use

- Current MDD:ADD: 1.41
- CT: 115 gpcd
- LRI: 95 gpcd (17% Reduction)

Needs Assessment

- CT: Five (5) Wells & 2.0 MG Storage
- LRI: Three (3) Wells & 0 MG Storage

Computed Capital Cost Savings: \$16.0M



Capital Cost Savings With LRI Water Use Commitment

City of Elgin, IL

Water Works System Component	Present Worth Capital Cost		
	CT	LRI	Savings
Supply	\$22,100,000	\$15,264,000	(\$6,836,000)
Treatment	\$12,600,000	\$12,600,000	\$0
Storage	\$6,933,000	\$2,727,000	(\$4,206,000)
Distribution	\$25,707,000 +	\$20,787,000 +	(\$4,920,000) -
TOTAL:	\$67,340,000 +	\$51,378,000 +	(\$15,962,000) -



WWS Sustainable Master Plan Results

Village of Huntley

Population

- 2010: 24,291
- 2040: 58,997

Water Supply System: Wells with Cation Exchange WTPs

Water Use

- Current MDD:ADD: 2.16
- CT: 90 gpcd
- LRI: 77 gpcd (15% Reduction)

Needs Assessment

- CT: Eight (8) Wells/WTPs & 4.3 MG Storage
- LRI: Four (4) Wells/WTPs & 2.0 MG Storage

Computed Capital Cost Savings: \$32.8M

Average Daily Water Use - Baseline & Irrigation
Village of Huntley, McHenry & Kane Cos., IL

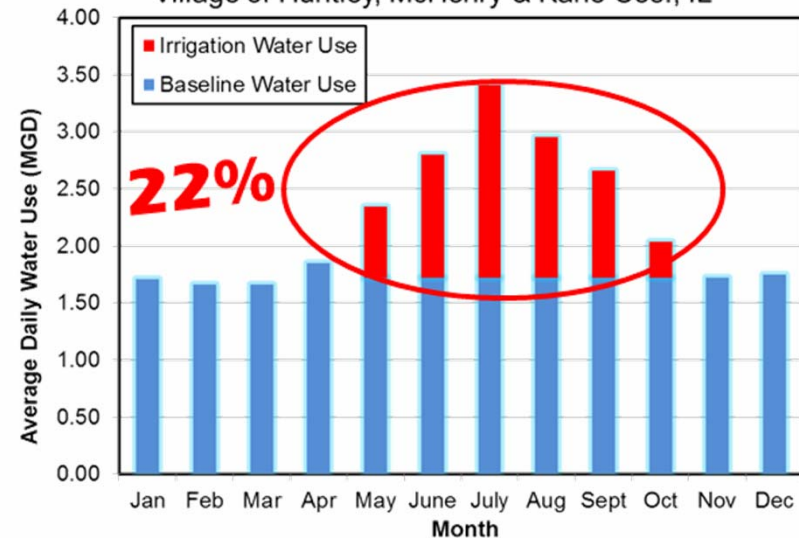
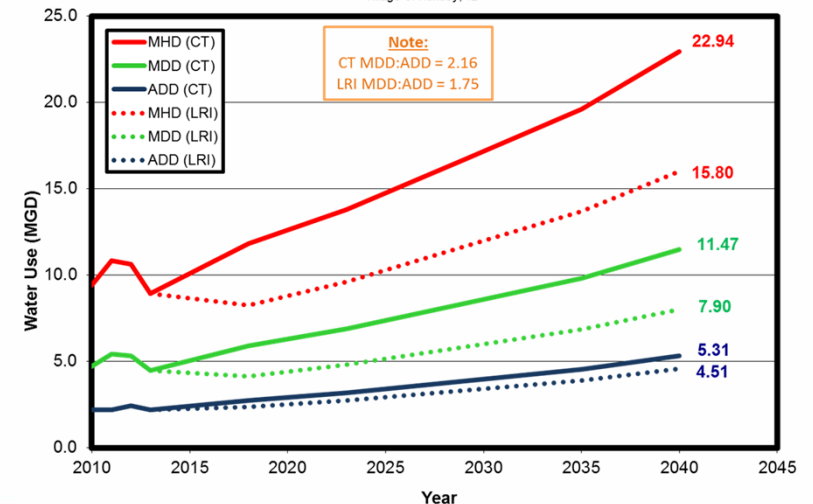


Exhibit 5-3: Historical and Projected Water Use Summary
Village of Huntley, IL





Water Conservation Impacts

NWPA Lawn Watering Ordinance

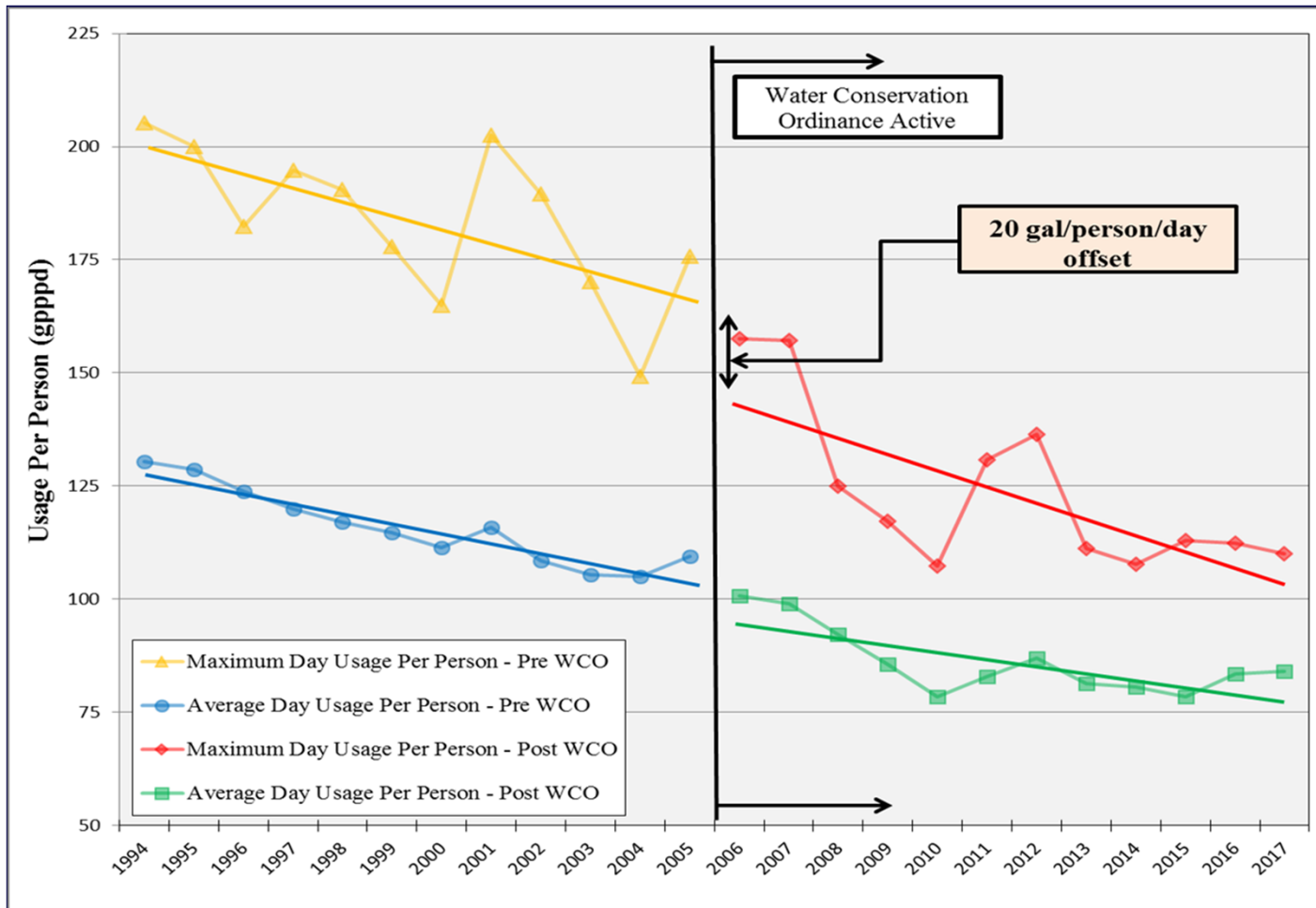
💧 Section 48-31 of Code

- Even/Odd Water Restriction Based on Home Address
- Watering Permitted 6:00 AM – 9:00 AM & 6:00 PM – 9:00 PM On Day
- Permanently Installed Systems Follow Same Times
- Sod Installation Prohibited In July and August (Special Sod Watering Permit Allowed Rest of Year)
- Watering Not Permitted On July 31st and August 31st





Water Conservation Impacts



Summer Water Use Reduced By 20 gpcd (4.0 MGD) → \$7.5M Capital Cost Savings



Implementation Realities

💧 **Planned Water Use Reduction Per Demand Management Strategy**

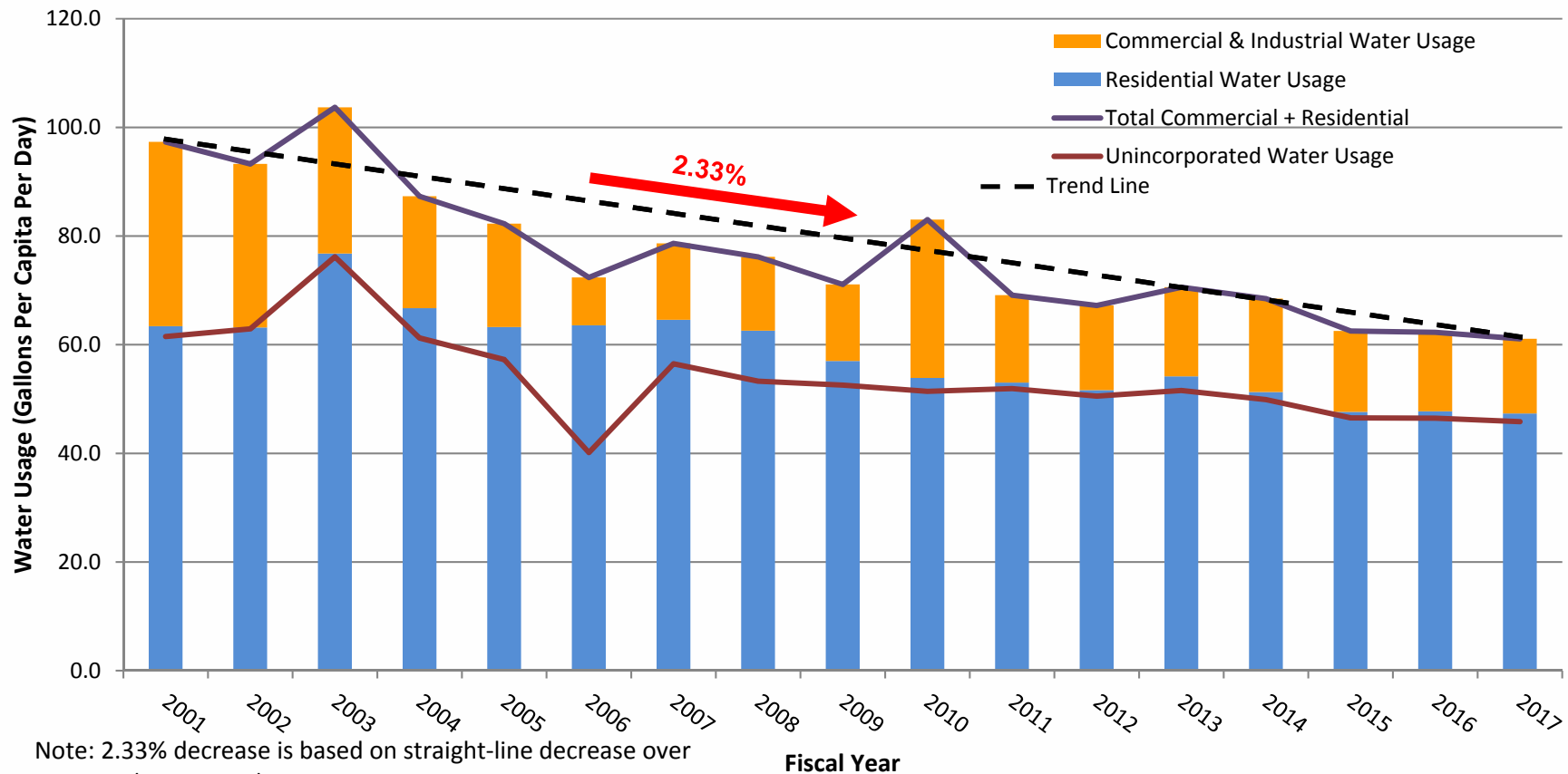
💧 **Unplanned Water Use Reduction Trend**



Implementation Realities

Exhibit 4-3: Historical Billed Water Use by Fiscal Year With Trend Line (GPCPD) (2001-2017)

Village of Montgomery, Kane & Kendall Cos., Illinois

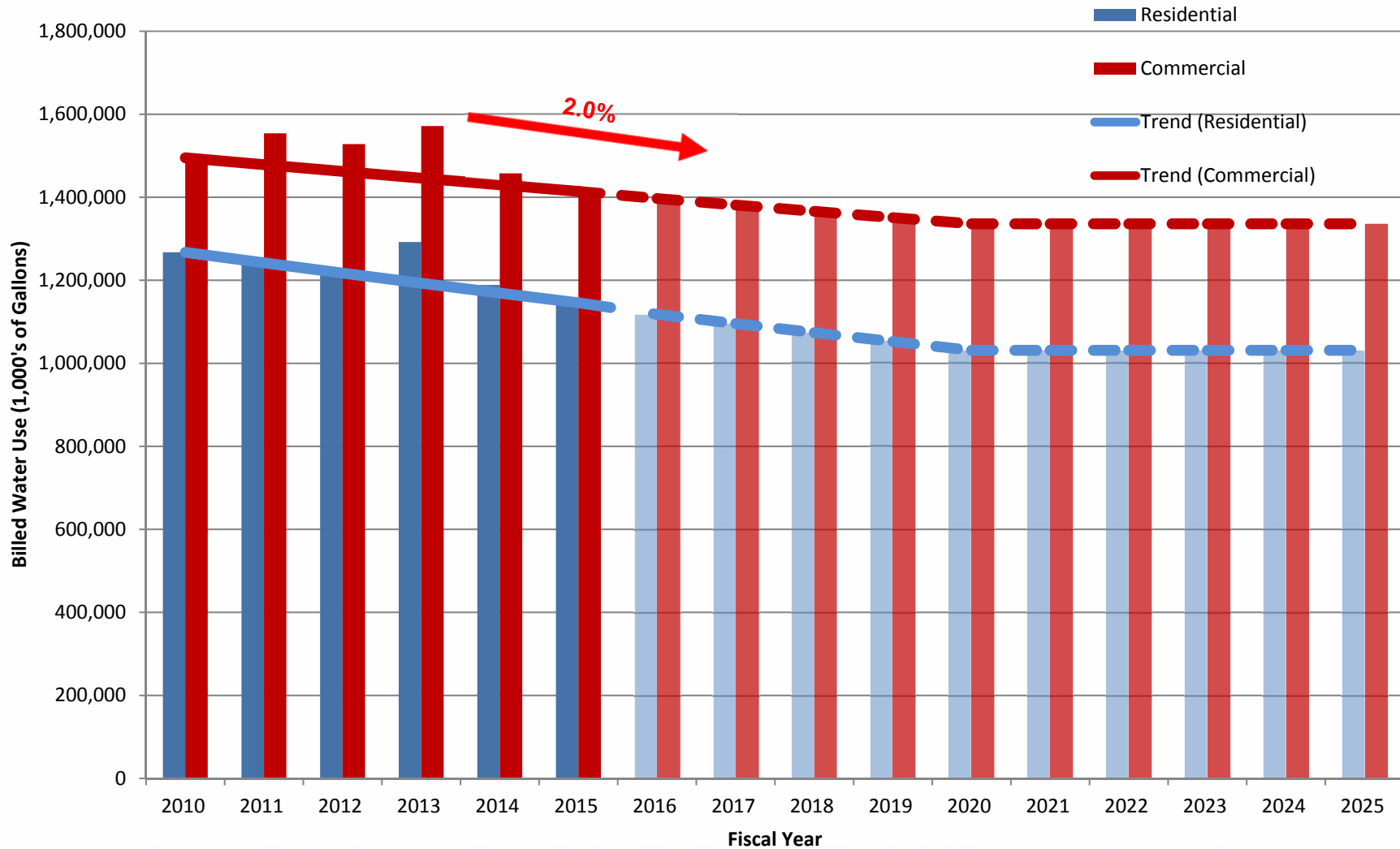


Note: 2.33% decrease is based on straight-line decrease over 16 years (2001-2017).



Implementation Realities

Historic and Projected Billed Water Use

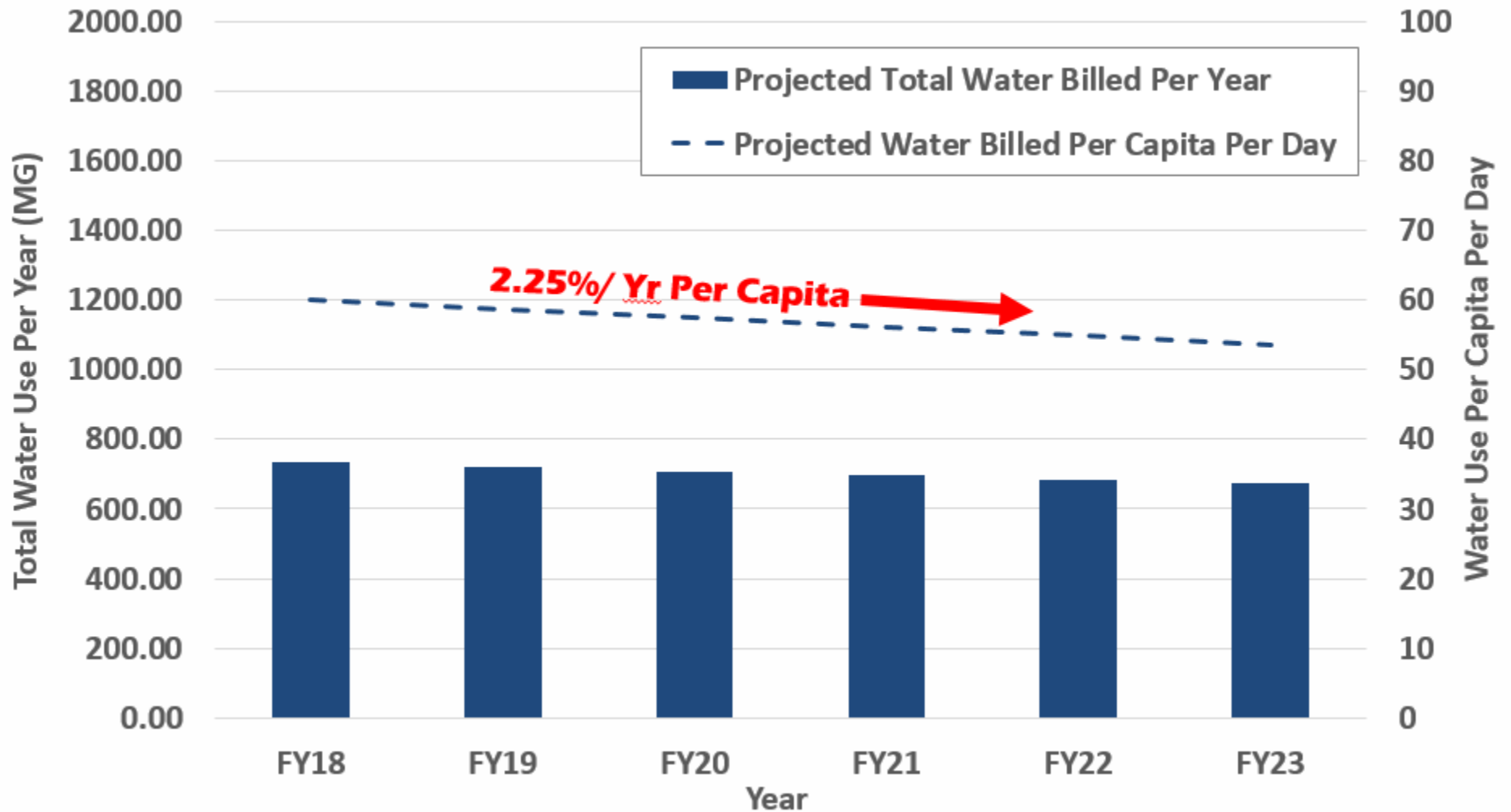




Implementation Realities



Projected Billed Water Use



*Population Increases By 180 PE/Year

The Great Conundrum

◆ Demand Management Success

- ◆ Long Term Capital Savings
- ◆ Short Term Revenue Reduction

◆ Items to Consider

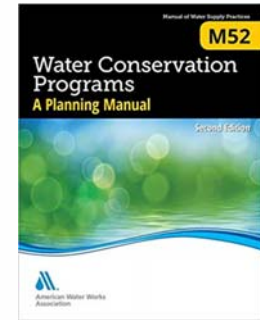
- ◆ Be Prepared to Adjust Rates
- ◆ Education





Resources

- Water Conservation Programs – A Planning Manual (M52)
 (<https://store.awwa.org/store/productdetail.aspx?productid=61841578>)
- Alliance for Water Efficiency
 (<http://www.allianceforwaterefficiency.org/>)
- EPA Water Sense
 (<https://www.epa.gov/watersense>)
- Water Research Foundation
 (<http://www.waterrf.org/Pages/Index3.aspx>)
- Northwest Water Planning Alliance
 (www.nwpa.us)



Alliance
for Water
Efficiency



EPA
WaterSense



THE
Water
Research
FOUNDATION



N O R T H W E S T
W A T E R P L A N N I N G
A L L I A N C E



Q&A

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