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# Water Conservation in a Nutshell: Navigating Options and Evaluating Potential



# AWE: A Voice for Water Efficiency

- Our mission is to promote an efficient and sustainable water future
- **Nearly 500** member organizations in **200 watersheds** delivering water to **50 million water users**



# Common Water Provider Conservation Programs

- Fixture and Appliance Rebates
- Landscape Programs
  - Irrigation Controller Rebates
  - Water Budgets
  - Free Materials
  - Native Landscapes
  - Turf Replacement
- Site Visits
- Custom Rebates
- Education Programs
- AMI Portals and Notifications



# Aspects and Considerations

## Common Sectors:

- Residential
  - Single Family
  - Multi Family
- Commercial
- Industrial
- Institutional



# Aspects and Considerations

## Common Use Types:

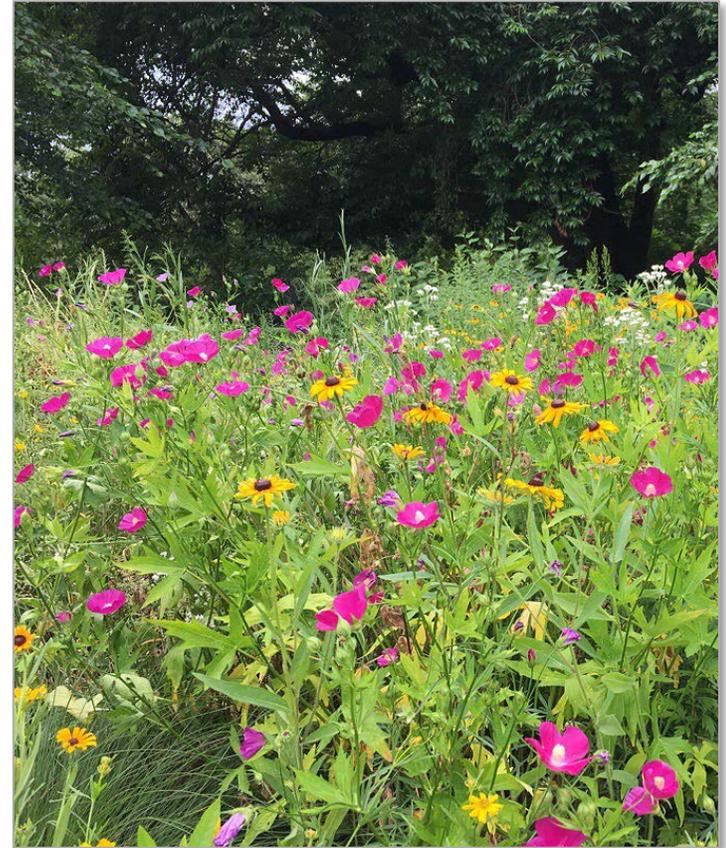
- Indoor
  - Residential End Uses
  - Commercial End Uses
  - Industrial Processes
- Outdoor
  - Irrigation



# Aspects and Considerations

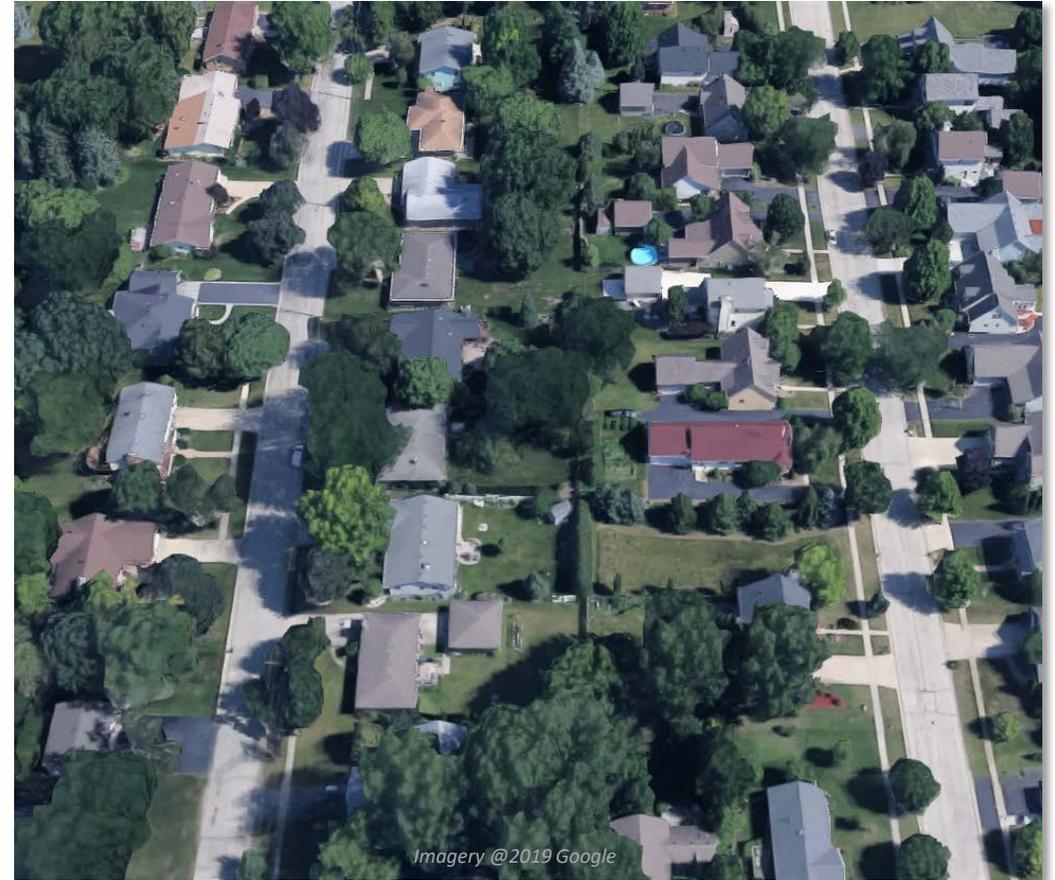
## Other Considerations:

- Existing Connections
- New Development
- Demand Side
- Supply Side
- Planning and Evaluation
- Policies/Ordinances



# Evaluating Potential - Example: Toilet Replacements

- What is a realistic number of old inefficient toilets to replace?
- Depends on age of housing stock
- In 2020 McHenry County will have an estimated 44,000 inefficient toilets that can be replaced
- Estimate created using Census data and natural replacement rates
- Estimates like this prevent unrealistic expectations



# Evaluating Costs and Benefits

## Water Conservation Program Costs

### Utility Side

- Incentives (e.g., rebates)
- Staff
- Marketing materials
- Other overhead

### Customer Side

- Any additional costs not covered by incentive
- Time

## Water Conservation Program Benefits

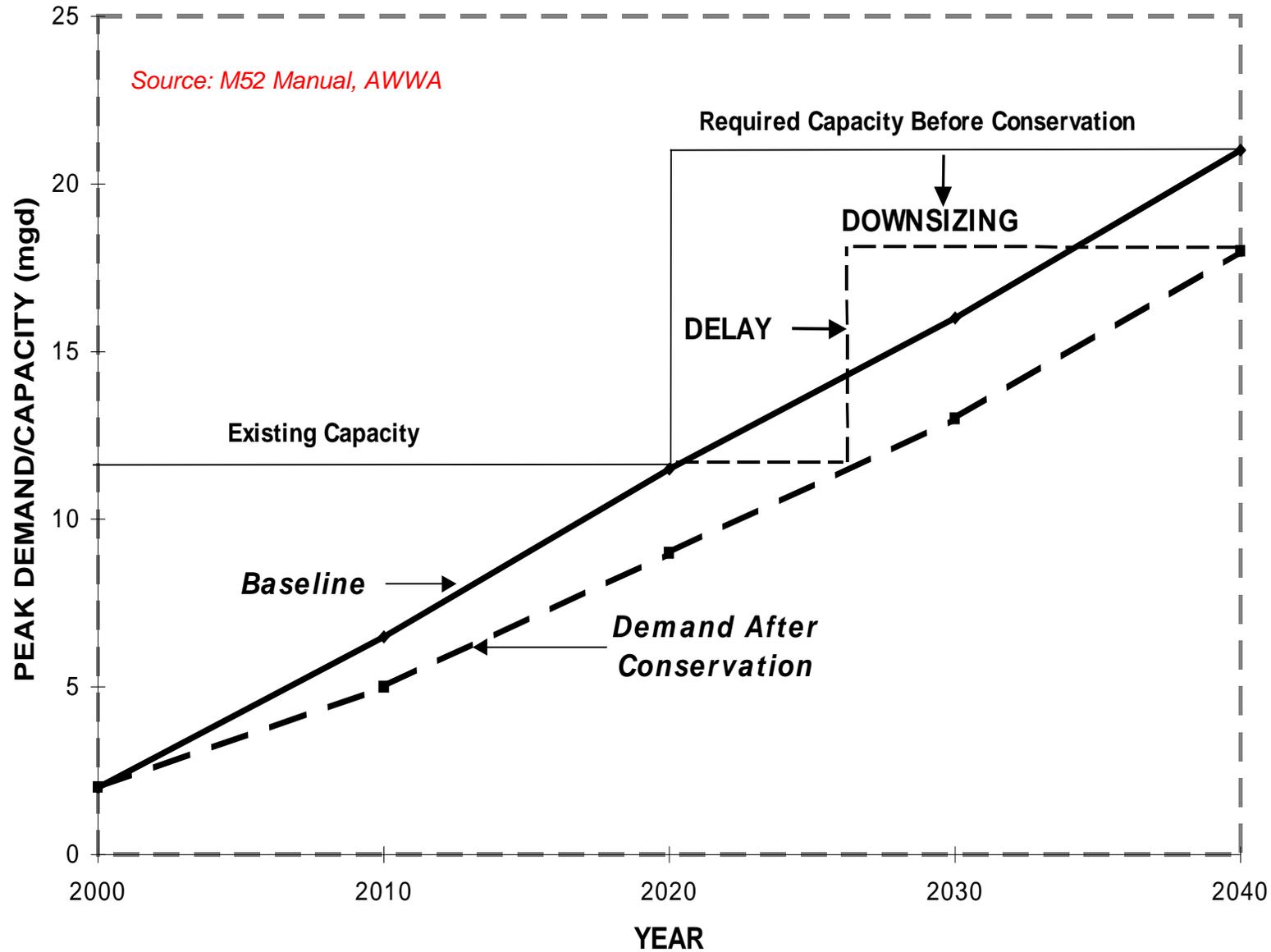
### Utility Side

- Reduced short-run costs
- Avoided, delayed, and/or downsized capacity expansion
- Reduced energy consumption

### Customer Side

- Lower utility bills in the short term (water, sewer, electric, and gas)
- Lower rate increases over the long term

# Evaluating Costs and Benefits



Welcome to the AWE Conservation Tracking Tool. This model is designed to help you plan for and track water conservation program activity and results. It provides a basic analytical framework for estimating the effects that plumbing/appliance standards and planned conservation programs will have on future water use, utility costs and sales revenue, and average customer rates and bills. It evaluates these effects in terms of costs and benefits from the perspectives of the utility (and its ratepayers) and program participants. Costs and benefits are separately calculated for each conservation measure and can be used to help screen measures and construct program portfolios.

The tracking tool is organized as a series of worksheets. There are three worksheet groups: (1) user input worksheets, (2) tracking tool output worksheets, (3) and background calculation and data storage worksheets. You need only concern yourself with the first two groups. Worksheets in the third group are accessible if you would like to audit the calculations made by the tracking tool, but knowledge of them is not required to use the tracking tool.

User input worksheets will include both cells that take inputs from you as well as cells that contain formulas. Changing the formulas will change the way the tracking tool works and therefore is not recommended. Data input cells are distinguished from all other cells in the model by their Light Yellow fill. Data input cells look like this:

The first two user input worksheets should be completed sequentially: 1. Common Assumptions then 2. Specify Demands. This will ensure the tracking tool has the basic data it needs to get started. After that, the remaining user input worksheets can be completed in any order. The last user input worksheet -- 6. Enter GHG Emission Factors -- is optional. You only need to complete it if you want the tracking tool to calculate GHG emission reductions from plumbing/appliance standards and planned conservation. The User Guide provides lots of additional information and help if you get stuck.

You can use the model schematic below to navigate to different parts of the model, or simply use Excel's standard worksheet navigation methods.

## User Input Sheets

1. Common Assumptions
2. Specify Demands
3. Enter Utility Avoided Costs
4. Define Activities
5. Enter Annual Activity
6. Enter GHG Emission Factors (Optional)



## Tracking Tool Output Sheets

- Activity Savings Profiles
- Water Savings Summary
- Utility Revenues and Rates
- Utility Costs and Benefits
- Water Loss Comparison
- Customer Costs and Benefits
- GHG Reduction Benefits



# Cost-Effective Water Conservation Keeps Bills Low

AWE published four case studies documenting lower water bills as a result of water conservation efforts

- Westminster, Colorado - 47% lower
- Tucson, Arizona - 12% lower
- Gilbert, Arizona - 6% lower
- Los Angeles, California - 27% lower



# Water Loss Control – AWWA Water Balance

The IWA/AWWA Water Balance						
Volume From Own Sources (corrected for known errors)	System Input Volume	Water Exported (corrected for known errors)	Billed Water Exported			Revenue Water
		Water Supplied	Authorized Consumption	Billed Authorized Consumption	Billed Metered Consumption	Billed Unmetered Consumption
Water Losses	Unbilled Authorized Consumption		Unbilled Metered Consumption	Unbilled Unmetered Consumption	Non-revenue Water	
	Apparent Losses	Customer Metering Inaccuracies	Unauthorized Consumption	Systematic Data Handling Errors		
		Real Losses	Leakage on Transmission and Distribution Mains	Leakage and Overflows at Utility's Storage Tanks		
			Leakage on Service Connections up to the Point of Customer Metering			
	Water Imported (corrected for known errors)					

NOTE: All data in volume for the period of reference, typically one year.

# Water Loss Control – Free Resources

- AWWA M36
- AWWA Free Water Audit Software
- AWE Webinars

AWWA Free Water Audit Software: WAS v5.0  
American Water Works Association.  
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Water Audit Report for: << Please enter system details and contact information on the Instructions tab >>  
Reporting Year:

\*\*\*\*\* REPORTING UNITS MUST BE SELECTED ON THE INSTRUCTIONS WORKSHEET BEFORE PERFORMANCE INDICATORS CAN BE DISPLAYED \*\*\*\*\*

**System Attributes:**

Apparent Losses:	<input type="text"/>
+ Real Losses:	<input type="text"/>
= <b>Water Losses:</b>	<input type="text"/>
? Unavoidable Annual Real Losses (UARL):	<input type="text"/>
Annual cost of Apparent Losses:	<input type="text"/>
Annual cost of Real Losses:	<input type="text"/>

Valued at **Variable Production Cost**  
Return to Reporting Worksheet to change this assumption

**Performance Indicators:**

Financial:	Non-revenue water as percent by volume of Water Supplied:	<input type="text"/>
	Non-revenue water as percent by cost of operating system:	<input type="text"/>

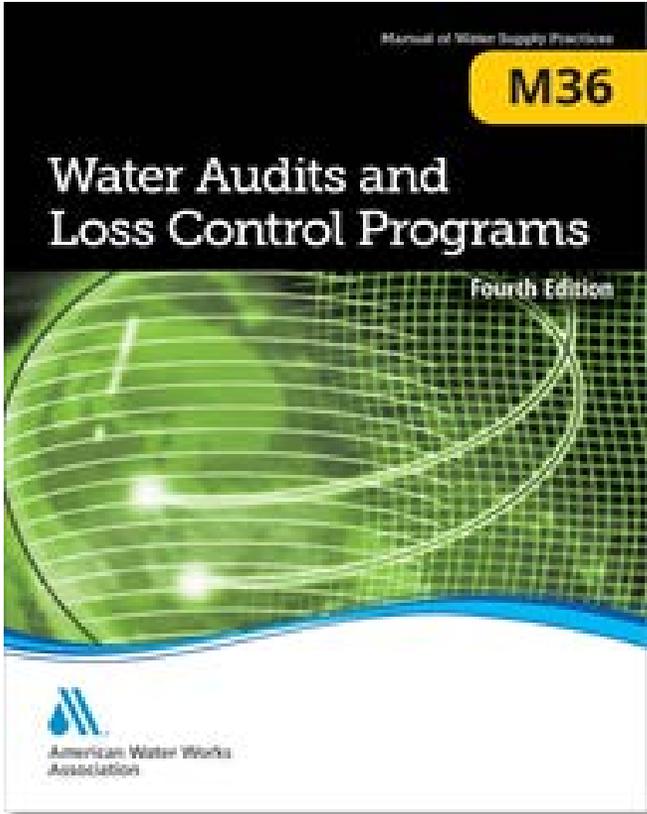
Real Losses valued at Variable Production Cost

Operational Efficiency:	Apparent Losses per service connection per day:	<input type="text"/>
	Real Losses per service connection per day:	<input type="text"/>
	Real Losses per length of main per day*:	<input type="text"/>
	Real Losses per service connection per day per meter (head) pressure:	<input type="text"/>

From Above, Real Losses = Current Annual Real Losses (CARL):

? Infrastructure Leakage Index (ILI) [CARL/UARL]:

\* This performance indicator applies for systems with a low service connection density of less than 32 service connections/mile of pipeline



<https://www.awwa.org/Store/M36-Water-Audits-and-Loss-Control-Programs-Fourth-Edition/ProductDetail/51439782>

<https://www.awwa.org/Resources-Tools/Resource-Topics/Water-Loss-Control>

# Water Loss Control – Key Performance Indicators

- No more percentages for unaccounted for water!
- KPI's for both volumetric and financial losses
- **Volumetric**
  - ✓ Real losses per connection per day
  - ✓ Real losses per mile or kilometer of main
  - ✓ Infrastructure Leakage Index (ILI)
  - ✓ Apparent losses per connection per day
- **Financial**
  - ✓ Annual Cost of Apparent losses
  - ✓ Annual Cost of Real Losses



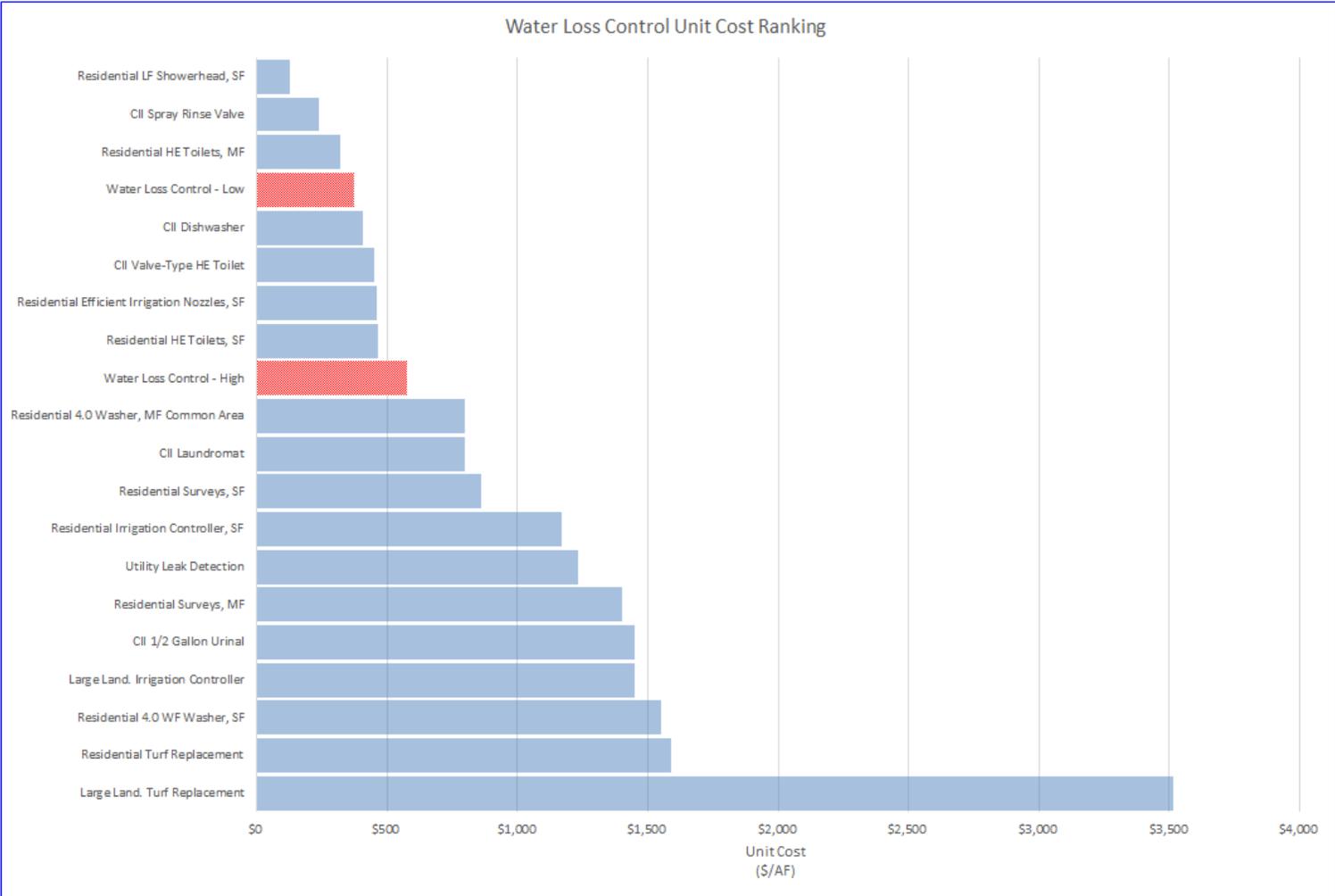
Water loss control programs to reduce system physical losses can be one of the more cost-effective ways utilities can save water. The chart on this worksheet shows how your conservation measures rank compared to the range of typical cost for water loss control programs.

**Unit Cost Range for Typical Utility Water Loss Control Program**

	Units	2014 \$	Rank
Low	\$/AF	\$375	4 of 20
High	\$/AF	\$575	9 of 20

**Unit cost ranking of water loss relative to your defined conservation measures**

11 of your conservation measures have unit costs above the high-end of the water loss control cost range.



# Education and Communication



Water: What You Pay For

[https://www.youtube.com/watch?v=dq9Yq\\_jlsUc](https://www.youtube.com/watch?v=dq9Yq_jlsUc)

<https://www.youtube.com/watch?v=m5Z1VmIDPTU>



Good Question: Why Are My Water Rates Going Up?

# Education and Communication

**How much water do you use?**

Using water in the bathroom

Click on one of the question marks to see if this is where your water is going. Click on the letter "i" to learn water saving tips.

Back

My Daily Usage  
Roll over for results

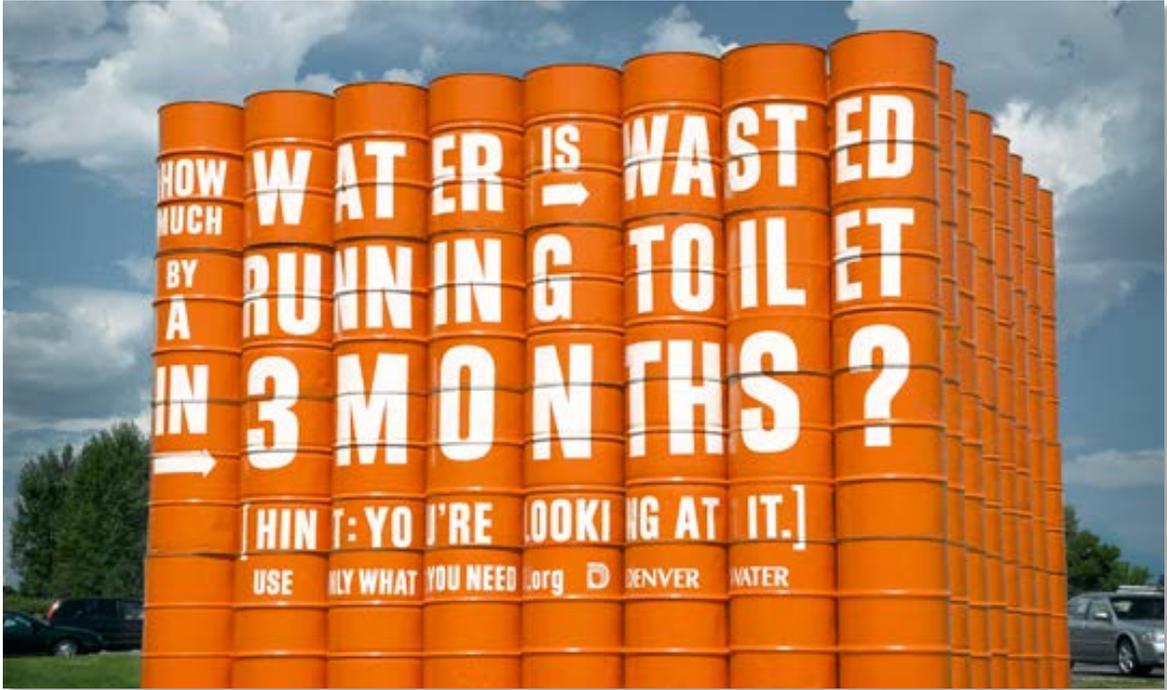
Percent Complete  
Roll over for number of questions

							
Toilet <b>24%</b> 32.6 gphd	Faucet <b>20%</b> 27.0 gphd	Shower <b>20%</b> 26.9 gphd	Clothes washer <b>16%</b> 22.0 gphd	Leak <b>13%</b> 17.8 gphd	Bath <b>3%</b> 4.4 gphd	Other* <b>3%</b> 4.0 gphd	Dishwasher <b>2%</b> 2.2 gphd

\* The "Other" category includes evaporative cooling, humidification, water softening, and other uncategorized indoor uses.

<https://www.waterrf.org/research/projects/residential-end-uses-water-version-2>

# Education and Communication



# Net Blue for New Development – The Problem

- Many cities in North America are already challenged to meet their customer demands for water
- Growing population and economic growth will place even more pressure in arid and water-short areas
- As drought and water shortages occur, customers raise the issue about available water for new development when they are being restricted



# Net Blue for New Development – The Answer

## Water Demand Offsets:

- Can allow growth without increasing system-wide water consumption
- Can be a combination of on-site water efficiency and off-site water efficiency
- Can reduce or completely eliminate impact of new development on water supply
- Can help avoid building moratoriums in resource-constrained communities



# Net Blue Toolkit

1. Model Ordinance Worksheet
2. Model Ordinance User Guide
3. Three Ordinance Examples
4. Offset Methodology Workbook
5. Offset Methodology User Guide
6. Three Offset Examples matching the ordinance examples
7. Outreach Materials



The screenshot shows the website for the Net Blue project. At the top, there is a navigation bar with the Alliance for Water Efficiency logo on the left, the tagline "PROMOTING AN EFFICIENT & SUSTAINABLE WATER FUTURE" in the center, and a "Select Language" dropdown on the right. Below the tagline are menu items: "IMPACT", "RESOURCES" (highlighted in green), "NEWS", "EVENTS", "MEMBERS", and "ABOUT". The main heading is "Net Blue: Supporting Water-Neutral Growth". Below this is a sub-section "Section: Water and Land Use Planning" and a banner image with the text "NET BLUE WATER NEUTRAL GROWTH". The main text describes the project as a collaborative initiative of the Alliance for Water Efficiency (AWE), the Environmental Law Institute (ELI), and River Network, aimed at supporting sustainable community growth. It mentions that a model ordinance was developed after consulting with communities across the United States. The project is divided into four parts, with the first being "1. Initial Offset Research". A report titled "Water Offset Policies for Water-Neutral Community Growth" is mentioned, which reviewed 13 communities and found that the most common scenario for offsetting new water use involves on-site efficiency measures and replacing inefficient fixtures in existing buildings. A small thumbnail image of the report cover is visible on the right side of the text.

<https://www.allianceforwaterefficiency.org/resources/topic/net-blue-supporting-water-neutral-growth>



**Purpose:**

The declaration of an ordinance's purpose primarily helps reviewing courts and officials charged with its administration to interpret the ordinance. A purpose section also can inform (a) elected officials as to why they are adopting the ordinance, and (b) the general public and property owners as to the intent of the ordinance.

*Reference ordinances: [Dungeness River Watershed](#); [Monterey County](#); [Morro Bay \(Ch. 13.20\)](#); [San Luis Obispo County \(Title 26\)](#); [Soquel Creek Water District](#)*

The purpose of this ordinance is to: **[select all that apply]**

- Protect and promote the public health, safety, and general welfare
- Ensure that there is enough water at all times to meet the basic needs of the community, including fighting fires
- Establish and assist in achieving sustainability goals and objectives
- Manage the demand for more water in **identified city, county, or district**, to ensure that **[select the applicable one]**
  - demand for water does not exceed available current or future supply
  - demand for water does not exceed the sustainable yield of the source
  - demand for water does not disproportionately adversely affect certain water user groups (e.g., low-income communities or the environment)
  - demands on water infrastructure do not exceed its capacity or impair its function
- Ensure a reasonable and orderly process and pace of making water **supply / infrastructure capacity** available to new users
- Minimize the adverse effects on the community of limitations on **identified city, county, or district's** water **supply / infrastructure**
- Manage **water / water infrastructure** to better satisfy both present and future human needs
- Manage **water / water infrastructure** to be more resilient to drought

# Net Blue – Methodology Workbook

- Designed to help communities evaluate and select off-site offsets for development projects



**NET BLUE**  
WATER  
NEUTRAL  
GROWTH

[Offset Strategies](#)

[Selected Offsets](#)

[Res-Toilet Stock Estimate](#)

[Rainwater Harvesting](#)

[Stormwater Calculator](#)

**Net Blue** is a collaborative initiative of the Alliance for Water Efficiency, the Environmental Law Institute, and River Network to support sustainable community growth.

This tool accompanies the model ordinance template and is intended to help communities evaluate and select strategies to offset the projected potable water use of new development or expanded use of existing connections. This workbook is related to offsite offsets and does not include calculations to determine the demand of new development, including onsite demand reduction measures.

This workbook contains the following worksheets:

**Offset Strategies** – The *Offset Strategies* worksheet can be used to evaluate and select a suite of measures to offset the demand of new or expanded water use. It contains example offset strategies related to indoor water fixture and appliance replacements and retrofits. Custom offset strategies can also be entered by the user.

**Selected Offsets** – This worksheet contains table that can be used to compile selected offset strategies for a new or expanded water use project. It can also be used to tally offset implementation. It is populated based on selections made on the *Offset Strategies Worksheet*.

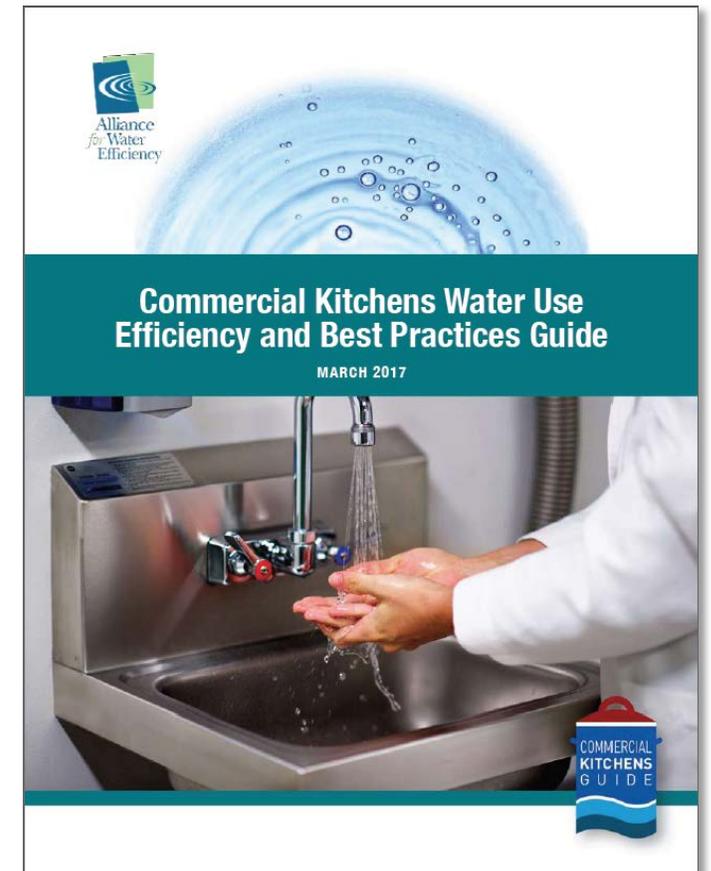
**Res-Toilet Stock Estimate** – This worksheet can be used to create a general estimate of the stock of inefficient toilets in a given service area if such an estimate does not already exist. This can be helpful to determine the potential for inefficient toilet replacements which is typically a cost-effective and reliable strategy that provides theoretically permanent water savings.

**Rainwater Harvesting** – This worksheet contains a calculator for estimating the yield of rainwater harvesting (RWH is assumed to be the rain that falls on building roofs; rain not on roofs is considered stormwater.) It carefully addresses how much of the harvested rainwater is used on-site (and thus reducing on-site potable water demand) and how much rainwater is used off-site to offset potable water demand offsite.

**Stormwater Calculator** – This worksheet contains information and links to the USEPA Stormwater Calculator. If stormwater is captured and can be distributed off-site use, then this volume of water would qualify as a potable water demand offsite.

# Commercial Kitchens Guide

- Prepared by AWE for use by its member utilities
- Specifically designed for food service industry professionals, with emphasis on efficient business management and the impact to bottom lines
- Best practices, case study summaries, and strategies for high-use equipment
- Guidance on preparing Action Plans
- PDF is free for AWE members, request online



# Cooling Towers

- Cooling towers are a key component of a cooling system
- They reject heat into the atmosphere via evaporation
- They are used to cool large buildings and in industrial processes
- They often represent huge water savings opportunities
- AWE is conducting research to develop tools and resources to help communities capture these savings



# Questions?

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