

# This presentation premiered at WaterSmart Innovations

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# Evaluating the Effectiveness of Water Conservation Programs

Mary Ann Dickinson

*With David Mitchell and Thomas Chesnutt*

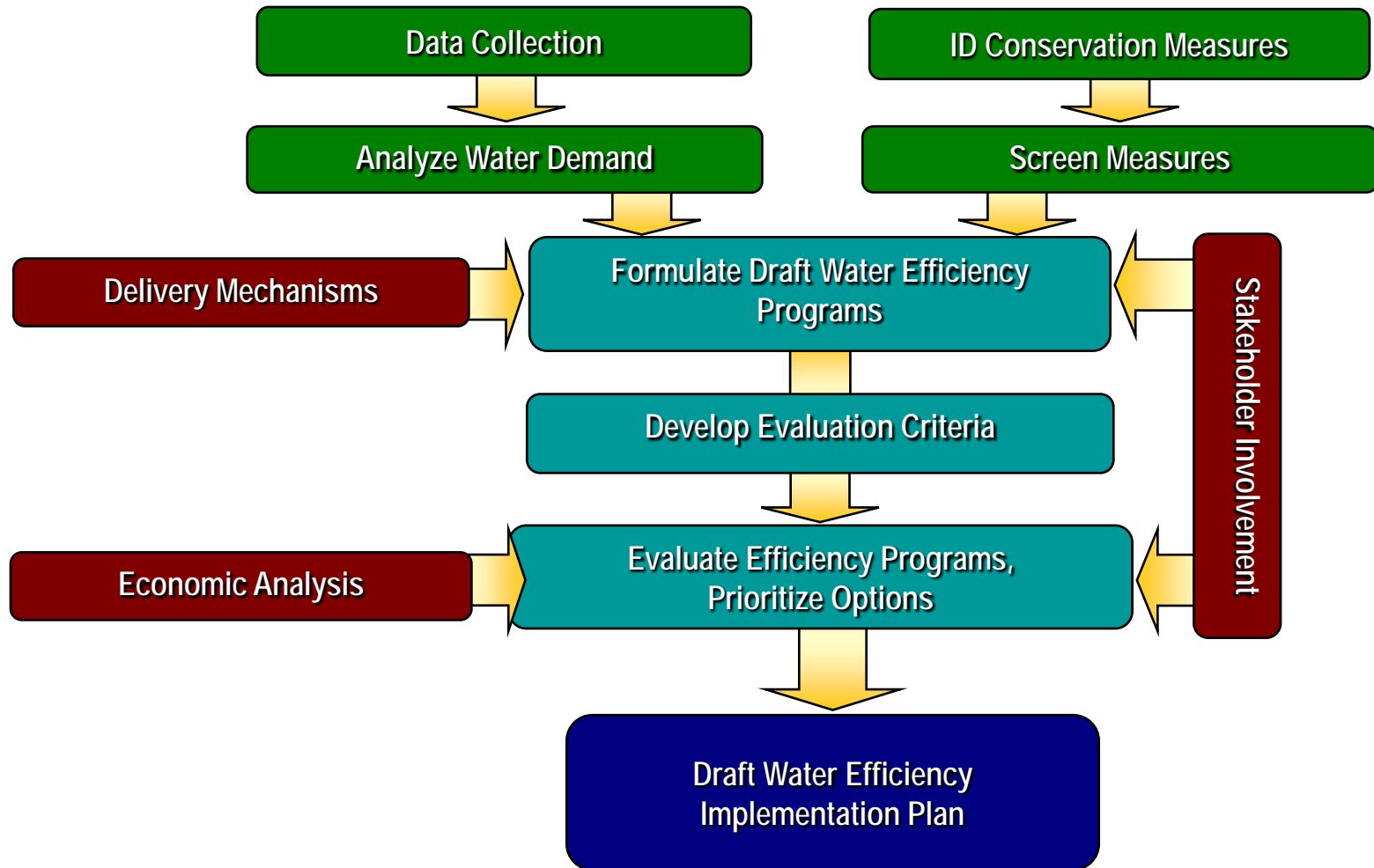
*2009 WaterSmart Innovations Conference*

A VOICE AND  
A PLATFORM  
PROMOTING THE  
EFFICIENT AND  
SUSTAINABLE  
USE OF WATER



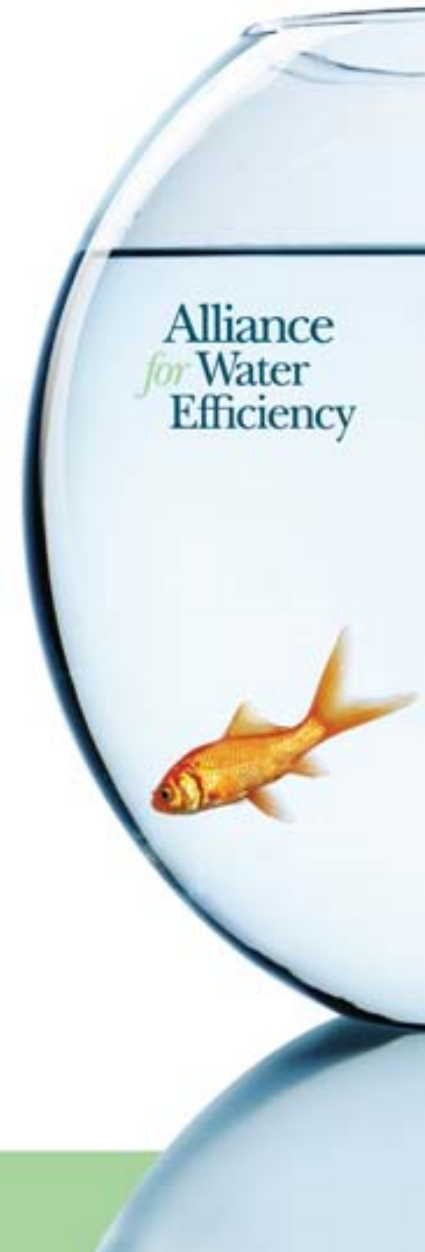
Alliance for Water Efficiency

# Constructing a Water Efficiency Plan



# So Why An Evaluation Model?

- Need for consistent and thorough analysis of cost-effective water conservation options
- Tools exist in various forms
- Most are proprietary
- WRF, ConEast, Maddaus DSS
- AWE wanted robust but easy to use model with transparent code
- Home Depot Foundation funded partial development
- “Tracking Tool” as well as analytical tool



# Tracking Tool Uses

- Analyze potential water savings, costs, and benefits of conservation measures
- Construct water conservation portfolios and long-range plans
- Rank conservation measures
- Track implementation, water savings, and costs
- Predict revenue impact
- Track and graph the benefits of actual conservation activities over time

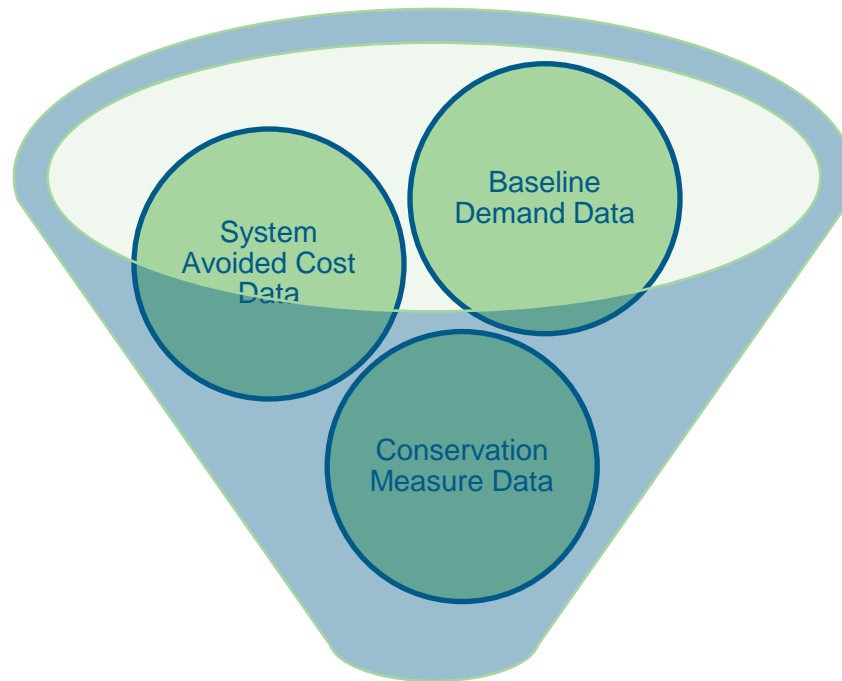


# Tracking Tool Features

- Runs in Excel 2002/03 or later version
- Flexible Representation of Water Savings
- Library of 25 Pre-Defined Conservation Measures
- Demand and Avoided Cost Analysis
- Simple User Interface
- Dynamic Tables, Charts, and Forms
- Switch Between English or Metric Units
- Scenario Management



# Tracking Tool Inputs and Outputs



Model Outputs

Savings Analysis

Benefit-Cost Analysis

Revenue/Rate Impacts

## Getting Started:

1. The model uses a simple worksheet tab color code:

- Blue Tabs = User Data Entry
- Green Tabs = Model Outputs/Results
- Grey Tabs = Data Storage and Library

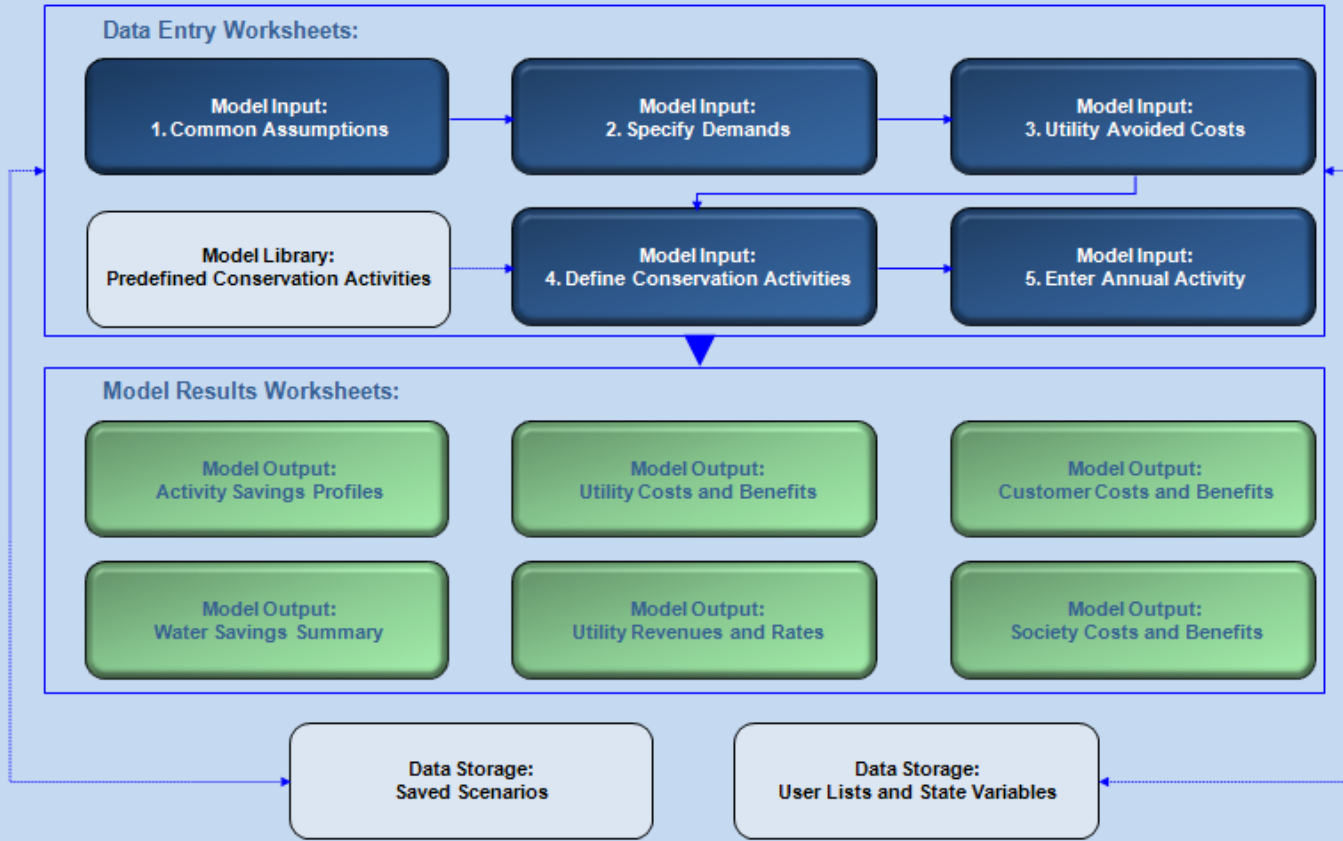
2. First provide information about your system, customers, and water demands. This is done on data entry worksheets 1 thru 3.

3. Next define or import conservation activities and set their annual activity levels. This is done on data entry worksheets 4 and 5.

4. You can save conservation activity scenarios at any time. You access the scenario manager on the Common Assumptions worksheet.

6. You can navigate to model worksheets by clicking on the model schematic below or by clicking on the worksheet tabs at the bottom of the screen.

7. Data entry cells on input worksheets look like this:  Only enter data in cells with this color coding.





# Common Assumptions

**AWE CONSERVATION TRACKING TOOL: COMMON ASSUMPTIONS WORKSHEET**

ENTER COMMON ASSUMPTIONS: Manage Scenarios [Return to Navigation Sheet](#) [Report Error](#)

Analysis Start Year	2008	2010	2020	2030	2040
Service Area Population	350,000	353,000	365,000	380,000	395,000
Service Area Population in 1990	300,000				
Peak-Season Start Date (month/day)	31-May				
Peak-Season End Date (month/day)	31-Oct				
Nominal Interest Rate	6.00%				
Inflation Rate	3.00%				
Persons Per Household - SF	2.25				
Persons Per Household - MF	1.50				
Full Bathrooms Per Household - SF	1.75				
Half Bathrooms Per Household - SF	0.75				
Full Bathrooms Per Household - MF	1.00				
Half Bathrooms Per Household - MF	0.25				
SF Housing Units Built <i>before 1992</i>	100,000				
MF Housing Units Built <i>before 1992</i>	50,000				
Reference ET (inches/yr)	57.33				
Avg. Annual Rainfall (inches/yr)	7.67				

CHOOSE VOLUME UNITS:

Water Volume Units

Million Gallons (MG)

Acre-Feet (AF)

Million Cubic Meters (MCM)

MODEL UNITS:

Flow: MGD

Volume: AF

SELECT CUSTOMER CLASSES:

Select Water User Classes

Water User Classes in Model	Current Customer	
	Water Rates (\$/Thou Gal)	Sewer Rates (\$/Thou Gal)
Single Family	\$2.50	\$0.70
Multi Family	\$2.30	\$0.70
CII	\$2.00	\$0.70
Irrigation	\$2.30	\$0.70

Navigation: 1. Common Assumptions 2. Specify Demands 3. Enter Utility Av

**Select Customer Classes**

Class Names	Selected Classes
Single Family	
Multi Family	
Residential	
CII	
Commercial	
Industrial	
Institutional	
Irrigation	
All Customers	
Miscellaneous	
Utility/Unaccounted	

Add >

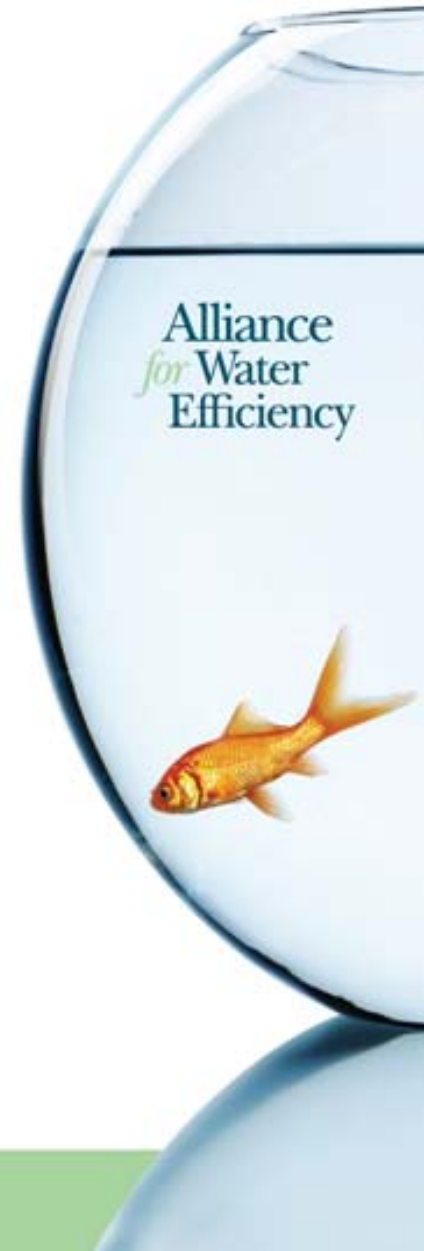
Move Up OK

Move Down

Delete Cancel

# Baseline Demands

- Two Data Entry Options
  - *Enter or link to an existing demand forecast*
  - *Use model to grow current demand by population*
- Plumbing/Energy Code Adjustment
  - *Model can adjust for impact of existing plumbing/energy codes as necessary*
- Demand Disaggregation
  - *Peak/Off Peak Seasonal Demands*
  - *Customer Class Disaggregation*



# Avoided Costs

- Two Data Entry Options
  - *Enter or link to an existing avoided cost forecast*
  - *Use model's avoided cost calculator*
- Model's Avoided Cost Calculator
  - Short-run avoided O&M
    - *Water Supply*
    - *Wastewater Treatment*
  - Long-run avoided or deferred capacity
    - *Calculates present value of delaying and/or downsizing peak season capacity expansion*



# Example of Capacity Deferral Analysis

## AWE CONSERVATION TRACKING TOOL: WATER SAVINGS SUMMARY WORKSHEET

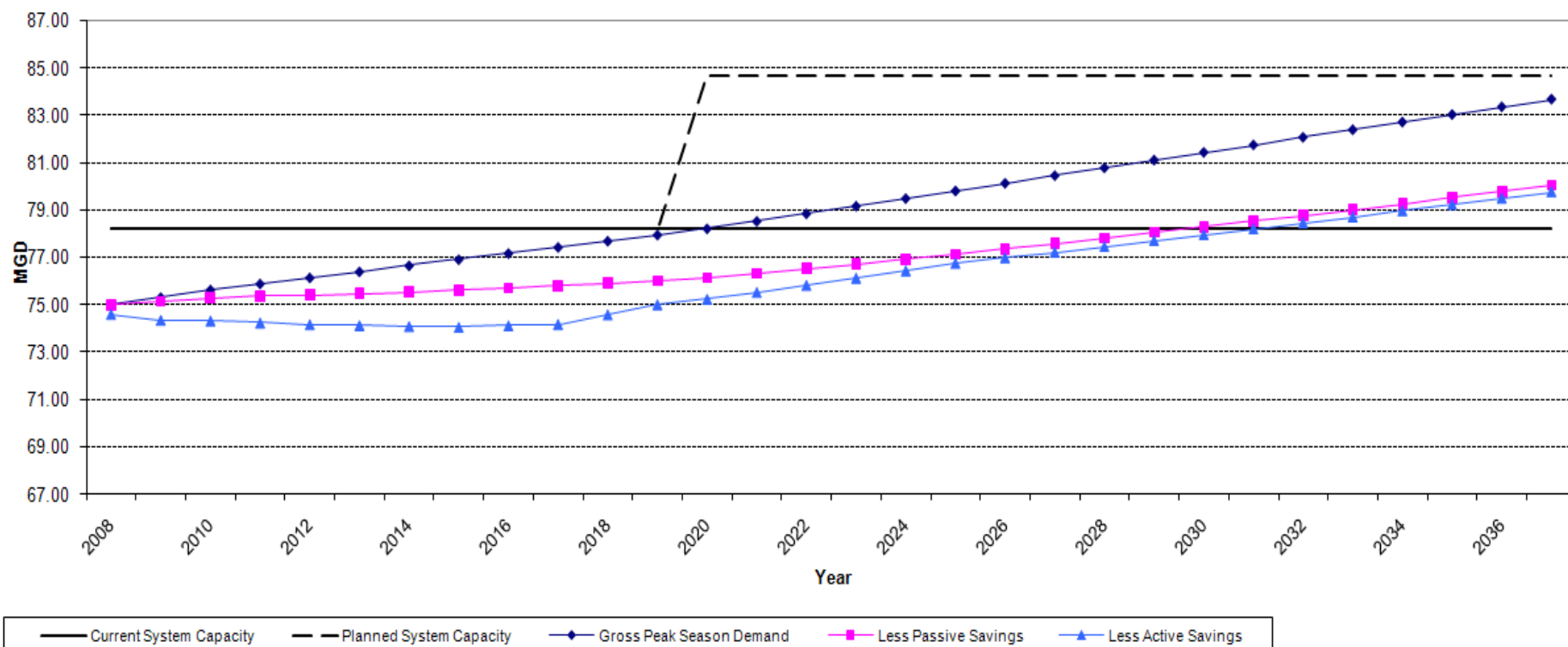
Year forecasted peak season demand equals existing peak season delivery capacity		Deferred Expansion (Years)	Deferred Capacity (MGD)	Benefit of Deferred Expansion (\$)	Avoided Capacity (MGD)	Benefit of Avoided Expansion (\$)
Baseline Demands	2020	N/A	N/A	N/A	N/A	N/A
Baseline - Code Savings	2029	9	6.4	\$7,471,940	0.0	\$0
Baseline - Code Savings - Program Savings	2031	11	6.4	\$8,886,090	0.0	\$0

Select Chart to View

Peak Season Capacity

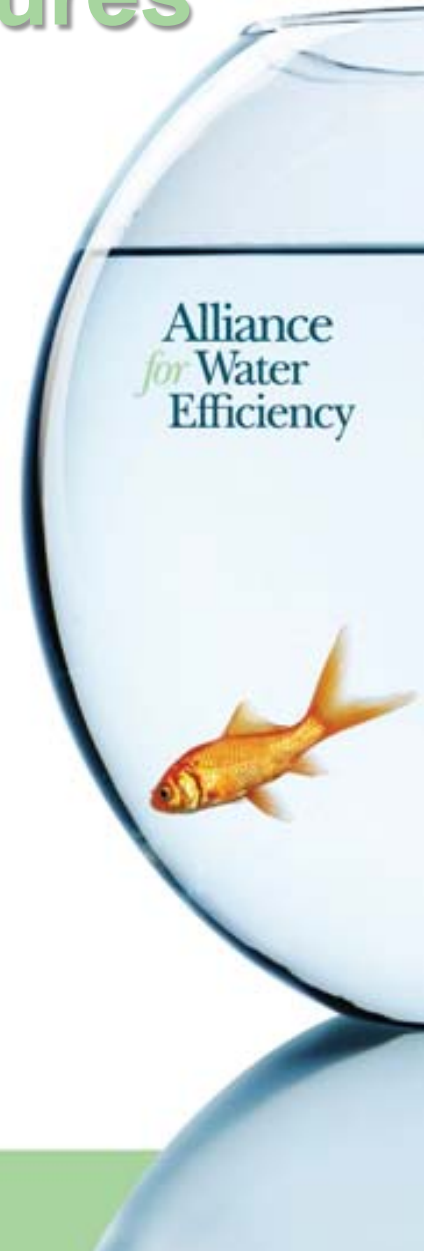
Chart Explanations

Peak Season System Capacity



# Setting Up Conservation Measures

- Two Specification Options
  - *Build from scratch*
  - *Import pre-defined measures from library*
  - *Pre-defined measures can be customized*
- Library currently includes 25 measures
  - *13 residential measures*
  - *8 CII measures*
  - *4 large landscape measures*



# Defining a New Conservation Measure

## AWE CONSERVATION TRACKING TOOL: DEFINE CONSERVATION ACTIVITIES WORKSHEET

### Define Conservation Program Activities

[Return to Navigation Sheet](#)

[Report Error](#)

Click to Import Library Activities or Define/Edit/Delete Custom Activities

Show Table of Activities in Model

#### Define Conservation Activities

Activity Name:

Affected Customer Class:

**Import an Activity from the Library**

Close Form

Previous Record

Next Record

New Record

Delete Record

1 of 5

Unit Water Savings | Utility Costs | Participant Costs | Participant Non Water Benefits | Plumbing Code

Unit Water Savings (Gal/Yr):	<input type="text" value="12,373.0"/>
Annual Rate of Savings Decay (%/Year):	<input type="text" value="20.00%"/>
Peak Period Savings (% of Annual):	<input type="text" value="65.00%"/> Peak days = 42% of days in a year.
Useful Life (Years):	<input type="text" value="5"/>
Participant Freeriders (% of Participants):	<input type="text" value="0.00%"/>

# Importing a Library Measure

**Define Conservation Activities** [X]

Activity Name:

Affected Customer Class:

Unit Water Savings | Utility Costs | Participant Costs | Participant Non-Water Benefits | Plumbing Code

Unit Water Savings (Gal/Yr):

Annual Rate of Savings Deca:

Peak Period Savings (% of A

Useful Life (Years):

Participant Freeriders (% of Participants):

**Import from Library** [X]

- Residential Surveys, SF
- Residential Surveys, MF
- Residential ULF Toilets, SF
- Residential ULF Toilets, MF
- Residential HE Toilets, SF**
- Residential HE Toilets, MF

OK

Cancel

**Import an Activity from the Library**

Close Form

Previous Record

Next Record

New Record

Delete Record

1 of 5

# Entering Annual Activity Levels

## AWE CONSERVATION TRACKING TOOL: ENTER ANNUAL CONSERVATION ACTIVITY WORKSHEET

### Enter Annual Conservation Activity

[Return to Navigation Sheet](#)

[Report Error](#)

Class	Activity Name	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Single Family	Residential Surveys, SF	1000	1000	1000	1000							
Single Family	Residential HE Toilets, SF	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
CII	CII HE Toilet	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
Single Family	Residential Irrigation Controller, SF	1000	1000	1000	1000	1000	1000	1000	1000			
Irrigation	Large Land. Irrigation Controller	100	100									

### Effective Conservation Activity

Class	Activity Name	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Single Family	Residential Surveys, SF	1,000	1,800	2,440	2,952	2,362	1,562	922	410	0	0	0
Single Family	Residential HE Toilets, SF	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000	10,000	10,000
CII	CII HE Toilet	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000	10,000	10,000
Single Family	Residential Irrigation Controller, SF	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	8,000	8,000	7,000
Irrigation	Large Land. Irrigation Controller	100	200	200	200	200	200	200	200	200	200	100

### Gross Water Savings (AF)

Class	Activity Name	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Single Family	Residential Surveys, SF	37.971343	68.3	92.7	112.1	89.7	59.3	35.0	15.6	0.0	0.0	0.0
Single Family	Residential HE Toilets, SF	27.8	55.7	83.5	111.4	139.2	167.0	194.9	222.7	250.6	278.4	278.4
CII	CII HE Toilet	35.5	71.0	106.5	142.1	177.6	213.1	248.6	284.1	319.6	355.1	355.1
Single Family	Residential Irrigation Controller, SF	61.6	123.1	184.7	246.3	307.8	369.4	431.0	492.5	492.5	492.5	431.0
Irrigation	Large Land. Irrigation Controller	134.1	268.2	268.2	268.2	268.2	268.2	268.2	268.2	268.2	268.2	134.1
<b>Total Gross Water Savings</b>		<b>297.0</b>	<b>586.4</b>	<b>735.6</b>	<b>880.0</b>	<b>982.5</b>	<b>1,077.0</b>	<b>1,177.6</b>	<b>1,283.1</b>	<b>1,330.9</b>	<b>1,394.3</b>	<b>1,198.6</b>

### Peak Gross Water Savings (AF)

Class	Activity Name	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Single Family	Residential Surveys, SF	24.7	44.4	60.2	72.9	58.3	38.5	22.7	10.1	0.0	0.0	0.0
Single Family	Residential HE Toilets, SF	11.7	23.5	35.2	47.0	58.7	70.5	82.2	94.0	105.7	117.5	117.5
CII	CII HE Toilet	15.0	30.0	45.0	59.9	74.9	89.9	104.9	119.9	134.9	149.8	149.8
Single Family	Residential Irrigation Controller, SF	43.1	86.2	129.3	172.4	215.5	258.6	301.7	344.8	344.8	344.8	301.7
Irrigation	Large Land. Irrigation Controller	93.9	187.7	187.7	187.7	187.7	187.7	187.7	187.7	187.7	187.7	93.9
<b>Total Gross Water Savings</b>		<b>188.4</b>	<b>371.8</b>	<b>457.4</b>	<b>539.9</b>	<b>595.1</b>	<b>645.2</b>	<b>699.3</b>	<b>756.5</b>	<b>773.1</b>	<b>799.8</b>	<b>662.8</b>

### Off-Peak Gross Water Savings (AF)



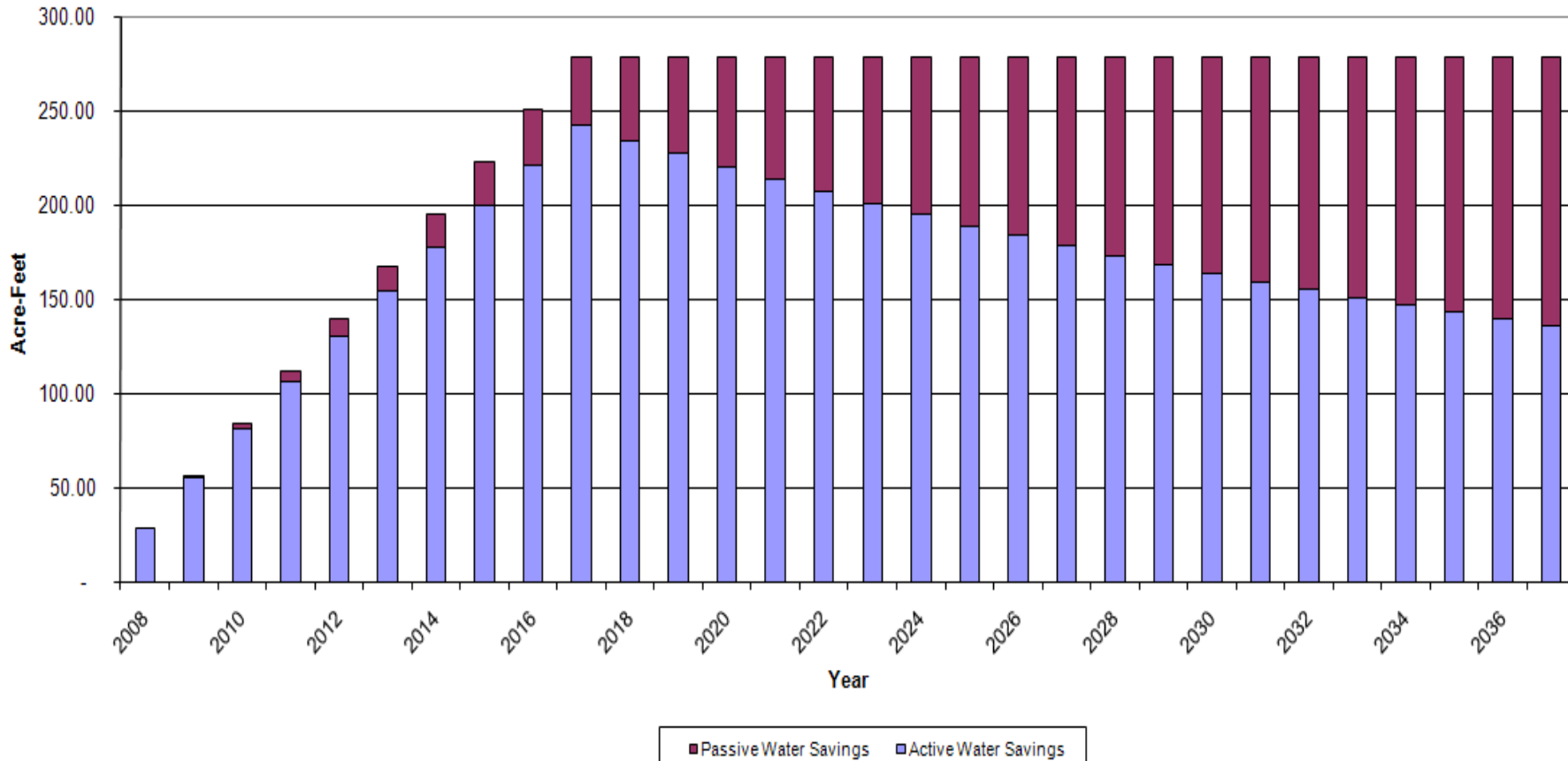
# AWE CONSERVATION TRACKING TOOL: ACTIVITY SAVINGS PROFILES WORKSHEET

Activity Name Residential HE Toilets, SF

[Return to Navigation Sheet](#)

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### Residential HE Toilets, SF Annual Water Savings



Residential HE Toilets, SF	Gross	Active	Passive
Lifetime Water Savings (AF)	15,452	7,957	7,495
Average Annual Water Savings (AF)	258	133	125

# AWE CONSERVATION TRACKING TOOL: WATER SAVINGS SUMMARY WORKSHEET

## Water Demand Summary

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Service Area Demands	Units	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Baseline Demands	AF	67,822	68,112	68,404	68,633	68,863	69,093	69,325	69,557	69,790	70,023
Baseline - Code Savings	AF	67,822	67,907	68,004	68,045	68,037	68,043	68,062	68,093	68,135	68,188
Baseline - Code Savings - Program Savings	AF	67,525	67,323	67,274	67,177	67,074	66,995	66,925	66,863	66,872	66,877

Per Capita Demands	Units	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Baseline Demands	GPD	173.0	173.0	173.0	173.0	173.0	173.0	173.0	173.0	173.0	173.0
Baseline - Code Savings	GPD	173.0	172.5	172.0	171.5	170.9	170.4	169.8	169.4	168.9	168.5
Baseline - Code Savings - Program Savings	GPD	172.2	171.0	170.1	169.3	168.5	167.7	167.0	166.3	165.8	165.2

Service Area Water Savings	Units	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Code Water Savings	AF	0.0	205.0	399.9	587.6	825.7	1,050.4	1,262.8	1,463.6	1,654.4	1,835.0
Program Water Savings	AF	297.0	584.3	729.5	867.9	962.7	1,047.7	1,137.1	1,229.8	1,263.3	1,310.8
<b>Total Water Savings</b>	<b>AF</b>	<b>297.0</b>	<b>789.3</b>	<b>1,129.4</b>	<b>1,455.6</b>	<b>1,788.4</b>	<b>2,098.1</b>	<b>2,399.9</b>	<b>2,693.4</b>	<b>2,917.6</b>	<b>3,145.8</b>
<b>% of Baseline Demands</b>	<b>%</b>	<b>0.4%</b>	<b>1.2%</b>	<b>1.7%</b>	<b>2.1%</b>	<b>2.6%</b>	<b>3.0%</b>	<b>3.5%</b>	<b>3.9%</b>	<b>4.2%</b>	<b>4.5%</b>

Class Water Savings	Units	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Single Family	AF	127.4	383.2	625.1	856.6	1,088.5	1,301.9	1,511.5	1,716.7	1,856.4	2,003.5
Multi Family	AF	-	47.3	92.2	135.6	187.0	235.5	281.5	325.1	366.7	406.1
CII	AF	35.5	90.6	143.8	195.2	244.7	292.5	338.7	383.3	426.4	468.0
Irrigation	AF	134.1	268.2	268.2	268.2	268.2	268.2	268.2	268.2	268.2	268.2
Water Losses	AF	-	-	-	-	-	-	-	-	-	-
<b>Total</b>	<b>AF</b>	<b>297.0</b>	<b>789.3</b>	<b>1,129.4</b>	<b>1,455.6</b>	<b>1,788.4</b>	<b>2,098.1</b>	<b>2,399.9</b>	<b>2,693.4</b>	<b>2,917.6</b>	<b>3,145.8</b>

Year forecasted peak season demand equals existing peak season delivery capacity		Deferred Expansion (Years)	Deferred Capacity (MGD)	Benefit of Deferred Expansion (\$)	Avoided Capacity (MGD)	Benefit of Avoided Expansion (\$)
Baseline Demands	<b>2020</b>	N/A	N/A	N/A	N/A	N/A
Baseline - Code Savings	<b>2029</b>	<b>9</b>	6.4	\$7,471,940	0.0	\$0
Baseline - Code Savings - Program Savings	<b>2031</b>	<b>11</b>	6.4	\$8,886,090	0.0	\$0

## Select Chart to View

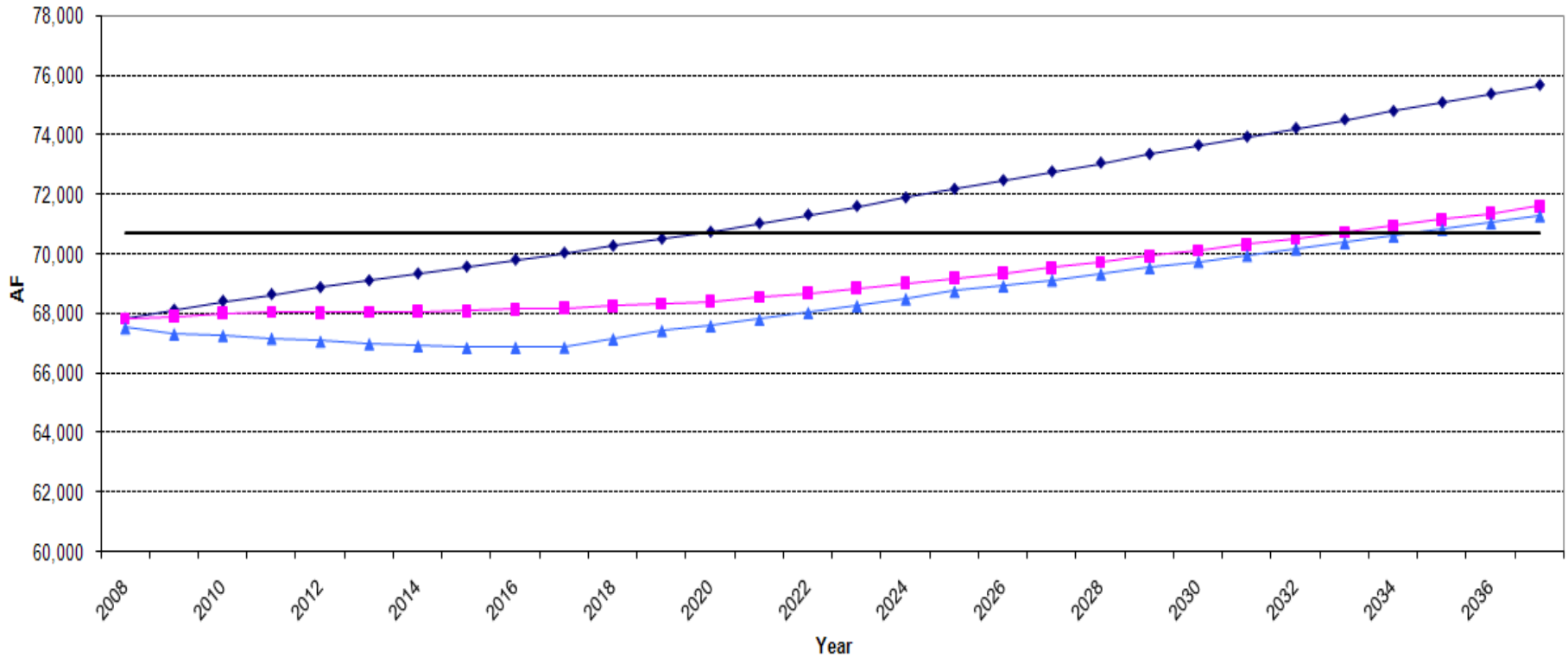
[Chart Explanations](#)

Select Chart to View

Service Area Demands

Chart Explanations

### Service Area Demands



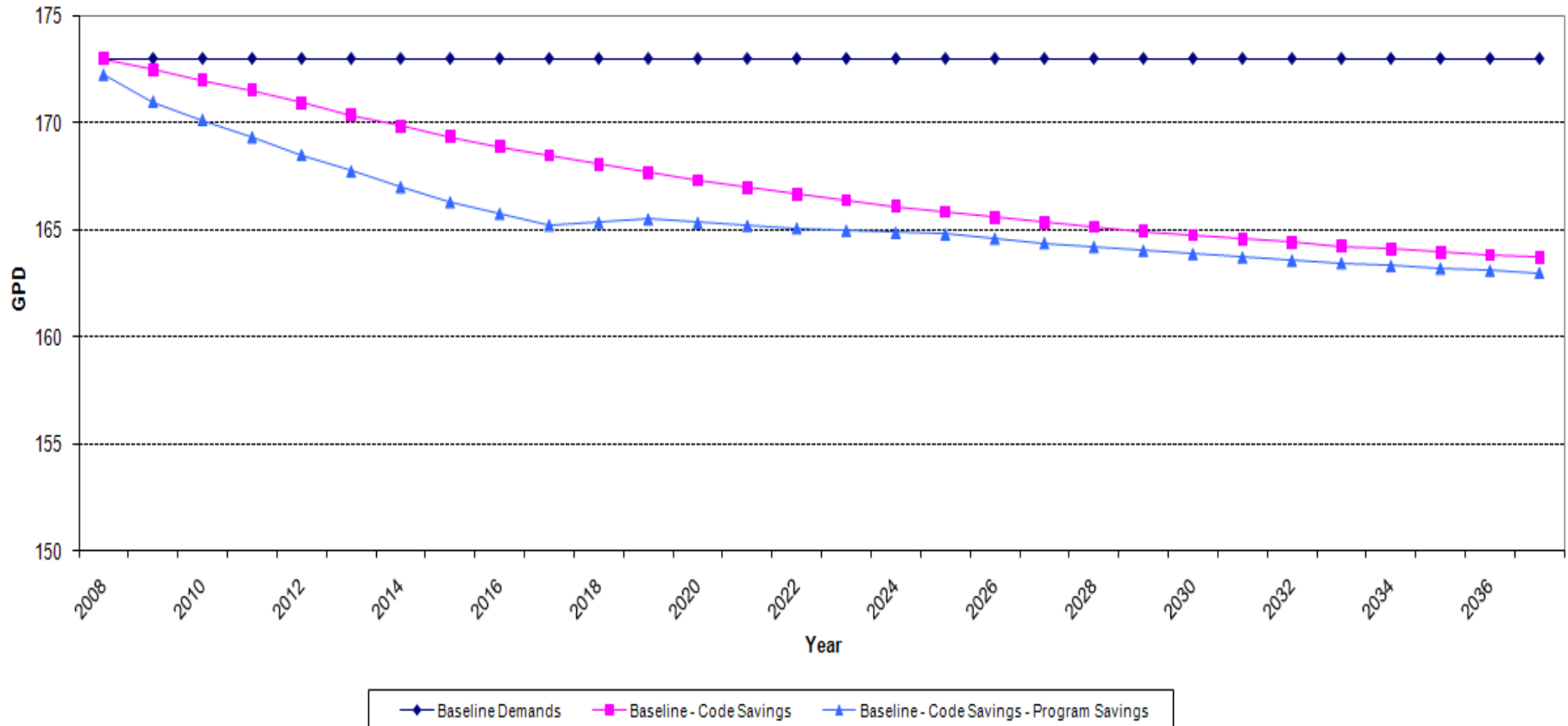
◆ Baseline Demands    ■ Baseline - Code Savings    ▲ Baseline - Code Savings - Program Savings    — Current Annual Delivery Capacity

Select Chart to View

Per Capita Demands

Chart Explanations

### Per Capita Demands

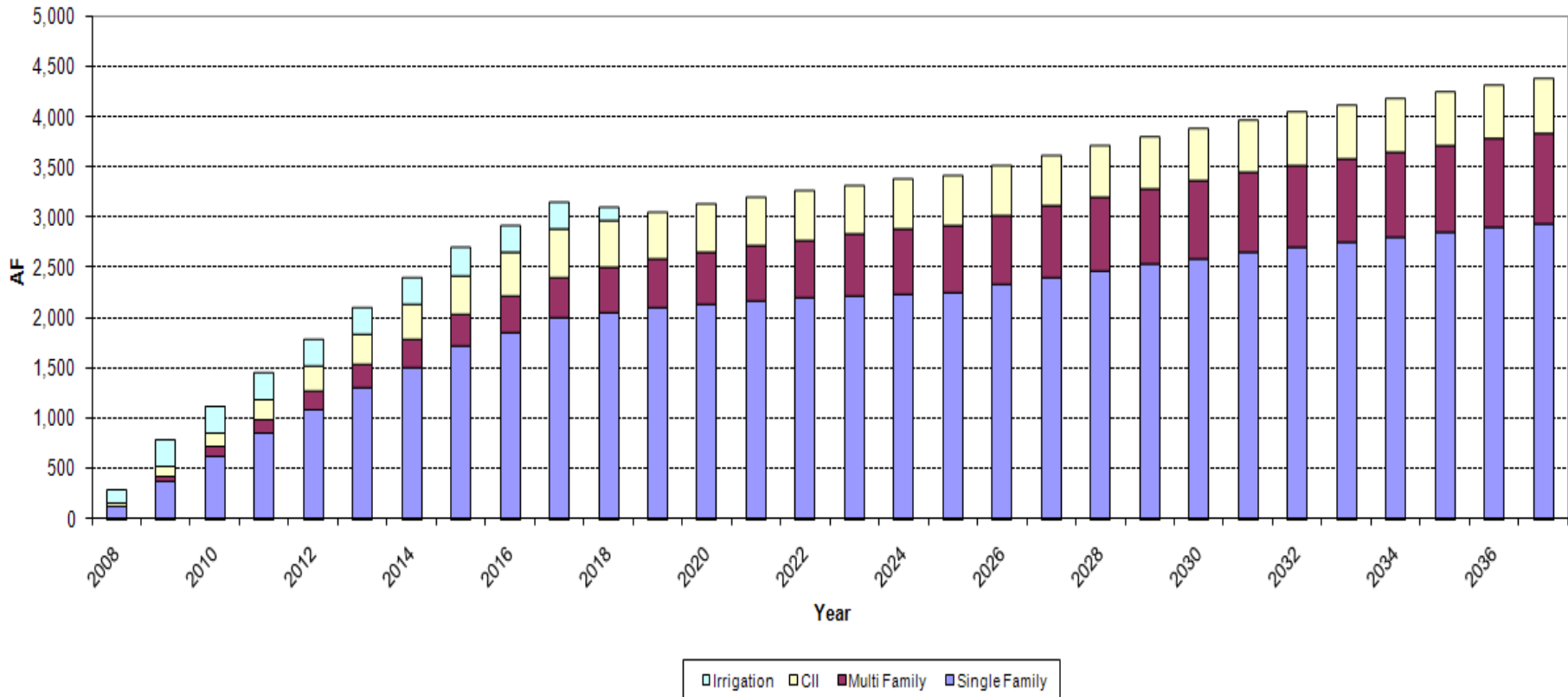


Select Chart to View

Total Class Savings

Chart Explanations

### Customer Class Water Savings (Program + Code-Driven)

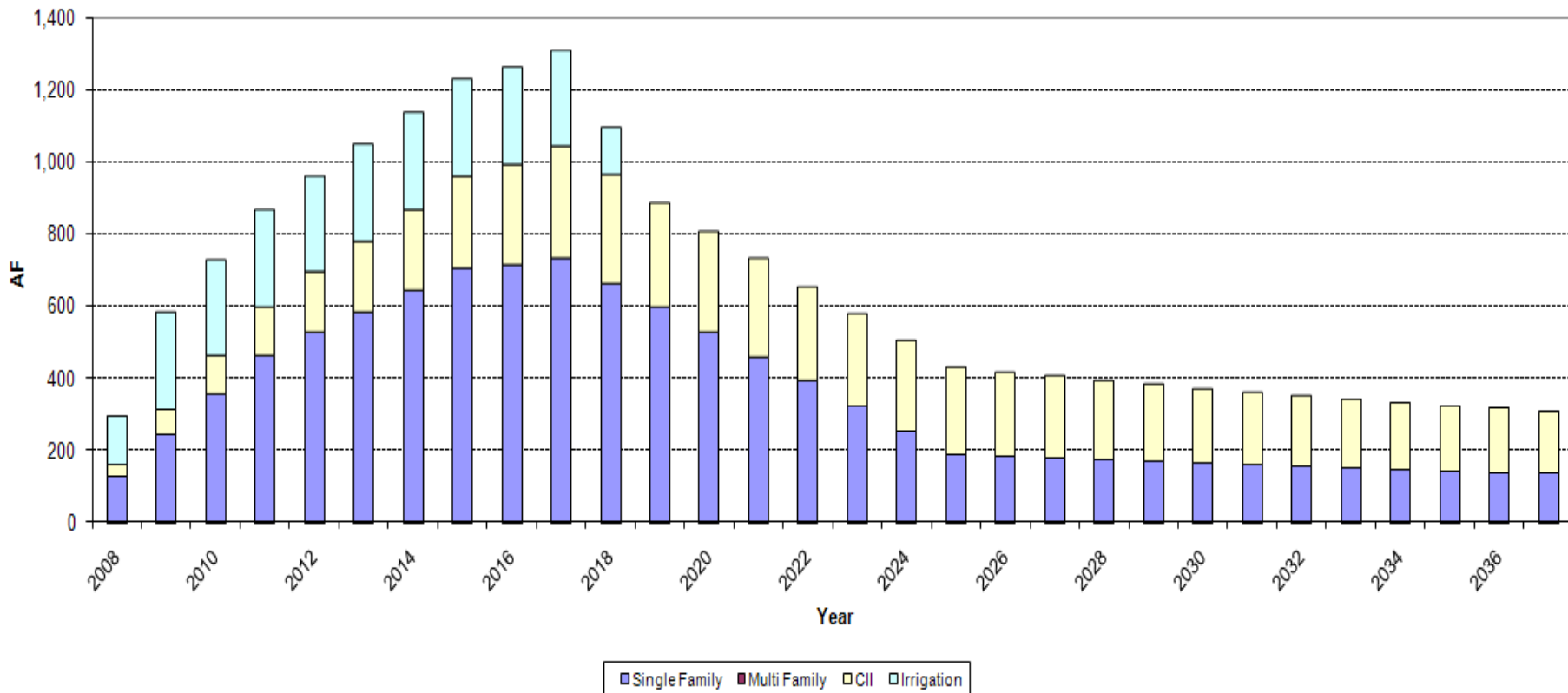


Select Chart to View

Program Class Savings

Chart Explanations

### Customer Class Water Savings (Program Only)



# Benefit-Cost Analysis Tabular Output

## AWE CONSERVATION TRACKING TOOL: UTILITY COSTS & BENEFITS WORKSHEET

Show Budget Table

[Return to Navigation Sheet](#) [Report Error](#)

### Conservation Program Cost Analysis (2009 Dollars)

Amort. Years: 20

Class	Activity Name	Unit Cost (\$/AF)	PV Cost	Amortized Cost
Single Family	Residential Surveys, SF	\$ 823	\$ 385,395	\$ 25,696
Single Family	Residential HE Toilets, SF	\$ 392	\$ 1,645,145	\$ 109,688
CII	CII HE Toilet	\$ 764	\$ 4,097,411	\$ 273,190
Single Family	Residential Irrigation Controller, SF	\$ 762	\$ 2,997,651	\$ 199,865
Irrigation	Large Land. Irrigation Controller	\$ 189	\$ 440,840	\$ 29,393
<b>Subtotal Conservation Activities</b>		<b>\$ 587</b>	<b>\$ 9,566,442</b>	<b>\$ 637,832</b>
<b>Total With Overhead &amp; Public Information</b>		<b>\$ 587</b>	<b>\$ 9,566,442</b>	<b>\$ 637,832</b>

### Conservation Benefit Analysis (2009 Dollars)

Class	Activity Name	Unit Benefit (\$/AF)	PV Benefit	Avoided Supply	Avoided Wastewater	Capacity Benefit
Single Family	Residential Surveys, SF	\$ 600	\$ 281,013	\$ 235,370	\$ 10,347	\$ 35,297
Single Family	Residential HE Toilets, SF	\$ 685	\$ 2,880,261	\$ 2,282,200	\$ 241,010	\$ 357,051
CII	CII HE Toilet	\$ 685	\$ 3,674,135	\$ 2,911,233	\$ 307,438	\$ 455,464
Single Family	Residential Irrigation Controller, SF	\$ 575	\$ 2,264,287	\$ 1,897,607	\$ -	\$ 366,680
Irrigation	Large Land. Irrigation Controller	\$ 567	\$ 1,321,437	\$ 1,121,780	\$ -	\$ 199,658
<b>Total</b>		<b>\$ 639</b>	<b>#####</b>	<b>\$ 8,448,189</b>	<b>\$ 558,794</b>	<b>\$ 1,414,150</b>

### Utility Conservation Program NPV and B/C Ratio (2009 Dollars)

Class	Activity Name	NPV (\$)	B/C Ratio
Single Family	Residential Surveys, SF	\$ (104,382)	0.73
Single Family	Residential HE Toilets, SF	\$ 1,235,117	1.75
CII	CII HE Toilet	\$ (423,277)	0.90
Single Family	Residential Irrigation Controller, SF	\$ (733,364)	0.76
Irrigation	Large Land. Irrigation Controller	\$ 880,597	3.00
<b>Subtotal Conservation Activities</b>		<b>\$ 854,691</b>	<b>1.09</b>
<b>Total With Overhead &amp; Public Information</b>		<b>\$ 854,691</b>	<b>1.09</b>

### Select Chart to View

Unit Costs Sorted

Chart Explanations





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FROM THE AMERICAN PEOPLE

**İDARA**

# Water Efficiency Planning for Aqaba Water Company: AWE Conservation Tracking Tool Preliminary Results





# Using the Tracking Tool for AWC

- US AID staff worked carefully with AWC staff
- Tool customized for Jordan
- Inputs defined to fit the Aqaba Water Company
- Model can be quickly changed to reflect new realities



# AWE CONSERVATION TRACKING TOOL: COMMON ASSUMPTIONS WORKSHEET

## ENTER COMMON ASSUMPTIONS:

Manage Scenarios

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Analysis Start Year	2009	<b>2010</b>	<b>2020</b>	<b>2030</b>	<b>2040</b>
Service Area Population	125,773	128,758	162,794	205,826	205,826
Population Growth Rate (%/Yr)		2.4%	2.4%	2.4%	0.0%

Peak-Season Start Date ('month/day')	1-May			
Peak-Season End Date ('month/day')	31-Aug	Number of Days in Peak Season:	123	

Nominal Interest Rate	6.00%
Inflation Rate	3.00%

## CHOOSE MEASUREMENT UNITS:

Water Volume Units

Million Gallons (MG)

Acre-Feet (AF)

Cu. Meters (M^3)

### MODEL UNITS:

<b>Flow:</b>	M^3/D
<b>Volume:</b>	MCM

## SELECT CUSTOMER CLASSES:

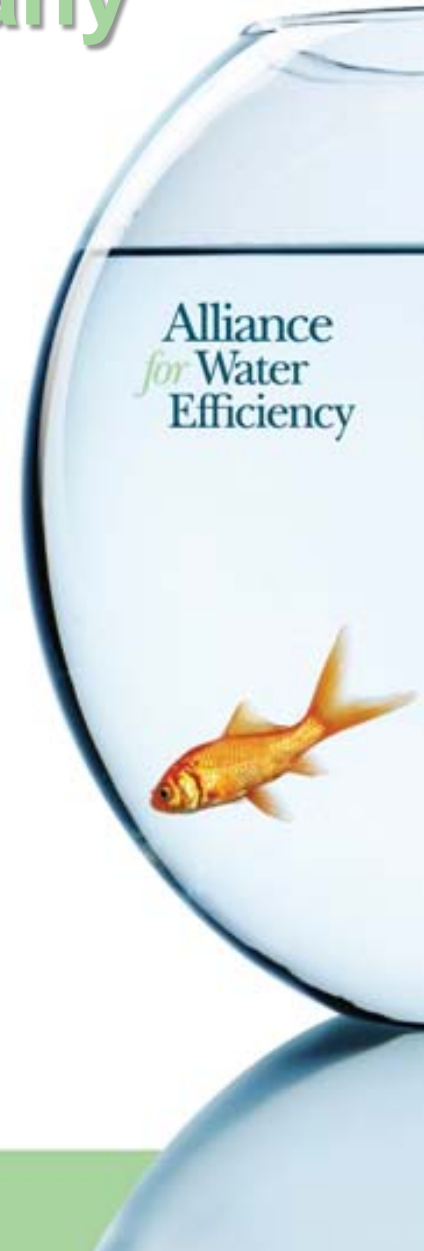
Select Customer Classes

## ENTER UTILITY RATE INFORMATION:

	Current Customer Utility Rates				Nominal Rate of Increase			
	Water Rates (JD/M^3)	Sewer Rates (JD/M^3)	Electric Rates (JD/KWh)	Gas Rates (JD/Therm)	Water Rates (%/Yr)	Sewer Rates (%/Yr)	Electric Rates (%/Yr)	Gas Rates (%/Yr)
<b>Water Customer Classes in Model</b>								
Residential	0.11	0.05	0.10		3.0%	3.0%	3.0%	3.0%
Commercial	1.00	0.65	0.10		3.0%	3.0%	3.0%	3.0%
Industrial	1.00	0.65	0.10		3.0%	3.0%	3.0%	3.0%
Touristic	1.00	0.65	0.10		3.0%	3.0%	3.0%	3.0%
Agricultural	1.00	0.65	0.10		3.0%	3.0%	3.0%	3.0%

# Inputs for Aqaba Water Company

- Specify Demands: Input from Demand Forecasting by Category
- Specify Utility Avoided Water and Wastewater Costs: what is a saved liter worth?
- Define Conservation Activities: How much can be saved and at what cost?



Home Insert Page Layout Formulas Data Review View Developer Add-Ins Acrobat

From Access From Web From Text From Other Sources Existing Connections Refresh All Properties Edit Links Connections

Sort Filter Clear Reapply Advanced Sort & Filter

Text to Columns Remove Duplicates Data Validation Consolidate What-If Analysis Data Tools

Group Ungroup Subtotal Show Detail Hide Detail Outline Analysis

FirstRecord Toilet, Residential

A B C D E F G H I J K L M N O P

**AWE CONSERVATION TRACKING TOOL: DEFINE CONSERVATION PROGRAMS WORKSHEET**

**Define Conservation Programs** [Return to Navigation Sheet](#) [Report Error](#)

Click to Define/Edit/Delete Conservation Programs

Hide Table of Programs in Model

**Warning: Only use the form to edit or delete activities. Editing/deleting activities directly in the table m**

ID	Program Name	Class	Savings, Per Unit (M <sup>3</sup> /YR)	Savings, Annual Rate of Decay (%)	Savings, Peak Period (% of Annual Savings)	Savings, Useful Life (yrs)	Savings, Participant Free Riders (% of Participants)	Utility Costs, Year Denominated	Utility Costs, Initial Fixed (JD)	Utility Costs, Initial Variable (JD/unit)	Utility Costs, Years of Follow-up (yrs)	Utility Costs, Follow-up Fixed (JD/yr)	Utility Costs, Follow-up Variable (JD/unit/yr)	Participant Costs, Year Denominated
1	Toilet, Residential	Commercial	21.4		34%	25		2009		400.00				
2	Showerhead & Faucets, Residential	Residential	54.6		34%	5		2009		15.00				
3	Toilet, Hotel	Touristic	7.39		34%	25		2009		200.00				
4	Showerhead & Faucets, Hotel	Touristic	37.23											
5	Toilet, Commercial Offices	Commercial	7.14											
6	Faucets, Commercial Offices	Commercial	4.29											
7	Toilet, Education	Commercial	14.78											
8	Faucets, Education	Commercial	3.07											
9	Toilet, Hospitals	Commercial	4.43											
10	Faucets, Hospitals	Commercial	10.95											
11	Showerhead, Hospitals	Commercial	11.68											
12	Faucets, Worship	Residential	10.95											
13														
14														
15														
16														
17														
18														
19														
20														
21														
22														
23														
24														
25														
26														
27														
28														

Define Conservation Programs

Activity Name\*: Toilet, Residential

Affected Subscriber Class\*: Commercial

Unit Water Savings | Utility Costs | Participant Costs | Participant Non Water Benefits | Plumbing Code

Unit Water Savings (M<sup>3</sup>/Yr)\*: 21.4

Annual Rate of Savings Decay (%/Year):

Peak Period Savings (% of Annual)\*: 34.00% *Peak days = 34% of days in a year.*

Useful Life (Years): 25

Participant Freeriders (% of Participants):

Import a Program from the Library

Close Form

Previous Record

Next Record

Delete Record

# AWE CONSERVATION TRACKING TOOL: ENTER ANNUAL PROGRAM ACTIVITY WORKSHEET

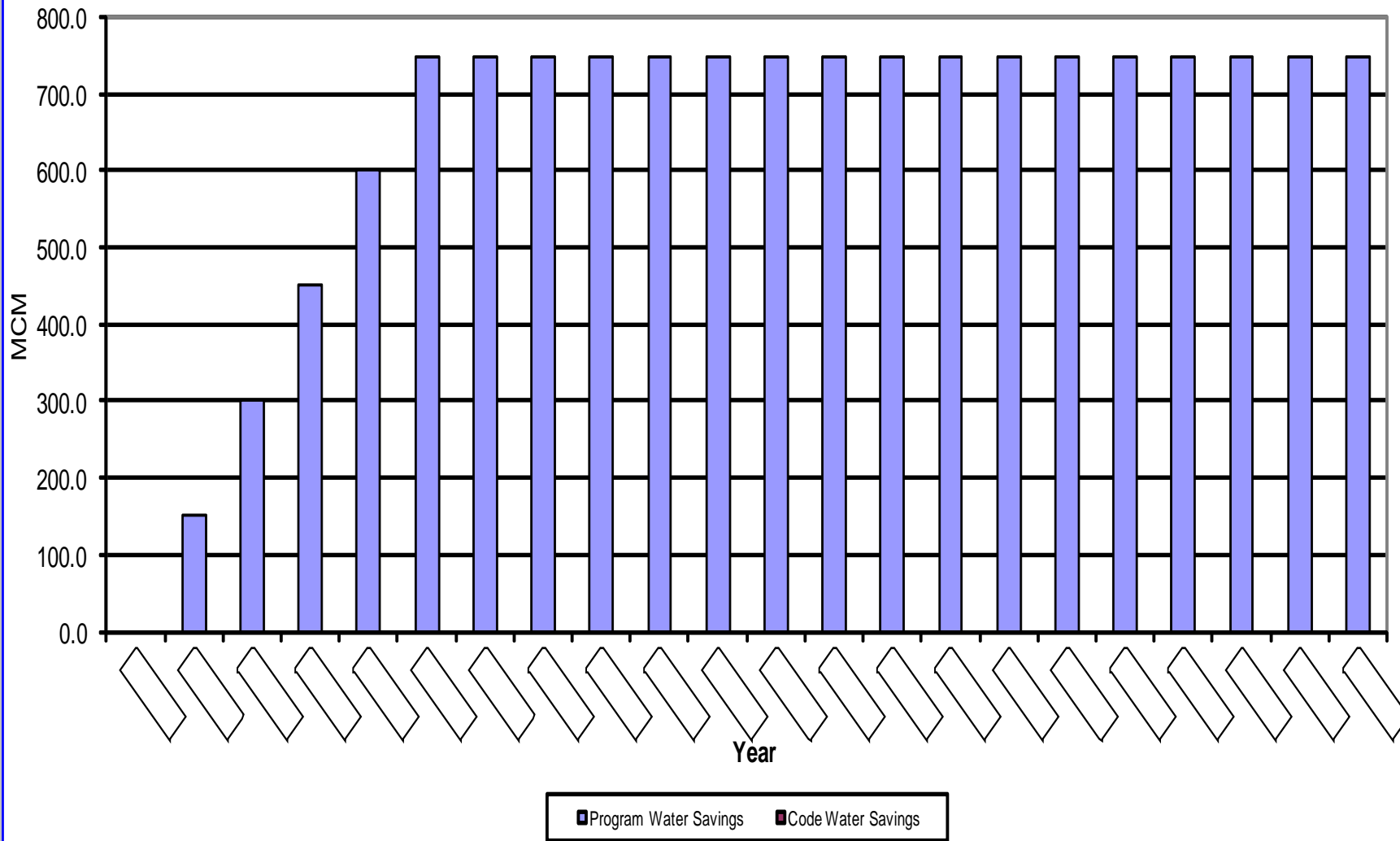
**Enter Annual Program Activity**
[Return to Navigation Sheet](#)      [Report Error](#)

Class	Program Name	2009	2010	2011	2012	2013	2014	2015	2016
Commercial	Toilet, Residential		1000	1000	1000	1000	1000		
Residential	Showerhead & Faucets, Residential		1000	1000	1000	1000	1000	1000	1000
Touristic	Toilet, Hotel		520	520	520	520	520		
Touristic	Showerhead & Faucets, Hotel		520	520	520	520	520	520	520
Commercial	Toilet, Commercial Offices		1840	1840	1840	1840	1840		
Commercial	Faucets, Commercial Offices		2040	2040	2040	2040	2040	2040	2040
Commercial	Toilet, Education		40	40	40	40	40		
Commercial	Faucets, Education		240	240	240	240	240	240	240
Commercial	Toilet, Hospitals		50						
Commercial	Faucets, Hospitals		50					50	
Commercial	Showerhead, Hospitals		20					20	
Residential	Faucets, Worship		60	60	60	60	60	60	60

## Effective Program Activity

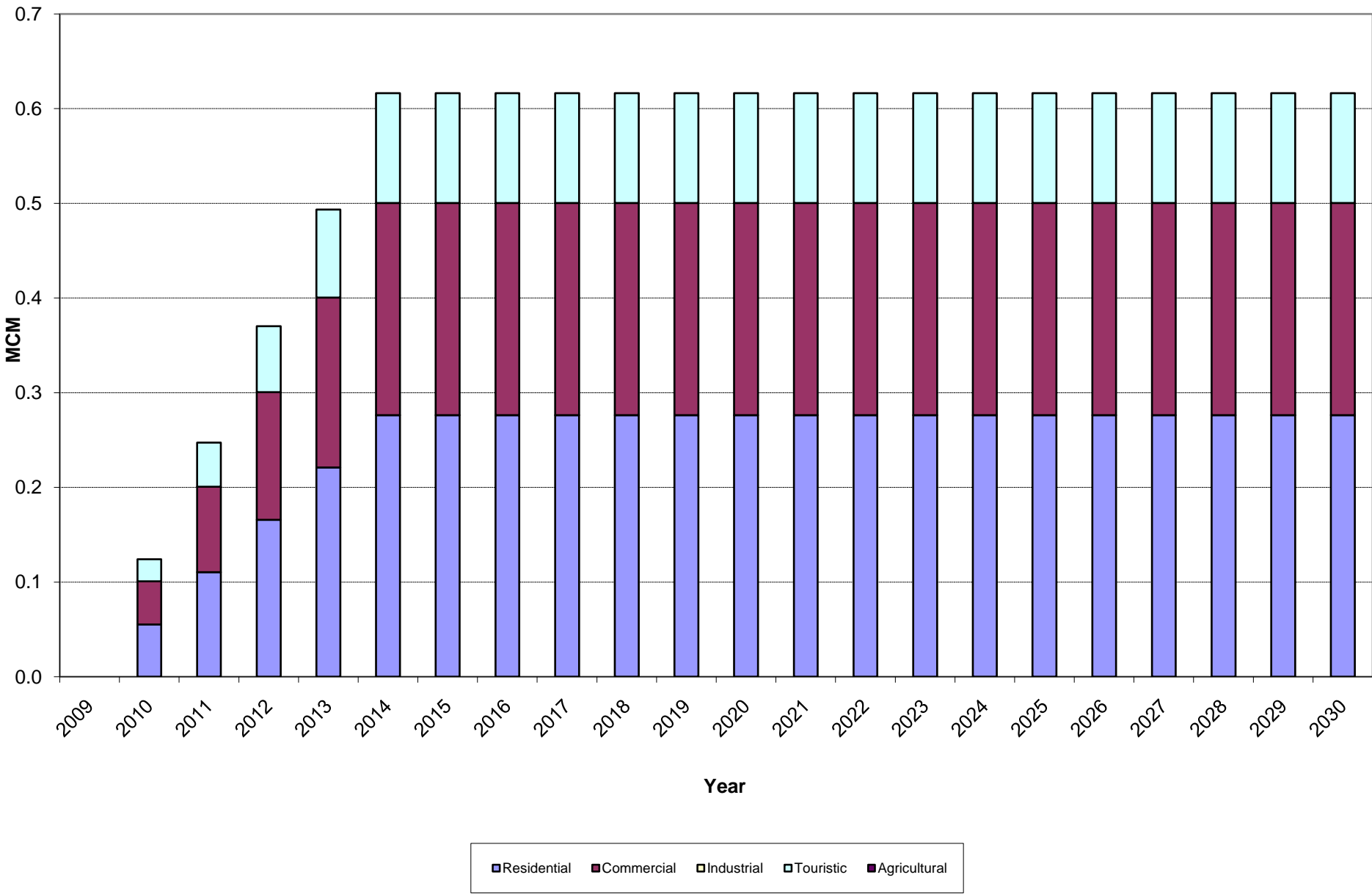
Class	Program Name	2009	2010	2011	2012	2013	2014	2015	2016
Commercial	Toilet, Residential	0	1,000	2,000	3,000	4,000	5,000	5,000	5,000
Residential	Showerhead & Faucets, Residential	0	1,000	2,000	3,000	4,000	5,000	5,000	5,000
Touristic	Toilet, Hotel	0	520	1,040	1,560	2,080	2,600	2,600	2,600
Touristic	Showerhead & Faucets, Hotel	0	520	1,040	1,560	2,080	2,600	2,600	2,600
Commercial	Toilet, Commercial Offices	0	1,840	3,680	5,520	7,360	9,200	9,200	9,200
Commercial	Faucets, Commercial Offices	0	2,040	4,080	6,120	8,160	10,200	10,200	10,200
Commercial	Toilet, Education	0	40	80	120	160	200	200	200
Commercial	Faucets, Education	0	240	480	720	960	1,200	1,200	1,200
Commercial	Toilet, Hospitals	0	50	50	50	50	50	50	50
Commercial	Faucets, Hospitals	0	50	50	50	50	50	50	50
Commercial	Showerhead, Hospitals	0	20	20	20	20	20	20	20
Residential	Faucets, Worship	0	60	120	180	240	300	300	300

### Showerhead & Faucets, Residential Annual Water Savings



Showerhead & Faucets, Residential	Total	Program	Code
Lifetime Water Savings (MCM)	5.73	5.73	-
Average Annual Water Savings (MCM)	0.23	0.23	-

# Subscriber Class Water Savings



# Preliminary Results

## Utility Conservation Program Costs (2009 JD)

Amort. Years: 20

Class	Program Name	Unit Cost (JD/MCM)	PV Cost	Amortized Cost
Commercial	Toilet, Residential	1,032,909	1,836,462	122,444
Residential	Showerhead & Faucets, Residential	58,144	233,184	15,547
Touristic	Toilet, Hotel	1,495,552	477,480	31,835
Touristic	Showerhead & Faucets, Hotel	85,272	121,256	8,085
Commercial	Toilet, Commercial Offices	1,547,917	1,689,545	112,649
Commercial	Faucets, Commercial Offices	493,347	317,130	21,144
Commercial	Toilet, Education	747,776	36,729	2,449
Commercial	Faucets, Education	689,400	37,309	2,488
Commercial	Toilet, Hospitals	2,494,838	9,717	648
Commercial	Faucets, Hospitals	193,284	1,861	124
Commercial	Showerhead, Hospitals	90,602	372	25
Residential	Faucets, Worship	96,642	4,664	311
<b>Total</b>		<b>505,213</b>	<b>4,765,709</b>	<b>317,748</b>

## Utility Conservation Program Benefits (2009 JD)

Class	Program Name	Unit Benefit (JD/MCM)	PV Benefit	Capacity Benefit	Avoided Supply & Wastewater	Avoided Wastewater
Commercial	Toilet, Residential	1,175,197	2,089,443	0	2,089,443	0
Residential	Showerhead & Faucets, Residential	1,173,256	4,705,259	0	4,705,259	0
Touristic	Toilet, Hotel	1,175,197	375,201	0	375,201	0
Touristic	Showerhead & Faucets, Hotel	1,173,256	1,668,350	0	1,668,350	0
Commercial	Toilet, Commercial Offices	1,175,197	1,282,723	0	1,282,723	0
Commercial	Faucets, Commercial Offices	1,173,256	754,186	0	754,186	0
Commercial	Toilet, Education	1,175,197	57,723	0	57,723	0
Commercial	Faucets, Education	1,173,256	63,495	0	63,495	0
Commercial	Toilet, Hospitals	1,143,148	4,452	0	4,452	0
Commercial	Faucets, Hospitals	1,143,148	11,005	0	11,005	0
Commercial	Showerhead, Hospitals	1,143,148	4,696	0	4,696	0
Residential	Faucets, Worship	1,173,256	56,618	0	56,618	0
<b>Total</b>		<b>1,173,866</b>	<b>11,073,152</b>	<b>0</b>	<b>11,073,152</b>	<b>0</b>



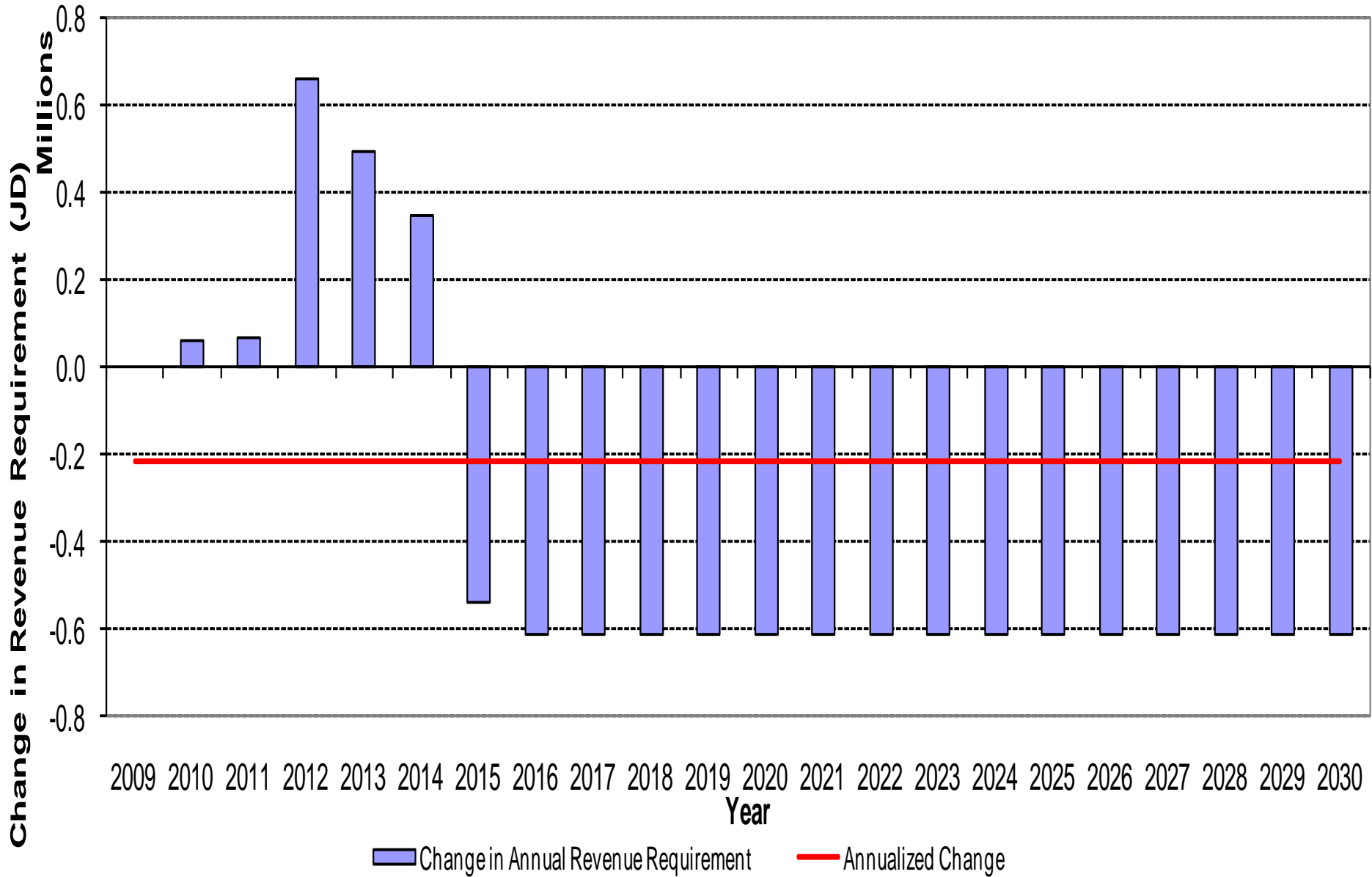
# Recommended



# Implementation Plan

	Year 1	Year 2	Year 3	Year 4	Year 5
Targeted Residential WSD Retrofit					
Residential HE Toilet Direct Install					
Touristic–Hotels Performance Contracts					
Residential WSD and HE Toilet Pilot					
Commercial Office WSD Retrofit					
Commercial HE Toilet Direct Install					
Educational Facilities Retrofit					
New Construction Code & Enforcement					
Training—Planning, Landscape, Audits					
Public Information Campaign					
<b>Projected Annual Water Savings (MCM/Yr)</b>	<b>0.09</b>	<b>0.17</b>	<b>0.30</b>	<b>0.42</b>	<b>0.54</b>
<b>Recommended Budget (JD/Yr)</b>	<b>0.12M JD</b>	<b>0.18M JD</b>	<b>1.2 M JD</b>	<b>1.2 M</b>	<b>1.2 M</b>
<b>Required Staff (FTE)</b>	<b>3.5</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>5</b>

# Impact to Utility Sales Revenue Requirement



# Beta Testing the Model

- Four US utilities tested the model: Seattle, San Antonio, Tampa Bay, Marin Municipal Water District
- Model tested in Aqaba, Jordan
- Model finalized with results from beta testing
- Version 1.1 available in excel
- Future versions will add to library of conservation measures
- Water loss evaluation component will be added



# Availability of Model

- Issued in July, 2009
- Available free to members
- AWE agrees to provide free all future updates and one free hour of technical assistance
- Looking for case study applications to feature on AWE web site
- May web-enable the model for future versions





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