

This presentation premiered at WaterSmart Innovations

watersmartinnovations.com



Tools for Integrating Water and Energy Management



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Pacific Institute
October 5, 2011

Pacific Institute Tools to Integrate Water and Energy Management

- WECalc – Your Home Water-Energy-Climate Calculator
- WESim – Water-Energy Simulator



WECalc

Your Home
Water-Energy-Climate
Calculator

	Household Water Use (gal. per day)	Greenhouse Gas Emissions (lb.CO ₂ equiv. per year)
Shower	12	340
Total So Far	12	340

Let's Begin

Hot Water
Heater

Tell Us About Your
Water Usage

Embedded
Energy

Your Results

Showers

Bathtubs

Toilets

Faucets

Dishwasher

Clothes Washer

Leaks

STEP BACK < > CONTINUE

Do you know the flow rate of your shower? Yes No

[» How can I determine the flow rate of my shower?](#)

Is this flow rate from the label or did you measure it?

[» Why are labeled and measured flow rates different?](#)

Enter the flow rate (gallons per minute)

What is the average temperature of your showers? °F

Does your shower have a drain water heat recovery system? Yes No

[» What is a drain heat recovery system?](#)



WECalc

Your Home
Water-Energy-Climate
Calculator

	Household Water Use (gal. per day)	Greenhouse Gas Emissions (lb.CO ₂ equiv. per year)
Lawn	14	9.6
Total So Far	120	1,200

Let's Begin

Hot Water
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Tell Us About Your
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STEP BACK < > CONTINUE

How big is the area of lawn that you water?

square feet

>> [How can I calculate the area of my lawn?](#)

During the months that you water, how often do you water your lawn?

times

per

During how many months out of the year do you water?

months out of 12

How do you water

>> [Description of watering methods in this calculator](#)

Do you have an ET Controller?



WECalc

Your Home
Water-Energy-Climate
Calculator

Household
Water Use
(gal. per day)

Greenhouse Gas
Emissions (lb.CO₂
equiv. per year)

Type Of Use

0

0

Total So Far

130

1,200

STEP BACK CONTINUE

Tell Us About Your
Water Usage

Your Energy
Use

Your Results

Water Chart

Carbon Chart

Hot Water
Chart

Comparison

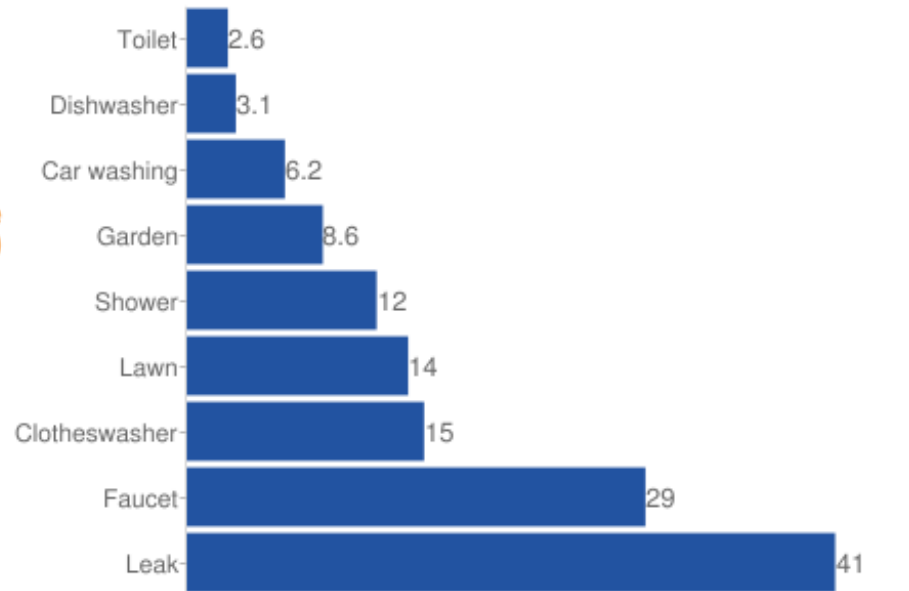
Suggestions

Summary

Feedback

Your household's average daily water use, by use:

Water Use
(gal per day)





WECalc

Your Home
Water-Energy-Climate
Calculator

	Household Water Use (gal. per day)	Greenhouse Gas Emissions (lb. CO ₂ equiv. per year)
Type Of Use	<u>0</u>	<u>0</u>
Total So Far	130	1,200

Water Usage

Your Results

Water Chart

Carbon Chart

Hot Water
Chart

Comparison

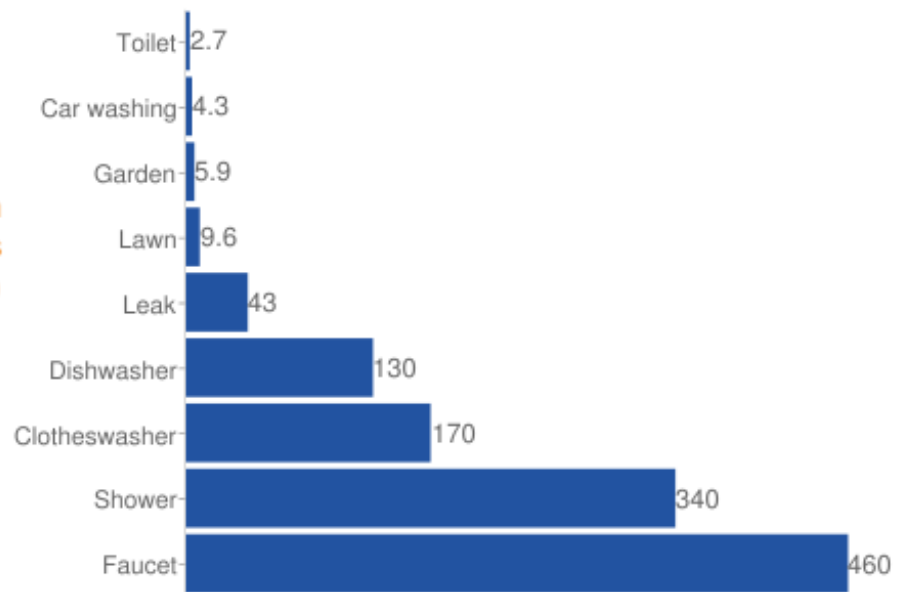
Suggestions

Summary

Feedback

Your household's average daily water-related
carbon emissions from:

Carbon
Emissions
(lb per day)





WECalc

Your Home
Water-Energy-Climate
Calculator

Household
Water Use
(gal. per day)

0

130

Greenhouse Gas
Emissions (lb.CO₂
equiv. per year)

0

1,200

Type Of Use

Total So Far

Tell Us About Your
Water Usage

Your Energy
Use

Your Results

Water Chart

Carbon Chart

Hot Water
Chart

Comparison

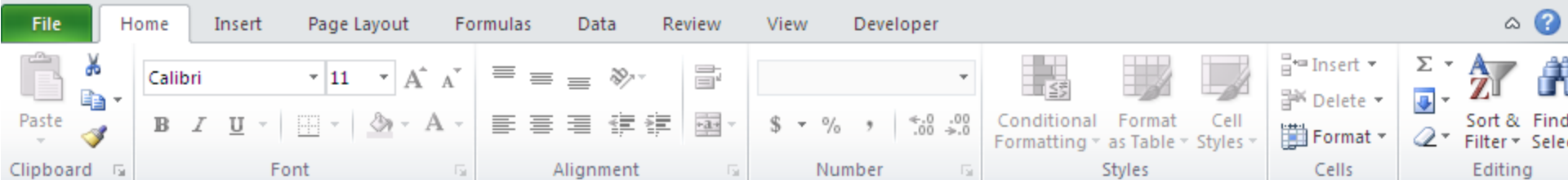
Suggestions

Summary

Feedback

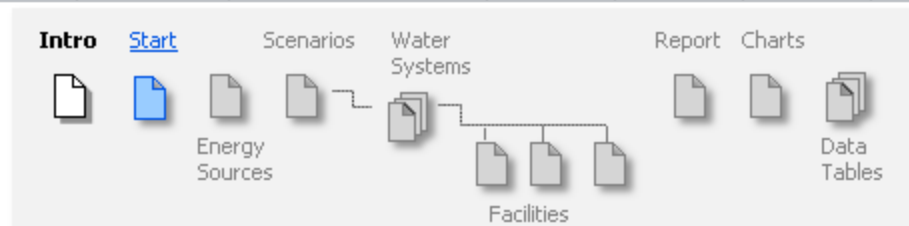
Suggestions (water & energy savings)

	Suggestion	Approximate Cost	Water Savings (gal/day)	GHG Reduction (lb CO ₂ /year)	Annual Savings (\$/year)	Payback (years)
1	Install 1.5 gpm faucet aerators	\$ 1 - 4	11.3	159	\$50.60	0.0198 - 0.0791
2	Install a drain heat recovery system on your shower drain	\$ 300 - 500	0	59.9	\$15.70	19.1 - 31.8
3	Shorten your showers by one minute	free	2.01	56.6	\$16.40	0
4	Purchase an efficient clothes washer	\$ 500 - 1,500	9.59	109	\$36.00	13.9 - 41.6
5	Rinse your clothes with cold water	free	0	152	\$40.00	0
6	Upgrade your dishwasher to an Energy Star-rated model	\$ 300 - 800	1.43	60.4	\$16.90	17.7 - 47.2
7	Install an electric heat pump	\$ 600 - 2,000	0	633	\$166.00	3.62 - 12.1

input fx

Introduction

Water-Energy Simulator (WESim)



Click here to get started:

[Start Page ->](#)

To navigate through WESim, use the hyperlinks with -> and -< symbols near the top of each page or the links on the top navigation panel. Within the panel, the active page is shown in white; click on the blue pages to navigate to them. Gray pages are not available from your current location.

If you get stuck, click the help links for more information.

Input cells look like this:

WESim can be used in either the user or developer mode; please see the manual for information about each. The user mode is enabled by default. You can select among the modes by clicking the buttons on the right.

User Mode



Developer Mode



WESim was developed by the Pacific Institute with support from the WaterReuse Foundation, the California Energy Commission, and the Candian Mortgage and Housing Corporation.



File Home Insert Page Layout Formulas Data Review View Developer

Clipboard Font Alignment Number Styles Cells Editing

A7

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

Scenario Manager

[Help on this page](#)



[-< Start Page](#)

[Output Report ->](#)

7		
8	Baseline (2010)	<div> <p>Scenario Management</p> <p>Add a Scenario + ... Rename a Scenario</p> <p>Duplicate a Scenario ... x Delete a Scenario</p> <p>Change Order of Scenarios ...</p> </div>
9	Baseline with recycled water	
10	Baseline with SWRO	
11	Baseline with SWRO and solar	
12		<div> <p>Edit a Scenario...</p> </div> <div> <p>Edit Energy Sources</p> </div>
13		

[Scenario Management Help](#)

File Home Insert Page Layout Formulas Data Review View Developer

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A7

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

Water System Manager



<- Scenario Manager Output Report ->

Scenario: Baseline (2010)

Show:

Water Flow Set flow units MG per day

Energy Use Set energy units GJ per day

Facility Management

Add a Facility + Rename a Facility ...

Duplicate a Facility ... Delete a Facility X

Change order of the Facilities ...

Edit a Facility...

[Facility Management Help](#)

Click button to edit a facility

Extraction	Main St. Pump	Jones St. Pump	Crystal Reservoir				
Water Conveyance	Crystal Pump #1	Crystal Pump #2	Crystal Pump #3				
Water Treatment	Chlorine Injector for GW	Crystal Treatment Plant					
Water Distribution	Booster Pump #204	Booster Pump #205	Booster Pump #206	Booster Pump #207			

File Home Insert Page Layout Formulas Data Review View Developer

Clipboard Font Alignment Number Styles Cells Editing

desc Main St. Pump

Water System Facility Editor

[Help on this page](#) Save Cancel

5 Facility Name: Import... [Import Help](#)

7 Facility Type: [Units Help](#)

9 Water Use: per Edit Energy Sources...

Energy Use [Help entering energy](#)

	Energy Source	Amt. of Energy	Units	Choose one	Units of Time	Units of
13	✗ Source 1: Electricity (Colorado)	<input type="text" value="370"/>	kWh	per <input type="radio"/> Time <input checked="" type="radio"/> Volume	<input type="text"/>	MG
14	✗ Source 2:	<input type="text"/>		per <input checked="" type="radio"/> Time <input type="radio"/> Volume	<input type="text"/>	
15	✗ Source 3:	<input type="text"/>		per <input checked="" type="radio"/> Time <input type="radio"/> Volume	<input type="text"/>	
16	✗ Source 4:	<input type="text"/>		per <input checked="" type="radio"/> Time <input type="radio"/> Volume	<input type="text"/>	
17	✗ Source 5:	<input type="text"/>		per <input checked="" type="radio"/> Time <input type="radio"/> Volume	<input type="text"/>	

Defaults Wizard

Use this wizard to fill in approximate default values for water wells and certain treatment technologies.

[Help](#)

Default Values | Water Treatment

Energy Intensities from the literature, in kWh/MG:

Category:

Water Treatment

Technology	Low Estimate	Median	High Estimate
Chlorine Disinfection	8	10	10
Conventional Treatment (<1 MGD)	620	1500	2000
Conventional Treatment (1-5 MGD)	300	750	1300
Conventional Treatment (5-20 MGD)	180	560	1100
Conventional Treatment (20+ MGD)	120	210	1000
UV Disinfection (Low-Pressure Lamps)	57	64	70
UV Disinfection (Medium Pressure Lamps)	100	150	160
Ozone Disinfection	120	160	440
Ultrafiltration/Microfiltration	320	500	750
Brackish Water Desalination (1000-3000 mg/l)	3000	3600	4200
Brackish Water Desalination (3000-5000 mg/l)	4200	4750	5300
Brackish Water Desalination (5000-7000 mg/l)	5300	5850	6400
Brackish Water Desalination (7000-10,000 mg/l)	6400	7350	8300

Estimate

 Low Median High

Value to Insert:

10

kWh

Electricity (Colorado)

per

MG

Insert

Cancel

B5

A

Water System Facility Editor

[Help on this page](#)

5 Facility Name: Chlorine Inje

7 Facility Type: Water Treat

10 Energy Use

11 [Help entering energy](#)

13 X Source 1: Electricity (C

15 X Source 2:

17 X Source 3:

19 X Source 4:

21 X Source 5:

Facility

Charts

Data Tables

ort... [Import Help](#)

Energy

Units of Time

Units of

MG

per Time Volumeper Time Volume

File Home Insert Page Layout Formulas Data Review View Developer

Clipboard Font Alignment Number Styles Cells Editing

numerEnergy GJ

Output Report

[Help on this page](#)

Export...

Intro Start Scenarios Water Systems Report Charts

Energy Sources Facilities Data Tables

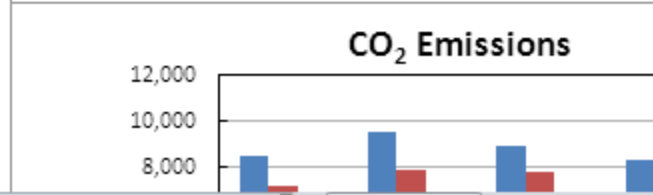
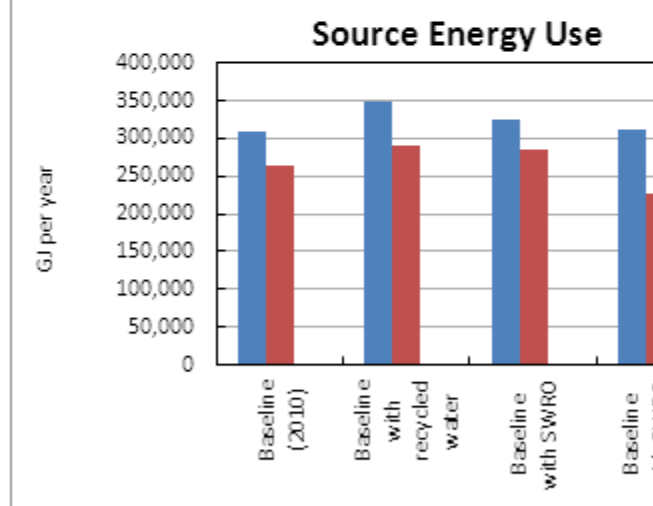
[-< Scenario Manager](#) [Charts ->](#)

Tables

Source Energy Use	GJ		per	year
	Water	Wastewater		
Baseline (2010)	309,000	265,000		0
Baseline with recycled wa	349,000	290,000		0
Baseline with SWRO	325,000	285,000		0
Baseline with SWRO and s	311,000	228,000		0

CO ₂ Emissions	metric ton		per	year
	Water	Wastewater		
Baseline (2010)	8,480	7,260		0
Baseline with recycled wa	9,590	7,950		0
Baseline with SWRO	8,920	7,830		0

System Charts



File Home Insert Page Layout Formulas Data Review View Developer

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chtScenario Baseline (2010)

Component Charts

[Help on this page](#)

Export...

Intro Start Scenarios Water Systems Report Charts

Energy Sources Facilities Data Tables

[<- Report](#) [Data Tables ->](#)

System Component Charts

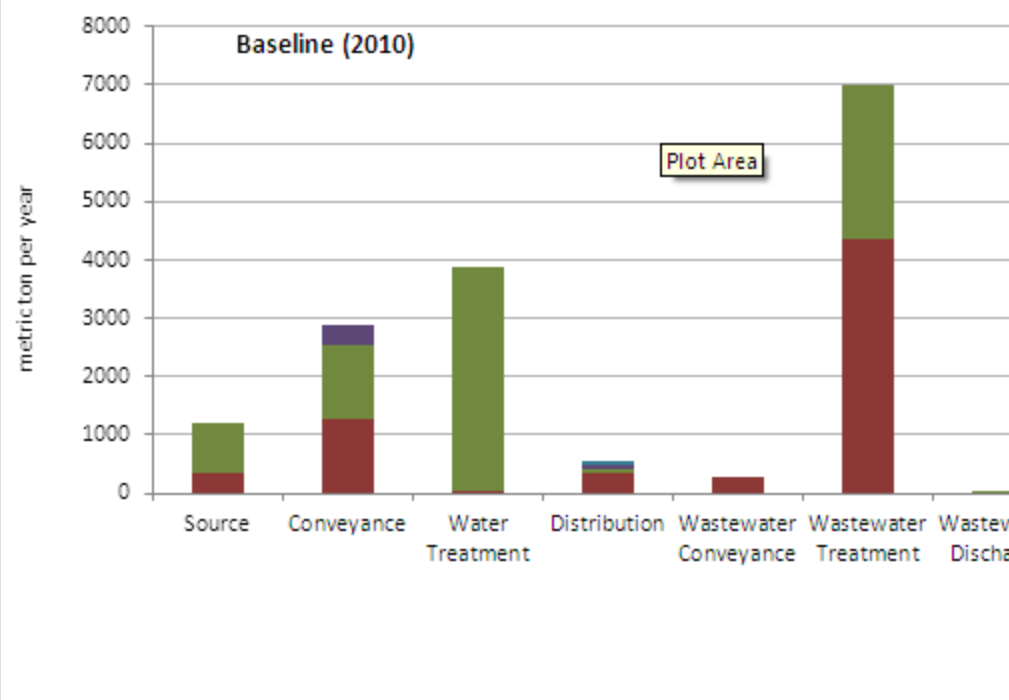
5 Scenario: **Baseline (2010)**

7 Parameter: **GHG**

9 Flow units: **ft³** per **year**

11 Source Energy Units: **Btu** per **year**

13 Emissions units: **metric ton** per **year**



Note: Different colors in each bar represent different facilities

File Home Insert Page Layout Formulas Data Review View Developer

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Calibri 11 A A B I U Font Alignment Number Styles Cells Editing

Conditional Formatting Format as Table Cell Styles Insert Delete Format Cells Sort & Find Filter Sele Editing

F6 f_x

Data Table 1		
Help on this page		
Export...		
Flow, Energy Use, and Emissions by Water System		
Scenario	Part of System	Factor
Baseline (2010)	Water	Extraction
Baseline (2010)	Water	Extraction
Baseline (2010)	Water	Extraction
Baseline (2010)	Water	Conveyance
Baseline (2010)	Water	Conveyance
Baseline (2010)	Water	Conveyance
Baseline (2010)	Water	Water Treatment
Baseline (2010)	Water	Water Treatment
Baseline (2010)	Water	Distribution
Baseline (2010)	Water	Distribution
Baseline (2010)	Water	Distribution
Baseline (2010)	Water	Distribution
Baseline (2010)	Water	Booster Pump #204
Baseline (2010)	Water	Booster Pump #205
Baseline (2010)	Water	Booster Pump #206
Baseline (2010)	Water	Booster Pump #207

Export





Export

- All
- Tables
- System Charts
- Component Charts
- Data Tables 1 & 2

Parameters

- All
- Flow
- Energy Use
- CO2 Emissions
- N2O Emissions
- CH4 Emissions
- Total GHGs

Format

- New Excel Workbook 
- Word Document 
- PowerPoint Presentation 
- Web Page (.html) 

[Export Help](#)

OK Cancel

[Charts](#)

Data Tables

[Data Table 2 ->](#)

	metric ton / year	metric ton / year	metric ton / year
Energy Use	CO ₂ Emissions	N ₂ O Emissions	CH ₄ Emissions
8702	356.6204414	0.014746379	0.003447230
2447	831.311164	0.034375005	0.001147230
0	0	0	0
5463	1265.038728	0.052309791	0.01147230
5463	1265.038728	0.052309791	0.01147230
0123	337.3436608	0.013949278	0.00447230
0816	27.71037213	0.001145834	0.000447230
1837	3840.296138	0.158797579	0.03147230
590614338.6	12648.34413	346.9820511	0.014347828
244134099.1	1805.02411	49.5172302	0.002047555
366201148.7	2707.536164	74.27584531	0.003071332
415027968.5	3068.540986	84.17929135	0.003480843



**PACIFIC
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Research for People and the Planet

Thank you!

Institute resources, including WECalc and WESim, are available in electronic form without charge:

<http://www.pacinst.org>