

Attachment 2 - Basis for Estimates

BASIS FOR ESTIMATING CUSTOMER WATER SAVINGS (gallons/year)

To calculate pre- and post-water use for targeted fixtures, we made the following assumptions:

RESIDENTIAL: Average per person per day*

Toilet use - flushes	5.1
Sink use - minutes	8.1
Shower use - minutes	5.3
People per household	2.7

* Handbook of Water Use and Conservation by Amy Vickers

COMMERCIAL: Avg/pre-rinse spray valve**

Run time (minutes/day)	180
Flow rate (gallons/minute)	1.6

** Food Service Technology Center
(www.fishnick.com/equipment/sprayvalves)

Using these figures, we generated the table below to determine water savings associated with each fixture:

RESIDENTIAL	Toilets	Showerheads	Sink Aerators	Residential Total	COMMERCIAL	Pre-Rinse Spray Valves
PRE-PROGRAM					PRE-PROGRAM	
Flushes or minutes per day	5.10	5.30	8.10		Minutes per day	180
Days per year	365	365	365		Days per year	365
Gals/flush or gals/minute	1.60	2.50	2.20		Gallons per minute	1.60
People per household	2.70	2.70	2.70		Spray valves per installation	1
Number of Sites	4,399				Number of sites	250
Pre-program gallons	35,375,350	57,441,592	77,253,522	170,070,465	Pre-program gallons	26,280,000
POST-PROGRAM					POST-PROGRAM	
Flushes or minutes per day	5.10	5.30	8.10		Minutes per day	180
Days per year	365	365	365		Days per year	365
Gals/flush or gals/minute	0.80	1.75	1.50		Gallons per minute	1.07
People per household	2.70	2.70	2.70		Spray valves per installation	1
Number of Sites	4,399				Number of sites	250
Post-program gallons	17,687,675	40,209,114	52,672,856	110,569,646	Post-program gallons	17,574,750
Total Residential Savings	Toilets	Showerheads	Sink Aerators	Total	Total Commercial Savings	
Gallons per year	17,687,675	17,232,478	24,580,666	59,500,819	Gallons per year	8,705,250

PROGRAM TOTAL	Residential	Commercial	Total
Pre-program	170,070,465	26,280,000	196,350,465
Post-program	110,569,646	17,574,750	128,144,396
Savings (gals/year)	59,500,819	8,705,250	68,206,069

BASIS FOR ESTIMATING HOT WATER SAVINGS (gallons/year)

To calculate hot water use, we made the following assumptions:

- * Half of the total water savings from replacing aerators, showerheads, and pre-rinse spray valves is hot water.
- * 50% of hot water heaters are gas powered.

Using these assumptions, we generated the table below:

Water savings (showerheads, aerators, & spray valves)	50,518,394
Hot water savings (gals/year)	25,259,197
Water heated by gas (gals/year)	12,629,598
Water heated by electricity (gals/year)	12,629,598

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BASIS FOR ESTIMATING ENERGY INTENSITY (kWh/MG) OF WATER SYSTEM

To determine the energy intensity of our water system, Santa Rosa Water staff used three years of water and energy data (2010-2012) to average pre-drought and drought conditions.

Water data shown below includes the volume (million gallons) of (1) water produced and delivered, (2) wastewater collected and treated, and (3) recycled water delivered.

Energy data from our operations (water, wastewater, and recycled water) includes (1) kilowatt hours (kWh) of electricity purchased from a power provider, (2) natural gas (therms converted to kWh) purchased from a power provider for our Combined Heat and Power (CHP) engines to generate electricity, and (3) kWh of electricity produced by CHP to help power the wastewater treatment plant.

Staff excluded energy used for administration buildings and for biosolids composting because this power consumption is not impacted by the volume of water delivered, treated, etc.

WATER (million gallons)	2010	2011	2012	AVERAGE
Water production (wells: 5% of supply)	298	410	258	322
Water delivery (imported & produced)	6,033	5,598	6,306	5,979
WW collection & treatment	7,500	7,100	6,900	7,167
Recycled water delivery	6,750	6,650	6,550	6,650
TOTAL MG	20,581	19,758	20,014	20,118

ENERGY (kilowatt hours)	2010	2011	2012	AVERAGE
Water production (wells: 5% of supply)	35,313	47,683	51,632	44,876
Water delivery (imported & produced)	4,149,383	4,357,395	3,969,035	4,158,604
WW collection & treatment	82,576,686	78,146,596	76,595,985	79,106,422
Recycled water delivery	2,826,979	2,794,524	2,892,439	2,837,981
TOTAL kWh	89,588,361	85,346,198	83,509,091	86,147,883

ENERGY INTENSITY (kWh/MG)	2010	2011	2012	AVERAGE
Water production (wells: 5% of supply)	119	116	200	145
Water delivery (imported & produced)	678	768	619	688
WW collection & treatment	11,010	11,007	11,101	11,039
Recycled water delivery	419	420	442	427

OVERALL ENERGY INTENSITY (Total MG / Total kWh)	4,353	4,320	4,172	4,282

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BASIS FOR ESTIMATING ENERGY INTENSITY (kWh/MG) OF IMPORTED WATER

Santa Rosa Water purchases (imports) water from the Sonoma County Water Agency (SCWA). This provides 95% of the water we deliver to our customers (5% comes from our own wells).

According to SCWA, the energy intensity of the water they deliver to us is 1,841 kWh/MG.

Water Transmission: 2013			
Contractor	MG of Delivered H2O	Total kWh	Annual kWh/MG
Ag uses	36	66,508	1,841
Cotati	199	366,684	1,841
Forestville	145	326,023	2,250
Larkfield	124	228,338	1,841
Marin Muni	2,216	5,177,381	2,337
N. Marin	2,511	5,867,423	2,337
Penngrove	65	119,844	1,841
Petaluma	3,158	5,811,805	1,841
Rohnert Park	1,231	2,265,360	1,841
Santa Rosa	6,743	12,410,361	1,841
Sonoma/Kenwood/Lawndale	718	2,822,269	3,929
VOM	893	3,505,663	3,927
Windsor	176	323,133	1,841

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BASIS FOR ESTIMATING GHG EMISSIONS

By the end of December, the City of Santa Rosa will be purchasing electricity from Sonoma Clean Power (SCP) rather than PG&E. Therefore, staff used the SCP emissions factor for GHGs.

SCP and PG&E jointly published their GHG emissions here:

<https://sonomacleanpower.org/wp-content/uploads/2013/12/SCP-2013-Electric-Power-Generation-Mix.pdf>

That document lists the emissions for each of these power providers is as follows:

PG&E - 445 pounds per megawatt hour

SCP - 294 pounds per megawatt hour

We converted 294 pounds per MWh to 0.133 kilograms per kWh using this formula:

$$294 \text{ pounds} \times 0.4536 \text{ kilograms per pound} / 1000 \text{ kWh per MWh} = 0.133 \text{ kg/kWh}$$