

This presentation premiered at WaterSmart Innovations

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Water Efficiency Benchmarks for New Single-Family Homes

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Are New Homes Using MORE Water?

- What's going on out there?
- How do “standard” new homes compare against “high-efficiency” new homes?
- What about EPAAct?
- What can be done to reduce water use in new homes?
- What are the most effective ways to conserve water in new homes?

EPA and Water Agencies Cooperative Research Study

- 3 year study
- Assess water use in new and existing homes
- Determine potential water savings from high-efficiency new homes
- Develop critical data in support of the WaterSense program



9 Participating Water Utilities

- Salt Lake City Water – Utah *Lead Agency*
- Denver Water – Colorado
- City of Aurora – Colorado
- Eugene Water and Electric – Oregon
- Phoenix Water – Arizona
- Roseville Water Dept. – California
- Southern Nevada Water Authority – Nevada
- Tampa Bay Water – Florida
- St. Johns River Water Mgmt. District – Florida
- Grant from US EPA

Research Team

- Aquacraft, Inc.
- National Research Center



Research Approach 1

- Billing data from each city –
2 samples
 - 1,000 homes built *before* 2001
 - 1,000 homes built *during and after* 2001
 - *Lot size data also sought*
- Mail survey to all sample homes
(approx. 18,000)

Research Approach 2

- End use data samples from each city
 - 40 “standard” homes built after 2001
 - Up to 20 brand new “high-efficiency” homes built by local builders
 - Many builders were unable to complete commitment to build homes because of the economy.

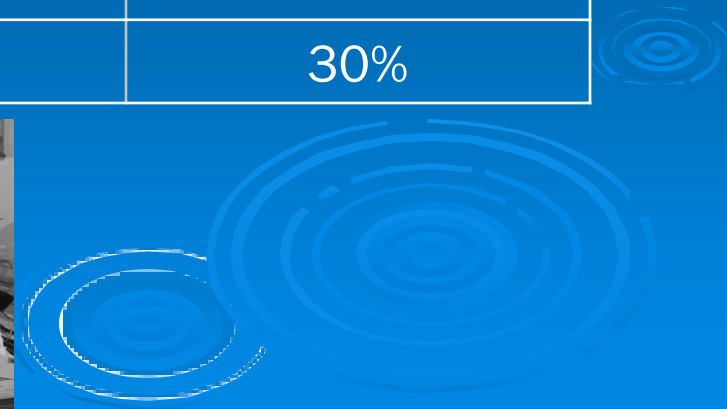


Mail Survey

- Instrument developed by Aquacraft, NRC, and participating agencies
- 4 pages, 45 questions (approx.)
- Three tiered implementation approach
 - Pre-survey note
 - Survey
 - Second survey
- 2,000 Surveys mailed per city
- Copy of survey instrument available upon request

Survey Response Rate

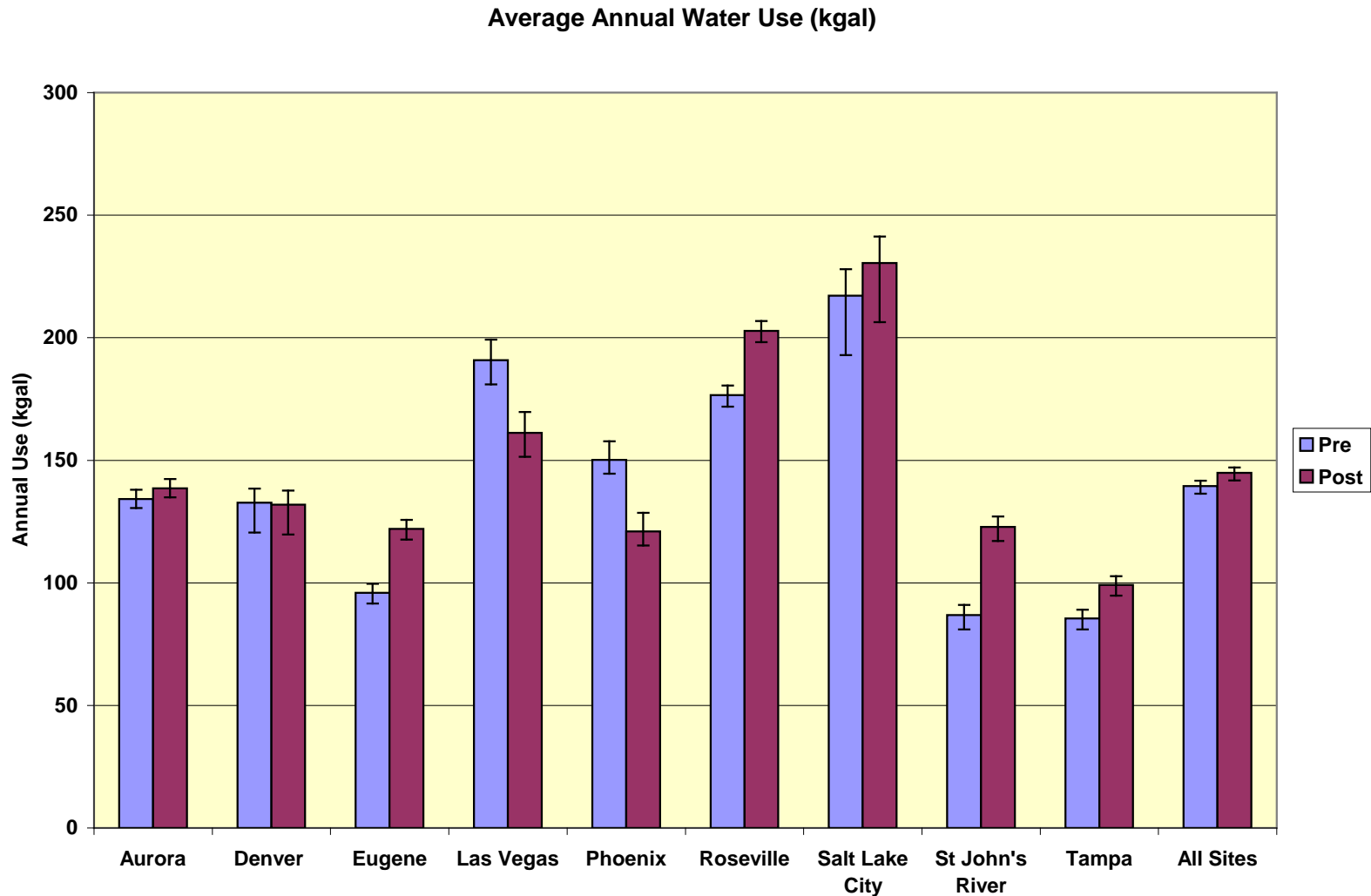
Agency	Completed Surveys	Response Rate
Aurora Water	1,032	50%
Denver Water	646	28%
Eugene Water	930	45%
Phoenix Water	730	32%
Roseville Water Dept	961	45%
Salt Lake City Water	572	39%
Southern Nevada Water Authority	633	27%
Tampa Bay Water	485	24%
St Johns River Water District	649	30%



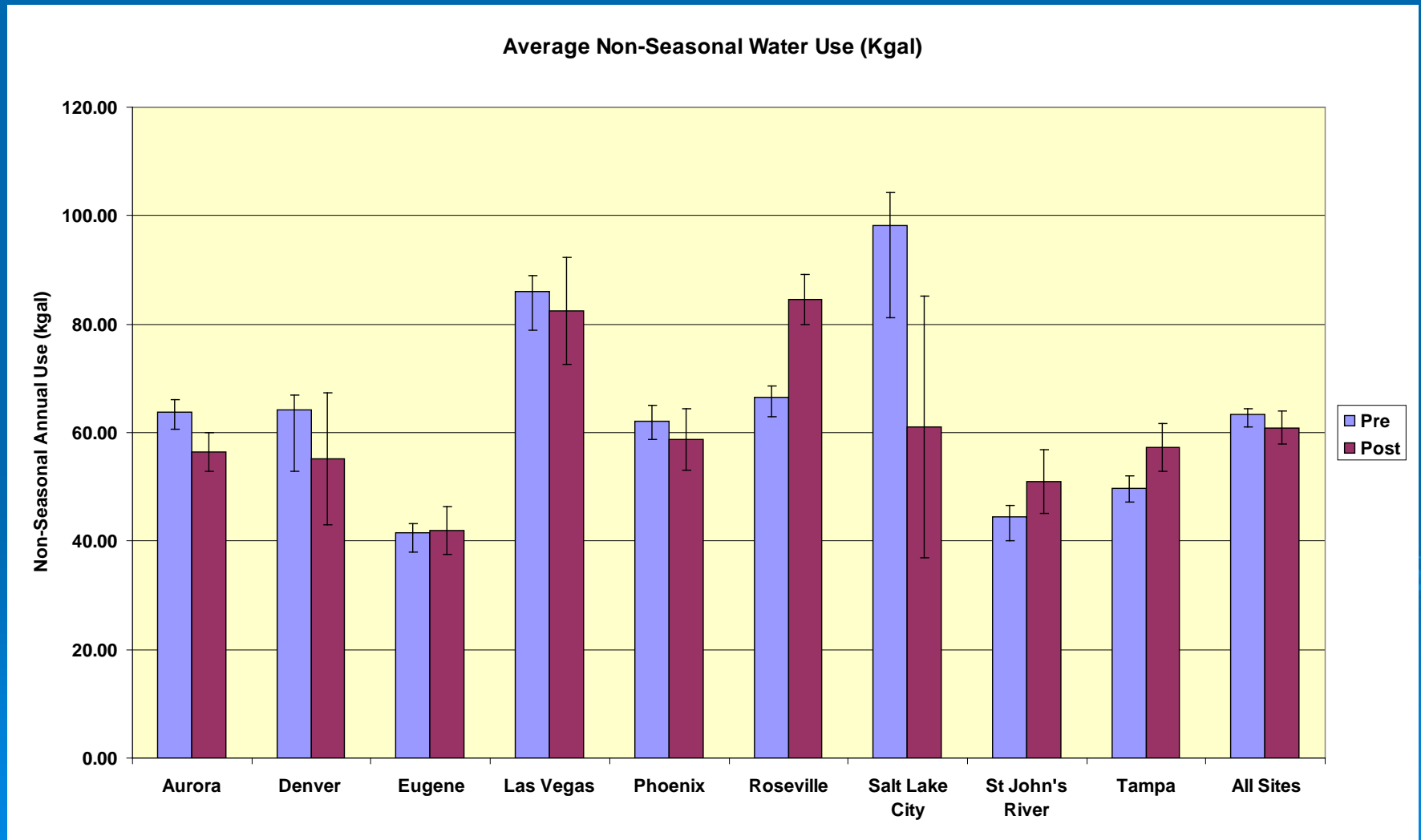
Billing Data Analysis

- 9 cities
- 2 study groups in each city
 - Pre-2001 – homes built *before* 2001
 - Post-2001 – homes built *in* 2001 *or later*
- In 2 cities, Phoenix and Las Vegas, new homes use less water than old homes
- In 2 cities, Denver and Aurora, new homes use about the same as old homes
- In 5 cities new homes use more water than old homes.

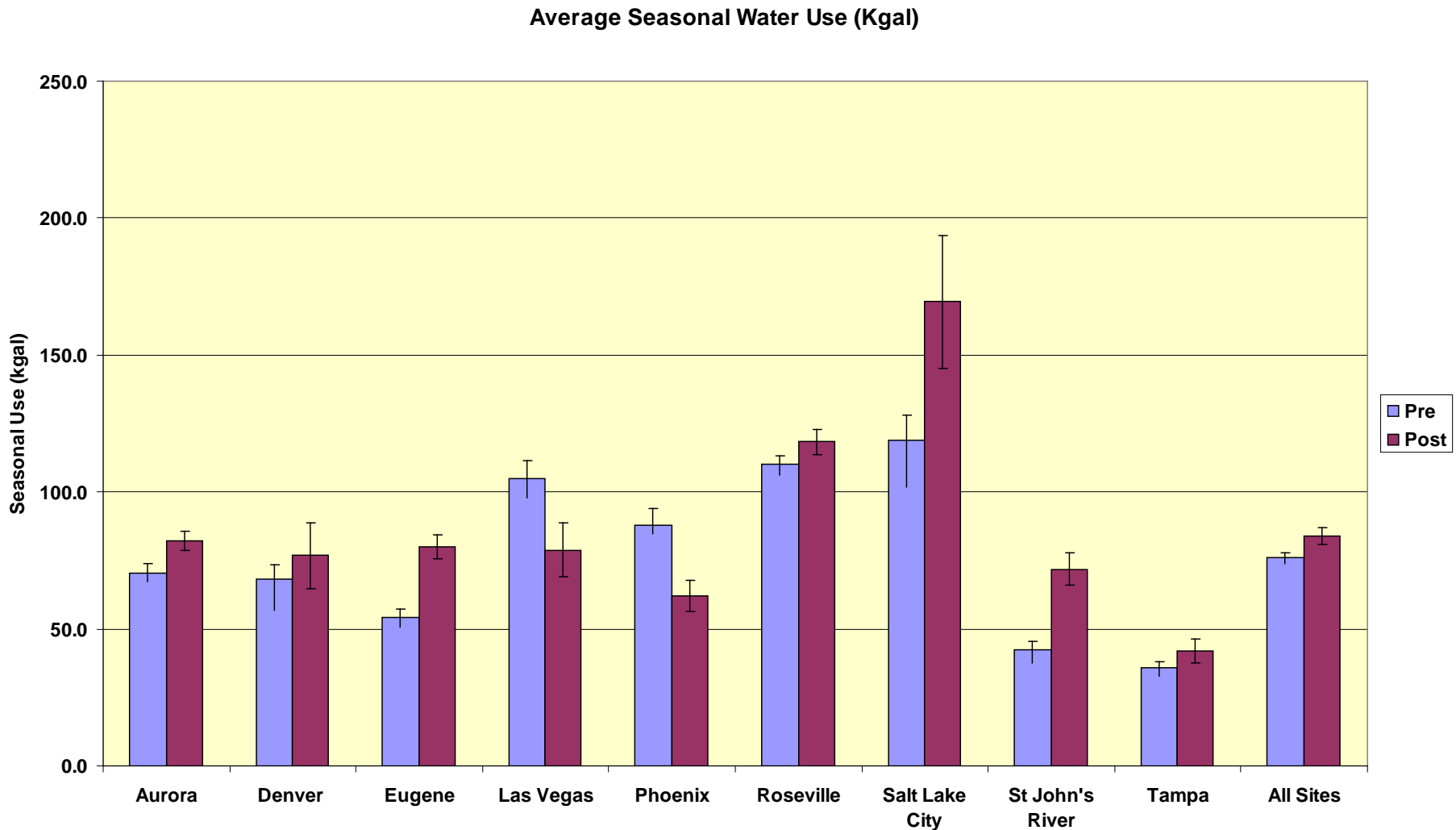
Avg. Annual Water Use (kgal) Pre- and Post-2001 SF Homes



Avg. Indoor (Non-Seasonal) Water Use (kgal) Pre- and Post-2001 SF Homes



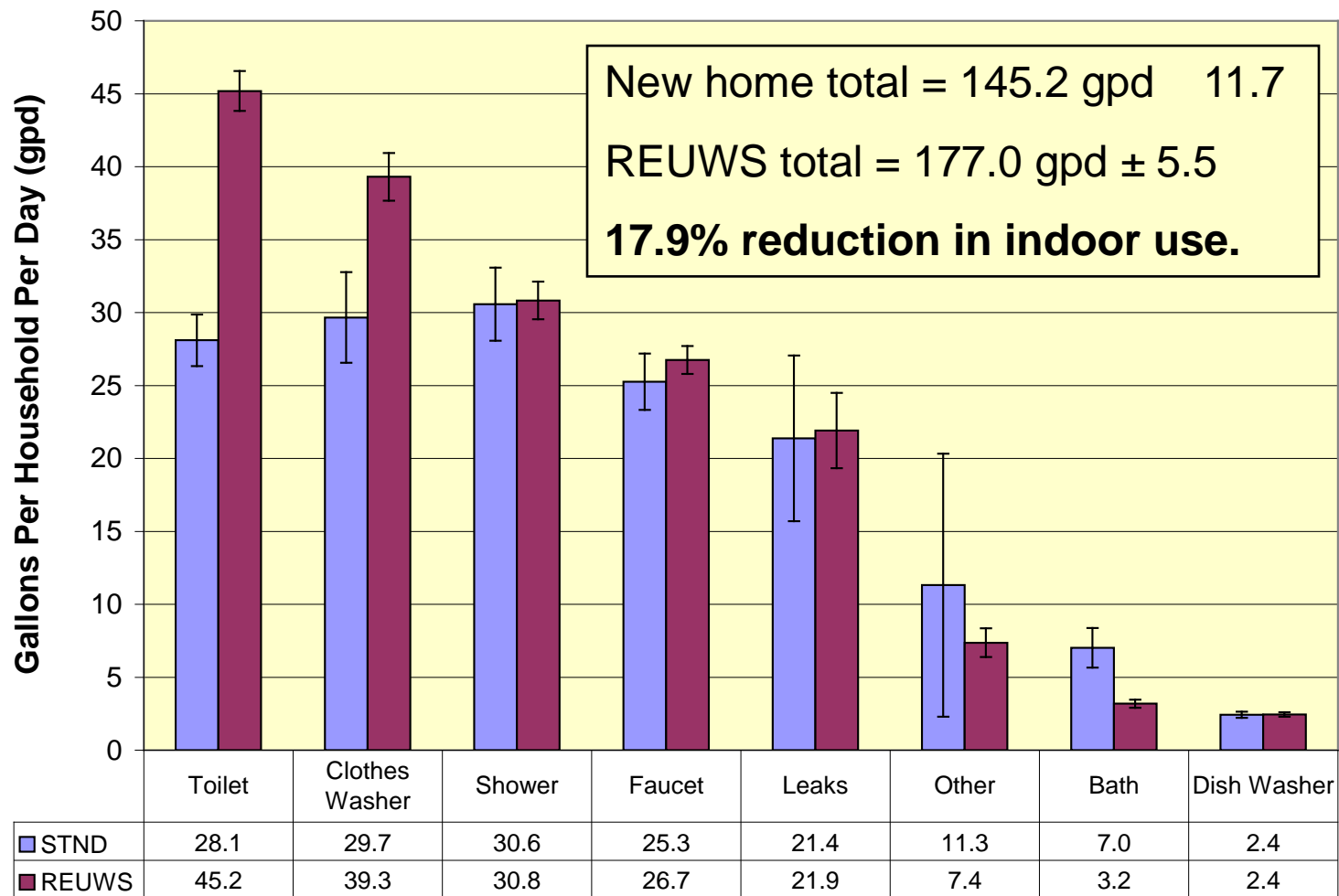
Avg. Outdoor (Seasonal) Water Use (kgal) Pre- and Post-2001 SF Homes



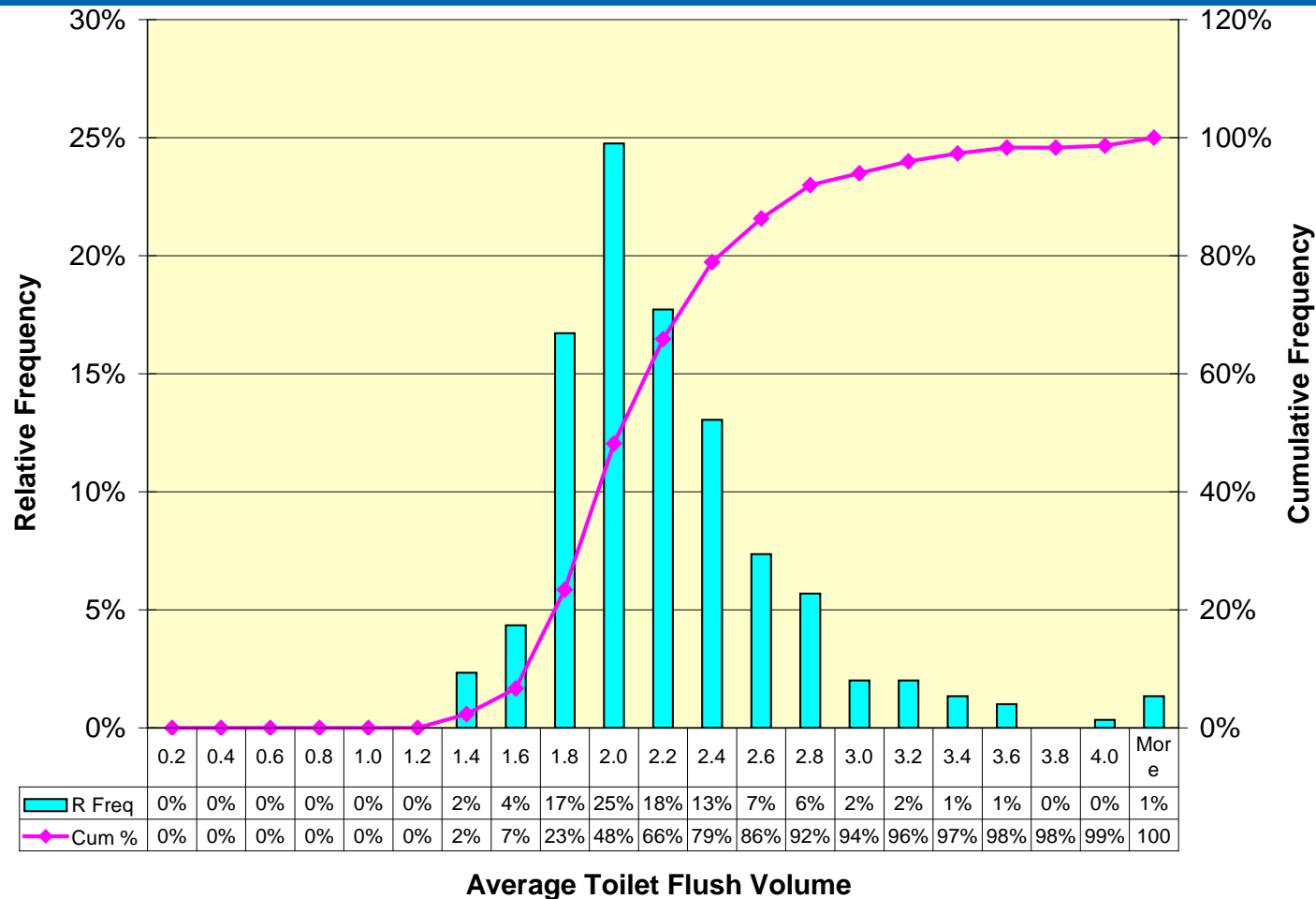
End Use Data Collection

- 40 home sample selected from post-2001 survey respondents.
- End use data obtained via Aquacraft's flow trace analysis techniques
 - Flow data recorders (data loggers)
 - Signal processing analysis software
- Household audits
- *AWWA Residential End Uses of Water; EPA Retrofit Studies; numerous end use studies in U.S., Canada, Australia, Europe.*

Indoor End Use Comparison vs. AWWA Residential End Use Study



Toilet Flushing Results



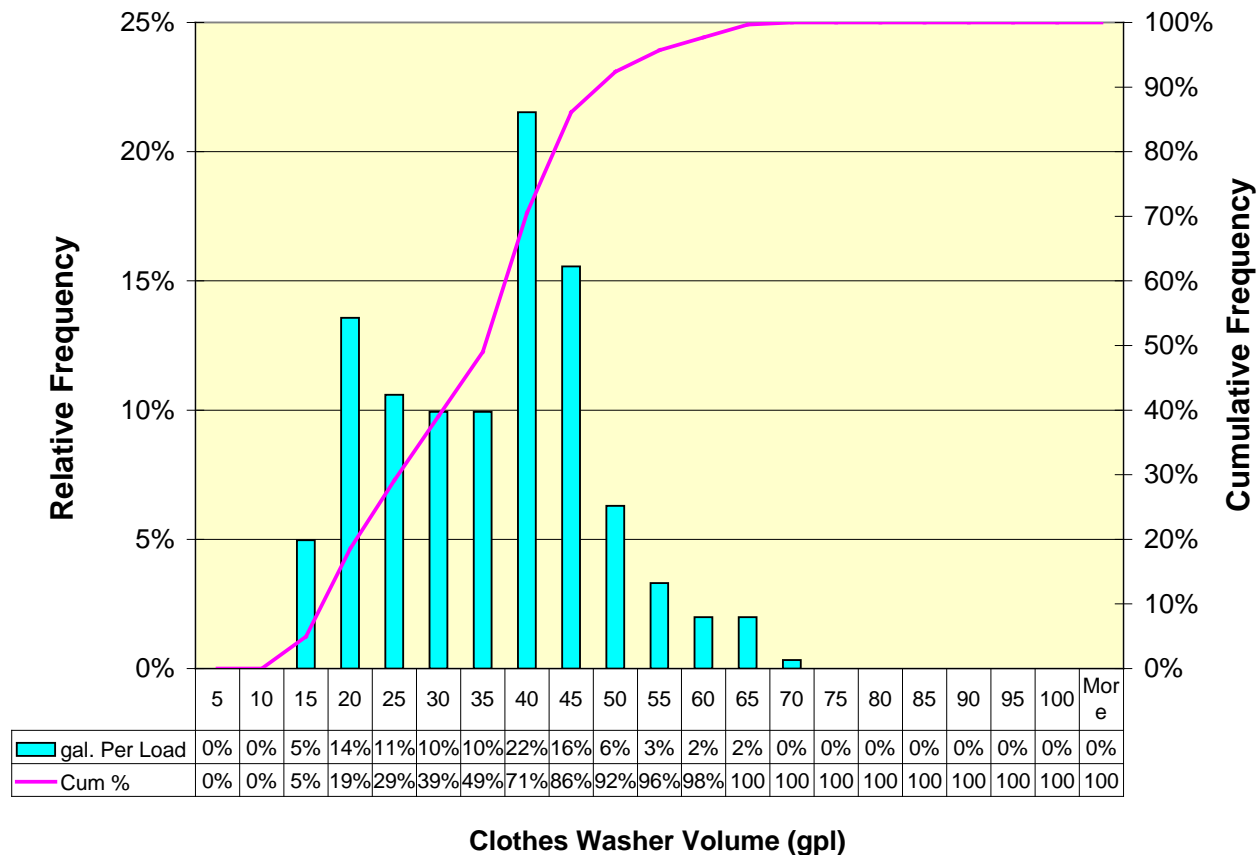
Average flushes per day per household = 12.9 (13.7 REUWS)

Average toilet flush volume (gal) = 2.13 (3.48 REUWS)

Median flush volume (gal) = 2.01 (3.53 REUWS)

38.8%
reduction in
gal/flush

Clothes Washer Volume



Average loads per day per household = 0.9 (1.0 REUWS)

Average gallons per load = 33.0 (40.9 REUWS)

Median gallons per load = 36.0 (39.8 REUWS)

19.3%
reduction in
gal/load

High-Efficiency New Homes

- Study team worked with water agencies and builders in each city
- Detailed specification developed
- Project delayed for 18 months waiting for homes to be completed and occupied.
- Economic situation limited new home purchases and put builders out of business.

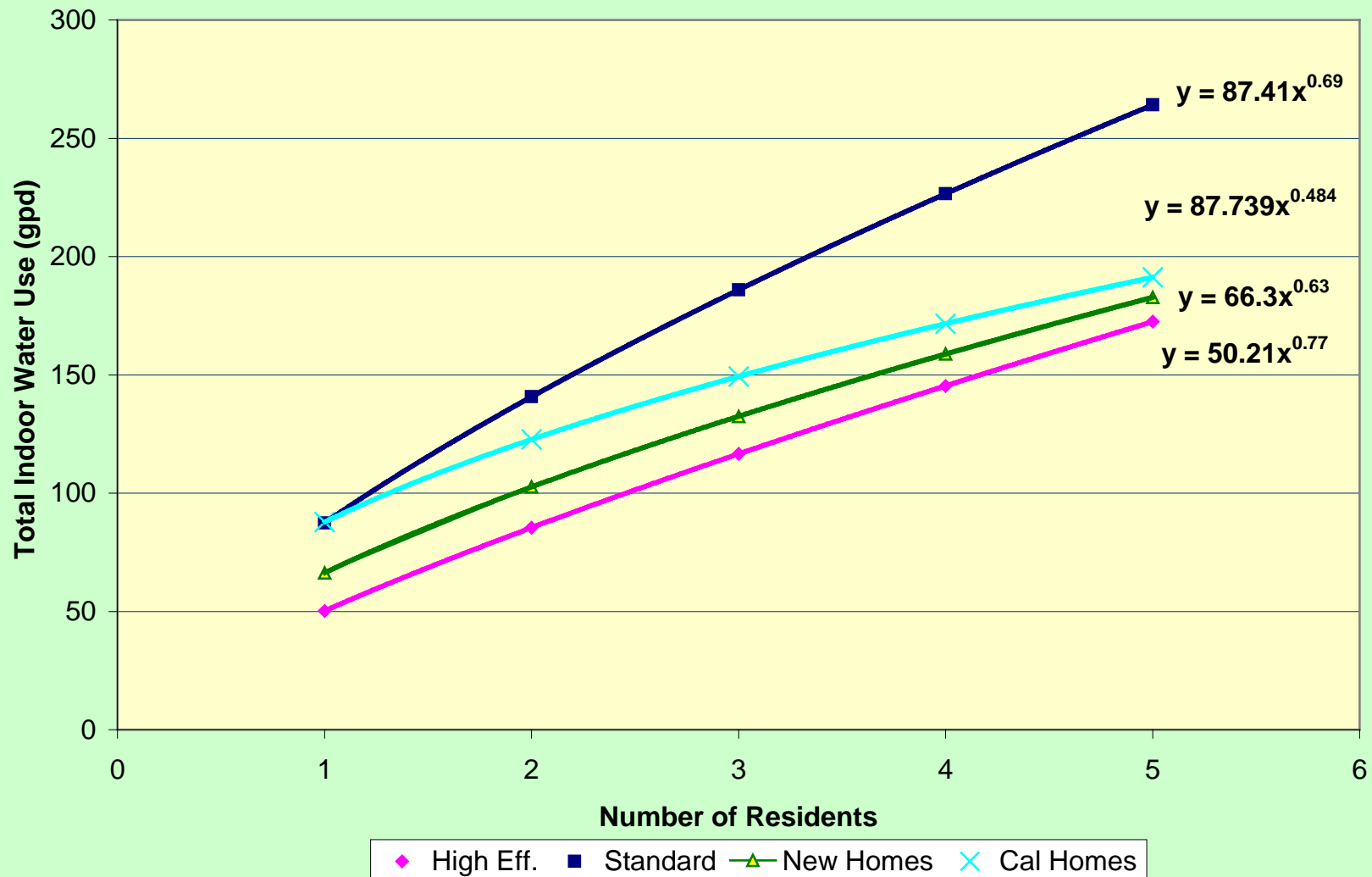


High Efficiency Specs

Feature	Performance Requirement	Performance Specification and/or Reference
High Efficiency Toilet (HET)*	1.28 gallons per flush (average)	EPA WaterSense draft HET spec
Faucet aerators*	Bath: 1.5 gpm @ 60 psi Kitchen: 2.2 gpm @ 60 psi	Builder option
Low-flow showerheads*	Single head using 1.6 gpm or less with “satisfactory” wetting performance	Builder option (e.g. Delta H2O Kinetics, Bricor, Niagara)
h-axis clothes washers*	Water Factor (WF) 7.5 or less	Consortium for Energy Efficiency rating Tier 3A
Energy Star dishwashers*	6.5 gal/cycle or less	Energy Star rating.
Water-wise landscape design and installation	Landscaped designed to require < 60% ETo overall. Must employ Xeriscape principles. Consult IA or local sources for appropriate BMP's.	See landscape budget worksheet on www.aquacraft.com
Smart irrigation controllers <i>Controller utilizes local data to adjust irrigation schedule automatically.</i>	Devices with published SWAT testing results presumed acceptable; others on a case by case basis.	Based on SWAT performance criteria.
Inspection of landscape and irrigation system by certified professional.	3 rd -party field inspection/testing of landscape & irrigation system performance.	Independent party must verify that landscape was installed as designed, and that the irrigation system meets minimum performance standards based on IA BMP's.

***Minimum specification must be achieved for inclusion in study.**
Specs are designed to be compatible with WaterSense and Florida WaterStar

Water Use Comparison



Project Information and Updates

- www.aquacraft.com – click on “EPA Water Efficiency Benchmarking Study”
- Contact the project team –
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