



Industrial, Commercial, and Institutional  
Water Conservation

Collaborative efforts of northern Colorado water providers

# **Water Use Benchmarks**

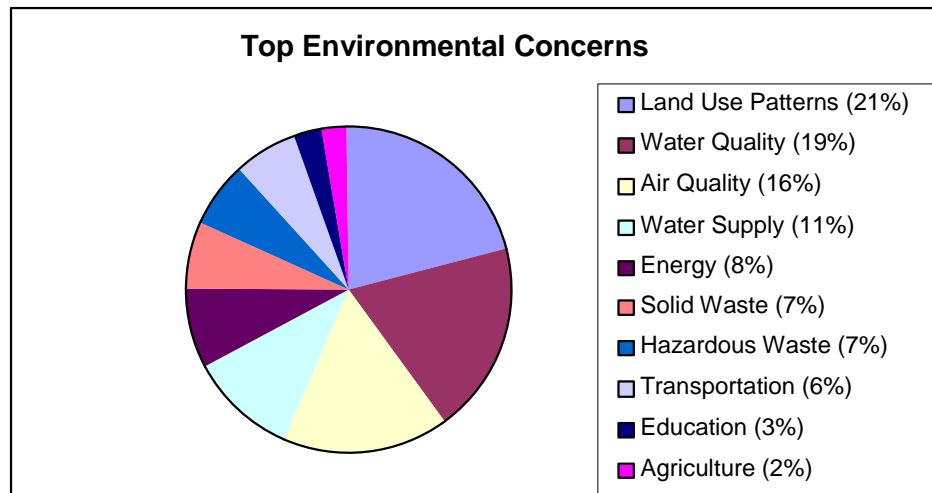
**Business Environmental Program Series**

**September 11<sup>th</sup>, 2007**

**Seth Jansen – The Brendle Group, Inc.**

# Water is a Priority

Water Quality + Water Supply = 30%



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# Water Conservation Projects

- Opportunities for water provider collaboration in industrial, commercial, and institutional (ICI) water conservation (2006, PPAB)
- **Water use benchmarks for select ICI water sectors (2007, PPAB)**
- Web-based ICI water conservation resource (2007, USBR)

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# Collaborative Opportunities

- **Water auditing templates with information organized by sector**
- Regional brochure on ICI water conservation
- **Regional factors for greenhouse gas emissions related to water use and conservation**
- **Outreach materials organized by sector**
- **Data collection/process matrix**
- **Technology-based education programs organized by sectors**
- Central technical expertise for screening new technology products related to ICI water conservation with information distribution
- **Benchmarks and/or normal usage information for top ICI sectors relevant to region, including evaluation strategies for conglomerate organization (e.g., multiple businesses of numerous sector types within a shopping center, master water meter, etc.)**
- **Program coordination or resource sharing within various water providers or other interested organizations within region**
- **An ICI water conservation handbook with relevant information, including benchmarks and audit templates**
- **A dynamic, interactive, and up-to-date regional website for ICI water conservation**
- Group-level advocacy and related effort toward State of Colorado government support for ICI water conservation
- AWWA report based on information from this study

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# Project Highlights

Goal: Inform conservation efforts for industrial, commercial, and institutional sectors. How much water should a facility use?

Process:

- Gather water use and normalizing data by sector
- Develop benchmarks
- Disseminate benchmarks to water providers and users

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# Participants

- Aurora Water
- **City of Fort Collins**
- City of Westminster
- **Colorado State University**
- City of Loveland
- City of Boulder
- City of Greeley
- Denver Water
- Colorado Springs Utilities
- Northern Colorado Water Conservancy District
- City of Thornton
- **Pollution Prevention Advisory Board (sponsor)**

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# Objectives

- Determine high-priority ICI sectors
- Gather relevant water use data within these sectors
- Develop useful benchmarks on the basis of gathered data and other resources



# Selection of High Priority Sectors

1. Ease and accuracy of classification
2. Accessibility of water usage data
3. Results from 2005 PPAB effort
4. Number of customers in sector
5. Water intensity of sector
6. Opportunity for water conservation
7. Availability of logical normalization factor(s)



# What Sector Interests You?

- Restaurants?
- Schools?
- Hotels?
- Nursing/assisted living facilities?

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# Selection of Normalization Factors

- Availability of data
- Usefulness of the factor in quickly evaluating facilities against the benchmark



# Data Analysis Notes

- Presence of swimming pools identified
- Collected building age where available
- Impact of drought restrictions
- Isolated winter use to reduce impact of irrigation



# Participant Response

- Participants invested in excess of 200 hours and gathered data from 631 accounts
- Many made calls to individual accounts to collect data



# Restaurant Benchmarks

- Accounts surveyed: 302
- Average building age: 40 years
- Median meter size: 1.5”
- Average square footage: 12,294
- Average indoor seating capacity: 149
- Consumption per square foot: **173-211 gal/sqft**
- Consumption per seat: **10.58-14.31 kgal/seat** (AwwaRF 10.8-12.7 kgal/seat)

AWWA Research Foundation, Commercial and Institutional End Uses of Water, <http://www.awwarf.org/research/topicsandprojects/execSum/241b.aspx>

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# School Benchmarks

- Accounts surveyed: 184
- Average building age: 37 years
- Median meter size: 2”
- Average square footage: 69,016
- Average number of students: 638
- Consumption per square foot: **12.1-18.9 gal/sqft** (AwwaRF 24.4 kgal/sqft)
- Consumption per student: **1.73-2.73 kgal/student** (AwwaRF 3.54 kgal/student)

AWWA Research Foundation, Commercial and Institutional End Uses of Water, <http://www.awwarf.org/research/topicsandprojects/execSum/241b.aspx>

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# Hotel and Motel Benchmarks

- Accounts surveyed: 97
- Average building age: 28 years
- Median meter size: 2”
- Average square footage: 48,516
- Average number of rooms: 97
- Consumption per square foot: **79-165 gal/sqft**
- Consumption per room: **30.2-39.5 kgal/room**  
(AwwaRF 42.6 kgal/room)

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# Nursing/Assisted Living Benchmarks

- Accounts surveyed: 48
- Average building age: 20 years
- Median meter size: 3”
- Average square footage: 59,920
- Average number of beds: 115
- Average number of apartments: 106
- Consumption per square foot: **62-101 gal/sqft**
- Consumption per bed: **32.8-40.7 kgal/bed**
- Consumption per apartment: **25.4-39.6 kgal/apartment**



# Potential Applications

- Conservation planning and implementation
- Water budgeting
- Tap fee evaluation and development
- **Evaluating a facility's water use**



# Estimating the Performance of Your Facility

- Gather one year worth of water bills
- If you irrigate, sort out bills for the months in which that takes place (May-November?)
- Calculate the average water use for the months without irrigation
- Multiply by 12
- Divide by a normalizing factor
- Compare your performance to benchmark



# Benchmarks for other sectors

- Other benchmarks available from Exergy (Australia), UK Watermark, Land Development Handbook, Water Demand Analysis Software, etc.
- Covering sectors including offices, public buildings, and grocery stores



# Restaurant Case Study

## Description of Operation

- Employees 100
- Approximately 7,000 square feet
- Seating capacity about 300
- Hours of operation 8 a.m. to midnight seven days a week

## Benchmark Performance

- 0.136 thousand gallons/square foot (40<sup>th</sup> percentile)
- 3.37 thousand gallons/seat (40<sup>th</sup> percentile)



# Restaurant Case Study

## Water Consumption Status

- Most of the toilets are 3.5 gallon per flush (gpf) models
- Most urinals are 1.6 gpf models
- Restroom faucet aerators in excess 1.0 gallons per minute (gpm)
- Two toilets were damaged and running during the assessment
- Some kitchen faucets lacked aerators, others were rated in excess of 2.0 gpm
- A low-flow pre-rinse spray nozzle was not installed
- Alternative controls were not in place for kitchen faucets (e.g. foot control)
- Two faucets in the kitchen were leaking
- Two water cooled ice machines rated at 1,300 lbs/24 hours were in place

## Opportunities

- Replacing toilets with 1.6 gpf models
- Replacing urinals with 1.0 gpf or waterless urinal models
- Replacing restroom faucet aerators with ones that use 0.5-1.0 gpm
- Repairing toilet leaks
- Install or replace kitchen sink aerators with 2.5 gpm models where higher flow is needed and 1.5-2.0 gpm models elsewhere
- Install a 1.6 gpm pre-rinse spray nozzle
- Install foot-activated faucets where appropriate to save water and for hands-free convenience
- Repair leaking faucets
- When replacing water-cooled ice machines consider air-cooled alternatives



# Hotel Case Study

## Description of Operation

- Building age 40 years
- Employees 165
- Approximately 51,000 square feet
- 269 rooms
- Swimming pool
- Restaurant
- Conference facility

## Benchmark Performance

- 0.259 thousand gallons/square foot (91<sup>st</sup> percentile)
- 49.3 thousand gallons/room (82<sup>nd</sup> percentile)



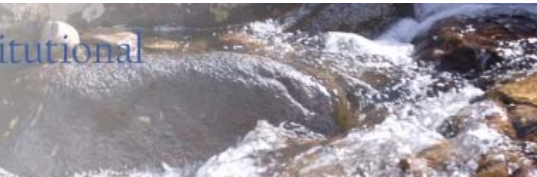
# Hotel Case Study

## Water Consumption Status

- Guest room faucet aerators rated at 2.2 gallons per minute (gpm)
- A low-flow pre-rinse spray nozzle was not installed
- Alternative controls were not in place for kitchen faucets (e.g. foot control)

## Opportunities

- Replacing restroom faucet aerators with ones that use 0.5-1.0 gpm
- Install a 1.6 gpm pre-rinse spray nozzle
- Install foot-activated faucets where appropriate to save water and for hands-free convenience



# Nursing/Assisted Living Case Study

## Description of Operation

- Building age 18-42 years
- Employees 50
- Approximately 229,000 square feet
- 24 hour operations

## Benchmark Performance

- 0.057 thousand gallons/square foot (37<sup>th</sup> percentile)
- 43.8 thousand gallons/apartment (73<sup>rd</sup> percentile)



# Nursing/Assisted Living Case Study

## Water Consumption Status

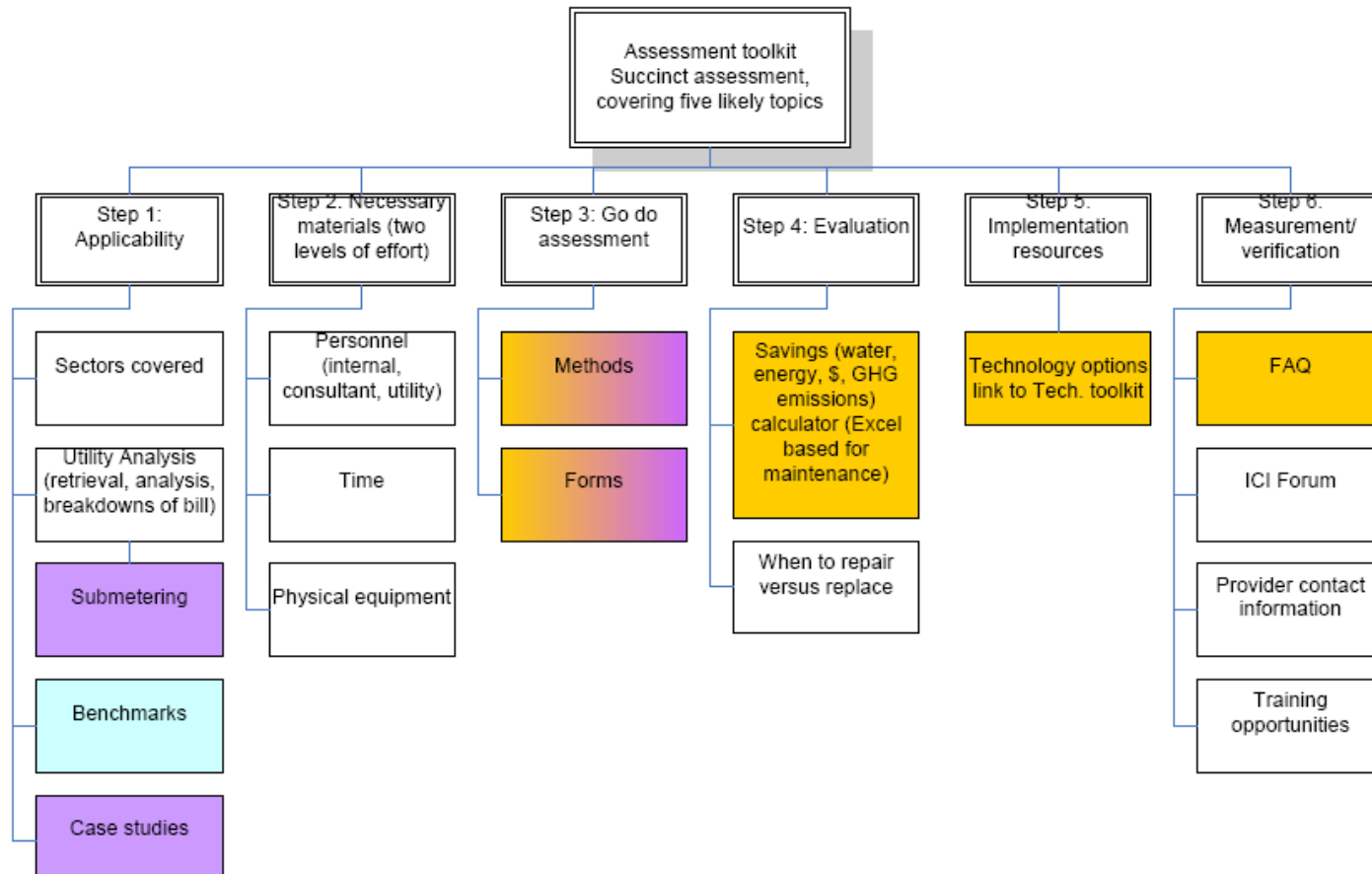
- About 60% of the toilets are 5.0 gallon per flush (gpf) models
- About 20% of the toilets are 3.5 gallon per flush (gpf) models
- About 55% of showerheads are 2.5 gpm
- Restroom faucet aerators rated in excess of 2.0 gallons per minute (gpm)

## Opportunities

- Replacing remaining older toilets with 1.6 gpf models
- Replacing showerheads with 1.5 gpm models
- Replacing restroom faucet aerators with ones that use 0.5-1.0 gpm



# Ongoing Work



# Resources

[water.brendlegroup.com](http://water.brendlegroup.com)

[www.fcgov.com/water/con  
serv.php](http://www.fcgov.com/water/con<br/>serv.php)



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