

Restroom Water Efficiency

Overview

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- **How much water is used in restrooms?**

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- **Brief history of restroom fixtures**

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- **Brief history of restroom fixtures**
- **Case Studies**

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- **Challenges/Solutions implementing high efficiency restroom fixtures**

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- **How much water is used in restrooms?**
- **Brief history of restroom fixtures**
- **Case Studies**
- **Challenges/Solutions implementing high efficiency restroom fixtures**
- **“Low Hanging Fruit”**

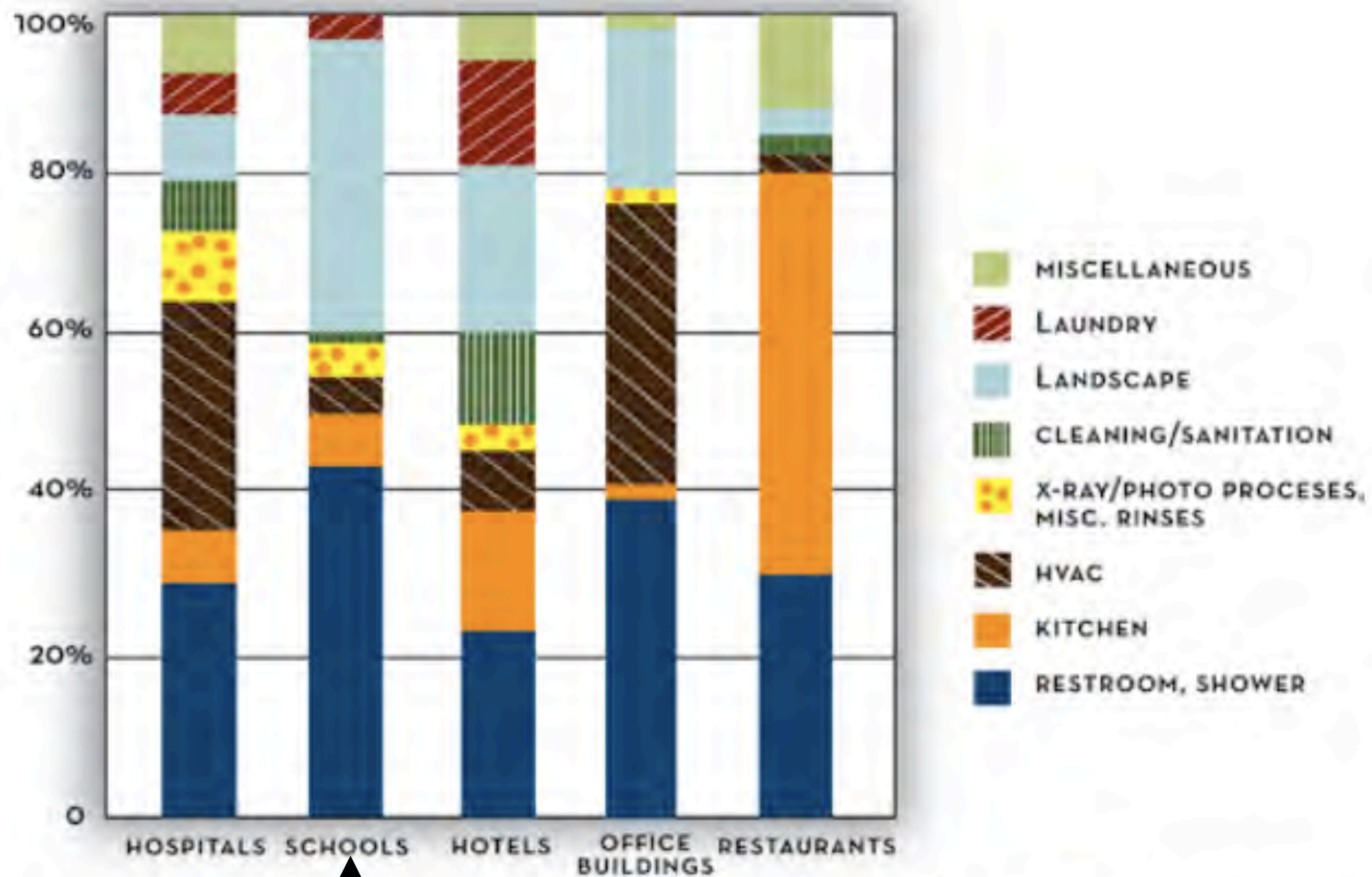


Figure 1. Commercial Building End Uses of Water. *Courtesy of Environmental Building News; Data from American Water Works Association.*

Over 45% of campus water is used in restrooms

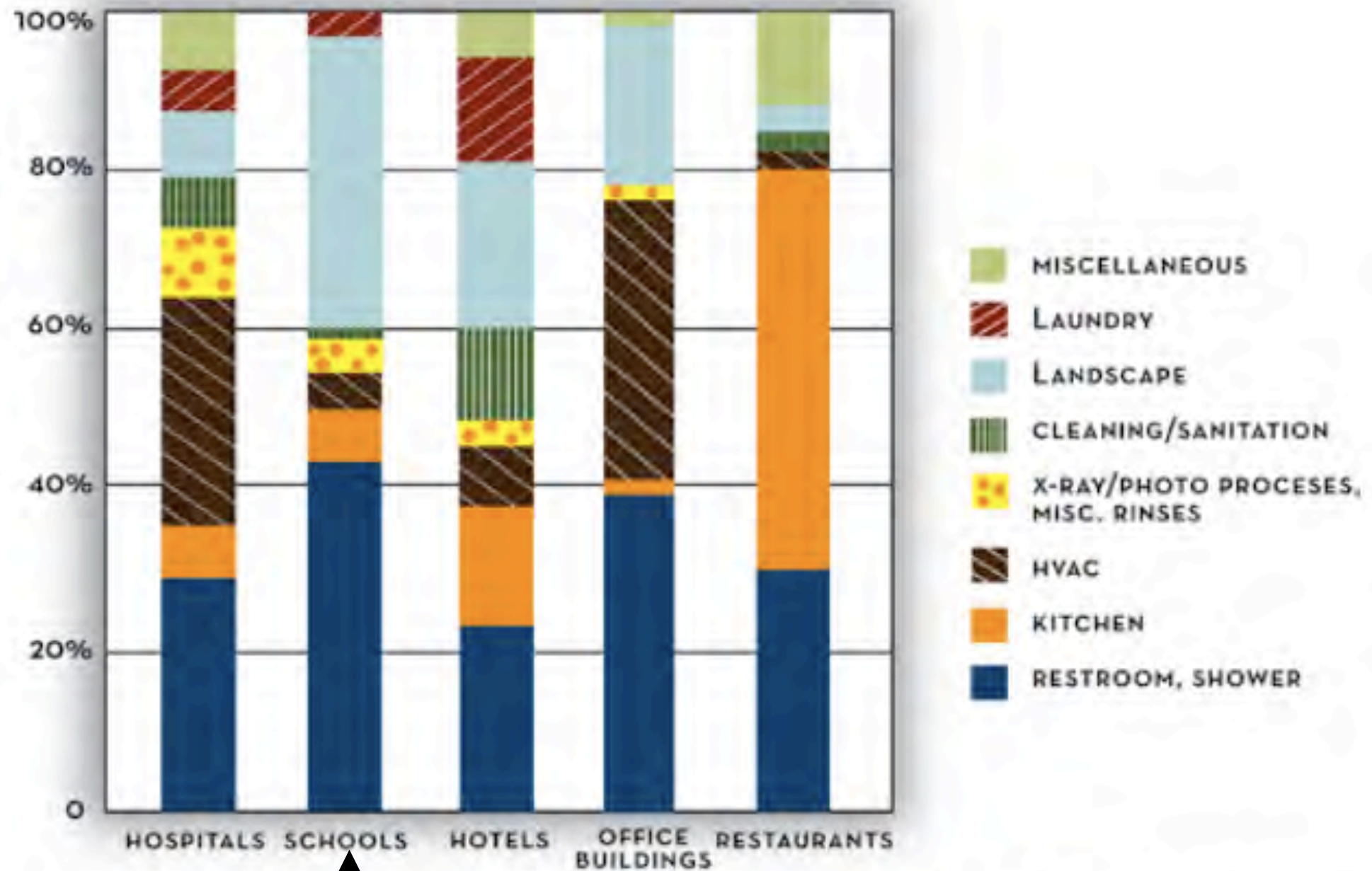
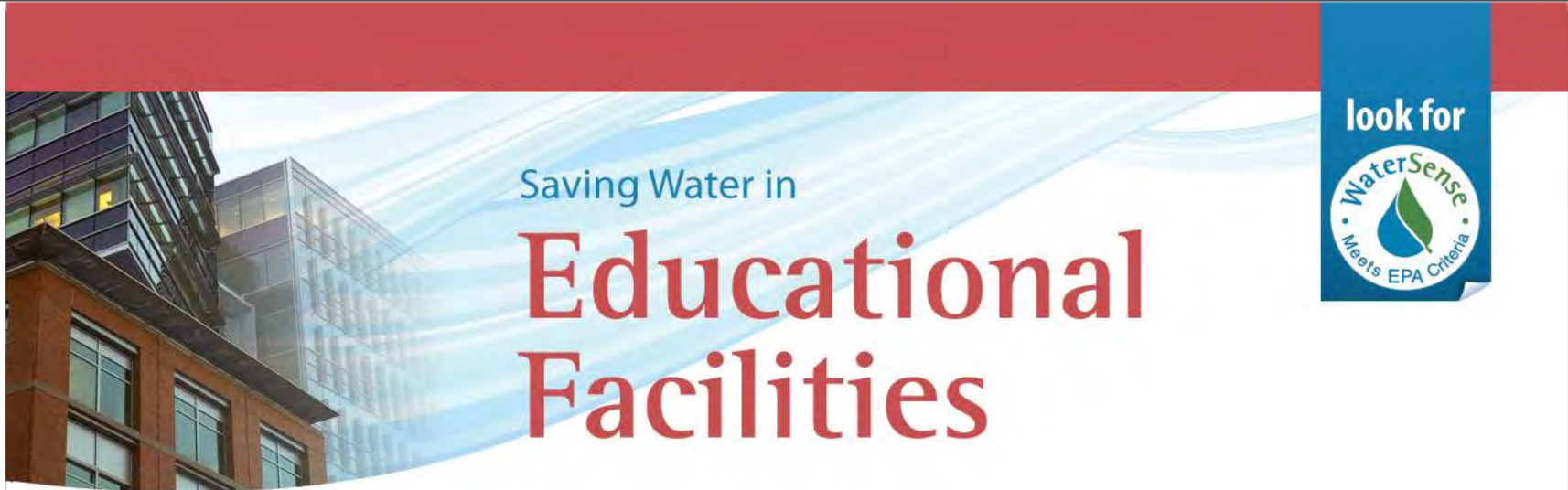


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Saving Water in

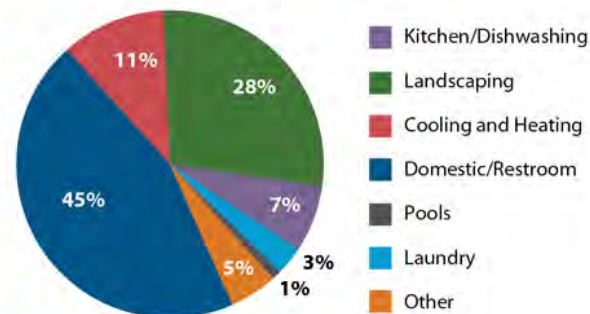
Educational Facilities



Commercial and institutional buildings use a large portion of municipally supplied water in the United States. With so many businesses making up the commercial and institutional sector, there are great opportunities to conserve water. *WaterSense at Work: Best Management Practices for Commercial and Institutional Facilities* promotes water-efficient techniques that can be applied across a wide range of facilities with varying water needs.

Approximately 6 percent of total water use in commercial and institutional facilities takes place in educational facilities, such as schools, universities, museums and libraries in the United States.¹ The largest uses of water in educational facilities are restrooms, landscaping, heating and cooling, and cafeteria kitchens.

End Uses of Water in Schools



Created by analyzing data from: New Mexico Office of the State Engineer, American Water Works Association (AWWA), AWWA Research Foundation, and East Bay Municipal Utility District.

THE BUSINESS CASE FOR WATER EFFICIENCY

Over the past 10 years, the costs of water and wastewater services have risen at a rate well above the consumer price index. Facility managers can expect these and other utility costs to continue to increase in order to offset the costs of replacing aging water supply systems.



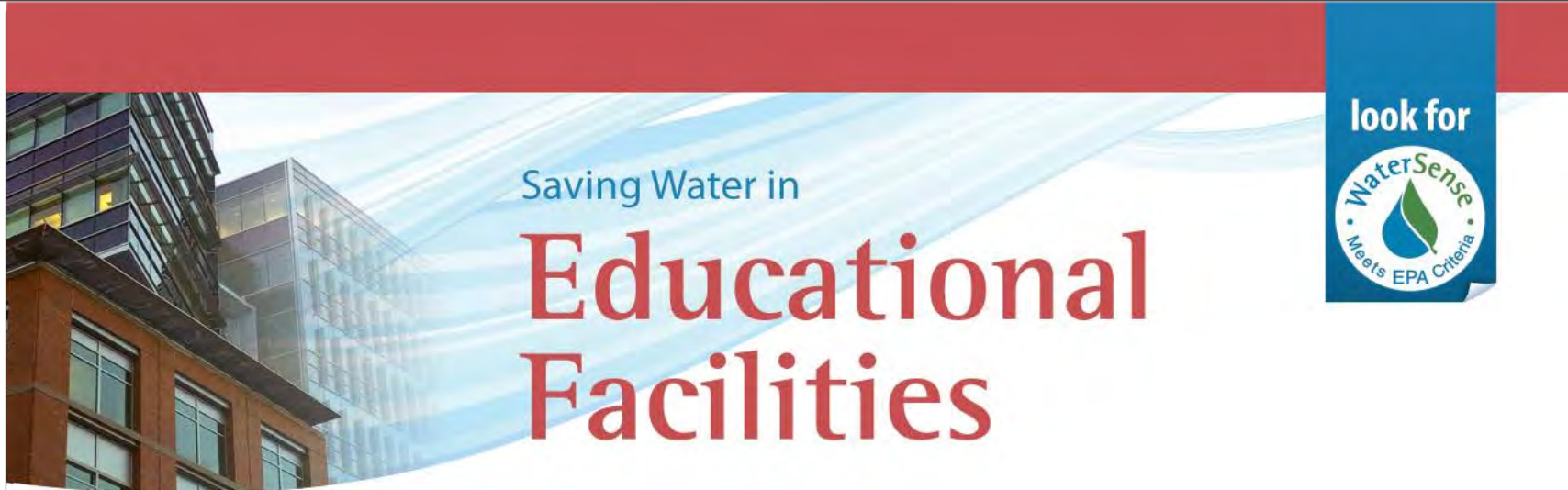
Operating costs and environmental impacts are influenced by water use. Industry estimates suggest that implementing water-efficient practices can decrease operating costs by approximately 11 percent and energy and water use by 10 and 15 percent, respectively.²

Many campuses have found it necessary to expand their facilities in order to keep up with the needs of a growing student body. Today's students are also looking for schools to demonstrate sustainable principles. Additionally, meeting voluntary green standards such as LEED® certification can be achieved through water efficiency in building design.

New building codes often require installation of water-efficient plumbing fixtures and appliances, which use at least 20 percent less water than standard models.

Putting Water Efficiency to Work

A university in Texas focused on recovering and reusing alternative water sources to reduce its use of municipally supplied water. This allowed the university to successfully decrease its campus' potable water use from 1 billion gallons to 668 million gallons, or more than 33 percent. The onsite alternative water sources identified include air handler condensate, single-pass cooling water, rainwater, and foundation groundwater.



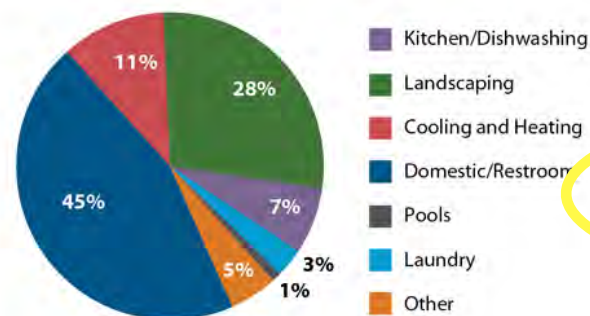
Saving Water in Educational Facilities



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Saving Water in Educational Facilities EPA WaterSense
2009. Water Use in Buildings SmartMarket Report. McGraw Hill Construction.

Restroom Fixtures

looking back

Urinals



Pre 1992: 1.5+ gallons per flush

Toilets

- **Pre 1992: 3.5+ gallons per flush**



Hand sink Faucets



- Pre 1992: 3 - 4 gallons per minute

Energy Policy Act 1992

Energy Policy Act 1992

- **Urinals 1.0GPF from 1.5GPF**

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- **Toilets 1.6GPF from 3.5GPF**

Energy Policy Act 1992

- **Urinals 1.0GPF from 1.5GPF**
- **Toilets 1.6GPF from 3.5GPF**
- **Faucets 2.2GPM from 4 GPM**

Urinals



Urinals

- **Post 1992: 1 gallon per flush**



Urinals

- **Post 1992: 1 gallon per flush**
- **0.5 gallon per flush**



Urinals

- **Post 1992: 1 gallon per flush**
- **0.5 gallon per flush**
- **0.125 gallon per flush**



Urinals

- **Post 1992: 1 gallon per flush**
- **0.5 gallon per flush**
- **0.125 gallon per flush**
- **waterless**



Toilets



Toilets



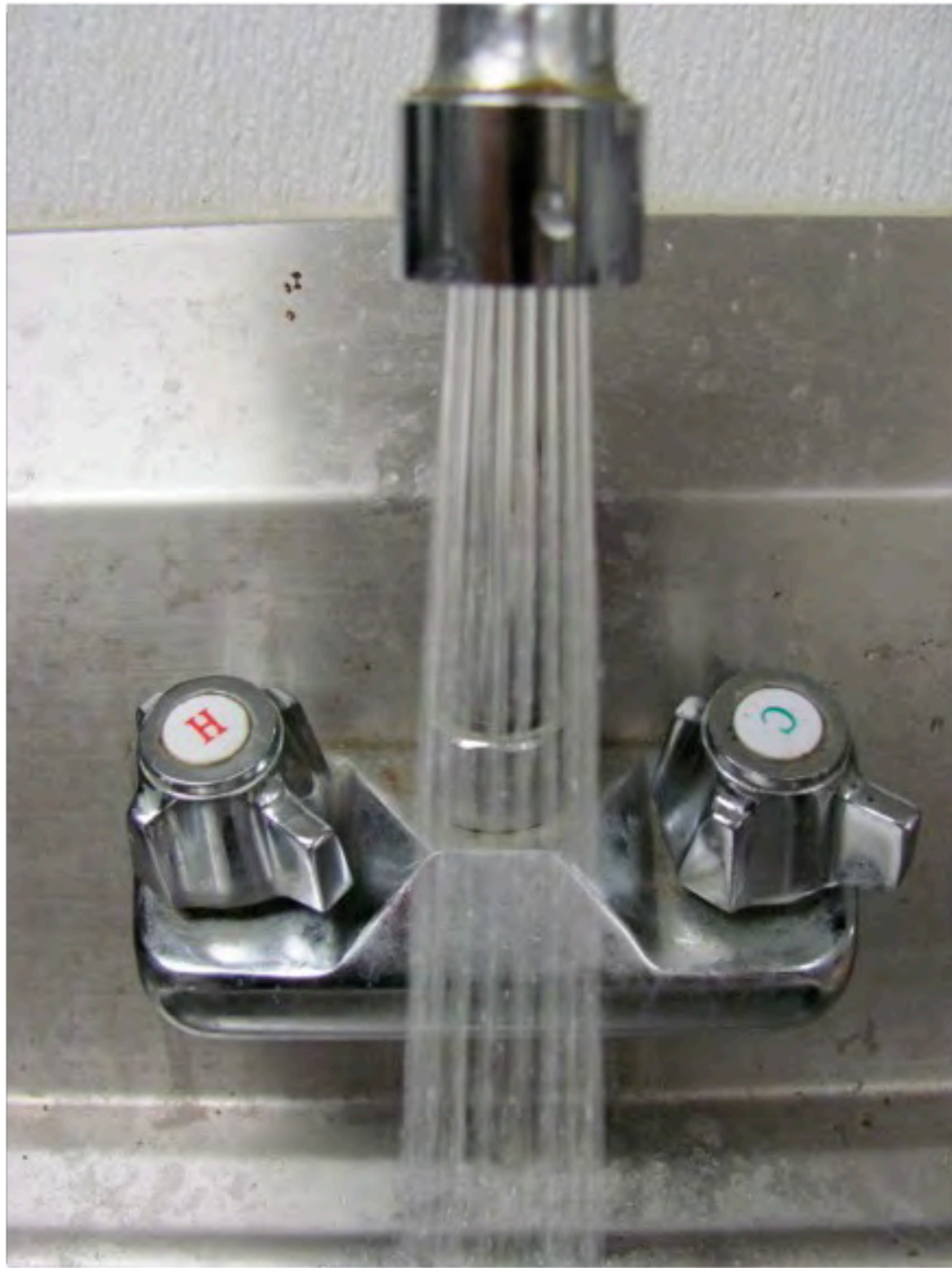
- **Post 1992: High efficiency toilets (HET's) 1.6 gallons per flush**

Toilets



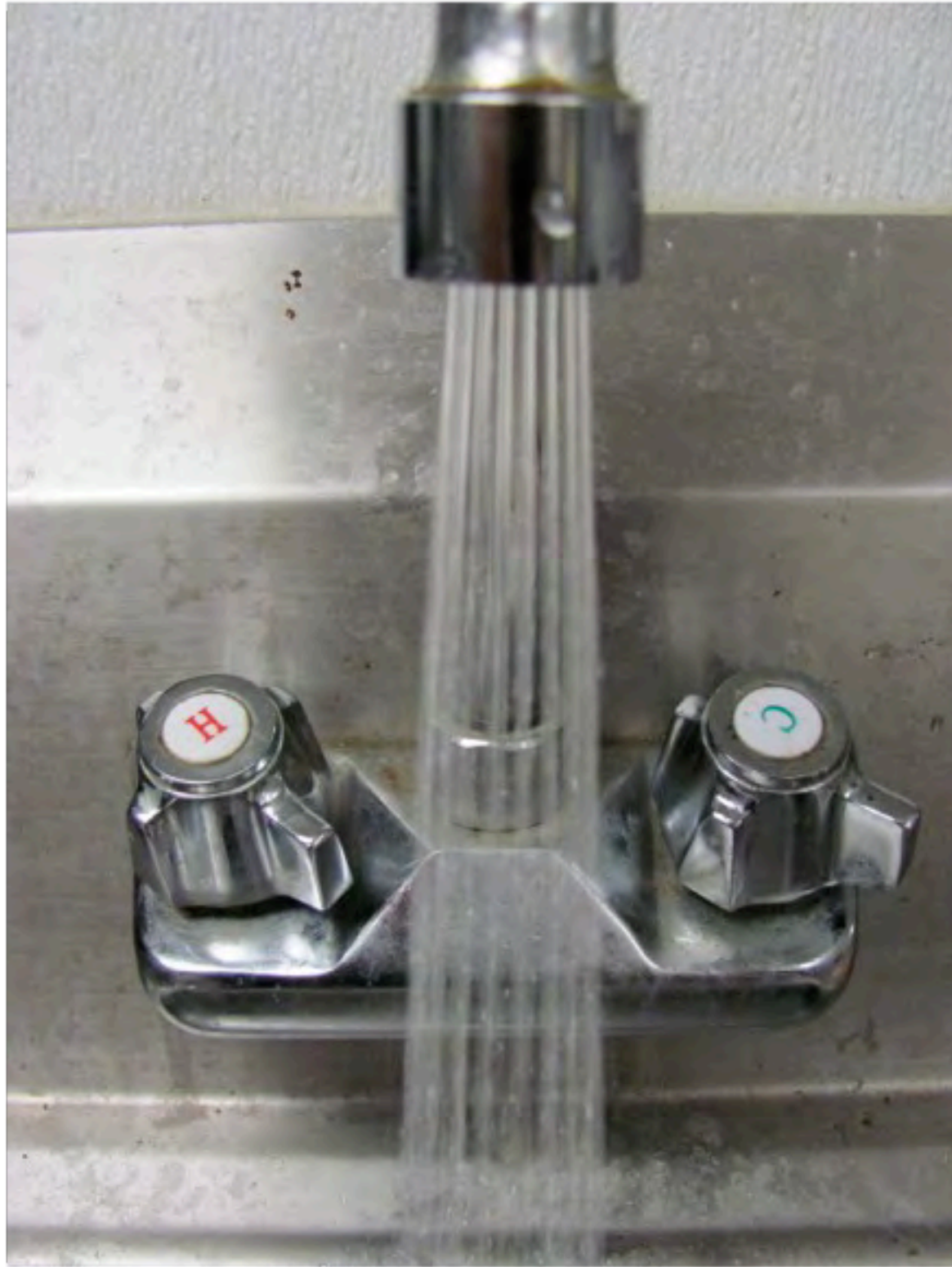
- **Post 1992: High efficiency toilets (HET's) 1.6 gallons per flush**
- **1.28 gallons per flush**

Hand sink Faucets



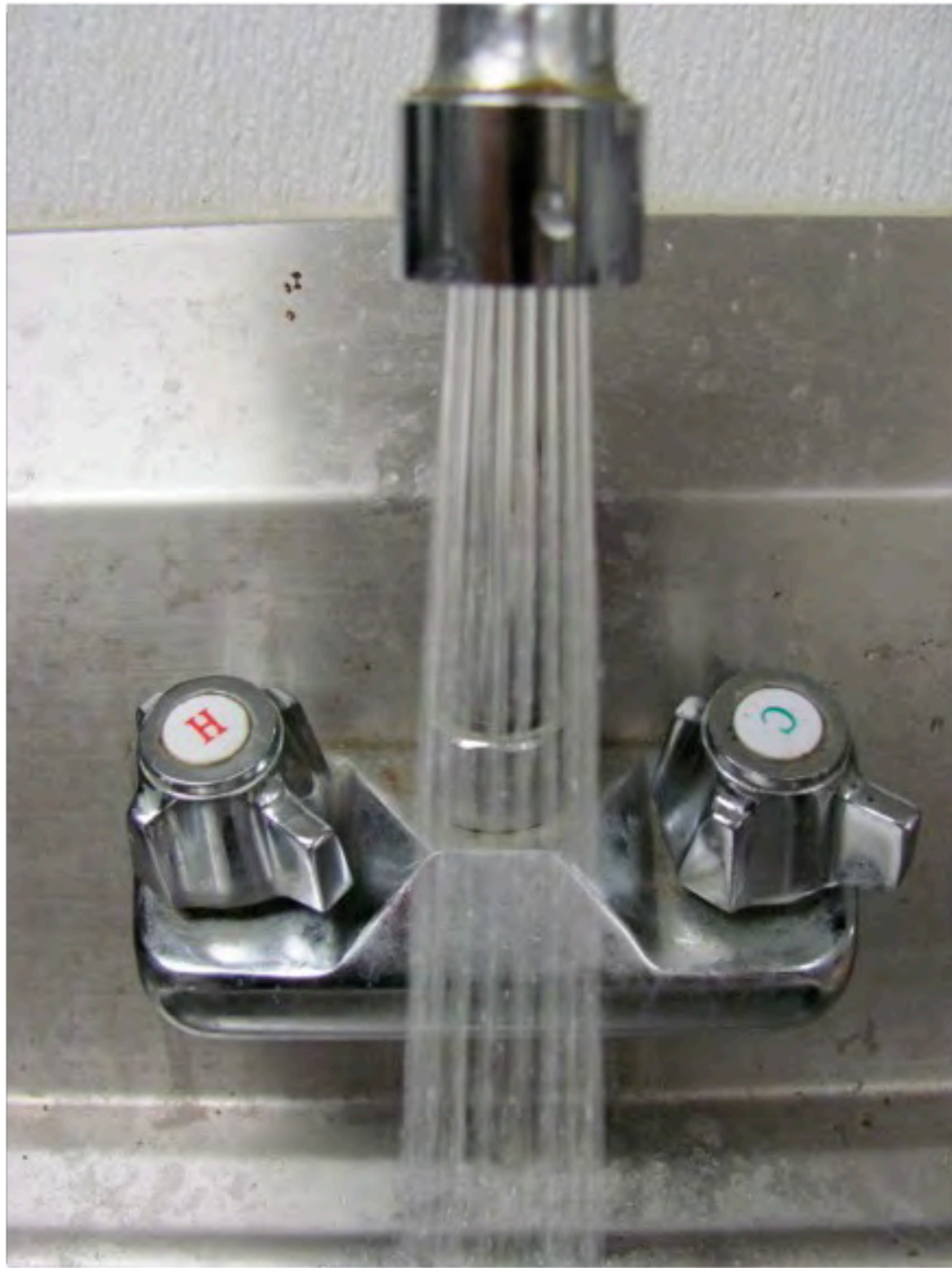
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Hand sink Faucets



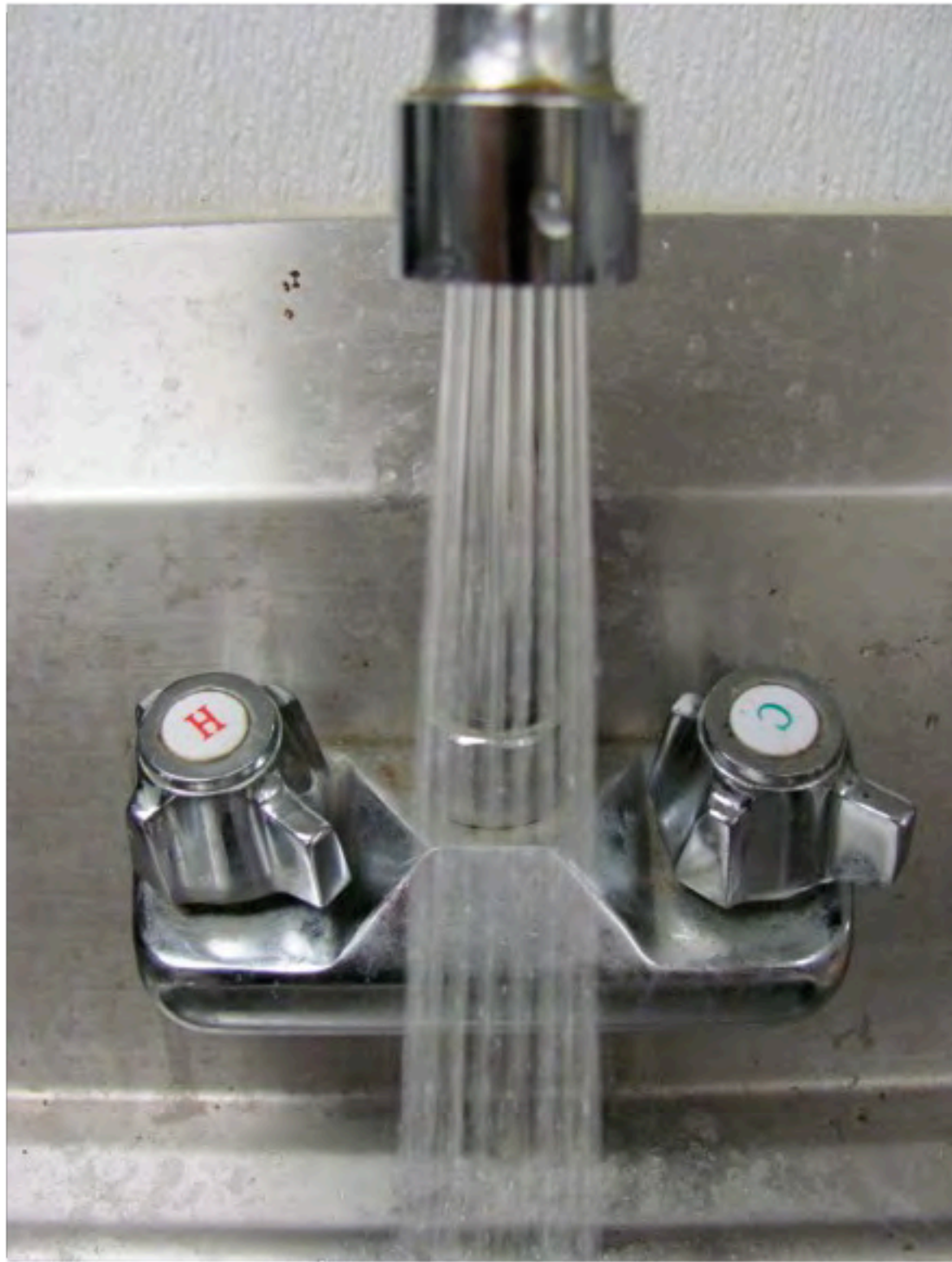
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Hand sink Faucets



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Case Study

UC Berkeley

UC BERKELEY WATER USAGE & CONSERVATION STUDY REPORT



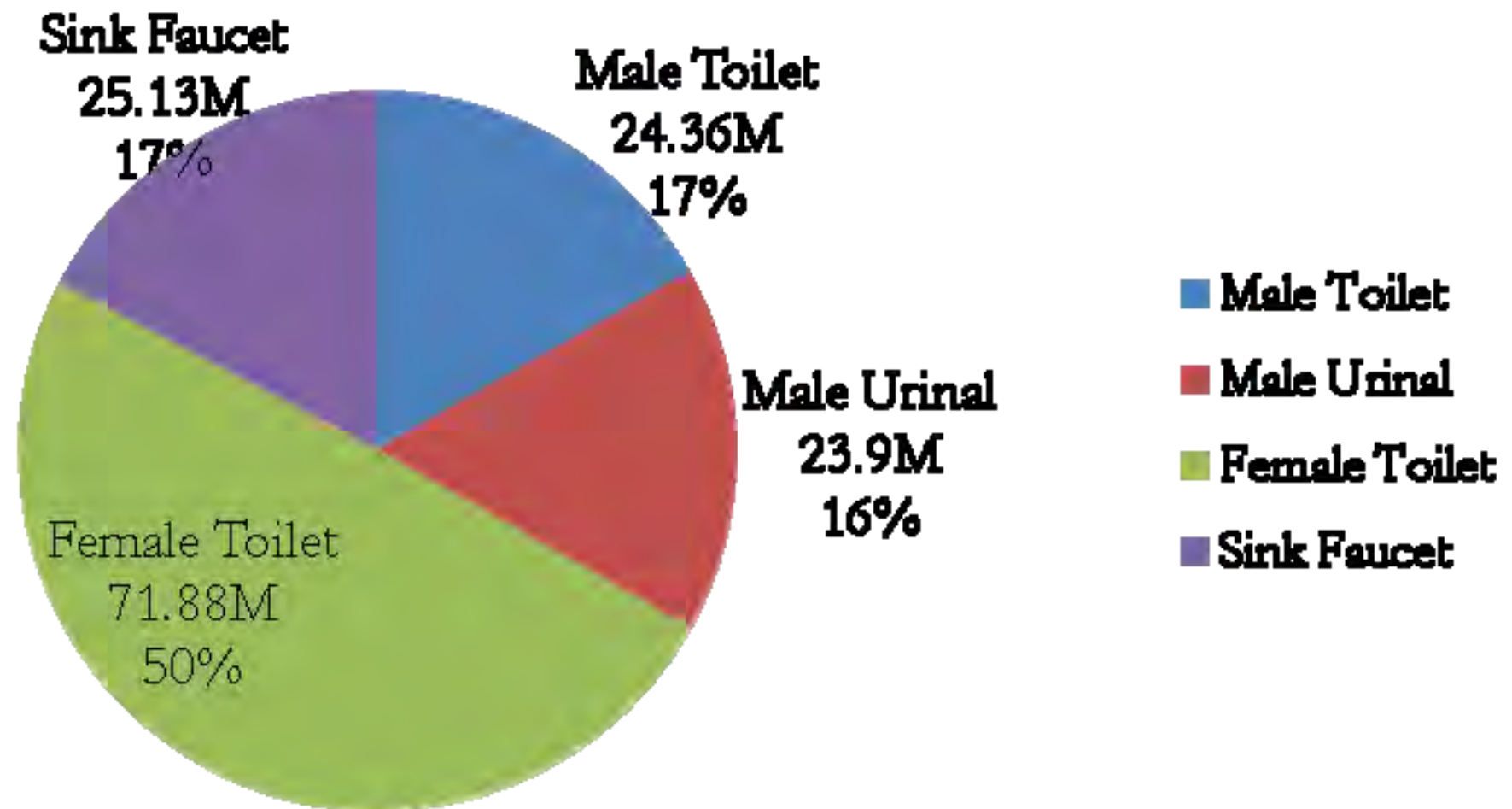
Prepared for: Chancellor's Advisory Committee on
Sustainability

Prepared by: Joanna Zhang

December 4, 2010

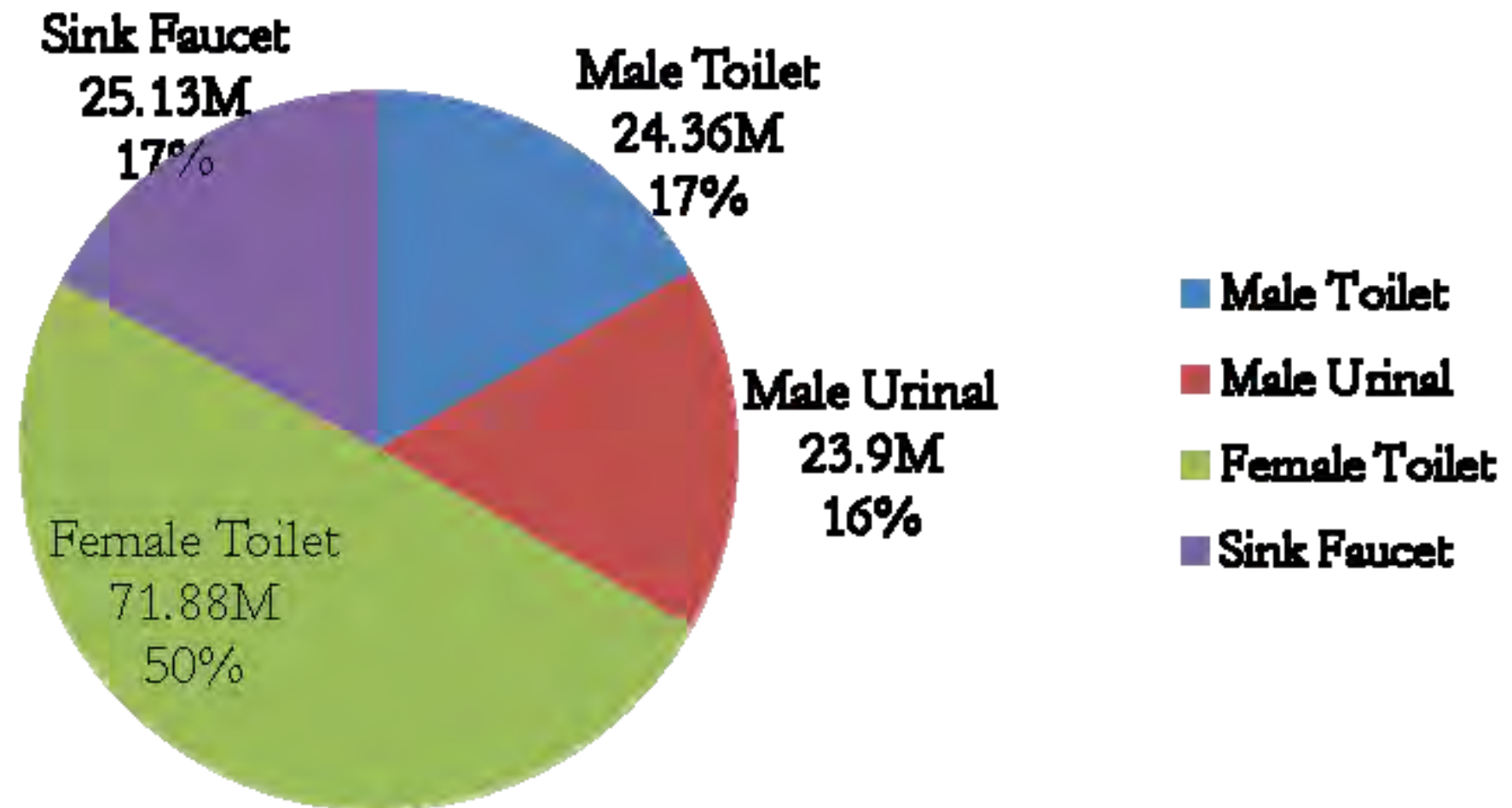
UC Berkeley 2008

Estimated Campus Restroom Water Usage



UC Berkeley 2008

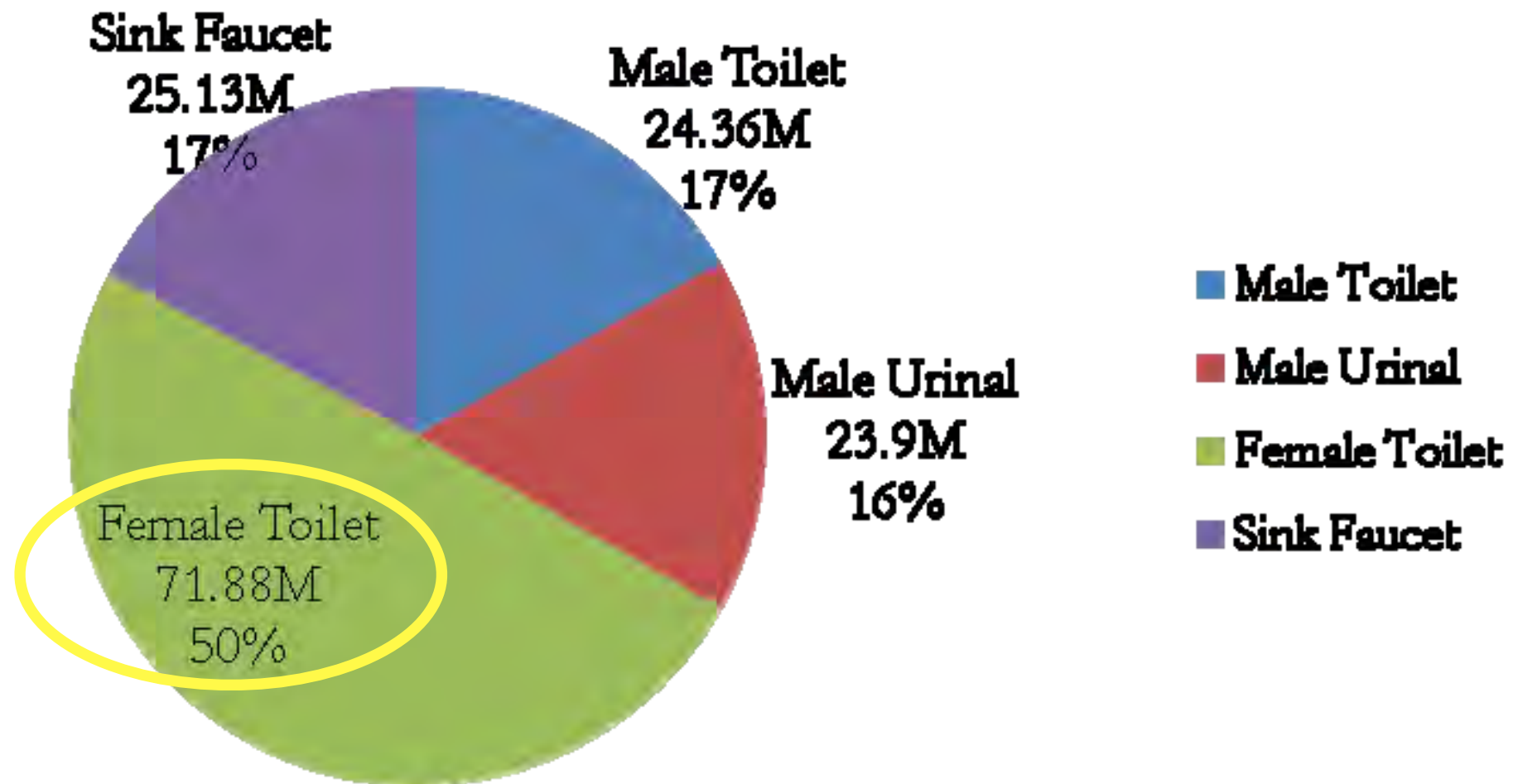
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**Total Restroom Water Use 147 Million
gallons of water**

UC Berkeley 2008

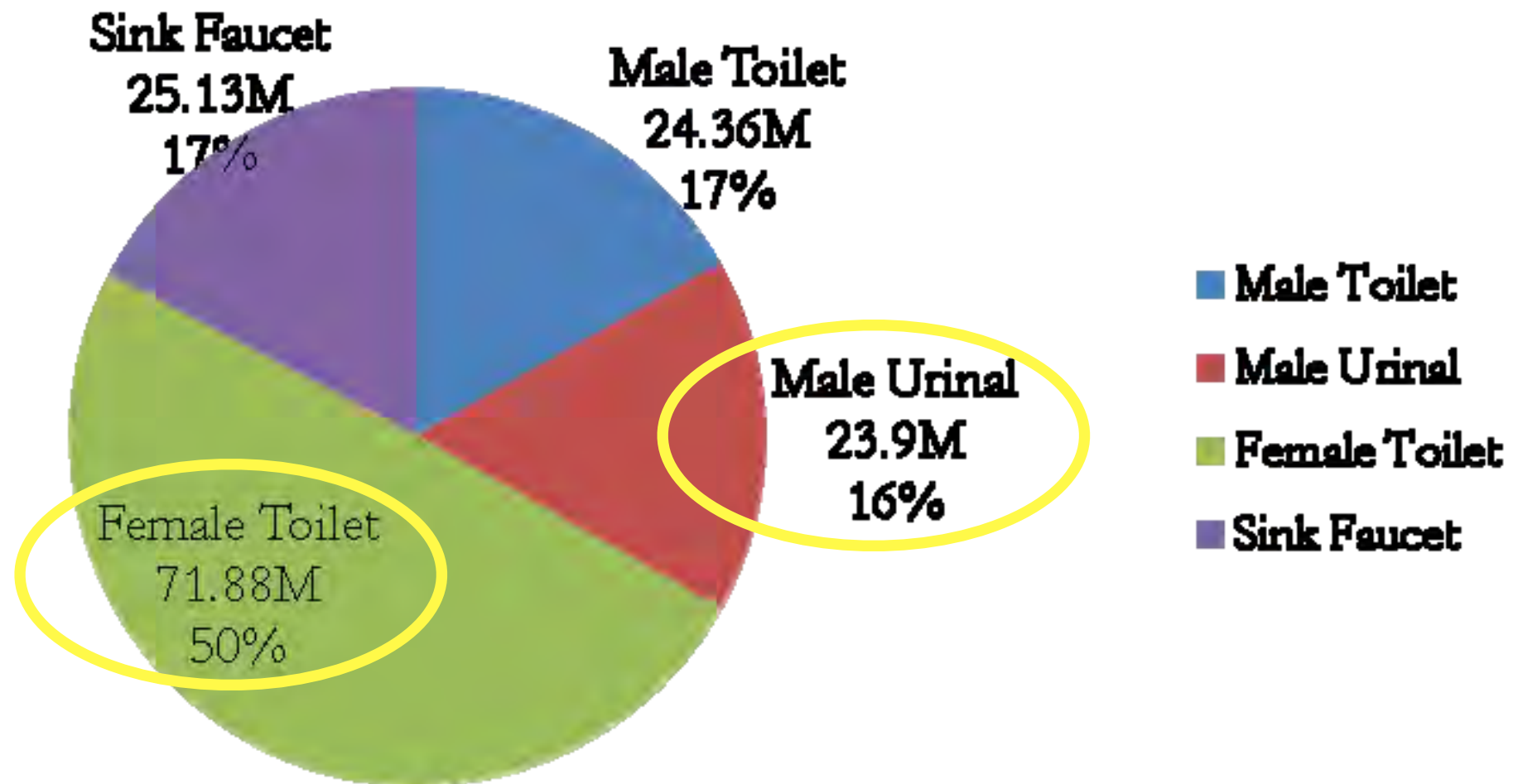
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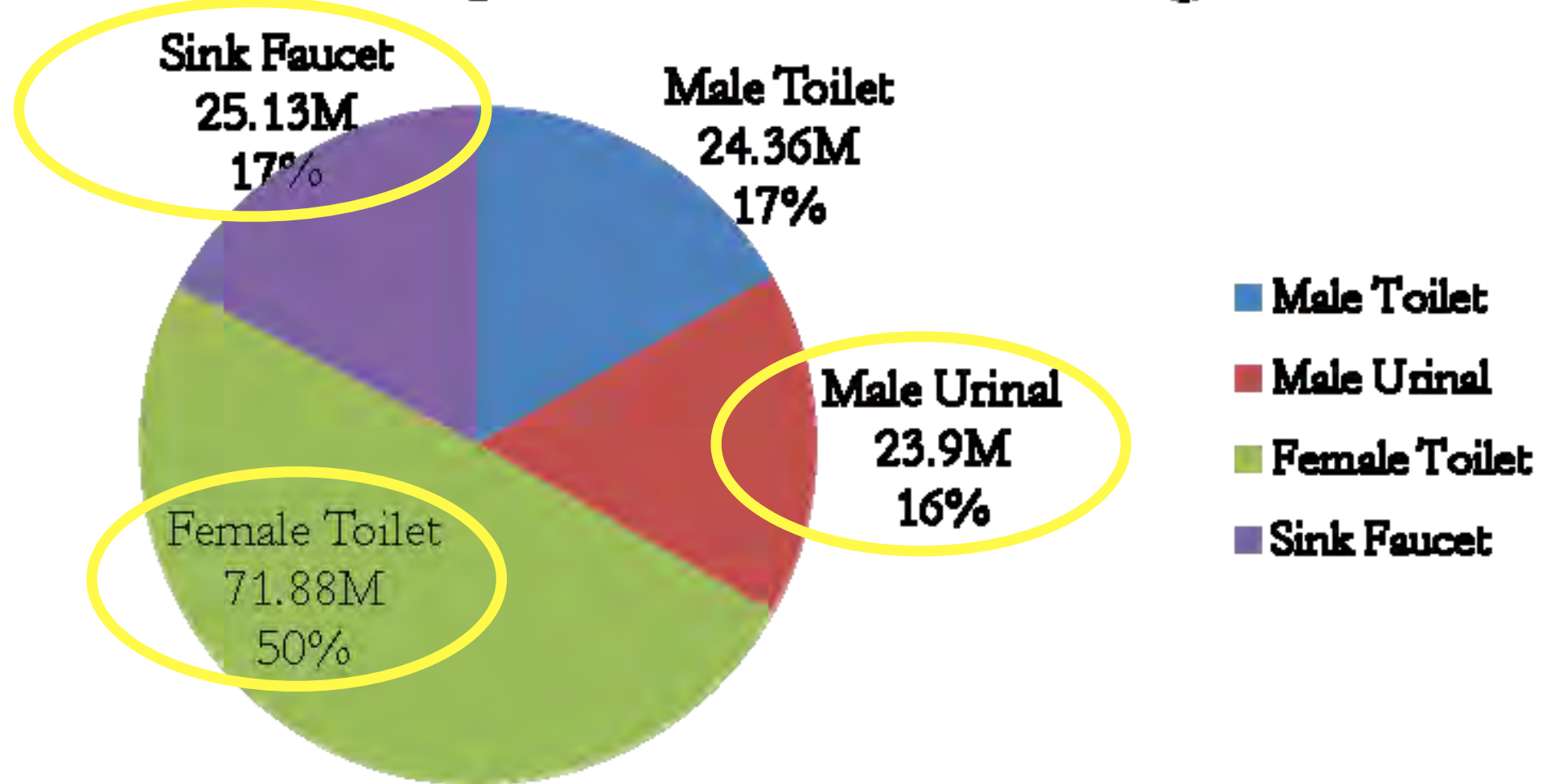
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UC Berkeley Students/ Employees Fall 2008

UC Berkeley Students/ Employees Fall 2008

- **25,784 female students/employees**

UC Berkeley Students/ Employees Fall 2008

- **25,784 female students/employees**
- **25,784 male students/employees**

What they had?

What they had?

- **859 toilets in female restrooms**
3.5GPF

What they had?

- **859 toilets in female restrooms**
3.5GPF

What they had?

- **859 toilets in female restrooms**
3.5GPF
- **555 toilets in male restrooms**
3.5GPF

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- **627 urinals 1.5GPF**

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What they had?

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- **555 toilets in male restrooms
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- **627 urinals 1.5GPF**
- **1012 hand sinks 2.2 GPM**

What they did?

- **replaced 75% of 3.5GPF toilets with 1.6GPF toilets**
- **replaced 1012 hand sink faucets with 0.5GPM flow controllers from 2.2GPM**
- **replaced 75% of 1.5 urinals with low flow urinals**

What they saved?

What they saved?

- **25.94 million gallons of water from toilets**

What they saved?

- **25.94 million gallons of water from toilets**
- **5.64 million gallons of water from urinals**

What they saved?

- **25.94 million gallons of water from toilets**
- **5.64 million gallons of water from urinals**
- **18.85 million gallons of water from hand sinks**

What they saved?

- **25.94 million gallons of water from toilets**
- **5.64 million gallons of water from urinals**
- **18.85 million gallons of water from hand sinks**
- **Total savings 50.43 million gallons of water**

University of Arizona Case Study

Fall 2012

STUDENTS

| | |
|--------------------|---------------|
| Undergraduate | 31,565 |
| Graduate | 7,162 |
| First Professional | 1,496 |
| Total | 40,223 |

EMPLOYEES

| | |
|--------------|---------------|
| Headcount | |
| Men | 7,392 |
| Women | 7,906 |
| Total | 15,298 |

University of Arizona Case Study

Fall 2012

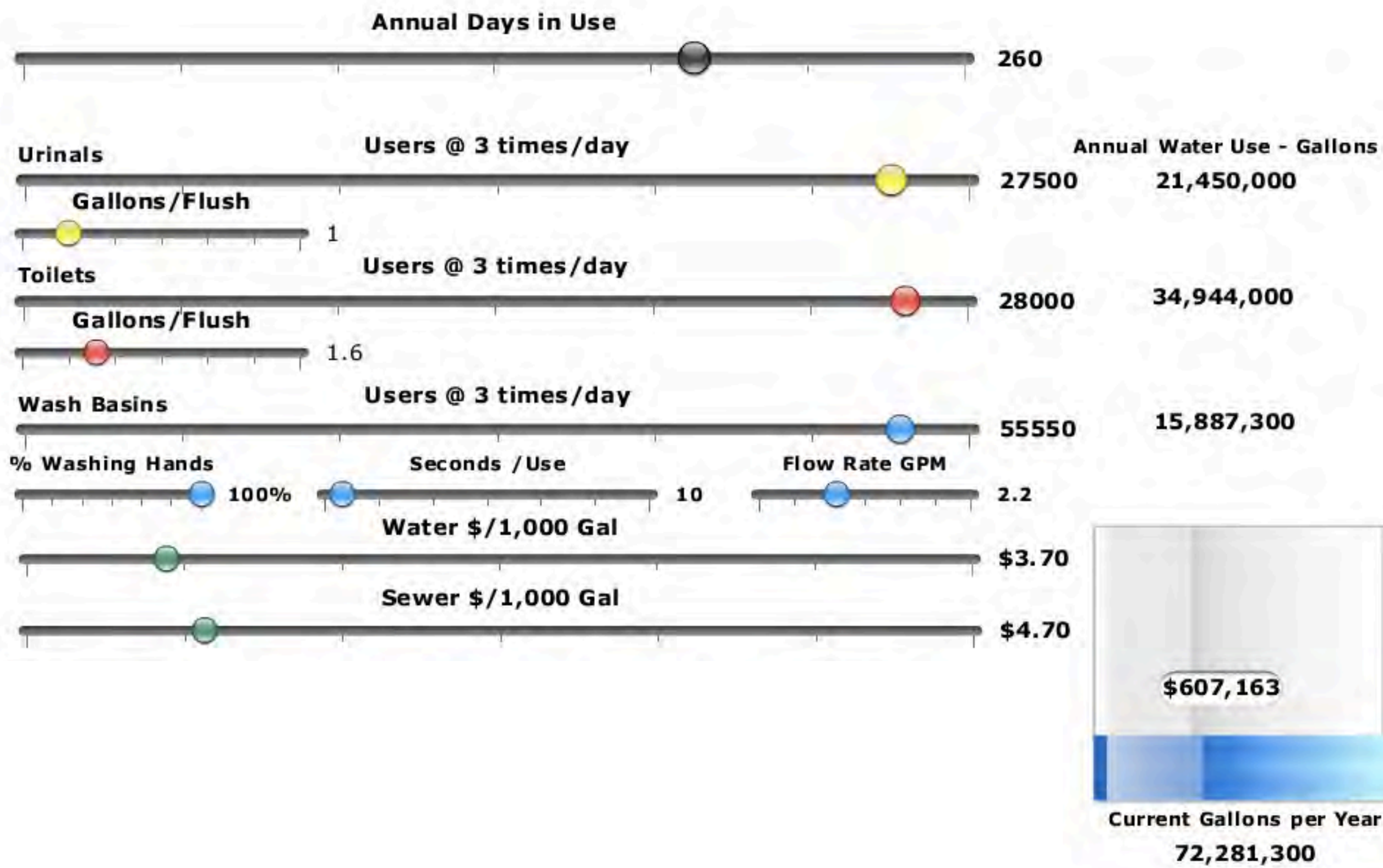
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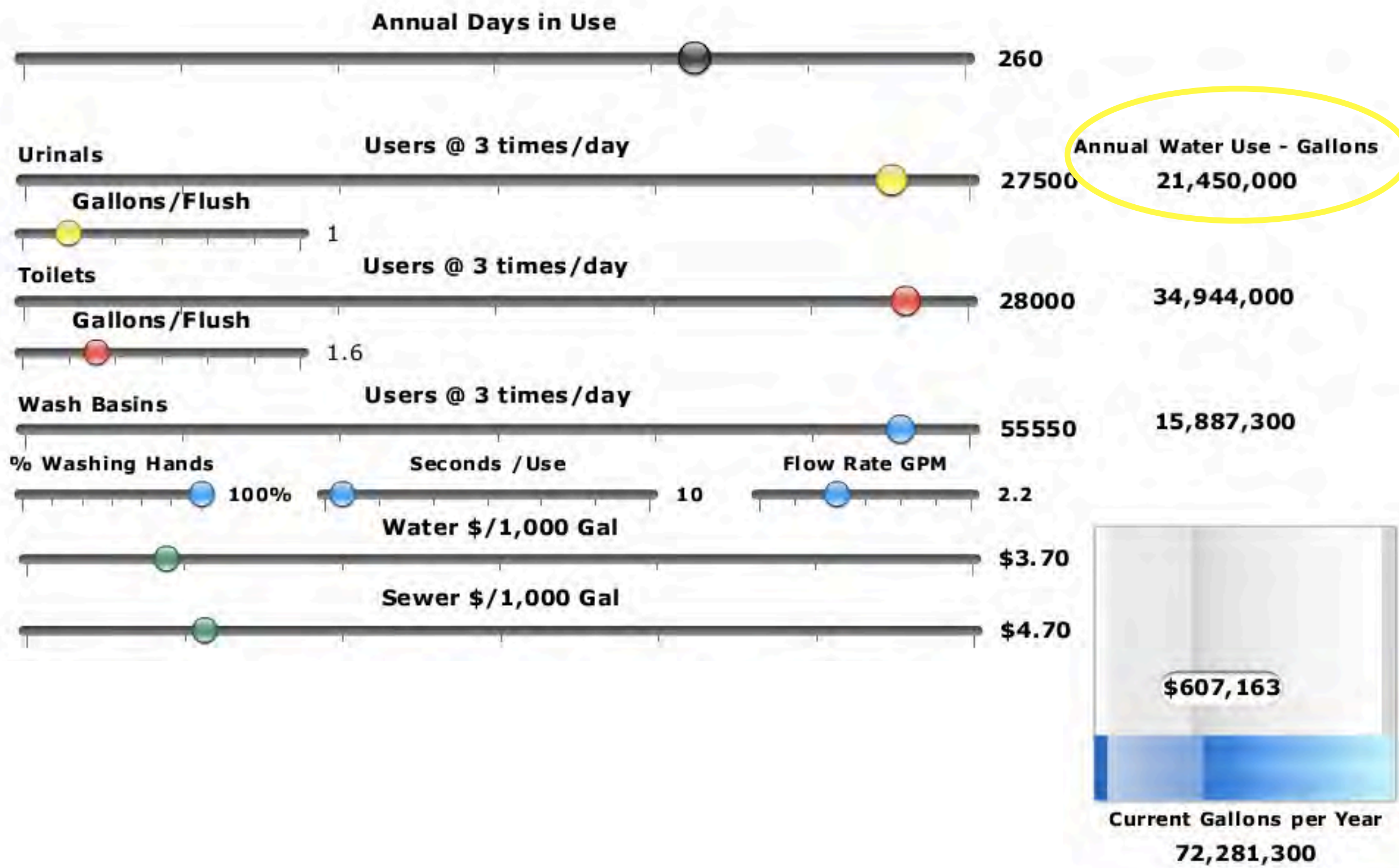
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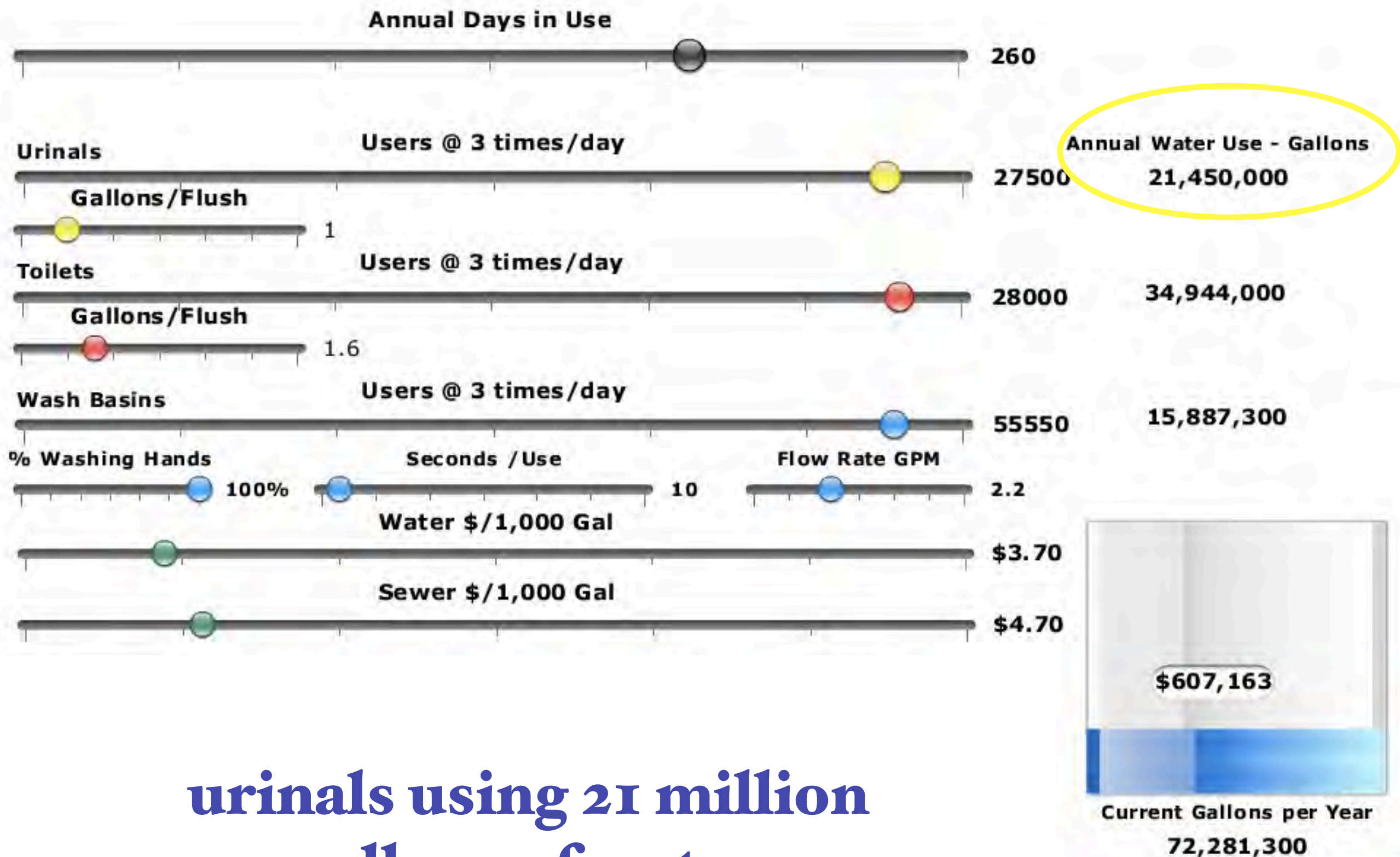
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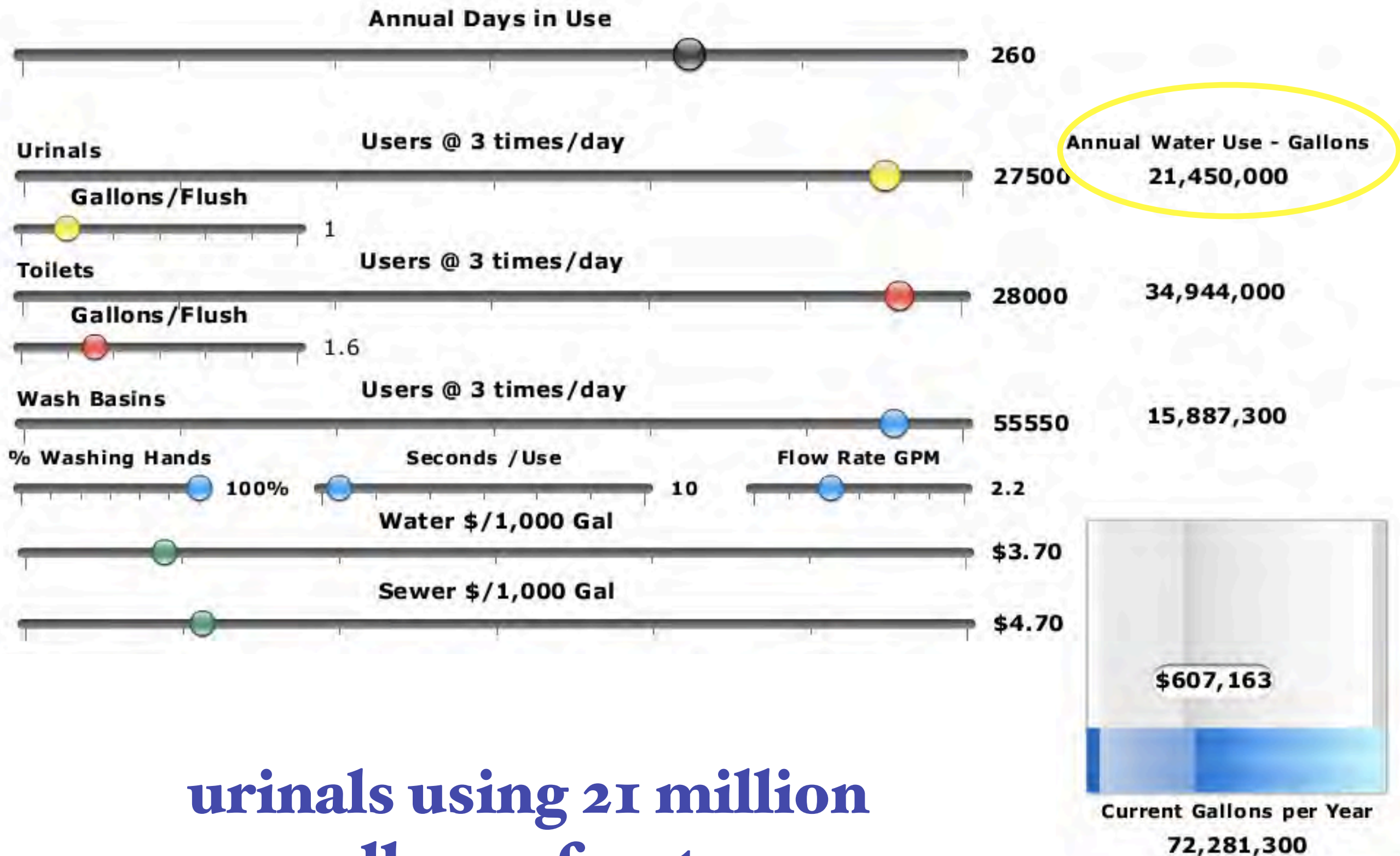
28,000 female students/employees
27,500 male students/employees





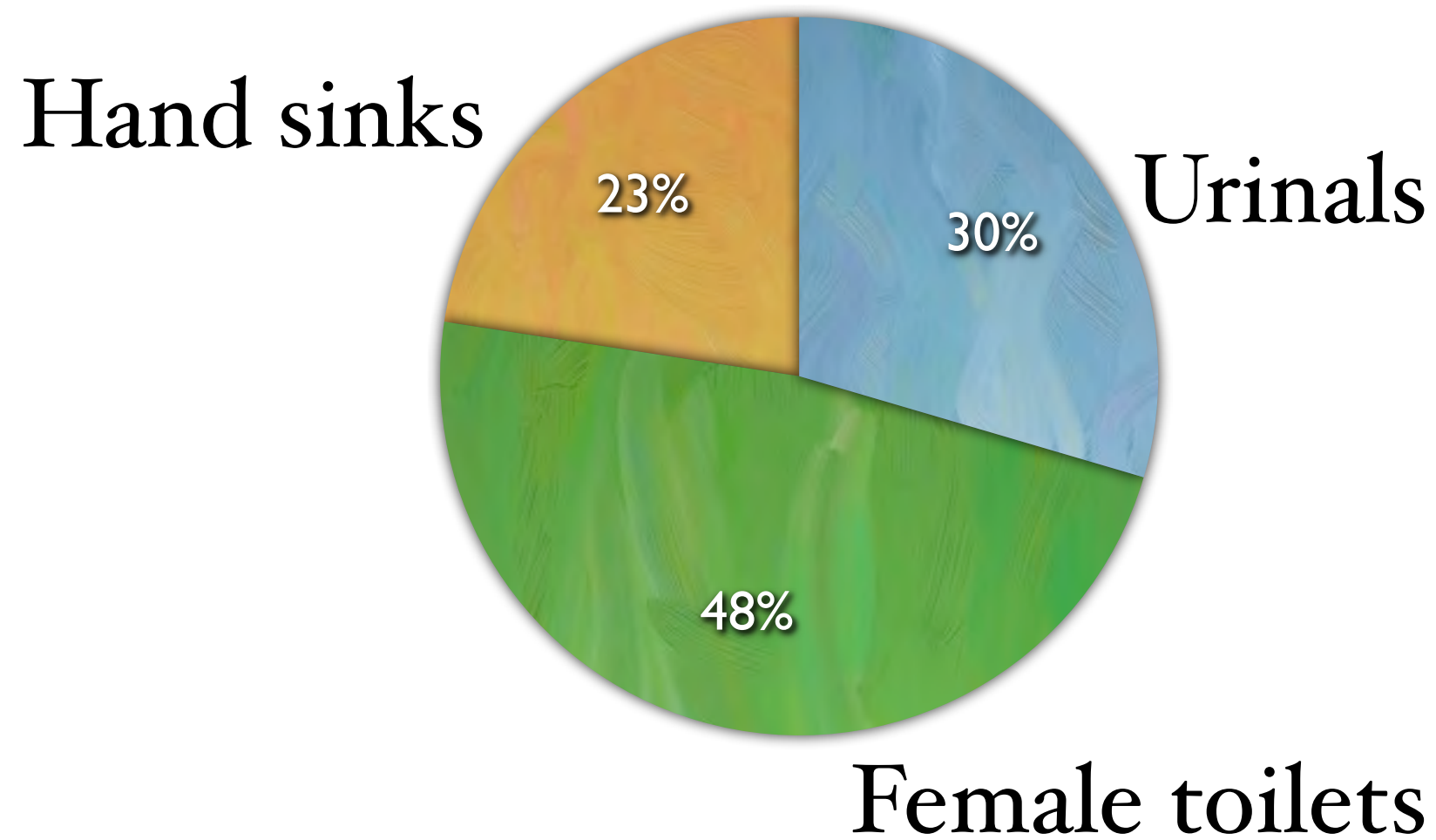


**urinals using 21 million
gallons of water**



**urinals using 21 million
gallons of water**

- Urinals
- Female Toilets
- Hand Sinks



Waterless Urinal Program

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- **Commenced 2004/2005**

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- **Problems encountered**

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- **Drain blockages/plumber call outs**

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Waterless Urinal Program

- **Commenced 2004/2005**
- **Problems encountered**
- **Drain blockages/plumber call outs**
- **Cartridge replacement/expensive**
- **Odor**
- **Pipe corrosion (copper pipes)**

Main Library 2009





Main Library 2009



Integrated Learning Center 2009

Ecoblue installed in waterless urinals July 2009

what is it?



what is it?



- **dissolvable, biodegradable
urinal cube**

what is it?



- **dissolvable, biodegradable
urinal cube**
- **contains bacteria, water
softeners and surfactants**

what is it?



- **dissolvable, biodegradable urinal cube**
- **contains bacteria, water softeners and surfactants**
- **yoghurt for the urinal**



how does it
work?



how does it work?

- **bacteria form a biofilm
throughout urinal and drain**



how does it work?

- **bacteria form a biofilm
throughout urinal and drain**
- **biofilm out-competes bacteria
that produce malodorous gases
(ammonia, volatile amines)**



how does it work?

- **bacteria form a biofilm throughout urinal and drain**
- **biofilm out-competes bacteria that produce malodorous gases (ammonia, volatile amines)**
- **urinal flushed 1 - 4 times per day**

Main Library 2009



Main Library 2013





Integrated Learning Center 2009



Integrated Learning Center 2013

University of Arizona





Tucson International Airport

Pima Community College



Ecoblue Cube Canister for Waterless Urinals



Retrofitting Flush Urinals with Ecoblue Cube



University of Arizona



University of Arizona



University of Arizona



University of Arizona



University of Arizona



University of Arizona



Ecoblue Cube Canister for Flush Urinals



University of Arizona

- **Ecoblue Installed**
- **500 waterless urinals**
- **550 urinals retrofitted**



Annual Days in Use 260

Urinals Users @ 3 times/day
Gallons/Flush 1 27500

Toilets Users @ 3 times/day
Gallons/Flush 1.6 28000

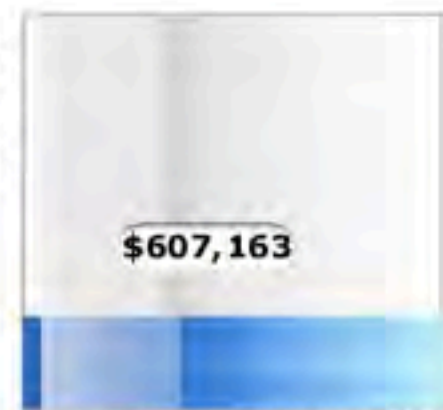
Wash Basins Users @ 3 times/day
% Washing Hands 100% Seconds / Use 10 Flow Rate GPM 2.2 55550

Water \$/1,000 Gal \$3.70

Sewer \$/1,000 Gal \$4.70

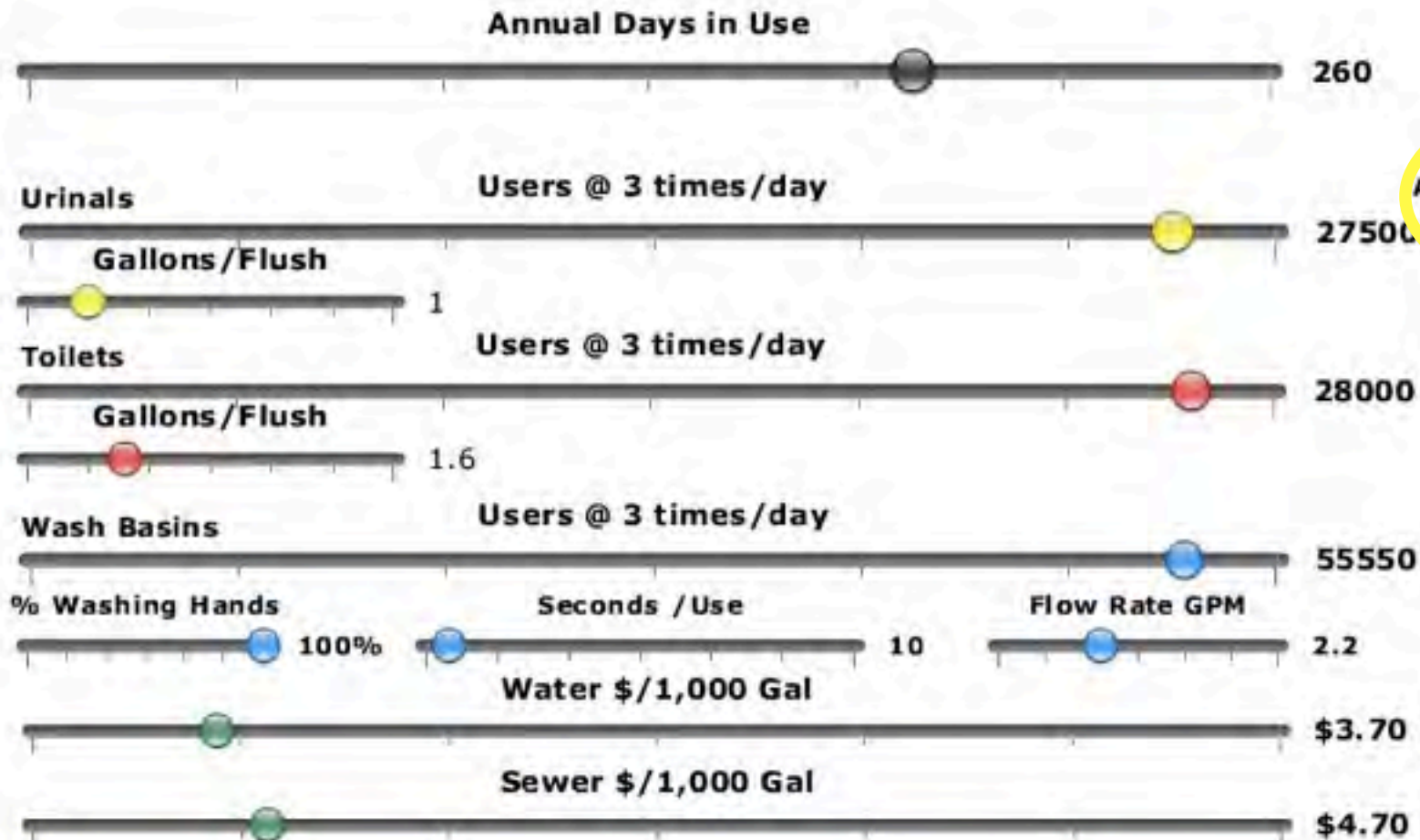
Annual Water Use - Gallons
21,450,000

Gallons used after Conversion
143,000



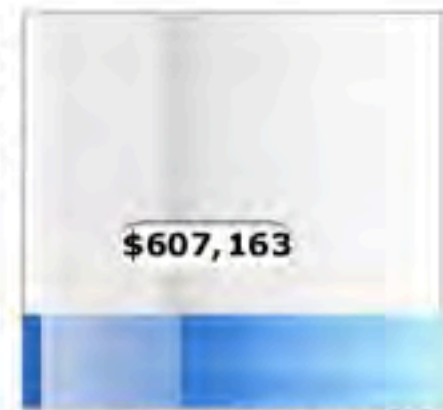
Current Gallons per Year
72,281,300

Analysis For: University of Arizona



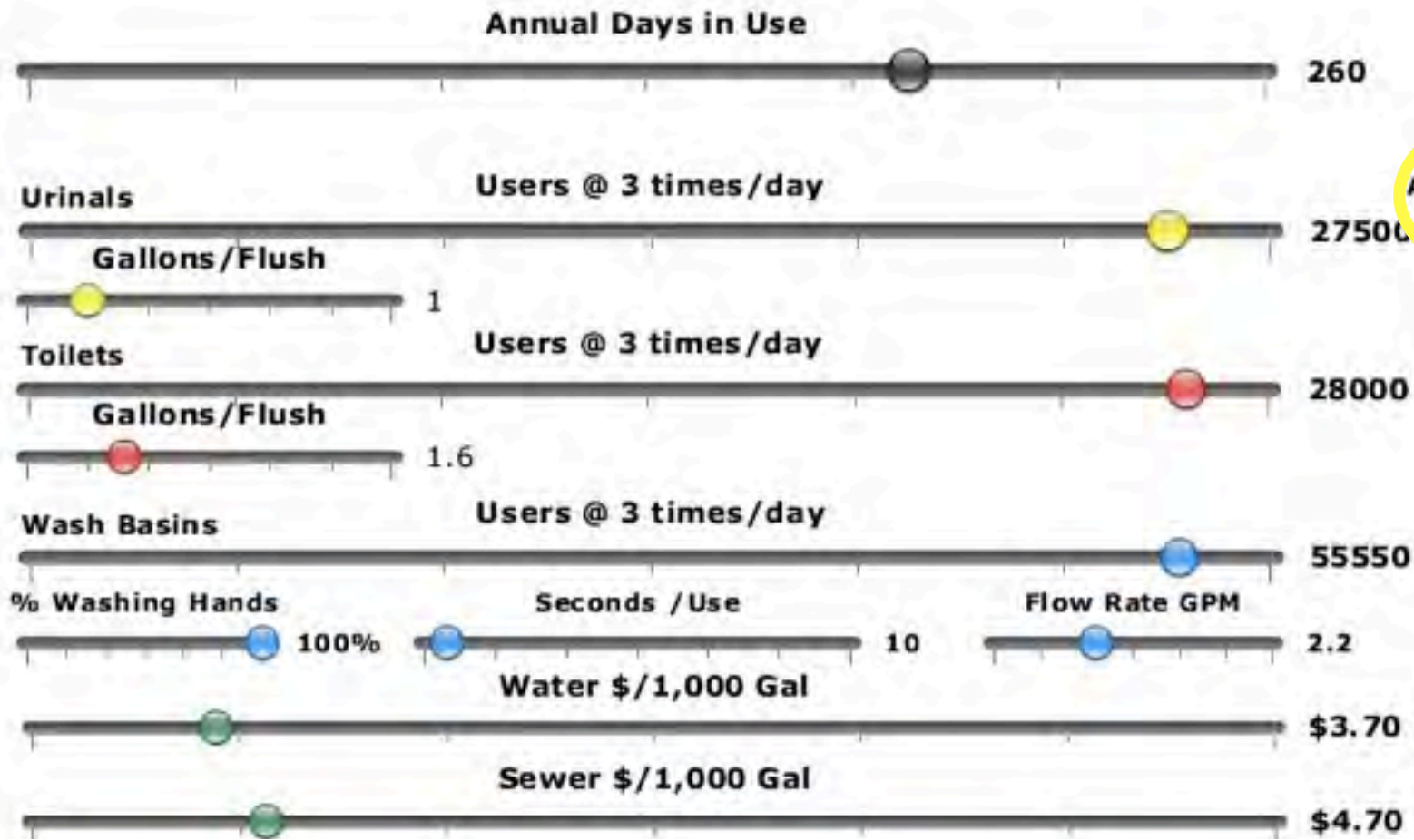
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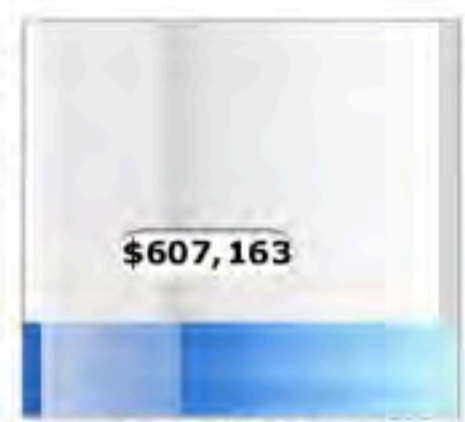
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Current Gallons per Year: 72,281,300

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advantages of the Ecoblue Cube...

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- **cost effective**

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- **cost effective**
- **eliminates all sources of odor**

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- **reduces water consumption by 99%**

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- **extends cartridge life**

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- **eliminates all sources of odor**
- **reduces water consumption by 99%**
- **environmentally friendly + chemical free**
- **extends cartridge life**
- **can work with existing flushing or waterless urinals**

**Challenges/Solutions
implementing high efficiency
restroom fixtures**

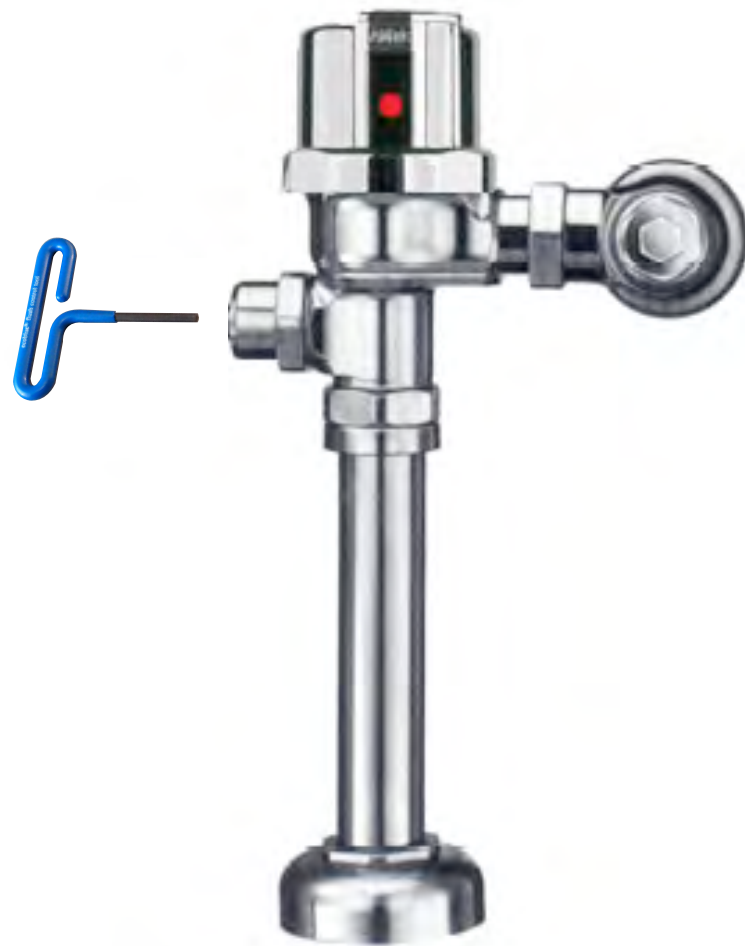
Copper Pipes











Programmable Automatic Flushometer with Ecoblue Flush Control Unit

- Easily adapts to Zurn and Sloan and other similar diaphragm type flushometers
- Easily programmed to flush every 1, 2, 4, 6, 12 or 24 hours
- Vandal resistant chrome plated metal construction
- 4 x AA Alkaline batteries (included in kit)
- Long battery life (up to 100,000 flush cycles)
- Easy battery replacement (no water shut off necessary)
- Quiet operation
- Recommended for use with Ecoblue Cube water saving system for urinals
- Janitor override achieved using Ecoblue Flush control tool
- Item code EAUTO





drain line blockages

high efficiency fixtures

- drain line pitch
- Low tensile strength toilet paper travelled 135 feet
- high tensile strength paper travelled 45 feet

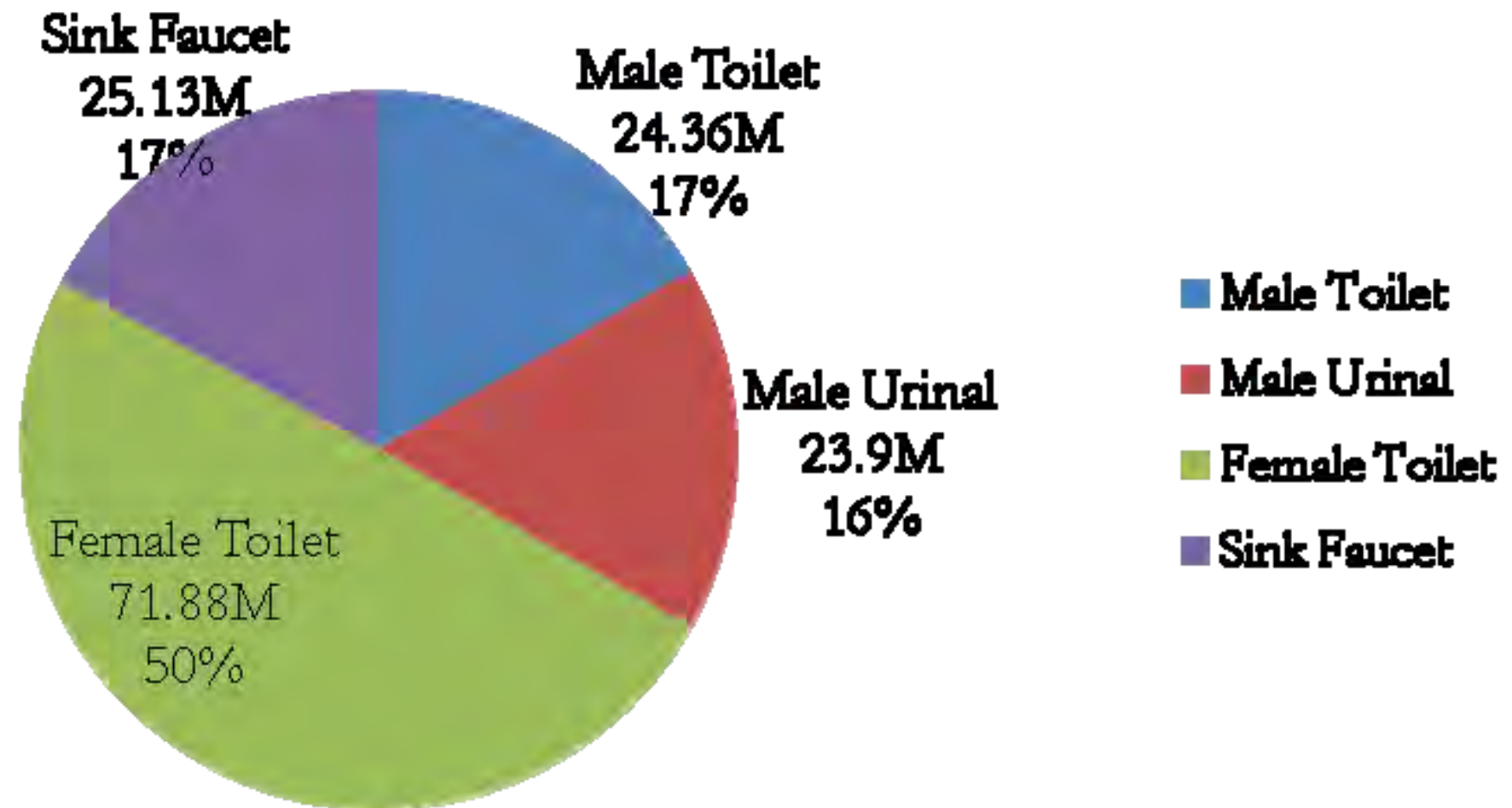
What else can you do?

What else can you do?

What's the low hanging fruit?

UC Berkeley 2008

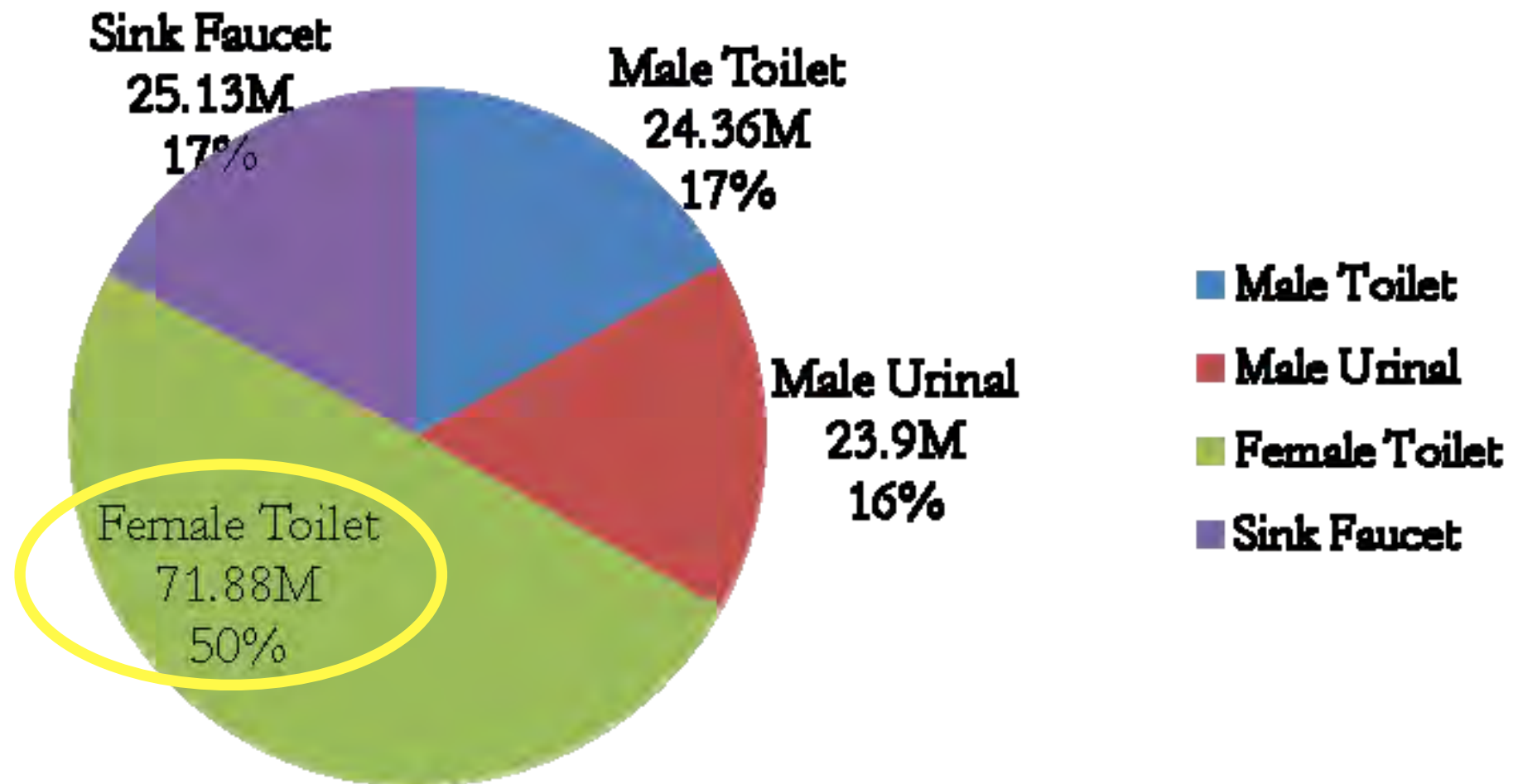
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UC Berkeley 2008

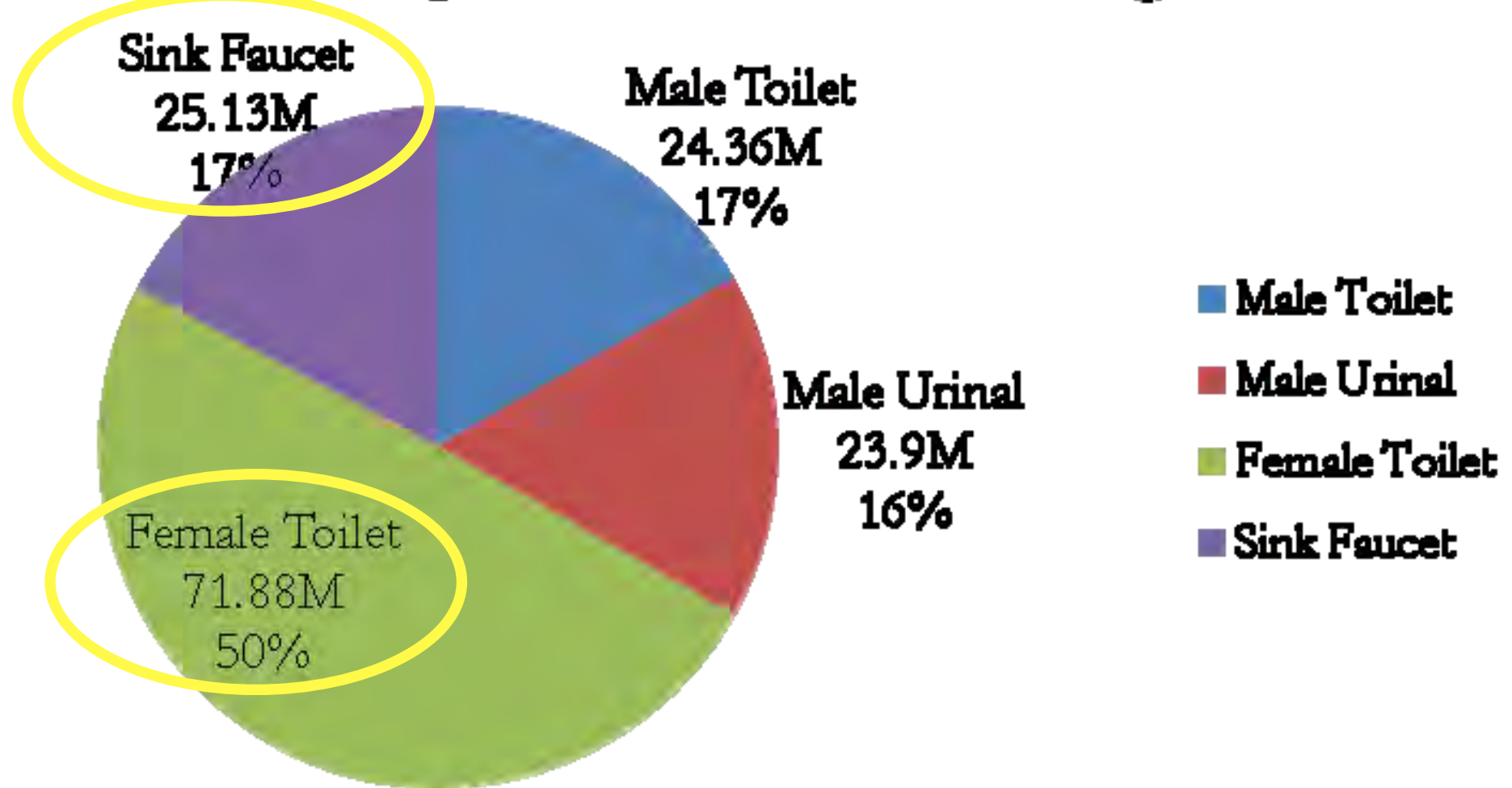
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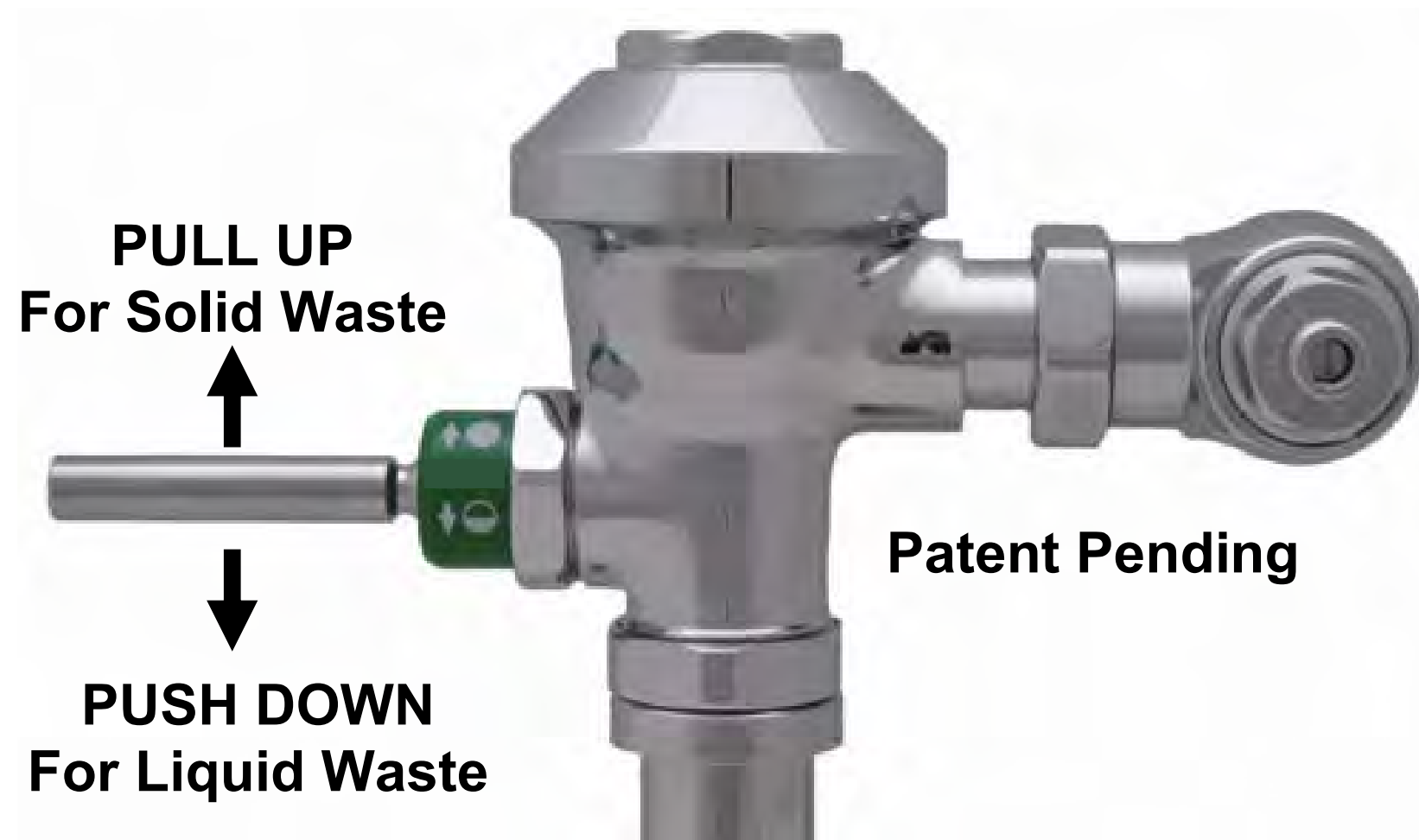
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Model DFR/1.6 for 1.6 GPF water closets
(save up to 30% when flushed for liquid waste)

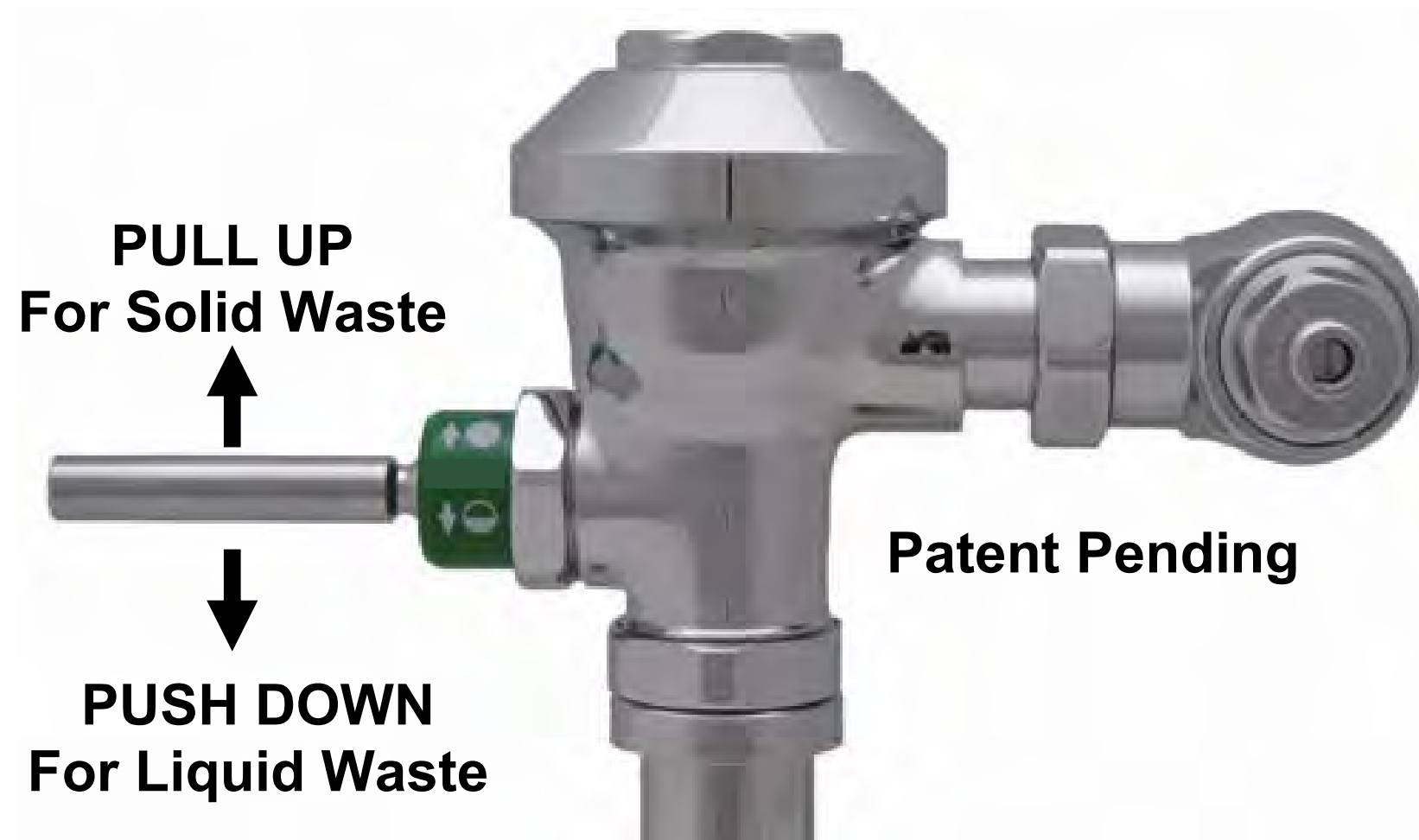
Model DFR/2.5 for 3.5 GPF water closets
(save up to 50% when flushed for liquid waste)

UPPERCUT™



University of Missouri

- Behavioral Study for Dual Flush Handles



Model DFR/1.6 for 1.6 GPF water closets
(save up to 30% when flushed for liquid waste)

Model DFR/2.5 for 3.5 GPF water closets
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?