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**United States General Accounting Office
Washington, DC 20548**

**Resources, Community, and
Economic Development Division**

B-285167

May 1, 2000

The Honorable Michael Bilirakis
Chairman
Subcommittee on Health
and Environment
Committee on Commerce
House of Representatives

The Honorable Sherwood L. Boehlert
Chairman
Subcommittee on Water Resources
and Environment
Committee on Transportation
and Infrastructure
House of Representatives

Subject: Water Infrastructure: Impact of National Water Efficiency Standards

The Energy Policy Act of 1992 set national standards for the manufacture of water-efficient plumbing fixtures—toilets, showerheads, urinals, and faucets—to be installed in new residential and commercial construction and retrofits of existing homes and businesses. The act also preempted state and local governments from setting differing water use standards for those products. In February 1999, legislation was filed to repeal the national water efficiency standards and eliminate the preemptive language from the act.¹

In preparation for the impending markup of the repeal legislation, you requested information on what existing studies and other data say about (1) the impact of the national water efficiency standards on water consumption levels and wastewater flows and (2) the impact of repealing the national standards on projected infrastructure investments for drinking water and wastewater treatment facilities. This letter summarizes the information provided to your staff during our briefing on April 11, 2000, and formally transmits the briefing charts (see enc. I).

¹The Plumbing Standards Improvement Act of 1999 (H.R. 623).

In brief, we found a variety of studies and other data indicate that the use of water-efficient plumbing fixtures has reduced the consumption of public water supplies and the level of wastewater flows into treatment plants and is projected to have a significant impact over the long term. For example, preliminary results from an ongoing national survey being conducted by the American Water Works Association show that for four locations (Austin, Tex.; Los Angeles, Calif.; Phoenix, Ariz.; and Tampa, Fla.), the water efficiency standards will reduce consumption by about 5 to 8 percent by the year 2020. Similarly, an ongoing study being sponsored by the Environmental Protection Agency (EPA) indicates that wastewater flows will be reduced by approximately 8 billion gallons per day nationwide—about 25 percent of the total daily flow—by the year 2020 as a result of using efficient plumbing fixtures.¹ Some communities are already achieving significant reductions in water consumption through accelerated toilet replacement programs. Surveys of participants in such programs indicate that satisfaction with low-flow toilets varies depending on the model and that higher-rated models are reported as having fewer problems like the need for double flushing. More data would be helpful in understanding the results of such surveys, however.

Repealing the national water efficiency standards will affect the extent to which investments in expanded drinking water and wastewater infrastructure can be deferred or avoided, according to preliminary findings by the American Water Works Association and EPA. The Association estimates that with the standards in place, the reduced water consumption in the four locations translates into savings of about \$180 million in current dollars by the year 2020 because these communities would be able to defer planned investments in expanded drinking water facilities.² When completed, EPA's study will include a national estimate of the impact of reduced wastewater flows on planned investments in wastewater treatment facilities. Developing this estimate may be problematic, however, because EPA's database on projected wastewater treatment needs may not adequately differentiate between investments in expanded capacity and replacement of existing facilities. Repealing the national standards may also affect the status of preexisting state and local standards. According to state and local water program officials, in some instances, such standards would automatically be revived upon repeal of the national requirements. In other cases, action would be required to reinstate the preexisting standards.

Agency Comments

We provided EPA with a draft of this report for its review and comment. We met with officials from EPA's Office of Water, including the Chief of the Regulatory Implementation Branch from the Office of Ground Water and Drinking Water and the

¹To compute the percentage reduction in wastewater flows, we used data on total U.S. flows from EPA's 1996 Clean Water Needs Survey Report to the Congress, Table C-3, the most recent data available.

²The \$180 million represents the present value of the savings using a 3-percent discount rate.

Chief of the Grants/Assistance Branch from the Office of Wastewater Management, to obtain their comments. The officials stated that EPA generally agreed with the facts presented in the report but noted that with further study of the agency's database on wastewater treatment needs, they may be able to isolate planned investments in new or expanded capacity from total needs. Although our report points out a potential problem with using EPA's database, we modified the language to acknowledge EPA's view. EPA officials also provided technical changes and suggestions for clarification, which we made as appropriate.

Scope and Methodology

To prepare the information in this report, we reviewed the status of ongoing nationwide studies of the impact of water efficiency standards on water consumption, wastewater flows, and projected infrastructure investments. We also reviewed reported water savings from accelerated toilet replacement programs in selected locations, including Austin, Tex.; Los Angeles, Calif.; New York, N.Y.; Phoenix, Ariz.; and Tampa and Hillsborough County, Fla. The criteria used to select these locations included (1) water efficiency standards that preceded the national standards, (2) use of rebate and/or retrofit programs to accelerate installation of low-flow toilets and other water-efficient fixtures, and (3) an assessment of the programs' impact on water consumption. We compared the estimated water savings from the replacement programs with the range of savings reported in studies that made more precise measurements of the impact of toilet replacements. Finally, we reviewed customer satisfaction surveys on ultra-low-flush toilets and obtained comments from state and local officials on the impact of repealing the national standards on preexisting state and local standards. We performed our work from January through April 2000 in accordance with generally accepted government auditing standards.

We will send copies of this report to the Honorable Carol M. Browner, EPA Administrator, and other interested parties. We will make copies available to others on request. Please contact me at (202) 512-6111 if you or your staff have any questions. Major contributors to this report were Willie Bailey, Ellen Crocker, Richard Frankel, and Bob Sayers.



Peter F. Guerrero
Director, Environmental Protection Issues

Enclosure

Enclosure I
Briefing Charts

GAO

**IMPACT OF NATIONAL
WATER EFFICIENCY
STANDARDS**

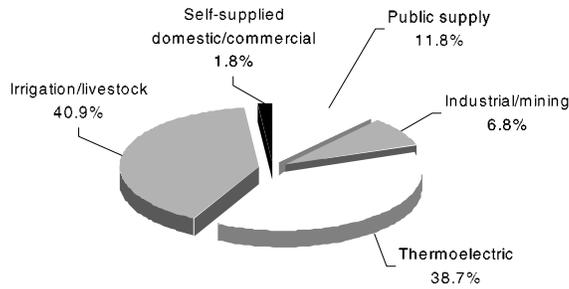
GAO **BACKGROUND: National Water Efficiency Standards**

- The Energy Policy Act of 1992 set standards for the manufacture of water-efficient plumbing fixtures--toilets, showerheads, urinals, and faucets--to be installed in new residential and commercial construction and retrofits of existing homes and businesses. The act also preempted state and local governments from setting differing water use standards for these products.
- With limited exceptions, the standards took effect in January 1994.
- H.R. 623, the Plumbing Standards Improvement Act of 1999, would repeal the national standards and eliminate the preemptive language of the 1992 act.

GAO Key Objectives

- What do existing studies and other data say about the impact of the national water efficiency standards on water consumption levels and wastewater flows?
- What would be the impact of repealing the national standards on projected infrastructure investments for drinking water and wastewater treatment facilities?

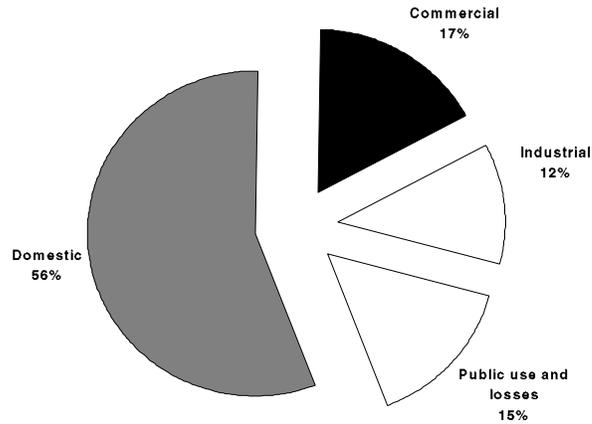
GAO BACKGROUND: Fresh Water Use in the United States



Note: Statistics include fresh water use in Puerto Rico and the Virgin Islands, which represents 0.2 percent of the total U.S. fresh water use.

Source: Estimated Use of Water in the United States in 1995, U.S. Geological Survey Circular 1200, p. 11.

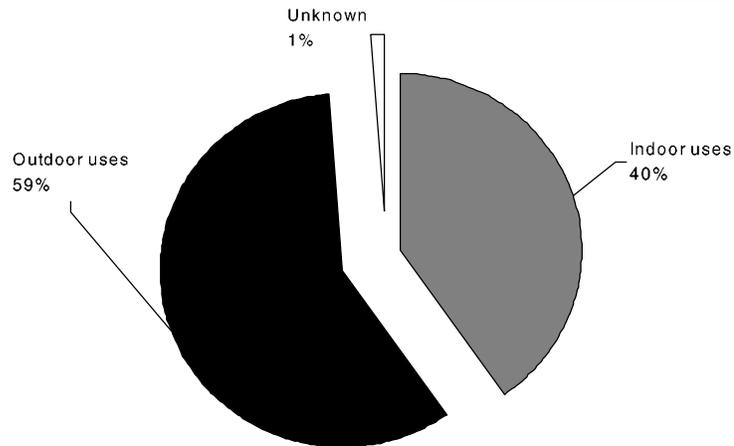
GAO BACKGROUND: Uses of Water Supplied by Public Water Systems



Notes: "Public use and losses" includes a variety of uses, such as water used for firefighting and street washing and water lost in drinking water distribution systems. Water used for cooling thermoelectric power plants accounts for less than 1 percent of the water supplied by public water systems.

Source: Estimated Use of Water in the United States in 1995, U.S. Geological Survey Circular 1200, p. 20.

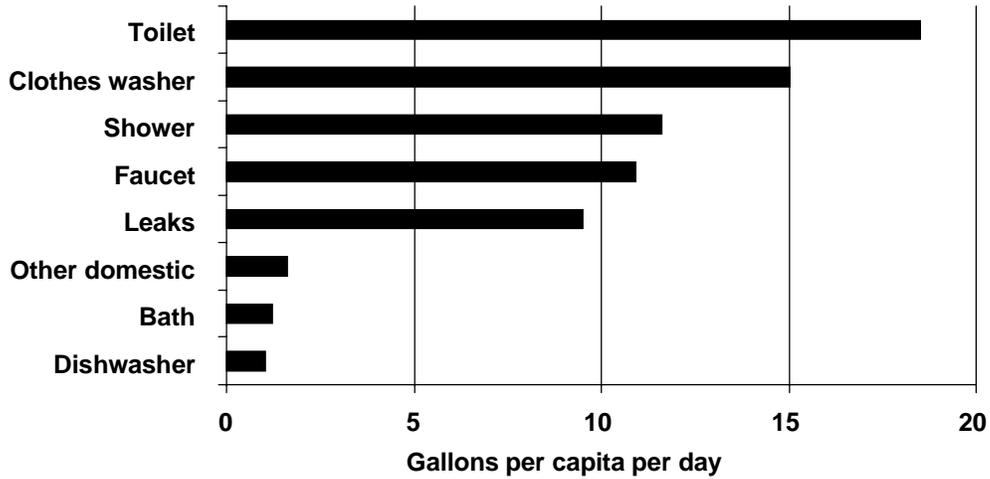
GAO BACKGROUND: Breakdown of Residential Water Use



Note: The 12 study sites are weighted toward the West and Southwest regions of the United States, and, according to EPA officials, these regions may have a higher percentage of outdoor water use than the nation as a whole.

Source: Mean daily per capita water use measured at 12 study sites, Residential End Uses of Water, American Water Works Association Research Foundation, 1999, p. xxv.

GAO BACKGROUND: Mean Daily Residential Indoor Water Use at 12 Study Sites



Source: Residential End Uses of Water, American Water Works Association Research Foundation, 1999, p. xxv.

GAO SCOPE: Description of Work

- Reviewed status of ongoing nationwide studies of the impact of water efficiency standards on water consumption, wastewater flows, and projected infrastructure investments.
- Reviewed reported water savings from accelerated toilet replacement programs in selected locations, including Austin, Tex.; Los Angeles, Calif.; New York, N.Y.; Phoenix, Ariz.; and Tampa and Hillsborough County, Fla.

GAO SCOPE: Description of Work

- Criteria used to select these sites included (1) water efficiency standards that preceded the national standards, (2) use of rebate and/or retrofit programs to accelerate installation of low-flow toilets and other water-efficient fixtures, and (3) an assessment of the programs' impact on water consumption.
- Reviewed customer satisfaction surveys on ultra-low-flush toilets.
- Obtained comments on the impact of repealing the national standards on preexisting state and local standards.

GAO OBJECTIVE 1: Impact of National Standards on Water Consumption

Estimated Water Savings Due to National Water Efficiency Standards

Location	Population	Average daily water use (million gallons per day) (a)	Per capita water use (gallons per day per person) (a)	Water savings in year 2020	
				Million gallons per day	Percentage (b)
Austin, TX	650,000	127	195	18.0	8.3
Los Angeles, CA	3,800,000	558	147	37.1	6.5
Phoenix, AZ	1,300,000	332	255	21.2	4.7
Tampa, FL	450,000	75	167	4.9	5.9

(a) Figures are based on 1999 water use data.

(b) This represents savings as a percentage of the estimated water use in 2020 without the national standards.

Source: Analysis conducted by Maddaus Water Management for the American Water Works Association.

GAO OBJECTIVE 1: Impact of National
Standards on Wastewater Flows

- EPA's Office of Wastewater Management is sponsoring a study that will estimate the amount of the reduction in wastewater flows attributable to the national water efficiency standards.
- Preliminary results from the study indicate that wastewater flows will be reduced by approximately 8 billion gallons per day, or about 25 percent of the total daily flow, by the year 2020 as a result of using water-efficient plumbing fixtures.

Note: To compute the percentage reduction in wastewater flows, we used data on total U.S. flows from EPA's 1996 Clean Water Needs Survey Report to the Congress, Table C-3, the most recent data available.

GAO OBJECTIVE 1: Water Savings From Accelerated Replacement of Toilets

Water Savings Reported by Selected Locations

Location	Period covered by program statistics (a)	Number of toilets distributed free or through rebate program	Estimated water savings per toilet (gallons per day)	Total estimated water savings (gallons per day)	Cost of toilet program
Austin, TX	1992 – 9/1999	48,222	29.3	1,400,000	\$2,000,000
Los Angeles, CA	1990 – 2/2000	905,923	31.7	28,700,000	107,000,000(b)
New York, NY	1994 – 4/1996	1,300,000	53.8	70,000,000	290,000,000
Phoenix, AZ	1994 – 3/2000	1,226	25.6	78,464	96,000
Tampa, FL	1993 – 9/1999	15,263	29.1	440,400	1,200,000
Hillsborough County, FL	1994 – 9/1999	60,305	23.4	1,400,000	8,800,000

(a) With the exception of New York, all programs are ongoing.

(b) Costs include other conservation efforts such as showerhead and clothes washer rebates, but the primary costs are for toilets.

GAO OBJECTIVE 1: Water Savings From Accelerated Replacement of Toilets

- Most of the estimated savings per toilet fall within the range of savings reported in studies that made more precise measurements of water savings from toilet replacements.
- The estimated water savings per toilet reported by New York are higher than in other localities. The manager of New York's rebate program attributes these results primarily to the replacement of older, higher-volume toilets in high-density neighborhoods.

GAO **OBJECTIVE 1: Customer Satisfaction
Surveys on Ultra-Low-Flush Toilets**

- Surveys of participants in various toilet replacement programs asked respondents to rate the model of low-flow toilet they received (e.g., in terms of the frequency of specific problems) and to compare its performance with that of their old (conventional) toilet.
- In general, the surveys show that satisfaction with low-flow toilets varies depending on the brand or model installed.
- Higher-rated brands are reported as being less likely to present problems in specific areas, such as the need for double flushing.

GAO OBJECTIVE 1: Customer Satisfaction
Surveys on Ultra-Low-Flush Toilets

- The surveys identified a number of models with high levels of customer satisfaction. For example, a December 1999 survey sponsored by the Metropolitan Water District of Southern California found that depending on the model, the percentage of respondents who reported
 - a high level of satisfaction with their low-flow toilets (rated “8,” “9,” or “10” on a 10-point scale) ranged from 78 to 39 percent and
 - double flushing their low-flow toilets the same or less often than their old toilets ranged from 87 to 44 percent.

GAO OBJECTIVE 1: Customer Satisfaction
Surveys on Ultra-Low-Flush Toilets

- The latter finding is consistent with the AWWA Research Foundation's recent study, Residential End Uses of Water, which found that the average number of flushes per day was 5.04 in households with low-flow toilets compared to 4.92 in households with conventional toilets.
- More data would be helpful in examining the results of the surveys. For example, demographic data on the survey respondents and nonrespondents would have helped us better understand the results.

GAO **OBJECTIVE 2: Impact on Projected
Investments in Drinking Water Facilities**

- The American Water Works Association (AWWA) is conducting a study to
 - collect data on planned investments in the expansion of drinking water treatment and storage facilities and
 - estimate the present value of any savings associated with infrastructure investments that can be deferred or avoided as a result of the national water efficiency standards.

GAO OBJECTIVE 2: Impact on Projected Investments in Drinking Water Facilities

- AWWA mailed surveys to over 3,700 water utilities and, as of April 7, 2000, had received over 600 responses. AWWA expects to complete its analysis of the responses by mid-May 2000.

Preliminary Results for Four Locations

Location	Investment projected through the year 2020 (millions)		Present value of savings (a)
	With efficiency standards	Without efficiency standards	
Austin, TX	\$390.8	\$417.5	\$26.7
Los Angeles, CA	1,870.8	1,959.3	88.5
Phoenix, AZ	451.4	472.8	21.4
Tampa, FL	486.3	529.4	43.1

(a) A discount rate of 3 percent was used to calculate the present value.

Source: Analysis conducted by Maddaus Water Management for the American Water Works Association.

GAO OBJECTIVE 2: Impact on Projected
Investments in Wastewater Facilities

- EPA's contractor is currently developing estimates of the extent to which planned expansions of wastewater treatment facilities could be deferred or avoided as a result of the reduced flows. The final report is expected by early summer.

GAO OBJECTIVE 2: Impact on Projected
Investments in Wastewater Facilities

- One potential concern is that EPA is relying on data from the 1996 Clean Water Needs Survey to estimate the potential savings from deferred or avoided investment in wastewater infrastructure. However, the needs survey may not adequately differentiate what proportion of the treatment needs are for expanded capacity as opposed to replacement of existing facilities.
- In contrast, the AWWA study is using questionnaires to determine the water utilities' planned investments in expansion of drinking water treatment and storage facilities.

GAO OBJECTIVE 2: Impact of Repealing
National Standards

- In Arizona, California, and Texas, state officials believe that the preexisting state standards would be automatically revived if the national standards are repealed.
- However, state officials in Texas and city officials in Phoenix are concerned that their state legislatures may act to repeal the state standards once the national standards are no longer in place.

GAO OBJECTIVE 2: Impact of Repealing
National Standards

- Water agency officials in Tampa and Hillsborough County, Fla., told us that the local plumbing codes in each location were modified to incorporate the national standards. If the national standards are repealed, they told us that they would have to take some affirmative action to reinstate the national standards at the local level.
- A New York City Department of Environment Protection official told us that New York City's plumbing code does not reference the national standards. If the national standards are repealed, he stated that their local plumbing code would come back into effect. However, with the exception of toilets, the city's code was less restrictive than the national standards.

GAO Summary of Key Points

- While domestic and commercial water consumption account for a relatively small percentage of total fresh water use in the United States, these uses constitute a major portion of the water supplied by public water systems and treated by municipal wastewater treatment plants.
- Preliminary results from an ongoing AWWA study indicate that for four locations the use of water-efficient plumbing fixtures will reduce water consumption by about 5 to 8 percent by the year 2020.

GAO Summary of Key Points

- For the four locations, this translates to an estimated savings of \$180 million--the present value of deferred or avoided investments in drinking water infrastructure through the year 2020.
- Preliminary results from EPA's ongoing study indicate that wastewater flows will be reduced by about 25 percent by the year 2020 as a result of using water-efficient plumbing fixtures. Estimates of the impact that reduced flows will have on future investments in wastewater treatment infrastructure will soon be available.

GAO Summary of Key Points

- Customer satisfaction surveys indicate that the degree of satisfaction with the performance of ultra-low-flow toilets varies according to the brand or model selected, with the most highly rated models reported as having the best performance in specific areas.
- The AWWA Research Foundation found little difference between ultra-low-flow toilets and conventional toilets in average number of flushes per day.

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