

**Environmental Protection Agency Region 4 Guidelines on  
Water Efficiency Measures  
For Water Supply Projects in the Southeast  
6-21-2010**

**Purpose of Guidelines:** These guidelines were developed to ensure the various Environmental Protection Agency (EPA) Region 4 programs and partners involved in reviewing water supply reservoir projects use consistent methods in evaluating the purpose and need and the analysis of alternatives for these projects, especially the need for additional capacity due to projected future demands and the determination of the least environmentally damaging practicable alternative (LEDPA). These guidelines were developed to inform local governments and water utilities of the actions EPA expects them to take in order to eliminate or minimize the need for additional capacity **before** consideration of a water supply reservoir project on a stream or river. These guidelines will also ensure water utilities use consistent and rigorous approaches to the implementation of water efficiency measures as they determine the projected demand based on future needs. EPA will also use these guidelines to evaluate water demand projections for non reservoir projects, such as new or significantly increased public surface water withdrawals or public ground water supply wells which are being reviewed through EPA grants, the National Environmental Policy Act (NEPA) or other EPA programs.

EPA Region 4 will be using these guidelines for the review of environmental documents and permit proposals for reservoir projects under both NEPA and Section 404 of the Clean Water Act (CWA). The evaluation of the water efficiency/water conservation measures in these guidelines should be reflected in the water demand projections for project purpose and need and should also be an important consideration in the economic practicability of the alternatives and in the determination of the LEDPA per the Section 404(b)(1) Guidelines, 40 CFR §230.10(a).

**Regulatory Authorities:**

The construction of water supply reservoir projects requires the issuance of a CWA, Section 404 permit for the discharge of the dredged or fill material in waters of the U.S. to build the dam and control structures. The U.S. Army Corps of Engineers (Corps) has defined *Loss of Waters* in the Department of the Army March 12, 2007, Notice of Issuance of Nationwide Permits (72FR 11092-11198) as the following: “Waters of the U.S. that include the filled area and other waters that are permanently adversely affected by flooding, excavation, or drainage because of the regulated activity.” [emphasis added]. EPA and the Corps’ responsibility in the Section 404 permit process is to ensure that any proposed project is consistent with the Section 404(b)(1) regulations which provide that “...no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem...” and that no permit shall be issued unless the potential impacts to waters of the U.S. be minimized to the degree practicable. With reservoir projects, this includes

impacts from both the fill and inundated areas. If required, under Section 404(q) EPA may elevate a proposed permit to higher levels of management review within EPA and in the Corps. In extreme situations, Section 404(c) authorizes EPA to prohibit, restrict, or deny the discharge of dredged or fill material at defined sites in waters of the United States (including wetlands) whenever it determines, after notice and opportunity for public hearing, that use of such sites for disposal would have an unacceptable adverse impact on one or more of various resources, including fisheries, wildlife, municipal water supplies, or recreational areas. EPA's objective is to ensure that alternatives that support sustainable water resource management and minimize environmental impacts through effective water efficiency and water conservation practices are employed to the maximum extent practicable at the project design stage of the proposal.

**Background:** Water is vital to the survival of everything on the planet and yet the earth's supply of freshwater is limited. Only one percent of the earth's water is available as freshwater for human use without the use of energy intensive and expensive methods of treatment. While the population and the demand on freshwater resources are increasing, the supply remains constant. Competing freshwater needs such as human consumption, aquatic habitat and water quality protection, energy production, agriculture and industrial uses, and recreational opportunities, are stretching our limited water supply in ways that will require new solutions for wise future use.

- a. **Water Consumption Demands:** Our nation's growing population and challenging climatic events continue to stress our available water supplies. Climatic extremes are affecting the availability of public water supplies in the Southeast. But there is good news for the Southeast. The U.S. Geologic Survey (USGS) Circulars 1268 and 1344 (*Estimated Use of Water in the United States in 2005*)<sup>1</sup> suggest the national per capita water consumption rate for public water supplies may be stabilizing. After rising for 30 years between 1950 and 1990, the public water supply consumption rate was relatively steady between 1990 and 2000. The latest numbers released by USGS circular 1344 suggest, the public supply consumption rate dropped in 2005 to close to the 1980 rate.<sup>2</sup> The USGS data do not provide the detail to explain the source of the decline in the public supply consumption rate. Although the overall lowering of water usage may be attributed to the use of more efficient irrigation systems and alternative technologies at power plants, these agriculture and power supply usages are not included in the gallon per capita per day (gpcd) public consumption rate. The decline in the public consumption rate is likely generated from many of the new programs which have been initiated in the last 10 years such as system-wide leak detection and correction, the use of high efficiency plumbing fixtures, and implementation of industrial Environmental Management Systems which lead to water use efficiencies.

The public water supply consumption rate, or gallons per capita per day (gpcd), is calculated by taking the national withdrawals of ground and surface waters for public water supplies and dividing the total by the population. Public water supply withdrawals include

withdrawals for domestic, commercial, and industrial consumption of public water supplies. Public water supply withdrawals also include unaccounted for water consumption from such sources as system leaks and public uses such as fire protection. The commercial/industrial consumption is added in to the gpcd use because it is necessary for determining the water demand projections.

Each of the eight Region 4 states are projected to have population increases through the year 2030 and most of our states had higher than average per capita water use rates in 2000.<sup>3</sup> As was stated earlier, this increasing demand has put additional stress on our region's water supply, contributing to human health and water quality problems along with increasing levels of greenhouse gas emissions related to the energy needed for pumping and treating drinking and waste water. However, many communities across the country, such as Seattle, Washington, have been able to meet the challenge of growing populations and limited water sources by instituting an aggressive water efficiency program. Since 1990, Seattle Public Utilities decreased water consumption in and around Seattle by 24 percent while the region's population grew by 11 percent.<sup>4</sup>

- b. **Environmental Costs and Consequences of Reservoirs:** Providing a clean and reliable water supply is a topic foremost on the agendas of many southeastern communities, as well as communities across the United States. Growing populations, climate change, and water resource disputes are causing communities to consider how they can best continue to provide adequate potable water to current customers while providing for future needs. Among the available solutions, reservoirs, large and small, created by damming streams to capture and store water, are often the first choice of water utilities due to the apparent quick fix provided by the ease of creating a large amount of storage. Unfortunately, water supply reservoirs have significant negative environmental impacts on water quality and stream health and do not address the root problem of the need to use our limited water supply wisely. Adverse water quality impacts are well documented in the literature and include adverse effects on both the impounded areas and downstream reaches. The elimination of flow makes the impounded area unsuitable habitat for native fluvial species and the physical, chemical and biological health of the downstream reaches may be greatly impacted due to numerous changes, including the alteration of sediment regime, water and food transport downstream, increased temperature and nutrients and low dissolved oxygen. The following two citations contain recent studies conducted by two southeastern states (Tennessee and North Carolina) addressing water quality impacts from impoundments:

- [http://www.tn.gov/environment/wpc/publications/pdf/isp\\_report.pdf](http://www.tn.gov/environment/wpc/publications/pdf/isp_report.pdf)
- *Selected Bibliography – Stream Impoundment Perspectives*, North Carolina Division of Water Quality, June 2008).

Not only do reservoirs cause disruption to the water cycle for the watershed and river basin, but they can also actually increase water loss due to evaporation and be very expensive to build in comparison to implementing water conservation/efficiency measures. Estimates are that dams and reservoirs can cost up to 8,500 times more than water efficiency measures. According to a Georgia Environmental Protection Division March 2008 paper, dams and reservoirs can cost \$4,000 per 1,000 gallons of capacity while water efficiency costs between \$0.46 to \$250 per 1,000 gallons saved or new capacity.<sup>5</sup> The State of California's Water Plan concluded that the largest single new water supply available to meet growth needs over the next 25 years will be water efficiency.<sup>6</sup>

Inefficient water usage also impacts air resources by increasing the need for energy production. It takes energy to pump water from the water source to the treatment facility, to treat water from wasteful uses such as leaks, inefficient outdoor irrigation, or water wasted at the tap as well as the energy it takes to pump the wastewater generated from inefficient water use back to a wastewater treatment plant. For example, energy use is can be reduced by such measures as the use of low flow shower heads which not only reduce water usage but can significantly reduce the amount of energy used for heating water. The increasing energy use at water and wastewater utilities has become a concern for EPA in our efforts to reduce greenhouse gas emissions. The EPA National Water Program Climate Change Response Actions Report<sup>7</sup> considers water conservation/efficiency to be an important factor in its climate change goals. One of the largest sources of greenhouse gases are from emissions associated with the generation of electricity from coal fired power plants which can be significantly reduced with water efficiency/conservation measures.<sup>8</sup> Additionally, increasing energy use without first considering approaches that are more energy efficient is contrary to the goals of the Energy Independence and Security Act. Increased energy use also indirectly impacts water quality because the power plants, which provide the additional energy necessary to accommodate inefficient water use, rely on our nation's water supply to meet their cooling needs. Nearly half of the 410 billion gallons of water used per day by Americans in 2005 was for producing electricity at thermoelectric power plants.<sup>9</sup> These are important considerations in evaluating the positive impacts of water efficiency measures and the many indirect environmental impacts of reservoir projects. EPA believes these concerns can be partially addressed by implementing water efficiency measures which reduce water supply needs resulting in reduced energy needs.

**Implementation of the Guidelines.** The Section 404 permit process requires a clearly stated project purpose, which for water supply reservoirs includes a projected demand analysis to support additional water capacity needs, and an analysis of alternatives. Before EPA considers a water supply reservoir as an alternative to address the need for additional water capacity, the water utility **must take actions to ensure** that, to the maximum extent practicable, they are implementing sustainable water management practices, including (1) Effective management,

(2) Pricing for Efficiency, (3) Efficient Water Use, and (4) Watershed Approaches. These four measures are designed to help an applicant eliminate the need for, or reduce the impacts to aquatic resources from future water facility expansions including the construction of water supply reservoirs. More information regarding these measures and their implementation can be found at: [www.epa.gov/waterinfrastructure](http://www.epa.gov/waterinfrastructure). These guidelines provide a discussion of water efficiency measures which represent a sustainable approach when developing water supply alternatives. Any applicant for a reservoir project will be expected to conduct an extensive analysis using this approach in developing their water demand projections and alternative analysis and provide a thorough discussion of reservoir needs **after** analysis of these measures.

**1. Effective Management:** Widespread adoption of better management practices offers great promise to reduce costs and direct system investments to ensuring existing infrastructure is sustainable for now and into the future. A critical element of the water demand projections and alternatives analysis is a description of how water utilities either are or will implement the following measures to ensure they are optimizing existing operations before determining future needs and sizing reservoirs.

- a. **A description of how the utility has or will implement water consumption reduction goals:** Water utilities should have a written plan which includes definitive and measurable water consumption reduction goals. The written plan can be incorporated in an existing plan such as a Water Use Plan or Environmental Management System, or can be in a separate document such as a Water Conservation Plan. The plan should also include how the municipality has incorporated or will incorporate the water efficiency measures contained in these guidelines.
- b. **Increase public understanding:** Communities should equip individuals with information about the cost of their water and the rate structure, their own water use patterns, and educate the public about smart, simple water efficiency solutions. The public should be made aware of the full-cost of operating, maintaining and upgrading the system so when rates are restructured, there is a basic understanding of how the rates are derived. An example of how to read a meter and check for leaks should be readily available for customers to ensure the customer can track their water use and check for leaks. Free audits can be provided to customers (both residential and commercial) to assess where the most cost effective and water efficient savings can be secured. Charlotte-Mecklenburg Utilities (Charlotte, North Carolina) was able to reduce consumption by 15.6 percent between 2003 and 2007 as a result of an integrated approach of education, incentives and community outreach programs focused on encouraging water efficiency.<sup>10</sup>
- c. **Involve water users in decisions:** Opportunities for significant water savings can be overlooked without the stakeholders at the table. Involving the water users encourages

higher rates of efficiency. The plan developed in 1.a. above should include a section on how the water utility will involve users in the decision-making process.

- d. **Use an Integrated Resource Management Approach:** Utilities should recognize the interrelationships between water, wastewater, stormwater, and energy when planning and evaluating infrastructure needs and solutions by close collaboration between all water related departments and organizations. A gallon of water conserved is a gallon of wastewater not collected, treated, and disposed of, with energy savings from both water and wastewater processes. The cost benefits of water conservation are even greater when the wastewater cost benefits are also considered. Wastewater reuse can reduce drinking water demands and costs. An Integrated Resource Management approach to infrastructure needs and solutions often provides greater benefits at lower costs.

2. **Pricing for Efficiency:** Water should be priced to cover the full costs of operating and maintaining a water utility and to encourage efficiency. Water utilities should estimate the demand reductions from pricing water for efficiency before sizing a reservoir.

- a. **Full Cost Pricing:** The flat service fee should cover all utility fixed costs, including pipe maintenance and pump substation operations. Water rates which reflect the full cost of service can help utilities capture the actual costs of operating water systems, raise revenues, and also help to conserve water.
- b. **Conservation Pricing:** The fees should also reward water conservation. This can be accomplished with a tiered fee system which includes a flat fee for fixed costs and a variable fee for volume of water consumed, with significantly higher rates as water consumption increases. It has been found that a relatively small increase in price does not significantly affect usage, but that higher prices do affect usage. For this reason, rates need to be designed so that the price is sufficient to encourage conservation. Pricing water for efficiency can yield a 15 percent reduction in consumption for a fraction of a penny per gallon.<sup>11</sup> A tiered pricing system adopted by Greensboro, North Carolina in 2000 was able to reduce average household consumption by 22 percent in seven years.<sup>12</sup>

3. **Efficient Water Use:** This measure is critical, particularly where communities are undergoing water shortages. Utilities need to create market incentives to encourage more efficient use of water and to protect our sources of water. The Alliance for Water Efficiency states that the most effective water efficiency measures for water utilities to implement are installing meters on unmetered customers and billing based on the quantity of water used. Some WaterSense statistics for estimated water savings with water saving fixtures are<sup>13</sup>:

Water Saving Fixture	WaterSense Estimated Water Savings
Toilets	4,000 gallons/year/toilet
Urinals	Between 1.0 and 4.5 gallons/flush
Bathroom Faucets	500 gallons/year for average household
Showerheads	Up to 1.0 gallon/minute

- a. **Stop leaks:** Over **six billion gallons** of water are lost each day in the U.S. due to aging water distribution systems<sup>14</sup>. All utilities should have both a leak detection and abatement program and a program to determine unmetered users. Water loss should be reduced to as close to zero as possible. All systems should, at a minimum, achieve the accepted industry standard of no higher than 10 percent.<sup>15</sup> Raleigh, North Carolina has an effective leak detection program that has been able to reduce leaks to 4.5 percent of their total water consumption.<sup>16</sup>
- b. **Meter all water users:** Most multifamily and commercial buildings have a fixed water rate which does not encourage conservation. The water utility should ensure water meters are installed on all new homes, on each unit of multi-family residential buildings, and on individual commercial stores so water users can measure, monitor and directly pay for their consumption. The Alliance for Water Efficiency has found that installing meters on unmetered customers to be one of the single most effective water conservation measure water utilities can implement. Their website describes many case studies where municipalities realized savings of 20 percent and higher by metering all users.<sup>17</sup>
- c. **Build smart for the future:** Recognizing that 50 percent of the homes that will exist in 2030 have not yet been built, building codes and ordinances should be updated to support or require the use of the most water efficient technologies in both new construction and existing buildings. The water utility should collaborate with the local jurisdiction responsible for building codes to help adopt water efficient building standards for all new buildings in the community. This should include water efficient fixtures, gray water use, and water efficient landscape requirements. The water utility should structure rates to encourage water efficient buildings. For example, a reduced water rate for the first year that a water efficient home is occupied could encourage the construction of water efficient buildings.
- d. **Harvest rainwater for non-potable needs:** The water utility should work with appropriate community stakeholders to ensure all new construction (homes, commercial, industrial and institutional development, neighborhood development, etc.) incorporate standards and/or codes that require the capture and reuse of stormwater for non-potable purposes.

- e. **Retrofit all buildings:** If all U.S. households installed water-efficient fixtures and appliances, the country would save more than **8.2 billion gallons** per day<sup>18</sup>. This savings could supply all Southeast states with their entire public water supply needs and equals approximately 20 percent of the total U.S. public water supply<sup>19</sup>. The retrofit requirement could be tied to the resale of property, the establishment of a new water account, or with issuance of a construction permit. The water utility should work with the local jurisdiction to ensure buildings are retrofitted with water efficient fixtures (WaterSense toilets, faucets and showerheads). Other measures for replacement of old water inefficient fixtures are voluntary incentive programs that provide rebates or direct installation. San Antonio, Texas implemented numerous water efficiency efforts including a free toilet retrofit program that provides up to two low flow toilets per water customer, funded by a surcharge on high volume use water customers. Water use per person has declined by 25 percent since the late 1980's. They have since expanded the program to include apartments, all schools (including colleges), 1200 restaurants and several hotels<sup>20</sup>.
- f. **Landscape to minimize water waste:** On average U.S. homes consume 30 percent of their water outdoors watering lawns, plants and trees<sup>21</sup>. Water utilities should separately meter large users of irrigation water and implement a pricing structure which encourages efficiency. Other measures should be the requirement of rain and moisture sensors for irrigation systems. Because the use of native and drought-tolerant plants and more efficient irrigation can produce significant water savings, water utilities should develop incentives to encourage their use in the landscape. Water utilities should work with planning and zoning departments to encourage "grass-free" residential development to demonstrate how creative use of native plantings and mulching can provide attractive, low maintenance yards that require no irrigation. An example is the Longleaf Subdivision at Callaway Gardens, Pine Mountain Georgia.<sup>22</sup> Another example is Cary, North Carolina that was able to reduce per capita water use by 15 percent between 1996 and 2008 due mainly to an aggressive "WaterWise" landscape water efficiency program.<sup>23</sup>

**4. Watershed Approaches:** This measure requires taking a broader look at water resources in a coordinated way to reduce utility costs, improve source water quality, and enhance water supplies by increasing groundwater recharge and wetlands/floodplains restoration.

- a. **Develop Water Budgets on a Watershed Scale:** Water budgets should provide:
- an evaluation of both the assimilative capacity under critical conditions and the ecologically healthy flow for a river or stream,
  - a determination of how much water can be sustainably withdrawn and still maintain both the assimilative capacity and an ecologically healthy flow, and

- an assessment of community priorities as to how the water source should be shared to address all users' needs.

This option provides for an instream flow study which includes an assessment of the current volume and location of water withdrawn for potable and other uses, as well as, the volume, timing, quality, and location of water returned to the water body from current discharges; an assessment of the health of the water body (lake, stream, river, ground water) based on existing withdrawals and discharges flows; actions needed to maintain or restore the chemical, physical and biological integrity of the water body; and determining, through stakeholder participation, how to best achieve the needs of all the communities served by the water body. This could include options such as consolidating water systems, combining water efficiency programs, and implementing watershed based opportunities for supplementing the flow, such as ground water recharge, floodplain wetlands restoration, use of reclaimed wastewater, etc.

Note: Water efficiency “savings” would result in lower withdrawals and help to sustain healthy instream flows for ecological and community use.

- b. **Seek opportunities for wetland restoration:** Restoring and preserving floodplain and formerly floodplain wetland acres for water storage is an environmental alternative to reservoirs (rainwater banking). The release of this banked water during dry periods would increase flows for water supplies, minimum flows for point source dischargers and for aquatic habitat.
- c. **Seek opportunities for groundwater recharge and storage:** Encourage increased recharge to groundwater for rainwater banking by implementing Green Infrastructure practices such as permeable pavement on all utility construction projects. Groundwater can then be directly pumped back out for water supply or it will discharge to streams to increase flows for water supply, assimilative capacity, and the ecologically sustainable flow for a healthy river.
- d. **Reuse of treated wastewater:** Encourage the reuse of treated wastewater for nonpotable uses, such as irrigation, as an alternative to using potable water for these activities. Reusing treated wastewater has been shown to reduce potable water demand significantly in many communities and, in some communities, has been demonstrated to be a reliable and safe means to augment source water for potable water supply during drought periods. Treated wastewater is routinely reused for irrigation of golf courses, ball fields, parks, and residential/commercial lawns and landscaping. It is also used for evaporative chillers for commercial cooling systems, boiler makeup water for steam heating systems, and other commercial uses.

- e. **Graywater reuse:** Allow the reuse of Graywater for commercial applications such as hotels, dormitories, apartment buildings, and residential applications. Some states either have or are developing guidelines for graywater reuse, such as Georgia Environmental Protection Division, which is presently finalizing the Georgia Graywater Reuse Guidelines to permit graywater to be used for toilet and urinal flushing.
- f. **Ensure source water is protected:** All utilities should develop a source water protection program to ensure the water supply source is protected for quality as well as quantity purposes. Using water efficiency practices to augment water supply needs makes it even more critical to protect the quality and quantity of the community's water supply. In addition to traditional source water protection programs based on use zones and limiting development types for water quality, such a program should include protection of the quantity of the source water through aquifer recharge protection and restoration as well as restoration of wetlands as rainwater banking. Stream buffers resulting from the restoration/enhancement or preservation of wetland and floodplain areas also provide water quality protection benefits. Even if already required by state regulations, a utility should review the existing source water protection program to ensure it provides for protection of the quality of the source water as well as protection of quantity of water coming from upstream, ground water recharge, wetlands, and other sources such as green infrastructure.

Additional information, including examples where implementation of water efficiency measures by water utilities in the Southeast and other parts of the country have achieved significant water use savings, can be obtained from EPA's WaterSense program's website at [www.epa.gov/watersense/tips/index.htm](http://www.epa.gov/watersense/tips/index.htm) and the reference section of these guidelines. As an example, the American Rivers paper (Hidden Reservoir, October 2008)<sup>24</sup> applied these water efficiency principles to four water systems in the Southeast using calculations which illustrate the potential water savings from applying these water efficiency measures. EPA's WaterSense program provides a water efficiency case study publication ([http://www.epa.gov/watersense/docs/utilityconservation\\_508.pdf](http://www.epa.gov/watersense/docs/utilityconservation_508.pdf)) with examples of water efficiency practices enacted by different municipalities and the water savings realized by these communities.

**It is EPA Region 4's intent to apply these guidelines in the following manner:**

- I) Review of Environmental Impact Statements, Environmental Assessments and in both the pre application discussions for 404 Permit applications and the 404 permit applications. These documents should show that the water efficiency measures in these Guidelines have been evaluated in the proposed project's water demand projections for purpose and need and in the alternatives analysis for reservoir projects.

- II) Encourage State 401 reviewers to ensure the recommendations under the Water Efficiency Guidelines have been evaluated in analyzing alternatives to reservoirs.
- III) Encourage states to ensure stormwater permits incorporate the above recommendations to restore urban watershed stream hydrographs to (or near) the natural hydrograph that existed before urbanization. These could include:
  - 1) Incorporating wetland restoration and groundwater recharge goals or performance standards into stormwater permits to mitigate for impervious surfaces.
  - 2) Incorporating rainwater capture and reuse goals or performance standards into stormwater permits.
- IV) Encourage siting of mitigation banks in water supply watersheds to store rainwater and supplement stream flows.

These guidelines were developed to address both the increasing water demand issues and the large environmental consequences to stream and wetlands associated with reservoir construction and other water supply projects. It is expected that any entity (public or private) pursuing a water supply project will comply with these guidelines and complete the attached Water Efficiency checklist during the planning process.

## References

1. Kenny, J.F., Barber, N.L., Hutson, S.S., Linsey, K.S., Lovelace, J.K., and Maupin, M.A., 2009, *Estimated Use of Water in the United States in 2005*, U.S. Geological Survey Circular 1344, 52 p.
2. Ibid.
3. U.S. Environmental Protection Agency WaterSense website. [www.epa.gov/watersense](http://www.epa.gov/watersense).
4. Ibid.
5. Georgia Water Use and Conservation Profiles, Georgia Department of Natural Resources Environmental Protection Division and CH2MHill, March 2008.
6. California State Water Plan website. [www.waterplan.water.ca.gov](http://www.waterplan.water.ca.gov).
7. U.S. Environmental Protection Agency. *National Water Program Strategy: Response to Climate Change*. September 2008. <http://www.epa.gov/ow/climatechange/strategy.html>
8. Ibid.
9. Kenny, J.F., Barber, N.L., Hutson, S.S., Linsey, K.S., Lovelace, J.K., and Maupin, M.A., 2009, *Estimated Use of Water in the United States in 2005*, U.S. Geological Survey Circular 1344, 52 p.
10. Simpson, Vic. Charlotte-Mecklenburg Utilities. Email Communication to American Rivers. September 15, 2008.
11. Southwest Florida Water Management District. *Water Rates: Conserving Water and Protecting Revenues*, 2005.
12. Williams, Kristine. Email communication to American Rivers. September 12, 2008.
13. U.S. Environmental Protection Agency WaterSense website. [www.epa.gov/watersense](http://www.epa.gov/watersense).
14. Wayne B. Solley, Robert R. Pierce and Howard A. Perlman, *Estimated Use of Water in the United States in 1995*.
15. U.S. Environmental Protection Agency WaterSense website. [www.epa.gov/watersense](http://www.epa.gov/watersense).

16. Buchan, Ed. Email communication with American Rivers, September 18, 2008.
17. Alliance for Water Efficiency website. [www.allianceforwaterefficiency.org/metering](http://www.allianceforwaterefficiency.org/metering).
18. U.S. Environmental Protection Agency WaterSense website. [www.epa.gov/watersense](http://www.epa.gov/watersense).
19. U.S. Geological Survey. *Estimated Use of Water in the United States in 2000*.
20. U.S. Environmental Protection Agency WaterSense website. [www.epa.gov/watersense](http://www.epa.gov/watersense).
21. Wayne B. Solley, Robert R. Pierce and Howard A. Perlman. *Estimated Use of Water in the United States in 1995*.
22. Freeman, Bob, U.S. Environmental Protection Agency, Region 4, Sustainable Infrastructure and Decentralized Wastewater Systems, Personal Communication, November 12, 2009.
23. Town of Cary, North Carolina. *Water Conservation Incentive Programs*.  
[www.townofcary.org/depts/pwdept/water/waterconservation/incentiveprograms.htm](http://www.townofcary.org/depts/pwdept/water/waterconservation/incentiveprograms.htm).
24. American Rivers. *Hidden Reservoir: Why Water Efficiency is the Best Solution for the Southeast*. October 2008.

## Water Efficiency Evaluation Checklist

Sustainable Water Management Practice	Strategy	Strategy Minimums (* indicates SRF loan funds are available for these purposes)	Strategy Met (Yes/No)	Estimated Demand Reductions
(1) Better Management	(a) Develop Water Consumption Reduction Goals	Must have: reduction goals, discussion of water efficiency measures that will be implemented to meet the goals, schedule for meeting the goals, and a method to track progress. (Complete before application.)		NA
	(b) Increase public understanding	Must have a public awareness program that consists of more than just inserts in the monthly bill. (Complete before application.)		NA
	(c) Involve water users in decisions	Must have a written policy of how water users will be involved in decision-making process. This policy should include how users' comments/concerns will be addressed. (Complete before application.)		NA
(2) Pricing for Efficiency	(a) Full Price costing	Must demonstrate that the full cost of operating, maintaining and improving the system is accounted for in the rate structure. (Complete before application.)		
	(b) Conservation pricing	Must have a rate structure that encourages water conservation. (Complete before		

Sustainable Water Management Practice	Strategy	Strategy Minimums (* indicates SRF loan funds are available for these purposes)	Strategy Met (Yes/No)	Estimated Demand Reductions
		application.)		
(3) Efficient Water Use	(a) Stop leaks	Must have an active leak detection and correction program which demonstrates progress in reducing water loss. (Complete before application.) *		
	(b) Meter all water users	Must have a program for metering individual users such as multi-family residential units and individual commercial operations. (Complete during process)*		
	(c) Build smart for the future	Must have requirements for new buildings and new landscapes to be water efficient (WaterSense fixtures and irrigation systems). (complete during process) If above is not feasible, must have a strong incentive program (such as rate reductions) to encourage new buildings and new landscapes are water efficient (WaterSense fixtures and irrigation systems). (Complete during process)*		
	(d) Harvest rainwater for nonpotable use	Must have strong incentives for rainwater harvesting for new and existing facilities. (Complete during process)*		

Sustainable Water Management Practice	Strategy	Strategy Minimums (* indicates SRF loan funds are available for these purposes)	Strategy Met (Yes/No)	Estimated Demand Reductions
	(e) Retrofit all buildings	Should have at least one program which provides ordinance or incentives for retrofits of existing buildings. (complete during process)*		
	(f) Landscape to minimize water waste	Should have at least one program which provides incentives for minimizing irrigation needs for existing landscapes. (Complete during process)*		
(4) Watershed Approaches	(a) Develop Water Budget/Instream Flow Study	Should conduct an instream flow study for any water body proposed for reservoir impacts. (Complete before application.)		NA
	(b) Seek opportunities for wetlands restoration			NA
	(c) Seek opportunities for ground water recharge			NA
	(d) Evaluate opportunities for use of treated	Should provide information on the availability of reclaimed wastewater, the cost-benefit of using treated wastewater in lieu of potable water for appropriate uses such as irrigation and		

Sustainable Water Management Practice	Strategy	Strategy Minimums (* indicates SRF loan funds are available for these purposes)	Strategy Met (Yes/No)	Estimated Demand Reductions
	wastewater	recharge where it is available, and any area-wide studies on the potential for developing reclaimed wastewater. If the water utility also owns and operates the wastewater utility, an area-wide study on the potential use should be initiated.		
	(e) Evaluate opportunities for use of treated graywater	Should provide information on any state restrictions to reuse of graywater. If no statewide restrictions exist, local barriers to graywater reuse should be investigated and guidelines should be developed to allow reuse of treated graywater in appropriate situations.		
	(f) Ensure the source water is protected	Should have a source water protection plan in place. An additional plan should be developed for any sources under development		NA
Summary	Total estimated demand reduction.	Should provide an accounting of the estimated demand reduction with and without the implementation of the WE measures.		